GEOTECHNICAL SITE INVESTIGATION

Project : **1-3 REID STREET & 2-4 WOODSIDE AVE, LINDFIELD NSW**
Client : **CPDM**
Date : **12 March 2025**
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GEOTESTA

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REVISION NO.	DATE	REASON FOR REVISION
2	March 2025	Issued to the client
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TITLE	NAME	POSITION TITLE	DATE
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Reviewed by	Addy Wuthisen	Engineering Manager NSW	March 2025

TABLE OF CONTENT

1 INTRODUCTION

Geotesta was engaged by CPDM for a geotechnical site investigation at 1-3 Reid Street & 2-4 Woodside Avenue, Lindfield NSW 2070. Considering the site plans provided by the client, the proposed development includes the demolition of existing structures on site followed by the construction of a residential apartment building. Based on the preliminary site plans provided, it is anticipated that the proposed development will include a residential apartment building with two levels of basement.

The following document was provided by the client for understanding the proposed development and hence, incorporated in preparation for this report:

- *Preliminary Architectural Concept prepared by PBD Architects: 1-3 Reid Street & 2-4 Woodside Avenue, Lindfield NSW 2070, dated 14/11/2024.*

The subject site and associated surroundings are shown in Figure 1.

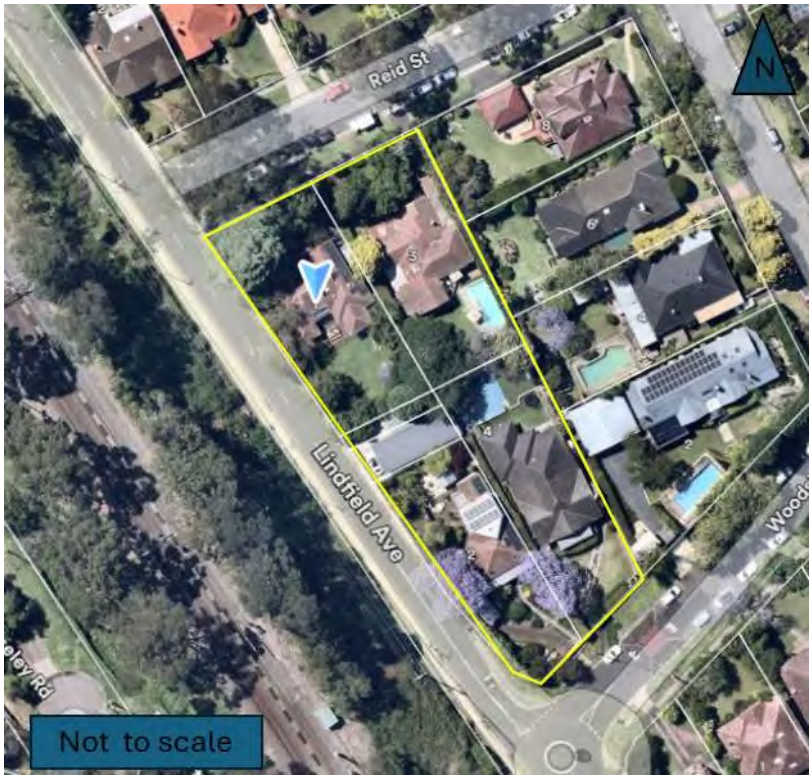

Figure 1. Site boundary and the surroundings.

1.1 Scope of Work

The assessment includes the following scope of work:

- A review of available geological data
- Subsurface profile encountered in the drilled boreholes and detailed logs
- Groundwater conditions encountered in the boreholes
- Laboratory test results
- Site classification
- Geotechnical design parameters and subsurface profile bearing capacity
- Discussion and recommendations for the proposed work

2 SITE INVESTIGATION

2.1 Site Location

The site under investigation is located at 1-3 Reid Street & 2-4 Woodside Avenue, Lindfield NSW 2070. The total site area is approximately 3900 m^2. The subject site is located within the Local Government Area of Ku Ring Gai Council. The site is located approximately 15 km northwest of Sydney CBD.

The surroundings of the site as noted were as below:

North - Reid Street followed by residential houses

East – Neighbouring residential houses

West – Lindfield Avenue followed by the railway line

Southwest – Woodside Avenue followed by residential houses

2.2 Geotechnical Investigation

The fieldwork for the geotechnical site investigation was conducted on 04th November 2024. The fieldwork included drilling a total of seven (7) boreholes across the site. During the investigation, the existing residential structures remained in place, necessitating the use of a combination of Ute-mounted drilling equipment and hand tools, depending on site accessibility. Two (2) boreholes were drilled using a Ute-mounted drilling rig to the refusal depth, and the remaining five (5) boreholes were drilled to 1.4-1.7m depth using a hand auger (hand tool). Dynamic Cone Penetration (DCP) testing was performed adjacent to each borehole to determine the soil consistency and strength.

A summary of the borehole drilling investigation is presented below in Table 1. The borehole locations are shown in Figure 2.

Table 1. Borehole details.

ID	Drilling method	Termination Depth (mg)
BH1	Hand auger	1.4
BH2	Hand auger	1.5
BH3	Ute-mounted rig	1.8
BH4	Hand auger	1.7
BH5	Ute-mounted rig	2.1
BH6	Hand auger	1.5
BH7	Hand auger	1.4

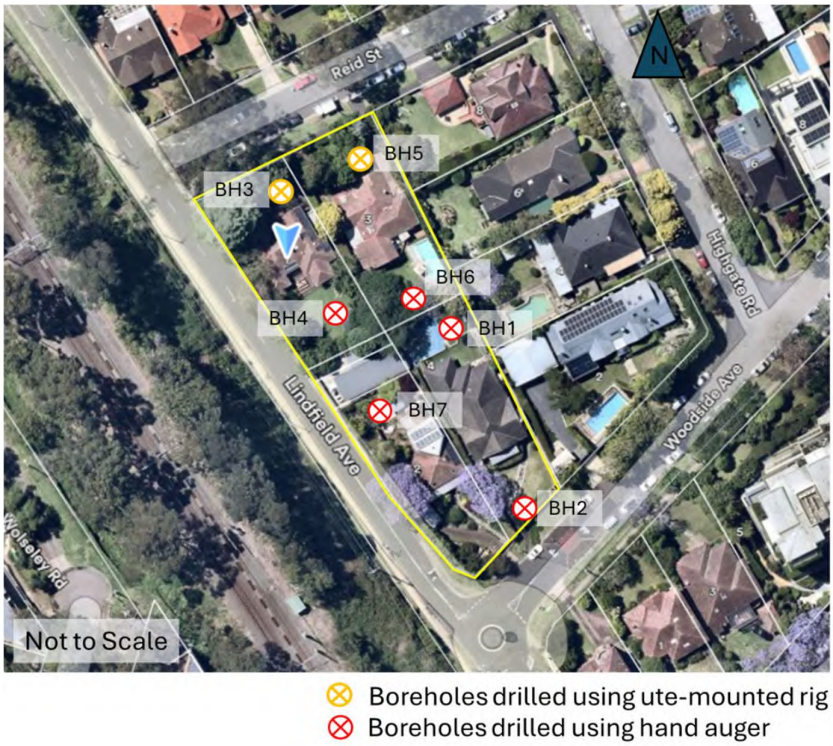

Figure 2. Borehole locations.

3 SITE FINDINGS

3.1 Site Condition and Topography

The site under investigation is located at 1-3 Reid Street & 2-4 Woodside Avenue, Lindfield NSW 2070.

Key site features:

- **Vegetation:** The site is characterized by the presence of mature trees and landscaped garden areas, with vegetation primarily concentrated toward the central portion of the site.
- T**opography:** The site elevation ranges from approximately 88 meters to 92 meters relative to the Australian Height Datum (AHD), as per data obtained from Nearmap. This variation indicates a relatively gentle slope across the site.
- **Land Use:** At the time of investigation, the site was actively occupied by existing residential properties. It encompasses four residential lots, featuring single- to double-storey dwellings that occupy a substantial portion of the site area.

3.2 Acid Sulphate Soils

A review of the Department for Infrastructure, Planning and Natural Resources (DIPNR) Acid Sulphate Soils Risk Mapping (1997) and the National Acid Sulphate Soil Mapping application was undertaken. The review indicated that the site is located within a Class 5 area. Acid sulphate soils are not typically found in Class 5 areas.

3.3 Site Geology

The geological origin of the soil profile was identified through a visual examination of the soil samples and reference to geological maps of the area. MinView, a web map application developed by Regional NSW, indicates that the investigated site is underlain by Ashfield Shale (Twia) from Wianamatta Group. This comprises black to light grey shale and laminate. Additionally, the nearby area features the Hawkesbury Sandstone (Tuth) geological unit, which consists of medium to coarse-grained sandstone with prominent high-angle crossbedding, along with minor shale and laminite lenses.

The site geology map is shown in Figure 3.

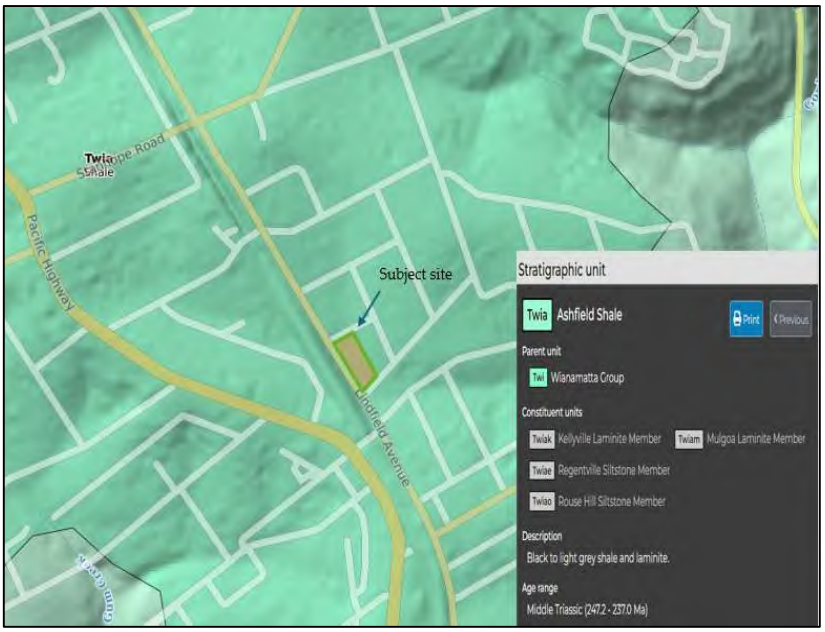

Figure 3: Site Geology Map.

