Appendix R
Preliminary Site Investigation

Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on
Preliminary Site Investigation (Contamination)

Powerhouse Ultimo Renewal
Powerhouse Ultimo, 500 Harris Street, Ultimo

Prepared for
Department of Enterprise, Investment and Trade

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

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Executive Summary

This report presents the results of a Preliminary Site Investigation (Contamination) undertaken for the Powerhouse Ultimo Renewal project at the Powerhouse Ultimo, 500 Harris Street, Ultimo. The purpose of the investigation was to assess the contamination status of the site with respect to proposed land uses.

This investigation included soil sampling from 11 designated sampling points (Boreholes 101 to 109 and Boreholes 201 and 202). Boreholes 104 and 105 were designated as groundwater monitoring wells and were subject to one round of groundwater sampling. The investigation is considered to be preliminary in nature. Drawing 1, Appendix A shows the borehole locations. Fill was observed to be up to 5 m in depth, comprise various soil types, and commonly containing anthropogenic materials.

Soil samples were selected for analysis for potential contaminants including eight metals; total recoverable hydrocarbons (TRH); TRH with silica gel clean-up; benzene, toluene, ethylbenzene and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAH); organochlorine pesticides (OCP); organophosphorus pesticides (OPP); polychlorinated biphenyls (PCB), phenols; volatile organic compounds (VOC); and asbestos. Groundwater samples from each groundwater monitoring well were analysed for potential contaminants including eight metals, TRH, BTEX, PAH, OCP, OPP, PCB, total phenols, ammonia and VOC.

The majority of the analytes were either not detected or found at low concentrations in the soil and groundwater samples analysed. Elevated concentrations of PAH, TRH, metals and OCP (above adopted assessment criteria) were identified in fill samples. In addition, an elevated concentration of ammonia in groundwater (above the adopted assessment criteria) was encountered at one sample location.

Overall, results indicate that remediation or management of contamination will be required for site development although the extent of remediation / management will likely depend on the layout of future site uses as well as the results of additional investigation.

The following is recommended for the Stage 2 detailed development application:

- A detailed site investigation (including soil and groundwater sampling).

The results of the detailed site investigation would be used to determine remediation or management requirements to address site contamination. On this basis, it is considered that the site can be made suitable for the proposed Powerhouse Ultimo Renewal development.

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1. Introduction

This report presents the results of a Preliminary Site Investigation (PSI) undertaken for the Powerhouse Ultimo Renewal project at the Powerhouse Ultimo, 500 Harris Street, Ultimo. This report was commissioned by the Department of Enterprise, Investment and Trade (ref: PROC 8007294 - 16) and was undertaken in accordance with Douglas Partners Pty Ltd (DP) proposal dated 23 February 2022 (ref: 86874.02.P.001.Rev1).

This report has been prepared to support a State Significant Development (SSD) Development Application (DA) for alterations and additions to Powerhouse Ultimo. It is understood that delivery of the Powerhouse Ultimo Renewal project will occur in stages, including a concept DA (Stage 1), an architectural design competition, and a detailed DA (Stage 2). Concept DA approval is being sought.

This report has been prepared to address item 18 of Planning Secretary's Environmental Assessment Requirements for the Powerhouse Ultimo Renewal project (application number SSD-32927319, issued on 18 January 2022), which states that *In accordance with SEPP 55, assess and quantify any soil and groundwater contamination and demonstrate that the site is suitable (or will be suitable, after remediation) for the development.* This report is the PSI listed as "documentation" under Condition 18.

The purpose of the PSI was to assess the contamination status of the site with respect to proposed land uses from the available soil and groundwater sampling (on the basis that untested parts of the site will be investigated for the Stage 2 detailed DA). The investigation was undertaken in conjunction with a geotechnical investigation by DP (ref: 86874.03.R.001.Rev3).

2. Scope of Works

The scope of works for the investigation was as follows:

- Review DP, *Desktop Study for Contamination, Powerhouse Museum Study of Alternate Uses, 500 Harris Street, Ultimo,* Prepared for CBRE Pty Ltd, September 2016 (ref: 85601.00.R.002.Rev0) [DP, 2016];
- Review Powerhouse Ultimo plans and Dial-Before-You-Dig plans to determine possible sampling locations;
- Set out a total of 11 borehole locations and scan each location for buried services using electromagnetic scanners;
- Collect soil samples at regular depths from each borehole drilled using a drilling rig and / or hand tools;
- Install groundwater monitoring wells at two boreholes;

- Screen all samples for volatile chemicals using a photoionisation detector (PID);
- Develop each groundwater monitoring well;
- Collect groundwater samples from each monitoring well using low flow techniques;
- Analysis of selected soil samples at a NATA accredited laboratory for various combinations of the following:
  - Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc);
  - Total recoverable hydrocarbons (TRH);
  - TRH with silica gel clean-up;
  - Benzene, toluene, ethylbenzene and xylenes (BTEX);
  - Polycyclic aromatic hydrocarbons (PAH);
  - Organochlorine pesticides (OCP);
  - Organophosphorus pesticides (OPP);
  - Polychlorinated biphenyls (PCB);
  - Phenols (total);
  - Volatile organic compounds (VOC);
  - Asbestos (40 g soil sample);
  - pH; and
  - Cation exchange capacity (CEC).
- Analysis of two groundwater samples at a NATA accredited laboratory for metals, TRH, BTEX, PAH, OCP, OPP, PCB, total phenols, ammonia, VOC and hardness;
- Analysis of QA / QC samples including trip spikes, trip blanks and inter-laboratory replicate samples and intra-laboratory samples; and
- Preparation of this report.

3. Site Identification and Description

The site is defined by the following land parcels that are owned by The Trustees of the Museum of Applied Arts and Sciences:

- Lot 1, Deposited Plan 770031;
- Lot 1, Deposited Plan 781732;
- Lots 1 and 3, Deposited Plan 631345;
- Lot 3, Deposited Plan 216854; and
- Lot 37, Deposited Plan 822345.

Powerhouse Ultimo has a street address of 500 Harris Street, Ultimo. It is noted, however, that Lot 1 in Deposited Plan 770031 (the former post office building) has street address 494 Harris Street, Ultimo according to SIX Maps (NSW Government Spatial Services). Drawing 1, Appendix A shows the site location and approximate site boundary.

The site covers approximately 2.45 ha and adjoins William Henry Street (and Lot 1 Deposited Plan 801428) to the north; Harris Street, Macarthur Street and Omnibus Lane to the west, and Mary Ann Street to the south. The surrounding area is used for a mix of residential and commercial purposes. A light rail line and pedestrian access adjoins the eastern site boundary. The Ian Thorpe Aquatic Centre is present on the northern side of William Henry Street.

The Powerhouse Ultimo site comprises the following:

- The Harwood Building which is a large standalone structure at the south of the site that was formerly the Ultimo Tram Depot. The building has a basement, ground level and mezzanine. The basement is mainly used for storage of museum items. The building also has workshops, a laboratory and associated offices and amenities;
- Interlinked buildings at the north which include the Boiler House, Engine House, Turbine House, Switch House, Wran Building and North Annex. The buildings have seven levels (according to drawings provided by the client) and are used for museum exhibits and associated offices, education facilities and amenities. A courtyard is present at the north-west corner of the site (to the north of the Boiler House);
- The former Post Office which is a standalone building on the north-west corner of the site. A courtyard is present between the former Post Office and the Wran Building;
- The Grace Brothers Courtyard and Kiosk (café) at the east of the site;
- A gatehouse and vehicular access from Macarthur Street; and
- Parking areas located to the east and south of the Harwood Building.

It is understood that no substantive works or changes in use are proposed to the Harwood building located between Macarthur Street and Mary Ann Street.

4. Summary of Previous Contamination Report

DP (2016) presents a desktop study for contamination which was undertaken to inform a study of future alternative uses for the site. Findings and identified potential sources of contamination presented in DP (2016) are summarised in the following subsections.

4.1 Regional Geology, Hydrogeology and Soils

The Sydney 1:100 000 Geology Sheet indicates that the site is underlain by Hawkesbury Sandstone to the west and stream alluvial and estuarine sediment to the east as shown on Figure 1. Hawkesbury sandstone comprises medium to course grained quartz sandstone, very minor shale and laminite lenses. Stream alluvial and estuarine sediment comprises silty to peaty quartz sand, silt, and clay with ferruginous and humic cementation in places and common shell layers.

Figure 1: Geology Sheet

According to the Sydney 1:100 000 Soils Landscape Sheet, the site is located within the Gymea soil landscape where natural soils are formed from the erosion of rock.

The land surrounding the site has gentle slopes down to the east and north-east. Groundwater flow at the site is anticipated to be towards the north-east, in the general direction of Darling Harbour. Stormwater at the site is expected to enter the local stormwater system.

A search of the NSW Office of Water groundwater database revealed that there are no registered groundwater bores within 400 m of the site.

Based on published 1:25 000 Acid Sulfate Soil Risk mapping data (1994-1998), the site is an area of no known occurrences of acid sulfate soils. As shown on Figure 2, Disturbed Terrain is located approximately 40 m to the east of the site where the depth to acid sulfate soils is unknown and soil investigations are required to assess for acid sulfate soils.

Figure 2: Acid Sulfate Soil Risk Mapping

According to the Sydney Local Environment Plan 2012, Acid Sulfate Soils Map, the site is located in a 'Class 5' area. Acid sulfate soils are not typically found in Class 5 areas but are within 500 m of lands associated with a risk of acid sulfate soils (Class 1, 2, 3 or 4 areas). Works in a Class 5 area that are likely to lower the water table below 1 m AHD on adjacent Class 1, 2, 3 or 4 land will trigger the requirement for assessment and may require management.

4.2 Site History Information

4.2.1 Historical Aerial Photographs

Aerial photographs from 1930, 1943, 1955, 1970, 1982, 1991 and 2014 were reviewed to determine possible previous uses of the site and surrounding land.

The 1930 aerial photograph showed the power station at the northern part of the site (including the Boiler House, Engine House, Turbine House and Switch House) with two stacks at the southern part of the Boiler House and a separate stack at the north. The Post Office building was present at the western-most corner of the site. The tram depot building (with a saw-tooth roof) was present at the south of the site. An industrial / commercial building was present to the south of the Post Office building. Some of the eastern part of the site (adjoining Harris Street) and the southern end of the site appeared to have been undeveloped.

The 1943 aerial photograph showed that a building appeared to have been constructed to the south of the Boiler House since 1930. A commercial / industrial building had also been constructed at the eastern part of the site (at the corner of Harris Street and Macarthur Street). The land to the north of this building appears to have been used for a yard. A small structure was also present at the south-eastern corner of the site.

The 1970 aerial photograph showed that commercial / industrial buildings had been constructed at the western part of the site since 1955 (in the area that was previously used as a yard). The stack at the north of the site appeared to have been demolished for the realignment of the roadway to the north.

The 1991 aerial photograph showed that the site had been subject to significant change since 1982. New roofing was present on the Boiler House, Engine House, Turbine House and Switch House. The building to the south of the Boiler House had been demolished and replaced by a courtyard, walkways and small structures. Buildings at the eastern part of the site had been replaced by the Wran Building and the Forecourt.

The 2014 aerial photograph showed that the Kiosk had been constructed at the eastern part of the site since 1994.

4.2.2 Historical Title Deeds

A historical title deed search was conducted in order to provide an indication of possible previous site uses.

Between 1898 and 1964, Lot 3 Deposited Plan 216854 was owned by government entities (Minister for Public Works, Commissioner for Government Transport and Commissioner for Government Transport) presumably associated with the tramway and tram depot. The Trustees of the Museum of Applied Arts and Sciences were the registered owners from 1964.

Between 1924 and 1978, Lot 1 Deposited Plan 781732 was owned by commercial or industrial companies including Sydney Glass Company Limited, Hermann Haege Pty Limited, Carmichael Paper Agencies Pty Limited. The Trustees of the Museum of Applied Arts and Sciences were the registered owners from 1988.

Between 1923 and 1938, the majority of Lot 3 Deposited Plan 631345 was owned by Maurice Henry Newstead (Merchant). The majority of this Lot was then owned by Maize Products Proprietary Limited to 1967 and then Manassen Investments Pty Limited to 1980. The Trustees of the Museum of Applied Arts and Sciences were the registered owners from 1988.

Sydney Glass Company Limited owned the south-western part of Lot 1 Deposited Plan 631345 between 1924 and 1948, before being owned by Commissioner for Railways 1948 to 1983. From circa 1900 to 1983, the majority of Lot 1 Deposited Plan 631345 was owned by government entities (Minister for Public Works, Chief Commissioner for Railways and Tramways, Electricity Commission of New South Wales, Commissioner for Railways) presumably associated with power generation and the tramway. The Trustees of the Museum of Applied Arts and Sciences were the registered owners from 1988.

4.2.3 Records for Storage of Hazardous Chemicals

A search of the SafeWork NSW database for the storage of hazardous chemicals at the site was requested. The search returned documents for record number 35/034632.

According to a licence amendment application to keep dangerous goods at 500 Harris Street, Ultimo, dated 20 June 2002, there were four dangerous goods storage depots including a roofed store (Depot 1), and three flammable liquids cabinets (Depots 2 to 4). A list of 14 other storage areas (identified as A, B, C, D, E, F, H, I, J, L, M, O, P and Q) was also provided.

According to the plan attached to the application, the roofed store (Depot 1) was located at the eastern side of the Harwood Building and was used to store petroleum spirit (typcally100 L), paint or paint thinners (typically 100 L), kerosene (typically 200 L), turpentine substitute (typically 160 L), toluene (typically 25 L), ethanol (typically 20 L) and nitrocellulose solution (typically 200 L). Depot 2 was located at the western part of the Boiler House basement and this cabinet was used to store paint (typically 160 L) and kerosene (typically 60 L). Depot 3 and 4 were located at the northern part of the Harwood Building and these cabinets were used to store paint (typically 160 L at each Depot), kerosene (typically 60 L at Depot 3) and turpentine substitute (typically 60 L at Depot 4).

Other storage areas identified at the Harwood Building (according to the plan attached to the application) were listed as:

- Flammable liquid cabinets (A, B, C, E, F, I);
- Cabinet (H);
- Roofed store (D);
- Gas cylinder store (J, L, M); and
- Roofed store (O).

The roofed store (O) was shown to be next to Depot 1 and was used for the storage of 7500 L of combustible oil.

Other storage areas identified at the Boiler House basement were listed as:

- Flammable liquid cabinet (P); and
- Roofed store (Q).

4.2.4 Council Records

Selected documents and plans relating to 500 Harris Street, Ultimo were retrieved by Council for review. Relevant site history information obtained from the review was summarised as follows:

- According to a document stamped May 1980, it was noted that for 64 years, the Power House had generated electricity for the tramway and provided power for domestic and industrial purposes. The Power House had been vacant since 1963;
- An Interim Development Application, dated May 1981, was for major alterations and additions to the Ultimo Tram Depot and Power House Building;

- A Development Application, dated April 1987, was for major alterations and additions to the Ultimo Tram Depot and Power House Building; and
- A Draft Environmental Impact Statement (associated with the above-listed Development Application) for the northern part of the site concluded that no significant negative impacts on the local environment were associated with the proposed Power House Museum. The Darling Harbour Goods Yard and Darling Harbour Goods Railway were noted to be present at neighbouring land to the east of the site at that time.

4.2.5 Previous Reports

According to Government Architect's Office (NSW), *Powerhouse: a study of the relocation of the Museum of Applied Arts and Sciences, in a development of the Ultimo Power Station and the Ultimo Tramway Depot, Sydney,* 1978:

- Site drilling was carried out to establish the nature of the foundation material and the level of hard stratum. Sandstone was located at an average of 4 m below the ground level on the region of the Boiler House, Turbine Hall and Coal Store Bunker. On the Tram Depot site, an investigation carried out in 1977 indicated hard stratum at an average 'level' of 3 m;
- The Ultimo Power Station was the original source of electricity for the Sydney tramway system. The original building dates from 1899, with later additions in 1916. A major reconstruction begun in 1927 and was completed in 1931. The station ceased operation in circa 1960 and was damaged during subsequent demolition, salvage operations, decay and vandalism. The power station consisted primarily of two adjacent halls, each approximately 85 m long by 25 m wide. The western hall (Turbine Hall) contained the engine room and turbine room. The eastern hall was originally the Boilerhouse and had one major floor positioned level with the old railway track diversion which ran into the building from the Darling Harbour Goods Yard lines. Towards the southern end of the Boilerhouse were two 5 m diameter masonry stacks which were then recently demolished to approximately roof level. Running down the centre of the Boilerhouse for almost the entire length of the hall were large steel coalhoppers. The main floor level was penetrated in a number of areas to a deep basement level below. An office annex was located at the northern end of the western hall. A switchhouse, approximately 60 m long by 20 m wide, was located at the southern end of the western wall;
- Between the power station and Harris Street a number of one and two storey commercial buildings, a petrol service station and the Ultimo Post Office were located;
- The Ultimo Tram Depot was a large single-level building for tramcar storage, constructed in 1910. The Small brick amenity areas were also present at the Darling Harbour railway boundary with a two-storey brick building on the Mary Ann Street frontage; and
- At 496-502 Harris Street (presumably the western part of the site, now part of 500 Harris Street), there was an office and warehouse building of three levels, including first floor offices, a ground floor warehouse area and basement. Adjoining this area were various older-style warehouses and workshops. The lease to Ampol at the southern section of the property was to expire in February 1979.

According to Architectural Projects Pty Ltd, *Conservation Management Plan for The Powerhouse Museum*, 2002:

- The location of the Powerhouse near the head of Darling Harbour gave it an adequate supply of salt water for condensers and proximity to the goods yards for coal supply and ash disposal;
- In 1980, the NSW government decided to develop the Power House and Tram Depot into the Museum. The Stage 1 work for the project saw the rebuilding and refurbishment of the Tram Depot. The Harwood building became a purpose-built museum structure. Photographic evidence indicated that nothing remained of the lines or tramway trenches at the Harwood building, although it was noted that a tiny section of track could be viewed from relatively inaccessible service areas;
- Stage 2 works included refurbishment of the power station and construction of The Wran Building (The Wran Building) which was opened in 1988; and
- The former Ultimo Post Office, built by 1901 was adapted to house a child care centre (at the time of preparing the conservation management plan).

Hibbs & Associates Pty Ltd, *Powerhouse Museum Asbestos Survey*, September 2014, provided a register and qualitative risk assessment of building materials containing asbestos. The survey did not include an assessment of potential contamination of soil from asbestos. It is noted that no friable asbestos was encountered during the inspection and no asbestos material (bonded asbestos) required short to medium term remedial works.

4.3 Site Walkover Observations

The site was subject to a walkover by a DP Environmental Engineer on 16 August 2016. The walkover was limited to external areas and ground and basement level areas that were shown by museum maintenance staff at that time. Not all ground and basement level areas were accessed. Noteworthy observations are listed as follows:

- The remnant stack at the northern end of the site could be observed from Pier Street (above). Litter and (probably) soil were observed to partially fill the remnant stack;
- The pedestrian access way at the eastern site boundary had been improved and a remnant railway track was observed to align with the Kiosk;
- A sandstone cutting was observed at the exterior to a fire passage at the western side of Level 3 of the Wran Building;
- Brick structures, similar in appearance to fireplaces, were observed at lowest part of the north-east corner of the Boiler House. These may have been used for the collection of ash from chutes above. The base of these structures appeared to be concrete;
- Two stacks were present at the southern end of the Boiler House. The inside of the easternmost stack appeared to have a concrete base. The inside of the other stack was not observed;
- The basement (Level 1) of the former power station housed boilers, pumps and a series of plant rooms. This area appeared to be well kept with concrete floors generally absent of staining. Chemicals were kept in cabinets. Water was observed in open drains. A room was used for the storage of chlorine and was next to the seawater room which had a grid mesh floor;
- Soil and rubble were observed at the southern end of the Harwood building basement. A possible remnant tram track was also observed amongst the soil and rubble;

- Glass pipes (amongst other pipes) were observed at the perimeter of the Harwood building basement, presumably to drain wastewater (potentially containing corrosives) from the laboratory (to a location unknown to the maintenance worker at the time); and
- Roots from trees at the courtyard next to the Kiosk appeared to be causing damage to the courtyard surface. It was understood that a concrete slab exists beneath the soil in which the trees were planted.

It was understood at the time of the inspection that there are no fuel storage tanks at the site.

4.4 Potential Sources of Contamination and Potential Contaminants

From a review of site information and the site walkover, identified potential sources of contamination and potential contaminants were summarised as in Table 1.

Table 1: Potential Sources of Contamination and Potential Contaminants

Potential Source of Contamination	Potential Contaminants	Comments
Coal ash from the previous power station operation.	Ash can contain metals and PAH.	Most of the ash is likely to have been removed and disposed off-site during the operation of the power station, however, some ash may have been used as filling or been placed (stockpiled) on surface soils during the power station's operation.
Former tram depot and railway use.	Total petroleum hydrocarbons (TPH), PAH, metals, phenolics (creosote), nitrates, ammonia and asbestos.	Asbestos may have been used in brake pads.
(Former) Switch House and other areas that housed electrical equipment.	PCB.	PCB are associated with transformers and capacitors.
Previous demolition of buildings.	Hazardous building materials including asbestos, lead and PCB.	Significant demolition occurred prior to the development of the museum, particularly at the western part of the site. Surface soils may have been impacted during demolition.
Imported contaminated filling to form the site.	Various possible such as TPH, PAH, metals, phenols, pesticides, asbestos and PCB.	The sandstone cutting and existing basement constructions indicated significant filling across much of the site is unlikely. Filling was considered more likely to be present at eastern parts of the site (where sandstone cuttings were not observed).

Potential Source of Contamination	Potential Contaminants	Comments
Previous petrol service station	TPH, VOC, lead, PAH and phenols.	The exact location of previous service station (present in 1978) is not known, but was adjacent Harris Street, to the south of the Post Office. A property at this part of the site was leased to Ampol. The lease was probably terminated in 1979. Potential TPH and VOC contamination may have dispersed since the service station ceased operation.
Previous general industrial use and workshops	Various possible such as TPH, VOC and metals.	Apart from the previous petrol service station, the western part of the site was previously used for (unknown) industrial purposes and workshops.
Chemicals including oils used by the museum (particularly at the Harwood Building which has workshops and a laboratory)	VOC and TPH	Contamination from chemicals and oils used in current operations is considered unlikely given that the museum appears to be well kept and maintained.

5. Preliminary Conceptual Site Model

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

5.1 Potential Contamination Sources

Potential contamination sources at the site are listed in Section 4.4. No obvious potential off-site sources of contamination were identified in DP (2016).

5.2 Potential Receptors

Given that the proposed development layout is yet to be confirmed, potential future receptors to contamination cannot be clearly established, however, in general, potential receptors of contamination for the proposed development may include:

- (R1) Future site users (guests, workers and visitors);
- (R2) Construction workers (for the proposed development);
- (R3) Future maintenance workers (post-construction);

- (R4) Adjacent land users (including residents, pedestrians, workers and visitors);
- (R5) Groundwater;
- (R6) Surface water body (Darling Harbour);
- (R7) Terrestrial ecosystem; and
- (R8) In ground building structures.

5.3 Potential Pathways

Potential pathways for contamination to impact receptors include:

- (P1) Ingestion and dermal contact;
- (P2) Inhalation of dust;
- (P3) Inhalation of vapours;
- (P4) Surface water runoff (particularly during construction);
- (P5) Leaching of contaminants and vertical migration into groundwater;
- (P6) Lateral migration of groundwater;
- (P7) Contact of contaminated ground with terrestrial organism; and
- (P8) Contact of contaminated ground within ground structures.

5.4 Preliminary Conceptual Site Model

A ‘source - pathway - receptor’ approach has been used to assess the potential risks of harm being caused to human or environmental receptors from contamination sources via exposure pathways (complete pathways). The possible pathways between the above listed sources and receptors are provided in Table 2.

Table 2: Preliminary Conceptual Site Model

Source	Transport Pathway	Receptor
Contaminated ground from previous and current site use (see Table 1, Section 4.4 for list of potential sources)	P1 - Ingestion and dermal contact P2 - Inhalation of dust P3 - Inhalation of vapours	R1 - Future site users R2 - Construction workers R3 - Future maintenance workers
	P2 - Inhalation of dust P3 - Inhalation of vapours	R4 - Adjacent site users
	P5 - Leaching of contaminants and vertical migration into groundwater	R5 - Groundwater
	P4 - Surface water runoff P6 - Lateral migration of groundwater	R6 - Surface water body
	P7 - Contact of contaminated ground with terrestrial organisms	R7 - Terrestrial ecosystem
	P8 - Contact of contaminated ground within ground structures	R8 - In ground building structures

6. Field Work and QA / QC

6.1 Sample Locations and Rationale

The site covers approximately 2.45 ha. According to NSW EPA, *Sampling Design Guidelines,* 1995, a minimum of 35 systematic sampling points is recommended to characterise a site of this size. This investigation included 11 designated sampling points and, therefore, this investigation is considered to be preliminary in nature. Positioning of boreholes was limited by existing structures and site operations (i.e., for the museum). Boreholes 101 to 106, 201 and 202 were positioned for both geotechnical and contamination assessment purposes to provide coverage of external areas that were accessible to a drilling rig. To provide some further site coverage, Borehole 107 was positioned at the external area at the northern corner of the site (which was not accessible to a drilling rig) and Boreholes 108 and 109 were positioned in the basement of the Harwood Building.

Boreholes 104 and 105 were designated as groundwater monitoring wells as these were drilled to depths at which groundwater was likely to be encountered on the lower side of the site.

6.2 Soil Sampling Procedures

Soil sampling was undertaken on 22, 23 and 28 October 2019 (Boreholes 101 to 109); and 15 and 26 November 2019 (Boreholes 201 and 202).

Boreholes 101 to 106 and 202 were drilled using Bobcat-mounted drill rig and Borehole 201 was drilled using a truck-mounted drill rig. Soil samples of the fill were collected from the solid flight auger at regular depth intervals (at least one soil sample per metre depth). At least one sample of natural soil was collected from the solid flight auger where natural soil was encountered.

Boreholes 107, 108 and 109 were drilled using hand tools. Soil samples of fill were collected from the hand auger where fill was encountered.

All sampling data was recorded on DP's borehole logs provided in Appendix B which also has notes about this report. The general sampling procedure adopted for the collection of soil samples for chemical analysis was:

- Collect soil samples directly from the solid flight auger or hand auger using disposable gloves;
- Transfer samples into laboratory-prepared glass jars with Teflon-lined lids, filled to minimise the headspace within the sample jar, and capping immediately to minimise the loss of volatiles;
- Label sample containers with individual and unique identification, including project number, sample location and sample depth; and
- Place the glass jars into a cooled, insulated and sealed container for transport to the laboratory.

Replicate samples were collected in zip-lock bags for screening of VOC using a calibrated PID and asbestos analysis. Samples were also collected in zip-lock bags for asbestos analysis.

6.3 Groundwater Monitoring Well Installation and Development

Groundwater monitoring well construction details are provided on the borehole logs in Appendix B.

The wells were constructed of 50 mm diameter acid washed, Class 18, PVC casing and machine slotted well screen intervals. Joints were screw threaded, thereby avoiding the use of glues and solvents which may contaminate the groundwater. The wells were completed with a gravel pack extending above the well screen and then a bentonite plug. A Gatic cover and concrete was used at the ground surface to complete the installation.

Each groundwater monitoring well was developed (on 13 November 2019) by using a submersible pump. Prior to groundwater well development, an interface dip-meter was used to measure the groundwater level and check for light non-aqueous phase liquids (LNAPL).

6.4 Groundwater Sampling

Prior to groundwater sample collection, an interface dip-meter was used to measure the groundwater level and check for light non-aqueous phase liquids (LNAPL).

Groundwater sampling at Borehole 104 and 105 was undertaken (on 15 November 2019) using a low-flow geo-pump (peristaltic pump) and disposable tubing, following stabilisation (or near stabilisation) of field parameters. Field parameters were obtained using a calibrated water quality meter with probes placed inside a flow-through cell. The field parameters included temperature, dissolved oxygen (DO), electrical conductivity (EC), pH, oxidation reduction potential (redox) and turbidity. Disposable sampling

equipment (tubing) was used between collection of samples to avoid the need for decontamination. Samples were collected from the upper part of the water column in each well.

Samples were collected in laboratory prepared bottles and vials. The groundwater samples collected for metals testing were filtered in the field through a 45 µm membrane filter into nitric acid preserved bottles. Sample containers were labelled with individual and unique identification, including project number and sample number. Samples were placed in cooled, insulated and sealed containers for transport to the laboratory.

Groundwater field sheets were used to record groundwater depths, sample depths, field parameters, observations and samples collected. The groundwater field sheets are provided in Appendix C.

6.5 Quality Assurance and Quality Control

The field QC procedures for sampling were undertaken as prescribed in DP's *Field Procedures Manual* and included the use of trip spikes and trip blanks as well as the collection of blind replicate samples. The results of field QA / QC procedures as well as a discussion of data quality objectives (DQO) and data quality indicators (DQI) for the assessment are provided in Appendix D.

The analytical laboratories, accredited by NATA, are required to conduct in-house QA / QC procedures. These are normally incorporated into every analytical run and include reagent blanks, spike recovery, surrogate recovery and duplicate samples. These results are included in the laboratory certificates in Appendix E and results are discussed in Appendix D.

7. Site Assessment Criteria

7.1 Soil

The site assessment criteria applied to soils are informed by the preliminary CSM which identified receptors to potential contamination at the site. Analytical results were assessed (as a Tier 1 assessment) against the site assessment criteria comprising the investigation levels, screening levels and management limits of Schedule B1 of the National Environment Protection Council, *National Environment Protection (Assessment of Site Contamination) Measure* 1999, as amended 2013 (NEPC, 2013). The investigation levels, screening levels and management limits are applicable to generic land use settings and include consideration of, where relevant, the soil type and the depth of contamination. The investigation levels, screening levels and management limits are not intended to be used as clean up levels. Rather, they establish concentrations above which further appropriate investigation (e.g., Tier 2 assessment) should be undertaken. They are intentionally conservative and are based on a reasonable worst-case scenario.

The site assessment criteria for soil adopted for this investigation are listed in the following sub-sections.

7.1.1 Health Investigation Levels

Health investigation levels (HIL) are applicable to assessing health risk arising via all relevant pathways of exposure for a range of metals and organic substances. The HIL are generic to all soil types and apply generally to a depth of 3 m below the surface. From a contamination assessment perspective, 'information and education facilities' are considered to be commercial usage. However, as the project is at the conceptual stage, for the purpose of this assessment we have assumed a potential partial residential type land use (such as accommodation) incorporated into the Powerhouse Ultimo Renewal project. Therefore, HIL B (applicable to a residential land use scenario with minimal opportunities for soil access) and HIL D (applicable to a commercial or industrial land use scenario) have been adopted as site assessment criteria. The adopted HIL are shown in Table 3.

Table 3: Health Investigation Levels

Contaminant		HIL B Residential (mg/kg)	HIL D Commercial/Industrial (mg/kg)
Metals	Arsenic	500	3000
	Cadmium	150	900
	Chromium (VI)	500	3600
	Copper	30 000	240 000
	Lead	1200	1 500
	Mercury (inorganic)	120	80
	Nickel	1200	6 000
	Zinc	60 000	400 000
PAH	Benzo(a)pyrene TEQ[1]	4	40
	Total PAH	400	4000
Phenol	Pentachlorophenol	130	660
	Phenol	45 000	240 000
	Cresols	4 700	25 000
OCP	Aldrin + Dieldrin	10	45
	Chlordane	90	530
	DDT+DDE+DDD	600	3600
	Endosulfan	400	2000
	Endrin	20	100
	Heptachlor	10	50
	HCB	15	80
	Methoxychlor	500	2500
OPP	Chlorpyrifos	340	2000
Other Organics	PCB[2]	1	7

Notes: [1] sum of carcinogenic PAH

[2] non-dioxin-like PCB only

7.1.2 Health Screening Levels for Vapour Intrusion

Health screening levels (HSL) for vapour intrusion are applicable to selected petroleum compounds and fractions to assess the risk to human health via the inhalation pathway. HSL have been developed for different land uses, soil types and depths to contamination.

The proposed ground floor or basement use of the proposed development is likely to be for non-residential purposes, and, therefore, HSL D (for a commercial or industrial land use scenario) have been adopted as site assessment criteria. Given that ground-level residential use has not been ruled out at this stage, HSL B (for a residential land use scenario with minimal opportunities for soil access) have also been adopted as site assessment criteria (for comparative purposes). The adopted HSL shown in Table 4 are for contamination at a depth of 0 m to <1 m, and are the most conservative for sand, silt or clay soils given that various soil types are present at the site. Less conservative HSL may be appropriate depending on the contamination depth and actual soil type.

Table 4: Health Screening Levels for Vapour Intrusion

Contaminant		HSL B Residential (mg/kg)	HSL D Commercial /Industrial (mg/kg)
PAH	Naphthalene	3	NL
TRH	TPH C_6-C_{10} less BTEX	40	250
	TPH >C_{10}-C_{16} less Naphthalene	110	NL
BTEX	Benzene	0.5	3
	Toluene	160	NL
	Ethylbenzene	55	NL
	Xylenes	40	230

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

7.1.3 Ecological Investigation Levels

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

The EIL is calculated using the following formula:

EIL = ABC + ACL,

The ABC is determined through direct measurement at an appropriate reference site 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 soil characteristics.

An *Interactive (Excel) Calculation Spreadsheet* may be used for calculating site-specific EIL and has been provided in the ASC NEPM Toolbox available on the NEPC website.

The adopted EIL, derived from the *Interactive (Excel) Calculation Spreadsheet* are shown in Table 5.

The following input data and assumptions have been used to determine the adopted EIL:

- Given that all elements of the proposed development are yet to be confirmed, adopted EIL for urban residential and commercial / industrial land use scenarios is have been adopted;
- Given the site history, the contamination is considered as “aged” (>2 years);
- NSW is the state;
- The traffic volume is high;
- A pH of 9 has been use as an input value. This is the average of the three pH values obtained from testing of fill (see laboratory certificates 229301 and 229472, Appendix E, for test results);
- A CEC of 22 meq/100g has been adopted. This is the rounded average of the three CEC values obtained from testing of fill (see laboratory certificates 229301 and 229472, Appendix E, for test results);
- An organic carbon content of 1% has been adopted as a default value in the absence of site-specific data;
- An ABC of 160 mg/kg for lead has been adopted from Table 67 of Schedule B5c of NEPC (2013); and
- A clay content of 1% has been used as a conservative value in the absence of site-specific test results.

Table 5: Ecological Investigation Levels

Contaminant		EIL Urban Residential (mg/kg)	EIL Commercial / Industrial (mg/kg)
Metals	Arsenic	100	160
	Copper	240	340
	Nickel	290	490
	Chromium III	200	320
	Lead	1300	2000
	Zinc	870	1300
PAH	Naphthalene	170	370
OCP	DDT	180	640

It is noted that EIL do not apply at areas of the site that will have limited ecological value under the proposed development (such as at basements, building footprints, etc.).

7.1.4 Ecological Screening Levels

Ecological screening levels (ESL) are used to assess the risk of selected hydrocarbon compounds to terrestrial ecosystems. ESL generally apply to the top 2 m of the soil profile as for EIL. ESL have been derived in NEPC (2013) for TPH fractions as well as BTEX and benzo(a)pyrene. Given that all elements of the proposed development are yet to be confirmed, adopted ESL for urban residential and commercial / industrial land use scenarios is have been adopted. The ESL shown in Table 6 are the more conservative for coarse and fine texture soils given that various soil types are present at the site.

Table 6: Ecological Screening Levels

Contaminant		ESL – Urban Residential (mg/kg)	ESL – Commercial / Industrial (mg/kg)
TRH	C_6-C_{10} (less BTEX)	180*	215*
	>C_{10}-C_{16}	120*	170*
	>C_{16}-C_{34}	300	1700
	>C_{34}-C_{40}	2800	3300
BTEX	Benzene	50	75
	Toluene	85	135
	Ethylbenzene	70	165
	Xylenes	105	180
PAH	Benzo(a)pyrene	0.7	1.4

Note: ESL are low reliability apart from those marked with * which indicates that the ESL is of moderate reliability.

It is noted that ESL do not apply at areas of the site that will have limited ecological value under the proposed development (such as at basements, building footprints, etc.).

7.1.5 Management Limits

In addition to appropriate consideration and application of the health-based and ecological assessment criteria, there are additional considerations which reflect the nature and properties of petroleum hydrocarbons, including:

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

'Management limits' to avoid or minimise these potential effects have been adopted in NEPC (2013) as Tier 1 guidance. Given that all elements of the proposed development are yet to be confirmed, management limits for a commercial / industrial land use scenario and an urban residential scenario have been adopted. The more conservative management limits for coarse and fine texture soils have been adopted given that various soil types are present at the site. Management limits may apply to any depth within the soil profile and are shown in Table 7.

Table 7: Management Limits

Analyte		Management Limit Residential (mg/kg)	Management Limit Commercial / Industrial (mg/kg)
TRH	$C_6 – C_{10}$	700	700
	$>C_{10}-C_{16}$	1000	1000
	$>C_{16}-C_{34}$	2500	3500
	$>C_{34}-C_{40}$	10 000	10 000

7.1.6 Asbestos in Soil

A detailed asbestos assessment has not been undertaken. Visual observations for possible asbestos-containing materials (ACM) and the presence / absence of asbestos at a limit of reporting of 0.1 g/kg have been adopted as assessment criteria for this investigation as an initial screen.

7.2 Groundwater

The assessment criteria used for contamination in groundwater are based on the potential uses or risks posed by contaminated groundwater at or down-gradient of the site. The potential receptors (informed by the preliminary CSM) are considered to be:

- The surface water body ecosystem at Darling Harbour (a marine water ecosystem);
- Recreational water use at Darling Harbour; and
- Human receptors (site users and adjacent site users) via the vapour intrusion pathway.

