

Geotechnical Testing Services

GTE1735 – Geotechnical and Environmental Report
7 August 2018

Client: R20 Pty Ltd, Penrith
Robert Pty Ltd,
Miaz Group Pty Ltd
Contact: Tony Isaac
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**RE: Geotechnical Investigation, Salinity Assessment and Stage 1 Contamination Assessment
at No.20 Robert Street, Penrith**

This letter presents a geotechnical report on the inspection and testing services associated with the geotechnical investigation undertaken at the above project.

Should you have any questions related to this report please do not hesitate to contact the undersigned.

For and on behalf of
Ground Technologies Pty Ltd



A. Bennett
Principal Geotechnical Engineer

Reviewed By



J. Harendran
Senior Geotechnical Engineer

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1. INTRODUCTION

Ground Technologies Pty Ltd (Ground Tech) has prepared this report to discuss the results of the geotechnical investigation undertaken for the proposed residential development at No.20 Robert Street, Penrith (herein referred to as the "site"). Ground Tech was engaged to provide professional assistance for this component of the project.

The geotechnical investigation included drilling two (2) boreholes drilled using a 4WD Toyota Landcruiser Ute mounted drill rig with 100mm diameter solid flight spiral augers. Two (2) samples were recovered for environmental testing and four (4) samples were recovered for salinity testing. This report provides a geotechnical and environmental assessment of the existing soil and rock conditions.

This report is based only on the information provided at the time of this report preparation and may not be valid if changes are made to the site or to the construction method.

1.1 Proposed Development

It is understood that the proposed development will entail the demolition of the existing structure allowing the construction of a four storey apartment building with a basement level car park. Excavations of up to 4.4m will be required across the entire building envelope in order to accommodate the basement level car park.

Figure 1 – Proposed Basement Plan

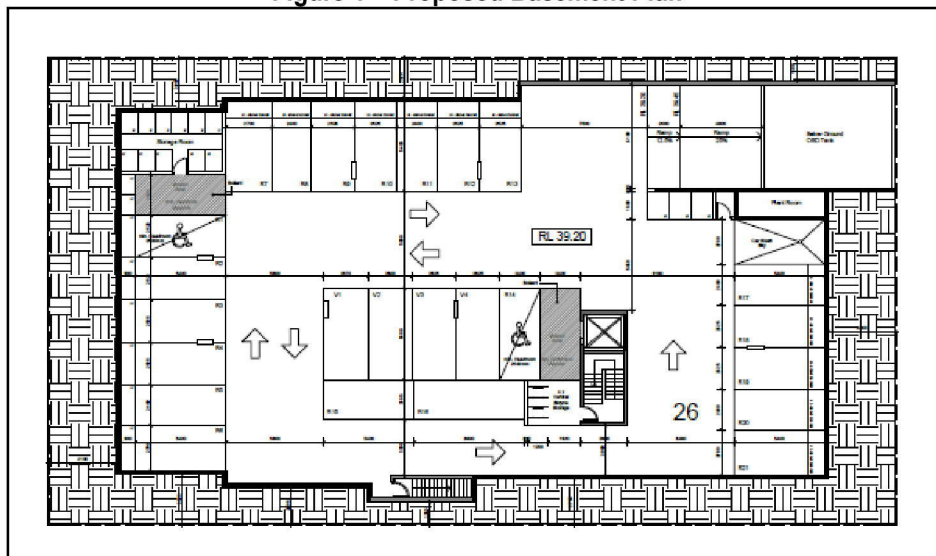


Figure 2 – Proposed Sections



2. SITE DETAILS

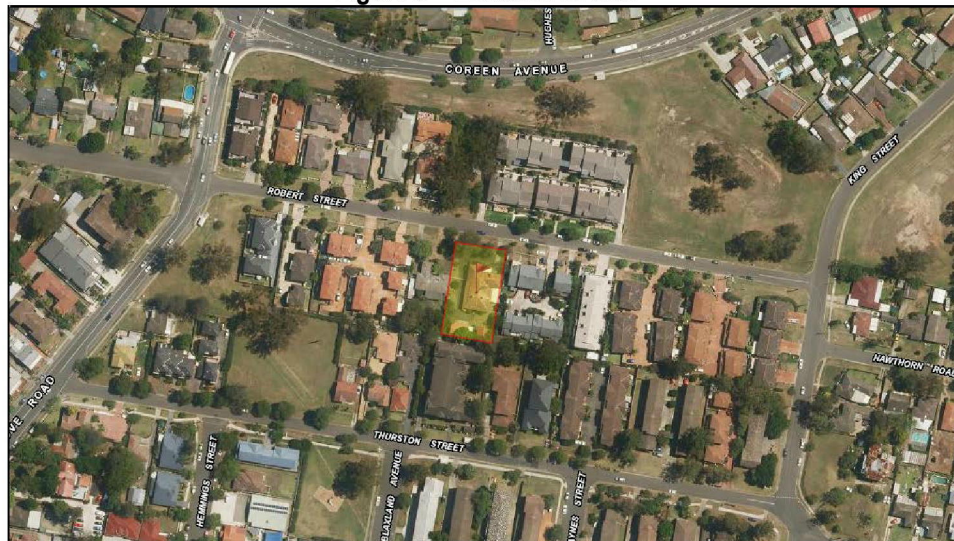
2.1 Site Description

The subject site is near-rectangular in shape, measuring approximately 28m wide along the Robert Street frontage and approximately 50m deep, covering an area of approximately 1400m². Ground slopes across the majority of the site fall towards the southern side of the property (rear) by approximately 2° to 5°, however the front driveway area falls towards the north (front) by approximately 5° to 10°. A single storey brick house is located within the centre portion of the site. A separate garage shed is located along the rear property boundary. These structures are to be demolished

Table 1: Summary of Site Details

Site Address	20 Robert Street, Penrith
Lot / DP	Lot 2 in DP513528
Council Area	Penrith City Council

Figure 3 – Location of Site



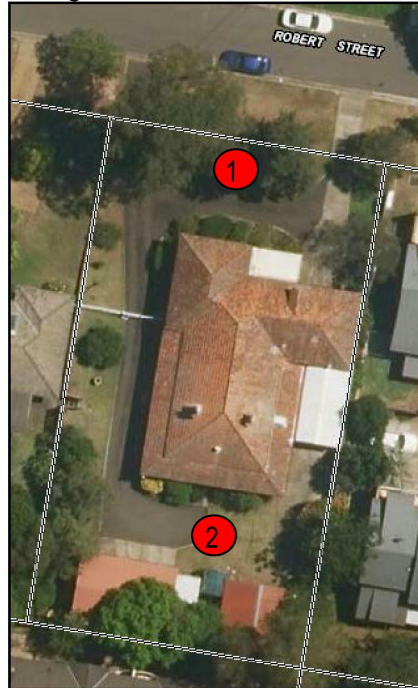
2.2 Geology

The 1:100,000 scale Geological Series Map of the Penrith region indicates that the subject site is underlain by Bringelly Shale of the Wianamatta Group dating back to the Middle Triassic period and generally comprises *shale, carbonaceous claystone, claystone, laminate, fine to medium grained lithic sandstone, and rare coal / tuff.*

3. GEOTECHNICAL INVESTIGATION

Fieldwork was undertaken on 13th of June 2018 and included drilling two boreholes using a 4WD Toyota Landcruiser Ute mounted drill rig with 100 mm solid flight spiral augers at locations shown on Figure 4. Two (2) samples were recovered for environmental testing and four (4) samples were recovered for salinity testing. Laboratory test certificates are presented in Appendix B.