3.4 Ground Profile

The encountered ground profile is shown in the borehole logs in Appendix A and summarised in Table 2. The site is covered by a topsoil layer comprising Silty Clay/Clayey Silt to a maximum depth of 0.2-0.7m below ground level. This layer is followed by a residual soil layer of Silty/Sandy Clay/Clayey Sand/ Gravelly Clay to a maximum of 0.5-1.8m depth below ground level. Sandstone bedrock was encountered in one of the deep drilled boreholes (BH3) at 1.8m depth below ground level to the termination depth.

Table 2. General subsurface profile.

Unit	Material	Approximate Depth range of Unit (mBGL*)						
		BH1	BH2	BH3	BH4	BH5	BH6	BH7
1	Topsoil/Fill	0.0-0.2	0.0-0.5	0.0-0.7	0.0-0.4	0.0-0.5	0.0-0.4	0.0-0.3
2A	Firm Silty CLAY	-	0.5-0.7	-	-	-	0.4-1.0	0.3-0.7
2B	Stiff Silty/Sandy CLAY	0.2-0.7	0.7-1.6	-	0.4-0.9 1.3-1.5	0.5-1.3	1.0-1.2	-
2C	Very Stiff Silty/Sandy CLAY	0.7-1.2	1.6-1.8	0.7-1.5	0.9-1.3. 1.7-1.9	1.3-1.9	1.2-1.5	0.7-1.4
2D	Hard Silty CLAY	1.2-1.4	> 1.8	1.5-1.7	1.5-1.7: > 1.9	> 1.9	> 1.5	> 1.4
3	Sandstone	-	-	1.7-1.8	2.1-2.2	-	-	-

**measured below ground level*

3.5 Groundwater Level

Groundwater was not encountered during auguring in any of the boreholes up to 1.8m depth below ground level except at BH4 where saturated soil was encountered. It was observed to be a perched groundwater from rainfall or irrigation events.

3.6 Surrounding Licensed Groundwater Boreholes

According to MinView, a web map application developed by Regional NSW, the data from nearby registered boreholes located close to the site was extracted. The data from these two boreholes is presented in Table 3.

Table 3. Nearby groundwater bore wells.

Borehole ID	Borehole depth (m)	Standing Water Level (m)	Distance from the site (m)
GW108792	174	65.0	1250
GW106029	180	63.0	750

3.7 Earthquake Design

Based on the information obtained from Table 3.2 and Figure 3.2(A) of AS 1170.4–2007, a hazard factor (Z) of 0.08 can be adopted for the Sydney region. The value of Z represents the effective peak ground acceleration (PGA) with an annual exceedance probability of 1 in 500 years.

4 LABORATORY TEST RESULTS AND FINDINGS

4.1 Site Classification

Four (4) soil samples were taken from the site and sent to Geotesta's NATA laboratory, for testing of index properties to assess the site reactivity and classification. The laboratory test results are presented in Table 4.

Table 4. Summary of Atterberg Limit Test Results.

Bore No.	Depth (m)	Wn (%)	LL (%)	PL (%)	PI (%)	LS (%)
BH1	0.6 - 0.9	20.1	50	22	28	12
BH3	0.8 - 1.2	16.7	44	16	28	10
BH5	1.0	24.0	46	23	23	12
BH7	0.5 - 0.8	24.8	43	18	25	11

Note: Wn=Moisture content; LL= Liquid Limit; PL=Plastic Limit; PI= Plasticity Index; LS= Linear Shrinkage

The test results indicate that the site soil is classified as medium plasticity. According to AS 2870 (2011), a site classification of "H1" should be adopted based on the thickness of clay layers and soil plasticity

4.2 Salinity and Aggressivity Assessment

Ten (10) soil samples were submitted to Eurofin MGT Laboratory, a NATA-accredited laboratory, for chemical tests for the salinity and aggressivity assessment. The testing was carried out for the aggressivity suite and to assess the exposure classification for the proposed development. The sampling locations are presented in Figure 4.

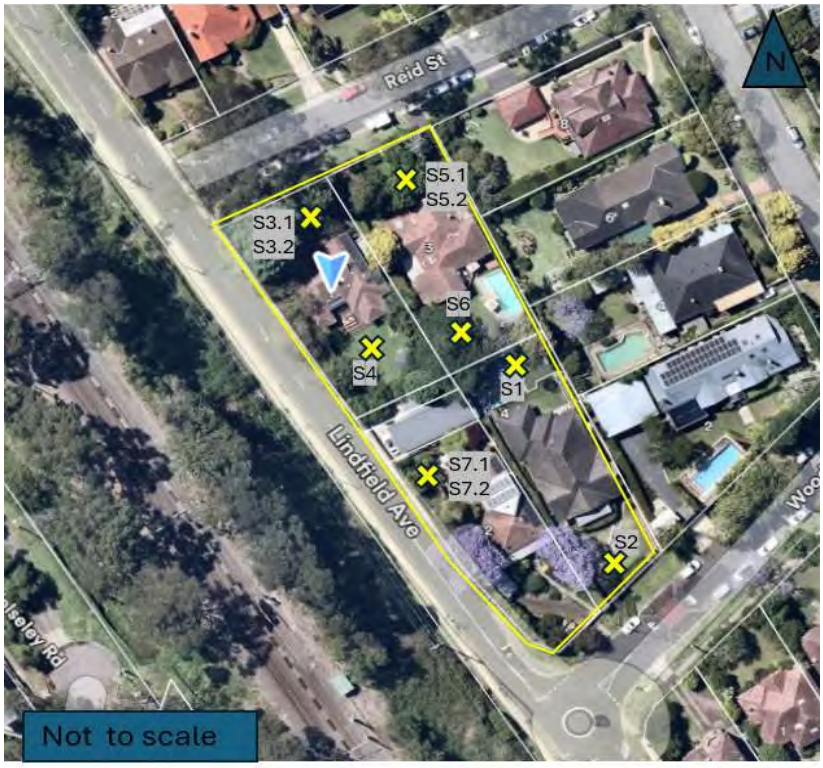

Figure 4. Salinity sampling locations.

4.2.1 Salinity Assessment

Laboratory test results for the salinity assessment are summarised in Table 5.

Table 5: Soil Salinity Test Results

Bore No.	Sample ID	Depth (m)	EC (1:5, dS/m)	ECe[1] (ds/m)	Salinity Classes
BH1	S1	0.6	0.05	0.45	Non-saline
BH2	S2	0.6	0.014	0.126	Non-saline
BH3	S3.1	0.8	0.048	0.432	Non-saline
BH3	S3.2	1.5	0.06	0.54	Non-saline
BH4	S4	0.6	< 0.01	< 0.09	Non-saline
BH5	S5.1	1.0	0.023	0.207	Non-saline
BH5	S5.2	2.0	0.073	0.657	Non-saline
BH6	S6	0.6	0.013	0.117	Non-saline
BH7	S7.1	0.5	0.025	0.225	Non-saline
BH7	S7.2	0.8	0.033	0.297	Non-saline

[1]Based on EC to ECe multiplication factors in Department of Land and Water Conservation (2002) Guidelines (Table 6.1), a multiplication factor of 9 were applied based on a saturation water content of 46% of clay loam.

[2]Based on Table 6.2 of Department of Land and Water Conservation (2002) where ECe < 2dS/m = Non-saline; ECe= 2-4dS/m = slightly saline; ECe = 4-8dS/m = moderately saline; ECe = 8-16dS/m = very saline; ECe > 16dS/m = highly saline.

Referring to the above test results, the site soil is non-saline.

4.2.2 Aggressivity Assessment

The aggressivity classification is mainly conducted upon the pH content, Chlorides content and Sulphate content of the soil. The Assessment Criteria for the exposure classification for concrete piles and steel piles are summarised in Tables 6 and 7.

Table 6: Exposure Classification for Concrete Piles – Piles in Soil

Exposure Condition				Exposure Classification*	
pH	Sulfates (expressed as SO_4**)		Chlorides in groundwater	Soil condition A ***	Soil condition B ****
	In soil ppm	In groundwater ppm			
> 5.5	< 5,000	< 1,000	< 6,000	Mild	Non-aggressive
4.5 – 5.5	5,000 – 10,000	1000 – 3,000	6,000 – 12,000	Moderate	Mild
4 - 4.5	10,000 – 20,000	3,000 – 120,000	12,000 – 30,000	Severe	Moderate
< 4	> 20,000	> 10,000	> 30,000	Very severe	Severe

* derived from *Table 6.4.2 (C), AS 2159—2009 Piling—Design and installation*

** Approximately 100 ppm SO4 = 80 ppm SO3
*** Soil conditions A—high permeability soils (e.g., sands and gravels) which are in groundwater
**** Soil conditions B—low permeability soils (e.g., silts and clays) or all soils above groundwater

Table 7: Exposure Classification for Steel Piles – Piles in Soil

Exposure Condition				Exposure Classification*	
pH	**Chlorides**		**Resistivity ohm.cm**	**Soil condition A ******	**Soil condition B *****
	In Soil ppm	**In groundwater ppm**			
> 5	< 5,000	< 1,000	> 5,000	Non-aggressive	Non-aggressive
4-5	5,000 – 20,000	1000 – 10,000	2,000 – 5,000	Mild	Non-aggressive
3-4	20,000 – 50,000	10,000 – 20,000	1,000 – 2,000	Moderate	Mild
< 3	> 50,000	> 20,000	< 1,000	Severe	Moderate

* Derived from *Table 6.5.2 (C), AS 2159—2009 Piling—Design and installation*
** Soil conditions A—high permeability soils (e.g., sands and gravels) that are in groundwater
*** Soil conditions B—low permeability soils (e.g., silts and clays) or all soils above groundwater

Sulphate and pH test results for aggressivity assessment are summarised in Table 8.

