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Report

Geotechnical and Salinity Investigation
Proposed Residential Subdivision Development
Part Lot 3 DP 1201486 No 80 Silverdale Road
The Oaks NSW

Prepared for

Mr & Mrs Nocera
C\-Proficient Constructions (Aust) Pty Ltd
PO Box 885
NARELLAN NSW 2567

Ref: JC24471A-r2(rev)
April 2024

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16th April 2024

Our Ref: JC24471A-r2(rev)

Mr & Mrs Nocera
C\-Proficient Constructions (Aust) Pty Ltd
PO Box 885
NARELLAN NSW 2567

Attention: Mr Chad Ghassibe

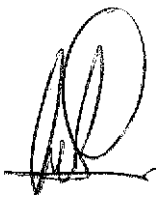
Dear Sir

Re Geotechnical and Salinity Investigation
Proposed Residential Subdivision Development
Part Lot 3 DP 1201486 No 80 Silverdale Road, The Oaks

We are pleased to submit our Geotechnical and Salinity Investigation report for the proposed residential development at the above address.

Should you have any queries, please contact the undersigned.

Yours faithfully
GeoEnviro Consultancy Pty Ltd



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1. INTRODUCTION

This report presents the results of our Geotechnical investigation for the site located at No 80 Silverdale Road in The Oaks and identified as Part Lot 3 Deposited Plan (DP) 12017486 (the Subject Site) as shown in Drawing No 1. The investigation was commissioned by Mr Chad Ghassibe of Proficient Constructions (Aust) Pty Ltd on behalf of the property owners, Mr & Mrs Nocera. The scope of this assessment was carried out in general accordance with our proposal referenced PC23376A dated 9th January 2024.

We understand the proposed development will include subdivision of the site into 9 rural residential lots and construction of residential roads. Based on the drawings provided, the eastern potion of the site will be mainly in cut up to at least 2m and the western portion of the site in fill.

The purpose of this investigation was to assess the subsurface ground conditions including fill and groundwater conditions and based on the information provided, to provide the following information;

- Subsurface conditions and provide recommendations on geotechnical issues considered relevant to the proposed development as follows;
    - Site preparations, fill construction and earthworks specification to AS3798 -Guidelines on Earthworks for Commercial and Residential Sites.
    - Shoring and retaining wall design parameters including lateral earth pressure coefficients, Ka, Ko and Kp
    - Slope batter design; temporary and permanent
    - Foundation design parameters including suitable footings, allowable bearing capacities and estimated settlement
    - Assessment on soil reactivity to AS2870
    - Recommendations on pavement subgrade preparation and pavement design
- Assessment on soil salinity and aggressiveness for durability design.

This investigation was carried out in conjunction with our Detailed Site Investigation Report and details of this assessment are compiled in our report referenced JC24471A-r1 dated April 2024.

2. SCOPE OF WORK

2.1 Geotechnical Assessment

The scope of work for geotechnical investigation included;

- Excavation of test pits across the site at accessible locations.
- Hand penetrometer testing on the clayey soil to assess the strength.
- Soil classification and assessment of insitu soil.
- Soil sampling and laboratory analysis in our NATA accredited laboratory to assess soil properties and characteristics.
- Preparing a report providing comments and general guidelines on issues such as earthworks, site preparation, suitable foundation systems and indicative site classifications to AS2870.

2.2 Salinity Assessment

The salinity assessment was performed in general conformance with our understanding of the guidelines prepared by the Department of Land and Water Conservation (Reference 3) and the Salinity Code of Practice prepared by Western Sydney Regional Organisation Council (Reference 4). The scope of work conducted consisted of:

- Excavation of test pits using a 5-tonne excavator.
- Soil sampling of the topsoil and at changes in the soil texture at lower depths at selected test pit locations.
- Laboratory analysis to aid assessment of physical and chemical properties

3. SITE INFORMATION

3.1 Site Location

No 80 Silverdale Road is located on the eastern side of Silverdale Road in The Oaks. We understand the subject site consists of the western portion of Lot 3 DP 1201486 (ie Subject Site) as shown on Drawing No 1. The site is irregular in shape measuring about 370m along the Silverdale Road frontage and extending to the east about 140m. Total site area is about 5.1 hectares.

The remainder of the property consists of bushland and undeveloped land, and is to be retained as part of the residential subdivision development. The site is within the jurisdiction of The Wollondilly Shire Council.

3.2 Site Topography

The site is situated on gently to moderately undulating terrain with ground surface within the site sloping to the north-east at angles of less than 5 degrees. Some steeper slopes are evident along the western boundary of the site at angle ranging from 6 to 12 degrees.

Based on Google Earth, the ground surface within the site ranges in elevation from about 280m to 270m above sea level.

3.3 Ground Cover and Salinity Indicators

The site comprised predominantly of vacant grassy areas with a swale in the middle of the site. The site generally appeared reasonably well drained with no visible signs of permanent water-logged areas, groundwater or “springs”.

There were no obvious signs and indicators of salinity impacts such salt crystals on the surface, salt attacks and markings on existing building footings and vegetation distress.

3.4 Soil Landscape and Geological Setting

The 1:100,000 Soil Landscape of Penrith prepared by the Soil Conservation Services of NSW indicates the site to be underlain by Residual soil belonging to the Blacktown landscape group (ref. 9030bt). Blacktown Landscape Group Soils typically consists of low permeability, highly plastic and moderately reactive soil. Refer to Drawing No 3.

The 1:100,000 Geological Map of Penrith indicates the site to be underlain by Bringelly shale of the Wianamatta Group consisting of shale, carbonaceous claystone, claystone, laminite, fine to medium grained lithic sandstone, rare coal and tuff. Refer to Drawing No 4 for Geological Map.

3.5 Soil Salinity Map

Based on Salinity Potential in Western Sydney 2002 prepared by the Western Sydney Regional Organisation of Councils Ltd, the site is situated in area with moderate salinity potential.

3.6 Existing Site Conditions and Description

A site visit was carried out on the 4th March 2024 by an environmental scientist to observe existing site features and identify obvious or suspected areas of potential contamination. Reference should be made to Drawing No 1 for site locality and features plan.

At the time of our site inspection, the site was largely vacant with grass cover and a large vegetated stockpile at the south-western portion of the site which may have been generated from construction of the swale within the property. There was a swale transecting the middle of the site in a north-south direction from the adjoining residential properties to the south to the dam to the north. There was also an access road along the northern boundary of the site.

The adjoining land adjacent the eastern boundary of the site falls steeply to the east at angles of between 20 and 40 degrees to the remainder of the property.

4. INVESTIGATION METHODOLOGY

4.1 Fieldwork

Field investigation included excavation of test pits using a 5-tonne excavator on the 4th March 2024. Twenty-one locations (identified as TP 1 to TP 21) were excavated across the site at accessible locations. Refer to Drawing No 6 for the test pit locations.

The test pits were excavated to depths varying from 0.7m to 2.8m below existing ground surface. To aid assessment of the strength of the subsurface profile, hand penetrometer tests were carried out in the test pits. The test pits were observed for groundwater during and upon completion of the excavation.

The field results together with details of the strata encountered are presented in Table 1.

4.2 Laboratory Analysis

Disturbed samples were taken from the site to our NATA accredited laboratory for Atterberg Limit tests to assess physical soil properties. Bulk samples were taken from the site for California Bearing Ratio (CBR) tests to assess pavement subgrade characteristics for pavement design.

To assess the likely impact of soil salinity on the proposed development, the following laboratory analysis was carried out;

- pH
- Electrical Conductivity (Ec)
- Chloride (Cl)
- Sulphate (SO_4)
- Resistivity

Salinity soil analysis was performed by Envirolab Services Pty Ltd, a laboratory accredited by the National Association of Testing Authorities (NATA). Disturbed soil samples were also taken to our NATA accredited laboratory for Emerson Class testing. The laboratory test reports for Geotechnical properties are attached in Appendix B and Appendix C of this report.

5. SUBSURFACE CONDITIONS

Reference should be made to the attached Table 1 in Appendix A for a summary of subsurface profiles encountered from the test pit investigation and Drawing No 6 for test pit location plan. The following is a summary of the subsurface profiles encountered in the test pits;

Topsoil and Topsoil/Fill

Topsoil and Topsoil/Fill consisting of Gravelly Sandy Silt and Clayey Silt was encountered on the surface of all test pits or below the fill in TP 1, 4, 5, 8, 15 and 16 with thickness ranging from 100mm to 500mm.

Fill

Fill was encountered on the surface and below the topsoil/fill in all test pits except TP 6 and 15 comprising of Gravelly Clayey Sandy/Gravelly Sandy Clay, Gravelly Silty Clay, Silty Clay and Clayey Silt. Some foreign inclusions were encountered in TP 1, 8, 16 and 17 including asphalt, concrete, glass, metal, plastic, tile and Styrofoam fragments with fibre-cement fragments encountered in TP 8 and 17.

The fill was found to have thickness ranging from 0.2m to 2.1m below existing ground level and was generally assessed to be dry to moist.

Natural Soil

Natural soil was encountered below the topsoil, topsoil/fill and fill in all test pits generally of medium plasticity Silty Clay and Gravelly Silty Clay with varying amounts of ironstone gravel and bands.

Based on the hand penetrometer test results, the natural clay was generally assessed to be dry to moist (ie moisture content less than or equal to the plastic limit) and very stiff to hard.

Bedrock

Bedrock consisting of Shale was encountered in TP 3 to 9, 11, 12, 15 and 18 to 21 at depths ranging from 0.6m to 2.4m below existing ground level.

Groundwater

Groundwater was not encountered in any of the test pits during the investigation. The test pits were taken to a maximum depth of 2.8m below existing ground level, therefore, the depth to groundwater in the majority of the site is expected to exceed this depth.

6. RESULTS OF THE INVESTIGAITON

6.1 Geotechnical

6.1.1 Principal of Lot Classification

Most natural clay soils have sufficient bearing capacities to support typical residential loads. Most distress to residential structures occurs due to reactive soil movements rather than settlement movements.

AS2870 establishes a classification system whereby reactive sites are classified based on the reactive soil movements anticipated. Other foundation conditions such as the presence of fill material, may affect the site classification. Appendix D of this report provides a comprehensive explanation of site classification.

The purpose of the classification is to allow the design of an economical footing system that will limit cracking of footings, floor slabs and masonry walls to an extent normally considered acceptable. The performance expectations associated with the design guidelines are presented in Appendix A of AS 2870. It is fundamental when applying the following site classifications to residential footing design that these performance expectations are acceptable to the house owners.

6.1.2 Laboratory Test Results

California Bearing Ratio

The following is a summary of the CBR test results;

Sample	Maximum Dry Density t/m^3	Optimum Moisture Content %	Field Moisture Content %	CBR %
TP 1 (0.4-0.5m)	1.72	20.5	21.0	8.0
TP 4 (0.4-0.6m)	1.77	16.5	17.0	4.0
TP 6 (0.3-0.4m)	1.74	18.5	17.5	7.0
TP 9 (0.3-0.5m)	1.81	16.5	13.0	5.0

The laboratory test results indicate the subgrade to have CBR values ranging from 4.0% to 8.0%.

Atterberg Limits

The following is a summary of the Atterberg Limit test results;

Sample	Liquid Limit %	Plastic Limit %	Plasticity Index %	Linear Shrinkage %	Natural Moisture Content %
TP 19 (0.3-0.4m)	46	20	26	14.0	18.0
TP 10 (1.0-1.3m)	40	18	22	11.5	13.0
TP 15 (0.3-0.4m)	49	18	31	13.5	19.0
TP 21 (1.0-1.1m)	48	18	30	11.0	13.5

Based on the laboratory results, the Atterberg Limit indicates the natural soil to generally be moderately plastic.

6.2 Salinity

6.2.1 Guidelines

Salinity refers to the presence of excess salt in the environment and is able to occur if salts which are naturally found in soil or groundwater mobilise, allowing capillary rise and evaporation to concentrate the salt at the upper subsurface soil profile. Such movements are caused by changes in the natural water cycle. In urban areas, the processes which causes salinity are intensified by the increased volumes of water added to the natural system from irrigation of gardens, lawn and parks and from leaking infrastructures (eg pipes, sewer, stormwater, etc) and pool.

Saline soil may have adverse impact on development such as;

- Damage to buildings and houses caused by deterioration of bricks, mortar and concrete when salt drawn up into capillaries of bricks and mortar expands resulting in spalling.
- Deterioration of concrete kerbs and gutters as a result of chemical reaction between concrete and sulphates.
- High chloride content in the soil may result in corrosion of steel reinforcement and buried metal structures.
- Damage to underground pipes and infrastructures.
- Water logging of ground surface due to sealing effect of sodic and dispersive soil.
- Loss of vegetation cover and plants due to high salt content resulting in retardation of plants.

In recognition of the potential adverse impact of salinity to development, the Western Sydney Regional Organisation of Councils Ltd has a Salinity Code of Practice (Reference 5) to address the issue of salinity. It was acknowledged in the Code that salinity problems can change substantially over time and it is difficult to predict exactly where salinity will occur and how it will respond to the changing environment conditions.

For assessment of soil salinity and aggressiveness, the Department of Land and Water Conservation has prepared a guideline entitled "Site Investigation for Urban Salinity". The fundamental criterion for assessing soil salinity is based on Electrical Conductivity.

Class	**EC_e (ds/m)**
Non-Saline	<2
Slightly Saline	2-4
Moderately Saline	4-8
Very Saline	8-16
Highly Saline	>16

Soil dispersion relates to stability of the soil in the presence of water. The following is a measure of soil dispersion;

Emerson Class No	**Dispersibility**
1	Very High
2	High
3	Moderate to High
4	Moderate
5 and 6	Slight
7 and 8	Negligible/Aggregated

Sodic soils are dispersible and are vulnerable to erosion and tunnelling. Sodicity is a measure of Exchangeable Sodium Percentage (ESP) and Cation Exchangeable Capacity (CEC). The following is a measure of soil sodicity;

ESP (%)	**Rating**
Less than 5	Non-Sodic
5 to 15	Sodic
Greater than 15	Highly Sodic

The measure of Cation Exchangeable Capacity is as follows;

CEC ($cmol^+/kg$)	**Rating**
Less than 6	Very Low
6 to 12	Low
12 to 25	Moderate
25 to 40	High
Greater than 40	Very High

In addition to the above, the presence of Sulphate and Chloride in the soil has the potential to cause high soil aggressivity to concrete and steel structures, in particular if the structures are in direct contact with the soil. The following is a measure of soil aggressivity to concrete based on the AS 2159-2009 "Piling – Design and Installation".

Sulfates (expressed as SO_4)		**pH**	**Chloride in Groundwater ppm**	**Soil Conditions A***	**Soil Conditions B#**
In Soil ppm	**In Groundwater ppm**				
<5000	<1000	>5.5	<6000	Mild	Non-aggressive
5000-10 000	1000-3000	4.5-5.5	6000-12 000	Moderate	Mild
10 000-20 000	3000-10 000	4-4.5	12 000-30 000	Severe	Moderate
>20 000	>10 000	<4	>30 000	Very Severe	Severe

Approximate 104ppm of SO4=80ppm of SO3
* Soil condition A = High permeability soils (eg sands and gravels) which is below groundwater
# Soil conditions B = Low permeability soils (eg silts and clays) and all soils above groundwater

The following is a measure of soil aggressivity to steel piles based on the AS 2159-2009 "Piling – Design and Installation".

pH	**Chlorides (Cl)**		**Resistivity ohm.cm**	**Soil Conditions A***	**Soil Conditions B#**
	In Soil ppm	**In Groundwater ppm**			
>5	<5000	<1000	>5000	Non-aggressive	Non-aggressive
4-5	5000-20 000	1000-10 000	2000-5000	Mild	Non-aggressive
3-4	20 000-50 000	10 000-20 000	1000-2000	Moderate	Mild
<3	>50 000	>20 000	<1000	Severe	Moderate

* Soil condition A = High permeability soils (eg sands and gravels) which is below groundwater
# Soil conditions B = Low permeability soils (eg silts and clays) and all soils above groundwater

In addition to the above, the AS 3600-2018 "Concrete Structures" outlines an exposure classification for concrete in sulphate soils as follows;

Exposure Conditions			**Exposure Classification**	
Sulphate (expressed as SO3)		**pH**	**Soil Conditions A***	**Soil conditions B#**
In Soil ppm	**In Groundwater ppm**			
<5000	<1000	>5.5	A2	A1
5000-10 000	1000-3000	4.5-5.5	B1	A2
10 000-20 000	3000-10 000	4-4.5	B2	B1
>20 000	>10 000	<4	C2	B2

Approximate 100ppm of SO4=80ppm of SO3
* Soil condition A = High permeability soils (eg sands and gravels) which is below groundwater
# Soil conditions B = Low permeability soils (eg silts and clays) and all soils above groundwater

6.2.2 Laboratory Test Results

The following is a summary of the laboratory test results;

Sample	Depth (m)	pH	ECe dS/m	Cl mg/kg	SO4 mg/kg	Resistivity ohm cm	CEC	ESP %
TP 1	0-0.1	7.3	0.39	<10	<10			
	0.4-0.5	8.6	1.14	<10	28	8300	25	<1
	1-1.2	4.9	0.30	22	10	25000		
TP 2	0-0.1	4.9	0.47	10	26			
	0.3-0.4	5.3	0.28	<10	10	27000		
	0.6-0.7	5.0	1.05	49	130	7400		
TP 2	1.3-1.4	4.9	1.05	130	34	7300	5.2	11
	2.3-2.4	5.0	0.98	120	23	7800		
TP 3	0.2-0.3	4.6	0.47	10	24			
	0.7-0.4	4.7	0.83	79	32	8900		
	1.2-1.3	5.1	0.69	66	55	11000	5.4	20
TP 4	0-0.1	5.1	0.65	10	48			
	0.4-0.6	5.2	0.56	31	46	13000		
	1.2-1.3	4.8	1.80	260	89	4100		
TP 5	0-0.1	4.8	0.39	<10	30			
	0.4-0.5	4.6	0.34	<10	27	22000	5	[NT]
	1.2-1.3	5.3	0.44	47	28	17000		
TP 6	0-0.1	4.9	0.34	10	28			
	0.3-0.4	5.0	0.36	10	30	21000		
TP 7	0.1-0.2	4.7	0.38	10	28			
	0.6-0.7	5.0	0.47	<10	20	16000		
	1.1-1.2	4.9	1.65	220	69	4500	4.1	31
TP 8	0.3-0.4	6.0	0.83	37	24			
	0.8-0.9	5.5	0.65	20	52	12000		
	1.4-1.5	5.7	0.35	<10	20	22000	5	13
TP 9	0-0.1	5.4	0.57	20	41			
	0.3-0.5	5.1	1.05	78	84	7200		

Note: ECe – Electrical Conductivity (dS/m) CEC – Cation Exchange Capacity
Cl – Chloride (mg/kg) ESP – Exchangeable Sodium Percentage

Sample	Depth (m)	pH	ECe dS/m	Cl mg/kg	SO4 mg/kg	Resistivity ohm cm	CEC	ESP %
TP 10	0.3-0.4	5.0	0.41	<10	24			
	1.2-1.3	5.3	0.69	46	44	11000		
TP 11	0.1-0.2	4.8	0.83	79	29			
	0.6-0.7	4.7	1.80	300	20	4100	2.1	23
	1.2-1.3	5.1	2.03	310	53	3800		
TP 12	0-0.1	5.2	0.42	<10	20			
	0.2-0.3	5.2	0.26	<10	33	28000		
	1-1.1	5.6	0.44	29	23	17000		
TP 13	0.4-0.5	5.2	0.40	<10	21			
	2.1-2.2	5.1	0.44	<10	28	17000	4.5	5
TP 14	0-0.1	5.1	0.47	25	37			
TP 15	0-0.1	5.9	0.79	10	22			
	0.3-0.4	5.0	0.37	<10	31	20000		
	1.3-1.4	5.1	0.59	37	65	13000	4.2	27
TP 16	0-0.1	7.4	1.52	<10	41			
	0.3-0.4	8.2	3.08	21	640	2500		
	1.3-1.4	7.3	2.93	57	320	2500		
	2.3-2.4	5.3	0.60	56	25	13000		
TP 17	0.5-0.6	8.1	9.75	37	3200			
	1.6-1.7	7.8	3.83	68	820	2000	21	2
	2.3-2.4	5.3	0.83	84	44	8800		
TP 18	0.5-0.6	5.0	0.50	21	30			
	1.5-1.6	5.2	0.49	26	29	15000		
	2.2-2.3	5.5	0.45	31	20	17000	3.3	22
TP 19	0.3-0.4	5.1	0.42	<10	21			
	0.8-0.9	5.3	1.05	66	37	7300		

Note: ECe – Electrical Conductivity (dS/m) CEC – Cation Exchange Capacity
Cl – Chloride (mg/kg) ESP – Exchangeable Sodium Percentage

Sample	Depth (m)	pH	ECe dS/m	Cl mg/kg	SO4 mg/kg	Resistivity ohm cm	CEC	ESP %
TP 20	0.3-0.4	4.8	0.38	<10	22			
	1.3-1.4	5.1	0.54	36	10	14000	4.2	7
	1.9-2	5.2	0.32	10	20	24000		
TP 21	0-0.1	4.9	0.83	10	45			
	1-1.1	5.0	0.72	10	43	10000		
	2.1-2.2	5.3	0.47	<10	30			

Note: ECe – Electrical Conductivity (dS/m) CEC – Cation Exchange Capacity
Cl – Chloride (mg/kg) ESP – Exchangeable Sodium Percentage

Emerson Class

Sample	Class	Dispersiveness
TP 1 (0.4-0.5m)	6	Slight
TP 4 (1.2-1.6m)	1	Very High
TP 6 (0.3-0.4m)	5	Slight
TP 9 (0.3-0.5m)	1	Very High
TP 10 (1.0-1.3m)	1	Very High
TP 15 (0.3-0.4m)	6	Slight
TP 19 (0.3-0.4m)	2	High
TP 21 (1.0-1.1m)	2	High

Particle Size Distribution

Sample	Clays/Silt (%)	Sand (%)	Gravels (%)
TP 1 (0.4-0.5m)	51	24	25
TP 4 (1.2-1.6m)	84	4	12
TP 9 (0.3-0.5m)	60	12	28
TP 21 (1.0-1.1m)	60	22	18

7. ASSESSMENT AND RECOMMENDATIONS

7.1 Geotechnical Assessment

Based on the drawings provided, the proposed road alignment wraps around the northern, eastern and southern boundaries of the site. The cut fill plan (Refer to Drawing No 2) indicates the majority of the eastern portion of the site and proposed road adjacent the steep slopes to be in cut of up to at least 2m. The western portion of the site within the lots are mainly in fill.

The test pit investigation revealed the site to be generally underlain by topsoil/fill and fill overlying natural clayey soil with Shale bedrock encountered at depths ranging from 0.6m to 2.4m below existing ground surface. The fill was generally found to comprise of Gravelly Clayey Sandy/Gravelly Sandy Clay, Gravelly Silty Clay, Silty Clay and Clayey Silt and ranging from 0.2m to 2.1m below existing ground level.

7.1.1 Stability Assessment

The site is situated on gently to moderately undulating terrain with ground surface within the site sloping to the north-east at angles of less than 5 degrees. Some steeper slopes are evident along the western boundary of the site at angle ranging from 6 to 12 degrees.

Based on Google Earth, the ground surface within the site ranges in elevation from about 280m to 270m above sea level.

The adjoining land adjacent the eastern boundary of the site falls steeply to the east at angles of between 20 and 40 degrees to the remainder of the property.

7.1.1.1 Hazard Identification

The stability of an apparently stable existing block of land may be adversely affected by many activities on or nearby the site as follows;

- The diversion of surface water onto the block by new roadways, houses or other activities involving landscaping.
- The addition of large volumes of filling either above or beside the block.
- The excavation of soil from the area below (downhill) of the block.
- The development of septic tile beds or other drainage systems whereby liquids are introduced into the soil/rock mass.

The risk of slope instability is affected by three main factors;

- Slope angle
- Strength of the subsurface materials
- Concentration of water

The following is a summary of potential hazard identified from our review of historic information and investigation.

Hazard I: Soil and gully erosion on bare ground surface or areas with concentration of runoffs. Localised slumping and scouring occurring on steep ground along the western boundary of the site.