Figure 4 – Borehole Locations



3.1 Soil Profiles

Six (6) distinct geological units were encountered during the field investigation. These units are detailed in table 2 along with the approximate depth of each unit. Full borehole logs are presented in Appendix A.

Table 2: Summary of Geological Units

UNIT	SOIL TYPE	BH1	BH2
UNIT A	TOPSOIL: Clayey SILT, brown	0-0.3m	0-0.2m
UNIT B	NATURAL: Silty CLAY, medium plasticity, red/orange, dry, hard	0.3-0.7m	0.2-0.5m
UNIT C	NATURAL: Silty Clay / Completely Weathered Rock, pale grey with red mottling, slightly moist, very stiff to hard	0.7-1.0m	0.5-1.6m
UNIT D	BEDROCK: SILTSTONE / SHALE, completely weathered with extremely weathered bands, extremely low strength, white with red	-	1.6-3.6m
UNIT E	BEDROCK: SILTSTONE / SHALE, extremely weathered, very low strength, pale brown, brown, Class V	1.0-2.0m	-
UNIT F	BEDROCK: SILTSTONE / SHALE, extremely weathered, low strength, grey, brown, dark-grey, Class IV	2.0-4.5m	3.6-4.5m

3.2 Groundwater

Groundwater was not encountered during the course of the investigation.

4. GEOTECHNICAL DESIGN RECOMMENDATIONS

4.1 Batter Slopes

We understand that deep excavation will form part of the development. Excavation within the natural silts, silty clays and completely weathered bedrock (Units A to D) should be battered at an angle of 45°. The very low to low strength bedrock (Units E to F), in the absence of surcharge loading, may be cut to high angle (approaching vertical) with these high angle cut faces safely free standing during the construction phase.

Unretained excavations should not extend below the “zone of influence” of adjacent structures. That is, a line drawn 45° down from the foundation level of adjacent structures or features. If excavations are to extend below this line, proposed excavations are to be retained prior to excavation.

4.2 Retaining Wall Design Parameters

Where there is insufficient space for batter construction as per section 4.1 of this report, pile installation should precede basement construction. They will initially act in a cantilever capacity but will, subsequent to basement construction, be tied via a capping beam to a suspended floor which will provide lateral support to the piles.

For the design of flexible retaining structures, where some lateral movement is acceptable, an active earth pressure co-efficient is recommended. If it is critical to limit the horizontal deformation of a retaining structure, use of an earth pressure co-efficient at rest should be considered. Recommended parameters for the design of retaining structures are presented in table 4.

Table 4 – Retaining Wall Design Parameters for each Geological Unit

	Geological Unit	
	Unit A to D	Unit E to F
Ka	0.4	0.2
Ko	0.6	0.3
Kp	2.5	200kPa
Unit Weight (kg/m³)	18	20

The retaining wall designs should also allow for any additional surcharge loads from adjoining structures, vehicles etc, which should be calculated separately. Appropriate drainage systems and free draining backfill should be provided to prevent the build-up of hydrostatic pressures behind all retaining walls.

4.3 Excavation

Excavations within the natural clays and completely weathered shales (Units A to D) should be achieved with bucket attachment to a mid sized excavator. Excavations within the shale bedrock (Unit E and F), intersecting more competent bedrock may require pre-loosening using rock breaking or ripping attachments.

If vibratory rock breaking equipment is required for the proposed excavations in sandstone bedrock we recommend that, prior to the use of vibratory equipment, the excavation perimeter is saw cut with the aid of an excavator mounted rock saw or by drill and split techniques so as to minimise transmission of vibrations to adjoining structures. Following sawing of the perimeter of the excavation, sandstone bedrock may be broken up using a vibratory hammer suited to an excavator. Induced vibrations in structures adjacent to the excavation are to be examined to ensure that they do not exceed a peak particle velocity (PPV) of 5mm/sec.

As a guide, safe working distances for typical items of vibration intensive plant are listed in Table 5. The safe working distances are quoted for “cosmetic” damage (refer BS 7385) and are detailed in the Construction Noise Strategy (2010) prepared by the NSW Transport Construction Authority.

Table 5: Recommended Safe Working Distances for Vibration Intensive Plant

Plant Item	Rating / Description	Safe Working Distance
Small Hydraulic Hammer	250kg – 1.5 tonne excavator	2m
Small Hydraulic Hammer	300kg - 5 to 12tonne excavator	2m
Medium Hydraulic Hammer	900kg - 12 to 18tonne excavator	7m
Large Hydraulic Hammer	1600kg - 18-34 tonne excavator	22m

Ground vibrations induced by excavations should be monitored and recorded by specialist contractors. Monitoring equipment / data loggers should be installed at the closest point of the adjacent structures to ensure that the excavation contractor does not exceed the recommended level. We recommend the operation of hydraulic hammers should include:

- Excavation of loose or rippable sandstone blocks by bucket or single ripper attachments prior to the commencement of rock hammering;
- Use of saw cutting around the perimeter
- Progressive breakage from open excavated faces;
- Selective breakage along open joints where these are present;
- Use of rock hammers in short bursts to prevent generation of resonant frequencies;
- Orientation of the rock hammer pick away from property boundaries and into existing open excavation;
- The movement of large blocks away from the structures prior to breaking up for transport from the site.

Excavation works should be carried out by an experienced operator who is aware of factors affecting vibration and transmission of vibration such as orientation of the hammer, duration of hammering and speed of the vibration of the hammer.

Prior to the excavation works, it is recommended that dilapidation surveys be undertaken out on the surrounding properties (if any) as a means of protecting all parties involved in or affected by the proposed works.

4.4 Bored Pier Footings

Bored concrete piers can be designed in accordance with the end bearing capacities detailed in table 6.

Table 6 – Bearing Capacity for Pier Footings in each Geological Unit

	Geological Unit	
	Unit E	Unit F
Bearing Capacity	700kPa	1000kPa
Shaft Adhesion	70kPa	100kPa

The quality of the founding stratum in all footing excavations is to be assessed by a structural or geotechnical engineer to confirm that the design parameters recommended in this report are appropriate. Footing excavations are to be cleaned out and inspected by a geotechnical engineer or the structural engineer prior to concrete placement. Concrete is to be placed within 24 hours of excavation, since the weathered bedrock may deteriorate rapidly upon exposure.

4.5 Basement Level Footings

Excavations for the basement level of the development will extend to a maximum depth of 4.4m below existing ground surface levels. Material exposed at the base of this excavation will comprise a completely to extremely weathered bedrock.

The proposed floor slab can be constructed at bulk excavation level designed on a Sub-grade Reaction Modulus (k) of 90 kPa/mm or CBR of 30.

Strip and Pad footings constructed within the completely weathered bedrock (Unit D) at basement level may be designed with the following maximum allowable end bearing capacities.

Isolated Pad Footings - 400kPa
Strip Footings - 400kPa

Strip and Pad footings constructed within the extremely weathered bedrock (Unit E and F) at basement level may be designed with the following maximum allowable end bearing capacities.

