Our Ref: PSM4580-003L Rev1

9 May 2022

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Attention: Michael Skala

Dear Michael

RE: 12 HASSELL STREET PARRAMATTA
GEOTECHNICAL INVESTIGATION - DUE DILIGENCE

1. Introduction

This letter presents the results of PSM's due diligence stage geotechnical investigation of the proposed development at 12 Hassall Street, Parramatta. This investigation was undertaken in accordance with the our proposal PSM4580-001E dated 3 September 2021. To assist in the preparation of this letter, we have been provided with the following documents:

- General Arrangement Plans by PTW Architects, dated 11 December 2020 (ref: *PA030431.01*)
- Survey plan by H Ramsay & Co., dated 12 September 2018 (ref: *8288*).

Additionally, we have reviewed the following geotechnical and groundwater investigations undertaken by other consultants at the nearby site, 189 Macquarie Street, Parramatta:

- Report to Parramatta City Council on Geotechnical Investigation for Proposed Redevelopment at 189 Macquarie Street, Parramatta, NSW – by Jeffery and Katauskas, dated 1 February 2021 (ref. *25354ZHrptRev1*)
- Proposed Residential Development 189 Macquarie Street, Parramatta; Report on Geotechnical Assessment of Proposed Additional Basements – by Asset Geotechnical, dated 24 May 2015 (ref. *2671-1-R1 Rev 1*)
- Groundwater Take and Impact Assessment, 189 Macquarie St, Parramatta, NSW – by Arcadis, dated 9 February 2017 (ref. *16246L01 rev3*).

From the information reviewed, we understand the following regarding the site and the proposed development:

- The proposed site comprises Lot 156 (DP1240854)
- The total site plan area is approximately 2,050 m^2
- The development proposes the construction of a 61 storey mixed use building, comprising:
  - 5 levels of basement parking (not including the B1 mezzanine and a pit maintenance level) containing 175 car parking spaces
  - A 4 storey podium providing commercial floor space and residents' amenities

  - Level 4 will provide residential amenities including a podium terrace with a swimming pool
  - A residential tower (levels 5 to 59) providing 391 build-to-rent apartments
  - Level 60 will provide residential amenities including a rooftop terrace, pool and lounge.
- The finished ground floor level will be RL 10.55 m AHD
- The lift overrun level (above to top storey) will be RL 202.95 m AHD.

Other details of the proposed re-development (i.e. loads, etc.) are not known by PSM.

2. Geotechnical Investigation

2.1 Fieldwork

Four days of fieldwork were undertaken on 22-24 and 28 September 2021, in which a total of four (4) boreholes were drilled using a track mounted drill rig. Two (2) boreholes were augered to maximum depths between 10 and 11.5 m below ground surface, with no rock coring. The remaining two (2) boreholes were cored to depths between 15 and 24 m below ground surface following augering.

Rotary augering techniques were employed in soil and some weathered rock units, and triple-tube coring was used in more competent rock.

The fieldwork was undertaken under the fulltime supervision of a PSM Geotechnical Engineer, who undertook the following tasks:

- Preparing field logs of material encountered
- Collecting soil samples for laboratory testing
- Conducting field tests such as Standard Penetrometer Tests (SPTs) and Point Load Index (Iss) tests.

SPTs were undertaken in soil units within selected boreholes. Point Load Index (Iss) tests were undertaken at approximately 1 m intervals on recovered rock core.

At the completion of the fieldwork, boreholes BH01, BH02 and BH04 were backfilled with the borehole cuttings and topped off with a grout-secured concrete plug. A piezometer (monitoring well) was installed in BH03.

The locations of the boreholes are presented in Figure 1. Selected site photographs are presented in Figures 2 to 6.

Appendix A presents the geotechnical borehole logs and photographs of the recovered rock core. Appendix B contains the results of the point load tests. Appendix C contains the piezometer construction record for the piezometer (PZ01) installed in BH03.

At the time of the investigation the eastern half of the site was inaccessible due to the presence of an existing building. Therefore, no boreholes were undertaken towards the eastern edge of the site. We recommend that prior to the detailed design stage additional boreholes be undertaken to understand the ground conditions in this area. The depth of soil units (FILL, ALLUVIUM, and RESIDUAL) may vary across the site, impacting the design of the retention system.

2.2 Laboratory testing

Soil samples from boreholes BH01, BH03 and BH04 were sent to a NATA approved laboratory for the following testing:

- 3 x Aggressivity and salinity tests.

The results of the laboratory testing are presented in Section 4.

3. Site Conditions

3.1 Geological Setting

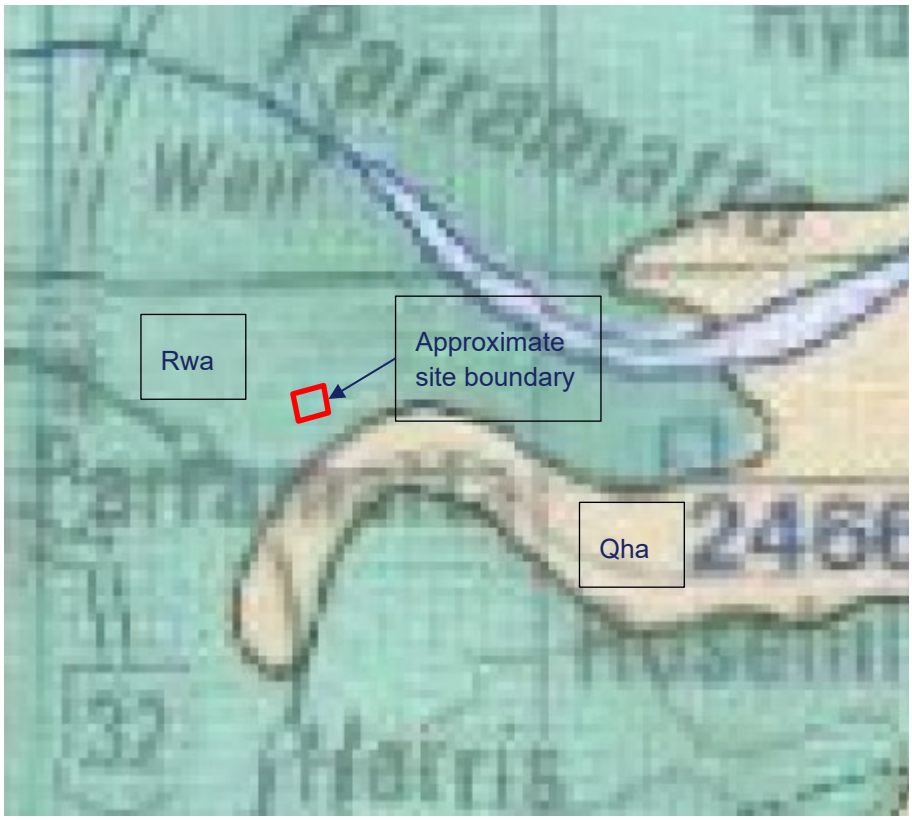
The 1:100,000 Sydney geological map (1983) indicates that the sjte is underlain by:

- (R_{wa}) Ashfield Shale of the Wianamatta Group comprising black to dark-grey shale and laminite.

The Sydney geological map indicates the presence of the Q_{ha} unit close to the site:

- (Q_{ha}) Silty to peaty quartz sand, silt, and clay. Ferruginous and humic cementation in places. Common shell layers.

Inset 1 presents the site location with regards to the geological settings.



Inset 1: Sydney 1:100,000 geological map (site marked in red)

Boreholes undertaken at 189 Macquarie Street, Parramatta, indicate the presence of alluvial and residual soils with maximum thicknesses of up to 7.7 m thick.

3.2 Surface Conditions

The existing site contains two buildings and carparking / hardstand areas. One building occupies the entire eastern half of the site. The second building is smaller and is located in the south-western quadrant of the site.

The carparking / hardstand areas are composed of concrete.

The site slopes down slightly towards the south-east. The north-west corner of the site has an approximate surface RL of approximately 11.83 m, and the middle of southern boundary has an RL of approximately 10.55.

The site is surrounded by existing high-rise buildings on its western, northern, and eastern boundaries. The western and eastern buildings are both up to 19 storeys high, and the northern building is up to 15 storeys high.

On its southern boundary the site is bound by Hassall Street. During the investigation of the site, the surface conditions were dry.

3.3 Subsurface Conditions

The subsurface conditions encountered within the boreholes are summarised in Table 1. Geotechnical borehole logs are provided in Appendix A.

Table 1 – Summary of Inferred Subsurface Conditions Encountered in PSM Boreholes

Inferred Unit	Depth to Top of Inferred Unit (m)	Material Description
PAVEMENT	0.0	CONCRETE
EXISTING FILL	0.09 – 0.12	Sandy GRAVEL; dark brown, fine to coarse, sub-angular up to 60 mm, medium dense, sand medium to coarse grained, trace brick up to 80 mm, moist. CLAY to Gravelly CLAY; high plasticity, dark brown to dark grey, firm, sub-rounded to sub-angular black gravel up to 40 mm, moist. SAND with gravel; coarse grained, light brown, loose, gravel sub-angular up to 4 mm.
ALLUVIUM	0.5 – 1.0	CLAY to CLAY trace gravel; high plasticity, reddish brown firm, gravel sub-rounded to sub-angular up to 5 mm, dry.
RESIDUAL SOIL	1.5 – 1.7	CLAY; high plasticity, grey, orange, red and yellow, stiff to hard, dry.
BEDROCK A	6.0	SILTSTONE; reddish brown to dark grey, thinly laminated to laminated, poorly developed to developed; very low to low strength; extremely weathered to slightly weathered, iron staining observed
BEDROCK B	9.5 – 10.5	SILTSTONE; reddish brown to dark grey, thinly laminated to laminated, poorly developed to developed; medium to high strength; with some low strength, fresh, iron staining observed

The thickness of each geotechnical unit encountered in the boreholes are summarised in Table 2.

Table 2 – Reduced Level at Top of Inferred Units Encountered in Boreholes

Borehole ID	Reduced Level at Top of Inferred Units (m AHD)						
	Pavement	Existing Fill	Alluvium	Residual Soil	Bedrock A	Bedrock B	EOH [1]
BH01	11.5	11.41	N/E	9.8	5.5	2.0	-3.7
BH02	10.6	10.48	10.0	9.1	4.6	N/E	-0.9
BH03	11.5	11.4	N/E	9.9	5.5	1.0	-12.5
BH04	11.7	11.61	10.7	10.2	5.7	N/E	1.7

1 EOH = End of Hole

2 N/E = Not encountered

Our experience in Ashfield Shale indicates that the following joints may be present in BEDROCK A and BEDROCK B:

- Two steep (90° ± 20°) orthogonal joint sets striking general north-south and east-west. These are ubiquitous
- Disperse joint clusters with dips usually in the range of 30° to 70°. Their frequency is considered random. Joints with dips within this range encountered in BH01 and BH03 indicate that these joints are present at site

- Such joints are typically spaced between 0.3 m and 5 m
- The length of the joints is typically less than 5 m, but joints longer than 20 m have been known to occur.