Hazard II: Creep and earthflows on slopes caused by saturation of soil with water resulting in soil mass moving downhill under the pull of gravity. Its speed can range from being barely noticeable to rapid movement.

Hazard III: Deep seated landslides on steep slopes. This type of landslide was not evident on the site however this mode of landslide has been recorded in on slopes greater than 12 degrees. The adjoining land to the east falls steeply at angles of between 20 and 40 degrees.

7.1.1.2 Frequency Analysis

There is no site specific data or study to enable quantitative evaluation. However, there are documented experiences of the various Landscape Grouping and site indicators which enable qualitative assessment using the terminology of the AGS 2007 guidelines (Appendix D) as follows;

- Hazard I: Soil erosion and scouring were not evident within the site.
- Hazard II: Creep and earthflows were not evident within the site.
- Hazard III: Deep seated landslides on steep slopes were not evident or obvious within the site however this mode of landslide has been recorded on slopes greater than 12 degrees and the adjoining land to the east falls steeply at angles of between 20 and 40 degrees.

Based on the above, our qualitative assessment of Likelihood for the various hazard types is as follows;

Area	Hazard Type	Mode of Landslip	Likelihoods
Proposed lot areas	I	Erosion and scour	POSSIBLE
	II	Creep and earthflows	UNLIKELY
	III	Deep seated landslides	BARELY CREDIBLE
Proposed road alignment along eastern boundary	I	Erosion and scour	LIKELY
	II	Creep and earthflows	POSSIBLE
	III	Deep seated landslides	RARE

7.1.1.3 Risk Assessment

The site is situated on gently to moderately undulating terrain with ground surface within the site sloping to the north-east at angles of less than 5 degrees. Some steeper slopes are evident along the western boundary of the site at angle ranging from 6 to 12 degrees.

The adjoining land adjacent the eastern boundary of the site falls steeply to the east at angles of between 20 and 40 degrees to the remainder of the property.

The site was found to be well drained with no obvious signs of ground water or natural springs and there are no obvious site indicators to suggest the site to have been impacted by previous slope instabilities.

Adopting the AGS March 2007 risk matrix in Appendix D, the risk levels as tabulated below.

Area	Hazard Type	Mode of Landslip	Likelihood	Consequence	Risk
Proposed lot areas	I	Erosion and scour	POSSIBLE	MINOR	MODERATE
	II	Creep and earthflows	UNLIKELY	MEDIUM	LOW
	III	Deep seated landslides	BARELY CREDIBLE	CATASTHROPIC	LOW
Proposed road alignment along eastern boundary	I	Erosion and scour	LIKELY	MINOR	MODERATE
	II	Creep and earthflows	POSSIBLE	MINOR	LOW
	III	Deep seated landslides	RARE	MEDIUM	LOW

Based on the results of the investigation, we are of the opinion that the risk of landslides within the Subject Site is considered Low to Moderate and therefore the site should be suitable for the proposed subdivision development.

As our landslip risk within the site was assessed to be Low to Moderate, our assessment on the probability of loss of life after development is less than 10^{-6} and this is considered acceptable.

Notwithstanding the above, some stabilisation of the upper slopes of the adjoining land to the east of the proposed road may be undertaken to reduce the risk of localised slope failures (ie surficial slides or slumping) which may include battering the upper clay soil profile to 1 Vertical to 2 Horizontal and shale to 1 vertical to 1 Horizontal.

7.1.2 Site Preparation and Earthworks

The test pit investigation revealed the site to be generally underlain by topsoil/fill and fill overlying natural clayey soil with Shale bedrock encountered at depths ranging from 0.6m to 2.4m below existing ground surface. The fill was generally found to comprise of Gravelly Clayey Sandy/Gravelly Sandy Clay, Gravelly Silty Clay, Silty Clay and Clayey Silt and ranging from 0.2m to 2.1m below existing ground level.

Based on the hand penetrometer test results, the natural clay was generally assessed to be dry to moist (ie moisture content less than or equal to the plastic limit) and very stiff to hard.

We anticipate site preparation for the proposed residential subdivision development will include;

- Stripping of the topsoil/fill to expose the insitu fill and natural soil subgrade.
- Proof rolling of the exposed areas using a minimum 10 tonne vibrating roller to identify any soft or heaving areas.
- Any soft or heaving areas observed during proof rolling should be excavated and replaced with a select granular fill such as ripped sandstone having a maximum particle size of 75mm. The depth of excavation and ground improvement should be determined on site during construction by a NATA accredited laboratory.
- All structural fill required to elevate the site to design level should be controlled and compacted in layers not exceeding 250mm thickness compacted to a minimum 95% Standard Maximum Dry Density at $\pm$2% Optimum Moisture.

Our general comments on suitable bearing material and reusability of onsite soil with respect to shallow foundation construction are as follows;

- The topsoil encountered on the surface in the majority of the test pits are not considered suitable to support permanent structures such as pavements, slabs and buildings and therefore should be excavated and removed. The topsoil and topsoil/fill may be reused in future landscaping areas (eg earth mounds and footpaths).

- All insitu fill encountered during construction would be classified as "Uncontrolled" fill in accordance with the definition outlined in AS 3798 and is therefore not suitable to support permanent structures such as pavements, slabs and buildings with shallow footings.

- Fill containing foreign inclusion (eg rubbish and building waste) or chemical contaminants are not considered suitable for reuse without treatment or remedial works. Fill containing high organic and topsoil material (eg Silt) is not suitable for reuse

- The underlying natural clay and shale are generally considered suitable for reuse as structural fill provided the fill is well graded with maximum particle size of not greater than 75mm.

Earthworks should be closely monitored by a geotechnical consultant and should include field density testing of fill at an appropriate frequency and level of supervision as detailed in AS3798 - 2007. Earthworks control and regarding of the site are likely to reduce the existing slopes within the site and therefore also reduce the likelihood of the hazard types noted in Section 7.1.1.

7.1.3 Retaining Walls and Support

Cut and fill should be adequately retained or battered. For walls propped at the top, thus limiting deflection, an "at-rest" lateral earth pressure coefficient (K_o) should be adopted in the design. For retaining walls designed to "yield", an "active" lateral earth pressure coefficient (K_a) may be adopted in the design. We recommend the following;

Material	K_o	K_a	Bulk Density
Compacted Fill	0.65	0.35	17.5kN/m^3
Natural Clay	0.5	0.33	19.0kN/m^3
Weathered Shale	0.25	0.15	22.0kN/m^3

Permanent subsurface drains should be provided at the back of the retaining wall, or full hydrostatic ground water pressure should be assumed in the design. Surcharge due to adjacent structures, sloping backfill or construction loads should be taken into account in the design if applicable.

All unretained cut and fill should be battered to not steeper than 1 Vertical to 2 Horizontal.

Implementation of the above and construction of retaining walls and appropriate batter slopes are likely to reduce the likelihood of the hazard types noted in Section 7.1.1.

7.1.4 Preliminary Lot Classification and Footings

Lot classification should be carried out after site preparation as described in the above Section 7.2.1. Shallow footings consisting of stiffened raft slabs, waffle slabs or strip and pad footings may be adopted for future residential buildings or light weight structures subject to site preparation and earthworks as described above.

Deep footings such as bored piles or grout injected piles should be adopted if the site contains "Uncontrolled" fill or other incompetent foundation material (eg soft and wet alluvial soil) and steep slopes in excess of 12 degrees.

For preliminary footing design, the following allowable bearing capacities may be adopted;

Foundation Material	Allowable Bearing Capacities
Controlled Fill	100kPa
Natural Very Stiff Clay or better	150kPa
Weathered Shale	600kPa

There is limited site information to classify the site to AS 2870 "Residential Slabs and Footings". Preliminary site classification assessment may be based on the following criteria;

Site Classification	Site Conditions
'S' (Slight)	Topsoil or uncontrolled fill less than 400mm thick Stable 'Controlled' fill compacted to a minimum 95% Standard Natural clay to be of very stiff or better consistency Bedrock profiles less than 0.6m deep Surface movements from reactive clay less than 20mm
'M' (Moderate)	Topsoil or uncontrolled fill less than 400mm thick Stable 'Controlled" fill compacted to a minimum 95% Standard Natural clay to be of very stiff or better consistency Bedrock profiles less than 1.5m deep Surface movements from reactive clay between 20mm to 40mm
'H1 and H2' (High)	Topsoil or uncontrolled fill less than 400mm thick Stable 'Controlled' fill compacted to a minimum 95% Standard Natural clay to be of very stiff or better consistency Bedrock profiles greater than 1.5m deep Surface movements from reactive clay between 40mm to 70mm
'P' (Problem)	Topsoil or 'Uncontrolled' fill greater than 400mm thick Soft and wet natural clay Steep site with slope gradients greater than 12 degrees.

Additional site specific investigations should be carried out to determine more accurately the site classification of individual blocks once the final design levels of the site are established.

7.1.5 Pavement Design

The test pit investigation revealed the site to be generally underlain by topsoil/fill and fill overlying natural clayey soil with Shale bedrock encountered at depths ranging from 0.6m to 2.4m below existing ground surface. The fill was generally found to comprise of Gravelly Clayey Sandy/Gravelly Sandy Clay, Gravelly Silty Clay, Silty Clay and Clayey Silt and ranging from 0.2m to 2.1m below existing ground level.

Based on the hand penetrometer test results, the natural clay was generally assessed to be dry to moist (ie moisture content less than or equal to the plastic limit) and very stiff to hard.

Based on the foregoing, we recommend pavement subgrade preparation to include the following;

- Site clearing and drainage improvement by construction of dish drains and earth mounds to divert stormwater runoffs.
- Stripping of topsoil and topsoil/fill and excavation of any “uncontrolled” fill.
- Boxing of subgrade to proposed design level and assessment of the subgrade for CBR values.
- Proof rolling of the base of the excavation with a heavy vibrating roller (minimum 10 tonne).
- Any soft areas identified during rolling should be excavated and replaced with ripped sandstone fill and this should remove all subgrade with poor CBR values at the same time.
- The excavated clay material may be reused as fill beneath pavements subject to moisture reconditioning. Alternatively, imported good quality fill such as ripped sandstone having a maximum particle size of 75mm may be used.
- The fill material should be compacted in layers not exceeding 250mm loose thickness compacted to a minimum 95% Standard Maximum Dry Density (SMDD) at close to Optimum Moisture Content.

- The upper 300mm of the fill material forming the pavement subgrade should be compacted to a minimum 100% SMDD.
- The subgrade preparation and pavement construction should be closely monitored by a geotechnical consultant and should include field density testing of the pavement material at an appropriate frequency and level of supervision as detailed in AS 3798 -2007.

Our laboratory test results indicate the pavement subgrade to have CBR values of 4.0% and 8.0%.

We recommend a design CBR value of 3.0% be adopted for preliminary pavement design. Confirmation of CBR value may be carried out after exposing to subgrade level.

In the absence of design traffic loading for the proposed roads, the following pavement design options may be adopted based on assumed design traffic loadings (ie Equivalent Standard Axle (ESA);

Material	**Assumed ESA**		
	6×10^4	**3×10^5**	**1×10^6**
Asphaltic Concrete (AC10)	40mm	40mm	50mm
Single Coat Seal	-	-	-
DGB20 Base Course	150mm	150mm	150mm
Crushed Sandstone Subbase Course	220mm	270mm	370mm
Total	**410mm**	**460mm**	**570mm**

The final pavement thickness design should be carried out based on Austroads publication, "Pavement Design – A Guide to the Structural Design of Road Pavements", and Austroads Pavement Research Group publication, Report No 21, "A Guide to the Design of New Pavements for Light Traffic".

The pavement design assumes the subgrade and pavement materials to be compacted to the following Minimum Dry Density Ratios (AS1289 5.1.1, 5.2.1);

Pavement Material	**Compaction Level**	**Compactive Effort**
Base Course	98%	Modified
Sub-Base Course	98%	Modified

7.2 Salinity Assessment

The proposed development may include some cut and fill to regrade the site for future residential lots and roadways. The laboratory test results indicate the insitu soil to generally be Non Saline to Slightly Saline with ECe values ranging from 0.26 dS/m to 3.83 dS/m. TP 17 (0.5-0.6m) encountered some Very Saline soil with ECe value of 9.75 dS/m.

The Emerson test results indicate the insitu soil was found to be Slight to Very Highly Dispersive.

The subsurface soil was found to have low concentrations of Sulphate and a minimum pH value of 4.6, therefore the soil is considered to be Mildly-aggressive to buried concrete structures and therefore the site may be classified as "Class A2" in accordance to AS 3600-2018 "Concrete Structures" (Reference 7).

The subsurface soil was found to have low concentrations of Chloride, with a minimum pH value of 4.6 and the lowest resistivity of 2000 ohms/cm, the site was assessed to be Non aggressive to buried steel structures based on A2159 (Reference 6).

For the proposed development, the following are our suggested management strategies;

7.2.1 Excavation and Filling

- Excavations in excess of 1.0m should be battered to a 1 vertical to a 1 horizontal. Excavated stockpile material may either be treated immediately on site using 3% by weight of lime, otherwise capped with non-porous clay soils greater than 0.5m thick. Alternatively excavated material may be removed off-site to a landfill for treatment and disposal.
- Gypsum should be mixed into filling containing sodic soils and cuts where sodic soils are exposed on slopes to improve soil structure and to minimise erosion potential.
- Any material removed from the site should be carried out by a licensed contractor. This material should be sealed and contained using appropriate lining and capping material.
- Exposure and disturbance of subsoil material must be reduced by minimising cut and fill. Time of exposure of bare ground (without vegetation) should be kept to a minimum. If extended periods of rain are forecast, the bare ground should be covered with stable fill such as ripped sandstone or stabilised with lime proportioned to 3% by weight.

- Stormwater runoff from upstream should be diverted away from excavation areas by the use of bunding.
- Filling areas are to be graded, revegetated and adequate surface drainage infrastructure installed as soon as practical to avoid excessive infiltration, minimise salt leaching, soil erosion and ponding of water on-site.
- All imported fill should be verified by sampling and testing to ensure the material is non to slightly saline. Moderately to highly saline soil is not acceptable. Supporting information and documentation should be supplied verifying that the subject material complies. The addition of salts in the materials, fill or water used during construction must be limited.
- Reversing or mixing the soil profile when undertaking cut and fill activities must be avoided. Soils must be replaced in their original order. Excavations deeper than 1m should be backfilled in the same order, alternatively this material may be treated by using lime or used in fill at depths more than 1m from finished level.
- Batter slopes should be compacted with control of the moisture content to optimum moisture content plus 2 per cent (OMC +2%) or otherwise over-filled, compacted and then trimmed back to the final alignment to minimise infiltration through the exposed filling batters and the potential resulting flushing of salts from the filling. If the latter is to be carried out, the outer zone (3 metres) of the fill should be placed at OMC +2%.

7.2.2 Infrastructure and Drainage

- Trenching for underground services should be carried out in such a manner that there is minimal rotation and vertical displacement of the original soil profile as the lower soil profile is more erodible.
- Pipes used for stormwater drainage should be sealed to minimise the risk of leakage. Drainage, sewerage and water infrastructure is to be regularly maintained and repaired to prevent leakages.
- Concrete of suitable strength and reinforcement cover is to be used for drainage structures and wherever contact with water and increased soil moisture is expected.

- Watering or irrigation practices are to be managed to avoid excessive infiltration and water logging.
- Natural drainage patterns and infiltration rates must be maintained as far as practicable. Drainage should not be designed to discharge to groundwater or salinity affected areas that is likely to cause increased water logging adjacent to the road or that concentrated surface runoff.
- Direct runoff from paved areas into lined stormwater drains rather than along grassed channels as necessary.
- Groundwater extraction must not occur on the site.

7.2.3 Stormwater

- During construction, hay bales and other temporary erosion control devices should be placed at appropriate locations in areas where concentrated flows are expected and suitable dish drains should be constructed to retard flow and trap silt particles during heavy runoff. Temporary detention ponds in construction sites should be regularly monitored for water quality and cloudy water should be treated by flocculation with gypsum. This is critical before a storm event.
- Surface drains should be provided along the top of batter slopes or greater than 2.5 metres height to reduce the potential for concentrated flows of water flows slopes which may cause scour. Well graded subsoil should be provided at the base of all slopes where there are road pavements below the slope to reduce the risk of water logging.
- Line or locate any ponds higher in the landscape to avoid recharge where proximity to the water table is likely to create groundwater mounding.
- Ensure an appropriate ratio of hard (impermeable) and permeable surfaces to avoid rainwater runoff infiltrating the ground in large volumes at any given location.

7.2.4 Building Materials

- In seepage and discharge areas or areas with a high potential sulphate, resistant building materials must be used. Sulphate resistant materials should be used for underground services, roads and paving.

- For all building materials, the manufacturer's advice must be complied with regarding durability and correct use. Exposure of building materials to corrosive elements in soils should be minimised. Appropriate construction techniques such as suspended slab or piering to encourage ventilation and prevent soil moisture from being forced up the walls of the structure should be used.

7.2.5 Roads

- Roads must have well designed sub surface drainage. A waterproof seal must be used on roads to minimise evaporation and the concentration of salt.
- Roads and shoulder areas must be designed to drain surface water such that there is no excessive concentration of runoff or ponding which may result in water logging or additional recharge or groundwater. Road shoulders must also be sealed.
- Materials and waters used in the construction of roads and fill embankments should be selected to contain minimal or no salt. Where it is difficult a capping layer of either topsoil or sandy materials should be placed to reduce capillary rise, act as a drainage layer and also reduce the potential for dispersive behaviour in the sodic soils.
- Roads should not intercept known salt affected or water logged areas, and should be designed in a manner that does not impede the sub-soil flow or creates hydraulic pressure causing groundwater discharge.
- Avoid or minimise the use of on site stormwater detention except where in accordance with a stormwater management strategy adopted for the Precinct.

7.2.6 Residential and Other Buildings

- A high impact waterproof membrane, (not just a vapour proof membrane), should be lain under house slabs. The waterproof membrane must be extended to the outside face of the external edge beam up to the finishing ground level, as detailed in the Building Code of Australia (BCA).
- For masonry building construction, the damp proof course must consist of polyethylene or poly-ethylene coated metal and correctly placed in accordance with BCA. Ground levels immediately adjacent to masonry walls must be kept below the damp proof course.
- Appropriate infrastructure should be in place to manage urban water cycle and this includes all water flows such as water supply, stormwater and wastewater. Relevant design considerations are outlined in "Evaluating Options for Water Sensitive Urban Design (WSUD) - a national guide" Joint Steering Committee for Waster Sensitive Cities, July 2009.
- For slab on ground construction, a layer of bedding sand at least 50mm thick should be laid under the slab to allow free drainage of water and to prevent pooling of water potentially carrying salts.
- Concrete floor slabs must comprise of Class 32MPa concrete or sulphate resisting Type SR cement with a water cement ratio of 0.5. Similar concrete should be used for bored piers or footings.
- Slabs must be vibrated and cured for a minimum 3 days
- The mini um cover to reinforcement should be 30mm from a membrane in contact with the ground.
- The minimum cover to reinforcement should be 50mm for strip footings and beams.

- Admixtures for waterproofing and /or corrosion prevention may be used.
- Salt tolerant masonry and mortar must be used below the damp proof course
- Constant monitoring of water pipes to detect any leakages and the repair of damaged pipes as soon as possible after detection
- Use Copper or non-metallic pipes instead of galvanised iron
- Ensure any underground services are provided with adequate corrosion protection.
- On sites where excavation and fill exceeds 1m, Council may require suspended slab or pier and beam construction as an alternative to 'slab on ground' construction. This may occur on sloping sites as this will minimise exposure to potentially corrosive soils and reduce the potential cut and fill on site which could alter subsurface flows.
- Other measures that can be considered to improve the durability of concrete in saline environments should be considered. These include reducing the water cement ratio (hence increasing strength), minimising cracks and joins in plumbing on or near the concrete, reducing turbulence of any water flowing over the concrete and using a quality assurance supplier.
- It is essential in all masonry buildings that a brick damp course be properly installed so that it cannot be bridged either internally or externally. This will prevent moisture moving into brick work and up the wall.
- As there are various exposure classifications and durability ratings for the wide range of masonry available, reference should be made to the supplier in choosing suitable bricks of at least exposure quality. Water proofing agents can also be added to mortar to further restrict potential water movement. Bricks that are not susceptible to damage from salt water should be used. These are generally less permeable, do not contain salts during their construction and have good internal strength so that they can withstand any stress imposed on them by any salt encrustation.
- Design and construction to be carried out in accordance with relevant Australian Standards, Building Codes and current 'Industry Best Practice' in regard to urban salinity.
- Service connections and stormwater runoffs should be checked to avoid leaky pipes which may affect off site areas lower down the slope and increase groundwater recharge resulting in increases in groundwater levels.

7.2.7 Detention Ponds and Playing Fields

- All excavation works should be minimised by staging the construction into small areas to prevent salinity from developing. Very saline soil is not recommended for use as building platform fill. This material may be buried beneath proposed roadways away from where underground services will be laid. Very saline soil should be placed at depths greater than 1.5m below design level and covered with non to slightly saline fill.
- Surplus saline soil from construction works may be reused in playing fields. A revegetation scheme which includes introduction of salt tolerant plants should be in place. Amenities buildings, light poles, fences and other associated structures should be appropriately designed to reduce adverse impacts of the saline soil. A capping layer of non saline material with a minimum thickness of 1.5m may be adopted to reduce the impacts of salinity.
- Detention ponds should be constructed to minimise build up of salts in the groundwater system via infiltration through the base of the ponds. This may be achieved by lining the ponds with synthetic HDPE liners. Clay liners may be considered if justification can be provided on the material selection process and proposed construction methodology. If using a clay lining, the possibility that on site clays may be saline should be investigated before they are used for this purpose. In these situations, an impermeable geotech fabric may be preferable.
- Sodic and dispersive soils can be managed by the addition of lime. Capping of sodic and dispersive soils within the embankments is recommended for protection against erosion.
- Spillways should be provided in pond embankments to reduce the potential for concentrated flows of water down slopes causing scour.
- Where mass concrete is required in or around the ponds, a minimum concrete strength of 32 MPa is recommended to limit the corrosive effects of the underlying and surrounding soils. Concrete or masonry elements of lower strength may be susceptible to long term adverse effects of the aggressive or saline soils.
- Utilise native and deep-rooted vegetation in order to minimise soil erosion and limit the rising of the water table.

8. LIMITATIONS

The interpretation and recommendations submitted in this report are based on a limited number of test pits. There is no investigation which is thorough enough to determine all site conditions and anomalies, no matter how comprehensive the investigation program is as site data is derived from extrapolation of limited test locations. The nature and extent of variations between test locations may not become evident until construction.

Groundwater conditions are only briefly examined in this investigation. The groundwater conditions may vary seasonally or as a consequence of construction activities on or adjacent to the site.

In view of the above, the subsurface soil and rock conditions between the test locations may be found to be different or interpreted to be different from those expected. If such differences appear to exist, we recommend that this office be contacted without delay.

The statements presented in these documents are intended to advise you of what should be your realistic expectations of this report, and to present you with recommendations on how to minimise the risks associated with the ground works for this project. The document is not intended to reduce the level of responsibility accepted by GeoEnviro Consultancy Pty Ltd, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing. Attached in Appendix E are documents entitled “Explanatory Notes” in conjunction with which this report must be read, as it details important limitations regarding the investigation undertaken and this report.

