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5 December 2022

Mr Doug Balcomb
Property Manager
Hills Marketplace
287 Mona Vale Road,
Terrey Hills NSW 2084

SUBJECT: **Geotechnical Report (Ref: 2101129TRpt01FinalV02_10May22)**

SITE: **287 Mona Vale Road, Terrey Hills NSW, 2084**

Dear Doug,

Geo-Logix understands that subsequent to the issuing of our Geotechnical Report for the site at 287 Mona Vale Road, Terrey Hills NSW, 2084 (Ref: 2101129TRpt01FinalV02_10May22), the decision has been taken to remove the planned basement from the proposed development. While the included advice on basement excavation, shoring, foundations, etc. is no longer required, Geo-Logix does not consider that this significantly alters the remaining advice provided in the report. The report is considered adequate to inform the design of the currently proposed on grade buildings.

Please feel free to contact me should you have any further questions regarding this letter.

Yours sincerely,

Edward Lilly
BSc Civil Engineering, MIEAust
Associate Engineer

GEOTECHNICAL REPORT

Hills Marketplace Extension
287 Mona Vale Road
Terrey Hills NSW, 2084

Hills Marketplace, May 2022

Geo-Logix
environment • geotech

DOCUMENT CONTROL

GEOTECHNICAL REPORT

Hills Marketplace
287 Mona Vale Road,
Terrey Hills NSW, 2084

PREPARED FOR

Doug Balcomb
Property Manager
Hills Marketplace
287 Mona Vale Road,
Terrey Hills NSW 2084

Report reference: 2101129TRpt01FinalV02_10May22

Date: 10 May 2022

DISTRIBUTION AND REVISION REGISTER

Revision Number	Date	Description	Recipient	Deliverables
V01	21/12/2021	Final Report 2101129TRpt01FinalV01_21Dec21	Geo-Logix Pty Ltd	1 Electronic Copy
V01	21/12/2021	Final Report 2101129TRpt01FinalV01_21Dec21	Hills Marketplace	1 Electronic Copy
V02	10/5/2022	Final Report 2101129TRpt01FinalV02_10May22	Geo-Logix Pty Ltd	1 Electronic Copy
V02	10/5/2022	Final Report 2101129TRpt01FinalV02_10May22	Hills Marketplace	1 Electronic Copy

Issued by: Geo-Logix Pty Ltd

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Project Scientist

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TABLE OF CONTENTS

FIGURES

ATTACHMENTS

1. INTRODUCTION

Geo-Logix Pty Ltd (Geo-Logix) was engaged by Mainbrace Pty Ltd on behalf of Hills Marketplace to conduct a geotechnical investigation of the property located at 287 Mona Vale Road, Terrey Hills NSW 2084 (Figure 1). The area of investigation comprised approximately 20,120 m^2 and is currently occupied by the Hills Marketplace retail and restaurant building and various other structures on site.

Geo-Logix understand that Hills Marketplace propose to upgrade and extend the existing central building with additional retail space, basement carparking and access roads. Excavation up to approximately 4.0 metres below grade (mbg) is anticipated for the proposed basement (Attachment A).

1.1 Objectives and Scope of Work

The objective of the geotechnical investigation was to provide an assessment of subsurface conditions to assist with planning of the proposed centre upgrade.

To satisfy the above objectives Geo-Logix completed the following scope of work:

- Visual appraisal of the site conditions and locality;
- Review of the geological maps for the area;
- Drilling of seven test borings to 4.5–8.0 mbg or refusal on rock with truck mounted drill rig (BH1–BH7);
- Performance of Standard Penetrometer Tests (SPT) within each boring at regular intervals to assess the relative density and/or consistency of the subsurface soils and to obtain representative soil samples;
- Logging of the borings in accordance with the Unified Soil Classification System (USCS);
- Collection of representative soil samples for selective geotechnical and chemical laboratory testing;
- Backfilling of borings with onsite soils and compacted on completion; and
- Provision of this report detailing the results of the above investigation, recommendations for design and construction of the proposed extension.

The Geo-Logix field investigation was conducted on 15 and 16 November 2021.

2. SITE INFORMATION

2.1 Site Identification and Description

The area of investigation comprises approximately 20,120 m^2 and is currently occupied by the Hills Marketplace, 287 Mona Vale Road, Terrey Hills (Figure 2). The following site descriptions are based on observations made during Geo-Logix's site investigation in November 2021.

The property comprises of a retail centre in the east of the property, two sheds for retail and storage in the northern corner and a residential house adjacent to the western boundary of the property. Landscaped garden areas and a stormwater retention dam are situated in the southern portion of the site. Remaining space is largely sealed with asphalt and concrete driveways with parking areas adjacent to most buildings.

2.2 Topography

The area of investigation was relatively flat with an elevation of approximately 195 mAHD and sloped gently toward the stormwater retention dam in the southwest. Moderate onsite relief was observed in the vicinity of the stormwater retention dam. The dam wall was about 3 m in height.

Regionally the site is on a broad ridge running from northeast to southwest and sloping gently to southwest.

2.3 Regional Geology

Review of the NSW 1:100,000 Sydney Map (Geological Survey of NSW, 1983) indicates the site is situated on Triassic age Hawkesbury Sandstone of the Narrabeen Group, comprising medium to coarse grained sandstone with minor shale and claystone lenses.

2.4 Regional Hydrology

Geo-Logix understands that prior to development, a water course ran through site and that groundwater inflow occurred during construction of the existing basement. It is expected that groundwater would follow the natural topography of the previous water course and generally flow to the southwest.

3. METHOD OF INVESTIGATION

3.1 Investigation Methods

Geotechnical fieldwork was undertaken on 15 and 16 November 2021 by Geo-Logix.

Prior to undertaking the borings, each location was scanned for underground services and utilities by an independent utility locator and cross-checked with the results of a 'Dial Before You Dig' (DBYD) search.

Bores BH1 to BH7 were completed by Geo-Logix utilising a truck mounted drill rig equipped with solid stem augers with a "V" shaped hardened steel bit (V-bit) to V-bit refusal. Drilling was then continued using a wing shaped bit with Tungsten Carbide cutting teeth (TC-bit) to TC-bit refusal in all borings. At the completion of drilling, the test bores were reinstated with soil cuttings and compacted.

Bores MW1 to MW3 were completed as above to TC-Bit refusal and then continued by NMLC rock core to 13 mbg. At locations MW1 to MW3 groundwater monitoring wells were installed in accordance with Minimum Construction Requirements for Water Bores in Australia, Edition 4 (NUDLC, 2020). Stabilised water levels were measured after a minimum of 48 hours.

In bores BH1 to BH7 SPTs were completed at regular intervals to provide representative samples of the subsurface and blow counts indicative of the soil/rock strength.

Encountered soils were logged in accordance with the Unified Soil Classification System (USCS). The boring logs, including SPT results and well construction details, are presented in Attachment B. Photographs of rock cores are presented in Attachment C.

Representative soil samples were submitted to Eurofins Environment Testing Australia Pty Ltd (Eurofins) and Macquarie Geotech for selective characterisation and chemical tests.

4. SITE GEOLOGY AND HYDROGEOLOGY

4.1 Surface and Subsurface Conditions

The following sections contain a summarised account of the site surface and subsurface. For detailed descriptions of individual locations please refer to the attached boring logs.

Filling

Fill soils to 1.8 m thick were encountered during investigation. These primarily comprised clayey sand with gravel. The fill appeared poorly to moderately compacted.

Soils and Rock

The underlying natural soil typically comprised moderate pale brown and pale orange, damp to moist, moderately dense clay Sand (SC), transitioning to Sandstone bedrock between 2.4 to 3.8 mbg. The strength of the encountered sandstone increased with depth. Upper sandstone strata typically appeared weathered with poor cementing and significant clay seams. Sandstone considered equivalent to Pell Class III or better was observed at depths below approximately 9 to 11 mbg with a typical top of stratum elevation of 175 mAHD.

4.2 Groundwater

Groundwater was encountered between 4.5 mbg and 5.0 mbg in most locations. Near to the dam, groundwater was shallower at 2.0 to 4.0 mbg.

5. LABORATORY RESULTS

Representative samples of soil were collected during the fieldwork and submitted to Eurofins and Macquarie Geotechnical for laboratory testing. Tests included:

- Atterberg Limits and Linear Shrinkage tests to assess the plasticity and reactivity of specific soil samples to assist with classification and description;
- Standard Maximum Dry Density (MDD), Optimum Moisture Content (OMC) and California Bearing Ratio (CBR) testing to assist with pavement and slab design;
- Aggressivity testing (electrical conductivity, sulphate, chloride and pH) to assess the exposure classification of the soil with respect to buried structural concrete and/or exposed steel; and
- Unconfined Compressive Strength (UCS) and Point Load Strength tests to assist with the determination of rock strength and rippability.

The laboratory test results are presented in Attachment D. A summary of the results is provided in the following sections.

5.1 USCS Classification Testing

Bulk soil samples were collected from locations BH1, BH3 and BH4 between 0.5–1.5 mbg and submitted for laboratory analysis to Macquarie for NATA accredited Atterberg Limits and Linear Shrinkage tests. The

sample was selected to confirm the USCS field classification of fill and natural soils across the site. Linear Shrinkage testing was completed to facilitate calculation of the free surface movement of the onsite soils for site classification in accordance with AS2870-2011. A summary of the results is provided in the following table.

Location/ Depth (m)	Sample Description	Liquid Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)	Material Finer than		
					2.0 mm (%)	500 µm (%)	63 µm (%)
BH1/1.0-1.5	Clayey Sand	24	15	3.5	--	--	--
BH1/1.1-1.5	Clayey Sand	29	17	--	--	--	--
BH1/2.0-2.6	Clayey Sand	26	12	4.0	--	--	--
BH1/3.5-3.6	Weathered Sandstone	25	12	--	--	--	--
BH3/1.0-1.5	Clayey Sand	15	0	1.0	--	--	--
BH4/0.5-1.0	Clayey Sand Fill	28	11	5.0	--	--	--
BH7/1.2	Clayey Sand	--	--	--	97.7	87	17
BH7/2.6-2.9	Sand with Clay	--	--	--	96.6	73	8.4
BH7/4.0	Clayey Sand	--	--	--	99.9	89.9	27

-- not analysed

The potential for surface movement based on the reactivity of the soil to changes in moisture is discussed in Section 6.6.

5.2 Californian Bearing Ratio (CBR)

Bulk soil samples were collected from locations BH1, BH3 and BH4 between 0.5–1.5 mbg and submitted for laboratory analysis to determine a CBR value for use in pavement design. The sample was submitted to Macquarie for NATA accredited testing of the CBR.

The CBR samples were remoulded in the laboratory and compacted to 100% standard maximum dry density (SMDD) at optimum moisture content (OMC). Prior to testing, the samples were soaked for four days under a surcharge load of 4.5 kg. The soaked CBR values are provided in the following table.

Location/ Depth (m)	Sample Description	SMDD (t/m^3)	OMC (%)	CBR Value (%)	Swell After Soaking (%)
BH1/1.0-1.5	Clayey Sand	2.00	10.0	25	0.0
BH3/1.0-1.5	Clayey Sand	1.9	11.6	35	0.0
BH4/0.5-1.0	Clayey Sand Fill	1.80	15.1	12	0.2

Pavement design based on these CBR results is discussed in Section 6.8.

5.3 Exposure Classification Tests

Selected soil profile samples were submitted to Eurofins for NATA accredited testing of pH, sulphate, chloride and electrical conductivity to determine the exposure classification (or aggressiveness/

corrosiveness potential of the soil) with respect to buried steel and/or concrete. The samples were selected as representative of onsite soils in which foundations were expected.

To determine the aggressiveness of the soil and water environment on concrete or steel, the chemical test results are compared to Tables 6.1 and 6.3 from Section 6 of the Australian Standard AS2159 – 2009. This section provides assessment criteria to assess the 'exposure classification' for a concrete or steel pile. The Standard has two classes of soil conditions:

- Type A – high permeability soils below groundwater; and
- Type B – low permeability soils and all soils above groundwater.

Based on the chemical testing results, the Standard provides a range of 'exposure classifications' from non-aggressive to very severe. For the range of chemical conditions in the soil surrounding the structure, the condition leading to the most severe aggressive conditions is adopted. A summary of the soil results is provided in the following table.

Location/ Depth (m)	Soil Condition	Electrical Conductivity (EC) (dS/m)	Soil Texture Factor	Extract Electrical Conductivity (EC_e) (dS/m)	Electrical Resistivity (Ω·cm)	pH	Chloride (mg/kg)	Sulphate (mg/kg)
BH4/1.3-1.5	B	0.012	17	0.20	83,000	5.5	< 10	< 10
BH4/2.6	B	0.029	17	0.49	34,000	6.5	< 10	< 10
BH4/3.7	A	0.027	17	0.46	37,000	6.6	< 10	16

The potential aggressivity of an environment towards concrete and steel is dependent on the sulphate, chloride and pH levels of the soil. Soil aggressivity is discussed in Section 6.9. Site Salinity is discussed in Section 6.10.

5.4 Uniaxial Compressive Strength and Point Load Strength Index Tests

To assess the strength of the encountered bedrock, representative samples of recovered rock core were collected from boreholes MW1, MW2 and MW3 and submitted to Macquarie Geotech for NATA accredited testing of Uniaxial Compressive Strength (UCS) and Point Load Strength Index $Is_{(50)}$ to facilitate the assessment of bearing capacity and excavatability of the rock.

Two samples from boreholes MW1 and MW2 at the proposed foundation level for the proposed development were selected for UCS testing. For UCS testing, each rock core sample was cut to a height/diameter ratio of between 2 and 3, and then loaded axially into a compression machine. Compression was applied uniaxially at a constant rate until failure occurs and the failure load recorded.

Point load tests were conducted from each rock core at approximately 1 m intervals. All point load tests were conducted in the diametral and axial directions. Axial results are considered of higher importance as foundation loads are expected to be in a similar direction.

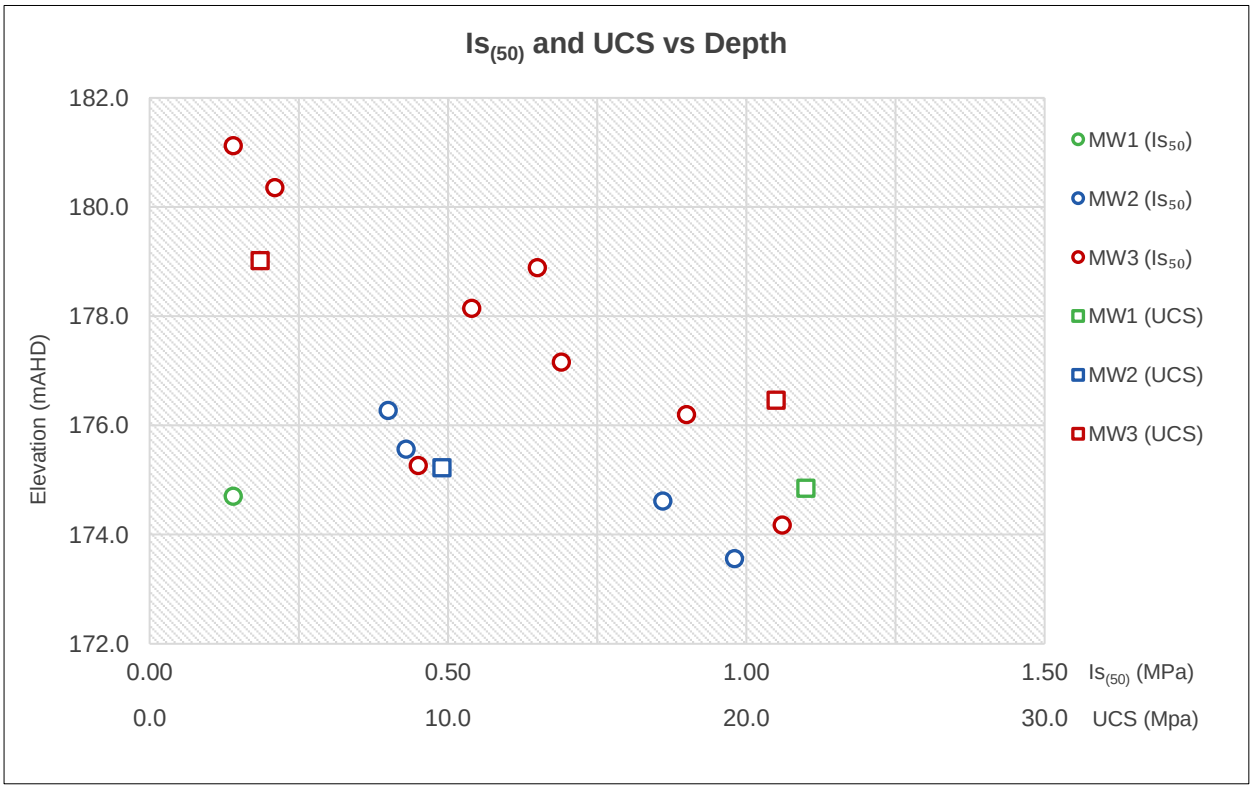
A summary of the tests results from samples submitted by Geo-Logix is provided in the following table and chart.

Borehole	Depth (mbg)	Elevation (mAHD)	Axial $Is_{(50)}$ (MPa)	Estimated UCS* ($Is_{(50)}$ × 20)	UCS (MPa)
MW1	12.40–12.60	174.95–174.75	--	--	22
MW1	12.60–12.70	174.75–174.65	0.14	2.8	--

Borehole	Depth (mbg)	Elevation (mAHD)	Axial $Is_{(50)}$ (MPa)	Estimated UCS* ($Is_{(50)}$ × 20)	UCS (MPa)
MW2	9.73–9.84	176.33–176.22	0.40	8.0	--
MW2	10.45–10.55	175.61–175.51	0.43	8.6	--
MW2	10.73–10.95	175.33–175.11	--	--	9.8
MW2	11.40–11.50	174.66–174.56	0.86	17.2	--
MW2	12.45–12.55	173.61–173.51	0.98	19.6	--
MW3	5.48–5.60	181.18–181.06	0.14	2.8	--
MW3	6.25–6.36	180.41–180.3	0.21	4.2	--
MW3	7.57–7.72	179.09–178.94	--	--	3.7
MW3	7.73–7.81	178.93–178.85	0.65	13.0	--
MW3	8.46–8.57	178.2–178.09	0.54	10.8	--
MW3	9.45–9.56	177.21–177.1	0.69	13.8	--
MW3	10.10–10.30	176.56–176.36	--	--	21
MW3	10.42–10.51	176.24–176.15	0.90	18.0	--
MW3	11.34–11.45	175.32–175.21	0.45	9.0	--
MW3	12.44–12.54	174.22–174.12	1.06	21.2	--

* Estimated UCS based on multiplication of Axial $Is_{(50)}$ by a correlation factor of 20.

-- Not tested.



The excavatability of rock is discussed in Section 6.2. Allowable bearing capacities of foundations on rock are discussed in Section 6.7.

6. DISCUSSION

6.1 Earthworks

The subject site should be prepared in accordance with AS 3798-2009 Section 6.1 and filled in accordance with AS 3798-2009 Section 6.2.

Initial Site Preparation

Initially surface features including pavements and building foundations should be stripped from the site, in an area extending at least 1.5 m laterally beyond any planned structures or improvements.

Utilities should be located and rerouted as necessary and any abandoned pipes or utility conduits should be removed or filled with grout. Utility trench excavations must be cut to competent bearing soils and backfilled with properly compacted structural fill.

Dam

The on-site dam should be dewatered and dam sediments dried prior to earthworks. The sediments may be disposed off-site or blended with onsite clayey Sand and/or crushed rock for reuse as fill. A blending ratio of 1:8 is considered appropriate. Contaminant levels in dam sediment should be assessed prior to re-use.

Structural Filling

Where the above site preparation procedures create excavations below the proposed final grade, the excavations should be backfilled with properly compacted structural fill. Materials selected for use as structural fill should not contain organic matter, waste construction debris, or deleterious materials. Fill materials should be granular material or should be of low or medium plasticity. Existing onsite fill meeting the above criteria may be used as structural fill. Under no circumstances should topsoil or other organic-laden soils be placed as fill beneath or within 1.5 horizontal metres of buildings, pavements or other structural areas.

Once final grade is reached in cut areas, and prior to fill placement in areas of the site that will receive new fill, the subgrade should be evaluated by a geotechnical engineer or their representative. Following subgrade evaluation, the exposed subgrade should be test-rolled in accordance with AS 3798-2009. Any unstable areas failing the evaluation or test-roll should be excavated to the depth of competent bearing material and filled in accordance with the general site fill placement methodology outlined below.

Fill materials should be placed in individual lifts of 300 mm or less loose measurement and compacted using a sheep's foot roller for cohesive soils and a smooth drum roller for cohesionless soils. Fill should be compacted to a minimum of 98% of standard compaction with a moisture content within ±2% of the optimum moisture content.

Test rolling and fill placement is to be undertaken under Level 1 Supervision or Level 2 Inspection and Testing.

6.2 Excavations

It is expected that on-site soils and rock within the expected depth of excavation will generally be excavatable using large equipment (i.e., excavators greater than 25 tonne). Localised assistance by ripping or rock hammer may be required during excavation. Groundwater management, batter and shoring of excavations are discussed in the following sections.

6.3 Groundwater Inflow

Shallow groundwater was encountered on-site primarily in the area surrounding the existing dam at approximately 2 mbg. While it is expected that groundwater levels will be depressed following draining of the dam, waterlogged soil may remain and groundwater inflow into excavations may occur. Depending on the proposed excavation methods and the extent of groundwater inflow experienced, groundwater may be managed either using drainage ditches and sump/pump methods for battered excavations. Alternately, if sheet pile or secant pile shoring is used, spear point relief wells may be more suitable. An experienced dewatering contractor should be consulted to determine if spearpoint wells are likely to be successful in the on-site geology.

Test pitting of proposed excavation areas prior to general excavation is recommended to gauge potential groundwater inflow.

Based on the depth of encountered groundwater, Geo-Logix considers that a tanked basement design may be prudent. If a drained basement design is adopted, in contrast with a tanked design, and depending on fluctuations in groundwater elevation, long-term dewatering of the carpark may be required. Volumes may be expected to be lower than those experienced during construction. Long-term dewatering plans should consider the potential for soil piping and subsidence under surrounding structures.

Permanent drainage systems should allow for water collection of seepage and flows from joints, with sumps and pumps suitably sized to dispose of the water in accordance with council and EPA regulations. Based on iron banding observed in the rock profile groundwater is expected to have significant concentrations of iron which will precipitate as iron oxide/hydroxide sludge. This should be taken into account when designing drainage lines and pump-out systems through provision for maintenance to remove the sludge incorporated into the design.

