

GCA Report No.

G25346-1

Date:

17th September 2025

Salinity Management Plan at:

241-245 Pennant Hills Road Carlingford NSW 2118

Prepared for:

Triple Eight Corporation Pty Ltd
c/o – Planning Direction Pty Ltd
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Attachments Enclosed:

Attachment 1 Important Information About Your Geotechnical Report

Attachment 2 Site Plan (Figure 1)

Attachment 3 Geotechnical Explanatory Notes

Attachment 4 Detailed Engineering Borehole Logs

Attachment 5 Aggressivity and Salinity Laboratory Test Results Certificates (NATA)

1. INTRODUCTION

This salinity management plan has been prepared by Geotechnical Consultants Australia Pty Ltd (GCA) on behalf of Triple Eight Corporation Pty Ltd (the client) at the Carlingford Unit for the construction and operation of a mixed-use development including infill affordable housing on land at nos. 241-245 Pennant Hills Road Carlingford NSW 2118 (the site

GCA previously undertook soil aggressivity and salinity sampling during a geotechnical investigation carried out on the 3rd, 4th and 5th July 2025 (report No. G25239-1-Rev A, and dated 16th September 2025). Laboratory testing was undertaken by a National Association of Testing Authorities, Australia (NATA) accredited laboratory (ALS Environmental) on nine (9) selected soil samples collected during auger drilling of the boreholes BH1 to BH3 inclusive.

This report summarises the results of our observations together with our assessment and recommendations on the soil salinity within the site. Reference should be made to the geotechnical engineering report prepared by GCA, referenced G25239-1-Rev A, and dated 16th September 2025.

This report accompanies a State Significant Development Application that seeks approval for the demolition and construction of a mixed-use residential and commercial development including infill affordable housing, which involves the following:

- Site preparation works, including demolition of existing structures, vegetation removal as necessary, and bulk excavation.
- Construction and operation of a mixed-use development comprising commercial premises, gymnasium, child care centre and shop top housing as follows:
 - One (1), 18-storey building (Building A) in the north-east corner of the site; and
 - two (2), 4-5 storey buildings (Building B & C) along the western edge of the site.

- A publicly accessible through site link between Pennant Hills Road and Felton Road.
- Six (6) commercial tenancies at ground floor.
- A three (3) storey gymnasium within the southern portion of Building C.
- A ninety-eight (98) place child care centre located on level 01 of Building A.
- 2,356m² of communal open space in the following locations.
 - The roof of Building A, B and C,
 - The two (2) storey podium of Building A.
 - The publicly accessible through site link
- A total of 136 residential apartments across the three buildings, including 25 infill affordable apartments,
- Provision of three levels of basement parking with a total of 263 car parking spaces comprising:
 - 151 residential car parking spaces (including 24 accessible spaces);
 - 30 commercial car parking spaces (including 4 accessible spaces);
 - 25 child care parking spaces (including 4 accessible spaces);
 - 26 gymnasium parking spaces (including 2 accessible spaces);
 - 26 visitor car parking spaces (including 12 accessible spaces); and
 - 3 car share spaces.
- Street tree planting and landscaping, extension and augmentation of services and infrastructure as required. For a detailed project description, refer to the Environmental Impact Statement prepared by Planning Direction.

For your review, **Appendix A** contains a document prepared by GCA entitled "Important Information About Your Geotechnical Report", which summarises the general limitations, responsibilities and use of geotechnical engineering reports

SEARs Declaration

Declaration

Name Joe Nader

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The undersigned declares that this geotechnical engineering report has been prepared in response to the following SEARs requirements issued for the Project on 23rd May 2025 for SSD- SSD-84699461:

SEARs Item No.	SEARs Requirement	Relevant Section of this Report
12.	Salinity Management Plan	Section 4, Section 5, Section 6 and Section 7

Signed



Dated 17th September 2025

2. PROVIDED INFORMATION

The following documentations were provided to GCA for review, or were referred to:

- Architectural drawings prepared by Kennedy Associates Architects, titled "Proposed Development, 241-245 Pennant Hills Road Carlingford NSW", and referenced No. 1804.
- Site survey plan taken from architectural drawings prepared by Kennedy Associates Architects, titled "Proposed Development 241-245 Pennant Hills Road Carlingford NSW", referenced drawing No. 1804-SD0050, revision No. P4 and dated 5th May 2025.
- Geotechnical engineering report prepared by Geotechnical Consultants Australia Pty Ltd, titled "Geotechnical Investigation Report & Preliminary Groundwater Assessment Report, Proposed Development at: 241-245 Pennant Hills Road Carlingford NSW 2118", referenced report No. G25239-1-Rev A, and dated 16th September 2025.

3. SCOPE OF WORK

Fieldwork for the soil aggressivity and salinity testing consisted of the collection of soil and rock samples at various depths within the boreholes (BH1 to BH3 inclusive) carried out during the geotechnical site investigation by GCA (G25239-1-Rev A, and dated 16th September 2025), and was followed by laboratory testing (NATA) on the selected samples recovered from the boreholes.

A summary of the subsurface conditions encountered during the geotechnical investigation is presented in Table 1 (extracted from the geotechnical engineering report by GCA), with explanatory notes and detailed borehole logs from the geotechnical investigation enclosed in **Attachment 3** and **Attachment 4**, respectively.

Table 1. Summary of Subsurface Conditions

Borehole ID			BH1	BH2	BH3
Approximate Surface RL at Borehole Location (m AHD) ⁴			RL106.4	RL109.3	RL109.1
Unit	Unit Type	Estimated Consistency/ Strength	Depth/Thickness of Unit (m bgl) (RL m AHD)		
1a	FILL: Silty Clay low to medium plasticity	N/A	0.0 – 0.5 (RL106.4 – 105.9)	–	0.05 – 0.6 (RL109.05 – 108.5)
1b	FILL: Silty Sand, fine to medium grained.	N/A	–	0.0 – 0.5 (RL109.3 – 108.8)	–
2a	NATURAL SOILS. Silty CLAY, medium to high plasticity	Stiff	0.5 – 0.9 (RL105.9 – 105.5)	0.5 – 1.9 (RL108.8 – 107.4)	0.6 – 1.0 (RL108.5 – 108.1)
2b	Extremely Weathered Material (Shale) ¹ Silty CLAY, medium to high	Soil Strength (Very Stiff)	0.9 – 1.8 (RL105.5 – 104.6)	–	–

	plasticity, pale grey				
3	SHALE, with extremely weathered clay seams (inferred Class V Shale) ^{2, 3}	VL – L	1.8 – 3.0 (RL104.6 – 103.4)	1.9 – 2.5 (RL107.4 – 106.8)	1.0 – 2.5? (RL108.1 – 106.6)
4	Class V Shale ²	VL – L	3.0 – 6.9 (RL103.4 – 99.5)	2.5 – 6.8 (RL106.8 – 102.5)	2.5? – 4.5? (RL106.6 – 104.6) 13.8 – 14.9 (RL95.3 – 94.2)
5	Class IV Shale ²	L – M	6.9 – 9.2 (RL99.5 – 97.2)	–	4.5? – 8.0 (RL104.6 – 101.10)
6	Class III Shale ²	M	–	6.8 – 10.2 (RL102.5 – 99.1)	–
7	Class III/II Shale ^{2, 5}	M – H	9.2 – 15.08 (RL97.2 – 91.32)	10.2 – 15.56 (RL99.1 – 93.74)	8.0 – 13.8 (RL101.1 – 95.3) 14.9 – 25.00 (RL94.2 – 84.10)

¹Extremely weathered material (Shale) is generally of soil strength, has been logged as a soil in accordance with AS 1726-2017 and is grouped with the natural clay soils.

²An experienced geotechnical engineer should confirm the underlying bedrock composition, class, depth and estimated strength by further cored borehole drilling and rock strength testing, and during excavation by inspection and appropriate testing (i.e. spoon testing, rock strength testing, etc.).

³This material could not be classified as it was drilled with auger only.

⁴RLs for each borehole are approximate and have been interpreted from the site survey plan referenced in Section 1.2.

⁵Additional cored boreholes are required prior to construction to confirm the presence of Class III/II Shale bedrock across the site. Spoon testing is also required during construction of the proposed development to confirm the underlying Class III/II Shale bedrock.

Notes:

- N/A = Not applicable, VL = Very low estimated strength, L = Low estimated strength, M = Medium estimated strength, H = High estimated strength.
- Clay seams, defects and fractured/extremely weathered zones are expected to be present throughout the underlying bedrock, predominantly at depths and locations unobserved during the geotechnical investigation.
- Rock strength is approximate and based on observations made during auger penetration resistance at the time of drilling, tactile assessment of rock core and auger cuttings and point load strength index (I_{s50}) tests carried out at approximately 1.0m intervals.
- Ground conditions are expected to vary across the site and should be confirmed by a geotechnical engineer during excavation by inspection, predominantly in areas not assessed during the geotechnical investigation.

4. SOIL AGGRESSIVITY AND SALINITY TEST RESULTS

Nine (9) selected soil samples were sent to a NATA accredited testing laboratory, ALS Environmental, to determine the pH, chloride and sulphate content, and electrical conductivity of the samples.

A summary of the laboratory tests results is provided in Table 2a and Table 2b below with laboratory certificates presented in **Attachment 5** of this report. The multiplication factor was obtained from NSW Government, Catchment Management Authority, "Calculating Electrical Conductivity and Salinity" and Department of Natural Resources (DNR) publication "Site Investigations for Urban Salinity" – 2002.