Isolated Pad Footings - 700kPa*
Strip Footings - 700kPa*

Note* - It is recommended that all footing excavations be inspected by a geotechnical engineer from Ground Tech to confirm that founding conditions are consistent with design recommendations. The footing size and the founding level may need to be adjusted, if required founding material is not encountered at the design founding level.

5. SALINITY ASSESSMENT

Salinity is a dynamic process with the potential for the movement and accumulation of salts to change over time and as a result of land use and management practices. The processes of salinity vary at different scales such as individual sites, regions and whole river catchments, so the impacts can be close to or distant from the cause, depending on the landscape and groundwater characteristics.

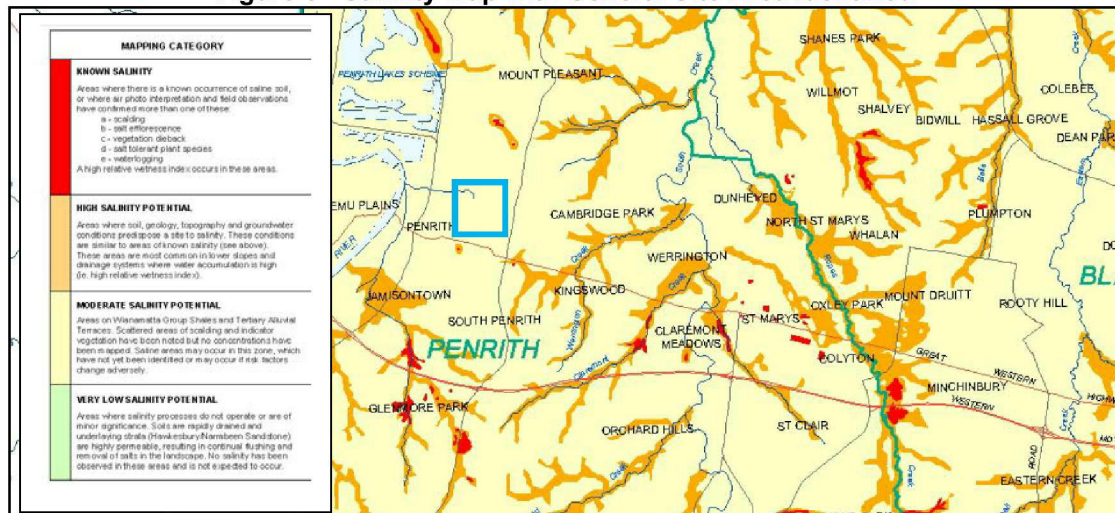
Urban salinity affects built infrastructure, due to the chemical and physical impact of salt on concrete, bricks and metal. The salt moves with water into the pores of bricks and concrete when they are exposed to damp, salt-laden soils. As the water is evaporated from the material, the salt concentrates and over time this can be substantial enough to cause corrosion and damage the material's structure. This is seen as crumbling, eroded or powdering mortar or bricks, the flaking of brick facing and the cracking or corrosion of concrete. The salt within the material can also have a corrosive effect on steel reinforcing. The long-term consequences can be structural damage.

Some building methods may also contribute to the development of salinity. Compacted surfaces can restrict groundwater flow and concentrate salt in one area. By cutting into slopes to build, groundwater or saline soil may be intercepted and exposed. In addition, fill used to build up an area may be a source of salt, or it may be less permeable, preventing good drainage.

5.1 Salinity Potential

The Department of Infrastructure and Planning (2002) Salinity Potential in Western Sydney map "Salinity Potential in Western Sydney 2002" indicates that the subject site is situated in a region with a moderate risk of saline soils.

Figure 5 - Salinity Map with General Site Area Identified



Four (4) screening tests were collected as a part of this assessment in order to gain a view on the risk of saline soils. This assessment is based on the booklet "Site Investigations for Urban Salinity" published by Department of Land and Water Conservation 2002. Laboratory analysis was completed by Australian Laboratory Services (ALS) Pty Ltd, a NATA accredited laboratory, Certificate Reference number ES18177360.

5.2 Salinity Analytes

Salinity refers to the presence of excessive salt, which is toxic to most plants. Because salt separates into positively and negatively charged ions when dissolved in water, the electrical conductivity of the water increases as the amount of salt increases. The EC_e values of soil salinity class is given below which has been adopted from the booklet "Site Investigations for Urban Salinity" published by Department of Land and Water Conservation 2002. The salinity exposure classification for various concrete strengths (F'_c) is detailed in Section 5.1 of AS 2870-2011 "Residential Slabs and Footings" code.

Table 7: EC_e values of Soil Salinity Class and Exposure Classification for Concrete

Class	EC_e	Exposure Classification for Concrete (AS 2870 – 2011 from Tables 5.1 & 5.3)
Non Saline	<2	A1 (min. $F'_c = 20$ MPa)
Slightly Saline	2-4	A1 (min. $F'_c = 20$ MPa)
Moderately Saline	4-8	A2 (min. $F'_c = 25$ MPa)
Very Saline	8-16	B1 (min. $F'_c = 32$ MPa)
Highly Saline	>16	B2 (min. $F'_c = 40$ MPa)

Chlorides are negatively charged ions (anions) which are corrosive to building material, particularly steels. In concrete, chlorides react with the steel reinforcement causing it to corrode and expand putting physical stress on the concrete.

Sulphates are negatively charged particles (anions) which are corrosive to building materials, particularly concrete. Sulphates react with the hydrated calcium aluminate in concrete. The products of the reaction have a greater volume than the original material, producing physical stress in the concrete.

Table 8: Sulphate and Chloride Values and Aggressivity

Concrete Structure		Steel Structure	
Sulphate (SO_4) Units(mg/kg)	Classification	Chloride Units(mg/kg)	Classification
<5,000	Non-aggressive	<20,000	Non-aggressive
5,000-10,000	Mild	20,000-50,000	Mild
10,000-20,000	Moderate	>50,000	Moderate
>20,000	Severe		

Source: Australian Standard 2159:2009 Piling – Design and Installation Guidelines

pH Measures acidity or alkalinity of soil and is important in determining the aggressiveness of the soil to building materials. Acids combine with the calcium hydroxide component of cement to form soluble calcium compounds which can leach from the concrete increasing its porosity and decreasing its strength.

Table 9: pH Values and Aggressivity

Concrete Structure		Steel Structures	
pH	Classification	pH	Classification
>5	Non-aggressive	>4	Non-aggressive
4.5-5	Mild	3-4	Mild
4.0-4.5	Moderate	<3	Moderate
<4.0	Severe		

Source: Australian Standard 2159:2009 Piling – Design and Installation Guidelines

5.3 Laboratory Test Results

Test results are tabulated and presented in table 10 & 11 below. The laboratory test certificate is located in Appendix C.