The adopted assessment criteria for groundwater based on the above potential receptors are listed in the following sub-sections.

7.2.1 Default Guideline Values

For the protection of surface water body ecosystems, freshwater default guideline values (DGV) recommended for a slightly to moderately disturbed ecosystem or, otherwise, an unknown level of species protection from the Australian and New Zealand Governments (ANZG), Australian and New Zealand Guidelines for Fresh and Marine Water Quality website (accessed on 8 March 2022) have been adopted. The DGV are shown in Table 8.

Table 8: Default Guideline Values

Contaminant		Marine Water DGV (µg/L)
Metals	Cadmium	0.7
	Chromium (III)	27
	Chromium (VI)	4.4
	Copper	1.3
	Lead	4.4
	Mercury	0.1
	Nickel	7
	Zinc	8
PAH	Anthracene	0.01
	Naphthalene	50
	Fluoranthene	1
	Benzo(a)pyrene	0.1
	Phenanthrene	0.6
BTEX & VOC	Benzene	500
	Toluene	180
	Ethylbenzene	80
	m-xylene	75
	o-xylene	350*
	p-xylene	200*
	Isopropylbenzene	30
	Tetrachloroethene	70
	Trichloroethene	330
	1,1-Dichloroethene	700
	Chloroethene (vinyl chloride)	100
	1,2,4-Trichlorobenzene	20
	1,2-Dichlorobenzene	160*
	1,3-Dichlorobenzene	260*
	1,4-Dichlorobenzene	60*
	1,1,2,2-Tetrachloroethane	400
	1,1,1-Trichloroethane	270
	1,1,2-Trichloroethane	1900
	1,2-Dichloroethane	1900
	Carbon tetrachloride	240
	Chloroform	370
	1,2-Dichloropropane	900
	1,3-Dichloropropane	1100
	Monochlorobenzene (chlorobenzene)	55
OCP	Aldrin	0.003
	Chlordane	0.001
	DDT	0.0004
	Dieldrin	0.01*
	Endosulfan	0.005
	Endrin	0.004
	Heptachlor	0.0004
	Methoxychlor	0.004

Contaminant		Marine Water DGV (µg/L)
OPP	Azinphos methyl	0.01*
	Chlorpyrifos	0.01
	Diazinon	0.01*
	Dimethoate	0.15
	Fenitrothion	0.001
	Malathion	0.05*
	Parathion	0.004*
PCB	Aroclor 1242	0.3*
	Aroclor 1254	0.01*
Non-metallic Inorganics	Ammonia (total) as N	5070 at pH 6.6**

Note: * DGV for fresh water in the absence of marine water DGV.
** DGV can be adjusted for pH. The DGV for a pH of 6.6 has been adopted based on field results.

Note that there are DGV for individual phenolic compounds which are not listed in Table 8.

7.2.2 Guidelines for Recreational Water

The National Health and Medical Research Council (NHMRC), *Guidelines for Managing Risks in Recreational Water,* 2008 adopts drinking water guideline values for managing risks in recreational waters. It is stated, however, that guideline values applicable for drinking water quality are based on a daily consumption of 2 L and when applying these values to recreational water exposure, consumption of 0.1 to 0.2 L per day should be taken into consideration. The adopted guidelines for the protection of recreational water shown in Table 9 are sourced from the National Health and Medical Research Council and National Resource Management Ministerial Council (NHMRC & NRMMC), *Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy,* 2011, updated January 2022, with health-based drinking water guideline values multiplied by 10 to account for consumption for recreational water exposure.

Table 9: Guidelines for Managing Risks to Users of Recreational Waters

Contaminant		Guideline for Recreational Water (µg/L)	
		Health	Aesthetic
Metals	Arsenic (total)	100	-
	Cadmium	20	-
	Chromium (VI)	500	-
	Copper	20 000	1000
	Lead	100	-
	Mercury	10	-
	Nickel	200	-
	Zinc	-	3000
PAH	Benzo(a)pyrene	0.1	-
BTEX & VOC	Benzene	10	-
	Toluene	8000	25
	Ethylbenzene	3000	3
	Xylene (total)	6000	20
	Tetrachloroethene	500	-
	1,1-Dichloroethene	300	-
	1,2-Dichloroethene	600	-
	1,3-Dichloropropene	1000	-
	Chloroethene (vinyl chloride)	3	-
	Chlorobenzene	3000	10
	Trichlorobenzenes (total)	300	5
	1,2-Dichlorobenzene	15 000	1
	1,3-Dichlorobenzene	-	20
	1,4-Dichlorobenzene	400	0.3
	1,2-Dichloroethane	30	-
	Carbon tetrachloride	30	-
	Trihalomethanes (total)	2500	-
	Styrene	300	4
	Hexachlorobutadiene	7	-
OCP	Chlordane	20	-
	DDT	90	-
	Aldrin & Dieldrin (combined)	3	-
	Endosulfan	200	-
	Heptachlor & Heptachlor Epoxide	3	-
	Methoxychlor	3000	-
OPP	Azinphos methyl	300	-
	Chlorpyrifos	100	-
	Diazinon	40	-
	Dichlorovos	50	-
	Dimethoate	70	-
	Fenitrothion	70	-
	Malathion	700	-
	Parathion	200	-
	Methyl parathion	7	-
	Bromophos ethyl	100	-
	Ethion	40	-
Non-metallic Inorganics	Ammonia	-	500

Note that there are guidelines for individual phenolic compounds which are not listed in Table 9.

7.2.3 Health Screening Levels for Vapour Intrusion

The proposed ground floor or basement use of the proposed development is likely to be for non-residential purposes, and, therefore, HSL D (for a commercial or industrial land use scenario) have been adopted as site assessment criteria. Given that ground-level residential use has not been ruled out at this stage, HSL B (for a residential land use scenario with minimal opportunities for soil access) have also been adopted as site assessment criteria (for comparative purposes). The adopted HSL shown in Table 10 are for groundwater at a depth of 2 m to <4 m; and are the most conservative for sand, silt and clay. Less conservative HSL may be applicable where groundwater is present at the site at a depth of 4 m or greater, however, (less conservative) site specific HSL may need to be considered where groundwater is within 2 m of the lowest floor level of the proposed building(s) or groundwater is to contact the proposed basement.

Table 10: Health Screening Levels for Vapour Intrusion

Contaminant		HSL B Residential (µg/L)	HSL D Commercial / Industrial (µg/L)
PAH	Naphthalene	NL	NL
TRH	TRH C_6-C_{10} less BTEX	1000	6000
	TRH >C_{10}-C_{16} less Naphthalene	1000	NL
BTEX	Benzene	800	5000
	Toluene	NL	NL
	Ethylbenzene	NL	NL
	Xylenes	NL	NL

Note: The solubility limit is defined as the groundwater concentration at which the water cannot dissolve any more of an individual chemical based on a petroleum mixture. The soil vapour which is in equilibrium with the groundwater will be at its maximum. If the derived groundwater HSL exceeds the water solubility limit, a soil-vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for a given scenario. For these scenarios no HSL is presented for these chemicals. These are denoted as not limiting 'NL'.

8. Field Work Results

8.1 Soil Observations and Field Results

Borehole logs are provided in Appendix B and should be referred to for detailed descriptions of soil and rock.

At Borehole 101, brown silty sand fill and red-brown sandstone boulder fill was underlain by concrete at depth of 0.55 m. The borehole was discontinued in this concrete at a depth of 0.78 m. The borehole was discontinued and not relocated nearby as the concrete may be associated with an unknown service or buried structure.

Borehole 102 was drilled through a surface layer of asphaltic concrete (0.05 m thick) then brown silty sand fill, grey sand fill and grey clayey sand fill to a depth of 1 m. Concrete fragments were observed in the fill at a depth of 0.3 m to 0.8 m. The borehole was discontinued at a depth of 1 m due to the presence of concrete.

Borehole 103 was drilled through a surface layer of asphaltic concrete (0.05 m thick) then grey-brown sand fill and red-brown sandstone boulder fill to a depth of 1.6 m. Building rubble (brick fragments) and steel rebars were observed at depths of 0.8 m and 1.1 - 1.2 m, respectively. The borehole was discontinued at a depth of 1.7 m in concrete which was encountered from a depth of 1.6 m. Two other attempts were made to drill through the fill, but these were unsuccessful due to the presence of buried obstructions at approximately 0.7 m depth.

Borehole 104 was drilled through a surface layer of concrete (0.1 m thick) which was underlain by fill to a depth of 4.5 m. Observed fill materials included brown sand, grey and brown clayey sand, black and grey coal wash gravel, grey and brown gravel and grey-brown sand. Coal wash was observed at depths of 1.5 - 1.6 m and 2.5 - 3.8 m. Building rubble (such as fragments of terracotta, brick, glass, ceramics and concrete) were observed at depths of 0.4 - 1.0 m and 2.5 - 4.5 m. Fill was underlain by alluvial grey silty clay and silty sand to a depth of 6.8 m, then residual grey mottled yellow-brown sandy clay and grey clay to a depth of 11.8 m. Yellow-brown sandstone was encountered from a depth of 11.8 m to 12.3 m. The borehole was discontinued in sandstone at a depth of 12.3 m.

Borehole 105 was drilled through a surface layer of concrete (0.23 m thick) which was underlain by fill to a depth of 3.5 m. Fill comprised yellow-brown, brown and grey sand and sandstone boulders / cobbles. Trace building rubble (fragments of brick, terracotta and ceramics) was observed at a depth of 1.4 m. Fill was underlain by alluvial grey-brown sand clay to a depth of 4 m, then residual yellow brown sandy clay to a depth of 4.5 m. Yellow- brown, grey and red-brown sandstone was encountered from a depth of 4.5 m to 10.5 m with siltstone beds at depths of 9.33 - 9.45 m and 9.55 - 9.61 m. The borehole was discontinued in sandstone at a depth of 10.5 m.

Borehole 106 was drilled through a surface layer of brick pavers (0.1 m thick) which was underlain by brown-grey sand fill to a depth of 1.5 m. This fill was underlain by residual yellow-brown and grey-yellow sandy clay to a depth of 3.5 m. Yellow, brown, yellow-brown and grey sandstone was encountered from a depth of 3.5 m to 10.06 m. The borehole was discontinued in sandstone at a depth of 10.06 m.

Borehole 107 was drilled through a concrete slab which was suspended over an apparent old storage space. The floor of the storage space was approximately 3.1 m below the ground surface. No soil samples were retrieved due to the significant void space.

Boreholes 108 and 109 were drilled through the concrete slab in the basement of the Harwood Building which was 0.1 to 0.15 m thick. The concrete slab was underlain by a thin layer of grey gravel fill (0.1 m to 0.15 m thick). Each borehole was discontinued on the underlying sandstone which may be sandstone boulders in fill.

Borehole 201 was drilled through brick pavers (0.05 m thick) which were underlain by a thin layer of yellow-brown sand fill (0.11 m thick) and then concrete (0.09 m thick). The concrete was underlain by brown sand fill which was observed to have a trace of coal at a depth of 0.5 m and tile at a depth of 1 m. This fill was underlain by red-brown sandy clay (possibly fill) at a depth of 1.3 - 1.5 m. Yellow-brown, grey, orange-brown and red-brown sandstone was encountered between depths of 1.5 m and 10 m. The borehole was discontinued in sandstone at a depth of 10 m.

Borehole 202 was drilled through a concrete slab (0.1 m thick) which was underlain by fill to a depth of 3.1 m. Observed fill materials included brown and grey clayey sand, grey gravelly sand and grey-brown silty sand. A hydrocarbon odour was associated with the fill at a depth of 1.2 - 2.0 m. Terracotta and ceramic fragments were observed in the fill at a depth of 2.3 m. Fill was underlain by (probably) alluvial (possibly residual) grey mottled yellow-brown silty clay to a depth of 5.7 m, then residual grey sandy clay to a depth of 5.7 m. Grey and yellow-brown sandstone was encountered from between depths of 5.7 m to 10 m. The borehole was discontinued in sandstone at a depth of 10 m.

Although asbestos containing materials were not observed in the fill, building rubble such as concrete, brick, tile, terracotta and ceramics (mentioned above) were identified in fill and asbestos contamination can be associated with building rubble in fill.

PID results were either less than or equal to 1 ppm indicating a low potential for the presence of volatile organic compounds.

8.2 Groundwater Observations and Field Results

Free groundwater was observed at a depth of 4 m whilst drilling at Borehole 104. No free groundwater was observed at the other boreholes whilst drilling. It is noted that the method of rock coring introduces tap water to the borehole which prevents making groundwater observations.

Well development and sampling field data is shown on the groundwater field sheets in Appendix C.

Approximately 100 L of water was removed from Borehole 104 for its development. For the development of Borehole 105, the well was dry after the removal of approximately 50 L of water. LNAPL was not identified from use of the dip-meter prior to development of each well.

Table 11 shows the measured groundwater levels at each monitoring well immediately prior to sampling. It is noted that the observed free groundwater whilst drilling at a depth of 4 m at Borehole 104 is considered likely to have been perched groundwater (i.e., groundwater in the sand fill, perched on the silty clay). The low groundwater depth at Borehole 104, as shown in Table 11, may reflect the collection of perched groundwater seeping into the well. As only two groundwater wells were installed, the direction of groundwater flow could not be determined from the groundwater measurements.

Table 11: Groundwater Levels Prior to Sampling

Borehole	Ground Surface Level (m AHD)	Groundwater Level (15 November 2019)	
		Depth (m bgl)	Water Level (m AHD)
104	5.8	6.42	-0.6
105	6.2	3.79	2.4

Notes: m bgl metres below ground level
m AHD metres Australian Height Datum

9. Laboratory Analytical Rationale and Results

9.1 Analytical Rationale

Soil samples were selected for analysis for potential contaminants based on field observations. The majority of selected samples for analysis were from fill as fill was considered to be a significant potential source of contamination at the site. Consequentially, multiple samples from boreholes with the greater fill depths were subject to analysis.

One soil sample from each borehole (except Borehole 109 where no soil samples were retrieved) was analysed for eight priority metals, TRH, BTEX, PAH, OCP, OPP, PCB, total phenols and asbestos to obtain data from each sample point (i.e., to provide site coverage). Four of these samples were analysed for VOC. Additional samples were analysed for a shorter suite of contaminants (typically eight priority metals, TRH, BTEX, PAH and asbestos). In particular:

- The sample from Borehole 102, depth 0.5 m, was analysed for asbestos given that concrete fragments were observed in the fill at this depth (and asbestos contamination may be associated with building rubble in fill);
- The sample from Borehole 103, depth 1 m, was analysed for asbestos given that building rubble (brick fragments) was observed in the fill at this depth;
- The samples from Borehole 104 at depths 0.5 m, 3 m and 4 m were analysed for asbestos given that building rubble (such as terracotta, brick, glass, ceramics and concrete) was observed in the fill at these depths;
- The samples from Borehole 104 at depths 1.5 m and 3 m were analysed for PAH given that coal wash was observed at these depths;
- Three samples of fill from Borehole 105 were analysed for asbestos given that building rubble (brick, terracotta and ceramics) were identified in the fill at this location;
- The sample from Borehole 201, depth 0.9 - 1.0 m, was analysed for PAH given the presence of coal in the fill at this location. This sample was analysed for asbestos given that tile was identified in the fill;
- The sample from Borehole 202, depth 1.2 - 13 m, was analysed for TRH, BTEX, PAH and VOC given that a hydrocarbon odour was associated with the fill at this depth; and
- The sample from Borehole 202, depth 2.0 - 1.2 m, was analysed for asbestos given the presence of terracotta and ceramic fragments at this depth.

Following review of initial laboratory results, the soil sample from Borehole 102, depth 0.5 m, was analysed for TRH C_{10}-C_{40} with silica gel clean-up given that a somewhat elevated concentration of TRH C_{10}-C_{40} was recorded in this sample.

Three fill samples from different sample locations (Borehole 102, depth 0.5 m; Borehole 104, depth 1.5 m; and Borehole 106, depth 1.0 m) were analysed for the soil parameters: pH and CEC.

A groundwater sample from each groundwater monitoring well was subject to analysis for a suite of potential contaminants including metals, TRH, BTEX, PAH, OCP, OPP, PCB, VOC, ammonia and phenols. Samples were also analysed for hardness.

9.2 Laboratory Results

Laboratory results are presented in the laboratory certificates in Appendix E.

Table 12 summarises laboratory results for contaminants in soil compared to the site assessment criteria for soil.

Table 13 summarises the laboratory results for contaminants in groundwater compared to the site assessment criteria.

Table 12: Summary of Results of Soil Analysis for Contamination (All results in mg/kg unless otherwise stated)

Sample Identification/ Location	Sample Depth (m)	Soil Type	Metals								Polycyclic Aromatic Hydrocarbons				Total Recoverable Hydrocabons						Total Petroleum Hydrocarbons (TRH C10-C40 Silica)				BTEX and other Volatile Organic Compounds					Organochlorine Pesticides																				Organophosphorus Pesticides		PCB (total)	Phenols (total)	Asbestos
			Arsenic	Cadmium	Chromium (III + VI)	Copper	Lead	Mercury	Nickel	Zinc	Benzo(a)pyrene	Benzo(a)pyrene TEQ	Naphthalene	Total PAHs	TRH C6-C10 less BTEX	TRH >C10-C16 less Naphthalene	TRH C6-C10	TRH >C10-C16	TRH >C16-C34	TRH >C34-C40	TPH >C10-C16 less Naphthalene	TPH >C10-C16	TPH >C16-C34	TPH >C34-C40	Benzene	Toluene	Ethylbenzene	Total Xylene	Other VOC	DDT	DDE	DDD	Aldrin	Dieldrin	Gamma-chlordane	Alpha-chlordane	Endosulfan I	Endosulfan II	Endosulfan Sulphate	Endrin	Heptachlor	HCB	Methoxychlor	Other OCP	Chlorpyriphos	Other OPP			Asbestos ID in soil
BH101	0.1	Fill	<4	<0.4	8	21	100	<0.1	7	72	0.1	<0.5	<0.1	1	<25	<50	<25	<50	<100	<100	-	-	-	-	<0.2	<0.5	<1	<3	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<PQL	<0.1	<PQL	<0.1	<5	NAD
BH102	0.5	Fill	7	0.8	12	130	170	0.3	13	360	**1.2**	1.8	0.2	12	<25	63	<25	63	**640**	200	<50	<50	**440**	180	<0.2	<0.5	<1	<3	<PQL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<PQL	<0.1	<PQL	<0.1	<5	NAD
BH103	1	Fill	4	<0.4	36	21	42	<0.1	16	69	0.1	<0.5	<0.1	0.79	<25	<50	<25	<50	<100	<100	-	-	-	-	<0.2	<0.5	<1	<3	<PQL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<PQL	<0.1	<PQL	<0.1	<5	NAD
BD2_20191022	1	Fill	5	<0.4	36	17	47	<0.1	14	62	-	-	<1	-	<25	<50	<25	<50	<100	<100	-	-	-	-	<0.2	<0.5	<1	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104	0.5	Fill	<4	<0.4	4	3	36	<0.1	<1	21	<0.05	<0.5	<0.1	<0.05	<25	<50	<25	<50	<100	<100	-	-	-	-	<0.2	<0.5	<1	<3	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<PQL	<0.1	<PQL	<0.1	<5	NAD
BD3_20191023	0.5	Fill	<4	<0.4	8	4	33	<0.1	1	22	-	-	<1	-	<25	<50	<25	<50	<100	<100	-	-	-	-	<0.2	<0.5	<1	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH104	1.5	Fill	<4	<0.4	43	66	120	0.1	40	150	0.54	0.8	<0.1	5.7	<25	<50	<25	<50	150	160	-	-	-	-	<0.2	<0.5	<1	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD
BH104	3	Fill	12	<0.4	32	**280**	1100	11	24	460	**1.3**	1.9	0.1	13	<25	<50	<25	<50	110	<100	-	-	-	-	<0.2	<0.5	<1	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD
BH104	4	Fill	5	<0.4	16	29	160	1.2	17	99	0.4	0.5	<0.1	4.1	<25	<50	<25	<50	<100	<100	-	-	-	-	<0.2	<0.5	<1	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD
BH105	1	Fill	8	<0.4	37	42	74	0.2	17	87	**2**	2.8	0.2	21	<25	<50	<25	<50	160	140	-	-	-	-	<0.2	<0.5	<1	<3	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<PQL	<0.1	<PQL	<0.1	<5	NAD
BH105	2	Fill	18	0.6	16	51	130	0.4	28	160	**7.9**	**11**	**3.9** & 2	100	<25	<50	<25	<50	**390**	190	-	-	-	-	<0.2	<0.5	<1	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD
BH105	3	Fill	10	<0.4	12	45	95	0.4	41	150	**5.8**	**7.9**	1.9 & **4**	67	<25	<50	<25	<50	**340**	150	-	-	-	-	<0.2	<0.5	<1	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD
BH106	0.1	Fill	<4	<0.4	11	44	15	0.1	86	41	0.2	<0.5	<0.1	1.4	<25	<50	<25	<50	<100	100	-	-	-	-	<0.2	<0.5	<1	<3	<PQL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<PQL	<0.1	<PQL	<0.1	<5	NAD
BH106	1	Fill	7	<0.4	15	45	99	0.4	29	120	**0.91**	1.3	<0.1	7.7	<25	<50	<25	<50	100	<100	-	-	-	-	<0.2	<0.5	<1	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD
BH106	2	Natural	<4	<0.4	14	3	7	<0.1	3	8	0.1	<0.5	0.1	1.4	<25	<50	<25	<50	<100	<100	-	-	-	-	<0.2	<0.5	<1	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH108	0.1-0.2	Fill	<4	<0.4	34	10	6	<0.1	37	20	<0.05	<0.5	<0.1	<0.05	<25	<50	<25	<50	<100	<100	-	-	-	-	<0.2	<0.5	<1	<3	-	<0.1	<0.1	<0.1	**7.9**	**15**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<PQL	<0.1	<PQL	<0.1	<5	NAD
BDA/20191022	0.1-0.2	Fill	<2	<0.4	67	22	14	<0.1	67	31	-	-	<0.5	-	<20	<50	<20	<50	<100	<100	-	-	-	-	<0.1	<0.1	<0.1	<0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH109	0.15-0.2	Fill	<4	<0.4	48	14	5	<0.1	50	25	<0.05	<0.5	<0.1	<0.05	<25	<50	<25	<50	<100	<100	-	-	-	-	<0.2	<0.5	<1	<3	-	<0.1	<0.1	<0.1	2.2	4.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<PQL	<0.1	<PQL	<0.1	<5	NAD
201	0.9-1.0	Fill	<4	<0.4	8	9	25	0.2	2	23	0.2	<0.5	<0.1	1.5	<25	<50	<25	<50	<100	<100	-	-	-	-	<0.2	<0.5	<1	<3	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<PQL	<0.1	<PQL	<0.1	<5	NAD
201	1.4-1.5	Natural (possible fill)	9	<0.4	19	54	38	0.1	5	100	<0.05	<0.5	<0.1	<0.05	<25	<50	<25	<50	<100	<100	-	-	-	-	<0.2	<0.5	<1	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
202	1.2-1.3	Fill	<4	<0.4	45	130	30	<0.1	35	96	**290**	**420**	**100** & **73**	**5700**	<25	**1000**	<25	**1100**	**8500**	1300	-	-	-	-	<0.2	<0.5	<1	<3	<PQL	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	<1	<1	<1	<PQL	<1	<PQL	<1	<5	NAD
202	2.0-2.1	Fill	4	<0.4	30	70	320	1.4	36	120	**21**	**31**	**8** & **6**	400	<25	76	<25	82	**780**	<100	-	-	-	-	<0.2	<0.5	<1	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NAD
BD26112019	2.0-2.1	Fill	8	<0.4	45	120	**1300**	3.9	40	240	-	-	**26**	-	<200	<500	<200	<500	**2300**	<1000	-	-	-	-	<0.5	<0.5	<0.5	<1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site Assessment Criteria																																																			
Residential HIL B			500	150	500	30000	1200	120	1200	60000	-	4	-	400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	600				10			90			400				20	10	15	500	-	340	-	1	130*	-
Commercial/Industrial HIL D			3000	900	3600 for Cr(VI)	240000	1500	730	6000	400000	-	40	-	4000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3600				45			530			2000				100	50	80	2500	-	2000	-	7	660*	-
Residential HSL B for Vapour Intrusion			-	-	-	-	-	-	-	-	-	-	3	-	40	110	-	-	-	-	110	-	-	-	0.5	160	55	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Commercial/Industrial HSL D for Vapour Intrusion			-	-	-	-	-	-	-	-	-	-	NL	-	250	NL	-	-	-	-	NL	-	-	-	3	NL	NL	230	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Urban Residential EIL			100	-	200 for Cr(III)	240	1300	-	290	870	-	-	170	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	180	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Commercial & Industrial EIL			160	-	320 for Cr(III)	340	2000	-	490	1300	-	-	370	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	640	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Urban Residential ESL			-	-	-	-	-	-	-	-	0.7	-	-	-	180	-	-	120	300	2800	-	120	300	2800	50	85	70	45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Commercial & Industrial ESL			-	-	-	-	-	-	-	-	1.4	-	-	-	215	-	-	170	1700	3300	-	170	1700	3300	75	135	165	95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residential Management Limits			-	-	-	-	-	-	-	-	-	-	-	-	-	-	700	1000	2500	10000	-	1000	2500	10000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Commercial/Industrial Management Limit			-	-	-	-	-	-	-	-	-	-	-	-	-	-	700	1000	3500	10000	-	1000	3500	10000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

BD2_20191022	Blind replicate of sample from BH103, depth 1 m
BD3_20191023	Blind replicate of sample from BH104, depth 0.5 m
BDA/20191022	Blind replicate of sample from BH104, depth 0.1-0.2 m
BD26112019	Blind replicate of sample from 202, depth 2.0-2.1 m
NAD	No asbestos detected at limit of reporting (0.1g/kg)
*	Value for pentachlorophenol
-	Not tested / Not applicable
TEQ	Toxicity Equivalent Quotient
PQL	Practical quantitation limit
BOLD	Exceeds Residential ecological criterion
BOLD	Exceeds Residential and Commercial & Industrial ecological criteria
BOLD	Exceeds Residential health-based criterion
BOLD	Exceeds Residential and Commercial & Industrial health-based criterion
BOLD	Exceeds Residential and Commercial & Industrial ecological criteria and management limits

Table 13: Summary of Results of Groundwater Analysis (All results in μg/L)

	Metals (dissolved)								Polycyclic Aromatic Hydrocarbons						Total Recoverable Hydrocarbons, BTEX and Volatile Organic Compounds																																								
Sample Identification (Borehole or Replicate)	Arsenic	Cadmium	Chromium (III + VI)	Copper	Lead	Mercury	Nickel	Zinc	Naphthalene	Anthracene	Fluoranthene	Benzo(a)pyrene	Phenanthrene	Other PAH	TRH C6-C10 less BTEX	TRH >C10-C16 less Naphthalene	TRH C6-C10	TRH >C10-C16	TRH >C16-C34	TRH >C34-C40	Benzene	Toulene	Ethylbenzene	o-xylene	m+p-xylene	Isopropylbenzene	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	trans-1,3-Dichloropropene	cis-1,3-Dichloropropene	Vinyl chloride	Tetrachloroethene	Trichloroethene	1,2,3-Trichlorobenzene	1,2,4-Trichlorobenzene	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	Chlorobenzene	1,1,2,2-Tetrachloroethane	1,1,1-Trichloroethane	1,1,2-Trichloroethane	1,2-Dichloroethane	Carbon tetrachloride	Chloroform	Bromodichloromethane	Dibromochloromethane	Bromoform	1,2-Dichloropropane	1,3-Dichloropropane	Styrene	Hexachlorobutadiene	Other VOC
MW104	<1	<0.1	<1	1	<1	<0.05	<1	**11**	<0.2	<0.1	<0.1	<0.1	<0.1	<PQL	<10	<50	<10	<50	<100	<100	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<PQL
MW105	1	<0.1	2	**4**	**5**	0.06	**12**	**18**	<0.2	<0.1	<0.1	<0.1	<0.1	<PQL	<10	<50	<10	<50	<100	<100	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<PQL
BD1/20191115	<1	<0.1	<1	**2**	<1	<0.05	**11**	**11**	<1	-	-	-	-	-	<10	<50	<10	<50	<100	<100	<1	<1	<1	<1	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Assessment Criteria																																																						
Marine Water DGV	-	0.7	27 for Cr(III) 4.4 for Cr(VI)	1.3	4.4	0.1	7	8	50	0.01	1	0.1	0.6	-	-	-	-	-	-	-	500	180	80	350	75 for m-xylene 200 for p-xylene	30	700	-	-	-		100	70	330	-	20	160	260	60	55	400	270	1900	1900	240	370	-	-	-	900	1100	-	-	-
Guidelines for Recreational Water – Health	100	20	500 for Cr(VI)	20000	100	10	200	-	-	-	-	0.1	-	-	-	-	-	-	-	-	10	8000	3000	6000		-	300	600		1000		3	500	-	300		15000	-	400	3000	-	-	-	30	30	2500				-	-	300	7	-
Guidelines for Recreational Water – Aesthetic	-	-	-	1000	-	-	-	3000	-	-	-	-	-	-	-	-	-	-	-	-	-	25	3	20		-	-	-		-		-	-	-	5		1	20	0.3	10	-	-	-	-	-	-				-	-	4	-	-
HSL B for Vapour Intrusion (depth 2 m to <4 m)	-	-	-	-	-	-	-	-	NL	-	-	-	-	-	1000	1000	-	-	-	-	800	NL	NL	NL		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HSL D for Vapour Intrusion (depth 2 m to <4 m)	-	-	-	-	-	-	-	-	NL	-	-	-	-	-	6000	NL	-	-	-	-	5000	NL	NL	NL		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

BD1/20191115 is blind replicate of the sample from 105

PQL Practical Quantitation Limit

\- not defined/ not analysed/ not applicable

BOLD Exceeds DGV

Table 13 (continued): Summary of Results of Groundwater Analysis (All results in μg/L)

Sample Identification (Borehole or Replicate)	Organochlorine Pesticides												Organophosphorus Pesticides												Polychlorinated Biphenyls			Phenols	Non-metallic Inorganics
	Aldrin	Dieldrin	gamma-Chlordane	alpha-Chlordane	pp-DDT	Endosulfan I	Endosulfan II	Endrin	Heptachlor	Heptachlor Epoxide	Methoxychlor	Other OCP	Azinphos-methyl	Bromophos-ethyl	Chlorpyrifos	Diazinon	Dichlorovos	Dimethoate	Ethion	Fenitrothion	Malathion	Parathion	Methyl Parathion	Other OPP	Aroclor 1242	Aroclor 1254	Other PCB	Total Phenols	Ammonia (total) as N
MW104	<0.01	<0.01	<0.01	<0.01	<0.006	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<PQL	<0.02	<0.2	<0.01	<0.01	<0.2	<0.15	<0.2	<0.2	<0.05	<0.01	<0.2	<PQL	<0.1	<0.1	<PQL	<50	**8300**
MW105	<0.01	<0.01	<0.01	<0.01	<0.006	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<PQL	<0.02	<0.2	<0.01	<0.01	<0.2	<0.15	<0.2	<0.2	<0.05	<0.01	<0.2	<PQL	<0.1	<0.1	<PQL	<50	220
BD1/20191115	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Assessment Criteria																													
Marine Water DGV	0.003	0.01	0.001		0.0004	0.005		0.004	0.0004	-	0.004	-	0.01	-	0.01	0.01	-	0.15	-	0.001	0.05	0.004	-	-	0.3	0.01	-	-	5070 at pH 6.6
Guidelines for Recreational Water – **Health**	3		20		90	200		-	3		3000	-	300	100	100	40	50	70	40	70	700	200	7	-	-	-	-	-	-
Guidelines for Recreational Water – **Aesthetic**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	500
HSL B for Vapour Intrusion (depth 2 m to <4 m)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HSL D for Vapour Intrusion (depth 2 m to <4 m)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

BD1/20191115 is blind replicate of the sample from 105

PQL Practical Quantitation Limit

\- not defined/ not analysed/ not applicable

BOLD Exceeds DGV and guideline for recreational water

9.3 Soil Contaminants

Concentrations of arsenic, chromium, nickel and zinc were within the respective HIL B, HIL D, urban residential EIL, commercial/industrial EIL in analysed soil samples. Concentrations of cadmium and mercury were within HIL B and HIL D.

Concentrations of copper in soil were within HIL B and HIL D and the commercial/industrial EIL. Concentrations of copper were within the urban residential EIL (240 mg/kg) except for the fill sample from Borehole 104, depth 3 m (280 mg/kg). Statistical analysis on fill samples using ProUCL 5.1 indicates that this exceedance of the urban residential EIL is not significant given that the 95% Adjusted Gamma Upper Confidence Limit (UCL) of 104 mg/kg is less than the urban residential EIL and the standard deviation of 68.96 mg/kg is less than half of the urban residential EIL. The input values and output values are shown in Appendix F. Note that, to be conservative, the higher recorded concentration for replicate pairs was used as input values.

Concentrations of lead were within HIL D, urban residential EIL and commercial/industrial EIL. Concentrations of lead were within HIL B (1200 mg/kg) except for the replicate fill sample (BD26112019) from Borehole 202, depth 2 - 2.1 m (1300 mg/kg). Statistical analysis on fill samples using ProUCL 5.1 indicates that this exceedance of the urban residential EIL is not significant given that the 95% Chebyshev Upper Confidence Limit (UCL) of 607.6 mg/kg is less than the urban residential EIL and the standard deviation of 378.9 mg/kg is less than half of the urban residential EIL. The input values and output values are shown in Appendix F. Note that, to be conservative, the higher recorded concentration for replicate pairs was used as input values. It is also noted that the primary sample from Borehole 202, depth 2 - 2.1 m, had a concentration of 320 mg/kg which is well within HIL B.

Concentrations of benzo(a)pyrene TEQ were within HIL B (4 mg/kg) except for samples from Borehole 105, depth 2 m (11 mg/kg); Borehole 105, depth 3 m (7.9 mg/kg); Borehole 202, depth 1.2 - 1.3 m (420 mg/kg); and Borehole 202, depth 2 - 2.1 m (31 mg/kg). Concentrations of benzo(a)pyrene TEQ were within HIL D (40 mg/kg) except for sample from Borehole 202, depth 1.2 - 1.3 m (420 mg/kg). Concentrations of total PAH were within HIL B (400 mg/kg) and HIL D (4000 mg/kg) except for the sample from Borehole 202, depth 1.2 - 1.3 m (5700 mg/kg).

Concentrations of benzo(a)pyrene exceeded the urban residential ESL (0.7 mg/kg) in eight of nineteen analysed samples. Concentrations of benzo(a)pyrene exceeded the commercial/industrial ESL (1.4 mg/kg) in five of these samples. CRC CARE 2017, *Technical Report No. 39, Risk-based management and remediation guidance for benzo(a)pyrene,* 2017 provides a high reliability ecological guidelines for fresh benzo(a)pyrene of 33 mg/kg for public open space and 172 mg/kg for commercial/industrial sites (and the bioavailability and bio-accessibility of aged benzo(a)pyrene tends to be less than that of fresh benzo(a)pyrene which means that the ecological guideline is conservative for aged benzo(a)pyrene). (It is considered that the benzo(a)pyrene in fill is aged given the site history). The recorded concentrations of benzo(a)pyrene for all analysed samples were within the CRC CARE ecological guidelines for residential sites and commercial / industrial sites except for the sample from Borehole 202, depth 1.2 - 1.3 m (290 mg/kg). In addition to CRC Care remediation guidance for benzo(a)pyrene, the Canadian Council of Ministers of the Environment, *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health, Polycyclic Aromatic Hydrocarbons,* 2010 provides Environmental Soil Quality Guidelines (SQG_E) of 20 mg/kg for residential sites and 72 mg/kg for commercial and industrial sites. The recorded concentrations of benzo(a)pyrene for all analysed samples are within the commercial / industrial SQG_E except for the sample from Borehole 202,

depth 1.2 - 1.3 m. Concentrations were within the residential SQG_E except for the samples from Borehole 202, depth 1.2 - 1.3 m and Borehole 202, depth 2.0 - 2.1 mg/kg (21 mg/kg).

Concentrations of naphthalene were within the urban residential EIL, commercial/industrial EIL and HSL D for vapour intrusion. Concentrations of naphthalene were within HSL B for vapour intrusion (3 mg/kg) except for samples from Borehole 105, depth 2 m (3.9 mg/kg); Borehole 105, depth 3 m (4 mg/kg); Borehole 202, depth 1.2 - 1.3 m (100 mg/kg and 73 mg/kg); Borehole 202, depth 2 - 2.1 m (8 mg/kg and 6 mg/kg for the primary samples and 26 mg/kg for the replicate sample). It is noted that samples from depths of 2 m and 3 m from Borehole 105 also had recorded naphthalene concentrations of 2 mg/kg and 1.9 mg/kg, respectively.

Concentrations of TRH C_6-C_{10} and BTEX were less than PQL in analysed samples, however, it is noted that the PQL for TRH C_6-C_{10} for the replicate sample BD26112019 was significantly raised due to matrix interference. The PQL of 200 mg/kg for TRH C_6-C_{10} in sample BD26112019 is greater than the HSL B for vapour intrusion and residential ESL. Apart from this, concentrations of TRH C_6-C_{10} and BTEX were within the respective HSL B for vapour intrusion, HSL D for vapour intrusion, residential ESL, commercial/industrial ESL, residential management limit and commercial / industrial management limit. Concentrations of VOC (in addition to BTEX) were less than the PQL in analysed samples.