Table 8. Soil Aggressivity Test Results and exposure classification for piles.

Sample ID	**pH (1:5)**	Sulphate (SO4) (mg/kg)	Chloride (mg/kg)	Aggressivity **Classes** (Concrete)	Aggressivity **Classes** (Steel)
S1	6.0	72	12	Non-aggressive	Non-aggressive
S2	6.0	36	< 10	Non-aggressive	Non-aggressive
S3.1	5.4	58	22	Mild	Non-aggressive
S3.2	4.7	100	20	Mild	Non-aggressive
S4	6.0	13	< 10	Non-aggressive	Non-aggressive
S5.1	5.9	30	< 10	Non-aggressive	Non-aggressive
S5.2	5.1	120	23	Mild	Non-aggressive
S6	6.6	12	< 10	Non-aggressive	Non-aggressive
S7.1	5.7	52	< 10	Non-aggressive	Non-aggressive
S7.2	5.3	67	< 10	Mild	Non-aggressive

[1]In accordance with AS2159(2009)

Referring to the above test results, the site is considered non-aggressive to mildly aggressive to concrete and non-aggressive to steel.

4.2.3 Exposure Classifications for concrete in Saline and sulphate soils

The salinity assessment results indicate the site soil is non-saline. The exposure classification indicates soil is non-aggressive to mildly aggressive towards concrete, and non-aggressive towards steel. An exposure classification of A1 for concrete in saline soil and an exposure classification of A2 for concrete in sulphate soils should be adopted for the preliminary design of proposed concrete structures.

4.3 Soil Sodicity

As part of the investigation, soil susceptibility to dispersion and possible erosion was estimated. Although salinity and sodicity (which can lead to potential erosion) are not directly related, saline soils often support sparse vegetation and if the soil is also sodic, it becomes prone to erosion. It is therefore important to know the sodic conditions of the soil. Soils are potentially prone to erosion where soils contain high amounts of sodium (sodic soils – where the Exchangeable Sodium Percentage (ESP) is greater than 5%).

The Assessment Criteria for the cation exchange capacity, sodicity, and calcium-to-magnesium ratio for dispersion assessment are summarised in Tables 9, 10, and 11, respectively.

Table 9. Ratings for Cation Exchange Capacity

Rating*	CEC (cmol(+)/kg)
Very Low	< 6 **
Low	6 – 12
Moderate	12 – 25
High	25 – 40
Very High	> 40

* Derived from *Table 5.5, Interpreting Soil Test Results, Hazelton and Murphy (2007)*
** soils with CEC less than three are often low in fertility and susceptible to soil acidification.

Table 10: Ratings for Sodicity and ESP.

Rating*	ESPs proposed for Australian soils (Northcote and Skene 1972)	ESPs proposed for NSW soils (Pope and Abbot 1989)
Non-sodic	0 - 6	0 – 5
Marginally sodic to sodic	6 – 14	5 – 10
Strongly sodic	> 14	> 10

* Derived from Table 5.45 of Hazelton and Murphy (2007)

Table 11: Ca/Mg Ratio

Description	Ca/Mg ratio
Ca deficient	< 1
Ca (low)	1 – 4
balanced	4 – 6
Mg (low)	6 – 10
Mg deficient	> 10

* Derived from Table 5.8 of Hazelton and Murphy (2007)

Soils high in sodium and magnesium show more dispersion than soils that are high in potassium and calcium.

The laboratory results are summarised in Table 12.

Table 12: Laboratory test results for sodicity.

ID	Depth (mbgl)	CEC[1]	CEC Rating	Ca/Mg Ratio	Exchangeable Cations (cmol(+)/kg)[2]				ESP (%)[3]	Sodicity Rating
					Na	K	Ca	Mg		
S1	0.6	5.4	Very Low	4.4	0.2	0.3	4	0.9	3.0	Non-sodic
S2	0.6	3.6	Very Low	1.1	0.2	0.1	1.7	1.5	5.1	Marginally sodic
S3.1	0.8	1.2	Very Low	0.6	0.3	< 0.1	0.3	0.5	26	Strongly sodic
S4	0.6	3.3	Very Low	1.4	0.2	1.2	1.7	1.2	7.2	Marginally sodic
S5.1	1	4.3	Very Low	1.6	0.2	1.5	2.4	1.5	4.5	Non-sodic
S6	0.6	6.9	Low	4.4	0.2	1.2	5.3	1.2	3.0	Non-sodic
S7.1	0.5	4.6	Very Low	2.2	< 0.1	1.3	2.9	1.3	2.0	Non-sodic

1-Cation Exchange Capacity (CEC, cmol(+)/kg) expressed as centimoles of positive charge per kilogram
2- Exchangeable cations expressed as centimoles of positive charge per kilogram
3- ESP is expressed as exchangeable sodium (Na_x) / CEC

Based on the test results, the site soil is generally classified as non-sodic to marginally sodic, except for the strongly sodic soil layer recovered at 0.8 mbgl in BH3. While the concentration of exchangeable sodium is within an acceptable range for soil, the elevated ESP values are attributed to the low CEC. These findings indicate that soils in certain areas of the site the soil may be highly susceptible to erosion and tunnelling, particularly where sodic conditions and poor soil structure prevail. The low ratio of calcium to magnesium observed in most areas, suggesting a high potential for dispersion as noted from sampled soil.

4.4 Acid Sulphate Assessment

A review of the Department for Infrastructure, Planning and Natural Resources (DIPNR) Acid Sulphate Soils Risk Mapping (1997) and the National Acid Sulphate Soil Mapping application was undertaken. The review indicated that the site is located in the areas of Class 5. Acid sulphate soils are not typically found in Class 5 areas. The presence of acid sulphate soils was assigned "a low probability of occurrence".

The NSW ASS Management Advisory Committee 1998 and Water Quality Australia 2018b mentions conducting field pH and peroxide tests as a way to indicate the presence of potential or actual ASS. The criteria for assessing the results have been summarised in Table 13.

In the event that multiple indicators of ASS are observed, detailed laboratory analysis will be required. The actionable criteria which determine whether material is classified as ASS are detailed in Table 14.

Table 13: Indicators of ASS and Potential ASS material.

Criteria[1]	Value
pH-F	≤4.0
pH-FOX	≤3.0
Delta pH (pH drop from pH-F to pH-FOX)	>1.0
Effervescence (present as Reaction Ratings)	≥3[2]
Release of sulfurous gases	Presence

[1]retrieved from Figure 5.2, Indicators of a Potential ASS materials following field peroxide testing, National Acid Sulfate Soils Guidance: National acid sulfate soils sampling and identification methods manual, Department of Agriculture and Water Resources, 2018.
[2]Field Screen uses the following fizz rating to classify the rate at which the samples reacted to the peroxide: 1.0; No reaction to slight. 2.0; Moderate reaction. 3.0; Strong reaction with persistent froth. 4.0; Extreme reaction, refer to Appendix B, lab results

Adapted from the NSW ASS Management Advisory Committee 1998 and Section 5.1 Field soil and water characteristics as indicators of ASS materials in Water Quality Australia 2018b.

Table 14: Acid Sulfate Soil Action Criteria.

Type of Material		Action Criteria 1-1000 tonnes disturbed		Action Criteria if more than 1000 tonnes disturbed	
Texture range	Approx. clay content (% < 0.002 mm)	Sulfur trail % S oxidisable (oven-dry basis)	Acid trait mol H^+/tonne (over-dry basis)	Sulfur trail % S oxidisable (oven-dry basis)	Acid trait mol H^+/tonne (over-dry basis)
Coarse Texture	≤5	0.03	18	0.03	18
Medium Texture	5-40	0.06	36	0.03	18
Fine Texture	≥40	0.1	62	0.03	18

Taken from Table 4.4 of the Acid Sulfate Soil Manual 1998 developed by the NSW Acid Sulfate Soil Management Advisory Committee

Laboratory analysis was undertaken by Eurofins. The laboratory analysis assessed the pH, oxidised pH and reaction rates of the soils. Upon analysis, the soils were deemed to have pH values of 5.0 to 6.3, though upon the addition of Hydrogen Peroxide, the pH values dropped to values of 3.7 to 5.1, with a pH drop of 0.8 to 1.3 pH units. Low reaction rates were observed by the laboratory within the samples.

The summarised laboratory test results are tabulated in Table 15. The detailed test results are attached in Appendix B.

Table 15: Laboratory results for Acid Sulphate Soil Potential

Sample ID	Borehole	Depth	$pH_{(f)}$	$pH_{(fox)}$	pH Difference	Reaction Rate	>2 Positive Indicators
S1	BH1	0.6	5.5	4.7	0.8	1	No
S2	BH2	0.6	5.7	4.9	0.8	2	No
S3.1	BH3	0.8	5.0	3.7	1.3	1	No
S3.2		1.5	5.1	3.8	1.3	1	No
S4	BH4	0.6	5.5	4.5	1.0	2	No
S5.1	BH5	1.0	5.3	4.3	1.0	1	No
S5.2		2.0	5.0	4.1	0.9	1	No
S6	BH6	0.6	6.3	5.1	1.2	1	No
S7.1	BH7	0.5	5.5	4.6	0.9	2	No
S7.2		0.8	5.5	4.4	1.1	2	No
Actionable Criteria			**≤4**	**≤3.5**	**>1**	**3.0**	**Yes**
					Only applies when pH criteria fail		

All detected pH-F and pH-FOX values are within the acceptable criteria of Acid Sulfate Soil indicators. Based on the pH difference and reaction rate, limited organic matters was present in the on-site soil. The preliminary results of the pH-F and pH-FOX analysis are not indicative of Potential Acid Sulfate Soils (PASS) within the samples. An Acid Sulfate Soil Management Plan is not required, up to a maximum assessment depth of 2.0 m.

