



**REPORT TO
RENT A SPACE SELF STORAGE**

**ON
DETAILED (STAGE 2) SITE INVESTIGATION**

**FOR
PROPOSED NEW COMMERCIAL STORAGE
BUILDING**

**AT
4 CROSS STREET, BROOKVALE, NSW**

Date: 14 August 2020

Ref: E32885PARpt2

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Executive Summary

Motaland Pty Ltd trading as Rent-A-Space-Brookvale Self Storage ('the client') commissioned JK Environments (JKE) to undertake a Detailed (Stage 2) Site Investigation (DSI) for the proposed new commercial storage building development at 4 Cross Street, Brookvale NSW ('the site'). JKE have previously undertaken a Preliminary (Stage 1) Site Investigation (PSI) with limited sampling at the site. A summary of this information has been included in this report. The purpose of the DSI is to make a detailed assessment of site contamination to address the data gaps from the PSI. The site location is shown on Figure 1 and the investigation was confined to the site boundaries as shown on Figure 2.

This report has been prepared to support the lodgement of a Development Application (DA) with Northern Beaches Council for the proposed new commercial storage building on site.

The proposed development includes construction of a new four storey self-storage building with no basement levels, founded on piles. The existing in-situ concrete slab is proposed to be retained as part of the new development. It is anticipated that minor excavations will be required for the centrally located lifts and stair cores as well as for piling and provision of services.

The primary aims of the DSI were to characterise the soil and groundwater contamination conditions following PSI in order to facilitate further an assessment of contamination-related risks in the context of the proposed development and anticipated land use. The objectives were to:

- Assess the current site conditions and use(s) via a site walkover inspection;
- Confirm potential contamination sources/areas of environmental concern (AEC) and contaminants of potential concern (CoPC);
- Assess the soil and groundwater contamination conditions via implementation of a detailed sampling and analysis program;
- Prepare an updated conceptual site model (CSM);
- Assess the potential risks posed by contamination to the receptors identified in the CSM (Tier 1 assessment);
- Provide a preliminary waste classification for off-site disposal of soil;
- Assess whether the site is suitable or can be made suitable for the proposed development (from a contamination viewpoint); and
- Assess whether remediation is required.

The scope of work included the following:

- Review of the previous PSI report;
- Preparation of a revised CSM;
- Design and implementation of a sampling, analysis and quality plan (SAQP);
- Interpretation of the analytical results against the adopted Site Assessment Criteria (SAC);
- Data Quality Assessment; and
- Preparation of a report including a Tier 1 risk assessment.

The DSI included a review of previous the PSI findings (including historical information), soil sampling from four boreholes and groundwater sampling from three monitoring wells installed on-site. The site has historically been used for various commercial/industrial activities including manufacturing and a rental storage space facility in more recent times. A major fire incident occurred at the site on the 28 March 2019 which resulted in previously existing building being destroyed.

The DSI has not identified any soil or groundwater contamination that was assessed to pose a risk to on-site receptors and/or in relation to the proposed development and anticipated land use. Exceedances above the ecological SAC were identified for total recoverable hydrocarbons (TRH F3) in soil and for heavy metals arsenic, lead and zinc in groundwater. The contaminant concentrations were relatively minor, risks were assessed to be low and acceptable, and no complete source-pathway-receptor (SPR) linkage was expected to occur. On this basis, the DSI did not identified any triggers for remediation.

Based on the findings of the investigation, JKE are of the opinion that remediation is not required and that the site is suitable for the proposed development.

There is considered to be a relatively low potential for contamination-related unexpected finds to occur at the site during the proposed development works. Unexpected finds would typically be able to be identified by visual or olfactory indicators and could include:

- Fibre cement fragments (e.g. ACM);
- Stained fill/soil; and/or
- Odorous soils (e.g. hydrocarbon odours).

The following should be implemented in the event of an unexpected find:

- All work in the immediate vicinity should cease and temporary barricades should be erected to isolate the area;
- A suitably qualified contaminated land consultant should be engaged to inspect the find and provide advice on the appropriate course of action. In the event that the unexpected find triggers remediation, the requirements of SEPP55 must be addressed (e.g. notifications to Council); and
- Any actions should be implemented and validated to demonstrate that there are no unacceptable risks to the receptors.

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



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Abbreviations

Asbestos Fines/Fibrous Asbestos	AF/FA
Ambient Background Concentrations	ABC
Added Contaminant Limits	ACL
Asbestos Containing Material	ACM
Australian Drinking Water Guidelines	ADWG
Area of Environmental Concern	AEC
Australian Height Datum	AHD
Acid Sulfate Soil	ASS
Above-Ground Storage Tank	AST
Below Ground Level	BGL
Benzo(a)pyrene Toxicity Equivalent Factor	BaP TEQ
Bureau of Meteorology	BOM
Benzene, Toluene, Ethylbenzene, Xylene	BTEX
Cation Exchange Capacity	CEC
Contaminated Land Management	CLM
Contaminant(s) of Potential Concern	CoPC
Chain of Custody	COC
Conceptual Site Model	CSM
Development Application	DA
Dial Before You Dig	DBYD
Data Quality Indicator	DQI
Data Quality Objective	DQO
Detailed Site Investigation	DSI
Ecological Investigation Level	EIL
Ecological Screening Level	ESL
Environmental Management Plan	EMP
Excavated Natural Material	ENM
Environment Protection Authority	EPA
Environmental Site Assessment	ESA
Ecological Screening Level	ESL
Fibre Cement Fragment(s)	FCF
General Approval of Immobilisation	GAI
Health Investigation Level	HILs
Hardness Modified Trigger Values	HMTV
Health Screening Level	HSL
Health Screening Level-Site Specific Assessment	HSL-SSA
International Organisation of Standardisation	ISO
JK Environments	JKE
Lab Control Spike	LCS
Light Non-Aqueous Phase Liquid	LNAPL
Map Grid of Australia	MGA
National Association of Testing Authorities	NATA
National Environmental Protection Measure	NEPM
Organochlorine Pesticides	OCF
Organophosphate Pesticides	OPP
Polycyclic Aromatic Hydrocarbons	PAH
Potential ASS	PASS
Polychlorinated Biphenyls	PCBs
Per- and Polyfluoroalkyl Substances	PFAS
Photo-ionisation Detector	PID
Protection of the Environment Operations	POEO
Practical Quantitation Limit	PQL
Quality Assurance	QA



Quality Control	QC
Remediation Action Plan	RAP
Relative Percentage Difference	RPD
Site Assessment Criteria	SAC
Sampling, Analysis and Quality Plan	SAQP
Site Audit Statement	SAS
Site Audit Report	SAR
Site Specific Assessment	SSA
Source, Pathway, Receptor	SPR
Specific Contamination Concentration	SCC
Standard Penetration Test	SPT
Standing Water Level	SWL
Trip Blank	TB
Toxicity Characteristic Leaching Procedure	TCLP
Total Recoverable Hydrocarbons	TRH
Trip Spike	TS
Upper Confidence Limit	UCL
United States Environmental Protection Agency	USEPA
Underground Storage Tank	UST
Virgin Excavated Natural Material	VENM
Volatile Organic Compounds	VOC
World Health Organisation	WHO
Work Health and Safety	WHS

Units

Litres	L
Metres BGL	mBGL
Metres	m
Millivolts	mV
Millilitres	ml or mL
Milliequivalents	meq
micro Siemens per Centimetre	$\mu\text{S}/\text{cm}$
Micrograms per Litre	$\mu\text{g}/\text{L}$
Milligrams per Kilogram	mg/kg
Milligrams per Litre	mg/L
Parts Per Million	ppm
Percentage	%

1 INTRODUCTION

Motaland Pty Ltd trading as Rent-A-Space-Brookvale Self Storage ('the client') commissioned JK Environments (JKE) to undertake a Detailed (Stage 2) Site Investigation (DSI) for the proposed new commercial storage building development at 4 Cross Street, Brookvale NSW ('the site'). The purpose of the investigation is to make a detailed assessment of site contamination. The site location is shown on Figure 1 and the investigation was confined to the site boundaries as shown on Figure 2.

This report has been prepared to support the lodgement of a Development Application (DA) with Northern Beaches Council for the proposed new commercial storage building on site.

JKE have previously undertaken a Preliminary (Stage 1) Site Investigation (PSI) with limited sampling at the site. A summary of this information has been included in Section 2.

1.1 Proposed Development Details

The proposed development includes construction of a new four storey self-storage building with no basement levels, founded on piles. The existing in-situ concrete slab is proposed to be retained as part of the new development. It is anticipated that minor excavations will be required for the centrally located lifts and stair cores as well as for piling and provision of services.

1.2 Aims and Objectives

The primary aims of the DSI were to characterise the soil and groundwater contamination conditions following PSI in order to facilitate further an assessment of contamination-related risks in the context of the proposed development and anticipated land use. The objectives were to:

- Assess the current site conditions and use(s) via a site walkover inspection;
- Confirm potential contamination sources/areas of environmental concern (AEC) and contaminants of potential concern (CoPC);
- Assess the soil and groundwater contamination conditions via implementation of a detailed sampling and analysis program;
- Prepare an updated conceptual site model (CSM);
- Assess the potential risks posed by contamination to the receptors identified in the CSM (Tier 1 assessment);
- Provide a preliminary waste classification for off-site disposal of soil;
- Assess whether the site is suitable or can be made suitable for the proposed development (from a contamination viewpoint); and
- Assess whether remediation is required.

1.3 Scope of Work

The investigation was undertaken generally in accordance with a JKE proposal (Ref: EP50619PA2) of 18 June 2020 and written acceptance from the client via e-mail on the 13 July 2020. The scope of work included the following:

- Review of the previous PSI report;

- Preparation of a revised CSM;
- Design and implementation of a sampling, analysis and quality plan (SAQP);
- Interpretation of the analytical results against the adopted Site Assessment Criteria (SAC);
- Data Quality Assessment; and
- Preparation of a report including a Tier 1 risk assessment.

The scope of work was undertaken with reference to the National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)¹, other guidelines made under or with regards to the Contaminated Land Management Act (1997)² and State Environmental Planning Policy No.55 – Remediation of Land (1998)³. A list of reference documents/guidelines is included in the appendices.

¹ National Environment Protection Council (NEPC), (2013). *National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013)*. (referred to as NEPM 2013)

² Contaminated Land Management Act 1997 (NSW) (referred to as CLM Act 1997)

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

2 SITE INFORMATION

2.1 Background

A Stage 1 Environmental Site Assessment (also known as a Preliminary Site Investigation – PSI) was previously undertaken by JKE in 2019⁴.

The scope of work for the PSI included a desktop review of site history information including review of historical aerial photographs, land title records, council records, planning certificates, NSW EPA records, a search of SafeWork NSW Dangerous Goods licence database and a site walkover inspection. The PSI identified the following potential areas of environmental concern (AEC)/potential sources of contamination at the site:

- Imported fill material;
- Historical commercial/industrial activities including manufacturing;
- Historical agricultural use including market gardening;
- Use of pesticides;
- Hazardous building materials from demolition of the previously existing building;
- Major Fire Incident (28 March 2019) during which PFAS containing AFFF may have been used. In addition, fire impacted asbestos roofing associated with the previously existing building on site may have resulted in release of asbestos fines across the site's surface; and
- Off-site industrial land uses – including automotive repairs operations to the north, and an industrial property located to the west (cross-gradient) of the site which was notified to the NSW EPA under Section 60 of the CLM Act 1997 and holds current license under the POEO Act 1997 for undertaking activities associated with fuel/chemical production and petroleum products.

A limited soil sampling and analytical program was completed as part of the PSI which included sampling from five boreholes (i.e. BH1 to BH5), drilled as part of the concurrent geotechnical investigation, and laboratory analysis of collected soil samples to a maximum depth of 1.9m below ground level (BGL).

All analytical results were below the adopted site acceptance criteria (SAC). This effectively indicated that there was a low potential for significant, widespread occurrence of pre-selected chemical of potential concern (CoPC) at the site. The PSI acknowledged that some of the CoPC identified during the historical assessment, such as per- and polyfluoroalkyl substances (PFAS), were not assessed.

A DSI was recommended with the primary objective of addressing the data gaps identified by the PSI. The scope of the DSI was to include the following:

- Installation and sampling of a network of groundwater monitoring wells to characterise groundwater across the site;
- Further sampling and testing of fill material from all additional boreholes which are required in order to meet the minimum sampling density for hotspot identification based on the site area, as outlined in the NSW EPA Contaminated Sites Sampling Design Guidelines (1995)⁵;
- Laboratory analysis of soil and groundwater for an extended suite of CoPC including PFAS; and
- Confirmatory laboratory testing for asbestos fines across the surface of the existing concrete slab.

⁴ JK Environments, (30 January 2020). *Report to Rent A Space Self Storage on Stage 1 Environmental Site Assessment Screening for Proposed New Commercial Storage Building at 4 Cross Street, Brookvale, NSW*. (Ref: E32885PRpt) (referred to as PSI)

⁵ NSW EPA, (1995), *Contaminated Sites Sampling Design Guidelines*. (referred to as EPA Sampling Design Guidelines 1995)

2.2 Site Identification

Table 2-1: Site Identification

Current Site Owner (certificate of title):	Motaland Pty Ltd
Site Address:	4 Cross Street, Brookvale, NSW
Lot & Deposited Plan:	Lot 2 in DP543012
Current Land Use:	Vacant
Proposed Land Use:	Commercial
Local Government Authority:	Northern Beaches Council
Current Zoning:	IN1 – General Industrial
Site Area (m²) (approx.):	2,578 m ²
RL (AHD in m) (approx.):	10-12
Geographical Location (decimal degrees) (approx.):	Latitude: -33.765135 Longitude: 151.266146
Site Location Plan:	Figure 1
Sample Location Plan:	Figure 2
Contamination Location Plan:	Figure 3
Groundwater Flow Diagram:	Figure 4

2.3 Site Location and Regional Setting

The site is located in a predominantly commercial/industrial area of Brookvale and is bound by commercial/industrial properties to the north, east and west with Cross Street bounding the site to the south beyond which was Westfield Warringah Mall shopping centre. The site is located approximately 100m to the east of Brookvale Creek which is considered to be the closest surface water body receptor to the site. The creek transitions into a concrete lined channel that extends further south beneath the Westfield Warringah Mall.

2.4 Topography

The regional topography is characterised by gently undulating terrain that falls gradually south and south-east towards Manly Creek and Manly Lagoon. The site area appeared to have been levelled to accommodate previously existing building on site.

2.5 Site Inspection

A walkover inspection of the site was undertaken by JKE on 16 July 2020. The inspection was limited to accessible areas of the site and immediate surrounds. A summary of the inspection findings is outlined in the following subsections:

2.5.1 Current Site Use and/or Indicators of Former Site Use

At the time of the inspection, the site was vacant with no buildings present. A concrete slab was present across the majority of the site area which was assumed to be associated with the former self-storage building. Parts of the site appeared to have been used as a storage area for materials resulting from a building strip out most likely at one of the adjoining properties. The recently stored materials were not considered to pose a risk with regards to land contamination.

2.5.2 Buildings, Structures and Roads

The concrete slab was present throughout the majority of the site area and appeared to be in good condition, with only minor cracks and some weathered edges identified in various area. Some exposed soil areas were observed most notably in the south-western part of the site as well as a small section along the eastern site boundary further towards the southern end of the site. The site was accessed from Cross Street to the south and via a dedicated access way to the north-west.

2.5.3 Boundary Conditions, Soil Stability and Erosion

The site boundary was fenced to the north, east and south (i.e. steel chain link fence with upper barbed wire) and was marked by adjoining buildings to the west. No obvious signs of soil erosion were observed at the boundaries.

2.5.4 Presence of Drums/Chemical Storage and Waste

Several industrial size waste bins were noted to have been kept on site and were filled with various building demolition and strip out waste. Dedicated storage cage area was also noted in northern section of the site with a number of small LPG gas cylinders kept inside. No evidence of any major chemical spills or leaks were identified anywhere on site.

2.5.5 Evidence of Cut and Fill

Based on our observations and previous investigations we note that fill material was used across the site to achieve the existing levels.

2.5.6 Visible or Olfactory Indicators of Contamination (odours, spills etc)

No apparent visible or olfactory indicators of contamination were identified during the walkover inspection or during the course of our intrusive investigation.

2.5.7 Drainage and Services

Surface water was not expected to accumulate at the site due to the presence of drainage in the form of stormwater drains adjacent to eastern and western site boundaries. An open stormwater drain was noted to run along the northern site boundary which connected to a municipal belowground stormwater drainage channel which ran along the eastern site boundary. Some of the surface water runoff is also expected to eventuate at the Cross Street frontage and ultimately discharge into the municipal stormwater system.

2.5.8 Sensitive Environments

Sensitive environments such as wetlands, ponds, creeks or extensive areas of natural vegetation were not identified on site. The section of Brookvale Creek immediately to the south of the site extends through what is understood to be a concrete-lined drainage channel and therefore does not retain any natural environmental/ecological features of the original creek.

2.5.9 Landscaped Areas and Visible Signs of Plant Stress

Small plants and shrubs were observed in the former garden area in the south-western section of the site. No obvious signs of vegetation stress or grass dieback were observed anywhere on site.

2.6 Surrounding Land Use

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

- North – commercial/industrial type properties occupied by buildings constructed to property boundaries with some of the tenancies which included “D&M Automotive”, “Warringah Auto Body Repairs” etc.;
- South – Westfield Shopping Centre (Westfield Warringah Mall) past Cross Street;
- East – commercial/industrial property occupied by “FormRite Group” – packaging solutions specialists;
- West – commercial property previously operated as a “Rent-A-Space” self-storage site, currently under redevelopment.

JKE are of the opinion that the adjacent auto mechanics tenancy (i.e. “Warringah Auto Body Repairs”) to the north-east of the site is a potential off-site contamination source as the mechanics is located within 20m of the site boundary and is considered to be approximately up or cross gradient of the site. “D&M Automotive” to the north-east was operated from the 2nd floor of the building above a different tenancy and was not considered as a potential contamination source of concern.

2.7 Underground Services

The ‘Dial Before You Dig’ (DBYD) plans were reviewed for the assessment in order to establish whether any major underground services exist at the site or in the immediate vicinity that could act as a preferential pathway for contamination migration. Major services were not identified at the site that would be expected to act as preferential pathways for contamination migration. However, stormwater drainage and services infrastructure currently present at the site are considered to be a potential preferential pathway for contaminant migration.

2.8 Additional Information

Fire and Rescue NSW incident report (eAIRS report for incident #057778) was submitted for our review as part of the PSI which related to a fire incident that took place on 28 March 2019. The previously existing, two-level building on site was destroyed by the fire and was demolished following the incident. It was reported that the fire affected building contained asbestos roofing which was damaged by the fire.

It was further noted that a mixture of water and firefighting foam were used to put out the fire across the site. We were unable to ascertain exactly which foam product was used and there was no material safety data sheet (MSDS) provided for the foam that was used. On this basis we have assumed that there is a potential that aqueous firefighting foam (AFFF) was used by the fire brigades in response to the incident and that the foam could have contained PFAS.

3 GEOLOGY AND HYDROGEOLOGY

3.1 Regional Geology

A review of the regional geological map of Sydney (1983)⁶ indicated that the site is underlain by Quaternary aged deposits of silty to peaty quartz sand, silt and clay with ferruginous and humic cementation in places and common shell layers.

3.2 Acid Sulfate Soil (ASS) Risk and Planning

The site is not located in an ASS risk area according to the risk maps prepared by the Department of Land and Water Conservation. However, the site was located within 50m of Class 4 and Class 5 land.

Based on the findings of the PSI, which included field tests and laboratory acid base accounting, it was confirmed that the natural soils underlying the fill material across the site from at least 1m below the surface is deemed to contain potential ASS (PASS). Disturbed PASS will require management during the proposed development works under the ASS management plan (ASSMP). The fill material across the site was not considered to be PASS.

3.3 Hydrogeology

Hydrogeological information presented as part of the PSI indicated that the regional aquifer on-site and in immediately surrounding areas most likely includes porous, extensive aquifers of low to moderate productivity. There were 10 registered bores noted within 1,000m radius of the site. In summary:

- The nearest registered bore was located approximately 114m from the site and was utilised for monitoring purposes;
- The majority of the bores were registered for monitoring purposes;
- Three of the bores were noted to be registered for domestic and recreation uses; and
- Information for the nearby bores (i.e. 114-147m to the west) revealed no recorded standing water levels (SWLs) however the installation depth ranged from 8.5mBGL to 10.0mBGL.

The soil stratigraphy observed in boreholes (BH1 to BH5) sampled as part of the PSI generally comprised:

- Fill material, encountered below the concrete slabs / asphaltic concrete surface, consisting of sand with gravel, silt and clay as well as sandy silty clay, with inclusions which comprised of varying sizes and fractions of igneous gravel, cemented sand, clay nodules and brick fragments. Fill material extended down to 0.4-1.2mBGL; overlying
- Natural alluvial soils generally comprising clayey silty sand/silty sand/sand and silty clay, encountered below the fill down to 14.76 – 24.21mBGL; underlain by
- Sandstone bedrock was encountered at depths ranging between 14.8-24.2mBGL.

Groundwater seepage was observed in all five boreholes at depths ranging between 1.2-1.6mBGL during and upon completion of drilling. No longer term groundwater monitoring was carried out as part of the PSI.

⁶ Department of Mineral Resources, (1983). *1:100,000 Geological Map of Sydney (Series 9130)*

Based on the information reviewed for the PSI, the subsurface conditions at the site were considered to consist of moderate to high permeability (alluvial) soils overlying relatively deep bedrock. Abstraction and use of groundwater at the site or in the immediate surrounds may be viable under these conditions, however the use of groundwater is not proposed as part of the development. There is a reticulated water supply in the area and consumption of groundwater is not expected to occur.

Considering the local topography and surrounding land features, the groundwater is expected to flow towards the south and south-east beneath the site.

3.4 Receiving Water Bodies

The site location and regional topography indicates that excess surface water flows have the potential to enter the nearby Brookvale Creek which is located downgradient of the site and which eventually flows into Manly Lagoon and Queens Cliff Bay/Tasman Sea further east/south-east. Hydraulic connectivity between the site and the concrete-lined section of the creek remains uncertain, however, the creek is still considered to be a potential receptor.

4 CONCEPTUAL SITE MODEL

NEPM (2013) defines a CSM as a representation of site related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM for the site is presented in the following sub-sections and is based on the site information presented as part of the PSI including site history as well as site inspection information obtained during previous PSI and the current DSI. Reference should also be made to the figures attached in the appendices.

A review of the CSM in relation to source, pathway and receptor (SPR) linkages has been undertaken as part of the Tier 1 risk assessment process, as outlined in Section 9.

4.1 Potential Contamination Sources/AEC and CoPC

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

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

Source / AEC	CoPC
<u>Fill material</u> – The site appears to have been historically filled to achieve the existing levels. The fill may have been imported from various sources and could be contaminated. Initial analysis of the fill for the PSI did not identify gross contamination impacts. However, the sampling density was low and further consideration of the fill is required as part of the DSI.	Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), petroleum hydrocarbons (referred to as total recoverable hydrocarbons – TRHs), benzene, toluene, ethylbenzene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), organophosphate pesticides (OPPs), polychlorinated biphenyls (PCBs) and asbestos.
<u>Major Fire Incident</u> – A fire incident on the 28 March 2019 resulted in previously existing building being destroyed and cleared offsite. It was reported that the building contained asbestos roofing which was damaged by the fire. Mixture of water and firefighting foam were reported to have been used to put out the fire across the site. No MSDS was provided for the foam used by the fire brigade.	PFAS and asbestos fines.
<u>Hazardous Building Material</u> – Hazardous building materials may be present associated with the former building and demolition activities.	Asbestos, lead and PCBs.
<u>Historical commercial/industrial activities including manufacturing</u> – Previously existing building historically included various commercial/industrial tenancies some of which specialised in manufacturing of plastics, doors and hardware. In more recent times the site was used as a self-storage centre.	Heavy metals, TRHs, BTEX, PAHs, and PCBs.
<u>Historical agricultural use</u> – The site appears to have been used for grazing and market garden purposes. This could have resulted in contamination across the site via use of machinery, application of pesticides and	Heavy metals, TRHs, PAHs, OCPs, OPPs. PCBs and asbestos.

Source / AEC	CoPC
building/demolition of various structures. Irrigation pipes made from asbestos cement may also be associated with this AEC.	JKE note that pesticides only became commercially available in the 1940s. Prior to this time pesticides were predominantly heavy metal compounds.
<u>Use of pesticides</u> – Pesticides may have been used beneath the previously existing building and/or around the site.	Heavy metals and OCPs.
<u>Off-site (cross-gradient) land use</u> –Industrial property located 89m west of the site was notified to the NSW EPA under Section 60 of the CLM Act 1997 and holds current license for operational activities under the POEO Act 1997 associated with fuel/chemical production and petroleum products. Areas to the north of the site are also used for automotive repairs which is a potentially contaminating activity.	Heavy metals, volatile organic compounds (VOCs) including chlorinated and halogenated compounds, TRHs, BTEX and phenols.

JKE note that herbicides have not been included as CoPC as herbicides are not commonly found at residual concentrations likely to pose a risk to human health or the environment (NSW DEC 2005, *Guidelines for Assessing Former Orchards and Market Gardens*).

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

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

Table 4-2: CSM

Potential mechanism for contamination	Potential mechanisms for contamination include: • Fill material – importation of impacted material, ‘top-down’ impacts (e.g. placement of fill, leaching from surficial material etc), or sub-surface release (e.g. impacts from buried material); • Major Fire Incident – ‘top-down’ (e.g. use of PFAS containing AFFF to put out the fire resulting in surficial impacts across the site including concrete slab and other paved areas, fire impacted asbestos roofing releasing asbestos fines resulting in surficial impact across the site); • Hazardous building materials – ‘top-down’ (e.g. demolition resulting in surficial impacts in unpaved areas); • Historical commercial/industrial activities including manufacturing – ‘top-down’, spills (e.g. leaks through cracks in the slab), or sub-surface release (e.g. from leaking underground tanks, pipework and/or separator/grease pits); • Historical agricultural use – ‘top-down’ and spills (e.g. application of pesticides, refuelling or repairing machinery, and other activities at the ground surface level); • Use of pesticides – ‘top-down’ and spills (e.g. during normal use, application and/or improper storage); and • Off-site industrial land uses which includes fuel/chemical production and activities associated with petroleum products – ‘top-down’, spill or sub-surface
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	release. Impacts to the site could also occur via migration of contaminated groundwater.
Affected media	Soil and groundwater have been identified as potentially affected media. The existing concrete slab has been identified as potentially affected medium in the context of asbestos fines and PFAS. Based on the findings of the PSI which uncovered low concentrations of heavy metals, PAHs, TRH/BTEX, OCPs, OPPs and PCBs in soil, it is considered unlikely that these contaminants were associated with historical on-site land uses which could have impacted the groundwater. On this basis, OCPs, OPPs and PCBs were not considered to be CoPC associated with groundwater in the context of this DSI. There is a potential however for groundwater contamination beneath the site from the fire incident and from off-site sources, and further assessment of SPR-linkages is required to better assess these risks.
Receptor identification	Human receptors include site occupants/users (including primarily adults), construction workers and intrusive maintenance workers. Off-site human receptors include adjacent land users and potential recreational water users downgradient of the site. Ecological receptors include terrestrial organisms and plants in the vicinity of the site, and freshwater/marine ecology in Brookvale Creek, Manly Creek and Manly Lagoon.
Potential exposure pathways	Potential exposure pathways relevant to the human receptors include ingestion, dermal absorption and inhalation of dust (all contaminants) and vapours (volatile TRH, naphthalene, VOCs and BTEX). The potential for exposure would typically be associated with the construction and excavation works, and future use of the site. Potential exposure pathways for ecological receptors include primary/direct contact and ingestion. Exposure during future site use could occur via direct contact with paved areas which may have been impacted with PFAS or asbestos fines, contact with soil in unpaved areas (such as proposed landscape areas), inhalation of dust including airborne asbestos fibres during soil disturbance, or inhalation of vapours within enclosed spaces such as within the proposed building. Direct contact exposure to groundwater is unlikely to occur during future site use due to the nature of the proposed development (i.e. no proposed basement levels or parts of the building envelope which would intersect the water table) as well as lack of beneficial groundwater uses at the site. However, exposure to groundwater may take place during the proposed construction and excavation works because of the shallow depth of groundwater table within the area (i.e. expected within 2m below the surface). Vapours from impacted groundwater also have the potential to enter and accumulate in enclosed spaces (via vapour intrusion) within the proposed building through, cracks, voids and service shafts/penetrations.
Potential exposure mechanisms	The following have been identified as potential exposure mechanisms for site contamination: • Contact (dermal, ingestion or inhalation) with potentially impacted paved areas of the site and exposed soils during proposed construction/excavation and future maintenance works and in proposed landscaped and/or unpaved areas across the site;

	• Migration of groundwater off-site and into nearby water bodies, including aquatic ecosystems and those being used for recreation; and • Vapour intrusion into the proposed building (either from soil contamination or volatilisation of contaminants from groundwater).
Presence of preferential pathways for contaminant movement	Stormwater drainage and services infrastructure is a potential preferential pathway for contaminant migration. This could occur via surface runoff and/or groundwater/seepage if present, or via vapour migration through the cracks, voids and services penetrations within the proposed building as well as drainage channels/pipework and/or trench backfill.

5 SAMPLING, ANALYSIS AND QUALITY PLAN

5.1 Data Quality Objectives (DQO)

Data Quality Objectives (DQOs) were developed to define the type and quality of data required to achieve the project objectives outlined in Section 1.2. The DQOs were prepared with reference to the process outlined in Schedule B2 of NEPM (2013) and the Guidelines for the NSW Site Auditor Scheme, 3rd Edition (2017)⁷. The seven-step DQO approach for this project is outlined in the following sub-sections.

The DQO process is validated in part by the Data Quality Assurance/Quality Control (QA/QC) Evaluation. The Data (QA/QC) Evaluation is summarised in Section 7.1 and the detailed evaluation is provided in the appendices.

5.1.1 Step 1 - State the Problem

This DSI follows a previously completed PSI which identified a number of data gaps. Further characterisation is considered necessary in order to assess the risks and confirm that the site is suitable for the proposed development without the need for remediation, or that remediation is actually required.

The CSM presented in this report confirms a number of potential sources of contamination/AEC at the site which may pose a risk to human health and the environment. Additional investigation data is required to address a number of data gaps identified by the PSI and to confirm the contamination status of the site. DSI is required to confirm the risks posed by the CoPC in the context of the proposed development/intended land use, and to assess whether remediation is required. Investigation data collected as part of the DSI will also be supplemented by the existing data collected during the PSI.

This information will be considered by the consent authority in exercising its planning functions in relation to the development proposal.

Further waste classification is also required prior to off-site disposal of excavated soil/bedrock.

5.1.2 Step 2 - Identify the Decisions of the Study

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

- Is the proposed SAQP suitable to confirm the presence or otherwise of contamination associated with the identified AECs and CoPC in the CSM?
- Are any results above the SAC?
- Do potential risks associated with contamination exist, and if so, what are they?
- Is remediation required?
- Is the site characterisation sufficient to provide adequate confidence in the above decisions?
- Is the site suitable for the proposed development and anticipated land use, or can the site be made suitable subject to further characterisation and/or remediation?

⁷ NSW EPA (2017). *Guidelines for the NSW Site Auditor Scheme, 3rd ed.* (referred to as Site Auditor Guidelines 2017)

5.1.3 Step 3 - Identify Information Inputs

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

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

5.1.4 Step 4 - Define the Study Boundary

The sampling will be confined to the site boundaries as shown in Figure 2 and will be limited vertically to a depth of 5.0mBGL (spatial boundary). The sampling was completed between 16-24 July 2020 (temporal boundary). The assessment of potential risk to adjacent land users has been made based on data collected within the site boundary.

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

5.1.5.1 Tier 1 Screening Criteria

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

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

5.1.5.2 Field and Laboratory QA/QC

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

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

In the event that acceptable limits are not met by the laboratory analysis, other lines of evidence are reviewed (e.g. field observations of samples, preservation, handling etc) and, where required, consultation

with the laboratory is undertaken in an effort to establish the cause of the non-conformance. Where uncertainty exists, JKE typically adopt the most conservative concentration reported (or in some cases, consider the data from the affected sample as an estimate).

5.1.5.3 Appropriateness of Practical Quantitation Limits (PQLs)

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

5.1.6 Step 6 – Specify Limits on Decision Errors

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

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

5.1.7 Step 7 - Optimise the Design for Obtaining Data

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

The sampling plan and methodology are outlined in the following sub-sections.

5.2 Soil Sampling Plan and Methodology

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

Table 5-1: Soil Sampling Plan and Methodology

Aspect	Input
Sampling Density	The sampling density for asbestos in soil included sampling at the minimum sampling density recommended in the Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (2009) ⁸ (endorsed in NEPM 2013). This density was considered adequate in the absence of any existing sub-surface data for the site.

⁸ Western Australian (WA) Department of Health (DoH), (2009). Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia. (referred to as WA DoH 2009)

Aspect	Input
	Samples for other contaminants were collected originally from five locations as part of the PSI and from four additional locations as part of the DSI, as shown on the attached Figure 2. This number of locations (i.e. a total of nine locations) met the minimum sampling density for hotspot identification, as outlined in the NSW EPA Contaminated Sites Sampling Design Guidelines (1995)⁹. Based on the above density, the following hotspot diameter has been calculated: • Circular hotspot diameter with a 95% confidence level (K value of 0.59) – 21.5m. Whilst the above hotspot diameter broadly applies, it is noted that the sampling plan was not probabilistic and was largely judgemental due to access constraints. On that basis we have not drawn any conclusions in relation to potential ‘hotspots’ at the site.
Sampling Plan	The sampling locations were placed on a judgemental sampling plan and were broadly positioned for site coverage, taking into consideration areas that were not easily accessible. This sampling plan was considered suitable based on the site layout to make an appropriate detailed assessment of potential risks associated with the AEC and CoPC identified in the CSM, and assess whether further investigation and/or remediation is warranted. This sampling plan was considered suitable to characterise the site with regards to contamination. Sampling also included: • Two surface soil samples (SS1 and SS2) from the southern garden areas which were assessed for PFAS as it was believed that if AFFF was used that these areas may have been closest to the discharge source. SS2 was marginally outside the site boundary; • Two surface swabs (SWAB1 and SWAB2) on top of the existing pavements which were assessed for asbestos to check whether there were any residual impacts from asbestos fibres released during the fire; • Two concrete pavement samples (BH102 surface and BH103 surface) which were analysed for PFAS.
Set-out and Sampling Equipment	Sampling locations were set out using hand held specialised survey GPS unit which utilises a Sokkia GCX3 GNSS Receiver (with an accuracy of $\pm 30\text{mm}$). In-situ sampling locations were checked for underground services by an external contractor prior to sampling. Samples were collected using a drill rig equipped with spiral flight augers (150mm diameter). Soil samples were obtained from a Standard Penetration Test (SPT) split-spoon sampler, and/or directly from the auger.
Sample Collection and Field QA/QC	Soil samples were obtained on 16, 20 and 21 July 2020 in accordance with our standard field procedures. Soil samples were collected from the fill and natural profiles based on field observations. The sample depths are shown on the logs attached in the appendices. Samples were placed in glass jars with plastic caps and teflon seals with minimal headspace. Samples for asbestos analysis were placed in zip-lock plastic bags. During sampling, soil at selected depths was split into primary and duplicate samples for field QA/QC analysis. The field splitting procedure included alternately filling the sampling containers to obtain a representative split sample.

⁹ NSW EPA, (1995), *Contaminated Sites Sampling Design Guidelines*. (referred to as EPA Sampling Design Guidelines 1995)

Aspect	Input
Field Screening	A portable Photoionisation Detector (PID) fitted with a 10.6mV lamp was used to screen the samples for the presence of volatile organic compounds (VOCs). PID screening for VOCs was undertaken on soil samples using the soil sample headspace method. VOC data was obtained from partly filled zip-lock plastic bags following equilibration of the headspace gases. PID calibration records are maintained on file by JKE. The field screening for asbestos quantification included the following: • A representative bulk sample was collected from fill at 1m intervals, or from each distinct fill profile. The quantity of material for each sample varied based on whatever return could be achieved using the auger. The bulk sample intervals are shown on the attached borehole logs; • Each sample was weighed using an electronic scale; • Each bulk sample was passed through a sieve with a 7.1mm aperture and inspected for the presence of fibre cement; • The condition of fibre cement or any other suspected asbestos materials was noted on the field records; and • If observed, any fragments of fibre cement in the bulk sample were collected, placed in a zip-lock bag and assigned a unique identifier. Calculations for asbestos content were undertaken based on the requirements outlined in Schedule B1 of NEPM (2013), as summarised in Section 6.1.
Decontamination and Sample Preservation	Sampling personnel used disposable nitrile gloves during sampling activities. Re-usable sampling equipment was decontaminated using potable water and wetted rags only due to the PFAS sampling protocols that were implemented. Rinsate samples were obtained during the decontamination process as part of the field QA/QC. Soil samples were preserved by immediate storage in an insulated sample container with ice. On completion of the fieldwork, the samples were stored temporarily in fridges in the JKE warehouse before being delivered in the insulated sample container to a NATA registered laboratory for analysis under standard chain of custody (COC) procedures.

