GEOTECHNICAL INVESTIGATION REPORT

Client – Anglicare
Project Title – 215, 229-239 Pitt St, Merrylands
Project Type – Proposed Multi-Storey Development
Project No. – GR24220rev01
Date Issued – 16/10/2025
Description of Services – Geotechnical Investigation Report

Document Control

Report Title: Geotechnical Investigation Report

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Revision	Details	Date	Amended By
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01	Updated Section	16/10/2025	DM

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1. Introduction

1.1 Background

CEC Geotechnical Pty Ltd was engaged by the client Anglicare to carry out a geotechnical investigation for the proposed multistorey residential development at **215, 229-239 Pitt St, Merrylands, NSW**.

This report provides geotechnical recommendations regarding the existing ground conditions in order to have a clear guidance for design and construction of ground structures.

The results presented in this report are mainly based on the investigation, the laboratory tests and the author's experience. This report is prepared based on the information received from the client. If the site conditions change before, during or after construction, the geotechnical engineer shall be notified.

1.2 Provided Information

- A set of Architectural Drawings including site plans, floor plans, prepared by Fuse Architects, date: 22/07/2025, Project No. 2421, Rev.A.
- Survey Plan prepared by Beveridge Williams Ref 2401343 issue: A, issue date: 23/09/2024.

1.3 Proposed Development

With reference to the information provided by the client, it is understood that the proposed development will comprise the demolition of existing dwelling & construction a multi-storey development with four basements and associated landscape work.

The lowest proposed basement has a Finished Floor level (FFL) of 4.4 and hence the maximum excavation depths will be approximately 13.5m. Deeper excavation is expected locally for the proposed lift shafts, building footings and service pits and trenches.

1.4 Objectives

The objective of this report included:

- Assessment of subsurface profiles and groundwater considerations.
- Excavation methodologies and monitoring.
- Design parameters and allowable bearing capacities.
- Earthquake subsoil classification in accordance with Australian Standards *"AS 1170.4-2007".*
- Soil salinity and aggressivity assessment.
- General geotechnical recommendations regarding site preparation or further works required.

1.5 Scope of Works

The geotechnical site investigation was carried out on 16/12/2024 to 19/12/2024 by an experienced geotechnical engineer in accordance with "*AS 1726*". The scope of works included:

- Desktop Study including a review of existing architectural drawings, geology and topography of the site and neighbouring properties.
- Drilling of 3 boreholes (BH1 to BH3) by a Camacchio drill rig with 100mm diameter solid flight auger to depths ranging from 25-30m. (location found in Appendix A and logs found in Appendix B)
- Standard Penetration Test (SPT) testing in accordance with Australian Standards "*AS 1289.6*"
- Site classification (see Section 4.1) in accordance with Australian Standards "*AS 2870 2011*".
- 9 soil samples were extracted from the borehole, to test the soil/rock salinity and aggressivity (see Appendix C)

1.6 Constraints

If a more detailed geotechnical investigation regarding soil reactivity is available, it should be provided to CEC Geotechnical Pty Ltd. In addition, any details related to the site's history should be supplied. This report was produced based on a limited geotechnical investigation in line with the requirements of "*AS 1726 and AS 2870*".

This classification is based on the findings in this investigation, including visual-tactile identification of the soil profile combined with the author's local knowledge and experience. If the site conditions change from those of the original investigation, the findings of this report may be void.

2. Desktop Assessment

2.1 General Site Description

The site is located within the Local Government Area (LGA) of City of Cumberland and is registered as Lot 2 DP501597, Lot 2 DP537031, Lot J DP10354, Lot 1 DP1079960, Lot 1 DP537031. The site covers an area of 2,106m^2 and is bounded by McFarlane Street to the North, Short Lane to the South, Pitt St to the East & Reyes St to the West with surrounding commercial and residential properties as shown in Figure 1. During the site visit, it was observed that there were existing storefronts and businesses situated on the site.

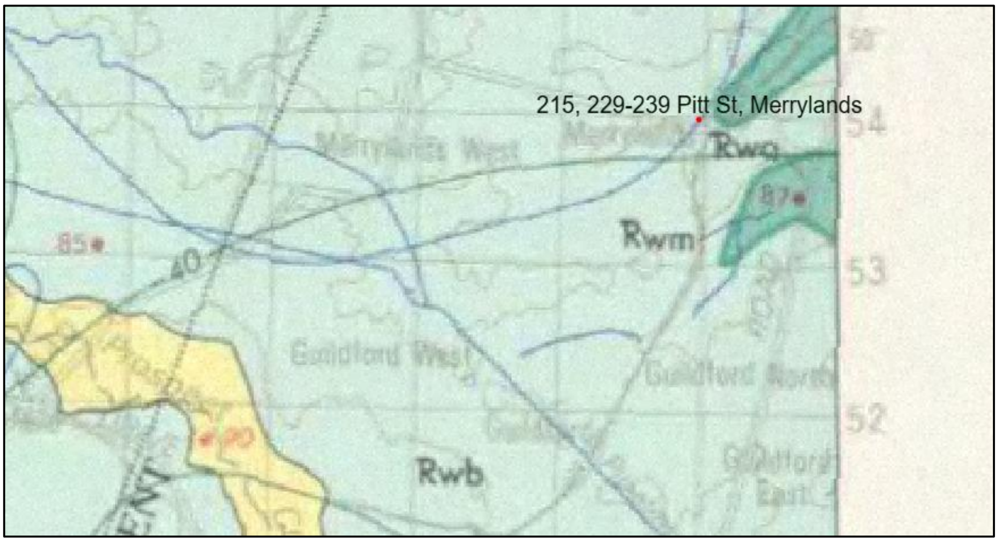
<u>Figure 1:</u> Site Location (215, 229-239 Pitt St, Merrylands NSW)

2.2 Topography and Geological Description

Based on the architectural drawings, it can be noted that the site is relatively flat.

The 1:100,000 scale Geological Series Sheet 9030 (Edition 1) 1991 of the Penrith region (Figure 2) indicates that the subject site is underlain by Wianamatta group Bringelly SHALE **(Rwb)** consists of dark-grey to black claystone-siltstone and fine sandstone-siltstone laminite.

Figure 2: 1:100,000 scale Geological Series Map of the Penrith Region



3. Geotechnical Investigation Results

3.1 Sub-Surface Conditions

The results of the investigation indicate that the subsurface profile comprises Silty CLAY underlain by SHALE BEDROCK. Based on the borehole information, a summary of subsurface conditions is presented below. The location of each borehole can be found in Appendix A and more detailed logs can be found in Appendix B.

Table 1: Subsurface Conditions

Unit	Description	BH01 (m)*	BH02 (m)*	BH03 (m)*
Unit – 1: Non-Soil	Concrete	0.0-0.2	0.0-0.2	0.0-0.1
Unit – 2: Non-Soil	Subbase Coarse	0.2-0.5	0.2-0.5	-
Unit – 3: Residual	Silty CLAY CH: stiff to very stiff, high plasticity, grey and yellow,	0.5-6.7	0.5-6.3	0.1-6.0
Unit – 4: Residual, (Class V)	SHALE: distinctly weathered, dark grey and black	6.7-7.5	6.3-8.8	6.0-10.4
Unit – 5: Rock, (Class IV)	SHALE: highly weathered, high strength, black and grey	7.5-12.7	8.8-14.3	10.4-21.7
Unit – 6: Rock, (Class III)	SHALE: moderately weathered, high strength, dark grey	12.7-24.0	14.3-30.0	21.7-25.0
Unit – 7: Rock, (Class II)	SHALE: slightly weathered, high to very high strength, dark grey	24.0-25.2	-	-

**Depths below ground level (BGL) at the location of each borehole. This may vary depending on other areas of the site.*
BH1, BH2 and BH3 were terminated at depths of 25.2 m, 30.0m and 25.0m respectively.

3.2 Groundwater Observation

Groundwater may have been encountered within the investigated depths during the geotechnical investigation on the 16th of December 2024 to the 19th of December 2024. However, due to the usage of water during the rock coring, the data for the water level was not accurate.

Three groundwater monitoring wells were installed in the boreholes (BH1, BH2 & BH3). The observed Groundwater levels were measured during additional site visits on 13/05/25 and 06/06/25 and are summarised in the table below. The measurement was conducted after the fieldwork was completed to allow the groundwater levels to stabilise. A geotechnical engineer regularly monitored the water levels for three months in order to establish a baseline groundwater level at the proposed site.

Table 2: Observed Groundwater Levels

Groundwater Well	Borehole	Ground RL	Groundwater Level (m bgl)/RL		Approximate depth of Rock Level Encountered bgl
			13/05/2025	06/06/2025	
GW1	BH1	17.03	12.9m/ RL 4.13	13.27m/ RL 3.76	6.7m/ RL 10.33
GW2	BH2	17.12	12.28m/ RL 4.84	13.47m/ RL 3.65	6.3m/ RL 10.82
GW3	BH3	17.27	12.43m/ RL 4.84	13.98m/ RL 3.29	6.0m/ RL 11.27

3.3 Lab Test Results

9 samples were collected at depths of 0.5 m, 1.0 m, 2.0 m and 3.0 m. The samples were submitted to NATA accredited laboratories for further testing. These tests included:

- Chemical testing (Salinity, pH, Chloride (Cl), sulphates (SO_4), and electrical conductivity) to assess soil salinity and aggressivity.

3.3.1 Soil Salinity & Aggressivity Test Results

The soil encountered is Silty CLAY and was tested as stipulated in the Department of Natural Resources (DNR) publication “Site Investigations for Urban Salinity” (2002).

Results of the laboratory testing are attached to this report in Appendix C and summarised in Tables 3 and 4.

Table 3: Results of Electrical Conductivity Test (Salinity)

Borehole	Depth (m bgl)	Electrical Conductivity (dS/m)	Multiplication Factor [a]	Electrical Conductivity of Saturated Extract (dS/m) EC_e	Soil Type
BH1	0.5-1.0	0.18	10	1.8	Loam
BH1	2.0	0.022	10	0.220	Loam
BH1	4.0	0.210	10	2.1	Loam
BH2	0.5	0.012	10	0.12	Loam
BH2	1.0	<0.01	10	<0.1	Loam
BH2	3.0	0.015	10	0.15	Loam
BH3	0.5	0.013	10	0.13	Loam
BH3	1.0	0.043	10	0.43	Loam
BH3	2.0	0.011	10	0.11	Loam

"Site Investigations for Urban Salinity" (2002)

Non-saline <2 dS/m
Saline at >4 dS/m
Slightly saline 2-4 dS/m
Moderately saline 4-8 dS/m
Very saline 8-16 dS/m
Highly saline >16 dS/m

Table 4: Soil pH, Chloride, Sulphate and Electrical Resistivity Test Results (AS 2159-2009)

Borehole	Depth (m bgl)	MC* (%)	pH	Chloride (mg/kg)	Sulphate as $S0^4$ (mg/kg)	Electrical Resistivity (ohm.cm)
BH1	0.5-1.0	18	8.3	<10	280	5600
BH1	2.0	16	9.3	11	<10	45000
BH1	4.0	15	8.7	240	45	4700
BH2	0.5	18	7.7	<10	<10	84000
BH2	1.0	17	8.1	<10	<10	130000
BH2	3.0	15	9.4	<10	<10	68000
BH3	0.5	14	9.3	<10	<10	74000
BH3	1.0	11	9.1	38	11	23000
BH3	2.0	16	9.0	<10	<10	92000

**MC = Moisture Content*
Note: Electrical Resistivity converted from Electrical Conductivity

3.4 Plasticity Index and Linear Shrinkage Results

The following tests were conducted in order to assess the site's reactivity and classification. Plasticity index is used to measure the moisture content range at which the soil stays in a plastic state, depending on the amount of clay in the sample. Additionally, linear shrinkage was also measured to determine the volatility of the clay materials within a sample. Table 5 demonstrates the plasticity index and linear shrinkage results which were obtained from a NATA accredited laboratory (20925). Based on these results, it can be determined that the sampled soil exhibits low plasticity characteristics in accordance with the Unified Soil Classification System (USCS) Plasticity Chart, as attached in Appendix D.

Table 5: Summary of Plasticity Index and Linear Shrinkage Laboratory Test Results

Borehole	Depth (m bgl)	Soil Type	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)
BH3	1.5	Silty CLAY	29	17	12	1.0

3.5 Uniaxial Compressive Strength Results

Uniaxial Compressive Strength (UCS) was conducted in order to determine the maximum axial compressive stress prior to failure in accordance with "*AS 4133.4.2 Determination of uniaxial compressive strength – rock strength less than 50 MPa*" with a rate of displacement of <0.1mm/min. These samples were tested from a NATA accredited Laboratory (14874) and demonstrated in Table 6 and Appendix C. It represents a summary of the UCS results obtained from each borehole with their respective locations and dimensions as shown.

Table 6: Summary of UCS Laboratory Test Results

Borehole	Depth (m bgl)	Specimen Height (mm)	Average Specimen Diameter (mm)	Moisture Content (%)	Uniaxial Compressive Strength (MPa)
BH1	10.2	101.1	51.6	2.3	27
BH1	15.2	126.9	51.7	1.9	21
BH1	19.4	104.8	51.6	1.6	21
BH1	24.6	107.5	51.3	1.5	31
BH2	17.1	100.9	51.5	2.4	23
BH2	21.1	119.4	51.4	2.4	15
BH3	11.8	101.9	51.4	2.2	40
BH3	15.27	129.4	51.7	16.8	43

4. Discussion and Recommendations

4.1 Site Classification

Due to the presence of trees and topsoil, the overall site is classified as **Class P** in accordance with *"AS 2870 2011"*. Once topsoil/fill is removed, this site will then be classified as **CLASS H1** in accordance with *"AS 2870 2011"*. Class H1 is indicative of highly reactive site which can experience **40 to 60mm** movement due to moisture changes.

At basement slab level the site can be classified as Class A which is indicative of little or no change in moment due to moisture change in accordance with *"AS 2870 2011"*.

4.2 Exposure Classification

The lab results show that the electrical conductivity of saturated extracts (ECe) is approximately <0.1 ds/m to 2.1 ds/m, and hence the samples of residual deposit soil are "**Slightly-Saline**".

- In accordance with *"AS 2159" Piling – Design and Installation*, the lab results indicated that the low permeability soil pH is: **"Non-aggressive"** for Steel piles and "**Non-aggressive"** for Reinforced Concrete Piles
- Chloride, Sulphate and Electrical resistivity is **"Non-aggressive"** for Steel Piles and Reinforced Concrete Piles.

4.3 Excavation Assessment

Accordance with the proposed basement levels, the excavations for the proposed basement should mostly encounter residual Silty CLAY underlain by SHALE Bedrock. Removal of materials should be carried out using conventional earthmoving equipment, such as a hydraulic excavator or backhoe. If rock hammers are to be used, such works will need to be completed carefully as there may be direct transmission of ground vibration to existing structures. We recommend that a geotechnical engineer to be present at the site as they may be required to carry out quantitative vibration monitoring to confirm vibration units do not exceed the maximum Peak Particle Velocity (PPV) values provided in Table 7 below.