Table 10: Analysis of the Soil Samples (Salinity)

Sample	Borehole	Depth (m)	EC $\mu\text{S/cm}$	Texture Factor	ECe	Salinity Class
S1	BH1	0.5m	84	7	0.59	Non Saline
S2	BH1	1.5m	462	9	4.16	Moderately Saline
S3	BH1	2.5m	503	9	4.53	Moderately Saline
S4	BH1	3.5m	491	9	4.42	Moderately Saline
S5	BH1	4.5m	478	9	4.30	Moderately Saline

Table 11: Analysis of the Soil Samples (Aggressiveness)

Sample	Borehole	Depth (m)	pH	Chloride	Sulphate	Resistivity	Aggressivity to Concrete	Aggressivity to Steel
			pH Units	mg/kg	mg/kg	Ohm.cm		
S1	BH1	0.5m	5.7	150	50	11905	Non Aggressive	Non Aggressive
S2	BH1	1.5m	5.0	390	310	2164	Mild	Non Aggressive
S3	BH1	2.5m	5.0	750	310	1988	Mild	Mild
S4	BH1	3.5m	5.3	630	320	2036	Mild	Non Aggressive
S5	BH1	4.5m	5.5	610	280	2092	Mild	Non Aggressive

5.4 Conclusions of Salinity Assessment

From the results presented in Table 10, the electrical conductivity results indicate that the soil salinity is moderately saline. The laboratory test values of sulphates, chlorides and pH (table 11) indicate that the soil is predominately mildly aggressive to both steel and concrete. Structural designs should take into account the following minimum design recommendations for concrete re-inforced structures

Table 12: Structural Design Recommendations

Ground Slabs ²			Concrete Bored Piers ³		
Exposure Class	F'c	Cover	F'c	Cover (50 year design life)	Cover (100 year design life)
A2	25MPa	45mm	32MPa	60mm	75mm

Note 2 – Reference AS2870 Residential Slabs and Footings

Note 3 – Reference AS2159:2009 Piling – Design and Installation Guidelines

6. ACID SULPHATE SOILS ASSESSMENT

Acid Sulfate Soils (ASS) are naturally occurring and usually form in low lying coastal areas, creeks, rivers and flood plains. The sulfates present in the soil are stable when in the saturated/waterlogged state, but react to form sulphuric acid when disturbed and exposed to oxygen. The Department of Land and Water Conservation has no record of Acid Sulphate soils within the Penrith area.

7. STAGE 1 CONTAMINATION ASSESSMENT

7.1 Site History

A review of Historical Aerial Photographs was undertaken in order to provide a greater insight into the site history.

1956 – In 1956, the subject site and surrounding sites were in use for residential purposes. No industrial facilities can be observed within the area. The approximate location of the subject site is highlighted in figure 6.

Figure 6 – Aerial Photograph from 1956



1994 – In 1994, the site and surrounds are still in use for residential purposes. The site and surrounds are in a similar condition to 2018. No industrial facilities can be observed within the area. The approximate location of the subject site is highlighted in figure 7.

Figure 7 – Aerial Photograph from 1994



7.2 Search of the Contaminated Land Management Register (NSW EPA)

A summary of the search of the NSW EPA Contaminated Land Management record of notices for the Penrith Area can be found in Appendix C. No notices have been issued to the subject site. One notice has been issued in the area.

7.3 Search of the Protection of the Environment operations Public Register (POEO) of Licensed and Delicensed Premises

A search of the POEO public register of licensed and delicensed premises (DECC) provided the details of seventy nine (19) licences to twenty one (21) premises in Penrith. No licensed or delicensed premises were located within the immediate surrounding area of the site (within 500m). Full results of the search can be found in Appendix C.

7.4 Summary of Potential sources of Contamination

The subject property appears to have been used for residential purposes for the last 60+years. No market gardening or heavy agriculture was identified within the site during the desktop study. No heavy industrial operations were identified within the site during the desktop study. A search of the NSW EPA Contaminated Land Management record of notices revealed that there were no notices issued to the subject site.

The neighbouring properties are residential and no industrial estates are located within 500m of the subject site. Therefore the risk of contamination migration caused by surface run-off from adjoining sites is minimal.

According to the interpretation of the sub-surface soil profile for this site, clay soils are present beneath the site. This material would provide a relatively impermeable layer and prevent the migration of any contamination into deeper soils or groundwater.

Whilst the potential for site contamination was very low, limited laboratory screening testing was undertaken as a part of this investigation to aid the assessment and assist in waste classification.

7.5 Sampling Methodology

Each sample location was excavated utilizing a truck mounted solid flight auger drill rig or hand auger with samples collected directly from the auger. The auger was decontaminated prior to each use to prevent cross contamination occurring. The samples were placed in 250g laboratory prepared glass jars which were capped using Teflon-sealed screw caps and then placed in a chilled container.

The samples were then forwarded to Australian Laboratory Services Pty Ltd (ALS) for analysis along with a Chain of Custody which was subsequently returned to confirm the receipt of all samples. ALS are accredited by the National Association of Testing Authorities (NATA) for the analyses carried out and are also accredited for compliance with ISO/IEC 17025.

7.6 Site Assessment Criteria

The Assessment criteria used in this investigation have been obtained from the National Environment Protection (Assessment of Site Contamination) Measure (NEPM, 2013). This document presents risk-based Health Investigation Levels based on a variety of exposure settings for a number of organic and inorganic contaminants. To assess the risk to human health the results of the laboratory analysis are compared against the Health Investigation Levels (HIL) for the exposure setting; 'standard residential with garden/accessible soil' ('A').

7.7 Laboratory Analysis

Whilst the potential for site contamination due to agriculture was low, two soil samples were collected for laboratory analysis. Contaminants of concern resulting from agricultural activities include Heavy Metals and Organochlorine Pesticides. Test results are tabulated and presented below (Table 13) along with the relevant assessment criteria. Full Laboratory test certificates (ES1817360) are located in Appendix B.

Table 13: Analysis of the Samples Recovered

Chemicals and other attributes	Sample Number		NEPM Health Investigation Level HILs (A)
	C1 BH1 0.1m	C2 BH2 0.1m	
Arsenic	<5	<5	100
Cadmium	<1	<1	20
Chromium (total)	14	11	100
Copper	26	15	6,000
Lead	100	44	300
Nickel	5	3	400
Zinc	75	27	7,400
Mercury	<0.1	<0.1	40
Aldrin + Dieldrin	<0.05	<0.05	45
Chlordane	<0.05	<0.05	530
Endosulfan	<0.05	<0.05	2,000
Endrin	<0.05	<0.05	100
Heptachlor	<0.05	<0.05	50
Methoxychlor	<0.2	<0.2	2,500
DDD+DDE+DDT	<0.05	<0.05	3,600

7.8 Conclusions from Stage 1 Contamination Assessment

The results of the desk top study and chemical analyses indicate that the site does not present a significant risk to human health or the environment in the exposure setting; 'standard residential with garden/accessible soil' ('A'). A remediation action plan is not required.

7.9 Waste Classification of Excavated Soils

Based on visual observations the Natural Silty Clay materials being excavated from the site appeared to be naturally occurring and free from foreign material as no suspicious odours or obvious signs of contamination were observed.

Hence the material on the above site is classified as virgin excavated natural material (VENM) for future use; since it is in accordance with the definition of VENM given under the *Protection of the Environments Operations Act 1997* as outlined below:

'Natural material (such as clay, gravel, sand, soil or rock fines):

- That has been excavated or quarried from areas that are not contaminated with manufactured chemicals or process residues, as a result of industrial, commercial, mining or agricultural activities, and
- That does not contain any sulfidic ores or soils or any other waste.'