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5. *What do all the numbers mean? A guide for the interpretation of soil test results. – Department of Conservation and Land Management, 1992*
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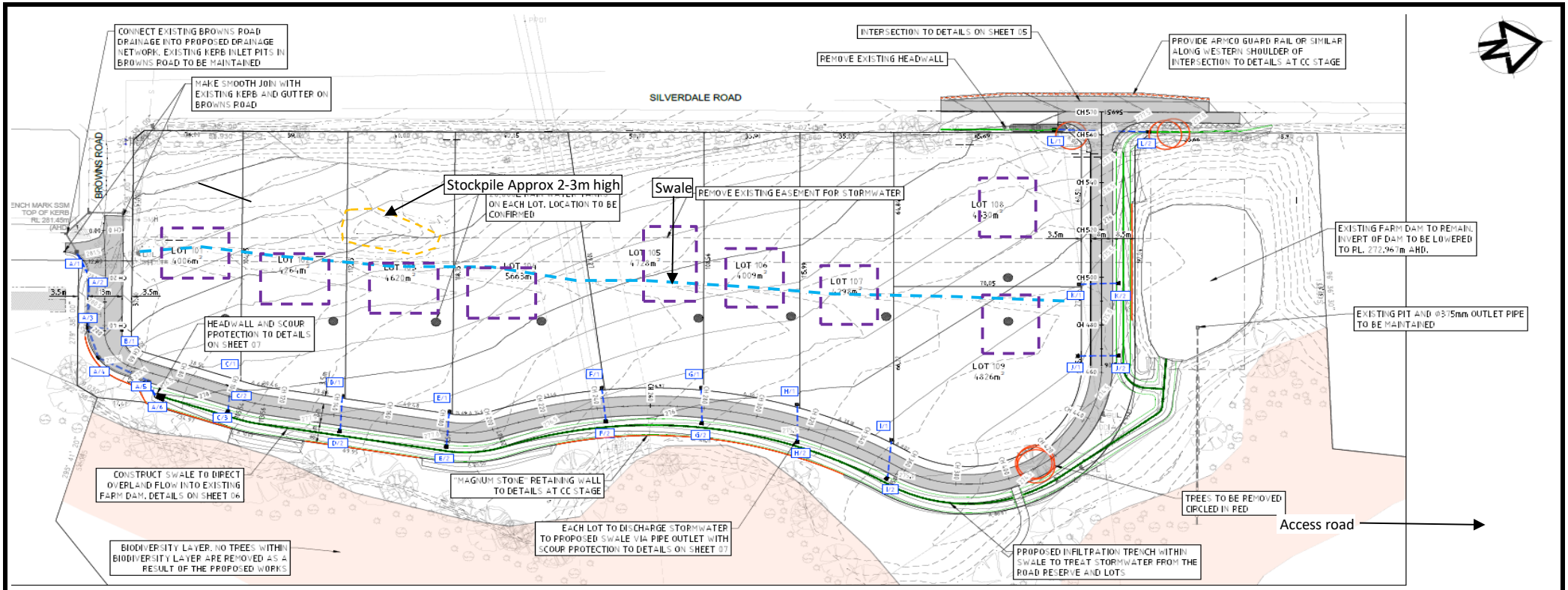
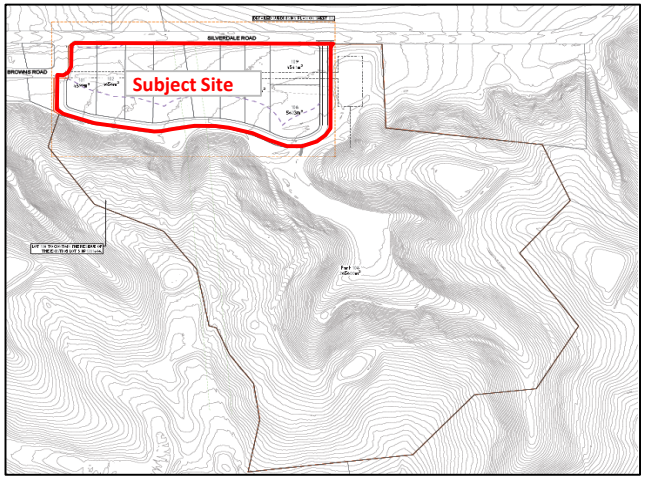
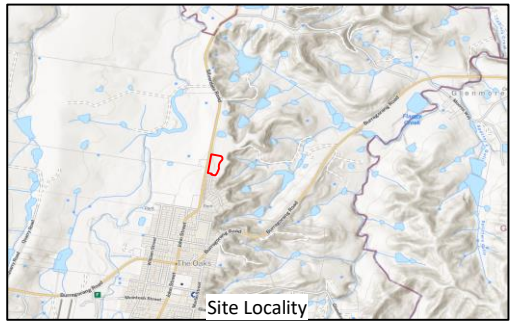






Legend

Subject Site

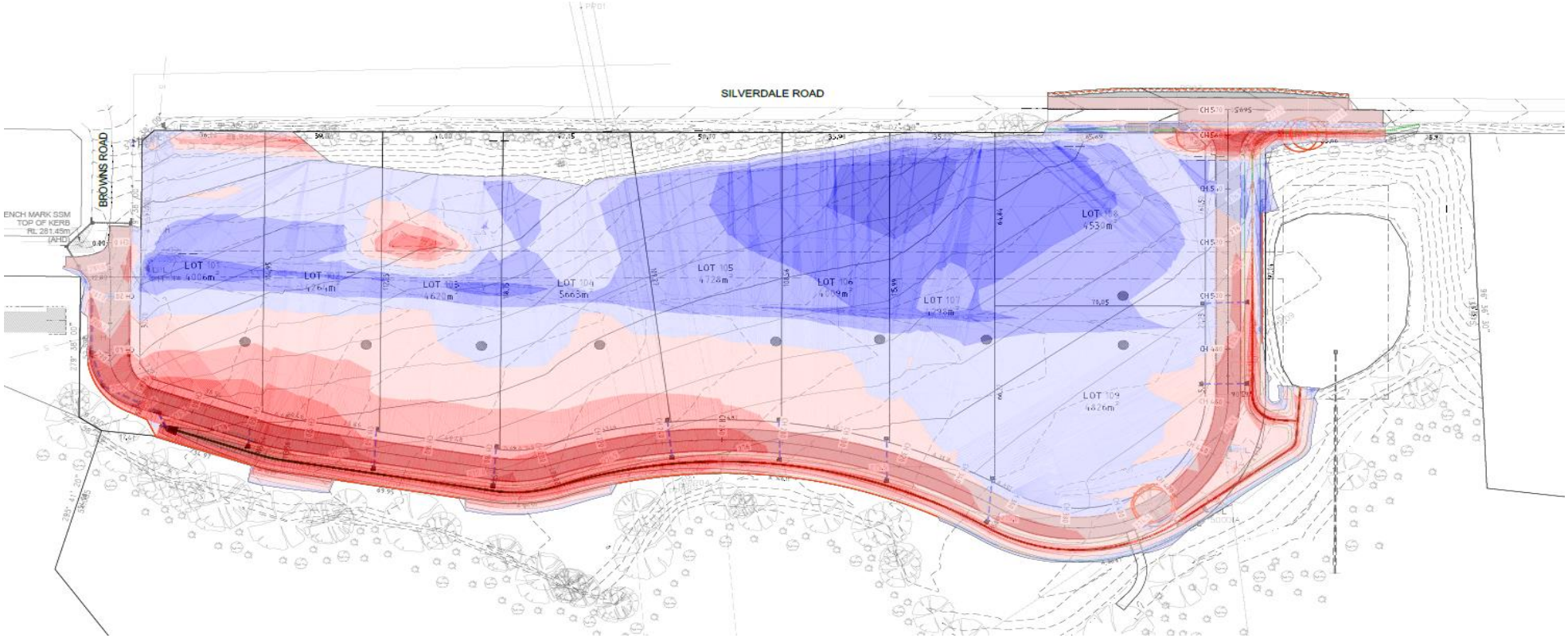
Proposed Building Envelope

GeoEnviro Consultancy Pty Ltd

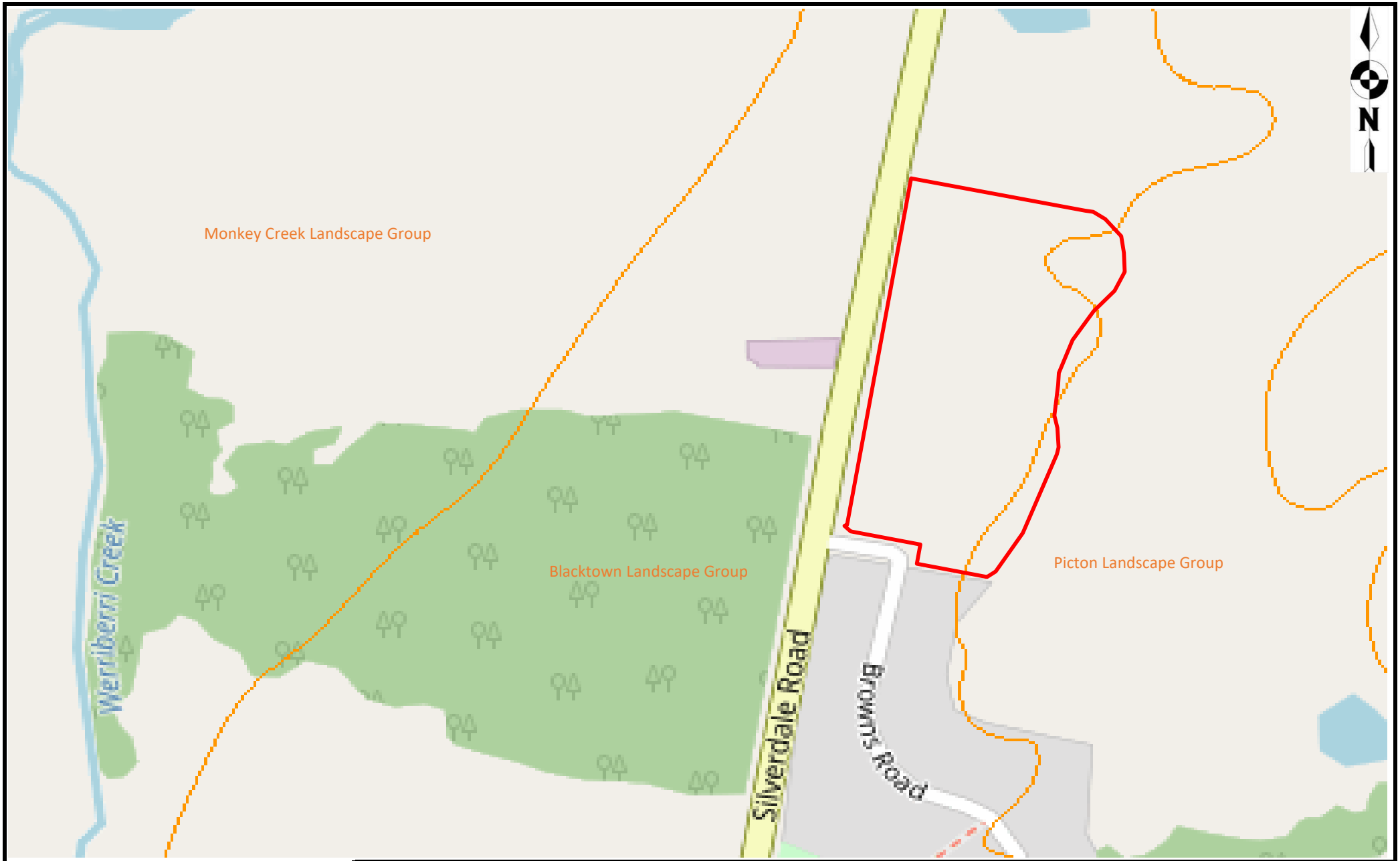
Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia

Tel: (02) 9679 8733 Fax: (02) 9679 8744

Drawn By: AT	Date: 18/3/24	**Proficient Constructions (Aust) Pty Ltd**	
Checked By: SL	Date: 18/3/24	**80 Silverdale Road The Oaks**	
Revision By:	Date:	**Site Locality and Proposed Development Plan**	
Scale: Not to Scale	A3	**Project No: JC24471A**	**Drawing No: 1**



GeoEnviro Consultancy Pty Ltd Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia Tel: (02) 9679 8733 Fax: (02) 9679 8744	Drawn By: AT	Date: 18/3/24	**Proficient Constructions (Aust) Pty Ltd** **80 Silverdale Road The Oaks** **Proposed Cut Fill Plan**	
	Checked By: SL	Date: 18/3/24		
	Revision By:	Date:		
	Scale: Not to Scale	A3	Project No: JC24471A	Drawing No: 2



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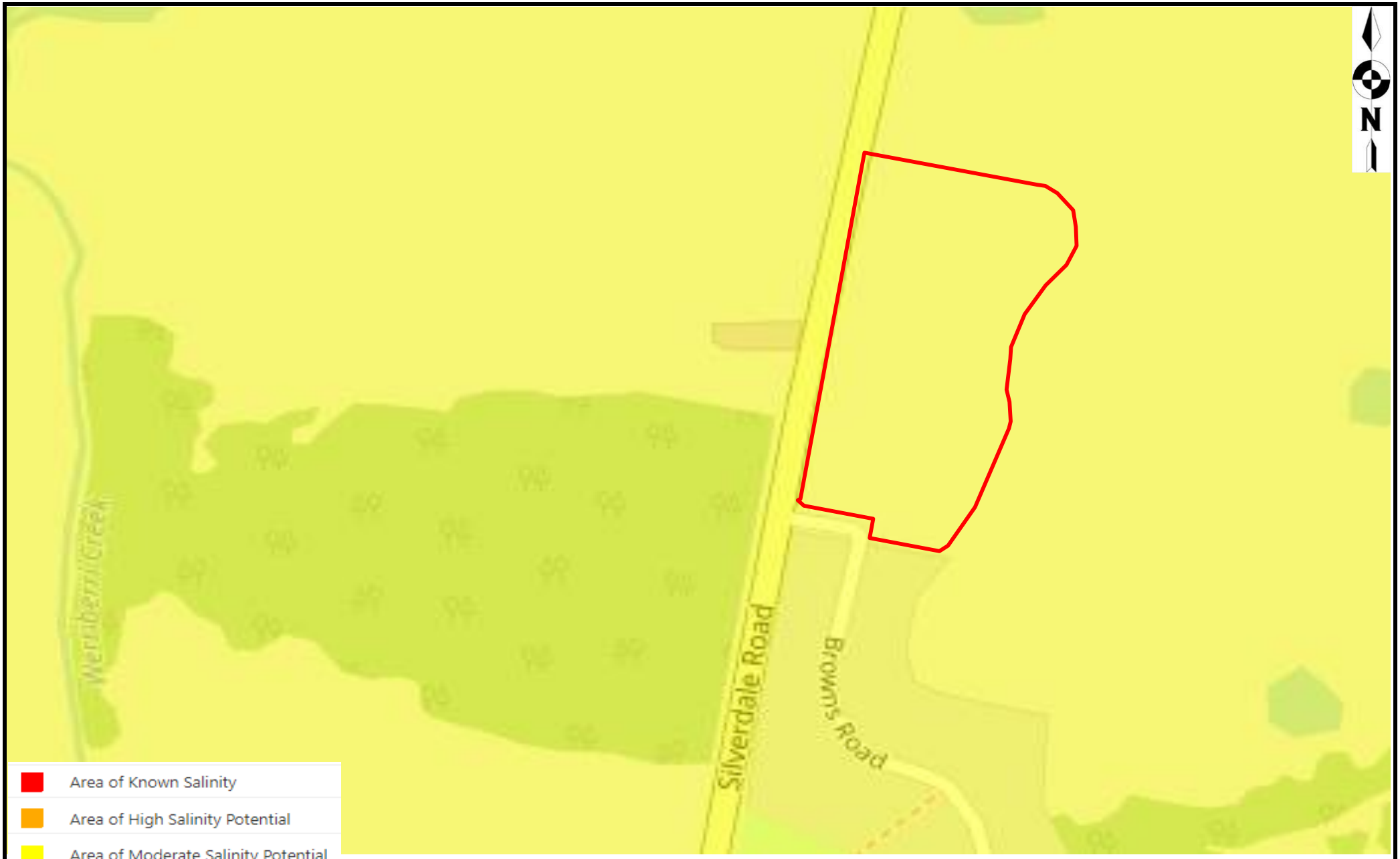
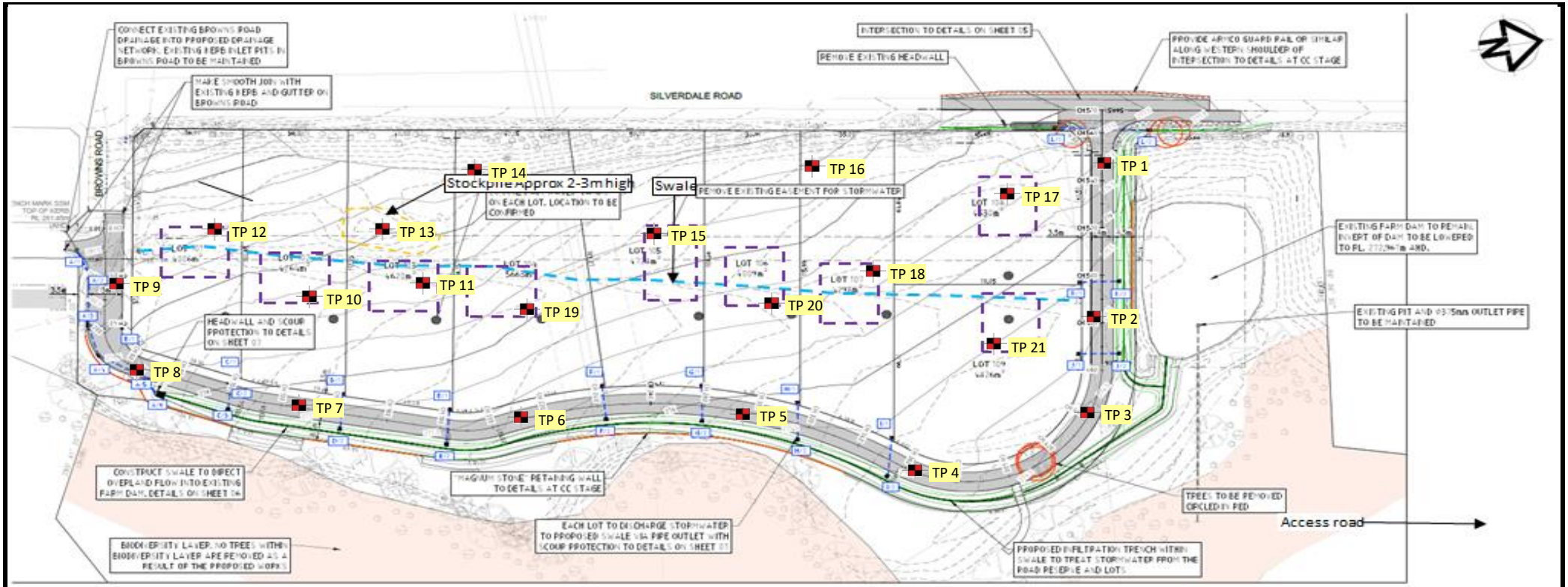
Drawn By: AT	Date: 18/3/24	Proficient Constructions (Aust) Pty Ltd 80 Silverdale Road The Oaks Soil Landscape Map	
Checked By: SL	Date: 18/3/24		
Revision By:	Date:		
Scale: Not to Scale	A3	Project No: JC24471A	Drawing No: 3

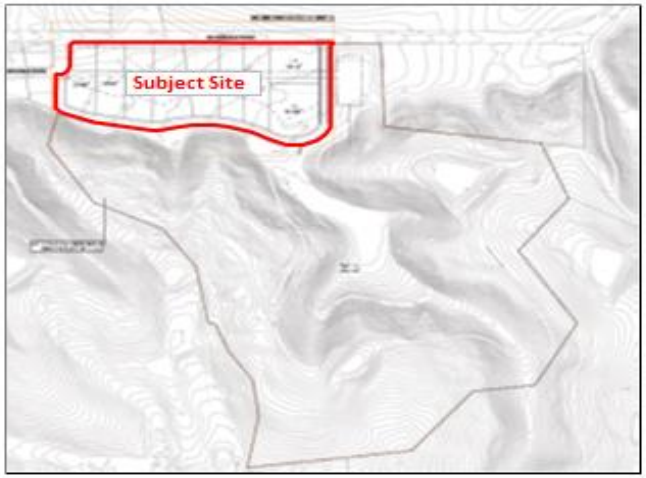
GeoEnviro Consultancy Pty Ltd	Drawn By: AT	Date: 18/3/24	**Proficient Constructions (Aust) Pty Ltd**
Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia	Checked By: SL	Date: 18/3/24	**80 Silverdale Road The Oaks**
Tel: (02) 9679 8733 Fax: (02) 9679 8744	Revision By:	Date:	**Geological Map**
	Scale: Not to Scale	A3	**Project No: JC24471A** / **Drawing No: 4**

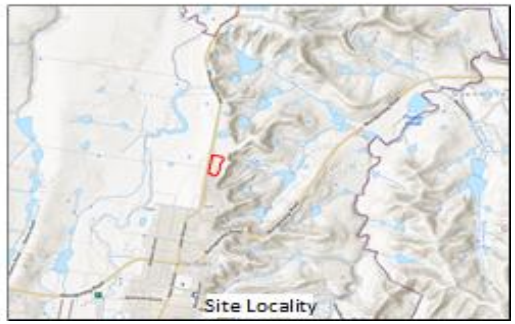


GeoEnviro Consultancy Pty Ltd
Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia
Tel: (02) 9679 8733 Fax: (02) 9679 8744

Drawn By: AT	Date: 18/3/24	Proficient Constructions (Aust) Pty Ltd 80 Silverdale Road The Oaks Salinity Potential Map	
Checked By: SL	Date: 18/3/24		
Revision By:	Date:		
Scale: Not to Scale	A3	Project No: JC24471A	Drawing No: 5







Legend

Test Pit

GeoEnviro Consultancy Pty Ltd

Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia

Tel: (02) 9679 8733 Fax: (02) 9679 8744

Drawn By: AT	Date: 18/3/24	Proficient Constructions (Aust) Pty Ltd
Checked By: SL	Date: 18/3/24	80 Silverdale Road The Oaks
Revision By:	Date:	Test Pit Location Plan
Scale: Not to Scale	A3	Project No: JC24471A / Drawing No: 6

APPENDIX A

Table 1: Summary of Soil Profile

Test Pit Number	Depth (m)	Profile Type	Description	PID (ppm)
1	0.00 - 0.15	Topsoil/Fill	Gravelly Sandy Silt: low liquid limit, brown, moist	2.7
	0.15 - 0.90	Fill	Gravelly Clayey Sand/Gravelly Sandy Clay: fine to coarse grained/low plasticity, dark brown with trace asphalt and concrete pieces, dry to moist	
	0.90 - 2.10	Natural	(CI) Gravelly Silty Clay: medium plasticity, grey red brown, dry to moist, hard PP=550kPa	
	2.10 - 2.20	Natural	As above with ironstone bands (refusal)	
2	0.00 - 0.30	Fill	Gravelly Silty Clay: medium plasticity, red brown grey, dry to moist	1.0
	0.30 - 0.60	Fill	As above but grey brown with shale gravel, dry	
	0.60 - 2.30	Natural	(CI) Gravelly Silty Clay: medium plasticity, grey red brown, dry, hard PP>600kPa	
	2.30 - 2.60	Natural	As above but grey brown with shale bands, dry	
3	0.00 - 0.70	Fill	Gravelly Silty Clay: medium plasticity, red brown grey, dry to moist	2.6
	0.70 - 1.10	Natural	(CI) Gravelly Silty Clay: medium plasticity, grey red brown, dry, hard PP=550-600kPa	
	1.10 - 1.30	Natural	As above but grey with shale and ironstone bands, dry	
	1.30 - 1.40	Bedrock	Shale: grey, low to medium strength, distinctly weathered (refusal)	
4	0.00 - 0.30	Topsoil/Fill	Clayey Silt: low liquid limit, brown, dry	1.9
	0.30 - 0.90	Fill	Silty Clay: medium plasticity, grey with gravel, dry	
	0.90 - 1.40	Natural	(CI) Silty Clay: medium plasticity, grey with ironstone gravel, dry	
	1.40 - 1.50	Bedrock	Shale: grey, low to medium strength, distinctly weathered (refusal)	
5	0.00 - 0.25	Topsoil/Fill	Clayey Silt: low liquid limit, brown with gravel, dry	0.9
	0.25 - 0.90	Fill	Gravelly Silty Clay: medium plasticity, brown grey, dry to moist, hard PP=480kPa	
	0.90 - 1.00	Topsoil	Clayey Silt: low liquid limit, pale brown, dry	
	1.00 - 1.50	Natural	(CI) Silty Clay: medium plasticity, grey brown red with gravel, dry, hard PP>600kPa	
	1.50 - 1.60	Bedrock	Shale: grey, low to medium strength, distinctly weathered (refusal)	
6	0.00 - 0.60	Natural	(CI) Gravelly Silty Clay: medium plasticity, brown, dry	1.1
	0.60 - 0.70	Natural	As above but grey with shale gravel, dry	
	0.70 - 0.80	Bedrock	Shale: grey, low to medium strength, distinctly weathered (refusal)	
7	0.00 - 0.60	Fill	Gravelly Silty Clay: medium plasticity, brown, dry to moist	1.3
	0.60 - 0.90	Fill	As above but grey, dry	
	0.90 - 1.40	Natural	(CI) Silty Clay: medium plasticity, brown grey with gravel, dry	
	1.40 - 1.60	Bedrock	Shale: grey, low to medium strength, distinctly weathered (refusal)	