Table 2a. Summary of Laboratory Test Results (Aggressivity and Salinity)

Borehole ID		BH1	BH1	BH1	BH2	BH2
Approximate Depth (m bgl)		0.5 – 0.85	1.4 – 1.5	2.4 – 2.6	0.5 – 0.95	1.5 – 1.6
Strata Type		Natural Soils	Natural Soils	Bedrock	Natural Soils	Natural soils
Aggressivity and Salinity	pH	4.5	4.7	5.1	4.4	4.6
	Moisture Content (%)	26.6	9.0	14.6	20.2	18.2
	Chloride (mg/kg)	<50	<10	<10	20	30
	Sulphate SO ₄ (mg/kg)	40	30	30	120	100
Electrical Conductivity (µS/cm)	EC (µS/cm)	31	26	27	83	83
	EC (dS/m)	0.031	0.026	0.027	0.083	0.083
	Multiplication Factor ¹	8	8	15	8	8
	Saturation Extract ECe (dS/m)	0.2	0.2	0.4	0.7	0.7

Table 2b. Summary of Laboratory Test Results (Aggressivity and Salinity)

Borehole ID		BH2	BH3	BH3	BH3	-
Approximate Depth (m bgl)		2.1 – 2.3	0.5 – 0.95	1.5 - 1.8	5.6 – 5.8	
Strata Type		Bedrock	Natural Soils	Natural Soils	Bedrock	
Aggressivity and Salinity	pH	5.0	4.9	5.4	5.8	
	Moisture Content (%)	10.7	22.8	9.3	8.8	
	Chloride (mg/kg)	<10	<10	10	<10	
	Sulphate SO ₄ (mg/kg)	80	80	20	40	
Electrical Conductivity (μS/cm)	EC (μS/cm)	58	56	21	39	-
	EC (dS/m)	0.058	0.056	0.021	0.039	
	Multiplication Factor ¹	15	8	8	15	
	Saturation Extract ECe (dS/m)	0.9	0.4	0.2	0.6	

5. SITE SOIL AGGRESSIVITY AND SALINITY ASSESSMENT

In accordance with Australian Standards (AS) 2159-2009 “Piling – Design and Installation” (as outlined in Table 3 below), results of laboratory tests and introduction of a multiplication factor for electrical conductivity on the selected samples indicates the following classification:

Table 3. Aggressivity and Salinity Reference Table

Reference	Element Type	Soil Condition A ¹	Soil Condition B ²	pH	Chloride (mg/kg)	Sulphate SO ₄ (mg/kg)
AS 2159-2009	Concrete Elements	Mild	Non	>5.5	N/A	<5,000
		Moderately	Mild	4.5 – 5.5		5,000 – 10,000
		Severely	Moderately	4.0 – 4.5		10,000 – 20,000
		Very Severely	Severely	<4.0		>20,000
	Steel Elements	Non	Non	>5.0	<5,000	N/A
		Mild	Non	4.0 – 5.0	5,000 – 20,000	
		Moderately	Mild	3.0 – 4.0	20,000 – 50,000	
		Severely	Moderately	<3.0	>50,000	
Dry Salinity 1993	Electrical Conductivity Saturation Extract E _{Ce} (dS/m) value range, based on an introduction of a multiplication factor from DNR publication.			Non-Saline <2 Slightly Saline 2 – 4 Moderately Saline 4 – 8 Very Saline 8 – 16 Highly Saline >16		

¹Soil Condition A refers to high permeability soils that are in groundwater.

²Soil Condition B refers to low permeability soils or all soils above groundwater.

Applying Soil Condition B, the:

- Underlying natural soils are considered:
 - Non aggressive to buried steel structural elements.
 - Mildly to moderately aggressive to buried concrete structural elements.
 - Electrical conductivity of saturated extract (ECe) ranging from 0.2dS/m to 0.7dS/m, indicating generally "non" saline natural soils underlying the site.
- Underlying bedrock is considered:
 - Non aggressive to buried steel structural elements.
 - Mildly aggressive to buried concrete structural elements.
 - Electrical conductivity of saturated extract (ECe) ranging from 0.4dS/m to 0.9dS/m, indicating generally "non" saline bedrock underlying the site.

Note that soil aggressivity and salinity may vary throughout the site, and the assessment above is based on testing at the selected locations and depths indicated, in conjunction with multiplication factors for electrical conductivity. Ground conditions and soil aggressivity and salinity are expected to vary across the site as discussed in this report, since no geotechnical or geological exploration program, no matter how comprehensive, can reveal and identify all subsurface conditions underlying the site.

Consideration should be given to additional borehole drilling and laboratory testing following demolition of existing infrastructure onsite, in order to confirm the preliminary findings presented above.

6. IMPACT OF AGGRESSIVITY AND SALINITY ON THE PROPOSED DEVELOPMENT

The usual test for salinity (electrical conductivity, ECe) (shown in Table 2a and Table 2b above), measures the soluble salts in the soils which are present. By measuring the composition of salts present, an accurate assessment of the adverse impacts which salinity may pose on the proposed development may be assessed.

The main mechanisms which salts in the soils affect reinforced concrete are, but not limited to:

- Physical attack on the concrete;
- Chemical breakdown of the concrete; and
- Corrosion of the reinforcement.

Physical attack on the concrete includes moisture from the soil entering the concrete, and leading to rising damp and crystallisation of salts (both chlorides and sulphates) as the water evaporates. Disruption of the concrete at the surface can occur, depending on the pressure exerted by these processes, eventually softening the surface layer of the concrete. Softening of the surface layer will affect the longevity of the structures.

In saline groundwater environments, naturally occurring sulphates of sodium, calcium, potassium or magnesium, may be found in the soils or dissolved in groundwater. At certain concentrations, these sulphates can chemically attack the concrete, with the severity depending on the concentration of the sulphates present, along with groundwater pressure, temperature and movement. Sulphate attack typically involves reaction between the sulphates and concrete. The resulting reaction causes swelling within the concrete members, leading to cracking, which in turn allows for further penetration and deterioration.

Deterioration of the concrete may lead to exposure of the reinforcement members within a slab or footing system. In turn, the exposure of reinforcement will lead to corrosion of the metal reinforcement. Growth of rust (iron oxides and hydroxides) is accompanied by an increase in volume and can cause cracking within the concrete ('concrete cancer').

Cracking in any concrete element may impact on the strength of the concrete structure, and may impact the durability of the concrete, as it provides a direct passage for moisture and oxygen to enter the concrete, leading to further corrosion and localised failure.

7. RECOMMENDATIONS

Results of testing indicate the natural soils and bedrock underlying the site to be generally “non” saline, and “mildly” to “moderately” aggressive to buried concrete structural elements.

The following recommendations and management strategies should be considered with the construction of the proposed development:

- Concrete elements such as infrastructure, slabs, drains and retaining walls, etc., should be designed to provide the required durability. The ground levels and design of the drainage system should be able to control the level of the groundwater table and seepage. In this respect, any salts present near the surface should be gradually leached further down the site, away from any structural elements.
- As groundwater will flow downward and laterally, and emerge at lower points of the site or a slope, construction of retaining walls and installation of services draining to stormwater systems should be implemented to divert surface run-off and water catchment to reach local creeks/rivers.
- The finished surface levels should provide adequate falls to the street to allow for runoff of water, prevent water ponding, and reduce infiltration of water into the ground.
- Adequate drainage should be provided behind walls and retaining walls. In an environment where the soils are saline, a plastic membrane behind the walls will also assist in reducing efflorescence on the exposed face of the wall.
- Concrete pipes with diameters larger than 750mm should utilise sulphate resistant cement.
- The walls and concrete slabs should have appropriate concrete strength and cover to the reinforcement. Recommended minimum concrete strength manufactured by ready mixed suppliers and concrete cover thickness to comply with the requirements of AS 3600-2018 “Concrete Structures” for the salinity classes are shown in Table 4 below, with the recommended concrete strength and reinforcement cover in piles in accordance with AS 2159-2009 “Piling – Design and Installation” in Table 5 below.

Table 4. Recommended Minimum Concrete Strength and Minimum Cover for Salinity Cases

Electrical Conductivity Saturation Extract E _{ce} (dS/m) Value Range	Exposure Classification ²	Salinity Class	Minimum Recommended Concrete Grade (MPa) ¹	Minimum Cover to Reinforcement (mm) ¹
<4	A1	Non and Slightly Saline ³	Not Given in Australian Standards	
4 – 8	A2	Moderately Saline	25	45
8 – 16	B1	Very Saline	32	50
<16	B2	Highly Saline	≥40	55

¹Minimum concrete strength and minimum cover to reinforcement given are a guide for saline conditions, and may not be adequate in highly acidic soils. Minimum concrete strength and minimum cover to reinforcement for structural elements may also need to be increased from the recommended grade given in Table 4, and should be confirmed by the project structural engineer. Taken from AS 3600-2018.

²Exposure classification taken from Table 5.1 of AS 2870-2011.

³Non and slightly saline soil E_{ce} (ds/m) value ranges given as <2 and 2 – 4, respectively.

Table 5. Recommended Concrete Strength and Reinforcement Cover in Piles for Aggressive Cases

Aggressivity Class	Minimum Concrete Strength f'_c (MPa)		Minimum Cover to Reinforcement (mm)			
			50 Year Design Life		100 Year Design Life	
	Precast and Prestressed Piles	Cast in Place Piles	Precast and Prestressed Piles	Cast in Place Piles	Precast and Prestressed Piles	Cast in Place Piles
Non-Aggressive	50	25 ¹	20	45	25	65
Mild Aggressive	50	32	20	60	30	75
Moderate Aggressive	50	40	25	65	40	85
Severe Aggressive ²	50	50	40	70	50	100
Very Severe Aggressive ²	>50 ³	>50 ³	40	75	50	120

¹For reinforced piles, use $f'_c = 32$ MPa minimum.

²Consideration shall be given to using an inert liner and/or coating for severe and very severe exposure classifications, in addition to specified concrete cover.

³Preferably >60.

- Reference to the aggressivity and salinity results presented in this report for the subject site must be made, and minimum concrete strength (MPa) and minimum cover to reinforcement (mm) selected with reference to relevant Australian Standards (Table 4 and Table 5).
 - As a precaution, GCA recommends adopting a "moderately" aggressive case for the underlying natural soils and bedrock.
- Adequate cover of good quality concrete should be placed above and below the reinforcement of a concrete membrane. Adequate cover to reinforcement for slabs, footings and beams which comply with AS 2870, and include:
 - For slabs and internal beams protected by damp-proofing membrane:
 - 20mm to internal surface.
 - 30mm to membrane in contact with the ground.
 - Perimeter footings and beams not protected by damp-proofing membrane:
 - 40mm for non-saline soils.
 - 45mm for moderately saline soils.
 - 50mm for very saline soils.
 - 55mm for highly saline soils.
- Concrete members should be allowed to cure continuously for either a minimum of three (3) or seven (7) days, in accordance with Table 4.4 in AS 3600-2018 "Concrete Structures" to limit any corrosive effects on the materials.
- Concrete admixtures and other ingredients may be added to improve the property of the concrete mixture, and should be manufactured and supplied in accordance with AS 1379-1979 "Specification and Supply of Concrete".
- Suspended floors for the proposed development should be taken into consideration, where strip footings are generally deeper than edge beams for typical slabs, extending further into the ground, increasing the risk of exposure to saline conditions.
- Concrete for strip and pad footings should be designed for the exposure conditions present in the site. A damp-proofing membrane must be installed, and should completely enclose the footing system.

- For pavements placed on saline soils, a plastic membrane such as a damp-proofing membrane can be placed under the pavement to prevent salts coming through the pavement material.
- Planting deep-rooted salt-resistant vegetation will assist in controlling the level of the water table by reducing infiltration. Salt resistant turf may also be considered.
- Testing of any imported fill should be undertaken prior to importation, to confirm test results of the salinity characteristics of the material.