3.4 Groundwater

Groundwater was not encountered during augering in any boreholes during the investigation.

Following the drilling of BH03 a piezometer (PZ01) was installed. A groundwater monitoring device (HOBO) was placed in the piezometer to record water levels. The data was collected approximately 1 week after installation. The data indicated that groundwater fluctuated between RL -3.0 m and RL -3.4 m (i.e., 14.5 m and 14.9 m below ground surface).

Figure 7 contains the groundwater plot of BH03.

The Arcadis groundwater report (ref. *16246L01 rev3*, dated 9 February 2017) records groundwater levels at 189 Macquarie Street, Parramatta, as encountered in geotechnical investigations undertaken at that site by Jefferey and Katauskas (2011) and Asset Geotechnical (2015). The groundwater levels were recorded to range between RL 2.61 m and RL 2.84 m.

These recorded groundwater levels are up to 6.3 m higher than those encountered in our investigation at 12 Hassall Street.

Other monitoring data in and around the Paramatta CBD indicate water levels between 4 m and 7 m below ground level. Which at the site would indicate groundwater between RL3 m AHD and RL 6 m AHD.

It is likely that this discrepancy is the result of drained basement systems from the neighbouring buildings adjacent to and in the vicinity of 12 Hassall Street which may be causing the groundwater table to be drained below its natural level at the 12 Hassall Street site. We are aware of 189 Macquarie Street is a deep drained basement but there may be closer ones to the site also affecting the groundwater level at the site.

If this is the case, the long term design groundwater level may be higher than encountered in our investigation and may be related to the efficacy of the drainage systems from the neighbouring basements.

Prior to detailed design, further investigation of the groundwater level is recommended.

4. Laboratory Testing Results

4.1 Aggessivity and Salinity Test Results

Table 3 presents a summary of the analytical laboratory testing results. Detailed results are provided in Appendix C.

Table 3 – Summary of Analytical Laboratory Test Results

Borehole ID – Depth	Material Description	pH	Moisture Content [%]	Chloride by Discrete Analyser [mg/kg]	Soluble Sulphate [mg/kg]	Electrical Conductivity [µS/cm]	Resistivity ohm.cm	Exchangeable Cations [meq/100g]					ESP [%]
								Ca	Mg	K	Na	CEC	
BH01 – 7.0 m	SILTSTONE (BEDROCK)	6.8	9.0	160	70	235	4260	0.4	4.3	0.4	3.8	8.9	42.6
BH03 – 0.4 m	CLAY (FILL)	6.7	17.3	<50	30	76	13200	7.2	1.3	0.4	0.5	9.4	5.2
BH04 – 1.8 m	CLAY (RESIDUAL SOIL)	5.5	18.0	<10	30	38	26300	0.2	3.0	0.2	1.0	8.7	22.7

5. Exposure Classification

5.1 Aggressivity / Corrosivity

Table 4.8.1 of Australian Standard AS 3600 (2018) Concrete Structures provides criteria for exposure classification for concrete in sulphate soils based on sulphate content and acidity in the soil and groundwater. Based on the laboratory results of the soil testing completed, we assess the exposure classification for concrete in the EXISTING FILL, RESIDUAL and BEDROCK units to be A1.

Table 6.4.2(C) of Australian Standard AS 2159 (2009) "Piling Design and Installation" provides criteria for exposure classification for concrete piles based on sulphates in the soil and groundwater, soil and groundwater pH, and chlorides in groundwater. Based on laboratory results of the soil testing completed, we assess the exposure classification for concrete piles in the EXISTING FILL, RESIDUAL and BEDROCK units to be "Mild" to "Non-aggressive".

Table 6.5.2(C) of Australian Standard AS 2159 (2009) "Piling – Design and Installation" provides criteria for exposure classification for steel piles based on soil and groundwater pH, chlorides in soil and groundwater and resistivity. Based on laboratory results of the soil testing completed, we assess the exposure classification for steel piles in the EXISTING FILL, RESIDUAL and BEDROCK units to be "Mild" to "Non-aggressive".

5.2 Sodicity

Sodicity provides a measure of the likely dispersion on wetting and to shrink / swell properties of a soil. Soil sodicity is classified based on the Exchangeable Sodium Percentage (ESP) which is the amount of exchangeable sodium as a percentage of the Cation Exchange Capacity (DLWC, 2002).

The Exchangeable Sodium Percentages calculated from the laboratory results was compared to the criteria provided in "Site Investigations for Urban Salinity", DLWC (2002). In the EXISTING FILL unit, the laboratory testing indicates that this unit is classified as "sodic", as per DLWC (2002). In the RESIDUAL and BEDROCK units, the laboratory testing indicates that these units are classified as "highly sodic".

6. Discussion

This section contains due diligence advice the proposed development at 12 Hassall Street, Parramatta.

6.1 Temporary and Permanent Batters in Soil Units

The batter slope angles shown in Table 4 are recommended for the design of batters up to 3 m height and above the groundwater table, subject to the following recommendations:

1. The batters shall be protected from erosion.
2. Permanent batters shall be drained.
3. Temporary batters shall not be left unsupported for more than 1 month without further advice, and inspection by a geotechnical engineer should be undertaken following significant rain events.
4. Where loads are imposed or structures / services are located within on batter height of the crest of the batter, further advice should be sought.

If the conditions above cannot be met, further advice should be sought.

Where Fill is not engineered/controlled fill, batter slope angles should be assessed by a suitable experienced geotechnical engineer.

Table 4 – Design Batter Slope Angles

Unit	Temporary	Permanent
SOIL UNITS, e.g., ENGINEEERED FILL, NATURAL SOIL	2H: 1V	2.5H: 1V

Proper and suitable safe work method statements and OHS documents need to be developed for works to be undertaken in the vicinity of the crest and toe of batters.

The batters should be inspected by an experienced geotechnical engineer or engineering geologist during excavation to confirm the batter advice provided.

6.2 Excavation Support and Groundwater Management

Excavation of the proposed basements will result in permanent vertical cuts in the EXISTING FILL, ALLUVIUM, RESIDUAL and BEDROCK A and BEDROCK B units. These will need to be supported by some form of retaining structure.

As discussed in Section 2.1 no boreholes could be undertaken in the eastern half of the site, which may contain thicker soil profiles than those encountered in the western half of the site.

The selection of the appropriate retention system is a matter of design. The designer should consider the following factors in making its selection:

- Technical factors:
  - Performance, i.e., allowable deformations at the boundary and at adjacent buildings
  - Ground conditions (this is addressed below in Table 5 with the design parameters)
  - Surcharge loading and
  - Proximity of structures, buildings, roads etc. We note that on the eastern boundary the basement excavation is proposed to be directly adjacent to the building at 14 Hassall Street.
- Non-technical factors:
  - Cost (to build and to maintain)
  - Other constraints such as real estate, neighbouring site/boundary, aesthetics, legislation, etc.

The design of these structures should be based on the following geotechnical properties:

  - Effective strength parameters in
- Table 5 when assessing the earth pressure on retaining structures
- A lateral pressure of 10 kPa for vertical cuts in the BEDROCK A and BEDROCK B units. This is to allow for small blocks and rock wedges formed due to adverse defects that may exist within the unit
- Loading resulting from larger wedges resulting from interaction of the longer inclined joints within BEDROCK A and BEDROCK B units. For these purposes, the designer should consider the general defect descriptions presented in this report. Further geotechnical input with how to deal with this loading will be required at detailed design stage when the details of the excavation and proposed support system are better understood
- Proposed wall geometry
- Surcharge loads behind the retention

- Water pressure (depending on the type of structure). Whilst the measured water table has been recorded between RL -3.0 m and RL -3.4 m, water levels are known to vary with time and periods of wet weather etc. Groundwater level are also likely to be affected by the presence of neighbouring drained basements. In any case the designer should consider the above when selecting an appropriate design groundwater level in their design. Should a tanked basement be adopted it would be prudent to include appropriately designed pressure relief points at the design groundwater level to control the effects of higher groundwater levels associated with rare conditions or changes from neighbouring developments. At due diligence stage we recommend that a design groundwater level no less than RL5.0 m be adopted when considering the design of the retention system. Further investigation of the groundwater and effect of adjacent dwellings is recommended prior to detailed design stage
- Consideration of deformations at the boundary and neighbouring buildings
- Consideration of stress relief movements as discussed in Section 6.3.

Note that design of retention systems may be based on either Ka or Ko earth pressures. Design using active earth pressures provides the minimum lateral earth pressure that must be supported to avoid failure and requires a wall that can rotate or translate to allow the pressures to reduce to these values (vertical and lateral movements up to 2% of height may occur, typical movements will be much less).

Where the design is based on Ko pressures, construction should be carefully controlled to avoid unwanted effects. It should be noted that designing for Ko pressures do not, of themselves, ensure that movement does not occur. Movements are controlled by the construction method, especially sequence.

Both surface and sub-surface drainage needs to be designed and constructed properly to prevent pore water pressures from building up behind the retaining walls and in the retained material. Otherwise, appropriate water pressures must be included in the design.

6.3 Stress relief movements

- Ground movements occurring adjacent to a deep excavation are largely due to the combined effect of relief of insitu stress and the rock mass modulus. Higher stresses and/or lower rock mass modulus lead to higher movements. The selection of appropriate combinations of in-situ stress and rock mass modulus are therefore required to provide realistic estimates of ground movements and retaining wall deflections.
- In Sydney these ground movements are well understood based on numerous well-monitored projects. It is commonly found that horizontal movements due to excavation induced stress relief typically accumulate at the rate of 0.5 to 1 mm per metre of excavation depth in rock, with higher displacements of up to 2.0 mm per metre depth occasionally observed. Note that this ‘rule of thumb’ applies to vertically excavated unsupported faces, which experience full stress relief.

6.4 Foundations

6.4.1 Preamble

In general, the designer should note the following with regards to foundation design:

- The bearing capacities provided are contingent on piles or footings being vertically and centrally loaded. Further advice should be sought if the footings are not vertically centrically loaded
- Where adjacent foundation details differ (e.g., pile and pad, differing loads or ground conditions) differential settlement will need to be assessed
- Deflections should be checked using the recommended elastic parameters in
- Table 5.

6.4.2 Shallow Foundations

Pad footings can be proportioned on the basis of an allowable bearing pressure (ABP) for centric vertical loads provided in Table 5.

We note that an allowable bearing pressure (ABP) is not a soil property. It depends on many factors such as the size of the footings, the embedment depth, the load direction and eccentricity, the stiffness of the footing, the adopted factor of safety (FOS), as well as the soil properties. As footings get bigger or deeper the capacity increases rapidly, as the load gains eccentricity or becomes inclined, the capacity reduces rapidly.

Settlements can be estimated using the elastic parameters provided in Table 5. When assessing the settlement of the shallow footings, the designer needs to consider the additional ground settlement due to the total building load on both shallow and deeper units. The differential settlement due to the building load shall also be assessed.