6.4 Batter Slopes and Shoring

Excavations must be designed and constructed in a stable manner. The sides of the excavation should be shored or battered so as to maintain stability of both the excavation sides and bottom. Assuming that excavations are undertaken prior to any other construction works, and provided all surcharge loads, including plant and stockpiled material are kept well clear of the top of the batters, minimum batter slopes are recommended as 1H:1V for temporary batters and 2H:1V for permanent batters.

Permanent batters should be protected from erosion by vegetation or other measures and designed with adequate surface and subsurface drainage. For batters taller than 2 m, localised assessment of batter slopes is recommended.

Stormwater runoff should be directed away from the tops of batters by use of berm drains. Where runoff must be directed down the face of a batter, the batter drains/chutes should be lined to prevent erosion. Properly installed silt fence should be used at the base of batter slopes to prevent offsite migration of sediment. Scouring of excavation faces due to runoff should be repaired prior to further works within the

excavation(s). All permanent batters should be protected from erosion by vegetation or other measures and designed with adequate surface and subsurface drainage.

The contractor is solely responsible for temporary excavation design and should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench depth, exceed those specified in local, state, and national safety regulations.

The following earth pressure coefficients are recommended for use in design of temporary and permanent retaining structures:

Retained Material	Bulk Density (kN/m^3)	Earth Pressure Coefficients			Ultimate Passive Pressure (kPa)	Ultimate Anchor Bond Stress (kPa)
		At rest (K_0)	Active (K_a)	Passive (K_p)		
Fill	21	0.55	0.40	2.75		
Onsite Clayey Sand (SC)	21	0.50	0.35	3.00		
Weathered Sandstone	23	0.35	0.22	4.50		300
Medium to High Strength Sandstone	25	0.0*	0.0*	--	4,000	1,000

-- Not applicable.

*This value assumes no adverse jointing.

The 'at rest' earth pressure coefficient (K_0) is suitable for retaining structures where anchors or other methods restrain retaining wall movement or where significant movements cannot be tolerated (rigid wall). A uniform or trapezoidal earth pressure distribution should be adopted. It should be noted that shoring which is designed for this 'at rest' coefficient will still undergo some lateral movements.

The active earth pressure coefficient (K_a) is suitable for retaining structures allowing movement of the top such as cantilevered pile walls. For these structures the pressure acting on the wall can be estimated on the basis of a triangular earth pressure distribution.

The passive earth pressure coefficient (K_p) is suitable for the calculation of resisting forces at the toe of concrete, reinforced stone, or masonry walls. Passive resistance for piles founded in rock below the base of the excavation (including allowance for service or footing excavations) may be based on a preliminary ultimate passive restraint equal to 4,000 kPa in medium strength or better sandstone. A factor of safety must be applied to these ultimate values to limit the amount of wall movement that is required to mobilise the passive resistance. The top 0.5 m of the rock socket should be ignored in calculations to account for defects and tolerance.

For anchored or propped walls, where minor movements can be tolerated e.g. where there are no movement sensitive structures or buried services within 2H of the excavation, we recommend the use of a trapezoidal earth pressure distribution of 6H (kPa) for the soil and Class IV/V bedrock, where H is the retained height in metres. These pressures should be assumed to be uniform over the central 50% of the support system. For the shotcrete infill panel design, a trapezoidal earth pressure distribution and a lateral earth pressure of 4H (kPa) can be adopted for the soil and Class IV/V bedrock.

For anchored or propped walls, supporting areas sensitive to lateral movement e.g. where there are movement sensitive structures or buried service present within 2H of the excavation, a trapezoidal earth pressure distribution of 8H (kPa) should be adopted for the soil profile and Class IV/V bedrock, where H is the retained height in metres. These pressures should be assumed to be uniform over the central 50% of

the support system. For the shotcrete infill panel design, a trapezoidal earth pressure distribution and a lateral earth pressure of 6H (kPa) can be adopted for the soil and Class IV/V bedrock.

Any surcharge affecting the walls (e.g. traffic, construction loads, adjacent footings, inclined backfill surface, etc.) should be allowed in the design using the appropriate earth pressure coefficient from above.

Temporary anchors for retaining walls may be preliminarily designed based on ultimate bond stresses of 300 and 1,000 kPa for Class IV-V Sandstone and Class III Sandstone respectively.

Testing should be carried out to confirm the anchor capacities. Anchors should have their bond lengths behind a projected 45° line from the bulk excavation level and should provide sufficient force to resist the movement of a wedge of rock. The frictional resistance of the wedge along the joint may be calculated assuming an angle of friction of 20°.

The design of temporary and permanent support will need to consider the possibility that 45° joints in the shale and laminite will daylight near the base of the excavation leading to large wedges of rock requiring support by the temporary and permanent retaining structures. Sufficient anchoring of the shoring wall should be undertaken to prevent movements along 45° joints.

Finally, computer aided analysis may be carried out to assess potential ground movements based on different wall designs and construction sequence, so as to control deflections to within tolerable limits. It is also considered prudent to carry out surveys before and after installation to measure the actual movement of the wall or soil.

Design of all retaining structures should be undertaken in accordance with AS4678-2002. Furthermore, the design of any retaining structures should make allowance for all applicable surcharge loadings including construction activities around the perimeter of the excavation, traffic loadings and adjacent buildings. Consideration should be given to the possibility of a hydrostatic pressure due to build-up of water behind the wall (e.g. from broken services), unless permanent subsurface drainage can be provided.

6.5 Construction Induced Vibrations

Onsite fill, native soils and weathered sandstone are expected to be readily excavatable using excavators or backhoes; so long as percussive piling or excavation methods are not used, construction induced vibrations are not expected to be an issue.

If percussive excavation equipment (e.g. rock hammer) is used, consideration must be given to possible construction induced ground vibration. Construction induced ground vibration is unlikely to be an issue at the site unless heavy impact tools are required for excavation. The use of other techniques which do not involve impact (e.g. rock saws), although less productive, would reduce or possibly eliminate risks of damage due to vibrations.

If adopting a rock hammer or similar, on-site guidance by a vibration specialist is recommended during the early part of excavation. This should include vibration characterisation trials that are used to define vibration levels for the selected equipment.

Peak Particle Velocity (PPV) is usually the adopted measure of ground vibration and the safe limits depend on the sensitivity of the adjoining structures and services. There are a number of Australian and overseas publications that provide vibration velocity guideline levels (or safe limits) including:

- Australian Standard AS2187.2-2006 Explosives - Storage and use - Use of explosives - Appendix J: Ground Vibrations and Airblast Overpressure;
- DIN 4150 – Part 3 – 1999. Effects if Vibration on Structures;

- Department of Environment and Conservation NSW, 2006. Assessing Vibration: a technical guideline;
- British Standard BS 7385-1:1990. Evaluation and measurement for vibration in buildings. Guide for measurement of vibrations and evaluation of their effects on buildings;
- British Standard BS 7385-2:1993. Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration.

The most appropriate guidelines levels for the proposed excavation work are provided in AS2187.2-2006, which refers to guideline values from BS7385-2 for the prevention of minor or cosmetic damage occurring in structures from ground vibration. Additionally, the guideline levels provided in DIN 4150 Part 3 is considered an appropriate source for guideline levels.

Ideally, safe limits should be determined by a specialist vibration consultant. However, as a preliminary guide, and considering the above guidelines and the type of adjoining structures present, Geo-Logix recommend a maximum PPV of 10 mm/sec (measured at the foundations of adjoining structures) to prevent cosmetic and structural damage.

The PPV limits of 10 mm/sec are expected to be achievable if rock breaker equipment or other excavation methods are restricted as indicated in the following table:

Distance from Adjoining structure (m)	Maximum Peak Particle Velocity 10 mm/sec*	
	Equipment	Operating Limit (% of Maximum Capacity)
1.5 to 2.5	300 kg rock hammer	50
2.5 to 5.0	300 kg rock hammer or 600 kg rock hammer	100 50
5.0 to 10.0	600 kg rock hammer Or 900 kg rock hammer	100 50

Geo-Logix notes human discomfort levels caused by vibration are typically less than the levels that are likely to cause cosmetic or structural damage to structures. Therefore, neighbours may lodge complaints before any cosmetic or structural damage occurs.

Regardless of excavation, retention or foundation methods, Geo-Logix recommends dilapidation surveys be carried out on neighbouring buildings prior to construction to confirm that the construction works are not causing damage. These surveys should be agreed to, and the report signed, by the owners of the adjacent building prior to work commencing.

6.6 Site Classification

Considering the depth of existing onsite fill, the appropriate site classification for surface structures founded on fill is Class ‘P’ in accordance with AS2870-2011.

Based on Linear Shrinkage testing results, for structures with foundations in the onsite natural soils, the appropriate site classification is considered to be equivalent to Class ‘S’ with a characteristic free surface movement (y_s) of 0–20 mm with changes in moisture (AS2870-2011).

Geo-Logix notes that this site classification has not included the effects of trees, poor site drainage, leaking plumbing, and exceptionally wet or dry moisture conditions.

6.7 Foundations

Geo-Logix recommends that footings be founded on a consistent medium to minimise any potential differential settlements. However, depending on the building loads and whether the structures are designed to be relatively flexible, this may not be significant. Existing on-site fill is not generally considered to be a suitable founding medium.

Provided new structural fill is placed in a controlled manner as advised in Section 5.1, native on-site soils and new structural fill are expected to be capable of supporting shallow footings. Assuming an allowable settlement of 25 mm shallow footings in soil may be designed based on an allowable bearing capacity of 100 kPa.

Geo-Logix recommend that foundation subgrade surfaces be observed and tested by a geotechnical engineer using Dynamic Cone Penetrometer (DCP) testing equipment or other satisfactory methods prior to steel or concrete placement. Any unsatisfactory soil detected during this evaluation should be undercut as directed by the geotechnical engineer. Footing excavations should be protected from surface water run-off; if water is allowed to accumulate within a footing excavation and soften the bearing soils, the deficient soils should be removed from the excavation prior to concrete placement.

Allowable bearing pressure and adhesion for deep foundations including bored piers and basements founded on rock are summarised in the following table.

Bearing Stratum	Typical Top of Stratum Elevation (mAHD)	Allowable Bearing Pressure (MPa)	Allowable Adhesion (kPa)*	Young's Modulus, Es (MPa)	Estimated Settlement
Class IV-V Sandstone	182.5	1,000	50	100	1% of Footing Width or Pier Base
Class III or better Sandstone	175	3,500	175	350	1% of Footing Width or Pier Base

*For pier foundations only, not applicable for footings. Assumes a clean socket of roughness R2 or better.

The bearing stratum should be verified prior to the placement of rebar or concrete. Pier borings should be filled on the same day as drilling. Pier borings should be dewatered immediately prior to placement of concrete. If required dewatering for pier borings may be accomplished by sump pump.

All footing systems should be designed and constructed in accordance with the recommendations contained in AS 2870-2011 and/or AS 2159-2009 by a suitably qualified and experienced structural engineer.

6.8 Ground Slabs and Pavements

Slab and pavement designs are based on the California Bearing Ratio (CBR) and modulus of the subgrade materials encountered after any excavation or re-grading has taken place. The principal aim of the subgrade preparation is to provide a uniform foundation over the entire slab/pavement formation which will not give rise to unevenness in the slab/pavement surface under the design loads. The final subgrade,

following the earthworks recommended in Section 5.1, may comprise natural soil or well compacted structural fill provided the material performs satisfactorily under test-rolling as detailed in AS3798-2007. Other than current pavement subgrades, existing on-site fill is not considered suitable for use as pavement subgrade unless excavated and reinstated as new structural fill.

Based on Laboratory results and Geo-Logix's experience with similar soil and provided the final subgrade performs under test-rolling and is compacted to at least 98% standard compaction, design of pavements and slabs-on-grade placed on onsite residual soils may be based on a CBR of 12%.

In order to provide uniform support beneath any proposed floor slab-on-grade, Geo-Logix recommends that floor slabs be underlain by a minimum of 100 mm of free-draining (a maximum particle size of 19 mm with less than 5 percent material passing the 75 µm sieve), well graded gravel or crushed rock base course.

Exterior slabs and pavements should be isolated from the building. These slabs should be reinforced to function as independent units. Movement of these slabs should not be transmitted to the building foundation or superstructure.

6.9 Aggressivity/Exposure Classification

Based on the preliminary exposure classification test results, and in accordance with AS3600-2009 and AS2159-2009, steel and concrete structures in contact with fill, natural soils and rock should be designed based on no less than mildly aggressive, A2, exposure.

6.10 Salinity Risk

Soil salinity risk is based on extract electrical conductivity (EC_e). Based on laboratory testing of the selected samples, on-site soils do not appear to be saline (Department of Land and Water Conservation NSW, 2002).

6.11 Earthquake Design

Structural design for earthquake loads should be carried out in accordance with the relevant provisions in AS1170.4–2007. Based on the subsurface profile encountered at the base elevation of the proposed basement excavation, and with reference to Tables 3.2 and 4.1 of AS1170.4, the site subsoil class is considered to be C_e (shallow soil site) with a hazard factor (Z) of 0.08.

7. LIMITATIONS

This report should be read in full, and no executive summary, conclusion or other section of the report may be used or relied on in isolation or taken as representative of the report as a whole. No responsibility is accepted by Geo-Logix, and any duty of care that may arise but for this statement is excluded, in relation to any use of any part of this report other than on this basis.

This report has been prepared for the sole benefit of and use by the Client. No other person may rely on the report for any purpose whatsoever except with Geo-Logix' express written consent. Any duty of care to third parties that would or may arise in respect of persons other than the Client, but for this statement, is excluded.

Geo-Logix owns the copyright in this report. No copies of this report are to be made or distributed by any person without express written consent to do so from Geo-Logix. If the Client provides a copy of this report to a third party, without Geo-Logix's consent, the Client indemnifies Geo-Logix against all loss, including without limitation consequential loss, damage and/or liability, howsoever arising, in connection with any use or reliance by a Third Party.

This report is based on the available project information and the subsurface information obtained by Geo-Logix. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, Geo-Logix should be notified immediately to determine if there are consequences to the recommendations provided in this report. If Geo-Logix is not retained to perform these functions, Geo-Logix cannot be responsible for the impact of those conditions on the performance of the project.

Unless otherwise expressly stated, Geo-Logix has assumed that the information and data contained in previous reports carried out by others and reviewed in preparation of this report are completely accurate and has not sought independently to verify the accuracy of the information or data.

Where laboratory tests have been carried out by others on Geo-Logix' behalf, the tests are reproduced in this report on the assumption that the tests are accurate. Geo-Logix has not sought independently to verify the accuracy of those tests and assumes no responsibility in respect of them.

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area at the time of this report. No other warranties are implied or expressed.

This report has been prepared for the specific application to the proposed development as described in the report. After the plans and specifications for the project are more complete the geotechnical engineer should be provided with the opportunity to review the final design plans and specifications to assess whether our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations.

8. REFERENCES

Australian Standard (2007) AS1170.4–2007 Structural design actions – Earthquake actions in Australia, Standards Australia.

Australian Standard (2007) AS3798–2007 Guidelines on earthworks for commercial and residential developments, Standards Australia.

Australian Standard (2009) *AS2159–2009 Piling Design and Installation,* Standards Australia.

Australian Standard (2009) *AS3600–2009 Concrete Structures,* Standards Australia.

Australian Standard (2011) *AS2870–2011 Residential slabs and footings,* Standards Australia.

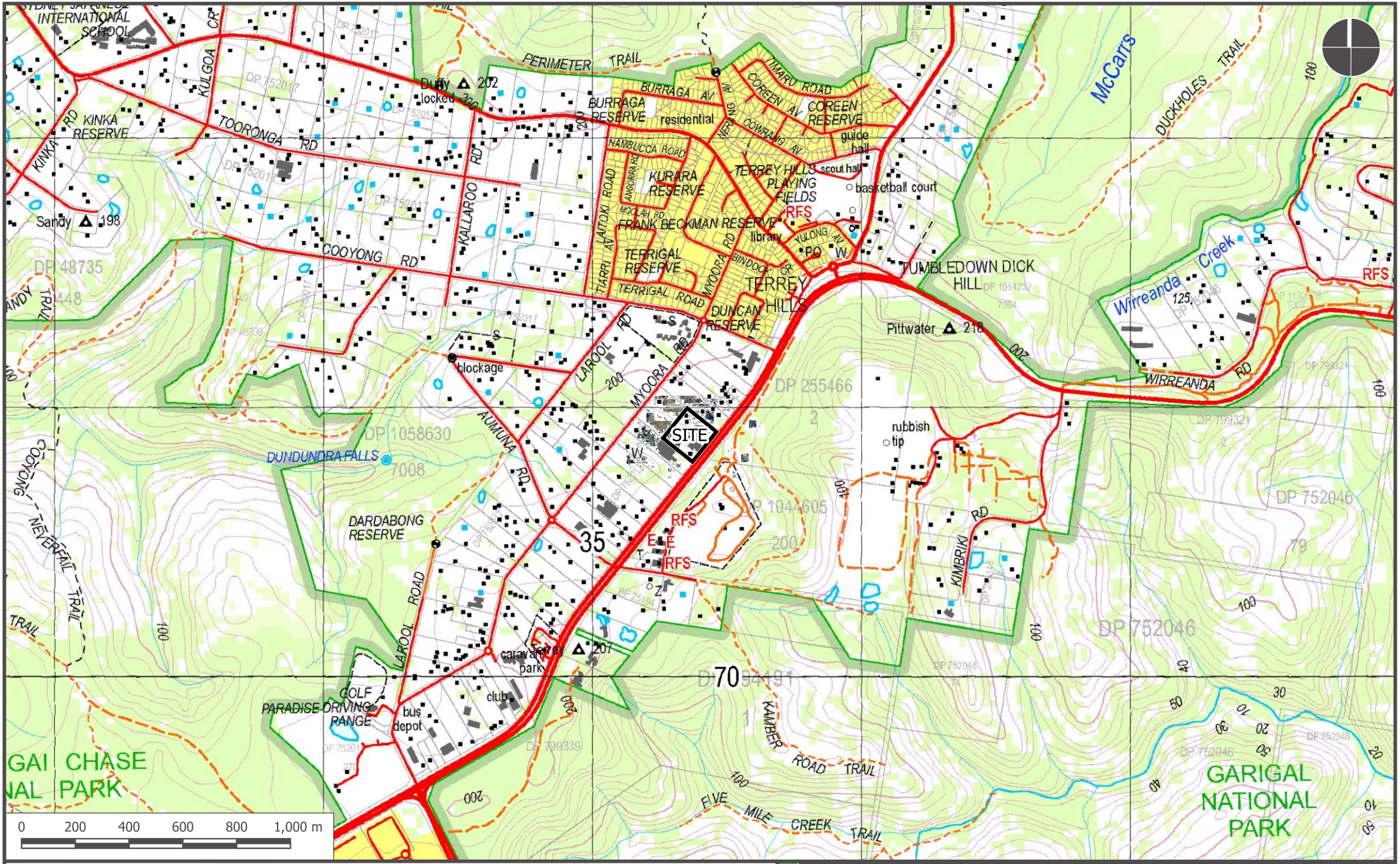
Bowles, J. E. (1996) *Foundation Analysis and Design, 5th Edition*, Mc-Graw Hill, Inc. New York.

Department of Land and Water Conservation NSW (2002) *Site Investigations for Urban Salinity*.

Pells et al (1998) *Foundations on Sandstone and Shale in the Sydney Region*, Australian Geomechanics Society, 1998.

WaterNSW (2021) All Groundwater Map, https://realtimedata.waternsw.com.au/water.stm. Accessed December 2021.