5.3 Groundwater Sampling Plan and Methodology

The groundwater sampling plan and methodology is outlined in the table below:

Table 5-2: Groundwater Sampling Plan and Methodology

Aspect	Input
Sampling Plan	Groundwater monitoring wells were installed in BH101 (MW101), BH102 (MW102) and BH103 (MW103). The wells were positioned to gain a snap-shot of the groundwater conditions. Considering the topography and the location of the nearest down-gradient water body, MW101 was considered to be in the up-gradient area of the site and would be expected to provide an indication of groundwater flowing onto (beneath) the site from the north. MW102 and MW103 were considered to be in the intermediate to down-gradient areas of the site and would be expected to provide an indication of groundwater flowing across (beneath) the site and beyond the down-gradient site boundary.

Aspect	Input
Monitoring Well Installation Procedure	The monitoring well construction details are documented on the appropriate borehole logs attached in the appendices. The monitoring wells were installed to depths of approximately 4.7m to 5mBGL. The wells were generally constructed as follows: • 50mm diameter Class 18 PVC (machine slotted screen) was installed in the lower section of the well to intersect groundwater; • 50mm diameter Class 18 PVC casing was installed in the upper section of the well (screw fixed), with the rubber o-ring removed to limit interference for PFAS sampling; • A 2mm sand filter pack was used around the screen section for groundwater infiltration; • A hydrated bentonite seal/plug was used on top of the sand pack to seal the well; and • A gatic cover was installed at the surface with a concrete plug to limit the inflow of surface water. The monitoring well installation, including the screen lengths, were considered suitable for assessment of general groundwater quality with regards to Table 5 in Schedule B2 of NEPM 2013.
Monitoring Well Development	The monitoring wells were developed on 20 and 21 July 2020 using a submersible electrical pump. The monitoring wells were developed until steady state conditions were achieved. Steady state conditions were considered to have been achieved when the difference in the pH measurements was less than 0.2 units, the difference in conductivity was less than 10%, and when the SWL was not in drawdown. The field monitoring records and calibration data are attached in the appendices.
Groundwater Sampling	The monitoring wells were allowed to recharge for approximately three to four days after development. Groundwater samples were obtained on 24 July 2020. Prior to sampling, the monitoring wells were checked for the presence of Light Non-Aqueous Phase Liquids (LNAPLs) using an inter-phase probe electronic dip meter. The monitoring well head space was checked for VOCs using a calibrated PID unit. The samples were obtained using a peristaltic pump. During sampling, the following parameters were monitored using calibrated field instruments: • SWL using an electronic dip meter; and • pH, temperature, electrical conductivity (EC), dissolved oxygen (DO) and redox potential (Eh) using a YSI Multi-probe water quality meter. Steady state conditions were considered to have been achieved when the difference in the pH measurements was less than 0.2 units, the difference in conductivity was less than 10%, and when the SWL was not in drawdown. Groundwater samples were obtained directly from the single use PVC tubing and placed in the sample containers. Duplicate samples were obtained by alternate filling of sample containers. This technique was adopted to minimise disturbance of the samples and loss of volatile contaminants associated with mixing of liquids in secondary containers, etc. Groundwater removed from the wells during development and sampling was transported to JKE in jerry cans and stored in holding drums prior to collection by a licensed waste water contractor for off-site disposal. The field monitoring record and calibration data are attached in the appendices.
Decontaminant and Sample Preservation	During development, the pump was flushed between monitoring wells with potable water (single-use tubing was used for each well). The pump tubing was discarded after each sampling event and replaced therefore no decontamination procedure was considered necessary.

Aspect	Input
	The samples were preserved with reference to the analytical requirements and placed in an insulated container with ice. On completion of the fieldwork, the samples were temporarily stored in a fridge at the JKE office, before being delivered in the insulated sample container to a NATA registered laboratory for analysis under standard COC procedures.
Monitoring Well Survey	All monitoring wells were surveyed using specialised hand held survey GPS unit which utilises a Sokkia GCX3 GNSS Receiver (with calibration accuracy of $\pm 30\text{mm}$) to obtain exact northing, easting and elevation (mAHD) data for each location. All well measurements were taken from top of the gatic cover.

5.4 Laboratory Analysis

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

Table 5-3: Laboratory Details

Samples	Laboratory	Report Reference
All primary samples and field QA/QC samples including (intra-laboratory duplicates, trip blanks, trip spikes and field rinsate samples)	Envirolab Services Pty Ltd NSW, NATA Accreditation Number – 2901 (ISO/IEC 17025 compliance)	247495 and 247692
Inter-laboratory duplicates	Envirolab Services Pty Ltd VIC, NATA Accreditation Number – 2901 (ISO/IEC 17025 compliance)	21980 and 22014

6 SITE ASSESSMENT CRITERIA (SAC)

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

6.1 Soil

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

6.1.1 Human Health

Due to the proposed commercial/industrial use of the site as a self-storage centre and based on the provided concept architectural plans for the proposed development (i.e. included as part of the appendices within the PSI report), which indicates no proposed basement levels and minor excavations for the centrally located lifts and stair cores as well as for piling and shallow buried services, the following human health based SAC values were deemed to be applicable as part of the Tier 1 risk assessment:

- Health Investigation Levels (HILs) for a 'commercial/industrial' exposure scenario (HIL-D);
- Health Screening Levels (HSLs) for vapour intrusion for a 'commercial/industrial' exposure scenario (HSL-D) which are also considered applicable given that closest adjoining downgradient properties (i.e. including Warringah Mall) are commercial/industrial in nature. HSLs were calculated based on conservative assumptions of 'sand' type soil strata throughout the site and a depth interval of 0-1m;
- HSLs for direct contact presented in the CRC Care Technical Report No. 10 – Health screening levels for hydrocarbons in soil and groundwater Part 1: Technical development document (2011)¹⁰;
- HIL-D criteria were adopted for PFAS assessment based on Table 2 in The PFAS National Environmental Management Plan (NEMP) Version 2.0 2020¹¹; and
- Asbestos was assessed against the HSL-D criteria. A summary of the asbestos criteria is provided in the table below:

Table 6-1: Details for Asbestos SAC

Guideline	Applicability
Asbestos in Soil	The HSL-D criteria were adopted for the assessment of asbestos in soil. The SAC adopted for asbestos were derived from the NEPM 2013 and are based on WA DoH (2009) guidance. The SAC include the following: • No visible asbestos at the surface/in the top 10cm of soil; • <0.05% w/w bonded asbestos containing material (ACM) in soil; and • <0.001% w/w asbestos fines/fibrous asbestos (AF/FA) in soil. Concentrations for bonded ACM concentrations in soil are based on the following equation which is presented in Schedule B1 of NEPM (2013): $\% \text{ w/w asbestos in soil} = \frac{\% \text{ asbestos content} \times \text{bonded ACM (kg)}}{\text{Soil volume (L)} \times \text{soil density (kg/L)}}$

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

¹¹ Heads of EPAs Australia and New Zealand (HEPA). PFAS National Environmental Management Plan Version 2.0 - January 2020 (referred to as NEMP 2020)

Guideline	Applicability
	However, we are of the opinion that the actual soil volume in a 10L bucket varies considerably due to the presence of voids, particularly when assessing cohesive soils. Therefore, each bucket sample was weighed using electronic scales and the above equation was adjusted as follows (we note that the units have also converted to grams): $\% \text{ w/w asbestos in soil} = \frac{\% \text{ asbestos content} \times \text{bonded ACM (g)}}{\text{Soil weight (g)}}$

6.1.2 Environment (Ecological – terrestrial ecosystems)

- Ecological Investigation Levels (EILs) and Ecological Screening Levels (ESLs) for a 'commercial/industrial' exposure scenario. These have only been applied to the top 2m of soil as outlined in NEPM (2013). The criterion for benzo(a)pyrene has been increased from the value presented in NEPM (2013) based on the Canadian Soil Quality Guidelines¹²;
- ESLs were adopted based on the soil type;
- The ecological (indirect exposure) guidelines for soil were adopted for PFAS assessment based on Table 3 in NEMP 2020; and
- EILs for selected metals were calculated based on the most conservative added contaminant limit (ACL) values presented in Schedule B(1) of NEPM (2013) and published ambient background concentration (ABC) values presented in the document titled Trace Element Concentrations in Soils from Rural and Urban Areas of Australia (1995)¹³. This method is considered to be adequate for the Tier 1 screening.

6.1.3 Management Limits for Petroleum Hydrocarbons

Management limits for petroleum hydrocarbons (as presented in Schedule B1 of NEPM 2013) were considered (if required).

6.1.4 Waste Classification

Data for the waste classification assessment were assessed in accordance with the Waste Classification Guidelines, Part 1: Classifying Waste (2014)¹⁴ as outlined in the following table:

Table 6-2: Waste Categories

Category	Description
General Solid Waste (non-putrescible)	• If Specific Contaminant Concentration (SCC) ≤ Contaminant Threshold (CT1) then Toxicity Characteristics Leaching Procedure (TCLP) not needed to classify the soil as general solid waste; and • If TCLP ≤ TCLP1 and SCC ≤ SCC1 then treat as general solid waste.
Restricted Solid Waste (non-putrescible)	• If SCC ≤ CT2 then TCLP not needed to classify the soil as restricted solid waste; and • If TCLP ≤ TCLP2 and SCC ≤ SCC2 then treat as restricted solid waste.

¹² Canadian Council of Ministers of the Environment, (1999). *Canadian soil quality guidelines for the protection of environmental and human health: Benzo(a)Pyrene (1997)* (referred to as the Canadian Soil Quality Guidelines)

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

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

Category	Description
Hazardous Waste	- If SCC > CT2 then TCLP not needed to classify the soil as hazardous waste; and - If TCLP > TCLP2 and/or SCC > SCC2 then treat as hazardous waste.
Virgin Excavated Natural Material (VENM)	Natural material (such as clay, gravel, sand, soil or rock fines) that meet the following: - That has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial mining or agricultural activities; - That does not contain sulfidic ores or other waste; and - Includes excavated natural material that meets such criteria for virgin excavated natural material as may be approved from time to time by a notice published in the NSW Government Gazette.

6.2 Groundwater

Groundwater data were compared to relevant Tier 1 screening criteria in accordance with NEPM (2013), following an assessment of environmental values in accordance with the Guidelines for the Assessment and Management of Groundwater Contamination (2007)¹⁵. Environmental values for this investigation include aquatic ecosystems, human uses, and human-health risks in non-use scenarios.

6.2.1 Human Health

- The NEPM (2013) HSLs were not applicable for this project as the groundwater was recorded at depths shallower than 2m. On this basis, JKE have undertaken a site-specific assessment (SSA) for the Tier 1 screening of human health risks posed by volatile contaminants in groundwater. The assessment included selection of alternative Tier 1 criteria that were considered suitably protective of human health. These criteria are based on drinking water guidelines and have been referred to as HSL-SSA. The criteria were based on the following (as shown in the attached report tables):
 - Australian Drinking Water Guidelines 2011 (updated 2018)¹⁶ for BTEX compounds and selected VOCs;
 - World Health Organisation (WHO) document titled Petroleum Products in Drinking-water, Background document for the development of WHO Guidelines for Drinking Water Quality (2008)¹⁷ for petroleum hydrocarbons;
 - USEPA Region 9 screening levels for naphthalene (threshold value for tap water); and
 - The use of the laboratory PQLs for other contaminants where there were no Australian guidelines.
- The ADWG 2011 were multiplied by a factor of 10 to assess potential risks associated with incidental/recreational-type exposure to groundwater (e.g. within down-gradient water bodies). These have been deemed as 'recreational' SAC; and
- The recreational water quality guideline value was adopted for PFAS assessment based on Table 1 in NEMP 2020.

¹⁵ NSW Department of Environment and Conservation, (2007). *Guidelines for the Assessment and Management of Groundwater Contamination*.

¹⁶ National Health and Medical Research Council (NHMRC), (2018). *National Water Quality Management Strategy, Australian Drinking Water Guidelines 2011* (referred to as ADWG 2011)

¹⁷ World Health Organisation (WHO), (2008). *Petroleum Products in Drinking-water, Background document for the development of WHO Guidelines for Drinking Water Quality* (referred to as WHO 2008)

6.2.2 Environment (Ecological - aquatic ecosystems)

Given proximity of the site to both freshwater (i.e. Brookvale Creek and Manly Lagoon) and marine ecosystems (i.e. in the Tasman Sea) the Groundwater Investigation Levels (GILs)/SAC for 95% protection of freshwater and marine species were adopted based on the Default Guideline Values in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2018)¹⁸.

The ecological (interim marine/freshwater) water quality guidelines were adopted for PFAS assessment based on NEMP 2020, based on 95% protection (slightly to moderately disturbed systems).

¹⁸ Australian and New Zealand Governments (ANZG), (2018). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia (referred to as ANZG 2018)

7 RESULTS

7.1 Summary of Data (QA/QC) Evaluation

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

7.2 Subsurface Conditions

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

Table 7-1: Summary of Subsurface Conditions

Profile	Description
Pavement	Concrete slabs, ranging in thickness between 160mm and 230mm, were encountered at the surface at all borehole locations.
Fill	Fill was encountered beneath concrete slabs in all boreholes and extended to depths of approximately 0.6-1.15mBGL. The fill typically comprised sandy clay, silty clayey sand, silty sand and clayey sand with inclusions of igneous, ironstone and sandstone gravel, and traces of brick fragments.
Natural Soil	Natural alluvial soils generally comprising silty clayey sand/silty sand/clayey sand and sandy clay were encountered below the fill at each borehole location extending down to terminal depths of 3.1-5.0m below existing surface level.
Bedrock	Bedrock was not encountered in any of the borehole locations down to the maximum depth of 5.0mBGL.
Groundwater	Groundwater seepage was observed in all locations at depths ranging between 1.9-2.9mBGL after completion of drilling. Groundwater monitoring wells were installed at BH101, BH102 and BH103 to allow for further groundwater sampling. The groundwater was observed at depths ranging between 1.63-1.95mBGL during well development and upon return to the site for sampling at a later date.

7.3 Field Screening

Summary of field screening results is presented in the following table:

Table 7-2: Summary of Field Screening

Aspect	Details
PID Screening of Soil Samples for VOCs	PID soil sample headspace readings are presented in attached report tables and the COC documents attached in the appendices. The results ranged from 0.1ppm to 7.9ppm equivalent isobutylene. These results indicate the relatively low concentrations of PID detectable VOCs were present in some samples. Samples with elevated PID readings were analysed for TRH and BTEX.
Bulk Screening for Asbestos	The bulk field screening results are summarised in the attached report tables. All results were below the SAC. Visible asbestos was not detected in any of the bulk screening samples.

Aspect	Details
Groundwater Depth & Flow	Groundwater seepage was encountered in all boreholes shortly after completion of drilling at depths of approximately 1.9mBGL to 2.9mBGL. SWLs measured in the monitoring wells installed at the site ranged from 1.63m to 1.95m below top of the gatic cover. Groundwater RLs calculated on these measurements ranged from RL 9.275 to 9.514 mAHD. A contour plot was prepared for the groundwater levels using Surfer v11.0.642 (Surface Mapping Program) and data obtained during well survey (refer Table 5.3) as shown on Figure 4. Groundwater flow generally occurs in a down gradient direction perpendicular to the groundwater elevation contours. The contour plot indicates that groundwater generally flows towards south/south-east and confirms our expectations from the PSI.
Groundwater Field Parameters	Field measurements recorded during sampling were as follows: - pH ranged from 5.06 to 5.86; - EC ranged from 187.5µS/cm to 375.3µS/cm; - Eh ranged from 60.2mV to 173.7mV; and - DO ranged from 0.2ppm to 1.5ppm.
LNAPLs petroleum hydrocarbons	Phase separated product (i.e. LNAPL) were not detected using the interphase probe during groundwater sampling.

7.4 Soil Laboratory Results

The soil laboratory results were assessed against the SAC presented in Section 6.1. Individual SAC are shown in the report tables attached in the appendices. A summary of the results is presented below:

7.4.1 Human Health and Environmental (Ecological) Assessment

Table 7-3: Summary of Soil Laboratory Results – Human Health and Environmental (Ecological)

Analyte	N	Max. (mg/kg)	N> Human Health SAC	N> Ecological SAC	Comments
Arsenic	8	4	0	0	-
Cadmium	8	<PQL	0	NSL	-
Chromium (total)	8	10	0	0	-
Copper	8	19	0	0	-
Lead	8	24	0	0	-
Mercury	8	<PQL	0	NSL	-
Nickel	8	3	0	0	-
Zinc	8	18	0	0	-
Total PAHs	8	0.1	0	NSL	-

Analyte	N	Max. (mg/kg)	N> Human Health SAC	N> Ecological SAC	Comments
Benzo(a)pyrene	8	<PQL	NSL	0	-
Carcinogenic PAHs (as BaP TEQ)	8	<PQL	0	NSL	-
Naphthalene	8	<PQL	0	NSL	-
DDT+DDE+DDD	4	<PQL	0	NSL	-
DDT	4	<PQL	NSL	0	-
Aldrin and dieldrin	4	<PQL	0	NSL	-
Chlordane	4	<PQL	0	NSL	-
Heptachlor	4	<PQL	0	NSL	-
PCBs	4	<PQL	0	NSL	-
TRH F1	8	<PQL	0	0	-
TRH F2	8	620	0	2	TRH F2 concentrations exceeded the adopted ESL of 170 mg/kg in the following samples: - SDUP3 which is a split field duplicate sample of BH103 (0.6-0.9m) – 620 mg/kg; and - BH103 (1.2-1.4m) – 190 mg/kg.
TRH F3	8	520	NSL	0	-
TRH F4	8	<PQL	NSL	0	-
Benzene	8	<PQL	0	0	-
Toluene	8	<PQL	0	0	-
Ethylbenzene	8	<PQL	0	0	-
Xylenes	8	<PQL	0	0	-
PFOS	7	0.7µg/kg	NSL	0	-
PFOS + PFHxS	7	0.7 µg/kg	0	NSL	-
PFOA	7	<PQL	0	0	-
Asbestos (in soil)	4	AF/FA <0.001% w/w	0	NA	Asbestos was absent in the samples analysed for the investigation.

Analyte	N	Max. (mg/kg)	N> Human Health SAC	N> Ecological SAC	Comments
		ACM <0.01%w /w			
Asbestos in material	0	NA	0	NSL	A fragment of material suspected of containing asbestos was collected from the site and submitted to the laboratory. This sample (FCF1) was not analysed since it was confirmed by the author of this report (who is a Licenced Asbestos Assessor) to be a fragment of plywood/MDF board type material and not fibre cement.
Asbestos in surface swab samples	2	Not Detected	0	NSL	Asbestos was not identified in two surface swab samples analysed as part of the investigation.

Notes:

N: Total number (primary samples)

NSL: No set limit

NL: Not limiting

7.4.2 Waste Classification Assessment

The laboratory results were assessed against the criteria presented in Section 6.1.4. The results are presented in the report tables attached in the appendices. A summary of the results is presented in the following table:

Table 7-4: Summary of Soil Laboratory Results Compared to CT and SCC Criteria

Analyte	N	N > CT Criteria	N > SCC Criteria	Comments
Arsenic	8	0	0	-
Cadmium	8	0	0	-
Chromium	8	0	0	-
Copper	8	NSL	NSL	-
Lead	8	0	0	-
Mercury	8	0	0	-
Nickel	8	0	0	-
Zinc	8	NSL	NSL	-
TRH (C ₆ -C ₉)	8	0	0	-
TRH (C ₁₀ -C ₃₆)	8	0	0	-

Analyte	N	N > CT Criteria	N > SCC Criteria	Comments
BTEX	8	0	0	-
Total PAHs	8	0	0	-
Benzo(a)pyrene	8	0	0	-
OCPs & OPPs	4	0	0	-
PCBs	4	0	0	-
PFOS	7	NSL	0	-
PFOS + PFHxS	7	NSL	0	-
Asbestos	6	-	-	Asbestos was not detected in the samples analysed.

N: Total number (primary samples)

NSL: No set limit

7.5 Groundwater Laboratory Results

The groundwater laboratory results were assessed against the SAC presented in Section 6.2. Individual SAC are shown in the report tables attached in the appendices. A summary of the results is presented below:

Table 7-5: Summary of Groundwater Laboratory Results – Human Health and Environmental (Ecological)

Analyte	N ^	Max. (µg/L)	N> Human Health SAC	N> Ecological SAC	Comments
Arsenic	3	6	0	1	The arsenic concentration in MW101 (6µg/L) exceeded the marine ecological SAC of 2.3µg/L.
Cadmium	3	<PQL	0	0	-
Chromium (total)	3	<PQL	0	0	-
Copper	3	<PQL	0	0	-
Lead	3	4	0	1	The lead concentration in MW103 (4µg/L) exceeded the freshwater ecological SAC of 3.4µg/L.
Mercury	3	<PQL	0	0	-
Nickel	3	2	0	0	-
Zinc	3	11	0	2	Zinc concentrations in MW102 (11µg/L) and MW103 (9µg/L) exceeded the freshwater ecological SAC of 8µg/L.
Total PAHs	3	0.48	0	0	-

Analyte	N ^	Max. (µg/L)	N> Human Health SAC	N> Ecological SAC	Comments
Benzo(a)pyrene	3	<PQL	0	0	-
Carcinogenic PAHs (as BaP TEQ)	3	<PQL	0	0	-
TRH F1	3	<PQL	0	0	-
TRH F2	3	<PQL	0	0	-
TRH F3	3	170	NSL	NSL	-
TRH F4	3	<PQL	NSL	NSL	-
Benzene	3	1	0	0	-
Toluene	3	<PQL	0	0	-
Ethylbenzene	3	<PQL	0	0	-
m+p-Xylene	3	<PQL	0	0	-
o-Xylene	3	<PQL	0	0	-
Total Xylenes	3	<PQL	0	0	-
PFOS	3	0.01	NSL	0	-
PFOS + PFHxS	3	0.032	0	NSL	-
PFOA	3	0.025	0	0	-

Notes:

^: Primary samples

N: Total number

NSL: No set limit

NL: Not limiting

8 WASTE CLASSIFICATION ASSESSMENT

Based on the results of the waste classification assessment, and at the time of reporting, the fill material is classified as **General Solid Waste (non-putrescible)** for off-site disposal purposes.

Based on the findings of the PSI it was confirmed that the natural soils underlying the fill material across the site from at least 1m below the surface is deemed to contain **PASS** and therefore cannot be classified as VENM for off-site disposal or re-use purposes in accordance with the Waste Classification Guidelines, Part 4: Acid Sulfate Soils (2014)¹⁹. Disturbed PASS will require management during the proposed development works under an ASS management plan (ASSMP) which should also include procedures for disposal of PASS from the site (if required). The fill material across the site was not considered to be PASS and does not require management under the ASSMP.

Waste fill/natural material should be disposed of to a facility that is appropriately licensed to receive the respective waste streams. The facility should be contacted to obtain the required approvals prior to commencement of excavation.

¹⁹ NSW EPA, (2014). *Waste Classification Guidelines, Part 4: Acid Sulfate Soils*.

9 DISCUSSION

9.1 Tier 1 Risk Assessment and Review of CSM

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

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

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

9.1.1 Soil

9.1.1.1 Asbestos

Asbestos was not identified in any of the samples tested.

9.1.1.2 Heavy metals

All heavy metals results were below the adopted human health-based and ecological SAC.

9.1.1.3 Hydrocarbons

All hydrocarbon concentrations (i.e. TRHs, PAHs and BTEX) in soil were below the adopted human health-based SAC as well as direct contact SAC applicable for workers (i.e. in trenches).

The concentrations of TRH F3 fraction exceeded the adopted ecological screening criteria for petroleum hydrocarbons in two samples from BH103. Detected concentration in fill material sample at this location (620 mg/kg) was noted to be higher than the concentration detected in the underlying natural material sample (190 mg/kg). This suggests that this exceedance is localised and is most likely associated with the fill material layer at this location which may have become impacted as a result of spills or leaks on top of the overlying slab (i.e. leaks through cracks in the slab).

Based on the available provided architectural plans for the proposed development (i.e. included within the PSI report), the area in the vicinity of BH103 is expected to remain sealed, following completion of the proposed development, with the existing slab to be retained. Upon completion this area is not expected to have any accessible soils and would present minimal opportunities (if any) for exposure to ecological receptors of concern. On this basis we have assessed that there are no unacceptable ecological risks associated with the occurrence of TRH at BH103. No further characterisation or remediation associated with this identified ecological exceedance is considered necessary.

9.1.1.4 Pesticides and PCBs

All pesticide and PCB concentrations were below the laboratory limits of reporting in all tested samples.

9.1.1.5 PFAS

Selected fill material samples, surface soil samples (i.e. SS1 and SS2) as well as concrete core samples from BH102 and BH103 were tested for an extended suite of PFAS group of CoPC. All PFAS results were below the adopted human health-based and ecological SAC. Based on the results reported, we consider it unlikely that the foam used on site during the fire incident contained significant PFAS concentrations that would be expected to pose a risk under the proposed land use scenario. The trace PFAS concentrations reported in the samples are considered to be indicative of what could be expected as 'background' concentrations within an urbanised and industrialised area.

9.1.2 Groundwater

9.1.2.1 Heavy metals

The following concentrations of heavy metals in excess of the ecological SAC were identified:

- Arsenic concentration in MW101 (6µg/L);
- Lead concentration in MW103 (4µg/L); and
- Zinc concentrations in MW102 (11µg/L) and MW103 (9µg/L).

Zinc in groundwater may potentially constitute a regional issue which is common in urban environments due to runoff and leaking water infrastructure. Arsenic and lead may also be a regional issue, however, it is also considered possible that arsenic and lead in groundwater could potentially be associated with historical commercial/industrial activities at the site or current/historical commercial/industrial activities on neighbouring properties. Although we note that specific uses of arsenic and/or lead were not identified and the on-site soils did not contain what would be considered as significantly elevated concentrations of these metals to the extent that the soils would pose a risk to groundwater.

Trace concentrations of lead and zinc were identified in all fill samples analysed as part of the DSI, whilst detectable concentrations of arsenic were only identified in fill for BH103 and BH104. Due to the observed shallow groundwater table (i.e. 1.69-1.95mBGL) and presence of moderate to high permeability (alluvial) soils at the site it is possible that these heavy metals could have leached from the fill soil and added to the contaminant load in the groundwater. However, given the fill is beneath a concrete slab and is above the water table, this transport mechanism is unlikely to be a concern. Other potential sources of heavy metal exceedances in groundwater were not confirmed to be present at the site.

The identified ecological exceedances of heavy metals in groundwater do not pose a risk to the on-site receptors as there is no complete SPR-linkage which is expected to occur. There could be a complete SPR-linkage to ecological receptors if there is groundwater connectivity with the creek, however, given that the occurrence of these heavy metals in groundwater is most likely a regional issue, the potential ecological risks are considered to be low and acceptable. No further characterisation or remediation associated with these ecological exceedances is considered necessary at this stage.

9.1.2.2 Hydrocarbons and Phenol

All hydrocarbon concentrations (i.e. TRHs, PAHs, BTEX) and phenols concentrations in groundwater were below the adopted human health-based and ecological SAC.

9.1.2.3 PFAS

All PFAS results in groundwater were below the adopted human health-based and ecological SAC.

9.2 Decision Statements

The decision statements are addressed below:

Is the SAQP suitable to confirm the presence or otherwise of contamination associated with the identified AECs and CoPC in the CSM?

Yes. A total of nine locations were investigated as part of the combined PSI and DSI scopes which met the minimum sampling density for hotspot identification, as outlined in the NSW EPA Contaminated Sites Sampling Design Guidelines (1995). Three groundwater wells were also installed, positioned to gain a snapshot of the groundwater conditions at the site. The sampling locations were placed on a judgemental sampling plan which was considered to be suitable based on the site area and layout to make an appropriate detailed assessment of potential risks associated with the AEC and CoPC identified in the CSM, and assess whether further investigation and/or remediation is warranted.

Are any results above the SAC?

Arsenic, lead and zinc were identified above the ecological SAC for groundwater. The concentrations of TRH F3 fraction exceeded the ecological SAC for soil in one location.

Do potential risks associated with contamination exist, and if so, what are they?

The DSI has not identified any soil or groundwater contamination that was assessed to pose a risk to the receptors.

Is remediation required?

No. JKE consider that remedial action is not warranted at this point in time.

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

Yes. The approach provided adequate spatial coverage of the site, and representative samples were analysed based on the results of field screening and observations.

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

We are of the opinion that the site is suitable for the proposed development. No further investigation and/or remedial works are required at this point in time.

9.3 Data Gaps

There are considered to be no data gaps that require further investigation in the context of site contamination and the DSI. The soils will require further management and characterisation for waste disposal purposes, should there be surplus waste generated during the proposed development works, as discussed previously.

10 CONCLUSIONS AND RECOMMENDATIONS

The DSI included a review of the previous PSI findings (including historical information), soil sampling from four boreholes and groundwater sampling from three monitoring wells installed on-site. The site has historically been used for various commercial/industrial activities including manufacturing and a rental storage space facility in more recent times. A major fire incident occurred at the site on the 28 March 2019 which resulted in the previously existing building being destroyed.

The DSI has not identified any soil or groundwater contamination that was assessed to pose a risk to on-site receptors and/or in relation to the proposed development and anticipated land use. Exceedances above the ecological SAC were identified for TRH F3 in soil and for heavy metals arsenic, lead and zinc in groundwater. The contaminant concentrations were relatively minor, risks were assessed to be low and acceptable, and no complete SPR-linkage was expected to occur. On this basis, the DSI did not identified any triggers for remediation.

Based on the findings of the investigation, JKE are of the opinion that remediation is not required and that the site is suitable for the proposed development described in Section 1.1.

There is considered to be a relatively low potential for contamination-related unexpected finds to occur at the site during the proposed development works. Unexpected finds would typically be able to be identified by visual or olfactory indicators and could include:

- Fibre cement fragments (e.g. ACM);
- Stained fill/soil; and/or
- Odorous soils (e.g. hydrocarbon odours).

The following should be implemented in the event of an unexpected find:

- All work in the immediate vicinity should cease and temporary barricades should be erected to isolate the area;
- A suitably qualified contaminated land consultant²⁰ should be engaged to inspect the find and provide advice on the appropriate course of action. In the event that the unexpected find triggers remediation, the requirements of SEPP55 must be addressed (e.g. notifications to Council); and
- Any actions should be implemented and validated to demonstrate that there are no unacceptable risks to the receptors.

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

²⁰ JKE recommend that the consultancy engaged for the work be a member of the Australian Contaminated Land Consultants Associated (ACLCA), and/or the individual undertaking the works be certified under one of the NSW EPA endorsed certified practitioner schemes

11 LIMITATIONS

The report limitations are outlined below:

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

Important Information About This Report

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

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

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

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

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

Changes in Subsurface Conditions

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

This Report is based on Professional Interpretations of Factual Data

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

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

Investigation Limitations

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

Misinterpretation of Site Investigations by Design Professionals

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

Logs Should not be Separated from the Investigation Report

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

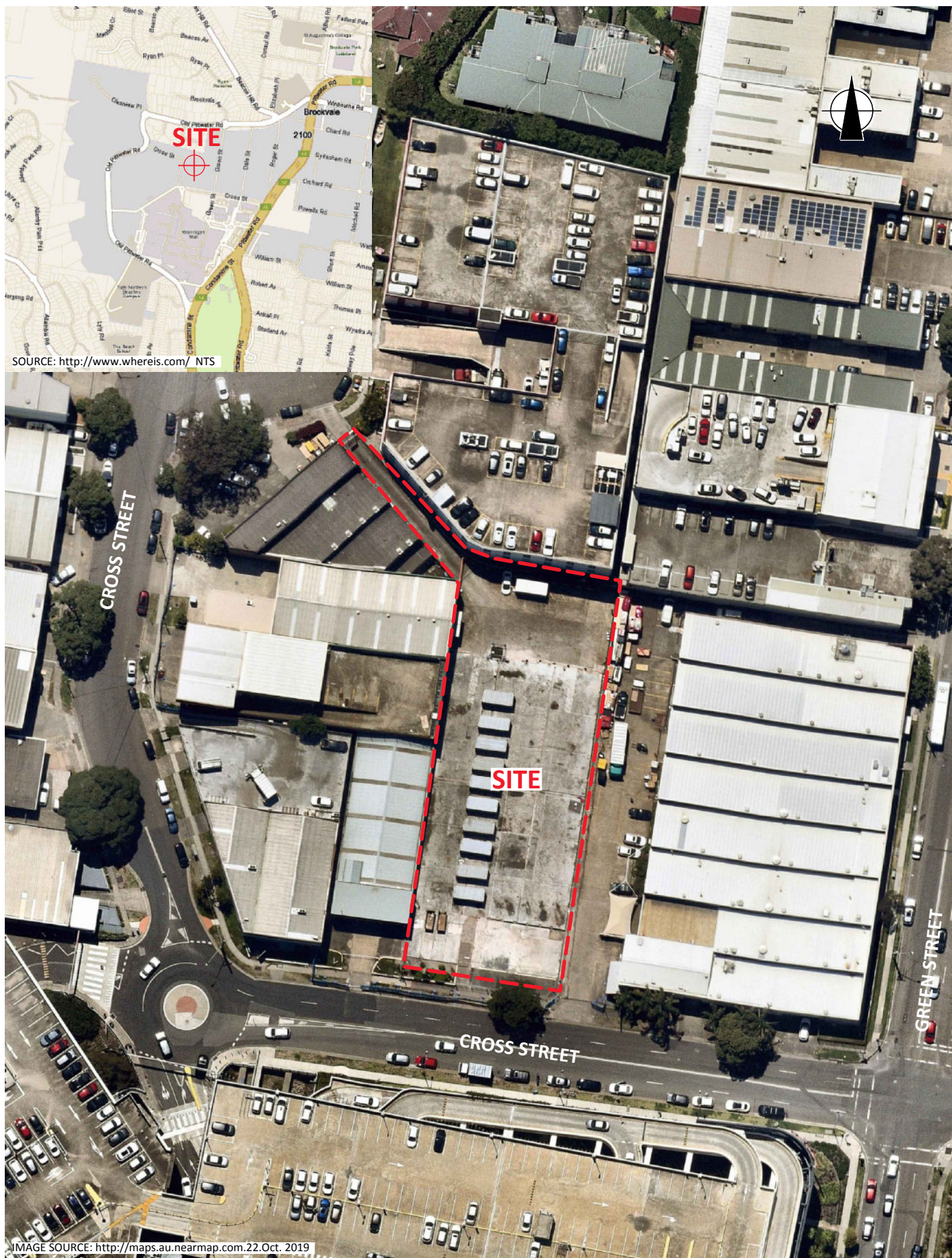
To reduce the likelihood of borehole and test pit log misinterpretation, the complete investigation should be available to persons or organisations involved in the project, such as contractors, for their use. Denial of such access and disclaiming responsibility for the accuracy of subsurface information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

Read Responsibility Clauses Closely

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

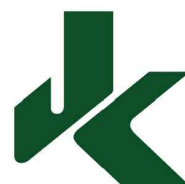


Appendix A: Report Figures



0 10 20 30 40 50
 SCALE 1:1000 @A4 m

Title:	SITE LOCATION PLAN	
Location:	4 CROSS STREET BROOKVALE, NSW	
Job No:	E32885PA	Figure: 1
JKEnvironments		

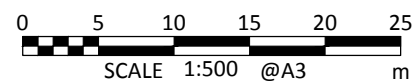


This plan should be read in conjunction with the Environmental report.