Note:
PP = Pocket Penetrometer
MC = Moisture Content
PL = Plastic Limit

GeoEnviro Consultancy

TABLE 1 (Page 1 of 3)
SUMMARY OF SOIL PROFILE

Proficient Constructions (Aust) Pty Ltd
Proposed Residential Subdivision Development
No 80 Silverdale Road Silverdale

Prepared By: ST Date: 15/04/2024
Checked By: SL Date: 15/04/2024

Test Pit Number	Depth (m)	Profile Type	Description	PID (ppm)
8	0.00 - 0.80	Fill	Clayey Silt: low liquid limit, brown with glass, metal and 2 fibre-cement fragments, dry	2.3
	0.80 - 1.00	Fill	Gravelly Silty Clay: medium plasticity, grey brown, dry	
	1.00 - 1.40	Topsoil	Clayey Silt: low liquid limit, brown, dry	
	1.40 - 1.80	Natural	(CI) Gravelly Silty Clay: medium plasticity, brown, dry	
	1.80 - 2.00	Bedrock	Shale: grey, low to medium strength, distinctly weathered (refusal)	
9	0.00 - 0.20	Fill	Gravelly Silty Clay: medium plasticity, brown, dry	2.9
	0.20 - 0.60	Natural	(CI) Gravelly Silty Clay: medium plasticity, grey brown, dry	
	0.60 - 0.70	Bedrock	Shale: grey, low to medium strength, distinctly weathered (refusal)	
10	0.00 - 1.20	Fill	Gravelly Silty Clay: medium plasticity, brown, dry	1.4
Building envelope	1.20 - 2.10	Natural	(CI) Gravelly Silty Clay: medium plasticity, grey brown with ironstone bands, dry to moist	
11	0.00 - 0.60	Fill	Gravelly Silty Clay: medium plasticity, brown, dry to moist	3.2
Building	0.60 - 0.80	Natural	(CI) Silty Clay: medium plasticity, brown, dry to moist	
envelope	0.80 - 1.30	Natural	(CI) Gravelly Silty Clay: medium plasticity, grey with ironstaining and ironstone bands, dry to moist	
	1.30 - 1.50	Bedrock	Shale: grey brown, low to medium strength, extremely weathered to distinctly weathered (refusal)	
12	0.00 - 0.20	Fill	Gravelly Silty Clay: medium plasticity, brown grey, dry to moist	1.7
Building	0.20 - 0.40	Natural	(CI) Gravelly Silty Clay: medium plasticity, brown, dry	
envelope	0.40 - 1.20	Natural	(CI) Gravelly Silty Clay: medium plasticity, grey with ironstone bands, dry	
	1.20 - 1.30	Bedrock	Shale: grey, low to medium strength, distinctly weathered (refusal)	
13	0.00 - 2.10	Fill	Clayey Silt: low liquid limit, brown with clay inclusions, dry to moist	0.4
Stockpile	2.10 - 2.70	Natural	(CI) Silty Clay: medium plasticity, brown with gravel, moist, very stiff PP=220kPa	
	2.70 - 2.80	Natural	As above but grey red with gravel, moist	
14	0.00 - 0.20	Fill	Silty Clay: medium plasticity, brown with gravel, dry	0.6
	0.20 - 0.40	Natural	(CI) Gravelly Silty Clay: medium plasticity, grey with ironstone bands, dry (refusal on hard ironstone band)	
15	0.00 - 0.50	Topsoil	Clayey Silt: low liquid limit, dark brown, dry to moist	1.2
Building	0.50 - 1.00	Natural	(CI) Gravelly Silty Clay: medium plasticity, brown, dry to moist, very stiff PP=310-330kPa	
envelope	1.00 - 1.80	Natural	(CI) Gravelly Silty Clay: medium plasticity, grey brown, dry to moist, very stiff PP=380-400kPa	
	1.80 - 1.90	Bedrock	Shale: grey, low to medium strength, distinctly weathered (refusal)	

Note:
PP = Pocket Penetrometer
MC = Moisture Content
PL = Plastic Limit

GeoEnviro Consultancy

TABLE 1 (Page 2 of 3)
SUMMARY OF SOIL PROFILE

Proficient Constructions (Aust) Pty Ltd
Proposed Residential Subdivision Development
No 80 Silverdale Road Silverdale

Prepared By: ST Date: 15/04/2024
Checked By: SL Date: 15/04/2024

Test Pit Number	Depth (m)	Profile Type	Description	PID (ppm)
16	0.00 - 0.30	Topsoil/Fill	Gravelly Clayey Silt: low liquid limit, brown, dry	3.0
	0.30 - 0.80	Fill	Gravelly Silty Clay: medium plasticity, brown with a terracotta piece and plastic and tile fragments, dry	
	0.80 - 1.80	Fill	Gravelly Silty Clay: medium plasticity, grey brown, dry	
	1.80 - 2.40	Natural	(CI) Silty Clay: medium plasticity, grey with ironstone bands, dry (refusal on ironstone)	
17	0.00 - 1.60	Fill	Gravelly Silty Clay: low plasticity, brown dark grey with tile, glass fragments, styrofoam and 1 fibre-cement fragment, dry	0.8
Building	1.60 - 2.10	Fill	Silty Clay: low plasticity, brown with gravel, dry	
envelope	2.10 - 2.50	Natural	(CI) Silty Clay: medium plasticity, grey brown, dry to moist (refusal on ironstone bands)	
18	0.00 - 1.20	Fill	Silty Clay: medium plasticity, grey brown with gravel, dry to moist	1.0
Building	1.20 - 2.00	Natural	(CI) Gravelly Silty Clay: medium plasticity, grey brown, dry to moist	
envelope	2.00 - 2.40	Natural	As above but grey with ironstone bands, dry	
	2.40 - 2.50	Bedrock	Shale: grey, low to medium strength, distinctly weathered (refusal)	
19	0.00 - 0.80	Fill	Gravelly Silty Clay: medium plasticity, brown, dry to moist	2.9
Building	0.80 - 0.90	Natural	(CI) Gravelly Silty Clay: medium plasticity, grey brown with shale bands, dry	
envelope	0.90 - 1.00	Bedrock	Shale: grey brown, low strength, extremely weathered to distinctly weathered (refusal)	
20	0.00 - 1.20	Fill	Gravelly Silty Clay: medium plasticity, brown, dry to moist	0.5
Building	1.20 - 1.50	Natural	(CI) Silty Clay: medium plasticity, brown with gravel, dry to moist	
envelope	1.50 - 2.10	Natural	As above but grey brown, moist	
	2.10 - 2.20	Bedrock	Shale: grey brown, low strength, extremely weathered to distinctly weathered (refusal)	
21	0.00 - 1.70	Fill	Gravelly Silty Clay: medium plasticity, brown, dry to moist	2.5
Building	1.70 - 2.40	Natural	(CI) Gravelly Silty Clay: medium plasticity, grey, dry	
envelope	2.40 - 2.50	Bedrock	Shale: grey brown, low strength, extremely weathered to distinctly weathered (refusal)	

Note:
PP = Pocket Penetrometer
MC = Moisture Content
PL = Plastic Limit

GeoEnviro Consultancy

TABLE 1 (Page 3 of 3)
SUMMARY OF SOIL PROFILE

Proficient Constructions (Aust) Pty Ltd
Proposed Residential Subdivision Development
No 80 Silverdale Road Silverdale

Prepared By: ST Date: 15/04/2024
Checked By: SL Date: 15/04/2024

APPENDIX B

Laboratory Test Reports – Geotechnical

GeoEnviro Consultancy Pty Ltd
Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia
Tel: (02) 96798733 Fax: (02) 96798744

Test Results - Atterberg Limits

Client / Address:	Proficient Constructions (Aust) Pty Ltd	Job No:	JC24471A
Project:	Proposed Rural Residential Subdivision	Date:	4/04/2024
Location:	No 80 Silverdale Road The Oaks	Report No:	R01A

Sample Identification	TP 19 (0.3-0.4m)	TP 10 (1.0-1.3m)	TP 15 (0.3-0.4m)	TP 21 (1.0-1.1m)
Sample Register No	SR 16718	SR 16716	SR 16717	SR 16719
Sample Date	4-Mar-24	4-Mar-24	4-Mar-24	4-Mar-24
Test Date	18-Mar-24	18-Mar-24	18-Mar-24	18-Mar-24
Sample Procedure	AS 1289 1.1, 1.2.1 (6.5.4)	AS 1289 1.1, 1.2.1 (6.5.4)	AS 1289 1.1, 1.2.1 (6.5.4)	AS 1289 1.1, 1.2.1 (6.5.4)
Test Results				
Test Procedure:	AS 1289 3.1.2	AS 1289 3.1.2	AS 1289 3.1.2	AS 1289 3.1.2
Liquid Limit (%)	46	40	49	48
Test Procedure:	AS 1289 3.2.1	AS 1289 3.2.1	AS 1289 3.2.1	AS 1289 3.2.1
Plastic Limit (%)	20	18	18	18
Test Procedure:	AS 1289 3.3.1	AS 1289 3.3.1	AS 1289 3.3.1	AS 1289 3.3.1
Plasticity Index (%)	26	22	31	30
Test Procedure:	AS 1289 3.4.1	AS 1289 3.4.1	AS 1289 3.4.1	AS 1289 3.4.1
Linear Shrinkage (%)	14.0	11.5	13.5	11.0
Test Procedure:	AS 1289 2.1.1	AS 1289 2.1.1	AS 1289 2.1.1	AS 1289 2.1.1
Natural Moisture Content %	18.0	13.0	19.0	13.5
Material Description	FILL: Gravelly Silty Clay: grey brown	Gravelly Silty Clay: grey brown	Gravelly Silty Clay: grey brown	FILL: Gravelly Silty Clay: grey brown

Remarks

Accredited for compliance with ISO/IEC 17025 - Field of Testing.
Authorised Signatory: Solern Liew
NATA Accredited Laboratory Number: 14208.
Date of Issue: 04/04/2024

GeoEnviro Consultancy Pty Ltd
Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia
Tel: (02) 96798733 Fax: (02) 96798744

Emerson Class Number

Client / Address:	Proficient Constructions (Aust) Pty Ltd	Job No:	JC24471A
Project:	Proposed Rural Residential Subdivision	Date:	4/04/2024
Location:	No 80 Silverdale Road The Oaks	Report No:	R02A

Sample Identification	TP 1 (0.4-0.5m)	TP 4 (1.2-1.6m)	TP 6 (0.3-0.4m)	TP 9 (0.3-0.5m)	TP 10 (1.0-1.3m)
Sample Register No	SR 16711	SR 16713	SR 16714	SR 16715	SR 16716
Sample Date	04-Mar-24	04-Mar-24	04-Mar-24	04-Mar-24	04-Mar-24
Test Date	16-Mar-24	16-Mar-24	16-Mar-24	16-Mar-24	16-Mar-24
Sample Procedure	AS 1289 1.1, 1.2.1 (6.5.4)	AS 1289 1.1, 1.2.1 (6.5.4)	AS 1289 1.1, 1.2.1 (6.5.4)	AS 1289 1.1, 1.2.1 (6.5.4)	AS 1289 1.1, 1.2.1 (6.5.4)
Test Procedure	AS 1289 1.1, 1.2.1, 3.8.1				

Test Results

Air Dried crumbs					
Time in water:	7:41	7:41	7:41	7:41	7:41
Time dispersion starts:	-	7:44	-	7:45	7:45
Remoulded Soil					
Time in water	9:55	-	9:55	-	-
Time dispersion starts	-	-	-	-	-
Type of water	Distilled	Distilled	Distilled	Distilled	Distilled
Temp. of water	23°	23°	23°	23°	23°
Emerson Class Number					
Class No.	6	1	5	1	1

Remarks

Accredited for compliance with ISO/IEC 17025 - Field of Testing.

Authorised Signatory: Solern Liew

NATA Accredited Laboratory Number: 14208.

Date of Issue: 04/04/2024

GeoEnviro Consultancy Pty Ltd
Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia
Tel: (02) 96798733 Fax: (02) 96798744

Emerson Class Number

Client / Address:	Proficient Constructions (Aust) Pty Ltd	Job No:	JC24471A
Project:	Proposed Rural Residential Subdivision	Date:	4/04/2024
Location:	No 80 Silverdale Road The Oaks	Report No:	R03A

Sample Identification	TP 15 (0.3-0.4m)	TP 19 (0.3-0.4m)	TP 21 (1.0-1.1m)		
Sample Register No	SR 16717	SR 16718	SR 16719		
Sample Date	04-Mar-24	04-Mar-24	04-Mar-24		
Test Date	16-Mar-24	16-Mar-24	16-Mar-24		
Sample Procedure	AS 1289 1.1, 1.2.1 (6.5.4)	AS 1289 1.1, 1.2.1 (6.5.4)	AS 1289 1.1, 1.2.1 (6.5.4)		
Test Procedure	AS 1289 1.1, 1.2.1, 3.8.1				

Test Results

Air Dried crumbs					
Time in water:	7:41	7:41	7:41		
Time dispersion starts:	-	9:30	9:30		
Remoulded Soil					
Time in water	9:55	-	-		
Time dispersion starts	-	-	-		
Type of water	Distilled	Distilled	Distilled		
Temp. of water	23°	23°	23°		
Emerson Class Number					
Class No.	6	2	2		

Remarks

Accredited for compliance with ISO/IEC 17025 - Field of Testing.

Authorised Signatory: Solern Liew

NATA Accredited Laboratory Number: 14208.

Date of Issue: 04/04/2024

GeoEnviro Consultancy Pty Ltd
Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia
Tel: (02) 96798733 Fax: (02) 96798744

Atterberg Limits & Particle Size Distribution

Client / Address:	Proficient Constructions (Aust) Pty Ltd	Job No:	JC24471A
Project:	Proposed Rural Residential Subdivision	Date:	4/04/2024
Location:	No 80 Silverdale Road The Oaks	Report No:	R04A

Lab Reference No:	SR 16711	Sample Identification:	TP 1 (0.4-0.5m)
Sample Date:	4/03/2024	Test Date:	27/03/2024

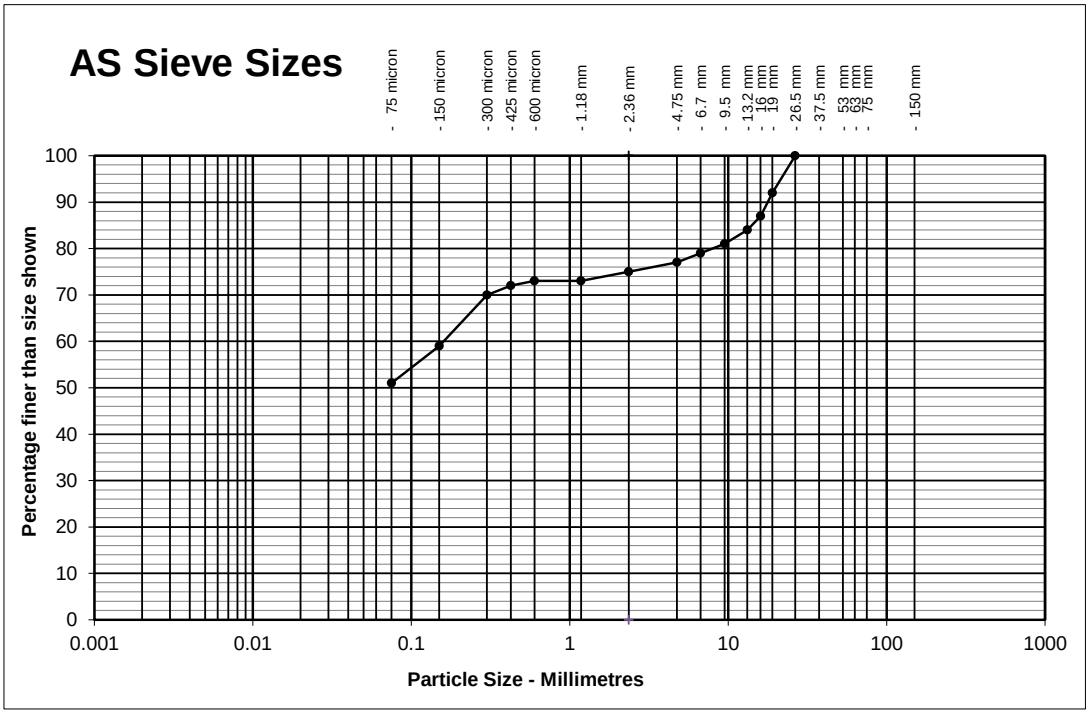
Laboratory Specimen Description: FILL: Gravelly Clayey Sand/Gravelly Sandy Clay: dark brown

Test Method	Test Results	Test Procedure
Liquid Limit (%)	-	AS 1289 3.1.1
Plastic Limit (%)	-	AS 1289 3.2.1
Plasticity Index (%)	-	AS 1289 3.3.1
Linear Shrinkage (%)	-	AS 1289 3.4.1
Natural Moisture %	-	AS 1289 2.1.1
Sample History:	-	
Preparation Method.	-	
Condition of linear shrinkage.	-	
Linear shrinkage mould length.	-	

ND = not determined NO = not obtainable NP = non plastic

Test Procedure AS1289 2.1.1, 3.6.1

Sieve Size	% Passing	Specification
150 mm		
75 mm		
63 mm		
53 mm		
37.5 mm		
26.5 mm	100	
19 mm	92	
16 mm	87	
13.2 mm	84	
9.5 mm	81	
6.7 mm	79	
4.75 mm	77	
2.36 mm	75	
1.18 mm	73	
600 um	73	
425 um	72	
300 um	70	
150 um	59	
75 um	51	



clay	silt			sand			gravel			cobbles
	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	

Remarks:

Accredited for compliance with ISO/IEC 17025 - Field of Testing.
horised Signatory: Solern Liew
NATA Accredited Laboratory Number: 14208.
Date of Issue: 04/04/2024

GeoEnviro Consultancy Pty Ltd
Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia
Tel: (02) 96798733 Fax: (02) 96798744

Atterberg Limits & Particle Size Distribution

Client / Address:	Proficient Constructions (Aust) Pty Ltd	Job No:	JC24471A
Project:	Proposed Rural Residential Subdivision	Date:	4/04/2024
Location:	No 80 Silverdale Road The Oaks	Report No:	R05A

Lab Reference No:	SR 16713	Sample Identification:	TP 4 (1.2-1.6m)
Sample Date:	4/03/2024	Test Date:	27/03/2024

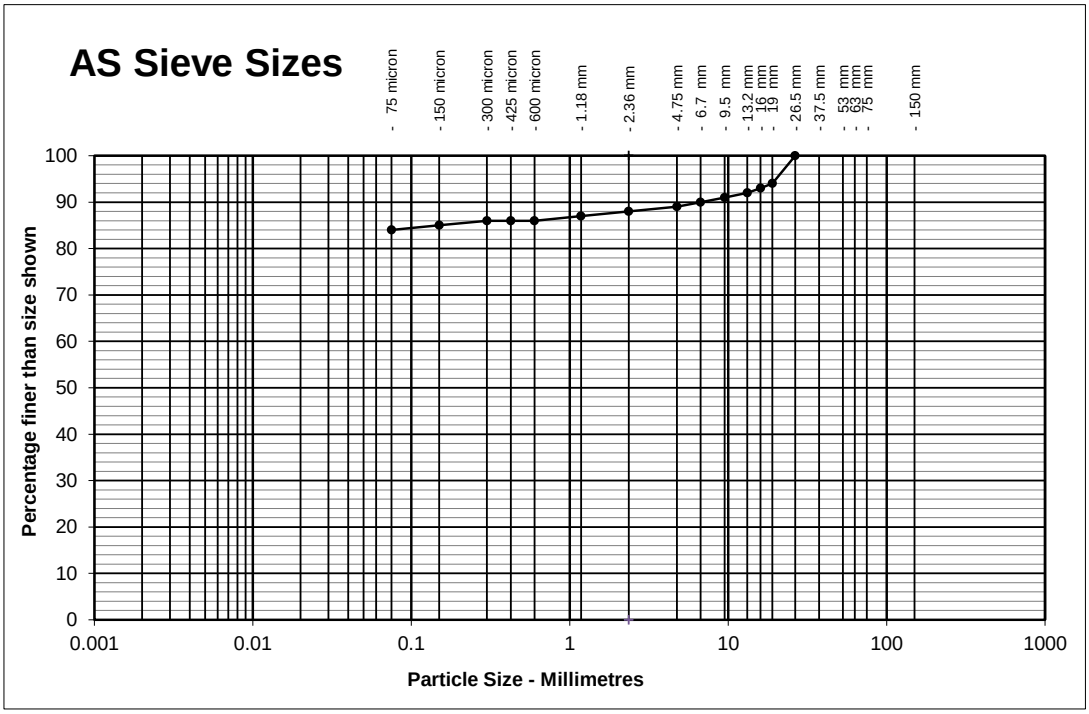
Laboratory Specimen Description: Silty Clay: grey

Test Method	Test Results	Test Procedure
Liquid Limit (%)	-	AS 1289 3.1.1
Plastic Limit (%)	-	AS 1289 3.2.1
Plasticity Index (%)	-	AS 1289 3.3.1
Linear Shrinkage (%)	-	AS 1289 3.4.1
Natural Moisture %	-	AS 1289 2.1.1
Sample History:	-	
Preparation Method.	-	
Condition of linear shrinkage.	-	
Linear shrinkage mould length.	-	

ND = not determined NO = not obtainable NP = non plastic

Test Procedure AS1289 2.1.1, 3.6.1

Sieve Size	% Passing	Specification
150 mm		
75 mm		
63 mm		
53 mm		
37.5 mm		
26.5 mm	100	
19 mm	94	
16 mm	93	
13.2 mm	92	
9.5 mm	91	
6.7 mm	90	
4.75 mm	89	
2.36 mm	88	
1.18 mm	87	
600 um	86	
425 um	86	
300 um	86	
150 um	85	
75 um	84	



clay	silt			sand			gravel			cobbles
	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	

Remarks:

Accredited for compliance with ISO/IEC 17025 - Field of Testing.
horised Signatory: Solern Liew
NATA Accredited Laboratory Number: 14208.
Date of Issue: 04/04/2024

GeoEnviro Consultancy Pty Ltd
Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia
Tel: (02) 96798733 Fax: (02) 96798744

Atterberg Limits & Particle Size Distribution

Client / Address:	Proficient Constructions (Aust) Pty Ltd	Job No:	JC24471A
Project:	Proposed Rural Residential Subdivision	Date:	4/04/2024
Location:	No 80 Silverdale Road The Oaks	Report No:	R06A

Lab Reference No:	SR 16715	Sample Identification:	TP 9 (0.3-0.5m)
Sample Date:	4/03/2024	Test Date:	27/03/2024