Table 7: Recommended Maximum PPV

Type of Building or Structure	Maximum PPV (mm/sec)
Historical buildings or structures in sensitive conditions	2
Residential and low-rise buildings	5
Brick or unreinforced structures in good condition	10
Commercial and industrial buildings or structures of reinforced concrete or steel construction	25

It is recommended that monitoring is carried out during demolition and excavation using a vibration monitoring instrument (Vibra) and alarm levels (being the appropriate PPV).

If the vibrations exceed the above values or appear excessive, the excavations should cease, and the project Geotechnical Engineer should be contacted immediately.

Excavation methods should be adopted which limit ground vibrations at the adjoining developments to not more than 10 mm/sec. Vibration monitoring may be required to verify that this is achieved. However, if the contractor adopts methods and/or equipment in accordance with the recommendations in Table 7 for a ground vibration limit of 5 mm/sec, vibration monitoring may not be required. The limits of 5 mm/sec and 10 mm/sec are expected to be achievable if rock breaker equipment or other excavation methods are restricted as indicated in Table 8 as follows:

Table 8: Rock Breaking Equipment and Operation Guidelines

Distance From Adjoining Structure (m)	Maximum Peak Particle Velocity 5 mm/sec		Maximum Peak Particle Velocity 10 mm/sec*	
	Equipment	Operating Limit (% of Maximum Capacity)	Equipment	Operating Limit (% of Maximum Capacity)
1.0 to 2.0	Hand operated jackhammer only	100	300 kg rock hammer	50
2.0 to 5.0	300 kg rock hammer	50	300 kg rock hammer *or* 600 kg rock hammer	100 50
5.0 to 10.0	300 kg rock hammer *or* 600 kg rock hammer	100 50	600 kg rock hammer *or* 900 kg rock hammer	100 50

**Vibration monitoring is recommended for a 10 mm/sec vibration limit.*

4.4 Shoring/Footings Design Parameters

The following parameters established from Rankine's theory would be valid in the design of a retention system. These bearing pressures apply where footings are founded minimum 300mm into the specified material.

Table 9: Geotechnical Design Parameters

Material Description	Unit Weight (kN/m³)	Allowable Bearing Capacity (kPa)	Ultimate Bearing Capacity (kPa)	C (kPa)	Friction Angle (°)	K_a#	K_p#	K_o#	Modulus of Elasticity (MPa)	Poisson's Ratio v'
Unit 3: Silty CLAY (CH): very stiff-hard	20	200	500	2	28	0.36	2.77	0.53	8	0.3
Unit 4: Extremely weathered, Rock (Class V)	20	500	1200	10	28	0.33	3.00	0.50	50	0.3
Unit 5: Highly weathered, Rock (Class IV)	21	1500	3700	50	30	0.31	3.25	0.47	100	0.3
Unit 6: Moderately weathered, Rock (Class III)	22	3500	8700	100	30	0.28	3.54	0.44	300	0.3
Unit 7: Slightly weathered, Rock (Class II)	24	5000	12500	250	34	0.28	3.54	0.44	1000	0.2

**Approximate depth below ground level based on borehole logs completed during geotechnical investigation.*
#K_a, K_p and K_o are the active, passive and at-rest earth pressure coefficients.
Note: Unit 1 & Unit 2 Non-Soil design parameters are not applicable.

The following may need to be adopted in response to the design of any retaining wall structures:

- The retaining walls which are propped or restrained by concrete slabs, should be designed using a triangular lateral earth pressure distribution and the K_o, as mentioned in Table 9, for the soil profiles and other backfill materials.
- Free-standing cantilever walls should be designed using a triangular lateral earth pressure distribution and the K_a, as mentioned in Table 9, for the soil profiles and other backfill materials.
- Lateral toe restraint can be achieved through passive resistance adjacent to the wall using a triangular lateral earth pressure and the K_p, as mentioned in Table 9, for the soil profiles and other backfill materials.
- All surcharge loads should be allowed for in the retaining wall design, including building footings and construction related activities, using the appropriate earth pressure coefficient as mentioned in Table 9. (Sloping needs to be considered a surcharge)

4.5 Batter Slopes (Temporary)

The following temporary batter slopes may be considered in areas where sufficient space exists between the basement excavation and the boundary and where an adjacent footing is outside a zone of influence obtained by drawing a line at a 45° angle up from the toe of the proposed excavation.

Table 10: Recommended Batter Slopes (temporary)

Material	Maximum Batter Slope (H:V)
Topsoil / Fill	2:1
Silty CLAY	1.5:1
Rock: SHALE	1:1

4.6 Groundwater Management

The proposed basement levels will extend about below the current predicted groundwater level. A comprehensive groundwater seepage analysis will be necessary to evaluate the inflow rates into the basement excavations and assess the potential groundwater drawdown behind the basement walls. Based on this analysis, the detailed hydrogeological assessment will decide whether the basement should be designed and constructed as a drained or tanked structure.

4.7 Earthquake Site Assessment

In accordance with Australian Standard *"AS 1170.4-2007"* (Reference 2) the site may be classified as "Shallow Soil Site " (Class Ce).

4.8 Sub-grade Preparation

- Fill should be compacted close to its optimum moisture content (+/- 2%) during compaction.
- The compaction method and equipment shall suit the filled material. The compaction of soil shall be tested by a NATA accredited laboratory and Geotechnical Inspection and Testing Authority (GITA) to ensure it meets the requirements of "*AS 3798-2007 Guidelines on earthworks for commercial and residential developments*".
- Any organic materials (including topsoil) within the proposed building envelope are to be removed.
- The site should be proof rolled after an initial site scrape to unveil any soft spots. Any soft areas are to be removed and backfilled with compacted fill material as described in "*AS 2870-2011*", cl 6.4.2.

4.9 Conditions of the Recommendations

- The descriptions of the soils encountered in the boreholes follow those outlined in "*AS 1726-2017*", Geotechnical Site Investigations. Colour descriptions can vary with soil moisture content and individual interpretation.
- The advice given in this report assumes that the test results are representative of the overall subsurface conditions. However, it should be noted that actual conditions in some parts of the building site may differ from those found in the boreholes. If excavations reveal soil conditions significantly different from those shown in our attached Borehole Log(s), CEC Geotechnical shall be consulted and the excavations shall be stopped immediately.
- Depths mentioned in this report are measured from the surface during testing and may vary accordingly if any filling or excavation works are carried out. The description of the foundation material has been provided for ease of recognition over the whole building site.
- Any sketches in this report should be considered as only approximate pictorial evidence of our work. Therefore, unless otherwise stated, any dimensions or slope information should not be used for any building cost calculations and/or positioning of the building. Dimensions on logs are correct.

5. Further Geotechnical Recommendations

Furthermore, CEC Geotechnical should be engaged at the following stages:

- An additional Hydrogeological Assessment Report and Dewatering Management Plan
- If soil conditions encountered differ significantly from those described within this report.
- If the proposed development is altered significantly from what has been assessed and described within this report.
- To confirm safe batter angles and excavation methods during construction.
- To confirm founding materials and allowable bearing capacity.
- If the site conditions at the time of construction differ from those described in this report, then CEC Geotechnical shall be contacted. The owner/builder will be responsible for any fees associated with this additional work.

6. Limitations

This report and its associated recommendations have been prepared exclusively for our client who is named on the front page of this report and is the only intended entity to benefit from this report. CEC Geotechnical notes that reliance on the information provided in this report by any third party will be at their own risk. It should be noted that the analysis and conclusions made in this report may rely on works by other consultants and entities and hence, should these documents and investigations be incorrect, CEC Geotechnical must be made aware and the results of this report may be void.

For and on behalf of CEC Geotechnical Pty Ltd

Dean Mitrevski

Geotechnical Engineer
B.E (Civil & Structures) (Hons)

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Principal Engineer
B.E. (Civil & Structures), M.E. (Geotechnical), M.I.E. Aust. CPEng, NER, APEC Eng IntPE(Aus)
NSW Fair Trading Design Practitioner (DEP0001792)
NSW Fair Trading Professional Engineer (PRE0001237)

References

- AS 2870 -2011, Residential Slab and Footings – Construction
- AS 1726-2017, Geotechnical Site Investigations
- AS 2159-2009, Piling - Design and Installation
- AS 3798-2007 “Guidelines on earthworks for commercial and residential developments”
- Geological Series Sheet 9030 (EDITION 1) 1991, Map of the Penrith Region, Scale 1:100,000
- Site investigations for urban salinity, Date 1 January 2002, Department of Land and Water Conservation.

APPENDIX A – Site Plan

CEC GEOTECHNICAL

Drawn	AS	CLIENT: ANGLICARE SITE ADDRESS: 215, 229-239 PITT ST, MERRYLANDS	Figure	1
Checked	AE		Title	Site Plan
Date	22/01/2025			
Scale @ A3	NTS		Job No	GR24220

APPENDIX B – Bore Hole Logs and DCP Test Results

CEC Geotechnical

U4 83, Grose Street, North Parramatta, NSW 2151

Phone: (02) 9630 0121

Geotechnical Log - Borehole

BH1

UTM	:	Drill Rig	: COMACCHIO	Job Number	: GR24220
Easting (m)	: 0.00	Driller Supplier	:	Client	: Anglicare
Northing (m)	: 0.00	Logged By	: AS	Project	: Proposed Development
Ground Elevation	: Not Surveyed	Reviewed By	:	Location	: 215/229-239 Pitt St, Merrylands NSW
Total Depth	: 25.2 m BGL	Date	: 15/01/2025	Loc Comment	:

Drilling Method	DCP Graph	Depth (m)	Water	Soil Origin	Graphic Log	Classification Code	Material Description	Moisture	Testing: SPT	Consistency	Well Diagram
100mm SFA		0.2		Non-Soil		CCT	Concrete				
		0.5				SBC	Sub Base Coarse				
		4		Residual		CH	Residual Silty CLAY CH: firm to stiff, high plasticity, grey and yellow, organic, dry.	D	0,0,0 (N=0); 4,6,6,(12)	F-St	
						CH	Residual Sandy CLAY CH: very stiff, high plasticity, grey and yellow, fine grained sand, organic, dry.		6,8,12,(20)	VSt	

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Geotechnical Log - Borehole

BH1

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Easting (m)	: 0.00	Driller Supplier	:	Client	: Anglicare
Northing (m)	: 0.00	Logged By	: AS	Project	: Proposed Development
Ground Elevation	: Not Surveyed	Reviewed By	:	Location	: 215/229-239 Pitt St, Merrylands NSW
Total Depth	: 25.2 m BGL	Date	: 15/01/2025	Loc Comment	:

Drilling Method	DCP Graph	Depth (m)	Water	Soil Origin	Graphic Log	Classification Code	Material Description	Moisture	Testing SPT	Consistency	Well Diagram
100mm SFA		6.7				CH	Residual Sandy CLAY CH: very stiff, high plasticity, grey and yellow, fine grained sand, organic, dry.			VSt	
		7.5		Rock		SHL	Rock SHALE: distinctly weathered, dark grey and black, medium grained, dry.				
							Commenced Coring at 7.5m				

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Geotechnical Log - Borehole

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Northing (m)	: 0.00	Logged By	: AS	Project	: Proposed Development
Ground Elevation	: Not Surveyed	Reviewed By	:	Location	: 215/229-239 Pitt St, Merrylands NSW
Total Depth	: 25.2 m BGL	Date	: 15/01/2025	Loc Comment	:

Drilling Method	Depth (m)	Soil Origin	Graphic Log	Classification Code	Material Description	Weathering	Estimated Strength (VLS, LS, MS, HS, VHS, EHS)	Is(50)	RQD% and TCR%	Defect Spacing (mm) (30, 100, 300, 1000, 3000)	Defect Description (type, inclination, planarity, roughness, coating thickness)	Well Diagram
	6, 7				**Commenced Coring at 7.5m**							
NMLC Coring	8, 9	Rock		SHL	Rock SHALE: highly weathered, high strength, black and grey, medium grained, dry.	HW	HS	1.81	RQD = 62.33% TCR = 100%		1, 1, J, PL, RO, CL, OP, 1, J, PL, RO, CL, OP, J, PL, RO, CL, OP, J, 3°, PL, SO, CL, OP, 1, J, PL, SO, CL, OP, 1, 1, 1, 1, J, PL, RO, CL, OP, J, PL, RO, CL, OP, J, PL, RO, CL, OP, 1, 1, 1, 1,	

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Geotechnical Log - Borehole

BH1

UTM	:	Drill Rig	: COMACCHIO	Job Number	: GR24220
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Total Depth	: 25.2 m BGL	Date	: 15/01/2025	Loc Comment	:

Drilling Method	Depth (m)	Soil Origin	Graphic Log	Classification Code	Material Description	Weathering	Estimated Strength (VLS, LS, MS, HS, VHS, EHS)	Is(50)	RQD% and TCR%	Defect Spacing (mm) (30, 100, 300, 1000, 3000)	Defect Description (type, inclination, planarity, roughness, coating thickness)	Well Diagram
NMLC Coring	11, 12	Rock		SHL	Rock SHALE: highly weathered, high strength, black and grey, medium grained, dry.	HW	HS	1.56	RQD = 62.33% TCR = 100%; RQD = 22.33% TCR = 100%		1, 1, 1, CZ, J, PL, RO, CL, OP, CZ, J, PL, RO, CL, OP, J, PL, RO, CL, OP, 1, PL, RO, CL, OP, 1, 1, 1, J, CV, RO, CL, OP, J, CV, RO, CL, OP, J, CV, RO, CL, OP, J, PL, RO, STN, OP, 1, 1, 1, J, PL, RO, CL, OP, J, PL, RO, CL, C, CZ, 1, 1, J, PL, RO, CL, OP, J, PL, SO, CL, C, J, PL, SO, CL, C, 1,	
	12.7, 13, 14	Rock		SHL	Rock SHALE: moderately weathered, high strength, dark grey, coarse grained, dry.	MW	HS	1.07	RQD = 61.17% TCR = 100%		J, PL, RO, CL, OP, J, PL, RO, CL, OP, J, PL, RO, CL, OP, J, PL, RO, CL, C, 1, 1, J, PL, RO, CL, OP, J, PL, RO, CL, OP, 1, 1, 1,	

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Geotechnical Log - Borehole

BH1

UTM	:	Drill Rig	: COMACCHIO	Job Number	: GR24220
Easting (m)	: 0.00	Driller Supplier	:	Client	: Anglicare
Northing (m)	: 0.00	Logged By	: AS	Project	: Proposed Development
Ground Elevation	: Not Surveyed	Reviewed By	:	Location	: 215/229-239 Pitt St, Merrylands NSW
Total Depth	: 25.2 m BGL	Date	: 15/01/2025	Loc Comment	:

Drilling Method	Depth (m)	Soil Origin	Graphic Log	Classification Code	Material Description	Weathering	Estimated Strength (VLS, LS, MS, HS, VHS, EHS)	Is(50)	RQD% and TCR%	Defect Spacing (mm) (30, 100, 300, 1000, 3000)	Defect Description (type, inclination, planarity, roughness, coating thickness)	Well Diagram
NMLC Coring	16, 17, 18, 19	Rock		SHL	Rock SHALE: moderately weathered, high strength, dark grey, coarse grained, dry.	MW	HS	1.86; 1.63	RQD = 61.17% TCR = 100%; RQD = 35.33% TCR = 100%; RQD = 37.3% TCR = 100%		1, J, CV, SO, CL, C, J, PL, SO, CL, C, 1, 1, 1, 1, J, PL, SO, CL, C, J, PL, SO, CL, C, J, CV, SO, CL, OP, 1, 1, J, PL, SO, CL, OP, J, PL, SO, CL, OP, PL, RO, STN, OP, IS, J, PL, RO, CL, OP, J, PL, RO, CL, OP, 1, 1, 1, J, PL, RO, CL, OP, 1, J, PL, SO, CL, C, J, PL, SO, CL, C, 1, 1, 1, J, PL, RO, CL, OP, 1, 1, J, PL, RO, CL, OP, J, UN, RO, CL, OP, 1, 1, 1, 1, 1, 1, 1, 1, CV, RO, CL, C, 1, CV, RO, CL, C, 1, CV, RO, CL, C, 1, CV, RO, CL, C, 1, CV, RO, CL, C, J, CV, RO, CL, C, IS, CV, RO, CT, OP,	

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Geotechnical Log - Borehole

BH1

UTM	:	Drill Rig	: COMACCHIO	Job Number	: GR24220
Easting (m)	: 0.00	Driller Supplier	:	Client	: Anglicare
Northing (m)	: 0.00	Logged By	: AS	Project	: Proposed Development
Ground Elevation	: Not Surveyed	Reviewed By	:	Location	: 215/229-239 Pitt St, Merrylands NSW
Total Depth	: 25.2 m BGL	Date	: 15/01/2025	Loc Comment	:

Drilling Method	Depth (m)	Soil Origin	Graphic Log	Classification Code	Material Description	Weathering	Estimated Strength (VLS, LS, MS, HS, VHS, EHS)	Is(50)	RQD% and TCR%	Defect Spacing (mm) (30, 100, 300, 1000, 3000)	Defect Description (type, inclination, planarity, roughness, coating thickness)	Well Diagram
NMLC Coring	21, 22, 23	Rock		SHL	Rock SHALE: moderately weathered, high strength, dark grey, coarse grained, dry.	MW	HS	2.13, 2.08	RQD = 37.3% TCR = 100%; RQD = 62.59% TCR = 100%		PL, RO, STN, OP, J, CV, RO, CL, OP, 1, 1, 1, 1, CZ, J, PL, RO, CL, OP, SZ, J, PL, SO, CL, OP, J, PL, SO, CL, OP, J, 10°, PL, SO, CL, OP,	
	24	Rock		SHL	Rock SHALE: slightly weathered, high to very high strength, dark grey, coarse to very coarse grained, dry.	SW	HS–VHS	3.14			1, J, PL, SO, CL, OP, J, STP, SO, CL, OP, 1, 1, 1, J, PL, SO, CL, C, 1, CORELOSS,	

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Geotechnical Log - Borehole

BH1

UTM	:	Drill Rig	: COMACCHIO	Job Number	: GR24220
Easting (m)	: 0.00	Driller Supplier	:	Client	: Anglicare
Northing (m)	: 0.00	Logged By	: AS	Project	: Proposed Development
Ground Elevation	: Not Surveyed	Reviewed By	:	Location	: 215/229-239 Pitt St, Merrylands NSW
Total Depth	: 25.2 m BGL	Date	: 15/01/2025	Loc Comment	:

Drilling Method	Depth (m)	Soil Origin	Graphic Log	Classification Code	Material Description	Weathering	Estimated Strength (VLS LS MS HS VHS EHS)	Is(50)	RQD% and TCR%	Defect Spacing (mm) (30 100 300 1000 3000)	Defect Description type, inclination, planarity, roughness, coating thickness	Well Diagram
NMLC Coring		Rock		SHL	Rock SHALE: slightly weathered, high to very high strength, dark grey, coarse to very coarse grained, dry.	SW	HS–VHS		RQD = 62.59% TCR = 100%		1,	
					BH1 Terminated at 25.2m							

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Point Load Test

Project Number:	GR24220
Site Address:	215, 229-239 PITT ST, MERRYLANDS

Sample ID	Sample Depth (m)	Test Type	Distance between the contact points, D (mm)	Specimen width, W (mm)	Equivalent Core Diameter, D_e (mm)	Failure Load, F (kN)	Uncorrected Point Load Index, I_s (MPa)	Corrected Point Load Index, $I_{s(50)}$ (MPa)	Unconfined Compressive Strength (UCS), Mpa
BH01 -1	8.31	Diametral		-					
		Axial	60	50.0	61.8	6.36	1.67	**1.81**	36.15
BH01-2	10.13	Diametral							
		Axial	45	50.0	53.5	4.70	1.64	**1.56**	31.29
BH01-3	13.84	Diametral		-					
		Axial	50	50.0	56.4	3.42	1.07	**1.07**	21.49
BH01-4	15.34	Diametral		-					
		Axial	51	50.0	57.0	5.98	1.84	**1.86**	37.17
BH01 -5	19.71	Diametral		-					
		Axial	64	50.0	63.8	5.96	1.46	**1.63**	32.69
BH01 -6	21.82	Diametral		-					
		Axial	57	50.0	60.2	7.30	2.01	**2.13**	42.68
BH01 -7	23.15	Diametral		-					
		Axial	65	50.0	64.3	7.64	1.85	**2.08**	41.55
BH01 -8	24.62	Diametral		-					
		Axial	50	50.0	56.4	10.00	3.14	**3.14**	62.83

Test Date: 15/01/2025
Test By: DM

Capital Engineering Consultants						
Client:	Anglicare			Date:	20/01/2025
Project Number:	GR24220			Drawn By:	DM
Bore No.:	**BH01**			Checked By:	AS
Project Location:	215, 229-239 PITT ST, MERRYLANDS			Issue Date:	

Capital Engineering Consultants	Client:	Anglicare			Date:	20/01/2024
	Project Number:	GR24220			Drawn By:	DM
	Bore No.:	**BH01**			Checked By:	AS
	Project Location:	215, 229-239 PITT ST, MERRYLANDS			Issue Date:	

Capital Engineering Consultants	Client:	Anglicare			Date:	20/01/2024
	Project Number:	GR24220			Drawn By:	DM
	Bore No.:	**BH01**			Checked By:	AS
	Project Location:	215, 229-239 PITT ST, MERRYLANDS			Issue Date:	

Capital Engineering Consultants						
Client:	Anglicare			Date:	20/01/2024
Project Number:	GR24220			Drawn By:	DM
Bore No.:	**BH01**			Checked By:	AS
Project Location:	215, 229-239 PITT ST, MERRYLANDS			Issue Date:	

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Geotechnical Log - Borehole

BH2

UTM	:	Drill Rig	: COMACCHIO	Job Number	: GR24220
Easting (m)	: 0.00	Driller Supplier	:	Client	: Anglicare
Northing (m)	: 0.00	Logged By	: AS	Project	: Proposed Development
Ground Elevation	: Not Surveyed	Reviewed By	:	Location	: 215/229-239 Pitt St, Merrylands NSW
Total Depth	: 30 m BGL	Date	: 15/01/2025	Loc Comment	:

Drilling Method	DCP Graph	Depth (m)	Water	Soil Origin	Graphic Log	Classification Code	Material Description	Moisture	Testing: SPT	Consistency	Well Diagram
100mm SFA		0.2		Non-Soil		CCT	Concrete				
		0.5				SBC	Sub Base Coarse				
		3		Residual		CH	Residual Silty CLAY CH: stiff, high plasticity, grey and yellow, organic, dry.	D	3,4,5,(9) 2,3,5,(8)	St	
		4.2				CH	Residual Silty CLAY CH: very stiff, high plasticity, grey and yellow, organic, dry.		4,8,8,(16)	VSt	
						CH	Residual Sandy CLAY CH: hard, high plasticity, grey and yellow, fine grained sand, organic, dry.		6,10,12,(22)	H	

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Geotechnical Log - Borehole

BH2

UTM	:	Drill Rig	: COMACCHIO	Job Number	: GR24220
Easting (m)	: 0.00	Driller Supplier	:	Client	: Anglicare
Northing (m)	: 0.00	Logged By	: AS	Project	: Proposed Development
Ground Elevation	: Not Surveyed	Reviewed By	:	Location	: 215/229-239 Pitt St, Merrylands NSW
Total Depth	: 30 m BGL	Date	: 15/01/2025	Loc Comment	:

Drilling Method	DCP Graph	Depth (m)	Water	Soil Origin	Graphic Log	Classification Code	Material Description	Moisture	Testing: SPT	Consistency	Well Diagram
100mm SFA		6.3				CH	Residual Sandy CLAY CH: hard, high plasticity, grey and yellow, fine grained sand, organic, dry.			H	
		8.8		Rock		SHL	Rock SHALE: distinctly weathered, dark grey and black, medium grained, dry.				
							Commenced Coring at 8.8m				

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Geotechnical Log - Borehole

BH2

UTM	:	**Drill Rig**	: COMACCHIO	**Job Number**	: GR24220
Easting (m)	: 0.00	**Driller Supplier**	:	**Client**	: Anglicare
Northing (m)	: 0.00	**Logged By**	: AS	**Project**	: Proposed Development
Ground Elevation	: Not Surveyed	**Reviewed By**	:	**Location**	: 215/229-239 Pitt St, Merrylands NSW
Total Depth	: 30 m BGL	**Date**	: 15/01/2025	**Loc Comment**	:

Drilling Method	Depth (m)	Soil Origin	Graphic Log	Classification Code	Material Description	Weathering	Estimated Strength (VLS, LS, MS, HS, VHS, EHS)	Is(50)	RQD% and TCR%	Defect Spacing (mm) (30, 100, 300, 1000, 3000)	Defect Description (type, inclination, planarity, roughness, coating thickness)	Well Diagram
	6											
	7											
	8				**Commenced Coring at 8.8m**							
NMLC Coring	9	Rock		SHL	Rock SHALE: highly weathered, high strength, dark grey, coarse grained, dry.	HW	HS	2.35	RQD = 68% TCR = 100%		CZ, 1, J, PL, SO, CL, OP, J, PL, SO, CL, C, J, IR, SO, CL, C, J, 15°, PL, SO, CL, OP,	

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Geotechnical Log - Borehole

BH2

UTM	:	Drill Rig	: COMACCHIO	Job Number	: GR24220
Easting (m)	: 0.00	Driller Supplier	:	Client	: Anglicare
Northing (m)	: 0.00	Logged By	: AS	Project	: Proposed Development
Ground Elevation	: Not Surveyed	Reviewed By	:	Location	: 215/229-239 Pitt St, Merrylands NSW
Total Depth	: 30 m BGL	Date	: 15/01/2025	Loc Comment	:

Drilling Method	Depth (m)	Soil Origin	Graphic Log	Classification Code	Material Description	Weathering	Estimated Strength (VLS, LS, MS, HS, VHS, EHS)	Is(50)	RQD% and TCR%	Defect Spacing (mm) (30, 100, 300, 1000, 3000)	Defect Description (type, inclination, planarity, roughness, coating thickness)	Well Diagram
NMLC Coring	11, 12, 13, 14	Rock		SHL	Rock SHALE: highly weathered, high strength, dark grey, coarse grained, dry.	HW	HS	3.20, 2.61	RQD = 68% TCR = 100%; RQD = 60% TCR = 100%		PL, RO, CT, C, J, PL, RO, CT, OP, J, PL, SO, STN, OP, J, PL, SO, STN, C, J, PL, SO, STN, OP, 1, J, STP, SO, CL, C, J, IR, SO, STN, OP, J, PL, RO, STN, OP, J, PL, RO, STN, OP, J, PL, SO, STN, C, 1, 1, J, PL, SO, STN, C, J, PL, SO, CL, C, J, PL, SO, CL, C, J, UN, SO, CL, OP, J, UN, SO, CL, OP, J, STP, SO, CL, OP, 1, J, PL, RO, CL, OP, J, PL, SO, CL, C, J, PL, SO, CL, C, J, PL, SO, CL, C, J, PL, SO, CL, C, J, PL, SO, STN, C, CZ, J, 30°, STP, SO, CL, C, 1, J, CV, SO, CL, OP, 1, J, PL, SO, CL, C, J, PL, SO, CL, C, J, STP, SO, CL, C, 1, J, UN, SO, STN, C, J, PL, SO, CL, OP, 1, J, PL, RO, CL, OP, J, PL, SO, CL, C,	
	14.3	Rock		SHL	Rock SHALE: moderately weathered, high strength, dark grey, coarse to very coarse grained, dry.	MW	HS		RQD = 63% TCR =		J, PL, SO, CL, C, J, PL, SO, CL, C, J, 30°, PL, SO, CL, C,	

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Geotechnical Log - Borehole

BH2

UTM	:	Drill Rig	: COMACCHIO	Job Number	: GR24220
Easting (m)	: 0.00	Driller Supplier	:	Client	: Anglicare
Northing (m)	: 0.00	Logged By	: AS	Project	: Proposed Development
Ground Elevation	: Not Surveyed	Reviewed By	:	Location	: 215/229-239 Pitt St, Merrylands NSW
Total Depth	: 30 m BGL	Date	: 15/01/2025	Loc Comment	:

Drilling Method	Depth (m)	Soil Origin	Graphic Log	Classification Code	Material Description	Weathering	Estimated Strength (VLS, LS, MS, HS, VHS, EHS)	Is(50)	RQD% and TCR%	Defect Spacing (mm) (30, 100, 300, 1000, 3000)	Defect Description (type, inclination, planarity, roughness, coating thickness)	Well Diagram
NMLC Coring	16 17 18 19	Rock		SHL	Rock SHALE: moderately weathered, high strength, dark grey, coarse to very coarse grained, dry.	MW	HS	2.23 2.75	RQD = 63% TCR = 100% RQD = 36.67% TCR = 100%		J, 10°, PL, SO, CL, OP, 1, J, UN, SO, CL, C, J, IR, RO, CT, OP, J, PL, SO, CL, OP, J, PL, SO, CL, OP, J, PL, SO, STN, OP, J, PL, SO, STN, OP, J, IR, RO, STN, OP, J, IR, RO, STN, OP, J, PL, RO, CL, OP, J, PL, RO, CL, OP, 1, 1, J, PL, RO, CL, OP, J, IR, RO, STN, OP, J, IR, RO, STN, OP, 1, J, IR, SO, CL, C, J, IR, SO, CL, OP, J, PL, SO, CL, C, J, CV, SO, CL, OP, J, PL, SO, CL, C, J, PL, SO, CL, C, J, PL, SO, CL, C, J, PL, SO, STN, C, J, PL, RO, STN, OP, J, PL, SO, STN, C, J, IR, SO, CL, OP, J, IR, SO, CL, OP, J, PL, SO, STN, C, J, CV, SO, STN, C, IR, RO, STN, OP, J, PL, SO, STN, C, 1, J, PL, SO, STN, C, J, UN, SO, STN, OP, J, PL, SO, STN, C, 1, J, PL, RO, CL, C, J, 40°, PL, SO, STN, C, 1, J, 20°, CV, SO, STN, C, J, PL, RO, STN, OP, J, IR, SO, STN, OP, 1, J, PL, RO, CL, OP, J, PL, RO, CL, OP, J, PL, RO, STN, OP, J, PL, RO, STN, OP, J, PL, RO, STN, C, J, PL, SO, STN, OP, J, PL, SO, CL, C, 1, J, PL, SO, CL, C,	