The minimum concrete strength and minimum cover to reinforcement for structural elements may also need to be increased from the recommended grade given in Table 4, and should be confirmed by the project structural engineer.

It is the project structural engineer's responsibility to ensure that all concrete elements are designed appropriately, and in accordance with relevant Australian Standards and building codes, to the site conditions and laboratory test results of the aggressivity and salinity assessment.

Specific geotechnical advice should also be obtained for footing designs and design of the foundation system (shallow and pile foundations) should be carried out in accordance with AS 2870-2011 "Residential slabs and footings" and AS 2159-2009 "Piling – Design and Installation".

8. LIMITATIONS

Geotechnical Consultants Australia Pty Ltd (GCA) has based its assessment on available information obtained prior to and during preparation of this report. The assessment and recommendations provided in this report, along with the surface, subsurface and geotechnical conditions are limited to the inspection and test areas assessed during the previous site investigation, and then only to the depths investigated at the time the work was carried out. Subsurface conditions can change abruptly, and may occur after GCA's field testing is completed.

It is recommended that if for any reason, the site surface, subsurface and geotechnical conditions (including groundwater conditions) encountered during the previous geotechnical investigation vary substantially from those conditions encountered during excavation, cut and fill and during construction, and from GCA's recommendations and conclusions, GCA should be contacted immediately for further testing and advice. This may be carried out as necessary, and a review of recommendations and conclusions may be provided at additional fees. GCA's advice and accuracy may be limited by undetected variations in ground conditions between borehole, test and sampling locations.

GCA does not accept any liability for any varying site conditions which were not observed, and were out of the inspection or test areas, or were in inaccessible areas during the time of the investigation. This report and any associated information and documentation are prepared solely for **Triple Eight Corporation Pty Ltd**, and any misinterpretation of this report or reliance on this report by third parties shall be at their own risk. Any legal or other liabilities resulting from the use of this report by other parties cannot be transferred to GCA.

This report should be read in full, including all conclusions and recommendations. Consultation should be made to GCA for any misunderstandings or misinterpretations of this report. All recommendations made within this report are solely based on laboratory testing results at the time of the previous geotechnical investigation, and reference to relevant Australian Standards.

For and behalf of

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9. REFERENCES

AS 1726-2017 Geotechnical Site Investigations. Standards Australia.

AS 2159-2009 Piling - Design and Installation. Standards Australia.

AS 2870-2011 Residential Slabs and Footings. Standards Australia.

AS 3600-2018 Concrete Structures. Standards Australia.

Department of Natural Resources (DNR) Publication "Site Investigations for Urban Salinity" – 2002.

NSW Government, Catchment Management Authority, "Calculating Electrical Conductivity and Salinity".

Important Information About Your Geotechnical Report

This geotechnical report has been prepared based on the scopes outlined in the project proposal. The works carried out by Geotechnical Consultants Australia Pty Ltd (GCA), have limitations during the site investigation, and may be affected by a number of factors. Please read the geotechnical investigation report in conjunction with this "Important Information About Your Geotechnical Report".

Geotechnical Services Are Performed for Specific Projects, Clients and Purposes.

Due to the fact that each geotechnical investigation is unique and varies from sites, each geotechnical report is unique, and is prepared solely for the client. A geotechnical report may satisfy the needs of a structural engineer, where it will not for a civil engineer or construction contractor. No one except the client should rely on the geotechnical report without first conferring with the specific geotechnical consultant who prepared the report. The report is prepared for the contemplated project or original purpose of the investigation. No one should apply this report to any other or similar project.

Reading The Full Report.

Do not read selected elements of the report or tables/figures only. Serious problems have occurred because those relying on the specially prepared geotechnical investigation report did not read it all in full context.

The Geotechnical Report is Based on a Unique Set of Project And Specific Factors.

When preparing a geotechnical report, the geotechnical engineering consultant considers a number of unique factors for the specific project. These typically include:

- Clients objectives, goals and risk management preferences;
- The general proposed development or nature of the structure involved (size, location, etc.); and
- Future planned or existing site improvements (parking lots, roads, underground services, etc.);

Care should be taken into identifying the reason of the geotechnical report, where you should not rely on a geotechnical engineering report that was:

- Not prepared for your project;
- Not prepared for the specific site;
- Not prepared for you;
- Does not take into consideration any important changes made to the project; or
- Was carried out prior to any new infrastructure on your subject site.

Typical changes that can affect the reliability of an existing geotechnical investigation report include those that affect:

- The function of the proposed structure, where it may change from one basement level to two basement levels, or from a light structure to a heavily loaded structure;
- Location, size, elevation or configuration of the proposed development;
- Changes in the structural design occur; or
- The owner of the proposed development/project has changed.

The geotechnical engineer of the project should always be notified of any changes – even minor – and be asked to evaluate if this has any impact. GCA does not accept responsibility or liability for problems that occur because its report did not consider developments which it was not informed of.

Subsurface Conditions Can Change

This report is based on conditions that existed at the time of the investigation, at the locations of the subsurface tests (i.e. boreholes) carried out during the site investigation. Subsurface conditions can be affected and modified by a number of factors including, but not limited to, the passage of time, man-made influences such as construction on or adjacent to the site, by natural forces such as floods, groundwater fluctuations or earthquakes. GCA should be contacted prior to submitting its report to determine if any further testing may be required. A minor amount of additional testing may prevent any major problems.

Geotechnical Findings Are Professional Opinions

Results of subsurface conditions are limited only to the points where the subsurface tests were carried out, or where samples were collected. The field and laboratory data is analysed and reviewed by a geotechnical engineer, who then applies their professional experience and recommendations about the site's subsurface conditions. Despite investigation, the actual subsurface conditions may differ – in some cases significantly – from the results presented in the geotechnical investigation report, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface anomalies and details.

Therefore, the recommendations in this report can only be used as preliminary. Retaining GCA as your geotechnical consultants on your project to provide construction observations is the most effective method of managing the risks associated with unanticipated subsurface conditions.

Geotechnical Report's Recommendations Are Not Final

Because geotechnical engineers provide recommendations based on experience and judgement, you should not overrely on the recommendations provided – they are not final. Only by observing the actual subsurface conditions revealed during construction may a geotechnical engineer finalise their recommendations. GCA does not assume responsibility or liability for the report's recommendations if no additional observations or testing is carried out.

Geotechnical Report's Are Subject to Misinterpretations

The project geotechnical engineer should consult with appropriate members of the design team following submission of the report. You should review your design teams plans and drawings, in conjunction with the geotechnical report to ensure they have all be incorporated. Due to many issues arising from misinterpretation of geotechnical reports between design teams and building contractors, GCA should participate in pre-construction meetings, and provide adequate construction observations.

Engineering Borehole Logs And Data Should Not be Redrawn

Geotechnical engineers prepare final borehole and testing logs, figure, etc. based on results and interpretation of field logs and laboratory data following the site investigation. The logs, figure, etc. provided in the geotechnical report should never be redrawn or altered for inclusion in any other documents from this report, included architectural or other design drawings.

Providing The Full Geotechnical Report For Guidance

The project design teams, subcontractors and building contractors should have a copy of the full geotechnical investigation report to help prevent any costly issues. This should be prefaced with a clearly written letter of transmittal. The letter should clearly advise the aforementioned that the report was prepared for proposed development/project requirements, and the report accuracy is limited. The letter should also encourage them to confer with GCA, and/or carry out further testing as may be required. Providing the report to your project team will help share the financial responsibilities stemming from any unanticipated issues or conditions in the site.

Understanding Limitation Provisions

As some clients, contractors and design professionals do not recognise geotechnical engineering is much broader and less exact than other engineering disciplines, this creates unrealistic expectations that lead to claims, disputes and other disappointments. As part of the geotechnical report, (in most cases) a 'limitations' explanatory provision is included, outlining the geotechnical engineers' limitations for your project – with the geotechnical engineers responsibilities to help other reduce their own. This should be read closely as part of your report.

Other Limitations

GCA will not be liable to revise or update the report to take into account any events or circumstances (seen or unforeseen), or any fact occurring or becoming apparent after the date of the report. This report is the subject of copyright and shall not be reproduced either totally or in part without the express permission of GCA. The report should not be used if there have been changes to the project, without first consulting with GCA to assess if the report's recommendations are still valid. GCA does not accept any responsibility for problems that occur due to project changes which have not been consulted.

Legend:  Approximate Boreholes/Standpipe Piezometer Locations



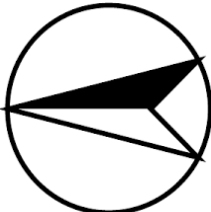
	Figure 1 Site Plan	Salinity Management Plan	Drawn: GN/GA	
		Triple Eight Corporation Pty Ltd	Date: 17/09/2025	
	Job No.: G25346-1	241-245 Pennant Hills Road Carlingford NSW 2118	Scale: NTS	

Image source: NSW Six Maps/NSW SDT Explorer. Accessed 7th July 2025.

Explanation of Notes, Abbreviations and Terms Used on Borehole and Test Pit Reports

DRILLING/EXCAVATION METHOD

Method	Description
AS	Auger Screwing
BH	Backhoe
CT	Cable Tool Rig
EE	Existing Excavation/Cutting
EX	Excavator
HA	Hand Auger
HQ	Diamond Core – 63mm
JET	Jetting
NMLC	Diamond Core – 52mm
NQ	Diamond Core – 47mm
PT	Push Tube
RAB	Rotary Air Blast
RB	Rotary Blade
RT	Rotary Tricone Bit
TC	Auger TC Bit
V	Auger V Bit
WB	Washbore
DT	Diatube
CC	Concrete Coring

PENETRATION/EXCAVATION RESISTANCE

These assessments are subjective and dependant on many factors including the equipment weight, power, condition of the drilling tools or excavation, and the experience of the operator.

- L **Low Resistance.** Rapid penetration possible with little effort from the equipment used.
- M **Medium Resistance.** Excavation possible at an acceptable rate with moderate effort required from the equipment used.
- H **High Resistance.** Further penetration is possible at a slow rate and required significant effort from the equipment.
- R **Refusal or Practical Refusal.** No further progress possible within the risk of damage or excessive wear to the equipment used.

WATER



Groundwater not observed: The observation of groundwater, whether present or not, was not possible due to drilling water, surface seepage or cave in of the borehole/test pit.

Groundwater not encountered: No free-flowing (springs or seepage) was intercepted, although the soil may be moist due to capillary water. Water may be observed in low permeable soils if the test pits/boreholes had been left open for at least 12-24 hours.