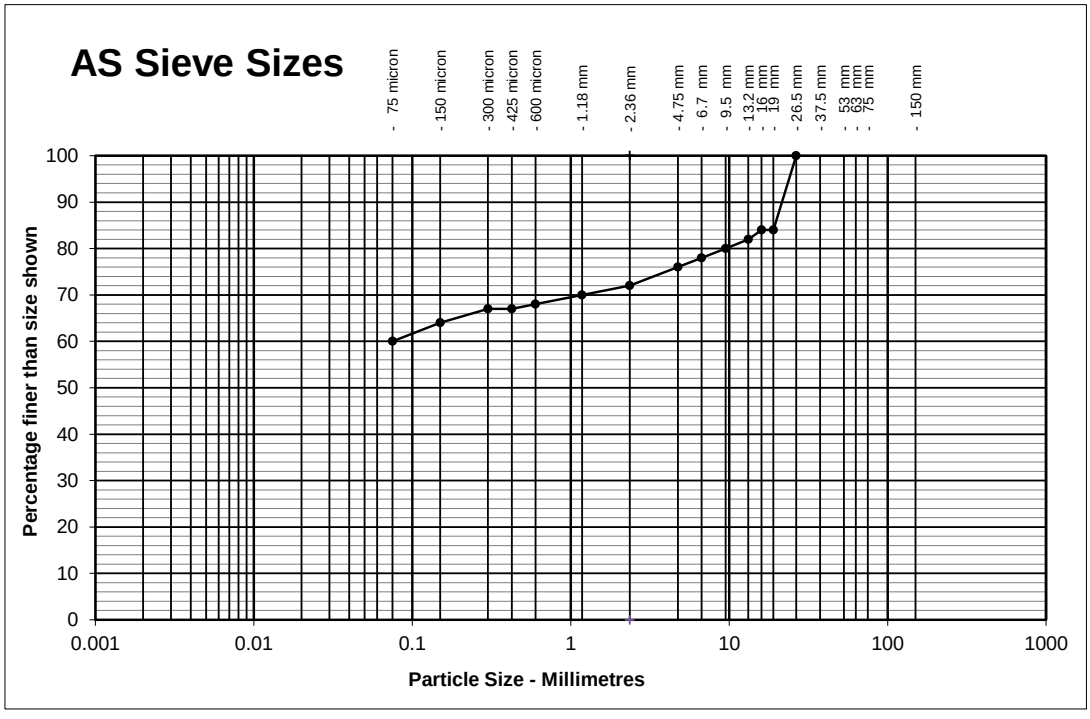
Laboratory Specimen Description: Gravelly Silty Clay: grey brown

Test Method	Test Results	Test Procedure
Liquid Limit (%)	-	AS 1289 3.1.1
Plastic Limit (%)	-	AS 1289 3.2.1
Plasticity Index (%)	-	AS 1289 3.3.1
Linear Shrinkage (%)	-	AS 1289 3.4.1
Natural Moisture %	-	AS 1289 2.1.1
Sample History:	-	
Preparation Method.	-	
Condition of linear shrinkage.	-	
Linear shrinkage mould length.	-	

ND = not determined NO = not obtainable NP = non plastic

Test Procedure AS1289 2.1.1, 3.6.1

Sieve Size	% Passing	Specification
150 mm		
75 mm		
63 mm		
53 mm		
37.5 mm		
26.5 mm	100	
19 mm	84	
16 mm	84	
13.2 mm	82	
9.5 mm	80	
6.7 mm	78	
4.75 mm	76	
2.36 mm	72	
1.18 mm	70	
600 um	68	
425 um	67	
300 um	67	
150 um	64	
75 um	60	



clay	silt			sand			gravel			cobbles
	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	

Remarks:

Accredited for compliance with ISO/IEC 17025 - Field of Testing.
horised Signatory: Solern Liew
NATA Accredited Laboratory Number: 14208.
Date of Issue: 04/04/2024

GeoEnviro Consultancy Pty Ltd
Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia
Tel: (02) 96798733 Fax: (02) 96798744

Atterberg Limits & Particle Size Distribution

Client / Address:	Proficient Constructions (Aust) Pty Ltd	Job No:	JC24471A
Project:	Proposed Rural Residential Subdivision	Date:	4/04/2024
Location:	No 80 Silverdale Road The Oaks	Report No:	R07A

Lab Reference No:	SR 16719	Sample Identification:	TP 21 (1.0-1.1m)
Sample Date:	4/03/2024	Test Date:	27/03/2024

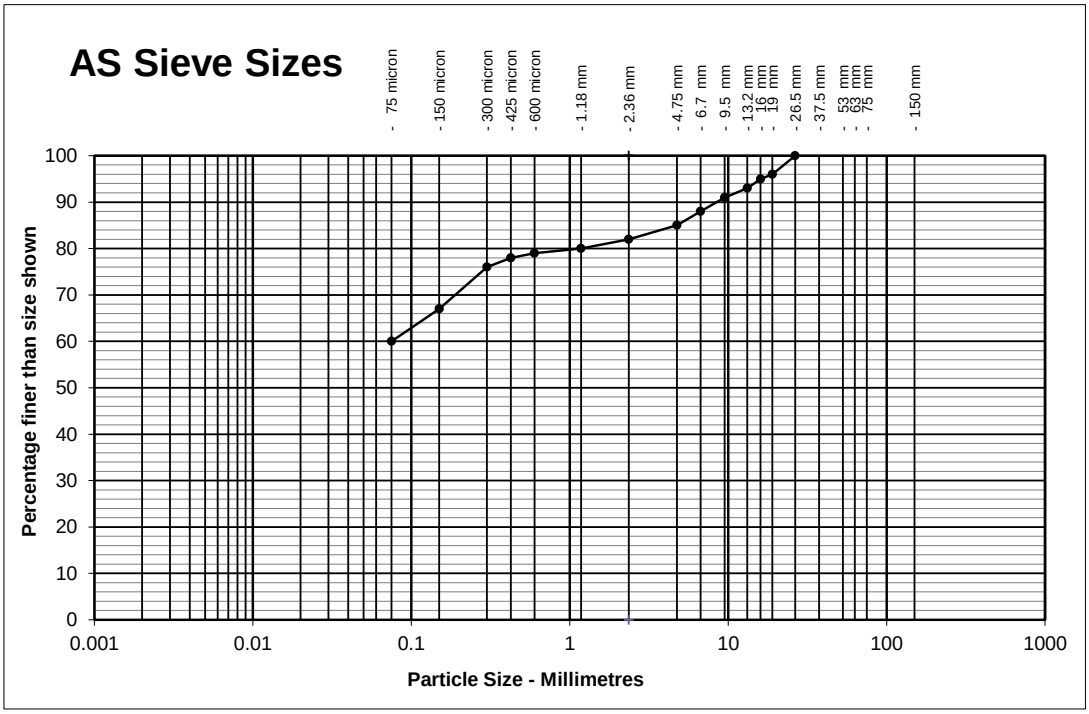
Laboratory Specimen Description: FILL: Gravelly Silty Clay: grey brown

Test Method	Test Results	Test Procedure
Liquid Limit (%)	-	AS 1289 3.1.1
Plastic Limit (%)	-	AS 1289 3.2.1
Plasticity Index (%)	-	AS 1289 3.3.1
Linear Shrinkage (%)	-	AS 1289 3.4.1
Natural Moisture %	-	AS 1289 2.1.1
Sample History:	-	
Preparation Method.	-	
Condition of linear shrinkage.	-	
Linear shrinkage mould length.	-	

ND = not determined NO = not obtainable NP = non plastic

Test Procedure AS1289 2.1.1, 3.6.1

Sieve Size	% Passing	Specification
150 mm		
75 mm		
63 mm		
53 mm		
37.5 mm		
26.5 mm	100	
19 mm	96	
16 mm	95	
13.2 mm	93	
9.5 mm	91	
6.7 mm	88	
4.75 mm	85	
2.36 mm	82	
1.18 mm	80	
600 um	79	
425 um	78	
300 um	76	
150 um	67	
75 um	60	



clay	silt			sand			gravel			cobbles
	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	

Remarks:

Accredited for compliance with ISO/IEC 17025 - Field of Testing.
horised Signatory: Solern Liew
NATA Accredited Laboratory Number: 14208.
Date of Issue: 04/04/2024

GeoEnviro Consultancy Pty Ltd
Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia
Tel: (02) 96798733 Fax: (02) 96798744

Test Results - California Bearing Ratio

Client / Address:	Proficient Constructions (Aust) Pty Ltd	Job No:	JC24471A
Project:	Proposed Rural Residential Subdivision	Date:	4/04/2024
Location:	No 80 Silverdale Road The Oaks	Report No:	R08A

SAMPLE INFORMATION Test Methods	AS 1289 1.1, 1.2.1 (6.5.4)				
Lab Reference No.	SR 16711	SR 16712	SR 16714	SR 16715	
Date Sampled / Received	04-Mar-24	04-Mar-24	04-Mar-24	04-Mar-24	
Date Tested	20-Mar-24	20-Mar-24	20-Mar-24	20-Mar-24	
Sample Identification	TP 1 (0.4-0.5m)	TP 4 (0.4-0.6m)	TP 6 (0.3-0.4m)	TP 9 (0.3-0.5m)	
Laboratory Specimen Description	FILL: Gravelly Clayey Sand/Gravelly Sandy Clay: dark brown	FILL: Silty Clay: grey	Gravelly Silty Clay: brown	Gravelly Silty Clay: grey brown	
Preparation of the test sample					
Liquid Limit Preformed Yes / No	No	No	No	No	
Visual / Tactile Assessment Yes / No	Yes	Yes	Yes	Yes	
Sample Curing Time	96 h (4 days)	96 h (4 days)	96 h (4 days)	96 h (4 days)	
TEST RESULTS					
Laboratory Compaction & Moisture Content - Test Methods AS1289 5.1.1 Mould A and AS1289 2.1.1					
Maximum Dry Density t/m3	1.72	1.77	1.74	1.81	
Optimum Moisture Content %	20.5	16.5	18.5	16.5	
Field Moisture Content %	21.0	17.0	17.5	13.0	
% Of Oversize 19mm	-	-	-	-	
Replacement of Oversize (See note B)	-	-	-	-	
California Bearing Ratio - Test Method AS1289 6.1.1					
CBR Test: Dry Density t/m3	Before Soaking	1.71	1.76	1.73	1.79
	After Soaking	1.69	1.74	1.72	1.77
CBR Test: Density Ratio %	Before Soaking	99.0	99.5	99.5	99.5
	After Soaking	98.5	98.0	99.0	98.0
CBR Test: Moisture Content %	Before Soaking	20.5	17.0	18.5	16.5
	After Soaking	22.0	19.0	21.0	18.5
CBR Test: Number of Days Soaked		4	4	4	4
CBR Test: Surcharge kg		4.5	4.5	4.5	4.5
CBR Test: Moisture Content After Test %	Top 30mm	24.5	21.5	23.0	21.0
	Whole Sample	22.0	19.0	21.0	18.5
CBR Test: Swell After Soaking %		0.7	1.2	0.4	1.2
CBR Test: Penetration mm		2.5	5.0	2.5	2.5
CBR Test: CBR Value %		8.0	4.0	7.0	5.0

Notes: (A) Test specimen was compacted to a target dry density of 100 percent standard (AS 1289 5.1.1)

(B) If specified the percentage of oversize retained on the 19mm may be replaced by an equal portion of –19mm to +4.75mm

Remarks

Accredited for compliance with ISO/IEC 17025 - Field of Testing.
Authorised Signatory: Solern Liew
NATA Accredited Laboratory Number: 14208.
Date of Issue: 04/04/2024

APPENDIX C

Laboratory Test Reports – Salinity

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

CERTIFICATE OF ANALYSIS 345910

Client Details

Client	Geoenviro Consultancy Pty Ltd
Attention	Steven Goss
Address	PO Box 1543, Macquarie Centre, North Ryde, NSW, 2113

Sample Details

Your Reference	**JC24471A, Proposed Rural Residential Subdivision**
Number of Samples	62 Soil, 2 Material, 1 Water
Date samples received	07/03/2024
Date completed instructions received	07/03/2024

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	15/03/2024
Date of Issue	15/03/2024

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

Results Approved By
Diego Bigolin, Inorganics Supervisor
Dragana Tomas, Senior Chemist
Hannah Nguyen, Metals Supervisor
Loren Bardwell, Development Chemist
Lucy Zhu, Asbestos Supervisor
Timothy Toll, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		345910-1	345910-5	345910-12	345910-16	345910-21
Your Reference	UNITS	TP 1	TP 2	TP 4	TP 5	TP 7
Depth		0-0.1	0.3-0.4	0-0.1	0.4-0.5	0.6-0.7
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/03/2024	11/03/2024	11/03/2024	11/03/2024	11/03/2024
Date analysed	-	14/03/2024	14/03/2024	14/03/2024	14/03/2024	14/03/2024
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTRH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	76	72	74	75	75

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		345910-24	345910-27	345910-31	345910-34	345910-40
Your Reference	UNITS	TP 8	TP 9	TP 11	TP 12	TP 15
Depth		0.3-0.4	0-0.1	0.1-0.2	0-0.1	0-0.1
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/03/2024	11/03/2024	11/03/2024	11/03/2024	11/03/2024
Date analysed	-	14/03/2024	14/03/2024	14/03/2024	14/03/2024	14/03/2024
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTRH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	91	71	77	80	79

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		345910-44	345910-47	345910-49	345910-51	345910-56
Your Reference	UNITS	TP 16	TP 17	TP 17	TP 18	TP 20
Depth		0.3-0.4	0.5-0.6	1.6-1.7	0.5-0.6	0.3-0.4
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/03/2024	11/03/2024	11/03/2024	11/03/2024	11/03/2024
Date analysed	-	14/03/2024	14/03/2024	14/03/2024	14/03/2024	14/03/2024
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTRH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	74	82	85	90	83

vTRH(C6-C10)/BTEXN in Soil					
Our Reference		345910-60	345910-62	345910-63	345910-64
Your Reference	UNITS	TP 21	TP DUP A	TP DUP B	Trip Blank 04/03/2024
Depth		1-1.1	-	-	-
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	11/03/2024	11/03/2024	11/03/2024	11/03/2024
Date analysed	-	14/03/2024	14/03/2024	14/03/2024	14/03/2024
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25
vTRH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	78	86	93	93

svTRH (C10-C40) in Soil						
Our Reference		345910-1	345910-5	345910-12	345910-16	345910-21
Your Reference	UNITS	TP 1	TP 2	TP 4	TP 5	TP 7
Depth		0-0.1	0.3-0.4	0-0.1	0.4-0.5	0.6-0.7
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/03/2024	11/03/2024	11/03/2024	11/03/2024	11/03/2024
Date analysed	-	12/03/2024	12/03/2024	12/03/2024	12/03/2024	13/03/2024
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} -C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	84	83	80	80	81

svTRH (C10-C40) in Soil						
Our Reference		345910-24	345910-27	345910-31	345910-34	345910-40
Your Reference	UNITS	TP 8	TP 9	TP 11	TP 12	TP 15
Depth		0.3-0.4	0-0.1	0.1-0.2	0-0.1	0-0.1
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/03/2024	11/03/2024	11/03/2024	11/03/2024	11/03/2024
Date analysed	-	13/03/2024	13/03/2024	13/03/2024	13/03/2024	13/03/2024
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} -C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	160
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	160
Surrogate o-Terphenyl	%	82	79	82	83	85

svTRH (C10-C40) in Soil						
Our Reference		345910-44	345910-47	345910-49	345910-51	345910-56
Your Reference	UNITS	TP 16	TP 17	TP 17	TP 18	TP 20
Depth		0.3-0.4	0.5-0.6	1.6-1.7	0.5-0.6	0.3-0.4
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/03/2024	11/03/2024	11/03/2024	11/03/2024	11/03/2024
Date analysed	-	13/03/2024	13/03/2024	13/03/2024	13/03/2024	13/03/2024
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} -C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	110	140	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	110	140	<50	<50	<50
Surrogate o-Terphenyl	%	81	82	81	81	88

svTRH (C10-C40) in Soil				
Our Reference		345910-60	345910-62	345910-63
Your Reference	UNITS	TP 21	TP DUP A	TP DUP B
Depth		1-1.1	-	-
Date Sampled		04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil
Date extracted	-	11/03/2024	11/03/2024	11/03/2024
Date analysed	-	13/03/2024	13/03/2024	13/03/2024
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50
TRH >C_{10} -C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50
Surrogate o-Terphenyl	%	80	79	80

PAHs in Soil						
Our Reference		345910-1	345910-5	345910-12	345910-16	345910-21
Your Reference	UNITS	TP 1	TP 2	TP 4	TP 5	TP 7
Depth		0-0.1	0.3-0.4	0-0.1	0.4-0.5	0.6-0.7
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/03/2024	11/03/2024	11/03/2024	11/03/2024	11/03/2024
Date analysed	-	13/03/2024	13/03/2024	13/03/2024	13/03/2024	13/03/2024
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	0.3	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	0.4	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	0.2	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	0.2	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	0.4	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.3	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	<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	0.2	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	2.3	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	106	107	98	104	114

PAHs in Soil						
Our Reference		345910-24	345910-27	345910-31	345910-34	345910-40
Your Reference	UNITS	TP 8	TP 9	TP 11	TP 12	TP 15
Depth		0.3-0.4	0-0.1	0.1-0.2	0-0.1	0-0.1
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/03/2024	11/03/2024	11/03/2024	11/03/2024	11/03/2024
Date analysed	-	13/03/2024	13/03/2024	13/03/2024	13/03/2024	13/03/2024
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	94	106	106	95	104

PAHs in Soil						
Our Reference		345910-44	345910-47	345910-49	345910-51	345910-56
Your Reference	UNITS	TP 16	TP 17	TP 17	TP 18	TP 20
Depth		0.3-0.4	0.5-0.6	1.6-1.7	0.5-0.6	0.3-0.4
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/03/2024	11/03/2024	11/03/2024	11/03/2024	11/03/2024
Date analysed	-	13/03/2024	14/03/2024	13/03/2024	13/03/2024	13/03/2024
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	0.3	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.1	0.7	<0.1	<0.1	<0.1
Pyrene	mg/kg	0.2	0.8	0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	0.4	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	0.3	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	0.7	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.1	0.4	0.07	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	0.2	<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	0.3	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	0.4	4.0	0.2	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	0.6	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	0.6	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	0.7	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	100	122	102	105	104

PAHs in Soil				
Our Reference		345910-60	345910-62	345910-63
Your Reference	UNITS	TP 21	TP DUP A	TP DUP B
Depth		1-1.1	-	-
Date Sampled		04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil
Date extracted	-	11/03/2024	11/03/2024	11/03/2024
Date analysed	-	13/03/2024	13/03/2024	13/03/2024
Naphthalene	mg/kg	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	91	96	93

Organochlorine Pesticides in soil						
Our Reference		345910-12	345910-24	345910-34	345910-47	345910-60
Your Reference	UNITS	TP 4	TP 8	TP 12	TP 17	TP 21
Depth		0-0.1	0.3-0.4	0-0.1	0.5-0.6	1-1.1
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/03/2024	11/03/2024	11/03/2024	11/03/2024	11/03/2024
Date analysed	-	13/03/2024	13/03/2024	13/03/2024	13/03/2024	13/03/2024
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Mirex	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	88	89	92	90	88

Organochlorine Pesticides in soil			
Our Reference		345910-62	345910-63
Your Reference	UNITS	TP DUP A	TP DUP B
Depth		-	-
Date Sampled		04/03/2024	04/03/2024
Type of sample		Soil	Soil
Date extracted	-	11/03/2024	11/03/2024
Date analysed	-	13/03/2024	13/03/2024
alpha-BHC	mg/kg	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1
Mirex	mg/kg	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1
Surrogate 4-Chloro-3-NBTF	%	87	88

PCBs in Soil						
Our Reference		345910-12	345910-24	345910-34	345910-47	345910-60
Your Reference	UNITS	TP 4	TP 8	TP 12	TP 17	TP 21
Depth		0-0.1	0.3-0.4	0-0.1	0.5-0.6	1-1.1
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/03/2024	11/03/2024	11/03/2024	11/03/2024	11/03/2024
Date analysed	-	13/03/2024	13/03/2024	13/03/2024	13/03/2024	13/03/2024
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate 2-Fluorobiphenyl	%	95	95	94	91	90

PCBs in Soil			
Our Reference		345910-62	345910-63
Your Reference	UNITS	TP DUP A	TP DUP B
Depth		-	-
Date Sampled		04/03/2024	04/03/2024
Type of sample		Soil	Soil
Date extracted	-	11/03/2024	11/03/2024
Date analysed	-	13/03/2024	13/03/2024
Aroclor 1016	mg/kg	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1
Surrogate 2-Fluorobiphenyl	%	92	91

Acid Extractable metals in soil						
Our Reference		345910-1	345910-2	345910-4	345910-5	345910-12
Your Reference	UNITS	TP 1	TP 1	TP 2	TP 2	TP 4
Depth		0-0.1	0.4-0.5	0-0.1	0.3-0.4	0-0.1
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/03/2024	12/03/2024	12/03/2024	12/03/2024	12/03/2024
Date analysed	-	12/03/2024	12/03/2024	12/03/2024	12/03/2024	12/03/2024
Arsenic	mg/kg	<4	7	8	6	16
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	8	30	29	7	45
Copper	mg/kg	28	110	7	30	4
Lead	mg/kg	100	60	11	15	16
Mercury	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	5	20	4	7	4
Zinc	mg/kg	94	71	10	54	10

Acid Extractable metals in soil						
Our Reference		345910-13	345910-15	345910-16	345910-18	345910-20
Your Reference	UNITS	TP 4	TP 5	TP 5	TP 6	TP 7
Depth		0.4-0.6	0-0.1	0.4-0.5	0-0.1	0.1-0.2
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/03/2024	12/03/2024	12/03/2024	12/03/2024	12/03/2024
Date analysed	-	12/03/2024	12/03/2024	12/03/2024	12/03/2024	12/03/2024
Arsenic	mg/kg	5	9	4	8	12
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	6	23	20	44	36
Copper	mg/kg	11	17	5	5	6
Lead	mg/kg	11	22	9	14	14
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	2	6	2	4	3
Zinc	mg/kg	6	34	5	8	7

Acid Extractable metals in soil						
Our Reference		345910-21	345910-24	345910-27	345910-29	345910-31
Your Reference	UNITS	TP 7	TP 8	TP 9	TP 10	TP 11
Depth		0.6-0.7	0.3-0.4	0-0.1	0.3-0.4	0.1-0.2
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/03/2024	12/03/2024	12/03/2024	12/03/2024	12/03/2024
Date analysed	-	12/03/2024	12/03/2024	12/03/2024	12/03/2024	12/03/2024
Arsenic	mg/kg	9	8	6	9	9
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	36	44	11	27	36
Copper	mg/kg	4	6	14	8	6
Lead	mg/kg	13	21	13	13	14
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	3	7	6	4	3
Zinc	mg/kg	8	180	25	11	8

Acid Extractable metals in soil						
Our Reference		345910-34	345910-40	345910-43	345910-44	345910-45
Your Reference	UNITS	TP 12	TP 15	TP 16	TP 16	TP 16
Depth		0-0.1	0-0.1	0-0.1	0.3-0.4	1.3-1.4
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/03/2024	12/03/2024	12/03/2024	12/03/2024	12/03/2024
Date analysed	-	12/03/2024	12/03/2024	12/03/2024	12/03/2024	12/03/2024
Arsenic	mg/kg	13	9	5	4	13
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	33	31	17	13	20
Copper	mg/kg	14	11	21	14	8
Lead	mg/kg	22	26	24	35	15
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	4	8	11	8	3
Zinc	mg/kg	17	35	35	51	13

Acid Extractable metals in soil						
Our Reference		345910-47	345910-49	345910-51	345910-56	345910-59
Your Reference	UNITS	TP 17	TP 17	TP 18	TP 20	TP 21
Depth		0.5-0.6	1.6-1.7	0.5-0.6	0.3-0.4	0-0.1
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/03/2024	12/03/2024	12/03/2024	12/03/2024	12/03/2024
Date analysed	-	12/03/2024	12/03/2024	12/03/2024	12/03/2024	12/03/2024
Arsenic	mg/kg	4	10	9	8	9
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	13	27	26	18	30
Copper	mg/kg	39	9	7	6	16
Lead	mg/kg	60	17	12	13	14
Mercury	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	8	5	4	2	8
Zinc	mg/kg	97	12	10	4	50

Acid Extractable metals in soil					
Our Reference		345910-60	345910-62	345910-63	345910-66
Your Reference	UNITS	TP 21	TP DUP A	TP DUP B	TP DUP A - [TRIPLICATE]
Depth		1-1.1	-	-	-
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	12/03/2024	12/03/2024	12/03/2024	12/03/2024
Date analysed	-	12/03/2024	12/03/2024	12/03/2024	12/03/2024
Arsenic	mg/kg	8	20	8	18
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	23	30	23	35
Copper	mg/kg	10	5	10	5
Lead	mg/kg	12	14	12	18
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	5	5	5	5
Zinc	mg/kg	19	12	17	13