FIGURES



Geo-Logix

SITE LOCATION

Geotechnical Investigation
287 Mona Vale Road, Terrey Hills NSW 2084

Project No. 2101129

Figure 1

Geo-Logix

SITE MAP

Geotechnical Investigaiton
287 Mona Vale Road, Terrey Hills NSW 2094

Project No. 2101129

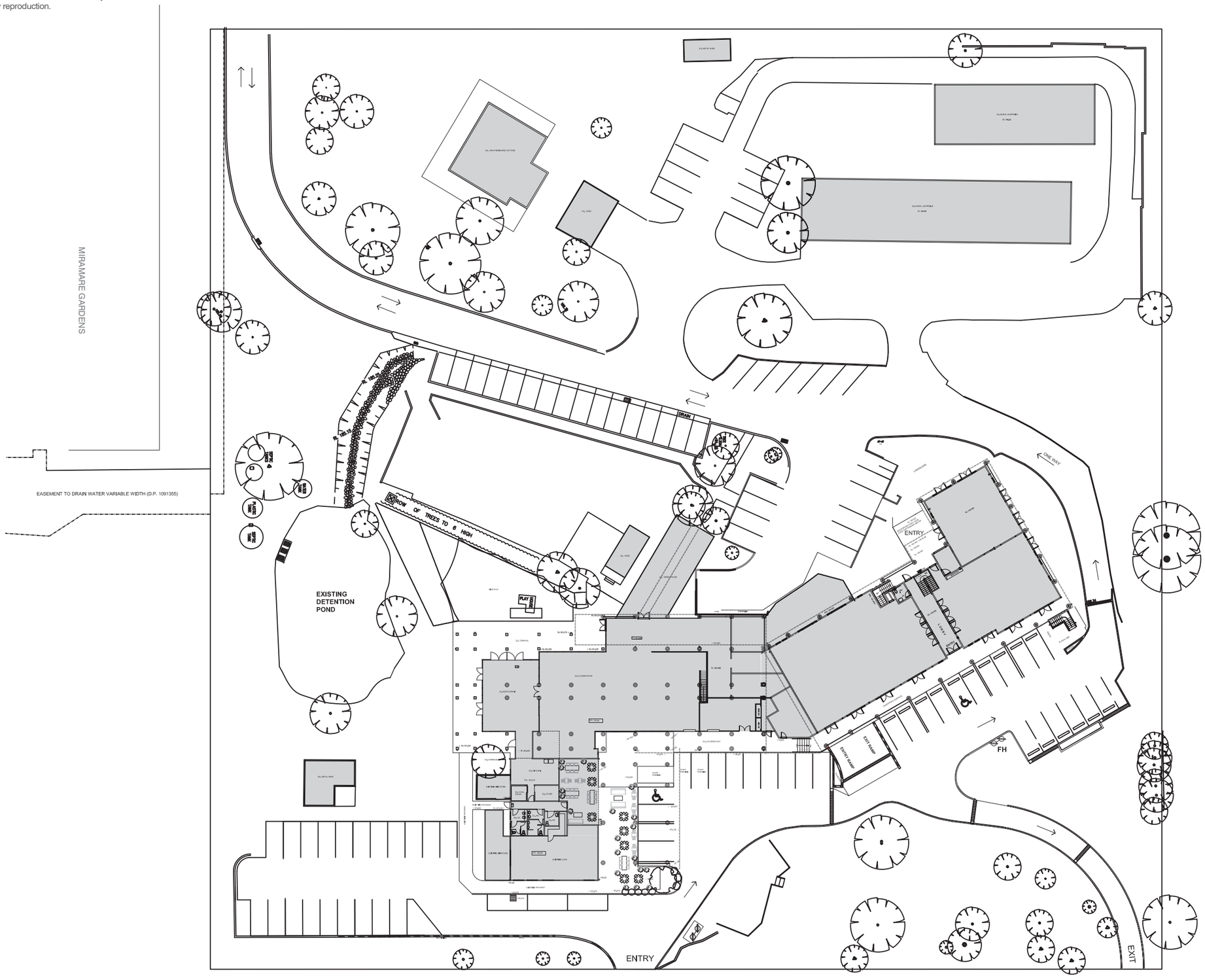
Figure 2

ATTACHMENT A

DRAFT FOR DISCUSSION ONLY

INDICATIVE ONLY: CONCEPT DESIGN

DRAFT FOR DISCUSSION ONLY



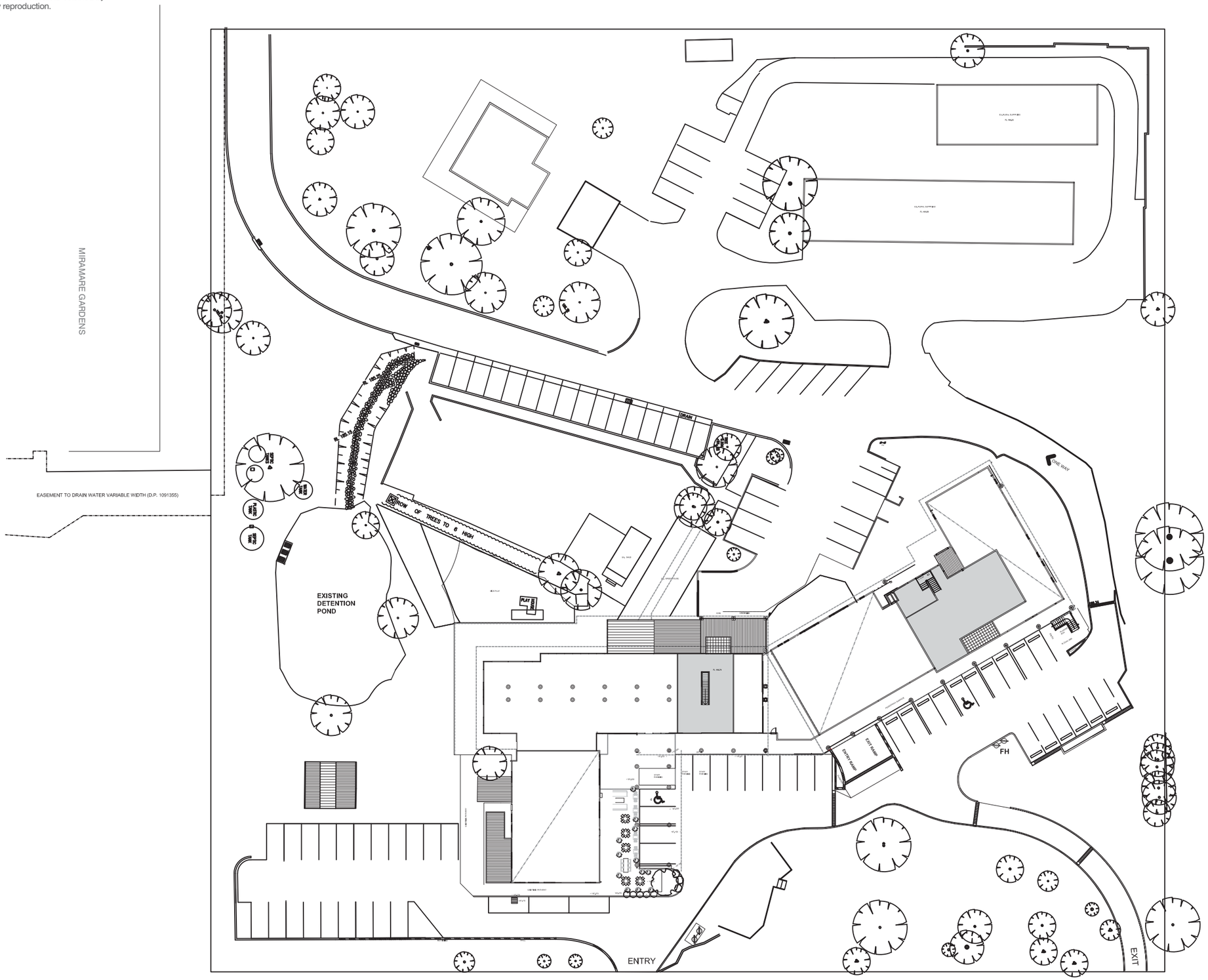
HILLS MARKETPLACE
CONCEPT DESIGN
22 JUNE 2021

GROUND FLOOR PLAN - EXISTING

SK - 01 SCALE 1:600@ A3

BN Architecture Urban Design Masterplanning Graphics Interiors

INDICATIVE ONLY: CONCEPT DESIGN



HILLS MARKETPLACE
CONCEPT DESIGN
22 JUNE 2021

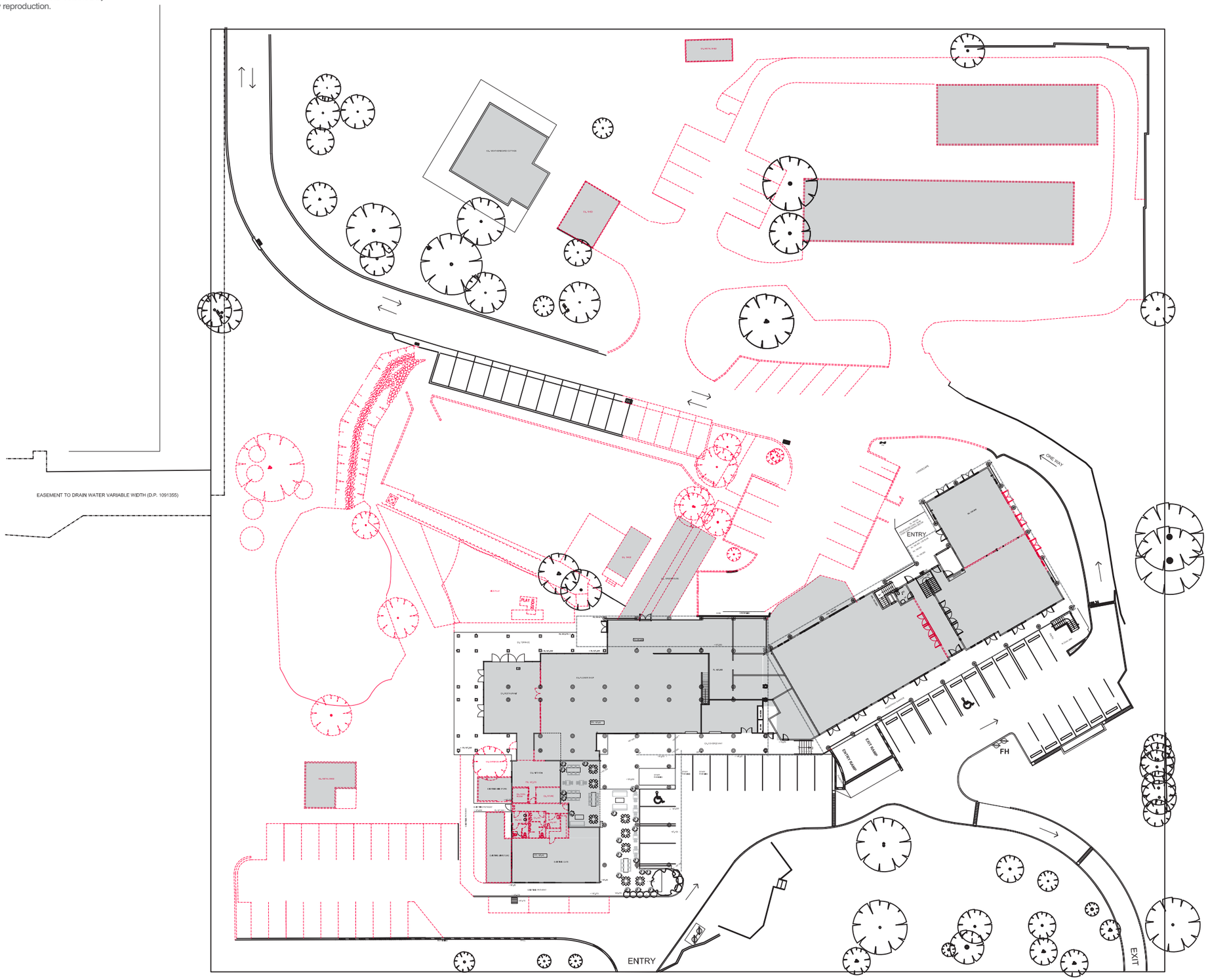
LEVEL 1 FLOOR PLAN - EXISTING

SK - 02 SCALE 1:600@ A3

BN Architecture Urban Design Masterplanning Graphics Interiors

INDICATIVE ONLY: CONCEPT DESIGN

DRAFT FOR DISCUSSION ONLY



HILLS MARKETPLACE
CONCEPT DESIGN
22 JUNE 2021

GROUND FLOOR PLAN - PROPOSED DEMOLITION
OPTION E.5
SK - 03 SCALE 1:600@ A3

BN Architecture Urban Design Masterplanning Graphics Interiors

INDICATIVE ONLY: CONCEPT DESIGN

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EXISTING USE RIGHTS FLOWER SHOP

RURAL SUPPLIES

RETAIL PLANT NURSERY

CAFE/RESTAURANT

ANCILLARY OFFICE

INDOOR RECREATION AND OFFICE

WASTE STORAGE/PLANT

RESIDENTIAL

HILLS MARKETPLACE
CONCEPT DESIGN
24 JUNE 2021

GROUND FLOOR PLAN - EXISTING USES
OPTION E.5
SK - 04 SCALE 1:600@ A3

BN Architecture Urban Design Masterplanning Graphics Interiors

INDICATIVE ONLY: CONCEPT DESIGN

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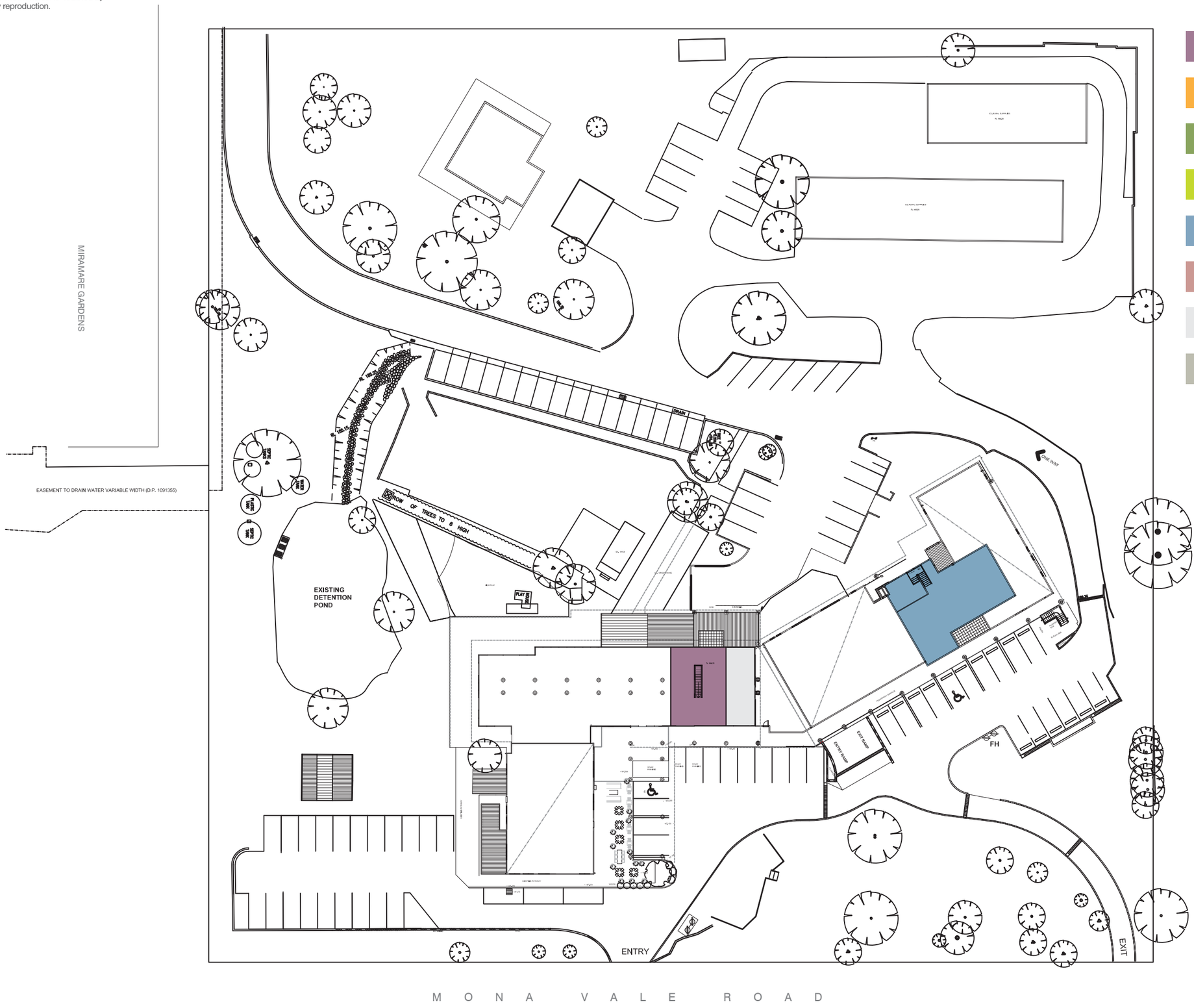

EXISTING USE RIGHTS FLOWER SHOP

RURAL SUPPLIES

RETAIL PLANT NURSERY

CAFE/RESTAURANT

ANCILLARY OFFICE

INDOOR RECREATION AND OFFICE

WASTE STORAGE/PLANT

RESIDENTIAL

HILLS MARKETPLACE
CONCEPT DESIGN
22 JUNE 2021

LEVEL 1 FLOOR PLAN - EXISTING USES

SK - 05 SCALE 1:600@ A3

BN Architecture Urban Design Masterplanning Graphics Interiors

INDICATIVE ONLY: CONCEPT DESIGN

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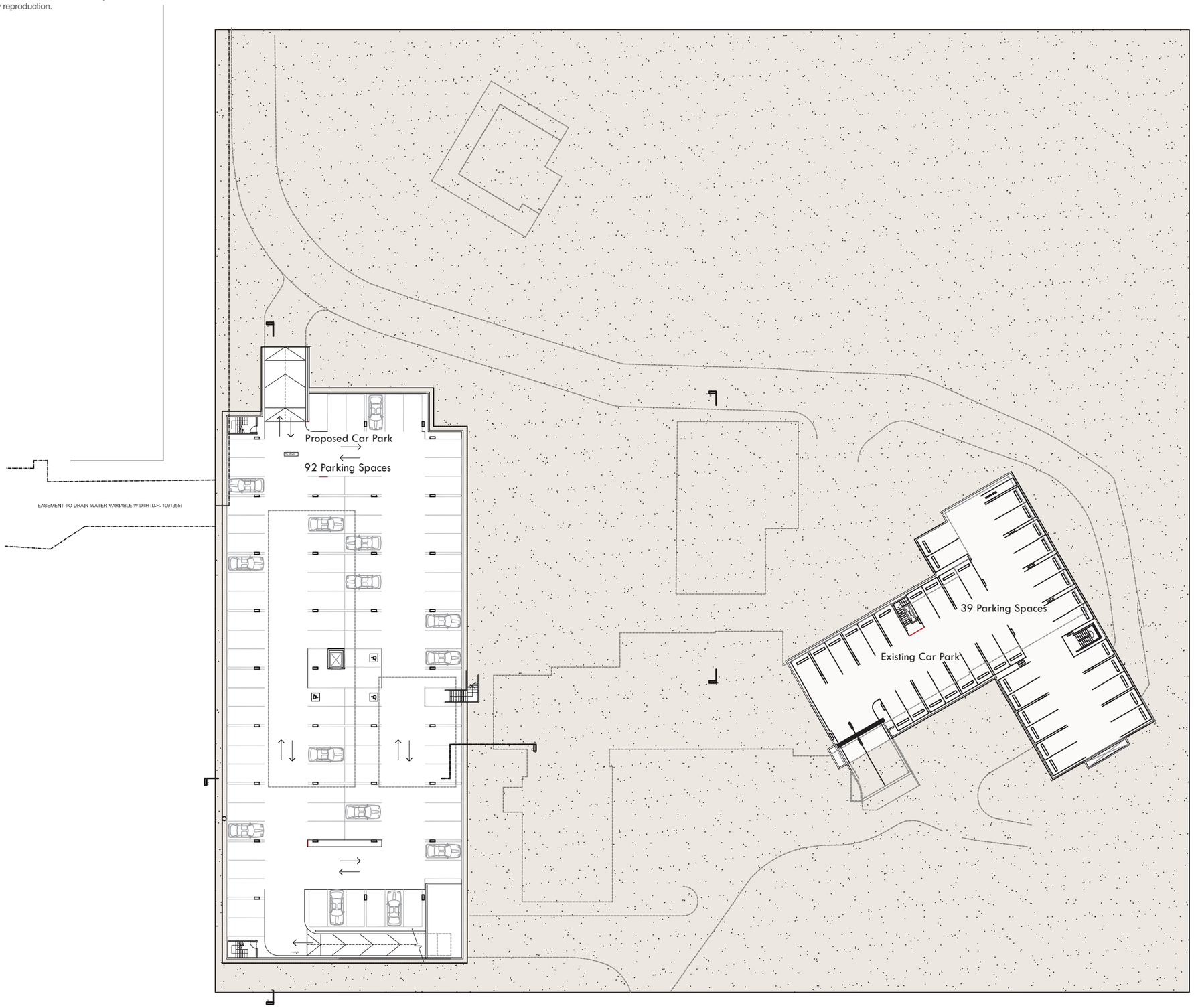
HILLS MARKETPLACE
CONCEPT DESIGN
22 JUNE 2021

GROUND FLOOR PLAN - PROPOSED
OPTION E.5
SK - 06 SCALE 1:600@ A3

BN Architecture Urban Design Masterplanning Graphics Interiors

INDICATIVE ONLY: CONCEPT DESIGN



HILLS MARKETPLACE
CONCEPT DESIGN
22 JUNE 2021

BASEMENT FLOOR PLAN - PROPOSED
OPTION E.5
SK - 07 SCALE 1:600@ A3

BN Architecture Urban Design Masterplanning Graphics Interiors

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EXISTING USE RIGHTS FLOWER SHOP

RURAL SUPPLIES

RETAIL PLANT NURSERY

CAFE/RESTAURANT

ANCILLARY OFFICE

INDOOR RECREATION AND OFFICE

WASTE STORAGE/PLANT

RESIDENTIAL

HILLS MARKETPLACE
CONCEPT DESIGN
22 JUNE 2021

GROUND FLOOR PLAN - PROPOSED USES
OPTION E.5
SK - 08 SCALE 1:600@ A3

BN Architecture Urban Design Masterplanning Graphics Interiors

INDICATIVE ONLY: CONCEPT DESIGN

DRAFT FOR DISCUSSION ONLY

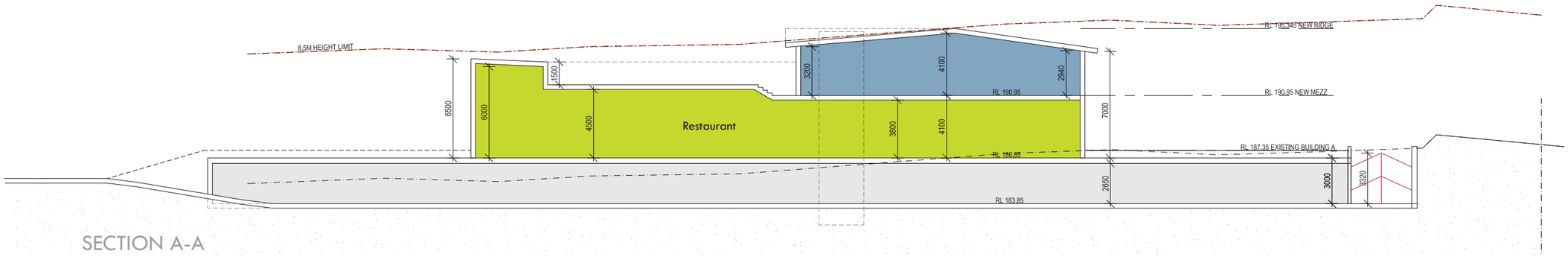
- EXISTING USE RIGHTS FLOWER SHOP
- RURAL SUPPLIES
- RETAIL PLANT NURSERY
- CAFE/RESTAURANT
- ANCILLARY OFFICE
- INDOOR RECREATION AND OFFICE
- WASTE STORAGE/PLANT
- RESIDENTIAL

HILLS MARKETPLACE
CONCEPT DESIGN
22 JUNE 2021

LEVEL 1 FLOOR PLAN - PROPOSED USES
OPTION E.5
SK - 09 SCALE 1:600@ A3

BN Architecture Urban Design Masterplanning Graphics Interiors

INDICATIVE ONLY: CONCEPT DESIGN



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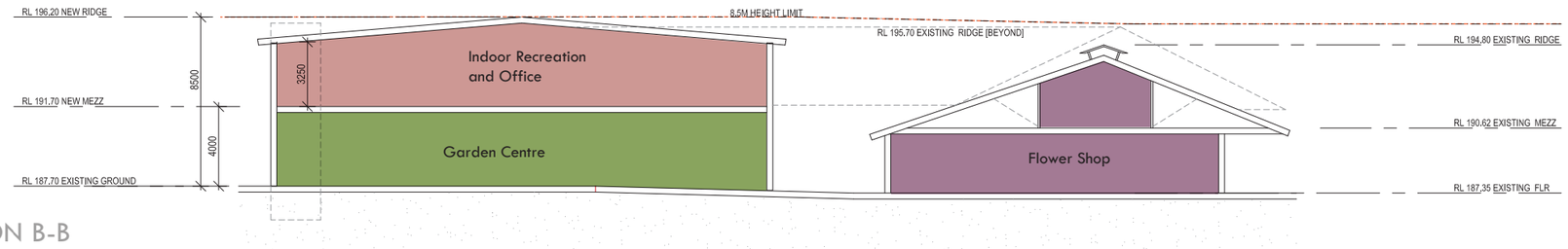