Concentrations of TRH >C_{10}-C_{16} were less than the PQL except for samples from Borehole 102, depth 0.5 m (63 mg/kg); Borehole 202, depth 1.2 - 1.3 m (1100 mg/kg); and Borehole 202, depth 2.0 - 2.1 m (82 mg/kg). The concentration of TRH >C_{10}-C_{16} with silica gel clean-up in the sample from Borehole 102, depth 0.5 m, was less than the PQL. It is noted that the PQL for TRH >C_{10}-C_{16} for the replicate sample BD26112019 was significantly raised due to matrix interference. The PQL of 500 mg/kg for TRH >C_{10}-C_{16} in sample BD26112019 is greater than the HSL B for vapour intrusion, residential ESL, and commercial/industrial ESL. Concentrations of TRH >C_{10}-C_{16} (less naphthalene) were within the HSL D for vapour intrusion. Concentrations of TRH >C_{10}-C_{16} (less naphthalene) were within HSL B for vapour intrusion (110 mg/kg) except for the sample from Borehole 202, depth 1.2 - 1.3 m (1000 mg/kg). Concentrations of TRH >C_{10}-C_{16} were within residential ESL (120 mg/kg), commercial/industrial ESL (170 mg/kg), residential management limit (1000 mg/kg) and commercial / industrial management limit (1000 mg/kg) except for the sample from Borehole 202, depth 1.2 - 1.3 m.

Concentrations of TRH >C_{16}-C_{34} were within the urban residential ESL (300 mg/kg) except for the samples from Borehole 102, depth 0.5 m (640 mg/kg); Borehole 105, depth 2 m (390 mg/kg); Borehole 105, depth 3 m (340 mg/kg); Borehole 202, depth 1.2 - 1.3 m (8500 mg/kg); and Borehole 202, depth 2.0 - 2.1 m (780 mg/kg for the primary sample and 2300 mg/kg for the replicate sample). The concentration of TRH >C_{16}-C_{34} with silica gel clean-up for the sample from Borehole 102, depth 0.5 m (440 mg/kg) exceeded the urban residential ESL. Concentrations of TRH >C_{16}-C_{34} were within the industrial /commercial ESL (1700 mg/kg) except for the sample from Borehole 202, depth 1.2 - 1.3 m, and the replicate sample from Borehole 202, depth 2.0 - 2.1 m. Concentrations of TRH >C_{16}-C_{34} were within the urban residential management limit (2500 mg/kg) and commercial / industrial management limit (3500 mg/kg) except for the sample from Borehole 202, depth 1.2 - 1.3 m.

Concentrations of TRH >C_{34}-C_{40} were within the urban residential ESL, industrial / commercial ESL, urban residential management limit and commercial / industrial management limit.

Concentrations of aldrin and dieldrin were less than the PQL except for the samples from Borehole 108, depth 0.1 - 0.2 m, and Borehole 109, depth 0.15 - 0.2 m. The concentrations of aldrin (7.9 mg/kg) and dieldrin (15 mg/kg) in the sample from Borehole 108 were above HIL B (10 mg/kg) but below HIL D (45 mg/kg). The concentrations of aldrin (2.2 mg/kg) and dieldrin (4.1 mg/kg) in the sample from Borehole 109 were within HIL B and HIL D.

Concentrations of OCP other than aldrin and dieldrin were less than the PQL in analysed samples. Hence, concentrations of DDT were within the urban residential EIL and commercial / industrial EIL; and concentrations of DDT, DDE, DDD, chlordane, endosulfan, endrin, heptachlor, HCB and methoxychlor were within HIL B and HIL D.

Concentrations of PCB, OPP and total phenols were less than the PQL, and, hence, concentrations of total PCB, phenols and chlorpyriphos were within the respective HIL B and HIL D.

Asbestos was not detected at the laboratory limits of reporting in analysed samples.

9.4 Groundwater Contaminants

Concentrations of arsenic were below the PQL except in the primary sample from Borehole 105. The concentration (1 µg/L) in this sample was well within the guideline for recreational water. There is no DGV for marine water for arsenic. It is noted, however, that the recorded concentration for the primary sample from Borehole 105 is within the freshwater DGV for a slightly to moderately disturbed ecosystem which are 24 for arsenic III and 13 for arsenic V.

Concentrations of cadmium were below the PQL in all analysed samples.

Concentrations of chromium were below the PQL except in the primary sample from Borehole 105. The concentration (2 µg/L) in this sample was within the DGV and guideline for recreational water.

The copper concentration (1 µg/L) for the sample from Borehole 104 was within the DGV and guideline for recreational water. The copper concentrations in the primary sample (4 µg/L) and replicate sample (2 µg/L) from Borehole 105 were above the DGV (1.3 µg/L) but well within the guidelines for recreational water use. The recorded copper concentrations are considered to be consistent with typical background ranges for groundwater in Sydney.

Concentrations of lead were below the PQL except in the primary sample from Borehole 105. The concentration (5 µg/L) in this sample was marginally above the DGV (4.4 µg/L) but well within the guideline for recreational water. It is noted that the replicate sample from BH105 had a concentration (<1 µg/L) within the DGV. The recorded lead concentrations are considered to be consistent with typical background ranges for groundwater in Sydney.

Concentrations of mercury were below the PQL except in the primary sample from Borehole 105. The concentration (0.06 µg/L) in this sample was within the DGV and guideline for recreational water.

The nickel concentration in the sample from Borehole 104 was less than the PQL. The nickel concentrations in the primary sample (12 µg/L) and the replicate sample (11 µg/L) from BH105 were above the DGV (7 µg/L) but well within the guideline for recreational water. The recorded nickel concentrations are considered to be consistent with typical background ranges for groundwater in Sydney.

The recorded zinc concentrations (11 µg/L in the sample from Borehole 104, and 11 µg/L and 18 µg/L in the samples from Borehole 105) were above the DGV (8 µg/L) but well within the guideline for recreational water. The recorded zinc concentrations are considered to be consistent with typical background ranges for groundwater in Sydney.

Concentrations of TRH, BTEX, VOC, OCP, OPP, PCB and total phenols were less than the PQL in all analysed samples.

The concentration of total ammonia in the sample from Borehole 105 (220 µg/L as N) was well within the DGV and guideline for recreational use. The concentration of total ammonia (8300 µg/L as N) in the sample from Borehole 104 was above the DGV (5070 µg/L as N at pH 6.6) and the guideline for recreational water (500 µg/L).

10. Discussion

Given the presence of a hydrocarbon odour and the observed absence of coal or a similar substance, the primary source of the high concentrations of PAH and TRH in fill at Borehole 202 may be coal tar, although this is not confirmed. Coal tar is pre-classified as hazardous waste according to NSW EPA, *Waste Classification Guidelines*, 2014. It is noted that concentrations of PAH and TRH were below the PQL in samples from the two groundwater monitoring wells (Boreholes 104 and 105) which are inferred to be down-gradient of Borehole 202 which indicates that the PAH and TRH contaminated fill at Borehole 202 has not impacted groundwater.

Apart from the potential coal tar at Borehole 202 discussed above, elevated concentrations of metals (in particular, copper and lead), PAH and TRH in fill may be attributed to the nature of the fill which was observed to contain various soil types and commonly contained anthropogenic materials. Coal and coal wash (which has a component of coal) was observed in fill and may be a source of PAH which was recorded at concentrations above the PQL in the majority of fill samples. The results for groundwater samples indicate that the fill with elevated concentrations of metals, PAH and TRH has not impacted groundwater at the southern part of the site.

The two fill samples with aldrin and dieldrin concentrations above the PQL (from Boreholes 108 and 109) were from directly beneath the concrete slab in the basement of the Harwood Building which indicates that these pesticides have been applied beneath the slab for the purpose of pest control. These chemicals were not identified in the groundwater at Borehole 105 which is inferred to be down-gradient of the Harwood Building, which indicates that groundwater has not been impacted from the use of these pesticides.

The source of ammonia in groundwater at Borehole 105 is not known and could potentially be from off-site. It is noted that the samples were not filtered and, thus, the elevated concentration in the sample from BH104 could be from particulate matter (soil) rather than dissolved ammonia.

Overall, results indicate that remediation or management of contamination will be required for site development although the extent of remediation / management will likely depend on the layout of future site uses and the presence or absence of accessible soil (for landscaping).

Prior to establishing plans for remediation / management of contamination, a detailed site investigation (including soil and groundwater sampling) should be undertaken.

11. Conclusion

Limited intrusive investigations have revealed the presence of fill up to 5 m in depth. Fill comprised various soil types and commonly contained anthropogenic materials. Elevated concentrations of PAH, TRH, metals and OCP have been identified in fill. In addition, an elevated concentration of ammonia in groundwater was encountered at one sample location.

Overall, results indicate that remediation or management of contamination will be required for site development although the extent of remediation / management will likely depend on the layout of future site uses as well as the results of additional investigation.

The following is recommended for the Stage 2 detailed DA:

- A detailed site investigation (including soil and groundwater sampling).

The results of the detailed site investigation would be used to determine remediation or management requirements to address site contamination. On this basis, it is considered that the site can be made suitable for the proposed Powerhouse Ultimo Renewal development.

12. Limitations

Douglas Partners (DP) has prepared this report for the Powerhouse Ultimo Renewal project at 500 Harris Street, Ultimo in general accordance with DP's proposals dated 23 February 2022 and acceptance received from Department of Premier and Cabinet. This report is provided for the exclusive use of Department of Premier and Cabinet 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.

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

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

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

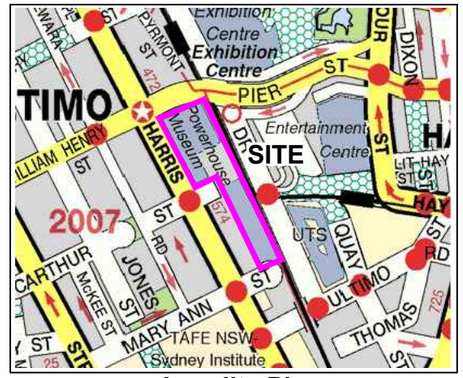
Asbestos has not been detected by observation or by laboratory analysis, either on the surface of the site, or in filling materials at the test locations sampled and analysed. Building demolition materials, such as concrete, brick, terracotta and ceramics, were, however, located in previous below-ground fill, and these are considered as indicative of the possible presence of hazardous building materials (HBM), including asbestos.

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

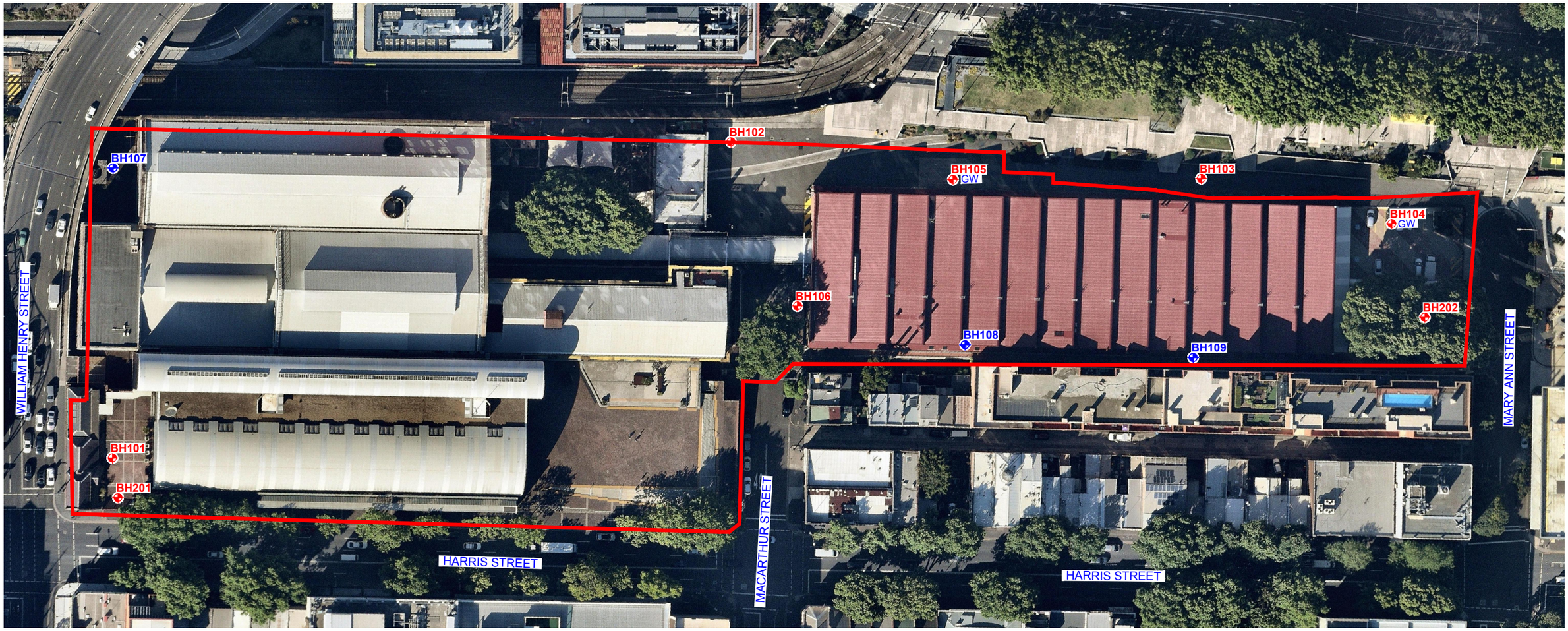
Douglas Partners Pty Ltd

Appendix A

Drawing



Locality Plan



0 10 20 30 40 50 75 100m

1:1000 @ A3

NOTE:
1: Base image from Nearmap.com (Dated 22.10.2019)
2: Test locations are approximate only and are shown with reference to existing features.

LEGEND

- Borehole location
- Hand auger bore
- GW Groundwater well

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Create NSW, Department of Premier and Cabinet		TITLE: **Location of Tests**	PROJECT No: 86874.00
OFFICE: Sydney	DRAWN BY: PSCH	**Powerhouse Museum**	DRAWING No: 1
SCALE: 1;1000 @ A3	DATE: 18.11.2019	**500 Harris Street, ULTIMO**	REVISION: 0

Appendix B

Borehole Logs

About this Report

BOREHOLE LOG

CLIENT: Creat NSW, Department of Premier and Cabinet
PROJECT: Ultimo Creative Industries Precinct
LOCATION: Powerhouse Museum, 500 Harris Street, Ultimo

SURFACE LEVEL: 15.2 AHD
EASTING: 333431
NORTHING: 6249918
DIP/AZIMUTH: 90°/--

BORE No: BH101
PROJECT No: 86874.00
DATE: 22/10/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
15	0.4	FILL/Silty SAND: fine, brown-dark brown, trace fine mixed origin gravel, moist		A/E	0.1		PID<1		
	0.55	FILL/SANDSTONE BOULDER: fine to medium, red-brown, dry		A/E*	0.5		PID<1		
	0.78	CONCRETE: pale grey, aggregate diameter from 10-25mm, 8mm steel reinforcement							
		Bore discontinued at 0.78m No further drilling after encountering concrete							
14	1								1
13	2								2
12	3								3
11	4								4

RIG: Bobcat **DRILLER:** JE **LOGGED:** RK **CASING:** HW to 0.5m, HQ to 0.5m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 0.55m, NMLC to 0.78m

WATER OBSERVATIONS: No free groundwater observed during augering

REMARKS: *replicate BD1_20191022

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

BORE: 101 **PROJECT: ULTIMO** **OCTOBER 2019**

0.55 – 0.78m

BOREHOLE LOG

CLIENT: Creat NSW, Department of Premier and Cabinet
PROJECT: Ultimo Creative Industries Precinct
LOCATION: Powerhouse Museum, 500 Harris Street, Ultimo

SURFACE LEVEL: 6.1 AHD
EASTING: 333572
NORTHING: 6249819
DIP/AZIMUTH: 90°/--

BORE No: BH102
PROJECT No: 86874.00
DATE: 22/10/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
6	0.05	ASPHALTIC CONCRETE: dark grey-black							
		FILL/Silty SAND: fine, dark brown-brown with fine to coarse mixed origin gravel, dry-moist		A/E	0.1		PID<1		
	0.3	FILL/SAND: fine to coarse, dark grey with concrete fragments (20-70mm diameter) and fine to coarse mixed origin gravel, moist		A/E	0.5		PID<1		
	0.8	FILL/Clayey SAND: fine to coarse, low plasticity, dark grey with fine to coarse mixed origin gravel, moist							
5	1 1.0	Bore discontinued at 1.0m No further drilling after encountering concrete		A/E S	1.0		PID<1 1/20mm refusal HB		1
4	2								2
3	3								3
2	4								4

RIG: Bobcat **DRILLER:** JE **LOGGED:** RK **CASING:** none

TYPE OF BORING: Solid Flight Auger (TC-bit) to 1.00m

WATER OBSERVATIONS: No free groundwater observed during augering

REMARKS: HB = SPT hammer bouncing

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Creat NSW, Department of Premier and Cabinet
PROJECT: Ultimo Creative Industries Precinct
LOCATION: Powerhouse Museum, 500 Harris Street, Ultimo

SURFACE LEVEL: 6.3 AHD
EASTING: 333618
NORTHING: 6249712
DIP/AZIMUTH: 90°/--

BORE No: BH103
PROJECT No: 86874.00
DATE: 22/10/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.05	ASPHALTIC CONCRETE: black-dark grey							
		FILL/SAND: fine to coarse, dark grey-dark brown with fine to coarse mixed origin gravel, dry-moist		A/E	0.1		PID<1		
	0.4	FILL/SANDSTONE BOULDERS: fine to medium, red-brown, with fine to coarse mixed origin gravel, moist		A/E	0.5		PID<1		
		0.80m: with building rubble (brick fragments)		A	0.8				
	1	1.10-1.20m: steel rebars (x2) in sidewall 1.20-1.30m: dimensioned sandstone block		A/E* S	1.0		PID<1 3/20mm refusal HB		1
				E	1.5		PID<1		
	1.6	CONCRETE: pale grey							
	1.7	Bore discontinued at 1.7m No further drilling after encountering concrete							
	2								2
	3								3
	4								4

RIG: Bobcat **DRILLER:** JE **LOGGED:** RK **CASING:** none

TYPE OF BORING: Solid Flight Auger (TC-bit) to 1.70m

WATER OBSERVATIONS: No free groundwater observed during augering

REMARKS: *replicate BD2_20191022, borehole location moved three times, about 0.5m apart, first two attempts refused on steel at a depth of 0.8m, HB = SPT hammer bouncing

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Creat NSW, Department of Premier and Cabinet
PROJECT: Ultimo Creative Industries Precinct
LOCATION: Powerhouse Museum, 500 Harris Street, Ultimo

SURFACE LEVEL: 5.8 AHD
EASTING: 333630
NORTHING: 6249665
DIP/AZIMUTH: 90°/--

BORE No: BH104
PROJECT No: 86874.00
DATE: 23/10/2019
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
5	0.1	CONCRETE: pale grey, aggregate diameter from 15-50mm		A/E	0.1		PID<1		Flush Gatic Cover
	0.4	FILL/SAND: medium to coarse, dark brown-brown, with fine to medium mixed origin gravel, moist-wet (wet from diatube)		A/E*	0.5		PID<1		Gravel
1	1.0	FILL/Clayey SAND: fine to medium, low plasticity, pale grey, trace building rubble (fragments of terracotta, brick and glass), moist		A/E S	1.0		PID<1 4,5,7 N = 12		
	1.5	FILL/CLAY: low plasticity, brown-dark brown with fine to medium clayey sand and fine to coarse mixed origin gravel, w<PL		A/E	1.5		PID<1		Blank
4	1.6	FILL/COAL WASH: fine to coarse coal wash gravel, black-dark grey with fine to coarse sand, moist							Bentonite
	2			A/E	2.0		PID<1		
	2.5	FILL/GRAVEL: fine to coarse mixed origin, dark grey and brown with igneous cobbles and fine to coarse sand, moist		E S	2.5		1,2,5 N = 7		
3		FILL/SAND: fine to coarse, dark grey-dark brown, trace clay, coal wash, fine to coarse mixed origin gravel and building rubble (fragments of terracotta, brick, ceramics and concrete), moist							
	3			E	3.0		PID<1		
				E	3.5		PID<1		
2	3.8	FILL/SAND: fine to medium, dark grey-dark brown, trace building rubble (fragments of terracotta and ceramics), moist 4.00m: becoming wet		E S	4.0		PID<1 5,6,8 N = 14		
	4.5	Silty CLAY CH: high plasticity, dark grey with fine sand, w<PL, firm, alluvial		E	4.5		PID<1		
1	5			A/E	5.0		PID<1		
	5.5	Silty SAND SP: fine to medium, dark grey with clay, wet, loose, alluvial		S	5.5		2,3,6 N = 9		
0	6							13-11-19	
	6.8	Sandy CLAY CL: low plasticity, fine, pale grey mottled yellow-brown, w<PL, very stiff, residual		S	7.0		8,11,12 N = 23		Gravel Slotted Pipe
-1	7								
	8								
	8.2	CLAY CH: high plasticity, dark grey-grey with fine sand, w<PL, very stiff, residual		S	8.5		5,10,14 N = 24		
-2	9								
	9.6	Sandy CLAY CI: low plasticity, fine to medium, pale grey, w<PL, very stiff, residual		S	10.0		7,11,12		

RIG: Bobcat **DRILLER:** JE **LOGGED:** RK **CASING:** HW to 6.0m

TYPE OF BORING: Diatube to 0.10m, Solid Flight Auger (TC-bit) to 6.00m, wash boring to 12.30m

WATER OBSERVATIONS: Free groundwater encountered at 4.00m

REMARKS: *replicate BD3_20191023, HB = SPT hammer bouncing

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Creat NSW, Department of Premier and Cabinet
PROJECT: Ultimo Creative Industries Precinct
LOCATION: Powerhouse Museum, 500 Harris Street, Ultimo

SURFACE LEVEL: 5.8 AHD
EASTING: 333630
NORTHING: 6249665
DIP/AZIMUTH: 90°/--

BORE No: BH104
PROJECT No: 86874.00
DATE: 23/10/2019
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
-5	11	Sandy CLAY CI: low plasticity, fine to medium, pale grey, w<PL, very stiff, residual *(continued)*					N = 23		11
-6	11.8								
	12	SANDSTONE: fine to medium, yellow-brown, inferred low-medium strength		S	12.1		7,5/50mm refusal HB		12 End Cap
	12.3	Bore discontinued at 12.3m Groundwater monitoring well installed							
-7	13								13
-8	14								14
-9	15								15
-10	16								16
-11	17								17
-12	18								18
-13	19								19
-14									

RIG: Bobcat **DRILLER:** JE **LOGGED:** RK **CASING:** HW to 6.0m

TYPE OF BORING: Diatube to 0.10m, Solid Flight Auger (TC-bit) to 6.00m, wash boring to 12.30m

WATER OBSERVATIONS: Free groundwater encountered at 4.00m

REMARKS: *replicate BD3_20191023, HB = SPT hammer bouncing

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Creat NSW, Department of Premier and Cabinet
PROJECT: Ultimo Creative Industries Precinct
LOCATION: Powerhouse Museum, 500 Harris Street, Ultimo

SURFACE LEVEL: 6.2 AHD
EASTING: 333589
NORTHING: 6249766
DIP/AZIMUTH: 90°/--

BORE No: BH105
PROJECT No: 86874.00
DATE: 28/10/2019
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
6	0.23	CONCRETE: pale grey, aggregate size from 15-45mm, 8mm reinforcing steel							A/E			PID<1
		FILL/ SAND: fine to coarse, yellow brown, with fine to coarse mixed origin gravel, moist (wet at top from diatube)							A/E			PID<1
5	1	0.7-.9m: sandstone boulders							A/E			PID<1
		0.9m: colour change to dark brown dark grey, trace fine to coarse mixed origin gravel							S			2,4,4 N = 8
		1.4m: trace building rubble (fragments of brick, terracotta and ceramics)							E			PID<1
4	2	2.0m: with low plasticity clay, trace sandstone cobbles							E*			PID<1
									E			PID<1
									S			1,2,5 N = 7
3	3								A/E			PID<1
	3.5	Sandy CLAY CL: low plasticity, fine to medium, dark grey dark brown, w<PL, soft to firm, alluvial							E			PID<1
						13-11-19						
2	4.0	Sandy CLAY CL-CI: low to medium plasticity, fine to medium, yellow brown, w<PL, stiff, residual							E			PID<1
									S			1,4,11 N = 15
	4.5	SANDSTONE: medium to coarse, yellow-brown, iron stained, low strength, moderately weathered, Hawkesbury Sandstone						4.55m: J 40°, cln, pl, vr				PL(A) = 0.2
1	5.0							4.8m: CORE LOSS: 200mm				
	5.38							5.11m: CORE LOSS: 270mm				
		SANDSTONE: medium to coarse, pale grey and yellow-brown some red-brown, iron stained, indistinctly bedded, medium then high strength, slightly weathered, slightly fractured, Hawkesbury Sandstone						5.62m: J 35°, cln. pl				PL(A) = 0.5
0	6							5.85m: J 65°, cln, pl	C	82	80	
								5.92m: B 10°, cln, pl				
								6.59m: B 10°, cln, pl, ro				PL(A) = 0.9
-1	7							6.84m: Cs, h 20mm				
								7.04m: B 5°, cln, pl, ro				
								7.75m: J 45°, cln, pl, ro				PL(A) = 1
-2	8							8.25m: J 30°, cln, pl, ro				
	8.0	SANDSTONE: as above						8.47m: B 10°, cln, pl, ro	C	100	93	PL(A) = 1.4
	8.62	SANDSTONE: medium to coarse, pale grey, indistinctly bedded, high strength, fresh, slightly fractured, Hawkesbury Sandstone						8.64m: B h, cln, pl, ro				
-3	9											
	9.33	9.33-9.45m: siltstone bed						9.33m: Cs h 35mm				PL(A) = 0.8
		9.55-9.61m: siltstone bed										

RIG: Bobcat **DRILLER:** JE **LOGGED:** RK **CASING:** HW to 4.0m, HQ to 4.5m

TYPE OF BORING: Diatube to 0.23m, Solid Flight Auger (TC-bit) to 4.00m, wash boring to 4.50m, NMLC coring to 10.15m

WATER OBSERVATIONS: No free groundwater observed during augering

REMARKS: *replicate BD4_20191028

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Creat NSW, Department of Premier and Cabinet
PROJECT: Ultimo Creative Industries Precinct
LOCATION: Powerhouse Museum, 500 Harris Street, Ultimo

SURFACE LEVEL: 6.2 AHD
EASTING: 333589
NORTHING: 6249766
DIP/AZIMUTH: 90°/--

BORE No: BH105
PROJECT No: 86874.00
DATE: 28/10/2019
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-4	10.15	SANDSTONE: fine to medium, pale grey, indistinctly bedded, high strength with very low to low strength beds, fresh, Hawkesbury Sandstone *(continued)*							C	100	93	PL(A) = 1.3
		Bore discontinued at 10.15m Target depth reached										
-5	11											
-6	12											
-7	13											
-8	14											
-9	15											
-10	16											
-11	17											
-12	18											
-13	19											

RIG: Bobcat **DRILLER:** JE **LOGGED:** RK **CASING:** HW to 4.0m, HQ to 4.5m

TYPE OF BORING: Diatube to 0.23m, Solid Flight Auger (TC-bit) to 4.00m, wash boring to 4.50m, NMLC coring to 10.15m

WATER OBSERVATIONS: No free groundwater observed during augering

REMARKS: *replicate BD4_20191028

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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BORE: 105 PROJECT: ULTIMO OCTOBER 2019

4.50 – 9.00m

BORE: 105 PROJECT: ULTIMO OCTOBER 2019

9.00 – 10.15m

BOREHOLE LOG

CLIENT: Creat NSW, Department of Premier and Cabinet
PROJECT: Ultimo Creative Industries Precinct
LOCATION: Powerhouse Museum, 500 Harris Street, Ultimo

SURFACE LEVEL: 6.2 AHD
EASTING: 333589
NORTHING: 6249766
DIP/AZIMUTH: 90°/--

BORE No: BH105
PROJECT No: 86874.00
DATE: 28/10/2019
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.23	CONCRETE: pale grey, aggregate size from 15-45mm, 8mm reinforcing steel							Flush Gatic Cover
		FILL/ SAND: fine to coarse, yellow brown, with fine to coarse mixed origin gravel, moist (wet at top from diatube)		A/E	0.3		PID<1		
		0.7-.9m: sandstone boulders		A/E	0.5		PID<1		
	1	0.9m: colour change to dark brown dark grey, trace fine to coarse mixed origin gravel		A/E	1.0		PID<1		1 Gravel
				S			2,4,4 N = 8		
		1.4m: trace building rubble (fragments of brick, terracotta and ceramics)		E	1.45 1.5		PID<1		
	2	2.0m: with low plasticity clay, trace sandstone cobbles		E*	2.0		PID<1		2 Blank
				E	2.5		PID<1		
				S			1,2,5 N = 7		Bentonite
	3			A/E	2.95 3.0		PID<1		3
	3.5	Sandy CLAY CL: low plasticity, fine to medium, dark grey dark brown, w<PL, soft to firm, alluvial		E	3.5		PID<1		
	4.0	Sandy CLAY CL-CI: low to medium plasticity, fine to medium, yellow brown, w<PL, stiff, residual		E	4.0		PID<1	13-11-19	4
				S			1,4,11 N = 15		
	4.5	SANDSTONE: medium to coarse, yellow-brown, iron stained, low strength, moderately weathered, Hawkesbury Sandstone			4.45 4.5 4.55		PL(A) = 0.2		
	5.0								5
	5.38	SANDSTONE: medium to coarse, pale grey and yellow-brown some red-brown, iron stained, indistinctly bedded, medium then high strength, slightly weathered, slightly fractured, Hawkesbury Sandstone		C	5.5		PL(A) = 0.5		
	6								6
					6.6		PL(A) = 0.9		Gravel
	7				7.11				7 Slotted Pipe
					7.5		PL(A) = 1		
	8.0	SANDSTONE: as above							8
	8.62	SANDSTONE: medium to coarse, pale grey, indistinctly bedded, high strength, fresh, slightly fractured, Hawkesbury Sandstone		C	8.5		PL(A) = 1.4		
	9								9
	9.33	SANDSTONE: fine to medium, pale grey, indistinctly bedded, high strength with very low to low strength beds, fresh, Hawkesbury Sandstone			9.45		PL(A) = 0.8		
		9.33-9.45m: siltstone bed			10.0		PL(A) = 1.3		

RIG: Bobcat **DRILLER:** JE **LOGGED:** RK **CASING:** HW to 4.0m, HQ to 4.5m

TYPE OF BORING: Diatube to 0.23m, Solid Flight Auger (TC-bit) to 4.00m, wash boring to 4.50m, NMLC coring to 10.15m

WATER OBSERVATIONS: No free groundwater observed during augering

REMARKS: *replicate BD4_20191028

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Creat NSW, Department of Premier and Cabinet
PROJECT: Ultimo Creative Industries Precinct
LOCATION: Powerhouse Museum, 500 Harris Street, Ultimo

SURFACE LEVEL: 6.2 AHD
EASTING: 333589
NORTHING: 6249766
DIP/AZIMUTH: 90°/--

BORE No: BH105
PROJECT No: 86874.00
DATE: 28/10/2019
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
-4	10.15	9.55-9.61m: siltstone bed		C	10.15				End Cap
		Bore discontinued at 10.15m Target depth reached							

RIG: Bobcat **DRILLER:** JE **LOGGED:** RK **CASING:** HW to 4.0m, HQ to 4.5m

TYPE OF BORING: Diatube to 0.23m, Solid Flight Auger (TC-bit) to 4.00m, wash boring to 4.50m, NMLC coring to 10.15m

WATER OBSERVATIONS: No free groundwater observed during augering

REMARKS: *replicate BD4_20191028

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Creat NSW, Department of Premier and Cabinet
PROJECT: Ultimo Creative Industries Precinct
LOCATION: Powerhouse Museum, 500 Harris Street, Ultimo

SURFACE LEVEL: 7.0 AHD
EASTING: 333544
NORTHING: 6249786
DIP/AZIMUTH: 90°/--

BORE No: BH106
PROJECT No: 86874.00
DATE: 28/10/2019
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
	0.1	BRICKS PAVERS							A/E			PID<1
		FILL/ SAND: fine to coarse grained, dark brown-dark grey. trace fine to coarse mixed origin gravel, moist							A/E			PID<1
6	1								A/E			PID<1
	1.5	Sandy CLAY CL-CI: low to medium plasticity, fine to medium grained, yellow brown, w<PL, firm to stiff, residual							A/E			PID<1
5	2								A/E*			PID<1
	2.5	Sandy CLAY CL-CI: low to medium plasticity, fine to medium grained, pale grey -yellow, w<PL, stiff, residual							S			4,4,6 N = 10
4	3											
	3.5	SANDSTONE: medium to coarse grained, yellow and pale-brown, inferred low-medium strength										
3	4	4.0 SANDSTONE: medium to coarse grained, pale grey and yellow-brown, indistinctly bedded to massive, medium to high strength, slightly weathered, Hawkesbury Sandstone						4.52m: J 40°, cln, pl, ro				PL(A) = 1
2	5							4.86m: J 40°, cln, pl, ro 4.91m: J 40°, 4.93m: J 40°, cln, pl, ro 5.03m: J 30°, cln, pl, ro 5.09m: J 30°, cln, pl, ro 5.29m: J 30°, cln, pl, ro 5.39m: J 25°, vn, cly 5.45m: B 10°, cln, pl, ro 5.48m: Cs h 20mm	C	100	92	PL(A) = 1
	5.35	SANDSTONE: medium to coarse grained, pale grey, indistinctly bedded, high strength, fresh, Hawkesbury Sandstone										
1	6											PL(A) = 1.9
								6.6m: J 60°, cln, pl, ro				
0	7							7.12m: J 45°, cln, pl, ro	C	100	91	
								7.65m: B 10°, cln, pl, ro 7.75m: B 10°, vn, cly				PL(A) = 1.8
-1	8							7.83m: B 10°,cln, pl, ro 7.84m: B 10°, cln, pl, ro 7.86m: B 10°, cln, pl, ro 8.27m: J 40°, cln, pl, ro 8.31m: J 55°, cln, pl, ro 8.36m: B 10°, cln, pl, ro	C	100	92	PL(A) = 2.1
								8.83m: B 10°, cln, pl, ro				
-2	9							9.45m: B 5°, cln, pl, ro	C	100	100	PL(A) = 2.8

RIG: Bobcat **DRILLER:** JE **LOGGED:** RK **CASING:** HW to 2.5, HQ to 4.0m

TYPE OF BORING: Hand auger to 1.3m, Solid Flight Auger (TC-bit) to 2.5m, wash boring to 4.0m, NMLC coring to 10.06m

WATER OBSERVATIONS: No free groundwater observed during augering

REMARKS: *replicate BD5-20191028

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Creat NSW, Department of Premier and Cabinet
PROJECT: Ultimo Creative Industries Precinct
LOCATION: Powerhouse Museum, 500 Harris Street, Ultimo

SURFACE LEVEL: 7.0 AHD
EASTING: 333544
NORTHING: 6249786
DIP/AZIMUTH: 90°/--

BORE No: BH106
PROJECT No: 86874.00
DATE: 28/10/2019
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-3	10.06	Bore discontinued at 10.06m Target depth reached						9.9m: B 5°, cln, pl, ro				PL(A) = 1.5
-4	11											
-5	12											
-6	13											
-7	14											
-8	15											
-9	16											
-10	17											
-11	18											
-12	19											

RIG: Bobcat **DRILLER:** JE **LOGGED:** RK **CASING:** HW to 2.5, HQ to 4.0m

TYPE OF BORING: Hand auger to 1.3m, Solid Flight Auger (TC-bit) to 2.5m, wash boring to 4.0m, NMLC coring to 10.06m

WATER OBSERVATIONS: No free groundwater observed during augering

REMARKS: *replicate BD5-20191028

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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BORE: 106 PROJECT: ULTIMO OCTOBER 2019

4.00 – 8.00m

BORE: 106 PROJECT: ULTIMO OCTOBER 2019

8.00 – 10.06m

BOREHOLE LOG

CLIENT: Creat NSW, Department of Premier and Cabinet
PROJECT: Ultimo Creative Industries Precinct
LOCATION: Powerhouse Museum, 500 Harris Street, Ultimo

SURFACE LEVEL: 5.8 AHD
EASTING: 333494
NORTHING: 6249446
DIP/AZIMUTH: 90°/--

BORE No: BH107
PROJECT No: 86874.00
DATE: 22/10/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
5	0.0	CONCRETE: suspended slab							
	0.3	VOID: probable disused storage space							
4	1								1
	2								2
3	3								3
	3.1	Bore discontinued at 3.1m Test Bore discontinued due to substantial void space							
2	4								4
1									

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

TYPE OF BORING: Diatube to 0.3m

WATER OBSERVATIONS: No free groundwater observed during augering

REMARKS: Level interpolated from LTS Lockley drawing 50686 001DT, 30/05/19

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Creat NSW, Department of Premier and Cabinet
PROJECT: Ultimo Creative Industries Precinct
LOCATION: Powerhouse Museum, 500 Harris Street, Ultimo

SURFACE LEVEL: 3.5 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH108
PROJECT No: 86874.00
DATE: 22/10/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.1	CONCRETE							
		FILL/ GRAVEL: dense, grey angular igneous gravel with trace sand		E*	0.1 0.2		PID<1		
	0.25	Bore discontinued at 0.25m refusal on sandstone or sandstone boulder in fill							

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

TYPE OF BORING: Diatube to 0.1m; Hand auger to 0.25m

WATER OBSERVATIONS: No free groundwater observed during augering

REMARKS: *replicate BDA/2019022, Level from drawing titled PLAN BASEMENT LEVEL, May 2005

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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BOREHOLE LOG

CLIENT: Creat NSW, Department of Premier and Cabinet
PROJECT: Ultimo Creative Industries Precinct
LOCATION: Powerhouse Museum, 500 Harris Street, Ultimo