MOISTURE CONDITION (AS 1726-2017)

- Dry - Cohesive soils are friable or powdery
Cohesionless soil grains are free-running
- Moist - Soil feels cool, darkened in colour
Cohesive soils can be moulded
Cohesionless soil grains tend to adhere
- Wet - Cohesive soils usually weakened
Free water forms on hands when handling

For cohesive soils the following codes may also be used:

- MC>PL Moisture Content greater than the Plastic Limit.
MC~PL Moisture Content near the Plastic Limit.
MC<PL Moisture Content less than the Plastic Limit.

SAMPLING AND TESTING

Sample	Description
B	Bulk Disturbed Sample
DS	Disturbed Sample
Jar	Jar Sample
SPT*	Standard Penetration Test
U50	Undisturbed Sample – 50mm
U75	Undisturbed Sample – 75mm

*SPT (4, 7, 11 N=18). 4, 7, 11 = Blows per 150mm. N= Blows per 300mm penetration following 150mm sealing.
SPT (30/80mm). Where practical refusal occurs, the blows and penetration for that interval is recorded.

ROCK QUALITY

The fracture spacing is shown where applicable and the Rock Quality Designation (RQD) or Total Core Recovery (TCR) is given where:

$$\text{TCR (\%)} = \frac{\text{length of core recovered}}{\text{length of core run}}$$

$$\text{RQD (\%)} = \frac{\text{sum of axial lengths of core > 100mm long}}{\text{length of core run}}$$

ROCK STRENGTH TEST RESULTS

- Diametral Point Load Index test
- Axial Point Load Index test

SOIL ORIGINS

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- **Residual soils:** derived from in-situ weathering of the underlying rock (see "rock material weathering" below).
- **Transported soils:** formed somewhere else and transported by nature to the site.
- **Filling:** moved/placed by man.

Transported soils may be further subdivided into:

- **Alluvium/alluvial:** river deposits.
- **Lacustrine:** lake deposits.
- **Aeolian:** wind deposits.
- **Littoral:** beach deposits.
- **Estuarine:** tidal river deposits.
- **Talus:** scree or coarse colluvium.
- **Slopewash or colluvium/colluvial:** transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.

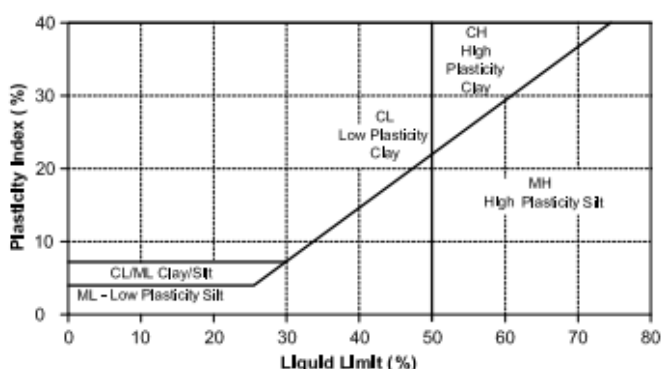
Method and Terms for Soil and Rock Descriptions Used on Borehole and Test Pit Reports

Soil and Rock is classified and described in reports of boreholes and test pits using the preferred method given in AS 1726-2017, Appendix A. The material properties are assessed in the field by visual/tactile methods. The appropriate symbols in the Unified Soil Classification are selected on the result of visual examination, field tests and available laboratory tests, such as, sieve analysis, liquid limit and plasticity index.

COHESIONLESS SOILS PARTICLE SIZE DESCRIPTIVE TERMS

Name	Subdivision	Size
Boulders		>200mm
Cobbles		63mm to 200mm
Gravel	coarse	20mm to 63mm
	medium	6mm to 20mm
	fine	2.36mm to 6mm
Sand	coarse	600µm to 2.36mm
	medium	200µm to 600µm
	fine	75µm to 200µm

PLASTICITY PROPERTIES



COHESIVE SOILS – CONSISTENCY (AS 1726-2017)

Strength	Symbol	Undrained Shear Strength, C_u (kPa)
Very Soft	VS	<12
Soft	S	12 to 25
Firm	F	25 to 50
Stiff	St	50 to 100
Very Stiff	VSt	100 to 200
Hard	H	>200
Friable	Fr	Easily crumbled or broken into small pieces by hand

PLASTICITY

Description of Plasticity	LL (%)
Low	<35
Medium	35 to 50
High	>50

COHESIONLESS SOILS - RELATIVE DENSITY

Term	Symbol	Density Index	N Value (blows/0.3m)
Very Loose	VL	0 to 15	0 to 4
Loose	L	15 to 35	4 to 10
Medium Dense	MD	35 to 65	10 to 30
Dense	D	65 to 85	30 to 50
Very Dense	VD	>85	>50

UNIFIED SOIL CLASSIFICATION

USC Symbol	Description
GW	Well graded gravel
GP	Poorly graded gravel
GM	Silty gravel
GC	Clayey gravel
SW	Well graded sand
SP	Poorly graded sand
SM	Silty sand
SC	Clayey sand
ML	Silt of low plasticity
CL	Clay of low plasticity
OL	Organic soil of low plasticity
MH	Silt of high plasticity
CH	Clay of high plasticity
OH	Organic soil of high plasticity
PT	Peaty Soil

ROCK MATERIAL WEATHERING

Symbol	Term	Definition
RS	Residual Soil	Soil definition on extremely weathered rock; the mass structure and substance are no longer evident; there is a large change in volume but the soil has not been significantly transported
EW	Extremely Weathered	Rock is weathered to such an extent that it has 'soil' properties, i.e. It either disintegrates or can be remoulded in water
HW	Highly Weathered	The rock substance is affected by weathering to the extent that limonite staining or bleaching affects the whole rock substance and other signs of chemical or physical decomposition are evident. Porosity and strength is usually decreased compared to the fresh rock. The colour and strength of the fresh rock is no longer recognisable.
DW	Distinctly Weathered (as per AS 1726)	
MW	Moderately Weathered	The whole of the rock substance is discoloured, usually by iron staining or bleaching, to the extent that the colour of the fresh rock is no longer recognisable
SW	Slightly Weathered	Rock is slightly discoloured but shows little or no change of strength from fresh rock
FR	Fresh	Rock shows no sign of decomposition or staining

ROCK STRENGTH (AS 1726-2017 and ISRM)

Term	Symbol	Point Load Index $IS_{(50)}$ (MPa)
Extremely Low	EL	<0.03
Very Low	VL	0.03 to 0.1
Low	L	0.1 to 0.3
Medium	M	0.3 to 1
High	H	1 to 3
Very High	VH	3 to 10
Extremely High	EH	>10

ABBREVIATIONS FOR DEFECT TYPES AND DESCRIPTIONS

Term	Defect Spacing	Bedding
Extremely closely spaced	<6mm	Thinly Laminated
	6mm to 20mm	Laminated
Very closely spaced	20mm to 60mm	Very Thin
Closely spaced	0.06m to 0.2m	Thin
Moderately widely spaced	0.2m to 0.6m	Medium
Widely spaced	0.6m to 2m	Thick
Very widely spaced	>2m	Very Thick

Type	Definition
B	Bedding
J	Joint
HJ	Horizontal to Sub-Horizontal Joint
VJ	Vertical to Sub-Vertical Joint
F	Fault
Cle	Cleavage
SZ	Shear Zone
SM	Shear Seam
FZ	Fractured Zone
CZ	Crushed Zone
CS	Crushed Seam
MB	Mechanical Break
HB	Handling Break

Planarity	Roughness
P – Planar	C – Clean
Ir – Irregular	Cl – Clay
St – Stepped	VR – Very Rough
U – Undulating	R – Rough
	S – Smooth
	Sl – Slickensides
	Po – Polished
	Fe – Iron

Coating or Infill	Description
Clean (C)	No visible coating or infilling
Stain	No visible coating or infilling but surfaces are discoloured by mineral staining
Veneer	A visible coating or infilling of soil or mineral substance but usually unable to be measured (<1mm). If discontinuous over the plane, patchy veneer
Coating	A visible coating or infilling of soil or mineral substance, >1mm thick. Describe composition and thickness
Iron (Fe)	Iron Staining or Infill.

ROCK SOCKET ROUGHNESS CLASSIFICATION AND CATEGORIES

Roughness Class	Description
R1	Straight, smooth-sided socket, grooves or indentations less than 1mm deep
R2	Grooves of depth 1mm to 4mm, width greater than 2mm, at spacing 50mm to 200mm
R3	Grooves of depth 1mm to 4mm, width greater than 2mm, at spacing 50mm to 200mm
R4	Grooves or undulations of depth >10mm, width >10mm, at spacing 50mm to 200mm

Source: "State of Practice for the Design of Socketed Piles in Rock" by P.J.N. Pells, 1999." in 8th Australia - New Zealand Conference on Geomechanics (Hobart, 1999).

CLIENT Triple Eight Corporation Pty Ltd

PROJECT NAME Geotechnical Investigation

PROJECT NUMBER G25239-1

PROJECT LOCATION 241-245 Pennant Hills Road Carlingford NSW 2118

DATE STARTED 3/7/25

COMPLETED 3/7/25

R.L. SURFACE 106.2

DATUM m AHD

DRILLING CONTRACTOR BG Drilling

SLOPE 90°

BEARING ---

EQUIPMENT Track Mounted Drilling Rig

HOLE LOCATION Refer To Site Plan (Figure 1) For Test Locations

HOLE SIZE 100mm Diameter

LOGGED BY AN/SS

CHECKED BY JN/RF

NOTES RL To The Top Of The Borehole & Depths Of The Subsurface Conditions Are Approximate

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
ADT	Not Encountered During Augering		106.0				FILL: Silty Clay, low to medium plasticity, brown to dark brown, trace of fine sandstone and igneous gravel, moist (w>PL), rootlets, grass covering.		FILL Well stickup length 0.13m above ground level.
				0.5		CI-CH	Silty CLAY, medium to high plasticity, brown, moist (w>PL), estimated stiff.	SPT 2, 4, 12 N=16 Agg/Sal	NATURAL SOILS
			105.5				Extremely Weathered Material (Shale): Auger cuttings returned as Silty CLAY, medium to high plasticity, pale grey, dark red and orange, with ironstone bands, moist (w<PL), estimated very stiff.		EXTREMELY WEATHERED MATERIAL
			105.0					Agg/Sal	
			104.5					SPT 15, 23, 5/30mm Bouncing	
				2.0			SHALE, pale brown to brown, laminated, highly weathered, very low estimated strength, moist.		BEDROCK
			104.0					Agg/Sal	
			103.5						
			103.0				Borehole BH1 continued as cored hole		
			102.5						