Misc Inorg - Soil						
Our Reference		345910-1	345910-2	345910-3	345910-4	345910-5
Your Reference	UNITS	TP 1	TP 1	TP 1	TP 2	TP 2
Depth		0-0.1	0.4-0.5	1-1.2	0-0.1	0.3-0.4
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	07/03/2024	07/03/2024	07/03/2024	07/03/2024	07/03/2024
Date analysed	-	14/03/2024	14/03/2024	14/03/2024	14/03/2024	14/03/2024
pH 1:5 soil:water	pH Units	7.3	8.6	4.9	4.9	5.3
Electrical Conductivity 1:5 soil:water	µS/cm	41	120	40	62	37
Chloride, Cl 1:5 soil:water	mg/kg	<10	<10	22	10	<10
Sulphate, SO4 1:5 soil:water	mg/kg	<10	28	10	26	10
Resistivity in soil*	ohm m	[NA]	83	250	[NA]	270

Misc Inorg - Soil						
Our Reference		345910-6	345910-7	345910-8	345910-9	345910-10
Your Reference	UNITS	TP 2	TP 2	TP 2	TP 3	TP 3
Depth		0.6-0.7	1.3-1.4	2.3-2.4	0.2-0.3	0.7-0.4
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	07/03/2024	07/03/2024	07/03/2024	07/03/2024	07/03/2024
Date analysed	-	14/03/2024	14/03/2024	14/03/2024	14/03/2024	14/03/2024
pH 1:5 soil:water	pH Units	5.0	4.9	5.0	4.6	4.7
Electrical Conductivity 1:5 soil:water	µS/cm	140	140	130	62	110
Chloride, Cl 1:5 soil:water	mg/kg	49	130	120	10	79
Sulphate, SO4 1:5 soil:water	mg/kg	130	34	23	24	32
Resistivity in soil*	ohm m	74	73	78	[NA]	89

Misc Inorg - Soil						
Our Reference		345910-11	345910-12	345910-13	345910-14	345910-15
Your Reference	UNITS	TP 3	TP 4	TP 4	TP 4	TP 5
Depth		1.2-1.3	0-0.1	0.4-0.6	1.2-1.3	0-0.1
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	07/03/2024	07/03/2024	07/03/2024	07/03/2024	07/03/2024
Date analysed	-	14/03/2024	14/03/2024	14/03/2024	14/03/2024	14/03/2024
pH 1:5 soil:water	pH Units	5.1	5.1	5.2	4.8	4.8
Electrical Conductivity 1:5 soil:water	µS/cm	92	68	75	240	41
Chloride, Cl 1:5 soil:water	mg/kg	66	10	31	260	<10
Sulphate, SO4 1:5 soil:water	mg/kg	55	48	46	89	30
Resistivity in soil*	ohm m	110	[NA]	130	41	[NA]

Misc Inorg - Soil						
Our Reference		345910-16	345910-17	345910-18	345910-19	345910-20
Your Reference	UNITS	TP 5	TP 5	TP 6	TP 6	TP 7
Depth		0.4-0.5	1.2-1.3	0-0.1	0.3-0.4	0.1-0.2
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	07/03/2024	07/03/2024	07/03/2024	07/03/2024	07/03/2024
Date analysed	-	14/03/2024	14/03/2024	14/03/2024	14/03/2024	14/03/2024
pH 1:5 soil:water	pH Units	4.6	5.3	4.9	5.0	4.7
Electrical Conductivity 1:5 soil:water	µS/cm	45	59	45	48	51
Chloride, Cl 1:5 soil:water	mg/kg	<10	47	10	10	10
Sulphate, SO4 1:5 soil:water	mg/kg	27	28	28	30	28
Resistivity in soil*	ohm m	220	170	[NA]	210	[NA]

Misc Inorg - Soil						
Our Reference		345910-21	345910-22	345910-24	345910-25	345910-26
Your Reference	UNITS	TP 7	TP 7	TP 8	TP 8	TP 8
Depth		0.6-0.7	1.1-1.2	0.3-0.4	0.8-0.9	1.4-1.5
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	07/03/2024	07/03/2024	07/03/2024	07/03/2024	07/03/2024
Date analysed	-	14/03/2024	14/03/2024	14/03/2024	14/03/2024	14/03/2024
pH 1:5 soil:water	pH Units	5.0	4.9	6.0	5.5	5.7
Electrical Conductivity 1:5 soil:water	µS/cm	63	220	87	86	46
Chloride, Cl 1:5 soil:water	mg/kg	<10	220	37	20	<10
Sulphate, SO4 1:5 soil:water	mg/kg	20	69	24	52	20
Resistivity in soil*	ohm m	160	45	[NA]	120	220

Misc Inorg - Soil						
Our Reference		345910-27	345910-28	345910-29	345910-30	345910-31
Your Reference	UNITS	TP 9	TP 9	TP 10	TP 10	TP 11
Depth		0-0.1	0.3-0.5	0.3-0.4	1.2-1.3	0.1-0.2
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	07/03/2024	07/03/2024	07/03/2024	07/03/2024	07/03/2024
Date analysed	-	14/03/2024	14/03/2024	14/03/2024	14/03/2024	14/03/2024
pH 1:5 soil:water	pH Units	5.4	5.1	5.0	5.3	4.8
Electrical Conductivity 1:5 soil:water	µS/cm	76	140	54	92	110
Chloride, Cl 1:5 soil:water	mg/kg	20	78	<10	46	79
Sulphate, SO4 1:5 soil:water	mg/kg	41	84	24	44	29
Resistivity in soil*	ohm m	[NA]	72	[NA]	110	[NA]

Misc Inorg - Soil						
Our Reference		345910-32	345910-33	345910-34	345910-35	345910-36
Your Reference	UNITS	TP 11	TP 11	TP 12	TP 12	TP 12
Depth		0.6-0.7	1.2-1.3	0-0.1	0.2-0.3	1-1.1
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	07/03/2024	07/03/2024	07/03/2024	07/03/2024	07/03/2024
Date analysed	-	14/03/2024	14/03/2024	14/03/2024	14/03/2024	14/03/2024
pH 1:5 soil:water	pH Units	4.7	5.1	5.2	5.2	5.6
Electrical Conductivity 1:5 soil:water	µS/cm	240	270	56	35	58
Chloride, Cl 1:5 soil:water	mg/kg	300	310	<10	<10	29
Sulphate, SO4 1:5 soil:water	mg/kg	20	53	20	33	23
Resistivity in soil*	ohm m	41	38	[NA]	280	170

Misc Inorg - Soil						
Our Reference		345910-37	345910-38	345910-39	345910-40	345910-41
Your Reference	UNITS	TP 13	TP 13	TP 14	TP 15	TP 15
Depth		0.4-0.5	2.1-2.2	0-0.1	0-0.1	0.3-0.4
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	07/03/2024	07/03/2024	07/03/2024	07/03/2024	07/03/2024
Date analysed	-	14/03/2024	14/03/2024	14/03/2024	14/03/2024	14/03/2024
pH 1:5 soil:water	pH Units	5.2	5.1	5.1	5.9	5.0
Electrical Conductivity 1:5 soil:water	µS/cm	42	58	62	83	49
Chloride, Cl 1:5 soil:water	mg/kg	<10	<10	25	10	<10
Sulphate, SO4 1:5 soil:water	mg/kg	21	28	37	22	31
Resistivity in soil*	ohm m	[NA]	170	[NA]	[NA]	200

Misc Inorg - Soil						
Our Reference		345910-42	345910-43	345910-44	345910-45	345910-46
Your Reference	UNITS	TP 15	TP 16	TP 16	TP 16	TP 16
Depth		1.3-1.4	0-0.1	0.3-0.4	1.3-1.4	2.3-2.4
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	07/03/2024	07/03/2024	07/03/2024	07/03/2024	07/03/2024
Date analysed	-	14/03/2024	14/03/2024	14/03/2024	14/03/2024	14/03/2024
pH 1:5 soil:water	pH Units	5.1	7.4	8.2	7.3	5.3
Electrical Conductivity 1:5 soil:water	µS/cm	78	160	410	390	80
Chloride, Cl 1:5 soil:water	mg/kg	37	<10	21	57	56
Sulphate, SO4 1:5 soil:water	mg/kg	65	41	640	320	25
Resistivity in soil*	ohm m	130	[NA]	25	25	130

Misc Inorg - Soil						
Our Reference		345910-47	345910-49	345910-50	345910-51	345910-52
Your Reference	UNITS	TP 17	TP 17	TP 17	TP 18	TP 18
Depth		0.5-0.6	1.6-1.7	2.3-2.4	0.5-0.6	1.5-1.6
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	07/03/2024	07/03/2024	07/03/2024	07/03/2024	07/03/2024
Date analysed	-	14/03/2024	14/03/2024	14/03/2024	14/03/2024	14/03/2024
pH 1:5 soil:water	pH Units	8.1	7.8	5.3	5.0	5.2
Electrical Conductivity 1:5 soil:water	µS/cm	1,300	510	110	67	65
Chloride, Cl 1:5 soil:water	mg/kg	37	68	84	21	26
Sulphate, SO4 1:5 soil:water	mg/kg	3,200	820	44	30	29
Resistivity in soil*	ohm m	[NA]	20	88	[NA]	150

Misc Inorg - Soil						
Our Reference		345910-53	345910-54	345910-55	345910-56	345910-57
Your Reference	UNITS	TP 18	TP 19	TP 19	TP 20	TP 20
Depth		2.2-2.3	0.3-0.4	0.8-0.9	0.3-0.4	1.3-1.4
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	07/03/2024	07/03/2024	07/03/2024	07/03/2024	07/03/2024
Date analysed	-	14/03/2024	14/03/2024	14/03/2024	14/03/2024	14/03/2024
pH 1:5 soil:water	pH Units	5.5	5.1	5.3	4.8	5.1
Electrical Conductivity 1:5 soil:water	µS/cm	60	56	140	51	72
Chloride, Cl 1:5 soil:water	mg/kg	31	<10	66	<10	36
Sulphate, SO4 1:5 soil:water	mg/kg	20	21	37	22	10
Resistivity in soil*	ohm m	170	[NA]	73	[NA]	140

Misc Inorg - Soil					
Our Reference		345910-58	345910-59	345910-60	345910-61
Your Reference	UNITS	TP 20	TP 21	TP 21	TP 21
Depth		1.9-2	0-0.1	1-1.1	2.1-2.2
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	07/03/2024	07/03/2024	07/03/2024	07/03/2024
Date analysed	-	14/03/2024	14/03/2024	14/03/2024	14/03/2024
pH 1:5 soil:water	pH Units	5.2	4.9	5.0	5.3
Electrical Conductivity 1:5 soil:water	µS/cm	42	110	96	63
Chloride, Cl 1:5 soil:water	mg/kg	10	10	10	<10
Sulphate, SO4 1:5 soil:water	mg/kg	20	45	43	30
Resistivity in soil*	ohm m	240	[NA]	100	[NA]

ESP/CEC						
Our Reference		345910-2	345910-7	345910-11	345910-16	345910-22
Your Reference	UNITS	TP 1	TP 2	TP 3	TP 5	TP 7
Depth		0.4-0.5	1.3-1.4	1.2-1.3	0.4-0.5	1.1-1.2
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	15/03/2024	15/03/2024	15/03/2024	15/03/2024	15/03/2024
Date analysed	-	15/03/2024	15/03/2024	15/03/2024	15/03/2024	15/03/2024
Exchangeable Ca	meq/100g	24	0.9	0.2	0.7	0.2
Exchangeable K	meq/100g	0.3	0.1	0.2	0.3	0.1
Exchangeable Mg	meq/100g	0.8	3.6	3.9	3.9	2.5
Exchangeable Na	meq/100g	<0.1	0.6	1.1	<0.1	1.3
Cation Exchange Capacity	meq/100g	25	5.2	5.4	5.0	4.1
ESP	%	<1	11	20	[NT]	31

ESP/CEC						
Our Reference		345910-26	345910-32	345910-38	345910-42	345910-49
Your Reference	UNITS	TP 8	TP 11	TP 13	TP 15	TP 17
Depth		1.4-1.5	0.6-0.7	2.1-2.2	1.3-1.4	1.6-1.7
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	15/03/2024	15/03/2024	15/03/2024	15/03/2024	15/03/2024
Date analysed	-	15/03/2024	15/03/2024	15/03/2024	15/03/2024	15/03/2024
Exchangeable Ca	meq/100g	1.1	0.2	1.3	0.2	17
Exchangeable K	meq/100g	0.3	<0.1	<0.1	0.1	0.3
Exchangeable Mg	meq/100g	2.9	1.4	2.9	2.8	3.7
Exchangeable Na	meq/100g	0.7	0.5	0.2	1.1	0.3
Cation Exchange Capacity	meq/100g	5.0	2.1	4.5	4.2	21
ESP	%	13	23	5	27	2

ESP/CEC			
Our Reference		345910-53	345910-57
Your Reference	UNITS	TP 18	TP 20
Depth		2.2-2.3	1.3-1.4
Date Sampled		04/03/2024	04/03/2024
Type of sample		Soil	Soil
Date prepared	-	15/03/2024	15/03/2024
Date analysed	-	15/03/2024	15/03/2024
Exchangeable Ca	meq/100g	0.4	0.6
Exchangeable K	meq/100g	0.1	<0.1
Exchangeable Mg	meq/100g	2.0	3.2
Exchangeable Na	meq/100g	0.7	0.3
Cation Exchange Capacity	meq/100g	3.3	4.2
ESP	%	22	7

Moisture						
Our Reference		345910-1	345910-2	345910-4	345910-5	345910-12
Your Reference	UNITS	TP 1	TP 1	TP 2	TP 2	TP 4
Depth		0-0.1	0.4-0.5	0-0.1	0.3-0.4	0-0.1
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	11/03/2024	11/03/2024	11/03/2024	11/03/2024	11/03/2024
Date analysed	-	12/03/2024	12/03/2024	12/03/2024	12/03/2024	12/03/2024
Moisture	%	10	9.0	20	11	17

Moisture						
Our Reference		345910-13	345910-15	345910-16	345910-18	345910-20
Your Reference	UNITS	TP 4	TP 5	TP 5	TP 6	TP 7
Depth		0.4-0.6	0-0.1	0.4-0.5	0-0.1	0.1-0.2
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	11/03/2024	11/03/2024	11/03/2024	11/03/2024	11/03/2024
Date analysed	-	12/03/2024	12/03/2024	12/03/2024	12/03/2024	12/03/2024
Moisture	%	20	19	14	16	15

Moisture						
Our Reference		345910-21	345910-24	345910-27	345910-29	345910-31
Your Reference	UNITS	TP 7	TP 8	TP 9	TP 10	TP 11
Depth		0.6-0.7	0.3-0.4	0-0.1	0.3-0.4	0.1-0.2
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	11/03/2024	11/03/2024	11/03/2024	11/03/2024	11/03/2024
Date analysed	-	12/03/2024	12/03/2024	12/03/2024	12/03/2024	12/03/2024
Moisture	%	19	11	14	18	18

Moisture						
Our Reference		345910-34	345910-40	345910-43	345910-44	345910-45
Your Reference	UNITS	TP 12	TP 15	TP 16	TP 16	TP 16
Depth		0-0.1	0-0.1	0-0.1	0.3-0.4	1.3-1.4
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	11/03/2024	11/03/2024	11/03/2024	11/03/2024	11/03/2024
Date analysed	-	12/03/2024	12/03/2024	12/03/2024	12/03/2024	12/03/2024
Moisture	%	19	22	12	8.7	21

Moisture						
Our Reference		345910-47	345910-49	345910-51	345910-56	345910-59
Your Reference	UNITS	TP 17	TP 17	TP 18	TP 20	TP 21
Depth		0.5-0.6	1.6-1.7	0.5-0.6	0.3-0.4	0-0.1
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	11/03/2024	11/03/2024	11/03/2024	11/03/2024	11/03/2024
Date analysed	-	12/03/2024	12/03/2024	12/03/2024	12/03/2024	12/03/2024
Moisture	%	13	16	16	13	18

Moisture				
Our Reference		345910-60	345910-62	345910-63
Your Reference	UNITS	TP 21	TP DUP A	TP DUP B
Depth		1-1.1	-	-
Date Sampled		04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil
Date prepared	-	11/03/2024	11/03/2024	11/03/2024
Date analysed	-	12/03/2024	12/03/2024	12/03/2024
Moisture	%	15	17	14

Asbestos ID - soils						
Our Reference		345910-1	345910-5	345910-12	345910-16	345910-21
Your Reference	UNITS	TP 1	TP 2	TP 4	TP 5	TP 7
Depth		0-0.1	0.3-0.4	0-0.1	0.4-0.5	0.6-0.7
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	13/03/2024	13/03/2024	13/03/2024	13/03/2024	13/03/2024
Sample mass tested	g	Approx. 15g	Approx. 15g	Approx. 15g	Approx. 20g	Approx. 15g
Sample Description	-	Brown clayey soil & rocks	Brown clayey soil & rocks	Brown clayey soil & rocks	Brown clayey soil & rocks	Brown clayey soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	NO	NO	NO	NO	NO
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils						
Our Reference		345910-24	345910-27	345910-31	345910-34	345910-40
Your Reference	UNITS	TP 8	TP 9	TP 11	TP 12	TP 15
Depth		0.3-0.4	0-0.1	0.1-0.2	0-0.1	0-0.1
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	13/03/2024	13/03/2024	13/03/2024	13/03/2024	13/03/2024
Sample mass tested	g	Approx. 20g	Approx. 15g	Approx. 20g	Approx. 20g	Approx. 20g
Sample Description	-	Brown clayey soil & rocks	Brown clayey soil & rocks	Brown clayey soil & rocks	Brown clayey soil & rocks	Brown clayey soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	NO	NO	NO	NO	NO
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils						
Our Reference		345910-44	345910-47	345910-49	345910-51	345910-56
Your Reference	UNITS	TP 16	TP 17	TP 17	TP 18	TP 20
Depth		0.3-0.4	0.5-0.6	1.6-1.7	0.5-0.6	0.3-0.4
Date Sampled		04/03/2024	04/03/2024	04/03/2024	04/03/2024	04/03/2024
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	13/03/2024	13/03/2024	13/03/2024	13/03/2024	13/03/2024
Sample mass tested	g	Approx. 25g	Approx. 25g	Approx. 20g	Approx. 20g	Approx. 25g
Sample Description	-	Brown clayey soil & rocks	Brown clayey soil & rocks	Brown clayey soil & rocks	Brown clayey soil & rocks	Brown clayey soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	NO	NO	NO	NO	NO
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils		
Our Reference		345910-60
Your Reference	UNITS	TP 21
Depth		1-1.1
Date Sampled		04/03/2024
Type of sample		Soil
Date analysed	-	13/03/2024
Sample mass tested	g	Approx. 25g
Sample Description	-	Brown clayey soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Asbestos comments	-	NO
Trace Analysis	-	No asbestos detected

Asbestos ID - materials			
Our Reference	UNITS	345910-23	345910-48
Your Reference		TP 8 (frag)	TP 17 (frag)
Depth		0.3-0.4	0.5-0.6
Date Sampled		04/03/2024	04/03/2024
Type of sample		Material	Material
Date analysed	-	12/03/2024	12/03/2024
Mass / Dimension of Sample	-	85x75x5mm	55x50x5mm
Sample Description	-	Brown fibrous sheet	Orange fibre cement material
Asbestos ID in materials	-	Chrysotile asbestos detected Amosite asbestos detected	Chrysotile asbestos detected
Trace Analysis	-	[NT]	[NT]

Metals in Waters - Acid extractable		
Our Reference		345910-65
Your Reference	UNITS	Rinsate 04/03/2024
Depth		-
Date Sampled		04/03/2024
Type of sample		Water
Date prepared	-	12/03/2024
Date analysed	-	13/03/2024
Arsenic - Total	mg/L	<0.05
Cadmium - Total	mg/L	<0.01
Chromium - Total	mg/L	<0.01
Copper - Total	mg/L	<0.01
Lead - Total	mg/L	<0.03
Mercury - Total	mg/L	<0.0005
Nickel - Total	mg/L	<0.02
Zinc - Total	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.
Inorg-001	pH - Measured using pH meter and electrode. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25oC in accordance with APHA 22nd ED 2510 and Rayment & Lyons. Resistivity is calculated from Conductivity (non NATA). Resistivity (calculated) may not correlate with results otherwise obtained using Resistivity-Current method, depending on the nature of the soil being analysed.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES.
Metals-020	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-OES analytical finish.
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-021/022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD and/or GC-MS/GC-MSMS. 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-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.