LEGEND

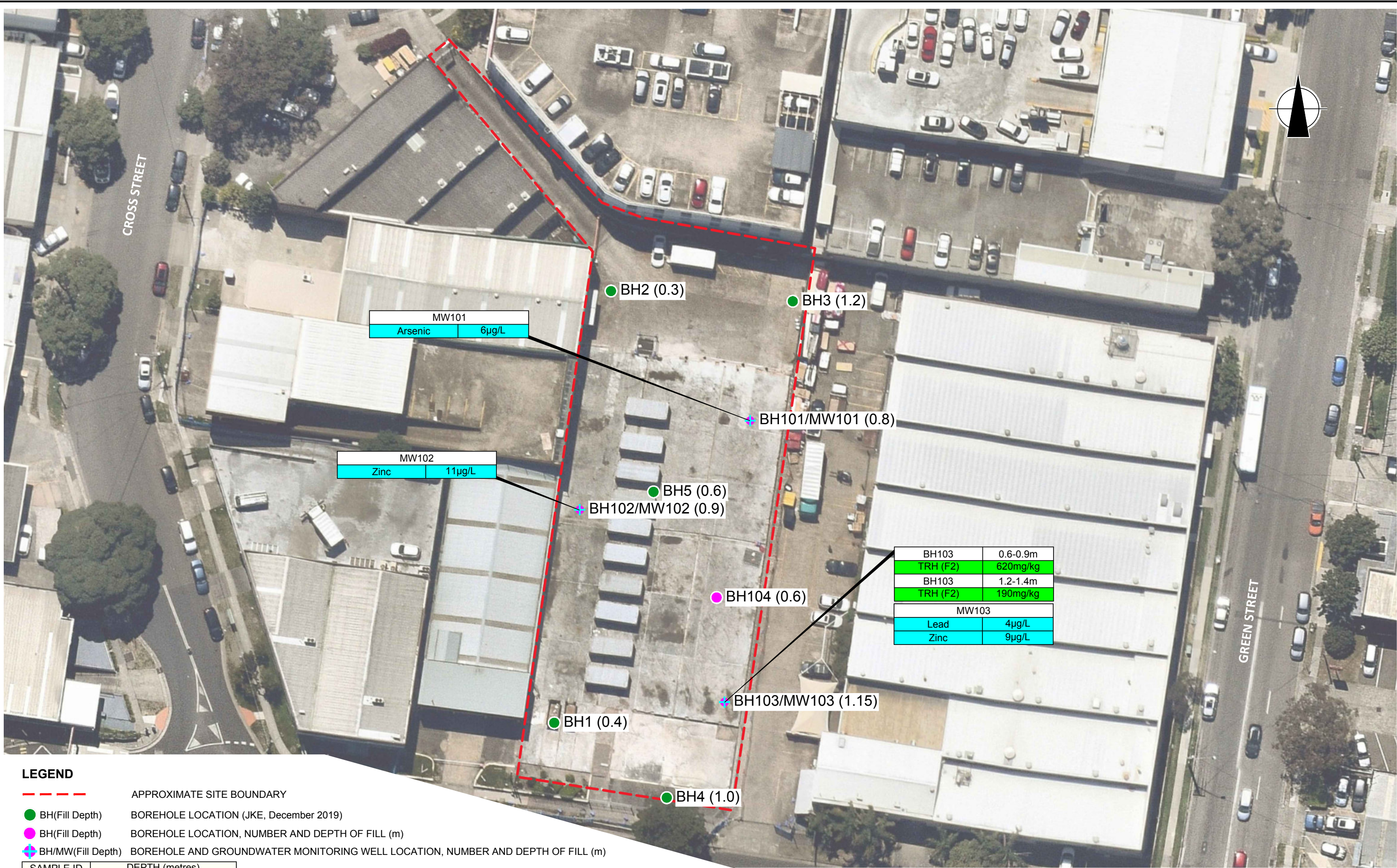
- | | |
|-----|---|
| --- | APPROXIMATE SITE BOUNDARY |
| ● | BH(Fill Depth) |
| ● | BOREHOLE LOCATION (JKE December 2019) |
| ● | BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m) |
| + | BH/MW(Fill Depth) |
| + | BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m) |
| ● | PFAS SURFACE SOIL SAMPLE |
| × | ASBESTOS COMPOSITE SURFACE SWAB SAMPLE |
| × | Swab1 |



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

Title: SAMPLE LOCATION PLAN	
Location: 4 CROSS STREET BROOKVALE, NSW	
Job No: E32885PR	Figure: 2
JKEnvironments	





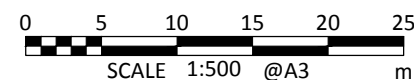
LEGEND

- APPROXIMATE SITE BOUNDARY
- BH(Fill Depth) BOREHOLE LOCATION (JKE, December 2019)
- BH(Fill Depth) BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
- ✚ BH/MW(Fill Depth) BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)

SAMPLE ID	DEPTH (metres)	SOIL/SURFACE SAMPLE EXCEEDANCE
CHEMICAL	CONCENTRATION	

SAMPLE ID	DEPTH (metres)	GROUNDWATER SAMPLE EXCEEDANCE
CHEMICAL	CONCENTRATION (µg/L)	

- SOIL CONTAMINATION ABOVE SAC FOR ECOLOGICAL RISK
- GROUNDWATER CONTAMINATION ABOVE SAC



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

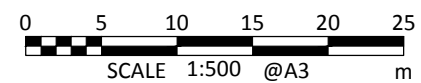
Title: CONTAMINATION LOCATION PLAN	
Location: 4 CROSS STREET BROOKVALE, NSW	
Job No: E32885PA	Figure: 3
JKEnvironments	





LEGEND

- APPROXIMATE SITE BOUNDARY
- BH(Fill Depth) BOREHOLE LOCATION (JKE, December 2019)
- BH(Fill Depth) BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)
- ⊕ BH/MW(Fill Depth) BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)
- - - 9.32 - - - GROUNDWATER CONTOURS (mAHD)



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

Title: GROUNDWATER FLOW DIAGRAM		
Location: 4 CROSS STREET BROOKVALE, NSW		
Job No:	E32885PA	Figure: 4
JKEnvironments		





Appendix B: Laboratory Results Summary Tables

ABBREVIATIONS AND EXPLANATIONS

Abbreviations used in the Tables:

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

Table Specific Explanations:

HIL Tables:

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

EIL/ESL Table:

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

Waste Classification and TCLP Table:

- Data assessed using the NSW EPA Waste Classification Guidelines, Part 1: Classifying Waste (2014).
- The assessment of Total Moderately Harmful pesticides includes: Dichlorovos, Dimethoate, Fenitrothion, Ethion, Malathion and Parathion.
- Assessment of Total Scheduled pesticides include: HBC, alpha-BHC, gamma-BHC, beta-BHC, Heptachlor, Aldrin, Heptachlor Epoxide, gamma-Chlordane, alpha-chlordane, pp-DDE, Dieldrin, Endrin, pp-DDD, pp-DDT, Endrin Aldehyde.

QA/QC Table:

- Field blank, Inter and Intra laboratory duplicate results are reported in mg/kg.
- Trip spike results are reported as percentage recovery.
- Field rinsate results are reported in µg/L.

TABLE S1
SOIL LABORATORY RESULTS COMPARED TO NEPM 2013.
HIL-D: 'Commercial/Industrial'

All data in mg/kg unless stated otherwise			HEAVY METALS								PAHs		ORGANOCHLORINE PESTICIDES (OCPs)							OP PESTICIDES (OPPs)		
			Arsenic	Cadmium	Chromium VI	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	Carcinogenic PAHs	HCB	Endosulfan	Methoxychlor	Aldrin & Dieldrin	Chlordane	DDT, DDD & DDE	Heptachlor	Chlorpyrifos	TOTAL PCBs	ASBESTOS FIBRES
PQL - Envirolab Services			4	0.4	1	1	1	0.1	1	1	-	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	100
Site Assessment Criteria (SAC)			3000	900	3600	240000	1500	730	6000	400000	4000	40	80	2000	2500	45	530	3600	50	2000	7	Detected/Not Detected
Sample Reference	Sample Depth	Sample Description																				
BH101	0.23-0.55	Fill: Sandy Clay	<4	<0.4	8	2	5	<0.1	<1	1	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH101 - [LAB_DUP]	0.23-0.55	Fill: Sandy Clay	<4	<0.4	8	<1	5	<0.1	<1	1	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
BH101	0.9-1.0	Silty Sand	<4	<0.4	2	6	19	<0.1	<1	4	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH102	0.3-0.6	Fill: Sity Clayey Sand	<4	<0.4	7	4	11	<0.1	3	7	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH102	1.0-1.2	Silty Sand	<4	<0.4	10	<1	8	<0.1	1	3	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH103	0.6-0.9	Fill: Silty Sand	<4	<0.4	<1	<1	1	<0.1	<1	1	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not Detected
BH103	1.2-1.4	Clayey Sand	<4	<0.4	3	<1	5	<0.1	2	7	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH104	0.16-0.35	Fill: Clayey Sand	<4	<0.4	7	2	9	<0.1	<1	3	<0.05	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
BH104	0.4-0.6	Fill: Silty Sand	4	<0.4	7	19	24	<0.1	1	18	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
SWAB1	surface	Swab	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
SWAB2	surface	Swab	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Not Detected
SDUP2	-	Soil Field Duplicate	<4	<0.4	7	3	7	<0.1	2	12	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SDUP3	-	Soil Field Duplicate	4	<0.4	4	3	6	<0.1	1	5	0.1	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SDUP3 - [LAB_DUP]	-	Soil Field Duplicate	NA	NA	NA	NA	NA	NA	NA	NA	<0.05	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Number of Samples			11	11	11	11	11	11	11	11	12	12	5	5	5	5	5	5	5	5	5	6
Maximum Value			4	<PQL	10	19	24	<PQL	3	18	0.1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	Not Detected
Concentration above the SAC Concentration above the PQL			VALUE Bold																			

TABLE S2
SOIL LABORATORY RESULTS COMPARED TO HSLs
All data in mg/kg unless stated otherwise

					C ₆ -C ₁₀ (F1)	>C ₁₀ -C ₁₆ (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	Field PID Measurement
PQL - Envirolab Services					25	50	0.2	0.5	1	1	1	ppm
NEPM 2013 HSL Land Use Category					HSL-D: COMMERCIAL/INDUSTRIAL							
Sample Reference	Sample Depth	Sample Description	Depth Category	Soil Category								
BH101	0.23-0.55	Fill: Sandy Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0.8
BH101 - [LAB_DUP]	0.23-0.55	Fill: Sandy Clay	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0.8
BH101	0.9-1.0	Silty Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0.3
BH102	0.3-0.6	Fill: Silty Clayey Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	1.3
BH102	1.0-1.2	Silty Sand	0m to <1m	Sand	<25	140	<0.2	<0.5	<1	<3	<1	6.5
BH103	0.6-0.9	Fill: Silty Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	2.1
BH103	1.2-1.4	Clayey Sand	0m to <1m	Sand	<25	190	<0.2	<0.5	<1	<3	<1	7.9
BH104	0.16-0.35	Fill: Clayey Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0.8
BH104	0.4-0.6	Fill: Silty Sand	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<3	<1	0.6
SDUP2	-	Soil Field Duplicate	0m to <1m	Sand	<25	<50	<0.2	<0.5	<1	<1	<1	-
SDUP3	-	Soil Field Duplicate	0m to <1m	Sand	<25	620	<0.2	<0.5	<1	<3	<1	-
SDUP3 - [LAB_DUP]	-	Soil Field Duplicate	0m to <1m	Sand	<25	380	<0.2	<0.5	<1	<3	<1	-
Total Number of Samples					12	12	12	12	12	12	12	9
Maximum Value					<PQL	620	<PQL	<PQL	<PQL	<PQL	<PQL	7.9

Concentration above the SAC

VALUE

Concentration above the PQL

Bold

The guideline corresponding to the concentration above the SAC is highlighted in grey in the Site Assessment Criteria Table below

HSL SOIL ASSESSMENT CRITERIA

Sample Reference	Sample Depth	Sample Description	Depth Category	Soil Category	C ₆ -C ₁₀ (F1)	>C ₁₀ -C ₁₆ (F2)	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene
BH101	0.23-0.55	Fill: Sandy Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH101 - [LAB_DUP]	0.23-0.55	Fill: Sandy Clay	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH101	0.9-1.0	Silty Sand	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH102	0.3-0.6	Fill: Silty Clayey Sand	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH102	1.0-1.2	Silty Sand	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH103	0.6-0.9	Fill: Silty Sand	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH103	1.2-1.4	Clayey Sand	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH104	0.16-0.35	Fill: Clayey Sand	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
BH104	0.4-0.6	Fill: Silty Sand	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SDUP2	-	Soil Field Duplicate	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SDUP3	-	Soil Field Duplicate	0m to <1m	Sand	260	NL	3	NL	NL	230	NL
SDUP3 - [LAB_DUP]	-	Soil Field Duplicate	0m to <1m	Sand	260	NL	3	NL	NL	230	NL

TABLE S3
SOIL LABORATORY RESULTS COMPARED TO MANAGEMENT LIMITS
All data in mg/kg unless stated otherwise

			C ₆ -C ₁₀ (F1) plus BTEX	>C ₁₀ -C ₁₆ (F2) plus naphthalene	>C ₁₆ -C ₃₄ (F3)	>C ₃₄ -C ₄₀ (F4)
PQL - Envirolab Services			25	50	100	100
NEPM 2013 Land Use Category			COMMERCIAL/INDUSTRIAL			
Sample Reference	Sample Depth	Soil Texture				
BH101	0.23-0.55	Coarse	<25	<50	<100	<100
BH101 - [LAB_DUP]	0.23-0.55	Coarse	<25	<50	<100	<100
BH101	0.9-1.0	Coarse	<25	<50	<100	<100
BH102	0.3-0.6	Coarse	<25	<50	<100	<100
BH102	1.0-1.2	Coarse	<25	140	110	<100
BH103	0.6-0.9	Coarse	<25	<50	<100	<100
BH103	1.2-1.4	Coarse	<25	190	160	<100
BH104	0.16-0.35	Coarse	<25	<50	<100	<100
BH104	0.4-0.6	Coarse	<25	<50	<100	<100
SDUP2	-	Coarse	<25	<50	<100	<100
SDUP3	-	Coarse	<25	620	520	<100
SDUP3 - [LAB_DUP]	-	Coarse	<25	380	340	<100
Total Number of Samples			12	12	12	12
Maximum Value			<PQL	620	520	<PQL
Concentration above the SAC			VALUE			
Concentration above the PQL			Bold			

MANAGEMENT LIMIT ASSESSMENT CRITERIA

Sample Reference	Sample Depth	Soil Texture	C ₆ -C ₁₀ (F1) plus BTEX	>C ₁₀ -C ₁₆ (F2) plus naphthalene	>C ₁₆ -C ₃₄ (F3)	>C ₃₄ -C ₄₀ (F4)
BH101	0.23-0.55	Coarse	700	1000	3500	10000
BH101 - [LAB_DUP]	0.23-0.55	Coarse	700	1000	3500	10000
BH101	0.9-1.0	Coarse	700	1000	3500	10000
BH102	0.3-0.6	Coarse	700	1000	3500	10000
BH102	1.0-1.2	Coarse	700	1000	3500	10000
BH103	0.6-0.9	Coarse	700	1000	3500	10000
BH103	1.2-1.4	Coarse	700	1000	3500	10000
BH104	0.16-0.35	Coarse	700	1000	3500	10000
BH104	0.4-0.6	Coarse	700	1000	3500	10000
SDUP2	-	Coarse	700	1000	3500	10000
SDUP3	-	Coarse	700	1000	3500	10000
SDUP3 - [LAB_DUP]	-	Coarse	700	1000	3500	10000

TABLE S4
SOIL LABORATORY RESULTS COMPARED TO DIRECT CONTACT CRITERIA
All data in mg/kg unless stated otherwise

Analyte	C ₆ -C ₁₀	>C ₁₀ -C ₁₆	>C ₁₆ -C ₃₄	>C ₃₄ -C ₄₀	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	PID	
PQL - Envirolab Services	25	50	100	100	0.2	0.5	1	1	1		
CRC 2011 -Direct contact Criteria	26,000	20,000	27,000	38,000	430	99,000	27,000	81,000	11,000		
Site Use		COMMERCIAL/INDUSTRIAL - DIRECT SOIL CONTACT									
Sample Reference	Sample Depth										
BH101	0.23-0.55	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0.8
BH101 - [LAB_DUP]	0.23-0.55	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0.8
BH101	0.9-1.0	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0.3
BH102	0.3-0.6	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	1.3
BH102	1.0-1.2	<25	140	110	<100	<0.2	<0.5	<1	<3	<1	6.5
BH103	0.6-0.9	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	2.1
BH103	1.2-1.4	<25	190	160	<100	<0.2	<0.5	<1	<3	<1	7.9
BH104	0.16-0.35	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0.8
BH104	0.4-0.6	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<1	0.6
SDUP2	-	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-
SDUP3	-	<25	620	520	<100	<0.2	<0.5	<1	<3	<1	-
SDUP3 - [LAB_DUP]	-	<25	380	340	<100	<0.2	<0.5	<1	<3	<1	-
Total Number of Samples		12	12	12	12	12	12	12	12	12	9
Maximum Value		<PQL	620	520	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	7.9
Concentration above the SAC		VALUE									
Concentration above the PQL		Bold									

TABLE S5
ASBESTOS QUANTIFICATION - FIELD OBSERVATIONS AND LABORATORY RESULTS
HSL-D: Commercial/Industrial

FIELD DATA															LABORATORY DATA													
Date Sampled	Sample reference	Sample Depth	Visible ACM in top 100mm	Approx. Volume of Soil (L)	Soil Mass (g)	Mass ACM (g)	Mass Asbestos in ACM (g)	[Asbestos from ACM in soil] (%w/w)	Mass ACM <7mm (g)	Mass Asbestos in ACM <7mm (g)	[Asbestos from ACM <7mm in soil] (%w/w)	Mass FA (g)	Mass Asbestos in FA (g)	[Asbestos from FA in soil] (%w/w)	Lab Report Number	Sample reference	Sample Depth	Sample Mass (g)	Asbestos ID in soil (AS4964) >0.1g/kg	Trace Analysis	Total Asbestos (g/kg)	Asbestos ID in soil <0.1g/kg	ACM >7mm Estimation (g)	FA and AF Estimation (g)	ACM >7mm Estimation % (w/w)	FA and AF Estimation % (w/w)		
SAC			No		0.05				0.001				0.001				0.05										0.001	
16.07.2020	BH101	0.23-0.8	NA	--	2,200	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	247495	BH101	0.23-0.55	520.89	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001		
20.07.2020	BH102	0.3-0.9	NA	--	1,300	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	247495	BH102	0.3-0.6	495.23	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001		
20.07.2020	BH103	0.35-1.15	NA	--	500	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	247495	BH103	0.6-0.9	474.51	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001		
21.07.2020	BH104	0.35-0.6	NA	--	1,260	No ACM observed	--	--	No ACM <7mm observed	--	--	No FA observed	--	--	247495	BH104	0.4-0.6	451.17	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	No asbestos detected	<0.1	No visible asbestos detected	--	--	<0.01	<0.001		
Concentration above the SAC						VALUE																						

TABLE S6 SOIL LABORATORY RESULTS COMPARED TO NEPM 2013 EILs AND ESLs All data in mg/kg unless stated otherwise																								
Land Use Category				COMMERCIAL/INDUSTRIAL																				
				pH	CEC (cmolc/kg)	Clay Content (% clay)	AGED HEAVY METALS-EILs						EILs		ESLs									
							Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C ₆ -C ₁₀ (F1)	>C ₁₀ -C ₁₆ (F2) plus naphthalene	>C ₁₆ -C ₃₄ (F3)	>C ₃₄ -C ₄₀ (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P	
PQL - Envirolab Services				-	1	-	4	1	1	1	1	1	1	0.1	25	50	100	100	0.2	0.5	1	1	0.05	
Ambient Background Concentration (ABC)				-	-	-	NSL	13	28	163	5	122	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	NSL	
Sample Reference	Sample Depth	Sample Description	Soil Texture																					
BH101	0.23-0.55	Fill: Sandy Clay	Coarse	NA	NA	NA	<4	8	2	5	<1	1	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05	
BH101 - [LAB_DUP]	0.23-0.55	Fill: Sandy Clay	Coarse	NA	NA	NA	<4	8	<1	5	<1	1	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05	
BH101	0.9-1.0	Silty Sand	Coarse	NA	NA	NA	<4	2	6	19	<1	4	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05	
BH102	0.3-0.6	Fill: Sity Clayey Sand	Coarse	NA	NA	NA	<4	7	4	11	3	7	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05	
BH102	1.0-1.2	Silty Sand	Coarse	NA	NA	NA	<4	10	<1	8	1	3	<1	NA	<25	140	110	<100	<0.2	<0.5	<1	<3	<0.05	
BH103	0.6-0.9	Fill: Silty Sand	Coarse	NA	NA	NA	<4	<1	<1	1	<1	1	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05	
BH103	1.2-1.4	Clayey Sand	Coarse	NA	NA	NA	<4	3	<1	5	2	7	<1	NA	<25	190	160	<100	<0.2	<0.5	<1	<3	<0.05	
BH104	0.16-0.35	Fill: Clayey Sand	Coarse	NA	NA	NA	<4	7	2	9	<1	3	<1	<0.1	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05	
BH104	0.4-0.6	Fill: Silty Sand	Coarse	NA	NA	NA	4	7	19	24	1	18	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.05	
SDUP2	-	Soil Field Duplicate	Coarse	NA	NA	NA	<4	7	3	7	2	12	<1	NA	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.05	
SDUP3	-	Soil Field Duplicate	Coarse	NA	NA	NA	4	4	3	6	1	5	<1	NA	<25	620	520	<100	<0.2	<0.5	<1	<3	<0.05	
SDUP3 - [LAB_DUP]	-	Soil Field Duplicate	Coarse	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1	NA	<25	380	340	<100	<0.2	<0.5	<1	<3	<0.05	
Total Number of Samples				0	0	0	11	11	11	11	11	11	12	5	12	12	12	12	12	12	12	12	12	
Maximum Value				NA	NA	NA	4	10	19	24	3	18	<PQL	<PQL	<PQL	620	520	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	
Concentration above the SAC				VALUE																				
Concentration above the PQL				Bold																				
The guideline corresponding to the elevated value is highlighted in grey in the EIL and ESL Assessment Criteria Table below																								

EIL AND ESL ASSESSMENT CRITERIA																							
Sample Reference	Sample Depth	Sample Description	Soil Texture	pH	CEC (cmolc/kg)	Clay Content (% clay)	Arsenic	Chromium	Copper	Lead	Nickel	Zinc	Naphthalene	DDT	C ₆ -C ₁₀ (F1)	>C ₁₀ -C ₁₆ (F2) plus naphthalene	>C ₁₆ -C ₃₄ (F3)	>C ₃₄ -C ₄₀ (F4)	Benzene	Toluene	Ethylbenzene	Total Xylenes	B(a)P
BH101	0.23-0.55	Fill: Sandy Clay	Coarse	NA	NA	NA	160	320	110	2000	60	230	370	640	215	170	1700	3300	75	135	165	180	72
BH101 - [LAB_DUP]	0.23-0.55	Fill: Sandy Clay	Coarse	NA	NA	NA	160	320	110	2000	60	230	370	640	215	170	1700	3300	75	135	165	180	72
BH101	0.9-1.0	Silty Sand	Coarse	NA	NA	NA	160	320	110	2000	60	230	370	--	215	170	1700	3300	75	135	165	180	72
BH102	0.3-0.6	Fill: Sity Clayey Sand	Coarse	NA	NA	NA	160	320	110	2000	60	230	370	640	215	170	1700	3300	75	135	165	180	72
BH102	1.0-1.2	Silty Sand	Coarse	NA	NA	NA	160	320	110	2000	60	230	370	--	215	170	1700	3300	75	135	165	180	72
BH103	0.6-0.9	Fill: Silty Sand	Coarse	NA	NA	NA	160	320	110	2000	60	230	370	640	215	170	1700	3300	75	135	165	180	72
BH103	1.2-1.4	Clayey Sand	Coarse	NA	NA	NA	160	320	110	2000	60	230	370	--	215	170	1700	3300	75	135	165	180	72
BH104	0.16-0.35	Fill: Clayey Sand	Coarse	NA	NA	NA	160	320	110	2000	60	230	370	640	215	170	1700	3300	75	135	165	180	72
BH104	0.4-0.6	Fill: Silty Sand	Coarse	NA	NA	NA	160	320	110	2000	60	230	370	--	215	170	1700	3300	75	135	165	180	72
SDUP2	-	Soil Field Duplicate	Coarse	NA	NA	NA	160	320	110	2000	60	230	370	--	215	170	1700	3300	75	135	165	180	72
SDUP3	-	Soil Field Duplicate	Coarse	NA	NA	NA	160	320	110	2000	60	230	370	--	215	170	1700	3300	75	135	165	180	72
SDUP3 - [LAB_DUP]	-	Soil Field Duplicate	Coarse	NA	NA	NA	--	--	--	--	--	--	370	--	215	170	1700	3300	75	135	165	180	72

TABLE S7
SOIL LABORATORY RESULTS COMPARED TO WASTE CLASSIFICATION GUIDELINES
All data in mg/kg unless stated otherwise

			HEAVY METALS								PAHs		OC/OP PESTICIDES				Total PCBs	PFAS^		TRH					BTX COMPOUNDS				ASBESTOS FIBRES
			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	B(a)P	Total Endosulfans	Chloropyrifos	Total Moderately Harmful	Total Scheduled		PFOS+ PFHxS	PFOA	C ₆ -C ₉	C ₁₀ -C ₁₄	C ₁₅ -C ₂₈	C ₂₉ -C ₃₆	Total C ₁₀ -C ₃₆	Benzene	Toluene	Ethyl benzene	Total Xylenes	
PQL - Envirolab Services			4	0.4	1	1	1	0.1	1	1	-	0.05	0.1	0.1	0.1	0.1	0.0001	0.0001	25	50	100	100	50	0.2	0.5	1	1	100	
General Solid Waste CT1			100	20	100	NSL	100	4	40	NSL	200	0.8	60	4	250	50	50	-	-	650		NSL	10,000	10	288	600	1,000	-	
General Solid Waste SCC1			500	100	1900	NSL	1500	50	1050	NSL	200	10	108	7.5	250	50	50	1.8	18	650		NSL	10,000	18	518	1,080	1,800	-	
Restricted Solid Waste CT2			400	80	400	NSL	400	16	160	NSL	800	3.2	240	16	1000	50	50	-	-	2600		NSL	40,000	40	1,152	2,400	4,000	-	
Restricted Solid Waste SCC2			2000	400	7600	NSL	6000	200	4200	NSL	800	23	432	30	1000	50	50	7.2	72	2600		NSL	40,000	72	2,073	4,320	7,200	-	
Sample Reference	Sample Depth	Sample Description																											
BH101	0.23-0.55	Fill: Sandy Clay	<4	<0.4	8	2	5	<0.1	<1	1	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.0001	<0.0001	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
BH101 - [LAB_DUP]	0.23-0.55	Fill: Sandy Clay	<4	<0.4	8	<1	5	<0.1	<1	1	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.0001	<0.0001	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	NA
BH101	0.9-1.0	Silty Sand	<4	<0.4	2	6	19	<0.1	<1	4	<0.05	<0.05	NA	NA	NA	NA	NA	NA	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	NA
BH102	0.3-0.6	Fill: Sity Clayey Sand	<4	<0.4	7	4	11	<0.1	3	7	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.0001	<0.0001	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
BH102	1.0-1.2	Silty Sand	<4	<0.4	10	<1	8	<0.1	1	3	<0.05	<0.05	NA	NA	NA	NA	NA	NA	NA	<25	63	180	<100	243	<0.2	<0.5	<1	<3	NA
BH103	0.2-0.35	Fill: Silty Sand	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0001	<0.0001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH103	0.6-0.9	Fill: Silty Sand	<4	<0.4	<1	<1	1	<0.1	<1	1	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
BH103	1.2-1.4	Clayey Sand	<4	<0.4	3	<1	5	<0.1	2	7	<0.05	<0.05	NA	NA	NA	NA	NA	NA	NA	<25	82	260	<100	342	<0.2	<0.5	<1	<3	NA
BH104	0.16-0.35	Fill: Clayey Sand	<4	<0.4	7	2	9	<0.1	<1	3	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	NA
BH104	0.4-0.6	Fill: Silty Sand	4	<0.4	7	19	24	<0.1	1	18	<0.05	<0.05	NA	NA	NA	NA	NA	NA	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<3	Not Detected
SS1	surface	Fill: Silty Sand	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0007	<0.0001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SS2	surface	Fill: Silty Sand	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0005	<0.0001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SDUP5	-	Soil Field Duplicate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0005	<0.0001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SDUP2	-	Soil Field Duplicate	<4	<0.4	7	3	7	<0.1	2	12	<0.05	<0.05	NA	NA	NA	NA	NA	NA	NA	<25	<50	<100	<100	<50	<0.2	<0.5	<1	<1	NA
SDUP3	-	Soil Field Duplicate	4	<0.4	4	3	6	<0.1	1	5	0.1	<0.05	NA	NA	NA	NA	NA	NA	NA	<25	300	810	<100	1110	<0.2	<0.5	<1	<3	NA
SDUP3 - [LAB_DUP]	-	Soil Field Duplicate	NA	NA	NA	NA	NA	NA	NA	NA	<0.05	<0.05	NA	NA	NA	NA	NA	NA	NA	<25	190	500	<100	690	<0.2	<0.5	<1	<3	NA
Total Number of Samples			11	11	11	11	11	11	11	11	12	12	5	5	5	5	5	7	7	12	12	12	12	12	12	12	12	12	4
Maximum Value			4	<PQL	10	19	24	<PQL	3	18	0.1	<PQL	<PQL	<PQL	<PQL	<PQL	<PQL	0.0007	<PQL	<PQL	300	810	<PQL	1110	<PQL	<PQL	<PQL	<PQL	Not Detected

Concentration above the CT1
Concentration above SCC1
Concentration above the SCC2
Concentration above PQL
^ PFAS laboratory data converted to mg/kg

VALUE

VALUE

VALUE

Bold

[illegible]

ABBREVIATIONS AND EXPLANATIONS

Abbreviations used in the Tables:

ADWG:	Australian Drinking Water Guidelines	PCBs:	Polychlorinated Biphenyls
ANZG	Australian and New Zealand Guidelines	PCE:	Perchloroethylene (Tetrachloroethylene or Tetrachloroethene)
B(a)P:	Benzo(a)pyrene	PQL:	Practical Quantitation Limit
CRC:	Cooperative Research Centre	RS:	Rinsate Sample
ESLs:	Ecological Screening Levels	RSL:	Regional Screening Levels
GIL:	Groundwater Investigation Levels	SAC:	Site Assessment Criteria
HILs:	Health Investigation Levels	SSA:	Site Specific Assessment
HSLs:	Health Screening Levels	SSHSLs:	Site Specific Health Screening Levels
HSL-SSA:	Health Screening Level-Site Specific Assessment	TB:	Trip Blank
NA:	Not Analysed	TCA:	1,1,1 Trichloroethane (methyl chloroform)
NC:	Not Calculated	TCE:	Trichloroethylene (Trichloroethene)
NEPM:	National Environmental Protection Measure	TS:	Trip Spike
NHMRC:	National Health and Medical Research Council	TRH:	Total Recoverable Hydrocarbons
NL:	Not Limiting	UCL:	Upper Level Confidence Limit on Mean Value
NSL:	No Set Limit	USEPA	United States Environmental Protection Agency
OCP:	Organochlorine Pesticides	VOCC:	Volatile Organic Chlorinated Compounds
OPP:	Organophosphorus Pesticides	WHO:	World Health Organisation
PAHs:	Polycyclic Aromatic Hydrocarbons		
ppm:	Parts per million		

TABLE G1 SUMMARY OF GROUNDWATER LABORATORY RESULTS COMPARED TO ECOLOGICAL GILS SAC All results in µg/L unless stated otherwise.									
	PQL Envirolab Services	ANZG 2018 Fresh Waters	SAMPLES						
			MW101	MW101 - [LAB_DUP]	MW102	MW102 - [LAB_DUP]	MW103	WDUP1	WDUP2
Inorganic Compounds and Parameters									
pH		6.5 - 8.5	NA	NA	NA	NA	NA	NA	NA
Electrical Conductivity (µS/cm)	1	NSL	NA	NA	NA	NA	NA	NA	NA
Turbidity (NTU)		NSL	NA	NA	NA	NA	NA	NA	NA
Metals and Metalloids									
Arsenic (As III)	1	24	6	6	<1	NA	<1	<1	<1
Cadmium	0.1	0.2	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Chromium (SAC for Cr III adopted)	1	3.3	<1	<1	<1	NA	<1	<1	<1
Copper	1	1.4	<1	<1	<1	NA	<1	<1	<1
Lead	1	3.4	<1	<1	<1	NA	<1	<1	4
Total Mercury (inorganic)	0.05	0.06	<0.05	<0.05	<0.05	NA	<0.05	<0.05	<0.05
Nickel	1	11	<1	<1	<1	NA	2	<1	2
Zinc	1	8	6	6	11	NA	7	9	9
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)									
Benzene	1	950	<1	NA	<1	<1	1	<1	<1
Toluene	1	180	<1	NA	<1	<1	<1	<1	<1
Ethylbenzene	1	80	<1	NA	<1	<1	<1	<1	<1
m+p-xylene	2	75	<2	NA	<2	<2	<2	<2	<2
o-xylene	1	350	<1	NA	<1	<1	<1	<1	<1
Total xylenes	2	NSL	<2	NA	<2	<2	<2	<2	<2
Volatile Organic Compounds (VOCs), including chlorinated VOCs									
Dichlorodifluoromethane	10	NSL	<10	NA	<10	<10	<10	NA	NA
Chloromethane	10	NSL	<10	NA	<10	<10	<10	NA	NA
Vinyl Chloride	10	100	<10	NA	<10	<10	<10	NA	NA
Bromomethane	10	NSL	<10	NA	<10	<10	<10	NA	NA
Chloroethane	10	NSL	<10	NA	<10	<10	<10	NA	NA
Trichlorofluoromethane	10	NSL	<10	NA	<10	<10	<10	NA	NA
1,1-Dichloroethene	1	700	<1	NA	<1	<1	<1	NA	NA
Trans-1,2-dichloroethene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,1-dichloroethane	1	90	<1	NA	<1	<1	<1	NA	NA
Cis-1,2-dichloroethene	1	NSL	<1	NA	<1	<1	<1	NA	NA
Bromochloromethane	1	NSL	<1	NA	<1	<1	<1	NA	NA
Chloroform	1	370	<1	NA	2	2	1	NA	NA
2,2-dichloropropane	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,2-dichloroethane	1	1900	<1	NA	<1	<1	<1	NA	NA
1,1,1-trichloroethane	1	270	<1	NA	<1	<1	<1	NA	NA
1,1-dichloropropene	1	NSL	<1	NA	<1	<1	<1	NA	NA
Cyclohexane	1	NSL	<1	NA	<1	<1	<1	NA	NA
Carbon tetrachloride	1	240	<1	NA	<1	<1	<1	NA	NA
Benzene	1	950	<1	NA	<1	<1	1	NA	NA
Dibromomethane	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,2-dichloropropane	1	900	<1	NA	<1	<1	<1	NA	NA
Trichloroethene	1	330	<1	NA	<1	<1	<1	NA	NA
Bromodichloromethane	1	NSL	<1	NA	<1	<1	<1	NA	NA
trans-1,3-dichloropropene	1	NSL	<1	NA	<1	<1	<1	NA	NA
cis-1,3-dichloropropene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,1,2-trichloroethane	1	6500	<1	NA	<1	<1	<1	NA	NA
Toluene	1	180	<1	NA	<1	<1	<1	NA	NA
1,3-dichloropropane	1	1100	<1	NA	<1	<1	<1	NA	NA
Dibromochloromethane	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,2-dibromoethane	1	NSL	<1	NA	<1	<1	<1	NA	NA
Tetrachloroethene	1	70	<1	NA	<1	<1	<1	NA	NA
1,1,1,2-tetrachloroethane	1	NSL	<1	NA	<1	<1	<1	NA	NA
Chlorobenzene	1	55	<1	NA	<1	<1	<1	NA	NA
Ethylbenzene	1	80	<1	NA	<1	<1	<1	NA	NA
Bromoform	1	NSL	<1	NA	<1	<1	<1	NA	NA
m+p-xylene	2	75	<2	NA	<2	<2	<2	NA	NA
Styrene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,1,2,2-tetrachloroethane	1	400	<1	NA	<1	<1	<1	NA	NA
o-xylene	1	350	<1	NA	<1	<1	<1	NA	NA
1,2,3-trichloropropane	1	NSL	<1	NA	<1	<1	<1	NA	NA
Isopropylbenzene	1	30	<1	NA	<1	<1	<1	NA	NA
Bromobenzene	1	NSL	<1	NA	<1	<1	<1	NA	NA
n-propyl benzene	1	NSL	<1	NA	<1	<1	<1	NA	NA
2-chlorotoluene	1	NSL	<1	NA	<1	<1	<1	NA	NA
4-chlorotoluene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,3,5-trimethyl benzene	1	NSL	<1	NA	<1	<1	<1	NA	NA
Tert-butyl benzene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,2,4-trimethyl benzene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,3-dichlorobenzene	1	260	<1	NA	<1	<1	<1	NA	NA
Sec-butyl benzene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,4-dichlorobenzene	1	60	<1	NA	<1	<1	<1	NA	NA
4-isopropyl toluene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,2-dichlorobenzene	1	160	<1	NA	<1	<1	<1	NA	NA
n-butyl benzene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,2-dibromo-3-chloropropane	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,2,4-trichlorobenzene	1	85	<1	NA	<1	<1	<1	NA	NA
Hexachlorobutadiene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,2,3-trichlorobenzene	1	3	<1	NA	<1	<1	<1	NA	NA
Polycyclic Aromatic Hydrocarbons (PAHs)									
Naphthalene	0.2	16	<0.2	NA	<0.2	NA	0.4	<0.2	0.5
Acenaphthylene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Acenaphthene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Fluorene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Phenanthrene	0.1	0.6	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Anthracene	0.1	0.01	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Fluoranthene	0.1	1	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Pyrene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Benzo(a)anthracene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Chrysene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Benzo(b,j,k)fluoranthene	0.2	NSL	<0.2	NA	<0.2	NA	<0.2	<0.2	<0.2
Benzo(a)pyrene	0.1	0.1	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Phenols									
Total Phenolics (as Phenol)	0.05	320	<0.05	NA	<0.05	NA	<0.05	NA	NA
Concentration above the SAC	VALUE								
Concentration above the PQL	Bold								
GIL >PQL	Red								