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NOTES RL To The Top Of The Borehole & Depths Of The Subsurface Conditions Are Approximate

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength	Is ₍₅₀₎ MPa D- diam- etral A- axial	RQD %	Defect Spacing mm	Defect Description
			106.0	0.5								
			105.5	1.0								
			105.0	1.5								
			104.5	2.0								
			104.0	2.5								
			103.5	3.0								
						Continued from non-cored borehole						
NMLC			103.0	3.5		SHALE, pale grey, orange, laminated at 0°, with pale grey extremely weathered clay seams, and red-brown ironstone bands, Ashfield Shale.	HW					3.00 - 3.02m: EW Clay Seam, 20mm. 3.06m: B, 0°, S, P, Fe Stain. 3.11m: B, 5°, S, P, Fe Stain. 3.13 - 3.14m: EW Clay Seam, 10mm. 3.21m: B, 0°, S, P, Cl Coating.
			102.5	4.0								3.43 - 3.46m: EW Clay Seam, 30mm. 3.54 - 3.57m: EW Clay Seam, 30mm. 3.61 - 3.62m: EW Clay Seam, 10mm. 3.68 - 3.71m: EW Clay Seam, 30mm. 3.75 - 3.77m: EW Clay Seam, 20mm. 3.86 - 3.89m: EW Clay Seam, 30mm. 3.95 - 3.96m: EW Clay Seam, 10mm. 4.04 - 4.06m: EW Clay Seam, 20mm. 4.13m: MB.
			102.0	4.5								4.28 - 4.29m: EW Clay Seam, 10mm. 4.33 - 4.35m: EW Clay Seam, 20mm.
			101.5	5.0		SHALE, dark grey-pale grey and orange, laminated at 0°, with extremely weathered clay seams, Ashfield Shale.	EW HW EW					4.55m: MB. 4.57m: B, 0°, S, P, Cl Coating. 4.64 - 4.78m: EW Clay Seam, 140mm. 4.81 - 4.83m: EW Clay Seam, 20mm. 4.85m: B, 0°, S, P, Fe Stain. 4.86 - 4.98m: EW Clay Seam, 120mm.

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SLOPE 90°

BEARING ---

EQUIPMENT Track Mounted Drilling Rig

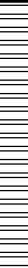
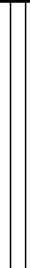
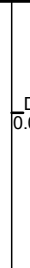
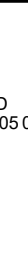
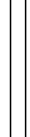
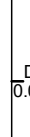
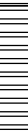
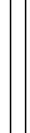
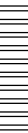
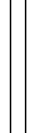
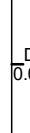
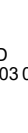
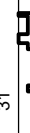
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HOLE SIZE 100mm Diameter

LOGGED BY AN/SS

CHECKED BY JN/RF

NOTES RL To The Top Of The Borehole & Depths Of The Subsurface Conditions Are Approximate

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength					Is ₍₅₀₎ MPa D- diam- etral A- axial	RQD %	Defect Spacing mm 30 100 300 1000 3000	Defect Description						
								EL	VL	J	M	H					VH	EH				
NMLC			101.0			SHALE, dark grey-pale grey and orange, laminated at 0°, with extremely weathered clay seams, Ashfield Shale. (continued)	HW								5.00m: HB.							
				5.5																	5.06m: B, 0°, R, P, Fe Stain.	
																					5.11m, 5.13m. 2x EW Clay Seam, 10mm.	
						100.5			NO CORE. 620mm.										5.16m: J, 10°, S, P, Fe Stain.			
																						5.24m: B, 5°, S, P, Fe Stain.
																						5.30 - 5.33m: J, 40°, S, P, C.
							6.0												5.37 - 5.38m: J, 10°, S, P, Fe Stain.			
									SHALE, dark grey-pale grey and orange, laminated at 0°, with extremely weathered clay seams, Ashfield Shale.	EW HW SW								5.38 - 5.49m: FZ (coarse, dark grey SHALE gravel), 110mm.				
																					5.49 - 5.57m: J, 70°, S, P, Fe Stain.	
																					5.57m: B, 0-5°, S, P, Fe Stain.	
							6.5												5.62m: EW Clay Seam, 5mm.			
									SHALE, dark grey, orange along beddings, laminated at 0-5°, Ashfield Shale.	EW HW SW								5.68 - 5.74m: EW Clay Seam, 60mm.				
																		5.76 - 5.78m: J, 10-50°, S, Curved, Fe Stain.				
																		5.78m, 5.80m. B, 0°, S, P, Fe Stain.				
																5.82 - 5.86m: EW Clay Seam, 40mm.						
				6.5												5.88 - 5.89m: EW Clay Seam, 10mm.						
						SHALE, dark grey, orange along beddings, laminated at 0-5°, Ashfield Shale.	EW HW SW								6.54 - 6.65m: EW Clay Seam, 110mm.							
																		6.65m: B, 0°, S, P, Fe Stain.				
																		6.67 - 6.72m: J, 60°, S, U, Fe Stain.				
																6.72 - 6.77m: EW Gravelly Clay Seam, 50mm.						
																6.80 - 6.88m: J, 85-90°, S, P, C.						
																6.88 - 6.90m: EW Clay Seam, 20mm.						
																6.92 - 6.96m: EW Clay Seam, 40mm.						
																7.00m: HB.						
																7.08m: B, 0°, S, P, Cl Coating.						
																7.12 - 7.14m: EW Clay Seam, 20mm.						
																7.15m, 7.23m, 7.31m, 7.33m, 7.36m: B x5, 0°, S, P, Fe Stain.						
																7.16 - 7.21m: J, 70°, S, P, Fe Stain.						
																7.27m: MB.						
																7.37 - 7.41m: J, 10-80°, S, Curved, Fe Stain.						
																7.46 - 7.47m: EW Clay Seam, 10mm.						
																7.49m, 7.51m. J, 20°, Fe Stain, Closed.						
																7.54 - 7.56m: EW Clay Seam, 20mm.						
																7.58m, 7.67m, 7.70m, 7.72m: B x4, 0-5°, Fe Stain, Closed.						
																7.60 - 7.62m: J, 60-80°, S, Curved, Fe Stain.						
																7.79m: MB.						
																7.80m: B, 0°, S, P, C.						
																7.85m: MB.						
																7.85 - 7.88m: J, 60°, S, P, Fe Stain.						
																7.89m, 7.92m. J, 40°, S, P, C.						
																8.00m: HB.						
																8.00 - 8.07m: J, 50-60°, S, Curved, Fe Stain.						
																8.07 - 8.20m: FZ (dark grey SHALE fragments), 130mm.						
																8.46 - 8.48m: EW Clay Seam, 20mm.						
																8.48 - 8.60m: J x2, 70°, S, P, C.						
																8.63m: B, 0°, S, P, Fe Stain.						
																8.67 - 8.72m: J, 50°, S, Curved, Fe Stain.						
																8.75m: MB.						
																8.80 - 8.81m: J, 50°, S, Curved, Fe Stain.						
																8.88 - 8.90m: EW Clay Seam, 20mm.						
																8.94m: MB.						
																8.96m, 8.98m: B, 0-5°, S, P, Fe Stain.						
																9.00m: HB.						
																9.05m, 9.11m: MB.						
																9.15 - 9.18m: J, 50-60°, S, P, C.						
																9.21m: B, 0-5°, S, P, Fe Stain.						
																9.40 - 9.42m: J, 30°, S, P, C.						
																9.59m: MB.						
																9.74m: MB.						

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PROJECT LOCATION 241-245 Pennant Hills Road Carlingford NSW 2118

DATE STARTED 3/7/25

COMPLETED 3/7/25

R.L. SURFACE 106.2

DATUM m AHD

DRILLING CONTRACTOR BG Drilling

SLOPE 90°

BEARING ---

EQUIPMENT Track Mounted Drilling Rig

HOLE LOCATION Refer To Site Plan (Figure 1) For Test Locations

HOLE SIZE 100mm Diameter

LOGGED BY AN/SS

CHECKED BY JN/RF

NOTES RL To The Top Of The Borehole & Depths Of The Subsurface Conditions Are Approximate

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength					Is ₍₅₀₎ MPa D- diam- etral A- axial	RQD %	Defect Spacing mm 30 100 300 1000 3000	Defect Description
								EU	VL	J	M	H	VH	EH		
NMLC			96.0			SHALE, dark grey, with up to 5% fine grained, pale grey SANDSTONE laminations, laminated at 0°, Ashfield Shale. (continued)	FR									9.98m: MB. 10.00m: HB. 10.02m: MB. 10.24m: MB.
				10.5												
			95.5													10.65m: MB.
				11.0												10.86m: MB.
			95.0													11.00m: HB. 11.03m: MB.
				11.5												11.40m: B, 0°, S, P, C. 11.42m: B, 0-5°, Ir, P, C. 11.54m: MB.
			94.5													
				12.0												11.84m: MB. 11.90m: MB. 12.00m: HB.
			94.0													12.13m: MB.
				12.5												12.36m: J, 10-15°, S, P, C.
			93.5													12.48m: MB.
				13.0												12.68m: MB.
			93.0													12.79m: MB. 12.84m: MB. 12.93m: MB.
				13.5		SHALE, dark grey, with up to 10-20% fine grained, pale grey SANDSTONE laminations, laminated at 5-10°, Ashfield Shale.	FR									12.96 - 13.00m: J, 40-70°, S, Curved, C. 13.00m: HB. 13.03 - 13.04m: J, 35-40°, S, P, C.
			92.5													13.34m: MB.
				14.0												13.55 - 13.77m: FZ (13.55m, 13.61m, 13.67m: J x3, 30°, S, P, C, 13.74m: J, 20-25°, S, P, C, 13.77m: B, 10°, S, P, C), 220mm.
			92.0													13.83 - 13.86m: J, 40°, S, P, C. 13.91m: B, 0-5°, S, P, C.
				14.5												14.00m: HB. 14.03m: MB.
			91.5													14.19m: B, 10°, S, P, C.
				15.0												14.47m: B, 5-10°, S, P, C. 14.54 - 14.57m: J, 50°, S, P, C.
																14.76m: B, 5-10°, S, P, C.
																14.97 - 15.00m: J, 40°, S, P, C.