8. CONDITIONS OF THE RECOMMENDATIONS

This type of investigation (as per our commission) is not designed or capable of locating all ground conditions, (which can vary even over short distances). The advice given in this report is based on the assumption that the test results are representative of the overall ground conditions. However, it should be noted that actual conditions in some parts of the site might differ from those found. If excavations reveal ground conditions significantly different from those shown in our findings, Ground Tech must be consulted.

This report is a geotechnical report only and the classification stated shall not be regarded as an engineering design nor shall it replace a design by engineering principles although it may contribute information for such designs. When this report is to be used as a reference by the engineer or builder or other relevant party, this report must be reproduced in total.

The foundation depths quoted in this report are measured from the surface during our testing and may vary accordingly if any filling or excavation works are carried out. The description of the foundation material for has been provided for its easy recognition over the whole building site.

Any sketches in this report should be considered as only an approximate pictorial evidence of our work. Therefore, unless otherwise stated, any dimensions or slope information should not be used for any building cost calculations and/or positioning of the building. Dimensions on logs are correct.

The scope and the period of Ground Tech services are described in the report and are subject to restrictions and limitations. Ground Tech did not perform a complete assessment of all possible conditions or circumstances that may exist at the Site. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by Ground Tech in regards to it.

Where data has been supplied by the client or a third party, it is assumed that the information is correct unless otherwise stated. No responsibility is accepted by Ground Tech for incomplete or inaccurate data supplied by others.

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9. REFERENCES





- Geological Series Sheet 9030 (EDITION 1) 1991, Map of the Penrith region, scale 1:100,000
- “Foundations of Sandstone and Shale in the Sydney Region” by P.J.N Pells, G. Mostyn & B.F Walker.
- Western Sydney Regional Organisation of Councils Ltd (2003) Western Sydney Salinity Code of Practice
- Department of Infrastructure, Planning and Natural Resources (2002) Site Investigations for Urban Salinity;
- Department of Infrastructure, Planning and Natural Resources (2003) Building in a Saline Environment
- Australian Standards AS2159 – 2009 Piling – Design and Installation
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- Contaminated Sites – Guidelines for Assessing Service Stations. NSW Environment Protection Authority (EPA) 1994
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- Managing Land Contamination: Planning Guidelines SEPP55 – Remediation of Land - Department of Urban Affairs and Planning and Environment Protection Authority (DUAP and EPA) 1998.
- National Environment Protection (Assessment of Site Contamination) Measure – National Environmental Protection Council 1999.

APPENDIX A

Borehole Logs

SITE LOCATION: 20 Robert Street, Penrith








BOREHOLE NO. 1

WATER	DEPTH (m)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION <small>(SOIL TYPE, COLOUR, MOISTURE, CONSISTENCY)</small>	GRAPHIC LOG	POCKET PENETROMETER	SAMPLE	REMARKS		
N I L	0.5	ML	Clayey Silt, brown			C1	Borehole start at R/L: 42.2m		
		CI	Silty Clay, medium plasticity, red/orange, dry, hard		400	S1			
	1	CH	Silty Clay / Completely Weathered Rock pale grey with red mottling, slightly moist, very stiff to hard		350			Class V Rock	
	ROCK	Siltstone / Shale, extremely weathered, very low strength, pale brown, brown				S2			
	1.5								Class IV Rock
	2		Siltstone / Shale, extremely weathered, low strength, grey, brown, pale grey/brown					S3	
	2.5								Basement exc. at R/L: 39.2m
	3								
	3.5							S4	
	4								
4.5			Borehole terminated at 4.5m			S5			

Method: 4WD Mounted Rig/Solid FlightSpiral Augers
Date of Drilling: 13/6/2018
Logged and Drilled by: AB

SITE LOCATION: 20 Robert Street, Penrith

BOREHOLE NO. 2

WATER	DEPTH (m)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION <small>(SOIL TYPE, COLOUR, MOISTURE, CONSISTENCY)</small>	GRAPHIC LOG	POCKET PENETROMETER	SAMPLE	REMARKS
N I L	0.5	ML	Clayey Silt, brown			C2	Borehole start at R/L: 43.0m
		CI	Silty Clay, medium plasticity, red/orange, dry, hard		400		
		CH	Silty Clay / Completely Weathered Rock pale grey with red mottling, slightly moist, very stiff to hard		350		
					400		
					400		
	1						
	1.5						
	2	ROCK	Siltstone / Shale, completely weathered with extremely weathered bands, extremely low strength, white with ironstaining		400		Material presents as clay when excavated but has minor rock structure
	2.5						
	3						
	3.5						
	4		Siltstone / Shale, extremely weathered, low strength, grey, brown, pale grey/brown				Class IV Rock Basement exc. at R/L: 39.2m
	4.5		Borehole terminated at 4.5m				

Method: 4WD Mounted Rig/Solid FlightSpiral Augers

Date of Drilling: 13/6/2018

Logged and Drilled by: AB

APPENDIX B

Laboratory Test Results

CHAIN OF CUSTODY



ALS Laboratory
please tick →

CLIENT: Ground Technologies
OFFICE: 19 Bernera Road, Prestons
PROJECT: GTE1735 - Penrith
ORDER NUMBER:
PROJECT MANAGER: Anthony Bennett
SAMPLER: Anthony Bennett
COC emailed to ALS? (NO)
Email Reports to: anthony@groundtech.com.au, joshua@groundtech.com.au
Email Invoice to (will default to PM if no other addresses are listed): lab@groundtech.com.au

TURNAROUND REQUIREMENTS:
Standard TAT (List due date):
Ultra Trace Organics)
ALS QUOTE NO.: SY1554/14
CONTACT PH: 0414 805 803
SAMPLER MOBILE:
EDD FORMAT (or default):

FOR LABORATORY USE ONLY (Circle)
Custody Seal intact? Yes No
Fragile / avoid reprints, pressure, etc? Yes No
Random Sample Temperature of Receipt? 21.3 °C
Other Comments:

RECEIVED BY:
DATE/TIME:

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE codes below)	CONTAINER INFORMATION (refer to TOTAL CONTAINERS	ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify total (unfiltered bottle required) or Dissolved (field filtered bottle required).	Additional Information
1	C1	13/06/2018	S		1	S28 X	
2	C2	13/06/2018	S		1	X	
3	S1	13/06/2018	S		1	X	
4	S2	13/06/2018	S		1	X	
5	S3	13/06/2018	S		1	X	
6	S4	13/06/2018	S		1	X	
7	S5	13/06/2018	S		1	X	

RECEIVED BY: *Anthony Bennett*
DATE/TIME: 13/6/18 14:00

RECEIVED BY: *Anthony Bennett*
DATE/TIME: 13/6/18 14:00

RECEIVED BY: *Anthony Bennett*
DATE/TIME: 13/6/18 14:00

RECEIVED BY: *Anthony Bennett*
DATE/TIME: 13/6/18 14:00

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DATE/TIME: 13/6/18 14:00

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DATE/TIME: 13/6/18 14:00

RECEIVED BY: *Anthony Bennett*
DATE/TIME: 13/6/18 14:00

RECEIVED BY: *Anthony Bennett*
DATE/TIME: 13/6/18 14:00



COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic
V = VOA Vial (HCl) Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl Preserved Plastic; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Solids; B = Unpreserved Bag.