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Geotechnical Log - Borehole

BH2

UTM	:	**Drill Rig**	: COMACCHIO	**Job Number**	: GR24220
Easting (m)	: 0.00	**Driller Supplier**	:	**Client**	: Anglicare
Northing (m)	: 0.00	**Logged By**	: AS	**Project**	: Proposed Development
Ground Elevation	: Not Surveyed	**Reviewed By**	:	**Location**	: 215/229-239 Pitt St, Merrylands NSW
Total Depth	: 30 m BGL	**Date**	: 15/01/2025	**Loc Comment**	:

Drilling Method	Depth (m)	Soil Origin	Graphic Log	Classification Code	Material Description	Weathering	Estimated Strength (VLS, LS, MS, HS, VHS, EHS)	Is(50)	RQD% and TCR%	Defect Spacing (mm) (30, 100, 300, 1000, 3000)	Defect Description (type, inclination, planarity, roughness, coating thickness)	Well Diagram
NMLC Coring	21, 22, 23, 24	Rock		SHL	Rock SHALE: moderately weathered, high strength, dark grey, coarse to very coarse grained, dry.	MW	HS	2.81	RQD = 36.67% TCR = 100%; RQD = 32% TCR = 100%; RQD = 46.33% TCR = 100%		J, PL, SO, STN, C, J, PL, SO, STN, C, J, PL, SO, STN, C, J, PL, SO, STN, C, J, UN, SO, STN, C, J, CV, SO, STN, C, J, STP, SO, STN, C, 1, 1, J, PL, SO, STN, C, J, PL, RO, STN, OP, J, PL, RO, STN, OP, J, PL, SO, STN, C, J, PL, SO, STN, OP, 1, 1, J, PL, SO, CL, OP, 1, J, PL, SO, CL, C, 1, 1, J, PL, RO, STN, OP, CZ, J, PL, RO, STN, OP, J, PL, SO, STN, C, 1, 1, J, PL, SO, STN, OP, J, STP, SO, STN, C, J, PL, SO, STN, C, J, PL, SO, STN, OP, J, PL, SO, STN, OP, J, UN, SO, STN, C, 1, J, PL, RO, CL, C, J, PL, RO, CL, C, J, STP, SO, STN, OP, J, STP, SO, STN, OP, SZ, 1, J, PL, SO, STN, OP, J, PL, SO, STN, OP, CZ, J, IR, RO, STN, OP,	

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Geotechnical Log - Borehole

BH2

UTM	:	**Drill Rig**	: COMACCHIO	**Job Number**	: GR24220
Easting (m)	: 0.00	**Driller Supplier**	:	**Client**	: Anglicare
Northing (m)	: 0.00	**Logged By**	: AS	**Project**	: Proposed Development
Ground Elevation	: Not Surveyed	**Reviewed By**	:	**Location**	: 215/229-239 Pitt St, Merrylands NSW
Total Depth	: 30 m BGL	**Date**	: 15/01/2025	**Loc Comment**	:

Drilling Method	Depth (m)	Soil Origin	Graphic Log	Classification Code	Material Description	Weathering	Estimated Strength (VLS LS MS HS VHS EHS)	Is(50)	RQD% and TCR%	Defect Spacing (mm) (30 100 300 1000 3000)	Defect Description (type, inclination, planarity, roughness, coating thickness)	Well Diagram
NMLC Coring	26, 27, 28, 29	Rock		SHL	Rock SHALE: moderately weathered, high strength, dark grey, coarse to very coarse grained, dry.	MW	HS	2.48 1.35 5.32	RQD = 46.33% TCR = 100% RQD = 46% TCR = 100%		J, PL, SO, STN, C, 1, CZ, J, STP, RO, CL, C, 1, J, STP, RO, CL, OP, J, PL, SO, CL, OP, J, PL, SO, CL, OP, J, PL, SO, CL, OP, J, PL, SO, CL, OP, J, PL, SO, CL, OP, J, PL, SO, CL, OP, J, PL, SO, CL, OP, J, PL, SO, CL, OP, J, PL, SO, CL, OP, J, PL, SO, CL, OP, J, PL, SO, CL, OP, J, STP, SO, CL, C, J, STP, SO, CL, C, J, PL, SO, CL, C, J, PL, RO, STN, C, 1, J, PL, SO, STN, OP, J, PL, SO, STN, OP, 1, J, PL, SO, STN, OP, J, PL, SO, STN, C, 1, STP, RO, STN, C, J, PL, SO, STN, C, J, PL, SO, STN, C, J, PL, SO, STN, C, J, PL, SO, STN, C, STP, SO, CL, C, J, PL, SO, CL, C, J, PL, SO, CL, C, J, PL, SO, CL, C, 1, 1, J, PL, SO, CL, C, 1, 1, J, PL, SO, CL, OP, J, PL, SO, CL, OP, J, PL, SO, CL, OP, 1, 1,	

BH2 Terminated at 30m

CEC Geotechnical

Point Load Test

Project Number:	GR24220
Site Address:	215, 229-239 PITT ST, MERRYLANDS

Sample ID	Sample Depth (m)	Test Type	Distance between the contact points, D (mm)	Specimen width, W (mm)	Equivalent Core Diameter, D_e (mm)	Failure Load, F (kN)	Uncorrected Point Load Index, I_s (MPa)	Corrected Point Load Index, $I_{s(50)}$ (MPa)	Unconfined Compressive Strength (UCS), Mpa
BH02 -1	8.95	Diametral		-					
		Axial	50	50.0	56.4	7.48	2.35	**2.35**	47.00
BH02-2	10.63	Diametral							
		Axial	45	50.0	53.5	9.62	3.36	**3.20**	64.05
BH02-3	13.60	Diametral		-					
		Axial	43	50.0	52.3	7.66	2.80	**2.61**	52.29
BH02-4	17.55	Diametral		-					
		Axial	51	50.0	57.0	7.16	2.21	**2.23**	44.50
BH02 -5	19.33	Diametral		-					
		Axial	53	50.0	58.1	9.04	2.68	**2.75**	55.01
BH02 -6	21.56	Diametral		-					
		Axial	61	50.0	62.3	9.98	2.57	**2.81**	56.21
BH02 -7	25.80	Diametral		-					
		Axial	45	50.0	53.5	7.46	2.60	**2.48**	49.67
BH02 -8	27.72	Diametral		-					
		Axial	55	50.0	59.2	7.58	2.16	**2.26**	45.19
BH03 -8	28.94	Diametral		-					
		Axial	50	50.0	56.4	4.30	1.35	**1.35**	27.02

Test Date: 15/01/2025
Test By: DM

CEC Geotechnical

Point Load Test

Project Number:	GR24220
Site Address:	215, 229-239 PITT ST, MERRYLANDS

Sample ID	Sample Depth (m)	Test Type	Distance between the contact points, D (mm)	Specimen width, W (mm)	Equivalent Core Diameter, D_e (mm)	Failure Load, F (kN)	Uncorrected Point Load Index, I_s (MPa)	Corrected Point Load Index, $I_{s(50)}$ (MPa)	Unconfined Compressive Strength (UCS), Mpa
BH02 -9	29.71	Diametral		-					
		Axial	60	50.0	61.8	18.73	4.90	**5.32**	106.46

Test Date: 15/01/2025
Test By: DM

Capital Engineering Consultants	Client:	Anglicare			Date:	20/01/2024
	Project Number:	GR24220			Drawn By:	DM
	Bore No.:	**BH02**			Checked By:	AS
	Project Location:	215, 229-239 PITT ST, MERRYLANDS			Issue Date:	

Capital Engineering Consultants

Client:	Anglicare	**Date:**	20/01/2024
Project Number:	GR24220	**Drawn By:**	DM
Bore No.:	**BH02**	**Checked By:**	AS
Project Location:	215, 229-239 PITT ST, MERRYLANDS	**Issue Date:**	

Capital Engineering Consultants	Client:	Anglicare			Date:	20/01/2024
	Project Number:	GR24220			Drawn By:	DM
	Bore No.:	**BH02**			Checked By:	AS
	Project Location:	215, 229-239 PITT ST, MERRYLANDS			Issue Date:	

Capital Engineering Consultants	Client:	Anglicare			Date:	20/01/2024
	Project Number:	GR24220			Drawn By:	DM
	Bore No.:	**BH02**			Checked By:	AS
	Project Location:	215, 229-239 PITT ST, MERRYLANDS			Issue Date:	

Capital Engineering Consultants	Client:	Anglicare			Date:	20/01/2024
	Project Number:	GR24220			Drawn By:	DM
	Bore No.:	**BH02**			Checked By:	AS
	Project Location:	215, 229-239 PITT ST, MERRYLANDS			Issue Date:	

CEC Geotechnical

U4 83, Grose Street, North Parramatta, NSW 2151

Phone: (02) 9630 0121

Geotechnical Log - Borehole

BH3

UTM	:	Drill Rig	: COMACCHIO	Job Number	: GR24220
Easting (m)	: 0.00	Driller Supplier	:	Client	: Anglicare
Northing (m)	: 0.00	Logged By	: AS	Project	: Proposed Development
Ground Elevation	: Not Surveyed	Reviewed By	:	Location	: 215/229-239 Pitt St, Merrylands NSW
Total Depth	: 25 m BGL	Date	: 15/01/2025	Loc Comment	:

Drilling Method	DCP Graph	Depth (m)	Water	Soil Origin	Graphic Log	Classification Code	Material Description	Moisture	Testing: SPT	Consistency	Well Diagram
100mm SFA		0.1		Non-Soil		CCT	Concrete				
		1.5		Residual		CH	Residual Silty CLAY CH: stiff, high plasticity, grey and yellow, organic, dry.	D	2,4,6,(10)	St	
						CH	Residual Sandy CLAY CH: very stiff, high plasticity, brown, fine grained sand, with coarse sized gravel, organic, dry.		6,8,11,(19) 8,10,10,(20)	VSt	

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Geotechnical Log - Borehole

BH3

UTM	:	Drill Rig	: COMACCHIO	Job Number	: GR24220
Easting (m)	: 0.00	Driller Supplier	:	Client	: Anglicare
Northing (m)	: 0.00	Logged By	: AS	Project	: Proposed Development
Ground Elevation	: Not Surveyed	Reviewed By	:	Location	: 215/229-239 Pitt St, Merrylands NSW
Total Depth	: 25 m BGL	Date	: 15/01/2025	Loc Comment	:

Drilling Method	DCP Graph	Depth (m)	Water	Soil Origin	Graphic Log	Classification Code	Material Description	Moisture	Testing: SPT	Consistency	Well Diagram
100mm SFA		6				CH	Residual Sandy CLAY CH: very stiff, high plasticity, brown, fine grained sand, with coarse sized gravel, organic, dry.			VSt	
		8.8		Rock		SHL	Rock SHALE: distinctly weathered, dark grey and black, medium grained, dry.				
							Commenced Coring at 8.8m				

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Geotechnical Log - Borehole

BH3

UTM	:	Drill Rig	: COMACCHIO	Job Number	: GR24220
Easting (m)	: 0.00	Driller Supplier	:	Client	: Anglicare
Northing (m)	: 0.00	Logged By	: AS	Project	: Proposed Development
Ground Elevation	: Not Surveyed	Reviewed By	:	Location	: 215/229-239 Pitt St, Merrylands NSW
Total Depth	: 25 m BGL	Date	: 15/01/2025	Loc Comment	:

Drilling Method	Depth (m)	Soil Origin	Graphic Log	Classification Code	Material Description	Weathering	Estimated Strength (VLS, LS, MS, HS, VHS, EHS)	Is(50)	RQD% and TCR%	Defect Spacing (mm) (30, 100, 300, 1000, 3000)	Defect Description (type, inclination, planarity, roughness, coating thickness)	Well Diagram
	6											
	7											
	8				**Commenced Coring at 8.8m**							
NMLC Coring	9	Rock		SHL	Rock SHALE: distinctly weathered, dark grey and black, medium grained, dry.							