TABLE G2 SUMMARY OF GROUNDWATER LABORATORY RESULTS COMPARED TO ECOLOGICAL GILs SAC All results in µg/L unless stated otherwise.									
	PQL Envirolab Services	ANZG 2018 Marine Waters	SAMPLES						
			MW101	MW101 - [LAB_DUP]	MW102	MW102 - [LAB_DUP]	MW103	WDUP1	WDUP2
Inorganic Compounds and Parameters									
pH		7 - 8.5	NA		NA		NA	NA	NA
Electrical Conductivity (µS/cm)	1	NSL	NA	NA	NA	NA	NA	NA	NA
Turbidity (NTU)		NSL	NA	NA	NA	NA	NA	NA	NA
Metals and Metalloids									
Arsenic (As III)	1	2.3	6	6	<1	NA	<1	<1	<1
Cadmium	0.1	0.7	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Chromium (SAC for Cr III adopted)	1	27	<1	<1	<1	NA	<1	<1	<1
Copper	1	1.3	<1	<1	<1	NA	<1	<1	<1
Lead	1	4.4	<1	<1	<1	NA	<1	<1	4
Total Mercury (inorganic)	0.05	0.1	<0.05	<0.05	<0.05	NA	<0.05	<0.05	<0.05
Nickel	1	7	<1	<1	<1	NA	2	<1	2
Zinc	1	15	6	6	11	NA	7	9	9
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)									
Benzene	1	500	<1	NA	<1	<1	1	<1	<1
Toluene	1	180	<1	NA	<1	<1	<1	<1	<1
Ethylbenzene	1	5	<1	NA	<1	<1	<1	<1	<1
m+p-xylene	2	75	<2	NA	<2	<2	<2	<2	<2
o-xylene	1	350	<1	NA	<1	<1	<1	<1	<1
Total xylenes	2	NSL	<2	NA	<2	<2	<2	<2	<2
Volatile Organic Compounds (VOCs), including chlorinated VOCs									
Dichlorodifluoromethane	10	NSL	<10	NA	<10	<10	<10	NA	NA
Chloromethane	10	NSL	<10	NA	<10	<10	<10	NA	NA
Vinyl Chloride	10	100	<10	NA	<10	<10	<10	NA	NA
Bromomethane	10	NSL	<10	NA	<10	<10	<10	NA	NA
Chloroethane	10	NSL	<10	NA	<10	<10	<10	NA	NA
Trichlorofluoromethane	10	NSL	<10	NA	<10	<10	<10	NA	NA
1,1-Dichloroethene	1	700	<1	NA	<1	<1	<1	NA	NA
Trans-1,2-dichloroethene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,1-dichloroethane	1	250	<1	NA	<1	<1	<1	NA	NA
Cis-1,2-dichloroethene	1	NSL	<1	NA	<1	<1	<1	NA	NA
Bromochloromethane	1	NSL	<1	NA	<1	<1	<1	NA	NA
Chloroform	1	370	<1	NA	2	2	1	NA	NA
2,2-dichloropropane	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,2-dichloroethane	1	1900	<1	NA	<1	<1	<1	NA	NA
1,1,1-trichloroethane	1	270	<1	NA	<1	<1	<1	NA	NA
1,1-dichloropropene	1	NSL	<1	NA	<1	<1	<1	NA	NA
Cyclohexane	1	NSL	<1	NA	<1	<1	<1	NA	NA
Carbon tetrachloride	1	240	<1	NA	<1	<1	<1	NA	NA
Benzene	1	500	<1	NA	<1	<1	1	NA	NA
Dibromomethane	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,2-dichloropropane	1	900	<1	NA	<1	<1	<1	NA	NA
Trichloroethene	1	330	<1	NA	<1	<1	<1	NA	NA
Bromodichloromethane	1	NSL	<1	NA	<1	<1	<1	NA	NA
trans-1,3-dichloropropene	1	NSL	<1	NA	<1	<1	<1	NA	NA
cis-1,3-dichloropropene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,1,2-trichloroethane	1	1900	<1	NA	<1	<1	<1	NA	NA
Toluene	1	180	<1	NA	<1	<1	<1	NA	NA
1,3-dichloropropane	1	1100	<1	NA	<1	<1	<1	NA	NA
Dibromochloromethane	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,2-dibromoethane	1	NSL	<1	NA	<1	<1	<1	NA	NA
Tetrachloroethene	1	70	<1	NA	<1	<1	<1	NA	NA
1,1,1,2-tetrachloroethane	1	NSL	<1	NA	<1	<1	<1	NA	NA
Chlorobenzene	1	55	<1	NA	<1	<1	<1	NA	NA
Ethylbenzene	1	5	<1	NA	<1	<1	<1	NA	NA
Bromoform	1	NSL	<1	NA	<1	<1	<1	NA	NA
m+p-xylene	2	75	<2	NA	<2	<2	<2	NA	NA
Styrene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,1,2,2-tetrachloroethane	1	400	<1	NA	<1	<1	<1	NA	NA
o-xylene	1	350	<1	NA	<1	<1	<1	NA	NA
1,2,3-trichloropropane	1	NSL	<1	NA	<1	<1	<1	NA	NA
Isopropylbenzene	1	30	<1	NA	<1	<1	<1	NA	NA
Bromobenzene	1	NSL	<1	NA	<1	<1	<1	NA	NA
n-propyl benzene	1	NSL	<1	NA	<1	<1	<1	NA	NA
2-chlorotoluene	1	NSL	<1	NA	<1	<1	<1	NA	NA
4-chlorotoluene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,3,5-trimethyl benzene	1	NSL	<1	NA	<1	<1	<1	NA	NA
Tert-butyl benzene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,2,4-trimethyl benzene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,3-dichlorobenzene	1	260	<1	NA	<1	<1	<1	NA	NA
Sec-butyl benzene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,4-dichlorobenzene	1	60	<1	NA	<1	<1	<1	NA	NA
4-isopropyl toluene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,2-dichlorobenzene	1	160	<1	NA	<1	<1	<1	NA	NA
n-butyl benzene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,2-dibromo-3-chloropropane	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,2,4-trichlorobenzene	1	20	<1	NA	<1	<1	<1	NA	NA
Hexachlorobutadiene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,2,3-trichlorobenzene	1	3	<1	NA	<1	<1	<1	NA	NA
Polycyclic Aromatic Hydrocarbons (PAHs)									
Naphthalene	0.2	50	<0.2	NA	<0.2	NA	0.4	<0.2	0.5
Acenaphthylene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Acenaphthene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Fluorene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Phenanthrene	0.1	0.6	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Anthracene	0.1	0.01	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Fluoranthene	0.1	1	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Pyrene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Benzo(a)anthracene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Chrysene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Benzo(b,j,k)fluoranthene	0.2	NSL	<0.2	NA	<0.2	NA	<0.2	<0.2	<0.2
Benzo(a)pyrene	0.1	0.1	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Phenols									
Total Phenolics (as Phenol)	0.05	320	<0.05	NA	<0.05	NA	<0.05	NA	NA
Concentration above the SAC									
Concentration above the PQL									
GIL >PQL									

TABLE G3 SUMMARY OF GROUNDWATER LABORATORY RESULTS COMPARED TO HUMAN CONTACT GILS All results in µg/L unless stated otherwise.									
	PQL Envirolab Services	Recreational (10 x NHMRC ADWG)	SAMPLES						
			MW101	MW101 - [LAB_DUP]	MW102	MW102 - [LAB_DUP]	MW103	WDUP1	WDUP2
Inorganic Compounds and Parameters									
pH		6.5 - 8.5	NA	NA	NA	NA	NA	NA	NA
Electrical Conductivity (µS/cm)	1	NSL	NA	NA	NA	NA	NA	NA	NA
Turbidity (NTU)		NSL	NA	NA	NA	NA	NA	NA	NA
Metals and Metalloids									
Arsenic (As III)	1	100	6	6	<1	NA	<1	<1	<1
Cadmium	0.1	20	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1
Chromium (total)	1	500	<1	<1	<1	NA	<1	<1	<1
Copper	1	20000	<1	<1	<1	NA	<1	<1	<1
Lead	1	100	<1	<1	<1	NA	<1	<1	4
Total Mercury (inorganic)	0.05	10	<0.05	<0.05	<0.05	NA	<0.05	<0.05	<0.05
Nickel	1	200	<1	<1	<1	NA	2	<1	2
Zinc	1	30000	6	6	11	NA	7	9	9
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)									
Benzene	1	10	<1	NA	<1	<1	1	<1	<1
Toluene	1	8000	<1	NA	<1	<1	<1	<1	<1
Ethylbenzene	1	3000	<1	NA	<1	<1	<1	<1	<1
m+p-xylene	2	NSL	<2	NA	<2	<2	<2	<2	<2
o-xylene	1	NSL	<1	NA	<1	<1	<1	<1	<1
Total xylenes	2	6000	<2	NA	<2	<2	<2	<2	<2
Volatile Organic Compounds (VOCs), including chlorinated VOCs									
Dichlorodifluoromethane	10	NSL	<10	NA	<10	<10	<10	NA	NA
Chloromethane	10	NSL	<10	NA	<10	<10	<10	NA	NA
Vinyl Chloride	10	3	<10	NA	<10	<10	<10	NA	NA
Bromomethane	10	NSL	<10	NA	<10	<10	<10	NA	NA
Chloroethane	10	NSL	<10	NA	<10	<10	<10	NA	NA
Trichlorofluoromethane	10	NSL	<10	NA	<10	<10	<10	NA	NA
1,1-Dichloroethene	1	300	<1	NA	<1	<1	<1	NA	NA
Trans-1,2-dichloroethene	1	600	<1	NA	<1	<1	<1	NA	NA
1,1-dichloroethane	1	NSL	<1	NA	<1	<1	<1	NA	NA
Cis-1,2-dichloroethene	1	600	<1	NA	<1	<1	<1	NA	NA
Bromochloromethane	1	2500	<1	NA	<1	<1	<1	NA	NA
Chloroform	1		<1	NA	2	2	1	NA	NA
2,2-dichloropropane	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,2-dichloroethane	1	30	<1	NA	<1	<1	<1	NA	NA
1,1,1-trichloroethane	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,1-dichloropropene	1	NSL	<1	NA	<1	<1	<1	NA	NA
Cyclohexane	1	NSL	<1	NA	<1	<1	<1	NA	NA
Carbon tetrachloride	1	30	<1	NA	<1	<1	<1	NA	NA
Benzene	1	10	<1	NA	<1	<1	1	NA	NA
Dibromomethane	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,2-dichloropropane	1	NSL	<1	NA	<1	<1	<1	NA	NA
Trichloroethene	1	NSL	<1	NA	<1	<1	<1	NA	NA
Bromodichloromethane	1	NSL	<1	NA	<1	<1	<1	NA	NA
trans-1,3-dichloropropene	1	1000	<1	NA	<1	<1	<1	NA	NA
cis-1,3-dichloropropene	1	1000	<1	NA	<1	<1	<1	NA	NA
1,1,2-trichloroethane	1	NSL	<1	NA	<1	<1	<1	NA	NA
Toluene	1	8000	<1	NA	<1	<1	<1	NA	NA
1,3-dichloropropane	1	NSL	<1	NA	<1	<1	<1	NA	NA
Dibromochloromethane	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,2-dibromoethane	1	NSL	<1	NA	<1	<1	<1	NA	NA
Tetrachloroethene	1	500	<1	NA	<1	<1	<1	NA	NA
1,1,1,2-tetrachloroethane	1	NSL	<1	NA	<1	<1	<1	NA	NA
Chlorobenzene	1	3000	<1	NA	<1	<1	<1	NA	NA
Ethylbenzene	1	3000	<1	NA	<1	<1	<1	NA	NA
Bromoform	1	NSL	<1	NA	<1	<1	<1	NA	NA
m+p-xylene	2	NSL	<2	NA	<2	<2	<2	NA	NA
Styrene	1	300	<1	NA	<1	<1	<1	NA	NA
1,1,2,2-tetrachloroethane	1	NSL	<1	NA	<1	<1	<1	NA	NA
o-xylene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,2,3-trichloropropane	1	NSL	<1	NA	<1	<1	<1	NA	NA
Isopropylbenzene	1	NSL	<1	NA	<1	<1	<1	NA	NA
Bromobenzene	1	NSL	<1	NA	<1	<1	<1	NA	NA
n-propyl benzene	1	NSL	<1	NA	<1	<1	<1	NA	NA
2-chlorotoluene	1	NSL	<1	NA	<1	<1	<1	NA	NA
4-chlorotoluene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,3,5-trimethyl benzene	1	NSL	<1	NA	<1	<1	<1	NA	NA
Tert-butyl benzene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,2,4-trimethyl benzene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,3-dichlorobenzene	1	200	<1	NA	<1	<1	<1	NA	NA
Sec-butyl benzene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,4-dichlorobenzene	1	400	<1	NA	<1	<1	<1	NA	NA
4-isopropyl toluene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,2-dichlorobenzene	1	15000	<1	NA	<1	<1	<1	NA	NA
n-butyl benzene	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,2-dibromo-3-chloropropane	1	NSL	<1	NA	<1	<1	<1	NA	NA
1,2,4-trichlorobenzene	1	300	<1	NA	<1	<1	<1	NA	NA
1,2,3-trichlorobenzene	1		<1	NA	<1	<1	<1	NA	NA
Hexachlorobutadiene	1	7	<1	NA	<1	<1	<1	NA	NA
Polycyclic Aromatic Hydrocarbons (PAHs)									
Naphthalene	0.2	NSL	<0.2	NA	<0.2	NA	0.4	<0.2	0.5
Acenaphthylene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Acenaphthene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Fluorene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Phenanthrene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Anthracene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Fluoranthene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Pyrene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Benzo(a)anthracene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Chrysene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Benzo(b,j,k)fluoranthene	0.2	NSL	<0.2	NA	<0.2	NA	<0.2	<0.2	<0.2
Benzo(a)pyrene	0.1	0.1	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	0.1	NSL	<0.1	NA	<0.1	NA	<0.1	<0.1	<0.1
Phenols									
Total Phenolics (as Phenol)	0.05	320	<0.05	NA	<0.05	NA	<0.05	NA	NA
Concentration above the SAC Concentration above the PQL GIL >PQL									
VALUE Bold Red									

TABLE G4 GROUNDWATER LABORATORY RESULTS COMPARED TO SITE SPECIFIC HSLs - RISK ASSESSMENT All results in µg/L unless stated otherwise.											
	PQL	NHMRC	WHO 2008	USEPA RSL	SAMPLES						
	Envirolab Services	ADWG 2011 (v3.5 2018)		Tapwater 2017	MW101	MW101 - [LAB_DUP]	MW102	MW102 - [LAB_DUP]	MW103	WDUP1	WDUP2
Total Recoverable Hydrocarbons (TRH)											
C ₆ -C ₉ Aliphatics (assessed using F1)	10	-	15000	-	<10	NA	<10	<10	<10	<10	<10
>C ₉ -C ₁₄ Aliphatics (assessed using F2)	50	-	100	-	<50	NA	<50	NA	<50	<50	<50
Monocyclic Aromatic Hydrocarbons (BTEX Compounds)											
Benzene	1	1	-	-	<1	NA	<1	<1	1	<1	<1
Toluene	1	800	-	-	<1	NA	<1	<1	<1	<1	<1
Ethylbenzene	1	300	-	-	<1	NA	<1	<1	<1	<1	<1
Total xylenes	2	600	-	-	<2	NA	<2	<2	<2	<2	<2
Polycyclic Aromatic Hydrocarbons (PAHs)											
Naphthalene	1	-	-	6.1	<1	NA	<1	<1	<1	<1	<1
Volatile Organic Compounds (VOCs), including chlorinated VOCs											
Dichlorodifluoromethane	10	-	-	-	<10	NA	<10	<10	<10	NA	NA
Chloromethane	10	-	-	-	<10	NA	<10	<10	<10	NA	NA
Vinyl Chloride	10	0.3	-	-	<10	NA	<10	<10	<10	NA	NA
Bromomethane	10	-	-	-	<10	NA	<10	<10	<10	NA	NA
Chloroethane	10	-	-	-	<10	NA	<10	<10	<10	NA	NA
Trichlorofluoromethane	10	-	-	-	<10	NA	<10	<10	<10	NA	NA
1,1-Dichloroethene	1	30	-	-	<1	NA	<1	<1	<1	NA	NA
Trans-1,2-dichloroethene	1	60	-	-	<1	NA	<1	<1	<1	NA	NA
1,1-dichloroethane	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
Cis-1,2-dichloroethene	1	60	-	-	<1	NA	<1	<1	<1	NA	NA
Bromochloromethane	1	250	-	-	<1	NA	<1	<1	<1	NA	NA
Chloroform	1		-	-	<1	NA	2	2	1	NA	NA
2,2-dichloropropane	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
1,2-dichloroethane	1	3	-	-	<1	NA	<1	<1	<1	NA	NA
1,1,1-trichloroethane	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
1,1-dichloropropene	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
Cyclohexane	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
Carbon tetrachloride	1	3	-	-	<1	NA	<1	<1	<1	NA	NA
Benzene	1	1	-	-	<1	NA	<1	<1	1	NA	NA
Dibromomethane	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
1,2-dichloropropane	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
Trichloroethene	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
Bromodichloromethane	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
trans-1,3-dichloropropene	1	100	-	-	<1	NA	<1	<1	<1	NA	NA
cis-1,3-dichloropropene	1	100	-	-	<1	NA	<1	<1	<1	NA	NA
1,1,2-trichloroethane	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
Toluene	1	800	-	-	<1	NA	<1	<1	<1	NA	NA
1,3-dichloropropane	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
Dibromochloromethane	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
1,2-dibromoethane	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
Tetrachloroethene	1	50	-	-	<1	NA	<1	<1	<1	NA	NA
1,1,1,2-tetrachloroethane	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
Chlorobenzene	1	300	-	-	<1	NA	<1	<1	<1	NA	NA
Ethylbenzene	1	300	-	-	<1	NA	<1	<1	<1	NA	NA
Bromoform	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
m+p-xylene	2	-	-	-	<2	NA	<2	<2	<2	NA	NA
Styrene	1	30	-	-	<1	NA	<1	<1	<1	NA	NA
1,1,2,2-tetrachloroethane	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
o-xylene	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
1,2,3-trichloropropane	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
Isopropylbenzene	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
Bromobenzene	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
n-propyl benzene	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
2-chlorotoluene	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
4-chlorotoluene	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
1,3,5-trimethyl benzene	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
Tert-butyl benzene	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
1,2,4-trimethyl benzene	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
1,3-dichlorobenzene	1	20	-	-	<1	NA	<1	<1	<1	NA	NA
Sec-butyl benzene	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
1,4-dichlorobenzene	1	40	-	-	<1	NA	<1	<1	<1	NA	NA
4-isopropyl toluene	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
1,2-dichlorobenzene	1	1500	-	-	<1	NA	<1	<1	<1	NA	NA
n-butyl benzene	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
1,2-dibromo-3-chloropropane	1	-	-	-	<1	NA	<1	<1	<1	NA	NA
1,2,4-trichlorobenzene	1	30	-	-	<1	NA	<1	<1	<1	NA	NA
1,2,3-trichlorobenzene	1		-	-	<1	NA	<1	<1	<1	NA	NA
Hexachlorobutadiene	1	7	-	-	<1	NA	<1	<1	<1	NA	NA
Concentration above the SAC Concentration above the PQL GIL >PQL											
	VALUE										
	Bold										
	Red										

		TRH C6 - C10	TRH >C10-C16	TRH >C16-C34	TRH >C34-C40	Benzene	Toluene	Ethylbenzene	m+p-xylene	o-Xylene	Napthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b,j,k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-c,d)pyrene	Dibenz(a,h)anthra-cene	Benzo(g,h,i)perylene	Arsenic	Cadmium	Chromium VI	Copper	Lead	Mercury	Nickel	Zinc	
	PQL Envirolab SYD	10	50	100	100	1	1	1	2	1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	1	0.1	1	1	1	0.05	1	1	
	PQL Envirolab VIC	10	50	100	100	1.0	1.0	1.0	2.0	1.0	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	1	0.1	1	1	1	0.05	1	1	
Intra-laboratory duplicate	MW102	1.69	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	<1	<1	<0.05	<1	11	
	WDUP1	1.69	<10	<50	<100	<100	<1	<1	<1	<2	<1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	<1	<1	<0.05	<1	9	
	MEAN		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	10	
	RPD %		nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	20%	
Inter-laboratory duplicate	MW103	1.95	<10	<50	<100	<100	1	<1	<1	<2	<1	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	<1	<1	<0.05	2	7	
	WDUP2	1.95	<10	<50	170	<100	<1	<1	<1	<2	<1	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<1	<1	4	<0.05	2	9	
	MEAN		nc	nc	110	nc	0.75	nc	nc	nc	nc	0.45	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	2.25	nc	2	8
	RPD %		nc	nc	109%	nc	67%	nc	nc	nc	nc	22%	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc	156%	nc	0%	25%
Field Blank	TBW1 24/07/2020		NA	NA	NA	NA	<1	<1	<1	<2	<1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Trip Spike	TSW1 24/07/2020		-	-	-	-	117%	110%	102%	105%	108%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Result outside of QA/QC acceptance criteria			Value																															

ABBREVIATIONS AND EXPLANATIONS

Abbreviations used in the Tables:

CT:	Contaminant Threshold
FTS:	Fluorotelomer sulfonic acid
NA:	Not Analysed
NC:	Not Calculated
NEMP	National Environmental Management Plan
NSL:	No Set Limit
PFAS	Per- and polyfluoroalkyl substances
PFHxS	Perfluorohexanesulfonic acid
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic acid
PQL:	Practical Quantitation Limit
RS:	Rinsate Sample
SAC:	Site Assessment Criteria
SCC:	Specific Contaminant Concentration
TB:	Trip Blank
TCLP:	Toxicity Characteristics Leaching Procedure
TS:	Trip Spike
UCL:	Upper Level Confidence Limit on Mean Value

Table Specific Explanations:

Groundwater Ecology Tables:

- 95% refers to a concentration that has been derived to protect 95% of aquatic species
- Statistical calculations are undertaken using ProUCL (USEPA). Statistical calculation is usually undertaken using data from fill samples.

Waste Classification and TCLP Table:

- Data assessed using the Addendum to the NSW EPA Waste Classification Guidelines, Part 1: Classifying Waste (2014) -October 2016

TABLE P1
SUMMARY OF PFAS CONCENTRATIONS IN SOIL - HUMAN HEALTH
Units are µg/Kg unless stated otherwise.

	PQL Envirolab Services	PFAS NEMP v2.0 Industrial/ Commercial	BH101 0.23-0.55 Fill: Sandy Clay	BH101 - [LAB_DUP] 0.23-0.55 Fill: Sandy Clay	BH102 surface Concrete	BH102 0.3-0.6 Fill: Silty Clayey Sand	BH103 surface Concrete	BH103 0.2-0.35 Fill: Silty Sand	SS1 surface Fill: Silty Sand	SS2 surface Fill: Silty Sand	SDUPS - Soil Field Duplicate
PFAS Compound											
Perfluorobutanesulfonic acid	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanesulfonic acid	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorohexanesulfonic acid - PFHxS	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoroheptanesulfonic acid	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorooctanesulfonic acid PFOS	0.1	NSL	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.7	0.5	0.5
Perfluorodecenesulfonic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorobutanoic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluoropentanoic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorohexanoic acid	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoroheptanoic acid	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorooctanoic acid PFOA	0.1	50,000	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorononanoic acid	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorodecanoic acid	0.5	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	<0.5
Perfluoroundecanoic acid	0.5	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorododecanoic acid	0.5	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1	<0.5
Perfluorotridecanoic acid	0.5	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotetradecanoic acid	5	NSL	<5	<5	<5	<5	<5	<5	<5	<5	<5
4:2 FTS	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
6:2 FTS	0.1	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
8:2 FTS	0.1	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
10:2 FTS	0.1	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorooctane sulfonamide	1	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Methyl perfluorooctane sulfonamide	1	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Ethyl perfluorooctanesulfonamide	1	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Me perfluorooctanesulfonamid ethanol	1	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Et perfluorooctanesulfonamid ethanol	5	NSL	<5	<5	<5	<5	<5	<5	<5	<5	<5
MePer uorooctanesulf-amid oacetic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	2	<0.2
EtPer uorooctanesulf-amid oacetic acid	0.2	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.3	<0.2
Total Positive PFHxS & PFOS	0.1	20,000	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	1	0.5	0.5
Total Positive PFOS & PFOA	0.1	NSL	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.7	0.5	0.5
Total Positive PFAS	0.1	NSL	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.7	4.4	0.5
Positive PFAS result PFAS result above the SAC Bold Bold											

TABLE P2
SUMMARY OF PFAS CONCENTRATIONS IN SOIL - ECOLOGY
Units are µg/Kg unless stated otherwise.

	PQL EnviroLab Services	PFAS NEMP v2.0 Direct exposure All land use	PFAS NEMP v2.0 Indirect exposure All land use	BH101 0.23-0.55 Fill: Sandy Clay	BH101 - [LAB_DUP] 0.23-0.55 Fill: Sandy Clay	BH102 surface Concrete	BH102 0.3-0.6 Fill: Silty Clayey Sand	BH103 surface Concrete	BH103 0.2-0.35 Fill: Silty Sand	SS1 surface Fill: Silty Sand	SS2 surface Fill: Silty Sand	SDUPS - Soil Field Duplicate
PFAS Compound												
Perfluorobutanesulfonic acid	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanesulfonic acid	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorohexanesulfonic acid - PFHxS	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoroheptanesulfonic acid	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorooctanesulfonic acid PFOS	0.1	1000	10	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.7	0.5	0.5
Perfluorodecanesulfonic acid	0.2	NSL	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorobutanoic acid	0.2	NSL	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluoropentanoic acid	0.2	NSL	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorohexanoic acid	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoroheptanoic acid	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorooctanoic acid PFOA	0.1	10,000	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorononanoic acid	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorodecanoic acid	0.5	NSL	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	<0.5
Perfluoroundecanoic acid	0.5	NSL	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorododecanoic acid	0.5	NSL	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1	<0.5
Perfluorotridecanoic acid	0.5	NSL	NSL	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotetradecanoic acid	5	NSL	NSL	<5	<5	<5	<5	<5	<5	<5	<5	<5
4:2 FTS	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
6:2 FTS	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
8:2 FTS	0.1	NSL	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
10:2 FTS	0.1	NSL	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorooctane sulfonamide	1	NSL	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Methyl perfluorooctane sulfonamide	1	NSL	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Ethyl perfluorooctanesulfonamide	1	NSL	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Me perfluorooctanesulfonamid ethanol	1	NSL	NSL	<1	<1	<1	<1	<1	<1	<1	<1	<1
N-Et perfluorooctanesulfonamid ethanol	5	NSL	NSL	<5	<5	<5	<5	<5	<5	<5	<5	<5
MePer uorooctanesulf-amid oacetic acid	0.2	NSL	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	2	<0.2
EtPer uorooctanesulf-amid oacetic acid	0.2	NSL	NSL	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.3	<0.2
Total Positive PFHxS & PFOS	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.7	0.5	0.5
Total Positive PFOS & PFOA	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.7	0.5	0.5
Total Positive PFAS	0.1	NSL	NSL	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.7	4.4	0.5
Positive PFAS result Bold PFAS result above the SAC Bold												

TABLE P3
SUMMARY OF PFAS CONCENTRATIONS IN GROUNDWATER - HUMAN HEALTH
All results in µg/L unless stated otherwise.

	PQL Envirolab Services	PFAS NEMP v2.0 Recreational	SAMPLES				
			MW101	MW101 - [LAB_DUP]	MW102	MW103	WDUP1
PFAS Compound							
Perfluorobutanesulfonic acid	0.0004	NSL	0.003	0.003	0.003	0.002	0.004
Perfluoropentanesulfonic acid	0.001	NSL	0.003	0.003	<0.001	<0.001	<0.001
Perfluorohexanesulfonic acid - PFHxS	0.0002	NSL	0.022	0.022	0.0055	0.0042	0.0052
Perfluoroheptanesulfonic acid	0.001	NSL	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluorooctanesulfonic acid PFOS	0.0002	NSL	0.01	0.0089	0.004	0.003	0.0039
Perfluorodecanesulfonic acid	0.002	NSL	<0.002	<0.002	<0.002	<0.002	<0.002
Perfluorobutanoic acid	0.002	NSL	0.007	0.008	0.004	0.003	0.004
Perfluoropentanoic acid	0.002	NSL	0.007	0.008	0.002	<0.002	0.002
Perfluorohexanoic acid	0.0004	NSL	0.011	0.011	0.003	0.002	0.003
Perfluoroheptanoic acid	0.0004	NSL	0.0086	0.0078	0.002	0.001	0.002
Perfluorooctanoic acid PFOA	0.0002	10	0.025	0.023	0.0047	0.0031	0.0051
Perfluorononanoic acid	0.001	NSL	0.002	0.002	<0.001	<0.001	<0.001
Perfluorodecanoic acid	0.002	NSL	<0.002	<0.002	<0.002	<0.002	<0.002
Perfluoroundecanoic acid	0.002	NSL	<0.002	<0.002	<0.002	<0.002	<0.002
Perfluorododecanoic acid	0.005	NSL	<0.005	<0.005	<0.005	<0.005	<0.005
Perfluorotridecanoic acid	0.01	NSL	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorotetradecanoic acid	0.05	NSL	<0.05	<0.05	<0.05	<0.05	<0.05
4:2 FTS	0.001	NSL	<0.001	<0.001	<0.001	<0.001	<0.001
6:2 FTS	0.0004	NSL	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
8:2 FTS	0.0004	NSL	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
10:2 FTS	0.002	NSL	<0.002	<0.002	<0.002	<0.002	<0.002
Perfluorooctane sulfonamide	0.01	NSL	<0.01	<0.01	<0.01	<0.01	<0.01
N-Methyl perfluorooctane sulfonamide	0.005	NSL	<0.005	<0.005	<0.005	<0.005	<0.005
N-Ethyl perfluorooctanesulfonamide	0.01	NSL	<0.01	<0.01	<0.01	<0.01	<0.01
N-Me perfluorooctanesulfonamid oethanol	0.005	NSL	<0.005	<0.005	<0.005	<0.005	<0.005
N-Et perfluorooctanesulfonamid oethanol	0.05	NSL	<0.05	<0.05	<0.05	<0.05	<0.05
MePer uorooctanesulf-amid oacetic acid	0.002	NSL	<0.002	<0.002	<0.002	<0.002	<0.002
EtPer uorooctanesulf-amid oacetic acid	0.002	NSL	<0.002	<0.002	<0.002	<0.002	<0.002
Total Positive PFHxS & PFOS	0.0002	2	0.032	0.031	0.0096	0.0072	0.0091
Total Positive PFOS & PFOA	0.0002	NSL	0.036	0.032	0.0088	0.0061	0.009
Total Positive PFAS	0.0002	NSL	0.1	0.096	0.028	0.019	0.029
Positive PFAS result PFAS result above the SAC							
		Bold					
		Bold					

TABLE P4
SUMMARY OF PFAS CONCENTRATIONS IN GROUNDWATER - ECOLOGY
All results in µg/L unless stated otherwise.

	PQL EnviroLab Services	PFAS NEMP v2.0 95% Marine/Freshwater	SAMPLES				
			MW101	MW101 - [LAB_DUP]	MW102	MW103	WDUP1
PFAS Compound							
Perfluorobutanesulfonic acid	0.0004	NSL	0.003	0.003	0.003	0.002	0.004
Perfluoropentanesulfonic acid	0.001	NSL	0.003	0.003	<0.001	<0.001	<0.001
Perfluorohexanesulfonic acid - PFHxS	0.0002	NSL	0.022	0.022	0.0055	0.0042	0.0052
Perfluoroheptanesulfonic acid	0.001	NSL	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluorooctanesulfonic acid PFOS	0.0002	0.13	0.01	0.0089	0.004	0.003	0.0039
Perfluorodecanesulfonic acid	0.002	NSL	<0.002	<0.002	<0.002	<0.002	<0.002
Perfluorobutanoic acid	0.002	NSL	0.007	0.008	0.004	0.003	0.004
Perfluoropentanoic acid	0.002	NSL	0.007	0.008	0.002	< 0.002	0.002
Perfluorohexanoic acid	0.0004	NSL	0.011	0.011	0.003	0.002	0.003
Perfluoroheptanoic acid	0.0004	NSL	0.0086	0.0078	0.002	0.001	0.002
Perfluorooctanoic acid PFOA	0.0002	220	0.025	0.023	0.0047	0.0031	0.0051
Perfluorononanoic acid	0.001	NSL	0.002	0.002	<0.001	<0.001	<0.001
Perfluorodecanoic acid	0.002	NSL	<0.002	<0.002	<0.002	<0.002	<0.002
Perfluoroundecanoic acid	0.002	NSL	<0.002	<0.002	<0.002	<0.002	<0.002
Perfluorododecanoic acid	0.005	NSL	<0.005	<0.005	<0.005	<0.005	<0.005
Perfluorotridecanoic acid	0.01	NSL	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorotetradecanoic acid	0.05	NSL	<0.05	<0.05	<0.05	<0.05	<0.05
4:2 FTS	0.001	NSL	<0.001	<0.001	<0.001	<0.001	<0.001
6:2 FTS	0.0004	NSL	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
8:2 FTS	0.0004	NSL	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
10:2 FTS	0.002	NSL	<0.002	<0.002	<0.002	<0.002	<0.002
Perfluorooctane sulfonamide	0.01	NSL	<0.01	<0.01	<0.01	<0.01	<0.01
N-Methyl perfluorooctane sulfonamide	0.005	NSL	<0.005	<0.005	<0.005	<0.005	<0.005
N-Ethyl perfluorooctanesulfonamide	0.01	NSL	<0.01	<0.01	<0.01	<0.01	<0.01
N-Me perfluorooctanesulfonamid ethanol	0.005	NSL	<0.005	<0.005	<0.005	<0.005	<0.005
N-Et perfluorooctanesulfonamid ethanol	0.05	NSL	<0.05	<0.05	<0.05	<0.05	<0.05
MePer uorooctanesulf-amid oacetic acid	0.002	NSL	<0.002	<0.002	<0.002	<0.002	<0.002
EtPer uorooctanesulf-amid oacetic acid	0.002	NSL	<0.002	<0.002	<0.002	<0.002	<0.002
Total Positive PFHxS & PFOS	0.0002	NSL	0.032	0.031	0.0096	0.0072	0.0091
Total Positive PFOS & PFOA	0.0002	NSL	0.036	0.032	0.0088	0.0061	0.009
Total Positive PFAS	0.0002	NSL	0.1	0.096	0.028	0.019	0.029
Positive PFAS result PFAS result above the SAC Bold Bold							

TABLE P5 PFAS QA/QC SUMMARY																																	
			Perfluorobutanesulfonic acid	Perfluoropentanesulfonic acid	Perfluorohexanesulfonic acid - PFHxS	Perfluoroheptanesulfonic acid	Perfluorooctanesulfonic acid PFOS	Perfluorodecanesulfonic acid	Perfluorobutanoic acid	Perfluoropentanoic acid	Perfluorohexanoic acid	Perfluoroheptanoic acid	Perfluorooctanoic acid PFOA	Perfluorononanoic acid	Perfluorodecanoic acid	Perfluoroundecanoic acid	Perfluorododecanoic acid	Perfluorotridecanoic acid	Perfluorotetradecanoic acid	4:2 FTS	6:2 FTS	8:2 FTS	10:2 FTS	Perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamide	N-Ethyl perfluorooctanesulfonamide	N-Me perfluorooctanesulfonamid oethanol	N-Et perfluorooctanesulfonamid oethanol	MePerfluorooctanesulf-amid oacetic acid	EtPerfluorooctanesulf-amid oacetic acid	Total Positive PFHxS & PFOS	Total Positive PFOS & PFOA	Total Positive PFAS
	PQL Soil µg/kg		0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.5	0.5	0.5	0.5	5	0.1	0.1	0.1	0.1	1	1	1	1	5	0.2	0.2	0.1	0.1	0.1
	PQL Groundwater µg/L		0.0004	0.001	0.0002	0.001	0.0002	0.002	0.002	0.002	0.0004	0.0004	0.0002	0.001	0.002	0.002	0.005	0.01	0.05	0.001	0.0004	0.0004	0.002	0.01	0.005	0.0100	0.005	0.0500	0.002	0.002	0.0002	0.0002	0.0002
	PQL Rinsate µg/L		0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.02	0.02	0.05	0.10	0.50	0.01	0.01	0.02	0.02	0.10	0.05	0.10	0.05	0.50	0.02	0.02	0.01	0.01	0.01
Intra laboratory duplicate (groundwater)																																	
	WDUP1		0.003	<0.001	0.0055	<0.001	0.004	<0.002	0.004	0.002	0.003	0.002	0.0047	<0.001	<0.002	<0.002	<0.005	<0.01	<0.05	<0.001	<0.0004	<0.0004	<0.002	<0.01	<0.005	<0.01	<0.005	<0.05	<0.002	<0.002	0.0096	0.0088	0.028
	MW102		0.004	<0.001	0.0052	<0.001	0.0039	<0.002	0.004	0.002	0.003	0.002	0.0051	<0.001	<0.002	<0.002	<0.005	<0.01	<0.05	<0.001	<0.0004	<0.0004	<0.002	<0.01	<0.005	<0.01	<0.005	<0.05	<0.002	<0.002	0.0091	0.009	0.029
	MEAN		0.0035	NC	0.00535	NC	0.00395	NC	0.004	0.002	0.003	0.002	0.0049	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	0.00935	0.0089	0.0285
	RPD %		28.6	NC	5.6	NC	2.5	NC	0	0	0	0	8.2	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	5.3	2.2
Intra laboratory duplicate (soil)	Text																																
	SS1	Surface	<0.1	<0.1	<0.1	<0.1	0.5	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1	0.5	<0.5	1	<0.5	<5	<0.1	<0.1	<0.2	<0.2	<1	<1	<1	<1	<5	2	0.3	0.5	0.5	4.4
	SDUP5	-	<0.1	<0.1	<0.1	<0.1	0.5	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<5	<0.1	<0.1	<0.2	<0.2	<1	<1	<1	<1	<5	<0.2	<0.2	0.5	0.5	0.5
	MEAN		NC	NC	NC	NC	0.5	NC	NC	NC	NC	NC	NC	NC	NC	NC	1	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	2	0.3	0.5	0.5	2.45
Field Rinsate	RPD %		NC	NC	NC	NC	0	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	0	0	159.2
	Text																																
	FR1-SPT 16/07/20	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.05	<0.1	<0.5	<0.01	<0.01	<0.02	<0.02	<0.1	<0.05	<0.1	<0.05	<0.5	<0.02	<0.02	<0.01	<0.01	<0.01
Result outside of QA/QC acceptance criteria																																	



Appendix C: Borehole Logs

JKEnvironments

ENVIRONMENTAL LOG



Log No. **BH / MW101**
1/1

Environmental logs are not to be used for geotechnical purposes

SDUP1: 0.23-0.55m

Client: RENT A SPACE SELF STORAGE Project: PROPOSED STORAGE BUILDING Location: 4 CROSS STREET, BROOKVALE, NSW													
Job No.: E32885PA Date: 16/7/20 Plant Type: JK350			Method: SPIRAL AUGER Logged/Checked by: C.R./B.P.				R.L. Surface: 11.234m Datum: AHD						
Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL									
DRY ON COMPLETION ON 24/7/20						0		-	CONCRETE: 230mm.t				
					N = 6 5,3,3				FILL: Sandy clay, low to medium plasticity, brown, fine to medium grained sand, trace of igneous gravel.	w<PL			2.2kg BUCKET NO FCF
					N = 11 6,6,5	1	SM	Silty SAND: fine to medium grained, dark and light grey.	M				ALLUVIAL
					N = 5 2,2,3	2	CL-CI	Sandy CLAY: low to medium plasticity, grey brown, fine to medium grained sand.	w≈PL				GROUNDWATER MONITORING WELL INSTALLED TO 5.0m. CLASS 18 MACHINE SLOTTED 50mm DIA. UPVC STANDPIPE 2.0m TO 5.0m. CASING 0.1m TO 2.0m. 2mm SAND FILTER PACK 1.0m TO 5.0m. BENTONITE SEAL 0.35m TO 1.0m. BACKFILLED WITH SAND TO THE SURFACE. COMPLETED WITH A CONCRETED GATIC COVER. WELL COMPLETED ON 20/7/20
						3	SC	Clayey SAND: fine to medium grained, grey brown.	W				
						4							
						5			END OF BOREHOLE AT 5.0m				
						6							
						7							

JKEnvironments

ENVIRONMENTAL LOG



Log No. **BH / MW102**
1/1

Environmental logs are not to be used for geotechnical purposes

SDUP2: 0.3-0.6m

Client: RENT A SPACE SELF STORAGE
Project: PROPOSED STORAGE BUILDING
Location: 4 CROSS STREET, BROOKVALE, NSW

Job No.: E32885PA **Method:** SPIRAL AUGER **R.L. Surface:** 11.220m
Date: 20/7/20 **Datum:** AHD
Plant Type: JK500 **Logged/Checked by:** C.R./B.P.