CERTIFICATE OF ANALYSIS

Work Order : **ES1817360**
Client : **GROUND TECHNOLOGIES**
Contact : **MR ANTHONY BENNETT**
Address : **16 Weld Street**
PRESTONS NSW, AUSTRALIA 2170
Telephone : **+61 02 8783 8200**
Project : **GTE1735-Penrith**
Order number :
C-O-C number : ----
Sampler : **ANTHONY BENNETT**
Site : ----
Quote number : **EN/222/17**
No. of samples received : **7**
No. of samples analysed : **7**

Page : 1 of 9
Laboratory : Environmental Division Sydney
Contact : Customer Services ES
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 13-Jun-2018 14:00
Date Analysis Commenced : 15-Jun-2018
Issue Date : 20-Jun-2018 10:09



Accreditation No. 825
 Accredited for compliance with
 ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
∅ = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR.
Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID				
				C1	C2	S1	S2	S3
Client sampling date / time				13-Jun-2018 00:00	13-Jun-2018 00:00	13-Jun-2018 00:00	13-Jun-2018 00:00	13-Jun-2018 00:00
Compound	CAS Number	LOR	Unit	ES1817360-001	ES1817360-002	ES1817360-003	ES1817360-004	ES1817360-005
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	----	----	5.7	5.0	5.3
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	----	----	84	462	503
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	12.3	12.1	14.4	9.1	11.7
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	----	----	50	310	310
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	----	----	150	390	750
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	<5	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	----	----
Chromium	7440-47-3	2	mg/kg	14	11	----	----	----
Copper	7440-50-8	5	mg/kg	26	15	----	----	----
Lead	7439-92-1	5	mg/kg	100	44	----	----	----
Nickel	7440-02-0	2	mg/kg	5	3	----	----	----
Zinc	7440-66-6	5	mg/kg	75	27	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	0.1	<0.1	----	----	----
EP066: Polychlorinated Biphenyls (PCB)								
Total Polychlorinated biphenyls	----	0.1	mg/kg	----	----	<0.1	<0.1	<0.1
EP068A: Organochlorine Pesticides (OC)								
alpha-BHC	319-84-6	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
beta-BHC	319-85-7	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
gamma-BHC	58-89-9	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
delta-BHC	319-86-8	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Heptachlor	76-44-8	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Aldrin	309-00-2	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Heptachlor epoxide	1024-57-3	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
^ Total Chlordane (sum)	----	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
trans-Chlordane	5103-74-2	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
alpha-Endosulfan	959-98-8	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
cis-Chlordane	5103-71-9	0.05	mg/kg	----	----	<0.05	<0.05	<0.05



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID				
Client sampling date / time				C1	C2	S1	S2	S3
Compound				13-Jun-2018 00:00	13-Jun-2018 00:00	13-Jun-2018 00:00	13-Jun-2018 00:00	13-Jun-2018 00:00
CAS Number	LOR	Unit		ES1817360-001	ES1817360-002	ES1817360-003	ES1817360-004	ES1817360-005
				Result	Result	Result	Result	Result
EP068A: Organochlorine Pesticides (OC) - Continued								
Dieldrin	60-57-1	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
4,4'-DDE	72-55-9	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Endrin	72-20-8	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
beta-Endosulfan	33213-65-9	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
[^] Endosulfan (sum)	115-29-7	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
4,4'-DDD	72-54-8	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Endrin aldehyde	7421-93-4	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Endosulfan sulfate	1031-07-8	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
4,4'-DDT	50-29-3	0.2	mg/kg	----	----	<0.2	<0.2	<0.2
Endrin ketone	53494-70-5	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
Methoxychlor	72-43-5	0.2	mg/kg	----	----	<0.2	<0.2	<0.2
[^] Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
[^] Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.05	mg/kg	----	----	<0.05	<0.05	<0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	0.9	<0.5	----	----	----
Pyrene	129-00-0	0.5	mg/kg	0.9	<0.5	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	----	----	----
[^] Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	1.8	<0.5	----	----	----
[^] Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	----	----	----
[^] Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	0.6	----	----	----
[^] Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	1.2	----	----	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID				
				C1	C2	S1	S2	S3
Client sampling date / time				13-Jun-2018 00:00	13-Jun-2018 00:00	13-Jun-2018 00:00	13-Jun-2018 00:00	13-Jun-2018 00:00
Compound	CAS Number	LOR	Unit	ES1817360-001	ES1817360-002	ES1817360-003	ES1817360-004	ES1817360-005
				Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	<50	----	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	<100	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	<100	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	<10	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	<50	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	<50	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	----	----	----
^ Sum of BTEX	----	0.2	mg/kg	<0.2	<0.2	----	----	----
^ Total Xylenes	----	0.5	mg/kg	<0.5	<0.5	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	<1	----	----	----
EP066S: PCB Surrogate								
Decachlorobiphenyl	2051-24-3	0.1	%	----	----	82.8	78.6	85.4
EP068S: Organochlorine Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.05	%	----	----	106	118	116
EP068T: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.05	%	----	----	76.5	76.9	63.6
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	83.3	88.7	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	98.2	97.8	----	----	----
2,4,6-Tribromophenol	118-79-6	0.5	%	97.5	101	----	----	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	C1	C2	S1	S2	S3
Client sampling date / time					13-Jun-2018 00:00	13-Jun-2018 00:00	13-Jun-2018 00:00	13-Jun-2018 00:00	13-Jun-2018 00:00
Compound	CAS Number	LOR	Unit	ES1817360-001	ES1817360-002	ES1817360-003	ES1817360-004	ES1817360-005	
				Result	Result	Result	Result	Result	
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%	82.3	90.9	----	----	----	
Anthracene-d10	1719-06-8	0.5	%	93.0	105	----	----	----	
4-Terphenyl-d14	1718-51-0	0.5	%	92.6	103	----	----	----	
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.2	%	94.8	91.9	----	----	----	
Toluene-D8	2037-26-5	0.2	%	90.1	88.5	----	----	----	
4-Bromofluorobenzene	460-00-4	0.2	%	99.7	100	----	----	----	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID			S4	S5	----	----	----
Client sampling date / time				13-Jun-2018 00:00	13-Jun-2018 00:00	----	----	----	----	----	
Compound	CAS Number	LOR	Unit	ES1817360-006	ES1817360-007	-----	-----	-----	-----	-----	
				Result	Result	----	----	----	----	----	
EA002 : pH (Soils)											
pH Value	----	0.1	pH Unit	5.3	5.5	----	----	----	----	----	
EA010: Conductivity											
Electrical Conductivity @ 25°C	----	1	µS/cm	491	478	----	----	----	----	----	
EA055: Moisture Content (Dried @ 105-110°C)											
Moisture Content	----	1.0	%	9.4	9.5	----	----	----	----	----	
ED040S : Soluble Sulfate by ICPAES											
Sulfate as SO4 2-	14808-79-8	10	mg/kg	320	280	----	----	----	----	----	
ED045G: Chloride by Discrete Analyser											
Chloride	16887-00-6	10	mg/kg	630	610	----	----	----	----	----	
EP066: Polychlorinated Biphenyls (PCB)											
Total Polychlorinated biphenyls	----	0.1	mg/kg	<0.1	<0.1	----	----	----	----	----	
EP068A: Organochlorine Pesticides (OC)											
alpha-BHC	319-84-6	0.05	mg/kg	<0.05	<0.05	----	----	----	----	----	
Hexachlorobenzene (HCB)	118-74-1	0.05	mg/kg	<0.05	<0.05	----	----	----	----	----	
beta-BHC	319-85-7	0.05	mg/kg	<0.05	<0.05	----	----	----	----	----	
gamma-BHC	58-89-9	0.05	mg/kg	<0.05	<0.05	----	----	----	----	----	
delta-BHC	319-86-8	0.05	mg/kg	<0.05	<0.05	----	----	----	----	----	
Heptachlor	76-44-8	0.05	mg/kg	<0.05	<0.05	----	----	----	----	----	
Aldrin	309-00-2	0.05	mg/kg	<0.05	<0.05	----	----	----	----	----	
Heptachlor epoxide	1024-57-3	0.05	mg/kg	<0.05	<0.05	----	----	----	----	----	
^ Total Chlordane (sum)	----	0.05	mg/kg	<0.05	<0.05	----	----	----	----	----	
trans-Chlordane	5103-74-2	0.05	mg/kg	<0.05	<0.05	----	----	----	----	----	
alpha-Endosulfan	959-98-8	0.05	mg/kg	<0.05	<0.05	----	----	----	----	----	
cis-Chlordane	5103-71-9	0.05	mg/kg	<0.05	<0.05	----	----	----	----	----	
Dieldrin	60-57-1	0.05	mg/kg	<0.05	<0.05	----	----	----	----	----	
4,4`-DDE	72-55-9	0.05	mg/kg	<0.05	<0.05	----	----	----	----	----	
Endrin	72-20-8	0.05	mg/kg	<0.05	<0.05	----	----	----	----	----	
beta-Endosulfan	33213-65-9	0.05	mg/kg	<0.05	<0.05	----	----	----	----	----	
^ Endosulfan (sum)	115-29-7	0.05	mg/kg	<0.05	<0.05	----	----	----	----	----	
4,4`-DDD	72-54-8	0.05	mg/kg	<0.05	<0.05	----	----	----	----	----	
Endrin aldehyde	7421-93-4	0.05	mg/kg	<0.05	<0.05	----	----	----	----	----	
Endosulfan sulfate	1031-07-8	0.05	mg/kg	<0.05	<0.05	----	----	----	----	----	
4,4`-DDT	50-29-3	0.2	mg/kg	<0.2	<0.2	----	----	----	----	----	
Endrin ketone	53494-70-5	0.05	mg/kg	<0.05	<0.05	----	----	----	----	----	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID		S4	S5	----	----	----
Client sampling date / time				13-Jun-2018 00:00	13-Jun-2018 00:00	----	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1817360-006	ES1817360-007	-----	-----	-----	-----	-----
				Result	Result	----	----	----	----	----
EP068A: Organochlorine Pesticides (OC) - Continued										
Methoxychlor	72-43-5	0.2	mg/kg	<0.2	<0.2	----	----	----	----	----
^ Sum of Aldrin + Dieldrin	309-00-2/60-57-1	0.05	mg/kg	<0.05	<0.05	----	----	----	----	----
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/5 0-2	0.05	mg/kg	<0.05	<0.05	----	----	----	----	----
EP066S: PCB Surrogate										
Decachlorobiphenyl	2051-24-3	0.1	%	82.8	70.6	----	----	----	----	----
EP068S: Organochlorine Pesticide Surrogate										
Dibromo-DDE	21655-73-2	0.05	%	124	143	----	----	----	----	----
EP068T: Organophosphorus Pesticide Surrogate										
DEF	78-48-8	0.05	%	81.8	85.9	----	----	----	----	----



Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP066S: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	39	149
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2,4,6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130

APPENDIX C

Search of the NSW EPA Contaminated Land Management Record

Search of the Protection of the Environment operations Public Register (POEO) of Licensed and Delicensed Premises: SITE



[Home](#) [Contaminated land](#) [Record of notices](#)

Search results

Your search for: Suburb: PENRITH

Matched 7 notices relating to 1 site.

[Search Again](#)

[Refine Search](#)

Suburb	Address	Site Name	Notices related to this site
PENRITH	Castlereagh ROAD	Crane Enfield Metals	4 current and 3 former

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3 July 2018

Number	Name	Location	Type	Status	Issued date
21071	5R Solutions Pty Ltd	2115-2131 Castlereagh Road , PENRITH, NSW 2750	POEO licence	Pending	
6357	ACI OPERATIONS PTY. LTD.	130-172 ANDREW ROAD, PENRITH, NSW 2750	POEO licence	Issued	7-Jun-00
1007008	ACI OPERATIONS PTY. LTD.	130-172 ANDREW ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	5-Jul-02
1020003	ACI OPERATIONS PTY. LTD.	130-172 ANDREW ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	9-Sep-02
1072516	ACI OPERATIONS PTY. LTD.	130-172 ANDREW ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	20-Aug-07
1085783	ACI OPERATIONS PTY. LTD.	130-172 ANDREW ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	21-Oct-08
1104746	ACI OPERATIONS PTY. LTD.	130-172 ANDREW ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	6-Aug-09
1109805	ACI OPERATIONS PTY. LTD.	130-172 ANDREW ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	26-Feb-10
1512576	ACI OPERATIONS PTY. LTD.	130-172 ANDREW ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	12-Aug-14
247	BORAL RESOURCES (NSW) PTY LTD	PEACHTREE ROAD, PENRITH, NSW 2750	POEO licence	No longer in force	22-Aug-00
12405	CAPRAL LIMITED	2115 CASTLEREAGH ROAD, PENRITH, NSW 2750	POEO licence	Issued	9-Mar-06
1070974	CAPRAL LIMITED	2115 CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	30-Jul-07
1077652	CAPRAL LIMITED	2115 CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	31-Aug-07
1109988	CAPRAL LIMITED	2115 CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	19-Apr-10
1525967	CAPRAL LIMITED	2115 CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	31-Oct-14
1526072	CAPRAL LIMITED	2115 CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	11-Nov-14
1098	CRANE ENFIELD METALS PTY. LIMITED	2115 CASTLEREAGH ROAD, PENRITH, NSW 2750	POEO licence	Issued	26-Jun-00
1017498	CRANE ENFIELD METALS PTY. LIMITED	2115 CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	24-Nov-03
1072470	CRANE ENFIELD METALS PTY. LIMITED	2115 CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	20-Sep-07
1104995	CRANE ENFIELD METALS PTY. LIMITED	2115 CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	4-Nov-09
1512789	CRANE ENFIELD METALS PTY. LIMITED	2115 CASTLEREAGH ROAD, PENRITH, NSW 2750	Compliance Audit	Complete	13-Mar-13
1512775	CRANE ENFIELD METALS PTY. LIMITED	2115 CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	19-Mar-13
1515690	CRANE ENFIELD METALS PTY. LIMITED	2115 CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	26-Jul-13
1525217	CRANE ENFIELD METALS PTY. LIMITED	2115 CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	26-Sep-14
10945	CUMMINS SOUTH PACIFIC PTY. LTD.	7 Andrews Road, PENRITH, NSW 2750	POEO licence	Surrendered	19-Jun-00
1035208	CUMMINS SOUTH PACIFIC PTY. LTD.	7 Andrews Road, PENRITH, NSW 2750	s.58 Licence Variation	Issued	8-Mar-04
308	DORF CLARK INDUSTRIES LIMITED	2101 CASTLEREAGH ROAD, PENRITH, NSW 2750	POEO licence	Surrendered	17-Jan-00
1024084	DORF CLARK INDUSTRIES LIMITED	2101 CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	6-Jan-03
1044228	DORF CLARK INDUSTRIES LIMITED	2101 CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	8-Feb-05
11290	ENDEAVOUR ENERGY	96-120 Blaikie Road, PENRITH, NSW 2750	POEO licence	No longer in force	8-Jan-01