CLIENT Triple Eight Corporation Pty Ltd PROJECT NAME Geotechnical Investigation
PROJECT NUMBER G25239-1 PROJECT LOCATION 241-245 Pennant Hills Road Carlingford NSW 2118
DATE STARTED 3/7/25 COMPLETED 3/7/25 R.L. SURFACE 106.2 DATUM m AHD
DRILLING CONTRACTOR BG Drilling SLOPE 90° BEARING ---
EQUIPMENT Track Mounted Drilling Rig HOLE LOCATION Refer To Site Plan (Figure 1) For Test Locations
HOLE SIZE 100mm Diameter LOGGED BY AN/SS CHECKED BY JN/RF
NOTES RL To The Top Of The Borehole & Depths Of The Subsurface Conditions Are Approximate

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength						Is ₍₅₀₎ MPa	D- diam- etral A- axial	RQD %	Defect Spacing mm	Defect Description
								EU	VL	M	H	VH	EH					
						BH1 terminated at 15.08m	FR							0.37	2.11			
			91.0															
				15.5														
			90.5															
				16.0														
			90.0															
				16.5														
			89.5															
				17.0														
			89.0															
				17.5														
			88.5															
				18.0														
			88.0															
				18.5														
			87.5															
				19.0														
			87.0															
				19.5														
			86.5															
				20.0														

CLIENT Triple Eight Corporation Pty Ltd **PROJECT NAME** Geotechnical Investigation
PROJECT NUMBER G25239-1 **PROJECT LOCATION** 241-245 Pennant Hills Road Carlingford NSW 2118
DATE STARTED 3/7/25 **COMPLETED** 4/7/25 **R.L. SURFACE** 109.3 **DATUM** m AHD
DRILLING CONTRACTOR BG Drilling **SLOPE** 90° **BEARING** ---
EQUIPMENT Track Mounted Drilling Rig **HOLE LOCATION** Refer To Site Plan (Figure 1) For Test Locations
HOLE SIZE 100mm Diameter **LOGGED BY** AN/SS **CHECKED BY** JN/RF
NOTES RL To The Top Of The Borehole & Depths Of The Subsurface Conditions Are Approximate

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
ADT		Not Encountered During Augering	109.0	0.5			FILL: Silty Sand, fine to medium grained, dark grey, with medium to coarse, subrounded to rounded sandstone gravel, moist, brick fragments.		FILL Well stickup length 0.04m below ground level.
			108.5	1.0		CI-CH	Silty CLAY, medium to high plasticity, red-brown, trace of yellow, moist (w<PL), estimated stiff. Becoming dark grey to pale brown from 1.0m bgl.	SPT 1, 4, 6 N=10 Agg/Sal	NATURAL SOILS
			108.0	1.5					
			107.5	2.0			SHALE, pale grey to pale brown, laminated, highly weathered, very low to low estimated strength, moist.	SPT 2, 9, 15/50mm Agg/Sal Bouncing	BEDROCK
			107.0	2.5				Agg/Sal	
							Borehole BH2 continued as cored hole		
			106.5	3.0					
			106.0	3.5					
			105.5	4.0					
			105.0	4.5					
			104.5	5.0					



CLIENT Triple Eight Corporation Pty Ltd

PROJECT NAME Geotechnical Investigation

PROJECT NUMBER G25239-1

PROJECT LOCATION 241-245 Pennant Hills Road Carlingford NSW 2118

DATE STARTED 3/7/25

COMPLETED 4/7/25

R.L. SURFACE 109.3

DATUM m AHD

DRILLING CONTRACTOR BG Drilling

SLOPE 90°

BEARING ---

EQUIPMENT Track Mounted Drilling Rig

HOLE LOCATION Refer To Site Plan (Figure 1) For Test Locations

HOLE SIZE 100mm Diameter

LOGGED BY AN/SS

CHECKED BY JN/RF

NOTES RL To The Top Of The Borehole & Depths Of The Subsurface Conditions Are Approximate

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength					Is ₍₅₀₎ MPa D- diam- etral A- axial	RQD %	Defect Spacing mm	Defect Description
								EL	VL	L	M	H				
				109.0												
				0.5												
				108.5												
				1.0												
				108.0												
				1.5												
				107.5												
				2.0												
				107.0												
				2.5		Continued from non-cored borehole										
NMLC				106.5		SHAILE, pale grey to brown, laminated at 0°, Ashfield Shale.	HW									2.51m, 2.57m, 2.62m: B x3, 0°, S, P, Fe Stain. 2.62 - 2.65m: J, 60°, S, U, C. 2.67m, 2.71m, 2.72m: B x3, 0°, S, P, Fe Stain. 2.75m: B, 0°, R, U, Clay Coating. 2.90 - 2.93m: VJ, 70 - 90°, R, U, C. 2.96m: B, 0°, R, U, C.
				3.0												
				106.0												
				3.5		SHAILE, pale brown to grey, with extremely weathered clay seams, laminated at 0°, Ashfield Shale.	HW									3.20 - 3.22m: CZ, 20mm. 3.22 - 3.26m: J, 60°, R, U, C. 3.35 - 3.40m: J, 45-60°, R, U, Fe Stain. 3.43 - 3.44m: FZ, 10mm. 3.49 - 3.54m: FZ, 50mm. 3.55 - 3.56m: EW Clay Seam, 10mm. 3.57 - 3.83m: FZ, 260mm.
				105.5												3.77 - 3.78m: EW Clay Seam, 10mm.
				4.0		NO CORE. 590mm.										
				105.0												
				4.5		SHAILE, grey to pale brown, Ashfield Shale.	HW									4.42 - 4.50m: CZ, 80mm. 4.50 - 4.53m: VJ, 70°, S, U, C. 4.56m: B, 0°, R, U, Fe Stain. 4.58 - 4.76m: FZ (4.65 - 4.69m: J, 70°, R, U, Fe Stain), 180mm. 4.76m: B, 0°, R, U, Fe Stain.
				104.5		SHAILE, pale brown to dark brown, pale grey, with extremely weathered clay seams, Ashfield Shale.	HW									4.84 - 4.86m: EW Clay Seam, 20mm. 4.86 - 4.88m: VJ, 80°, R, U, Cl Coating. 4.92m: B, 0-5°, R, U, Fe Stain.
				5.0												

CORED BOREHOLE G25239-1 CARLINGFORD BOREHOLE LOGS.GPJ GINT STD AUSTRALIA.GDT 10/8/25

NMLC

9-July-2025

CLIENT Triple Eight Corporation Pty Ltd

PROJECT NAME Geotechnical Investigation

PROJECT NUMBER G25239-1

PROJECT LOCATION 241-245 Pennant Hills Road Carlingford NSW 2118

DATE STARTED 3/7/25 **COMPLETED** 4/7/25

R.L. SURFACE 109.3

DATUM m AHD

DRILLING CONTRACTOR BG Drilling

SLOPE 90°

BEARING ---

EQUIPMENT Track Mounted Drilling Rig

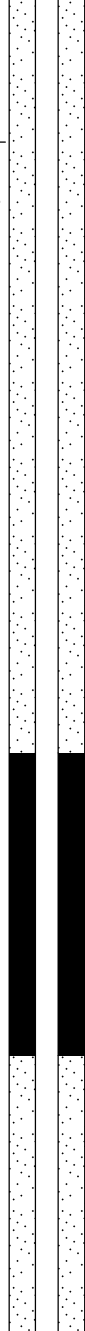
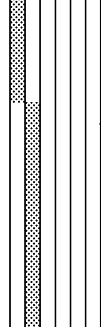
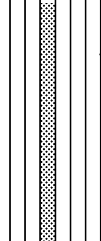
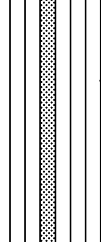
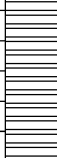
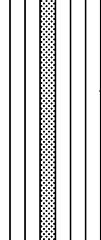
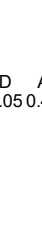
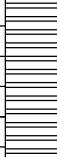
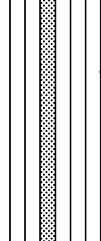
HOLE LOCATION Refer To Site Plan (Figure 1) For Test Locations

HOLE SIZE 100mm Diameter

LOGGED BY AN/SS

CHECKED BY JN/RF

NOTES RL To The Top Of The Borehole & Depths Of The Subsurface Conditions Are Approximate

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength					Is ₍₅₀₎ MPa D- diam- etral A- axial	RQD %	Defect Spacing mm 30 100 300 1000 3000	Defect Description
								EL	VL	L	W	H				
NMLC	28-July-2025		104.0	5.5		SHALE, pale brown to dark brown, pale grey, with extremely weathered clay seams, Ashfield Shale. (continued)	HW					16	4.95 - 4.96m: EW Clay Seam, 10mm. 4.96 - 5.00m: CZ, 40mm. 5.04 - 5.05m: EW Clay Seam, 10mm. 5.07m, 5.21m: B x2, 0°, R, U, Fe Stain. 5.24m: B, 0°, R, P, C. 5.27m, 5.30m, 5.34m: EW Clay Seams, 10mm. 5.565m: B, 0°, R, U, C. 5.66m: J, 30°, R, U, Fe Stain. 5.68 - 5.73m: FZ, 50mm. 5.77 - 5.83m: FZ, 60mm. 5.86m: B, 0-5°, R, U, Fe Stain. 5.89 - 6.00m: J, 60°, R, U, Fe Stain. 6.00 - 6.10m: CZ, 100mm.			
			103.5	6.0		NO CORE. 600mm.										
			103.0	6.5												
			102.5	7.0		SHALE, pale grey to dark grey, laminated at 0°, Ashfield Shale.	HW FR					61	6.75m: B, 0°, R, U, Clay Coating. 6.83m, 6.87m, 6.92m, 6.94m, 6.99m: B x5, 0°, S, P, C. 7.04m, 7.08m: B x2, 0°, S, P, C. 7.135m: B, 0°, S, P, C. 7.14m: B, 0°, S, P, C. 7.18m, 7.23m: B x2, 0°, S, P, C. 7.28m, 7.33m, 7.36m B x3, 0°, S, P, C. 7.41m: MB. 7.52 - 7.56m: FZ, 40mm.			
			102.0	7.5												
			101.5	8.0									7.82m: B, 0°, S, P, C. 7.88m: B, 0°, S, P, C. 7.94m: B, 0°, S, P, C. 8.14m: MB. 8.23m: MB. 8.29m: B, 0°, R, P, C.			
			101.0	8.5												
			100.5	9.0									8.51m: MB. 8.55m: B, 20-30°, R, P, C. 8.60m: B, 0°, S, P, C. 8.60 - 8.635m: FZ, 35mm. 8.92m: B, 0°, S, P, C. 9.00 - 9.20m: J, 30-40°, S, P, C.			
			100.0	9.5												
			99.5	10.0								100	9.21m, 9.33m, 9.45m: B x3, 0°, R, U, C. 9.64m: MB. 9.85m: MB.			