Groundwater Record	ES	ASS	ASB	SAL	DB	SAMPLES	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/Weathering	Strength/Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION								0		-	CONCRETE: 200mm.t				
							N = 9 3,5,4				FILL: Silty clayey sand, fine to medium grained, red brown and grey, trace of ironstone and sandstone gravel.	D M			INSUFFICIENT RETURN 1.30kg BUCKET NO FCF
							N = 6 3,2,4	1		SM	FILL: Silty clayey sand, fine to medium grained, dark brown and orange brown, trace of sandstone gravel. Silty SAND: fine to medium grained, orange brown.	M			ALLUVIAL
							N = 13 4,5,8	2			Silty SAND: fine to medium grained, light grey.	W			
								3							GROUNDWATER MONITORING WELL INSTALLED TO 5.0m. CLASS 18 MACHINE SLOTTED 50mm DIA. UPVC STANDPIPE 2.0m TO 5.0m. CASING 0.1m TO 2.0m. 2mm SAND FILTER PACK 1.5m TO 5.0m. BENTONITE SEAL 0.9m TO 1.5m. BACKFILLED WITH SAND TO THE SURFACE. COMPLETED WITH A CONCRETE GATIC COVER.
								4							
								5			END OF BOREHOLE AT 5.0m				
								6							
								7							

Client:	RENT A SPACE SELF STORAGE
Project:	PROPOSED STORAGE BUILDING
Location:	4 CROSS STREET, BROOKVALE, NSW

Logged/Checked by: C.R./B.P.

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ENVIRONMENTAL LOG

Log No.
BH104
1/1

Environmental logs are not to be used for geotechnical purposes

SDUP4: 0.4-0.6m

Client:

Project:

Location:

RENT A SPACE SELF STORAGE
PROPOSED STORAGE BUILDING
4 CROSS STREET, BROOKVALE, NSW

Job No.:

Method:

R.L. Surface:

E32885PA
SPIRAL AUGER
11.253m

Date:

Datum:

21/7/20
AHD

Plant Type:

Logged/Checked by:

JK500
C.R./B.P.

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	ASS	ASB	SAL									
15 MINS AFTER COMPLETION OF AUGERING						0		-	CONCRETE: 160mm.t FILL: Clayey sand, fine to medium grained, red brown and grey, trace of brick fragments.	M			INSUFFICIENT RETURN 1.26kg BUCKET NO FCF ALLUVIAL
					N = 14 3,7,7			SM	FILL: Silty sand, fine to medium grained, dark brown and dark grey. Silty SAND: fine to medium grained, grey and light brown.	M			
					N = 10 4,5,5	1			as above, but brown and orange brown.				
						2		SC	Silty clayey SAND: fine to medium grained, red brown, orange brown and yellow brown.				
								SM	Silty SAND: fine to medium grained, grey.				
						3			as above,	W			
									END OF BOREHOLE AT 3.1m				
						4							
						5							
						6							
						7							



ENVIRONMENTAL LOGS EXPLANATION NOTES

INTRODUCTION

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

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

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

DESCRIPTION AND CLASSIFICATION METHODS

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

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

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

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

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

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

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

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

INVESTIGATION METHODS

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

Test Pits: These are normally excavated with a backhoe or a tracked excavator, allowing close examination of the insitu soils and 'weaker' bedrock if it is safe to descend into the pit. The depth of penetration is limited to about 3m for a backhoe and up to 6m for a large excavator. Limitations of test pits are the problems associated with disturbance and difficulty of reinstatement and the consequent effects on close-by structures. Care must be taken if construction is to be carried out near test pit locations to either properly recompact the backfill during construction or to design and construct the

structure so as not to be adversely affected by poorly compacted backfill at the test pit location.

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

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

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

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

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

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

Standard Penetration Tests: Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils, as a means of indicating density or strength and also of obtaining a relatively undisturbed sample. The test procedure is

described in Australian Standard 1289.6.3.1–2004 (R2016) ‘*Methods of Testing Soils for Engineering Purposes, Soil Strength and Consolidation Tests – Determination of the Penetration Resistance of a Soil – Standard Penetration Test (SPT)*’.

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

The test results are reported in the following form:

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

N = 13
4, 6, 7

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

N > 30
15, 30/40mm

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

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

LOGS

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

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

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

GROUNDWATER

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

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

More reliable measurements can be made by installing standpipes which are read after the groundwater level has stabilised at intervals ranging from several days to perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from perched water tables or surface water.

FILL

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

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

LABORATORY TESTING

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

SYMBOL LEGENDS

SOIL



FILL



TOPSOIL



CLAY (CL, CI, CH)



SILT (ML, MH)



SAND (SP, SW)



GRAVEL (GP, GW)



SANDY CLAY (CL, CI, CH)



SILTY CLAY (CL, CI, CH)



CLAYEY SAND (SC)



SILTY SAND (SM)



GRAVELLY CLAY (CL, CI, CH)



CLAYEY GRAVEL (GC)



SANDY SILT (ML, MH)



PEAT AND HIGHLY ORGANIC SOILS (Pt)

ROCK



CONGLOMERATE



SANDSTONE



SHALE/MUDSTONE



SILTSTONE



CLAYSTONE



COAL



LAMINITE



LIMESTONE



PHYLLITE, SCHIST



TUFF



GRANITE, GABBRO



DOLERITE, DIORITE



BASALT, ANDESITE



QUARTZITE

OTHER MATERIALS



BRICKS OR PAVERS



CONCRETE



ASPHALTIC CONCRETE

CLASSIFICATION OF COARSE AND FINE GRAINED SOILS

Major Divisions		Group Symbol	Typical Names	Field Classification of Sand and Gravel	Laboratory Classification	
Coarse grained soil (more than 60% of soil excluding oversize fraction is greater than 0.075mm)	GRAVEL (more than half of coarse fraction is larger than 2.36mm)	GW	Gravel and gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	$C_u > 4$ $1 < C_c < 3$
		GP	Gravel and gravel-sand mixtures, little or no fines, uniform gravels	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	Fails to comply with above
		GM	Gravel-silt mixtures and gravel-sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength	≥ 12% fines, fines are silty	Fines behave as silt
		GC	Gravel-clay mixtures and gravel-sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength	≥ 12% fines, fines are clayey	Fines behave as clay
	SAND (more than half of coarse fraction is smaller than 2.36mm)	SW	Sand and gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	$C_u > 6$ $1 < C_c < 3$
		SP	Sand and gravel-sand mixtures, little or no fines	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength	≤ 5% fines	Fails to comply with above
		SM	Sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength	≥ 12% fines, fines are silty	N/A
		SC	Sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength	≥ 12% fines, fines are clayey	

Laboratory Classification Criteria

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

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

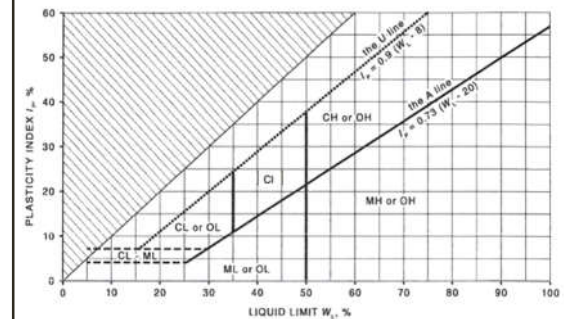
Where D_{10} , D_{30} and D_{60} are those grain sizes for which 10%, 30% and 60% of the soil grains, respectively, are smaller.

NOTES:

- For a coarse grained soil with a fines content between 5% and 12%, the soil is given a dual classification comprising the two group symbols separated by a dash; for example, for a poorly graded gravel with between 5% and 12% silt fines, the classification is GP-GM.
- Where the grading is determined from laboratory tests, it is defined by coefficients of curvature (C_c) and uniformity (C_u) derived from the particle size distribution curve.
- Clay soils with liquid limits $> 35\%$ and $\leq 50\%$ may be classified as being of medium plasticity.
- The U line on the Modified Casagrande Chart is an approximate upper bound for most natural soils.

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

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





LOG SYMBOLS

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



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

Classification of Material Weathering

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

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

Rock Material Strength Classification

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



Appendix D: Laboratory Reports & COC Documents

CERTIFICATE OF ANALYSIS 247495

Client Details

Client	Environmental Investigation Services
Attention	Anthony Barkway
Address	PO Box 976, North Ryde BC, NSW, 1670

Sample Details

Your Reference	<u>E32885PA, Brookvale</u>
Number of Samples	25 SOIL, 2 SWAB, 1 WATER, 1 MATERIAL
Date samples received	22/07/2020
Date completed instructions received	23/07/2020

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	29/07/2020
Date of Issue	28/07/2020
NATA Accreditation Number 2901. This document shall not be reproduced except in full.	
Accredited for compliance with ISO/IEC 17025 - Testing. Tests not covered by NATA are denoted with *	

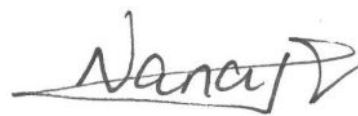
Asbestos Approved By

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

Results Approved By

Dragana Tomas, Senior Chemist
 Hannah Nguyen, Senior Chemist
 Jaimie Loa-Kum-Cheung, Metals Supervisor
 Lucy Zhu, Asbestos Supervisor
 Phalak Inthakesone, Organics Development Manager, Sydney

Authorised By



Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil

Our Reference		247495-1	247495-2	247495-4	247495-5	247495-9
Your Reference	UNITS	BH101	BH101	BH102	BH102	BH103
Depth		0.23-0.55	0.9-1.0	0.3-0.6	1.0-1.2	0.6-0.9
Date Sampled		16/07/2020	16/07/2020	20/07/2020	20/07/2020	20/07/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	24/07/2020	24/07/2020	24/07/2020	24/07/2020	24/07/2020
Date analysed	-	25/07/2020	25/07/2020	25/07/2020	25/07/2020	25/07/2020
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	%	116	118	122	115	128

vTRH(C6-C10)/BTEXN in Soil

Our Reference		247495-10	247495-12	247495-13	247495-22	247495-25
Your Reference	UNITS	BH103	BH104	BH104	SDUP3	TS-T1
Depth		1.2-1.4	0.16-0.35	0.4-0.6	-	-
Date Sampled		20/07/2020	21/07/2020	21/07/2020	16/07/2020	16/07/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	24/07/2020	24/07/2020	24/07/2020	24/07/2020	24/07/2020
Date analysed	-	25/07/2020	25/07/2020	25/07/2020	25/07/2020	25/07/2020
TRH C ₆ - C ₉	mg/kg	<25	<25	<25	<25	[NA]
TRH C ₆ - C ₁₀	mg/kg	<25	<25	<25	<25	[NA]
vTPH C ₆ - C ₁₀ less BTEX (F1)	mg/kg	<25	<25	<25	<25	[NA]
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	95%
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	94%
Ethylbenzene	mg/kg	<1	<1	<1	<1	95%
m+p-xylene	mg/kg	<2	<2	<2	<2	95%
o-Xylene	mg/kg	<1	<1	<1	<1	95%
naphthalene	mg/kg	<1	<1	<1	<1	[NA]
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	[NA]
Surrogate aaa-Trifluorotoluene	%	118	115	130	124	126

vTRH(C6-C10)/BTEXN in Soil		
Our Reference		247495-26
Your Reference	UNITS	TB-S1
Depth		-
Date Sampled		16/07/2020
Type of sample		SOIL
Date extracted	-	24/07/2020
Date analysed	-	25/07/2020
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	%	129

svTRH (C10-C40) in Soil						
Our Reference		247495-1	247495-2	247495-4	247495-5	247495-9
Your Reference	UNITS	BH101	BH101	BH102	BH102	BH103
Depth		0.23-0.55	0.9-1.0	0.3-0.6	1.0-1.2	0.6-0.9
Date Sampled		16/07/2020	16/07/2020	20/07/2020	20/07/2020	20/07/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	24/07/2020	24/07/2020	24/07/2020	24/07/2020	24/07/2020
Date analysed	-	27/07/2020	27/07/2020	27/07/2020	27/07/2020	27/07/2020
TRH C ₁₀ - C ₁₄	mg/kg	<50	<50	<50	63	<50
TRH C ₁₅ - C ₂₈	mg/kg	<100	<100	<100	180	<100
TRH C ₂₉ - C ₃₆	mg/kg	<100	<100	<100	<100	<100
TRH >C ₁₀ -C ₁₆	mg/kg	<50	<50	<50	140	<50
TRH >C ₁₀ - C ₁₆ less Naphthalene (F2)	mg/kg	<50	<50	<50	140	<50
TRH >C ₁₆ -C ₃₄	mg/kg	<100	<100	<100	110	<100
TRH >C ₃₄ -C ₄₀	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	250	<50
Surrogate o-Terphenyl	%	97	97	106	115	103

svTRH (C10-C40) in Soil					
Our Reference		247495-10	247495-12	247495-13	247495-22
Your Reference	UNITS	BH103	BH104	BH104	SDUP3
Depth		1.2-1.4	0.16-0.35	0.4-0.6	-
Date Sampled		20/07/2020	21/07/2020	21/07/2020	16/07/2020
Type of sample		SOIL	SOIL	SOIL	SOIL
Date extracted	-	24/07/2020	24/07/2020	24/07/2020	24/07/2020
Date analysed	-	27/07/2020	27/07/2020	27/07/2020	27/07/2020
TRH C ₁₀ - C ₁₄	mg/kg	82	<50	<50	300
TRH C ₁₅ - C ₂₈	mg/kg	260	<100	<100	810
TRH C ₂₉ - C ₃₆	mg/kg	<100	<100	<100	<100
TRH >C ₁₀ -C ₁₆	mg/kg	190	<50	<50	620
TRH >C ₁₀ - C ₁₆ less Naphthalene (F2)	mg/kg	190	<50	<50	620
TRH >C ₁₆ -C ₃₄	mg/kg	160	<100	<100	520
TRH >C ₃₄ -C ₄₀	mg/kg	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	350	<50	<50	1,100
Surrogate o-Terphenyl	%	123	101	99	#

PAHs in Soil						
Our Reference		247495-1	247495-2	247495-4	247495-5	247495-9
Your Reference	UNITS	BH101	BH101	BH102	BH102	BH103
Depth		0.23-0.55	0.9-1.0	0.3-0.6	1.0-1.2	0.6-0.9
Date Sampled		16/07/2020	16/07/2020	20/07/2020	20/07/2020	20/07/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	24/07/2020	24/07/2020	24/07/2020	24/07/2020	24/07/2020
Date analysed	-	24/07/2020	24/07/2020	24/07/2020	24/07/2020	24/07/2020
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate <i>p</i> -Terphenyl-d14	%	99	100	97	96	98

PAHs in Soil					
Our Reference		247495-10	247495-12	247495-13	247495-22
Your Reference	UNITS	BH103	BH104	BH104	SDUP3
Depth		1.2-1.4	0.16-0.35	0.4-0.6	-
Date Sampled		20/07/2020	21/07/2020	21/07/2020	16/07/2020
Type of sample		SOIL	SOIL	SOIL	SOIL
Date extracted	-	24/07/2020	24/07/2020	24/07/2020	24/07/2020
Date analysed	-	24/07/2020	24/07/2020	24/07/2020	24/07/2020
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	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5
Surrogate <i>p</i> -Terphenyl-d14	%	96	97	93	101

Organochlorine Pesticides in soil					
Our Reference		247495-1	247495-4	247495-9	247495-12
Your Reference	UNITS	BH101	BH102	BH103	BH104
Depth		0.23-0.55	0.3-0.6	0.6-0.9	0.16-0.35
Date Sampled		16/07/2020	20/07/2020	20/07/2020	21/07/2020
Type of sample		SOIL	SOIL	SOIL	SOIL
Date extracted	-	24/07/2020	24/07/2020	24/07/2020	24/07/2020
Date analysed	-	24/07/2020	24/07/2020	24/07/2020	24/07/2020
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	115	114	113	113

Organophosphorus Pesticides in Soil					
Our Reference		247495-1	247495-4	247495-9	247495-12
Your Reference	UNITS	BH101	BH102	BH103	BH104
Depth		0.23-0.55	0.3-0.6	0.6-0.9	0.16-0.35
Date Sampled		16/07/2020	20/07/2020	20/07/2020	21/07/2020
Type of sample		SOIL	SOIL	SOIL	SOIL
Date extracted	-	24/07/2020	24/07/2020	24/07/2020	24/07/2020
Date analysed	-	24/07/2020	24/07/2020	24/07/2020	24/07/2020
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1
Chlorpyrifos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1
Chlorpyrifos	mg/kg	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	115	114	113	113

PCBs in Soil					
Our Reference		247495-1	247495-4	247495-9	247495-12
Your Reference	UNITS	BH101	BH102	BH103	BH104
Depth		0.23-0.55	0.3-0.6	0.6-0.9	0.16-0.35
Date Sampled		16/07/2020	20/07/2020	20/07/2020	21/07/2020
Type of sample		SOIL	SOIL	SOIL	SOIL
Date extracted	-	24/07/2020	24/07/2020	24/07/2020	24/07/2020
Date analysed	-	24/07/2020	24/07/2020	24/07/2020	24/07/2020
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	115	114	113	113

Acid Extractable metals in soil

Our Reference		247495-1	247495-2	247495-4	247495-5	247495-9
Your Reference	UNITS	BH101	BH101	BH102	BH102	BH103
Depth		0.23-0.55	0.9-1.0	0.3-0.6	1.0-1.2	0.6-0.9
Date Sampled		16/07/2020	16/07/2020	20/07/2020	20/07/2020	20/07/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	24/07/2020	24/07/2020	24/07/2020	24/07/2020	24/07/2020
Date analysed	-	24/07/2020	24/07/2020	24/07/2020	24/07/2020	24/07/2020
Arsenic	mg/kg	<4	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	8	2	7	10	<1
Copper	mg/kg	2	6	4	<1	<1
Lead	mg/kg	5	19	11	8	1
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	<1	<1	3	1	<1
Zinc	mg/kg	1	4	7	3	1

Acid Extractable metals in soil

Our Reference		247495-10	247495-12	247495-13	247495-22
Your Reference	UNITS	BH103	BH104	BH104	SDUP3
Depth		1.2-1.4	0.16-0.35	0.4-0.6	-
Date Sampled		20/07/2020	21/07/2020	21/07/2020	16/07/2020
Type of sample		SOIL	SOIL	SOIL	SOIL
Date prepared	-	24/07/2020	24/07/2020	24/07/2020	24/07/2020
Date analysed	-	24/07/2020	24/07/2020	24/07/2020	24/07/2020
Arsenic	mg/kg	<4	<4	4	4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	3	7	7	4
Copper	mg/kg	<1	2	19	3
Lead	mg/kg	5	9	24	6
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	2	<1	1	1
Zinc	mg/kg	7	3	18	5

Moisture						
Our Reference	UNITS	247495-1	247495-2	247495-3	247495-4	247495-5
Your Reference		BH101	BH101	BH102	BH102	BH102
Depth		0.23-0.55	0.9-1.0	surface	0.3-0.6	1.0-1.2
Date Sampled		16/07/2020	16/07/2020	16/07/2020	20/07/2020	20/07/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	24/07/2020	24/07/2020	24/07/2020	24/07/2020	24/07/2020
Date analysed	-	27/07/2020	27/07/2020	27/07/2020	27/07/2020	27/07/2020
Moisture	%	11	7.7	5.1	11	15

Moisture						
Our Reference	UNITS	247495-7	247495-8	247495-9	247495-10	247495-12
Your Reference		BH103	BH103	BH103	BH103	BH104
Depth		surface	0.2-0.35	0.6-0.9	1.2-1.4	0.16-0.35
Date Sampled		20/07/2020	20/07/2020	20/07/2020	20/07/2020	21/07/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	24/07/2020	24/07/2020	24/07/2020	24/07/2020	24/07/2020
Date analysed	-	27/07/2020	27/07/2020	27/07/2020	27/07/2020	27/07/2020
Moisture	%	3.0	11	5.5	4.8	13

Moisture						
Our Reference	UNITS	247495-13	247495-17	247495-18	247495-22	247495-24
Your Reference		BH104	SS1	SS2	SDUP3	SDUP5
Depth		0.4-0.6	surface	surface	-	-
Date Sampled		21/07/2020	16/07/2020	16/07/2020	16/07/2020	16/07/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	24/07/2020	24/07/2020	24/07/2020	24/07/2020	24/07/2020
Date analysed	-	27/07/2020	27/07/2020	27/07/2020	27/07/2020	27/07/2020
Moisture	%	12	9.4	19	7.4	8.4

Asbestos ID - soils NEPM - ASB-001

Our Reference		247495-1	247495-4	247495-9	247495-13
Your Reference	UNITS	BH101	BH102	BH103	BH104
Depth		0.23-0.55	0.3-0.6	0.6-0.9	0.4-0.6
Date Sampled		16/07/2020	20/07/2020	20/07/2020	21/07/2020
Type of sample		SOIL	SOIL	SOIL	SOIL
Date analysed	-	24/07/2020	24/07/2020	24/07/2020	24/07/2020
Sample mass tested	g	520.89	495.23	474.51	451.17
Sample Description	-	Beige fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg
		Organic fibres detected	Organic fibres detected	Organic fibres detected	Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected
Total Asbestos ^{#1}	g/kg	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected
ACM >7mm Estimation*	g	—	—	—	—
FA and AF Estimation*	g	—	—	—	—
ACM >7mm Estimation*	%(w/w)	<0.01	<0.01	<0.01	<0.01
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001

PFAS in Soils Extended

Our Reference		247495-1	247495-3	247495-4	247495-7	247495-8
Your Reference	UNITS	BH101	BH102	BH102	BH103	BH103
Depth		0.23-0.55	surface	0.3-0.6	surface	0.2-0.35
Date Sampled		16/07/2020	16/07/2020	20/07/2020	20/07/2020	20/07/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	24/07/2020	24/07/2020	24/07/2020	24/07/2020	24/07/2020
Date analysed	-	24/07/2020	24/07/2020	24/07/2020	24/07/2020	24/07/2020
Perfluorobutanesulfonic acid	µg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanesulfonic acid	µg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorohexanesulfonic acid - PFHxS	µg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoroheptanesulfonic acid	µg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorooctanesulfonic acid PFOS	µg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Perfluorodecanesulfonic acid	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorobutanoic acid	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluoropentanoic acid	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorohexanoic acid	µg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoroheptanoic acid	µg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorooctanoic acid PFOA	µg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorononanoic acid	µg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorodecanoic acid	µg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluoroundecanoic acid	µg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorododecanoic acid	µg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotridecanoic acid	µg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Perfluorotetradecanoic acid	µg/kg	<5	<5	<5	<5	<5
4:2 FTS	µg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
6:2 FTS	µg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
8:2 FTS	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
10:2 FTS	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Perfluorooctane sulfonamide	µg/kg	<1	<1	<1	<1	<1
N-Methyl perfluorooctane sulfonamide	µg/kg	<1	<1	<1	<1	<1
N-Ethyl perfluorooctanesulfonamide	µg/kg	<1	<1	<1	<1	<1
N-Me perfluorooctanesulfonamid ethanol	µg/kg	<1	<1	<1	<1	<1
N-Et perfluorooctanesulfonamid ethanol	µg/kg	<5	<5	<5	<5	<5
MePerfluorooctanesulf- amid oacetic acid	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
EtPerfluorooctanesulf amid oacetic acid	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Surrogate ¹³ C ₈ PFOS	%	93	101	105	97	98
Surrogate ¹³ C ₂ PFOA	%	97	102	97	98	100
Extracted ISTD ¹³ C ₃ PFBS	%	98	106	102	103	94
Extracted ISTD ¹⁸ O ₂ PFHxS	%	97	103	97	98	92
Extracted ISTD ¹³ C ₄ PFOS	%	100	105	98	111	99

PFAS in Soils Extended						
Our Reference		247495-1	247495-3	247495-4	247495-7	247495-8
Your Reference	UNITS	BH101	BH102	BH102	BH103	BH103
Depth		0.23-0.55	surface	0.3-0.6	surface	0.2-0.35
Date Sampled		16/07/2020	16/07/2020	20/07/2020	20/07/2020	20/07/2020
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Extracted ISTD ¹³ C ₄ PFBA	%	95	101	98	91	94
Extracted ISTD ¹³ C ₃ PFPeA	%	97	104	101	102	95
Extracted ISTD ¹³ C ₂ PFHxA	%	96	103	101	86	92
Extracted ISTD ¹³ C ₄ PFHpA	%	100	113	115	96	100
Extracted ISTD ¹³ C ₄ PFOA	%	100	109	119	114	100
Extracted ISTD ¹³ C ₅ PFNA	%	98	112	117	122	104
Extracted ISTD ¹³ C ₂ PFDA	%	101	122	121	130	106
Extracted ISTD ¹³ C ₂ PFUnDA	%	103	128	120	138	110
Extracted ISTD ¹³ C ₂ PFDoDA	%	102	119	126	134	101
Extracted ISTD ¹³ C ₂ PFTeDA	%	70	73	111	81	61
Extracted ISTD ¹³ C ₂ 4:2FTS	%	97	111	135	77	97
Extracted ISTD ¹³ C ₂ 6:2FTS	%	101	126	168	156	104
Extracted ISTD ¹³ C ₂ 8:2FTS	%	95	133	165	#	111
Extracted ISTD ¹³ C ₈ FOSA	%	97	108	107	111	97
Extracted ISTD d ₃ N MeFOSA	%	88	98	95	107	88
Extracted ISTD d ₅ N EtFOSA	%	86	97	97	109	86
Extracted ISTD d ₇ N MeFOSE	%	96	109	91	95	93
Extracted ISTD d ₉ N EtFOSE	%	92	100	99	98	90
Extracted ISTD d ₃ N MeFOSAA	%	99	124	138	147	96
Extracted ISTD d ₅ N EtFOSAA	%	96	131	141	165	99
Total Positive PFHxS & PFOS	µg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Total Positive PFOS & PFOA	µg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Total Positive PFAS	µg/kg	<0.1	<0.1	<0.1	0.1	<0.1

PFAS in Soils Extended				
Our Reference		247495-17	247495-18	247495-24
Your Reference	UNITS	SS1	SS2	SDUP5
Depth		surface	surface	-
Date Sampled		16/07/2020	16/07/2020	16/07/2020
Type of sample		SOIL	SOIL	SOIL
Date prepared	-	24/07/2020	24/07/2020	24/07/2020
Date analysed	-	24/07/2020	24/07/2020	24/07/2020
Perfluorobutanesulfonic acid	µg/kg	<0.1	<0.1	<0.1
Perfluoropentanesulfonic acid	µg/kg	<0.1	<0.1	<0.1
Perfluorohexanesulfonic acid - PFHxS	µg/kg	<0.1	<0.1	<0.1
Perfluoroheptanesulfonic acid	µg/kg	<0.1	<0.1	<0.1
Perfluorooctanesulfonic acid PFOS	µg/kg	0.7	0.5	0.5
Perfluorodecanesulfonic acid	µg/kg	<0.2	<0.2	<0.2
Perfluorobutanoic acid	µg/kg	<0.2	<0.2	<0.2
Perfluoropentanoic acid	µg/kg	<0.2	<0.2	<0.2
Perfluorohexanoic acid	µg/kg	<0.1	<0.1	<0.1
Perfluoroheptanoic acid	µg/kg	<0.1	<0.1	<0.1
Perfluorooctanoic acid PFOA	µg/kg	<0.1	<0.1	<0.1
Perfluorononanoic acid	µg/kg	<0.1	<0.1	<0.1
Perfluorodecanoic acid	µg/kg	<0.5	0.5	<0.5
Perfluoroundecanoic acid	µg/kg	<0.5	<0.5	<0.5
Perfluorododecanoic acid	µg/kg	<0.5	1	<0.5
Perfluorotridecanoic acid	µg/kg	<0.5	<0.5	<0.5
Perfluorotetradecanoic acid	µg/kg	<5	<5	<5
4:2 FTS	µg/kg	<0.1	<0.1	<0.1
6:2 FTS	µg/kg	<0.1	<0.1	<0.1
8:2 FTS	µg/kg	<0.2	<0.2	<0.2
10:2 FTS	µg/kg	<0.2	<0.2	<0.2
Perfluorooctane sulfonamide	µg/kg	<1	<1	<1
N-Methyl perfluorooctane sulfonamide	µg/kg	<1	<1	<1
N-Ethyl perfluorooctanesulfonamide	µg/kg	<1	<1	<1
N-Me perfluorooctanesulfonamid oethanol	µg/kg	<1	<1	<1
N-Et perfluorooctanesulfonamid oethanol	µg/kg	<5	<5	<5
MePerfluorooctanesulf- amid oacetic acid	µg/kg	<0.2	2	<0.2
EtPerfluorooctanesulf amid oacetic acid	µg/kg	<0.2	0.3	<0.2
Surrogate ¹³ C ₈ PFOS	%	100	98	96
Surrogate ¹³ C ₂ PFOA	%	100	88	90
Extracted ISTD ¹³ C ₃ PFBS	%	101	99	103
Extracted ISTD ¹⁸ O ₂ PFHxS	%	103	91	102
Extracted ISTD ¹³ C ₄ PFOS	%	103	87	118

PFAS in Soils Extended				
Our Reference		247495-17	247495-18	247495-24
Your Reference	UNITS	SS1	SS2	SDUP5
Depth		surface	surface	-
Date Sampled		16/07/2020	16/07/2020	16/07/2020
Type of sample		SOIL	SOIL	SOIL
Extracted ISTD ¹³ C ₄ PFBA	%	99	97	100
Extracted ISTD ¹³ C ₃ PFPeA	%	104	101	101
Extracted ISTD ¹³ C ₂ PFHxA	%	104	91	105
Extracted ISTD ¹³ C ₄ PFHpA	%	120	97	122
Extracted ISTD ¹³ C ₄ PFOA	%	127	90	138
Extracted ISTD ¹³ C ₅ PFNA	%	137	85	140
Extracted ISTD ¹³ C ₂ PFDA	%	140	65	130
Extracted ISTD ¹³ C ₂ PFUnDA	%	149	39	145
Extracted ISTD ¹³ C ₂ PFDoDA	%	136	46	127
Extracted ISTD ¹³ C ₂ PFTeDA	%	79	#	64
Extracted ISTD ¹³ C ₂ 4:2FTS	%	153	179	173
Extracted ISTD ¹³ C ₂ 6:2FTS	%	#	#	#
Extracted ISTD ¹³ C ₂ 8:2FTS	%	#	#	#
Extracted ISTD ¹³ C ₈ FOSA	%	116	41	106
Extracted ISTD d ₃ N MeFOSA	%	92	26	75
Extracted ISTD d ₅ N EtFOSA	%	90	37	73
Extracted ISTD d ₇ N MeFOSE	%	87	25	75
Extracted ISTD d ₉ N EtFOSE	%	93	46	94
Extracted ISTD d ₃ N MeFOSAA	%	#	33	#
Extracted ISTD d ₅ N EtFOSAA	%	#	29	#
Total Positive PFHxS & PFOS	µg/kg	0.7	0.5	0.5
Total Positive PFOS & PFOA	µg/kg	0.7	0.5	0.5
Total Positive PFAS	µg/kg	0.7	4.4	0.5

Asbestos ID - Swab			
Our Reference	UNITS	247495-19	247495-20
Your Reference		SWAB1	SWAB2
Depth		surface	surface
Date Sampled		16/07/2020	16/07/2020
Type of sample		SWAB	SWAB
Date analysed	-	24/07/2020	24/07/2020
Mass / Dimension of Sample	-	160x130x5mm	150x140x5mm
Sample Description	-	Debris on swab	Debris on swab
Asbestos ID on Swab	-	No asbestos detected	No asbestos detected
		Organic fibres detected	Organic fibres detected
		Synthetic mineral fibres detected	

PFAS in Waters Extended		
Our Reference		247495-27
Your Reference	UNITS	FR1-SPT
Depth		-
Date Sampled		16/07/2020
Type of sample		WATER
Date prepared	-	23/07/2020
Date analysed	-	23/07/2020
Perfluorobutanesulfonic acid	µg/L	<0.01
Perfluoropentanesulfonic acid	µg/L	<0.01
Perfluorohexanesulfonic acid - PFHxS	µg/L	<0.01
Perfluoroheptanesulfonic acid	µg/L	<0.01
Perfluorooctanesulfonic acid PFOS	µg/L	<0.01
Perfluorodecanesulfonic acid	µg/L	<0.02
Perfluorobutanoic acid	µg/L	<0.02
Perfluoropentanoic acid	µg/L	<0.02
Perfluorohexanoic acid	µg/L	<0.01
Perfluoroheptanoic acid	µg/L	<0.01
Perfluorooctanoic acid PFOA	µg/L	<0.01
Perfluorononanoic acid	µg/L	<0.01
Perfluorodecanoic acid	µg/L	<0.02
Perfluoroundecanoic acid	µg/L	<0.02
Perfluorododecanoic acid	µg/L	<0.05
Perfluorotridecanoic acid	µg/L	<0.1
Perfluorotetradecanoic acid	µg/L	<0.5
4:2 FTS	µg/L	<0.01
6:2 FTS	µg/L	<0.01
8:2 FTS	µg/L	<0.02
10:2 FTS	µg/L	<0.02
Perfluorooctane sulfonamide	µg/L	<0.1
N-Methyl perfluorooctane sulfonamide	µg/L	<0.05
N-Ethyl perfluorooctanesulfonamide	µg/L	<0.1
N-Me perfluorooctanesulfonamid oethanol	µg/L	<0.05
N-Et perfluorooctanesulfonamid oethanol	µg/L	<0.5
MePerfluorooctanesulf- amid oacetic acid	µg/L	<0.02
EtPerfluorooctanesulf- amid oacetic acid	µg/L	<0.02
Surrogate ¹³ C ₈ PFOS	%	97
Surrogate ¹³ C ₂ PFOA	%	103
Extracted ISTD ¹³ C ₃ PFBS	%	100
Extracted ISTD ¹⁸ O ₂ PFHxS	%	103
Extracted ISTD ¹³ C ₄ PFOS	%	107