5 GEOTECHNICAL ASSESSMENT

5.1 Ground Model & Geotechnical Parameters

The geotechnical parameters of the soil materials/units encountered during the geotechnical site investigation are provided in Table 16.

Table 16. Geotechnical Parameters

Unit	Soil/Rock	γ (kN/m3)	Su (kPa)	c′ (kPa)	Φ′ (°)	E′ (MPa)	ν'
1	Topsoil/Fill	18	-	-	22	-	0.3
2A	Firm Silty CLAY	18	25	3	26	8	0.3
2B	Stiff Silty/Sandy CLAY	19	50	5	28	15	0.3
2C	Very Stiff Silty/Sandy CLAY	20	100	8	28	30	0.3
2D	Hard Silty CLAY	20	200	10	28	60	0.3
3	Sandstone Class V	22	-	30	35	300	0.3

5.2 Site Preparation

The topsoil/fill material was encountered in all the boreholes to a maximum depth of 0.7m below ground level. The fill material on site should be treated as uncontrolled fill during construction works. The following measures should be adopted for the site preparation of the site (Wherever is required and if applicable):

- Topsoil from the construction area should be stripped to subgrade/foundation level and stockpiled on site (if applicable) for possible re-use if required. Topsoil not being re-used should be disposed of offsite following a waste classification report.
- Any evidence of contamination or asbestos containing materials found during excavation works should be notified to the Project Engineer immediately.
- The existing subgrade shall be compacted with at least 6 passes of a 12-tonne roller to give a density ratio of 98% Standard determined using AS1289.5.4.1 (2007).
- The subgrade shall then be proof rolled with a 12-tonne minimum roller to test the subgrade in the presence of a geotechnical engineer.
- Where areas of subgrade fail a roller test the defective material shall be removed and replaced with similar sound material or other material approved by the Project Engineer or the Accredited Certifier and shall be re-tested to ensure a satisfactory inspection

It is recommended that Geotesta be engaged to provide a site inspection during the stages of construction to confirm that the ground conditions for the proposed construction are consistent with the assumptions or findings presented in this report.

All earthworks' recommendations should be complemented by reference to the latest edition of Safe Work Australia's 'Excavation Work Code of Practice' and AS3798 (2007).

5.3 Controlled/Engineered Fill

If required, the controlled fill can be used on the subgrade in uniform layers to provide the required design level in accordance with the foundation design. Controlled SAND fill must be well compacted in layers not exceeding 250mm thick. Controlled CLAY fill must be well compacted in layers no more than 200mm thick.

The natural clayey soils and ripped shale/sandstone bedrock are best suited for bulk filling. The material should not contain any particle sizes greater than 150 mm. It is expected that bedrock of low strength or less should readily break down beneath the weight of the rollers, however, bedrock of medium strength or higher may potentially need to be crushed using a rock crusher. If required, suitable granular materials to be imported on site to be used as engineered fill within the site.

The required backfill density and minimum frequency of testing for compaction control as detailed in AS 3798 (2007) are summarised below:

- 1 test per layer per 500m^2; or
- 1 test per 100m^3 distributed reasonably evenly throughout full depth and area; or
- 3 tests per visit (whichever requires the most tests).

Testing should be undertaken in accordance with AS 1289 "Methods of testing for soil engineering purposes". Tested layers that do not satisfy the outlined criteria are to be stripped, replaced, re-compacted, and re-tested to achieve the minimum compaction requirement specified above. Testing of compaction density should be undertaken by a suitably qualified geotechnical testing company.

5.4 Excavation

5.4.1 Excavation Class

The current site plans provided by the client indicated two levels of basement. Hence, the soft/intermediate excavation conditions are expected up to 2.1m depth in topsoil and natural soil layers. Excavation with a 20–30-ton excavator is relatively easy in these soils. However, below 2.1m depth, the subsurface profile is likely to encounter sandstone bedrock, hence intermediate to hard conditions may be encountered below this depth.

Refer to Table 17 for excavation class descriptions according to SANS 1200D.

Table 17: Excavation classes as per SANS 1200D

Excavation Class	Description
Soft	Excavation in material that can be efficiently removed by a back-acting excavator of flywheel power approximately 0.10kW per millimetre of tined-bucket width, without the use of pneumatic tools such as paving breakers
Intermediate	Excavation in material that requires a back-acting excavator of flywheel power exceeding 0.10 kW per millimetre of tined-bucket width or the use of pneumatic tools before removal by equipment equivalent to that specified for soft excavation.
Hard	Hard rock excavation shall be excavation in material (excluding boulder excavation) that cannot be efficiently removed without blasting or wedging and splitting.

5.4.2 Temporary Cut Batters

The preliminary site plans indicate two levels of basement will be required. For temporary cut batter and unsupported excavation up to 3m below ground level and in existing soil/rock, the values provided in Table 18 should be adopted. These recommendations are only applicable where no structures or services are adjacent. Allowable cut slopes may need to be revised based on nearby structures/services after earthworks begin. Some fretting and minor slumping of soil are anticipated after rainy periods, even with recommended cut batters.

As the proposed work will involve two levels of the basement, a detailed geotechnical investigation is recommended to provide further details.

Table 18: Recommendation on Batters

Soil Type	Temporary Batter Slope (H: V)	Permanent Better Slope (H:V)
Silty/Sandy CLAY or Sandstone (Class V)	1.5:1	2:1

The batter slope angle is recommended subjected to the following measures:

- The batters should be protected against erosion.
- Permanent batters should be drained.
- Temporary batters shall not be left unsupported for more than two months without further advice. Following heavy rains (more than 6 hours with an intensity of greater than 15mm/day) should be inspected by a geotechnical engineer.
- An offset distance of 1.5m from the batter crest should be maintained for the loads.

5.5 Retaining Wall Design Parameters

For the construction of retaining wall on the site, the design may be based on the Earth Pressure Approach using closed-form solutions, utilising geotechnical parameters summarised in Table 19.

Table 19: Retaining Wall Design Parameters for Earth Pressure Approach

Unit/Soil Type	γ (kN/m3)	K_0	Ka	Kp/ Ultimate Passive Earth Resistance
Silty/Sandy CLAY (Firm)	18	0.56	0.39	2.56
Silty/Sandy CLAY (Stiff)	19	0.55	0.38	2.63
Silty/Sandy CLAY (Very Stiff to Hard)	20	0.53	0.36	2.78
Class V Sandstone	22	0.2	0.15	350kPa

For construction methods that minimise deflection and where restraint is applied via struts, bracings, or anchors, the temporary or short-term lateral earth pressure distribution should be approximated as a trapezoidal distribution behind the retaining wall. A maximum lateral earth pressure of 8H kPa is obtained at a depth of 0.25H, where H is the total depth of the excavation to be retained. For basement walls where wall deflections are not critical, the maximum lateral earth pressure may be reduced to 6H kPa. It must be emphasised that where adjoining footings exist near the retaining walls, the "at rest" earth pressures must be maintained, and the active design condition is not appropriate. In cases of more complex support systems such as multiple-row anchored walls, advanced numerical modellings (e.g., 2D Finite Element Method, Finite Difference Method, etc.,) are recommended using more complex soil models to evaluate soil structure interactions. 3D numerical modelling may also be used to consider the excavation geometry to optimise the design.

5.6 Foundations

Considering the proposed development plans on site, the shallow footing is not recommended. Bored piles or screw piles are more suitable footing type considering the number of floor levels to avoid differential settlement.

The following sections will provide geotechnical parameters for different footing types.

5.6.1 Pad/strip footing

This type of footing is not recommended for the proposed development. In case required, the allowable bearing capacities for pad or strip footings are presented in Table 20. The footings should be founded on a suitable soil or rock profile, considering the type of structure, applied loads and allowable bearing capacities for the subsurface profile.

Strip/pad footings designed per Table 20 are expected to settle ≤ 1% of the footing width, depending on loads and foundation conditions.

Table 20: Allowable Bearing Capacity for Pad/Strip Footings

Unit/Material	Allowable Bearing Capacity (kPa)	Ultimate Bearing Capacity (kPa)
Silty CLAY (Firm to Stiff)	70	210
Silty CLAY (Very Stiff)	180	540
Silty CLAY (Hard)	300	900
Class V Sandstone	800	2400

The subsurface profile of the above site is based solely on the results obtained from the drilled boreholes. It is important to note that the soil/rock profile can vary across the site, and hence, it is recommended to engage a geotechnical engineer during the footing excavation stage to confirm founding depths and materials.

5.6.2 Pile foundation

Bored piles can be used to support the proposed development, founded with at least one pile diameter embedment into Sandstone bedrock. The allowable end-bearing capacities and shaft adhesion are presented in Table 21.

Table 21: Skin Friction and End Bearing Capacity of Piles

Unit/Material	Allowable End bearing (kPa)	Allowable Shaft Adhesion in Compression (kPa)	Ultimate End bearing (kPa)	Ultimate Shaft Adhesion in Compression (kPa)
Silty CLAY (Very Stiff)	250	15	900	50
Silty CLAY (Hard)	450	30	1350	80
Class V Sandstone	1000	50	3000	150

**Minimum embedment depths of one (1) and three (3) pile diameters in/to the rock are necessary to achieve these ultimate values for end bearing and adhesion, respectively*
50% of the shaft adhesion in compression can be adopted for the shaft adhesion in tension.