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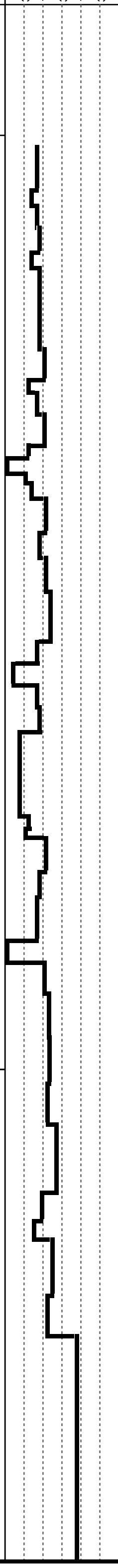
Geotechnical Log - Borehole

BH3

UTM	:	**Drill Rig**	: COMACCHIO	**Job Number**	: GR24220
Easting (m)	: 0.00	**Driller Supplier**	:	**Client**	: Anglicare
Northing (m)	: 0.00	**Logged By**	: AS	**Project**	: Proposed Development
Ground Elevation	: Not Surveyed	**Reviewed By**	:	**Location**	: 215/229-239 Pitt St, Merrylands NSW
Total Depth	: 25 m BGL	**Date**	: 15/01/2025	**Loc Comment**	:

Drilling Method	Depth (m)	Soil Origin	Graphic Log	Classification Code	Material Description	Weathering	Estimated Strength (VLS, LS, MS, HS, VHS, EHS)	Is(50)	RQD% and TCR%	Defect Spacing (mm)	Defect Description (type, inclination, planarity, roughness, coating thickness)	Well Diagram
NMLC Coring	– 10.42	Rock		SHL	Rock SHALE: distinctly weathered, dark grey and black, medium grained, dry.							
	10.42 –	Rock		SHL	Rock SHALE: highly weathered, high strength, grey, coarse grained, dry.	HW	HS	2.10; 2.46	RQD = 32.33% TCR = 100%; RQD = 89% TCR = 100%		see list below	

Depth markers: 11, 12, 13, 14



Defect Description (10.42 m – 15 m):

- J, PL, RO, STN, OP,
- J, STP, RO, STN, OP,
- J, 30°, CV, SO, STN, OP,
- J, PL, SO, STN, OP,
- 1,
- 1,
- PL, RO, STN, OP,
- J, PL, RO, STN, OP,
- J, STP, RO, STN, OP,
- J, CV, RO, STN, OP,
- J, 25°, STP, RO, STN, C,
- 1,
- J, PL, RO, STN, OP,
- CZ,
- J, CV, RO, STN, C,
- J, CV, RO, STN, OP,
- J, PL, RO, STN, OP,
- J, PL, RO, STN, OP,
- J, PL, RO, STN, OP,
- J, PL, RO, STN, OP,
- PL, RO, CL, OP,
- 1,
- J, PL, RO, CL, OP,
- J, PL, RO, STN, OP,
- J, PL, SO, STN, C,
- J, PL, SO, STN, C,
- 1,
- 1,
- J, PL, RO, STN, OP,
- J, PL, RO, STN, OP,
- CZ,
- 1,
- J, PL, SO, CL, C,
- J, PL, SO, CL, C,
- J, PL, SO, CL, C,
- 1,
- 1,
- 1,
- J, PL, RO, CL, C,
- 1,

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Phone: (02) 9630 0121

Geotechnical Log - Borehole

BH3

UTM	:	Drill Rig	: COMACCHIO	Job Number	: GR24220
Easting (m)	: 0.00	Driller Supplier	:	Client	: Anglicare
Northing (m)	: 0.00	Logged By	: AS	Project	: Proposed Development
Ground Elevation	: Not Surveyed	Reviewed By	:	Location	: 215/229-239 Pitt St, Merrylands NSW
Total Depth	: 25 m BGL	Date	: 15/01/2025	Loc Comment	:

Drilling Method	Depth (m)	Soil Origin	Graphic Log	Classification Code	Material Description	Weathering	Estimated Strength (VLS, LS, MS, HS, VHS, EHS)	Is(50)	RQD% and TCR%	Defect Spacing (mm) (30, 100, 300, 1000, 3000)	Defect Description (type, inclination, planarity, roughness, coating thickness)	Well Diagram
NMLC Coring	16, 17, 18, 19	Rock		SHL	Rock SHALE: highly weathered, high strength, grey, coarse grained, dry.	HW	HS	2.19; 2.10	RQD = 89% TCR = 100%; RQD = 47.67% TCR = 100%; RQD = 42.33% TCR = 100%		see list below	

Defect Description:

- 1,
- 1,
- J, PL, SO, CL, C,
- J, PL, SO, CL, C,
- J, CV, SO, CL, C,
- 1,
- J, STP, SO, CL, C,
- J, STP, SO, CL, C,
- J, PL, RO, STN, OP,
- J, 45°, PL, RO, STN, OP,
- J, PL, RO, STN, C,
- J, PL, RO, STN, C,
- J, PL, RO, STN, OP,
- J, PL, RO, STN, OP,
- J, PL, RO, STN, OP,
- 1,
- 1,
- 1,
- 1,
- J, PL, RO, STN, OP,
- J, STP, RO, STN, C,
- J, IR, RO, STN, OP,
- J, PL, SO, STN, OP,
- J, PL, SO, STN, OP,
- 1,
- J, STP, SO, STN, C,
- J, STP, SO, STN, C,
- J, PL, RO, STN, OP,
- J, STP, SO, CL, C,
- J, STP, SO, CL, OP,
- J, PL, SO, CL, OP,
- J, PL, SO, STN, OP,
- J, STP, SO, STN, C,
- J, IR, SO, STN, OP,
- 1,
- J, PL, RO, CL, OP,
- J, PL, RO, CL, OP,
- J, PL, SO, CL, OP,
- 1,
- 1,
- J, PL, SO, CL, OP,
- J, PL, SO, CL, OP,
- J, PL, SO, CL, OP,
- J, STP, RO, CL, C,
- J, STP, RO, CL, C,
- 1,
- J, UN, SO, STN, OP,
- J, UN, SO, STN, C,
- J, IR, RO, CL, OP,
- J, STP, SO, CL, OP,
- SZ,
- 1,
- J, STP, RO, CL, C,
- CZ,
- 1,

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Geotechnical Log - Borehole

BH3

UTM	:	Drill Rig	: COMACCHIO	Job Number	: GR24220
Easting (m)	: 0.00	Driller Supplier	:	Client	: Anglicare
Northing (m)	: 0.00	Logged By	: AS	Project	: Proposed Development
Ground Elevation	: Not Surveyed	Reviewed By	:	Location	: 215/229-239 Pitt St, Merrylands NSW
Total Depth	: 25 m BGL	Date	: 15/01/2025	Loc Comment	:

Drilling Method	Depth (m)	Soil Origin	Graphic Log	Classification Code	Material Description	Weathering	Estimated Strength (VLS LS MS HS VHS EHS)	Is(50)	RQD% and TCR%	Defect Spacing (mm) (30 100 300 1000 3000)	Defect Description (type, inclination, planarity, roughness, coating thickness)	Well Diagram
NMLC Coring	21, 21.7	Rock		SHL	Rock SHALE: highly weathered, high strength, grey, coarse grained, dry.	HW	HS	2.14	RQD = 42.33% TCR = 100%		PL, RO, STN, OP, J, PL, RO, STN, OP, J, PL, SO, STN, C, CZ, J, PL, SO, CL, C, J, PL, SO, CL, C, J, STP, RO, CL, OP, J, PL, SO, STN, C, J, PL, SO, CL, C, J, PL, RO, CL, C, CZ, J, PL, SO, CL, C, J, PL, SO, CL, OP, 1, PL, SO, STN, OP, J, PL, SO, CL, C, 1, J, PL, SO, CL, OP, J, PL, SO, STN, C, J, STP, SO, STN, OP,	
	22, 23, 24	Rock		SHL	Rock SHALE: moderately weathered, high strength, dark grey, coarse to very coarse grained, dry.	MW	HS	2.95 2.94	RQD = 66.67% TCR = 100%		J, CV, SO, STN, C, J, CV, SO, STN, OP, J, STP, SO, STN, OP, 1, J, PL, SO, CL, C, J, IR, RO, CL, C, J, 15°, PL, SO, STN, C, 1, J, PL, SO, STN, C, J, UN, SO, STN, OP, J, STP, SO, STN, OP, J, UN, SO, STN, C, 1, J, PL, SO, STN, OP, J, PL, RO, CL, C, J, PL, RO, STN, C, J, PL, SO, CL, C, 1, J, PL, RO, STN, OP, J, PL, SO, STN, OP, CZ,	

BH3 Terminated at 25m

Point Load Test

Project Number:	GR24220
Site Address:	215, 229-239 PITT ST, MERRYLANDS

Sample ID	Sample Depth (m)	Test Type	Distance between the contact points, D (mm)	Specimen width, W (mm)	Equivalent Core Diameter, D_e (mm)	Failure Load, F (kN)	Uncorrected Point Load Index, I_s (MPa)	Corrected Point Load Index, $I_{s(50)}$ (MPa)	Unconfined Compressive Strength (UCS), Mpa
BH03 -1	11.80	Diametral		-					
		Axial	60	50.0	61.8	7.40	1.94	**2.10**	42.06
BH03-2	13.30	Diametral							
		Axial	65	50.0	64.3	9.04	2.18	**2.46**	49.17
BH03-3	15.80	Diametral		-					
		Axial	50	50.0	56.4	6.98	2.19	**2.19**	43.86
BH03-4	18.36	Diametral		-					
		Axial	60	50.0	61.8	7.38	1.93	**2.10**	41.95
BH03 -5	20.44	Diametral		-					
		Axial	65	50.0	64.3	7.88	1.90	**2.14**	42.86
BH03 -6	22.55	Diametral		-					
		Axial	54	50.0	58.6	9.78	2.84	**2.95**	58.90
BH03 -7	24.43	Diametral		-					
		Axial	56	50.0	59.7	9.96	2.79	**2.94**	58.80

Test Date: 15/01/2025
Test By: DM

Capital Engineering Consultants

Client:	Anglicare			**Date:**	20/01/2024
Project Number:	GR24220			**Drawn By:**	DM
Bore No.:	**BH03**			**Checked By:**	AS
Project Location:	215, 229-239 PITT ST, MERRYLANDS			**Issue Date:**	

Capital Engineering Consultants

Client:	Anglicare	**Date:**	20/01/2024
Project Number:	GR24220	**Drawn By:**	DM
Bore No.:	**BH03**	**Checked By:**	AS
Project Location:	215, 229-239 PITT ST, MERRYLANDS	**Issue Date:**	

Capital Engineering Consultants

Client:	Anglicare	**Date:**	20/01/2024
Project Number:	GR24220	**Drawn By:**	DM
Bore No.:	**BH03**	**Checked By:**	AS
Project Location:	215, 229-239 PITT ST, MERRYLANDS	**Issue Date:**	

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EXPLANATION OF NOTES, ABBREVIATIONS & TERMS USED ON BOREHOLE AND TEST PIT LOGS - SOIL DESCRIPTION (AS1726 - 2017)

SOIL CLASSIFICATION SYSTEM

Coarse Grained Soil

GW	Well graded gravels, gravel-sand mixtures, little or no fines
GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines, uniform gravels
GM	Silty gravels, Gravel-sand-silt mixtures
GC	Clayey gravels, gravel-sand-clay mixtures
SW	Well-graded sands, gravelly sands, little or no fines
SP	Poorly-graded sands, gravelly sand, little or no fines
SM	Silty sands, sand-silt mixtures
SC	Clayey sands, sand-clay mixtures

Fine Grained Soils

ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or silts with low plasticity
CL, CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays
OL	Organic silts and organic silty clays or low plasticity
MH	Inorganic silts, micaceous or diatomaceous fine sand for silty soils
CH	Inorganic clays of high plasticity
OH	Organic clays of medium to high plasticity, organic silts
PT	Peat, humus, swamp soils with high organic contents

First Letter: G = Grave, S = Sand, M = Silt, C = Clay; Second Letter: W = Well graded, P = Poorly-graded, M = Mixture, O = Organic, L = Low plasticity, H = High plasticity

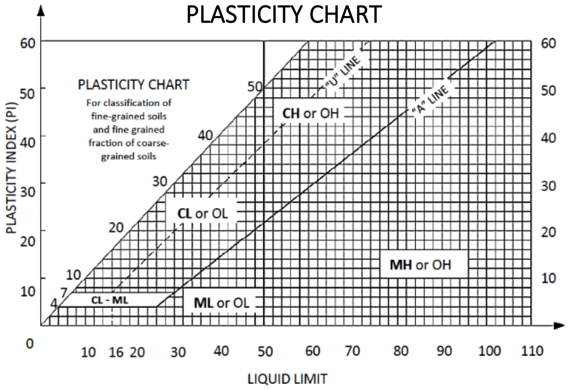
Soils may be a combination of multiple soil classifications where borderline

PARTICLE SIZE

Soil	Major Division	Sub-Division	Particle Size (mm)
Coarse	Boulders		>200
	Cobbles		63 – 200
	Gravel	Coarse	20 – 63
		Medium	6 – 20
		Fine	2.36 – 6
	Sand	Coarse	0.6 – 2.36
		Medium	0.2 – 0.6
		Fine	0.075 – 0.2
Fine	Silt		0.002 – 0.075
	Clay		<0.002

0.075 mm is the approximate minimum particle size discernible by eye

PLASTICITY CHART



MOISTURE CONDITION

Coarse	D	Dry	Sands and gravels are free flowing.
	M	Moist	Soils are darker than in the dry condition and may feel cool. Sands and gravels tend to cohere.
	W	Wet	Soils exude frere water. Sands and gravels tend to cohere
Fine	PL	Plastic Limit	Moisture content of fine grained soils are described; as below plastic limit (<PL), near to plastic limit (=PL), above plastic limit(>PL), near to the liquid limit (=LL), or above the liquid limit (>LL)
	LL	Liquid Limit	

CONSISTENTCY AND DENSITY

Fine Grained Soils

			Pocket Penetrometer Reading (kPa)
VS	Very Soft	Exudes between fingers when squeezed	<25
S	Soft	Can be moulded by light finger pressure	20 – 50
F	Firm	Can be moulded by strong finger pressure	50 – 100
St	Stiff	Cannot be moulded by fingers. Can be indented by thumb	100 – 200
VSt	Very Stiff	Can be indented by thumb nail	200 – 400
H	Hard	Can be indented by thumb nail with difficulty	>400

Coarse Grained Soils

		Density Index %	'N' Value
VL	Very Loose	≤15	0 – 4
L	Loose	15 – 35	4 – 10
MD	Medium Dense	35 – 65	10 – 30
D	Dense	65-85	30 – 50
VD	Very Dense	>85	>50

SECONDARY OR MINOR SOIL COMPONENTS

Designation of Components	In Coarse Grained Soils				In Fine Grained Soils	
	% Fines	Terminology	% Accessory Coarse Fraction	Terminology	% Sand/gravel	Terminology
Minor	≤5	'trace' clay/silt	≤15	'trace' sand/gravel	≤15	'trace' sand/gravel
	5 – 12	'with' clay/silt	15 – 30	'with' sand/gravel	15 – 30	'with' sand/gravel
Secondary	>15	Prefix silty or clayey	>30	Prefix sandy or gravelly	>30	Prefix sandy or gravelly

CEC Geotechnical

EXPLANATION OF NOTES, ABBREVIATIONS & TERMS USED ON BOREHOLE AND TEST PIT LOGS - SOIL DESCRIPTION (AS1726 - 2017)

STRENGTH OF INTACT ROCK

Symbol	Term	Point Load Index, (I_{s50}) MPa	Field Guide to Strength
VL	Very Low	$0.03 \leq I_{s50} < 0.1$	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; pieces up to 30 mm thick can be broken by finger pressure
L	Low	$0.1 \leq I_{s50} < 0.3$	Easily scored with knife; indentations 1 mm to 3 mm after firm blow with pick point; core 150mm long and 50 mm diameter can be broken by hand; sharp edges of core friable
M	Medium	$0.3 \leq I_{s50} < 1.0$	Readily scored with knife; core 150 mm long and 50 mm diameter can be broken by hand with difficulty
H	High	$1.0 \leq I_{s50} < 3$	Core 150 mm long and 50 mm diameter cannot be broken by hand but can be broken by single firm blow of pick; rock rings under hammer
VH	Very High	$3 \leq I_{s50} < 10$	Hand held specimen breaks with pick after more than one blow; rock rings under hammer
EH	Extremely High	$10 \leq I_{s50} <$	Specimen requires many pick blows to break intact rock, rock rings under hammer

Material with rock strength less than "Very Low" is to be described using soil properties

DEGREE OF ROCK WEATHERING

<table>
<tr><th colspan="2">Term</th><th colspan="2">Symbol</th><th>Definition</th></tr>
<tr><td colspan="2">Residual Soil</td><td colspan="2">RS</td><td>Soil derived from the weathering of rock; the mass structure and material fabric are no longer evident the soil has not been significantly transported.</td></tr>
<tr><td colspan="2">Extremely Weathered</td><td colspan="2">XW</td><td>Material is weathered to such an extent that it has soil properties, i.e. it either disintegrates or can be remoulded in water. Fabric of original rock still visible.</td></tr>
<tr><td>Highly Weathered</td><td rowspan="2">Distinctly Weathered</td><td>HW</td><td rowspan="2">DW</td><td>Rock strength is changed by weathering. The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognizable. Some minerals are decomposed to clay minerals. Porosity may be increased by leach, or may be decreased due to deposition or weathering products in pores.</td></tr>
<tr><td>Moderately Weathered</td><td>MW</td><td>The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognizable, but shows little or no change of strength from fresh rock.</td></tr>
<tr><td colspan="2">Slightly Weathered</td><td colspan="2">SW</td><td>Rock is slightly discoloured but shows little or no change of strength from fresh rock.</td></tr>
<tr><td colspan="2">Fresh</td><td colspan="2">FR</td><td>Rock shows no sign of decomposition or staining.</td></tr>
</table>

Distinctly Weathered is to be used when it is not possible to differentiate between highly and moderately weathered.