PFAS in Waters Extended		
Our Reference		247495-27
Your Reference	UNITS	FR1-SPT
Depth		-
Date Sampled		16/07/2020
Type of sample		WATER
Extracted ISTD ¹³ C ₄ PFBA	%	98
Extracted ISTD ¹³ C ₃ PFPeA	%	98
Extracted ISTD ¹³ C ₂ PFHxA	%	97
Extracted ISTD ¹³ C ₄ PFHpA	%	108
Extracted ISTD ¹³ C ₄ PFOA	%	97
Extracted ISTD ¹³ C ₅ PFNA	%	100
Extracted ISTD ¹³ C ₂ PFDA	%	103
Extracted ISTD ¹³ C ₂ PFUnDA	%	91
Extracted ISTD ¹³ C ₂ PFDoDA	%	95
Extracted ISTD ¹³ C ₂ PFTeDA	%	92
Extracted ISTD ¹³ C ₂ 4:2FTS	%	88
Extracted ISTD ¹³ C ₂ 6:2FTS	%	94
Extracted ISTD ¹³ C ₂ 8:2FTS	%	101
Extracted ISTD ¹³ C ₈ FOSA	%	98
Extracted ISTD d ₃ N MeFOSA	%	86
Extracted ISTD d ₅ N EtFOSA	%	79
Extracted ISTD d ₇ N MeFOSE	%	90
Extracted ISTD d ₉ N EtFOSE	%	88
Extracted ISTD d ₃ N MeFOSAA	%	98
Extracted ISTD d ₅ N EtFOSAA	%	98
Total Positive PFHxS & PFOS	µg/L	<0.01
Total Positive PFOA & PFOS	µg/L	<0.01
Total Positive PFAS	µg/L	<0.01

vTRH(C6-C10)/BTEXN in Water		
Our Reference		247495-27
Your Reference	UNITS	FR1-SPT
Depth		-
Date Sampled		16/07/2020
Type of sample		WATER
Date extracted	-	24/07/2020
Date analysed	-	24/07/2020
TRH C ₆ - C ₉	µg/L	<10
TRH C ₆ - C ₁₀	µg/L	<10
TRH C ₆ - C ₁₀ less BTEX (F1)	µg/L	<10
Benzene	µg/L	<1
Toluene	µg/L	<1
Ethylbenzene	µg/L	<1
m+p-xylene	µg/L	<2
o-xylene	µg/L	<1
Naphthalene	µg/L	<1
Surrogate Dibromofluoromethane	%	129
Surrogate toluene-d8	%	95
Surrogate 4-BFB	%	82

svTRH (C10-C40) in Water		
Our Reference		247495-27
Your Reference	UNITS	FR1-SPT
Depth		-
Date Sampled		16/07/2020
Type of sample		WATER
Date extracted	-	24/07/2020
Date analysed	-	25/07/2020
TRH C ₁₀ - C ₁₄	µg/L	<50
TRH C ₁₅ - C ₂₈	µg/L	<100
TRH C ₂₉ - C ₃₆	µg/L	<100
TRH >C ₁₀ - C ₁₆	µg/L	<50
TRH >C ₁₀ - C ₁₆ less Naphthalene (F2)	µg/L	<50
TRH >C ₁₆ - C ₃₄	µg/L	<100
TRH >C ₃₄ - C ₄₀	µg/L	<100
Surrogate o-Terphenyl	%	94

PAHs in Water		
Our Reference		247495-27
Your Reference	UNITS	FR1-SPT
Depth		-
Date Sampled		16/07/2020
Type of sample		WATER
Date extracted	-	24/07/2020
Date analysed	-	24/07/2020
Naphthalene	µg/L	<1
Acenaphthylene	µg/L	<1
Acenaphthene	µg/L	<1
Fluorene	µg/L	<1
Phenanthrene	µg/L	<1
Anthracene	µg/L	<1
Fluoranthene	µg/L	<1
Pyrene	µg/L	<1
Benzo(a)anthracene	µg/L	<1
Chrysene	µg/L	<1
Benzo(b,j+k)fluoranthene	µg/L	<2
Benzo(a)pyrene	µg/L	<1
Indeno(1,2,3-c,d)pyrene	µg/L	<1
Dibenzo(a,h)anthracene	µg/L	<1
Benzo(g,h,i)perylene	µg/L	<1
Benzo(a)pyrene TEQ	µg/L	<5
Total +ve PAH's	µg/L	NIL (+)VE
Surrogate <i>p</i> -Terphenyl-d14	%	76

Metals in Water - Dissolved		
Our Reference		247495-27
Your Reference	UNITS	FR1-SPT
Depth		-
Date Sampled		16/07/2020
Type of sample		WATER
Date digested	-	24/07/2020
Date analysed	-	24/07/2020
Arsenic - Dissolved	mg/L	<0.05
Cadmium - Dissolved	mg/L	<0.01
Chromium - Dissolved	mg/L	<0.01
Copper - Dissolved	mg/L	<0.01
Lead - Dissolved	mg/L	<0.03
Mercury - Dissolved	mg/L	<0.0005
Nickel - Dissolved	mg/L	<0.02
Zinc - Dissolved	mg/L	<0.02

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.
ASB-001	Asbestos ID - Identification of asbestos in soil samples using Polarised Light Microscopy and Dispersion Staining Techniques. Minimum 500mL soil sample was analysed as recommended by "National Environment Protection (Assessment of site contamination) Measure, Schedule B1 and "The Guidelines from the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia - May 2009" with a reporting limit of 0.1g/kg (0.01% w/w) as per Australian Standard AS4964-2004. Results reported denoted with * are outside our scope of NATA accreditation. NOTE #1 Total Asbestos g/kg was analysed and reported as per Australian Standard AS4964 (This is the sum of ACM >7mm, <7mm and FA/AF) NOTE #2 The screening level of 0.001% w/w asbestos in soil for FA and AF only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres. Estimation = Estimated asbestos weight Results reported with "--" is equivalent to no visible asbestos identified using Polarised Light microscopy and Dispersion Staining Techniques.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-020	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-020	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-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.

Method ID	Methodology Summary
Org-021	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-022	Determination of VOCs sampled onto coconut shell charcoal sorbent tubes, that can be desorbed using carbon disulphide, and analysed by GC-MS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. 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-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-022/025	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-023	Water samples are analysed directly by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	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)-BTX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	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)-BTX 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.

Method ID	Methodology Summary
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.3 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			24/07/2020	1	24/07/2020	24/07/2020		24/07/2020	[NT]
Date analysed	-			25/07/2020	1	25/07/2020	25/07/2020		25/07/2020	[NT]
TRH C ₆ - C ₉	mg/kg	25	Org-023	<25	1	<25	<25	0	79	[NT]
TRH C ₆ - C ₁₀	mg/kg	25	Org-023	<25	1	<25	<25	0	79	[NT]
Benzene	mg/kg	0.2	Org-023	<0.2	1	<0.2	<0.2	0	72	[NT]
Toluene	mg/kg	0.5	Org-023	<0.5	1	<0.5	<0.5	0	83	[NT]
Ethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	86	[NT]
m+p-xylene	mg/kg	2	Org-023	<2	1	<2	<2	0	78	[NT]
o-Xylene	mg/kg	1	Org-023	<1	1	<1	<1	0	74	[NT]
naphthalene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	128	1	116	126	8	118	[NT]

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]	22	24/07/2020	24/07/2020		[NT]	[NT]
Date analysed	-			[NT]	22	25/07/2020	25/07/2020		[NT]	[NT]
TRH C ₆ - C ₉	mg/kg	25	Org-023	[NT]	22	<25	<25	0	[NT]	[NT]
TRH C ₆ - C ₁₀	mg/kg	25	Org-023	[NT]	22	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	22	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	22	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	22	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	22	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	22	<1	<1	0	[NT]	[NT]
naphthalene	mg/kg	1	Org-023	[NT]	22	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	22	124	128	3	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-3	[NT]
Date extracted	-			24/07/2020	1	24/07/2020	24/07/2020		24/07/2020	[NT]
Date analysed	-			27/07/2020	1	27/07/2020	27/07/2020		27/07/2020	[NT]
TRH C ₁₀ - C ₁₄	mg/kg	50	Org-020	<50	1	<50	<50	0	115	[NT]
TRH C ₁₅ - C ₂₈	mg/kg	100	Org-020	<100	1	<100	<100	0	93	[NT]
TRH C ₂₉ - C ₃₆	mg/kg	100	Org-020	<100	1	<100	<100	0	92	[NT]
TRH >C ₁₀ -C ₁₆	mg/kg	50	Org-020	<50	1	<50	<50	0	115	[NT]
TRH >C ₁₆ -C ₃₄	mg/kg	100	Org-020	<100	1	<100	<100	0	93	[NT]
TRH >C ₃₄ -C ₄₀	mg/kg	100	Org-020	<100	1	<100	<100	0	92	[NT]
Surrogate o-Terphenyl	%		Org-020	93	1	97	115	17	89	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	22	24/07/2020	24/07/2020		[NT]	[NT]
Date analysed	-			[NT]	22	27/07/2020	27/07/2020		[NT]	[NT]
TRH C ₁₀ - C ₁₄	mg/kg	50	Org-020	[NT]	22	300	190	45	[NT]	[NT]
TRH C ₁₅ - C ₂₈	mg/kg	100	Org-020	[NT]	22	810	500	47	[NT]	[NT]
TRH C ₂₉ - C ₃₆	mg/kg	100	Org-020	[NT]	22	<100	<100	0	[NT]	[NT]
TRH >C ₁₀ -C ₁₆	mg/kg	50	Org-020	[NT]	22	620	380	48	[NT]	[NT]
TRH >C ₁₆ -C ₃₄	mg/kg	100	Org-020	[NT]	22	520	340	42	[NT]	[NT]
TRH >C ₃₄ -C ₄₀	mg/kg	100	Org-020	[NT]	22	<100	<100	0	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-020	[NT]	22	#	#		[NT]	[NT]

QUALITY CONTROL: PAHs in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			24/07/2020	1	24/07/2020	24/07/2020		24/07/2020	[NT]
Date analysed	-			24/07/2020	1	24/07/2020	24/07/2020		24/07/2020	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	96	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	94	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	96	[NT]
Anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	94	[NT]
Pyrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	100	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	84	[NT]
Benzo(b,j,k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	1	<0.05	<0.05	0	112	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	104	1	99	98	1	102	[NT]

QUALITY CONTROL: PAHs in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	22	24/07/2020	24/07/2020		[NT]	[NT]
Date analysed	-			[NT]	22	24/07/2020	24/07/2020		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	22	0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	22	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	22	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-022/025	[NT]	22	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	22	<0.1	<0.1	0	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-022/025	[NT]	22	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	22	<0.1	<0.1	0	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-022/025	[NT]	22	<0.1	<0.1	0	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	22	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	22	<0.1	<0.1	0	[NT]	[NT]
Benzo(b,j,k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	22	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	22	<0.05	<0.05	0	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	22	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	22	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	22	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	22	101	96	5	[NT]	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			24/07/2020	1	24/07/2020	24/07/2020		24/07/2020	[NT]
Date analysed	-			24/07/2020	1	24/07/2020	24/07/2020		24/07/2020	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	96	[NT]
HCB	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	94	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	70	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	114	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	110	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	116	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	98	[NT]
Endrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	88	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	98	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	70	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	120	1	115	118	3	114	[NT]

QUALITY CONTROL: Organophosphorus Pesticides in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			24/07/2020	1	24/07/2020	24/07/2020		24/07/2020	[NT]
Date analysed	-			24/07/2020	1	24/07/2020	24/07/2020		24/07/2020	[NT]
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	128	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chlorpyrifos-methyl	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	120	[NT]
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	106	[NT]
Malathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	109	[NT]
Chlorpyrifos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	118	[NT]
Parathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	128	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-022	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	130	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	120	1	115	118	3	114	[NT]

QUALITY CONTROL: PCBs in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			24/07/2020	1	24/07/2020	24/07/2020		24/07/2020	[NT]
Date analysed	-			24/07/2020	1	24/07/2020	24/07/2020		24/07/2020	[NT]
Aroclor 1016	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	106	[NT]
Aroclor 1260	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	120	1	115	118	3	114	[NT]

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			24/07/2020	1	24/07/2020	24/07/2020		24/07/2020	[NT]
Date analysed	-			24/07/2020	1	24/07/2020	24/07/2020		24/07/2020	[NT]
Arsenic	mg/kg	4	Metals-020	<4	1	<4	<4	0	103	[NT]
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	95	[NT]
Chromium	mg/kg	1	Metals-020	<1	1	8	8	0	99	[NT]
Copper	mg/kg	1	Metals-020	<1	1	2	<1	67	105	[NT]
Lead	mg/kg	1	Metals-020	<1	1	5	5	0	100	[NT]
Mercury	mg/kg	0.1	Metals-021	<0.1	1	<0.1	<0.1	0	94	[NT]
Nickel	mg/kg	1	Metals-020	<1	1	<1	<1	0	102	[NT]
Zinc	mg/kg	1	Metals-020	<1	1	1	1	0	98	[NT]

QUALITY CONTROL: PFAS in Soils Extended					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	247495-3
Date prepared	-			24/07/2020	1	24/07/2020	24/07/2020		24/07/2020	24/07/2020
Date analysed	-			24/07/2020	1	24/07/2020	24/07/2020		24/07/2020	24/07/2020
Perfluorobutanesulfonic acid	µg/kg	0.1	Org-029	<0.1	1	<0.1	<0.1	0	97	95
Perfluoropentanesulfonic acid	µg/kg	0.1	Org-029	<0.1	1	<0.1	<0.1	0	102	97
Perfluorohexanesulfonic acid - PFHxS	µg/kg	0.1	Org-029	<0.1	1	<0.1	<0.1	0	102	98
Perfluoroheptanesulfonic acid	µg/kg	0.1	Org-029	<0.1	1	<0.1	<0.1	0	99	100
Perfluorooctanesulfonic acid PFOS	µg/kg	0.1	Org-029	<0.1	1	<0.1	<0.1	0	98	95
Perfluorodecanesulfonic acid	µg/kg	0.2	Org-029	<0.2	1	<0.2	<0.2	0	95	98
Perfluorobutanoic acid	µg/kg	0.2	Org-029	<0.2	1	<0.2	<0.2	0	100	98
Perfluoropentanoic acid	µg/kg	0.2	Org-029	<0.2	1	<0.2	<0.2	0	97	95
Perfluorohexanoic acid	µg/kg	0.1	Org-029	<0.1	1	<0.1	<0.1	0	103	100
Perfluoroheptanoic acid	µg/kg	0.1	Org-029	<0.1	1	<0.1	<0.1	0	97	95
Perfluorooctanoic acid PFOA	µg/kg	0.1	Org-029	<0.1	1	<0.1	<0.1	0	96	98
Perfluorononanoic acid	µg/kg	0.1	Org-029	<0.1	1	<0.1	<0.1	0	101	98
Perfluorodecanoic acid	µg/kg	0.5	Org-029	<0.5	1	<0.5	<0.5	0	96	95
Perfluoroundecanoic acid	µg/kg	0.5	Org-029	<0.5	1	<0.5	<0.5	0	107	95
Perfluorododecanoic acid	µg/kg	0.5	Org-029	<0.5	1	<0.5	<0.5	0	109	104
Perfluorotridecanoic acid	µg/kg	0.5	Org-029	<0.5	1	<0.5	<0.5	0	128	142
Perfluorotetradecanoic acid	µg/kg	5	Org-029	<5	1	<5	<5	0	101	99
4:2 FTS	µg/kg	0.1	Org-029	<0.1	1	<0.1	<0.1	0	103	101
6:2 FTS	µg/kg	0.1	Org-029	<0.1	1	<0.1	<0.1	0	94	101
8:2 FTS	µg/kg	0.2	Org-029	<0.2	1	<0.2	<0.2	0	101	93
10:2 FTS	µg/kg	0.2	Org-029	<0.2	1	<0.2	<0.2	0	113	101
Perfluorooctane sulfonamide	µg/kg	1	Org-029	<1	1	<1	<1	0	104	99
N-Methyl perfluorooctane sulfonamide	µg/kg	1	Org-029	<1	1	<1	<1	0	106	95
N-Ethyl perfluorooctanesulfonamide	µg/kg	1	Org-029	<1	1	<1	<1	0	102	88
N-Me perfluorooctanesulfonamidethanol	µg/kg	1	Org-029	<1	1	<1	<1	0	100	108
N-Et perfluorooctanesulfonamidethanol	µg/kg	5	Org-029	<5	1	<5	<5	0	108	108
MePerfluorooctanesulfonamidacetic acid	µg/kg	0.2	Org-029	<0.2	1	<0.2	<0.2	0	102	101
EtPerfluorooctanesulfonamidacetic acid	µg/kg	0.2	Org-029	<0.2	1	<0.2	<0.2	0	104	99
Surrogate ¹³ C ₈ PFOS	%		Org-029	95	1	93	94	1	97	95
Surrogate ¹³ C ₂ PFOA	%		Org-029	103	1	97	102	5	99	98

QUALITY CONTROL: PFAS in Soils Extended					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	247495-3
Extracted ISTD ¹³ C ₃ PFBS	%		Org-029	100	1	98	93	5	102	93
Extracted ISTD ¹⁸ O ₂ PFHxS	%		Org-029	100	1	97	92	5	100	94
Extracted ISTD ¹³ C ₄ PFOS	%		Org-029	108	1	100	98	2	107	101
Extracted ISTD ¹³ C ₄ PFBA	%		Org-029	103	1	95	93	2	102	88
Extracted ISTD ¹³ C ₃ PFPeA	%		Org-029	103	1	97	95	2	102	93
Extracted ISTD ¹³ C ₂ PFHxA	%		Org-029	103	1	96	93	3	100	95
Extracted ISTD ¹³ C ₄ PFHpA	%		Org-029	109	1	100	100	0	105	107
Extracted ISTD ¹³ C ₄ PFOA	%		Org-029	106	1	100	97	3	107	116
Extracted ISTD ¹³ C ₅ PFNA	%		Org-029	114	1	98	99	1	107	119
Extracted ISTD ¹³ C ₂ PFDA	%		Org-029	114	1	101	104	3	109	127
Extracted ISTD ¹³ C ₂ PFUnDA	%		Org-029	121	1	103	93	10	108	142
Extracted ISTD ¹³ C ₂ PFDoDA	%		Org-029	112	1	102	99	3	98	124
Extracted ISTD ¹³ C ₂ PFTeDA	%		Org-029	72	1	70	66	6	74	69
Extracted ISTD ¹³ C ₂ 4:2FTS	%		Org-029	98	1	97	92	5	101	135
Extracted ISTD ¹³ C ₂ 6:2FTS	%		Org-029	117	1	101	93	8	108	144
Extracted ISTD ¹³ C ₂ 8:2FTS	%		Org-029	106	1	95	101	6	107	#
Extracted ISTD ¹³ C ₈ FOSA	%		Org-029	104	1	97	91	6	101	106
Extracted ISTD d ₃ N MeFOSA	%		Org-029	97	1	88	82	7	97	98
Extracted ISTD d ₅ N EtFOSA	%		Org-029	92	1	86	80	7	90	102
Extracted ISTD d ₇ N MeFOSE	%		Org-029	100	1	96	92	4	102	116

QUALITY CONTROL: PFAS in Soils Extended					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	247495-3
Extracted ISTD d ₉ N EtFOSE	%		Org-029	95	1	92	88	4	98	103
Extracted ISTD d ₃ N MeFOSAA	%		Org-029	104	1	99	81	20	104	138
Extracted ISTD d ₅ N EtFOSAA	%		Org-029	103	1	96	107	11	103	177

QUALITY CONTROL: PFAS in Waters Extended						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			23/07/2020	[NT]	[NT]	[NT]	[NT]	23/07/2020	[NT]
Date analysed	-			23/07/2020	[NT]	[NT]	[NT]	[NT]	23/07/2020	[NT]
Perfluorobutanesulfonic acid	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	95	[NT]
Perfluoropentanesulfonic acid	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	101	[NT]
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	98	[NT]
Perfluoroheptanesulfonic acid	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	99	[NT]
Perfluorooctanesulfonic acid PFOS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	94	[NT]
Perfluorodecanesulfonic acid	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	96	[NT]
Perfluorobutanoic acid	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	94	[NT]
Perfluoropentanoic acid	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	95	[NT]
Perfluorohexanoic acid	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	99	[NT]
Perfluoroheptanoic acid	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	98	[NT]
Perfluorooctanoic acid PFOA	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	96	[NT]
Perfluorononanoic acid	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	96	[NT]
Perfluorodecanoic acid	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	107	[NT]
Perfluoroundecanoic acid	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	93	[NT]
Perfluorododecanoic acid	µg/L	0.05	Org-029	<0.05	[NT]	[NT]	[NT]	[NT]	96	[NT]
Perfluorotridecanoic acid	µg/L	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Perfluorotetradecanoic acid	µg/L	0.5	Org-029	<0.5	[NT]	[NT]	[NT]	[NT]	97	[NT]
4:2 FTS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	92	[NT]
6:2 FTS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	101	[NT]
8:2 FTS	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	91	[NT]
10:2 FTS	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	116	[NT]
Perfluorooctane sulfonamide	µg/L	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	103	[NT]
N-Methyl perfluorooctane sulfonamide	µg/L	0.05	Org-029	<0.05	[NT]	[NT]	[NT]	[NT]	98	[NT]
N-Ethyl perfluorooctanesulfonamide	µg/L	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]
N-Me perfluorooctanesulfonamidethanol	µg/L	0.05	Org-029	<0.05	[NT]	[NT]	[NT]	[NT]	96	[NT]
N-Et perfluorooctanesulfonamidethanol	µg/L	0.5	Org-029	<0.5	[NT]	[NT]	[NT]	[NT]	107	[NT]
MePerfluorooctanesulfonamidacetic acid	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	98	[NT]
EtPerfluorooctanesulfonamidacetic acid	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	96	[NT]
Surrogate ¹³ C ₈ PFOS	%		Org-029	101	[NT]	[NT]	[NT]	[NT]	99	[NT]
Surrogate ¹³ C ₂ PFOA	%		Org-029	99	[NT]	[NT]	[NT]	[NT]	99	[NT]

QUALITY CONTROL: PFAS in Waters Extended					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Extracted ISTD ¹³ C ₃ PFBS	%		Org-029	100	[NT]	[NT]	[NT]	[NT]	104	[NT]
Extracted ISTD ¹⁸ O ₂ PFHxS	%		Org-029	99	[NT]	[NT]	[NT]	[NT]	100	[NT]
Extracted ISTD ¹³ C ₄ PFOS	%		Org-029	106	[NT]	[NT]	[NT]	[NT]	111	[NT]
Extracted ISTD ¹³ C ₄ PFBA	%		Org-029	96	[NT]	[NT]	[NT]	[NT]	98	[NT]
Extracted ISTD ¹³ C ₃ PFPeA	%		Org-029	98	[NT]	[NT]	[NT]	[NT]	97	[NT]
Extracted ISTD ¹³ C ₂ PFHxA	%		Org-029	94	[NT]	[NT]	[NT]	[NT]	97	[NT]
Extracted ISTD ¹³ C ₄ PFHpA	%		Org-029	98	[NT]	[NT]	[NT]	[NT]	97	[NT]
Extracted ISTD ¹³ C ₄ PFOA	%		Org-029	97	[NT]	[NT]	[NT]	[NT]	98	[NT]
Extracted ISTD ¹³ C ₅ PFNA	%		Org-029	104	[NT]	[NT]	[NT]	[NT]	104	[NT]
Extracted ISTD ¹³ C ₂ PFDA	%		Org-029	98	[NT]	[NT]	[NT]	[NT]	99	[NT]
Extracted ISTD ¹³ C ₂ PFUnDA	%		Org-029	96	[NT]	[NT]	[NT]	[NT]	104	[NT]
Extracted ISTD ¹³ C ₂ PFDoDA	%		Org-029	101	[NT]	[NT]	[NT]	[NT]	107	[NT]
Extracted ISTD ¹³ C ₂ PFTeDA	%		Org-029	106	[NT]	[NT]	[NT]	[NT]	102	[NT]
Extracted ISTD ¹³ C ₂ 4:2FTS	%		Org-029	91	[NT]	[NT]	[NT]	[NT]	88	[NT]
Extracted ISTD ¹³ C ₂ 6:2FTS	%		Org-029	88	[NT]	[NT]	[NT]	[NT]	86	[NT]
Extracted ISTD ¹³ C ₂ 8:2FTS	%		Org-029	103	[NT]	[NT]	[NT]	[NT]	105	[NT]
Extracted ISTD ¹³ C ₈ FOSA	%		Org-029	101	[NT]	[NT]	[NT]	[NT]	99	[NT]
Extracted ISTD d ₃ N MeFOSA	%		Org-029	99	[NT]	[NT]	[NT]	[NT]	96	[NT]
Extracted ISTD d ₅ N EtFOSA	%		Org-029	100	[NT]	[NT]	[NT]	[NT]	88	[NT]
Extracted ISTD d ₇ N MeFOSE	%		Org-029	93	[NT]	[NT]	[NT]	[NT]	95	[NT]

QUALITY CONTROL: PFAS in Waters Extended						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Extracted ISTD d ₉ N EtFOSE	%		Org-029	98	[NT]	[NT]	[NT]	[NT]	94	[NT]
Extracted ISTD d ₃ N MeFOSAA	%		Org-029	95	[NT]	[NT]	[NT]	[NT]	99	[NT]
Extracted ISTD d ₅ N EtFOSAA	%		Org-029	94	[NT]	[NT]	[NT]	[NT]	99	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			24/07/2020	[NT]	[NT]	[NT]	[NT]	24/07/2020	[NT]
Date analysed	-			24/07/2020	[NT]	[NT]	[NT]	[NT]	24/07/2020	[NT]
TRH C ₆ - C ₉	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	100	[NT]
TRH C ₆ - C ₁₀	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	100	[NT]
Benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Toluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	94	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	103	[NT]
m+p-xylene	µg/L	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	104	[NT]
o-xylene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	103	[NT]
Naphthalene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	112	[NT]	[NT]	[NT]	[NT]	97	[NT]
Surrogate toluene-d8	%		Org-023	96	[NT]	[NT]	[NT]	[NT]	98	[NT]
Surrogate 4-BFB	%		Org-023	88	[NT]	[NT]	[NT]	[NT]	102	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			24/07/2020	[NT]	[NT]	[NT]	[NT]	24/07/2020	[NT]
Date analysed	-			24/07/2020	[NT]	[NT]	[NT]	[NT]	24/07/2020	[NT]
TRH C ₁₀ - C ₁₄	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	80	[NT]
TRH C ₁₅ - C ₂₈	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	81	[NT]
TRH C ₂₉ - C ₃₆	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	82	[NT]
TRH >C ₁₀ - C ₁₆	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	80	[NT]
TRH >C ₁₆ - C ₃₄	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	81	[NT]
TRH >C ₃₄ - C ₄₀	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	82	[NT]
Surrogate o-Terphenyl	%		Org-020	79	[NT]	[NT]	[NT]	[NT]	101	[NT]

QUALITY CONTROL: PAHs in Water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			24/07/2020	[NT]	[NT]	[NT]	[NT]	24/07/2020	[NT]
Date analysed	-			24/07/2020	[NT]	[NT]	[NT]	[NT]	24/07/2020	[NT]
Naphthalene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Acenaphthylene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluorene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Phenanthrene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	88	[NT]
Anthracene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	86	[NT]
Pyrene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Benzo(a)anthracene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	70	[NT]
Benzo(b,j+k)fluoranthene	µg/L	2	Org-022/025	<2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	1	Org-022/025	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	96	[NT]	[NT]	[NT]	[NT]	80	[NT]

QUALITY CONTROL: Metals in Water - Dissolved					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date digested	-			24/07/2020	[NT]	[NT]	[NT]	[NT]	24/07/2020	[NT]
Date analysed	-			24/07/2020	[NT]	[NT]	[NT]	[NT]	24/07/2020	[NT]
Arsenic - Dissolved	mg/L	0.05	Metals-020	<0.05	[NT]	[NT]	[NT]	[NT]	104	[NT]
Cadmium - Dissolved	mg/L	0.01	Metals-020	<0.01	[NT]	[NT]	[NT]	[NT]	104	[NT]
Chromium - Dissolved	mg/L	0.01	Metals-020	<0.01	[NT]	[NT]	[NT]	[NT]	98	[NT]
Copper - Dissolved	mg/L	0.01	Metals-020	<0.01	[NT]	[NT]	[NT]	[NT]	100	[NT]
Lead - Dissolved	mg/L	0.03	Metals-020	<0.03	[NT]	[NT]	[NT]	[NT]	98	[NT]
Mercury - Dissolved	mg/L	0.0005	Metals-021	<0.0005	[NT]	[NT]	[NT]	[NT]	93	[NT]
Nickel - Dissolved	mg/L	0.02	Metals-020	<0.02	[NT]	[NT]	[NT]	[NT]	98	[NT]
Zinc - Dissolved	mg/L	0.02	Metals-020	<0.02	[NT]	[NT]	[NT]	[NT]	100	[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.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

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-ID in soil: NEPM

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

Note: All samples analysed as received. However, samples 247495-4, 9, 13 are below the minimum 500mL sample volume as per National Environment Protection (Assessment of Site Contamination) Measure, Schedule B1, May 2013.

PFAS in Soil Extended - For PFAS Extracted Internal Standards denoted with # or outside the 50-150% acceptance range, the respective target analyte results may be unaffected, in other circumstances the PQL has been raised to accommodate the outlier(s).

PFAS_W_EXT1_TR: Matrix spike recovery for 247495-3 for PFTTrDA is outside global acceptance criteria (60-140%), however an acceptable recovery was obtained for the LCS.

TRH_S_NEPM:

Percent recovery for the surrogate/matrix spike is not possible to report as the high concentration of analytes in sample/s 247495-22,22d have caused interference.

SAMPLE RECEIPT ADVICE

Client Details

Client	Environmental Investigation Services
Attention	Anthony Barkway

Sample Login Details

Your reference	E32885PA, Brookvale
Envirolab Reference	247495
Date Sample Received	22/07/2020
Date Instructions Received	23/07/2020
Date Results Expected to be Reported	29/07/2020

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	25 SOIL, 2 SWAB, 1 WATER, 1 MATERIAL
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	4.6
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:

Sample ID	VTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides in Soil	PCBs in Soil	Acid Extractable metals in soil	Asbestos ID - soils NEPM - ASB-001	PFAS in Soils Extended	Asbestos ID - materials	Asbestos ID - Swab	PFAS in Waters Extended	VTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	PAHs in Water	HM in water - dissolved	On Hold
BH101-0.23-0.55	✓	✓	✓	✓	✓	✓	✓	✓	✓								
BH101-0.9-1.0	✓	✓	✓				✓										
BH102-surface									✓								
BH102-0.3-0.6	✓	✓	✓	✓	✓	✓	✓	✓	✓								
BH102-1.0-1.2	✓	✓	✓				✓										
BH102-1.9-2.0																	✓
BH103-surface									✓								
BH103-0.2-0.35									✓								
BH103-0.6-0.9	✓	✓	✓	✓	✓	✓	✓	✓									
BH103-1.2-1.4	✓	✓	✓				✓										
BH103-2.2-2.4																	✓
BH104-0.16-0.35	✓	✓	✓	✓	✓	✓	✓										
BH104-0.4-0.6	✓	✓	✓				✓	✓									
BH104-0.7-0.8																	✓
BH104-1.3-1.5																	✓
BH104-2.9-3.0																	✓
SS1-surface									✓								
SS2-surface									✓								
SWAB1-surface											✓						
SWAB2-surface											✓						
SDUP1																	✓
SDUP3	✓	✓	✓				✓										
SDUP4																	✓
SDUP5									✓								
TS-T1	✓																
TB-S1	✓																
FR1-SPT												✓	✓	✓	✓	✓	
BH101-1.6-1.7																	✓
FCF1-surface																	✓

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.

SAMPLE AND CHAIN OF CUSTODY FORM

TO: ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201 Attention: Aileen		JKE Job Number: E32885PA Date Results Required: STANDARD Page: 1/2		FROM:  JKE Environments REAR OF 115 WICKS ROAD, MACQUARIE PARK, NSW 2113 P: 02-9888 5000 F: 02-9888 5001 Attention: Anthony Barkway abarkway@jkenvironments.com.au												
Location: Brookvale		Sample Preserved in Esky on Ice														
Sampler: CR		Tests Required														
Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 3	Combo 6	Asbestos - 500ml WA	Asbestos ID	PFAS Routine Extended	HOLD				
16/07/2020	1	BH101	0.23-0.55	G, A, P1	0.8	Fill: Silty Clay		X	X		X					
16/07/2020	2	BH101	0.9-1.0	G	0.3	Silty Sand	X									
20/07/2020	3	BH102	Surface	P1	-	Concrete					X					
20/07/2020	4	BH102	0.3-0.6	G, A, P1	1.3	Fill: Silty Clayey Sand		X	X		X					
20/07/2020	5	BH102	1.0-1.2	G	6.5	Silty Sand	X									
20/07/2020	6	BH102	1.9-2.0	P1	-	Silty Sand						X				
20/07/2020	7	BH103	Surface	P1	-	Concrete					X					
20/07/2020	8	BH103	0.2-0.35	P1	-	Fill: Silty Sand					X					
20/07/2020	9	BH103	0.6-0.9	G, A, P1	2.1	Fill: Silty Sand		X	X							
20/07/2020	10	BH103	1.2-1.4	G	7.9	Clayey Sand	X									
20/07/2020	11	BH103	2.2-2.4	G, P1	0.1	Silty Sand						X				
21/07/2020	12	BH104	0.16-0.35	G	0.8	Fill: Clayey Sand		X								
21/07/2020	13	BH104	0.4-0.6	G,A	0.6	Fill: Silty Sand	X		X							
21/07/2020	14	BH104	0.7-0.8	G	3.9	Silty Sand						X				
21/07/2020	15	BH104	1.3-1.5	G	0.1	Silty Sand						X				
21/07/2020	16	BH104	2.9-3.0	G, P1	0.2	Silty Sand						X				
16/07/2020	17	SS1	Surface	P1	-	Fill: Silty Sand					X					
16/07/2020	18	SS2	Surface	P1	-	Fill: Silty Sand					X					
16/07/2020	19	Swab 1	Surface	A	-	Swab				X						
16/07/2020	20	Swab 2	Surface	A	-	Swab				X						
	21	SDUP1	-	G	1.4	Duplicate						X				
	22	SDUP2	-	G	1.7	Duplicate	X									
	23	SDUP3	-	G	2.4	Duplicate	X									
	24	SDUP4	-	G	1.4	Duplicate						X				
	25	SDUP5	-	P1	-	Duplicate					X					
Remarks (comments/detection limits required): Please send SDUP2 duplicate sample to Melbourne for inter-laboratory analysis							Sample Containers: G - 250mg Glass Jar P1 - PFAS Soil Jar A - Ziplock Asbestos Bag G1 - 200ml Amber Glass Bottle P - Plastic Bag H - HNO3 Washed PVC V- BTEX Vial P2 - PFAS Water Bottle									
Relinquished By: Anthony Barkway				Date: 22.07.2020			Time:		Received By: K. Gore			Date:				


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

Job No: 247495

Date Received: 22-07-2020

Time Received: 5:35

Received By: KA

Temp (Cool/Ambient): 4.6

Cooling: Ice/Icepack

Security: Intact/Broken/None

TO: ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201 Attention: Aileen	JKE Job Number: E32885PA Date Results Required: STANDARD Page: 2/2	FROM: JKEnvironments REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000 F: 02-9888 5001 Attention: Anthony Barkway
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247495

CERTIFICATE OF ANALYSIS 247692

Client Details

Client	Environmental Investigation Services
Attention	Anthony Barkway
Address	PO Box 976, North Ryde BC, NSW, 1670

Sample Details

Your Reference	<u>E32885PA, Brookvale</u>
Number of Samples	6 WATER
Date samples received	24/07/2020
Date completed instructions received	24/07/2020

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.