SURFACE LEVEL: 3.5 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH109
PROJECT No: 86874.00
DATE: 22/10/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.15	CONCRETE							
	0.25	FILL/ GRAVEL: grey angular igneous gravel with trace sand							
		Bore discontinued at 0.25m refusal on sandstone or sandstone boulder in fill							

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

TYPE OF BORING: Diatube to 0.15m; Hand auger to 0.25m

WATER OBSERVATIONS: No free groundwater observed during augering

REMARKS: Level from drawing titled PLAN BASEMENT LEVEL, May 2005

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: Creat NSW, Department of Premier and Cabinet
PROJECT: Ultimo Creative Industries Precinct
LOCATION: Powerhouse Museum, 500 Harris Street, Ultimo

SURFACE LEVEL: 15.6 AHD
EASTING: 333423
NORTHING: 6249912
DIP/AZIMUTH: 90°/--

BORE No: BH201
PROJECT No: 86874.00
DATE: 15/11/2019
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
	0.05	Bick Paver							D			
	0.16	FILL/SAND: fine to medium, yellow brown, dry, possibly cemented										
	0.25	CONCRETE: 20 mm igneous gravel, 12 mm Reinforcement at 0.24 m							A/E*			PID<1
	1.3	FILL/SAND: fine to coarse, brown, trace of silt and sandstone gravel (3-20 mm), dry, apparently compacted							A/E			PID<1
	1.5	0.5 m: trace of coal							S			18,24/150 R refusal
	1.8	1.0 m: increased silt content, with cement fragments and igneous gravel (20-40 mm) and tile (3-20 mm)						2.06m: Cs,10mm	A			PL(A) = 1.3
		Sandy CLAY CL: low plasticity, red brown, fine to coarse sand, trace of ironstone gravel (10-30mm), w<PL, possibly fill										PL(A) = 1.8
		SANDSTONE: yellow brown, very low becoming high strength						2.74m: Cs,10mm	C	100	97	
		SANDSTONE: medium to coarse, pale grey with orange brown patches, indistinctly to distinctly bedded at 0-10°, slightly weathered with moderately weathered band to fresh, slightly fractured and unbroken, high strength, Hawkesbury Sandstone						3.18m: Cs,10mm				PL(A) = 1.5
								>>				PL(A) = 1.4
									C	100	99	PL(A) = 2.3
	6.12	SANDSTONE: medium to coarse, orange brown and red brown, thinly bedded at 0-5°, moderately weathered, slightly fractured and unbroken, high strength, Hawkesbury Sandstone						6.07m: B,0°,pl,ro,cly vn				PL(A) = 1.6
								6.72m: B,0°,pl,ro,cly 1mm				
								7.32m: B,0°,pl,ro,cly 3mm				
	7.88	SANDSTONE: medium to coarse, pale grey, thinly bedded at 0-5°, slightly weathered becoming fresh, slightly fractured and unbroken, high strength, Hawkesbury Sandstone										PL(A) = 1
		8.51-8.70 m: bedding at 20°						8.10-8.18m: B(x2),0°,pl,ro,cly 3mm	C	100	95	
								8.44m: Cs,15mm				PL(A) = 1.2
								9.05-9.09m: B(x3`),0°,pl,ro,cly 1-3mm				
								9.06m: Cs,10mm				
								9.22m: Ds,100mm				PL(A) = 2.1
	10.0	Bore discontinued at 10.0m										

RIG: Scout Target depth reached **DRILLER:** JE **LOGGED:** LS **CASING:** HW to 1.8m

TYPE OF BORING: Diatube 0.4m, Solid Flight Auger (TC-bit) to 1.8m, NMLC coring to 10.0m

WATER OBSERVATIONS: No free groundwater observed during augering

REMARKS: *BD20191115-1

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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BORE: 201 PROJECT: ULTIMO OCTOBER 2019

1.80 – 6.00m

BORE: 201 PROJECT: ULTIMO OCTOBER 2019

6.00 – 10.00m

BOREHOLE LOG

CLIENT: Creat NSW, Department of Premier and Cabinet
PROJECT: Ultimo Creative Industries Precinct
LOCATION: Powerhouse Museum, 500 Harris Street, Ultimo

SURFACE LEVEL: 5.4 AHD
EASTING: 333613
NORTHING: 6249647
DIP/AZIMUTH: 90°/--

BORE No: BH202
PROJECT No: 86874.00
DATE: 26/11/2019
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	0.1	CONCRETE: pale grey, aggregate 10-40mm, 8mm diameter steel reinforcement							A/E			PID<1
	0.8	FILL/Clayey SAND: fine to medium, pale brown-brown, low plasticity clay, with fine sandstone gravel, trace silt, dry							A/E			PID<1
	1.2	FILL/Gravelly SAND: fine to coarse, grey-dark grey, fine to coarse igneous gravel with clay, moist							A/E			PID<1
									S			24/120 refusal HB
									A/E			PID<1
	2.0	FILL/Clayey SAND: fine to coarse, dark grey, low plasticity clay, with fine igneous gravel and silt, moist, slight hydrocarbon odour							A/E*			PID=1
		FILL/Silty SAND: fine to medium, dark grey-dark brown, with fine sandstone gravel, moist							E			PID<1
		2.30m: with terracotta and ceramic fragments and clay							S			3,6,14 N = 20
	3.1	Silty CLAY CH: high plasticity, grey mottled yellow-brown, trace fine ironstone gravel, w<PL, stiff, appears alluvial (possibly residual)							E			PID<1
									A/E			PID<1
									S			3,4,7 N = 11
	5.0	Sandy CLAY CL: low plasticity, pale grey, fine to medium sand, w<PL, hard, residual										
	5.7	SANDSTONE: medium to coarse, pale grey, indistinctly bedded, high strength, fresh, slightly fractured, Hawkesbury Sandstone						5.77m: B, 10°, cln pl ro 5.91m: B, 10°, cln, pl, ro	S			5,11/50 refusal HB PL(A) = 1.1
		6.03m: becoming yellow-brown and pale grey, slightly weathered						6.29m: B, 15°, cln, pl, ro 6.47m: B, 15°, vn, cly, pl 6.55m: B, 15°, cln, pl, ro 6.65m: B, 15°, cln, pl, ro	C	100	88	PL(A) = 1.8
								7.1m: B, 5°, cln, pl, ro				PL(A) = 1.5
								8.36m: B, 15°, cln, pl, ro	C	10	93	PL(A) = 1
								9.02m: B, 10°, cln, pl, ro				
	9.48	9.22m: carbonaceous bed (5mm thick)										
	10.0	SANDSTONE: fine to medium, pale grey-pale brown, distinct carbonaceous laminations at 0-5°,										PL(A) = 0.2

RIG: Scout 1 **DRILLER:** JE **LOGGED:** RK **CASING:** HW to 4.3m, HQ to 5.5m

TYPE OF BORING: Diatube to 0.1m, Solid Flight Auger (TC-bit) to 4.5m, wash boring to 5.7m, NMLC to 10.0m

WATER OBSERVATIONS: No free groundwater observed during augering

REMARKS: *BD26112019, HB = SPT hammer bouncing

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: Creat NSW, Department of Premier and Cabinet
PROJECT: Ultimo Creative Industries Precinct
LOCATION: Powerhouse Museum, 500 Harris Street, Ultimo

SURFACE LEVEL: 5.4 AHD
EASTING: 333613
NORTHING: 6249647
DIP/AZIMUTH: 90°/--

BORE No: BH202
PROJECT No: 86874.00
DATE: 26/11/2019
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW, HW, MW, SW, FS, FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-5	11	very low strength, highly weathered, Hawkesbury Sandstone 9.70m: becoming indistinctly bedded, low strength Bore discontinued at 10.0m Target depth reached										
-6	12											
-7	13											
-8	14											
-9	15											
-10	16											
-11	17											
-12	18											
-13	19											
-14												

RIG: Scout 1 **DRILLER:** JE **LOGGED:** RK **CASING:** HW to 4.3m, HQ to 5.5m

TYPE OF BORING: Diatube to 0.1m, Solid Flight Auger (TC-bit) to 4.5m, wash boring to 5.7m, NMLC to 10.0m

WATER OBSERVATIONS: No free groundwater observed during augering

REMARKS: *BD26112019, HB = SPT hammer bouncing

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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BORE: 202 PROJECT: ULTIMO NOVEMBER 2019

5.70 – 10.00m

Sampling Methods

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Sampling

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

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

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

Test Pits

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

Large Diameter Augers

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

Continuous Spiral Flight Augers

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

Non-core Rotary Drilling

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

Continuous Core Drilling

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

Standard Penetration Tests

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

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

The test results are reported in the following form.

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

  4,6,7
  N=13

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

  15, 30/40 mm

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

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

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

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

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are generally based on Australian Standard AS1726:2017, Geotechnical Site Investigations. 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	19 - 63
Medium gravel	6.7 - 19
Fine gravel	2.36 – 6.7
Coarse sand	0.6 - 2.36
Medium sand	0.21 - 0.6
Fine sand	0.075 - 0.21

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

The proportions of secondary constituents of soils are described as follows:

In fine grained soils (>35% fines)

Term	Proportion of sand or gravel	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	>30%	Sandy Clay
With	15 – 30%	Clay with sand
Trace	0 - 15%	Clay with trace sand

In coarse grained soils (>65% coarse)
- with clays or silts

Term	Proportion of fines	Example
And	Specify	Sand (70%) and Clay (30%)
Adjective	>12%	Clayey Sand
With	5 - 12%	Sand with clay
Trace	0 - 5%	Sand with trace clay

In coarse grained soils (>65% coarse)
- with coarser fraction

Term	Proportion of coarser fraction	Example
And	Specify	Sand (60%) and Gravel (40%)
Adjective	>30%	Gravelly Sand
With	15 - 30%	Sand with gravel
Trace	0 - 15%	Sand with trace gravel

The presence of cobbles and boulders shall be specifically noted by beginning the description with ‘Mix of Soil and Cobbles/Boulders’ with the word order indicating the dominant first and the proportion of cobbles and boulders described together.

Soil Descriptions

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
Friable	Fr	-

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	Density Index (%)
Very loose	VL	<15
Loose	L	15-35
Medium dense	MD	35-65
Dense	D	65-85
Very dense	VD	>85

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;
- Extremely weathered material – formed from in-situ weathering of geological formations. Has soil strength but retains the structure or fabric of the parent rock;
- Alluvial soil – deposited by streams and rivers;
- Estuarine soil – deposited in coastal estuaries;
- Marine soil – deposited in a marine environment;
- Lacustrine soil – deposited in freshwater lakes;
- Aeolian soil – carried and deposited by wind;
- Colluvial soil – soil and rock debris transported down slopes by gravity;
- Topsoil – mantle of surface soil, often with high levels of organic material.
- Fill – any material which has been moved by man.

Moisture Condition – Coarse Grained Soils

For coarse grained soils the moisture condition should be described by appearance and feel using the following terms:

- Dry (D) Non-cohesive and free-running.
- Moist (M) Soil feels cool, darkened in colour.
  Soil tends to stick together.
  Sand forms weak ball but breaks easily.
- Wet (W) Soil feels cool, darkened in colour.
  Soil tends to stick together, free water forms when handling.

Moisture Condition – Fine Grained Soils

For fine grained soils the assessment of moisture content is relative to their plastic limit or liquid limit, as follows:

- ‘Moist, dry of plastic limit’ or ‘w <PL’ (i.e. hard and friable or powdery).
- ‘Moist, near plastic limit’ or ‘w ≈ PL (i.e. soil can be moulded at moisture content approximately equal to the plastic limit).
- ‘Moist, wet of plastic limit’ or ‘w >PL’ (i.e. soils usually weakened and free water forms on the hands when handling).
- ‘Wet’ or ‘w ≈LL’ (i.e. near the liquid limit).
- ‘Wet’ or ‘w >LL’ (i.e. wet of the liquid limit).

Rock Strength

Rock strength is defined by the Unconfined Compressive Strength and it 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 Point Load Strength Index $Is_{(50)}$ is commonly used to provide an estimate of the rock strength and site specific correlations should be developed to allow UCS values to be determined. The point load strength test procedure is described by Australian Standard AS4133.4.1-2007. The terms used to describe rock strength are as follows:

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

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

Rock Descriptions

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 occasional fragments
Fractured	Core lengths of 30-100 mm with occasional shorter and longer sections
Slightly Fractured	Core lengths of 300 mm or longer with occasional sections of 100-300 mm
Unbroken	Core contains very few fractures

Rock Quality Designation

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

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

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

Stratification Spacing

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

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

Symbols & Abbreviations

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

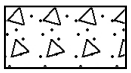
Symbols & Abbreviations

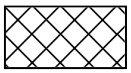
Graphic Symbols for Soil and Rock

General

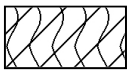

Asphalt

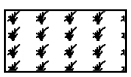

Road base

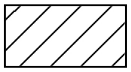

Concrete

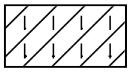

Filling

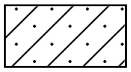
Soils


Topsoil

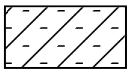

Peat

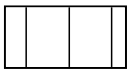

Clay

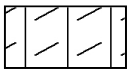

Silty clay

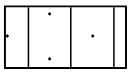

Sandy clay

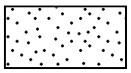

Gravelly clay

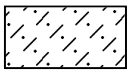

Shaly clay

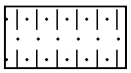

Silt


Clayey silt


Sandy silt

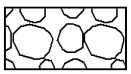

Sand

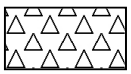

Clayey sand


Silty sand


Gravel

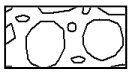

Sandy gravel


Cobbles, boulders

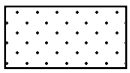

Talus

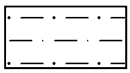
Sedimentary Rocks

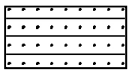

Boulder conglomerate

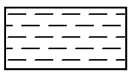

Conglomerate


Conglomeratic sandstone

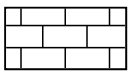

Sandstone


Siltstone

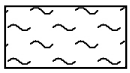

Laminite

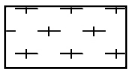

Mudstone, claystone, shale

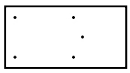

Coal


Limestone

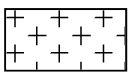
Metamorphic Rocks

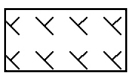

Slate, phyllite, schist

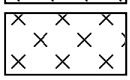

Gneiss

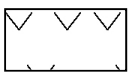

Quartzite

Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

About this Report

Douglas Partners

Introduction

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

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

Copyright

Borehole and Test Pit Logs

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

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

Groundwater

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

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

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

Reports

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

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

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

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

About this Report

Site Anomalies

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

Information for Contractual Purposes

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

Site Inspection

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

Appendix C

Groundwater Field Sheets

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Groundwater Field Sheet

Bore Volume = casing volume + filter pack volume
$= \pi h_1 d_2^2/4 + n(\pi h_1 d_1^2/4 - \pi h_2 d_2^2/4)$
Where: $\pi = 3.14$
n = porosity (0.3 for most filter pack material)
h_1 = height of water column
d_1 = diameter of annulus
h_2 = length of filter pack
d_2 = diameter of casing
Bore Vol Normally: 7.2*h

Project and Bore Installation Details	
Bore / Standpipe ID:	MW104
Project Name:	Powerhouse Museum
Project Number:	86874.01
Site Location:	Ultimo
Bore GPS Co-ord:	
Installation Date:	
GW Level (during drilling):	- m bgl
Well Depth:	m bgl
Screened Interval:	m bgl
Contaminants/Comments:	-

Bore Development Details	
Date/Time:	13/11/19 11:30am
Purged By:	CL
GW Level (pre-purge):	6.90 m bgl
GW Level (post-purge):	9.69 m bgl
PSH observed:	Yes / (No) (interface / visual). Thickness if observed:
Observed Well Depth:	11.89 m bgl
Estimated Bore Volume:	41 L
Total Volume Purged:	(target: no drill mud, min 3 well vol. or dry) 1 Vols ~100%
Equipment:	Twister pump. Interface meter

Micropurge and Sampling Details	
Date/Time:	13/11/19 11:30am
Sampled By:	CL
Weather Conditions:	Sunny
GW Level (pre-purge):	6.62 m bgl
GW Level (post sample):	7.89 m bgl
PSH observed:	Yes / (No) (interface / visual). Thickness if observed:
Observed Well Depth:	11.7 m bgl
Estimated Bore Volume:	38 L
Total Volume Purged:	27.4 L
Equipment:	Low flow pump, TPS meter, Interface meter, Bailer

Water Quality Parameters

Time / Volume	Temp (°C)	DO (mg/L)	EC (µS or mS/cm)	pH	Turbidity	Redox (mV)
Stabilisation Criteria (3 readings)	***0.1 °C***	**+/- 0.3 mg/L**	**+/- 3%**	**+/- 0.1**	**+/- 10%**	**+/- 10 mV**
11:40	38.5	6.30	1467	6.62	200	-53
11:61	33.5	4.09	1531	6.60	(300)	-56
11:42	26.3	2.47	1626	6.58	153	-68
11:45	25.4	2.60	1643	6.57	157.1	-70
11:64	24.6	2.33	1669	6.56	149	-73

Additional Readings Following stabilisation:	DO % Sat	SPC	TDS			

Sample Details

Sampling Depth (rationale):	7.5 m bgl,
Sample Appearance (e.g. colour, siltiness, odour):	N/A
Sample ID:	MW104
QA/QC Samples:	N/A
Sampling Containers and filtration:	1 x Amber 2 x Vols, 3 x plastic
Comments / Observations:	—

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Geotechnics / Environment / Groundwater

Groundwater Field Sheet

Bore Volume = casing volume + filter pack volume
$= \pi h_1 d_2^2/4 + n(\pi h_1 d_1^2/4 - \pi h_2 d_2^2/4)$
Where: $\pi = 3.14$
n = porosity (0.3 for most filter pack material)
h_1 = height of water column
d_1 = diameter of annulus
h_2 = length of filter pack
d_2 = diameter of casing
Bore Vol Normally: 7.2*h

Project and Bore Installation Details	
Bore / Standpipe ID:	MW105
Project Name:	Powerhouse Museum
Project Number:	86574-01
Site Location:	Ultimo
Bore GPS Co-ord:	
Installation Date:	
GW Level (during drilling):	- m bgl
Well Depth:	m bgl
Screened Interval:	m bgl
Contaminants/Comments:	-

Bore Development Details	
Date/Time:	13/11/19 10:30 am
Purged By:	CL
GW Level (pre-purge):	3.86 m bgl
GW Level (post-purge):	4.9 m bgl
PSH observed:	Yes / (No) (interface / visual). Thickness if observed:
Observed Well Depth:	10.2 m bgl
Estimated Bore Volume:	47.8 L
Total Volume Purged:	(target: no drill mud, min 3 well vol. or dry) full dry ~ 50L
Equipment:	tubber pump, Interface meter

Micropurge and Sampling Details	
Date/Time:	13/11/19 10:30 am
Sampled By:	CL
Weather Conditions:	Sunny
GW Level (pre-purge):	3.79 m bgl
GW Level (post sample):	1.0 m bgl
PSH observed:	Yes / (No) (interface / visual). Thickness if observed:
Observed Well Depth:	1.0 m bgl
Estimated Bore Volume:	6.45 L
Total Volume Purged:	36 L
Equipment:	Lowflow pump, Interface meter, TPS meter, Boiler

Water Quality Parameters

Time / Volume	Temp (°C)	DO (mg/L)	EC (µS or mS/cm)	pH	Turbidity	Redox (mV)
Stabilisation Criteria (3 readings)	***0.1 °C***	**+/- 0.3 mg/L**	**+/- 3%**	**+/- 0.1**	**+/- 10%**	**+/- 10 mV**
10:43	26.3	1.11	1161	6.33	34.8	187
10:46	24.3	1.57	1174	6.36	33.3	183
10:45	22.8	1.35	1175	6.37	34.3	180
10:46	22.5	1.19	1179	6.37	35.0	175
10:47	22.3	1.09	1172	6.36	36.8	170
Additional Readings Following stabilisation:	DO % Sat	SPC	TDS			

Sample Details

Sampling Depth (rationale):	5.1 m bgl, Mid-Column
Sample Appearance (e.g. colour, siltiness, odour):	N/A
Sample ID:	MW105
QA/QC Samples:	BD1/20191115
Sampling Containers and filtration:	3x Vols, 1x Amber, ~~1x Metal~~ 3x plastic
Comments / Observations:	

Appendix D

QA / QC Report

QA / QC PROCEDURES AND RESULTS

Q1. Data Quality Objectives

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

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

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

Table Q1: Data Quality Objectives

Data Quality Objective	Report Section where Addressed
State the Problem	S1 Introduction
Identify the Decision	S10 Discussion S11 Conclusion
Identify Inputs to the Decision	S1 Introduction S3 Site Identification and Description S4 Summary of Previous Contamination Report S5 Preliminary Conceptual Site Model S8 Field Work Results S9 Laboratory Analytical Rational and Results
Define the Boundary of the Assessment	S3 Site Identification and Description
Develop a Decision Rule	S7 Site Assessment Criteria
Specify Acceptable Limits on Decision Errors	S6 Field Work and QA/QC
Optimise the Design for Obtaining Data	S2 Scope of Works S6 Field Work and QA/QC

Q2. FIELD AND LABORATORY QUALITY CONTROL

The field and laboratory QC procedures and results are described below. Field work procedures are documented in Section 6. Laboratory certificates are provided in Appendix E.

Q2.1 Trip Spike and Blank

During the course of soil sampling, two sets of soil trip spikes and soil trip blanks were taken into the field and subject to the same conditions as the soil samples that were collected in jars. Similarly, one water trip blank and water trip spike was take into the field and subject to the same conditions as the groundwater samples.

The results of analysis of the trip spike and trip blank is shown in Tables Q2 and Q3. Trip spike recoveries between 60% to 140% and trip blank results of less than the practical quantitation limits were achieved.

Table Q2: Trip Spike Results (%)

Sample	Media	Benzene	Toluene	Ethylbenzene	m+p-Xylene	o-Xylene
229301-12 TS	Soil	113	108	109	116	125
230944-4 TS	Water	103	108	100	95	101
231640-3 TS	Soil	103	103	107	106	106

Table Q3 Trip Blank Results

Sample	Media	Benzene	Toluene	Ethylbenzene	m+p-Xylene	o-Xylene
229301-13 TB	Soil	<0.2 mg/kg	<0.5 mg/kg	<1 mg/kg	<2 mg/kg	<1 mg/kg
230944-5 TB	Water	<1 µg/L	<1 µg/L	<1 µg/L	<2 µg/L	<1 µg/L
231640-4 TB	Soil	<0.2 mg/kg	<0.5 mg/kg	<1 mg/kg	<2 mg/kg	<1 mg/kg

Q2.2 Intra-laboratory Analysis

An intra-laboratory replicate was analysed as an internal check of the reproducibility within the primary laboratory (Envirolab Services) and as a measure of consistency of sampling techniques. The comparative results of analysis between the primary samples and intra-laboratory replicate samples are summarised in Tables Q4 to Q6.

Table Q4: Relative Percentage Difference for Intra-laboratory Replicate BD2_20191022

Contaminant	Sample BH103 / 1m	Sample BD2_20191022		
	Concentration (mg/kg)	Concentration (mg/kg)	Difference (mg/kg)	RPD (%)
Arsenic	4	5	1	22
Cadmium	<0.4	<0.4	0	0
Chromium	36	36	0	0
Copper	21	17	4	21
Lead	42	47	5	11
Mercury	<0.1	<0.1	0	0
Nickel	16	14	2	13
Zinc	69	62	7	11
TRH C_6 - C_{10}	<25	<25	0	0
TRH >C_{10}-C_{16}	<50	<50	0	0
TRH >C_{16}-C_{34}	<100	<100	0	0
TRH >C_{34}-C_{40}	<100	<100	0	0
Benzene	<0.2	<0.2	0	0
Toluene	<0.5	<0.5	0	0
Ethylbenzene	<1	<1	0	0
Total Xylenes	<3	<3	0	0
Naphthalene	<1	<1	0	0

Table Q5: Relative Percentage Difference for Intra-laboratory Replicate BD3_20191023

Contaminant	Sample BH104 / 0.5m	Sample BD3_20191023		
	Concentration (mg/kg)	Concentration (mg/kg)	Difference (mg/kg)	RPD (%)
Arsenic	<4	<4	0	0
Cadmium	<0.4	<0.4	0	0
Chromium	4	8	4	**67**
Copper	3	4	1	29
Lead	36	33	3	9
Mercury	<0.1	<0.1	0	0
Nickel	<1	1	0	0
Zinc	21	22	1	5
TRH C_6 - C_{10}	<25	<25	0	0
TRH >C_{10}-C_{16}	<50	<50	0	0
TRH >C_{16}-C_{34}	<100	<100	0	0
TRH >C_{34}-C_{40}	<100	<100	0	0
Benzene	<0.2	<0.2	0	0
Toluene	<0.5	<0.5	0	0
Ethylbenzene	<1	<1	0	0
Total Xylenes	<3	<3	0	0
Naphthalene	<1	<1	0	0

Table Q6: Relative Percentage Difference for Intra-laboratory Replicate BD1/20191115

Contaminant	Sample MW105	Sample BD1/20191115		
	Concentration (µg/L)	Concentration (µg/L)	Difference (µg/L)	RPD (%)
Arsenic	1	<1	0	0
Cadmium	<0.1	<0.1	0	0
Chromium	2	<1	1	**50**
Copper	4	2	2	**67**
Lead	5	<1	4	**133**
Mercury	0.06	<0.05	0.01	18
Nickel	12	11	1	9
Zinc	18	11	7	**48**
TRH C_6 - C_{10}	<10	<10	0	0
TRH >C_{10}-C_{16}	<50	<50	0	0
TRH >C_{16}-C_{34}	<100	<100	0	0
TRH >C_{34}-C_{40}	<100	<100	0	0
Benzene	<1	<1	0	0
Toluene	<1	<1	0	0
Ethylbenzene	<1	<1	0	0
o-Xylene	<1	<1	0	0
m+p xylene	<2	<2	0	0
Naphthalene	<1	<1	0	0

The calculated relative percentage difference (RPD) values were less than 50% for organics. A number of calculated RPD values were greater than 30% for inorganics (metals) as shown in bold, however, these are not considered to be significant because the actual concentration differences between samples is small indicating little variation in concentrations between replicate pairs. Overall, the intra-laboratory replicate comparisons indicate that the sampling techniques were generally consistent and repeatable.

Q2.3 Inter-laboratory Analysis

Inter-laboratory replicates were conducted as a check of the reproducibility of results between the primary laboratory (Envirolab Services) and the secondary laboratory (Eurofins) and as a measure of consistency of sampling techniques. The comparative results of analysis between the primary and inter-laboratory replicate samples are summarised in Tables Q7 and Q8.

Table Q7: Relative Percentage Difference for Inter-laboratory Replicate BDA/20191022

Contaminant	Sample BH108 / 0.1-0.2 m	Sample BDA/20191022		
	Concentration (mg/kg)	Concentration (mg/kg)	Difference (mg/kg)	RPD (%)
Arsenic	<4	<2	0	0
Cadmium	<0.4	<0.4	0	0
Chromium	34	67	33	**65**
Copper	10	22	12	**75**
Lead	6	14	8	**80**
Mercury	<0.1	<0.1	0	0
Nickel	37	67	30	**58**
Zinc	20	31	11	**43**
TRH C_6 - C_{10}	<25	<20	0	0
TRH >C_{10}-C_{16}	<50	<50	0	0
TRH >C_{16}-C_{34}	<100	<100	0	0
TRH >C_{34}-C_{40}	<100	<100	0	0
Benzene	<0.2	<0.1	0	0
Toluene	<0.5	<0.1	0	0
Ethylbenzene	<1	<0.1	0	0
Total Xylenes	<3	<0.3	0	0
Naphthalene	<1	<0.5	0	0

Table Q8: Relative Percentage Difference for Inter-laboratory Replicate BD26112019

Contaminant	Sample 202 / 2.0-2.1	Sample BD26112019		
	Concentration (mg/kg)	Concentration (mg/kg)	Difference (mg/kg)	RPD (%)
Arsenic	4	8	4	**67**
Cadmium	<0.4	<0.4	0	0
Chromium	30	45	15	**40**
Copper	70	120	50	**52**
Lead	320	1300	980	**121**
Mercury	1.4	3.9	2.5	**94**
Nickel	36	40	4	**11**
Zinc	120	240	120	**67**
TRH C_6 - C_{10}	<25	<200	0	0
TRH >C_{10}-C_{16}	82	<500	0	0
TRH >C_{16}-C_{34}	780	2300	1520	**99**
TRH >C_{34}-C_{40}	<100	<1000	0	0
Benzene	<0.2	<0.5	0	0
Toluene	<0.5	<0.5	0	0
Ethylbenzene	<1	<0.5	0	0
Total Xylenes	<3	<1.5	0	0
Naphthalene	6	26	20	**163**

A number of calculated RPD values were above 50% for organics and 30% for inorganics (metals) as shown in bold. These are not considered to be significant because:

- In many cases, the actual concentration differences (in mg/kg) between samples is small;
- The replicate pairs are from fill soils which is heterogeneous in nature; and
- Soil replicates, rather than homogenised soil duplicates, were used to minimise the risk of possible volatile loss, hence variability can be expected.

Overall, the inter-laboratory replicate comparisons indicate that the sampling techniques were generally consistent and repeatable and the sampling handling and analytical methods for the two laboratories are comparable.

Q2.4 Laboratory QC

A summary of laboratory QC is shown in Table Q9.

Table Q9: Laboratory QC

Item	Frequency	Acceptance Criteria	Achievement
Analytical laboratories used		NATA accreditation	Yes
Holding times		In accordance with NEPC (2013) which references various Australian and international standards	Yes
Laboratory / Reagent Blanks	1 per lab batch	<PQL	Yes
Laboratory duplicates	10% primary samples	Laboratory specific	Yes
Matrix Spikes	1 per lab batch	70-130% recovery (inorganics); 60-140% (organics); 10-140% (SVOC, speciated phenols)	Generally yes (see comments below)
Surrogate Spikes	organics by GC	70-130% recovery (inorganics); 60-140% (organics); 10-140% (SVOC, speciated phenols)	Generally yes (see comments below)
Control Samples	1 per lab batch	70-130% recovery (inorganics); 60-140% (organics); 10-140% (SVOC, speciated phenols)	Yes

Where laboratory QA / QC results were unable to be achieved by the laboratory, report comments were made by the laboratory. These included:

- Percent recovery in the matrix spike for sample 231640-1 was not possible to report due to the inhomogeneous nature of the element/s in the sample/s. However an acceptable recovery was obtained for the laboratory control sample (LCS).
- For TRH C_{10}-C_{40}, percent recovery for the surrogate and matrix spike was not possible to report as the high concentration of analytes in sample 231640-1 caused interference.
- For OCP, OPP and PCB, the PQL was raised due to interferences from analytes (other than those being tested) in sample 231640-1. Percent recovery for the matrix spike was not possible to report due to interference from analytes (other than those being tested) in sample 231640-1.
- For sample S19-No38471, RPD results for arsenic, copper and zinc were outside the acceptable range, however, the RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria.
- The limits of reporting were raised due to matrix interference in sample S19-No38471.

Overall, laboratory QA / QC results indicate that laboratory results are usable for this assessment.

Q3. Data Quality Indicators

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

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

The DQIs were assessed as outlined in the following Table Q10.

Table Q10: Data Quality Indicators

Data Quality Indicator	Method(s) of Achievement
Completeness	Preparation of borehole logs, sample location plan and chain of custody records; Preparation of field groundwater sampling sheets; Laboratory sample receipt information received confirming receipt of samples intact and appropriateness of the chain of custody; Samples analysed for identified potential contaminants; Completion of chain of custody (COC) documentation; NATA accredited laboratory results certificates provided by the laboratory; Satisfactory frequency and results for field and laboratory quality control (QC) samples.
Comparability	Using appropriate techniques for sample recovery, storage and transportation, which were the same for the duration of the project; Experienced samplers used; Use of NATA registered laboratories, with test methods the same or similar between laboratories; Satisfactory results for field and laboratory QC samples.
Representativeness	Target media sampled; Sample numbers recovered and analysed are considered to be representative of the target media and complying with DQOs; Samples were extracted and analysed within holding times; Samples were analysed in accordance with the COC.

Data Quality Indicator	Method(s) of Achievement
Precision	Field staff followed standard operating procedures; Acceptable RPD between original samples and replicates; Satisfactory results for all other field and laboratory QC samples.
Accuracy	Field staff followed standard operating procedures; Satisfactory results for all field and laboratory QC samples.