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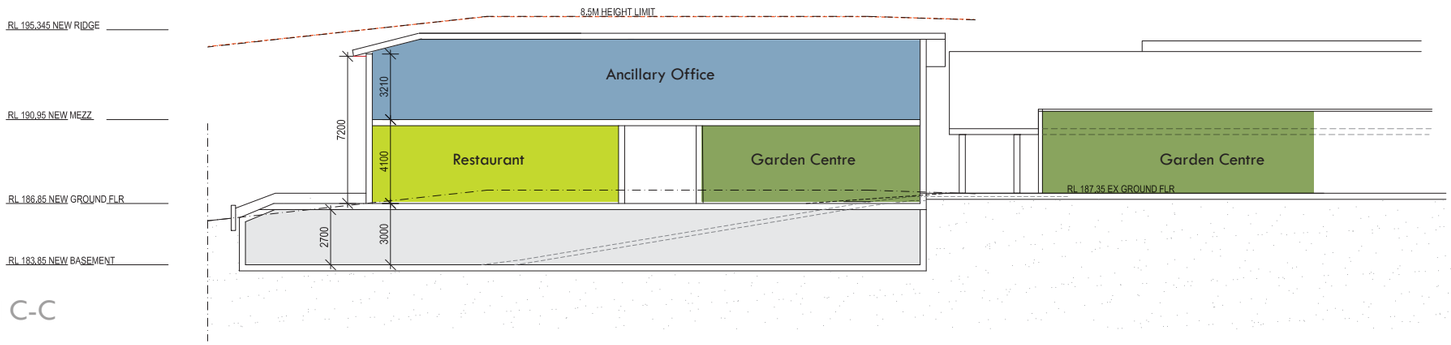


SECTION C-C

EXISTING USE RIGHTS FLOWER SHOP

RURAL SUPPLIES

RETAIL PLANT NURSERY

CAFE/RESTAURANT

ANCILLARY OFFICE

INDOOR RECREATION AND OFFICE

WASTE STORAGE/PLANT

RESIDENTIAL

HILLS MARKETPLACE
CONCEPT DESIGN
22 JUNE 2021

SECTIONS - PROPOSED
OPTION E.5
SK - 10 SCALE 1:300@ A3

BN Architecture Urban Design Masterplanning Graphics Interiors

Existing Approval L&E Court		
Site	20000	
Landscape Ratio	*12402*	**62.01%**
Hard Surface	*7598*	**37.99%**
Building	*3178*	**15.89%**

Proposed - Option E.5		
Site	20000	
Landscape Ratio	12291	61.46%
Total Hard Surface	7709	38.55%
Building Footprint (GBA)	3005	15.03%

L& E Approved Car Spaces	
Ground MV Rd Side	39
Ground North Side	38
Basement	39
	116

Proposed Spaces Opt E	
Ground MV Rd Side	29
Ground North Side	16
Basement B1 North	39
Basement B1 South	92
(1 per 23.3sq.m)	**176**

INDICATIVE ONLY: CONCEPT DESIGN

HILLS MARKETPLACE
CONCEPT DESIGN
07 MAY 2021

FINISHES AND MATERIALS

BOARD 01

BN Architecture
Urban Design
Masterplanning
Graphics
Interiors

INDICATIVE ONLY: CONCEPT DESIGN

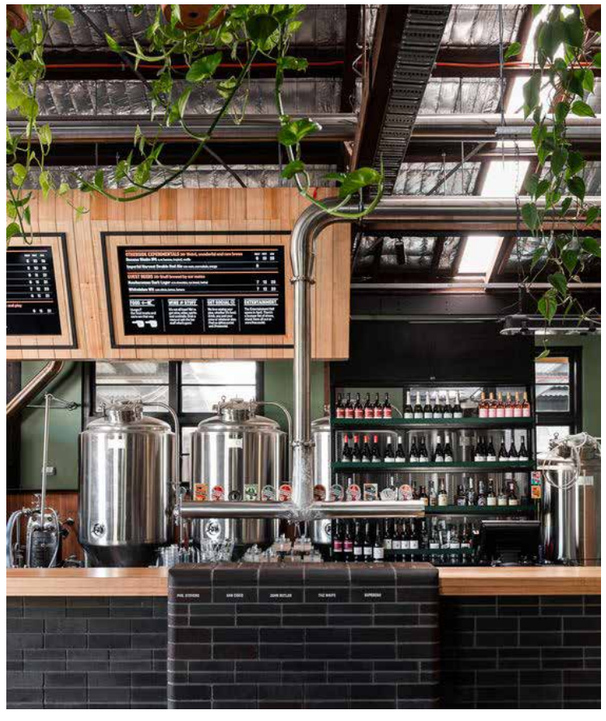
HILLS MARKETPLACE
CONCEPT DESIGN
07 MAY 2021

FINISHES AND MATERIALS

BOARD 02

BN Architecture
Urban Design
Masterplanning
Graphics
Interiors

INDICATIVE ONLY: CONCEPT DESIGN



HILLS MARKETPLACE
CONCEPT DESIGN
07 MAY 2021

FINISHES AND MATERIALS

BOARD 03

BN Architecture
Urban Design
Masterplanning
Graphics
Interiors

INDICATIVE ONLY: CONCEPT DESIGN

HILLS MARKETPLACE
CONCEPT DESIGN
07 MAY 2021

FINISHES AND MATERIALS

BOARD 04

BN Architecture
Urban Design
Masterplanning
Graphics
Interiors

ATTACHMENT B

BOREHOLE LOG: BH1

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Project Number:	**2101129**
Hole Depth:	**7.50 m**
Date Started:	**16/11/2021**
Date Completed:	**16/11/2021**

Project Name: **Detailed Site Investigation**
Location / Site: **287 Mona Vale Road, Terrey Hills NSW**
Client: **Hills Marketplace**
Contractor: **Fico Group Pty Limited**
Method: **Solid Flight Auger (Truck mounted)**

Method	Water Level	Depth (mBGL)	Sample Type	HC Odour	Sample ID	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	Tests: SPT	Observations / Comments
SFA (V-bit)		1	D	Z	BH1/0.5-0.6	Fill	F		**FILL**- dark reddish brown / moderate brown (5YR 3/4), 30% clay, 30% sand, 40% gravel, low plasticity, moderately compacted.	damp		
		1.10										
			R	Z	BH1/1.1-1.5				**Silty CLAY**- very pale brown / very pale orange (10YR 8/2) and brownish yellow / dark yellowish orange (10YR 6/6), 60% clay, 40% sand, low plasticity, stiff.	damp	5,3,5 N=8	
		2	D	Z	BH1/1.5-1.6		CL					
		2.65	R	Z	BH1/2.5-2.6						6,ref.	
SFA (TC-bit)		3				Natural			**SANDSTONE**- very pale brown / greyish orange (10YR 7/4), low resistance.	damp		SPT refusal at 2.65m (from 4th blow count in second 150mm advancement).
			D	Z	BH1/3.5-3.6							
		4										
	▽	4.70	D	Z	BH1/4.5-4.6		CL		**CLAY**- very pale brown / greyish orange (10YR 7/4).	moist to wet		Clay seam.
		4.90							**SANDSTONE**- very pale brown / greyish orange (10YR 7/4), moderate resistance.	damp		
		5										
		6										
		6.20							**SANDSTONE**- very pale brown / very pale orange (10YR 8/2), high resistance.	damp		Increasing auger resistance with depth.
		7										
		8							**Terminated at 7.50 m** TC-bit refusal.			

Abbreviations:

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous
J Jar
Asb Asbestos

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

Water Levels
▽ Encountered Groundwater
▼ Stabilised Groundwater

Abandonment Method: Backfill with soil and compact.
Additional Comments: SPT hammer type: Donut hammer.

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Caden Pengelly** Date: **16/11/2021**
Checked By: **Ted Lilly** Date: **17/12/2021**

BOREHOLE LOG: BH2

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Project Number:	**2101129**
Hole Depth:	**8.00 m**
Date Started:	**15/11/2021**
Date Completed:	**15/11/2021**

Project Name: **Detailed Site Investigation**
Location / Site: **287 Mona Vale Road, Terrey Hills NSW**
Client: **Hills Marketplace**
Contractor: **Fico Group Pty Limited**
Method: **Solid Flight Auger (Truck mounted)**

Method	Water Level	Depth (mBGL)	Sample Type	HC Odour	Sample ID	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	Tests: SPT	Observations / Comments
SFA (V-bit)		0.90	D	Z	BH2/0.4-0.6	Fill	F		**FILL**- dark greyish brown / dark yellowish brown (10YR 4/2), 40% clay, 30% sand, 30% gravel, moderately compacted.	damp		
			R	Z	BH2/1.2-1.5	Natural	SC		**Clayey SAND**- very pale brown / greyish orange (10YR 7/4), 20% clay, 80% sand, loose.	damp	2,2,2 N=4	
		2.40	D	Z	BH2/1.4-1.6							
SFA (TC-bit)	▽								**SANDSTONE**- very pale brown / very pale orange (10YR 8/2) and brownish yellow / dark yellowish orange (10YR 6/6).	damp	20+,ref.	V-bit refusal at 2.4m.
									Moderate resistance from 4.8m.		20+/ 50mm	
		6.00							**SANDSTONE**- moderate resistance.			Apparent seams 50-200mm in thickness based on drilling resistance.
		8.00							**Terminated at 8.00 m** Target depth.			

Abbreviations:

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous
J Jar
Asb Asbestos

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

Water Levels
▽ Encountered Groundwater
▼ Stabilised Groundwater

Abandonment Method: Backfill with soil and compact.
Additional Comments: SPT hammer type: Donut hammer.

Log Drawn By:	Laurie White	Logged By:	**Caden Pengelly** Date: **15/11/2021**
Contact:	laurie.white@reumad.com.au	Checked By:	**Ted Lilly** Date: **17/12/2021**

BOREHOLE LOG: BH3

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Project Number:	**2101129**
Hole Depth:	**4.50 m**
Date Started:	**16/11/2021**
Date Completed:	**16/11/2021**

Project Name: **Detailed Site Investigation**
Location / Site: **287 Mona Vale Road, Terrey Hills NSW**
Client: **Hills Marketplace**
Contractor: **Fico Group Pty Limited**
Method: **Solid Flight Auger (Truck mounted)**

Method	Water Level	Depth (mBGL)	Sample Type	HC Odour	Sample ID	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	Tests: SPT	Observations / Comments
SFA (V-bit)		1	D	Z	BH3/0.5-0.6	Fill	F		**FILL**- dark reddish brown / moderate brown (5YR 3/4), 30% clay, 40% sand, 30% gravel, moderately compacted.	damp		
		1.10	R	Z	BH3/1.0-1.4	Natural	SC		**Clayey SAND**- very pale brown / greyish orange (10YR 7/4) and light brownish grey / pale yellowish brown (10YR 6/2), 30% clay, 70% sand, loose.	moist	2,1,1 N=2	
			B	Z	BH3/1.0-1.5							
			D	Z	BH3/1.5-1.6							
		1.80										
	▽	2					SC		**Clayey SAND**- pinkish white / greyish orange pink (10R 8/2) and brownish yellow / dark yellowish orange (10YR 6/6), 20% clay, 80% sand, loose.	wet		
			R	Z	BH3/2.5-2.6						3,7,ref.	
		2.80										V-bit & SPT refusal at 2.8m.
SFA (TC-bit)		3							**Weathered SANDSTONE**- pinkish white / greyish orange pink (10R 8/2), consistent profile with minor clay lenses.	moist to wet		
			D	Z	BH3/3.5-3.6							
		4										
		5							**Terminated at 4.50 m**			

Abbreviations:

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous
J Jar
Asb Asbestos

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

Water Levels
▽ Encountered Groundwater
▼ Stabilised Groundwater

Abandonment Method: Backfill with soil and compact.
Additional Comments: SPT hammer type: Donut hammer.

Log Drawn By:	Laurie White	Logged By:	**Caden Pengelly** Date: **16/11/2021**
Contact:	laurie.white@reumad.com.au	Checked By:	**Ted Lilly** Date: **17/12/2021**

BOREHOLE LOG: BH4

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Project Number:	**2101129**
Hole Depth:	**4.20 m**
Date Started:	**15/11/2021**
Date Completed:	**15/11/2021**

Project Name: **Detailed Site Investigation**
Location / Site: **287 Mona Vale Road, Terrey Hills NSW**
Client: **Hills Marketplace**
Contractor: **Fico Group Pty Limited**
Method: **Solid Flight Auger (Truck mounted)**

Method	Water Level	Depth (mBGL)	Sample Type	HC Odour	Sample ID	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	Tests: SPT	Observations / Comments
SFA (V-bit)		0	D	Z	BH4/0.5	Fill			**FILL**- dark reddish brown / moderate brown (5YR 3/4), 40% clay, 40% sand, 20% gravel, moderately compacted.	damp		
		1.30	R	Z	BH4/1.3-1.5	Natural	SC		**Clayey SAND**- very pale brown / greyish orange (10YR 7/4), 30% clay, 70% sand, loose.	moist	5,6,3 N=9	
	▼	2.00					SC		**Clayey SAND**- brownish yellow / dark yellowish orange (10YR 6/6) and light red / moderate reddish orange (10R 6/6), 40% clay, 60% sand, loose.	wet		
	▽	2.60	R	Z	BH4/2.6		CL		**Sandy CLAY**- pinkish white / greyish orange pink (10R 8/2) and light red / moderate reddish orange (10R 6/6), 65% clay, 35% sand, firm.	wet	2,2,6 N=8	
		3.80	D	Z	BH4/3.7							
(TC-bit)		4							**SANDSTONE**.		20+/ 100mm	V-bit refusal at 3.8m.
		5							**Terminated at 4.20 m** TC-bit refusal.			

Abbreviations:

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous
J Jar
Asb Asbestos

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

Water Levels
▽ Encountered Groundwater
▼ Stabilised Groundwater

Abandonment Method: Backfill with soil and compact.
Additional Comments: SPT hammer type: Donut hammer.

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Caden Pengelly** Date: **15/11/2021**
Checked By: **Ted Lilly** Date: **17/12/2021**

BOREHOLE LOG: BH5

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Project Number:	**2101129**
Hole Depth:	**3.70 m**
Date Started:	**15/11/2021**
Date Completed:	**15/11/2021**

Project Name: **Detailed Site Investigation**
Location / Site: **287 Mona Vale Road, Terrey Hills NSW**
Client: **Hills Marketplace**
Contractor: **Fico Group Pty Limited**
Method: **Solid Flight Auger (Truck mounted)**

Method	Water Level	Depth (mBGL)	Sample Type	HC Odour	Sample ID	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	Tests: SPT	Observations / Comments
SFA (V-bit)		0.90	D	Z	BH5/0.5	Fill	F		**FILL**- dark reddish brown / moderate brown (5YR 3/4), 50% clay, 10% silt, 30% sand, 10% gravel, poorly compacted.	damp		
		1				Fill	F		**FILL**- light brownish grey / pale yellowish brown (10YR 6/2), 70% clay, 30% sand, low plasticity, moderately compacted.	damp	3,3,4 N=7	
		1.80				Natural	CL		**Sandy CLAY**- very pale brown / very pale orange (10YR 8/2), 60% clay, 40% sand, low plasticity, firm.	damp to moist	3,3,3 N=6	
		2										
		3										
		3.20										
SFA (TC-bit)									**SANDSTONE**.			V-bit refusal at 3.2m.
		4							**Terminated at 3.70 m** TC-bit refusal.			
		5										

Abbreviations:

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous
J Jar
Asb Asbestos

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

Water Levels
Encountered Groundwater
Stabilised Groundwater

Abandonment Method: Backfill with soil and compact.
Additional Comments: SPT hammer type: Donut hammer.
Boring noted to be much drier than BH4 & BH7, no encountered standing water, however wet clay.

REUMAD

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Caden Pengelly** Date: **15/11/2021**
Checked By: **Ted Lilly** Date: **17/12/2021**

BOREHOLE LOG: BH6

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Project Number:	**2101129**
Hole Depth:	**4.50 m**
Date Started:	**16/11/2021**
Date Completed:	**16/11/2021**

Project Name: **Detailed Site Investigation**
Location / Site: **287 Mona Vale Road, Terrey Hills NSW**
Client: **Hills Marketplace**
Contractor: **Fico Group Pty Limited**
Method: **Solid Flight Auger (Truck mounted)**

Method	Water Level	Depth (mBGL)	Sample Type	HC Odour	Sample ID	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	Tests: SPT	Observations / Comments
SFA (TC-bit)		0.40	D	Z	BH6/0.5-0.7	Fill	F		**FILL**- dark reddish brown / moderate brown (5YR 3/4), 20% clay, 40% sand, 40% gravel, well compacted.	damp		TC-bit required for fill.
		1.10					F		**FILL**- dark reddish brown / moderate brown (5YR 3/4), 40% clay, 40% sand, 20% gravel, moderately compacted.	damp		
SFA (V-bit)		2.10	R	Z	BH6/1.1-1.3	Natural	CL		**CLAY with Sand & Silt**- brownish yellow / dark yellowish orange (10YR 6/6) and light red / moderate reddish orange (10R 6/6), 50% clay, 20% silt, 30% sand, medium plasticity, firm.	damp	5,4,2 N=7	
		3.40					CL		**Sandy CLAY**- pinkish white / greyish orange pink (10R 8/2) and light red / moderate reddish orange (10R 6/6), 60% clay, 40% sand, low plasticity, stiff.	damp	3,5,6 N=11	
SFA (TC-bit)	▽	4							**Extremely Weathered SANDSTONE**- very pale brown / very pale orange (10YR 8/2) and brownish yellow / dark yellowish orange (10YR 6/6).	moist to wet	20+/ 150mm	SPT refusal at 4.15m.
		5							**Terminated at 4.50 m**			

Abbreviations:

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous
J Jar
Asb Asbestos

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

Water Levels
▽ Encountered Groundwater
▼ Stabilised Groundwater

Abandonment Method: Backfill with soil and compact.
Additional Comments: SPT hammer type: Donut hammer.

REUMAD

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Caden Pengelly** Date: **16/11/2021**
Checked By: **Ted Lilly** Date: **17/12/2021**

BOREHOLE LOG: BH7

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Project Number:	**2101129**
Hole Depth:	**6.70 m**
Date Started:	**15/11/2021**
Date Completed:	**15/11/2021**

Project Name: **Detailed Site Investigation**
Location / Site: **287 Mona Vale Road, Terrey Hills NSW**
Client: **Hills Marketplace**
Contractor: **Fico Group Pty Limited**
Method: **Solid Flight Auger (Truck mounted)**

Method	Depth (mBGL)	Sample Type	HC Odour	Sample ID	Material Type	USCS Symbol	Material Description	Moisture	Tests (SPT)	Observations / Comments
SFA (V-bit)	0	D	Z	BH7/0.5	Fill	F	**FILL**- very dark brown / dusky yellowish brown (10YR 2/2), 30% clay, 50% sand, 20% gravel, medium dense.	damp		
	1.10	R	Z	BH7/1.2	Natural	SC	**Clayey SAND**- very pale brown / greyish orange (10YR 7/4), 15% clay, 85% sand, loose.	damp	4,2,2 N=4	
	2.00					SC	**Clayey SAND**- light red / moderate reddish orange (10R 6/6) and brownish yellow / dark yellowish orange (10YR 6/6), 15% clay, 85% sand, medium dense.	moist		
	2.40	R	Z	BH7/2.6-2.9		SP	**SAND with Clay**- pinkish white / greyish orange pink (10R 8/2) and light red / moderate reddish orange (10R 6/6), 10% clay, 90% sand, loose.	moist	2,3,4 N=7	
	3.50	R	Z	BH7/4.0		SC	**Clayey SAND**- very pale brown / very pale orange (10YR 8/2), 25% clay, 75% sand, medium dense.	moist to wet	5,7,7 N=14	
SFA (TC-bit)	4.80						**Weathered SANDSTONE**- with clay seams, low resistance.			V-bit refusal at 4.8m.
	6.20						**Weathered SANDSTONE**- moderate resistance.			
							Terminated at 6.70 m TC-bit practicable refusal.			

Abbreviations:

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous
J Jar
Asb Asbestos

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

Water Levels
Encountered Groundwater
Stabilised Groundwater

Abandonment Method: Backfill with soil and compact.
Additional Comments: SPT hammer type: Donut hammer.

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Caden Pengelly** Date: **15/11/2021**
Checked By: **Ted Lilly** Date: **17/12/2021**

MONITORING WELL LOG: MW1

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Project Number:	**2101029**
Hole Depth:	**13.00 m**
Date Started:	**04/04/2022**
Date Completed:	**04/04/2022**

Project Name: **Geotechnical Report**
Location / Site: **287 Mona Vale Rd, Terrey Hills NSW**
Client: **Hills Marketplace**
Contractor: **Fico Group Pty Limited**
Method: **Auger, Core (Truck mounted Geoprobe)**

Method	Water Level	Depth (mBGL)	RL	Sample Type	Sample ID	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	SPT	Run / RQD%	Defect Spacing (mm) 20 60 200 600 2000	Observations / Comments *Defect Description (Type, Inclination, Planarity, Roughness, Coating)*	Well Details	Well Construction
SFA (V-bit)	1.510m 26/04/2022	1	187			Fill	F		**FILL**- dark reddish brown / moderate brown (5YR 3/4), 70% clay, 20% sand, 10% gravel, medium plasticity, moderately compacted.	damp						Gat.
		2	186													Grout
						Natural	SC		**Clayey SAND**- dark reddish brown / greyish brown (5YR 3/2), 40% clay, 60% sand, medium dense.	wet					1.50	Bentonite
		3	185												2.00	
							SC		**Clayey SAND**- pinkish white / greyish orange pink (10R 8/2), 40% clay, 60% sand, medium dense.	wet					2.50	
		4	184													Sand

Notes Monitoring Well installed in separate bore adjacent to primary bore.

Abbreviations

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

Rock Weathering
XW Extremely Weathered
HW Highly Weathered
MW Moderately Weathered
SW Slightly Weathered
FR Fresh

Encountered Groundwater
Stabilised Groundwater

Defect Descriptors

Type
MB Mechanical Break
JT Joint
PT Parting
FZ Fractured Zone
SZ Shear Zone
SS Shear Surface
SM Seam
CS Crushed Seam

Inclination
#° Degrees

Planarity
PL Planar
CU Curved
UN Undulating
ST Stepped
IR Irregular

Roughness
VR Very Rough
RO Rough
SO Smooth
SL Slickensided

Coating
CN Clean
SN Stained
VN Veneer
CO Coating

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Tiffany Mabbott** Date: **04/04/2022**
Checked By: **Ted Lilly** Date: **05/05/2022**

MONITORING WELL LOG: MW1

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Project Number:	**2101029**
Hole Depth:	**13.00 m**
Date Started:	**04/04/2022**
Date Completed:	**04/04/2022**

Project Name: **Geotechnical Report**
Location / Site: **287 Mona Vale Rd, Terrey Hills NSW**
Client: **Hills Marketplace**
Contractor: **Fico Group Pty Limited**
Method: **Auger, Core (Truck mounted Geoprobe)**

Method	Depth (mBGL)	RL	Material Description	Moisture	Observations / Comments	Well Details
SFA (V-bit)	4.5	183	**Clayey SAND**- pinkish white / greyish orange pink (10R 8/2), 40% clay, 60% sand, medium dense.*(continued)*	wet	V-bit refusal at 4.5m. Switch to TC-bit.	Screen
SFA (TC-bit)	5	182	**Weathered SANDSTONE**- pinkish white / greyish orange pink (10R 8/2), low drilling resistance (Class IV-V).	wet		
	6	181				
	7	180				
	8					5.50

Material Type: Natural
USCS Symbol: SC
Graphic Log
Water Level
Sample Type
Sample ID
SPT
Run / RQD%
Defect Spacing (mm): 20 60 200 600 2000
Observations / Comments: *Defect Description (Type, Inclination, Planarity, Roughness, Coating)*
Well Construction

Notes Monitoring Well installed in separate bore adjacent to primary bore.