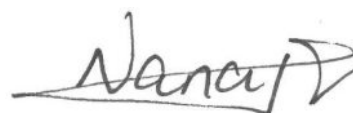
Report Details

Date results requested by	31/07/2020
Date of Issue	30/07/2020
NATA Accreditation Number 2901. This document shall not be reproduced except in full.	
Accredited for compliance with ISO/IEC 17025 - Testing. Tests not covered by NATA are denoted with *	

Results Approved By

Diego Bigolin, Team Leader, Inorganics
 Dragana Tomas, Senior Chemist
 Jaimie Loa-Kum-Cheung, Metals Supervisor
 Phalak Inthakesone, Organics Development Manager, Sydney

Authorised By



Nancy Zhang, Laboratory Manager

VOCs in water				
Our Reference		247692-1	247692-2	247692-3
Your Reference	UNITS	MW101	MW102	MW103
Date Sampled		24/07/2020	24/07/2020	24/07/2020
Type of sample		WATER	WATER	WATER
Date extracted	-	28/07/2020	28/07/2020	28/07/2020
Date analysed	-	28/07/2020	28/07/2020	28/07/2020
Dichlorodifluoromethane	µg/L	<10	<10	<10
Chloromethane	µg/L	<10	<10	<10
Vinyl Chloride	µg/L	<10	<10	<10
Bromomethane	µg/L	<10	<10	<10
Chloroethane	µg/L	<10	<10	<10
Trichlorofluoromethane	µg/L	<10	<10	<10
1,1-Dichloroethene	µg/L	<1	<1	<1
Trans-1,2-dichloroethene	µg/L	<1	<1	<1
1,1-dichloroethane	µg/L	<1	<1	<1
Cis-1,2-dichloroethene	µg/L	<1	<1	<1
Bromochloromethane	µg/L	<1	<1	<1
Chloroform	µg/L	<1	2	1
2,2-dichloropropane	µg/L	<1	<1	<1
1,2-dichloroethane	µg/L	<1	<1	<1
1,1,1-trichloroethane	µg/L	<1	<1	<1
1,1-dichloropropene	µg/L	<1	<1	<1
Cyclohexane	µg/L	<1	<1	<1
Carbon tetrachloride	µg/L	<1	<1	<1
Benzene	µg/L	<1	<1	1
Dibromomethane	µg/L	<1	<1	<1
1,2-dichloropropane	µg/L	<1	<1	<1
Trichloroethene	µg/L	<1	<1	<1
Bromodichloromethane	µg/L	<1	<1	<1
trans-1,3-dichloropropene	µg/L	<1	<1	<1
cis-1,3-dichloropropene	µg/L	<1	<1	<1
1,1,2-trichloroethane	µg/L	<1	<1	<1
Toluene	µg/L	<1	<1	<1
1,3-dichloropropane	µg/L	<1	<1	<1
Dibromochloromethane	µg/L	<1	<1	<1
1,2-dibromoethane	µg/L	<1	<1	<1
Tetrachloroethene	µg/L	<1	<1	<1
1,1,1,2-tetrachloroethane	µg/L	<1	<1	<1
Chlorobenzene	µg/L	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1

VOCs in water				
Our Reference		247692-1	247692-2	247692-3
Your Reference	UNITS	MW101	MW102	MW103
Date Sampled		24/07/2020	24/07/2020	24/07/2020
Type of sample		WATER	WATER	WATER
Bromoform	µg/L	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2
Styrene	µg/L	<1	<1	<1
1,1,2,2-tetrachloroethane	µg/L	<1	<1	<1
o-xylene	µg/L	<1	<1	<1
1,2,3-trichloropropane	µg/L	<1	<1	<1
Isopropylbenzene	µg/L	<1	<1	<1
Bromobenzene	µg/L	<1	<1	<1
n-propyl benzene	µg/L	<1	<1	<1
2-chlorotoluene	µg/L	<1	<1	<1
4-chlorotoluene	µg/L	<1	<1	<1
1,3,5-trimethyl benzene	µg/L	<1	<1	<1
Tert-butyl benzene	µg/L	<1	<1	<1
1,2,4-trimethyl benzene	µg/L	<1	<1	<1
1,3-dichlorobenzene	µg/L	<1	<1	<1
Sec-butyl benzene	µg/L	<1	<1	<1
1,4-dichlorobenzene	µg/L	<1	<1	<1
4-isopropyl toluene	µg/L	<1	<1	<1
1,2-dichlorobenzene	µg/L	<1	<1	<1
n-butyl benzene	µg/L	<1	<1	<1
1,2-dibromo-3-chloropropane	µg/L	<1	<1	<1
1,2,4-trichlorobenzene	µg/L	<1	<1	<1
Hexachlorobutadiene	µg/L	<1	<1	<1
1,2,3-trichlorobenzene	µg/L	<1	<1	<1
Surrogate Dibromofluoromethane	%	124	122	129
Surrogate toluene-d8	%	105	97	100
Surrogate 4-BFB	%	92	92	98

vTRH(C6-C10)/BTEXN in Water						
Our Reference		247692-1	247692-2	247692-3	247692-4	247692-5
Your Reference	UNITS	MW101	MW102	MW103	WDUP1	TSW1
Date Sampled		24/07/2020	24/07/2020	24/07/2020	24/07/2020	24/07/2020
Type of sample		WATER	WATER	WATER	WATER	WATER
Date extracted	-	28/07/2020	28/07/2020	28/07/2020	28/07/2020	28/07/2020
Date analysed	-	28/07/2020	28/07/2020	28/07/2020	28/07/2020	28/07/2020
TRH C ₆ - C ₉	µg/L	<10	<10	<10	<10	[NA]
TRH C ₆ - C ₁₀	µg/L	<10	<10	<10	<10	[NA]
TRH C ₆ - C ₁₀ less BTEX (F1)	µg/L	<10	<10	<10	<10	[NA]
Benzene	µg/L	<1	<1	1	<1	117%
Toluene	µg/L	<1	<1	<1	<1	110%
Ethylbenzene	µg/L	<1	<1	<1	<1	102%
m+p-xylene	µg/L	<2	<2	<2	<2	105%
o-xylene	µg/L	<1	<1	<1	<1	108%
Naphthalene	µg/L	<1	<1	<1	<1	111%
Surrogate Dibromofluoromethane	%	124	122	129	122	120
Surrogate toluene-d8	%	105	97	100	99	101
Surrogate 4-BFB	%	92	92	98	102	107

vTRH(C6-C10)/BTEXN in Water		
Our Reference		247692-6
Your Reference	UNITS	TBW1
Date Sampled		24/07/2020
Type of sample		WATER
Date extracted	-	28/07/2020
Date analysed	-	28/07/2020
Benzene	µg/L	<1
Toluene	µg/L	<1
Ethylbenzene	µg/L	<1
m+p-xylene	µg/L	<2
o-xylene	µg/L	<1
Naphthalene	µg/L	<1
Surrogate Dibromofluoromethane	%	125
Surrogate toluene-d8	%	100
Surrogate 4-BFB	%	99

svTRH (C10-C40) in Water					
Our Reference		247692-1	247692-2	247692-3	247692-4
Your Reference	UNITS	MW101	MW102	MW103	WDUP1
Date Sampled		24/07/2020	24/07/2020	24/07/2020	24/07/2020
Type of sample		WATER	WATER	WATER	WATER
Date extracted	-	28/07/2020	28/07/2020	28/07/2020	28/07/2020
Date analysed	-	28/07/2020	28/07/2020	28/07/2020	28/07/2020
TRH C ₁₀ - C ₁₄	µg/L	<50	<50	<50	<50
TRH C ₁₅ - C ₂₈	µg/L	<100	<100	<100	<100
TRH C ₂₉ - C ₃₆	µg/L	<100	<100	<100	<100
TRH >C ₁₀ - C ₁₆	µg/L	<50	<50	<50	<50
TRH >C ₁₀ - C ₁₆ less Naphthalene (F2)	µg/L	<50	<50	<50	<50
TRH >C ₁₆ - C ₃₄	µg/L	<100	<100	<100	<100
TRH >C ₃₄ - C ₄₀	µg/L	<100	<100	<100	<100
Surrogate o-Terphenyl	%	98	101	94	87

PAHs in Water - Low Level					
Our Reference		247692-1	247692-2	247692-3	247692-4
Your Reference	UNITS	MW101	MW102	MW103	WDUP1
Date Sampled		24/07/2020	24/07/2020	24/07/2020	24/07/2020
Type of sample		WATER	WATER	WATER	WATER
Date extracted	-	28/07/2020	28/07/2020	28/07/2020	28/07/2020
Date analysed	-	28/07/2020	28/07/2020	28/07/2020	28/07/2020
Naphthalene	µg/L	<0.2	<0.2	0.4	<0.2
Acenaphthylene	µg/L	<0.1	<0.1	<0.1	<0.1
Acenaphthene	µg/L	<0.1	<0.1	<0.1	<0.1
Fluorene	µg/L	<0.1	<0.1	<0.1	<0.1
Phenanthrene	µg/L	<0.1	<0.1	<0.1	<0.1
Anthracene	µg/L	<0.1	<0.1	<0.1	<0.1
Fluoranthene	µg/L	<0.1	<0.1	<0.1	<0.1
Pyrene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1
Chrysene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	µg/L	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ	µg/L	<0.5	<0.5	<0.5	<0.5
Total +ve PAH's	µg/L	<0.1	<0.1	0.43	<0.1
Surrogate <i>p</i> -Terphenyl-d14	%	97	105	101	87

Total Phenolics in Water				
Our Reference		247692-1	247692-2	247692-3
Your Reference	UNITS	MW101	MW102	MW103
Date Sampled		24/07/2020	24/07/2020	24/07/2020
Type of sample		WATER	WATER	WATER
Date extracted	-	27/07/2020	27/07/2020	27/07/2020
Date analysed	-	27/07/2020	27/07/2020	27/07/2020
Total Phenolics (as Phenol)	mg/L	<0.05	<0.05	<0.05

HM in water - dissolved					
Our Reference		247692-1	247692-2	247692-3	247692-4
Your Reference	UNITS	MW101	MW102	MW103	WDUP1
Date Sampled		24/07/2020	24/07/2020	24/07/2020	24/07/2020
Type of sample		WATER	WATER	WATER	WATER
Date prepared	-	28/07/2020	28/07/2020	28/07/2020	28/07/2020
Date analysed	-	28/07/2020	28/07/2020	28/07/2020	28/07/2020
Arsenic-Dissolved	µg/L	6	<1	<1	<1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1
Copper-Dissolved	µg/L	<1	<1	<1	<1
Lead-Dissolved	µg/L	<1	<1	<1	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	<1	<1	2	<1
Zinc-Dissolved	µg/L	6	11	7	9

PFAS in Waters Trace Extended					
Our Reference		247692-1	247692-2	247692-3	247692-4
Your Reference	UNITS	MW101	MW102	MW103	WDUP1
Date Sampled		24/07/2020	24/07/2020	24/07/2020	24/07/2020
Type of sample		WATER	WATER	WATER	WATER
Date prepared	-	28/07/2020	28/07/2020	28/07/2020	28/07/2020
Date analysed	-	28/07/2020	28/07/2020	28/07/2020	28/07/2020
Perfluorobutanesulfonic acid	µg/L	0.003	0.003	0.002	0.004
Perfluoropentanesulfonic acid	µg/L	0.003	<0.001	<0.001	<0.001
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.022	0.0055	0.0042	0.0052
Perfluoroheptanesulfonic acid	µg/L	<0.001	<0.001	<0.001	<0.001
Perfluorooctanesulfonic acid PFOS	µg/L	0.010	0.0040	0.0030	0.0039
Perfluorodecanesulfonic acid	µg/L	<0.002	<0.002	<0.002	<0.002
Perfluorobutanoic acid	µg/L	0.007	0.004	0.003	0.004
Perfluoropentanoic acid	µg/L	0.007	0.002	<0.002	0.002
Perfluorohexanoic acid	µg/L	0.011	0.003	0.002	0.003
Perfluoroheptanoic acid	µg/L	0.0086	0.002	0.001	0.002
Perfluorooctanoic acid PFOA	µg/L	0.025	0.0047	0.0031	0.0051
Perfluorononanoic acid	µg/L	0.002	<0.001	<0.001	<0.001
Perfluorodecanoic acid	µg/L	<0.002	<0.002	<0.002	<0.002
Perfluoroundecanoic acid	µg/L	<0.002	<0.002	<0.002	<0.002
Perfluorododecanoic acid	µg/L	<0.005	<0.005	<0.005	<0.005
Perfluorotridecanoic acid	µg/L	<0.01	<0.01	<0.01	<0.01
Perfluorotetradecanoic acid	µg/L	<0.05	<0.05	<0.05	<0.05
4:2 FTS	µg/L	<0.001	<0.001	<0.001	<0.001
6:2 FTS	µg/L	<0.0004	<0.0004	<0.0004	<0.0004
8:2 FTS	µg/L	<0.0004	<0.0004	<0.0004	<0.0004
10:2 FTS	µg/L	<0.002	<0.002	<0.002	<0.002
Perfluorooctane sulfonamide	µg/L	<0.01	<0.01	<0.01	<0.01
N-Methyl perfluorooctane sulfonamide	µg/L	<0.005	<0.005	<0.005	<0.005
N-Ethyl perfluorooctanesulfonamide	µg/L	<0.01	<0.01	<0.01	<0.01
N-Me perfluorooctanesulfonamid oethanol	µg/L	<0.005	<0.005	<0.005	<0.005
N-Et perfluorooctanesulfonamid oethanol	µg/L	<0.05	<0.05	<0.05	<0.05
MePerfluorooctanesulf- amid oacetic acid	µg/L	<0.002	<0.002	<0.002	<0.002
EtPerfluorooctanesulf- amid oacetic acid	µg/L	<0.002	<0.002	<0.002	<0.002
Surrogate ¹³ C ₈ PFOS	%	94	101	93	96
Surrogate ¹³ C ₂ PFOA	%	79	86	89	85
Extracted ISTD ¹³ C ₃ PFBS	%	73	102	104	103
Extracted ISTD ¹⁸ O ₂ PFHxS	%	78	103	100	105
Extracted ISTD ¹³ C ₄ PFOS	%	90	96	86	99
Extracted ISTD ¹³ C ₄ PFBA	%	29	65	76	64

PFAS in Waters Trace Extended					
Our Reference		247692-1	247692-2	247692-3	247692-4
Your Reference	UNITS	MW101	MW102	MW103	WDUP1
Date Sampled		24/07/2020	24/07/2020	24/07/2020	24/07/2020
Type of sample		WATER	WATER	WATER	WATER
Extracted ISTD ¹³ C ₃ PFPeA	%	28	64	76	62
Extracted ISTD ¹³ C ₂ PFHxA	%	45	87	93	84
Extracted ISTD ¹³ C ₄ PFHpA	%	64	103	103	99
Extracted ISTD ¹³ C ₄ PFOA	%	95	121	112	120
Extracted ISTD ¹³ C ₅ PFNA	%	104	116	104	118
Extracted ISTD ¹³ C ₂ PFDA	%	80	94	81	101
Extracted ISTD ¹³ C ₂ PFUnDA	%	65	71	69	75
Extracted ISTD ¹³ C ₂ PFDoDA	%	49	59	57	53
Extracted ISTD ¹³ C ₂ PFTeDA	%	49	43	40	33
Extracted ISTD ¹³ C ₂ 4:2FTS	%	127	#	166	#
Extracted ISTD ¹³ C ₂ 6:2FTS	%	173	#	172	#
Extracted ISTD ¹³ C ₂ 8:2FTS	%	179	#	141	#
Extracted ISTD ¹³ C ₈ FOSA	%	55	65	63	66
Extracted ISTD d ₃ N MeFOSA	%	20	35	28	29
Extracted ISTD d ₅ N EtFOSA	%	24	38	25	29
Extracted ISTD d ₇ N MeFOSE	%	31	40	38	37
Extracted ISTD d ₉ N EtFOSE	%	33	45	39	39
Extracted ISTD d ₃ N MeFOSAA	%	60	74	65	76
Extracted ISTD d ₅ N EtFOSAA	%	48	55	57	63
Total Positive PFHxS & PFOS	µg/L	0.032	0.0096	0.0072	0.0091
Total Positive PFOS & PFOA	µg/L	0.036	0.0088	0.0061	0.0090
Total Positive PFAS	µg/L	0.10	0.028	0.019	0.029

Method ID	Methodology Summary
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-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS.
Org-020	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-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-023	Water samples are analysed directly by purge and trap GC-MS.
Org-023	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-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.3 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER.

QUALITY CONTROL: VOCs in water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			28/07/2020	2	28/07/2020	28/07/2020		28/07/2020	[NT]
Date analysed	-			28/07/2020	2	28/07/2020	28/07/2020		28/07/2020	[NT]
Dichlorodifluoromethane	µg/L	10	Org-023	<10	2	<10	<10	0	[NT]	[NT]
Chloromethane	µg/L	10	Org-023	<10	2	<10	<10	0	[NT]	[NT]
Vinyl Chloride	µg/L	10	Org-023	<10	2	<10	<10	0	[NT]	[NT]
Bromomethane	µg/L	10	Org-023	<10	2	<10	<10	0	[NT]	[NT]
Chloroethane	µg/L	10	Org-023	<10	2	<10	<10	0	[NT]	[NT]
Trichlorofluoromethane	µg/L	10	Org-023	<10	2	<10	<10	0	[NT]	[NT]
1,1-Dichloroethene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Trans-1,2-dichloroethene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,1-dichloroethane	µg/L	1	Org-023	<1	2	<1	<1	0	113	[NT]
Cis-1,2-dichloroethene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Bromochloromethane	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Chloroform	µg/L	1	Org-023	<1	2	2	2	0	107	[NT]
2,2-dichloropropane	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,2-dichloroethane	µg/L	1	Org-023	<1	2	<1	<1	0	109	[NT]
1,1,1-trichloroethane	µg/L	1	Org-023	<1	2	<1	<1	0	106	[NT]
1,1-dichloropropene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Cyclohexane	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Carbon tetrachloride	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Benzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Dibromomethane	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,2-dichloropropane	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Trichloroethene	µg/L	1	Org-023	<1	2	<1	<1	0	106	[NT]
Bromodichloromethane	µg/L	1	Org-023	<1	2	<1	<1	0	99	[NT]
trans-1,3-dichloropropene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
cis-1,3-dichloropropene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,1,2-trichloroethane	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Toluene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,3-dichloropropane	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Dibromochloromethane	µg/L	1	Org-023	<1	2	<1	<1	0	105	[NT]
1,2-dibromoethane	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Tetrachloroethene	µg/L	1	Org-023	<1	2	<1	<1	0	111	[NT]
1,1,1,2-tetrachloroethane	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Chlorobenzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Bromoform	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
m+p-xylene	µg/L	2	Org-023	<2	2	<2	<2	0	[NT]	[NT]
Styrene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,1,2,2-tetrachloroethane	µg/L	1	Org-023	<1	2	<1	<1	0	[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-023	<1	2	<1	<1	0	[NT]	[NT]
1,2,3-trichloropropane	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Isopropylbenzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Bromobenzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
n-propyl benzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
2-chlorotoluene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
4-chlorotoluene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,3,5-trimethyl benzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Tert-butyl benzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,2,4-trimethyl benzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,3-dichlorobenzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Sec-butyl benzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,4-dichlorobenzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
4-isopropyl toluene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,2-dichlorobenzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
n-butyl benzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,2-dibromo-3-chloropropane	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,2,4-trichlorobenzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Hexachlorobutadiene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
1,2,3-trichlorobenzene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	113	2	122	123	1	96	[NT]
Surrogate toluene-d8	%		Org-023	100	2	97	102	5	104	[NT]
Surrogate 4-BFB	%		Org-023	95	2	92	95	3	108	[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	-			28/07/2020	2	28/07/2020	28/07/2020		28/07/2020	[NT]
Date analysed	-			28/07/2020	2	28/07/2020	28/07/2020		28/07/2020	[NT]
TRH C ₆ - C ₉	µg/L	10	Org-023	<10	2	<10	<10	0	113	[NT]
TRH C ₆ - C ₁₀	µg/L	10	Org-023	<10	2	<10	<10	0	113	[NT]
Benzene	µg/L	1	Org-023	<1	2	<1	<1	0	107	[NT]
Toluene	µg/L	1	Org-023	<1	2	<1	<1	0	117	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	2	<1	<1	0	111	[NT]
m+p-xylene	µg/L	2	Org-023	<2	2	<2	<2	0	115	[NT]
o-xylene	µg/L	1	Org-023	<1	2	<1	<1	0	117	[NT]
Naphthalene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	113	2	122	123	1	96	[NT]
Surrogate toluene-d8	%		Org-023	100	2	97	102	5	104	[NT]
Surrogate 4-BFB	%		Org-023	95	2	92	95	3	108	[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	-			28/07/2020	[NT]	[NT]	[NT]	[NT]	28/07/2020	[NT]
Date analysed	-			28/07/2020	[NT]	[NT]	[NT]	[NT]	28/07/2020	[NT]
TRH C ₁₀ - C ₁₄	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	104	[NT]
TRH C ₁₅ - C ₂₈	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	92	[NT]
TRH C ₂₉ - C ₃₆	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	92	[NT]
TRH >C ₁₀ - C ₁₆	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	104	[NT]
TRH >C ₁₆ - C ₃₄	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	92	[NT]
TRH >C ₃₄ - C ₄₀	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	92	[NT]
Surrogate o-Terphenyl	%		Org-020	111	[NT]	[NT]	[NT]	[NT]	104	[NT]

QUALITY CONTROL: PAHs in Water - Low Level					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			28/07/2020	[NT]	[NT]	[NT]	[NT]	28/07/2020	[NT]
Date analysed	-			28/07/2020	[NT]	[NT]	[NT]	[NT]	28/07/2020	[NT]
Naphthalene	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	92	[NT]
Acenaphthylene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluorene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	90	[NT]
Phenanthrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	94	[NT]
Anthracene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	92	[NT]
Pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	94	[NT]
Benzo(a)anthracene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	70	[NT]
Benzo(b,j+k)fluoranthene	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	0.1	Org-022/025	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	114	[NT]	[NT]	[NT]	[NT]	96	[NT]

QUALITY CONTROL: Total Phenolics in Water					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			27/07/2020	[NT]	[NT]	[NT]	[NT]	27/07/2020	[NT]
Date analysed	-			27/07/2020	[NT]	[NT]	[NT]	[NT]	27/07/2020	[NT]
Total Phenolics (as Phenol)	mg/L	0.05	Inorg-031	<0.05	[NT]	[NT]	[NT]	[NT]	103	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	247692-2
Date prepared	-			28/07/2020	1	28/07/2020	28/07/2020		28/07/2020	28/07/2020
Date analysed	-			28/07/2020	1	28/07/2020	28/07/2020		28/07/2020	28/07/2020
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	6	6	0	96	95
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	<0.1	<0.1	0	94	96
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	99	92
Copper-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	100	88
Lead-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	96	89
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	<0.05	<0.05	0	100	81
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	90	82
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	6	6	0	96	91

QUALITY CONTROL: PFAS in Waters Trace Extended					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	247692-2
Date prepared	-			28/07/2020	1	28/07/2020	28/07/2020		28/07/2020	28/07/2020
Date analysed	-			28/07/2020	1	28/07/2020	28/07/2020		28/07/2020	28/07/2020
Perfluorobutanesulfonic acid	µg/L	0.0004	Org-029	<0.0004	1	0.003	0.003	0	96	91
Perfluoropentanesulfonic acid	µg/L	0.001	Org-029	<0.001	1	0.003	0.003	0	101	116
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.0002	Org-029	<0.0002	1	0.022	0.022	0	102	131
Perfluoroheptanesulfonic acid	µg/L	0.001	Org-029	<0.001	1	<0.001	<0.001	0	91	95
Perfluorooctanesulfonic acid PFOS	µg/L	0.0002	Org-029	<0.0002	1	0.010	0.0089	12	101	104
Perfluorodecanesulfonic acid	µg/L	0.002	Org-029	<0.002	1	<0.002	<0.002	0	62	50
Perfluorobutanoic acid	µg/L	0.002	Org-029	<0.002	1	0.007	0.008	13	105	122
Perfluoropentanoic acid	µg/L	0.002	Org-029	<0.002	1	0.007	0.008	13	103	109
Perfluorohexanoic acid	µg/L	0.0004	Org-029	<0.0004	1	0.011	0.011	0	103	113
Perfluoroheptanoic acid	µg/L	0.0004	Org-029	<0.0004	1	0.0086	0.0078	10	103	115
Perfluorooctanoic acid PFOA	µg/L	0.0002	Org-029	<0.0002	1	0.025	0.023	8	103	104
Perfluorononanoic acid	µg/L	0.001	Org-029	<0.001	1	0.002	0.002	0	93	88
Perfluorodecanoic acid	µg/L	0.002	Org-029	<0.002	1	<0.002	<0.002	0	102	112
Perfluoroundecanoic acid	µg/L	0.002	Org-029	<0.002	1	<0.002	<0.002	0	103	86
Perfluorododecanoic acid	µg/L	0.005	Org-029	<0.005	1	<0.005	<0.005	0	100	90
Perfluorotridecanoic acid	µg/L	0.01	Org-029	<0.01	1	<0.01	<0.01	0	99	120
Perfluorotetradecanoic acid	µg/L	0.05	Org-029	<0.05	1	<0.05	<0.05	0	99	110
4:2 FTS	µg/L	0.001	Org-029	<0.001	1	<0.001	<0.001	0	104	124
6:2 FTS	µg/L	0.0004	Org-029	<0.0004	1	<0.0004	<0.0004	0	100	114
8:2 FTS	µg/L	0.0004	Org-029	<0.0004	1	<0.0004	<0.0004	0	109	116
10:2 FTS	µg/L	0.002	Org-029	<0.002	1	<0.002	<0.002	0	76	102
Perfluorooctane sulfonamide	µg/L	0.01	Org-029	<0.01	1	<0.01	<0.01	0	102	120
N-Methyl perfluorooctane sulfonamide	µg/L	0.005	Org-029	<0.005	1	<0.005	<0.005	0	98	71
N-Ethyl perfluorooctanesulfonamide	µg/L	0.01	Org-029	<0.01	1	<0.01	<0.01	0	89	60
N-Me perfluorooctanesulfonamidethanol	µg/L	0.005	Org-029	<0.005	1	<0.005	<0.005	0	109	124
N-Et perfluorooctanesulfonamidethanol	µg/L	0.05	Org-029	<0.05	1	<0.05	<0.05	0	106	114
MePerfluorooctanesulfonamidacetic acid	µg/L	0.002	Org-029	<0.002	1	<0.002	<0.002	0	114	79
EtPerfluorooctanesulfonamidacetic acid	µg/L	0.002	Org-029	<0.002	1	<0.002	<0.002	0	112	98
Surrogate ¹³ C ₈ PFOS	%		Org-029	100	1	94	101	7	96	99
Surrogate ¹³ C ₂ PFOA	%		Org-029	101	1	79	75	5	103	82

QUALITY CONTROL: PFAS in Waters Trace Extended					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	247692-2
Extracted ISTD ¹³ C ₃ PFBS	%		Org-029	101	1	73	75	3	99	106
Extracted ISTD ¹⁸ O ₂ PFHxS	%		Org-029	105	1	78	83	6	104	101
Extracted ISTD ¹³ C ₄ PFOS	%		Org-029	77	1	90	95	5	92	100
Extracted ISTD ¹³ C ₄ PFBA	%		Org-029	102	1	29	28	4	100	65
Extracted ISTD ¹³ C ₃ PFPeA	%		Org-029	98	1	28	27	4	95	61
Extracted ISTD ¹³ C ₂ PFHxA	%		Org-029	100	1	45	48	6	99	85
Extracted ISTD ¹³ C ₄ PFHpA	%		Org-029	104	1	64	66	3	103	97
Extracted ISTD ¹³ C ₄ PFOA	%		Org-029	97	1	95	104	9	96	121
Extracted ISTD ¹³ C ₅ PFNA	%		Org-029	91	1	104	113	8	101	124
Extracted ISTD ¹³ C ₂ PFDA	%		Org-029	82	1	80	88	10	100	102
Extracted ISTD ¹³ C ₂ PFUnDA	%		Org-029	69	1	65	75	14	77	83
Extracted ISTD ¹³ C ₂ PFDoDA	%		Org-029	61	1	49	67	31	68	70
Extracted ISTD ¹³ C ₂ PFTeDA	%		Org-029	52	1	49	50	2	59	38
Extracted ISTD ¹³ C ₂ 4:2FTS	%		Org-029	110	1	127	145	13	107	184
Extracted ISTD ¹³ C ₂ 6:2FTS	%		Org-029	113	1	173	184	6	114	#
Extracted ISTD ¹³ C ₂ 8:2FTS	%		Org-029	105	1	179	#		135	#
Extracted ISTD ¹³ C ₈ FOSA	%		Org-029	70	1	55	56	2	75	68
Extracted ISTD d ₃ N MeFOSA	%		Org-029	40	1	20	35	55	44	52
Extracted ISTD d ₅ N EtFOSA	%		Org-029	43	1	24	41	52	47	59
Extracted ISTD d ₇ N MeFOSE	%		Org-029	53	1	31	33	6	55	44

QUALITY CONTROL: PFAS in Waters Trace Extended						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	247692-2
Extracted ISTD d ₉ N EtFOSE	%		Org-029	56	1	33	41	22	59	49
Extracted ISTD d ₃ N MeFOSAA	%		Org-029	66	1	60	85	34	74	81
Extracted ISTD d ₅ N EtFOSAA	%		Org-029	77	1	48	66	32	79	72

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.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

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

Dissolved Metals: no filtered, preserved sample was received for sample #4, therefore the unpreserved sample was filtered through 0.45µm filter at the lab. Note: there is a possibility some elements may be underestimated.

PFAS in water TRACE Extended - For PFAS Extracted Internal Standards denoted with # or outside the 50-150% acceptance range, the respective target analyte results may be unaffected, in other circumstances the PQL has been raised to accommodate the outlier(s).

PFAS_W_EXT1_TR: MeFOSA and EtFOSA Extracted Internal Standards are outside of global acceptance criteria (50-150%) for MB and LCS but they are within analyte specific acceptance criteria.

PFAS_W_EXT1_TR: Matrix spike recovery for 247692-2MS for PFDS is outside global acceptance criteria (60-140%), however an acceptable recovery was obtained for the LCS.

SAMPLE RECEIPT ADVICE

Client Details

Client	Environmental Investigation Services
Attention	Anthony Barkway

Sample Login Details

Your reference	E32885PA, Brookvale
Envirolab Reference	247692
Date Sample Received	24/07/2020
Date Instructions Received	24/07/2020
Date Results Expected to be Reported	31/07/2020

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	6 WATER
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	1.2
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

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

Analysis Underway, details on the following page:



Envirolab Services Pty Ltd

ABN 37 112 535 645

12 Ashley St Chatswood NSW 2067

ph 02 9910 6200 fax 02 9910 6201

customerservice@envirolab.com.au

www.envirolab.com.au

Sample ID	VOCs in water	VTRH(C6-C10)/BTEXN in Water	svTRH (C10-C40) in Water	PAHs in Water - Low Level	Total Phenolics in Water	HM in water - dissolved	PFAS in Waters Trace Extended
MW101	✓	✓	✓	✓	✓	✓	✓
MW102	✓	✓	✓	✓	✓	✓	✓
MW103	✓	✓	✓	✓	✓	✓	✓
WDUP1		✓	✓	✓		✓	✓
TSW1		✓					
TBW1		✓					

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.

SAMPLE AND CHAIN OF CUSTODY FORM

TO:		FROM:	
ENVIROLAB SERVICES PTY LTD	JKE Job	 JKEnvironments	
12 ASHLEY STREET	Number:	REAR OF 115 WICKS ROAD	
CHATSWOOD NSW 2067	Date Results	MACQUARIE PARK, NSW 2113	
P: (02) 99106200	Required:	P: 02-9888 5000 F: 02-9888 5001	
F: (02) 99106201	Page:	Attention: Anthony Barkway	
Attention: Aileen			

[illegible]

CERTIFICATE OF ANALYSIS 21980

Client Details

Client	JK Environments
Attention	Anthony Barkway
Address	PO Box 976, North Ryde BC, NSW, 1670

Sample Details

Your Reference	<u>E32885PA</u>
Number of Samples	1 Soil
Date samples received	24/07/2020
Date completed instructions received	24/07/2020

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	30/07/2020
Date of Issue	30/07/2020
NATA Accreditation Number 2901. This document shall not be reproduced except in full.	
Accredited for compliance with ISO/IEC 17025 - Testing. Tests not covered by NATA are denoted with *	

Results Approved By

Chris De Luca, Operations Manager

Authorised By



Pamela Adams, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil		
Our Reference		21980-1
Your Reference	UNITS	SDUP2
Date Sampled		20/07/2020
Type of sample		Soil
Date extracted	-	27/07/2020
Date analysed	-	28/07/2020
vTRH C ₆ - C ₉	mg/kg	<25
vTRH C ₆ - C ₁₀	mg/kg	<25
TRH 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 BTEX	mg/kg	<1
Total +ve Xylenes	mg/kg	<1
Surrogate aaa-Trifluorotoluene	%	90

TRH Soil C10-C40 NEPM		
Our Reference		21980-1
Your Reference	UNITS	SDUP2
Date Sampled		20/07/2020
Type of sample		Soil
Date extracted	-	27/07/2020
Date analysed	-	29/07/2020
TRH C ₁₀ - C ₁₄	mg/kg	<50
TRH C ₁₅ - C ₂₈	mg/kg	<100
TRH C ₂₉ - C ₃₆	mg/kg	<100
Total +ve TRH (C10-C36)	mg/kg	<50
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	%	87

PAHs in Soil		
Our Reference		21980-1
Your Reference	UNITS	SDUP2
Date Sampled		20/07/2020
Type of sample		Soil
Date extracted	-	27/07/2020
Date analysed	-	28/07/2020
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	<0.1
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	<0.1
Pyrene	mg/kg	<0.1
Benzo(a)anthracene	mg/kg	<0.1
Chrysene	mg/kg	<0.1
Benzo(b,j&k)fluoranthene	mg/kg	<0.2
Benzo(a)pyrene	mg/kg	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1
Total +ve PAH's	mg/kg	<0.05
Benzo(a)pyrene TEQ calc (Zero)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc (Half)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc (PQL)	mg/kg	<0.5
Surrogate <i>p</i> -Terphenyl-d ₁₄	%	86

Acid Extractable metals in soil		
Our Reference		21980-1
Your Reference	UNITS	SDUP2
Date Sampled		20/07/2020
Type of sample		Soil
Date digested	-	28/07/2020
Date analysed	-	28/07/2020
Arsenic	mg/kg	<4
Cadmium	mg/kg	<0.4
Chromium	mg/kg	7
Copper	mg/kg	3
Lead	mg/kg	7
Mercury	mg/kg	<0.1
Nickel	mg/kg	2
Zinc	mg/kg	12

Moisture		
Our Reference	UNITS	21980-1
Your Reference		SDUP2
Date Sampled		20/07/2020
Type of sample		Soil
Date prepared	-	28/07/2020
Date analysed	-	29/07/2020
Moisture	%	11

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105 deg C for a minimum of 12 hours.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Org-020	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-022	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL' values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero' values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL' values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	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)-BTX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			27/07/2020	[NT]	[NT]	[NT]	[NT]	27/07/2020	[NT]
Date analysed	-			28/07/2020	[NT]	[NT]	[NT]	[NT]	28/07/2020	[NT]
vTRH C ₆ - C ₉	mg/kg	25	Org-023	<25	[NT]	[NT]	[NT]	[NT]	90	[NT]
vTRH C ₆ - C ₁₀	mg/kg	25	Org-023	<25	[NT]	[NT]	[NT]	[NT]	90	[NT]
Benzene	mg/kg	0.2	Org-023	<0.2	[NT]	[NT]	[NT]	[NT]	92	[NT]
Toluene	mg/kg	0.5	Org-023	<0.5	[NT]	[NT]	[NT]	[NT]	92	[NT]
Ethylbenzene	mg/kg	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	88	[NT]
m+p-xylene	mg/kg	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	90	[NT]
o-Xylene	mg/kg	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	89	[NT]
Naphthalene	mg/kg	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	97	[NT]	[NT]	[NT]	[NT]	100	[NT]

QUALITY CONTROL: TRH Soil C10-C40 NEPM					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			27/07/2020	[NT]	[NT]	[NT]	[NT]	27/07/2020	[NT]
Date analysed	-			28/07/2020	[NT]	[NT]	[NT]	[NT]	29/07/2020	[NT]
TRH C ₁₀ - C ₁₄	mg/kg	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	100	[NT]
TRH C ₁₅ - C ₂₈	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	107	[NT]
TRH C ₂₉ - C ₃₆	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	120	[NT]
TRH >C ₁₀ -C ₁₆	mg/kg	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	100	[NT]
TRH >C ₁₆ -C ₃₄	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	107	[NT]
TRH >C ₃₄ -C ₄₀	mg/kg	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	120	[NT]
Surrogate o-Terphenyl	%		Org-020	85	[NT]	[NT]	[NT]	[NT]	90	[NT]

QUALITY CONTROL: PAHs in Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			27/07/2020	[NT]	[NT]	[NT]	[NT]	27/07/2020	[NT]
Date analysed	-			28/07/2020	[NT]	[NT]	[NT]	[NT]	28/07/2020	[NT]
Naphthalene	mg/kg	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	88	[NT]
Acenaphthylene	mg/kg	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	86	[NT]
Acenaphthene	mg/kg	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	86	[NT]
Phenanthrene	mg/kg	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	88	[NT]
Anthracene	mg/kg	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	82	[NT]
Pyrene	mg/kg	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	80	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Benzo(b,j&k)fluoranthene	mg/kg	0.2	Org-022	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022	<0.05	[NT]	[NT]	[NT]	[NT]	110	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d ₁₄	%		Org-022	74	[NT]	[NT]	[NT]	[NT]	80	[NT]

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date digested	-			28/07/2020	[NT]	[NT]	[NT]	[NT]	28/07/2020	[NT]
Date analysed	-			28/07/2020	[NT]	[NT]	[NT]	[NT]	28/07/2020	[NT]
Arsenic	mg/kg	4	Metals-020 ICP-AES	<4	[NT]	[NT]	[NT]	[NT]	97	[NT]
Cadmium	mg/kg	0.4	Metals-020 ICP-AES	<0.4	[NT]	[NT]	[NT]	[NT]	97	[NT]
Chromium	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Copper	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	[NT]	[NT]	94	[NT]
Lead	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	[NT]	[NT]	87	[NT]
Mercury	mg/kg	0.1	Metals-021 CV-AAS	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Nickel	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	[NT]	[NT]	93	[NT]
Zinc	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	[NT]	[NT]	95	[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.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

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.