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

Appendix E

Laboratory Certificates

Chain of Custody

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 229301

Client Details

Client	Douglas Partners Pty Ltd
Attention	David Walker
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**86874.01, Ultimo**
Number of Samples	13 Soil
Date samples received	25/10/2019
Date completed instructions received	25/10/2019

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	01/11/2019
Date of Issue	01/11/2019
Reissue Details	This report replaces R00 created on 31/10/2019 due to: sample ID error

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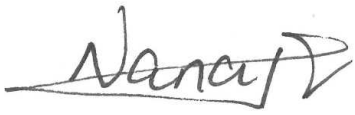
Asbestos Approved By
Analysed by Asbestos Approved Identifier: Lucy Zhu
Authorised by Asbestos Approved Signatory: Lucy Zhu

Results Approved By
Diego Bigolin, Team Leader, Inorganics
Jaimie Loa-Kum-Cheung, Metals Supervisor
Josh Williams, Chemist
Loren Bardwell, Senior Chemist
Lucy Zhu, Senior Asbestos Analyst
Priya Samarawickrama, Senior Chemist
Steven Luong, Organics Supervisor

Authorised By



Nancy Zhang, Laboratory Manager

VOCs in soil			
Our Reference		229301-2	229301-3
Your Reference	UNITS	BH102	BH103
Depth		0.5	1.0
Date Sampled		22/10/2019	22/10/2019
Type of sample		Soil	Soil
Date extracted	-	28/10/2019	28/10/2019
Date analysed	-	29/10/2019	29/10/2019
Dichlorodifluoromethane	mg/kg	<1	<1
Chloromethane	mg/kg	<1	<1
Vinyl Chloride	mg/kg	<1	<1
Bromomethane	mg/kg	<1	<1
Chloroethane	mg/kg	<1	<1
Trichlorofluoromethane	mg/kg	<1	<1
1,1-Dichloroethene	mg/kg	<1	<1
trans-1,2-dichloroethene	mg/kg	<1	<1
1,1-dichloroethane	mg/kg	<1	<1
cis-1,2-dichloroethene	mg/kg	<1	<1
bromochloromethane	mg/kg	<1	<1
chloroform	mg/kg	<1	<1
2,2-dichloropropane	mg/kg	<1	<1
1,2-dichloroethane	mg/kg	<1	<1
1,1,1-trichloroethane	mg/kg	<1	<1
1,1-dichloropropene	mg/kg	<1	<1
Cyclohexane	mg/kg	<1	<1
carbon tetrachloride	mg/kg	<1	<1
Benzene	mg/kg	<0.2	<0.2
dibromomethane	mg/kg	<1	<1
1,2-dichloropropane	mg/kg	<1	<1
trichloroethene	mg/kg	<1	<1
bromodichloromethane	mg/kg	<1	<1
trans-1,3-dichloropropene	mg/kg	<1	<1
cis-1,3-dichloropropene	mg/kg	<1	<1
1,1,2-trichloroethane	mg/kg	<1	<1
Toluene	mg/kg	<0.5	<0.5
1,3-dichloropropane	mg/kg	<1	<1
dibromochloromethane	mg/kg	<1	<1
1,2-dibromoethane	mg/kg	<1	<1
tetrachloroethene	mg/kg	<1	<1
1,1,1,2-tetrachloroethane	mg/kg	<1	<1
chlorobenzene	mg/kg	<1	<1

VOCs in soil			
Our Reference		229301-2	229301-3
Your Reference	UNITS	BH102	BH103
Depth		0.5	1.0
Date Sampled		22/10/2019	22/10/2019
Type of sample		Soil	Soil
Ethylbenzene	mg/kg	<1	<1
bromoform	mg/kg	<1	<1
m+p-xylene	mg/kg	<2	<2
styrene	mg/kg	<1	<1
1,1,2,2-tetrachloroethane	mg/kg	<1	<1
o-Xylene	mg/kg	<1	<1
1,2,3-trichloropropane	mg/kg	<1	<1
isopropylbenzene	mg/kg	<1	<1
bromobenzene	mg/kg	<1	<1
n-propyl benzene	mg/kg	<1	<1
2-chlorotoluene	mg/kg	<1	<1
4-chlorotoluene	mg/kg	<1	<1
1,3,5-trimethyl benzene	mg/kg	<1	<1
tert-butyl benzene	mg/kg	<1	<1
1,2,4-trimethyl benzene	mg/kg	<1	<1
1,3-dichlorobenzene	mg/kg	<1	<1
sec-butyl benzene	mg/kg	<1	<1
1,4-dichlorobenzene	mg/kg	<1	<1
4-isopropyl toluene	mg/kg	<1	<1
1,2-dichlorobenzene	mg/kg	<1	<1
n-butyl benzene	mg/kg	<1	<1
1,2-dibromo-3-chloropropane	mg/kg	<1	<1
1,2,4-trichlorobenzene	mg/kg	<1	<1
hexachlorobutadiene	mg/kg	<1	<1
1,2,3-trichlorobenzene	mg/kg	<1	<1
Surrogate Dibromofluorometha	%	112	110
Surrogate aaa-Trifluorotoluene	%	98	127
Surrogate Toluene-d_8	%	112	111
Surrogate 4-Bromofluorobenzene	%	119	114

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		229301-1	229301-2	229301-3	229301-4	229301-5
Your Reference	UNITS	BH101	BH102	BH103	BH104	BH104
Depth		0.1	0.5	1.0	0.5	1.5
Date Sampled		22/10/2019	22/10/2019	22/10/2019	23/10/2019	23/10/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	28/10/2019	28/10/2019	28/10/2019	28/10/2019	28/10/2019
Date analysed	-	29/10/2019	29/10/2019	29/10/2019	29/10/2019	29/10/2019
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	115	98	127	127	114

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		229301-6	229301-7	229301-8	229301-9	229301-10
Your Reference	UNITS	BH104	BH104	BH108	BH109	BD2_20191022
Depth		3.0	4.0	0.1-0.2	0.15-0.2	-
Date Sampled		23/10/2019	23/10/2019	22/10/2019	22/10/2019	23/10/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	28/10/2019	28/10/2019	28/10/2019	28/10/2019	28/10/2019
Date analysed	-	29/10/2019	29/10/2019	29/10/2019	29/10/2019	30/10/2019
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	115	126	132	128	86

vTRH(C6-C10)/BTEXN in Soil				
Our Reference		229301-11	229301-12	229301-13
Your Reference	UNITS	BD3_20191023	TS	TB
Depth		-	-	-
Date Sampled		23/10/2019	22/10/2019	22/10/2019
Type of sample		Soil	Soil	Soil
Date extracted	-	28/10/2019	28/10/2019	28/10/2019
Date analysed	-	29/10/2019	29/10/2019	29/10/2019
TRH C_6 - C_9	mg/kg	<25	[NA]	[NA]
TRH C_6 - C_{10}	mg/kg	<25	[NA]	[NA]
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	[NA]	[NA]
Benzene	mg/kg	<0.2	113%	<0.2
Toluene	mg/kg	<0.5	108%	<0.5
Ethylbenzene	mg/kg	<1	109%	<1
m+p-xylene	mg/kg	<2	116%	<2
o-Xylene	mg/kg	<1	125%	<1
naphthalene	mg/kg	<1	[NA]	<1
Total +ve Xylenes	mg/kg	<3	[NA]	<3
Surrogate aaa-Trifluorotoluene	%	132	82	131

svTRH (C10-C40) in Soil						
Our Reference		229301-1	229301-2	229301-3	229301-4	229301-5
Your Reference	UNITS	BH101	BH102	BH103	BH104	BH104
Depth		0.1	0.5	1.0	0.5	1.5
Date Sampled		22/10/2019	22/10/2019	22/10/2019	23/10/2019	23/10/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	28/10/2019	28/10/2019	28/10/2019	28/10/2019	28/10/2019
Date analysed	-	28/10/2019	28/10/2019	29/10/2019	29/10/2019	29/10/2019
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	380	<100	<100	150
TRH C_{29} - C_{36}	mg/kg	<100	350	<100	<100	160
TRH >C_{10} -C_{16}	mg/kg	<50	63	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	63	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	640	<100	<100	150
TRH >C_{34} -C_{40}	mg/kg	<100	200	<100	<100	160
Total +ve TRH (>C10-C40)	mg/kg	<50	900	<50	<50	310
Surrogate o-Terphenyl	%	119	129	111	110	97

svTRH (C10-C40) in Soil						
Our Reference		229301-6	229301-7	229301-8	229301-9	229301-10
Your Reference	UNITS	BH104	BH104	BH108	BH109	BD2_20191022
Depth		3.0	4.0	0.1-0.2	0.15-0.2	-
Date Sampled		23/10/2019	23/10/2019	22/10/2019	22/10/2019	23/10/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	28/10/2019	28/10/2019	28/10/2019	28/10/2019	28/10/2019
Date analysed	-	29/10/2019	29/10/2019	29/10/2019	29/10/2019	29/10/2019
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	110	<100	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	110	<50	<50	<50	<50
Surrogate o-Terphenyl	%	99	95	96	92	93

svTRH (C10-C40) in Soil		
Our Reference		229301-11
Your Reference	UNITS	BD3_20191023
Depth		-
Date Sampled		23/10/2019
Type of sample		Soil
Date extracted	-	28/10/2019
Date analysed	-	29/10/2019
TRH C_{10} - C_{14}	mg/kg	<50
TRH C_{15} - C_{28}	mg/kg	<100
TRH C_{29} - C_{36}	mg/kg	<100
TRH >C_{10} -C_{16}	mg/kg	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50
TRH >C_{16} -C_{34}	mg/kg	<100
TRH >C_{34} -C_{40}	mg/kg	<100
Total +ve TRH (>C10-C40)	mg/kg	<50
Surrogate o-Terphenyl	%	107

PAHs in Soil						
Our Reference		229301-1	229301-2	229301-3	229301-4	229301-5
Your Reference	UNITS	BH101	BH102	BH103	BH104	BH104
Depth		0.1	0.5	1.0	0.5	1.5
Date Sampled		22/10/2019	22/10/2019	22/10/2019	23/10/2019	23/10/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	28/10/2019	28/10/2019	28/10/2019	28/10/2019	28/10/2019
Date analysed	-	29/10/2019	29/10/2019	29/10/2019	29/10/2019	29/10/2019
Naphthalene	mg/kg	<0.1	0.2	<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	0.9	0.1	<0.1	0.4
Anthracene	mg/kg	<0.1	0.2	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.2	1.8	0.2	<0.1	1
Pyrene	mg/kg	0.2	2.0	0.2	<0.1	1
Benzo(a)anthracene	mg/kg	0.1	1.2	0.1	<0.1	0.5
Chrysene	mg/kg	0.1	1.1	<0.1	<0.1	0.5
Benzo(b,j+k)fluoranthene	mg/kg	0.2	2	<0.2	<0.2	1
Benzo(a)pyrene	mg/kg	0.1	1.2	0.1	<0.05	0.54
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	0.6	<0.1	<0.1	0.3
Dibenzo(a,h)anthracene	mg/kg	<0.1	0.2	<0.1	<0.1	0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	0.8	<0.1	<0.1	0.4
Total +ve PAH's	mg/kg	1.0	12	0.79	<0.05	5.7
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	1.8	<0.5	<0.5	0.8
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	1.8	<0.5	<0.5	0.8
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	1.8	<0.5	<0.5	0.8
Surrogate p-Terphenyl-d14	%	124	105	120	114	112

PAHs in Soil					
Our Reference		229301-6	229301-7	229301-8	229301-9
Your Reference	UNITS	BH104	BH104	BH108	BH109
Depth		3.0	4.0	0.1-0.2	0.15-0.2
Date Sampled		23/10/2019	23/10/2019	22/10/2019	22/10/2019
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	28/10/2019	28/10/2019	28/10/2019	28/10/2019
Date analysed	-	29/10/2019	29/10/2019	29/10/2019	29/10/2019
Naphthalene	mg/kg	0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	1.3	0.3	<0.1	<0.1
Anthracene	mg/kg	0.4	0.1	<0.1	<0.1
Fluoranthene	mg/kg	2.2	0.8	<0.1	<0.1
Pyrene	mg/kg	2.2	0.7	<0.1	<0.1
Benzo(a)anthracene	mg/kg	1.2	0.4	<0.1	<0.1
Chrysene	mg/kg	1	0.3	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	2	0.6	<0.2	<0.2
Benzo(a)pyrene	mg/kg	1.3	0.4	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	0.7	0.2	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	0.2	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.9	0.3	<0.1	<0.1
Total +ve PAH's	mg/kg	13	4.1	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	1.9	0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	1.9	0.6	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	1.9	0.6	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	118	113	123	125

Organochlorine Pesticides in soil						
Our Reference		229301-1	229301-2	229301-3	229301-4	229301-8
Your Reference	UNITS	BH101	BH102	BH103	BH104	BH108
Depth		0.1	0.5	1.0	0.5	0.1-0.2
Date Sampled		22/10/2019	22/10/2019	22/10/2019	23/10/2019	22/10/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	28/10/2019	28/10/2019	28/10/2019	28/10/2019	28/10/2019
Date analysed	-	29/10/2019	29/10/2019	29/10/2019	29/10/2019	29/10/2019
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	7.9
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	15
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	71	104	76	77	78

Organochlorine Pesticides in soil		
Our Reference		229301-9
Your Reference	UNITS	BH109
Depth		0.15-0.2
Date Sampled		22/10/2019
Type of sample		Soil
Date extracted	-	28/10/2019
Date analysed	-	29/10/2019
alpha-BHC	mg/kg	<0.1
HCB	mg/kg	<0.1
beta-BHC	mg/kg	<0.1
gamma-BHC	mg/kg	<0.1
Heptachlor	mg/kg	<0.1
delta-BHC	mg/kg	<0.1
Aldrin	mg/kg	2.2
Heptachlor Epoxide	mg/kg	<0.1
gamma-Chlordane	mg/kg	<0.1
alpha-chlordane	mg/kg	<0.1
Endosulfan I	mg/kg	<0.1
pp-DDE	mg/kg	<0.1
Dieldrin	mg/kg	4.1
Endrin	mg/kg	<0.1
Endosulfan II	mg/kg	<0.1
pp-DDD	mg/kg	<0.1
Endrin Aldehyde	mg/kg	<0.1
pp-DDT	mg/kg	<0.1
Endosulfan Sulphate	mg/kg	<0.1
Methoxychlor	mg/kg	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1
Surrogate TCMX	%	77

Organophosphorus Pesticides in Soil						
Our Reference		229301-1	229301-2	229301-3	229301-4	229301-8
Your Reference	UNITS	BH101	BH102	BH103	BH104	BH108
Depth		0.1	0.5	1.0	0.5	0.1-0.2
Date Sampled		22/10/2019	22/10/2019	22/10/2019	23/10/2019	22/10/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	28/10/2019	28/10/2019	28/10/2019	28/10/2019	28/10/2019
Date analysed	-	29/10/2019	29/10/2019	29/10/2019	29/10/2019	29/10/2019
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	71	104	76	77	78

Organophosphorus Pesticides in Soil		
Our Reference		229301-9
Your Reference	UNITS	BH109
Depth		0.15-0.2
Date Sampled		22/10/2019
Type of sample		Soil
Date extracted	-	28/10/2019
Date analysed	-	29/10/2019
Dichlorvos	mg/kg	<0.1
Dimethoate	mg/kg	<0.1
Diazinon	mg/kg	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1
Ronnel	mg/kg	<0.1
Fenitrothion	mg/kg	<0.1
Malathion	mg/kg	<0.1
Chlorpyriphos	mg/kg	<0.1
Parathion	mg/kg	<0.1
Bromophos-ethyl	mg/kg	<0.1
Ethion	mg/kg	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1
Surrogate TCMX	%	77

PCBs in Soil						
Our Reference		229301-1	229301-2	229301-3	229301-4	229301-8
Your Reference	UNITS	BH101	BH102	BH103	BH104	BH108
Depth		0.1	0.5	1.0	0.5	0.1-0.2
Date Sampled		22/10/2019	22/10/2019	22/10/2019	23/10/2019	22/10/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	28/10/2019	28/10/2019	28/10/2019	28/10/2019	28/10/2019
Date analysed	-	29/10/2019	29/10/2019	29/10/2019	29/10/2019	29/10/2019
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	71	104	76	77	78

PCBs in Soil		
Our Reference		229301-9
Your Reference	UNITS	BH109
Depth		0.15-0.2
Date Sampled		22/10/2019
Type of sample		Soil
Date extracted	-	28/10/2019
Date analysed	-	29/10/2019
Aroclor 1016	mg/kg	<0.1
Aroclor 1221	mg/kg	<0.1
Aroclor 1232	mg/kg	<0.1
Aroclor 1242	mg/kg	<0.1
Aroclor 1248	mg/kg	<0.1
Aroclor 1254	mg/kg	<0.1
Aroclor 1260	mg/kg	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1
Surrogate TCMX	%	77

Acid Extractable metals in soil						
Our Reference		229301-1	229301-2	229301-3	229301-4	229301-5
Your Reference	UNITS	BH101	BH102	BH103	BH104	BH104
Depth		0.1	0.5	1.0	0.5	1.5
Date Sampled		22/10/2019	22/10/2019	22/10/2019	23/10/2019	23/10/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	28/10/2019	28/10/2019	28/10/2019	28/10/2019	28/10/2019
Date analysed	-	28/10/2019	28/10/2019	28/10/2019	28/10/2019	28/10/2019
Arsenic	mg/kg	<4	7	4	<4	<4
Cadmium	mg/kg	<0.4	0.8	<0.4	<0.4	<0.4
Chromium	mg/kg	8	12	36	4	43
Copper	mg/kg	21	130	21	3	66
Lead	mg/kg	100	170	42	36	120
Mercury	mg/kg	<0.1	0.3	<0.1	<0.1	0.1
Nickel	mg/kg	7	13	16	<1	40
Zinc	mg/kg	72	360	69	21	150

Acid Extractable metals in soil						
Our Reference		229301-6	229301-7	229301-8	229301-9	229301-10
Your Reference	UNITS	BH104	BH104	BH108	BH109	BD2_20191022
Depth		3.0	4.0	0.1-0.2	0.15-0.2	-
Date Sampled		23/10/2019	23/10/2019	22/10/2019	22/10/2019	23/10/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	28/10/2019	28/10/2019	28/10/2019	28/10/2019	28/10/2019
Date analysed	-	28/10/2019	28/10/2019	28/10/2019	28/10/2019	28/10/2019
Arsenic	mg/kg	12	5	<4	<4	5
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	32	16	34	48	36
Copper	mg/kg	280	29	10	14	17
Lead	mg/kg	1,100	160	6	5	47
Mercury	mg/kg	11	1.2	<0.1	<0.1	<0.1
Nickel	mg/kg	24	17	37	50	14
Zinc	mg/kg	460	99	20	25	62

Acid Extractable metals in soil		
Our Reference		229301-11
Your Reference	UNITS	BD3_20191023
Depth		-
Date Sampled		23/10/2019
Type of sample		Soil
Date prepared	-	28/10/2019
Date analysed	-	28/10/2019
Arsenic	mg/kg	<4
Cadmium	mg/kg	<0.4
Chromium	mg/kg	8
Copper	mg/kg	4
Lead	mg/kg	33
Mercury	mg/kg	<0.1
Nickel	mg/kg	1
Zinc	mg/kg	22

Misc Soil - Inorg						
Our Reference		229301-1	229301-2	229301-3	229301-4	229301-8
Your Reference	UNITS	BH101	BH102	BH103	BH104	BH108
Depth		0.1	0.5	1.0	0.5	0.1-0.2
Date Sampled		22/10/2019	22/10/2019	22/10/2019	23/10/2019	22/10/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	28/10/2019	28/10/2019	28/10/2019	28/10/2019	28/10/2019
Date analysed	-	28/10/2019	28/10/2019	28/10/2019	28/10/2019	28/10/2019
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5	<5

Misc Soil - Inorg		
Our Reference		229301-9
Your Reference	UNITS	BH109
Depth		0.15-0.2
Date Sampled		22/10/2019
Type of sample		Soil
Date prepared	-	28/10/2019
Date analysed	-	28/10/2019
Total Phenolics (as Phenol)	mg/kg	<5

Moisture						
Our Reference		229301-1	229301-2	229301-3	229301-4	229301-5
Your Reference	UNITS	BH101	BH102	BH103	BH104	BH104
Depth		0.1	0.5	1.0	0.5	1.5
Date Sampled		22/10/2019	22/10/2019	22/10/2019	23/10/2019	23/10/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	28/10/2019	28/10/2019	28/10/2019	28/10/2019	28/10/2019
Date analysed	-	29/10/2019	29/10/2019	29/10/2019	29/10/2019	29/10/2019
Moisture	%	5.0	11	5.2	7.7	12

Moisture						
Our Reference		229301-6	229301-7	229301-8	229301-9	229301-10
Your Reference	UNITS	BH104	BH104	BH108	BH109	BD2_20191022
Depth		3.0	4.0	0.1-0.2	0.15-0.2	-
Date Sampled		23/10/2019	23/10/2019	22/10/2019	22/10/2019	23/10/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	28/10/2019	28/10/2019	28/10/2019	28/10/2019	28/10/2019
Date analysed	-	29/10/2019	29/10/2019	29/10/2019	29/10/2019	29/10/2019
Moisture	%	22	15	3.7	4.4	6.3

Moisture		
Our Reference		229301-11
Your Reference	UNITS	BD3_20191023
Depth		-
Date Sampled		23/10/2019
Type of sample		Soil
Date prepared	-	28/10/2019
Date analysed	-	29/10/2019
Moisture	%	8.6

Asbestos ID - soils						
Our Reference		229301-1	229301-2	229301-3	229301-4	229301-5
Your Reference	UNITS	BH101	BH102	BH103	BH104	BH104
Depth		0.1	0.5	1.0	0.5	1.5
Date Sampled		22/10/2019	22/10/2019	22/10/2019	23/10/2019	23/10/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	31/10/2019	31/10/2019	31/10/2019	31/10/2019	31/10/2019
Sample mass tested	g	Approx. 50g	Approx. 30g	Approx. 40g	Approx. 35g	Approx. 40g
Sample Description	-	Brown sandy soil & rocks	Brown sandy soil & rocks	Brown sandy soil & rocks	Beige sandy 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
Asbestos comments	-	NO	NO	NO	NO	NO
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils					
Our Reference		229301-6	229301-7	229301-8	229301-9
Your Reference	UNITS	BH104	BH104	BH108	BH109
Depth		3.0	4.0	0.1-0.2	0.15-0.2
Date Sampled		23/10/2019	23/10/2019	22/10/2019	22/10/2019
Type of sample		Soil	Soil	Soil	Soil
Date analysed	-	31/10/2019	31/10/2019	31/10/2019	31/10/2019
Sample mass tested	g	Approx. 35g	Approx. 30g	Approx. 75g	Approx. 75g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Grey bituminous soil & rocks	Grey bituminous 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
Asbestos comments	-	NO	NO	NO	NO
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Misc Inorg - Soil			
Our Reference		229301-2	229301-5
Your Reference	UNITS	BH102	BH104
Depth		0.5	1.5
Date Sampled		22/10/2019	23/10/2019
Type of sample		Soil	Soil
Date prepared	-	28/10/2019	28/10/2019
Date analysed	-	28/10/2019	28/10/2019
pH 1:5 soil:water	pH Units	8.9	9.1

CEC			
Our Reference		229301-2	229301-5
Your Reference	UNITS	BH102	BH104
Depth		0.5	1.5
Date Sampled		22/10/2019	23/10/2019
Type of sample		Soil	Soil
Date prepared	-	29/10/2019	29/10/2019
Date analysed	-	29/10/2019	29/10/2019
Exchangeable Ca	meq/100g	21	24
Exchangeable K	meq/100g	0.4	0.5
Exchangeable Mg	meq/100g	2.9	2.8
Exchangeable Na	meq/100g	0.39	0.40
Cation Exchange Capacity	meq/100g	25	28

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.
AT-008	Determination of VOCs sampled onto coconut shell charcoal sorbent tubes, that can be desorbed using carbon disulphide, and analysed by GC-MS.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Metals-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-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-012/017	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS.

Method ID	Methodology Summary
Org-012/017	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS and/or GC-MS/MS. 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-012/017	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/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-7	229301-3
Date extracted	-			28/10/2019	2	28/10/2019	28/10/2019		28/10/2019	28/10/2019
Date analysed	-			29/10/2019	2	29/10/2019	29/10/2019		29/10/2019	29/10/2019
Dichlorodifluoromethane	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
Chloromethane	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
Vinyl Chloride	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
Bromomethane	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
Chloroethane	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
Trichlorofluoromethane	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
1,1-Dichloroethene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
trans-1,2-dichloroethene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
1,1-dichloroethane	mg/kg	1	Org-014	<1	2	<1	<1	0	128	134
cis-1,2-dichloroethene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
bromochloromethane	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
chloroform	mg/kg	1	Org-014	<1	2	<1	<1	0	107	110
2,2-dichloropropane	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
1,2-dichloroethane	mg/kg	1	Org-014	<1	2	<1	<1	0	108	108
1,1,1-trichloroethane	mg/kg	1	Org-014	<1	2	<1	<1	0	108	112
1,1-dichloropropene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
Cyclohexane	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
carbon tetrachloride	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-014	<0.2	2	<0.2	<0.2	0	[NT]	[NT]
dibromomethane	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
1,2-dichloropropane	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
trichloroethene	mg/kg	1	Org-014	<1	2	<1	<1	0	106	110
bromodichloromethane	mg/kg	1	Org-014	<1	2	<1	<1	0	103	105
trans-1,3-dichloropropene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
cis-1,3-dichloropropene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
1,1,2-trichloroethane	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-014	<0.5	2	<0.5	<0.5	0	[NT]	[NT]
1,3-dichloropropane	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
dibromochloromethane	mg/kg	1	Org-014	<1	2	<1	<1	0	108	109
1,2-dibromoethane	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
tetrachloroethene	mg/kg	1	Org-014	<1	2	<1	<1	0	120	126
1,1,1,2-tetrachloroethane	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
chlorobenzene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
bromoform	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-014	<2	2	<2	<2	0	[NT]	[NT]
styrene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
1,1,2,2-tetrachloroethane	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]

QUALITY CONTROL: VOCs in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	229301-3
o-Xylene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
1,2,3-trichloropropane	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
isopropylbenzene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
bromobenzene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
n-propyl benzene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
2-chlorotoluene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
4-chlorotoluene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
1,3,5-trimethyl benzene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
tert-butyl benzene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
1,2,4-trimethyl benzene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
1,3-dichlorobenzene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
sec-butyl benzene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
1,4-dichlorobenzene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
4-isopropyl toluene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
1,2-dichlorobenzene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
n-butyl benzene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
1,2-dibromo-3-chloropropane	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
1,2,4-trichlorobenzene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
hexachlorobutadiene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
1,2,3-trichlorobenzene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluorometha	%		Org-014	111	2	112	119	6	101	101
Surrogate aaa-Trifluorotoluene	%		Org-014	138	2	98	123	23	124	126
Surrogate Toluene-d_8	%		Org-014	110	2	112	109	3	103	100
Surrogate 4-Bromofluorobenzene	%		Org-014	111	2	119	111	7	105	100

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	229301-3
Date extracted	-			28/10/2019	2	28/10/2019	28/10/2019		28/10/2019	28/10/2019
Date analysed	-			29/10/2019	2	29/10/2019	29/10/2019		29/10/2019	29/10/2019
TRH C_6 - C_9	mg/kg	25	Org-016	<25	2	<25	<25	0	123	125
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	2	<25	<25	0	123	125
Benzene	mg/kg	0.2	Org-016	<0.2	2	<0.2	<0.2	0	115	120
Toluene	mg/kg	0.5	Org-016	<0.5	2	<0.5	<0.5	0	120	125
Ethylbenzene	mg/kg	1	Org-016	<1	2	<1	<1	0	126	126
m+p-xylene	mg/kg	2	Org-016	<2	2	<2	<2	0	126	126
o-Xylene	mg/kg	1	Org-016	<1	2	<1	<1	0	123	122
naphthalene	mg/kg	1	Org-014	<1	2	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	113	2	98	123	23	124	126

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]	8	28/10/2019	28/10/2019		[NT]	[NT]
Date analysed	-			[NT]	8	29/10/2019	29/10/2019		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-016	[NT]	8	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-016	[NT]	8	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-016	[NT]	8	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-016	[NT]	8	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-016	[NT]	8	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-016	[NT]	8	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-016	[NT]	8	<1	<1	0	[NT]	[NT]
naphthalene	mg/kg	1	Org-014	[NT]	8	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	[NT]	8	132	78	51	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	229301-3
Date extracted	-			28/10/2019	2	28/10/2019	28/10/2019		28/10/2019	28/10/2019
Date analysed	-			28/10/2019	2	28/10/2019	28/10/2019		28/10/2019	29/10/2019
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	2	<50	<50	0	129	117
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	2	380	400	5	107	116
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	2	350	370	6	108	86
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	2	63	59	7	129	117
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	2	640	680	6	107	116
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	2	200	220	10	108	86
Surrogate o-Terphenyl	%		Org-003	118	2	129	112	14	115	111

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	8	28/10/2019	28/10/2019		[NT]	[NT]
Date analysed	-			[NT]	8	29/10/2019	29/10/2019		[NT]	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-003	[NT]	8	<50	<50	0	[NT]	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-003	[NT]	8	<100	<100	0	[NT]	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-003	[NT]	8	<100	<100	0	[NT]	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	[NT]	8	<50	<50	0	[NT]	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	[NT]	8	<100	<100	0	[NT]	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	[NT]	8	<100	<100	0	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-003	[NT]	8	96	94	2	[NT]	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	229301-3
Date extracted	-			28/10/2019	2	28/10/2019	28/10/2019		28/10/2019	28/10/2019
Date analysed	-			29/10/2019	2	29/10/2019	29/10/2019		29/10/2019	29/10/2019
Naphthalene	mg/kg	0.1	Org-012/017	<0.1	2	0.2	0.2	0	116	121
Acenaphthylene	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	118	124
Phenanthrene	mg/kg	0.1	Org-012/017	<0.1	2	0.9	0.9	0	106	122
Anthracene	mg/kg	0.1	Org-012/017	<0.1	2	0.2	0.3	40	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012/017	<0.1	2	1.8	2.2	20	104	120
Pyrene	mg/kg	0.1	Org-012/017	<0.1	2	2.0	2.5	22	104	120
Benzo(a)anthracene	mg/kg	0.1	Org-012/017	<0.1	2	1.2	1.6	29	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012/017	<0.1	2	1.1	1.4	24	106	120
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012/017	<0.2	2	2	2.5	22	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012/017	<0.05	2	1.2	1.7	34	114	126
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012/017	<0.1	2	0.6	0.8	29	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012/017	<0.1	2	0.2	0.3	40	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012/017	<0.1	2	0.8	1	22	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012/017	123	2	105	104	1	109	107

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	8	28/10/2019	28/10/2019		[NT]	[NT]
Date analysed	-			[NT]	8	29/10/2019	29/10/2019		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012/017	[NT]	8	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012/017	[NT]	8	<0.05	<0.05	0	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012/017	[NT]	8	123	123	0	[NT]	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	229301-3
Date extracted	-			28/10/2019	2	28/10/2019	28/10/2019		28/10/2019	28/10/2019
Date analysed	-			29/10/2019	2	29/10/2019	29/10/2019		29/10/2019	29/10/2019
alpha-BHC	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	116	118
HCB	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	92	89
gamma-BHC	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	92	93
delta-BHC	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	106	108
Heptachlor Epoxide	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	104	102
gamma-Chlordane	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	104	104
Dieldrin	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	128	114
Endrin	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	116	116
Endosulfan II	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	104	102
Endrin Aldehyde	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	96	85
Methoxychlor	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-012/017	72	2	104	99	5	132	112

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	8	28/10/2019	28/10/2019		[NT]	[NT]
Date analysed	-			[NT]	8	29/10/2019	29/10/2019		[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
HCB	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
gamma-BHC	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
delta-BHC	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-012/017	[NT]	8	7.9	13	49	[NT]	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
gamma-Chlordane	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Dieldrin	mg/kg	0.1	Org-012/017	[NT]	8	15	24	46	[NT]	[NT]
Endrin	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Endosulfan II	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Methoxychlor	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-012/017	[NT]	8	78	81	4	[NT]	[NT]

QUALITY CONTROL: Organophosphorus Pesticides in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	229301-3
Date extracted	-			28/10/2019	2	28/10/2019	28/10/2019		28/10/2019	28/10/2019
Date analysed	-			29/10/2019	2	29/10/2019	29/10/2019		29/10/2019	29/10/2019
Dichlorvos	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	106	106
Dimethoate	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	114	116
Fenitrothion	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	116	116
Malathion	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	117	113
Chlorpyriphos	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	128	130
Parathion	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	122	122
Bromophos-ethyl	mg/kg	0.1	AT-008	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	124	128
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-012/017	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-012/017	72	2	104	99	5	132	112

QUALITY CONTROL: Organophosphorus Pesticides in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	8	28/10/2019	28/10/2019		[NT]	[NT]
Date analysed	-			[NT]	8	29/10/2019	29/10/2019		[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Fenitrothion	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Malathion	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	AT-008	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-012/017	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-012/017	[NT]	8	78	81	4	[NT]	[NT]

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	229301-3
Date extracted	-			28/10/2019	2	28/10/2019	28/10/2019		28/10/2019	28/10/2019
Date analysed	-			29/10/2019	2	29/10/2019	29/10/2019		29/10/2019	29/10/2019
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	2	<0.1	<0.1	0	80	76
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	2	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-006	72	2	104	99	5	132	112

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	8	28/10/2019	28/10/2019		[NT]	[NT]
Date analysed	-			[NT]	8	29/10/2019	29/10/2019		[NT]	[NT]
Aroclor 1016	mg/kg	0.1	Org-006	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-006	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-006	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-006	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-006	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-006	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1260	mg/kg	0.1	Org-006	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-006	[NT]	8	78	81	4	[NT]	[NT]

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	229301-3
Date prepared	-			28/10/2019	2	28/10/2019	28/10/2019		28/10/2019	28/10/2019
Date analysed	-			28/10/2019	2	28/10/2019	28/10/2019		28/10/2019	28/10/2019
Arsenic	mg/kg	4	Metals-020	<4	2	7	9	25	108	107
Cadmium	mg/kg	0.4	Metals-020	<0.4	2	0.8	0.6	29	107	93
Chromium	mg/kg	1	Metals-020	<1	2	12	13	8	112	95
Copper	mg/kg	1	Metals-020	<1	2	130	120	8	107	110
Lead	mg/kg	1	Metals-020	<1	2	170	180	6	110	91
Mercury	mg/kg	0.1	Metals-021	<0.1	2	0.3	0.3	0	81	72
Nickel	mg/kg	1	Metals-020	<1	2	13	17	27	105	89
Zinc	mg/kg	1	Metals-020	<1	2	360	380	5	106	97

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	8	28/10/2019	28/10/2019		[NT]	[NT]
Date analysed	-			[NT]	8	28/10/2019	28/10/2019		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	8	<4	<4	0	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	8	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	8	34	44	26	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	8	10	12	18	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	8	6	6	0	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	8	<0.1	<0.1	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	8	37	41	10	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	8	20	20	0	[NT]	[NT]

QUALITY CONTROL: Misc Soil - Inorg						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	[NT]
Date prepared	-			28/10/2019	1	28/10/2019	28/10/2019		28/10/2019	[NT]
Date analysed	-			28/10/2019	1	28/10/2019	28/10/2019		28/10/2019	[NT]
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	1	<5	<5	0	100	[NT]

QUALITY CONTROL: Misc Inorg - Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	[NT]
Date prepared	-			28/10/2019	[NT]	[NT]	[NT]	[NT]	28/10/2019	[NT]
Date analysed	-			28/10/2019	[NT]	[NT]	[NT]	[NT]	28/10/2019	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	102	[NT]

QUALITY CONTROL: CEC						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	[NT]
Date prepared	-			29/10/2019	[NT]	[NT]	[NT]	[NT]	29/10/2019	[NT]
Date analysed	-			29/10/2019	[NT]	[NT]	[NT]	[NT]	29/10/2019	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	[NT]	[NT]	83	[NT]
Exchangeable K	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	[NT]	[NT]	93	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	[NT]	[NT]	80	[NT]
Exchangeable Na	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	[NT]	[NT]	108	[NT]

Result Definitions

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

Quality Control Definitions

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-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 sam

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.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Report Comments

Asbestos: A portion of the supplied sample was sub-sampled for asbestos analysis according to Envirolab procedures.
We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g of sample in its own container.
Note: Samples 229301-8 & 9 were sub-sampled from jars provided by the client.

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project No: 86874.01	**Suburb:** Ultimo	**To:**	Envirolab Services
Project Name: Ultimo	**Order Number**		12 Ashley Street, Chatswood NSW 2067
Project Manager: David Walker	**Sampler:** T. Graham, R. Keavey	**Attn:**	
Emails: david.walker@douglaspartners.com.au		**Phone:**	02 9910 6200
Date Required: Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☐ Standard ☑		**Email:**	sydney@envirolab.com.au
Prior Storage: ☐ Esky ☑ Fridge ☐ Shelved	Do samples contain 'potential' HBM? Yes ☐ No ☑ (If YES, then handle, transport and store in accordance with FPM HAZID)		

Sample ID	depth (m)	Lab ID	Date Sampled	Sample Type (S - soil, W - water)	Container Type (G - glass, P - plastic)	Analytes: Combo 8a	VOC's	Combo 3a	Combo 1a	TRH/BTEX	Metals (8)	BTEX only	pH + CEC		Notes/preservation
BH101	0.1	1	22/10/19	S	G/P	✓							–		subsample OK for asbestos analysis
BH102	0.5	2	22/10/19	S	G/P	✓	✓						✓		
BH103	1.0	3	22/10/19	S	G/P	✓	✓						✓		
BH104	0.5	4	23/10/19	S	G/P	✓									
BH104	1.5	5	23/10/19	S	G/P			✓					✓		
BH104	3.0	6	23/10/19	S	G/P			✓							
BH104	4.0	7	23/10/19	S	G/P			✓							
BH108	0.1-0.2	8	22/10/19	S	G	✓									
BH109	0.15-0.2	9	22/10/19	S	G	✓									
BD2_20191022		10	22/10/19	S	G				✓						
BD3-20191023		11	23/10/19	S	G				✓						
BDA/20191022		✱	22/10/19	S	G					✓	✓				✱ Send sample to Eurofins for analysis
TS		12		S	G							✓			
TB		13		S	G							✓			
PQL (S) mg/kg													**ANZECC PQLs req'd for all water analytes** ☐		

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

Job No: 229301
Date Received: 25/10/19
Time Received: 11:20
Received by: SR
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

Metals to Analyse: 8HM unless specified here:

Lab Report/Reference No:

Total number of samples in container: **Relinquished by:** DW **Transported to laboratory by:** Courier

Send Results to: Douglas Partners Pty Ltd **Address:** 96 Hermitage Road, West Ryde **Phone:** 98090666 **Fax:** 98094095

Signed: **Received by:** **Date & Time:** 25/10/19

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
Attention	David Walker

Sample Login Details

Your reference	86874.01, Ultimo
Envirolab Reference	229301
Date Sample Received	25/10/2019
Date Instructions Received	25/10/2019
Date Results Expected to be Reported	01/11/2019

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	13 Soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	12.7
Cooling Method	Ice Pack
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 Pesticides in soil	Organophosphorus Pesticides in Soil	PCBsin Soil	Acid Extractable metalsin soil	Misc Soil - Inorg	Asbestos ID - soils	Misc Inorg - Soil	CEC
BH101-0.01		✓	✓	✓	✓	✓	✓	✓	✓	✓		
BH102-0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH103-1.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
BH104-0.5		✓	✓	✓	✓	✓	✓	✓	✓	✓		
BH104-1.5		✓	✓	✓				✓		✓	✓	✓
BH104-3.0		✓	✓	✓				✓		✓		
BH104-4.0		✓	✓	✓				✓		✓		
BH108-0.1-0.2		✓	✓	✓	✓	✓	✓	✓	✓	✓		
BH109-0.15-0.2		✓	✓	✓	✓	✓	✓	✓	✓	✓		
BD2_20191022		✓	✓					✓				
BD3_20191023		✓	✓					✓				
TS		✓										
TB		✓										

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.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

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 229301-A

Client Details

Client	Douglas Partners Pty Ltd
Attention	David Walker
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**86874.01, Ultimo**
Number of Samples	13 Soil
Date samples received	25/10/2019
Date completed instructions received	01/11/2019

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	08/11/2019
Date of Issue	05/11/2019

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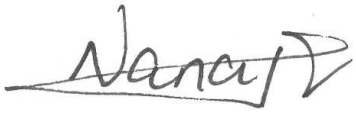
Results Approved By
Josh Williams, Senior Chemist

Authorised By



Nancy Zhang, Laboratory Manager

sTPH in Soil (C10-C40)-Silica		
Our Reference		229301-A-2
Your Reference	UNITS	BH102
Depth		0.5
Date Sampled		22/10/2019
Type of sample		Soil
Date extracted	-	04/11/2019
Date analysed	-	05/11/2019
TPH C_{10} - C_{14}	mg/kg	<50
TPH C_{15} - C_{28}	mg/kg	260
TPH C_{29} - C_{36}	mg/kg	240
TPH >C_{10} -C_{16}	mg/kg	<50
TPH >C_{16} -C_{34}	mg/kg	440
TPH >C_{34} -C_{40}	mg/kg	180
Surrogate o-Terphenyl	%	90

Method ID	Methodology Summary
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.