CLIENT Triple Eight Corporation Pty Ltd

PROJECT NAME Geotechnical Investigation

PROJECT NUMBER G25239-1

PROJECT LOCATION 241-245 Pennant Hills Road Carlingford NSW 2118

DATE STARTED 3/7/25

COMPLETED 4/7/25

R.L. SURFACE 109.3

DATUM m AHD

DRILLING CONTRACTOR BG Drilling

SLOPE 90°

BEARING ---

EQUIPMENT Track Mounted Drilling Rig

HOLE LOCATION Refer To Site Plan (Figure 1) For Test Locations

HOLE SIZE 100mm Diameter

LOGGED BY AN/SS

CHECKED BY JN/RF

NOTES RL To The Top Of The Borehole & Depths Of The Subsurface Conditions Are Approximate

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength					Is ₍₅₀₎ MPa D- diam- etral A- axial	RQD %	Defect Spacing mm	Defect Description				
								EL	VL	L	M	H					VH	EH		
NMLC						SHALE, pale grey to dark grey, laminated at 0°, Ashfield Shale. <i>(continued)</i>	FR							100		10.10 - 10.16m: FZ, 60mm. 10.43m: B, 0°, S, P, C. 10.44m: B, 0°, R, U, C. 10.67m: B, 0°, S, P, C. 10.86m, 10.87m, 10.92m: B x3, 0°, S, P, C. 11.20m: B, 0°, S, P, C. 11.45m: B, 0°, S, P, C. 11.51m: B, 0°, S, P, C. 11.90m: MB. 11.97m: MB. 12.12m: MB. 12.57m: MB. 12.89m: MB. 13.00m: HB. 13.08m: MB. 13.13m: B, 0-5°, S, P, C. 13.15m: MB. 13.27m: MB. 13.54m: MB. 13.62m: MB. 13.84m: MB. 13.87m: MB. 14.00m: HB. 14.13m: MB. 14.34m: MB. 14.50m: MB. 14.62m: MB. 14.88m: MB.				
				99.0																
				10.5																
				98.5																
				11.0																
				98.0																
				11.5																
				97.5																
				12.0																
				97.0																
				12.5																
				96.5				SHALE, dark grey, with up to 20% fine-grained, pale grey SANDSTONE laminations, laminated at 0-5°, Ashfield Shale.												
				13.0																
			96.0																	
			13.5																	
			95.5																	
			14.0																	
			95.0																	
			14.5																	
			94.5																	
			15.0																	



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R.L. SURFACE 109.3

DATUM m AHD

DRILLING CONTRACTOR BG Drilling

SLOPE 90°

BEARING ---

EQUIPMENT Track Mounted Drilling Rig

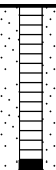
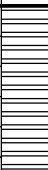
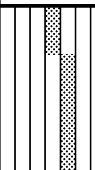
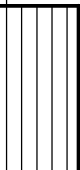
HOLE LOCATION Refer To Site Plan (Figure 1) For Test Locations

HOLE SIZE 100mm Diameter

LOGGED BY AN/SS

CHECKED BY JN/RF

NOTES RL To The Top Of The Borehole & Depths Of The Subsurface Conditions Are Approximate

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength						Is ₍₅₀₎ MPa D- diam- etral A- axial	RQD %	Defect Spacing mm	Defect Description	
								EL	VL	L	M	H	VH					EH
NMLC			94.0	15.5		SHALE, dark grey, with up to 20% fine-grained, pale grey SANDSTONE laminations, laminated at 0-5°, Ashfield Shale. (continued)	FR								0.13 1.22	100		15.00m: HB. 15.04m: MB. 15.09m: MB. 15.16m: MB. 15.32m: MB. 15.36m: MB. 15.53m: MB.
			93.5	16.0		BH2 terminated at 15.56m												
			93.0	16.5														
			92.5	17.0														
			92.0	17.5														
			91.5	18.0														
			91.0	18.5														
			90.5	19.0														
			90.0	19.5														
			89.5	20.0														

CLIENT Triple Eight Corporation Pty Ltd

PROJECT NAME Geotechnical Investigation

PROJECT NUMBER G25239-1

PROJECT LOCATION 241-245 Pennant Hills Road Carlingford NSW 2118

DATE STARTED 4/7/25

COMPLETED 5/7/25

R.L. SURFACE 109.1

DATUM m AHD

DRILLING CONTRACTOR BG Drilling

SLOPE 90°

BEARING ---

EQUIPMENT Track Mounted Drilling Rig

HOLE LOCATION Refer To Site Plan (Figure 1) For Test Locations

HOLE SIZE 100mm Diameter

LOGGED BY AN/SS

CHECKED BY JN/RF

NOTES RL To The Top Of The Borehole & Depths Of The Subsurface Conditions Are Approximate

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
ADT	Not Encountered During Augering		109.0	0.0			PAVEMENT, 50mm. FILL: Silty Clay, low to medium plasticity, dark brown and orange-brown, trace of igneous gravel, moist (w>PL).		PAVEMENT FILL
			108.5	0.5		CI-CH	Silty CLAY, medium to high plasticity, red, moist (w>PL), estimated stiff.	SPT 3, 5, 6 N=11 Agg/Sal	NATURAL SOILS
			108.0	1.0			SHALE, pale grey, orange and dark grey, laminated, highly weathered, very low to low estimated strength, moist.		BEDROCK
			107.5	1.5				SPT 9, 25 Agg/Sal Bouncing	
			106.5	2.5			SHALE, dark grey and orange, laminated, highly weathered, low estimated strength, moist.		
			106.0	3.0					
			105.5	3.5					
			105.0	4.0					
			104.5	4.5			SHALE, dark grey and brown, laminated, highly to moderately weathered, low to medium estimated strength, moist.		
				5.0					



CLIENT Triple Eight Corporation Pty Ltd PROJECT NAME Geotechnical Investigation
PROJECT NUMBER G25239-1 PROJECT LOCATION 241-245 Pennant Hills Road Carlingford NSW 2118
DATE STARTED 4/7/25 COMPLETED 5/7/25 R.L. SURFACE 109.1 DATUM m AHD
DRILLING CONTRACTOR BG Drilling SLOPE 90° BEARING ---
EQUIPMENT Track Mounted Drilling Rig HOLE LOCATION Refer To Site Plan (Figure 1) For Test Locations
HOLE SIZE 100mm Diameter LOGGED BY AN/SS CHECKED BY JN/RF
NOTES RL To The Top Of The Borehole & Depths Of The Subsurface Conditions Are Approximate

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
ADT			104.0				SHALE, dark grey and brown, laminated, highly to moderately weathered, low to medium estimated strength, moist. (continued)		
				5.5					
			103.5					Agg/Sal	
				6.0			Borehole BH3 continued as cored hole		
			103.0						
				6.5					
			102.5						
				7.0					
			102.0						
				7.5					
			101.5						
				8.0					
			101.0						
				8.5					
			100.5						
				9.0					
			100.0						
				9.5					
			99.5						
				10.0					

CLIENT Triple Eight Corporation Pty Ltd

PROJECT NAME Geotechnical Investigation

PROJECT NUMBER G25239-1

PROJECT LOCATION 241-245 Pennant Hills Road Carlingford NSW 2118

DATE STARTED 4/7/25

COMPLETED 5/7/25

R.L. SURFACE 109.1

DATUM m AHD

DRILLING CONTRACTOR BG Drilling

SLOPE 90°

BEARING ---

EQUIPMENT Track Mounted Drilling Rig

HOLE LOCATION Refer To Site Plan (Figure 1) For Test Locations

HOLE SIZE 100mm Diameter

LOGGED BY AN/SS

CHECKED BY JN/RF

NOTES RL To The Top Of The Borehole & Depths Of The Subsurface Conditions Are Approximate

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength	Is ₍₅₀₎ MPa	D- diam- etral A- axial	RQD %	Defect Spacing mm	Defect Description
			104.0										
				5.5									
			103.5										
						Continued from non-cored borehole							
NMLC			103.0	6.0		SHALE, dark grey and orange-brown, laminated at 0°, Ashfield Shale.	SW			D 0.06 A 0.12			5.85 - 5.87m: EW Clay Seam, 20mm. 5.88m: J, 30°, S, Curved, Fe Stain. 5.92m, 5.97m, 6.05m: B x3, 0°, S, P, Fe Stain. 5.93 - 5.95m: EW Clay Seam, 20mm. 6.00m, 6.07m: HB. 6.11m: B, 0°, S, P, Cl Coating. 6.13m: MB. 6.15m: B, 0°, S, P, Fe Stain. 6.17m, 6.23m: MB. 6.24 - 6.30m: B x4, 0°, S, P, Fe Stain. 6.34 - 6.47m: B x4, 0°, S, P, Fe Stain to Cl Veneer. 6.52m, 6.58m, 6.64m: B, 0-5°, R, P, Fe Stain. 6.67 - 7.13m: CZ (J, 80°, R, P, Cl Coating), 460mm.
			102.5	6.5						D 0.15 A 0.28			7.13 - 7.27m: J, 30°, S, Ir, Fe Stain. 7.22m: MB. 7.32m: MB. 7.33m: B, 5°, S, P, C. 7.33 - 7.55m: VJ, 85°, S, Ir, Fe Stain.
			102.0	7.0									7.58m, 7.62m: 2x J, 40°, S, Curved, C. 7.67m: B, 0°, S, P, Fe Stain. 7.75m: MB. 7.80m, 7.84m: B, 0°, S, P, Fe Stain. 7.85 - 7.88m: J, 40°, S, P, C. 7.88 - 8.00m: VJ, S, P, Fe Stain.
			101.5	7.5						D 0.7 A 5.63			8.07m: MB. 8.23m: MB. 8.42m: MB.
			101.0	8.0		SHALE, dark grey with up to 10% fine grained, pale grey SANDSTONE laminations, thinly laminated at 0°, Ashfield Shale.	FR						8.89m: MB. 9.00m: HB. 9.02m: HB. 9.07m: MB. 9.07 - 9.22m: J, 80°, S, Curved, C. 9.27 - 9.33m: J, 60°, S, P, C.
			100.5	8.5						D 0.21 A 0.53			9.68m: MB. 9.80m: MB. 9.88 - 9.90m: J, 40-50°, S, P, C. 9.89m: MB.
			100.0	9.0									
			99.5	9.5						D 0.2 A 0.66			
			100.0	10.0									