SAMPLE RECEIPT ADVICE

Client Details

Client	JK Environments
Attention	Anthony Barkway

Sample Login Details

Your reference	E32885PA
Envirolab Reference	21980
Date Sample Received	24/07/2020
Date Instructions Received	24/07/2020
Date Results Expected to be Reported	30/07/2020

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	1 Soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	7.6
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Pamela Adams

Phone: 03 9763 2500
Fax: 03 9763 2633
Email: padams@envirolab.com.au

Chris De Luca

Phone: 03 9763 2500
Fax: 03 9763 2633
Email: cdeluca@envirolab.com.au

Analysis Underway, details on the following page:



Envirolab Services Pty Ltd

ABN 37 112 535 645 - 002

25 Research Drive Croydon South VIC 3136

ph 03 9763 2500 fax 03 9763 2633

melbourne@envirolab.com.au

www.envirolab.com.au

Sample ID	VTRH(C6-C10)/BTEXN in Soil	TRH Soil C10-C40 NEPM	PAHs in Soil	Acid Extractable metals in soil
SDUP2	✓	✓	✓	✓

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.

Job No: 21980
Date Received: 24/7/20
Time Received: 2:40pm 7-62
Received By: KS

SAMPLE AND CHAIN OF CUSTODY FORM

TO: ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201 Attention: Aileen	JKE Job Number: E32885PA Date Results Required: STANDARD Page: 1/2	FROM: REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000 F: 02-9888 5001 Attention: Anthony Barkway abarkway@jkenvironments.com.au
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Location:	Brookvale	Sample Preserved in Esky on Ice																
Sampler:	CR	Tests Required																
Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 3	Combo 6	Asbestos - 500ml WA	Asbestos ID	PFAS Routine Extended	HOLD						
16/07/2020	1	BH101	0.23-0.55	G, A, P1	0.8	Fill: Sandy Clay		X	X		X							
16/07/2020	2	BH101	0.9-1.0	G	0.3	Silty Sand	X											
20/07/2020	3	BH102	Surface	P1	-	Concrete					X							
20/07/2020	4	BH102	0.3-0.6	G, A, P1	1.3	Fill: Silty Clayey Sand		X	X		X							
20/07/2020	5	BH102	1.0-1.2	G	6.5	Silty Sand	X											
20/07/2020	6	BH102	1.9-2.0	P1	-	Silty Sand						X						
20/07/2020	7	BH103	Surface	P1	-	Concrete					X							
20/07/2020	8	BH103	0.2-0.35	P1	-	Fill: Silty Sand					X							
20/07/2020	9	BH103	0.6-0.9	G, A, P1	2.1	Fill: Silty Sand		X	X									
20/07/2020	10	BH103	1.2-1.4	G	7.9	Clayey Sand	X											
20/07/2020	11	BH103	2.2-2.4	G, P1	0.1	Silty Sand						X						
21/07/2020	12	BH104	0.16-0.35	G	0.8	Fill: Clayey Sand		X										
21/07/2020	13	BH104	0.4-0.6	G, A	0.6	Fill: Silty Sand	X		X									
21/07/2020	14	BH104	0.7-0.8	G	3.9	Silty Sand						X						
21/07/2020	15	BH104	1.3-1.5	G	0.1	Silty Sand						X						
21/07/2020	16	BH104	2.9-3.0	G, P1	0.2	Silty Sand						X						
16/07/2020	17	SS1	Surface	P1	-	Fill: Silty Sand					X							
16/07/2020	18	SS2	Surface	P1	-	Fill: Silty Sand					X							
16/07/2020	19	Swab 1	Surface	A	-	Swab				X								
16/07/2020	20	Swab 2	Surface	A	-	Swab				X								
	21	SDUP1	-	G	1.4	Duplicate						X						
	22	SDUP2	-	G	1.7	Duplicate	X											
	23	SDUP3	-	G	2.4	Duplicate	X											
	24	SDUP4	-	G	1.4	Duplicate						X						
	25	SDUP5	-	P1	-	Duplicate					X							

Remarks (comments/detection limits required): Please send SDUP2 duplicate sample to Melbourne for inter-laboratory analysis	Sample Containers: G - 250mg Glass Jar P1 - PFAS Soil Jar A - Ziplock Asbestos Bag G1 - 200ml Amber Glass Bottle P - Plastic Bag H - HNO3 Washed PVC V - BTEX Vial P2 - PFAS Water Bottle
Relinquished By: Anthony Barkway	Date: 22.07.2020
Time:	Received By: K. Gore
	Date:

Relinquished by AS sup
C-mulien
23/7/20 500
CM

ENVIROLAB
 12 Ashley St
 Chatswood NSW 2067
 Ph: (02) 9910 6200
 Job No: 247495
 Date Received: 23-07-2020
 Time Received: 5:35
 Received By: K.G.
 Temp: Cool/Ambient 4.6
 Cooling: Ice/icepack
 Security: Intact/Broken/None

CERTIFICATE OF ANALYSIS 22014

Client Details

Client	JK Environments
Attention	Anthony Barkway
Address	PO Box 976, North Ryde BC, NSW, 1670

Sample Details

Your Reference	<u>E32885PA</u>
Number of Samples	1 WATER
Date samples received	28/07/2020
Date completed instructions received	28/07/2020

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	03/08/2020
Date of Issue	01/08/2020
NATA Accreditation Number 2901. This document shall not be reproduced except in full.	
Accredited for compliance with ISO/IEC 17025 - Testing. Tests not covered by NATA are denoted with *	

Results Approved By

Pamela Adams, Laboratory Manager, Melbourne

Authorised By



Pamela Adams, Laboratory Manager

vTRH(C6-C10)/BTEXN in Water		
Our Reference	UNITS	22014-1
Your Reference		WDUP2
Date Sampled		24/07/2020
Type of sample		WATER
Date extracted	-	30/07/2020
Date analysed	-	30/07/2020
TRH C ₆ - C ₉	µg/L	<10
TRH C ₆ - C ₁₀	µg/L	<10
TRH C ₆ -C ₁₀ less BTEX (F1)	µg/L	<10
Benzene	µg/L	<1
Toluene	µg/L	<1
Ethylbenzene	µg/L	<1
m+p-xylene	µg/L	<2
o-xylene	µg/L	<1
Naphthalene	µg/L	<1
Total +ve Xylenes	µg/L	<1
Total BTEX in water	µg/L	<1
Surrogate Dibromofluoromethane	%	102
Surrogate toluene-d8	%	99
Surrogate 4-BFB	%	101

TRH Water(C10-C40) NEPM		
Our Reference		22014-1
Your Reference	UNITS	WDUP2
Date Sampled		24/07/2020
Type of sample		WATER
Date extracted	-	29/07/2020
Date analysed	-	29/07/2020
TRH C ₁₀ - C ₁₄	µg/L	<50
TRH C ₁₅ - C ₂₈	µg/L	<100
TRH C ₂₉ - C ₃₆	µg/L	120
Total +ve TRH (C10-C36)	µg/L	120
TRH >C ₁₀ - C ₁₆	µg/L	<50
TRH >C ₁₀ - C ₁₆ less Naphthalene (F2)	µg/L	<50
TRH >C ₁₆ - C ₃₄	µg/L	170
TRH >C ₃₄ - C ₄₀	µg/L	<100
Total +ve TRH (>C10-C40)	µg/L	170
Surrogate o-Terphenyl	%	85

PAHs in Water - Low Level		
Our Reference		22014-1
Your Reference	UNITS	WDUP2
Date Sampled		24/07/2020
Type of sample		WATER
Date extracted	-	29/07/2020
Date analysed	-	30/07/2020
Naphthalene	µg/L	0.5
Acenaphthylene	µg/L	<0.1
Acenaphthene	µg/L	<0.1
Fluorene	µg/L	<0.1
Phenanthrene	µg/L	<0.1
Anthracene	µg/L	<0.1
Fluoranthene	µg/L	<0.1
Pyrene	µg/L	<0.1
Benzo(a)anthracene	µg/L	<0.1
Chrysene	µg/L	<0.1
Benzo(b,j&k)fluoranthene	µg/L	<0.2
Benzo(a)pyrene	µg/L	<0.1
Indeno(1,2,3-c,d)pyrene	µg/L	<0.1
Dibenzo(a,h)anthracene	µg/L	<0.1
Benzo(g,h,i)perylene	µg/L	<0.1
Total +ve PAH's	µg/L	0.48
Benzo(a)pyrene TEQ	µg/L	<0.5
Surrogate <i>p</i> -Terphenyl-d ₁₄	%	86

HM in water - dissolved		
Our Reference		22014-1
Your Reference	UNITS	WDUP2
Date Sampled		24/07/2020
Type of sample		WATER
Date prepared	-	29/07/2020
Date analysed	-	31/07/2020
Arsenic-Dissolved	µg/L	<1
Cadmium-Dissolved	µg/L	<0.1
Chromium-Dissolved	µg/L	<1
Copper-Dissolved	µg/L	<1
Lead-Dissolved	µg/L	4
Nickel-Dissolved	µg/L	2
Zinc-Dissolved	µg/L	9
Mercury-Dissolved	µg/L	<0.05

Method ID	Methodology Summary
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Metals-022 ICP-MS	Determination of various metals by ICP-MS.
Org-020	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-022	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater 2013.
Org-023	Water samples are analysed directly by purge and trap GC-MS.
Org-023	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 Water						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			30/07/2020	[NT]	[NT]	[NT]	[NT]	30/07/2020	[NT]
Date analysed	-			30/07/2020	[NT]	[NT]	[NT]	[NT]	30/07/2020	[NT]
TRH C ₆ - C ₉	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	94	[NT]
TRH C ₆ - C ₁₀	µg/L	10	Org-023	<10	[NT]	[NT]	[NT]	[NT]	94	[NT]
Benzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	94	[NT]
Toluene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	95	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	94	[NT]
m+p-xylene	µg/L	2	Org-023	<2	[NT]	[NT]	[NT]	[NT]	94	[NT]
o-xylene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	93	[NT]
Naphthalene	µg/L	1	Org-023	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Surrogate Dibromofluoromethane	%		Org-023	99	[NT]	[NT]	[NT]	[NT]	99	[NT]
Surrogate toluene-d8	%		Org-023	98	[NT]	[NT]	[NT]	[NT]	98	[NT]
Surrogate 4-BFB	%		Org-023	100	[NT]	[NT]	[NT]	[NT]	100	[NT]

QUALITY CONTROL: TRH Water(C10-C40) NEPM					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			29/07/2020	[NT]	[NT]	[NT]	[NT]	29/07/2020	[NT]
Date analysed	-			29/07/2020	[NT]	[NT]	[NT]	[NT]	29/07/2020	[NT]
TRH C ₁₀ - C ₁₄	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	67	[NT]
TRH C ₁₅ - C ₂₈	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	98	[NT]
TRH C ₂₉ - C ₃₆	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	107	[NT]
TRH >C ₁₀ - C ₁₆	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	67	[NT]
TRH >C ₁₆ - C ₃₄	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	98	[NT]
TRH >C ₃₄ - C ₄₀	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	107	[NT]
Surrogate o-Terphenyl	%		Org-020	78	[NT]	[NT]	[NT]	[NT]	76	[NT]

QUALITY CONTROL: PAHs in Water - Low Level					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date extracted	-			29/07/2020	[NT]	[NT]	[NT]	[NT]	29/07/2020	[NT]
Date analysed	-			30/07/2020	[NT]	[NT]	[NT]	[NT]	30/07/2020	[NT]
Naphthalene	µg/L	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Acenaphthylene	µg/L	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	86	[NT]
Acenaphthene	µg/L	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluorene	µg/L	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	88	[NT]
Phenanthrene	µg/L	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	94	[NT]
Anthracene	µg/L	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fluoranthene	µg/L	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Pyrene	µg/L	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Benzo(a)anthracene	µg/L	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chrysene	µg/L	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(b,j&k)fluoranthene	µg/L	0.2	Org-022	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(a)pyrene	µg/L	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	90	[NT]
Indeno(1,2,3-c,d)pyrene	µg/L	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Dibenzo(a,h)anthracene	µg/L	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Benzo(g,h,i)perylene	µg/L	0.1	Org-022	<0.1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d ₁₄	%		Org-022	100	[NT]	[NT]	[NT]	[NT]	88	[NT]

QUALITY CONTROL: HM in water - dissolved					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			29/07/2020	[NT]	[NT]	[NT]	[NT]	29/07/2020	[NT]
Date analysed	-			31/07/2020	[NT]	[NT]	[NT]	[NT]	31/07/2020	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	[NT]	[NT]	102	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	[NT]	[NT]	[NT]	[NT]	101	[NT]
Chromium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	[NT]	[NT]	101	[NT]
Copper-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Nickel-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Zinc-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	[NT]	[NT]	[NT]	[NT]	103	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021 CV-AAS	<0.05	[NT]	[NT]	[NT]	[NT]	109	[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.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

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.

SAMPLE RECEIPT ADVICE

Client Details

Client	JK Environments
Attention	Anthony Barkway

Sample Login Details

Your reference	E32885PA
Envirolab Reference	22014
Date Sample Received	28/07/2020
Date Instructions Received	28/07/2020
Date Results Expected to be Reported	03/08/2020

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	1 WATER
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	12.6
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Pamela Adams

Phone: 03 9763 2500
Fax: 03 9763 2633
Email: padams@envirolab.com.au

Chris De Luca

Phone: 03 9763 2500
Fax: 03 9763 2633
Email: cdeluca@envirolab.com.au

Analysis Underway, details on the following page:



Envirolab Services Pty Ltd

ABN 37 112 535 645 - 002

25 Research Drive Croydon South VIC 3136

ph 03 9763 2500 fax 03 9763 2633

melbourne@envirolab.com.au

www.envirolab.com.au

Sample ID	vTRH(C6-C10)/BTEXN in Water	TRH Water(C10-C40) NEPM	PAHs in Water - Low Level	HM in water - dissolved
WDUP2	✓	✓	✓	✓

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.

SAMPLE AND CHAIN OF CUSTODY FORM

TO: ENVIROLAB SERVICES PTY LTD 12 ASHLEY STREET CHATSWOOD NSW 2067 P: (02) 99106200 F: (02) 99106201 Attention: Aileen		JKE Job Number: E32885PA Date Results Required: STANDARD Page: 1		FROM:  JKE Environments REAR OF 115 WICKS ROAD MACQUARIE PARK, NSW 2113 P: 02-9888 5000 F: 02-9888 5001 Attention: Anthony Barkway														
Location: Brookvale		Sample Preserved in Esky on Ice																
Sampler: AM		Tests Required																
Date Sampled	Lab Ref:	Sample Number	Sample Containers	PID	Sample Description	Combo 4L	PFAS (Trace level - extended)	VOCs	EC/pH/Hardness	Combo 3L	BTEX							
24.7.20	1	MW101	G1 x 2, V x 2, H, P, PFAS x 2	0.2	Water	X	X	X										
24.7.20	2	MW102	G1 x 2, V x 2, H, P, PFAS x 2	0.5	Water	X	X	X										
24.7.20	3	MW103	G1 x 2, V x 2, H, P, PFAS x 2	0.5	Water	X	X	X										
24.7.20	4	WDUP1	G1 x 2, V x 2, H, PFAS x 2	-	DUP Water		X			X								
24.7.20	5	WDUP2	G1 x 2, V x 2, H	-	DUP Water					X								
24.7.20	5	TS-W1	V	-	Trip Spike Water						X							
24.7.20	6	TB-W1	V	-	Trip Blank Water						X							
 Envirolab Services 25 Research Drive Croydon South VIC 3136 Ph: (03) 9753 2500 Job No: 22014 Date Received: 24/7/20 Time Received: 3:30pm Received By: [Signature] Temp: 12-6°C Cooling: Ice/Icepack Security: Intact/Broken/None						 Envirolab Services 12 Ashley St Chatswood NSW 2067 Ph: (02) 9910 6200 Job No: 247692 Date Received: 24/7/20 Time Received: 1629 Received By: [Signature] Temp: Cool/Ambient Cooling: Ice/Icepack Security: Intact/Broken/None												
Remarks (comments/detection limits required): All analysis PQLs to ANZECC (2000) Detection Limits Please Please send WDUP2 duplicate sample to Melbourne for inter-laboratory analysis						Sample Containers: G1 - 500mL Amber Glass Bottle G2 - 1L Amber Glass Bottle V - BTEX Vial H - HNO3 Wash PVC P-H2SO4 Wash PVC PFAS- PFAS Plastic Bottles												
Relinquished By: Anthony Barkway		Date: 24.07.2020		Time: 1629		Received By: [Signature]		Date: 24/7/2020										



Appendix E: Report Explanatory Notes



QA/QC Definitions

The QA/QC terms used in this report are defined below. The definitions are in accordance with US EPA publication SW-846, entitled *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (1994)²¹ methods and those described in *Environmental Sampling and Analysis, A Practical Guide*, (1991)²². The NEPM (2013) is consistent with these documents.

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

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

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

B. Precision

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

C. Accuracy

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

D. Representativeness

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

E. Completeness

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

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

²¹ US EPA, (1994). *SW-846: Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*. (US EPA SW-846)

²² Keith., H, (1991). *Environmental Sampling and Analysis, A Practical Guide*

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

F. Comparability

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

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

G. Blanks

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

H. Matrix Spikes

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

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

I. Surrogate Spikes

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

J. Duplicates

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

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



Appendix F: Data (QA/QC) Evaluation



Data (QA/QC) Evaluation

A. INTRODUCTION

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

1. Field and Laboratory Considerations

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

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

2. Field QA/QC Samples and Analysis

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

Sample Type	Sample Identification	Frequency (of Sample Type)	Analysis Performed
Intra-laboratory duplicate (soil)	SDUP3 (primary sample BH103 0.6-0.9m)	Approximately 25% of primary samples	Heavy metals, TRH/BTEX and PAHs
Inter-laboratory duplicate (soil)	SDUP2 (primary sample BH102 0.3-0.6m)	As above	Heavy metals, TRH/BTEX and PAHs
Intra-laboratory duplicate (soil)	SDUP5 (primary sample SS1)	Approximately 20% of primary soil samples	PFAS
Intra-laboratory duplicate (groundwater)	WDUP1 (primary sample MW102)	Approximately 33% of primary samples	Heavy metals, TRH/BTEX, PAHs and PFAS
Inter-laboratory duplicate (groundwater)	WDUP2 (primary sample MW103)	As above	Heavy metals, TRH/BTEX and PAHs
Trip spike	TS-S1 (16/07/20) – Soil TSW1 (24/07/20) - Groundwater	One for the assessment of soil and one for the assessment of groundwater to demonstrate adequacy of preservation, storage and transport methods	BTEX
Trip blank	TB-S1 (16/07/20) – Soil TBW1 (24/07/20) - Groundwater	One for the assessment of soil and one for the assessment of groundwater to demonstrate adequacy of preservation, storage and transport methods	BTEX

Sample Type	Sample Identification	Frequency (of Sample Type)	Analysis Performed
Rinsate (soil SPT)	FR1-SPT (16/07/20)	One for the investigation to demonstrate adequacy of decontamination methods	Heavy Metals, TRH/BTEX, PAHs and PFAS.

The results for the field QA/QC samples are detailed in the laboratory summary tables (Tables S8, G5 and P5) attached to the investigation report and are discussed in the subsequent sections of this Data (QA/QC) Evaluation report.

3. **Data Assessment Criteria**

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

Field Duplicates

Acceptable targets for precision of field duplicates in this report will be 30% or less, consistent with NEPM (2013). RPD failures will be considered qualitatively on a case-by-case basis taking into account factors such as the concentrations used to calculate the RPD (i.e. RPD exceedance where concentrations are close to the PQL are typically not as significant as those where concentrations are reported at least five or 10 times the PQL), sample type, collection methods and the specific analyte where the RPD exceedance was reported.

Field/Trip Blanks and Rinsates

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

Trip Spikes

Acceptable targets for trip spike samples in this report will be 70% to 130%.

Laboratory QA/QC

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

A summary of the acceptable limits adopted by the primary laboratory (Envirolab) is provided below:

RPDs

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

Laboratory Control Samples (LCS) and Matrix Spikes

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

Surrogate Spikes

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

Method Blanks

- All results less than PQL.

B. DATA EVALUATION

1. Sample Collection, Storage, Transport and Analysis

Samples were collected by trained field staff in accordance. Field sampling procedures were designed to be consistent with relevant guidelines, including NEPM (2013) and other guidelines made under the CLM Act 1997.

Appropriate sample preservation, handling and storage procedures were adopted. Laboratory analysis was undertaken within specified holding times in accordance with Schedule B(3) of NEPM (2013) and the laboratory NATA accredited methodologies.

JKE note that the temperature on receipt of groundwater samples was reported to be up to 12.6°C. JKE understand that the temperature is measured at the laboratory using an infrared temperature probe by scanning the outside of the sample container (i.e. one sample jar/container at the time of registering the samples). This procedure is not considered to be robust as there is a potential for the outside of the jar to warm to ambient temperature, or at least to increase from that of the internal contents, relatively quickly. On this basis, JKE are of the opinion that the temperatures reported on the Sample Receipts are unlikely to be reliable or representative of the overall batch. This is further supported by the trip spike recovery results (discussed further below) which reported adequate recovery in the range of 102% to 117%.

EnviroLab noted that the asbestos results (500ml soil quantification analysis) were reported to be consistent with the recommendations in NEPM (2013), however this level of reporting is outside the scope of their NATA accreditation. In the absence of other available analytical methods for asbestos, this was found to be acceptable for the purpose of this investigation.

Review of the project data also indicated that:

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

2. Laboratory PQLs

Appropriate PQLs were adopted for the analysis and all PQLs were below the SAC. With the exception of the anthracene PQL for groundwater analysis which was 10 times greater than the ecological SAC. In light of the PAH concentrations reported for soil and groundwater, JKE are of the opinion that this is not significant, and it does not affect the quality of the dataset as a whole or the outcome of the investigation.

3. Field QA/QC Sample Results

Field Duplicates

The results indicated that field precision was acceptable. RPD non-conformances were reported for some analytes as discussed below:

- Elevated RPDs were reported for TRH (>C10-C16) and TRH (>C16-C34) fractions, naphthalene and heavy metals arsenic, chromium, copper, lead nickel and zinc in soil samples SDUP3/BH103 (0.6-0.9m);
- Elevated RPDs were reported for heavy metals lead, nickel and zinc in soil samples SDUP2/BH102 (0.3-0.6m);
- Elevated RPDs were also reported for Total Positive PFAS in soil samples SDUP5/SS1; and
- Elevated RPDs were reported for TRH (>C10-C16) fraction and benzene, as well as heavy metal lead in groundwater samples WDUP2/MW103.

Values outside the acceptable limits for soil primary/duplicate pairs have been attributed to the heterogeneous nature of fill material strata from which these samples were collected and the difficulties associated with obtaining homogenous duplicate samples of heterogeneous matrices. In addition, detectable concentrations of these analytes were relatively low and close to the laboratory PQLs, especially those detected for groundwater primary/duplicate pair, which would yield higher RPD values for detected variations. Both the primary and duplicate sample results were screened against the SAC, therefore the RPD exceedances are not significant.

Field/Trip Blanks

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

Rinsates

All results were below the PQL. This indicated that cross-contamination artefacts associated with sampling equipment were not present and the potential for cross-contamination to have occurred was low.

Trip Spikes

The results ranged from 94% to 95% for soil and from 102% to 117% for groundwater which indicated that field preservation methods were appropriate.

4. Laboratory QA/QC

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

Minor laboratory RPD exceedances were detected for soil and groundwater. The result is attributed to minor heterogeneity in the fill and is not significant as the concentrations of these analytes were below the SAC. The heterogeneity is not considered to impact the reliability of the data or the conclusion regarding site suitability as all results were substantially lower than the health-based SAC.

C. DATA QUALITY SUMMARY

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

A number of results from field duplicates indicated some uncertainty in quantification for TRHs and heavy metals. Due to the characteristics of the duplicate samples, the uncertainty is not considered to materially impact the report findings.

Non-conformances were reported for some field QA/QC samples and laboratory QA/QC analysis. These non-conformances were considered to be sporadic and minor, and were not considered to be indicative of systematic sampling or analytical errors. On this basis, these non-conformances are not considered to materially impact the report findings.

There was only one groundwater monitoring event undertaken for the investigation. On this basis there is some uncertainty around the representativeness of the groundwater data, particularly during different climatic conditions and after wet/dry periods. However, given the low contaminant concentrations reported, this is not considered to alter the conclusions of the investigation.



Appendix G: Field Work Documents



Client:	Motaland Pty Ltd	Job No.:	E32885PA
Project:	Proposed Storage Building	Well No.:	MW101
Location:	4 Cross Street, BROOKVALE, NSW	Depth (m):	4.85-

WELL FINISH DETAILS

	Gatic Cover ☒	Standpipe ☐	Other (describe) ☐
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WELL DEVELOPMENT DETAILS

Method:	17111000	SWL – Before (m):	1.72
Date:	20/1/20	Time – Before:	14:00
Undertaken By:	CR	SWL – After (m):	2.61
Total Vol. Removed:	96	Time – After:	15:55
PID Reading (ppm):	—		

Comments:

DEVELOPMENT MEASUREMENTS

[illegible]

Comments	Odours (YES / NO)	NAPL/PSH (YES / NO)	Sheen (YES / NO)	Steady State Achieved (YES / NO)

YSI Used: 4

~10L of potable water added to the well
to de-silt.

Tested By:	CYL	Remarks: - Steady state conditions - Difference in the pH less than 0.2 units, difference in the conductivity less than 10% and SWL stable/not in drawdown - Minimum 3 monitoring well volumes purged, unless well purged until it is effectively dry
Date Tested:	20/7/20	
Checked By:	AVB	
Date:	21.7.20	



Client:	Motaland Pty Ltd	Job No.:	E32885PA
Project:	Proposed Storage Building	Well No.:	MW102
Location:	4 Cross Street, BROOKVALE, NSW	Depth (m):	5.00

WELL FINISH DETAILS

	Gatic Cover ☒	Standpipe ☐	Other (describe) ☐
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WELL DEVELOPMENT DETAILS

Method:	TYPHOON	SWL – Before (m):	1.63
Date:	21/7/20	Time – Before:	09.43
Undertaken By:	CR	SWL – After (m):	1.73
Total Vol. Removed:	75L	Time – After:	10.30
PID Reading (ppm):	—		

Comments:

DEVELOPMENT MEASUREMENTS

[illegible]

Comments: Odours (YES / NO), NAPL/PSH (YES / NO), Sheen (YES / NO), Steady State Achieved (YES / NO)

YSI Used: 4

TURBID - mod-HIGH SILT LOAD

Tested By:	CR	Remarks: - Steady state conditions - Difference in the pH less than 0.2 units, difference in the conductivity less than 10% and SWL stable/not in drawdown - Minimum 3 monitoring well volumes purged, unless well purged until it is effectively dry
Date Tested:	2/7/20	
Checked By:	AVB	
Date:	22-J-20	



WATER QUALITY METER CALIBRATION FORM

Client:	Motoland Pty Ltd		
Project:	Proposed Storage Building		
Location:	4 Cross Street, BROOKVALE, NSW		
Job Number:	E32885PA		
DISSOLVED OXYGEN			
Make:	Model:		
Date of calibration:	20/7/20	Name of Calibrator: CR	
Span value: 70% to 130%			
Measured value: 104			
Measured reading Acceptable (Yes/No): YES			
pH			
Make:	Model:		
Date of calibration:	20/7/20	Name of Calibrator: CR	
Buffer 1: Theoretical pH = 7.01 ± 0.01	Expiry date: 03/21	Lot No: 343262	
Buffer 2: Theoretical pH = 4.01 ± 0.01	Expiry date: 06/21	Lot No: 349208	
Measured reading of Buffer 1:	7.26	couldn't calibrate on 3rd attempt	
Measured reading of Buffer 2:	4.41		
Slope:	Measured reading Acceptable (Yes/No): YES		
EC			
Make:	Model:		
Date:	20/7/20	Name of Calibrator: CR	Temperature: 14. °C
Calibration solution:	141345/CR	Expiry date: 04/21	Lot No: 344907
Theoretical conductivity at temperature (see solution container):		1116	µS/cm
Measured conductivity:	1119 µS/cm	Measured reading Acceptable (Yes/No): YES	
REDOX			
Make:	Model:		
Date of calibration:	20/7/20	Name of Calibrator: CR	
Calibration solution:	ORP TEST SOLUTION	Expiry date: 01/25	Lot No: 4923
Theoretical redox value:		240mV	
Measured redox reading:	226.7mV	Measured reading Acceptable (Yes/No): YES	

YES 4.



WATER QUALITY METER CALIBRATION FORM

Client:	Motaland Pty Ltd		
Project:	Proposed Storage Building		
Location:	4 Cross Street, BROOKVALE, NSW		
Job Number:	E32885PA		
DISSOLVED OXYGEN			
Make:	Model:		
Date of calibration: 21/7/20	Name of Calibrator: CR		
Span value: 70% to 130%			
Measured value: 107			
Measured reading Acceptable (Yes/No): YES			
pH			
Make:	Model:		
Date of calibration: 21/7/20	Name of Calibrator: CR		
Buffer 1: Theoretical pH = 7.01 ± 0.01	Expiry date: 03/21	Lot No: 343 262	
Buffer 2: Theoretical pH = 4.01 ± 0.01	Expiry date: 06/21	Lot No: 349 208	
Measured reading of Buffer 1: 7.16			
Measured reading of Buffer 2: 4.12			
Slope:	Measured reading Acceptable (Yes/No): YES		
EC			
Make:	Model:		
Date: 21/7/20	Name of Calibrator: CR	Temperature: 11.4 °C	
Calibration solution: 1413 mS/cm	Expiry date: 04/21	Lot No: 344 907	
Theoretical conductivity at temperature (see solution container): 1035 µS/cm			
Measured conductivity: 1125 µS/cm	Measured reading Acceptable (Yes/No): YES		
REDOX			
Make:	Model:		
Date of calibration: 21/7/20	Name of Calibrator: CR		
Calibration solution: ORP TEST SOLUTION	Expiry date: 01/25	Lot No: 4923	
Theoretical redox value: 240mV			
Measured redox reading: 245 mV	Measured reading Acceptable (Yes/No): YES		

YSI 4

Tested By: <u>Anthony Barkway- AM</u>	Remarks: - Steady state conditions - difference in the pH less than 0.2 units, difference in conductivity less than 10% 10% and SWL stable/not in drawdown
Date Tested: <u>24/7/20</u>	
Checked By: <u>AVB</u>	
Date: <u>25/7/20</u>	

Comments: Odours (YES / <u>NO</u>), NAPL/PSH (YES / NO), Sheen (YES / <u>NO</u>), Steady State Achieved (<u>YES</u> / NO)	
<i>light green colour</i> Sampling Containers Used: <i>4</i> x glass amber, <i>4</i> x BTEX vials, <i>2</i> x HNO3 plastic, <i>1</i> x H2SO4 plastic, <i>1</i> x unpreserved <i>PFAS</i> plastic YSI used: <i>4</i> <i>WDWPI</i>	
Tested By: <i>Anthony Parkway AM</i>	Remarks:
Date Tested: <i>21/7/20</i>	- Steady state conditions
Checked By: <i>AVB</i>	- difference in the pH less than 0.2 units, difference in conductivity less than 10%
Date: <i>25.7.20</i>	10% and SWL stable/not in drawdown



WATER QUALITY METER CALIBRATION FORM

Client:	Motaland Pty Ltd		
Project:	Proposed Storage Building		
Location:	4 Cross Street, BROOKVALE, NSW		
Job Number:	E32885PA		
DISSOLVED OXYGEN			
Make:	Model:		
Date of calibration:	24/7/20	Name of Calibrator: AM	
Span value: 70% to 130%			
Measured value: 89			
Measured reading Acceptable (Yes/No):			
pH			
Make:	Model:		
Date of calibration:	24/7/20	Name of Calibrator: AM	
Buffer 1: Theoretical pH = 7.01 ± 0.01	Expiry date: 1/21	Lot No: 349208	
Buffer 2: Theoretical pH = 4.01 ± 0.01	Expiry date: 12/20	Lot No: 346922	
Measured reading of Buffer 1:	7.17	Only pH 7 Calibrated	
Measured reading of Buffer 2:	—		
Slope:	Measured reading Acceptable (Yes/No):		
EC			
Make:	Model:		
Date:	24/7/20	Name of Calibrator:	AM Temperature: 13 °C
Calibration solution:	Conductivity Standard	Expiry date:	10/20 Lot No: 344907
Theoretical conductivity at temperature (see solution container): 1089 µS/cm			
Measured conductivity:	1012 µS/cm	Measured reading Acceptable (Yes/No):	
REDOX			
Make:	Model:		
Date of calibration:	24/7/20	Name of Calibrator: AM	
Calibration solution:	ORP Test Solution	Expiry date:	11/24 Lot No: 4801
Theoretical redox value: 240mV			
Measured redox reading:	236.1 mV	Measured reading Acceptable (Yes/No):	



PID FIELD CALIBRATION FORM

Client:	Motaland Pty Ltd		
Project:	Proposed Storage Building		
Location:	4 Cross Street, BROOKVALE, NSW		
Job Number:	E32885PR		
PID			
Make: <i>Mini Rae 2000</i>	Model: <i>PID</i>	Unit:	Date of last factory calibration: <i>14/2/22</i>
Date of calibration: <i>23/7/20</i>	Name of Calibrator: <i>AM</i>		
Calibration gas: Iso-butylene	Calibration Gas Concentration: 100.0 ppm		
Measured reading: <i>100</i> ppm	Error in measured reading: $\pm$ ppm		
Measured reading Acceptable (Yes/No): <u>Yes</u>			
PID			
Make:	Model:	Unit:	Date of last factory calibration:
Date of calibration:	Name of Calibrator:		
Calibration gas: Iso-butylene	Calibration Gas Concentration: 100.0 ppm		
Measured reading: ppm	Error in measured reading: $\pm$ ppm		
Measured reading Acceptable (Yes/No):			
PID			
Make:	Model:	Unit:	Date of last factory calibration:
Date of calibration:	Name of Calibrator:		
Calibration gas: Iso-butylene	Calibration Gas Concentration: 100.0 ppm		
Measured reading: ppm	Error in measured reading: $\pm$ ppm		
Measured reading Acceptable (Yes/No):			
PID			
Make:	Model:	Unit:	Date of last factory calibration:
Date of calibration:	Name of Calibrator:		
Calibration gas: Iso-butylene	Calibration Gas Concentration: 100.0 ppm		
Measured reading: ppm	Error in measured reading: $\pm$ ppm		
Measured reading Acceptable (Yes/No):			
PID			
Make:	Model:	Unit:	Date of last factory calibration:
Date of calibration:	Name of Calibrator:		
Calibration gas: Iso-butylene	Calibration Gas Concentration: 100.0 ppm		
Measured reading: ppm	Error in measured reading: $\pm$ ppm		
Measured reading Acceptable (Yes/No):			



Appendix H: Guidelines and Reference Documents



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

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

Canadian Council of Ministers of the Environment, (1999). Canadian soil quality guidelines for the protection of environmental and human health: Benzo(a)Pyrene (1997)

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

Contaminated Land Management Act 1997 (NSW)

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

Heads of EPAs Australia and New Zealand (HEPA). PFAS National Environmental Management Plan Version 2.0 - January 2020 (referred to as NEMP 2020)

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

National Health and Medical Research Council (NHMRC), (2018). National Water Quality Management Strategy, Australian Drinking Water Guidelines 2011

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

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

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

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

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

NSW EPA, (2020). Consultants Reporting on Contaminated Land, Contaminated Land Guidelines

National Environment Protection Council (NEPC), (2013). National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended (2013)

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

Protection of the Environment Operations Act 1997 (NSW)

State Environmental Planning Policy No.55 – Remediation of Land 1998 (NSW)

World Health Organisation (WHO), (2008). Petroleum Products in Drinking-water, Background document for the development of WHO Guidelines for Drinking Water Quality

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