QUALITY CONTROL: sTPH in Soil (C10-C40)-Silica						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			04/11/2019	[NT]	[NT]	[NT]	[NT]	04/11/2019	[NT]
Date analysed	-			05/11/2019	[NT]	[NT]	[NT]	[NT]	05/11/2019	[NT]
TPH C_{10} - C_{14}	mg/kg	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	111	[NT]
TPH C_{15} - C_{28}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	130	[NT]
TPH C_{29} - C_{36}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	121	[NT]
TPH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	111	[NT]
TPH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	130	[NT]
TPH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	121	[NT]
Surrogate o-Terphenyl	%		Org-003	70	[NT]	[NT]	[NT]	[NT]	122	[NT]

Result Definitions

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

Quality Control Definitions

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-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 sam

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.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Andrew Fitzsimons

From: David Walker <David.Walker@douglaspartners.com.au>
Sent: Friday, 1 November 2019 2:03 PM
To: Samplereceipt
Subject: Analysis request

Ref: 229301-A
TAT: Std
Due: 8/11/19

Follow Up Flag: Follow up
Flag Status: Flagged

Hi

2

Please conduct TRH with silica gel clean up analysis on 229301-2 BH102 0.5m. Standard t/a.

thanks

David Walker | Associate / Environmental Engineer
Douglas Partners Pty Ltd | ABN 75 053 980 117 | www.douglaspartners.com.au
96 Hermitage Road West Ryde NSW 2114 | PO Box 472 West Ryde NSW 1685
P: 02 9809 0666 | M: 0407 540 537 | E: David.Walker@douglaspartners.com.au

Disclaimer

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
Attention	David Walker

Sample Login Details

Your reference	86874.01, Ultimo
Envirolab Reference	229301-A
Date Sample Received	25/10/2019
Date Instructions Received	01/11/2019
Date Results Expected to be Reported	08/11/2019

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	13 Soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	12.7
Cooling Method	Ice Pack
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	sTPH in Soil (C10-C40)-Silica	On Hold
BH101-0.1		✓
BH102-0.5	✓	
BH103-1.0		✓
BH104-0.5		✓
BH104-1.5		✓
BH104-3.0		✓
BH104-4.0		✓
BH108-0.1-0.2		✓
BH109-0.15-0.2		✓
BD2_20191022		✓
BD3_20191023		✓
TS		✓
TB		✓

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.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Envirolab Services Pty Ltd
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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 229472

Client Details

Client	Douglas Partners Pty Ltd
Attention	David Walker
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**86874.01**
Number of Samples	6 Soil
Date samples received	29/10/2019
Date completed instructions received	29/10/2019

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	05/11/2019
Date of Issue	04/11/2019

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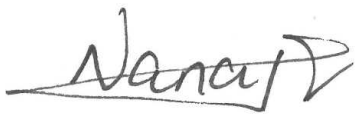
Asbestos Approved By
Analysed by Asbestos Approved Identifier: Aida Marner
Authorised by Asbestos Approved Signatory: Lucy Zhu

Results Approved By
Diego Bigolin, Team Leader, Inorganics
Dragana Tomas, Senior Chemist
Jaimie Loa-Kum-Cheung, Metals Supervisor
Josh Williams, Chemist
Loren Bardwell, Senior Chemist
Lucy Zhu, Senior Asbestos Analyst
Priya Samarawickrama, Senior Chemist
Steven Luong, Organics Supervisor

Authorised By



Nancy Zhang, Laboratory Manager

VOCs in soil		
Our Reference		229472-3
Your Reference	UNITS	BH105
Depth		3.0
Date Sampled		28/10/2019
Type of sample		Soil
Date extracted	-	31/10/2019
Date analysed	-	01/11/2019
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

VOCs in soil		
Our Reference		229472-3
Your Reference	UNITS	BH105
Depth		3.0
Date Sampled		28/10/2019
Type of sample		Soil
Ethylbenzene	mg/kg	<1
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	%	107
Surrogate aaa-Trifluorotoluene	%	92
Surrogate Toluene-d_8	%	109
Surrogate 4-Bromofluorobenzene	%	118

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		229472-1	229472-2	229472-3	229472-4	229472-5
Your Reference	UNITS	BH105	BH105	BH105	BH106	BH106
Depth		1.0	2.0	3.0	0.1	1.0
Date Sampled		28/10/2019	28/10/2019	28/10/2019	28/10/2019	28/10/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	31/10/2019	31/10/2019	31/10/2019	31/10/2019	31/10/2019
Date analysed	-	01/11/2019	01/11/2019	01/11/2019	01/11/2019	01/11/2019
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	2	4	<1	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	85	121	92	85	96

vTRH(C6-C10)/BTEXN in Soil		
Our Reference		229472-6
Your Reference	UNITS	BH106
Depth		2.0
Date Sampled		28/10/2019
Type of sample		Soil
Date extracted	-	31/10/2019
Date analysed	-	01/11/2019
TRH C_6 - C_9	mg/kg	<25
TRH C_6 - C_{10}	mg/kg	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25
Benzene	mg/kg	<0.2
Toluene	mg/kg	<0.5
Ethylbenzene	mg/kg	<1
m+p-xylene	mg/kg	<2
o-Xylene	mg/kg	<1
naphthalene	mg/kg	<1
Total +ve Xylenes	mg/kg	<3
Surrogate aaa-Trifluorotoluene	%	123

svTRH (C10-C40) in Soil						
Our Reference		229472-1	229472-2	229472-3	229472-4	229472-5
Your Reference	UNITS	BH105	BH105	BH105	BH106	BH106
Depth		1.0	2.0	3.0	0.1	1.0
Date Sampled		28/10/2019	28/10/2019	28/10/2019	28/10/2019	28/10/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/10/2019	30/10/2019	30/10/2019	30/10/2019	30/10/2019
Date analysed	-	31/10/2019	31/10/2019	31/10/2019	31/10/2019	31/10/2019
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	240	210	<100	<100
TRH C_{29} - C_{36}	mg/kg	110	210	170	<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	160	390	340	<100	100
TRH >C_{34} -C_{40}	mg/kg	140	190	150	100	<100
Total +ve TRH (>C10-C40)	mg/kg	300	570	480	100	100
Surrogate o-Terphenyl	%	75	77	76	78	76

svTRH (C10-C40) in Soil		
Our Reference		229472-6
Your Reference	UNITS	BH106
Depth		2.0
Date Sampled		28/10/2019
Type of sample		Soil
Date extracted	-	30/10/2019
Date analysed	-	31/10/2019
TRH C_{10} - C_{14}	mg/kg	<50
TRH C_{15} - C_{28}	mg/kg	<100
TRH C_{29} - C_{36}	mg/kg	<100
TRH >C_{10} -C_{16}	mg/kg	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50
TRH >C_{16} -C_{34}	mg/kg	<100
TRH >C_{34} -C_{40}	mg/kg	<100
Total +ve TRH (>C10-C40)	mg/kg	<50
Surrogate o-Terphenyl	%	81

PAHs in Soil						
Our Reference		229472-1	229472-2	229472-3	229472-4	229472-5
Your Reference	UNITS	BH105	BH105	BH105	BH106	BH106
Depth		1.0	2.0	3.0	0.1	1.0
Date Sampled		28/10/2019	28/10/2019	28/10/2019	28/10/2019	28/10/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	30/10/2019	30/10/2019	30/10/2019	30/10/2019	30/10/2019
Date analysed	-	31/10/2019	31/10/2019	31/10/2019	31/10/2019	31/10/2019
Naphthalene	mg/kg	0.2	3.9	1.9	<0.1	<0.1
Acenaphthylene	mg/kg	0.2	0.8	0.6	<0.1	0.1
Acenaphthene	mg/kg	0.1	0.6	0.3	<0.1	<0.1
Fluorene	mg/kg	0.1	1.2	0.6	<0.1	<0.1
Phenanthrene	mg/kg	2.3	17	10	0.1	0.6
Anthracene	mg/kg	0.4	3.2	2.0	<0.1	0.2
Fluoranthene	mg/kg	4.2	20	13	0.3	1.3
Pyrene	mg/kg	4.0	18	12	0.3	1.3
Benzo(a)anthracene	mg/kg	1.6	6.2	4.6	0.2	0.7
Chrysene	mg/kg	1.4	5.5	4.3	0.2	0.7
Benzo(b,j+k)fluoranthene	mg/kg	1	5.5	4.1	<0.2	0.7
Benzo(a)pyrene	mg/kg	2.0	7.9	5.8	0.2	0.91
Indeno(1,2,3-c,d)pyrene	mg/kg	1.2	4.7	3.3	<0.1	0.5
Dibenzo(a,h)anthracene	mg/kg	0.3	1.0	0.9	<0.1	0.2
Benzo(g,h,i)perylene	mg/kg	1.7	6.7	4.6	0.1	0.6
Total +ve PAH's	mg/kg	21	100	67	1.4	7.7
Benzo(a)pyrene TEQ calc (zero)	mg/kg	2.8	11	7.9	<0.5	1.3
Benzo(a)pyrene TEQ calc(half)	mg/kg	2.8	11	7.9	<0.5	1.3
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	2.8	11	7.9	<0.5	1.3
Surrogate p-Terphenyl-d14	%	94	96	96	94	95

PAHs in Soil		
Our Reference		229472-6
Your Reference	UNITS	BH106
Depth		2.0
Date Sampled		28/10/2019
Type of sample		Soil
Date extracted	-	30/10/2019
Date analysed	-	31/10/2019
Naphthalene	mg/kg	0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	0.4
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	0.4
Pyrene	mg/kg	0.3
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	0.1
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	1.4
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	%	98

Organochlorine Pesticides in soil			
Our Reference		229472-1	229472-4
Your Reference	UNITS	BH105	BH106
Depth		1.0	0.1
Date Sampled		28/10/2019	28/10/2019
Type of sample		Soil	Soil
Date extracted	-	30/10/2019	30/10/2019
Date analysed	-	31/10/2019	31/10/2019
alpha-BHC	mg/kg	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1
gamma-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
Endosulfan II	mg/kg	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1
pp-DDT	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	%	93	93

Organophosphorus Pesticides in Soil			
Our Reference		229472-1	229472-4
Your Reference	UNITS	BH105	BH106
Depth		1.0	0.1
Date Sampled		28/10/2019	28/10/2019
Type of sample		Soil	Soil
Date extracted	-	30/10/2019	30/10/2019
Date analysed	-	31/10/2019	31/10/2019
Dichlorvos	mg/kg	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1
Surrogate TCMX	%	93	93

PCBs in Soil			
Our Reference		229472-1	229472-4
Your Reference	UNITS	BH105	BH106
Depth		1.0	0.1
Date Sampled		28/10/2019	28/10/2019
Type of sample		Soil	Soil
Date extracted	-	30/10/2019	30/10/2019
Date analysed	-	31/10/2019	31/10/2019
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 TCMX	%	93	93

Acid Extractable metals in soil						
Our Reference		229472-1	229472-2	229472-3	229472-4	229472-5
Your Reference	UNITS	BH105	BH105	BH105	BH106	BH106
Depth		1.0	2.0	3.0	0.1	1.0
Date Sampled		28/10/2019	28/10/2019	28/10/2019	28/10/2019	28/10/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	30/10/2019	30/10/2019	30/10/2019	30/10/2019	30/10/2019
Date analysed	-	30/10/2019	30/10/2019	30/10/2019	30/10/2019	30/10/2019
Arsenic	mg/kg	8	18	10	<4	7
Cadmium	mg/kg	<0.4	0.6	<0.4	<0.4	<0.4
Chromium	mg/kg	37	16	12	11	15
Copper	mg/kg	42	51	45	44	45
Lead	mg/kg	74	130	95	15	99
Mercury	mg/kg	0.2	0.4	0.4	0.1	0.4
Nickel	mg/kg	17	28	41	86	29
Zinc	mg/kg	87	160	150	41	120

Acid Extractable metals in soil		
Our Reference		229472-6
Your Reference	UNITS	BH106
Depth		2.0
Date Sampled		28/10/2019
Type of sample		Soil
Date prepared	-	30/10/2019
Date analysed	-	30/10/2019
Arsenic	mg/kg	<4
Cadmium	mg/kg	<0.4
Chromium	mg/kg	14
Copper	mg/kg	3
Lead	mg/kg	7
Mercury	mg/kg	<0.1
Nickel	mg/kg	3
Zinc	mg/kg	8

Misc Soil - Inorg			
Our Reference		229472-1	229472-4
Your Reference	UNITS	BH105	BH106
Depth		1.0	0.1
Date Sampled		28/10/2019	28/10/2019
Type of sample		Soil	Soil
Date prepared	-	30/10/2019	30/10/2019
Date analysed	-	30/10/2019	30/10/2019
Total Phenolics (as Phenol)	mg/kg	<5	<5

Misc Inorg - Soil		
Our Reference		229472-5
Your Reference	UNITS	BH106
Depth		1.0
Date Sampled		28/10/2019
Type of sample		Soil
Date prepared	-	30/10/2019
Date analysed	-	30/10/2019
pH 1:5 soil:water	pH Units	9.0

CEC		
Our Reference	UNITS	229472-5
Your Reference		BH106
Depth		1.0
Date Sampled		28/10/2019
Type of sample		Soil
Date prepared	-	31/10/2019
Date analysed	-	31/10/2019
Exchangeable Ca	meq/100g	11
Exchangeable K	meq/100g	0.1
Exchangeable Mg	meq/100g	0.98
Exchangeable Na	meq/100g	<0.1
Cation Exchange Capacity	meq/100g	12

Moisture						
Our Reference		229472-1	229472-2	229472-3	229472-4	229472-5
Your Reference	UNITS	BH105	BH105	BH105	BH106	BH106
Depth		1.0	2.0	3.0	0.1	1.0
Date Sampled		28/10/2019	28/10/2019	28/10/2019	28/10/2019	28/10/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	30/10/2019	30/10/2019	30/10/2019	30/10/2019	30/10/2019
Date analysed	-	31/10/2019	31/10/2019	31/10/2019	31/10/2019	31/10/2019
Moisture	%	9.0	9.4	9.7	7.1	6.7

Moisture		
Our Reference		229472-6
Your Reference	UNITS	BH106
Depth		2.0
Date Sampled		28/10/2019
Type of sample		Soil
Date prepared	-	30/10/2019
Date analysed	-	31/10/2019
Moisture	%	15

Asbestos ID - soils						
Our Reference		229472-1	229472-2	229472-3	229472-4	229472-5
Your Reference	UNITS	BH105	BH105	BH105	BH106	BH106
Depth		1.0	2.0	3.0	0.1	1.0
Date Sampled		28/10/2019	28/10/2019	28/10/2019	28/10/2019	28/10/2019
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	31/10/2019	31/10/2019	31/10/2019	31/10/2019	31/10/2019
Sample mass tested	g	Approx. 30g	Approx. 35g	Approx. 55g	Approx. 45g	Approx. 55g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	NO	NO	NO	NO	NO
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
AT-008	Determination of VOCs sampled onto coconut shell charcoal sorbent tubes, that can be desorbed using carbon disulphide, and analysed by GC-MS.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Metals-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-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-012/017	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS.

Method ID	Methodology Summary
Org-012/017	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS and/or GC-MS/MS. 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-012/017	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/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-8	[NT]
Date extracted	-			31/10/2019	[NT]	[NT]	[NT]	[NT]	31/10/2019	[NT]
Date analysed	-			01/11/2019	[NT]	[NT]	[NT]	[NT]	01/11/2019	[NT]
Dichlorodifluoromethane	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chloromethane	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Vinyl Chloride	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bromomethane	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chloroethane	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Trichlorofluoromethane	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,1-Dichloroethene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
trans-1,2-dichloroethene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,1-dichloroethane	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	99	[NT]
cis-1,2-dichloroethene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
bromochloromethane	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
chloroform	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	90	[NT]
2,2-dichloropropane	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2-dichloroethane	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	91	[NT]
1,1,1-trichloroethane	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	97	[NT]
1,1-dichloropropene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Cyclohexane	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
carbon tetrachloride	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzene	mg/kg	0.2	Org-014	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
dibromomethane	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2-dichloropropane	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
trichloroethene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	104	[NT]
bromodichloromethane	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	92	[NT]
trans-1,3-dichloropropene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
cis-1,3-dichloropropene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,1,2-trichloroethane	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Toluene	mg/kg	0.5	Org-014	<0.5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,3-dichloropropane	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
dibromochloromethane	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	108	[NT]
1,2-dibromoethane	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
tetrachloroethene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	117	[NT]
1,1,1,2-tetrachloroethane	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
chlorobenzene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
bromoform	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-014	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
styrene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,1,2,2-tetrachloroethane	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]

QUALITY CONTROL: VOCs in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	[NT]
o-Xylene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2,3-trichloropropane	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
isopropylbenzene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
bromobenzene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
n-propyl benzene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
2-chlorotoluene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
4-chlorotoluene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,3,5-trimethyl benzene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
tert-butyl benzene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2,4-trimethyl benzene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,3-dichlorobenzene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
sec-butyl benzene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,4-dichlorobenzene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
4-isopropyl toluene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2-dichlorobenzene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
n-butyl benzene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2-dibromo-3-chloropropane	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2,4-trichlorobenzene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
hexachlorobutadiene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2,3-trichlorobenzene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluorometha	%		Org-014	108	[NT]	[NT]	[NT]	[NT]	97	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-014	101	[NT]	[NT]	[NT]	[NT]	120	[NT]
Surrogate Toluene-d_8	%		Org-014	109	[NT]	[NT]	[NT]	[NT]	101	[NT]
Surrogate 4-Bromofluorobenzene	%		Org-014	122	[NT]	[NT]	[NT]	[NT]	123	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	[NT]
Date extracted	-			31/10/2019	[NT]	[NT]	[NT]	[NT]	31/10/2019	[NT]
Date analysed	-			01/11/2019	[NT]	[NT]	[NT]	[NT]	01/11/2019	[NT]
TRH C_6 - C_9	mg/kg	25	Org-016	<25	[NT]	[NT]	[NT]	[NT]	123	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	[NT]	[NT]	[NT]	[NT]	123	[NT]
Benzene	mg/kg	0.2	Org-016	<0.2	[NT]	[NT]	[NT]	[NT]	102	[NT]
Toluene	mg/kg	0.5	Org-016	<0.5	[NT]	[NT]	[NT]	[NT]	110	[NT]
Ethylbenzene	mg/kg	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	134	[NT]
m+p-xylene	mg/kg	2	Org-016	<2	[NT]	[NT]	[NT]	[NT]	134	[NT]
o-Xylene	mg/kg	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	132	[NT]
naphthalene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	101	[NT]	[NT]	[NT]	[NT]	120	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	[NT]
Date extracted	-			31/10/2019	[NT]	[NT]	[NT]	[NT]	30/10/2019	[NT]
Date analysed	-			01/11/2019	[NT]	[NT]	[NT]	[NT]	31/10/2019	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	119	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	103	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	108	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	119	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	103	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	108	[NT]
Surrogate o-Terphenyl	%		Org-003	79	[NT]	[NT]	[NT]	[NT]	96	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	[NT]
Date extracted	-			30/10/2019	[NT]	[NT]	[NT]	[NT]	30/10/2019	[NT]
Date analysed	-			31/10/2019	[NT]	[NT]	[NT]	[NT]	31/10/2019	[NT]
Naphthalene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	108	[NT]
Acenaphthylene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Phenanthrene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Anthracene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Pyrene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	102	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012/017	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012/017	<0.05	[NT]	[NT]	[NT]	[NT]	100	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012/017	95	[NT]	[NT]	[NT]	[NT]	100	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	[NT]
Date extracted	-			30/10/2019	[NT]	[NT]	[NT]	[NT]	30/10/2019	[NT]
Date analysed	-			31/10/2019	[NT]	[NT]	[NT]	[NT]	31/10/2019	[NT]
alpha-BHC	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	110	[NT]
HCB	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	92	[NT]
gamma-BHC	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	92	[NT]
delta-BHC	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]
gamma-Chlordane	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Dieldrin	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Endrin	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	90	[NT]
Endosulfan II	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	94	[NT]
Methoxychlor	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-012/017	97	[NT]	[NT]	[NT]	[NT]	95	[NT]

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	[NT]
Date extracted	-			30/10/2019	[NT]	[NT]	[NT]	[NT]	30/10/2019	[NT]
Date analysed	-			31/10/2019	[NT]	[NT]	[NT]	[NT]	31/10/2019	[NT]
Dichlorvos	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	91	[NT]
Dimethoate	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	112	[NT]
Fenitrothion	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Malathion	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	67	[NT]
Chlorpyriphos	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	124	[NT]
Parathion	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	122	[NT]
Bromophos-ethyl	mg/kg	0.1	AT-008	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ethion	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	112	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-012/017	97	[NT]	[NT]	[NT]	[NT]	95	[NT]

QUALITY CONTROL: PCBs in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	[NT]
Date extracted	-			30/10/2019	[NT]	[NT]	[NT]	[NT]	30/10/2019	[NT]
Date analysed	-			31/10/2019	[NT]	[NT]	[NT]	[NT]	31/10/2019	[NT]
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	86	[NT]
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-006	97	[NT]	[NT]	[NT]	[NT]	95	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-9	[NT]
Date prepared	-			30/10/2019	[NT]	[NT]	[NT]	[NT]	30/10/2019	[NT]
Date analysed	-			30/10/2019	[NT]	[NT]	[NT]	[NT]	30/10/2019	[NT]
Arsenic	mg/kg	4	Metals-020	<4	[NT]	[NT]	[NT]	[NT]	108	[NT]
Cadmium	mg/kg	0.4	Metals-020	<0.4	[NT]	[NT]	[NT]	[NT]	105	[NT]
Chromium	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	110	[NT]
Copper	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	110	[NT]
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	114	[NT]
Mercury	mg/kg	0.1	Metals-021	<0.1	[NT]	[NT]	[NT]	[NT]	87	[NT]
Nickel	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	107	[NT]
Zinc	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]

QUALITY CONTROL: Misc Soil - Inorg					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	[NT]
Date prepared	-			30/10/2019	[NT]	[NT]	[NT]	[NT]	30/10/2019	[NT]
Date analysed	-			30/10/2019	[NT]	[NT]	[NT]	[NT]	30/10/2019	[NT]
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	[NT]	[NT]	[NT]	[NT]	103	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	[NT]
Date prepared	-			30/10/2019	[NT]	[NT]	[NT]	[NT]	30/10/2019	[NT]
Date analysed	-			30/10/2019	[NT]	[NT]	[NT]	[NT]	30/10/2019	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	102	[NT]

QUALITY CONTROL: CEC						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	[NT]
Date prepared	-			31/10/2019	[NT]	[NT]	[NT]	[NT]	31/10/2019	[NT]
Date analysed	-			31/10/2019	[NT]	[NT]	[NT]	[NT]	31/10/2019	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	[NT]	[NT]	108	[NT]
Exchangeable K	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	[NT]	[NT]	110	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	[NT]	[NT]	107	[NT]
Exchangeable Na	meq/100g	0.1	Metals-009	<0.1	[NT]	[NT]	[NT]	[NT]	110	[NT]

Result Definitions

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

Quality Control Definitions

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-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 sam

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.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Report Comments

Asbestos: Excessive sample volume was provided for asbestos analysis. A portion of the supplied sample was sub-sampled according to Envirolab procedures. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g (50mL) of sample in its own container as per AS4964-2004.
Note: Samples 229472-1 to 5 were sub-sampled from bags provided by the client.

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project No: 86874.01	**Suburb:** Ultimo	**To:**	Envirolab Services
Project Name: Ultimo	**Order Number**		12 Ashley Street, Chatswood NSW 2067
Project Manager: David Walker	**Sampler:** ~~David Walker~~ R.K.	**Attn:**	
Emails: david.walker@douglaspartners.com.au		**Phone:**	02 9910 6200
Date Required: Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☐ Standard ☑		**Email:**	sydney@envirolab.com.au
Prior Storage: ☐ Esky ☑ Fridge ☐ Shelved	Do samples contain 'potential' HBM? Yes ☐ No ☑ (If YES, then handle, transport and store in accordance with FPM HAZID)		

Sample ID	depth (m)	Lab ID	Date Sampled	Sample Type: S - soil, W - water	Container Type: G - glass, P - plastic	Analytes: Combo 8a	Combo 3a	Combo 3	VOC	pH + CEC					Notes/preservation
BH105	1.0	1	28.10.19	S	G/P	✓									OK to sub sample for asbestos.
BH105	2.0	2			G/P		✓								
BH105	3.0	3			G/P		✓		✓						
BH106	0-1	4			G/P	✓									
BH106	1.0	5			G/P		✓			✓					
BH106	2.0	6			G			✓							
PQL (S) mg/kg															**ANZECC PQLs req'd for all water analytes** ☐

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

Job No: 229472
Date Received: 29/10/2019
Time Received: 10.32
Received by:
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

Metals to Analyse: 8HM unless specified here:

Lab Report/Reference No:

Total number of samples in container: **Relinquished by:** DW **Transported to laboratory by:** Courier

Send Results to: Douglas Partners Pty Ltd **Address:** 96 Hermitage Road, West Ryde **Phone:** 98090666 **Fax:** 98094095

Signed: **Received by:** May **Date & Time:** 29/10/2019 10.32

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
Attention	David Walker

Sample Login Details

Your reference	86874.01
Envirolab Reference	229472
Date Sample Received	29/10/2019
Date Instructions Received	29/10/2019
Date Results Expected to be Reported	05/11/2019

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	6 Soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	11.6
Cooling Method	Ice Pack
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 Pesticides in soil	Organophosphorus Pesticides in Soil	PCBsin Soil	Acid Extractable metalsin soil	Misc Soil - Inorg	Misc Inorg - Soil	CEC	Asbestos ID - soils
BH105-1.0		✓	✓	✓	✓	✓	✓	✓	✓			✓
BH105-2.0		✓	✓	✓				✓				✓
BH105-3.0	✓	✓	✓	✓				✓				✓
BH106-0.1		✓	✓	✓	✓	✓	✓	✓	✓			✓
BH106-1.0		✓	✓	✓				✓		✓	✓	✓
BH106-2.0		✓	✓	✓				✓				

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.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Envirolab Services Pty Ltd
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12 Ashley St Chatswood NSW 2067
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customerservice@envirolab.com.au
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CERTIFICATE OF ANALYSIS 230944

Client Details

Client	Douglas Partners Pty Ltd
Attention	David Walker
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**86874.01, Ultimo**
Number of Samples	5 Water
Date samples received	15/11/2019
Date completed instructions received	15/11/2019

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	22/11/2019
Date of Issue	22/11/2019

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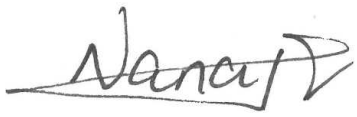
Results Approved By
Diego Bigolin, Team Leader, Inorganics
Jaimie Loa-Kum-Cheung, Metals Supervisor
Josh Williams, Senior Chemist
Loren Bardwell, Senior Chemist
Nick Sarlamis, Inorganics Supervisor
Steven Luong, Organics Supervisor

Authorised By



Nancy Zhang, Laboratory Manager

VOCs in water			
Our Reference		230944-1	230944-2
Your Reference	UNITS	MW105	MW104
Date Sampled		15/11/2019	15/11/2019
Type of sample		Water	Water
Date extracted	-	19/11/2019	19/11/2019
Date analysed	-	20/11/2019	20/11/2019
Dichlorodifluoromethane	µg/L	<10	<10
Chloromethane	µg/L	<10	<10
Vinyl Chloride	µg/L	<10	<10
Bromomethane	µg/L	<10	<10
Chloroethane	µg/L	<10	<10
Trichlorofluoromethane	µg/L	<10	<10
1,1-Dichloroethene	µg/L	<1	<1
Trans-1,2-dichloroethene	µg/L	<1	<1
1,1-dichloroethane	µg/L	<1	<1
Cis-1,2-dichloroethene	µg/L	<1	<1
Bromochloromethane	µg/L	<1	<1
Chloroform	µg/L	<1	<1
2,2-dichloropropane	µg/L	<1	<1
1,2-dichloroethane	µg/L	<1	<1
1,1,1-trichloroethane	µg/L	<1	<1
1,1-dichloropropene	µg/L	<1	<1
Cyclohexane	µg/L	<1	<1
Carbon tetrachloride	µg/L	<1	<1
Benzene	µg/L	<1	<1
Dibromomethane	µg/L	<1	<1
1,2-dichloropropane	µg/L	<1	<1
Trichloroethene	µg/L	<1	<1
Bromodichloromethane	µg/L	<1	<1
trans-1,3-dichloropropene	µg/L	<1	<1
cis-1,3-dichloropropene	µg/L	<1	<1
1,1,2-trichloroethane	µg/L	<1	<1
Toluene	µg/L	<1	<1
1,3-dichloropropane	µg/L	<1	<1
Dibromochloromethane	µg/L	<1	<1
1,2-dibromoethane	µg/L	<1	<1
Tetrachloroethene	µg/L	<1	<1
1,1,1,2-tetrachloroethane	µg/L	<1	<1
Chlorobenzene	µg/L	<1	<1
Ethylbenzene	µg/L	<1	<1

VOCs in water			
Our Reference		230944-1	230944-2
Your Reference	UNITS	MW105	MW104
Date Sampled		15/11/2019	15/11/2019
Type of sample		Water	Water
Bromoform	µg/L	<1	<1
m+p-xylene	µg/L	<2	<2
Styrene	µg/L	<1	<1
1,1,2,2-tetrachloroethane	µg/L	<1	<1
o-xylene	µg/L	<1	<1
1,2,3-trichloropropane	µg/L	<1	<1
Isopropylbenzene	µg/L	<1	<1
Bromobenzene	µg/L	<1	<1
n-propyl benzene	µg/L	<1	<1
2-chlorotoluene	µg/L	<1	<1
4-chlorotoluene	µg/L	<1	<1
1,3,5-trimethyl benzene	µg/L	<1	<1
Tert-butyl benzene	µg/L	<1	<1
1,2,4-trimethyl benzene	µg/L	<1	<1
1,3-dichlorobenzene	µg/L	<1	<1
Sec-butyl benzene	µg/L	<1	<1
1,4-dichlorobenzene	µg/L	<1	<1
4-isopropyl toluene	µg/L	<1	<1
1,2-dichlorobenzene	µg/L	<1	<1
n-butyl benzene	µg/L	<1	<1
1,2-dibromo-3-chloropropane	µg/L	<1	<1
1,2,4-trichlorobenzene	µg/L	<1	<1
Hexachlorobutadiene	µg/L	<1	<1
1,2,3-trichlorobenzene	µg/L	<1	<1
Surrogate Dibromofluoromethane	%	83	91
Surrogate toluene-d8	%	62	66
Surrogate 4-BFB	%	100	106

vTRH(C6-C10)/BTEXN in Water						
Our Reference	UNITS	230944-1	230944-2	230944-3	230944-4	230944-5
Your Reference		MW105	MW104	BD1/20191115	TS	TB
Date Sampled		15/11/2019	15/11/2019	15/11/2019	15/11/2019	15/11/2019
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	19/11/2019	19/11/2019	19/11/2019	19/11/2019	19/11/2019
Date analysed	-	20/11/2019	20/11/2019	20/11/2019	20/11/2019	20/11/2019
TRH C_6 - C_9	µg/L	<10	<10	<10	[NA]	[NA]
TRH C_6 - C_{10}	µg/L	<10	<10	<10	[NA]	[NA]
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	<10	[NA]	[NA]
Benzene	µg/L	<1	<1	<1	103%	<1
Toluene	µg/L	<1	<1	<1	108%	<1
Ethylbenzene	µg/L	<1	<1	<1	100%	<1
m+p-xylene	µg/L	<2	<2	<2	95%	<2
o-xylene	µg/L	<1	<1	<1	101%	<1
Naphthalene	µg/L	<1	<1	<1	[NA]	<1
Surrogate Dibromofluoromethane	%	83	91	84	106	105
Surrogate toluene-d8	%	62	66	85	106	103
Surrogate 4-BFB	%	100	106	102	104	105

svTRH (C10-C40) in Water				
Our Reference	UNITS	230944-1	230944-2	230944-3
Your Reference		MW105	MW104	BD1/20191115
Date Sampled		15/11/2019	15/11/2019	15/11/2019
Type of sample		Water	Water	Water
Date extracted	-	18/11/2019	18/11/2019	18/11/2019
Date analysed	-	19/11/2019	19/11/2019	19/11/2019
TRH C_{10} - C_{14}	µg/L	<50	<50	<50
TRH C_{15} - C_{28}	µg/L	<100	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100	<100
TRH >C_{10} - C_{16}	µg/L	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50	<50
TRH >C_{16} - C_{34}	µg/L	<100	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100	<100
Surrogate o-Terphenyl	%	92	86	78

PAHs in Water - Low Level			
Our Reference	UNITS	230944-1	230944-2
Your Reference		MW105	MW104
Date Sampled		15/11/2019	15/11/2019
Type of sample		Water	Water
Date extracted	-	18/11/2019	18/11/2019
Date analysed	-	19/11/2019	19/11/2019
Naphthalene	µg/L	<0.2	<0.2
Acenaphthylene	µg/L	<0.1	<0.1
Acenaphthene	µg/L	<0.1	<0.1
Fluorene	µg/L	<0.1	<0.1
Phenanthrene	µg/L	<0.1	<0.1
Anthracene	µg/L	<0.1	<0.1
Fluoranthene	µg/L	<0.1	<0.1
Pyrene	µg/L	<0.1	<0.1
Benzo(a)anthracene	µg/L	<0.1	<0.1
Chrysene	µg/L	<0.1	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<0.2	<0.2
Benzo(a)pyrene	µg/L	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1	<0.1
Benzo(a)pyrene TEQ	µg/L	<0.5	<0.5
Total +ve PAH's	µg/L	<0.1	<0.1
Surrogate p-Terphenyl-d14	%	76	77

OCPs in Water - Low Level			
Our Reference	UNITS	230944-1	230944-2
Your Reference		MW105	MW104
Date Sampled		15/11/2019	15/11/2019
Type of sample		Water	Water
Date extracted	-	18/11/2019	18/11/2019
Date analysed	-	19/11/2019	19/11/2019
alpha-BHC	µg/L	<0.01	<0.01
HCB	µg/L	<0.01	<0.01
beta-BHC	µg/L	<0.01	<0.01
gamma-BHC	µg/L	<0.01	<0.01
Heptachlor	µg/L	<0.01	<0.01
delta-BHC	µg/L	<0.01	<0.01
Aldrin	µg/L	<0.01	<0.01
Heptachlor Epoxide	µg/L	<0.01	<0.01
gamma-Chlordane	µg/L	<0.01	<0.01
alpha-Chlordane	µg/L	<0.01	<0.01
Endosulfan I	µg/L	<0.01	<0.01
pp-DDE	µg/L	<0.01	<0.01
Dieldrin	µg/L	<0.01	<0.01
Endrin	µg/L	<0.01	<0.01
Endosulfan II	µg/L	<0.01	<0.01
pp-DDD	µg/L	<0.01	<0.01
Endrin Aldehyde	µg/L	<0.01	<0.01
pp-DDT	µg/L	<0.006	<0.006
Endosulfan Sulphate	µg/L	<0.01	<0.01
Methoxychlor	µg/L	<0.01	<0.01
Surrogate TCMX	%	69	64

OP in water LL ANZECCF/ADWG			
Our Reference	UNITS	230944-1	230944-2
Your Reference		MW105	MW104
Date Sampled		15/11/2019	15/11/2019
Type of sample		Water	Water
Date extracted	-	18/11/2019	18/11/2019
Date analysed	-	19/11/2019	19/11/2019
Dichlorovos	µg/L	<0.2	<0.2
Dimethoate	µg/L	<0.15	<0.15
Diazinon	µg/L	<0.01	<0.01
Chlorpyriphos-methyl	µg/L	<0.2	<0.2
Methyl Parathion	µg/L	<0.2	<0.2
Ronnel	µg/L	<0.2	<0.2
Fenitrothion	µg/L	<0.2	<0.2
Malathion	µg/L	<0.05	<0.05
Chlorpyriphos	µg/L	<0.01	<0.01
Parathion	µg/L	<0.01	<0.01
Bromophos ethyl	µg/L	<0.2	<0.2
Ethion	µg/L	<0.2	<0.2
Azinphos-methyl (Guthion)	µg/L	<0.02	<0.02
Surrogate TCMX	%	69	64

PCBs in Water - Low Level			
Our Reference		230944-1	230944-2
Your Reference	UNITS	MW105	MW104
Date Sampled		15/11/2019	15/11/2019
Type of sample		Water	Water
Date extracted	-	18/11/2019	18/11/2019
Date analysed	-	19/11/2019	19/11/2019
Aroclor 1016	µg/L	<0.1	<0.1
Aroclor 1221	µg/L	<0.1	<0.1
Aroclor 1232	µg/L	<0.1	<0.1
Aroclor 1242	µg/L	<0.1	<0.1
Aroclor 1248	µg/L	<0.1	<0.1
Aroclor 1254	µg/L	<0.1	<0.1
Aroclor 1260	µg/L	<0.1	<0.1
Surrogate TCMX	%	69	64

Total Phenolics in Water			
Our Reference		230944-1	230944-2
Your Reference	UNITS	MW105	MW104
Date Sampled		15/11/2019	15/11/2019
Type of sample		Water	Water
Date extracted	-	19/11/2019	19/11/2019
Date analysed	-	19/11/2019	19/11/2019
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05

HM in water - dissolved				
Our Reference	UNITS	230944-1	230944-2	230944-3
Your Reference		MW105	MW104	BD1/20191115
Date Sampled		15/11/2019	15/11/2019	15/11/2019
Type of sample		Water	Water	Water
Date prepared	-	19/11/2019	19/11/2019	19/11/2019
Date analysed	-	19/11/2019	19/11/2019	19/11/2019
Arsenic-Dissolved	µg/L	1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	2	<1	<1
Copper-Dissolved	µg/L	4	1	2
Lead-Dissolved	µg/L	5	<1	<1
Mercury-Dissolved	µg/L	0.06	<0.05	<0.05
Nickel-Dissolved	µg/L	12	<1	11
Zinc-Dissolved	µg/L	18	11	11

Miscellaneous Inorganics			
Our Reference	UNITS	230944-1	230944-2
Your Reference		MW105	MW104
Date Sampled		15/11/2019	15/11/2019
Type of sample		Water	Water
Date prepared	-	15/11/2019	15/11/2019
Date analysed	-	15/11/2019	15/11/2019
Ammonia as N in water	mg/L	0.22	8.3

Cations in water Dissolved			
Our Reference		230944-1	230944-2
Your Reference	UNITS	MW105	MW104
Date Sampled		15/11/2019	15/11/2019
Type of sample		Water	Water
Date digested	-	19/11/2019	19/11/2019
Date analysed	-	21/11/2019	21/11/2019
Calcium - Dissolved	mg/L	120	190
Magnesium - Dissolved	mg/L	23	48
Hardness	mgCaCO 3 /L	400	680

Method ID	Methodology Summary
AT-008	Determination of VOCs sampled onto coconut shell charcoal sorbent tubes, that can be desorbed using carbon disulphide, and analysed by GC-MS.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-012/017	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS.
Org-012/017	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-013	Water samples are analysed directly by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