Abbreviations

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

Rock Weathering
XW Extremely Weathered
HW Highly Weathered
MW Moderately Weathered
SW Slightly Weathered
FR Fresh

Encountered Groundwater
Stabilised Groundwater

Defect Descriptors

Type
MB Mechanical Break
JT Joint
PT Parting
FZ Fractured Zone
SZ Shear Zone
SS Shear Surface
SM Seam
CS Crushed Seam

Inclination
#° Degrees

Planarity
PL Planar
CU Curved
UN Undulating
ST Stepped
IR Irregular

Roughness
VR Very Rough
RO Rough
SO Smooth
SL Slickensided

Coating
CN Clean
SN Stained
VN Veneer
CO Coating

REUMAD

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Tiffany Mabbott** Date: **04/04/2022**
Checked By: **Ted Lilly** Date: **05/05/2022**

MONITORING WELL LOG: MW1

Geo-Logix Pty Ltd
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Unit 2309 / 4 Daydream Street
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www.geo-logix.com.au

Project Number:	**2101029**
Hole Depth:	**13.00 m**
Date Started:	**04/04/2022**
Date Completed:	**04/04/2022**

Project Name: **Geotechnical Report**
Location / Site: **287 Mona Vale Rd, Terrey Hills NSW**
Client: **Hills Marketplace**
Contractor: **Fico Group Pty Limited**
Method: **Auger, Core (Truck mounted Geoprobe)**

Method	Water Level	Depth (mBGL)	RL	Sample Type	Sample ID	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	SPT	Run / RQD%	Defect Spacing (mm) 20 60 200 600 2000	Observations / Comments *Defect Description (Type, Inclination, Planarity, Roughness, Coating)*	Well Details	Well Construction
SFA (TC-bit)		9	179			Natural			**Weathered SANDSTONE-** pinkish white / greyish orange pink (10R 8/2), low drilling resistance (Class IV-V).*(continued)*	wet						
		10	178													
		11	177													
NMLC Coring			176						**CORE LOSS**.			Run1 2.000m RQD 41%		TC-bit effective refusal at 11m. Start coring.		
		11.77							**CORE LOSS**.							
		11.91							**SANDSTONE-** (Class III).							
		12														

Notes Monitoring Well installed in separate bore adjacent to primary bore.

Abbreviations

Hydrocarbon Odour
H High
M Medium
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Sample Type
D Disturbed
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B Bulk
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C Continuous

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

Rock Weathering
XW Extremely Weathered
HW Highly Weathered
MW Moderately Weathered
SW Slightly Weathered
FR Fresh

Encountered Groundwater
Stabilised Groundwater

Defect Descriptors

Type
MB Mechanical Break
JT Joint
PT Parting
FZ Fractured Zone
SZ Shear Zone
SS Shear Surface
SM Seam
CS Crushed Seam

Inclination
#° Degrees

Planarity
PL Planar
CU Curved
UN Undulating
ST Stepped
IR Irregular

Roughness
VR Very Rough
RO Rough
SO Smooth
SL Slickensided

Coating
CN Clean
SN Stained
VN Veneer
CO Coating

REUMAD

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Tiffany Mabbott** Date: **04/04/2022**
Checked By: **Ted Lilly** Date: **05/05/2022**

MONITORING WELL LOG: MW1

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Project Number:	**2101029**
Hole Depth:	**13.00 m**
Date Started:	**04/04/2022**
Date Completed:	**04/04/2022**

Project Name: **Geotechnical Report**
Location / Site: **287 Mona Vale Rd, Terrey Hills NSW**
Client: **Hills Marketplace**
Contractor: **Fico Group Pty Limited**
Method: **Auger, Core (Truck mounted Geoprobe)**

Method	Water Level	Depth (mBGL)	RL	Sample Type	Sample ID	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	SPT	Run / RQD%	Defect Spacing (mm) 20 60 200 600 2000	Observations / Comments *Defect Description (Type, Inclination, Planarity, Roughness, Coating)*	Well Details	Well Construction
NMLC Coring		13	175			Natural			**SANDSTONE-** (Class III).*(continued)*			Run1 2.000m RQD 41%		SM, 5°, PL, VR, CO SM, 5°, PL, VR, CO JT, 5°, PL, VR, CO JT, 0°, PL, SO, CN		
		14	174						**Terminated at 13.00 m**							
		15	173													
		16	172													

Notes Monitoring Well installed in separate bore adjacent to primary bore.

Abbreviations

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

Rock Weathering
XW Extremely Weathered
HW Highly Weathered
MW Moderately Weathered
SW Slightly Weathered
FR Fresh

Encountered Groundwater
Stabilised Groundwater

Defect Descriptors

Type
MB Mechanical Break
JT Joint
PT Parting
FZ Fractured Zone
SZ Shear Zone
SS Shear Surface
SM Seam
CS Crushed Seam

Inclination
#° Degrees

Planarity
PL Planar
CU Curved
UN Undulating
ST Stepped
IR Irregular

Roughness
VR Very Rough
RO Rough
SO Smooth
SL Slickensided

Coating
CN Clean
SN Stained
VN Veneer
CO Coating

REUMAD

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Tiffany Mabbott** Date: **04/04/2022**
Checked By: **Ted Lilly** Date: **05/05/2022**

MONITORING WELL LOG: MW2

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Project Number:	**2101029**
Hole Depth:	**13.00 m**
Date Started:	**04/04/2022**
Date Completed:	**04/04/2022**

Project Name: **Geotechnical Report**
Location / Site: **287 Mona Vale Rd, Terrey Hills NSW**
Client: **Hills Marketplace**
Contractor: **Fico Group Pty Limited**
Method: **Auger, Core (Truck mounted Geoprobe)**

Method	Water Level	Depth (mBGL)	RL	Sample Type	Sample ID	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	SPT	Run / RQD%	Defect Spacing (mm) 20 60 200 600 2000	Observations / Comments (Defect Description (Type, Inclination, Planarity, Roughness, Coating))	Well Details	Well Construction
SFA (V-bit)	2.110m 26/04/2022	0	186			Fill	F		**FILL**- dark reddish brown / moderate brown (5YR 3/4), 70% clay, 20% sand, 10% gravel, medium plasticity, moderately compacted.	damp						Gat.
		1	185								4,4,3 N=7					Grout
		1.2							**Sandy CLAY**- dark reddish brown / greyish brown (5YR 3/2), 60% clay, 40% sand, low plasticity, firm.	wet				Recovery 420mm.	1.20	
		2	184			Natural	CL								1.70	Bentonite
		2.2							**Sandy CLAY**- pinkish white / greyish orange pink (10R 8/2), 60% clay, 40% sand, low plasticity, soft.	wet					2.20	
		3	183				CL				1,1,2 N=3			Recovery 530mm.		
		3.5												V-bit refusal at 3.5m. Switch to TC-bit.		Sand
SFA (TC-bit)		4							**Weathered SANDSTONE**- pinkish white / greyish orange pink (10R 8/2), (Class IV-V).	wet						

Notes Monitoring Well installed in separate bore adjacent to primary bore.

Abbreviations

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

Rock Weathering
XW Extremely Weathered
HW Highly Weathered
MW Moderately Weathered
SW Slightly Weathered
FR Fresh

Encountered Groundwater
Stabilised Groundwater

Defect Descriptors

Type
MB Mechanical Break
JT Joint
PT Parting
FZ Fractured Zone
SZ Shear Zone
SS Shear Surface
SM Seam
CS Crushed Seam

Inclination
#° Degrees

Planarity
PL Planar
CU Curved
UN Undulating
ST Stepped
IR Irregular

Roughness
VR Very Rough
RO Rough
SO Smooth
SL Slickensided

Coating
CN Clean
SN Stained
VN Veneer
CO Coating

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Tiffany Mabbott** Date: **04/04/2022**
Checked By: **Ted Lilly** Date: **05/05/2022**

MONITORING WELL LOG: MW2

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Project Number:	**2101029**
Hole Depth:	**13.00 m**
Date Started:	**04/04/2022**
Date Completed:	**04/04/2022**

Project Name: **Geotechnical Report**
Location / Site: **287 Mona Vale Rd, Terrey Hills NSW**
Client: **Hills Marketplace**
Contractor: **Fico Group Pty Limited**
Method: **Auger, Core (Truck mounted Geoprobe)**

Method	Water Level	Depth (mBGL)	RL	Sample Type	Sample ID	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	SPT	Run / RQD%	Defect Spacing (mm) 20 60 200 600 2000	Observations / Comments *Defect Description (Type, Inclination, Planarity, Roughness, Coating)*	Well Details	Well Construction
SFA (TC-bit)		5	182			Natural			**Weathered SANDSTONE-** pinkish white / greyish orange pink (10R 8/2), (Class IV-V).*(continued)*	wet					5.20	Screen
		6	181													
		7	180													
		7.3	179											TC-bit effective refusal at 7.3m. Start coring.		
NMLC Coring		8							**CORE LOSS**.							

Notes Monitoring Well installed in separate bore adjacent to primary bore.

Abbreviations

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

Rock Weathering
XW Extremely Weathered
HW Highly Weathered
MW Moderately Weathered
SW Slightly Weathered
FR Fresh

Encountered Groundwater
Stabilised Groundwater

Defect Descriptors

Type
MB Mechanical Break
JT Joint
PT Parting
FZ Fractured Zone
SZ Shear Zone
SS Shear Surface
SM Seam
CS Crushed Seam

Inclination
#° Degrees

Planarity
PL Planar
CU Curved
UN Undulating
ST Stepped
IR Irregular

Roughness
VR Very Rough
RO Rough
SO Smooth
SL Slickensided

Coating
CN Clean
SN Stained
VN Veneer
CO Coating

REUMAD

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Tiffany Mabbott** Date: **04/04/2022**
Checked By: **Ted Lilly** Date: **05/05/2022**

MONITORING WELL LOG: MW2

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Project Number:	**2101029**
Hole Depth:	**13.00 m**
Date Started:	**04/04/2022**
Date Completed:	**04/04/2022**

Project Name: **Geotechnical Report**
Location / Site: **287 Mona Vale Rd, Terrey Hills NSW**
Client: **Hills Marketplace**
Contractor: **Fico Group Pty Limited**
Method: **Auger, Core (Truck mounted Geoprobe)**

Method	Water Level	Depth (mBGL)	RL	Sample Type	Sample ID	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	SPT	Run / RQD%	Defect Spacing (mm) 20 60 200 600 2000	Observations / Comments *Defect Description (Type, Inclination, Planarity, Roughness, Coating)*	Well Details	Well Construction
NMLC Coring		8.309	178			Natural			**CORE LOSS**.*(continued)*							
		9							**CORE LOSS**.							
		9.108	177						**SANDSTONE**- pale red (10R 6/2), low strength.					clay seam		
									red / moderate reddish brown (10R 4/6).					FZ, °, IR, VR		
									moderate red (5R 5/4).					JT, 0°, PL, RO clay seam		
		10	176						pinkish white / greyish orange pink (10R 8/2).					JT, 30°, PL, RO clay seam FZ, 30°, PL, VR		
		10.31 10.324							**CORE LOSS**.					MB, 0°, PL, RO		
									SANDSTONE- pinkish white / greyish orange pink (10R 8/2), moderate strength (Class III).							
		11	175											MB, 0°, PL, RO		
														JT, 15°, PL, RO		
									light red / moderate reddish orange (10R 6/6). pink / moderate orange pink (5YR 8/4).					clay seam MB, 0°, PL, VR		
		12														

Notes Monitoring Well installed in separate bore adjacent to primary bore.

Abbreviations

Hydrocarbon Odour
H High
M Medium
L Low
Z Zero

Sample Type
D Disturbed
U Undisturbed
B Bulk
R Representative
C Continuous

Strength Testing
SPT Standard Penetration Test
DCP Dynamic Cone Penetrometer
PP Pocket Penetrometer

Rock Weathering
XW Extremely Weathered
HW Highly Weathered
MW Moderately Weathered
SW Slightly Weathered
FR Fresh

Encountered Groundwater
Stabilised Groundwater

Defect Descriptors

Type
MB Mechanical Break
JT Joint
PT Parting
FZ Fractured Zone
SZ Shear Zone
SS Shear Surface
SM Seam
CS Crushed Seam

Inclination
#° Degrees

Planarity
PL Planar
CU Curved
UN Undulating
ST Stepped
IR Irregular

Roughness
VR Very Rough
RO Rough
SO Smooth
SL Slickensided

Coating
CN Clean
SN Stained
VN Veneer
CO Coating

REUMAD

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Tiffany Mabbott** Date: **04/04/2022**
Checked By: **Ted Lilly** Date: **05/05/2022**

MONITORING WELL LOG: MW2

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Project Number:	**2101029**
Hole Depth:	**13.00 m**
Date Started:	**04/04/2022**
Date Completed:	**04/04/2022**

Project Name: **Geotechnical Report**
Location / Site: **287 Mona Vale Rd, Terrey Hills NSW**
Client: **Hills Marketplace**
Contractor: **Fico Group Pty Limited**
Method: **Auger, Core (Truck mounted Geoprobe)**

Method	Water Level	Depth (mBGL)	RL	Sample Type	Sample ID	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	SPT	Run / RQD%	Defect Spacing (mm) 20 60 200 600 2000	Observations / Comments *Defect Description (Type, Inclination, Planarity, Roughness, Coating)*	Well Details	Well Construction
NMLC Coring		12.32	174			Natural			**SANDSTONE**- pinkish white / greyish orange pink (10R 8/2), moderate strength (Class III).*(continued)* light red / moderate reddish orange (10R 6/6).					JT, 15°, PL, RO		
		13							**SANDSTONE**- pink / moderate orange pink (5YR 8/4), medium strength.							
			173						**Terminated at 13.00 m**							
		14	172													
		15	171													
		16														

Notes Monitoring Well installed in separate bore adjacent to primary bore.

Abbreviations

Hydrocarbon Odour
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M Medium
L Low
Z Zero

Sample Type
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R Representative
C Continuous

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Rock Weathering
XW Extremely Weathered
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Encountered Groundwater
Stabilised Groundwater

Defect Descriptors

Type
MB Mechanical Break
JT Joint
PT Parting
FZ Fractured Zone
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Inclination
#° Degrees

Planarity
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CU Curved
UN Undulating
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IR Irregular

Roughness
VR Very Rough
RO Rough
SO Smooth
SL Slickensided

Coating
CN Clean
SN Stained
VN Veneer
CO Coating

REUMAD

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Tiffany Mabbott** Date: **04/04/2022**
Checked By: **Ted Lilly** Date: **05/05/2022**

MONITORING WELL LOG: MW3

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Project Number:	**2101029**
Hole Depth:	**13.29 m**
Date Started:	**04/04/2022**
Date Completed:	**04/04/2022**

Project Name: **Geotechnical Report**
Location / Site: **287 Mona Vale Rd, Terrey Hills NSW**
Client: **Hills Marketplace**
Contractor: **Fico Group Pty Limited**
Method: **Auger, Core (Truck mounted Geoprobe)**

Method	Water Level	Depth (mBGL)	RL	Sample Type	Sample ID	Material Type	USCS Symbol	Material Description	Moisture	SPT	Run / RQD%	Defect Spacing (mm)	Observations / Comments	Well Details	Well Construction
SFA (V-bit)	1.590m 01/04/269	0.01	186	D	MW3/0.3-0.4	Natural	CL	**FILL**- Gravel Carpark. **Sandy CLAY**- light brownish grey / pale yellowish brown (10YR 6/2), 60% clay, 40% sand, low plasticity, soft.	damp	2,1,1 N=2			Recovery 100mm.	0.50	Gat. Grout Bentonite
		0.8					CH	**CLAY**- light brownish grey / pale yellowish brown (10YR 6/2), 80% clay, 10% sand, 10% gravel, high plasticity, soft.	damp					1.00	
		1.2						**Clayey SAND**- dark reddish brown / greyish brown (5YR 3/2), 40% clay, 60% sand, loose, sulfur odour, rootlets.	wet					1.50	
		1	185	D	MW3/1.4-1.5					1,1,1 N=2			Recovery 600mm.		
		2					SC	light brownish grey / pale yellowish brown (10YR 6/2).	sat'd						Sand
		3	184	D	MW3/3.1-3.2					0,0,1 N=1			SPT sunk under weight of hammer, groundwater ingress.		Screen
		3.9	183										V-bit refusal at 3.9. Switch to TC-bit.		
		4						*(see next page)*							

2101029 TERREY HILLS V2.GPJ GL.GDT 5/6/22 9:41:19 AM - drawn by laurie white at www.reumad.com.au
GL CH MOI SAM SPT RQD SPAC DEF MW 2022

Notes Monitoring Well installed in separate bore adjacent to primary bore.

Abbreviations

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Sample Type
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R Representative
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DCP Dynamic Cone Penetrometer
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Rock Weathering
XW Extremely Weathered
HW Highly Weathered
MW Moderately Weathered
SW Slightly Weathered
FR Fresh

Encountered Groundwater
Stabilised Groundwater

Defect Descriptors

Type
MB Mechanical Break
JT Joint
PT Parting
FZ Fractured Zone
SZ Shear Zone
SS Shear Surface
SM Seam
CS Crushed Seam

Inclination
#° Degrees

Planarity
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CU Curved
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ST Stepped
IR Irregular

Roughness
VR Very Rough
RO Rough
SO Smooth
SL Slickensided

Coating
CN Clean
SN Stained
VN Veneer
CO Coating

REUMAD

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Tiffany Mabbott** Date: **04/04/2022**
Checked By: **Ted Lilly** Date: **05/05/2022**

MONITORING WELL LOG: MW3

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Project Number:	**2101029**
Hole Depth:	**13.29 m**
Date Started:	**04/04/2022**
Date Completed:	**04/04/2022**

Project Name: **Geotechnical Report**
Location / Site: **287 Mona Vale Rd, Terrey Hills NSW**
Client: **Hills Marketplace**
Contractor: **Fico Group Pty Limited**
Method: **Auger, Core (Truck mounted Geoprobe)**

Method	Depth (mBGL)	RL	Material Description	Observations / Comments
SFA (TC-bit)	4.2	182	**Weathered SANDSTONE-** (Class IV-V).*(continued)*	TC-bit refusal at 4.2m. Starting coring.
	5		**SANDSTONE-** very pale brown / greyish orange (10YR 7/4), poorly cemented.	46% recovery, no core taken
NMLC Coring	5.36	181	**SANDSTONE-** pale red / moderate orange pink (10R 7/4), low strength.	MB, 0°, PL, RO JT, 0°, PL, VR, SN MB, 0°, UN, RO
	6			conglomerate bedding
	7	180	pinkish white (5R 8/2).	clay seam JT, 0°, PL, RO, CN
	7.91	179	**CORE LOSS.**	core loss
	8			

Natural

Defect Spacing (mm): 20, 60, 200, 600, 2000

Well Details: 4.50

Notes Monitoring Well installed in separate bore adjacent to primary bore.

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REUMAD

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Tiffany Mabbott** Date: **04/04/2022**
Checked By: **Ted Lilly** Date: **05/05/2022**

MONITORING WELL LOG: MW3

Geo-Logix Pty Ltd
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Project Number:	**2101029**
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Date Completed:	**04/04/2022**

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Location / Site: **287 Mona Vale Rd, Terrey Hills NSW**
Client: **Hills Marketplace**
Contractor: **Fico Group Pty Limited**
Method: **Auger, Core (Truck mounted Geoprobe)**

Method	Water Level	Depth (mBGL)	RL	Sample Type	Sample ID	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	SPT	Run / RQD%	Defect Spacing (mm) 20 60 200 600 2000	Observations / Comments *Defect Description (Type, Inclination, Planarity, Roughness, Coating)*	Well Details	Well Construction
NMLC Coring		8.109				Natural			**CLAY SEAM**- pinkish white (5R 8/2).					core loss		
		8.306							**CORE LOSS**.					SM, 0°, UN, RO, clay seam		
		8.451							**SANDSTONE**- pinkish white (5R 8/2), (Class III). red / moderate reddish brown (10R 4/6).					core loss JT, 0°, PL, RO, CN		
			178						pinkish white (5R 8/2).					0°, PL, RO MB, 20°, PL, RO FZ, 0°, IR, VR clay seam		
		9												JT, 0°, UN, RO		
														JT, 0°, UN, RO JT, 0°, PL, RO, SN		
			177						pale red / moderate orange pink (10R 7/4).					JT, 0°, PL, RO MB, 0°, PL, RO		
		10														
			176						light red / moderate reddish orange (10R 6/6). pale red (10R 6/2).					FZ, 0°, UN, RO, SN FZ, 0°, PL, VR, SN JT, 0°, PL, RO		
		11												MB, 0°, PL, RO		
			175						pinkish white (5R 8/2).					MB, 0°, PL, RO JT, 0°, CU, RO JT, 0°, CU, RO JT, 0°, PL, RO clay seam JT, 0°, PL, RO JT, 0°, PL, RO JT, 0°, PL, RO clay seam FZ, 0°, IR, VR		
		11.77							*(see next page)*							
		12														

Notes Monitoring Well installed in separate bore adjacent to primary bore.

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Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

Logged By: **Tiffany Mabbott** Date: **04/04/2022**
Checked By: **Ted Lilly** Date: **05/05/2022**

MONITORING WELL LOG: MW3

Geo-Logix Pty Ltd
Building Q2, Level 3
Unit 2309 / 4 Daydream Street
Warriewood NSW 2102
www.geo-logix.com.au

Project Number:	**2101029**
Hole Depth:	**13.29 m**
Date Started:	**04/04/2022**
Date Completed:	**04/04/2022**

Project Name: **Geotechnical Report**
Location / Site: **287 Mona Vale Rd, Terrey Hills NSW**
Client: **Hills Marketplace**
Contractor: **Fico Group Pty Limited**
Method: **Auger, Core (Truck mounted Geoprobe)**

Method	Water Level	Depth (mBGL)	RL	Sample Type	Sample ID	Material Type	USCS Symbol	Graphic Log	Material Description	Moisture	SPT	Run / RQD%	Defect Spacing (mm) 20 60 200 600 2000	Observations / Comments *Defect Description (Type, Inclination, Planarity, Roughness, Coating)*	Well Details	Well Construction
NMLC Coring		13	174			Natural			**SANDSTONE**- pinkish white (5R 8/2), medium strength (Class III).*(continued)* pale red (10R 6/2).					JT, 0°, PL, RO JT, 0°, PL, RO JT, 0°, PL, VR JT, 0°, PL, RO clay seam JT, 20°, PL, RO MB, 0°, PL, RO MB, 0°, UN, RO		
		14	173						**Terminated at 13.29 m**							
		15	172													
		16	171													

Notes Monitoring Well installed in separate bore adjacent to primary bore.