Extremely Weathered material is to be described using soil properties

ROCK MASS PROPERTIES

Term	Separation of Stratification Planes	Term	Description
Thinly laminated	< 6 mm	Fragmented	Primarily fragments < 20 mm length and mostly of width < core diameter
Laminated	6 mm to 20 mm	Highly fractured	Core lengths generally less than 20 mm to 40 mm with occasional fragments
Very thinly bedded	20 mm to 60 mm		
Thinly bedded	60 mm to 200 mm	Fractured	Core lengths mainly 30 mm to 100 mm with occasional shorter and longer pieces
Medium bedded	0.2 m to 0.6 m	Slightly fractured	Core lengths generally 0.3 m to 1.0 m with occasional longer and shorter sections
Thickly bedded	0.6 m to 2.0 m		
Massive	> 2 m	Unbroken	Core has no fractures

DEFECT TYPES AND DESCRIPTIONS

Defect Type

- BR Bedding parting
- JT Joint
- SR Sheared surface
- SZ Sheared zone
- SS Sheared seam
- CS Crushed seam
- IS Infill seam
- XS Extremely Weathered Seam

Defect Shape

- PL Planar
- ST Stepped
- CR Curved
- IR Irregular
- UN Undulating

Surface Roughness

- VR Very rough
- RO Rough
- SM Smooth
- PO Polished
- SL Slickenside

Defect Coatings

- CL Clean
- ST Stained
- VN Veneer
- CT Coating

Vertical Boreholes – The dip of the defect is given from the horizontal

Inclined Boreholes – The angle of the defect is given from the core axis

APPENDIX C – Laboratory Test Results

eurofins | Environment Testing

Certificate of Analysis

CEC Geotechnical
Unit 4 83 Grose Street
North Paramatta
NSW 2151

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Attention: **Diego**

Report **1177725-S**
Project name ADDITIONAL: PSI/WASTE CLASS
Project ID ER24029
Received Date Jan 15, 2025

Client Sample ID			**BH01 0.5-1M**	**BH01 2.0M**	**BH01 4.0M**	**BH02 0.5M**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S25-Ja0018526**	**S25-Ja0018527**	**S25-Ja0018528**	**S25-Ja0018529**
Date Sampled			**Dec 16, 2024**	**Dec 16, 2024**	**Dec 16, 2024**	**Dec 16, 2024**
Test/Reference	LOR	Unit				
Chloride	10	mg/kg	< 10	11	240	< 10
Conductivity (1:5 aqueous extract at 25 °C as rec.)	10	uS/cm	180	22	210	12
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	8.3	9.3	8.7	7.7
Resistivity*	0.5	ohm.m	56	450	47	840
Sulphate (as SO4)	10	mg/kg	280	< 10	45	< 10
Sample Properties						
% Moisture	1	%	18	16	15	18

Client Sample ID			**BH02 1.0M**	**BH02 3.0M**	**BH03 0.5M**	**BH03 1.0M**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S25-Ja0018530**	**S25-Ja0018531**	**S25-Ja0018532**	**S25-Ja0018533**
Date Sampled			**Dec 16, 2024**	**Dec 16, 2024**	**Dec 16, 2024**	**Dec 16, 2024**
Test/Reference	LOR	Unit				
Chloride	10	mg/kg	< 10	< 10	< 10	38
Conductivity (1:5 aqueous extract at 25 °C as rec.)	10	uS/cm	< 10	15	13	43
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	8.1	9.4	9.3	9.1
Resistivity*	0.5	ohm.m	1300	680	740	230
Sulphate (as SO4)	10	mg/kg	< 10	< 10	< 10	11
Sample Properties						
% Moisture	1	%	17	15	14	11

eurofins

Environment Testing

Client Sample ID			BH03 2.0M
Sample Matrix			**Soil**
Eurofins Sample No.			**S25-Ja0018534**
Date Sampled			**Dec 16, 2024**
Test/Reference	LOR	Unit	
Chloride	10	mg/kg	< 10
Conductivity (1:5 aqueous extract at 25 °C as rec.)	10	uS/cm	11
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	9.0
Resistivity*	0.5	ohm.m	920
Sulphate (as SO4)	10	mg/kg	< 10
Sample Properties			
% Moisture	1	%	16

Environment Testing

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	Jan 16, 2025	28 Days
- Method: LTM-INO-4270 Anions by Ion Chromatography			
Conductivity (1:5 aqueous extract at 25 °C as rec.)	Sydney	Jan 16, 2025	7 Days
- Method: LTM-INO-4030 Conductivity			
pH (1:5 Aqueous extract at 25 °C as rec.)	Sydney	Jan 16, 2025	7 Days
- Method: LTM-GEN-7090 pH by ISE			
Sulphate (as SO4)	Sydney	Jan 16, 2025	28 Days
- Method: In-house method LTM-INO-4270 Sulphate by Ion Chromatograph			
% Moisture	Sydney	Jan 15, 2025	14 Days
- Method: LTM-GEN-7080 Moisture			

Company Name: CEC Geotechnical
Address: Unit 4 83 Grose Street
North Paramatta
NSW 2151

Project Name: ADDITIONAL: PSI/WASTE CLASS
Project ID: ER24029

Order No.:
Report #: 1177725
Phone: 02 9630 0121
Fax:

Received: Jan 15, 2025 5:11 PM
Due: Jan 20, 2025
Priority: 3 Day
Contact Name: Diego

Eurofins Analytical Services Manager : Adam Bateup

Sample Detail						Aggressivity Soil Set	Moisture Set
Sydney Laboratory - NATA # 1261 Site # 18217						X	X
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	BH01 0.5-1M	Dec 16, 2024		Soil	S25-Ja0018526	X	X
2	BH01 2.0M	Dec 16, 2024		Soil	S25-Ja0018527	X	X
3	BH01 4.0M	Dec 16, 2024		Soil	S25-Ja0018528	X	X
4	BH02 0.5M	Dec 16, 2024		Soil	S25-Ja0018529	X	X
5	BH02 1.0M	Dec 16, 2024		Soil	S25-Ja0018530	X	X
6	BH02 3.0M	Dec 16, 2024		Soil	S25-Ja0018531	X	X
7	BH03 0.5M	Dec 16, 2024		Soil	S25-Ja0018532	X	X
8	BH03 1.0M	Dec 16, 2024		Soil	S25-Ja0018533	X	X
9	BH03 2.0M	Dec 16, 2024		Soil	S25-Ja0018534	X	X
Test Counts						9	9

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	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank									
Chloride			mg/kg	< 10			10	Pass	
Conductivity (1:5 aqueous extract at 25 °C as rec.)			uS/cm	< 10			10	Pass	
Sulphate (as SO4)			mg/kg	< 10			10	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	S25-Ja0018527	CP	%	101			70-130	Pass	
Sulphate (as SO4)	S25-Ja0018527	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			
Chloride	S25-Ja0018526	CP	mg/kg	< 10	< 10	<1	30%	Pass	
Conductivity (1:5 aqueous extract at 25 °C as rec.)	S25-Ja0018526	CP	uS/cm	180	170	2.0	30%	Pass	
pH (1:5 Aqueous extract at 25 °C as rec.)	S25-Ja0018526	CP	pH Units	8.3	8.4	pass	30%	Pass	
Resistivity*	S25-Ja0018526	CP	ohm.m	56	58	2.0	30%	Pass	
Sulphate (as SO4)	S25-Ja0018526	CP	mg/kg	280	270	1.0	30%	Pass	
Duplicate									
Sample Properties				Result 1	Result 2	RPD			
% Moisture	S25-Ja0018464	NCP	%	16	14	9.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Conductivity (1:5 aqueous extract at 25 °C as rec.)	S25-Ja0018527	CP	uS/cm	22	20	10	30%	Pass	
pH (1:5 Aqueous extract at 25 °C as rec.)	S25-Ja0018527	CP	pH Units	9.3	9.4	pass	30%	Pass	
Resistivity*	S25-Ja0018527	CP	ohm.m	450	500	10	30%	Pass	

Environment Testing

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

Authorised by:

Nileshni Goundar	Analytical Services Manager
Ryan Phillips	Senior Analyst-Inorganic
Ryan Phillips	Senior Analyst-Sample Properties

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.

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CEC Geotechnical

Laboratory Test Request / Chain of Custody Record

Email reports: admin@cec-au.com dean@cec-au.com diego@cec-au.com ali.s@cec-au.com

Unit 4 83 Grose Street, North Parramatta, NSW 2151
Ph : 96300121

Email invoices: admin@cec-au.com amir@cec-au.com

Sampling Date: 16/12/2024 **Job No: GR24220**

Sampled By: AA **Project: 215, 229-239 PITT ST, MERRYLANDS**

Project Manager: AS **Location: 215, 229-239 PITT ST, MERRYLANDS**

Sampling details			Sample type			Results required by: standard TAT Quotation Number (if applicable):										
Location	Depth (m)	Date	Soil	Water (Filled Up)	Air	EC	pH	Sulphate	Chloride	Aggressivity	Resistivity	pHf	pHFox		Analysis Suite(s)	KEEP SAMPLE?
BH01	**0.5**	**16/12/2024**	x			x	x	x	x	x	x					Yes
BH01	**2.0**	**16/12/2024**	x			x	x	x	x	x	x					Yes
BH01	**4.0**	**16/12/2024**	x			x	x	x	x	x	x					Yes
BH02	**0.5**	**16/12/2024**	x			x	x	x	x	x	x					Yes
BH02	**1.0**	**16/12/2024**	x			x	x	x	x	x	x					Yes
BH02	**3.0**	**16/12/2024**	x			x	x	x	x	x	x					Yes
BH03	**0.5**	**16/12/2024**	x			x	x	x	x	x	x					Yes
BH03	**1.0**	**16/12/2024**	x			x	x	x	x	x	x					Yes
BH03	**2.0**	**16/12/2024**	x			x	x	x	x	x	x					Yes

Relinquished by			Received by		
Name	Signature	Date	Name	Signature	Date

Legend:

WG	Water sample, glass bottle	USG	Undisturbed soil sample (glass jar)	DSP	Disturbed soil sample (small plastic bag)
WP	Water sample, plastic bottle	DSG	Disturbed soil sample (glass jar)	✓	Test required
GV	Glass vial	OTH	Other	ACAN	Air sample, canister

@ mole H^+/tonne

Material Test Report

Report Number:	**P25508-1**
Issue Number:	1
Date Issued:	10/01/2025
Client:	CEC GEOTECHNICAL PTY LTD
	8 Buller Street, North Parramatta, North Parramatta NSW 2151
Contact:	Ali Selman
Project Number:	P25508
Project Name:	215,229-239 PITT ST, MERRYLANDS
Project Location:	215,229-239 PITT ST, MERRYLANDS
Client Reference:	GR24220 - GR24220
Work Request:	6745
Sample Number:	25-6745A
Date Sampled:	06/01/2025
Dates Tested:	06/01/2025 - 09/01/2025
Sampling Method:	Sampled by Client
	The results apply to the sample as received
Remarks:	GR24220 - BH3 1.5m
Sample Location:	**BH3 1.5m , Depth: 1.5**
Material:	Silty CLAY
Material Source:	U50 Sample

ROSE TESTING

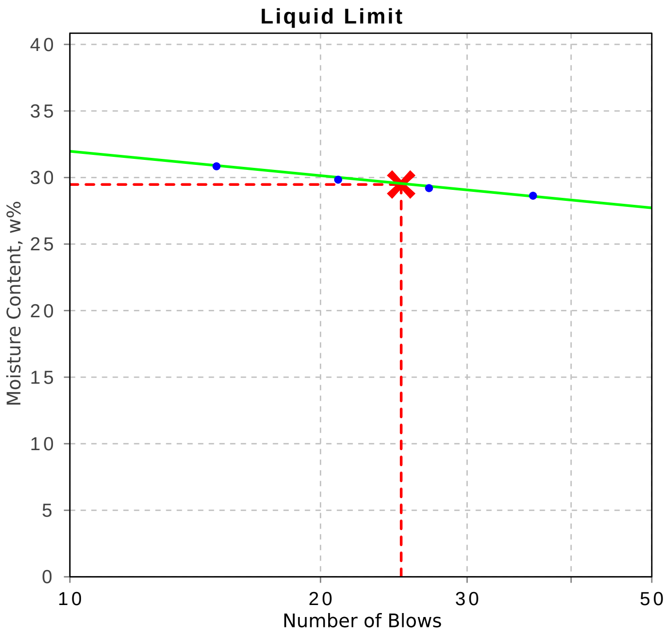
Rose Testing Pty Ltd
Rose Testing
Unit 8/21 Hickeys Lane Penrith NSW 2750
Phone: 0474 100 050
Email: navid@rosetesting.com

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Navid Ghafourian
Laboratory Accreditation Number: 20925

Atterberg Limit (AS1289 3.1.1 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Air Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	29		
Plastic Limit (%)	17		
Plasticity Index (%)	**12**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.1		
Linear Shrinkage (%)	**1.0**		
Cracking Crumbling Curling	Cracking		



Uniaxial Compressive Strength

Client	CEC Geotechnical	**Sample Source**	BH01 10.20m
Address	4/83 Grose Street, North Parramatta, NSW 2151	**Sample Description**	Shale
Project	GR24220 - 215 219-239 PITT ST MERRYLANDS	**Report #**	S102965-UCS
Job #	S25020-1	**Sample #**	S102965

Test Procedure	AS 4133.4.2.2 Determination of uniaxial compressive strength-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	16/12/2024
Storage History	Sealed	**Storage Environment**	Sealed at as received moisture condition
Sample Curing	-	**Testing Machine**	Matest 2000 kN Compression Machine

Uniaxial Compressive Strength 27 MPa

Date Tested:	22/01/2025		Moisture Content:	2.3	%
Specimen Height:	101.1	mm	Duration of Test:	634	seconds
Average Specimen Diameter:	51.6	mm	Rate of Displacement:	< 0.1	mm/min
Failure Type:	Mixed mode				
Other Pertinent Observations:					
Deviation from Standard:	Test specimen length to diameter ratio falls outside of standard limitations of 2.5-3.0.				