Foundation conditions at the proposed shallow pad locations should be inspected by a suitable qualified geotechnical engineer prior to the pouring of concrete.

Specific advice is to be sought if footings are to be founded within 1 batter height of a ledge.

6.4.3 Piles

Piles should be designed in accordance with the requirements in AS 2159 (2009), *Piling – Design and Installation*. Selection of the pile system depends on many considerations and should be undertaken by the designer in conjunction with the Principal and contractor / builder. The parameters provided in

Table 5 may be adopted in the design of piles founded in the BEDROCK A and BEDROCK B units.

The designer should note the following with regards to the pile design:

- The ABP needs to be confirmed by a geotechnical engineer through pile inspections prior to pouring concrete
- Under permanent load, the contribution of side adhesion for soils including ENGINEERED FILL, ALLUVIAL and RESIDUAL units should be ignored
- Deflection should be checked using the recommended elastic parameters in Table 5
- Where adjacent foundation details differ (e.g., pile and pad, differing loads or ground conditions), differential settlement should also be assessed.

Should higher bearing capacities be required of the Bedrock, this may be available subject to further advice.

With regards to the pile design we recommend that:

- A basic geotechnical strength reduction factor, Φgb = 0.60 (AS2159 CL. 4.3.2) be adopted for a high redundancy system for an assessed average risk rating (ARR) between 2.5 and 3.0. This should be reviewed to suit the specific design and appropriate pile testing proposed by the structural / pile designers in accordance with the requirements of AS2159
- It may be possible to increase the pile reduction factors, if the details of the proposed pile installation procedures indicate a high level of quality control with regards to concrete placement, base cleanliness, etc.
- If a geotechnical strength reduction factor, Φg = 0.40 is adopted then no pile testing will be required (AS2159 Clause 8.2.4 (b)).

Where the pile is sized using the allowable bearing capacity in Table 5 (i.e., assuming all serviceability load is carried by the base), the settlement would be expected to be less than 1% of the pile diameter plus elastic shortening of the pile itself.

Table 5 – Engineering Parameters of Inferred Geotechnical Units

Inferred Unit	Bulk Unit Weight (kN/m3)	Soil Effective Strength Parameters		Ultimate Bearing Pressure under Vertical Centric Loading (kPa)	Allowable Bearing Pressure (ABP) under Vertical Centric Loading (kPa)	Ultimate Shaft Adhesion [3] (kPa)	Anchor Bond Stress (kPa)		Elastic Parameters	
		c' (kPa)	φ' (deg)				Allowable	Ultimate	Long Term Youngs Modulus (MPa)	Poisson's Ratio
EXISTING FILL	18	0	27	N/A	N/A	N/A	N/A	N/A	8	0.3
ENGINEERED FILL / ALLUVIUM / RESIDUAL[1]	18	3	30	420	150	N/A	N/A	N/A	15	0.3
BEDROCK A [2,4]	22	10	30	3,000	1,000	150	150	300	200	0.25
BEDROCK B [2,4]	24	150	30	6,000 – 30,000 [6]	2,500 – 5,000 [6]	350	350	700	500 – 1000 [7]	0.25

1 Pad footings (for ABP of 150 kPa) should have a minimum horizontal dimension of 1.0 m and a minimum embedment depth of 0.5 m.

2 Ultimate values occur at large settlement (>5% of minimum footing / pile dimensions).

3 Clean socket of roughness category R2 or better.

4 End bearing pressure to cause settlement of <1% of minimum footing / pile dimensions.

5 Further advice should be sought for shallow footings to be founded within the EXISTING FILL unit.

6 Ultimate bearing pressure of 30,000 kPa and allowable bearing pressure of 5,000 kPa may be achievable, subject to confirmation by geotechnical inspections and spoon testing at base of excavation.

Young's Modulus of 1000 MPa may be adopted where higher bearing pressure values are adopted, as per note 6

7. Suitability and Recommendations

Provided that ground conditions are as encountered in the investigation herein described, we consider that the site is suitable for the proposed development.

Further investigation should be undertaken once the eastern half of the site is accessible to confirm ground conditions. We note in particular the possibility of the presence of thicker soil profiles up to 8 m thick in the eastern portion of the site.

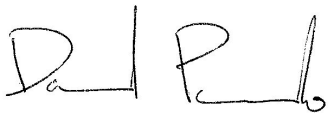
The measured groundwater at the site is lower than measured in neighbouring sites and should not be used as the basis of design without the further investigations regarding effect of neighbouring basements. A minimum design groundwater level for use at due diligence stage has been provided in Section 6.2 of this report.

8. General

If at any time, the conditions are found to vary from those described in this report, further advice should be sought.

Should there be any queries, please no not hesitate to contact the undersigned.

Yours Sincerely



GREG FAZZZONE
GEOTECHNICAL ENGINEER

DAVID PICCOLO
PRINCIPAL

Encl.	Figure 1	Site Locality Plan
	Figure 2	Selected Site Photographs (1 of 5)
	Figure 3	Selected Site Photographs (2 of 5)
	Figure 4	Selected Site Photographs (3 of 5)
	Figure 5	Selected Site Photographs (4 of 5)
	Figure 6	Selected Site Photographs (5 of 5)
	Figure 7	Groundwater Level Plot
	Appendix A	Geotechnical Borehole Logs
	Appendix B	Point Load Test Results
	Appendix C	PZ01 Piezometer Construction Record
	Appendix D	Salinity and Aggressivity Laboratory Test Results

Legend

- PSM Borehole Locations
- Approximate Site Boundary

Notes:

1. Piezometer (monitoring well) was installed in BH03.
2. Image taken from Nearmap, dated 7 August 2021.

N

2 0 2 4 6 8m

1 : 400 FULL SIZE A3

P S M

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12 Hassall Street
Parramatta

BOREHOLE LOCALITY PLAN

PSM4580-003L | Figure 1

Photo 1 - Typical site conditions comprising two buildings and carkparking/hardstand areas

Photo 2 - Towers to the west (left image) and north (right image) of the site

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12 Hassall Street

Parramatta

SELECTED SITE PHOTOGRAPHS (1 of 5)

PSM4580-003L	Figure 2

Photo 3 - Towers to the east (left image) and south (right image) of the site

Photo 4 - Existing building occupying the eastern half of the site

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Parramatta

SELECTED SITE PHOTOGRAPHS (2 of 5)

PSM4580-003L	Figure 3

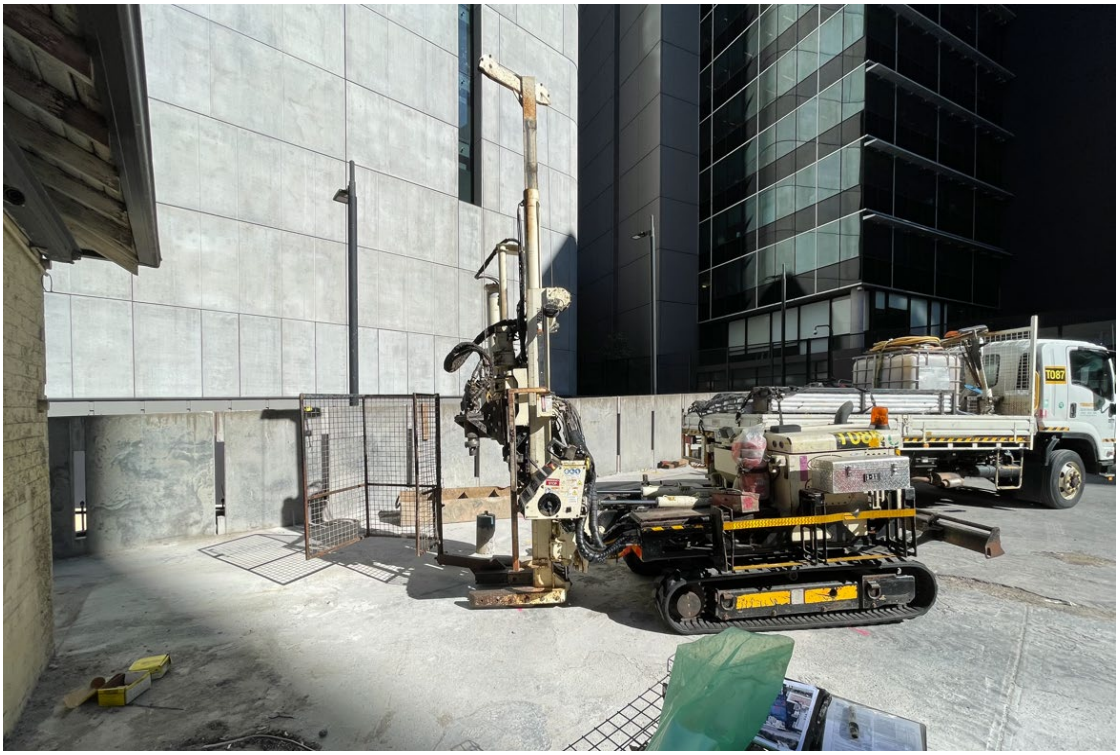

Photo 5 - Typical drill rig set up (at BH03)

Photo 6 - Typical FILL (CLAY) unit

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SELECTED SITE PHOTOGRAPHS (3 of 5)

P S M	PSM4580-003L	Figure 4

Photo 7 - Typical RESIDUAL (CLAY) unit

Photo 8 - Typical RESIDUAL (CLAY) unit at BH02

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SELECTED SITE PHOTOGRAPHS (4 of 5)