For limit state design, AS2159 (2009) specifies that the ultimate geotechnical pile capacity is adjusted by a geotechnical reduction factor (Φgb). This factor is determined based on an Average Risk Rating (ARR), which considers uncertainties in geotechnical conditions, redundancy of the foundation system, construction oversight, and the extent of pile testing.

6 SCOPE/RECOMMENDATIONS

Due to limited site access, the field investigation was conducted using hand augers, and borehole drilling was restricted to shallow depths. Given that the proposed development includes two basement levels, a further detailed geotechnical site investigation to deeper depths is advised after the demolition of existing structures on site when full site access is available.

7 REFERENCES

- AS 1726 (2017), Geotechnical site investigations, Standard method, Standards Australia
- AS 2159 (2009), Piling-Design and installation, Standard method, Standards Australia
- AS 2870 (2011), Residential slabs and footings, Standard method, Standards Australia
- AS 3600 (2009), Concrete structures, Standard method, Standards Australia
- AS 3798 (1996), Guidelines on earthworks for commercial and residential developments, Standard method, Standards Australia
- AS 4678 (2002), Earth-retaining structures, Standard method, Standards Australia
- Nicolson, R. (2003), Western salinity code of practice, Western Sydney Reginal Organisation of Councils Ltd.
- Pells, P.J.N., Mostyn, G., Walker, B.F. (1998), Foundations on Sandstone and Shale in the Sydney Region

Information about This Report

The report contains the results of a soil and water quality Assessment conducted for a specific purpose and client. The results should not be used by other parties, or for other purposes, as they may contain neither adequate nor appropriate information.

Test Hole Logging

The information on the test hole logs (boreholes, exposures etc.) is based on a visual and tactile assessment, except at the discrete locations where test information is available (field and/or laboratory results). The test hole logs include both factual data and inferred information.

Groundwater

Unless otherwise indicated, the water levels obtained from piezometers were recorded at the given time of measuring. The actual groundwater level may differ from this recorded level depending on material permeability (i.e. depending on the response time of the measuring instrument). Further, variations of this level could occur with time due to such effects as seasonal, environmental and tidal fluctuations or construction activities.

Interpretation of Results

The discussion or recommendations contained within this report normally are based on a site evaluation from discrete test hole data. Generalised, idealised or inferred subsurface conditions (including any geotechnical cross-sections) have been assumed or prepared by interpolation and/or extrapolation of these data. As such these conditions are an interpretation and must be considered as a guide only.

Change in Conditions

Local variations or anomalies in the generalised ground conditions do occur in the natural environment, particularly between discrete test hole locations. Additionally, certain design or construction procedures may have been assumed in assessing the soil-structure interaction behaviour of the site. Furthermore, conditions may change at the site from those encountered at the time of the geotechnical investigation through construction activities and constantly changing natural forces.

Any change in design, construction methods, or in-ground conditions as noted during construction, from those assumed or reported should be referred to GEOTESTA for appropriate assessment and comment.

Reproduction of Reports

Where it is desired to reproduce the information contained in our geotechnical report or other technical information, for the inclusion in contract documents or engineering specification of the subject development, such reproductions should include at least all of the relevant test hole and test data, together with the appropriate standard description sheets and remarks made in the written report of a factual or descriptive nature. Reports are the subject of copyright and shall not be reproduced without the permission of Geotesta.

Appendix A – Borehole Logs

BOREHOLE LOG

BOREHOLE No: BH1

Page: 1 **of** 1

Client:	CPDM	Drilling Co:	Geotesta Pty Ltd	Easting:	---
Project:	Geotechnical Site Investigation (GSI)	Driller:		Northing:	---
Job No:	NE1995	Rig Type:	Ute Mounted	Grid Ref:	See Figure 1
Location:	1-3 Reid St & 2-4 Woodside Ave, Lindfield	Inclination:	Vertical	Collar RL:	
Date Drilled:	4/11/2024	Bearing:	Vertical	Logged by:	MA Checked by: AW

Test Method: AS 1289.6.3.2-1997 & AS 1726-2017

Depth (m)	Drilling Method	Graphic Log	Group Symbol	MATERIAL DESCRIPTION Type, colour, particle size and shape, structure	Moisture	Consistency / Strength	DCP blows/100mm	FIELD TESTS & NOTES	Sampling / Runs	Water Levels	Depth (m)
0.00											0.00
				Mulching and pebbles (0-0.05m)	M		1				
			SP	Silty **SAND**: brown, with rootlets and organic matters	M		3				
			CI	Silty **CLAY** with sand: medium plasticity, dark brown to grey, trace gravel and rootlets	M	ST	5 4				
0.50							3				0.50
							4				
				Grades: becoming brown, mottled grey			4				
						VST	6				
				Becoming Sandy **CLAY**, pale grey			7				
1.00							7				1.00
							8				
							9				
						H	HB				
1.50	Hand auger			Borehole terminated @1.4m depth due to refusal							1.50
2.00											2.00
2.50											2.50
3.00											3.00
3.50											3.50
4.00											4.00
4.50											4.50
5.00											5.00

consistency:

VS	very soft
S	soft
F	firm
ST	stiff
VST	very stiff
H	hard
WC	well compacted

relative density:

VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

EL: extremly low strength

moisture:

D	Dry
M	Moist
W	Wet
S	Saturated

water:

water level

level risen to

water inflow

soil classification:
soil is classified in accordance with AS1726 unless otherwise noted

Notes:

sampling / testing:

intact sample from core

intact tube sample

Standard Penetration Test

B Bulk sample

Supp Su from Pocket Penetrometer

Suv Su from Field Vane Shear test

BOREHOLE LOG

BOREHOLE No: BH2

Page: 1 **of** 1

Client:	CPDM	Drilling Co:	Geotesta Pty Ltd	Easting:	---
Project:	Geotechnical Site Investigation (GSI)	Driller:		Northing:	---
Job No:	NE1995	Rig Type:	Ute Mounted	Grid Ref:	See Figure 1
Location:	1-3 Reid St & 2-4 Woodside Ave,	Inclination:	Vertical	Collar RL:	
Date Drilled:	4/11/2024	Bearing:	Vertical	Logged by:	MA Checked by: AW

Test Method: AS 1289.6.3.2-1997 & AS 1726-2017

Depth (m)	Drilling Method	Graphic Log	Group Symbol	MATERIAL DESCRIPTION Type, colour, particle size and shape, structure	Moisture	Consistency / Strength	DCP blows/100mm	FIELD TESTS & NOTES	Sampling / Runs	Water Levels	Depth (m)
0.00											0.00
			FILL	**TOPSOIL/FILL**: Clayey SILT, dark grey, trace rootlets	M		1				
							1				
				Grades: Silty **CLAY,** medium plasticity, brown			2				
							2				
0.50							2				0.50
			CI	Natural Silty **CLAY:** medium plasticity, brown	M	F	2				
							2				
						ST	4				
							3				
1.00							4				1.00
							4				
							4				
							5				
							5				
1.50				Becoming Sandy **CLAY:** medium plasticity, brown			4				1.50
				Borehole terminated at 1.5m depth, target depth achieved			4				
						VST	6				
							7				
						H	HB				
2.00											2.00
	Hand auger										
2.50											2.50
3.00											3.00
3.50											3.50
4.00											4.00
4.50											4.50
5.00											5.00

consistency:

VS	very soft
S	soft
F	firm
ST	stiff
VST	very stiff
H	hard
WC	well compacted

relative density:

VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

EL: extremly low strength

moisture:

D	Dry
M	Moist
W	Wet
S	Saturated

water: ▼ water level; level risen to; water inflow

sampling / testing: intact sample from core; intact tube sample (T); Standard Penetration Test; B Bulk sample; Supp Su from Pocket Penetrometer; Suv Su from Field Vane Shear test

soil classification:
soil is classified in accordance with AS1726
unless otherwise noted

Notes:

BOREHOLE LOG

BOREHOLE No: BH3

Page: 1 **of** 1

Client:	CPDM	Drilling Co:	Geotesta Pty Ltd	Easting:	---
Project:	Geotechnical Site Investigation (GSI)	Driller:		Northing:	---
Job No:	NE1995	Rig Type:	Ute Mounted	Grid Ref:	See Figure 1
Location:	1-3 Reid St & 2-4 Woodside Ave,	Inclination:	Vertical	Collar RL:	
Date Drilled:	4/11/2024	Bearing:	Vertical	Logged by:	MA Checked by: AW

Test Method: AS 1289.6.3.2-1997 & AS 1726-2017

Depth (m)	Drilling Method	Graphic Log	Group Symbol	MATERIAL DESCRIPTION Type, colour, particle size and shape, structure	Moisture	Consistency / Strength	DCP blows/100mm	FIELD TESTS & NOTES	Sampling / Runs	Water Levels	Depth (m)
0.00											0.00
	Ute mounted rig			**TOPSOIL**: Silty **SAND**, fine-grained, dark grey, trace clay and rootlets	M	ST	4				
						VST	8				
							7				
							6				
0.50				**Grades:** becoming brown, trace gravelly clay			8				0.50
				Grades: boulders			1	Rod fall			
							1				
			Cl	Natural Silty **CLAY:** medium plasticity, red brown, with siltstone fragments	M	VST	5				
							10				
1.00							12				1.00
				Becoming Sandy **CLAY**: medium plasticity, pale grey			8				
							6				
							11				
							9				
1.50							7				1.50
						H	R				
				SANDSTONE: grey, very low strength, extremely weathered							
				Borehole terminated at 1.8 depth due to refusal							
2.00											2.00
2.50											2.50
3.00											3.00
3.50											3.50
4.00											4.00
4.50											4.50
5.00											5.00

consistency:

VS	very soft
S	soft
F	firm
ST	stiff
VST	very stiff
H	hard
WC	well compacted

relative density:

VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

EL: extremly low strength

moisture:

D	Dry
M	Moist
W	Wet
S	Saturated

water:

water level

level risen to

water inflow

soil classification:
soil is classified in accordance with AS1726
unless otherwise noted

sampling / testing:

intact sample from core

T intact tube sample

Standard Penetration Test

B Bulk sample

Supp Su from Pocket Penetrometer

Suv Su from Field Vane Shear test

Notes:

BOREHOLE LOG

BOREHOLE No: BH4

Page: 1 **of** 1

Client:	CPDM	Drilling Co:	Geotesta Pty Ltd	Easting:	---
Project:	Geotechnical Site Investigation (GSI)	Driller:		Northing:	---
Job No:	NE1995	Rig Type:	Ute Mounted	Grid Ref:	See Figure 1
Location:	1-3 Reid St & 2-4 Woodside Ave,	Inclination:	Vertical	Collar RL:	
Date Drilled:	4/11/2024	Bearing:	Vertical	Logged by:	MA Checked by: AW

Test Method: AS 1289.6.3.2-1997 & AS 1726-2017

Depth (m)	Drilling Method	Graphic Log	Group Symbol	MATERIAL DESCRIPTION Type, colour, particle size and shape, structure	Moisture	Consistency / Strength	DCP blows/100mm	FIELD TESTS & NOTES	Sampling / Runs	Water Levels	Depth (m)
0.00											0.00
			FILL	**FILL:** Clayey **SILT** with sand, dark grey, trace rootlets	M		1 1 2 2				
0.50			CI	Silty **CLAY**: medium plasticity, brown, trace sandstone/siltstone fragments	M	ST	3 3 4				0.50
							3 4				
1.00						VST	5 5 7 6				1.00
				Grades: saturated soil	M-W	ST	4				
1.50				Becoming Sandy **CLAY**: medium plasticity, pale grey			4				1.50
				Grades: with siltstone/sandstone fragments		H	11 15				
				Borehole terminated @1.7m depth, target depth achieved		VST	7 10				
2.00	Hand auger					H	12 10 11 11 17				2.00
2.50							R				2.50
3.00											3.00
3.50											3.50
4.00											4.00
4.50											4.50
5.00											5.00

consistency:

VS	very soft
S	soft
F	firm
ST	stiff
VST	very stiff
H	hard
WC	well compacted

relative density:

VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

EL: extremly low strength

moisture:

D	Dry
M	Moist
W	Wet
S	Saturated

water: water level; level risen to; water inflow

sampling / testing: intact sample from core; intact tube sample; Standard Penetration Test

B Bulk sample
Supp Su from Pocket Penetrometer
Suv Su from Field Vane Shear test

soil classification:
soil is classified in accordance with AS1726 unless otherwise noted

Notes:

BOREHOLE LOG

BOREHOLE No: BH5

Page: 1 **of** 1

Client:	CPDM	Drilling Co:	Geotesta Pty Ltd	Easting:	---
Project:	Geotechnical Site Investigation (GSI)	Driller:		Northing:	---
Job No:	NE1995	Rig Type:	Ute Mounted	Grid Ref:	See Figure 1
Location:	1-3 Reid St & 2-4 Woodside Ave,	Inclination:	Vertical	Collar RL:	
Date Drilled:	4/11/2024	Bearing:	Vertical	Logged by:	MA Checked by: AW

Test Method: AS 1289.6.3.2-1997 & AS 1726-2017

Depth (m)	Drilling Method	Graphic Log	Group Symbol	MATERIAL DESCRIPTION Type, colour, particle size and shape, structure	Moisture	Consistency / Strength	DCP blows/100mm	FIELD TESTS & NOTES	Sampling / Runs	Water Levels	Depth (m)
0.00											0.00
				TOPSOIL: Clayey **SILT** with sand, dark grey	M	F	1 3 3 2 1				
0.50											0.50
			CI	Silty **CLAY:** medium plasticity, brown	M	ST	4 5 5 5 4 4 4 4				
1.00											1.00
				Becoming Sandy **CLAY**: medium plasticity, pale grey		VST	5				
1.50				**Grades**: with sandstone fragments			5 9 10 10 8				1.50
2.00						H	HB				2.00
				SANDSTONE: grey, very low strength, extremely weathered							
	Ute mounted rig			Borehole terminated @2.2m depth due to refusal							
2.50											2.50
3.00											3.00
3.50											3.50
4.00											4.00
4.50											4.50
5.00											5.00

consistency:

VS	very soft
S	soft
F	firm
ST	stiff
VST	very stiff
H	hard
WC	well compacted

relative density:

VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

EL: extremly low strength

moisture:

D	Dry
M	Moist
W	Wet
S	Saturated

water: water level; level risen to; water inflow

sampling / testing: intact sample from core; intact tube sample; Standard Penetration Test

B Bulk sample
Supp Su from Pocket Penetrometer
Suv Su from Field Vane Shear test

soil classification:
soil is classified in accordance with AS1726
unless otherwise noted

Notes:

BOREHOLE LOG

BOREHOLE No: BH6

Page: 1 **of** 1

Client:	CPDM	Drilling Co:	Geotesta Pty Ltd	Easting:	---
Project:	Geotechnical Site Investigation (GSI)	Driller:		Northing:	---
Job No:	NE1995	Rig Type:	Ute Mounted	Grid Ref:	See Figure 1
Location:	1-3 Reid St & 2-4 Woodside Ave,	Inclination:	Vertical	Collar RL:	
Date Drilled:	4/11/2024	Bearing:	Vertical	Logged by:	MA Checked by: AW

Test Method: AS 1289.6.3.2-1997 & AS 1726-2017

Depth (m)	Drilling Method	Graphic Log	Group Symbol	MATERIAL DESCRIPTION Type, colour, particle size and shape, structure	Moisture	Consistency / Strength	DCP blows/100mm	FIELD TESTS & NOTES	Sampling / Runs	Water Levels	Depth (m)
0.00											0.00
			FILL	**FILL:** Silty **SAND,** grey to brown	M		1 2 2 2				
0.50			CI	Silty **CLAY**: medium plasticity, brown	M	F	2 2 2 4 3				0.50
1.00						ST	2 3 3				1.00
				Becoming Sandy **CLAY**: medium plasticity, pale grey		VST	5 5				
1.50							5				1.50
				Borehole terminated @1.5m depth, target depth achieved		H	HB				
2.00											2.00
2.50	Hand auger										2.50
3.00											3.00
3.50											3.50
4.00											4.00
4.50											4.50
5.00											5.00

consistency:

VS	very soft
S	soft
F	firm
ST	stiff
VST	very stiff
H	hard
WC	well compacted

relative density:

VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

EL: extremly low strength

moisture:

D	Dry
M	Moist
W	Wet
S	Saturated

water:

▼ water level

level risen to

water inflow

soil classification:
soil is classified in accordance with AS1726 unless otherwise noted

sampling / testing:

intact sample from core

T intact tube sample

Standard Penetration Test

B Bulk sample

Supp Su from Pocket Penetrometer

Suv Su from Field Vane Shear test

Notes:

BOREHOLE LOG

BOREHOLE No: BH7

Page: 1 **of** 1

Client:	CPDM	Drilling Co:	Geotesta Pty Ltd	Easting:	---
Project:	Geotechnical Site Investigation (GSI)	Driller:		Northing:	---
Job No:	NE1995	Rig Type:	Ute Mounted	Grid Ref:	See Figure 1
Location:	1-3 Reid St & 2-4 Woodside Ave,	Inclination:	Vertical	Collar RL:	
Date Drilled:	4/11/2024	Bearing:	Vertical	Logged by:	MA Checked by: AW

Test Method: AS 1289.6.3.2-1997 & AS 1726-2017

Depth (m)	Drilling Method	Graphic Log	Group Symbol	MATERIAL DESCRIPTION Type, colour, particle size and shape, structure	Moisture	Consistency / Strength	DCP blows/100mm	FIELD TESTS & NOTES	Sampling / Runs	Water Levels	Depth (m)
0.00											0.00
			SP	**TOPSOIL/FILL:** SAND, coarse-grained, yellow brown	M		2 1 2				
				Grades: trace clay							
0.50			CI	Silty **CLAY**: medium plasticity, brown, with bedrock sandstone fragments	M	F	2 2 2 3				0.50
						VST	6 6				
1.00				Becoming Sandy **CLAY**: medium plasticity, pale grey			7 7 7 9 5				1.00
1.50	Solid Flight Auger			Borehole refusal @1.4m depth		H	HB				1.50
2.00											2.00
2.50											2.50
3.00											3.00
3.50											3.50
4.00											4.00
4.50											4.50
5.00											5.00

consistency:

VS	very soft
S	soft
F	firm
ST	stiff
VST	very stiff
H	hard
WC	well compacted

relative density:

VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

EL: extremly low strength

moisture:

D	Dry
M	Moist
W	Wet
S	Saturated

water:

▼ water level

level risen to

water inflow

soil classification:
soil is classified in accordance with AS1726
unless otherwise noted

sampling / testing:

intact sample from core

T intact tube sample

Standard Penetration Test

B Bulk sample

Supp Su from Pocket Penetrometer

Suv Su from Field Vane Shear test

Notes:

Appendix B – Laboratory Test Results

Material Test Report

Report Number:
Issue Number:
Date Issued:
Client:

Geotesta Pty Ltd
Sydney Laboratory
6/20-22 Foundry Road Seven Hills NSW 2147
Phone: 1300 852 216
Email: info@geotesta.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Mohammed Rizwan
Laboratory Manager
NATA Accredited Laboratory Number: 21314

Contact:
Project Number: SL1373
Project Name: Woodside Ave, Lindfield, 2070 NSW
Project Location: Woodside Ave, Lindfield, 2070 NSW
Work Request: 359
Sample Number: S-359A
Date Sampled: 05/11/2024
Dates Tested: 05/11/2024 - 11/11/2024
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Remarks: The lab is not accredited for the above sampling method; the material was sampled by the client.
Site Selection: Selected by Client
Sample Location: **Woodside Ave, Lindfield, 2070 NSW , Depth: BH1@0.6-0.9**
Material: Silty CLAY