Accredited for compliance with ISO/IEC 17025 - Testing.

Authorised Signatory:

Chris Lloyd

NATA Accredited Laboratory Number: 14874

Date: 28/01/2025

Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

Uniaxial Compressive Strength

Client	CEC Geotechnical	**Sample Source**	BH01 15.20m
Address	4/83 Grose Street, North Parramatta, NSW 2151	**Sample Description**	Shale
Project	GR24220 - 215 219-239 PITT ST MERRYLANDS	**Report #**	S102966-UCS
Job #	S25020-1	**Sample #**	S102966

Test Procedure	AS 4133.4.2.2 Determination of uniaxial compressive strength-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	16/12/2024
Storage History	Sealed	**Storage Environment**	Sealed at as received moisture condition
Sample Curing	-	**Testing Machine**	Matest 2000 kN Compression Machine

Uniaxial Compressive Strength 21 MPa

Date Tested:	22/01/2025	Moisture Content:	1.9 %
Specimen Height:	126.9 mm	Duration of Test:	620 seconds
Average Specimen Diameter:	51.7 mm	Rate of Displacement:	< 0.1 mm/min
Failure Type:	Tensile dominated		
Other Pertinent Observations:			
Deviation from Standard:	Test specimen length to diameter ratio falls outside of standard limitations of 2.5-3.0.		

Accredited for compliance with ISO/IEC 17025 - Testing.

Authorised Signatory:

Chris Lloyd

NATA Accredited Laboratory Number: 14874

Date: 28/01/2025

Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

Uniaxial Compressive Strength

Client	CEC Geotechnical	**Sample Source**	BH01 19.40m
Address	4/83 Grose Street, North Parramatta, NSW 2151	**Sample Description**	Shale
Project	GR24220 - 215 219-239 PITT ST MERRYLANDS	**Report #**	S102967-UCS
Job #	S25020-1	**Sample #**	S102967

Test Procedure	AS 4133.4.2.2 Determination of uniaxial compressive strength-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	16/12/2024
Storage History	Sealed	**Storage Environment**	Sealed at as received moisture condition
Sample Curing	-	**Testing Machine**	Matest 2000 kN Compression Machine

Uniaxial Compressive Strength 21 MPa

Date Tested:	22/01/2025		Moisture Content:	1.6	%
Specimen Height:	104.8	mm	Duration of Test:	609	seconds
Average Specimen Diameter:	51.6	mm	Rate of Displacement:	< 0.1	mm/min
Failure Type:	Tensile dominated				
Other Pertinent Observations:					
Deviation from Standard:	Test specimen length to diameter ratio falls outside of standard limitations of 2.5-3.0.				

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Authorised Signatory:

Chris Lloyd

NATA Accredited Laboratory Number: 14874

Date: 28/01/2025

Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

Uniaxial Compressive Strength

Client	CEC Geotechnical	**Sample Source**	BH01 24.60m
Address	4/83 Grose Street, North Parramatta, NSW 2151	**Sample Description**	Shale
Project	GR24220 - 215 219-239 PITT ST MERRYLANDS	**Report #**	S102968-UCS
Job #	S25020-1	**Sample #**	S102968

Test Procedure	AS 4133.4.2.2 Determination of uniaxial compressive strength-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	16/12/2024
Storage History	Sealed	**Storage Environment**	Sealed at as received moisture condition
Sample Curing	-	**Testing Machine**	Matest 2000 kN Compression Machine

Uniaxial Compressive Strength 31 MPa

Date Tested:	22/01/2025		Moisture Content:	1.5	%
Specimen Height:	107.5	mm	Duration of Test:	668	seconds
Average Specimen Diameter:	51.3	mm	Rate of Displacement:	< 0.1	mm/min
Failure Type:	Tensile dominated				
Other Pertinent Observations:					
Deviation from Standard:	Test specimen length to diameter ratio falls outside of standard limitations of 2.5-3.0.				

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Authorised Signatory:

Chris Lloyd

NATA Accredited Laboratory Number: 14874

Date: 28/01/2025

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Results relate only to the samples tested.

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14 Carter St
Lidcombe NSW 2141

Uniaxial Compressive Strength

Client	CEC Geotechnical	**Sample Source**	BH02 17.10m
Address	4/83 Grose Street, North Parramatta, NSW 2151	**Sample Description**	Shale
Project	GR24220 - 215 219-239 PITT ST MERRYLANDS	**Report #**	S102970-UCS
Job #	S25020-1	**Sample #**	S102970

Test Procedure	AS 4133.4.2.2 Determination of uniaxial compressive strength-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	17/12/2024
Storage History	Sealed	**Storage Environment**	Sealed at as received moisture condition
Sample Curing	-	**Testing Machine**	Matest 2000 kN Compression Machine

Uniaxial Compressive Strength 23 MPa

Date Tested:	22/01/2025		Moisture Content:	2.4	%
Specimen Height:	100.9	mm	Duration of Test:	611	seconds
Average Specimen Diameter:	51.5	mm	Rate of Displacement:	< 0.1	mm/min
Failure Type:	Mixed mode				
Other Pertinent Observations:					
Deviation from Standard:	Test specimen length to diameter ratio falls outside of standard limitations of 2.5-3.0.				

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Authorised Signatory:

Chris Lloyd

NATA Accredited Laboratory Number: 14874

Date: 28/01/2025

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Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

Uniaxial Compressive Strength

Client	CEC Geotechnical	**Sample Source**	BH02 21.10m
Address	4/83 Grose Street, North Parramatta, NSW 2151	**Sample Description**	Shale
Project	GR24220 - 215 219-239 PITT ST MERRYLANDS	**Report #**	S102971-UCS
Job #	S25020-1	**Sample #**	S102971

Test Procedure	AS 4133.4.2.2 Determination of uniaxial compressive strength-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	17/12/2024
Storage History	Sealed	**Storage Environment**	Sealed at as received moisture condition
Sample Curing	-	**Testing Machine**	Matest 2000 kN Compression Machine

Uniaxial Compressive Strength 15 MPa

Date Tested:	22/01/2025		Moisture Content:	2.4	%
Specimen Height:	19.4	mm	Duration of Test:	604	seconds
Average Specimen Diameter:	51.4	mm	Rate of Displacement:	< 0.1	mm/min
Failure Type:	Mixed mode				
Other Pertinent Observations:					
Deviation from Standard:	Test specimen length to diameter ratio falls outside of standard limitations of 2.5-3.0.				

Accredited for compliance with ISO/IEC 17025 - Testing.

Authorised Signatory:

Chris Lloyd

NATA Accredited Laboratory Number: 14874

Date: 28/01/2025

Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

Uniaxial Compressive Strength

Client	CEC Geotechnical	**Sample Source**	BH03 11.80m
Address	4/83 Grose Street, North Parramatta, NSW 2151	**Sample Description**	Shale
Project	GR24220 - 215 219-239 PITT ST MERRYLANDS	**Report #**	S102973-UCS
Job #	S25020-1	**Sample #**	S102973

Test Procedure	AS 4133.4.2.2 Determination of uniaxial compressive strength-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	17/12/2024
Storage History	Sealed	**Storage Environment**	Sealed at as received moisture condition
Sample Curing	-	**Testing Machine**	Matest 2000 kN Compression Machine

Uniaxial Compressive Strength 40 MPa

Date Tested:	22/01/2025	Moisture Content:	2.2 %
Specimen Height:	101.9 mm	Duration of Test:	653 seconds
Average Specimen Diameter:	51.4 mm	Rate of Displacement:	< 0.1 mm/min
Failure Type:	Tensile dominated		
Other Pertinent Observations:			
Deviation from Standard:	Test specimen length to diameter ratio falls outside of standard limitations of 2.5-3.0.		

NATA

Accredited for compliance with ISO/IEC 17025 - Testing.

Authorised Signatory:

Chris Lloyd

NATA Accredited Laboratory Number: 14874

Date: 28/01/2025

MACQUARIE GEOTECH

Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

Uniaxial Compressive Strength

Client	CEC Geotechnical	**Sample Source**	BH02 21.10m
Address	4/83 Grose Street, North Parramatta, NSW 2151	**Sample Description**	Shale
Project	GR24220 - 215 219-239 PITT ST MERRYLANDS	**Report #**	S102971-UCS
Job #	S25020-1	**Sample #**	S102971

Test Procedure	AS 4133.4.2.2 Determination of uniaxial compressive strength-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	17/12/2024
Storage History	Sealed	**Storage Environment**	Sealed at as received moisture condition
Sample Curing	-	**Testing Machine**	Matest 2000 kN Compression Machine

Uniaxial Compressive Strength 15 MPa

Date Tested:	22/01/2025		Moisture Content:	2.4	%
Specimen Height:	119.4	mm	Duration of Test:	604	seconds
Average Specimen Diameter:	51.4	mm	Rate of Displacement:	< 0.1	mm/min
Failure Type:	Mixed mode				
Other Pertinent Observations:					
Deviation from Standard:	Test specimen length to diameter ratio falls outside of standard limitations of 2.5-3.0.				

NATA

Accredited for compliance with ISO/IEC 17025 - Testing.

Authorised Signatory:

Chris Lloyd

NATA Accredited Laboratory Number: 14874

Date: 11/02/2025

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This document shall not be reproduced, except in full.
Results relate only to the samples tested.

Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

APPENDIX D – Site Classification General Information

Foundation Maintenance and Footing Performance: A Homeowner's Guide

BTF 18 replaces Information Sheet 10/91

Buildings can and often do move. This movement can be up, down, lateral or rotational. The fundamental cause of movement in buildings can usually be related to one or more problems in the foundation soil. It is important for the homeowner to identify the soil type in order to ascertain the measures that should be put in place in order to ensure that problems in the foundation soil can be prevented, thus protecting against building movement.

This Building Technology File is designed to identify causes of soil-related building movement, and to suggest methods of prevention of resultant cracking in buildings.

Soil Types

The types of soils usually present under the topsoil in land zoned for residential buildings can be split into two approximate groups – granular and clay. Quite often, foundation soil is a mixture of both types. The general problems associated with soils having granular content are usually caused by erosion. Clay soils are subject to saturation and swell/shrink problems.

Classifications for a given area can generally be obtained by application to the local authority, but these are sometimes unreliable and if there is doubt, a geotechnical report should be commissioned. As most buildings suffering movement problems are founded on clay soils, there is an emphasis on classification of soils according to the amount of swell and shrinkage they experience with variations of water content. The table below is Table 2.1 from AS 2870, the Residential Slab and Footing Code.

Causes of Movement

Settlement due to construction

There are two types of settlement that occur as a result of construction:

- Immediate settlement occurs when a building is first placed on its foundation soil, as a result of compaction of the soil under the weight of the structure. The cohesive quality of clay soil mitigates against this, but granular (particularly sandy) soil is susceptible.
- Consolidation settlement is a feature of clay soil and may take place because of the expulsion of moisture from the soil or because of the soil's lack of resistance to local compressive or shear stresses. This will usually take place during the first few months after construction, but has been known to take many years in exceptional cases.

These problems are the province of the builder and should be taken into consideration as part of the preparation of the site for construction. Building Technology File 19 (BTF 19) deals with these problems.

Erosion

All soils are prone to erosion, but sandy soil is particularly susceptible to being washed away. Even clay with a sand component of say 10% or more can suffer from erosion.

Saturation

This is particularly a problem in clay soils. Saturation creates a bog-like suspension of the soil that causes it to lose virtually all of its bearing capacity. To a lesser degree, sand is affected by saturation because saturated sand may undergo a reduction in volume – particularly imported sand fill for bedding and blinding layers. However, this usually occurs as immediate settlement and should normally be the province of the builder.

Seasonal swelling and shrinkage of soil

All clays react to the presence of water by slowly absorbing it, making the soil increase in volume (see table below). The degree of increase varies considerably between different clays, as does the degree of decrease during the subsequent drying out caused by fair weather periods. Because of the low absorption and expulsion rate, this phenomenon will not usually be noticeable unless there are prolonged rainy or dry periods, usually of weeks or months, depending on the land and soil characteristics.

The swelling of soil creates an upward force on the footings of the building, and shrinkage creates subsidence that takes away the support needed by the footing to retain equilibrium.

Shear failure

This phenomenon occurs when the foundation soil does not have sufficient strength to support the weight of the footing. There are two major post-construction causes:

- Significant load increase.
- Reduction of lateral support of the soil under the footing due to erosion or excavation.
- In clay soil, shear failure can be caused by saturation of the soil adjacent to or under the footing.

GENERAL DEFINITIONS OF SITE CLASSES

Class	Foundation
A	Most sand and rock sites with little or no ground movement from moisture changes
S	Slightly reactive clay sites with only slight ground movement from moisture changes
M	Moderately reactive clay or silt sites, which can experience moderate ground movement from moisture changes
H	Highly reactive clay sites, which can experience high ground movement from moisture changes
E	Extremely reactive sites, which can experience extreme ground movement from moisture changes
A to P	Filled sites
P	Sites which include soft soils, such as soft clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise

Tree root growth
Trees and shrubs that are allowed to grow in the vicinity of footings can cause foundation soil movement in two ways:

- Roots that grow under footings may increase in cross-sectional size, exerting upward pressure on footings.
- Roots in the vicinity of footings will absorb much of the moisture in the foundation soil, causing shrinkage or subsidence.

Unevenness of Movement

The types of ground movement described above usually occur unevenly throughout the building's foundation soil. Settlement due to construction tends to be uneven because of:

- Differing compaction of foundation soil prior to construction.
- Differing moisture content of foundation soil prior to construction.

Movement due to non-construction causes is usually more uneven still. Erosion can undermine a footing that traverses the flow or can create the conditions for shear failure by eroding soil adjacent to a footing that runs in the same direction as the flow.

Saturation of clay foundation soil may occur where subfloor walls create a dam that makes water pond. It can also occur wherever there is a source of water near footings in clay soil. This leads to a severe reduction in the strength of the soil which may create local shear failure.

Seasonal swelling and shrinkage of clay soil affects the perimeter of the building first, then gradually spreads to the interior. The swelling process will usually begin at the uphill extreme of the building, or on the weather side where the land is flat. Swelling gradually reaches the interior soil as absorption continues. Shrinkage usually begins where the sun's heat is greatest.

Effects of Uneven Soil Movement on Structures

Erosion and saturation
Erosion removes the support from under footings, tending to create subsidence of the part of the structure under which it occurs. Brickwork walls will resist the stress created by this removal of support by bridging the gap or cantilevering until the bricks or the mortar bedding fail. Older masonry has little resistance. Evidence of failure varies according to circumstances and symptoms may include:

- Step cracking in the mortar beds in the body of the wall or above/below openings such as doors or windows.
- Vertical cracking in the bricks (usually but not necessarily in line with the vertical beds or perpends).