PSM4580-003L	Figure 5

Photo 9 - SILTSTONE cuttings at BH03

Photo 10 - Recovered cuttings from BH02

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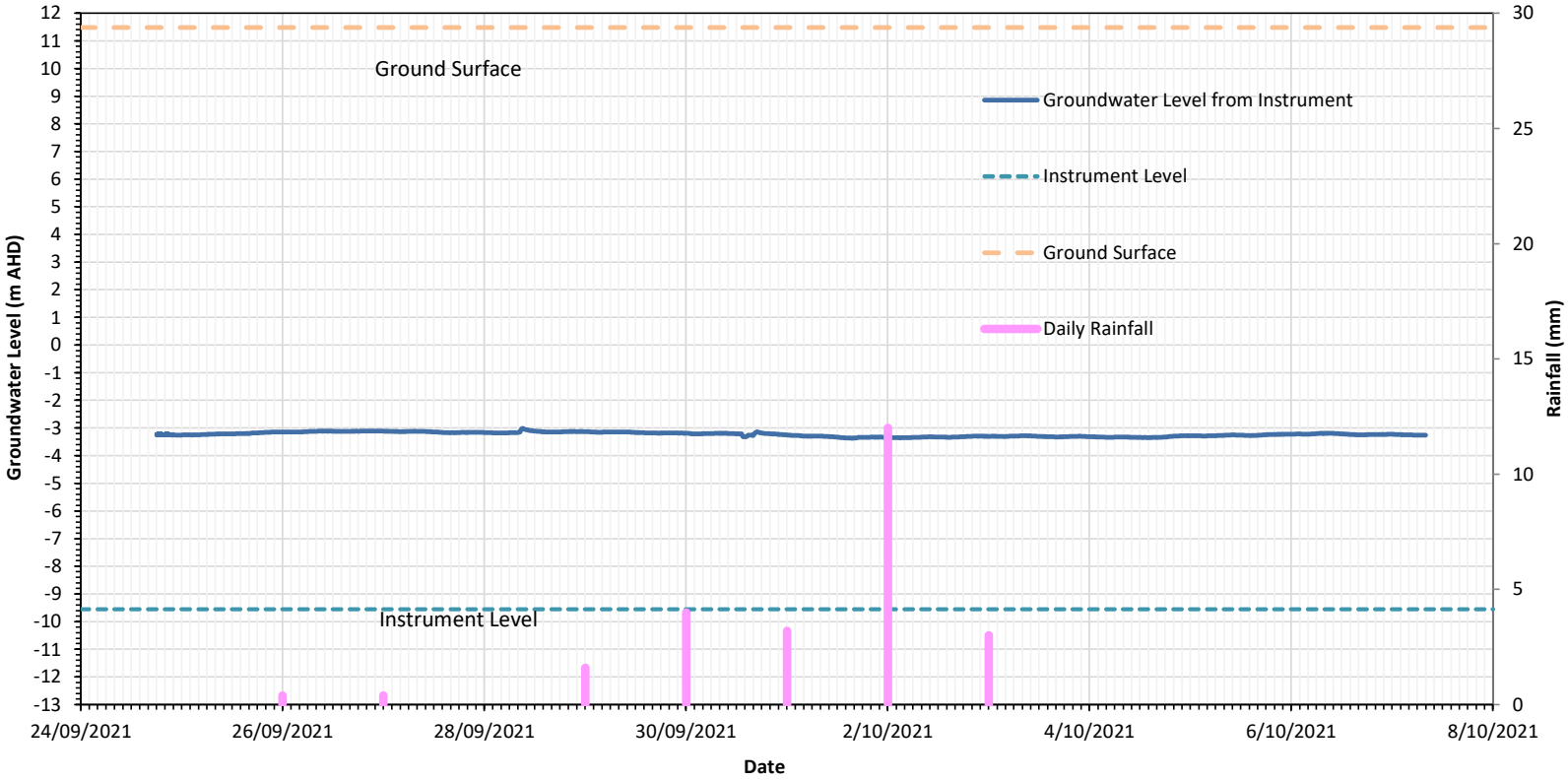
SELECTED SITE PHOTOGRAPHS (5 of 5)

PSM4580-003L	Figure 6

Groundwater Level in Borehole BH03



Notes:

1. Instrument elevation (m RL): -9.55
2. Ground surface elevation (mRL): 11.5
3. Water level was measured manually on 07/10/2021
4. Data logger instrument installed on 24/09/2021
5. Rainfall data from BOM, station 066124, downloaded 07/10/2021

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12 Hassall Street
Parramatta, NSW
GROUNDWATER MONITORING
PZ01 (BH03)

PSM4580-003L	Figure 7

Appendix A
Geotechnical Borehole Logs

Borehole ID

BH01

Page 1 of 5

Engineering Log - Non Cored Borehole

Project No.: PSM4580

Client:	Gurner	Commenced:	24/09/2021
Project Name:	12 Hassall Street, Parramatta	Completed:	28/09/2021
Hole Location:	Refer to Figure 1	Logged By:	JS
Hole Position:	315641.0 m E 6256274.0 m N MGA2020 Zone 56	Checked By:	GF

Drill Model and Mounting:	Geoprobe 7822DT	Inclination:	-90°	RL Surface:	11.50 m		
Hole Diameter:	130 mm	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information								***Soil Description***				***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
HA		N	Not Encountered			11.50	0			CONCRETE				0.00: PAVEMENT
									GW	Sandy GRAVEL: dark brown, fine to coarse, sub-angular up to 60 mm; sand medium to coarse, trace brick up to 80 mm		MD		0.09: FILL
									CH	Gravelly CLAY: high plasticity, dark brown, black; gravel sub-angular up to 40 mm	M			
									CH	CLAY trace gravel: high plasticity, dark grey, brown; gravel sub-rounded to sub-angular up to 5 mm				
						10.5	1		CH	CLAY trace gravel: high plasticity, reddish brown; gravel sub-rounded to sub-angular up to 5 mm		F		
										Becoming reddish orange, brown				1.60: Plastic observed
									CH	CLAY: high plasticity, grey, red				1.70: RESIDUAL SOIL
AD/V		N				9.5	2					St		
						8.5	3			Becoming grey	D			
						7.5	4					VSt		

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger screwing
CT - Continuous push tube 1.5m long 76mm diameter

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM4580

Client:	Gurner	Commenced:	24/09/2021
Project Name:	12 Hassall Street, Parramatta	Completed:	28/09/2021
Hole Location:	Refer to Figure 1	Logged By:	JS
Hole Position:	315641.0 m E 6256274.0 m N MGA2020 Zone 56	Checked By:	GF

Drill Model and Mounting:	Geoprobe 7822DT	Inclination:	-90°	RL Surface:	11.50 m		
Hole Diameter:	130 mm	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information							***Soil Description***				***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Encountered						CH		D	VSt		
						5.5	6			SILTSTONE: grey, very low strength, highly weathered				6.00: BEDROCK 6.65: Start of coring
				D-1		4.5	7			Continued on cored borehole sheet				7.00: End of augering (350 mm cave-in at start of coring) Sample taken for aggressivity and salinity
						3.5	8							
						2.5	9							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger screwing
CT - Continuous push tube 1.5m long 76mm diameter

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
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VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4580

Client:	Gurner	Commenced:	24/09/2021
Project Name:	12 Hassall Street, Parramatta	Completed:	28/09/2021
Hole Location:	Refer to Figure 1	Logged By:	JS
Hole Position:	315641.0 m E 6256274.0 m N MGA2020 Zone 56	Checked By:	GF

Drill Model and Mounting:	Geoprobe 7822DT	Inclination:	-90°	RL Surface:	11.50 m		
Barrel Type and Length:	NMLC 1.5 m	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information							Rock Substance						Rock Mass Defects	
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL L M H VH EH 0.1 0.3 1 3 10	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
					5.5	6		Continued from non-cored borehole sheet				
NMLC	Not Encountered				4.5	7		Cave-in material (between 6.65 m and 7 m)				
		69	Is(50) d=0.02 a=0.09 MPa					SILTSTONE: grey, poorly developed, iron staining observed				BP, 0°, CN, PR, RF BP, 25°, CN, PR, RF BP, 0°, CN, PR, S BP, 0°, CN, PR, S BP, 0°, CN, PR, S BP, 20°, CN, PR, RF BP, 0°, CN, PR, S
												FZ, 0°, 40 mm
		23	Is(50) d=0.04 a=0.22 MPa		3.5	8		CLAY: high plasticity, grey, dark brown; dry; very stiff				
								SILTSTONE: grey, poorly developed, iron staining observed Becoming dark grey, thinly laminated, developed Becoming reddish brown Becoming dark grey				BP, 0°, CL, PR, S FZ, 0°, 50 mm BPx2, 0°, CL, PR, S FZ, 0°, 30 mm BP, 0°, CL VR, PR, S BP, 0°, CL VR, PR, S BP, 0°, CL VR, PR, S BP, 0°, CL,G, PR, S BP, 15°, CL,G, PR, S BPx2, 0°, CL, PR, S BP, 0°, CL, PR, S BP, 0°, CL VR, PR, S FZ, 0°, 50 mm BP, 0°, CN, PR, S BP, 0°, CN, PR, S BP, 0°, CN, PR, S BP, 10°, PR BP, 0°, CL,G, PR, S FZ, 0°, 60 mm BP, 0°, CL, PR, S BP, 0°, CN, PR, S BP, 0°, CL VR, PR, S BP, 0°, CL VR, PR, S BP, 0°, CL VR, PR, S BP, 0°, CL VR, PR, S
		100	Is(50) d=0.13 a=0.48 MPa		2.5	9						

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

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

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4580

Client:	Gurner	Commenced:	24/09/2021
Project Name:	12 Hassall Street, Parramatta	Completed:	28/09/2021
Hole Location:	Refer to Figure 1	Logged By:	JS
Hole Position:	315641.0 m E 6256274.0 m N MGA2020 Zone 56	Checked By:	GF

Drill Model and Mounting:	Geoprobe 7822DT	Inclination:	-90°	RL Surface:	11.50 m		
Barrel Type and Length:	NMLC 1.5 m	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information							***Rock Substance***			***Rock Mass Defects***	
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL L M H VH EH 0.1 0.3 1 3 10	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
NMLC	Not Encountered	100	Is(50) d=0.14 a=0.47 MPa		0.5	11						BP, 0°, CN, PR, S JT, 40°, CN, PR, S BP, 0°, CL VR, PR, S BP, 0°, CL VR, PR, S
		94	Is(50) d=0.1 a=0.57 MPa		-0.5	12						BP, 0°, CN, PR, S BP, 5°, CN, PR, S BP, 0°, CN, PR, S BP, 0°, CN, PR, S JT, 90°, CN, PR, S BP, 0°, CL VR, PR, S
		97	Is(50) d=0.41 a=0.49 MPa		-1.5	13						BP, 0°, CL VR, PR, S BP, 0°, CL VR, PR, S
		91	Is(50) d=0.53 a=1.64 MPa Is(50) d=0.87 a=2.3 MPa		-2.5	14						BP, 0°, CN, PR, S JT, 70°, CN, PR, S BP, 0°, CL VR, PR, S BP, 0°, CL VR, PR, S BP, 0°, CN, PR, S BP, 0°, CL VR, PR, S BP, 0°, CL VR, PR, S

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

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

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4580

Client:	Gurner	Commenced:	24/09/2021
Project Name:	12 Hassall Street, Parramatta	Completed:	28/09/2021
Hole Location:	Refer to Figure 1	Logged By:	JS
Hole Position:	315641.0 m E 6256274.0 m N MGA2020 Zone 56	Checked By:	GF

Drill Model and Mounting:	Geoprobe 7822DT	Inclination:	-90°	RL Surface:	11.50 m		
Barrel Type and Length:	NMLC 1.5 m	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information							Rock Substance																	Rock Mass Defects		
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Weathering XW	HW	MW	SW	FR	Strength Is(50) ● - Axial ○ - Diametral VL 0.1	L	M 0.3	H 1	VH 3	EH 10	Defect Spacing (mm) <20	60	200	600	1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
		91	Is(50) d=0.98 a=2.44 MPa													○	●							BP, 0°, CL,S, PR, S
					-4.5	16		Hole Terminated at 15.20 m Target depth																		
					-5.5	17																				
					-6.5	18																				
					-7.5	19																				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

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

Strength
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L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

JOB NO: PSM4580

PROJECT: 12 Hassall Street

LOCATION: Parramatta

DATE: 24/09/2021 to 28/09/2021

BH ID: BH01

FROM: 6.65 m

TO: 10.0 m

Gurner

12 Hassall Street

Parramatta

CORE PHOTOS BH01

(Core Photo 1 OF 3)