QUALITY CONTROL: VOCs in water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			19/11/2019	[NT]	[NT]	[NT]	[NT]	19/11/2019	[NT]
Date analysed	-			20/11/2019	[NT]	[NT]	[NT]	[NT]	20/11/2019	[NT]
Dichlorodifluoromethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chloromethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Vinyl Chloride	µg/L	10	Org-013	<10	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bromomethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chloroethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Trichlorofluoromethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,1-Dichloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Trans-1,2-dichloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,1-dichloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	85	[NT]
Cis-1,2-dichloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bromochloromethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chloroform	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	84	[NT]
2,2-dichloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2-dichloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	80	[NT]
1,1,1-trichloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	78	[NT]
1,1-dichloropropene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Cyclohexane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Carbon tetrachloride	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibromomethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2-dichloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Trichloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Bromodichloromethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	93	[NT]
trans-1,3-dichloropropene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
cis-1,3-dichloropropene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,1,2-trichloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Toluene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,3-dichloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibromochloromethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	75	[NT]
1,2-dibromoethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Tetrachloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	75	[NT]
1,1,1,2-tetrachloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ethylbenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bromoform	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
m+p-xylene	µg/L	2	Org-013	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Styrene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,1,2,2-tetrachloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]

QUALITY CONTROL: VOCs in water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
o-xylene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2,3-trichloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Isopropylbenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Bromobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
n-propyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
2-chlorotoluene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
4-chlorotoluene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,3,5-trimethyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Tert-butyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2,4-trimethyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,3-dichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Sec-butyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,4-dichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
4-isopropyl toluene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2-dichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
n-butyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2-dibromo-3-chloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2,4-trichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Hexachlorobutadiene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
1,2,3-trichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-013	83	[NT]	[NT]	[NT]	[NT]	74	[NT]
Surrogate toluene-d8	%		Org-013	83	[NT]	[NT]	[NT]	[NT]	81	[NT]
Surrogate 4-BFB	%		Org-013	108	[NT]	[NT]	[NT]	[NT]	97	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			19/11/2019	[NT]	[NT]	[NT]	[NT]	19/11/2019	[NT]
Date analysed	-			20/11/2019	[NT]	[NT]	[NT]	[NT]	20/11/2019	[NT]
TRH C_6 - C_9	µg/L	10	Org-016	<10	[NT]	[NT]	[NT]	[NT]	96	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-016	<10	[NT]	[NT]	[NT]	[NT]	96	[NT]
Benzene	µg/L	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	101	[NT]
Toluene	µg/L	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	82	[NT]
Ethylbenzene	µg/L	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	97	[NT]
m+p-xylene	µg/L	2	Org-016	<2	[NT]	[NT]	[NT]	[NT]	96	[NT]
o-xylene	µg/L	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Naphthalene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-016	83	[NT]	[NT]	[NT]	[NT]	74	[NT]
Surrogate toluene-d8	%		Org-016	83	[NT]	[NT]	[NT]	[NT]	81	[NT]
Surrogate 4-BFB	%		Org-016	108	[NT]	[NT]	[NT]	[NT]	97	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			18/11/2019	[NT]	[NT]	[NT]	[NT]	18/11/2019	[NT]
Date analysed	-			18/11/2019	[NT]	[NT]	[NT]	[NT]	18/11/2019	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	104	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	97	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	108	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	104	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	97	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	108	[NT]
Surrogate o-Terphenyl	%		Org-003	78	[NT]	[NT]	[NT]	[NT]	111	[NT]

QUALITY CONTROL: PAHs in Water - Low Level						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			18/11/2019	[NT]	[NT]	[NT]	[NT]	18/11/2019	[NT]
Date analysed	-			19/11/2019	[NT]	[NT]	[NT]	[NT]	19/11/2019	[NT]
Naphthalene	µg/L	0.2	Org-012/017	<0.2	[NT]	[NT]	[NT]	[NT]	116	[NT]
Acenaphthylene	µg/L	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	µg/L	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluorene	µg/L	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	108	[NT]
Phenanthrene	µg/L	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	92	[NT]
Anthracene	µg/L	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	µg/L	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	82	[NT]
Pyrene	µg/L	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	94	[NT]
Benzo(a)anthracene	µg/L	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	µg/L	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	80	[NT]
Benzo(b,j+k)fluoranthene	µg/L	0.2	Org-012/017	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	µg/L	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	86	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012/017	72	[NT]	[NT]	[NT]	[NT]	75	[NT]

QUALITY CONTROL: OCPs in Water - Low Level					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			18/11/2019	[NT]	[NT]	[NT]	[NT]	18/11/2019	[NT]
Date analysed	-			19/11/2019	[NT]	[NT]	[NT]	[NT]	19/11/2019	[NT]
alpha-BHC	µg/L	0.01	Org-012/017	<0.01	[NT]	[NT]	[NT]	[NT]	91	[NT]
HCB	µg/L	0.01	Org-012/017	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
beta-BHC	µg/L	0.01	Org-012/017	<0.01	[NT]	[NT]	[NT]	[NT]	88	[NT]
gamma-BHC	µg/L	0.01	Org-012/017	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Heptachlor	µg/L	0.01	Org-012/017	<0.01	[NT]	[NT]	[NT]	[NT]	84	[NT]
delta-BHC	µg/L	0.01	Org-012/017	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aldrin	µg/L	0.01	Org-012/017	<0.01	[NT]	[NT]	[NT]	[NT]	94	[NT]
Heptachlor Epoxide	µg/L	0.01	Org-012/017	<0.01	[NT]	[NT]	[NT]	[NT]	89	[NT]
gamma-Chlordane	µg/L	0.01	Org-012/017	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-Chlordane	µg/L	0.01	Org-012/017	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan I	µg/L	0.01	Org-012/017	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDE	µg/L	0.01	Org-012/017	<0.01	[NT]	[NT]	[NT]	[NT]	92	[NT]
Dieldrin	µg/L	0.01	Org-012/017	<0.01	[NT]	[NT]	[NT]	[NT]	106	[NT]
Endrin	µg/L	0.01	Org-012/017	<0.01	[NT]	[NT]	[NT]	[NT]	101	[NT]
Endosulfan II	µg/L	0.01	Org-012/017	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDD	µg/L	0.01	Org-012/017	<0.01	[NT]	[NT]	[NT]	[NT]	91	[NT]
Endrin Aldehyde	µg/L	0.01	Org-012/017	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDT	µg/L	0.006	AT-008	<0.006	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan Sulphate	µg/L	0.01	Org-012/017	<0.01	[NT]	[NT]	[NT]	[NT]	98	[NT]
Methoxychlor	µg/L	0.01	Org-012/017	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-012/017	70	[NT]	[NT]	[NT]	[NT]	75	[NT]

QUALITY CONTROL: OP in water LL ANZECCF/ADWG						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			18/11/2019	[NT]	[NT]	[NT]	[NT]	18/11/2019	[NT]
Date analysed	-			19/11/2019	[NT]	[NT]	[NT]	[NT]	19/11/2019	[NT]
Dichlorovos	µg/L	0.2	Org-012/017	<0.2	[NT]	[NT]	[NT]	[NT]	120	[NT]
Dimethoate	µg/L	0.15	Org-012/017	<0.15	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Diazinon	µg/L	0.01	Org-012/017	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chlorpyriphos-methyl	µg/L	0.2	Org-012/017	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Methyl Parathion	µg/L	0.2	Org-012/017	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ronnel	µg/L	0.2	Org-012/017	<0.2	[NT]	[NT]	[NT]	[NT]	78	[NT]
Fenitrothion	µg/L	0.2	Org-012/017	<0.2	[NT]	[NT]	[NT]	[NT]	94	[NT]
Malathion	µg/L	0.05	Org-012/017	<0.05	[NT]	[NT]	[NT]	[NT]	71	[NT]
Chlorpyriphos	µg/L	0.01	Org-012/017	<0.01	[NT]	[NT]	[NT]	[NT]	108	[NT]
Parathion	µg/L	0.01	Org-012/017	<0.01	[NT]	[NT]	[NT]	[NT]	96	[NT]
Bromophos ethyl	µg/L	0.2	Org-012/017	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ethion	µg/L	0.2	Org-012/017	<0.2	[NT]	[NT]	[NT]	[NT]	124	[NT]
Azinphos-methyl (Guthion)	µg/L	0.02	Org-012/017	<0.02	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-012/017	78	[NT]	[NT]	[NT]	[NT]	62	[NT]

QUALITY CONTROL: PCBs in Water - Low Level						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			18/11/2019	[NT]	[NT]	[NT]	[NT]	18/11/2019	[NT]
Date analysed	-			19/11/2019	[NT]	[NT]	[NT]	[NT]	19/11/2019	[NT]
Aroclor 1016	µg/L	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1221	µg/L	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1232	µg/L	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1242	µg/L	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1248	µg/L	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1254	µg/L	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	73	[NT]
Aroclor 1260	µg/L	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-006	70	[NT]	[NT]	[NT]	[NT]	75	[NT]

QUALITY CONTROL: Total Phenolics in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			19/11/2019	[NT]	[NT]	[NT]	[NT]	19/11/2019	[NT]
Date analysed	-			19/11/2019	[NT]	[NT]	[NT]	[NT]	19/11/2019	[NT]
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	[NT]	[NT]	[NT]	[NT]	98	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	230944-2
Date prepared	-			19/11/2019	1	19/11/2019	19/11/2019		19/11/2019	19/11/2019
Date analysed	-			19/11/2019	1	19/11/2019	19/11/2019		19/11/2019	19/11/2019
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	1	1	0	96	97
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	<0.1	<0.1	0	99	104
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	2	2	0	104	101
Copper-Dissolved	µg/L	1	Metals-022	<1	1	4	4	0	105	98
Lead-Dissolved	µg/L	1	Metals-022	<1	1	5	5	0	109	104
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	0.06	0.06	0	102	95
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	12	12	0	104	100
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	18	18	0	100	96

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			15/11/2019	[NT]	[NT]	[NT]	[NT]	15/11/2019	[NT]
Date analysed	-			15/11/2019	[NT]	[NT]	[NT]	[NT]	15/11/2019	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	[NT]	[NT]	[NT]	[NT]	95	[NT]

QUALITY CONTROL: Cations in water Dissolved					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date digested	-			19/11/2019	[NT]	[NT]	[NT]	[NT]	19/11/2019	[NT]
Date analysed	-			21/11/2019	[NT]	[NT]	[NT]	[NT]	21/11/2019	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	91	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	[NT]	[NT]	[NT]	[NT]	93	[NT]

Result Definitions

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

Quality Control Definitions

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-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 sam

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.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project No: 86874-01	**Suburb:** Ultimo	**To:**	EnviroLab
Project Name: Powerhouse Museum	**Order Number**		12 Ashley Street, Chatswood 2067
Project Manager: DW	**Sampler:** CL	**Attn:**	Aileen Hie
Emails: dowrd.walker@douglaspartners.com.au		**Phone:**	(02) 9910 6200
Date Required: Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☐ Standard ☑		**Email:**	Ahie@envirolab.com.au
Prior Storage: ☐ Esky ☐ Fridge ☐ Shelved	Do samples contain 'potential' HBM? Yes ☐ No ☐ (If YES, then handle, transport and store in accordance with FPM HAZID)		

Sample ID	Lab ID	Date Sampled	Sample Type (S - soil, W - water)	Container Type (G - glass, P - plastic)	Analytes: Combo 8L	Ammonia	Hardness	VOC	BTEX	TRH	Metals			Notes/preservation
MW105	1	15/11/19	W	G/P	X	X	X	X						
MW104	2	↓	↓	↓	X	X	X	X						
BD/20191115	3	↓	↓	↓					X	X	X			
TS/TB	4/5								X					

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

Job No: 230944
Date Received: 15/11/19
Time Received: 1524
Received by: CM
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

ANZECC PQLs req'd for all water analytes ☐

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

Metals to Analyse: 8HM unless specified here:

Lab Report/Reference No:

Total number of samples in container: | **Relinquished by:** | **Transported to laboratory by:**

Send Results to: Douglas Partners Pty Ltd | **Address:** | **Phone:** | **Fax:**

Signed: | **Received by:** ELS SYDNEY CHAINE MULONEY | **Date & Time:** 1524 15/11/19

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
Attention	David Walker

Sample Login Details

Your reference	86874.01, Ultimo
Envirolab Reference	230944
Date Sample Received	15/11/2019
Date Instructions Received	15/11/2019
Date Results Expected to be Reported	22/11/2019

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	5 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	21.5
Cooling Method	Ice Pack
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 water	vTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	PAHs in Water - Low Level	Organochlorine Pesticides in Water	OP Pesticides in Water	PCBs in Water	Total Phenolics in Water	HM in water - dissolved	Ammonia as N in water	Cations in water Dissolved
MW105	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MW104	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BD1/20191115		✓	✓						✓		
TS		✓									
TB		✓									

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.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

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CERTIFICATE OF ANALYSIS 231002

Client Details

Client	Douglas Partners Pty Ltd
Attention	David Walker
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**86874.01, Ultimo**
Number of Samples	2 soil
Date samples received	18/11/2019
Date completed instructions received	18/11/2019

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	25/11/2019
Date of Issue	22/11/2019

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

Results Approved By
Diego Bigolin, Team Leader, Inorganics
Jaimie Loa-Kum-Cheung, Metals Supervisor
Josh Williams, Senior Chemist
Lucy Zhu, Senior Asbestos Analyst
Steven Luong, Organics Supervisor

Authorised By

Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil			
Our Reference		231002-1	231002-2
Your Reference	UNITS	201	201
Depth		0.9-1.0	1.4-1.5
Date Sampled		15/11/2019	15/11/2019
Type of sample		soil	soil
Date extracted	-	19/11/2019	19/11/2019
Date analysed	-	20/11/2019	20/11/2019
TRH C_6 - C_9	mg/kg	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25
Benzene	mg/kg	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1
m+p-xylene	mg/kg	<2	<2
o-Xylene	mg/kg	<1	<1
naphthalene	mg/kg	<1	<1
Total +ve Xylenes	mg/kg	<3	<3
Surrogate aaa-Trifluorotoluene	%	91	91

svTRH (C10-C40) in Soil			
Our Reference		231002-1	231002-2
Your Reference	UNITS	201	201
Depth		0.9-1.0	1.4-1.5
Date Sampled		15/11/2019	15/11/2019
Type of sample		soil	soil
Date extracted	-	19/11/2019	19/11/2019
Date analysed	-	20/11/2019	20/11/2019
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-C36)	mg/kg	<50	<50
Total +ve TRH (>C10-C40)	mg/kg	<50	<50
Surrogate o-Terphenyl	%	79	79

PAHs in Soil			
Our Reference		231002-1	231002-2
Your Reference	UNITS	201	201
Depth		0.9-1.0	1.4-1.5
Date Sampled		15/11/2019	15/11/2019
Type of sample		soil	soil
Date extracted	-	19/11/2019	19/11/2019
Date analysed	-	20/11/2019	20/11/2019
Naphthalene	mg/kg	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1
Phenanthrene	mg/kg	0.2	<0.1
Anthracene	mg/kg	<0.1	<0.1
Fluoranthene	mg/kg	0.3	<0.1
Pyrene	mg/kg	0.3	<0.1
Benzo(a)anthracene	mg/kg	0.2	<0.1
Chrysene	mg/kg	0.2	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	0.2	<0.2
Benzo(a)pyrene	mg/kg	0.2	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1
Total +ve PAH's	mg/kg	1.5	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	103	99

Organochlorine Pesticides in soil		
Our Reference		231002-1
Your Reference	UNITS	201
Depth		0.9-1.0
Date Sampled		15/11/2019
Type of sample		soil
Date extracted	-	19/11/2019
Date analysed	-	20/11/2019
alpha-BHC	mg/kg	<0.1
HCB	mg/kg	<0.1
beta-BHC	mg/kg	<0.1
gamma-BHC	mg/kg	<0.1
Heptachlor	mg/kg	<0.1
delta-BHC	mg/kg	<0.1
Aldrin	mg/kg	<0.1
Heptachlor Epoxide	mg/kg	<0.1
gamma-Chlordane	mg/kg	<0.1
alpha-chlordane	mg/kg	<0.1
Endosulfan I	mg/kg	<0.1
pp-DDE	mg/kg	<0.1
Dieldrin	mg/kg	<0.1
Endrin	mg/kg	<0.1
Endosulfan II	mg/kg	<0.1
pp-DDD	mg/kg	<0.1
Endrin Aldehyde	mg/kg	<0.1
pp-DDT	mg/kg	<0.1
Endosulfan Sulphate	mg/kg	<0.1
Methoxychlor	mg/kg	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1
Surrogate TCMX	%	95

Organophosphorus Pesticides in Soil		
Our Reference		231002-1
Your Reference	UNITS	201
Depth		0.9-1.0
Date Sampled		15/11/2019
Type of sample		soil
Date extracted	-	19/11/2019
Date analysed	-	20/11/2019
Dichlorvos	mg/kg	<0.1
Dimethoate	mg/kg	<0.1
Diazinon	mg/kg	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1
Ronnel	mg/kg	<0.1
Fenitrothion	mg/kg	<0.1
Malathion	mg/kg	<0.1
Chlorpyriphos	mg/kg	<0.1
Parathion	mg/kg	<0.1
Bromophos-ethyl	mg/kg	<0.1
Ethion	mg/kg	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1
Surrogate TCMX	%	95

PCBs in Soil		
Our Reference		231002-1
Your Reference	UNITS	201
Depth		0.9-1.0
Date Sampled		15/11/2019
Type of sample		soil
Date extracted	-	19/11/2019
Date analysed	-	20/11/2019
Aroclor 1016	mg/kg	<0.1
Aroclor 1221	mg/kg	<0.1
Aroclor 1232	mg/kg	<0.1
Aroclor 1242	mg/kg	<0.1
Aroclor 1248	mg/kg	<0.1
Aroclor 1254	mg/kg	<0.1
Aroclor 1260	mg/kg	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1
Surrogate TCMX	%	95

Acid Extractable metals in soil			
Our Reference		231002-1	231002-2
Your Reference	UNITS	201	201
Depth		0.9-1.0	1.4-1.5
Date Sampled		15/11/2019	15/11/2019
Type of sample		soil	soil
Date prepared	-	19/11/2019	19/11/2019
Date analysed	-	19/11/2019	19/11/2019
Arsenic	mg/kg	<4	9
Cadmium	mg/kg	<0.4	<0.4
Chromium	mg/kg	8	19
Copper	mg/kg	9	54
Lead	mg/kg	25	38
Mercury	mg/kg	0.2	0.1
Nickel	mg/kg	2	5
Zinc	mg/kg	23	100

Misc Soil - Inorg		
Our Reference		231002-1
Your Reference	UNITS	201
Depth		0.9-1.0
Date Sampled		15/11/2019
Type of sample		soil
Date prepared	-	19/11/2019
Date analysed	-	19/11/2019
Total Phenolics (as Phenol)	mg/kg	<5

Moisture			
Our Reference		231002-1	231002-2
Your Reference	UNITS	201	201
Depth		0.9-1.0	1.4-1.5
Date Sampled		15/11/2019	15/11/2019
Type of sample		soil	soil
Date prepared	-	19/11/2019	19/11/2019
Date analysed	-	20/11/2019	20/11/2019
Moisture	%	7.5	3.7

Asbestos ID - soils		
Our Reference		231002-1
Your Reference	UNITS	201
Depth		0.9-1.0
Date Sampled		15/11/2019
Type of sample		soil
Date analysed	-	21/11/2019
Sample mass tested	g	Approx. 50g
Sample Description	-	Brown sandy soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
AT-008	Determination of VOCs sampled onto coconut shell charcoal sorbent tubes, that can be desorbed using carbon disulphide, and analysed by GC-MS.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Metals-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-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-012/017	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS.
Org-012/017	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS and/or GC-MS/MS. 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.

Method ID	Methodology Summary
Org-012/017	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	[NT]
Date extracted	-			19/11/2019	[NT]	[NT]	[NT]	[NT]	19/11/2019	[NT]
Date analysed	-			20/11/2019	[NT]	[NT]	[NT]	[NT]	20/11/2019	[NT]
TRH C_6 - C_9	mg/kg	25	Org-016	<25	[NT]	[NT]	[NT]	[NT]	103	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	[NT]	[NT]	[NT]	[NT]	103	[NT]
Benzene	mg/kg	0.2	Org-016	<0.2	[NT]	[NT]	[NT]	[NT]	97	[NT]
Toluene	mg/kg	0.5	Org-016	<0.5	[NT]	[NT]	[NT]	[NT]	105	[NT]
Ethylbenzene	mg/kg	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	102	[NT]
m+p-xylene	mg/kg	2	Org-016	<2	[NT]	[NT]	[NT]	[NT]	105	[NT]
o-Xylene	mg/kg	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	103	[NT]
naphthalene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	81	[NT]	[NT]	[NT]	[NT]	95	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	[NT]
Date extracted	-			19/11/2019	[NT]	[NT]	[NT]	[NT]	19/11/2019	[NT]
Date analysed	-			19/11/2019	[NT]	[NT]	[NT]	[NT]	19/11/2019	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	97	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	68	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	92	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	97	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	68	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	92	[NT]
Surrogate o-Terphenyl	%		Org-003	81	[NT]	[NT]	[NT]	[NT]	130	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	[NT]
Date extracted	-			19/11/2019	[NT]	[NT]	[NT]	[NT]	19/11/2019	[NT]
Date analysed	-			20/11/2019	[NT]	[NT]	[NT]	[NT]	20/11/2019	[NT]
Naphthalene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	116	[NT]
Acenaphthylene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Phenanthrene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Anthracene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	102	[NT]
Pyrene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012/017	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012/017	<0.05	[NT]	[NT]	[NT]	[NT]	102	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012/017	101	[NT]	[NT]	[NT]	[NT]	101	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	[NT]
Date extracted	-			19/11/2019	[NT]	[NT]	[NT]	[NT]	19/11/2019	[NT]
Date analysed	-			20/11/2019	[NT]	[NT]	[NT]	[NT]	20/11/2019	[NT]
alpha-BHC	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	112	[NT]
HCB	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	118	[NT]
gamma-BHC	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	82	[NT]
delta-BHC	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	108	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	106	[NT]
gamma-Chlordane	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	108	[NT]
Dieldrin	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Endrin	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Endosulfan II	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	102	[NT]
Methoxychlor	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-012/017	94	[NT]	[NT]	[NT]	[NT]	91	[NT]

QUALITY CONTROL: Organophosphorus Pesticides in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	[NT]
Date extracted	-			19/11/2019	[NT]	[NT]	[NT]	[NT]	19/11/2019	[NT]
Date analysed	-			20/11/2019	[NT]	[NT]	[NT]	[NT]	20/11/2019	[NT]
Dichlorvos	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	87	[NT]
Dimethoate	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	83	[NT]
Fenitrothion	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	85	[NT]
Malathion	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	82	[NT]
Chlorpyriphos	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	89	[NT]
Parathion	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	103	[NT]
Bromophos-ethyl	mg/kg	0.1	AT-008	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ethion	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	85	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-012/017	94	[NT]	[NT]	[NT]	[NT]	91	[NT]

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	[NT]
Date extracted	-			19/11/2019	[NT]	[NT]	[NT]	[NT]	19/11/2019	[NT]
Date analysed	-			20/11/2019	[NT]	[NT]	[NT]	[NT]	20/11/2019	[NT]
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	83	[NT]
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-006	94	[NT]	[NT]	[NT]	[NT]	91	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	[NT]
Date prepared	-			19/11/2019	[NT]	[NT]	[NT]	[NT]	19/11/2019	[NT]
Date analysed	-			19/11/2019	[NT]	[NT]	[NT]	[NT]	19/11/2019	[NT]
Arsenic	mg/kg	4	Metals-020	<4	[NT]	[NT]	[NT]	[NT]	92	[NT]
Cadmium	mg/kg	0.4	Metals-020	<0.4	[NT]	[NT]	[NT]	[NT]	89	[NT]
Chromium	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Copper	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	91	[NT]
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	101	[NT]
Mercury	mg/kg	0.1	Metals-021	<0.1	[NT]	[NT]	[NT]	[NT]	84	[NT]
Nickel	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	88	[NT]
Zinc	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	97	[NT]

QUALITY CONTROL: Misc Soil - Inorg					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-10	[NT]
Date prepared	-			19/11/2019	[NT]	[NT]	[NT]	[NT]	19/11/2019	[NT]
Date analysed	-			19/11/2019	[NT]	[NT]	[NT]	[NT]	19/11/2019	[NT]
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	[NT]	[NT]	[NT]	[NT]	98	[NT]

Result Definitions

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

Quality Control Definitions

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-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 sam

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.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Asbestos: A portion of the supplied sample was sub-sampled for asbestos analysis according to Envirolab procedures.
We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g of sample in its own container.
Note: Sample 231002-1 was sub-sampled from a jar provided by the client.

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project No: 86874.01	**Suburb:** Ultimo	**To:**	Envirolab Services
Project Name: Ultimo	**Order Number**		12 Ashley Street, Chatswood NSW 2067
Project Manager: David Walker	**Sampler:** C.Li	**Attn:**	
Emails: david.walker@douglaspartners.com.au		**Phone:**	02 9910 6200
Date Required: Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☐ Standard ☑		**Email:**	sydney@envirolab.com.au
Prior Storage: ☐ Esky ☑ Fridge ☐ Shelved	Do samples contain 'potential' HBM? Yes ☐ No ☑ (If YES, then handle, transport and store in accordance with FPM HAZID)		

Sample ID	depth (m)	Lab ID	Date Sampled	Sample Type (S - soil, W - water)	Container Type (G - glass, P - plastic)	Analytes: Combo 8a	Combo 3								Notes/preservation
201	0.9-1.0	1	15-11-19	S	G/P	✓									
201	1.4-1.5	2	15-11-19	S	G/P		✓								
PQL (S) mg/kg														**ANZECC PQLs req'd for all water analytes** ☐	

ENVIROLAB

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

Job No: 231002
Date Received: 18/11/19
Time Received: 2
Received by:
Temp: Cool/Ambient 14.1
Cooling: Ice/Icepack
Security: Intact/Broken/None

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

Metals to Analyse: 8HM unless specified here:

Lab Report/Reference No:

Total number of samples in container: **Relinquished by:** DW **Transported to laboratory by:** Courier

Send Results to: Douglas Partners Pty Ltd **Address.** 96 Hermitage Road, West Ryde **Phone:** 98090666 **Fax:** 98094095

Signed: **Received by:** **Date & Time:** 18/11/2019 14:1

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

SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Pty Ltd
Attention	David Walker

Sample Login Details

Your reference	86874.01, Ultimo
Envirolab Reference	231002
Date Sample Received	18/11/2019
Date Instructions Received	18/11/2019
Date Results Expected to be Reported	25/11/2019

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	2 soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	14.1
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

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

Analysis Underway, details on the following page:

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

Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides in Soil	PCBsin Soil	Acid Extractable metalsin soil	Misc Soil - Inorg	Asbestos ID - soils
201-0.9-1.0	✓	✓	✓	✓	✓	✓	✓	✓	✓
201-1.4-1.5	✓	✓	✓				✓		

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.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

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CERTIFICATE OF ANALYSIS 231640

Client Details

Client	Douglas Partners Pty Ltd
Attention	David Walker
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**86874.01, Ultimo**
Number of Samples	4 soil
Date samples received	26/11/2019
Date completed instructions received	26/11/2019

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	29/11/2019
Date of Issue	29/11/2019
Reissue Details	This report replaces R00 created on 29/11/2019 due to: result entry error for Acenapthylene for sample 1.

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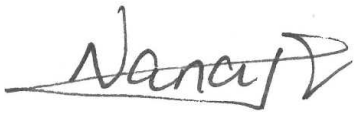
Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

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

Results Approved By
Diego Bigolin, Team Leader, Inorganics
Jaimie Loa-Kum-Cheung, Metals Supervisor
Lucy Zhu, Senior Asbestos Analyst
Steven Luong, Organics Supervisor

Authorised By



Nancy Zhang, Laboratory Manager

VOCs in soil		
Our Reference		231640-1
Your Reference	UNITS	202
Depth		1.2-1.3
Date Sampled		26/11/2019
Type of sample		soil
Date extracted	-	27/11/2019
Date analysed	-	28/11/2019
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

VOCs in soil		
Our Reference		231640-1
Your Reference	UNITS	202
Depth		1.2-1.3
Date Sampled		26/11/2019
Type of sample		soil
Ethylbenzene	mg/kg	<1
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	%	96
Surrogate aaa-Trifluorotoluene	%	76
Surrogate Toluene-d_8	%	96
Surrogate 4-Bromofluorobenzene	%	75

vTRH(C6-C10)/BTEXN in Soil					
Our Reference		231640-1	231640-2	231640-3	231640-4
Your Reference	UNITS	202	202	TS	TB
Depth		1.2-1.3	2.0-2.1	-	-
Date Sampled		26/11/2019	26/11/2019	26/11/2019	26/11/2019
Type of sample		soil	soil	soil	soil
Date extracted	-	27/11/2019	27/11/2019	27/11/2019	27/11/2019
Date analysed	-	28/11/2019	28/11/2019	27/11/2019	27/11/2019
TRH C_6 - C_9	mg/kg	<25	<25	[NA]	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	[NA]	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	[NA]	<25
Benzene	mg/kg	<0.2	<0.2	103%	<0.2
Toluene	mg/kg	<0.5	<0.5	103%	<0.5
Ethylbenzene	mg/kg	<1	<1	107%	<1
m+p-xylene	mg/kg	<2	<2	106%	<2
o-Xylene	mg/kg	<1	<1	106%	<1
naphthalene	mg/kg	73	6	[NA]	<1
Total +ve Xylenes	mg/kg	<3	<3	[NA]	<3
Surrogate aaa-Trifluorotoluene	%	76	68	102	84

svTRH (C10-C40) in Soil			
Our Reference		231640-1	231640-2
Your Reference	UNITS	202	202
Depth		1.2-1.3	2.0-2.1
Date Sampled		26/11/2019	26/11/2019
Type of sample		soil	soil
Date extracted	-	27/11/2019	27/11/2019
Date analysed	-	28/11/2019	27/11/2019
TRH C_{10} - C_{14}	mg/kg	380	<50
TRH C_{15} - C_{28}	mg/kg	6,700	620
TRH C_{29} - C_{36}	mg/kg	3,000	270
TRH >C_{10} -C_{16}	mg/kg	1,100	82
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	1,000	76
TRH >C_{16} -C_{34}	mg/kg	8,500	780
TRH >C_{34} -C_{40}	mg/kg	1,300	<100
Total +ve TRH (>C10-C40)	mg/kg	11,000	860
Surrogate o-Terphenyl	%	#	83

PAHs in Soil			
Our Reference		231640-1	231640-2
Your Reference	UNITS	202	202
Depth		1.2-1.3	2.0-2.1
Date Sampled		26/11/2019	26/11/2019
Type of sample		soil	soil
Date extracted	-	27/11/2019	27/11/2019
Date analysed	-	28/11/2019	28/11/2019
Naphthalene	mg/kg	100	8.0
Acenaphthylene	mg/kg	2.0	2.5
Acenaphthene	mg/kg	220	12
Fluorene	mg/kg	240	13
Phenanthrene	mg/kg	1,200	83
Anthracene	mg/kg	390	25
Fluoranthene	mg/kg	1,000	71
Pyrene	mg/kg	830	60
Benzo(a)anthracene	mg/kg	430	31
Chrysene	mg/kg	340	22
Benzo(b,j+k)fluoranthene	mg/kg	480	33
Benzo(a)pyrene	mg/kg	290	21
Indeno(1,2,3-c,d)pyrene	mg/kg	73	1.2
Dibenzo(a,h)anthracene	mg/kg	24	3.2
Benzo(g,h,i)perylene	mg/kg	82	12
Total +ve PAH's	mg/kg	5,700	400
Benzo(a)pyrene TEQ calc (zero)	mg/kg	420	31
Benzo(a)pyrene TEQ calc(half)	mg/kg	420	31
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	420	31
Surrogate p-Terphenyl-d14	%	130	110

Organochlorine Pesticides in soil		
Our Reference		231640-1
Your Reference	UNITS	202
Depth		1.2-1.3
Date Sampled		26/11/2019
Type of sample		soil
Date extracted	-	27/11/2019
Date analysed	-	28/11/2019
alpha-BHC	mg/kg	<1
HCB	mg/kg	<1
beta-BHC	mg/kg	<1
gamma-BHC	mg/kg	<1
Heptachlor	mg/kg	<1
delta-BHC	mg/kg	<1
Aldrin	mg/kg	<1
Heptachlor Epoxide	mg/kg	<1
gamma-Chlordane	mg/kg	<1
alpha-chlordane	mg/kg	<1
Endosulfan I	mg/kg	<1
pp-DDE	mg/kg	<1
Dieldrin	mg/kg	<1
Endrin	mg/kg	<1
Endosulfan II	mg/kg	<1
pp-DDD	mg/kg	<1
Endrin Aldehyde	mg/kg	<1
pp-DDT	mg/kg	<1
Endosulfan Sulphate	mg/kg	<1
Methoxychlor	mg/kg	<1
Total +ve DDT+DDD+DDE	mg/kg	<1
Surrogate TCMX	%	110

Organophosphorus Pesticides in Soil		
Our Reference		231640-1
Your Reference	UNITS	202
Depth		1.2-1.3
Date Sampled		26/11/2019
Type of sample		soil
Date extracted	-	27/11/2019
Date analysed	-	28/11/2019
Dichlorvos	mg/kg	<1
Dimethoate	mg/kg	<1
Diazinon	mg/kg	<1
Chlorpyriphos-methyl	mg/kg	<1
Ronnel	mg/kg	<1
Fenitrothion	mg/kg	<1
Malathion	mg/kg	<1
Chlorpyriphos	mg/kg	<1
Parathion	mg/kg	<1
Bromophos-ethyl	mg/kg	<1
Ethion	mg/kg	<1
Azinphos-methyl (Guthion)	mg/kg	<1
Surrogate TCMX	%	110

PCBs in Soil		
Our Reference		231640-1
Your Reference	UNITS	202
Depth		1.2-1.3
Date Sampled		26/11/2019
Type of sample		soil
Date extracted	-	27/11/2019
Date analysed	-	28/11/2019
Aroclor 1016	mg/kg	<1
Aroclor 1221	mg/kg	<1
Aroclor 1232	mg/kg	<1
Aroclor 1242	mg/kg	<1
Aroclor 1248	mg/kg	<1
Aroclor 1254	mg/kg	<1
Aroclor 1260	mg/kg	<1
Total +ve PCBs (1016-1260)	mg/kg	<1
Surrogate TCMX	%	110

Acid Extractable metals in soil			
Our Reference		231640-1	231640-2
Your Reference	UNITS	202	202
Depth		1.2-1.3	2.0-2.1
Date Sampled		26/11/2019	26/11/2019
Type of sample		soil	soil
Date prepared	-	27/11/2019	27/11/2019
Date analysed	-	27/11/2019	27/11/2019
Arsenic	mg/kg	<4	4
Cadmium	mg/kg	<0.4	<0.4
Chromium	mg/kg	45	30
Copper	mg/kg	130	70
Lead	mg/kg	30	320
Mercury	mg/kg	<0.1	1.4
Nickel	mg/kg	35	36
Zinc	mg/kg	96	120

Misc Soil - Inorg		
Our Reference		231640-1
Your Reference	UNITS	202
Depth		1.2-1.3
Date Sampled		26/11/2019
Type of sample		soil
Date prepared	-	27/11/2019
Date analysed	-	27/11/2019
Total Phenolics (as Phenol)	mg/kg	<5

Moisture			
Our Reference		231640-1	231640-2
Your Reference	UNITS	202	202
Depth		1.2-1.3	2.0-2.1
Date Sampled		26/11/2019	26/11/2019
Type of sample		soil	soil
Date prepared	-	27/11/2019	27/11/2019
Date analysed	-	28/11/2019	28/11/2019
Moisture	%	5.3	9.8

Asbestos ID - soils			
Our Reference		231640-1	231640-2
Your Reference	UNITS	202	202
Depth		1.2-1.3	2.0-2.1
Date Sampled		26/11/2019	26/11/2019
Type of sample		soil	soil
Date analysed	-	27/11/2019	27/11/2019
Sample mass tested	g	Approx. 45g	Approx. 25g
Sample Description	-	Brown fine-grained soil & rocks	Brown fine-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
Trace Analysis	-	No asbestos detected	No asbestos detected

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
AT-008	Determination of VOCs sampled onto coconut shell charcoal sorbent tubes, that can be desorbed using carbon disulphide, and analysed by GC-MS.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Metals-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-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-012/017	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS.
Org-012/017	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS and/or GC-MS/MS. 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.