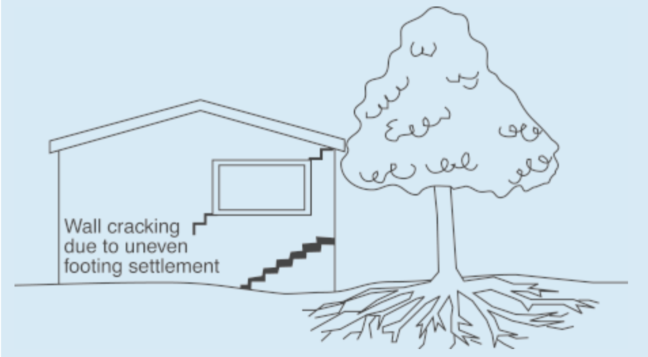
Isolated piers affected by erosion or saturation of foundations will eventually lose contact with the bearers they support and may tilt or fall over. The floors that have lost this support will become bouncy, sometimes rattling ornaments etc.

Seasonal swelling/shrinkage in clay
Swelling foundation soil due to rainy periods first lifts the most exposed extremities of the footing system, then the remainder of the perimeter footings while gradually permeating inside the building footprint to lift internal footings. This swelling first tends to create a dish effect, because the external footings are pushed higher than the internal ones.

The first noticeable symptom may be that the floor appears slightly dished. This is often accompanied by some doors binding on the floor or the door head, together with some cracking of cornice mitres. In buildings with timber flooring supported by bearers and joists, the floor can be bouncy. Externally there may be visible dishing of the hip or ridge lines.

As the moisture absorption process completes its journey to the innermost areas of the building, the internal footings will rise. If the spread of moisture is roughly even, it may be that the symptoms will temporarily disappear, but it is more likely that swelling will be uneven, creating a difference rather than a disappearance in symptoms. In buildings with timber flooring supported by bearers and joists, the isolated piers will rise more easily than the strip footings or piers under walls, creating noticeable doming of flooring.

Trees can cause shrinkage and damage



As the weather pattern changes and the soil begins to dry out, the external footings will be first affected, beginning with the locations where the sun's effect is strongest. This has the effect of lowering the external footings. The doming is accentuated and cracking reduces or disappears where it occurred because of dishing, but other cracks open up. The roof lines may become convex.

Doming and dishing are also affected by weather in other ways. In areas where warm, wet summers and cooler dry winters prevail, water migration tends to be toward the interior and doming will be accentuated, whereas where summers are dry and winters are cold and wet, migration tends to be toward the exterior and the underlying propensity is toward dishing.

Movement caused by tree roots
In general, growing roots will exert an upward pressure on footings, whereas soil subject to drying because of tree or shrub roots will tend to remove support from under footings by inducing shrinkage.

Complications caused by the structure itself
Most forces that the soil causes to be exerted on structures are vertical – i.e. either up or down. However, because these forces are seldom spread evenly around the footings, and because the building resists uneven movement because of its rigidity, forces are exerted from one part of the building to another. The net result of all these forces is usually rotational. This resultant force often complicates the diagnosis because the visible symptoms do not simply reflect the original cause. A common symptom is binding of doors on the vertical member of the frame.

Effects on full masonry structures
Brickwork will resist cracking where it can. It will attempt to span areas that lose support because of subsided foundations or raised points. It is therefore usual to see cracking at weak points, such as openings for windows or doors.

In the event of construction settlement, cracking will usually remain unchanged after the process of settlement has ceased.

With local shear or erosion, cracking will usually continue to develop until the original cause has been remedied, or until the subsidence has completely neutralised the affected portion of footing and the structure has stabilised on other footings that remain effective.

In the case of swell/shrink effects, the brickwork will in some cases return to its original position after completion of a cycle, however it is more likely that the rotational effect will not be exactly reversed, and it is also usual that brickwork will settle in its new position and will resist the forces trying to return it to its original position. This means that in a case where swelling takes place after construction and cracking occurs, the cracking is likely to at least partly remain after the shrink segment of the cycle is complete. Thus, each time the cycle is repeated, the likelihood is that the cracking will become wider until the sections of brickwork become virtually independent.

With repeated cycles, once the cracking is established, if there is no other complication, it is normal for the incidence of cracking to stabilise, as the building has the articulation it needs to cope with the problem. This is by no means always the case, however, and monitoring of cracks in walls and floors should always be treated seriously.

Upheaval caused by growth of tree roots under footings is not a simple vertical shear stress. There is a tendency for the root to also exert lateral forces that attempt to separate sections of brickwork after initial cracking has occurred.

The normal structural arrangement is that the inner leaf of brickwork in the external walls and at least some of the internal walls (depending on the roof type) comprise the load-bearing structure on which any upper floors, ceilings and the roof are supported. In these cases, it is internally visible cracking that should be the main focus of attention, however there are a few examples of dwellings whose external leaf of masonry plays some supporting role, so this should be checked if there is any doubt. In any case, externally visible cracking is important as a guide to stresses on the structure generally, and it should also be remembered that the external walls must be capable of supporting themselves.

Effects on framed structures
Timber or steel framed buildings are less likely to exhibit cracking due to swell/shrink than masonry buildings because of their flexibility. Also, the doming/dishing effects tend to be lower because of the lighter weight of walls. The main risks to framed buildings are encountered because of the isolated pier footings used under walls. Where erosion or saturation cause a footing to fall away, this can double the span which a wall must bridge. This additional stress can create cracking in wall linings, particularly where there is a weak point in the structure caused by a door or window opening. It is, however, unlikely that framed structures will be so stressed as to suffer serious damage without first exhibiting some or all of the above symptoms for a considerable period. The same warning period should apply in the case of upheaval. It should be noted, however, that where framed buildings are supported by strip footings there is only one leaf of brickwork and therefore the externally visible walls are the supporting structure for the building. In this case, the subfloor masonry walls can be expected to behave as full brickwork walls.

Effects on brick veneer structures
Because the load-bearing structure of a brick veneer building is the frame that makes up the interior leaf of the external walls plus perhaps the internal walls, depending on the type of roof, the building can be expected to behave as a framed structure, except that the external masonry will behave in a similar way to the external leaf of a full masonry structure.

Water Service and Drainage

Where a water service pipe, a sewer or stormwater drainage pipe is in the vicinity of a building, a water leak can cause erosion, swelling or saturation of susceptible soil. Even a minuscule leak can be enough to saturate a clay foundation. A leaking tap near a building can have the same effect. In addition, trenches containing pipes can become watercourses even though backfilled, particularly where broken rubble is used as fill. Water that runs along these trenches can be responsible for serious erosion, interstrata seepage into subfloor areas and saturation.

Pipe leakage and trench water flows also encourage tree and shrub roots to the source of water, complicating and exacerbating the problem.
Poor roof plumbing can result in large volumes of rainwater being concentrated in a small area of soil:

- Incorrect falls in roof guttering may result in overflows, as may gutters blocked with leaves etc.
- Corroded guttering or downpipes can spill water to ground.
- Downpipes not positively connected to a proper stormwater collection system will direct a concentration of water to soil that is directly adjacent to footings, sometimes causing large-scale problems such as erosion, saturation and migration of water under the building.

Seriousness of Cracking

In general, most cracking found in masonry walls is a cosmetic nuisance only and can be kept in repair or even ignored. The table below is a reproduction of Table C1 of AS 2870.

AS 2870 also publishes figures relating to cracking in concrete floors, however because wall cracking will usually reach the critical point significantly earlier than cracking in slabs, this table is not reproduced here.

Prevention/Cure

Plumbing
Where building movement is caused by water service, roof plumbing, sewer or stormwater failure, the remedy is to repair the problem. It is prudent, however, to consider also rerouting pipes away from the building where possible, and relocating taps to positions where any leakage will not direct water to the building vicinity. Even where gully traps are present, there is sometimes sufficient spill to create erosion or saturation, particularly in modern installations using smaller diameter PVC fixtures. Indeed, some gully traps are not situated directly under the taps that are installed to charge them, with the result that water from the tap may enter the backfilled trench that houses the sewer piping. If the trench has been poorly backfilled, the water will either pond or flow along the bottom of the trench. As these trenches usually run alongside the footings and can be at a similar depth, it is not hard to see how any water that is thus directed into a trench can easily affect the foundation's ability to support footings or even gain entry to the subfloor area.

Ground drainage
In all soils there is the capacity for water to travel on the surface and below it. Surface water flows can be established by inspection during and after heavy or prolonged rain. If necessary, a grated drain system connected to the stormwater collection system is usually an easy solution.

It is, however, sometimes necessary when attempting to prevent water migration that testing be carried out to establish watertable height and subsoil water flows. This subject is referred to in BTF 19 and may properly be regarded as an area for an expert consultant.

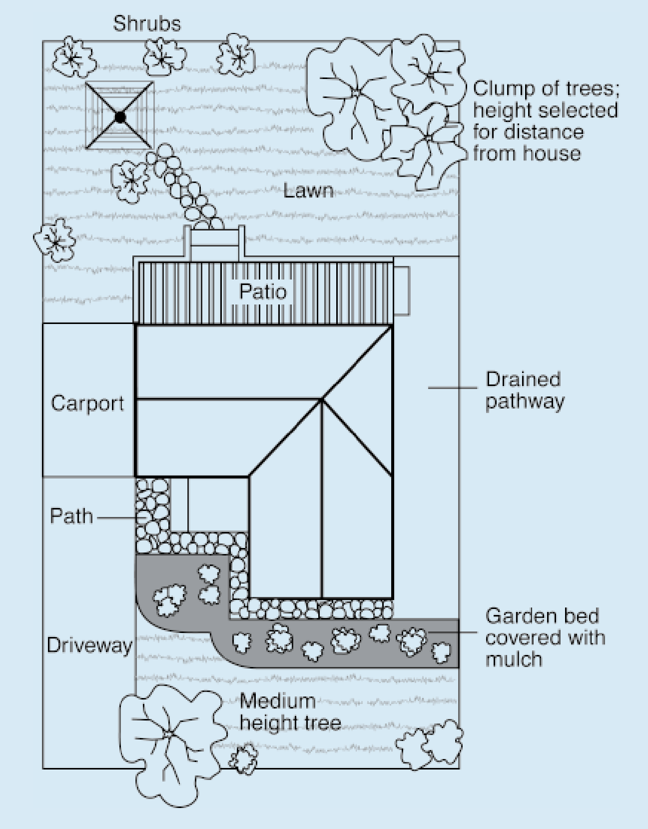
Protection of the building perimeter
It is essential to remember that the soil that affects footings extends well beyond the actual building line. Watering of garden plants, shrubs and trees causes some of the most serious water problems.

For this reason, particularly where problems exist or are likely to occur, it is recommended that an apron of paving be installed around as much of the building perimeter as necessary. This paving

CLASSIFICATION OF DAMAGE WITH REFERENCE TO WALLS

Description of typical damage and required repair	Approximate crack width limit (see Note 3)	Damage category
Hairline cracks	<0.1 mm	0
Fine cracks which do not need repair	<1 mm	1
Cracks noticeable but easily filled. Doors and windows stick slightly	<5 mm	2
Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weathertightness often impaired	5–15 mm (or a number of cracks 3 mm or more in one group)	3
Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Window and door frames distort. Walls lean or bulge noticeably, some loss of bearing in beams. Service pipes disrupted	15–25 mm but also depend on number of cracks	4

Gardens for a reactive site



should extend outwards a minimum of 900 mm (more in highly reactive soil) and should have a minimum fall away from the building of 1:60. The finished paving should be no less than 100 mm below brick vent bases.

It is prudent to relocate drainage pipes away from this paving, if possible, to avoid complications from future leakage. If this is not practical, earthenware pipes should be replaced by PVC and backfilling should be of the same soil type as the surrounding soil and compacted to the same density.

Except in areas where freezing of water is an issue, it is wise to remove taps in the building area and relocate them well away from the building – preferably not uphill from it (see BTF 19).

It may be desirable to install a grated drain at the outside edge of the paving on the uphill side of the building. If subsoil drainage is needed this can be installed under the surface drain.

Condensation

In buildings with a subfloor void such as where bearers and joists support flooring, insufficient ventilation creates ideal conditions for condensation, particularly where there is little clearance between the floor and the ground. Condensation adds to the moisture already present in the subfloor and significantly slows the process of drying out. Installation of an adequate subfloor ventilation system, either natural or mechanical, is desirable.

Warning: Although this Building Technology File deals with cracking in buildings, it should be said that subfloor moisture can result in the development of other problems, notably:

- Water that is transmitted into masonry, metal or timber building elements causes damage and/or decay to those elements.
- High subfloor humidity and moisture content create an ideal environment for various pests, including termites and spiders.
- Where high moisture levels are transmitted to the flooring and walls, an increase in the dust mite count can ensue within the living areas. Dust mites, as well as dampness in general, can be a health hazard to inhabitants, particularly those who are abnormally susceptible to respiratory ailments.

The garden

The ideal vegetation layout is to have lawn or plants that require only light watering immediately adjacent to the drainage or paving edge, then more demanding plants, shrubs and trees spread out in that order.

Overwatering due to misuse of automatic watering systems is a common cause of saturation and water migration under footings. If it is necessary to use these systems, it is important to remove garden beds to a completely safe distance from buildings.

Existing trees

Where a tree is causing a problem of soil drying or there is the existence or threat of upheaval of footings, if the offending roots are subsidiary and their removal will not significantly damage the tree, they should be severed and a concrete or metal barrier placed vertically in the soil to prevent future root growth in the direction of the building. If it is not possible to remove the relevant roots without damage to the tree, an application to remove the tree should be made to the local authority. A prudent plan is to transplant likely offenders before they become a problem.

Information on trees, plants and shrubs

State departments overseeing agriculture can give information regarding root patterns, volume of water needed and safe distance from buildings of most species. Botanic gardens are also sources of information. For information on plant roots and drains, see Building Technology File 17.

Excavation

Excavation around footings must be properly engineered. Soil supporting footings can only be safely excavated at an angle that allows the soil under the footing to remain stable. This angle is called the angle of repose (or friction) and varies significantly between soil types and conditions. Removal of soil within the angle of repose will cause subsidence.

Remediation

Where erosion has occurred that has washed away soil adjacent to footings, soil of the same classification should be introduced and compacted to the same density. Where footings have been undermined, augmentation or other specialist work may be required. Remediation of footings and foundations is generally the realm of a specialist consultant.

Where isolated footings rise and fall because of swell/shrink effect, the homeowner may be tempted to alleviate floor bounce by filling the gap that has appeared between the bearer and the pier with blocking. The danger here is that when the next swell segment of the cycle occurs, the extra blocking will push the floor up into an accentuated dome and may also cause local shear failure in the soil. If it is necessary to use blocking, it should be by a pair of fine wedges and monitoring should be carried out fortnightly.

This BTF was prepared by John Lewer FAIB, MIAMA, Partner, Construction Diagnosis.

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