Number	Name	Location	Type	Status	Issued date
1035197	ENDEAVOUR ENERGY	96-120 Blaikie Road, PENRITH, NSW 2750	s.58 Licence Variation	Issued	8-Mar-04
1526441	Glass Recovery Services Pty Ltd	126 Andrews Road, PENRITH, NSW 2740	s.91 Clean Up Notice	Issued	27-Jan-15
1535765	Glass Recovery Services Pty Ltd	126 Andrews Road, PENRITH, NSW 2740	s.91 Clean Up Notice	Issued	23-Aug-16
3085780565	Glass Recovery Services Pty Ltd	126 Andrews Road, PENRITH, NSW 2740	Penalty Notice	Issued	28-Oct-16
20381	Glass Recovery Services Pty Ltd	126 Andrews Road, PENRITH, NSW 2740	POEO licence	Issued	7-Nov-17
12132	Gulf Western Lubricating Oils Pty Ltd	1 COOMBES DRIVE, PENRITH, NSW 2750	POEO licence	Surrendered	1-Oct-04
1097227	Gulf Western Lubricating Oils Pty Ltd	1 COOMBES DRIVE, PENRITH, NSW 2750	s.58 Licence Variation	Issued	2-Feb-09
1104874	Gulf Western Lubricating Oils Pty Ltd	1 COOMBES DRIVE, PENRITH, NSW 2750	s.58 Licence Variation	Issued	17-Aug-09
6472	JAMES KEITH COSGROVE	8 HOYLE PLACE, PENRITH, NSW 2750	POEO licence	Surrendered	21-Jun-00
1044521	JAMES KEITH COSGROVE	8 HOYLE PLACE, PENRITH, NSW 2750	s.58 Licence Variation	Issued	16-Feb-05
7019	JAMISON PRIVATE HOSPITAL PROPERTY PTY LTD	366 JAMISON ROAD, PENRITH, NSW 2750	POEO licence	Surrendered	20-Mar-01
2869	LD&D MILK PTY LTD	2257 - 2265 CASTLEREAGH ROAD, PENRITH, NSW 2750	POEO licence	Issued	5-Jun-00
1012903	LD&D MILK PTY LTD	2257 - 2265 CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	18-Feb-02
1525246	LD&D MILK PTY LTD	2257 - 2265 CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	2-Oct-14
1556498	LD&D MILK PTY LTD	2257 - 2265 CASTLEREAGH ROAD, PENRITH, NSW 2750	s.96 Prevention Notice	Issued	8-Sep-17
21087	MEYER TIMBER N.S.W. PTY LTD	2101-2113 Castlereagh Road, PENRITH, NSW 2750	POEO licence	Issued	6-Apr-18
3741	NAREX AUSTRALIA PTY LTD	LOT D FROGMORE ROAD, PENRITH, NSW 2750	POEO licence	Surrendered	31-Jan-01
1007235	NAREX AUSTRALIA PTY LTD	LOT D FROGMORE ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	10-May-01
1008444	NAREX AUSTRALIA PTY LTD	LOT D FROGMORE ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	20-Aug-01
2818	PANASONIC AVC NETWORKS AUSTRALIA PTY LTD	164 STATION STREET, PENRITH, NSW 2750	POEO licence	Surrendered	24-Mar-00
1048338	PANASONIC AVC NETWORKS AUSTRALIA PTY LTD	164 STATION STREET, PENRITH, NSW 2750	s.58 Licence Variation	Issued	31-May-05
10349	SYDNEY OLYMPIC PARK AUTHORITY	CASTLEREAGH ROAD, PENRITH, NSW 2750	POEO licence	Surrendered	6-Jan-00
1409	SYDNEY WATER CORPORATION	CASTLEREAGH ROAD, PENRITH, NSW 2750	POEO licence	Issued	25-May-00
1005313	SYDNEY WATER CORPORATION	CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	22-Oct-01
1017898	SYDNEY WATER CORPORATION	CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	26-Jun-02
1018895	SYDNEY WATER CORPORATION	CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	23-Dec-02
1028330	SYDNEY WATER CORPORATION	CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	8-Jul-03
1032690	SYDNEY WATER CORPORATION	CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	25-Nov-03
1032982	SYDNEY WATER CORPORATION	CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	19-Mar-04
1047700	SYDNEY WATER CORPORATION	CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	30-Jun-05

Number	Name	Location	Type	Status	Issued date
1061410	SYDNEY WATER CORPORATION	CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	29-Jun-06
1074754	SYDNEY WATER CORPORATION	CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	27-Jun-07
1116048	SYDNEY WATER CORPORATION	CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	2-Jul-10
1129012	SYDNEY WATER CORPORATION	CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	27-Jun-11
1504851	SYDNEY WATER CORPORATION	CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	28-Jun-12
1528922	SYDNEY WATER CORPORATION	CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	23-Mar-15
1538189	SYDNEY WATER CORPORATION	CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	19-Feb-16
11461	TOTAL CONCRETE SOLUTIONS PTY LIMITED	261 COOMBES DRIVE, PENRITH, NSW 2750	POEO licence	No longer in force	19-Oct-01
1294	VICARY CORPORATION PTY LIMITED	60-62 REGENTVILLE ROAD, PENRITH, NSW 2750	POEO licence	Surrendered	22-Aug-00
12106	VIP STEEL PACKAGING PTY LTD	182-184 Andrews Road, PENRITH, NSW 2750	POEO licence	Surrendered	28-Apr-04
1042219	VIP STEEL PACKAGING PTY LTD	182-184 Andrews Road, PENRITH, NSW 2750	s.58 Licence Variation	Issued	10-Nov-04
1065654	VIP STEEL PACKAGING PTY LTD	182-184 Andrews Road, PENRITH, NSW 2750	s.58 Licence Variation	Issued	25-Oct-06
1093267	VIP STEEL PACKAGING PTY LTD	182-184 Andrews Road, PENRITH, NSW 2750	s.58 Licence Variation	Issued	10-Nov-08
1127751	VIP STEEL PACKAGING PTY LTD	182-184 Andrews Road, PENRITH, NSW 2750	s.58 Licence Variation	Issued	3-Jun-11
5269	VIRBAC (AUSTRALIA) PTY LTD	2152 CASTLEREAGH ROAD, PENRITH, NSW 2750	POEO licence	Issued	10-Aug-00
1066270	VIRBAC (AUSTRALIA) PTY LTD	2152 CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	15-Dec-06
1072508	VIRBAC (AUSTRALIA) PTY LTD	2152 CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	23-Jul-07
1100623	VIRBAC (AUSTRALIA) PTY LTD	2152 CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	7-Oct-09
1526064	VIRBAC (AUSTRALIA) PTY LTD	2152 CASTLEREAGH ROAD, PENRITH, NSW 2750	s.58 Licence Variation	Issued	11-Nov-14