PSM4580-003L	Appendix A

JOB NO: PSM4580

PROJECT: 12 Hassall Street

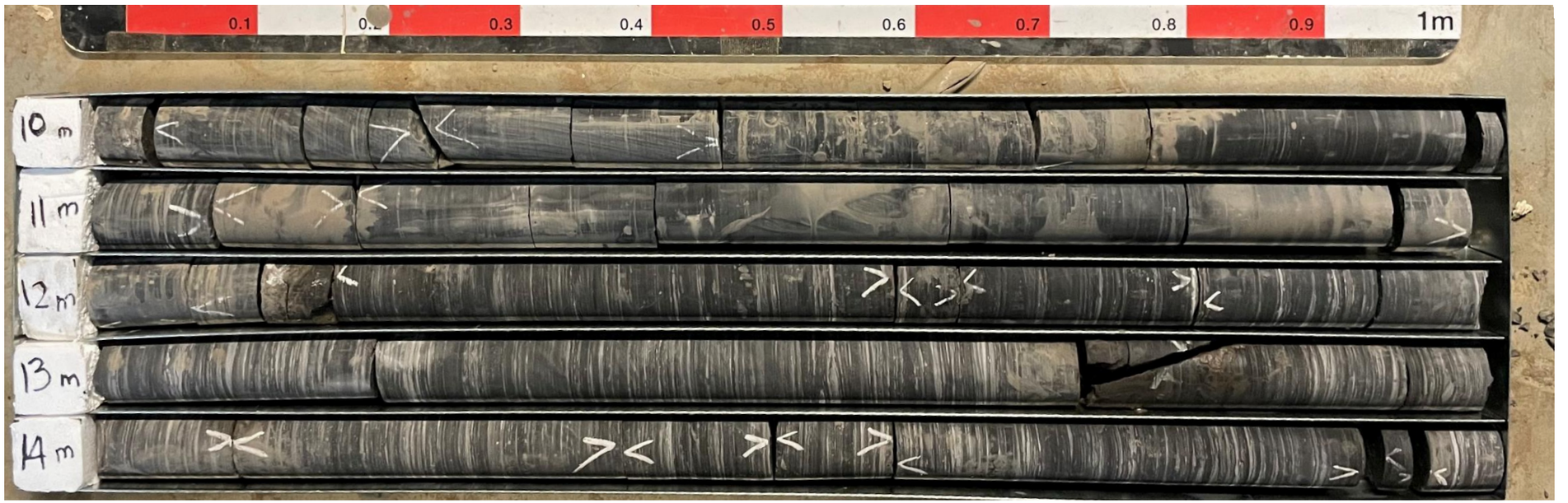
LOCATION: Parramatta

DATE: 24/09/2021 to 28/09/2021

BH ID: BH01

FROM: 10.0 m

TO: 15.0 m



Gurner

12 Hassall Street

Parramatta

CORE PHOTOS BH01

(Core Photo 2 OF 3)

PSM4580-003L	Appendix A

JOB NO: PSM4580

PROJECT: 12 Hassall Street

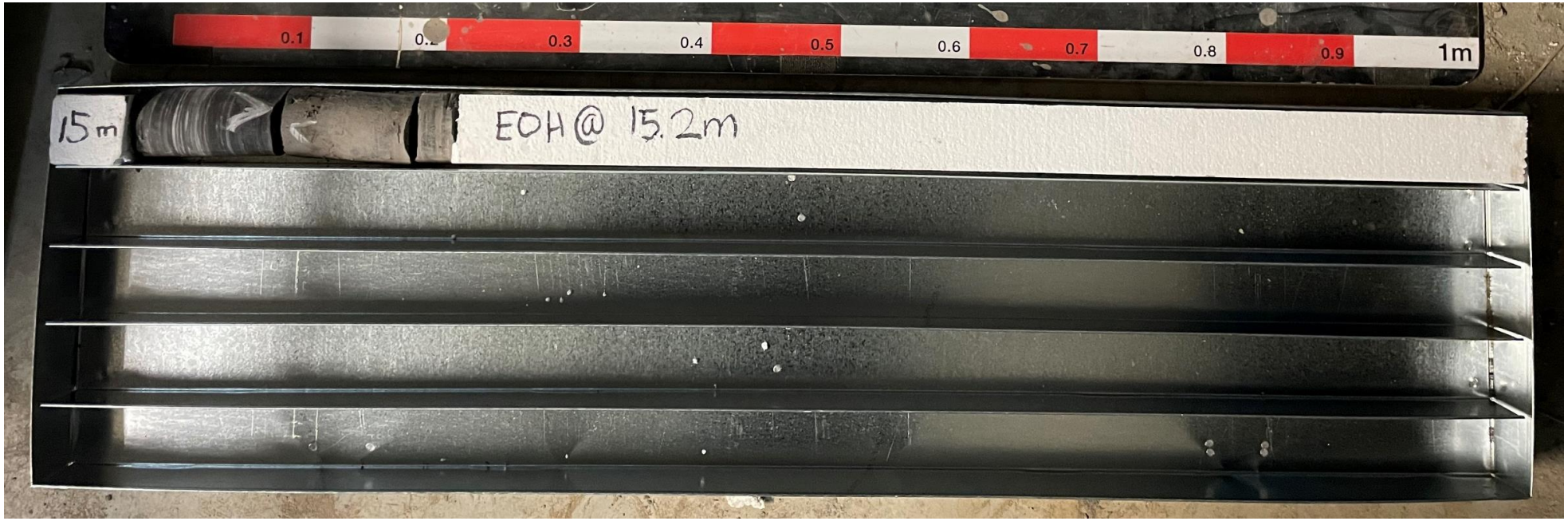
LOCATION: Parramatta

DATE: 24/09/2021 to 28/09/2021

BH ID: BH01

FROM: 15.0 m

TO: 15.2 m



Gurner

12 Hassall Street

Parramatta

CORE PHOTOS BH01

(Core Photo 3 OF 3)

PSM4580-003L	Appendix A

Engineering Log - Non Cored Borehole

Project No.: PSM4580

Client:	Gurner	Commenced:	28/09/2021
Project Name:	12 Hassall Street, Parramatta	Completed:	28/09/2021
Hole Location:	Refer to Figure 1	Logged By:	JS
Hole Position:	315650.0 m E 6256251.0 m N MGA2020 Zone 56	Checked By:	GF

Drill Model and Mounting:	Geoprobe 7822DT	Inclination:	-90°	RL Surface:	10.60 m		
Hole Diameter:	130 mm	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information								***Soil Description***					***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
										CONCRETE				0.00: PAVEMENT
AD/T		N	Not Encountered	SPT: 1,2,4 N=6					CH	CLAY: high plasticity, dark brown	M			0.12: FILL
						9.6	1		CH	CLAY trace gravel: high plasticity, reddish brown, gravel sub-rounded to sub-angular up to 5 mm		F		0.60: Possibly ALLUVIUM
AD/V		N		SPT: 5,6,9 N=15		8.6	2		CH	CLAY: high plasticity, grey, orange, rock fabric visible				1.50: RESIDUAL SOIL
										Becoming grey, yellow, red	D			
				SPT: 3,5,9 N=14		7.6	3					St		
										Becoming light grey, yellow				
						6.6	4							
				SPT: 10,12,13 N=25								VSt		
										Becoming dark red Becoming light grey, yellow				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger screwing
CT - Continuous push tube 1.5m long 76mm diameter

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM4580

Client:	Gurner	Commenced:	28/09/2021
Project Name:	12 Hassall Street, Parramatta	Completed:	28/09/2021
Hole Location:	Refer to Figure 1	Logged By:	JS
Hole Position:	315650.0 m E 6256251.0 m N MGA2020 Zone 56	Checked By:	GF

Drill Model and Mounting:	Geoprobe 7822DT	Inclination:	-90°	RL Surface:	10.60 m		
Hole Diameter:	130 mm	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information								Soil Description				Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Encountered			4.6	6		CH	CLAY: high plasticity, grey, orange, rock fabric visible *(continued)*	D	VSt		
										SILTSTONE: grey, very low strength grading into low to medium strength, highly weathered				6.00: BEDROCK Strength inferred from cuttings and drill resistance
AD/T		N				3.6	7							7.00: Drill bit changed due to increased drill resistance
						2.6	8							
						1.6	9							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger screwing
CT - Continuous push tube 1.5m long 76mm diameter

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM4580

Client:	Gurner	Commenced:	28/09/2021
Project Name:	12 Hassall Street, Parramatta	Completed:	28/09/2021
Hole Location:	Refer to Figure 1	Logged By:	JS
Hole Position:	315650.0 m E 6256251.0 m N MGA2020 Zone 56	Checked By:	GF

Drill Model and Mounting:	Geoprobe 7822DT	Inclination:	-90°	RL Surface:	10.60 m		
Hole Diameter:	130 mm	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information								***Soil Description***				***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/T		N	Not Encountered			-0.4	11				D			
						-1.4	12			Hole Terminated at 11.50 m Target depth				
						-2.4	13							
						-3.4	14							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger screwing
CT - Continuous push tube 1.5m long 76mm diameter

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

BH03

Engineering Log - Non Cored Borehole

Project No.: PSM4580

Client:	Gurner	Commenced:	22/09/2021
Project Name:	12 Hassall Street, Parramatta	Completed:	24/09/2021
Hole Location:	Refer to Figure 1	Logged By:	JS
Hole Position:	315632.0 m E 6256263.0 m N MGA2020 Zone 56	Checked By:	GF

Drill Model and Mounting:	Geoprobe 7822DT	Inclination:	-90°	RL Surface:	11.50 m		
Hole Diameter:	130 mm	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information								***Soil Description***					***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/T		N	Not Encountered	D 0.40 m SPT: 2,3,4 N=7		10.5	1		CONCRETE					0.00: PAVEMENT
									SW	SAND with gravel: light brown, coarse; gravel sub-angular up to 4 mm				0.10: FILL
									CH	CLAY: high plasticity, dark brown				0.40: Sample taken for aggressivity and salinity
									CH	CLAY: high plasticity, reddish brown	M	F		
				SPT: 2,3,5 N=8		9.5	2			Becoming dark brown, orange				
										Becoming brown, red, grey, shale fragments observed				1.50: Construction waste observed
									CH	CLAY: high plasticity, light brown, red, grey, rock fabric visible				1.60: RESIDUAL SOIL
						8.5	3			Trace gravel sub-rounded up to 5 mm observed	D	St		
AD/V		N				7.5	4					VSt		

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger screwing
CT - Continuous push tube 1.5m long 76mm diameter

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM4580

Client:	Gurner	Commenced:	22/09/2021
Project Name:	12 Hassall Street, Parramatta	Completed:	24/09/2021
Hole Location:	Refer to Figure 1	Logged By:	JS
Hole Position:	315632.0 m E 6256263.0 m N MGA2020 Zone 56	Checked By:	GF