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	50		
Plastic Limit (%)	22		
Plasticity Index (%)	**28**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.1		
Linear Shrinkage (%)	**12.0**		
Cracking Crumbling Curling	Cracking & Crumbling		

Material Test Report

Geotesta Pty Ltd
Sydney Laboratory
6/20-22 Foundry Road Seven Hills NSW 2147
Phone: 1300 852 216
Email: info@geotesta.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Mohammed Rizwan
Laboratory Manager
NATA Accredited Laboratory Number: 21314

Report Number:	**SL1373-1**
Issue Number:	1
Date Issued:	18/11/2024
Client:	Woodside Residence Holding DM Pty Ltd Suite G02, Ground Floor, 22 Atchison Street St Leonards NSW, 2065,
Contact:	Michael Gee
Project Number:	SL1373
Project Name:	Woodside Ave, Lindfield, 2070 NSW
Project Location:	Woodside Ave, Lindfield, 2070 NSW
Work Request:	359
Sample Number:	S-359B
Date Sampled:	05/11/2024
Dates Tested:	05/11/2024 - 11/11/2024
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and Preparation of Soils
Remarks:	The lab is not accredited for the above sampling method; the material was sampled by the client.
Site Selection:	Selected by Client
Sample Location:	**Woodside Ave, Lindfield, 2070 NSW , Depth: BH3@0.8-1.2**
Material:	Silty CLAY

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	44		
Plastic Limit (%)	16		
Plasticity Index (%)	**28**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.1		
Linear Shrinkage (%)	**10.0**		
Cracking Crumbling Curling	Cracking		

Material Test Report

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Report Number: **SL1373-1**
Issue Number: 1
Date Issued: 18/11/2024
Client: Woodside Residence Holding DM Pty Ltd
Suite G02, Ground Floor, 22 Atchison Street St Leonards NSW, 2065,
Contact: Michael Gee
Project Number: SL1373
Project Name: Woodside Ave, Lindfield, 2070 NSW
Project Location: Woodside Ave, Lindfield, 2070 NSW
Work Request: 359
Sample Number: S-359C
Date Sampled: 05/11/2024
Dates Tested: 05/11/2024 - 11/11/2024
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Remarks: The lab is not accredited for the above sampling method; the material was sampled by the client.
Site Selection: Selected by Client
Sample Location: **Woodside Ave, Lindfield, 2070 NSW , Depth: BH5@1.00**
Material: Silty CLAY

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	46		
Plastic Limit (%)	23		
Plasticity Index (%)	**23**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.1		
Linear Shrinkage (%)	**12.0**		
Cracking Crumbling Curling	Cracking		

Material Test Report

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Approved Signatory: Mohammed Rizwan
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Report Number: **SL1373-1**
Issue Number: 1
Date Issued: 18/11/2024
Client: Woodside Residence Holding DM Pty Ltd
Suite G02, Ground Floor, 22 Atchison Street St Leonards NSW, 2065,
Contact: Michael Gee
Project Number: SL1373
Project Name: Woodside Ave, Lindfield, 2070 NSW
Project Location: Woodside Ave, Lindfield, 2070 NSW
Work Request: 359
Sample Number: S-359D
Date Sampled: 05/11/2024
Dates Tested: 05/11/2024 - 11/11/2024
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Remarks: The lab is not accredited for the above sampling method; the material was sampled by the client.
Site Selection: Selected by Client
Sample Location: **Woodside Ave, Lindfield, 2070 NSW , Depth: BH7@0.5-0.8**
Material: Silty CLAY

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	43		
Plastic Limit (%)	18		
Plasticity Index (%)	**25**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.1		
Linear Shrinkage (%)	**11.0**		
Cracking Crumbling Curling	Cracking		

Material Test Report

Report Number: **SL1373-1**
Issue Number: 1
Date Issued: 18/11/2024
Client: Woodside Residence Holding DM Pty Ltd
Suite G02, Ground Floor, 22 Atchison Street St Leonards NSW, 2065,
Contact: Michael Gee
Project Number: SL1373
Project Name: Woodside Ave, Lindfield, 2070 NSW
Project Location: Woodside Ave, Lindfield, 2070 NSW
Work Request: 359
Date Sampled: 05/11/2024
Dates Tested: 05/11/2024 - 05/11/2024
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Remarks: The lab is not accredited for the above sampling method; the material was sampled by the client.
Site Selection: Selected by Client
Location: Woodside Ave, Lindfield, 2070 NSW
Material: Silty CLAY

GEOTESTA
Geotesta Pty Ltd
Sydney Laboratory
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NATA WORLD RECOGNISED ACCREDITATION

Approved Signatory: Mohammed Rizwan
Laboratory Manager
NATA Accredited Laboratory Number: 21314

Moisture Content AS 1289 2.1.1

Sample Number	Sample Location	Moisture Content (%)	Min	Max	Material
S-359A	Woodside Ave, Lindfield, 2070 NSW , Depth: BH1@0.6-0.9	20.1 %	**	**	Silty CLAY
S-359B	Woodside Ave, Lindfield, 2070 NSW , Depth: BH3@0.8-1.2	16.7 %	**	**	Silty CLAY
S-359C	Woodside Ave, Lindfield, 2070 NSW , Depth: BH5@1.00	24.0 %	**	**	Silty CLAY
S-359D	Woodside Ave, Lindfield, 2070 NSW , Depth: BH7@0.5-0.8	24.8 %	**	**	Silty CLAY

Geotesta Pty Ltd (NSW)
Unit 6, 20/22 Foundry Road
Seven Hills
NSW 2147

Attention: **Addy Wuthisen**

Report **1156684-S**
Project name WOODSIDE AVE LINDFIELD
Project ID NE1995
Received Date Nov 05, 2024

Client Sample ID			**S1**	**S2**	**S3.1**	**S3.2**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S24-No0011179**	**S24-No0011180**	**S24-No0011181**	**S24-No0011182**
Date Sampled			**Nov 04, 2024**	**Nov 04, 2024**	**Nov 04, 2024**	**Nov 04, 2024**
Test/Reference	LOR	Unit				
Chloride	10	mg/kg	12	< 10	22	20
Conductivity (1:5 aqueous extract at 25 °C as rec.)	10	uS/cm	50	14	48	60
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	6.0	6.0	5.4	4.7
Resistivity*	0.5	ohm.m	200	700	210	170
Sulphate (as SO4)	10	mg/kg	72	36	58	100
Exchangeable Sodium Percentage (ESP)*	0.1	%	3.0	5.1	26	-
Magnesium (exchangeable)*	0.1	meq/100g	0.9	1.5	0.5	-
Potassium (exchangeable)*	0.1	meq/100g	0.3	0.1	< 0.1	-
Sodium (exchangeable)*	0.1	meq/100g	0.2	0.2	0.3	-
Cation Exchange Capacity						
Calcium (exchangeable)*	0.1	meq/100g	4.0	1.7	0.3	-
Cation Exchange Capacity	0.5	meq/100g	5.4	3.6	1.2	-
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.5	5.7	5.0	5.1
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.7	4.9	3.7	3.8
Reaction Ratings*[S05]	0	comment	1.0	2.0	1.0	1.0
Sample Properties						
% Moisture	1	%	16	17	13	12

Client Sample ID			**S4**	**S5.1**	**S5.2**	**S6**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S24-No0011183**	**S24-No0011184**	**S24-No0011185**	**S24-No0011186**
Date Sampled			**Nov 04, 2024**	**Nov 04, 2024**	**Nov 04, 2024**	**Nov 04, 2024**
Test/Reference	LOR	Unit				
Chloride	10	mg/kg	< 10	< 10	23	< 10
Conductivity (1:5 aqueous extract at 25 °C as rec.)	10	uS/cm	< 10	23	73	13
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	6.0	5.9	5.1	6.6
Resistivity*	0.5	ohm.m	1100	440	140	750
Sulphate (as SO4)	10	mg/kg	13	30	120	12
Exchangeable Sodium Percentage (ESP)*	0.1	%	7.2	4.5	-	3.0
Magnesium (exchangeable)*	0.1	meq/100g	1.2	1.5	-	1.2
Potassium (exchangeable)*	0.1	meq/100g	0.1	0.2	-	0.1
Sodium (exchangeable)*	0.1	meq/100g	0.2	0.2	-	0.2

Client Sample ID			S4	S5.1	S5.2	S6
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S24-No0011183	S24-No0011184	S24-No0011185	S24-No0011186
Date Sampled			Nov 04, 2024	Nov 04, 2024	Nov 04, 2024	Nov 04, 2024
Test/Reference	LOR	Unit				
Cation Exchange Capacity						
Calcium (exchangeable)*	0.1	meq/100g	1.7	2.4	-	5.3
Cation Exchange Capacity	0.5	meq/100g	3.3	4.3	-	6.9
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.5	5.3	5.0	6.3
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.5	4.3	4.1	5.1
Reaction Ratings*[S05]	0	comment	2.0	1.0	1.0	1.0
Sample Properties						
% Moisture	1	%	15	18	9.9	17