Method ID	Methodology Summary
Org-012/017	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/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-1	231640-1
Date extracted	-			27/11/2019	1	27/11/2019	27/11/2019		27/11/2019	27/11/2019
Date analysed	-			28/11/2019	1	28/11/2019	28/11/2019		28/11/2019	28/11/2019
Dichlorodifluoromethane	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
Chloromethane	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
Vinyl Chloride	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
Bromomethane	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
Chloroethane	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
Trichlorofluoromethane	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
1,1-Dichloroethene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
trans-1,2-dichloroethene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
1,1-dichloroethane	mg/kg	1	Org-014	<1	1	<1	<1	0	86	71
cis-1,2-dichloroethene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
bromochloromethane	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
chloroform	mg/kg	1	Org-014	<1	1	<1	<1	0	70	60
2,2-dichloropropane	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
1,2-dichloroethane	mg/kg	1	Org-014	<1	1	<1	<1	0	92	77
1,1,1-trichloroethane	mg/kg	1	Org-014	<1	1	<1	<1	0	90	74
1,1-dichloropropene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
Cyclohexane	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
carbon tetrachloride	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-014	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
dibromomethane	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
1,2-dichloropropane	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
trichloroethene	mg/kg	1	Org-014	<1	1	<1	<1	0	87	74
bromodichloromethane	mg/kg	1	Org-014	<1	1	<1	<1	0	92	80
trans-1,3-dichloropropene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
cis-1,3-dichloropropene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
1,1,2-trichloroethane	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-014	<0.5	1	<0.5	<0.5	0	[NT]	[NT]
1,3-dichloropropane	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
dibromochloromethane	mg/kg	1	Org-014	<1	1	<1	<1	0	88	74
1,2-dibromoethane	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
tetrachloroethene	mg/kg	1	Org-014	<1	1	<1	<1	0	95	77
1,1,1,2-tetrachloroethane	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
chlorobenzene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
bromoform	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-014	<2	1	<2	<2	0	[NT]	[NT]
styrene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
1,1,2,2-tetrachloroethane	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]

QUALITY CONTROL: VOCs in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	231640-1
o-Xylene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
1,2,3-trichloropropane	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
isopropylbenzene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
bromobenzene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
n-propyl benzene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
2-chlorotoluene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
4-chlorotoluene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
1,3,5-trimethyl benzene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
tert-butyl benzene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
1,2,4-trimethyl benzene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
1,3-dichlorobenzene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
sec-butyl benzene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
1,4-dichlorobenzene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
4-isopropyl toluene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
1,2-dichlorobenzene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
n-butyl benzene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
1,2-dibromo-3-chloropropane	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
1,2,4-trichlorobenzene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
hexachlorobutadiene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
1,2,3-trichlorobenzene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluorometha	%		Org-014	94	1	96	89	8	92	78
Surrogate aaa-Trifluorotoluene	%		Org-014	79	1	76	88	15	80	69
Surrogate Toluene-d_8	%		Org-014	97	1	96	108	12	93	99
Surrogate 4-Bromofluorobenzene	%		Org-014	72	1	75	79	5	88	89

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	231640-1
Date extracted	-			27/11/2019	1	27/11/2019	27/11/2019		27/11/2019	27/11/2019
Date analysed	-			28/11/2019	1	28/11/2019	28/11/2019		28/11/2019	28/11/2019
TRH C_6 - C_9	mg/kg	25	Org-016	<25	1	<25	<25	0	90	86
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	1	<25	<25	0	90	86
Benzene	mg/kg	0.2	Org-016	<0.2	1	<0.2	<0.2	0	91	81
Toluene	mg/kg	0.5	Org-016	<0.5	1	<0.5	<0.5	0	92	90
Ethylbenzene	mg/kg	1	Org-016	<1	1	<1	<1	0	79	80
m+p-xylene	mg/kg	2	Org-016	<2	1	<2	<2	0	93	89
o-Xylene	mg/kg	1	Org-016	<1	1	<1	<1	0	91	87
naphthalene	mg/kg	1	Org-014	<1	1	73	56	26	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	79	1	76	88	15	80	69

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	231640-1
Date extracted	-			27/11/2019	[NT]	[NT]	[NT]	[NT]	27/11/2019	27/11/2019
Date analysed	-			27/11/2019	[NT]	[NT]	[NT]	[NT]	27/11/2019	27/11/2019
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	94	#
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	77	#
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	77	#
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	94	#
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	77	#
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	77	#
Surrogate o-Terphenyl	%		Org-003	88	[NT]	[NT]	[NT]	[NT]	106	#

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	231640-1
Date extracted	-			27/11/2019	[NT]	[NT]	[NT]	[NT]	27/11/2019	27/11/2019
Date analysed	-			28/11/2019	[NT]	[NT]	[NT]	[NT]	28/11/2019	28/11/2019
Naphthalene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	116	#
Acenaphthylene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	114	#
Phenanthrene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	112	#
Anthracene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	114	#
Pyrene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	118	#
Benzo(a)anthracene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	116	#
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012/017	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012/017	<0.05	[NT]	[NT]	[NT]	[NT]	114	#
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012/017	97	[NT]	[NT]	[NT]	[NT]	109	130

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	231640-1
Date extracted	-			27/11/2019	[NT]	[NT]	[NT]	[NT]	27/11/2019	27/11/2019
Date analysed	-			28/11/2019	[NT]	[NT]	[NT]	[NT]	28/11/2019	28/11/2019
alpha-BHC	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	132	#
HCB	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	108	#
gamma-BHC	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	108	120
delta-BHC	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	118	#
Heptachlor Epoxide	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	116	125
gamma-Chlordane	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	120	114
Dieldrin	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	114	114
Endrin	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	98	#
Endosulfan II	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	118	#
Endrin Aldehyde	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	120	128
Methoxychlor	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-012/017	94	[NT]	[NT]	[NT]	[NT]	105	125

QUALITY CONTROL: Organophosphorus Pesticides in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	231640-1
Date extracted	-			27/11/2019	[NT]	[NT]	[NT]	[NT]	27/11/2019	27/11/2019
Date analysed	-			28/11/2019	[NT]	[NT]	[NT]	[NT]	28/11/2019	28/11/2019
Dichlorvos	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	104	106
Dimethoate	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	90	100
Fenitrothion	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	82	107
Malathion	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	80	114
Chlorpyriphos	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	106	#
Parathion	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	98	100
Bromophos-ethyl	mg/kg	0.1	AT-008	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ethion	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	92	#
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-012/017	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-012/017	94	[NT]	[NT]	[NT]	[NT]	105	125

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	231640-1
Date extracted	-			27/11/2019	[NT]	[NT]	[NT]	[NT]	27/11/2019	27/11/2019
Date analysed	-			28/11/2019	[NT]	[NT]	[NT]	[NT]	28/11/2019	28/11/2019
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	114	106
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-006	94	[NT]	[NT]	[NT]	[NT]	105	125

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	231640-1
Date prepared	-			27/11/2019	[NT]	[NT]	[NT]	[NT]	27/11/2019	27/11/2019
Date analysed	-			27/11/2019	[NT]	[NT]	[NT]	[NT]	27/11/2019	27/11/2019
Arsenic	mg/kg	4	Metals-020	<4	[NT]	[NT]	[NT]	[NT]	106	84
Cadmium	mg/kg	0.4	Metals-020	<0.4	[NT]	[NT]	[NT]	[NT]	100	79
Chromium	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	110	72
Copper	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	108	92
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	113	80
Mercury	mg/kg	0.1	Metals-021	<0.1	[NT]	[NT]	[NT]	[NT]	100	83
Nickel	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	101	73
Zinc	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	109	#

QUALITY CONTROL: Misc Soil - Inorg					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			27/11/2019	[NT]	[NT]	[NT]	[NT]	27/11/2019	[NT]
Date analysed	-			27/11/2019	[NT]	[NT]	[NT]	[NT]	27/11/2019	[NT]
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	[NT]	[NT]	[NT]	[NT]	103	[NT]

Result Definitions

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

Quality Control Definitions

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-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.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

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

8 metals in soil - # Percent recovery is not possible to report due to the inhomogeneous nature of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

TRH Soil C10-C40 NEPM - # Percent recovery for the surrogate and matrix spike is not possible to report as the high concentration of analytes in sample 231640-1 has caused interference.

PAHs in Soil - # Percent recovery for the matrix spike is not possible to report as the high concentration of analytes in samples 231640-1 has caused interference.

OC's in Soil - The PQL has been raised due to interferences from analytes (other than those being tested) in sample 231640-1.
Percent recovery for the matrix spike is not possible to report due to interference from analytes (other than those being tested) in sample 231640-1.

OP's in Soil - The PQL has been raised due to interferences from analytes (other than those being tested) in sample 231640-1.
Percent recovery for the matrix spike is not possible to report due to interference from analytes (other than those being tested) in sample 231640-1.

PCBs in Soil - The PQL has been raised due to interferences from analytes (other than those being tested) in sample 231640-1.
Percent recovery for the matrix spike is not possible to report due to interference from analytes (other than those being tested) in sample 231640-1.

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project No: 86874.01	**Suburb:** Ultimo	**To:**	Envirolab Services
Project Name: Ultimo	**Order Number**		12 Ashley Street, Chatswood NSW 2067
Project Manager: David Walker	**Sampler:** Rob Keaveny	**Attn:**	
Emails: david.walker@douglaspartners.com.au		**Phone:**	02 9910 6200
Date Required: Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☑ Standard ☐		**Email:**	sydney@envirolab.com.au
Prior Storage: ☐ Esky ☑ Fridge ☐ Shelved	Do samples contain 'potential' HBM? Yes ☐	No ☑	(If YES, then handle, transport and store in accordance with FPM HAZID)

Sample ID	depth (m)	Lab ID	Date Sampled	Sample Type (S - soil, W - water)	Container Type (G - glass, P - plastic)	Analytes: Combo 8a	Combo 3a	VOC	BTEX only	Metals (8)	TRH BTEX				Notes/preservation
202	1.2-1.3	1	26-11-19	S	G/P	✓		✓							OK to subsample for asbestos.
202	2.0-2.1	2	26-11-19	S	G/P		✓								
TS		3	↓	S	G				✓						
TB		4	↓	S	G				✓						
* BD26112019		–	↓	S	G					✓	✓				* Send sample to Eurofins for analysis 3 Day TAT
PQL (S) mg/kg															**ANZECC PQLs req'd for all water analytes** ☐

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

Job No: 231640
Date Received: 26-11-19
Time Received: 17:15
Received by: TC
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Esup.

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

Metals to Analyse: 8HM unless specified here:

Lab Report/Reference No: 231640

Total number of samples in container: **Relinquished by:** DW **Transported to laboratory by:** Courier

Send Results to: Douglas Partners Pty Ltd **Address:** 96 Hermitage Road, West Ryde **Phone:** 98090666 **Fax:** 98094095

Signed: **Received by:** ECS, Thiruvad Connaeeo **Date & Time:** 26-11-19, 17:15

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
Attention	David Walker

Sample Login Details

Your reference	86874.01, Ultimo
Envirolab Reference	231640
Date Sample Received	26/11/2019
Date Instructions Received	26/11/2019
Date Results Expected to be Reported	29/11/2019

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	4 soil
Turnaround Time Requested	3 days
Temperature on Receipt (°C)	20..8
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 Pesticides in soil	Organophosphorus Pesticides in Soil	PCBsin Soil	Acid Extractable metalsin soil	Misc Soil - Inorg	Asbestos ID - soils
202-1.2-1.3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
202-2.0-2.1		✓	✓	✓				✓		✓
TS		✓								
TB		✓								

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.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Douglas Partners
Geotechnics | Environment | Groundwater

#684979

CHAIN OF CUSTODY DESPATCH SHEET

Project No: 86874.01	**Suburb:** Ultimo	**To:**	Envirolab Services
Project Name: Ultimo	**Order Number**		12 Ashley Street, Chatswood NSW 2067
Project Manager: David Walker	**Sampler:** T. Graham, R. Keavery	**Attn:**	
Emails: david.walker@douglaspartners.com.au		**Phone:**	02 9910 6200
Date Required: Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☐ Standard ☑		**Email:**	sydney@envirolab.com.au
Prior Storage: ☐ Esky ☑ Fridge ☐ Shelved	Do samples contain 'potential' HBM? Yes ☐ No ☑ (If YES, then handle, transport and store in accordance with FPM HAZID)		

Sample ID	depth (m)	Lab ID	Date Sampled	Sample Type (S - soil, W - water)	Container Type (G - glass, P - plastic)	Analytes: Combo 8a	VOC	Combo 3	Combo 1m	TRH/BTEX	metals (8)	BTEX only	PAH + CEC		Notes/preservation
BH101	0.1	1	22/10/19	S	G/P	✓									subsample OK for asbestos analysis
BH102	0.5	2	22/10/19	S	G/P	✓	✓						✓		
BH103	1.0	3	22/10/19	S	G/P	✓	✓								
BH104	0.5	4	23/10/19	S	G/P	✓									
BH104	1.5	5	23/10/19	S	G/P			✓					✓		
BH104	3.0	6	23/10/19	S	G/P			✓							
BH104	4.0	7	23/10/19	S	G/P			✓							
BH108	0.1-0.2	8	22/10/19	S	G	✓									
BH109	0.15-0.2	9	22/10/19	S	G	✓									
BD2_20191022		10	22/10/19	S	G				✓						
BD3-20191023		11	23/10/19	S	G				✓						
BDA/20191022	*		22/10/19	S	G					✓	✓				* Send sample to Eurofins for analysis
TS		12		S	G							✓			
TB		13		S	G							✓			
PQL (S) mg/kg													**ANZECC PQLs req'd for all water analytes** ☐		

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

Job No: 229301
Date Received: 25/10/19
Time Received: 11:30
Received by: SZ
Temp: (Cool)/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

Metals to Analyse: 8HM unless specified here:

Lab Report/Reference No:

Total number of samples in container: | **Relinquished by:** DW | **Transported to laboratory by:** Courier

Send Results to: Douglas Partners Pty Ltd | **Address** 96 Hermitage Road, West Ryde | **Phone:** 98090666 **Fax:** 98094095

Signed: | **Received by:** | **Date & Time:** 25/10/19

Relinquished by: ELS Syd K-Crow 28-10-19 1200

Suzanne Kong 28/10/19 4:11PM

eurofins | Environment Testing

Melbourne
6 Monterey Road
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Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261 Site # 23736

ABN – 50 005 085 521 e.mail : EnviroSales@eurofins.com web : www.eurofins.com.au

Sample Receipt Advice

Company name:	**Douglas Partners (Syd)**
Contact name:	David Walker
Project name:	ULTIMO
Project ID:	86874.01
COC number:	Not provided
Turn around time:	5 Day
Date/Time received:	Oct 28, 2019 4:11 PM
Eurofins reference:	**684979**

Sample information

☑ A detailed list of analytes logged into our LIMS, is included in the attached summary table.

☑ All samples have been received as described on the above COC.

☑ COC has been completed correctly.

☑ Attempt to chill was evident.

☑ Appropriately preserved sample containers have been used.

☑ All samples were received in good condition.

☑ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.

☑ Appropriate sample containers have been used.

☒ Split sample sent to requested external lab.

☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Contact notes

If you have any questions with respect to these samples please contact:

Ursula Long on Phone : or by e.mail: UrsulaLong@eurofins.com

Results will be delivered electronically via e.mail to David Walker - david.walker@douglaspartners.com.au.

eurofins | Environment Testing

ABN – 50 005 085 521
e.mail : EnviroSales@eurofins.com
web : www.eurofins.com.au

Melbourne
6 Monterey Road
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Lane Cove West NSW 2066
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NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Company Name:	Douglas Partners (Syd)	**Order No.:**		**Received:**	Oct 28, 2019 4:11 PM
Address:	96 Hermitage Road West Ryde NSW 2114	**Report #:**	684979	**Due:**	Nov 4, 2019
		Phone:	02 9809 0666	**Priority:**	5 Day
		Fax:		**Contact Name:**	David Walker
Project Name:	ULTIMO				
Project ID:	86874.01				

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						Moisture Set	Eurofins | mgt Suite B6
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217						X	X
Brisbane Laboratory - NATA Site # 20794							
Perth Laboratory - NATA Site # 23736							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	BDA/20191022	Oct 22, 2019		Rock	S19-Oc43532	X	X
Test Counts						1	1

Douglas Partners (Syd)
96 Hermitage Road
West Ryde
NSW 2114

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Attention: **David Walker**

Report **684979-S**
Project name ULTIMO
Project ID 86874.01
Received Date Oct 28, 2019

Client Sample ID			**BDA/20191022**
Sample Matrix			**Rock**
Eurofins Sample No.			**S19-Oc43532**
Date Sampled			**Oct 22, 2019**
Test/Reference	LOR	Unit	
Total Recoverable Hydrocarbons - 1999 NEPM Fractions			
TRH C6-C9	20	mg/kg	< 20
TRH C10-C14	20	mg/kg	< 20
TRH C15-C28	50	mg/kg	< 50
TRH C29-C36	50	mg/kg	< 50
TRH C10-C36 (Total)	50	mg/kg	< 50
BTEX			
Benzene	0.1	mg/kg	< 0.1
Toluene	0.1	mg/kg	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2
o-Xylene	0.1	mg/kg	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3
4-Bromofluorobenzene (surr.)	1	%	84
Total Recoverable Hydrocarbons - 2013 NEPM Fractions			
Naphthalene[N02]	0.5	mg/kg	< 0.5
TRH C6-C10	20	mg/kg	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20
TRH >C10-C16	50	mg/kg	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50
TRH >C16-C34	100	mg/kg	< 100
TRH >C34-C40	100	mg/kg	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100
Heavy Metals			
Arsenic	2	mg/kg	< 2
Cadmium	0.4	mg/kg	< 0.4
Chromium	5	mg/kg	67
Copper	5	mg/kg	22
Lead	5	mg/kg	14
Mercury	0.1	mg/kg	< 0.1
Nickel	5	mg/kg	67
Zinc	5	mg/kg	31
% Moisture	1	%	3.7

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Eurofins | mgt Suite B6			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Sydney	Oct 30, 2019	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Sydney	Oct 30, 2019	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Oct 30, 2019	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Oct 30, 2019	
- Method: LTM-ORG-2010 TRH C6-C40			
Metals M8	Sydney	Oct 30, 2019	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
% Moisture	Sydney	Oct 28, 2019	14 Days
- Method: LTM-GEN-7080 Moisture			

eurofins | Environment Testing

ABN – 50 005 085 521
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NATA # 1261
Site # 23736

Company Name:	Douglas Partners (Syd)	**Order No.:**		**Received:**	Oct 28, 2019 4:11 PM
Address:	96 Hermitage Road West Ryde NSW 2114	**Report #:**	684979	**Due:**	Nov 4, 2019
		Phone:	02 9809 0666	**Priority:**	5 Day
		Fax:		**Contact Name:**	David Walker
Project Name:	ULTIMO				
Project ID:	86874.01				

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						Moisture Set	Eurofins | mgt Suite B6
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217						X	X
Brisbane Laboratory - NATA Site # 20794							
Perth Laboratory - NATA Site # 23736							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	BDA/20191022	Oct 22, 2019		Rock	S19-Oc43532	X	X
Test Counts						1	1

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
ug/L: micrograms per litre
ppm: Parts per million
ppb: Parts per billion
%: Percentage
org/100mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	97			70-130	Pass	
TRH C10-C14	%	124			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	104			70-130	Pass	
Toluene	%	104			70-130	Pass	
Ethylbenzene	%	105			70-130	Pass	
m&p-Xylenes	%	108			70-130	Pass	
o-Xylene	%	107			70-130	Pass	
Xylenes - Total	%	108			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	94			70-130	Pass	
TRH C6-C10	%	91			70-130	Pass	
TRH >C10-C16	%	122			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic	%	94			70-130	Pass	
Cadmium	%	87			70-130	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Chromium			%	94			70-130	Pass	
Copper			%	96			70-130	Pass	
Lead			%	96			70-130	Pass	
Mercury			%	93			70-130	Pass	
Nickel			%	96			70-130	Pass	
Zinc			%	90			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S19-Oc46824	NCP	%	98			70-130	Pass	
TRH C10-C14	S19-Oc38300	NCP	%	120			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S19-Oc46824	NCP	%	98			70-130	Pass	
Toluene	S19-Oc46824	NCP	%	95			70-130	Pass	
Ethylbenzene	S19-Oc46824	NCP	%	96			70-130	Pass	
m&p-Xylenes	S19-Oc46824	NCP	%	99			70-130	Pass	
o-Xylene	S19-Oc46824	NCP	%	98			70-130	Pass	
Xylenes - Total	S19-Oc46824	NCP	%	99			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S19-Oc46824	NCP	%	86			70-130	Pass	
TRH C6-C10	S19-Oc46824	NCP	%	98			70-130	Pass	
TRH >C10-C16	S19-Oc38300	NCP	%	118			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S19-Oc41515	NCP	%	110			70-130	Pass	
Cadmium	S19-Oc41515	NCP	%	104			70-130	Pass	
Chromium	S19-Oc41515	NCP	%	108			70-130	Pass	
Copper	S19-Oc41515	NCP	%	116			70-130	Pass	
Lead	S19-Oc41515	NCP	%	114			70-130	Pass	
Mercury	S19-Oc41515	NCP	%	109			70-130	Pass	
Nickel	S19-Oc41515	NCP	%	104			70-130	Pass	
Zinc	S19-Oc41515	NCP	%	113			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S19-Oc41514	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C10-C14	S19-Oc46822	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	S19-Oc46822	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	S19-Oc46822	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S19-Oc41514	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	S19-Oc41514	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	S19-Oc41514	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	S19-Oc41514	NCP	mg/kg	0.5	0.5	4.0	30%	Pass	
o-Xylene	S19-Oc41514	NCP	mg/kg	0.2	0.2	6.0	30%	Pass	
Xylenes - Total	S19-Oc41514	NCP	mg/kg	0.7	0.7	4.0	30%	Pass	

Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S19-Oc41514	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	S19-Oc41514	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH >C10-C16	S19-Oc46822	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	S19-Oc46822	NCP	mg/kg	< 100	< 100	<1	30%	Pass	
TRH >C34-C40	S19-Oc46822	NCP	mg/kg	< 100	< 100	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	S19-Oc41514	NCP	mg/kg	2.6	2.3	11	30%	Pass	
Cadmium	S19-Oc41514	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	S19-Oc41514	NCP	mg/kg	15	16	7.0	30%	Pass	
Copper	S19-Oc41514	NCP	mg/kg	17	16	8.0	30%	Pass	
Lead	S19-Oc41514	NCP	mg/kg	12	12	3.0	30%	Pass	
Mercury	S19-Oc41514	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Nickel	S19-Oc41514	NCP	mg/kg	28	24	18	30%	Pass	
Zinc	S19-Oc41514	NCP	mg/kg	44	44	1.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S19-Oc43487	NCP	%	11	12	6.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.

Authorised By

Ursula Long	Analytical Services Manager
Andrew Sullivan	Senior Analyst-Organic (NSW)
Gabriele Cordero	Senior Analyst-Metal (NSW)

Glenn Jackson

General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project No: 86874.01	**Suburb:** Ultimo	**To:**	Envirolab Services
Project Name: Ultimo	**Order Number**		12 Ashley Street, Chatswood NSW 2067
Project Manager: David Walker	**Sampler:** Rob Keaveney	**Attn:**	
Emails: david.walker@douglaspartners.com.au		**Phone:**	02 9910 6200
Date Required: Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☑ Standard ☐		**Email:**	sydney@envirolab.com.au
Prior Storage: ☐ Esky ☑ Fridge ☐ Shelved	Do samples contain potential' HBM? Yes ☐	No ☑	(If YES, then handle, transport and store in accordance with FPM HAZID)

Sample ID	depth (m)	Lab ID	Date Sampled	Sample Type (S - soil, W - water)	Container Type (G - glass, P - plastic)	Analytes: Combo 8a	Combo 3a	VOC	BTEX only	Metals (8)	TRH BTEX				Notes/preservation
202	1.2-1.3	1	26-11-19	S	G/P	✓		✓							OK to subsample for asbestos.
202	2.0-2.1	2	26-11-19	S	G/P		✓								
TS		3	↓	S	G				✓						
TB		4	↓	S	G				✓						
* BD26112019		–	↓	S	G					✓	✓				* Send sample to Eurofins for analysis 3 Day TAT
PQL (S) mg/kg														ANZECC PQLs req'd for all water analytes ☐	

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

Job No: 231640
Date Received: 26.11.19
Time Received: 17:15
Received by: TC
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Comp.

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

Metals to Analyse: 8HM unless specified here:

Lab Report/Reference No: 231640

Total number of samples in container: | **Relinquished by:** DW | **Transported to laboratory by:** Courier

Send Results to: Douglas Partners Pty Ltd | **Address** 96 Hermitage Road, West Ryde | **Phone:** 98090666 **Fax:** 98094095

Signed: | **Received by:** ELS, Hillcrest Connaees | **Date & Time:** 26.11.19, 17:15

Relinquished by: ELS Syd K.Crane 27.11.2019 1200 Rec: Grace Eurofins 27/11 2:40pm #690424

eurofins | Environment Testing

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6 Monterey Road
Dandenong South Vic 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
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Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
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Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261 Site # 23736

ABN – 50 005 085 521 e.mail : EnviroSales@eurofins.com web : www.eurofins.com.au

Sample Receipt Advice

Company name:	**Douglas Partners (Syd)**
Contact name:	David Walker
Project name:	ULTIMO
Project ID:	86874.01
COC number:	Not provided
Turn around time:	3 Day
Date/Time received:	Nov 27, 2019 2:40 PM
Eurofins reference:	**690424**

Sample information

☑ A detailed list of analytes logged into our LIMS, is included in the attached summary table.

☑ All samples have been received as described on the above COC.

☑ COC has been completed correctly.

☑ Attempt to chill was evident.

☑ Appropriately preserved sample containers have been used.

☑ All samples were received in good condition.

☑ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.

☑ Appropriate sample containers have been used.

☒ Split sample sent to requested external lab.

☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Contact notes

If you have any questions with respect to these samples please contact:

Ursula Long on Phone : or by e.mail: UrsulaLong@eurofins.com

Results will be delivered electronically via e.mail to David Walker - david.walker@douglaspartners.com.au.

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Contact name:	David Walker
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Results will be delivered electronically via e.mail to David Walker - david.walker@douglaspartners.com.au.

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NATA # 1261
Site # 23736

Company Name: Douglas Partners (Syd)
Address: 96 Hermitage Road
West Ryde
NSW 2114

Project Name: ULTIMO
Project ID: 86874.01

Order No.:
Report #: 690424
Phone: 02 9809 0666
Fax:

Received: Nov 27, 2019 2:40 PM
Due: Dec 2, 2019
Priority: 3 Day
Contact Name: David Walker

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						Moisture Set	Eurofins | mgt Suite B6
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217						X	X
Brisbane Laboratory - NATA Site # 20794							
Perth Laboratory - NATA Site # 23736							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	BD26112019	Nov 26, 2019		Soil	S19-No38471	X	X
Test Counts						1	1

Douglas Partners (Syd)
96 Hermitage Road
West Ryde
NSW 2114

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Attention: **David Walker**

Report **690424-S**
Project name ULTIMO
Project ID 86874.01
Received Date Nov 27, 2019

Client Sample ID			[G01] **BD26112019**
Sample Matrix			**Soil**
Eurofins Sample No.			**S19-No38471**
Date Sampled			**Nov 26, 2019**
Test/Reference	LOR	Unit	
Total Recoverable Hydrocarbons - 1999 NEPM Fractions			
TRH C6-C9	20	mg/kg	< 200
TRH C10-C14	20	mg/kg	< 200
TRH C15-C28	50	mg/kg	2000
TRH C29-C36	50	mg/kg	600
TRH C10-C36 (Total)	50	mg/kg	2600
BTEX			
Benzene	0.1	mg/kg	< 0.5
Toluene	0.1	mg/kg	< 0.5
Ethylbenzene	0.1	mg/kg	< 0.5
m&p-Xylenes	0.2	mg/kg	< 1
o-Xylene	0.1	mg/kg	< 0.5
Xylenes - Total	0.3	mg/kg	< 1.5
4-Bromofluorobenzene (surr.)	1	%	87
Total Recoverable Hydrocarbons - 2013 NEPM Fractions			
Naphthalene[N02]	0.5	mg/kg	26
TRH C6-C10	20	mg/kg	< 200
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 200
TRH >C10-C16	50	mg/kg	< 500
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 500
TRH >C16-C34	100	mg/kg	2300
TRH >C34-C40	100	mg/kg	< 1000
TRH >C10-C40 (total)*	100	mg/kg	2300
Heavy Metals			
Arsenic	2	mg/kg	8.0
Cadmium	0.4	mg/kg	< 0.4
Chromium	5	mg/kg	45
Copper	5	mg/kg	120
Lead	5	mg/kg	1300
Mercury	0.1	mg/kg	3.9
Nickel	5	mg/kg	40
Zinc	5	mg/kg	240
% Moisture	1	%	11

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Eurofins | mgt Suite B6			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Sydney	Nov 28, 2019	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Sydney	Nov 28, 2019	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Nov 28, 2019	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Nov 28, 2019	
- Method: LTM-ORG-2010 TRH C6-C40			
Metals M8	Sydney	Nov 28, 2019	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
% Moisture	Sydney	Nov 27, 2019	14 Days
- Method: LTM-GEN-7080 Moisture			

eurofins | Environment Testing

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NATA # 1261
Site # 23736

Company Name:	Douglas Partners (Syd)	**Order No.:**		**Received:**	Nov 27, 2019 2:40 PM
Address:	96 Hermitage Road West Ryde NSW 2114	**Report #:**	690424	**Due:**	Dec 2, 2019
		Phone:	02 9809 0666	**Priority:**	3 Day
		Fax:		**Contact Name:**	David Walker
Project Name:	ULTIMO				
Project ID:	86874.01				

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						Moisture Set	Eurofins | mgt Suite B6
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217						X	X
Brisbane Laboratory - NATA Site # 20794							
Perth Laboratory - NATA Site # 23736							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	BD26112019	Nov 26, 2019		Soil	S19-No38471	X	X
Test Counts						1	1

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
ug/L: micrograms per litre
ppm: Parts per million
ppb: Parts per billion
%: Percentage
org/100mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	86			70-130	Pass	
TRH C10-C14	%	98			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	89			70-130	Pass	
Toluene	%	90			70-130	Pass	
Ethylbenzene	%	96			70-130	Pass	
m&p-Xylenes	%	89			70-130	Pass	
o-Xylene	%	86			70-130	Pass	
Xylenes - Total	%	88			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	112			70-130	Pass	
TRH C6-C10	%	87			70-130	Pass	
TRH >C10-C16	%	92			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic	%	101			70-130	Pass	
Cadmium	%	104			70-130	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Chromium			%	111			70-130	Pass	
Copper			%	113			70-130	Pass	
Lead			%	113			70-130	Pass	
Mercury			%	108			70-130	Pass	
Nickel			%	113			70-130	Pass	
Zinc			%	110			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S19-No41937	NCP	%	81			70-130	Pass	
TRH C10-C14	S19-No35398	NCP	%	95			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S19-No41937	NCP	%	87			70-130	Pass	
Toluene	S19-No41937	NCP	%	85			70-130	Pass	
Ethylbenzene	S19-No41937	NCP	%	93			70-130	Pass	
m&p-Xylenes	S19-No41937	NCP	%	84			70-130	Pass	
o-Xylene	S19-No41937	NCP	%	83			70-130	Pass	
Xylenes - Total	S19-No41937	NCP	%	84			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S19-No41937	NCP	%	81			70-130	Pass	
TRH C6-C10	S19-No41937	NCP	%	83			70-130	Pass	
TRH >C10-C16	S19-No35398	NCP	%	91			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S19-No40801	NCP	%	100			70-130	Pass	
Cadmium	S19-No40801	NCP	%	108			70-130	Pass	
Chromium	S19-No40801	NCP	%	111			70-130	Pass	
Copper	S19-No40801	NCP	%	110			70-130	Pass	
Lead	S19-No40801	NCP	%	114			70-130	Pass	
Mercury	S19-No40801	NCP	%	121			70-130	Pass	
Nickel	S19-No40801	NCP	%	112			70-130	Pass	
Zinc	S19-No40801	NCP	%	105			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S19-No37845	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C10-C14	S19-No36589	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	S19-No36589	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	S19-No36589	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S19-No37845	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	S19-No37845	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	S19-No37845	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	S19-No37845	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	S19-No37845	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total	S19-No37845	NCP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	

Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S19-No37845	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	S19-No37845	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH >C10-C16	S19-No36589	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	S19-No36589	NCP	mg/kg	< 100	< 100	<1	30%	Pass	
TRH >C34-C40	S19-No36589	NCP	mg/kg	< 100	< 100	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	S19-No40799	NCP	mg/kg	11	8.3	31	30%	Fail	Q15
Cadmium	S19-No40799	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	S19-No40799	NCP	mg/kg	13	12	16	30%	Pass	
Copper	S19-No40799	NCP	mg/kg	30	77	88	30%	Fail	Q15
Lead	S19-No40799	NCP	mg/kg	26	25	1.0	30%	Pass	
Mercury	S19-No40799	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Nickel	S19-No40799	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Zinc	S19-No40799	NCP	mg/kg	39	25	44	30%	Fail	Q15
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S19-No38860	NCP	%	17	17	1.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
G01	The LORs have been raised due to matrix interference
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised By

Ursula Long	Analytical Services Manager
Andrew Sullivan	Senior Analyst-Organic (NSW)
Gabriele Cordero	Senior Analyst-Metal (NSW)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

Appendix F

ProUCL 5.1 Inputs & Outputs

	A	B
1	sample	copper
2	BH101	21
3	BH102	130
4	BH103	21
5	BD3_20191	4
6	BH104	66
7	BH104	280
8	BH104	29
9	BH105	42
10	BH105	51
11	BH105	45
12	BH106	44
13	BH106	45
14	BDA/20191(	22
15	BH109	14
16	201	9
17	202	130
18	BD2611201	120

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	ProUCL 5.12/12/2019 2:00:08 PM
From File	copper fill input.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

copper

General Statistics

Total Number of Observations	17	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	4	Mean	63.12
Maximum	280	Median	44
SD	68.96	Std. Error of Mean	16.72
Coefficient of Variation	1.093	Skewness	2.206

Normal GOF Test

Shapiro Wilk Test Statistic	0.74	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.276	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.207	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	92.32	95% Adjusted-CLT UCL (Chen-1995)	100.2
		95% Modified-t UCL (Johnson-1978)	93.81

Gamma GOF Test

A-D Test Statistic	0.389	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.763	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.168	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.214	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.165	k star (bias corrected MLE)	0.999
Theta hat (MLE)	54.19	Theta star (bias corrected MLE)	63.21
nu hat (MLE)	39.6	nu star (bias corrected)	33.95
MLE Mean (bias corrected)	63.12	MLE Sd (bias corrected)	63.17
		Approximate Chi Square Value (0.05)	21.62
Adjusted Level of Significance	0.0346	Adjusted Chi Square Value	20.6

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	99.09	95% Adjusted Gamma UCL (use when n<50)	104

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.978	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.118	**Lilliefors Lognormal GOF Test**

55	5% Lilliefors Critical Value					0.207	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59	Minimum of Logged Data					1.386	Mean of logged Data					3.658
60	Maximum of Logged Data					5.635	SD of logged Data					1.061
61												
62	**Assuming Lognormal Distribution**											
63	95% H-UCL					141.7	90% Chebyshev (MVUE) UCL					120.8
64	95% Chebyshev (MVUE) UCL					146.1	97.5% Chebyshev (MVUE) UCL					181.2
65	99% Chebyshev (MVUE) UCL					250.1						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71	95% CLT UCL					90.63	95% Jackknife UCL					92.32
72	95% Standard Bootstrap UCL					88.8	95% Bootstrap-t UCL					116.1
73	95% Hall's Bootstrap UCL					148.5	95% Percentile Bootstrap UCL					91.76
74	95% BCA Bootstrap UCL					102.2						
75	90% Chebyshev(Mean, Sd) UCL					113.3	95% Chebyshev(Mean, Sd) UCL					136
76	97.5% Chebyshev(Mean, Sd) UCL					167.6	99% Chebyshev(Mean, Sd) UCL					229.5
77												
78	**Suggested UCL to Use**											
79	95% Adjusted Gamma UCL					104						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	Recommendations are based upon data size, data distribution, and skewness.											
83	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
84	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
85												

	A	B
1	sample	lead
2	BH101	100
3	BH102	170
4	BD2_20191022	47
5	BH104	36
6	BH104	120
7	BH104	1100
8	BH104	160
9	BH105	74
10	BH105	130
11	BH105	95
12	BH106	15
13	BH106	99
14	BDA/20191022	14
15	BH109	5
16	201	25
17	202	30
18	BD26112019	1300

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	ProUCL 5.12/12/2019 2:03:04 PM
From File	lead fill input.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

lead

General Statistics

Total Number of Observations	17	Number of Distinct Observations	17
		Number of Missing Observations	0
Minimum	5	Mean	207.1
Maximum	1300	Median	95
SD	378.9	Std. Error of Mean	91.89
Coefficient of Variation	1.83	Skewness	2.562

Normal GOF Test

Shapiro Wilk Test Statistic	0.521	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.421	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.207	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	367.5	95% Adjusted-CLT UCL (Chen-1995)	419.2
		95% Modified-t UCL (Johnson-1978)	377

Gamma GOF Test

A-D Test Statistic	1.19	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.789	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.267	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.219	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.599	k star (bias corrected MLE)	0.532
Theta hat (MLE)	345.9	Theta star (bias corrected MLE)	389.1
nu hat (MLE)	20.35	nu star (bias corrected)	18.09
MLE Mean (bias corrected)	207.1	MLE Sd (bias corrected)	283.8
		Approximate Chi Square Value (0.05)	9.459
Adjusted Level of Significance	0.0346	Adjusted Chi Square Value	8.81

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	396.1	95% Adjusted Gamma UCL (use when n<50)	425.3

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.162	**Lilliefors Lognormal GOF Test**

55	5% Lilliefors Critical Value					0.207	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59	Minimum of Logged Data					1.609	Mean of logged Data					4.3
60	Maximum of Logged Data					7.17	SD of logged Data					1.433
61												
62	**Assuming Lognormal Distribution**											
63	95% H-UCL					688.9	90% Chebyshev (MVUE) UCL					409
64	95% Chebyshev (MVUE) UCL					510.4	97.5% Chebyshev (MVUE) UCL					651.1
65	99% Chebyshev (MVUE) UCL					927.6						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71	95% CLT UCL					358.2	95% Jackknife UCL					367.5
72	95% Standard Bootstrap UCL					353.4	95% Bootstrap-t UCL					1187
73	95% Hall's Bootstrap UCL					1365	95% Percentile Bootstrap UCL					362.6
74	95% BCA Bootstrap UCL					424.3						
75	90% Chebyshev(Mean, Sd) UCL					482.7	95% Chebyshev(Mean, Sd) UCL					607.6
76	97.5% Chebyshev(Mean, Sd) UCL					780.9	99% Chebyshev(Mean, Sd) UCL					1121
77												
78	**Suggested UCL to Use**											
79	95% Chebyshev (Mean, Sd) UCL					607.6						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	Recommendations are based upon data size, data distribution, and skewness.											
83	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
84	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
85												