Drill Model and Mounting:	Geoprobe 7822DT	Inclination:	-90°	RL Surface:	11.50 m		
Hole Diameter:	130 mm	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information								***Soil Description***				***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Encountered						CH		D	VSt		5.6: Start of coring
						5.5	6			Continued on cored borehole sheet				6.00: End of augering (400 mm cave-in at start of coring), V-bit refusal
						4.5	7							
						3.5	8							
						2.5	9							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger screwing
CT - Continuous push tube 1.5m long 76mm diameter

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
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VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4580

Client:	Gurner	Commenced:	22/09/2021
Project Name:	12 Hassall Street, Parramatta	Completed:	24/09/2021
Hole Location:	Refer to Figure 1	Logged By:	JS
Hole Position:	315632.0 m E 6256263.0 m N MGA2020 Zone 56	Checked By:	GF

Drill Model and Mounting:	Geoprobe 7822DT	Inclination:	-90°	RL Surface:	11.50 m		
Barrel Type and Length:	NMLC 1.5 m	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information							***Rock Substance***			***Rock Mass Defects***	
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Weathering XW HW MW SW FR Strength Is(50) ● - Axial ○ - Diametral VL L M H VH EH 0.1 0.3 1 3 10	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
								Continued from non-cored borehole sheet			
NMLC	Not Encountered	51	Is(50) d=0.02 a=0.07 MPa		5.5	6		Cave-in material (augering ended at 6 m, start of coring at 5.6 m because of 400 mm cave-in)			
								SILTSTONE: dark grey, brown, thinly laminated, poorly developed			BP, 0°, CN, PR, S CZ, CL, IR, 60 mm SM, 0°, CL, 10 mm SM, 0°, CL, 50 mm BP, 0°, CL, PR, S BPx2, 0°, CL, PR, S BP, 0°, CL, PR, S JT, 90°, CL, PR, S BP, 3°, CL, S SM, RF, 5 mm
								Orange and dark brown laminations, iron stained Becoming developed			
					4.5	7		Dark red laminations			JT, 80°, CL BP, 20°, CL, PR, S FZ, 3°, CL,RF, 60 mm BP, 0°, CN, PR, S
		41	Is(50) d=0.04 a=0.27 MPa								BP, 0°, CN, PR, S JT, 70°, CL, PR, S BPx2, 0°, CN, PR, S CZ, RF, 100 mm SM, 0°, CL, 20 mm BP, 0°, CN, PR, S
								Becoming orange brown			BP, 0°, FE,CLVR, PR, S
					3.5	8		Becoming dark grey			BP, 0°, CN, PR, S BP, 0°, CLVR, PR, S BP, 0°, CLVR, PR, S BP, 0°, CN, PR, S BPx2, 0°, CN, PR, S BP, 0°, CN, PR, S JT, 70°, CN, PR, S FZ, RF, 40 mm
			Is(50) d=0.04 a=0.28 MPa					Becoming orange brown and dark grey			BP, 0°, CN, PR, S BP, 0°, CLVR, PR, S
								Becoming dark grey Becoming laminated			JTx2, 20°, CN, PR, S BP, 3°, CLVR, PR, S BPx2, 0°, CL, PR, S BPx2, 0°, CN, PR, S
					2.5	9					FZ, 10 mm JT, 40°, CL, PR, S BP, 0°, CN, PR, S BP, 0°, CL, PR, S BP, 0°, CL, PR, S BP, 0°, CL, PR, S BP, 3°, CN, PR, S BPx2, 0°, CN, PR, S
		89	Is(50) d=0.05 a=0.43 MPa								BP, 0°, CN, PR, S JT, 85°, CN, PR, S CZ, RF, 35 mm

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

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

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4580

Client:	Gurner	Commenced:	22/09/2021
Project Name:	12 Hassall Street, Parramatta	Completed:	24/09/2021
Hole Location:	Refer to Figure 1	Logged By:	JS
Hole Position:	315632.0 m E 6256263.0 m N MGA2020 Zone 56	Checked By:	GF

Drill Model and Mounting:	Geoprobe 7822DT	Inclination:	-90°	RL Surface:	11.50 m		
Barrel Type and Length:	NMLC 1.5 m	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information							***Rock Substance***			***Rock Mass Defects***	
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL L M H VH EH 0.1 0.3 1 3 10	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
NMLC	Not Encountered	89	Is(50) d=0.12 a=0.75 MPa		0.5	11		Becoming massive				BP, 0°, CN, PR, S BP, 0°, CN, PR, S BP, 0°, CN, PR, S BP, 5°, CN, PR, S JT, 90° BP, 0°, CLVR, PR, S BP, 0°, CLVR, PR, S
		96	Is(50) d=0.24 a=0.37 MPa		-0.5	12		Becoming laminated Becoming thinly laminated and developed NO CORE: 60 mm SILTSTONE: dark grey, thinly laminated, developed				BP, 0°, CLVR, PR, S BP, 0°, CN, PR, S BP, 0°, CN, PR, S BP, 0°, CLVR, PR, S BP, 0°, CN, PR, S BP, 0°, CN, PR, S CZ, RF, 10 mm FZ, 60 mm JT, 90°, CN, PR, S BP, 0°, CN, PR, S
		80	Is(50) d=0.5 a=1.54 MPa		-1.5	13						BP, 0°, CN, PR, S JT, 90°, CN, PR, S BP, 0°, CN, PR, S JT, 45°, CN, PR, S BP, 0°, CN, PR, S BP, 0°, CN, PR, S BP, 0°, CN, PR, S CZ, RF, 20 mm BP, 25°, CN, PR, S BP, 0°, CN, PR, S BP, 20°, CN, PR, S BP, 0°, CN, PR, S BP, 0°, CN, PR, S
		92	Is(50) d=0.78 a=1.87 MPa		-2.5	14						BP, 0°, CN, PR, S BP, 0°, CN, PR, S
			Is(50) d=0.63 a=2.29 MPa									

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

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

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4580

Client:	Gurner	Commenced:	22/09/2021
Project Name:	12 Hassall Street, Parramatta	Completed:	24/09/2021
Hole Location:	Refer to Figure 1	Logged By:	JS
Hole Position:	315632.0 m E 6256263.0 m N MGA2020 Zone 56	Checked By:	GF

Drill Model and Mounting:	Geoprobe 7822DT	Inclination:	-90°	RL Surface:	11.50 m		
Barrel Type and Length:	NMLC 1.5 m	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information							***Rock Substance***				***Rock Mass Defects***	
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL L M H VH EH 0.1 0.3 1 3 10	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
NMLC	Not Encountered	66	Is(50) d=0.57 a=1.74 MPa		-4.5	16				○●		BP, 0°, CN, PR, S BP, 0°, CLVR, PR, S BP, 0°, CLVR, PR, S BP, 0°, CN, PR, S BP, 10°, CLVR, PR, S BP, 0°, CN, PR, S BP, 0°, CN, PR, S BP, 0°, CN, PR, S BP, 0°, CN, PR, S BPx2, 0°, CN, PR, S BP, 0°, CN, PR, S
		34	Is(50) d=0.91 a=1.88 MPa		-5.5	17				○●		BP, 0°, CLVR, PR, S BP, 0°, CLVR, PR, S BP, 5°, CLVR, PR, S BP, 0°, CLVR, PR, S BP, 0°, CLVR, PR, S BP, 0°, RF, PR, S BP, 0°, RF, IR, S BP, 0°, CLVR,S, PR, S FZ, 30°, CLVR,S, 30 mm BP, 30°, CLVR,S, PR, RF FZ, 0°, CLVR,S, PR, RF, 50 mm
			Is(50) d=1.25 a=1.78 MPa		-6.5	18				○●		BP, 0°, CLVR,S, PR, RF JT, 45°, CLVR,S, PR, RF JT, 20°, IR BP, 20°, CLVR,S, PR, S FZ, IR, 40 mm JT, 75°, PR, S JT, 20°, CLVR,S,G, PR, S JT, 20°, CLVR,S,G, PR, S BP, 0°, CLVR,S,G, PR, S BP, 0°, CN, PR, S BP, 0°, CL,S, PR, RF JT, 30°, CL,S, PR, RF FZ, IR, 30 mm
		61	Is(50) d=0.73 a=1.58 MPa		-7.5	19				○●		JT, 70°, CL,S, PR, S BP, 10°, CL,S, PR, S BP, 10°, CL,S, PR, S BP, 0°, CN, PR, S BP, 0°, CN, PR, S JT, 45°, CLVR, PR, S BP, 20°, CLVR, PR, S BP, 10°, CN, PR, S BPx2, 10°, CN, PR, S BP, 10°, CLVR, S, PR, S CZ, RF, S BP, CL,S, PR, S BP, 0°, CLVR,S, PR, S BP, 0°, CLVR,S, PR, S BP, 0°, CLVR,S, PR, S
		36	Is(50) d=0.52 a=1.07 MPa					Becoming darker grey		○●		BP, 0°, CN, PR, S BP, 0°, CN, PR, S BP, 0°, RF, PR, S BP, 25°, CN, PR, S BP, 0°, CN, PR, S BP, 0°, CN, PR, S

Method
- AD/T - Auger drilling TC bit
- AD/V - Auger drilling V bit
- WB - Washbore
- HQ3- Wireline core (63.5 mm)
- PQ3- Wireline core (85.0 mm)
- SPT- Standard penetration test
- PT - Push tube
- WPT - Water pressure test

Water
- Inflow
- Partial Loss
- Complete Loss

Graphic Log/Core Loss
- Core recovered (hatching indicates material)
- No core recovery

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

Strength
- VL - Very Low
- L - Low
- M - Medium
- H - High
- VH - Very High
- EH - Extremely High

Defect Type
- FT - Fault
- SS - Shear Surface
- SZ - Shear Zone
- BP - Bedding parting
- SM - Seam
- IS - Infilled Seam
- JT - Joint
- CO - Contact
- CZ - Crushed Zone
- VN - Vein
- FZ - Fracture Zone
- BSH - Bedding Shear
- DB - Drilling Break

Infilling/Coating
- CN - Clean
- SN - Stain
- VN - Veneer
- CO - Coating
- RF - Rock fragments
- G - Gravel
- S - Sand
- Z - Silt
- CA - Calcite
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- FE - Iron
- QZ - Quartz
- X - Carbonaceous

Roughness
- SL - Slickensided
- POL - Polished
- S - Smooth
- RF - Rough
- VR - Very Rough

Shape
- PR - Planar
- CU - Curved
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- ST - Stepped
- IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4580

Client:	Gurner	Commenced:	22/09/2021
Project Name:	12 Hassall Street, Parramatta	Completed:	24/09/2021
Hole Location:	Refer to Figure 1	Logged By:	JS
Hole Position:	315632.0 m E 6256263.0 m N MGA2020 Zone 56	Checked By:	GF