Client Sample ID			S7.1	S7.2
Sample Matrix			Soil	Soil
Eurofins Sample No.			S24-No0011187	S24-No0011188
Date Sampled			Nov 04, 2024	Nov 04, 2024
Test/Reference	LOR	Unit		
Chloride	10	mg/kg	< 10	< 10
Conductivity (1:5 aqueous extract at 25 °C as rec.)	10	uS/cm	25	33
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	5.7	5.3
Resistivity*	0.5	ohm.m	390	300
Sulphate (as SO4)	10	mg/kg	52	67
Exchangeable Sodium Percentage (ESP)*	0.1	%	2.0	-
Magnesium (exchangeable)*	0.1	meq/100g	1.3	-
Potassium (exchangeable)*	0.1	meq/100g	0.3	-
Sodium (exchangeable)*	0.1	meq/100g	< 0.1	-
Cation Exchange Capacity				
Calcium (exchangeable)*	0.1	meq/100g	2.9	-
Cation Exchange Capacity	0.5	meq/100g	4.6	-
Acid Sulfate Soils Field pH Test				
pH-F (Field pH test)*	0.1	pH Units	5.5	5.5
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.6	4.4
Reaction Ratings*[S05]	0	comment	2.0	2.0
Sample Properties				
% Moisture	1	%	19	23

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

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

Description	Testing Site	Extracted	Holding Time
Chloride	Sydney	Nov 07, 2024	28 Days
- Method: LTM-INO-4270 Anions by Ion Chromatography			
pH (1:5 Aqueous extract at 25 °C as rec.)	Sydney	Nov 07, 2024	7 Days
- Method: LTM-GEN-7090 pH by ISE			
Sulphate (as SO4)	Sydney	Nov 07, 2024	28 Days
- Method: In-house method LTM-INO-4270 Sulphate by Ion Chromatograph			
Conductivity (1:5 aqueous extract at 25 °C as rec.)	Sydney	Nov 07, 2024	7 Days
- Method: LTM-INO-4030 Conductivity			
Magnesium (exchangeable)	Melbourne	Nov 12, 2024	180 Days
- Method: LTM-MET-3060 Cation Exchange Capacity and ESP			
Potassium (exchangeable)	Melbourne	Nov 12, 2024	180 Days
- Method: LTM-MET-3060 Cation Exchange Capacity and ESP			
Sodium (exchangeable)	Melbourne	Nov 12, 2024	180 Days
- Method: LTM-MET-3060 Cation Exchange Capacity and ESP			
Cation Exchange Capacity	Melbourne	Nov 12, 2024	28 Days
- Method: LTM-MET-3060 Cation Exchange Capacity by bases & Exchangeable Sodium Percentage			
Exchangeable Sodium Percentage (ESP)	Melbourne	Nov 12, 2024	28 Days
- Method: LTM-MET-3060 - Cation Exchange Capacity (CEC) & Exchangeable Sodium Percentage (ESP)			
Acid Sulfate Soils Field pH Test	Sydney	Nov 07, 2024	7 Days
- Method: LTM-GEN-7060 Determination of field pH (pHF) and field pH peroxide (pHFOX) tests			
% Moisture	Sydney	Nov 05, 2024	14 Days
- Method: LTM-GEN-7080 Moisture			

eurofins

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Eurofins Environment Testing Australia Pty Ltd
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Company Name: Geotesta Pty Ltd (NSW)
Address: Unit 6, 20/22 Foundry Road
Seven Hills
NSW 2147

Project Name: WOODSIDE AVE LINDFIELD
Project ID: NE1995

Order No.:
Report #: 1156684
Phone: 1300852 216
Fax:

Received: Nov 5, 2024 4:05 PM
Due: Nov 12, 2024
Priority: 5 Day
Contact Name: Addy Wuthisen

Eurofins Analytical Services Manager : Asim Khan

Sample Detail						Acid Sulfate Soils Field pH Test	Aggressivity Soil Set	Eurofins Suite B20	Moisture Set
Melbourne Laboratory - NATA # 1261 Site # 1254								X	
Sydney Laboratory - NATA # 1261 Site # 18217						X	X	X	X
External Laboratory									
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**				
1	S1	Nov 04, 2024		Soil	S24-No0011179	X	X	X	X
2	S2	Nov 04, 2024		Soil	S24-No0011180	X	X	X	X
3	S3.1	Nov 04, 2024		Soil	S24-No0011181	X	X	X	X
4	S3.2	Nov 04, 2024		Soil	S24-No0011182	X	X		X
5	S4	Nov 04, 2024		Soil	S24-No0011183	X	X	X	X
6	S5.1	Nov 04, 2024		Soil	S24-No0011184	X	X	X	X
7	S5.2	Nov 04, 2024		Soil	S24-No0011185	X	X		X
8	S6	Nov 04, 2024		Soil	S24-No0011186	X	X	X	X
9	S7.1	Nov 04, 2024		Soil	S24-No0011187	X	X	X	X
10	S7.2	Nov 04, 2024		Soil	S24-No0011188	X	X		X
Test Counts						10	10	7	10

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ppm:** parts per million
µg/L: micrograms per litre	**ppb:** parts per billion	**%:** Percentage
org/100 mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100 mL:** Most Probable Number of organisms per 100 millilitres
CFU: Colony Forming Unit	**Colour:** Pt-Co Units (CU)	

Terms

APHA	American Public Health Association
CEC	Cation Exchange Capacity
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where moisture has been determined on a solid sample, the result is expressed on a dry weight basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples, these are performed on laboratory-certified clean sands and in the case of water samples, these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC represents the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a similar compound to the analyte target is reported as percentage recovery. See below for acceptance criteria.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment; however, free tributyltin was measured, and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 6.0
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should only be used as a guide and may be different when site-specific Sampling Analysis and Quality Plan (SAQP) have been implemented.

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is ≤30%; however, the following acceptance guidelines are equally applicable:

Results <10 times the LOR:	No Limit
Results between 10-20 times the LOR:	RPD must lie between 0-50%
Results >20 times the LOR:	RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range, not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%, VOC recoveries 50 – 150%

PFAS field samples containing surrogate recoveries above the QC limit designated in QSM 6.0, where no positive PFAS results have been reported or reviewed, and no data was affected.

QC Data General Comments

1. Where a result is reported as less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown are not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery, the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results, a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data; thus, it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Chloride	mg/kg	< 10			10	Pass	
Sulphate (as SO4)	mg/kg	< 10			10	Pass	
Exchangeable Sodium Percentage (ESP)*	%	< 0.1			0.1	Pass	
Magnesium (exchangeable)*	meq/100g	< 0.1			0.1	Pass	
Potassium (exchangeable)*	meq/100g	< 0.1			0.1	Pass	
Sodium (exchangeable)*	meq/100g	< 0.1			0.1	Pass	
Method Blank							
Cation Exchange Capacity							
Calcium (exchangeable)*	meq/100g	< 0.1			0.1	Pass	
Cation Exchange Capacity	meq/100g	< 0.5			0.5	Pass	
Method Blank							
Conductivity (1:5 aqueous extract at 25 °C as rec.)	uS/cm	< 10			10	Pass	
Method Blank							
Conductivity (1:5 aqueous extract at 25 °C as rec.)	uS/cm	< 10			10	Pass	
LCS - % Recovery							
Chloride	%	117			70-130	Pass	
Sulphate (as SO4)	%	109			70-130	Pass	
LCS - % Recovery							
Conductivity (1:5 aqueous extract at 25 °C as rec.)	%	97			70-130	Pass	
Resistivity*	%	97			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Chloride	S24-No0011183	CP	%	104			70-130	Pass	
Sulphate (as SO4)	S24-No0011183	CP	%	100			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Conductivity (1:5 aqueous extract at 25 °C as rec.)	S24-No0011183	CP	uS/cm	< 10	< 10	<1	30%	Pass	
pH (1:5 Aqueous extract at 25 °C as rec.)	S24-No0011183	CP	pH Units	6.0	5.9	pass	30%	Pass	
Resistivity*	S24-No0011183	CP	ohm.m	1100	1100	5.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Chloride	S24-No0011185	CP	mg/kg	23	24	1.0	30%	Pass	
Conductivity (1:5 aqueous extract at 25 °C as rec.)	S24-No0011185	CP	uS/cm	73	73	1.0	30%	Pass	
pH (1:5 Aqueous extract at 25 °C as rec.)	S24-No0011185	CP	pH Units	5.1	5.0	pass	30%	Pass	
Resistivity*	S24-No0011185	CP	ohm.m	140	140	1.0	30%	Pass	
Sulphate (as SO4)	S24-No0011185	CP	mg/kg	120	120	1.0	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	S24-No0011185	CP	pH Units	5.0	5.0	pass	20%	Pass	
pH-FOX (Field pH Peroxide test)*	S24-No0011185	CP	pH Units	4.1	4.0	pass	0%	Pass	

Duplicate									
				Result 1	Result 2	RPD			
Exchangeable Sodium Percentage (ESP)*	S24-No0011186	CP	%	3.0	3.2	5.0	30%	Pass	
Magnesium (exchangeable)*	S24-No0011186	CP	meq/100g	1.2	1.2	2.0	30%	Pass	
Potassium (exchangeable)*	S24-No0011186	CP	meq/100g	0.1	0.2	9.0	30%	Pass	
Sodium (exchangeable)*	S24-No0011186	CP	meq/100g	0.2	0.2	4.0	30%	Pass	
Duplicate									
Cation Exchange Capacity				Result 1	Result 2	RPD			
Calcium (exchangeable)*	S24-No0011186	CP	meq/100g	5.3	5.2	2.0	30%	Pass	
Cation Exchange Capacity	S24-No0011186	CP	meq/100g	6.9	6.8	2.0	30%	Pass	
Duplicate									
Sample Properties				Result 1	Result 2	RPD			
% Moisture	S24-No0011188	CP	%	23	20	13	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	No
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
S05	Field Screen uses the following fizz rating to classify the rate the samples reacted to the peroxide: 1.0; No reaction to slight. 2.0; Moderate reaction. 3.0; Strong reaction with persistent froth. 4.0; Extreme reaction.

Authorised by:

Asim Khan	Analytical Services Manager
Mary Makarios	Senior Analyst-Metal
Roopesh Rangarajan	Senior Analyst-Sample Properties
Ryan Phillips	Senior Analyst-Inorganic
Vivian Wang	Senior Analyst-Metal

Glenn Jackson
Managing Director

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.