CLIENT Triple Eight Corporation Pty Ltd

PROJECT NAME Geotechnical Investigation

PROJECT NUMBER G25239-1

PROJECT LOCATION 241-245 Pennant Hills Road Carlingford NSW 2118

DATE STARTED 4/7/25

COMPLETED 5/7/25

R.L. SURFACE 109.1

DATUM m AHD

DRILLING CONTRACTOR BG Drilling

SLOPE 90°

BEARING ---

EQUIPMENT Track Mounted Drilling Rig

HOLE LOCATION Refer To Site Plan (Figure 1) For Test Locations

HOLE SIZE 100mm Diameter

LOGGED BY AN/SS

CHECKED BY JN/RF

NOTES RL To The Top Of The Borehole & Depths Of The Subsurface Conditions Are Approximate

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength					Is ₍₅₀₎ MPa	D- diam- etral A- axial	RQD %	Defect Spacing mm	Defect Description
								EL	VL	J	M	H	VH	EH			
NMLC			99.0			SHALE, dark grey with up to 10% fine grained, pale grey SANDSTONE laminations, thinly laminated at 0°, Ashfield Shale. (continued)	FR										9.96m: MB.
																	10.00m: HB.
																	10.12m: MB.
																	10.27m: MB.
																	10.46m: MB.
																	10.55m: MB.
																	10.69m: B, 0°, S, P, C.
																	10.81m: MB.
																	10.84m: MB.
																	10.98m: MB.
																	11.00m: MB.
						NO CORE. 320mm.											11.21m: MB.
																	11.40m: B, 0°, S, P, C.
																	11.53m: MB.
																	11.83m: MB.
																	11.83 - 11.92m: J, 75°, S, P, C.
																	11.92m: MB.
																	12.00m: HB.
																	12.00 - 12.03m: J, 80-85°, S, P, C.
																	12.03m: MB.
																	12.11m: MB.
						Extremely weathered clay seam, dark grey. 150mm.	EW										12.49m: MB.
																	12.53m: MB.
																	12.61m: MB.
																	12.78 - 12.80m: J, 30°, S, P, C.
																	12.94m: MB.
																	12.95m: MB.
																	12.98m: B, 0°, S, P, CI Coating.
																	13.00m: HB.
																	13.24 - 13.28m: J, 30°, S, P, C.
																	13.43m: MB.
						SHALE, dark grey, with up to 20% fine grained, pale grey SANDSTONE laminations, laminated at 0°, Ashfield Shale.	FR										13.68m: MB.
																	13.79 - 13.80m: J, 15-20°, S, P, C.
																	13.86m: MB.
																	13.93 - 13.95m: J, 20°, S, P, CI Veneer.
																	13.95 - 13.98m: J, 40°, S, P, C.
																	14.00 - 14.09m: J, 80-90°, S, P, C.
																	14.45 - 14.60m: EW Clay Seam, 150mm.
																	14.66 - 14.70m: J, 40°, S, P, C.
																	14.75m: J, 20-30°, S, P, C.
																	14.78m: MB.
																	14.91m: MB.

CLIENT Triple Eight Corporation Pty Ltd

PROJECT NAME Geotechnical Investigation

PROJECT NUMBER G25239-1

PROJECT LOCATION 241-245 Pennant Hills Road Carlingford NSW 2118

DATE STARTED 4/7/25

COMPLETED 5/7/25

R.L. SURFACE 109.1

DATUM m AHD

DRILLING CONTRACTOR BG Drilling

SLOPE 90°

BEARING ---

EQUIPMENT Track Mounted Drilling Rig

HOLE LOCATION Refer To Site Plan (Figure 1) For Test Locations

HOLE SIZE 100mm Diameter

LOGGED BY AN/SS

CHECKED BY JN/RF

NOTES RL To The Top Of The Borehole & Depths Of The Subsurface Conditions Are Approximate

[illegible]

CLIENT Triple Eight Corporation Pty Ltd

PROJECT NAME Geotechnical Investigation

PROJECT NUMBER G25239-1

PROJECT LOCATION 241-245 Pennant Hills Road Carlingford NSW 2118

DATE STARTED 4/7/25

COMPLETED 5/7/25

R.L. SURFACE 109.1

DATUM m AHD

DRILLING CONTRACTOR BG Drilling

SLOPE 90°

BEARING ---

EQUIPMENT Track Mounted Drilling Rig

HOLE LOCATION Refer To Site Plan (Figure 1) For Test Locations

HOLE SIZE 100mm Diameter

LOGGED BY AN/SS

CHECKED BY JN/RF

NOTES RL To The Top Of The Borehole & Depths Of The Subsurface Conditions Are Approximate

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength						Is ₍₅₀₎ MPa	D- diam- etral A- axial	RQD %	Defect Spacing mm	Defect Description																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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NMLC			89.0			SHALE, dark grey, with up to 20% fine grained, pale grey SANDSTONE laminations, laminated at 0°, Ashfield Shale. (continued)	FR																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
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BH3 terminated at 25m



CERTIFICATE OF ANALYSIS

Work Order : **ES2520520**
Client : **GEOTECHNICAL CONSULTANTS AUSTRALIA PTY LTD**
Contact : **JOE NADER**
Address : **2 HAROLD STREET**
PARRAMATTA NSW 2150
Telephone : **----**
Project : **G25239-1 Geotechnical Investigation**
Order number : **----**
C-O-C number : **----**
Sampler : **ANGUS N, S Suraj**
Site : **241-245 Pennant Hills Road Carlingford NSW 2118**
Quote number : **EN/333**
No. of samples received : **9**
No. of samples analysed : **9**

Page : 1 of 4
Laboratory : Environmental Division Sydney
Contact : Customer Services ES
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 04-Jul-2025 15:00
Date Analysis Commenced : 09-Jul-2025
Issue Date : 14-Jul-2025 12:02



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

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

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

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

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

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

- ED045G: LOR raised for Chloride on sample 1 due to sample matrix.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH1 0.5-0.85m	BH1 1.4-1.5m	BH1 2.4-2.6m	BH2 0.5-0.95m	BH2 1.5-1.6m
Sampling date / time					03-Jul-2025 00:00	03-Jul-2025 00:00	03-Jul-2025 00:00	03-Jul-2025 00:00	03-Jul-2025 00:00
Compound	CAS Number	LOR	Unit		ES2520520-001	ES2520520-002	ES2520520-003	ES2520520-004	ES2520520-005
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		4.5	4.7	5.1	4.4	4.6
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		31	26	27	83	83
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		26.6	9.0	14.6	20.2	18.2
ED040S : Soluble Sulfate by ICPAES									
Sulfate as SO4 2-	14808-79-8	10	mg/kg		40	30	30	120	100
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg		<50	<10	<10	20	30



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH2 2.1-2.3m	BH3 0.5-0.95m	BH3 1.5-1.8m	BH3 5.6-5.8m	----
Sampling date / time					03-Jul-2025 00:00	04-Jul-2025 00:00	04-Jul-2025 00:00	04-Jul-2025 00:00	----
Compound	CAS Number	LOR	Unit		ES2520520-006	ES2520520-007	ES2520520-008	ES2520520-009	-----
				Result	Result	Result	Result	Result	----
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		5.0	4.9	5.4	5.8	----
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		58	56	21	39	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		10.7	22.8	9.3	8.8	----
ED040S : Soluble Sulfate by ICPAES									
Sulfate as SO4 2-	14808-79-8	10	mg/kg		80	80	20	40	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg		<10	<10	10	<10	----



QUALITY CONTROL REPORT

Work Order	: ES2520520	Page	: 1 of 3
Client	: GEOTECHNICAL CONSULTANTS AUSTRALIA PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: JOE NADER	Contact	: Customer Services ES
Address	: 2 HAROLD STREET PARRAMATTA NSW 2150	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: G25239-1 Geotechnical Investigation	Date Samples Received	: 04-Jul-2025
Order number	: ----	Date Analysis Commenced	: 09-Jul-2025
C-O-C number	: ----	Issue Date	: 14-Jul-2025
Sampler	: ANGUS N, S Suraj		
Site	: 241-245 Pennant Hills Road Carlingford NSW 2118		
Quote number	: EN/333		
No. of samples received	: 9		
No. of samples analysed	: 9		



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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

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

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot

CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

RPD = Relative Percentage Difference

= Indicates failed QC

* = The final LOR has been raised due to dilution or other sample specific cause; adjusted LOR is shown in brackets. The duplicate ranges for Acceptable RPD% are applied to the final LOR where applicable.

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA002: pH 1:5 (Soils) (QC Lot: 6706553)									
ES2520527-002	Anonymous	EA002: pH Value	----	0.1	pH Unit	6.4	6.8	6.5	0% - 20%
ES2520520-001	BH1 0.5-0.85m	EA002: pH Value	----	0.1	pH Unit	4.5	4.6	0.0	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 6706552)									
ES2520527-002	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	292	288	1.5	0% - 20%
ES2520520-001	BH1 0.5-0.85m	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	31	27	13.6	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 6706556)									
ES2520459-008	Anonymous	EA055: Moisture Content	----	0.1 (1.0)*	%	18.1	17.8	1.8	0% - 50%
ES2520520-001	BH1 0.5-0.85m	EA055: Moisture Content	----	0.1 (1.0)*	%	26.6	24.5	8.3	0% - 20%
ED040S: Soluble Major Anions (QC Lot: 6706551)									
ES2520520-004	BH2 0.5-0.95m	ED040S: Sulfate as SO4 2-	14808-79-8	10	mg/kg	120	100	19.4	0% - 50%
ES2520536-002	Anonymous	ED040S: Sulfate as SO4 2-	14808-79-8	10	mg/kg	90	100	0.0	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 6706554)									
ES2520527-001	Anonymous	ED045G: Chloride	16887-00-6	10	mg/kg	50	40	0.0	No Limit
ES2520520-001	BH1 0.5-0.85m	ED045G: Chloride	16887-00-6	10 (50)*	mg/kg	<50	60	24.7	No Limit



Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA002: pH 1:5 (Soils) (QCLot: 6706553)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.8	101
				----	7 pH Unit	101	98.8	101
EA010: Conductivity (1:5) (QCLot: 6706552)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	100	92.0	108
ED040S: Soluble Major Anions (QCLot: 6706551)								
ED040S: Sulfate as SO4 2-	14808-79-8	10	mg/kg	<10	750 mg/kg	97.5	80.0	120
ED045G: Chloride by Discrete Analyser (QCLot: 6706554)								
ED045G: Chloride	16887-00-6	10	mg/kg	<10	250 mg/kg	104	75.0	125
				<10	5000 mg/kg	102	79.0	117

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery (%) MS	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number			Low	High
ED045G: Chloride by Discrete Analyser (QCLot: 6706554)							
ES2520520-001	BH1 0.5-0.85m	ED045G: Chloride	16887-00-6	12500 mg/kg	128	70.0	130