Drill Model and Mounting:	Geoprobe 7822DT	Inclination:	-90°	RL Surface:	11.50 m		
Barrel Type and Length:	NMLC 1.5 m	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information							Rock Substance					Rock Mass Defects	
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL L M H VH EH 0.1 0.3 1 3 10	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
NMLC	Not Encountered	36	Is(50) d=0.23 a=0.93 MPa		-9.5	21				○●		BPx2, 10°, CN, PR, S JT, 90°, CN, PR, RF BP, 0°, CN, PR, S JT, 35°, CN, PR, S BP, 0°, RF, PR, S, 10 mm BP, 0°, RF, PR, S BP, 20°, CL, PR, S BP, 30°, S, PR, RF BP, 0°, CN, PR, S BP, 15° BP, 5°, RF, PR, S BP, 0°, CN, PR, S BP, 40°, CN, PR, S BP, 15°, CN, PR, S BP, 20°, CN, PR, S
		93	Is(50) d=0.32 a=1.03 MPa		-10.5	22				○●		BP, 0°, CLVR, PR, S BP, 10°, CLVR, S, PR, S BP, 0°, CN, PR, S BP, 0°, CN, PR, S BPx2, 0°, CL, PR, S
		100	Is(50) d=0.36 a=1.16 MPa		-11.5	23				○●		BP, 0°, CN, PR, S BP, 0°, CLVR, PR, S JT, 70°, CN, PR, S BP, 0°, CL, PR, S
			Is(50) d=0.34 a=0.99 MPa		-12.5	24				○●		BP, 0°, CL, PR, S
								Hole Terminated at 24.00 m Target depth. PZ03 installed.				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

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

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

JOB NO: PSM4580

PROJECT: 12 Hassall Street

LOCATION: Parramatta

DATE: 22/09/2021 to 24/09/2021

BH ID: BH03

FROM: 5.6 m

TO: 10.0 m

Gurner

12 Hassall Street

Parramatta

CORE PHOTOS BH03

(Core Photo 1 OF 4)

PSM4580-003L	Appendix A

JOB NO: PSM4580

PROJECT: 12 Hassall Street

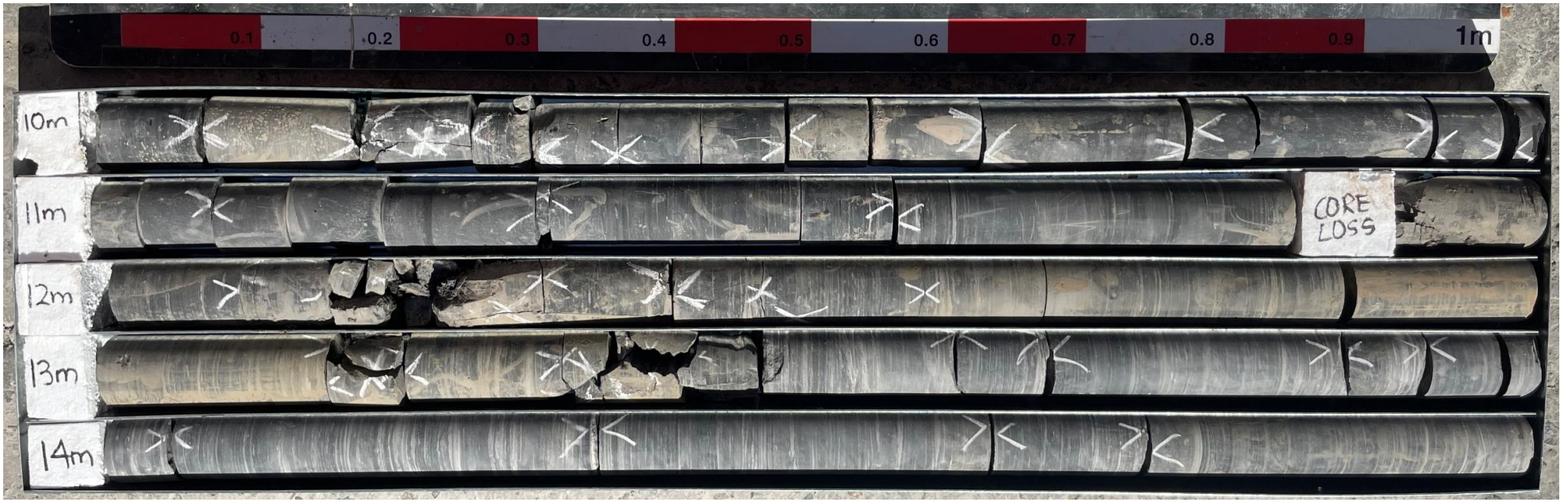
LOCATION: Parramatta

DATE: 22/09/2021 to 24/09/2021

BH ID: BH03

FROM: 10.0 m

TO: 15.0 m



Gurner

12 Hassall Street

Parramatta

CORE PHOTOS BH03

(Core Photo 2 OF 4)

PSM4580-003L	Appendix A

JOB NO: PSM4580

PROJECT: 12 Hassall Street

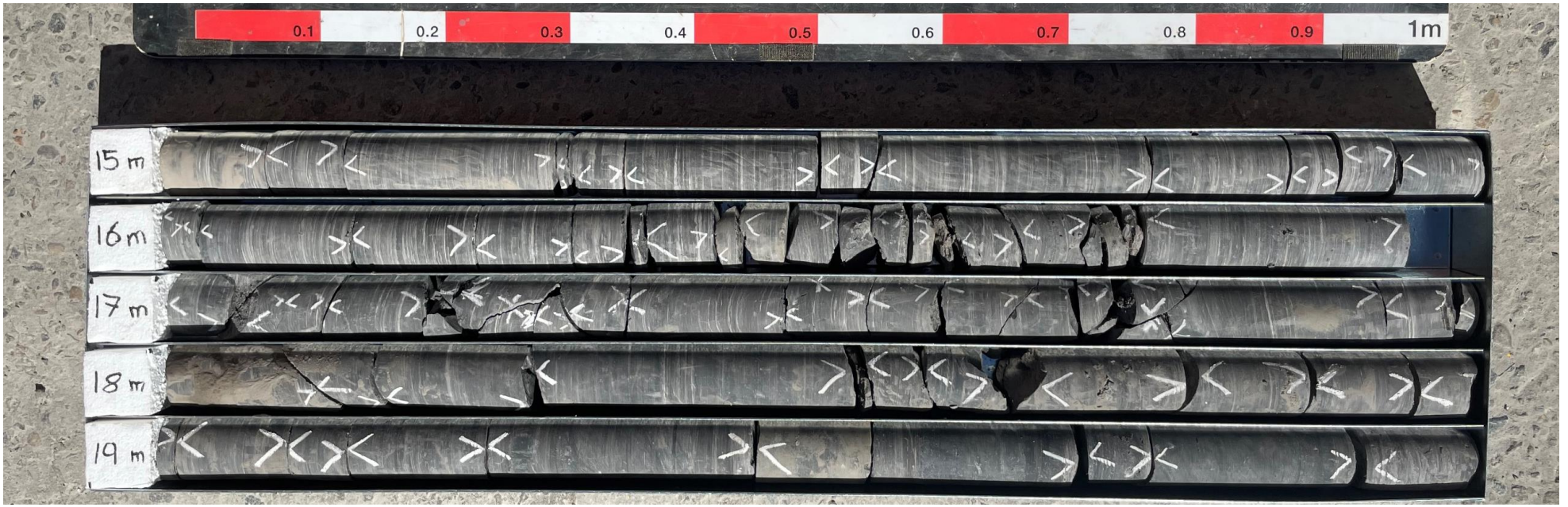
LOCATION: Parramatta

DATE: 22/09/2021 to 24/09/2021

BH ID: BH03

FROM: 15.0 m

TO: 20.0 m



Gurner

12 Hassall Street

Parramatta

CORE PHOTOS BH03

(Core Photo 3 OF 4)

PSM4580-003L	Appendix A

JOB NO: PSM4580

PROJECT: 12 Hassall Street

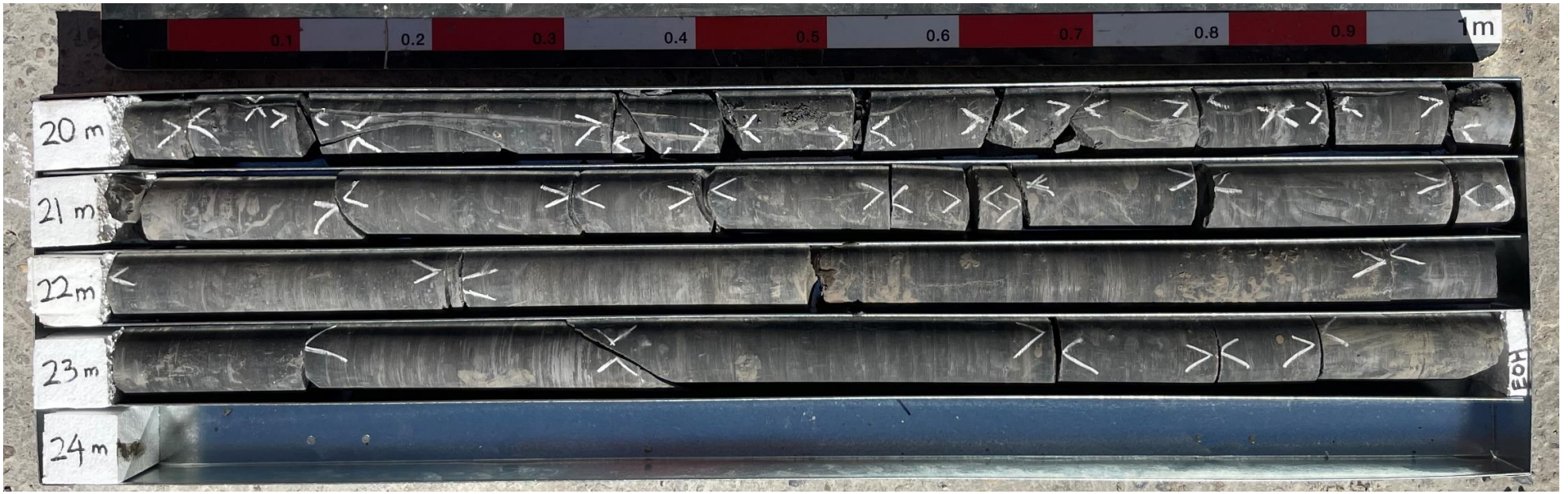
LOCATION: Parramatta

DATE: 22/09/2021 to 24/09/2021

BH ID: BH03

FROM: 20.0 m

TO: 24.0 m



Gurner

12 Hassall Street

Parramatta

CORE PHOTOS BH03

(Core Photo 4 OF 4)

PSM4580-003L	Appendix A

Borehole ID

BH04

Engineering Log - Non Cored Borehole

Project No.: PSM4580

Client:	Gurner	Commenced:	24/09/2021
Project Name:	12 Hassall Street, Parramatta	Completed:	28/09/2021
Hole Location:	Refer to Figure 1	Logged By:	JS
Hole Position:	315628.0 m E 6256275.0 m N MGA2020 Zone 56	Checked By:	GF