Abbreviations

Hydrocarbon Odour
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Defect Descriptors

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Inclination
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Planarity
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Roughness
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Coating
CN Clean
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VN Veneer
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REUMAD

Log Drawn By: Laurie White
Contact: laurie.white@reumad.com.au

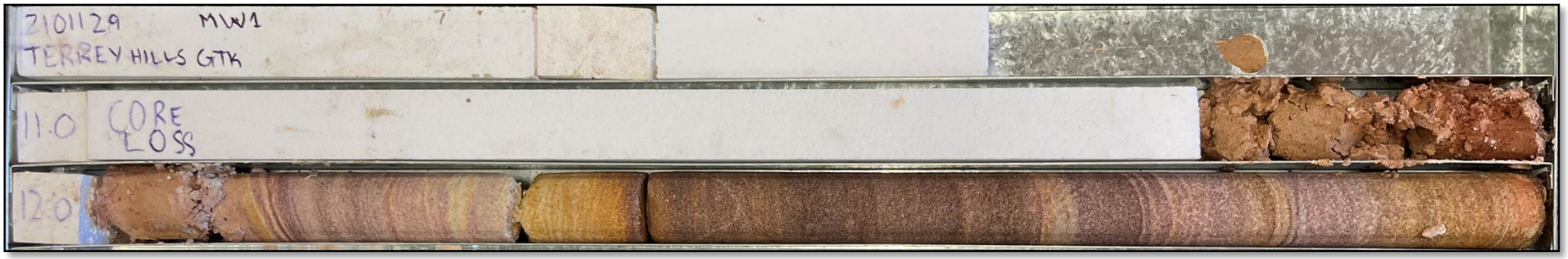
Logged By: **Tiffany Mabbott** Date: **04/04/2022**
Checked By: **Ted Lilly** Date: **05/05/2022**

ATTACHMENT C

Core Photographs

Geotechnical Report

Hills Marketplace
287 Mona Vale Road,
Terrey Hills NSW, 2084

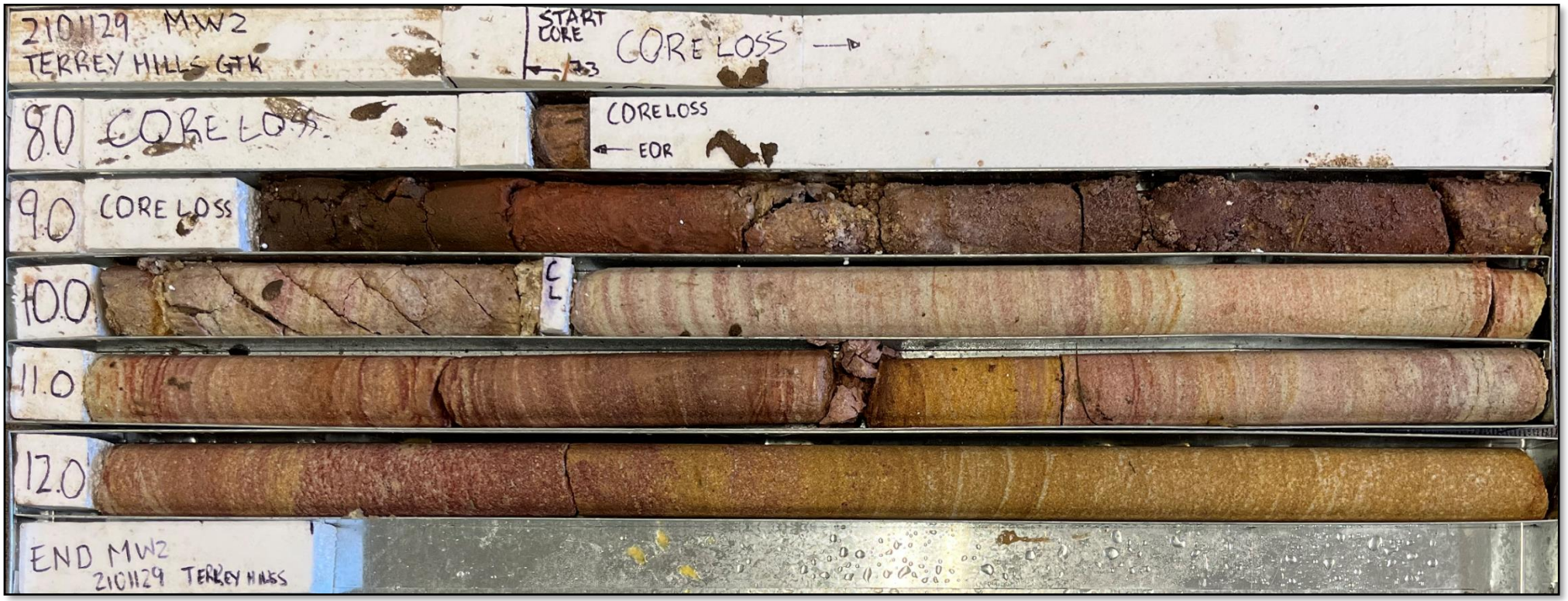


Borehole MW1 – NMLC coring completed from 11.00 to 13.00 mbg.

Core Photographs

Geotechnical Report

Hills Marketplace
287 Mona Vale Road,
Terrey Hills NSW, 2084



Borehole MW2 – NMLC coring completed from 7.30 to 13.00 mbg.

Core Photographs

Geotechnical Report

Hills Marketplace
287 Mona Vale Road,
Terrey Hills NSW, 2084

Borehole MW3 – NMLC coring completed from 5.36 to 13.29 mbg.

ATTACHMENT D

DRY DENSITY / OPTIMUM MOISTURE CONTENT REPORT

Client	Geo-Logix Pty Ltd	**Source**	BH1 1.0-1.5m
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description**	Clayey SAND
Project	Terrey Hills (2101129)	**Report No**	S72805-MDD
Job No	S21421-	**Sample No**	S72805

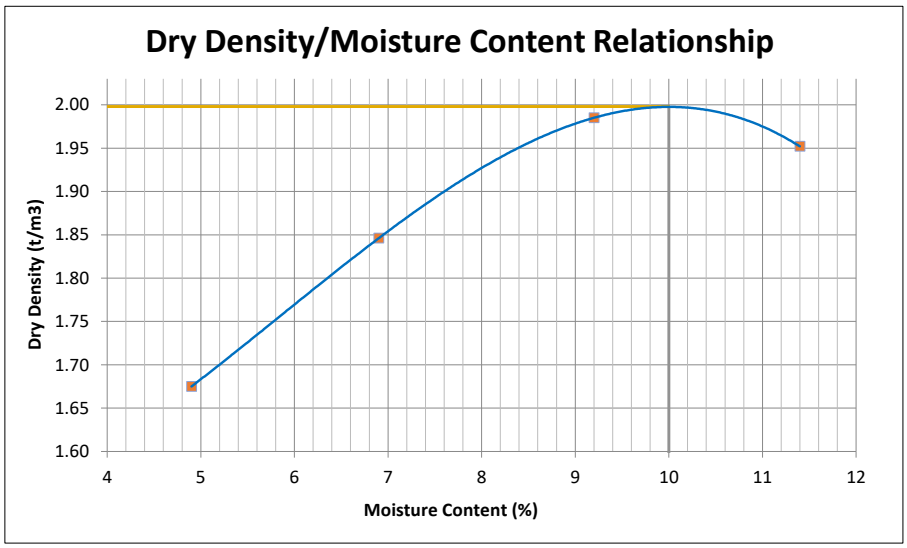
Test Procedure

☑ AS1289.5.1.1 Dry Density / Moisture Content Relationship - Standard Compaction

☑ AS1289.2.1.1 Moisture Content - Oven Drying Method (Standard Method)

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 16/11/2021

Preparation Prepared in accordance with the test method **Date Tested** 25/11/2021



Maximum Dry Density (t/m^3)	1.998
Optimum Moisture Content (%)	10.0
Oversize Retained on 19mm sieve (%)	0.0
Oversize Retained on 37.5mm sieve (%)	0.0
Curing Time	49 hrs
Liquid Limit Determination	Technician Assessment

Notes

NATA

Accredited for compliance with ISO/IEC 17025 - Testing.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. This document shall not be reproduced, except in full. Results relate only to the samples tested.

NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

4/12/2021

Date:

MACQUARIE GEOTECH

Macquarie Geotechnical
U7/8 10 Bradford Street
Alexandria NSW 2015

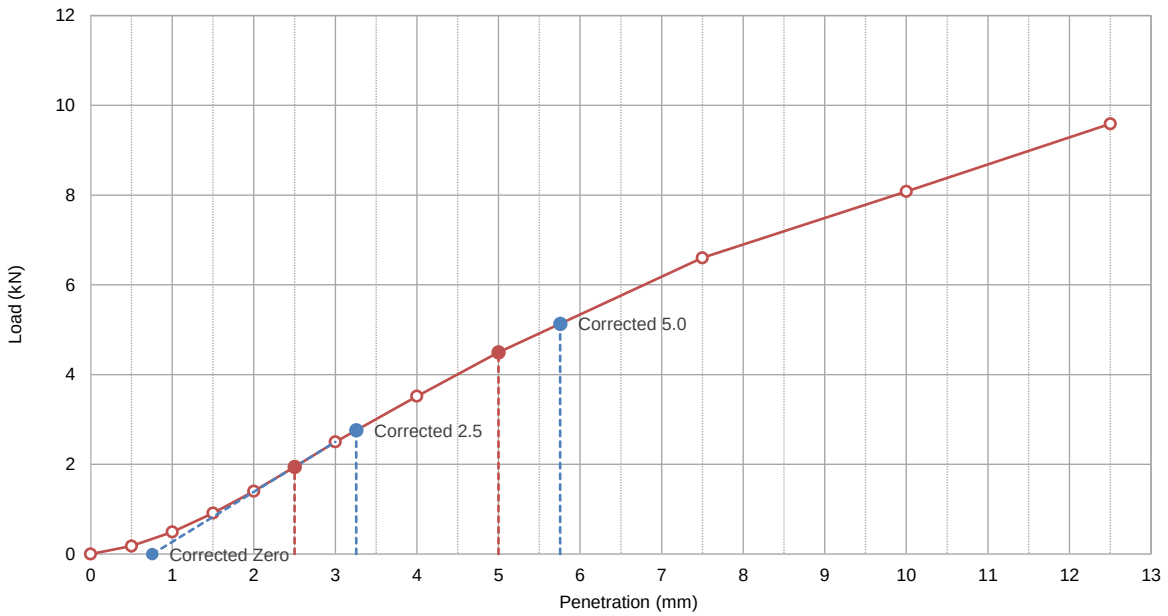
CALIFORNIA BEARING RATIO REPORT

Client	Geo-Logix Pty Ltd	**Source**	BH1 1.0-1.5m
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description**	Clayey SAND
Project	Terrey Hills (2101129)	**Report No.**	S72805-CBR
Job No.	S21421-	**Sample No.**	S72805

Test Procedure	☑ AS 1289.6.1.1	☐ RMS T117	California Bearing Ratio
	☑ AS 1289.5.1.1	☐ RMS T111	Dry Density / Moisture Content Relationship - Standard Compaction
	☐ AS 1289.5.2.1	☐ RMS T112	Dry Density / Moisture Content Relationship - Modified Compaction
	☑ AS 1289.2.1.1	☐ RMS T120	Moisture Content - Oven Drying Method (Standard Method)

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 16/11/2021

Preparation Prepared in accordance with the test method **Date Tested** 3/12/2021



Preparation & Specification	
Retained on 19.0mm Sieve (%)	0
Method of Establishing Plasticity Level	Technician Assessment
Sample Curing Time (hrs)	24 hrs
Compaction Hammer Used	Standard
Surcharge Mass Applied (kg)	4.5
Period of Soaking (Days)	4
Maximum Dry Density - MDD (t/m³)	2.00
Optimum Moisture Content - OMC (%)	10.0

Density & Moisture	Achieved	Target
Lab Moisture Ratio - LMR (%)	101.0	100.0
Lab Density Ratio - LDR (%)	99.5	100.0
Dry Density - At Compaction (t/m³)	1.98	2.00
Dry Density - After Soaking (t/m³)	1.98	
Specimen Swell (%)	0.0	
Moisture Content - At Compaction (%)	10.1	
Moisture Content - Top 30mm (%)	11.4	
Moisture Content - Remainder (%)	9.9	

Material CBR Value (%): **25** **at a penetration of** **5.0** **mm**

Notes

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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

4/12/2021

Chris Lloyd Date:

MACQUARIE GEOTECH

Macquarie Geotechnical
U7/8 10 Bradford Street
Alexandria NSW 2015

DRY DENSITY / OPTIMUM MOISTURE CONTENT REPORT

Client	Geo-Logix Pty Ltd	**Source**	BH3 1.0-1.5m
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description**	Silty SAND
Project	Terrey Hills (2101129)	**Report No**	S72806-MDD
Job No	S21421-	**Sample No**	S72806

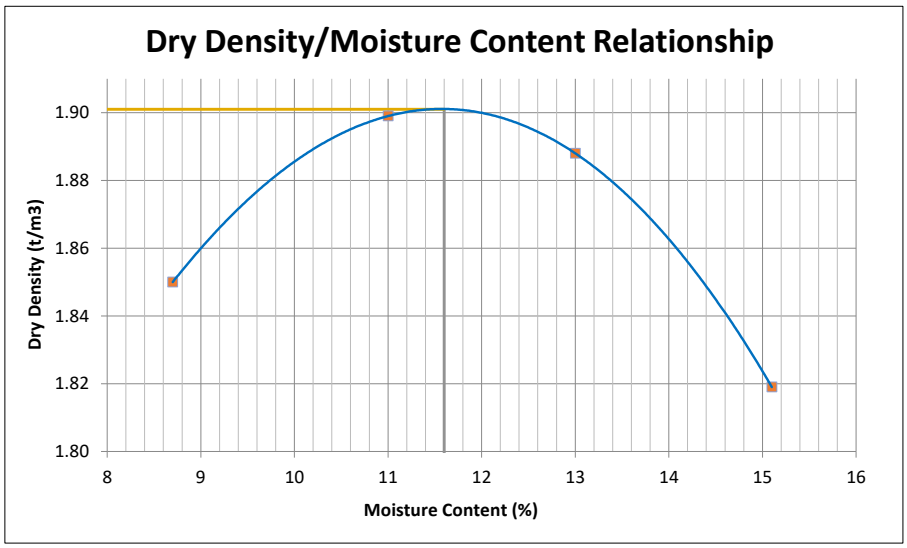
Test Procedure

☑ AS1289.5.1.1 Dry Density / Moisture Content Relationship - Standard Compaction

☑ AS1289.2.1.1 Moisture Content - Oven Drying Method (Standard Method)

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 16/11/2021

Preparation Prepared in accordance with the test method **Date Tested** 25/11/2021



Maximum Dry Density (t/m^3)	1.901
Optimum Moisture Content (%)	11.6
Oversize Retained on 19mm sieve (%)	0.0
Oversize Retained on 37.5mm sieve (%)	0.0
Curing Time	49 hrs
Liquid Limit Determination	Technician Assessment

Notes

NATA

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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

4/12/2021

Date:

MACQUARIE GEOTECH

Macquarie Geotechnical
U7/8 10 Bradford Street
Alexandria NSW 2015

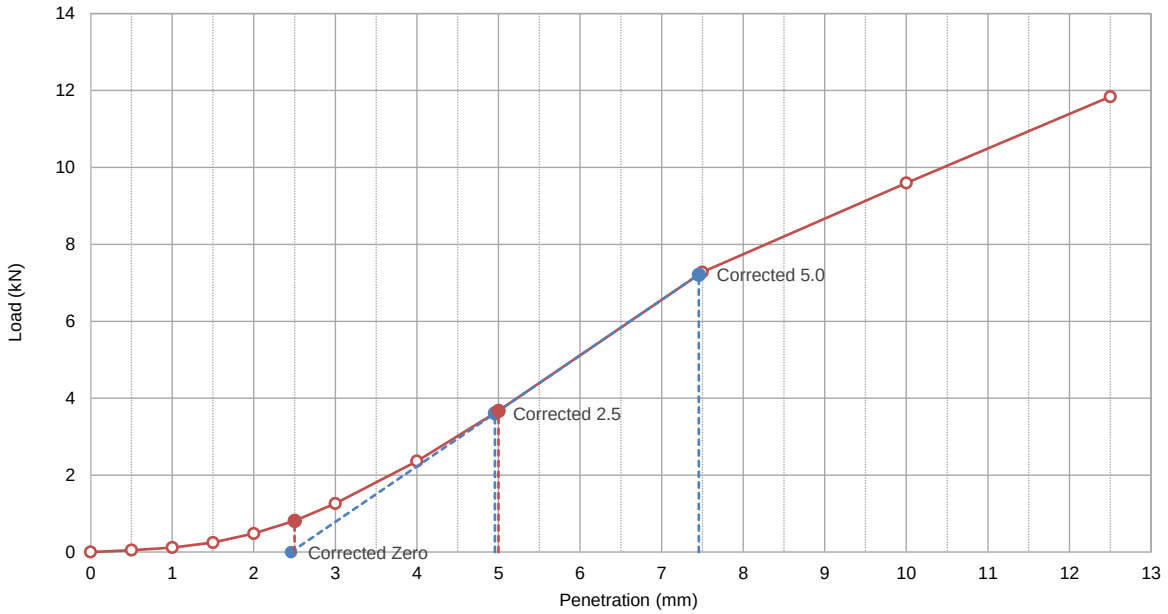
CALIFORNIA BEARING RATIO REPORT

Client	Geo-Logix Pty Ltd	**Source**	BH3 1.0-1.5m
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description**	Silty SAND
Project	Terrey Hills (2101129)	**Report No.**	S72806-CBR
Job No.	S21421-	**Sample No.**	S72806

Test Procedure	☑ AS 1289.6.1.1	☐ RMS T117	California Bearing Ratio
	☑ AS 1289.5.1.1	☐ RMS T111	Dry Density / Moisture Content Relationship - Standard Compaction
	☐ AS 1289.5.2.1	☐ RMS T112	Dry Density / Moisture Content Relationship - Modified Compaction
	☑ AS 1289.2.1.1	☐ RMS T120	Moisture Content - Oven Drying Method (Standard Method)

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 16/11/2021

Preparation Prepared in accordance with the test method **Date Tested** 3/12/2021



Preparation & Specification	
Retained on 19.0mm Sieve (%)	0
Method of Establishing Plasticity Level	Technician Assessment
Sample Curing Time (hrs)	24 hrs
Compaction Hammer Used	Standard
Surcharge Mass Applied (kg)	4.5
Period of Soaking (Days)	4
Maximum Dry Density - MDD (t/m³)	1.90
Optimum Moisture Content - OMC (%)	11.6

Density & Moisture	Achieved	Target
Lab Moisture Ratio - LMR (%)	97.0	100.0
Lab Density Ratio - LDR (%)	100.0	100.0
Dry Density - At Compaction (t/m³)	1.90	1.90
Dry Density - After Soaking (t/m³)	1.90	
Specimen Swell (%)	0.0	
Moisture Content - At Compaction (%)	11.3	
Moisture Content - Top 30mm (%)	12.1	
Moisture Content - Remainder (%)	11.5	

Material CBR Value (%): **35** **at a penetration of** **5.0** **mm**

Notes

NATA

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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

4/12/2021

Chris Lloyd Date:

MACQUARIE GEOTECH

Macquarie Geotechnical
U7/8 10 Bradford Street
Alexandria NSW 2015

DRY DENSITY / OPTIMUM MOISTURE CONTENT REPORT

Client	Geo-Logix Pty Ltd	**Source**	BH4 0.5-1.0m
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description**	Gravelly CLAY
Project	Terrey Hills (2101129)	**Report No**	S72807-MDD
Job No	S21421-	**Sample No**	S72807

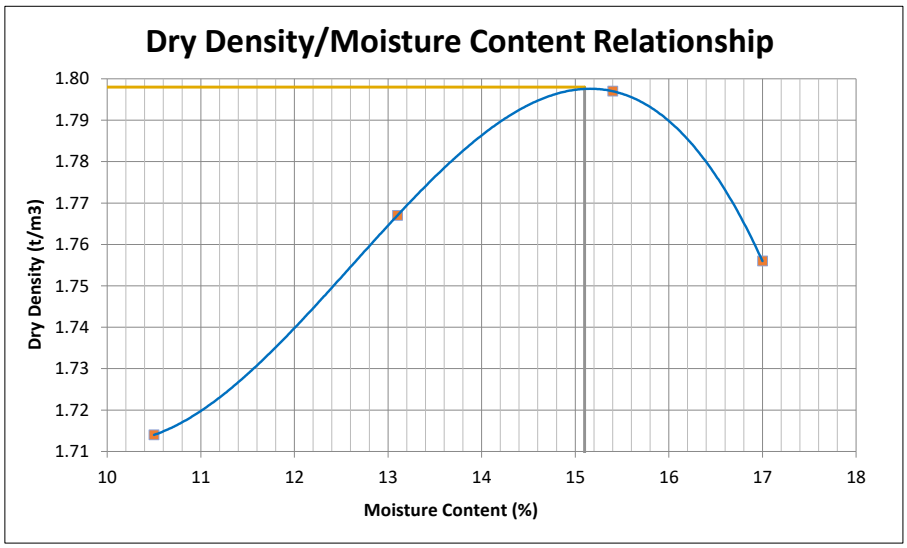
Test Procedure

☑ AS1289.5.1.1 Dry Density / Moisture Content Relationship - Standard Compaction

☑ AS1289.2.1.1 Moisture Content - Oven Drying Method (Standard Method)

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 15/11/2021

Preparation Prepared in accordance with the test method **Date Tested** 29/11/2021



Maximum Dry Density (t/m^3)	1.798
Optimum Moisture Content (%)	15.1
Oversize Retained on 19mm sieve (%)	2.5
Oversize Retained on 37.5mm sieve (%)	1.4
Curing Time	125 hrs
Liquid Limit Determination	Technician Assessment

Notes

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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

8/12/2021

Date:

MACQUARIE GEOTECH

Macquarie Geotechnical
U7/8 10 Bradford Street
Alexandria NSW 2015

CALIFORNIA BEARING RATIO REPORT

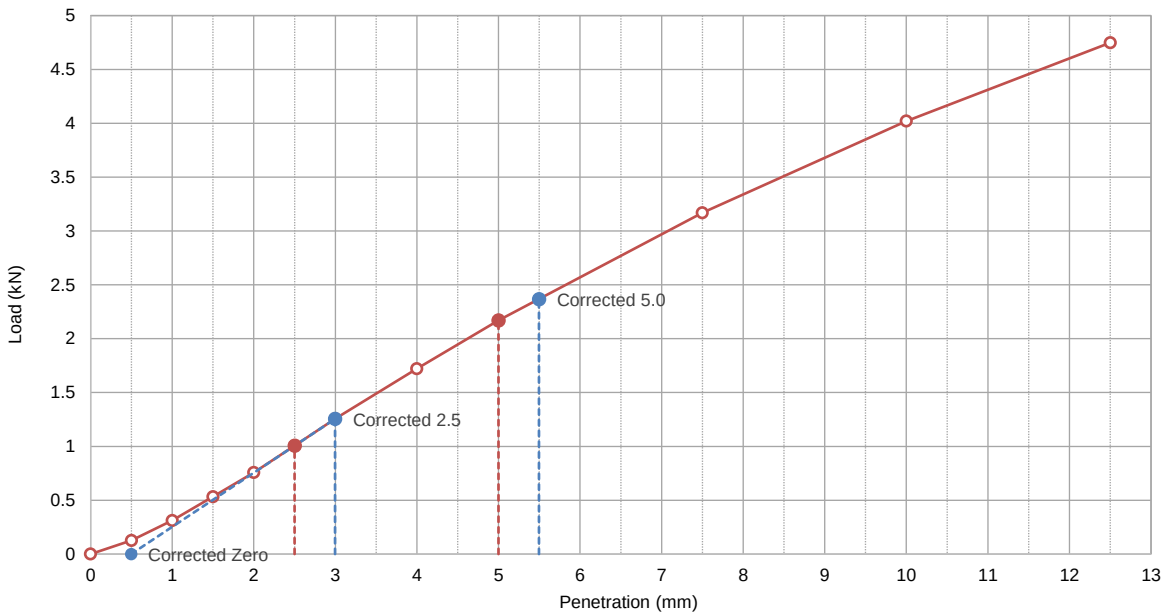
Client	Geo-Logix Pty Ltd	**Source**	BH4 0.5-1.0m
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description**	Gravelly CLAY
Project	Terrey Hills (2101129)	**Report No.**	S72807-CBR
Job No.	S21421-	**Sample No.**	S72807

Test Procedure

☑	AS 1289.6.1.1	☐ RMS T117	California Bearing Ratio
☑	AS 1289.5.1.1	☐ RMS T111	Dry Density / Moisture Content Relationship - Standard Compaction
☐	AS 1289.5.2.1	☐ RMS T112	Dry Density / Moisture Content Relationship - Modified Compaction
☑	AS 1289.2.1.1	☐ RMS T120	Moisture Content - Oven Drying Method (Standard Method)

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 15/11/2021

Preparation Prepared in accordance with the test method **Date Tested** 6/12/2021



Preparation & Specification	
Retained on 19.0mm Sieve (%)	3
Method of Establishing Plasticity Level	Technician Assessment
Sample Curing Time (hrs)	26 hrs
Compaction Hammer Used	Standard
Surcharge Mass Applied (kg)	4.5
Period of Soaking (Days)	4
Maximum Dry Density - MDD (t/m³)	1.80
Optimum Moisture Content - OMC (%)	15.1

Density & Moisture	Achieved	Target
Lab Moisture Ratio - LMR (%)	99.5	100.0
Lab Density Ratio - LDR (%)	99.0	100.0
Dry Density - At Compaction (t/m³)	1.78	1.80
Dry Density - After Soaking (t/m³)	1.78	
Specimen Swell (%)	0.2	
Moisture Content - At Compaction (%)	15.1	
Moisture Content - Top 30mm (%)	15.8	
Moisture Content - Remainder (%)	14.8	

Material CBR Value (%): **12** **at a penetration of** **5.0** **mm**

Notes

NATA

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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

8/12/2021

Chris Lloyd Date:

MACQUARIE GEOTECH

Macquarie Geotechnical
U7/8 10 Bradford Street
Alexandria NSW 2015

SOIL CLASSIFICATION REPORT

Client	Geo-Logix Pty Ltd	**Source**	BH1 1.0-1.5m
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description**	Clayey SAND
Project	Terrey Hills (2101129)	**Report No.**	S72805-PI
Job No.	S21421-	**Lab No.**	S72805

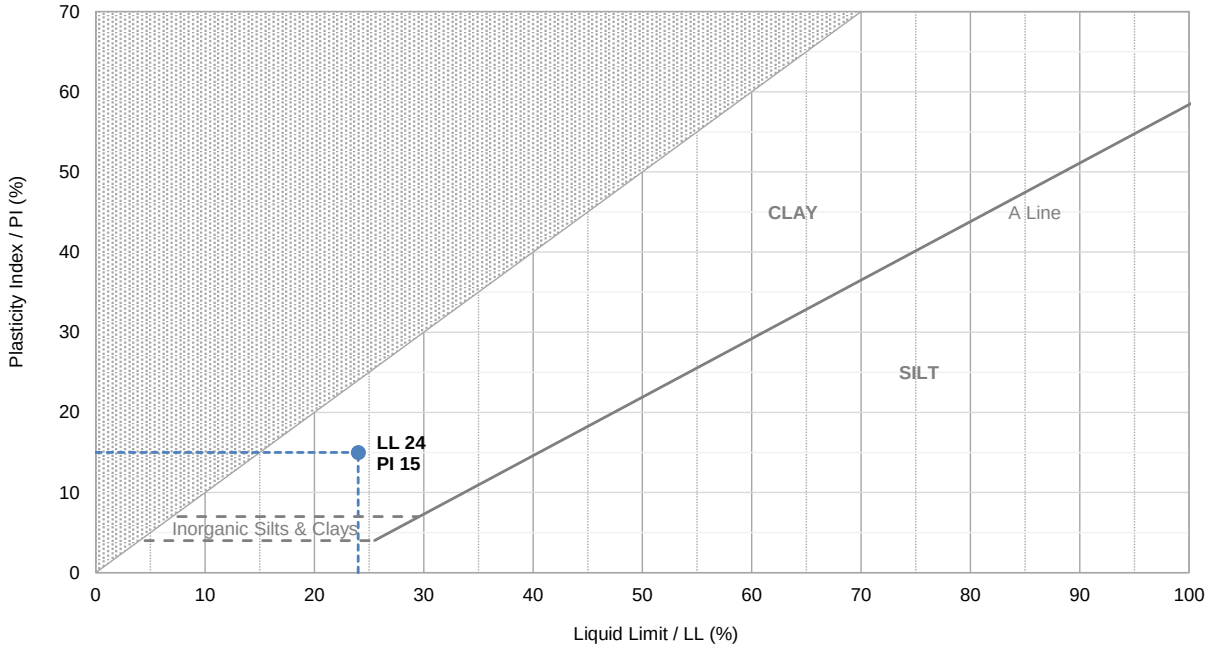
Test Procedure

☐	AS1289 3.1.1	Liquid Limit - Four point Casagrande method
☑	AS1289 3.1.2	Liquid Limit - One point Casagrande method
☑	AS1289 3.2.1	Plastic Limit - Standard method
☑	AS1289 3.3.1	Calculation of the Plasticity Index
☑	AS1289 3.4.1	Linear Shrinkage - Standard method

Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	16/11/2021
Preparation	Prepared in accordance with the test method	**Date Tested**	3/12/2021

Plasticity Chart for Classification of Fine-Grained Soils

AS 1726:2017 Clause 6.1.6 (Figure 5)



Preparation	
Method of Preparation	**Dry Sieved**
History of the Sample	**Air Dried**

Results	
Liquid Limit / LL (%)	**24**
Plastic Limit (%)	**9**
Plasticity Index / PI (%)	**15**
Linear Shrinkage (%)	**3.5**
Condition upon Drying	**Linear**

Notes

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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

8/12/2021

Date:

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Macquarie Geotechnical
U7/8 10 Bradford Street
Alexandria NSW 2015

SOIL CLASSIFICATION REPORT

Client	Geo-Logix Pty Ltd	**Source**	BH1 1.1-1.5m
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description**	Sandy CLAY
Project	Terrey Hills (2101129)	**Report No.**	S72804-PI
Job No.	S21421-	**Lab No.**	S72804

Test Procedure

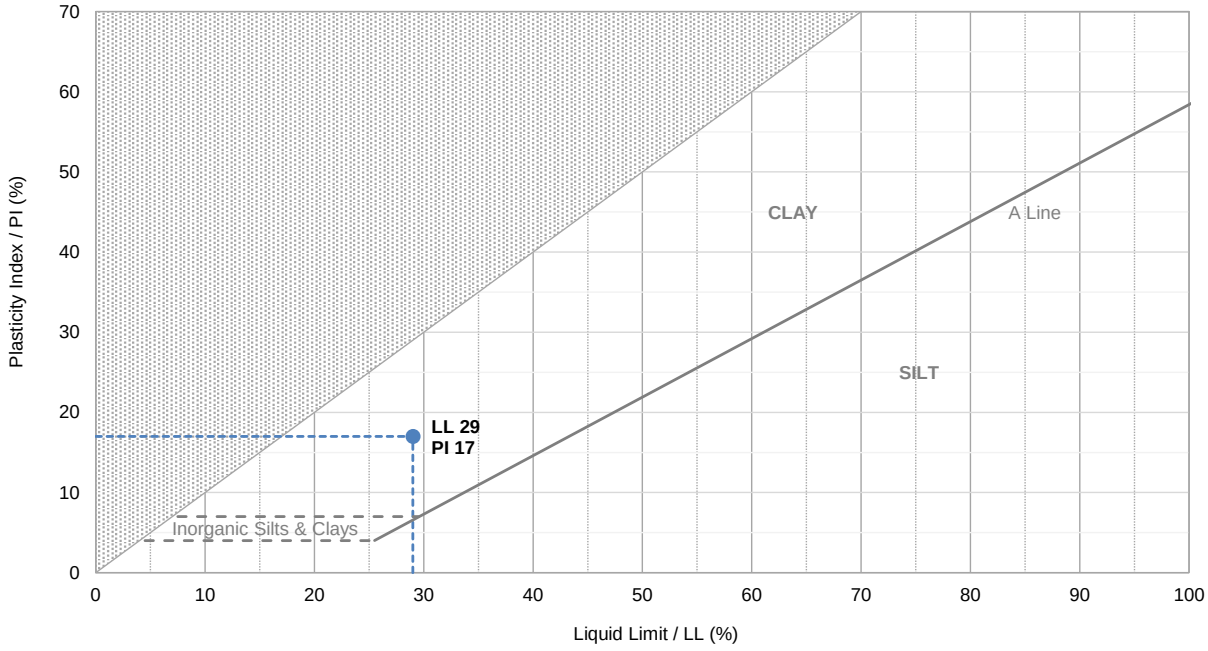
☐	AS1289 3.1.1	Liquid Limit - Four point Casagrande method
☑	AS1289 3.1.2	Liquid Limit - One point Casagrande method
☑	AS1289 3.2.1	Plastic Limit - Standard method
☑	AS1289 3.3.1	Calculation of the Plasticity Index
☐	AS1289 3.4.1	Linear Shrinkage - Standard method

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 16/11/2021

Preparation Prepared in accordance with the test method **Date Tested** 6/12/2021

Plasticity Chart for Classification of Fine-Grained Soils

AS 1726:2017 Clause 6.1.6 (Figure 5)



Preparation	
Method of Preparation	**Dry Sieved**
History of the Sample	**Air Dried**

Results	
Liquid Limit / LL (%)	**29**
Plastic Limit (%)	**12**
Plasticity Index / PI (%)	**17**
Linear Shrinkage (%)	**-**
Condition upon Drying	**N/A**

Notes

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Authorised Signatory:

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8/12/2021

Date:

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U7/8 10 Bradford Street
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SOIL CLASSIFICATION REPORT

Client	Geo-Logix Pty Ltd	**Source**	BH1 2.5-2.6m
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description**	Clayey SAND
Project	Terrey Hills (2101129)	**Report No.**	S72802-PI
Job No.	S21421-	**Lab No.**	S72802

Test Procedure

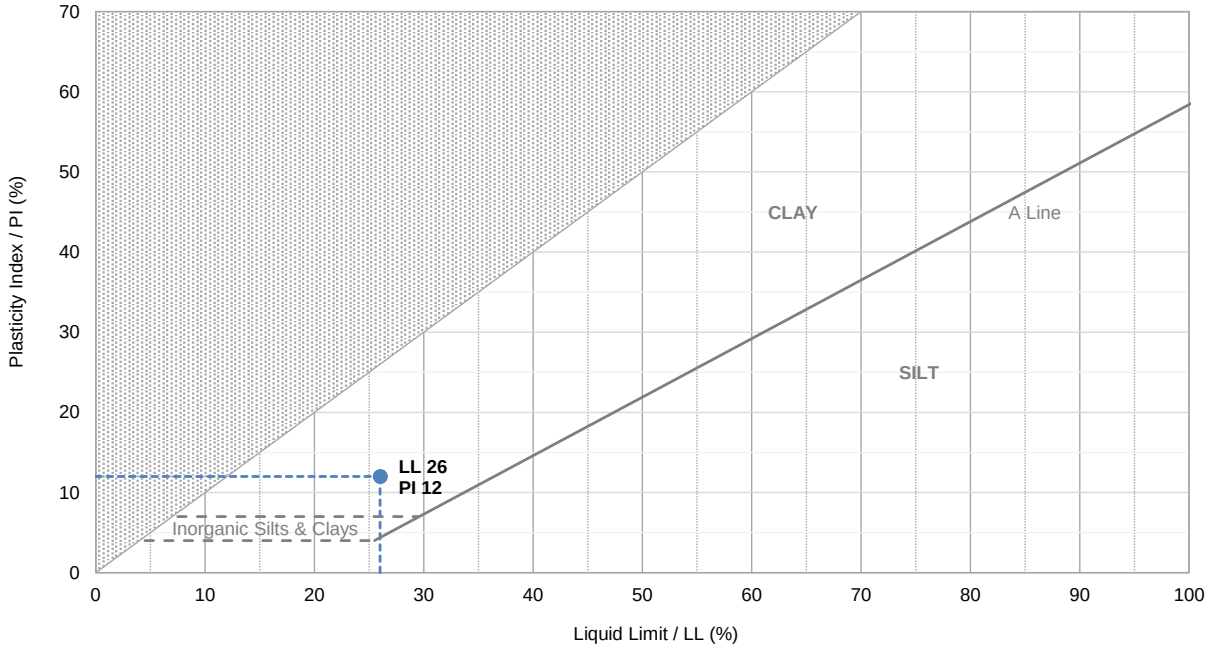
☐	AS1289 3.1.1	Liquid Limit - Four point Casagrande method
☑	AS1289 3.1.2	Liquid Limit - One point Casagrande method
☑	AS1289 3.2.1	Plastic Limit - Standard method
☑	AS1289 3.3.1	Calculation of the Plasticity Index
☐	AS1289 3.4.1	Linear Shrinkage - Standard method

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 16/11/2021

Preparation Prepared in accordance with the test method **Date Tested** 3/12/2021

Plasticity Chart for Classification of Fine-Grained Soils

AS 1726:2017 Clause 6.1.6 (Figure 5)



Preparation	
Method of Preparation	**Dry Sieved**
History of the Sample	**Air Dried**

Results	
Liquid Limit / LL (%)	**26**
Plastic Limit (%)	**14**
Plasticity Index / PI (%)	**12**
Linear Shrinkage (%)	**4.0**
Condition upon Drying	**Linear**

Notes

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8/12/2021

Date:

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U7/8 10 Bradford Street
Alexandria NSW 2015

SOIL CLASSIFICATION REPORT

Client	Geo-Logix Pty Ltd	**Source**	BH1 3.5-3.6m
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description**	Sandy CLAY
Project	Terrey Hills (2101129)	**Report No.**	S72803-PI
Job No.	S21421-	**Lab No.**	S72803

Test Procedure

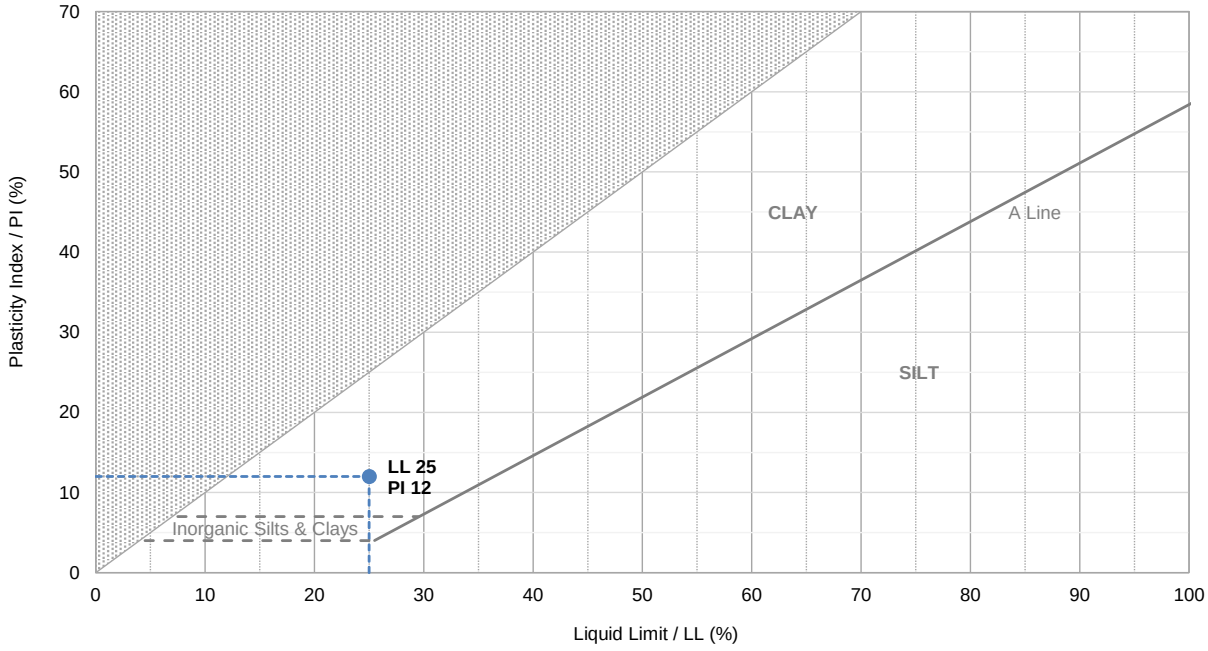
☐	AS1289 3.1.1	Liquid Limit - Four point Casagrande method
☑	AS1289 3.1.2	Liquid Limit - One point Casagrande method
☑	AS1289 3.2.1	Plastic Limit - Standard method
☑	AS1289 3.3.1	Calculation of the Plasticity Index
☐	AS1289 3.4.1	Linear Shrinkage - Standard method

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 16/11/2021

Preparation Prepared in accordance with the test method **Date Tested** 6/12/2021

Plasticity Chart for Classification of Fine-Grained Soils

AS 1726:2017 Clause 6.1.6 (Figure 5)



Preparation	
Method of Preparation	**Dry Sieved**
History of the Sample	**Air Dried**

Results	
Liquid Limit / LL (%)	**25**
Plastic Limit (%)	**13**
Plasticity Index / PI (%)	**12**
Linear Shrinkage (%)	**-**
Condition upon Drying	**N/A**

Notes

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Authorised Signatory:

Chris Lloyd

8/12/2021

Date:

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U7/8 10 Bradford Street
Alexandria NSW 2015

SOIL CLASSIFICATION REPORT

Client	Geo-Logix Pty Ltd	**Source**	BH3 1.0-1.5m
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description**	Silty SAND
Project	Terrey Hills (2101129)	**Report No.**	S72806-PI
Job No.	S21421-	**Lab No.**	S72806

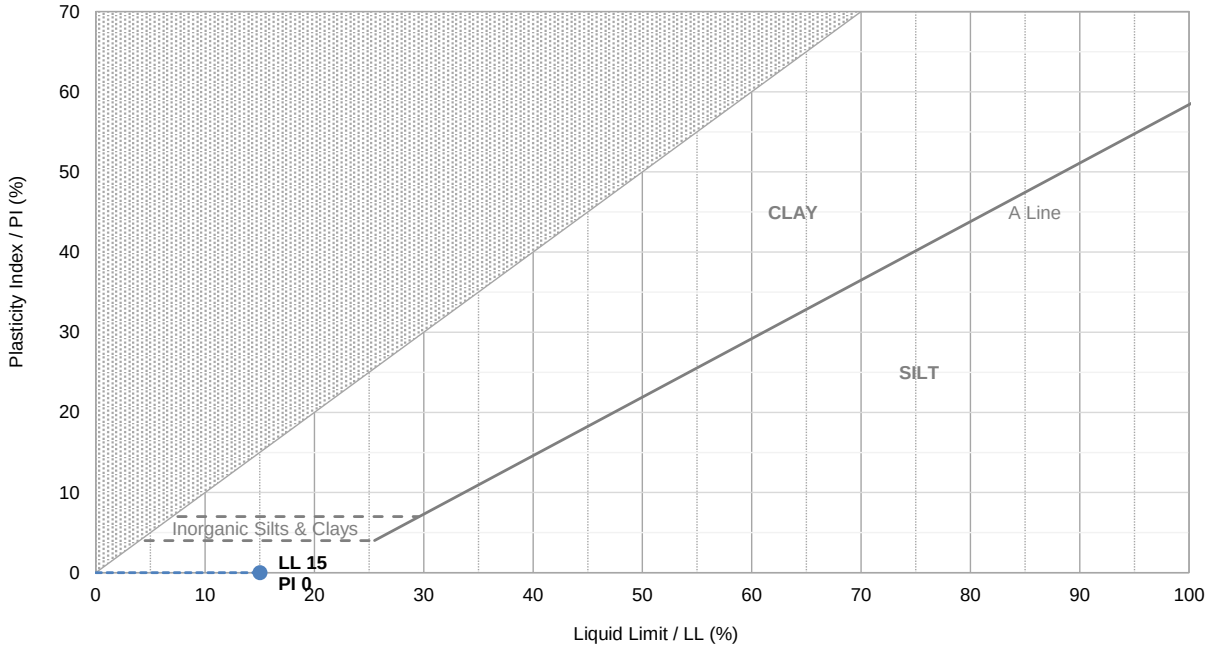
Test Procedure

☐	AS1289 3.1.1	Liquid Limit - Four point Casagrande method
☑	AS1289 3.1.2	Liquid Limit - One point Casagrande method
☑	AS1289 3.2.1	Plastic Limit - Standard method
☑	AS1289 3.3.1	Calculation of the Plasticity Index
☑	AS1289 3.4.1	Linear Shrinkage - Standard method

Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	16/11/2021
Preparation	Prepared in accordance with the test method	**Date Tested**	3/12/2021

Plasticity Chart for Classification of Fine-Grained Soils

AS 1726:2017 Clause 6.1.6 (Figure 5)



Preparation	
Method of Preparation	**Dry Sieved**
History of the Sample	**Air Dried**

Results	
Liquid Limit / LL (%)	**15**
Plastic Limit (%)	**15**
Plasticity Index / PI (%)	**0**
Linear Shrinkage (%)	**1.0**
Condition upon Drying	**Linear**

Notes

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Authorised Signatory:

Chris Lloyd

8/12/2021

Date:

MACQUARIE GEOTECH

Macquarie Geotechnical
U7/8 10 Bradford Street
Alexandria NSW 2015

SOIL CLASSIFICATION REPORT

Client	Geo-Logix Pty Ltd	**Source**	BH4 0.5-1.0m
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description**	Gravelly CLAY
Project	Terrey Hills (2101129)	**Report No.**	S72807-PI
Job No.	S21421-	**Lab No.**	S72807

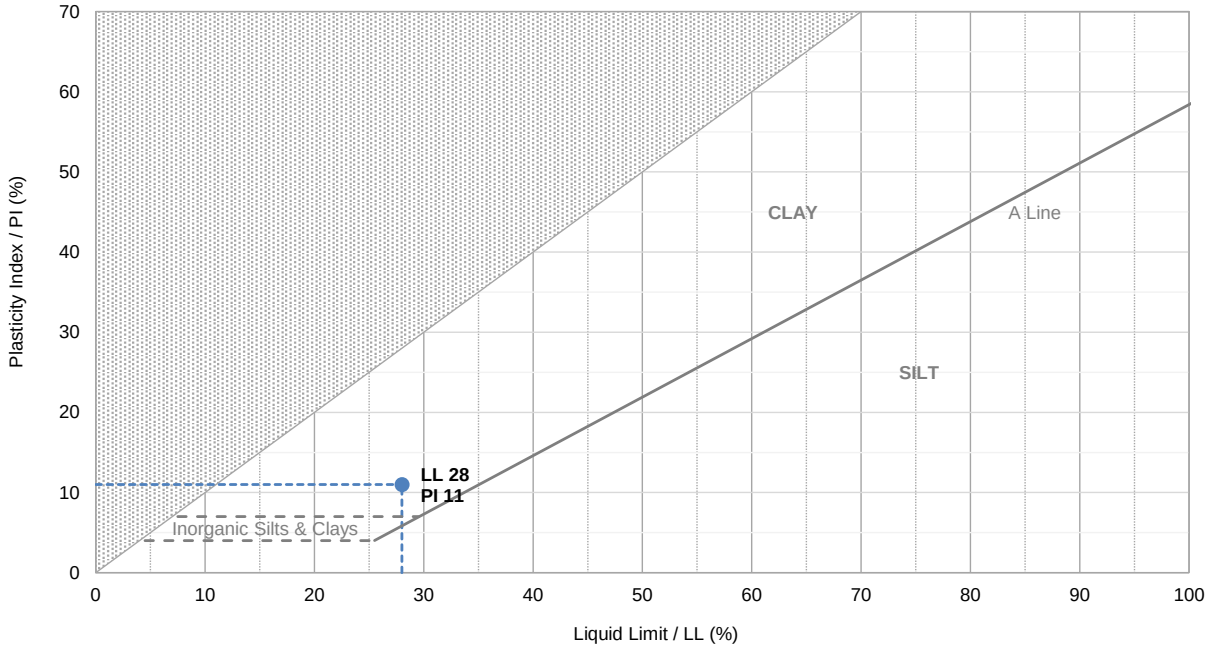
Test Procedure

☐	AS1289 3.1.1	Liquid Limit - Four point Casagrande method
☑	AS1289 3.1.2	Liquid Limit - One point Casagrande method
☑	AS1289 3.2.1	Plastic Limit - Standard method
☑	AS1289 3.3.1	Calculation of the Plasticity Index
☑	AS1289 3.4.1	Linear Shrinkage - Standard method

Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	15/11/2021
Preparation	Prepared in accordance with the test method	**Date Tested**	3/12/2021

Plasticity Chart for Classification of Fine-Grained Soils

AS 1726:2017 Clause 6.1.6 (Figure 5)



Preparation	
Method of Preparation	**Dry Sieved**
History of the Sample	**Air Dried**

Results	
Liquid Limit / LL (%)	**28**
Plastic Limit (%)	**17**
Plasticity Index / PI (%)	**11**
Linear Shrinkage (%)	**5.0**
Condition upon Drying	**Linear**

Notes

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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

8/12/2021

Date:

MACQUARIE GEOTECH

Macquarie Geotechnical
U7/8 10 Bradford Street
Alexandria NSW 2015

Geo-Logix P/L
Bld Q2 Level 3, 2309/4 Daydream St
Warriewood
NSW 2102

Attention: **Ted Lilly**

Report **843357-S**
Project name TERREY HILLS
Project ID 2101129
Received Date Nov 17, 2021

Client Sample ID			**BH4/1.3-1.5**	**BH4/2.6**	**BH4/3.7**	**BH7/1.2**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S21-No53817**	**S21-No53818**	**S21-No53819**	**S21-No53826**
Date Sampled			**Nov 16, 2021**	**Nov 16, 2021**	**Nov 16, 2021**	**Nov 16, 2021**
Test/Reference	LOR	Unit				
Chloride	10	mg/kg	< 10	< 10	< 10	-
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	12	29	27	-
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	5.7	6.5	6.5	-
Resistivity*	0.5	ohm.m	810	340	370	-
Sulphate (as SO4)	10	mg/kg	< 10	< 10	16	-
% Moisture	1	%	11	17	20	12
Particle Size by Sieve analysis*						
<63 Micron	0.1	% w/w	-	-	-	17
>2000 Micron	0.1	% w/w	-	-	-	2.3
1000-2000 Micron	0.1	% w/w	-	-	-	1.0
125-250 Micron	0.1	% w/w	-	-	-	30
250-500 Micron	0.1	% w/w	-	-	-	34
500-1000 Micron	0.1	% w/w	-	-	-	10
63-125 Micron	0.1	% w/w	-	-	-	5.9

Client Sample ID			**BH7/2.6-2.9**	**BH7/4.0**
Sample Matrix			**Soil**	**Soil**
Eurofins Sample No.			**S21-No53827**	**S21-No53828**
Date Sampled			**Nov 16, 2021**	**Nov 16, 2021**
Test/Reference	LOR	Unit		
% Moisture	1	%	16	15
Particle Size by Sieve analysis*				
<63 Micron	0.1	% w/w	8.4	27
>2000 Micron	0.1	% w/w	3.4	0.1
1000-2000 Micron	0.1	% w/w	0.8	0.2
125-250 Micron	0.1	% w/w	24	30
250-500 Micron	0.1	% w/w	34	24
500-1000 Micron	0.1	% w/w	23	9.9
63-125 Micron	0.1	% w/w	7.5	9.2

Sample History

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

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

Description	Testing Site	Extracted	Holding Time
Chloride	Sydney	Nov 25, 2021	28 Days
- Method: In-house method LTM-INO-4270 Anions by Ion Chromatography			
Conductivity (1:5 aqueous extract at 25°C as rec.)	Sydney	Nov 25, 2021	7 Days
- Method: LTM-INO-4030 Conductivity			
pH (1:5 Aqueous extract at 25°C as rec.)	Sydney	Nov 25, 2021	7 Days
- Method: LTM-GEN-7090 pH by ISE			
Sulphate (as SO4)	Sydney	Nov 25, 2021	28 Days
- Method: In-house method LTM-INO-4270 Sulphate by Ion Chromatograph			
% Moisture	Sydney	Nov 23, 2021	14 Days
- Method: LTM-GEN-7080 Moisture			
Particle Size by Sieve analysis*	Melbourne	Dec 04, 2021	28 Days
- Method: AS1289.C6.1-1977 Determination of Particle Size by Sieving			

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Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Company Name: Geo-Logix P/L
Address: Bld Q2 Level 3, 2309/4 Daydream St
Warriewood
NSW 2102

Project Name: TERREY HILLS
Project ID: 2101129

Order No.:
Report #: 843357
Phone: 02 9979 1722
Fax: 02 9979 1222

Received: Nov 17, 2021 1:22 PM
Due: Nov 24, 2021
Priority: 5 Day
Contact Name: Ted Lilly

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						CANCELLED	HOLD	Particle Size by Sieve analysis*	Aggressivity Soil Set	Moisture Set
Melbourne Laboratory - NATA # 1261 Site # 1254								X		
Sydney Laboratory - NATA # 1261 Site # 18217						X	X		X	X
Brisbane Laboratory - NATA # 1261 Site # 20794										
Mayfield Laboratory - NATA # 1261 Site # 25079										
Perth Laboratory - NATA # 2377 Site # 2370										
External Laboratory										
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**					
1	BH1/0.5-0.6	Nov 16, 2021		Soil	S21-No53809		X			
2	BH1/1.5-1.6	Nov 16, 2021		Soil	S21-No53810		X			
3	BH1/4.5-4.6	Nov 16, 2021		Soil	S21-No53811		X			
4	BH3/0.5-0.6	Nov 16, 2021		Soil	S21-No53812		X			
5	BH3/1.5-1.6	Nov 16, 2021		Soil	S21-No53813		X			
6	BH3/2.5-2.6	Nov 16, 2021		Soil	S21-No53814		X			
7	BH3/3.5-3.6	Nov 16, 2021		Soil	S21-No53815		X			
8	BH4/0.5	Nov 16, 2021		Soil	S21-No53816		X			
9	BH4/1.3-1.5	Nov 16, 2021		Soil	S21-No53817				X	X

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Company Name: Geo-Logix P/L
Address: Bld Q2 Level 3, 2309/4 Daydream St
Warriewood
NSW 2102

Project Name: TERREY HILLS
Project ID: 2101129

Order No.:
Report #: 843357
Phone: 02 9979 1722
Fax: 02 9979 1222

Received: Nov 17, 2021 1:22 PM
Due: Nov 24, 2021
Priority: 5 Day
Contact Name: Ted Lilly

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						CANCELLED	HOLD	Particle Size by Sieve analysis*	Aggressivity Soil Set	Moisture Set
Melbourne Laboratory - NATA # 1261 Site # 1254								X		
Sydney Laboratory - NATA # 1261 Site # 18217						X	X		X	X
Brisbane Laboratory - NATA # 1261 Site # 20794										
Mayfield Laboratory - NATA # 1261 Site # 25079										
Perth Laboratory - NATA # 2377 Site # 2370										
External Laboratory										
10	BH4/2.6	Nov 16, 2021		Soil	S21-No53818				X	X
11	BH4/3.7	Nov 16, 2021		Soil	S21-No53819				X	X
12	BH5/0.5	Nov 16, 2021		Soil	S21-No53820		X			
13	BH2/0.4-0.6	Nov 16, 2021		Soil	S21-No53821		X			
14	BH2/1.2-1.5	Nov 16, 2021		Soil	S21-No53822		X			
15	BH6/0.5-0.7	Nov 16, 2021		Soil	S21-No53823		X			
16	BH6/1.1-1.3	Nov 16, 2021		Soil	S21-No53824	X				
17	BH7/0.5	Nov 16, 2021		Soil	S21-No53825		X			
18	BH7/1.2	Nov 16, 2021		Soil	S21-No53826			X		X
19	BH7/2.6-2.9	Nov 16, 2021		Soil	S21-No53827			X		X
20	BH7/4.0	Nov 16, 2021		Soil	S21-No53828			X		X

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Company Name: Geo-Logix P/L
Address: Bld Q2 Level 3, 2309/4 Daydream St
Warriewood
NSW 2102

Project Name: TERREY HILLS
Project ID: 2101129

Order No.:
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Phone: 02 9979 1722
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Received: Nov 17, 2021 1:22 PM
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Priority: 5 Day
Contact Name: Ted Lilly

Eurofins Analytical Services Manager : Ursula Long

Sample Detail	CANCELLED	HOLD	Particle Size by Sieve analysis*	Aggressivity Soil Set	Moisture Set
Melbourne Laboratory - NATA # 1261 Site # 1254			X		
Sydney Laboratory - NATA # 1261 Site # 18217	X	X		X	X
Brisbane Laboratory - NATA # 1261 Site # 20794					
Mayfield Laboratory - NATA # 1261 Site # 25079					
Perth Laboratory - NATA # 2377 Site # 2370					
External Laboratory					
Test Counts	1	13	3	3	6

Internal Quality Control Review and Glossary

General

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

Holding Times

Please refer to '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 prior to sample receipt deadlines as stated on the SRA.

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

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

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
ug/L: micrograms per litre
ppm: Parts per million
ppb: Parts per billion
%: Percentage
org/100mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - 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.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient
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 be used as a guide only 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% Phenols & 50-150% PFASs..

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM where no positive PFAS results have been reported have been reviewed and no data was affected.

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QC Data General Comments

1. Where a result is reported as a 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 is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Chloride	mg/kg	< 10			10	Pass	
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							
Chloride	%	101			70-130	Pass	
Conductivity (1:5 aqueous extract at 25°C as rec.)	%	98			70-130	Pass	
Resistivity*	%	98			70-130	Pass	
Sulphate (as SO4)	%	103			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Conductivity (1:5 aqueous extract at 25°C as rec.)	S21-No41042	NCP	uS/cm	110	110	2.8	30%	Pass	
pH (1:5 Aqueous extract at 25°C as rec.)	S21-No41042	NCP	pH Units	6.0	6.0	<1	30%	Pass	
Resistivity*	S21-No41042	NCP	ohm.m	94	91	2.8	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S21-No53826	CP	%	12	12	2.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
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:

Emma Beesley	Analytical Services Manager
Charl Du Preez	Senior Analyst-Inorganic (NSW)
Scott Beddoes	Senior Analyst-Inorganic (VIC)

Glenn Jackson
General Manager

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.

POINT LOAD STRENGTH INDEX REPORT

Client	Geo-Logix Pty Ltd	**Moisture Content Condition**	As received
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Storage History**	Core boxes
Project	Terry Hills (2101129)	**Report #**	S76618-PL
Job #	S21598-1	**Test Date**	21/04/2022

Test Procedure ☑ AS4133 4.1 Rock strength tests - Determination of point load strength index

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 5/04/2022

Preparation Prepared in accordance with the test method

Sample Number	Sample Source	Sample Description	Test Type	Average Width (mm)	Platen Separation (mm)	Failure Load (kN)	Point Load Index Is (MPa)	Point Load Index $Is_{(50)}$ (MPa)	Failure Mode
S76618	MW2 9.73-9.84m	Sandstone	Diametral	-	49.0	0.54	0.22	0.22	2
			Axial	51.6	35.0	0.93	0.40	0.40	1
S76619	MW2 10.45-10.55m	Sandstone	Diametral	-	50.0	0.82	0.33	0.33	1
			Axial	51.3	44.0	1.21	0.42	0.43	1
S76620	MW2 11.40-11.50m	Sandstone	Diametral	-	50.0	1.50	0.60	0.60	1
			Axial	51.2	45.0	2.43	0.83	0.86	1
S76621	MW2 12.45-12.55m	Sandstone	Diametral	-	50.0	1.93	0.77	0.77	1
			Axial	51.9	42.0	2.65	0.95	0.98	1
S76622	MW1 12.60-12.70m	Sandstone	Diametral	-	50.0	0.25	0.10	0.10	1
			Axial	51.5	46.0	0.41	0.14	0.14	1
S76623	MW3 5.48-5.60m	Sandstone	Diametral	-	50.0	0.31	0.12	0.12	1
			Axial	51.8	36.0	0.34	0.14	0.14	1
S76624	MW3 6.25-6.36m	Sandstone	Diametral	-	49.0	0.41	0.17	0.17	1
			Axial	51.6	40.0	0.55	0.21	0.21	1
S76625	MW3 7.73-7.81m	Sandstone	Diametral	-	49.0	1.61	0.67	0.66	1
			Axial	51.8	46.0	1.90	0.63	0.65	1
S76626	MW3 8.46-8.57m	Sandstone	Diametral	-	50.0	0.43	0.17	0.17	1
			Axial	51.7	34.0	1.24	0.55	0.54	1
S76627	MW3 9.45-9.56m	Sandstone	Diametral	-	50.0	0.63	0.25	0.25	1
			Axial	51.4	36.0	1.64	0.70	0.69	1

Failure Modes

1 - Fracture through fabric of specimen oblique to bedding, not influenced by weak planes.

2 - Fracture along bedding.

3 - Fracture influenced by pre-existing plane, microfracture, vein or chemical alteration.

4 - Chip or partial fracture.

Notes

Accredited for compliance with ISO/IEC 17025 - Testing.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
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Results relate only to the samples tested.

NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

28/04/2022

Date

MACQUARIE GEOTECH
Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

POINT LOAD STRENGTH INDEX REPORT

Client	Geo-Logix Pty Ltd	**Moisture Content Condition**	As received
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Storage History**	Core boxes
Project	Terry Hills (2101129)	**Report #**	S76628-PL
Job #	S21598-1	**Test Date**	21/04/2022

Test Procedure ☑ AS4133 4.1 Rock strength tests - Determination of point load strength index

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 4/04/2022

Preparation Prepared in accordance with the test method

Sample Number	Sample Source	Sample Description	Test Type	Average Width (mm)	Platen Separation (mm)	Failure Load (kN)	Point Load Index Is (MPa)	Point Load Index $Is_{(50)}$ (MPa)	Failure Mode
S76628	MW3 10.42-10.51m	Sandstone	Diametral	-	50.0	1.31	0.52	0.52	1
			Axial	51.7	43.0	2.48	0.88	0.90	1
S76629	MW3 11.34-11.45m	Sandstone	Diametral	-	49.0	0.94	0.39	0.39	1
			Axial	51.6	45.0	1.29	0.44	0.45	1
S76630	MW3 12.44-12.54m	Sandstone	Diametral	-	49.0	2.20	0.92	0.91	1
			Axial	51.9	43.0	2.92	1.03	1.06	1

Failure Modes

1 - Fracture through fabric of specimen oblique to bedding, not influenced by weak planes.

2 - Fracture along bedding.

3 - Fracture influenced by pre-existing plane, microfracture, vein or chemical alteration.

4 - Chip or partial fracture.

Notes

NATA Accredited Laboratory Number: 14874

Authorised Signatory:

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28/04/2022

Date

MACQUARIE GEOTECH

Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

Uniaxial Compressive Strength

Client	Geo-Logix Pty Ltd	**Sample Source**	MW1 12.40-12.60m
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description**	Sandstone
Project	Terry Hills (2101129)	**Report No.**	S76616-UCS
Job No.	S21598-1	**Lab No.**	S76616
Test Procedure	AS 4133.4.2.2 Determination of uniaxial compressive strength-Rock strength less than 50 MPa		
Testing Machine	Matest 2000 kN Compression Machine	**Sample Curing**	-
Sampling Method	Sampled by Client - results apply to the sample as received	**Date Sampled**	6/04/2022
Storage History	Core Box	**Storage Environment**	Sealed at as received moisture condition

Uniaxial Compressive Strength 22 MPa

Date Tested:	26/04/2022		Moisture Content:	8.0	%
Specimen Height:	146.8	mm	Duration of Test:	667	seconds
Average Specimen Diameter:	51.8	mm	Rate of Displacement:	< 0.1	mm/min
Failure Type:	Mixed mode				
Other Pertinent Observations:					

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Jacob Lloyd

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Lidcombe NSW 2141

Uniaxial Compressive Strength

Client	Geo-Logix Pty Ltd	**Sample Source**	MW2 10.73-10.95m
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description**	Sandstone
Project	Terry Hills (2101129)	**Report No.**	S76617-UCS
Job No.	S21598-1	**Lab No.**	S76617
Test Procedure	AS 4133.4.2.2 Determination of uniaxial compressive strength-Rock strength less than 50 MPa		
Testing Machine	Matest 2000 kN Compression Machine	**Sample Curing**	-
Sampling Method	Sampled by Client - results apply to the sample as received	**Date Sampled**	5/04/2022
Storage History	Core Box	**Storage Environment**	Sealed at as received moisture condition

Uniaxial Compressive Strength 9.8 MPa

Date Tested:	26/04/2022		Moisture Content:	10.5	%
Specimen Height:	147.1	mm	Duration of Test:	641	seconds
Average Specimen Diameter:	51.4	mm	Rate of Displacement:	< 0.1	mm/min
Failure Type:	Single shear plane				
Other Pertinent Observations:					

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Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

Uniaxial Compressive Strength

Client	Geo-Logix Pty Ltd	**Sample Source**	MW3 7.57-7.72m
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description**	Sandstone
Project	Terry Hills (2101129)	**Report No.**	S76631-UCS
Job No.	S21598-1	**Lab No.**	S76631
Test Procedure	AS 4133.4.2.2 Determination of uniaxial compressive strength-Rock strength less than 50 MPa		
Testing Machine	Matest 2000 kN Compression Machine	**Sample Curing**	-
Sampling Method	Sampled by Client - results apply to the sample as received	**Date Sampled**	4/04/2022
Storage History	Core Box	**Storage Environment**	Sealed at as received moisture condition

Uniaxial Compressive Strength 3.7 MPa

Date Tested:	26/04/2022		Moisture Content:	11.2	%
Specimen Height:	139.8	mm	Duration of Test:	628	seconds
Average Specimen Diameter:	50.9	mm	Rate of Displacement:	< 0.1	mm/min
Failure Type:	Mixed mode				
Other Pertinent Observations:					

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Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

Uniaxial Compressive Strength

Client	Geo-Logix Pty Ltd	**Sample Source**	MW3 10.10-10.30m
Address	Building Q2, Level 3, 2309/4 Daydream St, Warriewood, NSW 2102	**Sample Description**	Sandstone
Project	Terry Hills (2101129)	**Report No.**	S76632-UCS
Job No.	S21598-1	**Lab No.**	S76632
Test Procedure	AS 4133.4.2.2 Determination of uniaxial compressive strength-Rock strength less than 50 MPa		
Testing Machine	Matest 2000 kN Compression Machine	**Sample Curing**	-
Sampling Method	Sampled by Client - results apply to the sample as received	**Date Sampled**	4/04/2022
Storage History	Core Box	**Storage Environment**	Sealed at as received moisture condition

Uniaxial Compressive Strength 21 MPa

Date Tested:	26/04/2022		Moisture Content:	7.9	%
Specimen Height:	146.8	mm	Duration of Test:	662	seconds
Average Specimen Diameter:	51.7	mm	Rate of Displacement:	< 0.1	mm/min
Failure Type:	Single shear plane				
Other Pertinent Observations:					

Notes

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