Method ID	Methodology Summary
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 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	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)-BTEX 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)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-17	345910-24
Date extracted	-			11/03/2024	12	11/03/2024	11/03/2024		11/03/2024	11/03/2024
Date analysed	-			14/03/2024	12	14/03/2024	14/03/2024		14/03/2024	14/03/2024
TRH C_6 - C_9	mg/kg	25	Org-023	<25	12	<25	<25	0	104	99
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	12	<25	<25	0	104	99
Benzene	mg/kg	0.2	Org-023	<0.2	12	<0.2	<0.2	0	101	96
Toluene	mg/kg	0.5	Org-023	<0.5	12	<0.5	<0.5	0	103	97
Ethylbenzene	mg/kg	1	Org-023	<1	12	<1	<1	0	98	93
m+p-xylene	mg/kg	2	Org-023	<2	12	<2	<2	0	110	104
o-Xylene	mg/kg	1	Org-023	<1	12	<1	<1	0	111	104
Naphthalene	mg/kg	1	Org-023	<1	12	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	98	12	74	80	8	101	88

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]	47	11/03/2024	11/03/2024		[NT]	[NT]
Date analysed	-			[NT]	47	14/03/2024	14/03/2024		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	47	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	47	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	47	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	47	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	47	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	47	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	47	<1	<1	0	[NT]	[NT]
Naphthalene	mg/kg	1	Org-023	[NT]	47	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	47	82	71	14	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-17	345910-24
Date extracted	-			11/03/2024	12	11/03/2024	11/03/2024		11/03/2024	11/03/2024
Date analysed	-			12/03/2024	12	12/03/2024	12/03/2024		12/03/2024	13/03/2024
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	12	<50	<50	0	115	122
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	12	<100	<100	0	108	120
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	12	<100	<100	0	114	86
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	12	<50	<50	0	115	122
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	12	<100	<100	0	108	120
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	12	<100	<100	0	114	86
Surrogate o-Terphenyl	%		Org-020	84	12	80	84	5	88	82

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	47	11/03/2024	11/03/2024		[NT]	[NT]
Date analysed	-			[NT]	47	13/03/2024	13/03/2024		[NT]	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	[NT]	47	<50	<50	0	[NT]	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	[NT]	47	<100	<100	0	[NT]	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	[NT]	47	<100	<100	0	[NT]	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	[NT]	47	<50	<50	0	[NT]	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	[NT]	47	140	150	7	[NT]	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	[NT]	47	<100	<100	0	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-020	[NT]	47	82	83	1	[NT]	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-17	345910-24
Date extracted	-			11/03/2024	12	11/03/2024	11/03/2024		11/03/2024	11/03/2024
Date analysed	-			13/03/2024	12	13/03/2024	13/03/2024		13/03/2024	13/03/2024
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	94	86
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	88	88
Fluorene	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	86	84
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	102	84
Anthracene	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	96	82
Pyrene	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	100	78
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	80	84
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	12	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	12	<0.05	<0.05	0	106	92
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	105	12	98	97	1	99	87

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	47	11/03/2024	11/03/2024		[NT]	[NT]
Date analysed	-			[NT]	47	14/03/2024	14/03/2024		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	47	0.3	0.3	0	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	47	0.7	0.7	0	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-022/025	[NT]	47	0.8	0.8	0	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	47	0.4	0.4	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	47	0.3	0.4	29	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	47	0.7	0.7	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	47	0.4	0.4	0	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	47	0.2	0.2	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	47	0.3	0.3	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	47	122	122	0	[NT]	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-17	345910-24
Date extracted	-			11/03/2024	12	11/03/2024	11/03/2024		11/03/2024	11/03/2024
Date analysed	-			13/03/2024	12	13/03/2024	13/03/2024		13/03/2024	13/03/2024
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	130	112
HCB	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	128	108
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	126	104
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	132	116
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	128	124
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	120	120
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	130	126
Endrin	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	112	108
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	110	106
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	110	102
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	<0.1	12	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	82	12	88	89	1	87	83

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	47	11/03/2024	11/03/2024		[NT]	[NT]
Date analysed	-			[NT]	47	13/03/2024	13/03/2024		[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
HCB	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Endrin	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Mirex	mg/kg	0.1	Org-022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Surrogate 4-Chloro-3-NBTF	%		Org-022/025	[NT]	47	90	88	2	[NT]	[NT]

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-17	345910-24
Date extracted	-			11/03/2024	12	11/03/2024	11/03/2024		11/03/2024	11/03/2024
Date analysed	-			13/03/2024	12	13/03/2024	13/03/2024		13/03/2024	13/03/2024
Aroclor 1016	mg/kg	0.1	Org-021/022/025	<0.1	12	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021/022/025	<0.1	12	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021/022/025	<0.1	12	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021/022/025	<0.1	12	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021/022/025	<0.1	12	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021/022/025	<0.1	12	<0.1	<0.1	0	89	80
Aroclor 1260	mg/kg	0.1	Org-021/022/025	<0.1	12	<0.1	<0.1	0	[NT]	[NT]
Surrogate 2-Fluorobiphenyl	%		Org-021/022/025	97	12	95	95	0	95	90

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	47	11/03/2024	11/03/2024		[NT]	[NT]
Date analysed	-			[NT]	47	13/03/2024	13/03/2024		[NT]	[NT]
Aroclor 1016	mg/kg	0.1	Org-021/022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021/022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021/022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021/022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021/022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021/022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1260	mg/kg	0.1	Org-021/022/025	[NT]	47	<0.1	<0.1	0	[NT]	[NT]
Surrogate 2-Fluorobiphenyl	%		Org-021/022/025	[NT]	47	91	93	2	[NT]	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-17	345910-24
Date prepared	-			12/03/2024	12	12/03/2024	12/03/2024		12/03/2024	12/03/2024
Date analysed	-			12/03/2024	12	12/03/2024	12/03/2024		12/03/2024	12/03/2024
Arsenic	mg/kg	4	Metals-020	<4	12	16	16	0	101	87
Cadmium	mg/kg	0.4	Metals-020	<0.4	12	<0.4	<0.4	0	107	89
Chromium	mg/kg	1	Metals-020	<1	12	45	34	28	102	111
Copper	mg/kg	1	Metals-020	<1	12	4	4	0	103	100
Lead	mg/kg	1	Metals-020	<1	12	16	17	6	110	96
Mercury	mg/kg	0.1	Metals-021	<0.1	12	<0.1	<0.1	0	108	93
Nickel	mg/kg	1	Metals-020	<1	12	4	5	22	102	88
Zinc	mg/kg	1	Metals-020	<1	12	10	12	18	108	114

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-18	345910-63
Date prepared	-			[NT]	47	12/03/2024	12/03/2024		12/03/2024	12/03/2024
Date analysed	-			[NT]	47	12/03/2024	12/03/2024		12/03/2024	12/03/2024
Arsenic	mg/kg	4	Metals-020	[NT]	47	4	5	22	105	91
Cadmium	mg/kg	0.4	Metals-020	[NT]	47	<0.4	<0.4	0	110	97
Chromium	mg/kg	1	Metals-020	[NT]	47	13	14	7	107	96
Copper	mg/kg	1	Metals-020	[NT]	47	39	27	36	106	100
Lead	mg/kg	1	Metals-020	[NT]	47	60	78	26	116	98
Mercury	mg/kg	0.1	Metals-021	[NT]	47	0.1	0.1	0	109	93
Nickel	mg/kg	1	Metals-020	[NT]	47	8	8	0	105	93
Zinc	mg/kg	1	Metals-020	[NT]	47	97	110	13	111	93

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	62	12/03/2024	12/03/2024		[NT]	[NT]
Date analysed	-			[NT]	62	12/03/2024	12/03/2024		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	62	20	17	16	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	62	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	62	30	45	40	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	62	5	4	22	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	62	14	17	19	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	62	<0.1	<0.1	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	62	5	5	0	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	62	12	13	8	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	345910-3
Date prepared	-			07/03/2024	1	07/03/2024	07/03/2024		07/03/2024	07/03/2024
Date analysed	-			14/03/2024	1	14/03/2024	14/03/2024		14/03/2024	14/03/2024
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	1	7.3	7.2	1	101	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	1	41	50	20	104	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	1	<10	<10	0	101	90
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	1	<10	<10	0	102	119
Resistivity in soil*	ohm m	1	Inorg-002	<1	21	160	160	0	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-17	345910-24
Date prepared	-			[NT]	12	07/03/2024	07/03/2024		07/03/2024	07/03/2024
Date analysed	-			[NT]	12	14/03/2024	14/03/2024		14/03/2024	14/03/2024
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	12	5.1	5.1	0	100	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	12	68	64	6	104	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	12	10	10	0	98	70
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	12	48	39	21	100	77
Resistivity in soil*	ohm m	1	Inorg-002	[NT]	41	200	210	5	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-18	345910-43
Date prepared	-			[NT]	21	07/03/2024	07/03/2024		07/03/2024	07/03/2024
Date analysed	-			[NT]	21	14/03/2024	14/03/2024		14/03/2024	14/03/2024
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	21	5.0	5.0	0	100	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	21	63	61	3	104	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	21	<10	<10	0	99	100
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	21	20	20	0	100	90
Resistivity in soil*	ohm m	1	Inorg-002	[NT]	52	150	130	14	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	31	07/03/2024	07/03/2024		[NT]	[NT]
Date analysed	-			[NT]	31	14/03/2024	14/03/2024		[NT]	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	31	4.8	4.8	0	[NT]	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	31	110	130	17	[NT]	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	31	79	100	23	[NT]	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	31	29	34	16	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	41	07/03/2024	07/03/2024		[NT]	[NT]
Date analysed	-			[NT]	41	14/03/2024	14/03/2024		[NT]	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	41	5.0	5.0	0	[NT]	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	41	49	47	4	[NT]	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	41	<10	<10	0	[NT]	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	41	31	28	10	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	52	07/03/2024	07/03/2024		[NT]	[NT]
Date analysed	-			[NT]	52	14/03/2024	14/03/2024		[NT]	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	52	5.2	5.2	0	[NT]	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	52	65	75	14	[NT]	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	52	26	27	4	[NT]	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	52	29	29	0	[NT]	[NT]

QUALITY CONTROL: ESP/CEC						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	345910-26
Date prepared	-			15/03/2024	22	15/03/2024	15/03/2024		15/03/2024	15/03/2024
Date analysed	-			15/03/2024	22	15/03/2024	15/03/2024		15/03/2024	15/03/2024
Exchangeable Ca	meq/100g	0.1	Metals-020	<0.1	22	0.2	0.3	40	103	100
Exchangeable K	meq/100g	0.1	Metals-020	<0.1	22	0.1	0.2	67	106	98
Exchangeable Mg	meq/100g	0.1	Metals-020	<0.1	22	2.5	3.7	39	93	88
Exchangeable Na	meq/100g	0.1	Metals-020	<0.1	22	1.3	1.6	21	115	107
ESP	%	1	Metals-020	[NT]	22	31	28	10	[NT]	[NT]

QUALITY CONTROL: Metals in Waters - Acid extractable					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			12/03/2024	[NT]	[NT]	[NT]	[NT]	12/03/2024	[NT]
Date analysed	-			13/03/2024	[NT]	[NT]	[NT]	[NT]	13/03/2024	[NT]
Arsenic - Total	mg/L	0.05	Metals-020	<0.05	[NT]	[NT]	[NT]	[NT]	99	[NT]
Cadmium - Total	mg/L	0.01	Metals-020	<0.01	[NT]	[NT]	[NT]	[NT]	103	[NT]
Chromium - Total	mg/L	0.01	Metals-020	<0.01	[NT]	[NT]	[NT]	[NT]	96	[NT]
Copper - Total	mg/L	0.01	Metals-020	<0.01	[NT]	[NT]	[NT]	[NT]	99	[NT]
Lead - Total	mg/L	0.03	Metals-020	<0.03	[NT]	[NT]	[NT]	[NT]	95	[NT]
Mercury - Total	mg/L	0.0005	Metals-021	<0.0005	[NT]	[NT]	[NT]	[NT]	102	[NT]
Nickel - Total	mg/L	0.02	Metals-020	<0.02	[NT]	[NT]	[NT]	[NT]	103	[NT]
Zinc - Total	mg/L	0.02	Metals-020	<0.02	[NT]	[NT]	[NT]	[NT]	96	[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.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

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

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

Report Comments

Asbestos: A portion of the supplied sample was sub-sampled for asbestos according to ASB-001 asbestos subsampling procedure. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab/MPL recommends supplying 40-60g or 500ml of sample in its own container.
Note: Samples requested for asbestos testing were sub-sampled from jars provided by the client.

Acid Extractable Metals in Soil: The laboratory RPD acceptance criteria has been exceeded for 345910-62 for Cr. Therefore a triplicate result has been issued as laboratory sample number 345910-66.

ESP: Where the exchangeable Sodium is less than the PQL and CEC is less than 10meq/100g, the ESP cannot be calculated.

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SAMPLE RECEIPT ADVICE

Client Details

Client	Geoenviro Consultancy Pty Ltd
Attention	Steven Goss

Sample Login Details

Your reference	JC24471A, Proposed Rural Residential Subdivision
Envirolab Reference	345910
Date Sample Received	07/03/2024
Date Instructions Received	07/03/2024
Date Results Expected to be Reported	15/03/2024

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	62 Soil, 2 Material, 1 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	24
Cooling Method	None
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:

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Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	PCBs in Soil	Acid Extractable metalsin soil	Misc Inorg - Soil	ESP/CEC	Asbestos ID - soils	Asbestos ID - materials	Metals in Waters -Acid extractable
TP 1-0-0.1	✓	✓	✓			✓	✓		✓		
TP 1-0.4-0.5						✓	✓	✓			
TP 1-1-1.2							✓				
TP 2-0-0.1						✓	✓				
TP 2-0.3-0.4	✓	✓	✓			✓	✓		✓		
TP 2-0.6-0.7							✓				
TP 2-1.3-1.4							✓	✓			
TP 2-2.3-2.4							✓				
TP 3-0.2-0.3							✓				
TP 3-0.7-0.4							✓				
TP 3-1.2-1.3							✓	✓			
TP 4-0-0.1	✓	✓	✓	✓	✓	✓	✓		✓		
TP 4-0.4-0.6						✓	✓				
TP 4-1.2-1.3							✓				
TP 5-0-0.1						✓	✓				
TP 5-0.4-0.5	✓	✓	✓			✓	✓	✓	✓		
TP 5-1.2-1.3							✓				
TP 6-0-0.1						✓	✓				
TP 6-0.3-0.4							✓				
TP 7-0.1-0.2						✓	✓				
TP 7-0.6-0.7	✓	✓	✓			✓	✓		✓		
TP 7-1.1-1.2							✓	✓			
TP 8 (frag)-0.3-0.4										✓	
TP 8-0.3-0.4	✓	✓	✓	✓	✓	✓	✓		✓		
TP 8-0.8-0.9							✓				
TP 8-1.4-1.5							✓	✓			
TP 9-0-0.1	✓	✓	✓			✓	✓		✓		
TP 9-0.3-0.5							✓				
TP 10-0.3-0.4						✓	✓				
TP 10-1.2-1.3							✓				
TP 11-0.1-0.2	✓	✓	✓			✓	✓		✓		
TP 11-0.6-0.7							✓	✓			

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Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	PCBs in Soil	Acid Extractable metalsin soil	Misc Inorg - Soil	ESP/CEC	Asbestos ID - soils	Asbestos ID - materials	Metals in Waters -Acid extractable
TP 11-1.2-1.3							✓				
TP 12-0-0.1	✓	✓	✓	✓	✓	✓	✓		✓		
TP 12-0.2-0.3							✓				
TP 12-1-1.1							✓				
TP 13-0.4-0.5							✓				
TP 13-2.1-2.2							✓	✓			
TP 14-0-0.1							✓				
TP 15-0-0.1	✓	✓	✓			✓	✓		✓		
TP 15-0.3-0.4							✓				
TP 15-1.3-1.4							✓	✓			
TP 16-0-0.1						✓	✓				
TP 16-0.3-0.4	✓	✓	✓			✓	✓		✓		
TP 16-1.3-1.4						✓	✓				
TP 16-2.3-2.4							✓				
TP 17-0.5-0.6	✓	✓	✓	✓	✓	✓	✓		✓		
TP 17 (frag)-0.5-0.6										✓	
TP 17-1.6-1.7	✓	✓	✓			✓	✓	✓	✓		
TP 17-2.3-2.4							✓				
TP 18-0.5-0.6	✓	✓	✓			✓	✓		✓		
TP 18-1.5-1.6							✓				
TP 18-2.2-2.3							✓	✓			
TP 19-0.3-0.4							✓				
TP 19-0.8-0.9							✓				
TP 20-0.3-0.4	✓	✓	✓			✓	✓		✓		
TP 20-1.3-1.4							✓	✓			
TP 20-1.9-2							✓				
TP 21-0-0.1						✓	✓				
TP 21-1-1.1	✓	✓	✓	✓	✓	✓	✓		✓		
TP 21-2.1-2.2							✓				
TP DUP A	✓	✓	✓	✓	✓	✓					
TP DUP B	✓	✓	✓	✓	✓	✓					
Trip Blank 04/03/2024	✓										

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Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	PCBs in Soil	Acid Extractable metalsin soil	Misc Inorg - Soil	ESP/CEC	Asbestos ID - soils	Asbestos ID - materials	Metals in Waters -Acid extractable
Rinsate 04/03/2024											✓

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.

GeoEnviro Consultancy Pty Ltd
Unit 5, 39-41 Fourth Avenue, Blacktown NSW 2148, Australia
Tel: (02) 96798733 Fax: (02) 96798744

Laboratory Test Request/Chain of Custody Record

Job Details
Job Number: JC24471A
Client:
Project: Proposed Rural Residential Subdivision Development
Location: No 80 Silverdale Road, The Oaks

Sample Date: 04/03/2024
Sampled By: SG
Project Manager: SL
Store Location:

External Laboratory Details:
Laboratory name: Envirolab Services Pty Ltd
Address: 12 Ashley Street
Chatswood
Contact: Tania Notaris

Sampling Details			Sample Type		Test Required (\) / Test Performed(X)																						
Location	Depth (m)		Soil	Water	Combination 3a	Combination 5a	Combination 5	Metals (As Cd Cr Cu Pb Zn Ni Hg)	OCP	PCB	TRH	BTEX	PAH	ASBESTOS	pH	CEC/ESP	Aggressivity (pH, EC, Cl, SO4)	Resistivity	Turbidity	Dissolved Oxygen	Total Suspended Solids	Total N & Total P - Low Level	Faecal Coliforms	Faecal Enterococci	E.Coli	Hardness	Keep Sample
	From	To																									
TP 1 1	0-0.1		DG		X												X										
TP 1 2	0.4-0.5		DG					X								X	x	X									
TP 1 3	1-1.2		DG														x	X									
TP 2 4	0-0.1		DG					X									X										
TP 2 5	0.3-0.4		DG		X												x	X									
TP 2 6	0.6-0.7		DG														x	X									
TP 2 7	1.3-1.4		DG													X	x	X									
TP 2 8	2.3-2.4		DG														x	X									
TP 3 9	0.2-0.3		DG														X										
TP 3 10	0.7-0.4		DG														x	X									
TP 3 11	1.2-1.3		DG													X	x	X									
TP 4 12	0-0.1		DG			X											X										
TP 4 13	0.4-0.6		DG					X									x	X									
TP 4 14	1.2-1.3		DG														x	X									
TP 5 15	0-0.1		DG					X									X										
TP 5 16	0.4-0.5		DG		X											X	x	X									
TP 5 17	1.2-1.3		DG														x	X									
TP 6 18	0-0.1		DG					X									X										

ENVIROLAB

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

Job No: 345910
Date Received: 7/3/24
Time Received: 16:00
Received By: [illegible]
Temp: Cool/Ambient 24°C
Cooling: Ice/Icepack
Security: Intact/Broken/None

Relinquished by				Received By			
Laboratory	Name	Signature	Date	Laboratory	Name	Signature	Date
GeoEnviro Consultancy	Steven Goss	SMGoss					

Legend

DB Disturbed Sample (Bulk, Plastic bag)
DS Disturbed Sample (Small, Plastic bag)
DG Disturbed Sample (Glass Jar)
STP Standard Penetration Test Sample
U50 Undisturbed Sample, 50mm Tube
U75 Undisturbed Sample, 75mm Tube
WG Water Sample, Amber Glass Jar
WP Water Sample, Plastic Bottle
Y Keep Sample
N Discard Sample

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345910

Laboratory Test Request/Chain of Custody Record

Job Details
Job Number: JC24471A
Client:
Project: Proposed Rural Residential Subdivision Development
Location: No 80 Silverdale Road, The Oaks

Sample Date: 04/03/2024
Sampled By: SG
Project Manager: SL
Store Location:

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Contact: Tania Notaris

Sampling Details			Sample Type		Test Required (\) / Test Performed(X)																						
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	From	To																									
TP 6 19	0.3-0.4		DG														X	X									
TP 7 20	0.1-0.2		DG					X									X										
TP 7 21	0.6-0.7		DG		X												X	X									
TP 7 22	1.1-1.2		DG													X	X	X									
TP 8 (frag) 23	0.3-0.4		DG											X													
TP 8 24	0.3-0.4		DG			X											X										
TP 8 25	0.8-0.9		DG														X	X									
TP 8 26	1.4-1.5		DG													X	X	X									
TP 9 27	0-0.1		DG		X												X										
TP 9 28	0.3-0.5		DG														X	X									
TP 10 29	0.3-0.4		DG					X									X										
TP 10 30	1.2-1.3		DG														X	X									
TP 11 31	0.1-0.2		DG		X												X										
TP 11 32	0.6-0.7		DG													X	X	X									
TP 11 33	1.2-1.3		DG														X	X									
TP 12 34	0-0.1		DG			X											X										
TP 12 35	0.2-0.3		DG														X	X									
TP 12 36	1-1.1		DG														X	X									

Relinquished by				Received By			
Laboratory	Name	Signature	Date	Laboratory	Name	Signature	Date
GeoEnviro Consultancy	Steven Goss	SMGoss					

Legend

DB Disturbed Sample (Bulk, Plastic bag)
DS Disturbed Sample (Small, Plastic bag)
DG Disturbed Sample (Glass Jar)
STP Standard Penetration Test Sample
U50 Undisturbed Sample, 50mm Tube
U75 Undisturbed Sample, 75mm Tube
WG Water Sample, Amber Glass Jar
WP Water Sample, Plastic Bottle
Y Keep Sample
N Discard Sample

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345910

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Chatswood
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	From	To																									
TP 13 37	0.4-0.5		DG														X										
TP 13 38	2.1-2.2		DG													X	X	X									
TP 14 39	0-0.1		DG														X										
TP 15 40	0-0.1		DG		X												X										
TP 15 41	0.3-0.4		DG														X	X									
TP 15 42	1.3-1.4		DG													X	X	X									
TP 16 43	0-0.1		DG					X									X										
TP 16 44	0.3-0.4		DG		X												X	X									
TP 16 45	1.3-1.4		DG					X									X	X									
TP 16 46	2.3-2.4		DG														X	X									
TP 17 47	0.5-0.6		DG			X											X										
TP 17 (frag) 48	0.5-0.6		DG											X													
TP 17 49	1.6-1.7		DG		X											X	X	X									
TP 17 50	2.3-2.4		DG														X	X									
TP 18 51	0.5-0.6		DG		X												X										
TP 18 52	1.5-1.6		DG														X	X									
TP 18 53	2.2-2.3		DG													X	X	X									
TP 19 54	0.3-0.4		DG														X										

Relinquished by				Received By			
Laboratory	Name	Signature	Date	Laboratory	Name	Signature	Date
GeoEnviro Consultancy	Steven Goss	SMGoss					

Legend

DB Disturbed Sample (Bulk, Plastic bag)
DS Disturbed Sample (Small, Plastic bag)
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Laboratory Test Request/Chain of Custody Record

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Sampling Details			Depth (m)		Sample Type		Test Required (\)												Test Performed(X)										
Location					Soil	Water	Combination 3a	Combination 5a	Combination 5	Metals (As Cd Cr Cu Pb Zn Ni Hg)	OCP	PCB	TRH	BTEX	PAH	ASBESTOS	pH	CEC/ESP	Aggressivity (pH, EC, Cl, SO4)	Resistivity	Turbidity	Dissolved Oxygen	Total Suspended Solids	Total N & Total P - Low Level	Faecal Coliforms	Faecal Enterococci	E.Coli	Hardness	Keep Sample
OW			From	To																									
1	TP 19	55	0.8-0.9		DG														X	X									
2	TP 20	56	0.3-0.4		DG		X												X										
3	TP 20	57	1.3-1.4		DG													X	X	X									
4	TP 20	58	1.9-2		DG										-				X	X									
5	TP 21	59	0-0.1		DG					X									X										
6	TP 21	60	1-1.1		DG			X											X	X									
7	TP 21	61	2.1-2.2		DG														X										
8	TP DUP A	62	-		DG				X																				
9	TP DUP B	63	-		DG				X																				
10	Trip Blank 04/03/2024	64	-		DG									X															
11	Rinsate 04/03/2024	65	-		WP					X																			

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

Job No: 345910
Date Received: 7/3/24
Time Received: 1620
Received By: OW
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Relinquished by				Received By			
Laboratory	Name	Signature	Date	Laboratory	Name	Signature	Date
GeoEnviro Consultancy	Steven Goss	SMGoss			O-WILLIAMS	O-W	7/3/24

Legend

DB Disturbed Sample (Bulk, Plastic bag)	U50 Undisturbed Sample, 50mm Tube	Y Keep Sample
DS Disturbed Sample (Small, Plastic bag)	U75 Undisturbed Sample, 75mm Tube	N Discard Sample
DG Disturbed Sample (Glass Jar)	WG Water Sample, Amber Glass Jar	
STP Standard Penetration Test Sample	WP Water Sample, Plastic Bottle	

APPENDIX D

A Brief Explanation of Site Classification
Extracts of AGS 2007 – Guidelines for Landslide Risk Management

A BRIEF EXPLANATION OF SITE CLASSIFICATION

1. Introduction

The intention of the Australian Standard 2870-2011, "Residential Slabs and Footings" is to provide guidance on footing design for residential buildings with a particular emphasis on reactive clay sites. Footing design and construction involves the following steps:

- site classification
- selection of an appropriate footing system
- structural design
- construction in accordance with the required design details and construction methods
- proper site maintenance after construction

The classification assessed in this report is the first step in providing an economical footing system for a residence which will limit cracking of footings, floor slabs and masonry walls to an extent normally considered acceptable. (Performance expectations are explained in AS 2870- 2011). It is necessary that each subsequent step be diligently observed to achieve acceptable performance.

It is imperative when applying the site classifications presented in this report to residential footing design, that these performance expectations are acceptable to the home owner.

2. What is a Reactive Soil?

A reactive soil undergoes appreciable volume change when its moisture content changes. This causes ground surface movements which can result in fooling movements. The extent of ground movement that can occur depends on the clay mineralogy, the depth of clay in the soil profile, the depth of potential moisture variation in the soil and the change in soil suction that occurs from dry to wet soil conditions. AS2870 provides a classification system to quantify the range of ground surface movements anticipated (defined as having less than 5% chance of being exceeded in the design life of the structure).

3. How are Sites Classified in the Sydney Region

Experiment and observation within the Sydney Region indicates a high variability in the potential for reactive movements, which is not clearly related to soil association, terrain location or visual appearance and may not be accurately predicted by simple soil tests. Intense, complex and expensive testing is required at a site to accurately predict its potential for reactive behaviour. To avoid this, a simplified classification procedure for the Sydney region has been devised which is based on the depth of clay in the soil profile. This procedure is detailed in AS2870 – 2011.

4. What is a Class P Site?

Footing design may need to consider other factors beside reactive soils. Such factors include the presence of filling, the presence of compressible or collapsible soils, or the need to consider slope stability aspects. When these or other factors need to be considered the site may be classified P. The footing "solution" for Class P sites requires special engineering consideration. On many sites the "solution may the straight forward and may not necessarily incur major cost increases.

5. Filled Sites

The most common "problem" associated with residential lots is the presence of fill, compacted or otherwise, overlying the natural soils. If the fill is uncompacted, or if there are no records of adequate compaction, a piered footing system is usually adopted which penetrates the fill and found on natural ground.

AS2870 - 2011 indicates that a compacted fill site may be given a less severe classification than P if assessed in accordance with engineering principles. Subdivision developments often include areas of compacted filling which will usually have been required to have been compacted to the relevant Council Specifications. Adequately compacted filling will usually provide sufficient bearing capacity for residential footing loads, but the clay in the fill will also experience reactive soil movements. Depending on the moisture content at which the fill is placed and the compaction which has been achieved, reactive soil movements may exceed those experienced by the natural soil from which the fill has been derived. As a result, classification of compacted fill sites sometimes needs to be conservative.

6. Site Classifications should be Project Specific

Many Councils require that all lots within a new subdivision be classified prior to subdivision approval. This practice precludes a consideration of the impact of site preparation works on the classification. Sites which are not level are often cut and filled to provide a level platform for floor slab construction. AS2870 specifies that the classification shall be reconsidered if:

(a) the depth of cut exceeds 500mm, or
(b) the depth of compacted fill exceeds 400mm for clay (or 800mm for sand).

Where the classification provided in this report is carried out prior to the site development details being known it is a condition of this report that plans for future development of the block be reviewed by a geotechnical engineer to assess the impact of proposed site works and also the impact of work which may have occurred on adjacent sites since the date of this classification. Altering the site classification may be required in some cases.

7. Site Maintenance

The classifications presented in this report have been assessed for moisture variations caused by climatic and "normal" garden conditions. More severe moisture variation can be caused by other common factors, such as removing or planting trees, leaking plumbing, irrigation systems etc. Guidelines to appropriate site maintenance are provided in CSIRO 10-91 "A Guide to Home Owners on Foundation Maintenance and Footing Performance". Most Damage to residences on reactive sites is due to poor site maintenance. Footings designed to AS2870 may not perform satisfactorily if sites are not properly maintained.

PRACTICE NOTE GUIDELINES FOR LANDSLIDE RISK MANAGEMENT 2007

APPENDIX C: LANDSLIDE RISK ASSESSMENT

QUALITATIVE TERMINOLOGY FOR USE IN ASSESSING RISK TO PROPERTY

QUALITATIVE MEASURES OF LIKELIHOOD

Approximate Annual Probability		Implied Indicative Landslide Recurrence Interval		Description	Descriptor	Level
Indicative Value	Notional Boundary					
10^{-1}	$5x10^{-2}$	10 years	20 years	The event is expected to occur over the design life.	ALMOST CERTAIN	A
10^{-2}	$5x10^{-3}$	100 years	200 years	The event will probably occur under adverse conditions over the design life.	LIKELY	B
10^{-3}	$5x10^{-4}$	1000 years	2000 years	The event could occur under adverse conditions over the design life.	POSSIBLE	C
10^{-4}	$5x10^{-5}$	10,000 years	20,000 years	The event might occur under very adverse circumstances over the design life.	UNLIKELY	D
10^{-5}	$5x10^{-6}$	100,000 years	200,000 years	The event is conceivable but only under exceptional circumstances over the design life.	RARE	E
10^{-6}		1,000,000 years		The event is inconceivable or fanciful over the design life.	BARELY CREDIBLE	F

Note: (1) The table should be used from left to right; use Approximate Annual Probability or Description to assign Descriptor, not *vice versa*.

QUALITATIVE MEASURES OF CONSEQUENCES TO PROPERTY

Approximate Cost of Damage		Description	Descriptor	Level
Indicative Value	Notional Boundary			
200%	100%	Structure(s) completely destroyed and/or large scale damage requiring major engineering works for stabilisation. Could cause at least one adjacent property major consequence damage.	CATASTROPHIC	1
60%	40%	Extensive damage to most of structure, and/or extending beyond site boundaries requiring significant stabilisation works. Could cause at least one adjacent property medium consequence damage.	MAJOR	2
20%	10%	Moderate damage to some of structure, and/or significant part of site requiring large stabilisation works. Could cause at least one adjacent property minor consequence damage.	MEDIUM	3
5%	1%	Limited damage to part of structure, and/or part of site requiring some reinstatement stabilisation works.	MINOR	4
0.5%		Little damage. (Note for high probability event (Almost Certain), this category may be subdivided at a notional boundary of 0.1%. See Risk Matrix.)	INSIGNIFICANT	5

Notes: (2) The Approximate Cost of Damage is expressed as a percentage of market value, being the cost of the improved value of the unaffected property which includes the land plus the unaffected structures.

(3) The Approximate Cost is to be an estimate of the direct cost of the damage, such as the cost of reinstatement of the damaged portion of the property (land plus structures), stabilisation works required to render the site to tolerable risk level for the landslide which has occurred and professional design fees, and consequential costs such as legal fees, temporary accommodation. It does not include additional stabilisation works to address other landslides which may affect the property.

(4) The table should be used from left to right; use Approximate Cost of Damage or Description to assign Descriptor, not vice versa

APPENDIX C: – QUALITATIVE TERMINOLOGY FOR USE IN ASSESSING RISK TO PROPERTY (CONTINUED)

QUALITATIVE RISK ANALYSIS MATRIX – LEVEL OF RISK TO PROPERTY

LIKELIHOOD		CONSEQUENCES TO PROPERTY (With Indicative Approximate Cost of Damage)				
	Indicative Value of Approximate Annual Probability	**1: CATASTROPHIC 200%**	**2: MAJOR 60%**	**3: MEDIUM 20%**	**4: MINOR 5%**	**5: INSIGNIFICANT 0.5%**
A – ALMOST CERTAIN	10^{-1}	VH	VH	VH	H	M or **L** (5)
B - LIKELY	10^{-2}	VH	VH	H	M	**L**
C - POSSIBLE	10^{-3}	VH	H	M	M	**VL**
D - UNLIKELY	10^{-4}	H	M	**L**	**L**	**VL**
E - RARE	10^{-5}	M	**L**	**L**	**VL**	**VL**
F - BARELY CREDIBLE	10^{-6}	**L**	**VL**	**VL**	**VL**	**VL**

Notes: (5) For Cell A5, may be subdivided such that a consequence of less than 0.1% is Low Risk.
(6) When considering a risk assessment it must be clearly stated whether it is for existing conditions or with risk control measures which may not be implemented at the current time.

RISK LEVEL IMPLICATIONS

Risk Level		**Example Implications** (7)
VH	VERY HIGH RISK	Unacceptable without treatment. Extensive detailed investigation and research, planning and implementation of treatment options essential to reduce risk to Low; may be too expensive and not practical. Work likely to cost more than value of the property.
H	HIGH RISK	Unacceptable without treatment. Detailed investigation, planning and implementation of treatment options required to reduce risk to Low. Work would cost a substantial sum in relation to the value of the property.
M	MODERATE RISK	May be tolerated in certain circumstances (subject to regulator's approval) but requires investigation, planning and implementation of treatment options to reduce the risk to Low. Treatment options to reduce to Low risk should be implemented as soon as practicable.
L	LOW RISK	Usually acceptable to regulators. Where treatment has been required to reduce the risk to this level, ongoing maintenance is required.
VL	VERY LOW RISK	Acceptable. Manage by normal slope maintenance procedures.

Note: (7) The implications for a particular situation are to be determined by all parties to the risk assessment and may depend on the nature of the property at risk; these are only given as a general guide.

APPENDIX G - SOME GUIDELINES FOR HILLSIDE CONSTRUCTION

	GOOD ENGINEERING PRACTICE	*POOR ENGINEERING PRACTICE*
ADVICE		
GEOTECHNICAL ASSESSMENT	Obtain advice from a qualified, experienced geotechnical practitioner at early stage of planning and before site works.	Prepare detailed plan and start site works before geotechnical advice.
PLANNING		
SITE PLANNING	Having obtained geotechnical advice, plan the development with the risk arising from the identified hazards and consequences in mind.	Plan development without regard for the Risk.
DESIGN AND CONSTRUCTION		
HOUSE DESIGN	Use flexible structures which incorporate properly designed brickwork, timber or steel frames, timber or panel cladding. Consider use of split levels. Use decks for recreational areas where appropriate.	Floor plans which require extensive cutting and filling. Movement intolerant structures.
SITE CLEARING	Retain natural vegetation wherever practicable.	Indiscriminately clear the site.
ACCESS & DRIVEWAYS	Satisfy requirements below for cuts, fills, retaining walls and drainage. Council specifications for grades may need to be modified. Driveways and parking areas may need to be fully supported on piers.	Excavate and fill for site access before geotechnical advice.
EARTHWORKS	Retain natural contours wherever possible.	Indiscriminatory bulk earthworks.
CUTS	Minimise depth. Support with engineered retaining walls or batter to appropriate slope. Provide drainage measures and erosion control.	Large scale cuts and benching. Unsupported cuts. Ignore drainage requirements
FILLS	Minimise height. Strip vegetation and topsoil and key into natural slopes prior to filling. Use clean fill materials and compact to engineering standards. Batter to appropriate slope or support with engineered retaining wall. Provide surface drainage and appropriate subsurface drainage.	Loose or poorly compacted fill, which if it fails, may flow a considerable distance including onto property below. Block natural drainage lines. Fill over existing vegetation and topsoil. Include stumps, trees, vegetation, topsoil, boulders, building rubble etc in fill.
ROCK OUTCROPS & BOULDERS	Remove or stabilise boulders which may have unacceptable risk. Support rock faces where necessary.	Disturb or undercut detached blocks or boulders.
RETAINING WALLS	Engineer design to resist applied soil and water forces. Found on rock where practicable. Provide subsurface drainage within wall backfill and surface drainage on slope above. Construct wall as soon as possible after cut/fill operation.	Construct a structurally inadequate wall such as sandstone flagging, brick or unreinforced blockwork. Lack of subsurface drains and weepholes.
FOOTINGS	Found within rock where practicable. Use rows of piers or strip footings oriented up and down slope. Design for lateral creep pressures if necessary. Backfill footing excavations to exclude ingress of surface water.	Found on topsoil, loose fill, detached boulders or undercut cliffs.
SWIMMING POOLS	Engineer designed. Support on piers to rock where practicable. Provide with under-drainage and gravity drain outlet where practicable. Design for high soil pressures which may develop on uphill side whilst there may be little or no lateral support on downhill side.	
DRAINAGE		
SURFACE	Provide at tops of cut and fill slopes. Discharge to street drainage or natural water courses. Provide general falls to prevent blockage by siltation and incorporate silt traps. Line to minimise infiltration and make flexible where possible. Special structures to dissipate energy at changes of slope and/or direction.	Discharge at top of fills and cuts. Allow water to pond on bench areas.
SUBSURFACE	Provide filter around subsurface drain. Provide drain behind retaining walls. Use flexible pipelines with access for maintenance. Prevent inflow of surface water.	Discharge roof runoff into absorption trenches.
SEPTIC & SULLAGE	Usually requires pump-out or mains sewer systems; absorption trenches may be possible in some areas if risk is acceptable. Storage tanks should be water-tight and adequately founded.	Discharge sullage directly onto and into slopes. Use absorption trenches without consideration of landslide risk.
EROSION CONTROL & LANDSCAPING	Control erosion as this may lead to instability. Revegetate cleared area.	Failure to observe earthworks and drainage recommendations when landscaping.
DRAWINGS AND SITE VISITS DURING CONSTRUCTION		
DRAWINGS	Building Application drawings should be viewed by geotechnical consultant	
SITE VISITS	Site Visits by consultant may be appropriate during construction/	
INSPECTION AND MAINTENANCE BY OWNER		
OWNER'S RESPONSIBILITY	Clean drainage systems; repair broken joints in drains and leaks in supply pipes. Where structural distress is evident see advice. If seepage observed, determine causes or seek advice on consequences.	

APPENDIX E

Explanatory Notes

EXPLANATORY NOTES

Introduction

These notes have been provided to amplify the geotechnical report with regard to investigation procedures, classification methods and certain matters relating to the Discussion and Comments sections. Not all notes are necessarily relevant to all reports.

Geotechnical reports are based on information gained from finite sub-surface probing, excavation, boring, sampling or other means of investigation, supplemented by experience and knowledge of local geology. For this reason they must be regarded as interpretative rather than factual documents, limited to some extent by the scope of information on which they rely.

Description and Classification Methods
The methods the description and classification of soils and rocks used in this report are based on Australian standard 1726, the SSA Site investigation Code, in general descriptions cover the following properties - strength or density, colour, structure, soil or rock type and inclusions. Identification and classification of soil and rock involves to a large extent, judgement within the acceptable level commonly adopted by current geotechnical practices.

Soil types are described according to the predominating particle size, qualified by the grading or other particles present (eg sandy clay) on the following bases:

Soil Classification	Particle Size
Clay	Less than 0.002mm
Silt	0.002 to 0.6mm
Sand	0.6 to 2.00mm
Gravel	2.00m to 60.00mm

Soil Classification	Particle size
Clay	less than 0.002mm
Silt	0.002 to 0.06mm
Sand	0.06 to 2.00mm
Gravel	2.00mm to 60.00mm

Cohesive soils are classified on the basis of strength, either by laboratory testing or engineering examination. The strength terms are defined as follows:

Classification	Undrained Shear Strength kPa
Very Soft	Less than 12
Soft	12 - 25
Firm	25 - 50
Stiff	50 - 100
Very Stiff	100 - 200
Hard	Greater than 200

Non-cohesive soils are classified on the basis of relative density, generally from the results of standard penetration tests (SPT) or Dutch cone penetrometer test (CPT), as below:

Relative Dense	SPT 'N' Value (blows/300mm)	CPT Cone Value (q_c-Mpa)
Very Loose	Less than 5	Less than 2
Loose	5 - 10	2 - 5
Medium Dense	10 - 30	5 - 15
Dense	30 - 50	15 - 25
Very Dense	> 50	> 25

Rock types are classified by their geological names, together with descriptive terms on degrees of weathering strength, defects and other minor components. Where relevant, further information regarding rock classification, is given on the following sheet.

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

Disturbed samples taken during drilling provided information on plasticity, grained size, colour, type, moisture content, inclusions and depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin walled sample tube (normally know as U_{50}) into the soil and withdrawing a sample of the soil in a relatively undisturbed state. Such Samples yield information on structure and strength and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils. Details of the type and method of sampling are given in the report.

Field Investigation Methods
The following is a brief summary of investigation methods currently carried out by this company and comments on their use and application.

Hand Auger Drilling
The borehole is advanced by manually operated equipment. The diameter of the borehole ranges from 50mm to 100mm. Penetration depth of hand augered boreholes may be limited by premature refusal on a variety of materials, such as hard clay, gravels or ironstone.

Test Pits
These are excavated with a tractor-mounted backhoe or a tracked excavator, allowing close examination of the insitu soils if it is safe to descend into the pit. The depth of penetration is limited to about 3.0m for a backhoe and up to 6.0m for an excavator. A potential disadvantage is the disturbance caused by the excavation.

Care must be taken if construction is to be carried out near, or within the test pit locations, to either adequately recompact the backfill during construction, or to design the structure or accommodate the poorly compacted backfill.

Large Diameter Auger (eg Pengo)
The hole is advanced by a rotating plate or short spiral auger generally 300mm or larger in diameter. The cuttings are returned to the surface at intervals (generally of not more than 05m) and are disturbed, but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers and is usually supplemented by occasional undisturbed tube sampling.

Continuous Spiral Flight Augers
The hole is advanced by using 90mm - 115mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling or 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, or may be collected after withdrawal of the augers flights, but they are very disturbed and may be highly mixed with soil of other stratum.

Information from the drilling (as distinct from specific sampling by SPT or undisturbed samples) is of relatively low reliability due to remoulding, mixing or softening of samples by ground water, resulting in uncertainties of the original sample depth.

Continuous Spiral Flight Augers (continued)
The spiral augers are usually advanced by using a V - bit through the soil profile refusal, followed by Tungsten Carbide (TC) bit, to penetrate into bedrock. The quality and continuity of the bedrock may be assessed by examination of the recovered rock fragments and through observation of the drilling penetration resistance.

Non - core Rotary Drilling (Wash Boring)
The hole is advanced by a rotary bit, with water being pumped down the drill rod and returned up the annulus, carrying the cuttings, together with some information from the "feel" and rate of penetration.

Rotary Mud Stabilised Drilling
This is similar to rotary drilling, but uses drilling mud as a circulating fluid, which may consist of a range of products, from bentonite to polymers such as Revert or Biogel. The mud tends to mask the cuttings and reliable identification is again only possible from separate intact sampling (eg SPT and U_{50} samples).

Continuous Core Drilling
A continuous core sample is obtained using a diamond tipped core barrel. Providing full core recovery is achieved (which is not always possible in very weak rock and granular soils) this technique provides a very reliable (but relatively expensive) method of investigation. In rocks an NMLC triple tube core barrel which gives a core of about 50mm diameter, is usually used with water flush.

Portable Proline Drilling
This is manually operated equipment and is only used in sites which require bedrock core sampling and there is restricted site access to truck mounted drill rigs. The boreholes are usually advanced initially using a tricone roller bit and water circulation to penetrate the upper soil profile. In some instances a hand auger may be used to penetrate the soil profile. Subsequent drilling into bedrock involves the use of NMLC triple tube equipment, using water as a lubricant.

Standard Penetration Tests
Standard penetration tests are used mainly in non-cohesive soils, but occasionally also in cohesive soils, as a means of determining density or strength and of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289 "Methods of testing Soils for Engineering Purpose"- Test F31.

The test is carried out in a borehole by driving a 50mm diameter split sample tube under the impact of a 63Kg hammer with a free fall of 769mm. 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 rocks, the full 450mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form:

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

  as 4, 6, 7
  N = 13

- 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 15,30/40mm

The results of the tests can be related empirically to the engineering properties of the soil. Occasionally the test methods is used to obtain samples in 50mm diameter thin walled samples tubes in clays. In these circumstances, the best results are shown on the bore logs in brackets.

Dynamic Cone Penetration Test
A modification to the SPT test is where the same driving system is used with a solid 60^0 tipped steel cone of the same diameter as the SPT hollow sampler. The cone can be continuously driven into the borehole and is normally used in areas with thick layers of soft clays or loose sand. The results of this test are shown as 'N_c' on the bore logs, together with the number of blows per 150mm penetration.

Cone Penetrometer Testing and Interpretation
Cone penetrometer testing (sometimes referred to as Dutch Cone-CPT) described in this report, has been carried out using an electrical friction cone penetrometer and the test is described in Australian Standard 1289 test F5.1.

In the test, a 35mm diameter rod with cone tipped end is pushed continuously into the soil, the reaction being provided by a specially designed truck or rig, which is fitted with a hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the friction resistance on a separate 130mm long sleeve, immediately behind the cone. Transducer in the tip of the assembly are connected by electrical wires passing through the centre of the push rods to an amplifier and recorder unit mounted on the control truck.

As penetration occurs (at a rate of approximately 20mm per second) the information is output on continuous chart recorders. The plotted results in this report have been traced from the original records. The information provided on the charts comprises:

- Cone resistance - the actual end bearing force divided by the cross sectional area of the cone, expressed in Mpa.
- Sleeve friction - the frictional force on the sleeve divided by the surface area, expressed in kPa.
- Friction ratio - the ratio of sleeve friction to cone resistance, expressed in percentage.

There are two scales available for measurement of cone resistance. The lower "A" scale (0-5Mpa) is used in very soft soils where increased sensitivity is required and is shown in the graphs as a dotted line. The main "B" scale (0-50Mpa) is less sensitive and is shown as a full line.

The ratios of the sleeve resistance to cone resistance will vary with the type of soil encountered, with higher relative frictions in clays than in sands. Friction ratios of 1% to 2% are commonly encountered in sands and very soft clays, rising to 4% to 10% in stiff clays.

In sands, the relationship between cone resistance and SPT value is commonly in the range:

$$q_c \text{ (Mpa)} = (0.4 \text{ to } 0.6)\ N \text{ (blows per 300mm)}$$

In clays the relationship between undrained shear strength and cone resistance is commonly in the range:

$$q_c = (12 \text{ to} 18)\ C_u$$

Interpretation of CPT values can also be made to allow estimate of modulus or compressibility values to allow calculation of foundation settlements. Inferred stratification, as shown on the attached report, is assessed from the cone and friction traces, from experience and information from nearby boreholes etc.

Cone Penetrometer Testing and Interpretation continued
This information is presented for general guidance, but must be regarded as being to some extent interpretive. The test method provides a continuous profile of engineering properties and where precise information or soil classification is required, direct drilling and sampling may be preferable.

Portable Dynamic Cone Penetrometer (AS1289)
Portable dynamic cone penetrometer tests are carried out by driving a rod in to the ground with a falling weight hammer and measuring the blows per successive 100mm increments of penetration.

There are two similar tests, Cone Penetrometer (commonly known as Scala Penetrometer) and the Perth Sand Penetrometer. Scala Penetrometer is commonly adopted by this company and consists of a 16mm rod with a 20mm diameter cone end, driven with a 9kg hammer, dropping 510mm (AS 1289 Test F3.2).

Laboratory Testing
Laboratory testing is carried out in accordance with Australian Standard 1289 "Methods of Testing Soil for Engineering Purposes". Details of the test procedures are given on the individual report forms.

Engineering Logs
The engineering logs presented herein are an engineering and/or geological interpretation of the sub-surface conditions and their reliability will depend to some extent on frequency of sampling and the method of drilling. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, however, this is not always practicable or possible to justify economically. As it is, the boreholes represent only a small sample of the total sub-surface profile. Interpretation of the information and its application to design and construction should take into account the spacing of boreholes, frequency of sampling and the possibility of other than "straight line" variations between the boreholes.

Ground water
Where ground water levels are measured in boreholes, there are several potential problems:

- In low permeability soils, ground water although present, may enter the hole slowly, or perhaps not at all, during the investigation period.
- A localised perched water table may lead to a erroneous indication of the true water table.
- Water table levels will vary from time to time, due to the seasons or recent weather changes. They may not be the same at the time of construction as indicated in the report.
- The use of water or mud as a drilling fluid will mask any ground water inflow. Water has to be blown out of the hole and drilling mud must be washed out of the hole if any water observations are to be made.

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

Engineering Reports
Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal is changed, say to a twenty storey building. If this occurs, the company will be pleased to review the report and sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of sub-surface conditions, discussions of geotechnical aspects and recommendations or suggestions for design and construction. However, the company cannot always anticipate or assume responsibility for:

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

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

Site Anomalies
In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, the company request immediate notification. Most problems are much more readily resolved when conditions are exposed than at some later stage, well after the event.

Reproduction of Information for Contractual Purposes
Attention is drawn to the document “Guidelines for the Provision of Geotechnical Information trader Documents”, published by the Institute of Engineers Australia. Where information obtained for this investigation is provided for tender purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. The Company would be pleased to assist in this regard and/or make additional copies of the report available for contract purpose, at a nominal charge.

Site Inspection

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

Review of Design
Where major civil or structural developments are proposed, or where only a limited investigation has been completed, or where the geotechnical conditions are complex, it is prudent to have the design reviewed by a Senior Geotechnical Engineer.

GeoEnviro Consultancy Pty Ltd

Graphic Symbols For Soil and Rock

SOIL

 Fill

 Topsoil

 Gravel (GW , GP)

 Sand (SP, SW)

 Silt (ML, MH)

 Clay (CL, CH)

 Clayey Gravel (GC)

 Silty Sand (SM)

 Clayey Sand (SC)

 Sandy Silt (ML)

 Gravelly Clay (CL, CH)

 Silty Clay (CL, CH)

 Sandy Clay (CL, CH)

 Peat or Organic Soil

ROCK

 Shale

 Sandstone

 Siltstone,Mudstone,Claystone

 Granite, Gabbro

 Dolerite, Diorite

 Basalt, Andesite

Other Materials

 Concrete

 Bitumen, Asphaltic Concrete, Coal

 Ironstone Gravel

 Organic Material