Drill Model and Mounting:	Geoprobe 7822DT	Inclination:	-90°	RL Surface:	11.70 m		
Hole Diameter:	130 mm	Bearing:		Datum:	AHD	Operator:	Terratest

Drilling Information							***Soil Description***					***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
										CONCRETE				0.00: PAVEMENT
									CH	CLAY trace gravel: high plasticity, dark brown; gravel sub-rounded to sub-angular up to 15 mm				0.09: FILL
										Becoming brown, orange	D to M	F		
HA		N				10.7	1		CH	CLAY: high plasticity, reddish brown				1.00: Possibly ALLUVIUM
												St		
									CH	CLAY: high plasticity, red, grey				1.50: RESIDUAL SOIL
				D 1.80 m										1.80: Sample taken for aggressivity and salinity
						9.7	2			Becoming grey, orange, red				
										Shale fragments up to 20 mm observed		VSt		
AD/V		N	Not Encountered	SPT: 10,15,18 N=33						Becoming grey, orange				
						8.7	3			Shale fragment up to 15 mm observed	D			
												H		
				SPT: 3,11,22 N=33		7.7	4							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger screwing
CT - Continuous push tube 1.5m long 76mm diameter

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM4580

Client:	Gurner	Commenced:	24/09/2021
Project Name:	12 Hassall Street, Parramatta	Completed:	28/09/2021
Hole Location:	Refer to Figure 1	Logged By:	JS
Hole Position:	315628.0 m E 6256275.0 m N MGA2020 Zone 56	Checked By:	GF
Drill Model and Mounting:	Geoprobe 7822DT	Inclination: -90°	RL Surface: 11.70 m
Hole Diameter:	130 mm	Bearing:	Datum: AHD Operator: Terratest

Drilling Information								***Soil Description***				***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	Not Encountered			5.7	6		CH			H		
										SILTSTONE: grey, very low strength grading into low to medium strength, highly weathered	D			6.00: BEDROCK Strength inferred from cuttings and drill resistance
AD/T		N				4.7	7							7.00: Drill bit changed due to increased drill resistance
						3.7	8							
						2.7	9							

Hole Terminated at 10.00 m Target depth

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger screwing
CT - Continuous push tube 1.5m long 76mm diameter

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
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SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
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Moisture Condition
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Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Appendix B
Point Load Test Results

Pells Sullivan Meynink

POINT LOAD STRENGTH INDEX TEST RESULTS

Job No. *PSM4580* **Sheet** 1 of 2

Project *12 Hassall Street, Parramatta*

Test Method	*AS 4133.4.1-2007 Methods of testing rocks for engineering purposes - Determination of point load strength index*	Sampling Technique	*NLMC*	Sampling Date	
		Storage History	*North Ryde office storage*	Testing Date	*29/09/2021*
Test Machine	*GSA 6510-0304*	Moisture Condition	*Natural*	Tested By	*JS*
Calibration Date	*25/11/2021*	Loading Rate	*< 30 seconds*		

Rock Type	Location	Depth	Diametral Tests					Axial Tests						AS 1726:2017 Strength Class
			D	L	P	$I_{s(50)}$	Failure Mode	W	D	P	I_s	$I_{s(50)}$	Failure Mode	
		(m)	(mm)	(mm)	(kN)	(MPa)		(mm)	(mm)	(kN)	(MPa)	(MPa)		
Siltstone	***BH01***	***7.50***	*50*	*130*	*0.0*	***0.0***	*Parallel to bedding*	*50*	*40*	*0.2*	*0.1*	***0.1***	*Through substance*	***VL***
Siltstone	***BH01***	***8.50***	*50*	*55*	*0.1*	***0.0***	*Parallel to bedding*	*50*	*45*	*0.6*	*0.2*	***0.2***	*Through substance*	***VL / L***
Siltstone	***BH01***	***9.50***	*50*	*140*	*0.3*	***0.1***	*Parallel to bedding*	*50*	*35*	*1.1*	*0.5*	***0.5***	*Through substance*	***L / M***
Siltstone	***BH01***	***10.40***	*50*	*110*	*0.3*	***0.1***	*Parallel to bedding*	*50*	*40*	*1.2*	*0.5*	***0.5***	*Through substance*	***L / M***
Siltstone	***BH01***	***11.40***	*50*	*90*	*0.2*	***0.1***	*Parallel to bedding*	*50*	*40*	*1.5*	*0.6*	***0.6***	*Through substance*	***VL / M***
Siltstone	***BH01***	***12.70***	*50*	*160*	*1.0*	***0.4***	*Parallel to bedding*	*50*	*45*	*1.4*	*0.5*	***0.5***	*Through substance*	***M***
Siltstone	***BH01***	***13.50***	*50*	*200*	*1.3*	***0.5***	*Parallel to bedding*	*50*	*45*	*4.6*	*1.6*	***1.6***	*Through substance*	***M / H***
Siltstone	***BH01***	***14.50***	*50*	*85*	*2.2*	***0.9***	*Parallel to bedding*	*50*	*45*	*6.4*	*2.2*	***2.3***	*Through substance*	***M / H***
Siltstone	***BH01***	***15.10***	*50*	*85*	*2.5*	***1.0***	*Parallel to bedding*	*50*	*35*	*5.6*	*2.5*	***2.4***	*Through substance*	***M / H***
Siltstone	***BH03***	***6.30***	*50*	*120*	*0.1*	***0.0***	*Parallel to bedding*	*50*	*40*	*0.2*	*0.1*	***0.1***	*Through substance*	***VL***
Siltstone	***BH03***	***7.50***	*50*	*75*	*0.1*	***0.0***	*Parallel to bedding*	*50*	*40*	*0.7*	*0.3*	***0.3***	*Through substance*	***VL / L***
Siltstone	***BH03***	***8.40***	*50*	*75*	*0.1*	***0.0***	*Parallel to bedding*	*50*	*45*	*0.8*	*0.3*	***0.3***	*Through substance*	***VL / L***
Siltstone	***BH03***	***9.50***	*50*	*150*	*0.1*	***0.0***	*Parallel to bedding*	*50*	*45*	*1.2*	*0.4*	***0.4***	*Through substance*	***VL / M***
Siltstone	***BH03***	***10.50***	*50*	*55*	*0.3*	***0.1***	*Parallel to bedding*	*50*	*40*	*1.9*	*0.7*	***0.7***	*Through substance*	***L / M***
Siltstone	***BH03***	***11.50***	*50*	*65*	*0.6*	***0.2***	*Parallel to bedding*	*50*	*45*	*1.0*	*0.4*	***0.4***	*Through substance*	***L / M***
Siltstone	***BH03***	***12.70***	*50*	*200*	*1.3*	***0.5***	*Parallel to bedding*	*50*	*40*	*3.9*	*1.5*	***1.5***	*Through substance*	***M / H***
Siltstone	***BH03***	***13.50***	*50*	*130*	*2.0*	***0.8***	*Parallel to bedding*	*50*	*40*	*4.7*	*1.9*	***1.9***	*Through substance*	***M / H***
Siltstone	***BH03***	***14.60***	*50*	*110*	*1.6*	***0.6***	*Parallel to bedding*	*50*	*40*	*5.8*	*2.3*	***2.3***	*Through substance*	***M / H***
Siltstone	***BH03***	***15.40***	*50*	*150*	*1.4*	***0.6***	*Parallel to bedding*	*50*	*35*	*4.0*	*1.8*	***1.7***	*Through substance*	***M / H***
Siltstone	***BH03***	***16.30***	*50*	*55*	*2.3*	***0.9***	*Parallel to bedding*	*50*	*40*	*4.8*	*1.9*	***1.9***	*Through substance*	***M / H***
Siltstone	***BH03***	***17.40***	*50*	*120*	*3.1*	***1.3***	*Parallel to bedding*	*50*	*40*	*4.5*	*1.8*	***1.8***	*Through substance*	***H***
Siltstone	***BH03***	***18.20***	*50*	*110*	*1.8*	***0.7***	*Parallel to bedding*	*50*	*40*	*4.0*	*1.6*	***1.6***	*Through substance*	***M / H***
Siltstone	***BH03***	***19.50***	*50*	*90*	*1.3*	***0.5***	*Parallel to bedding*	*50*	*40*	*2.7*	*1.1*	***1.1***	*Through substance*	***M / H***
Siltstone	***BH03***	***20.50***	*50*	*90*	*0.6*	***0.2***	*Parallel to bedding*	*50*	*40*	*2.4*	*0.9*	***0.9***	*Through substance*	***L / M***
Siltstone	***BH03***	***21.50***	*50*	*130*	*0.8*	***0.3***	*Parallel to bedding*	*50*	*40*	*2.6*	*1.0*	***1.0***	*Through substance*	***M / H***
Siltstone	***BH03***	***22.60***	*50*	*210*	*0.9*	***0.4***	*Parallel to bedding*	*50*	*40*	*2.9*	*1.2*	***1.2***	*Through substance*	***M / H***

By: *JS* **Checked: GF** **Date:** *30/9/2021*

Pells Sullivan Meynink

POINT LOAD STRENGTH INDEX TEST RESULTS

Job No. ***PSM4580*** **Sheet 2 of 2**

Project ***12 Hassall Street, Parramatta***

Test Method	*AS 4133.4.1-2007 Methods of testing rocks for engineering purposes - Determination of point load strength index*	Sampling Technique	*NLMC*	Sampling Date	
		Storage History	*North Ryde office storage*	Testing Date	*29/09/2021*
Test Machine	*GSA 6510-0304*	Moisture Condition	*Natural*	Tested By	*JS*
Calibration Date	*25/11/2021*	Loading Rate	*< 30 seconds*		

Rock Type	Location	Depth	Diametral Tests					Axial Tests						AS 1726:2017 Strength Class
			D	L	P	$I_{s(50)}$	Failure Mode	W	D	P	I_s	$I_{s(50)}$	Failure Mode	
		(m)	(mm)	(mm)	(kN)	(MPa)		(mm)	(mm)	(kN)	(MPa)	(MPa)		
Siltstone	***BH03***	***23.70***	*50*	*110*	*0.9*	***0.3***	*Parallel to bedding*	*50*	*40*	*2.5*	*1.0*	***1.0***	*Through substance*	***M***

By: ***JS*** **Checked: GF** **Date:** ***30/9/2021***

Appendix C
PZ01 Piezometer Construction Record

Pells Sullivan Meynink
Engineering Consultants
Rock - Soil - Water

JOB No. PSM4580

PROJECT: 12 Hassall St, Parramatta

PIEZOMETER CONSTRUCTION RECORD

HOLE NUMBER: BH03
PIEZOMETER: PZ01
COLLAR EASTING: 315632
COLLAR NORTHING: 6256263
COLLAR RL(m): 11.48
DATUM: AHD

DRILLING CONTRACTOR: Terratest
RIG: Geoprobe 7822DT
DEPTH OF HOLE (m): 24
BOREHOLE INCLINATION: -90º
PIEZO INSTALLATION DATE: 24/09/2021
SUPERVISED BY: JS

Tick boxes

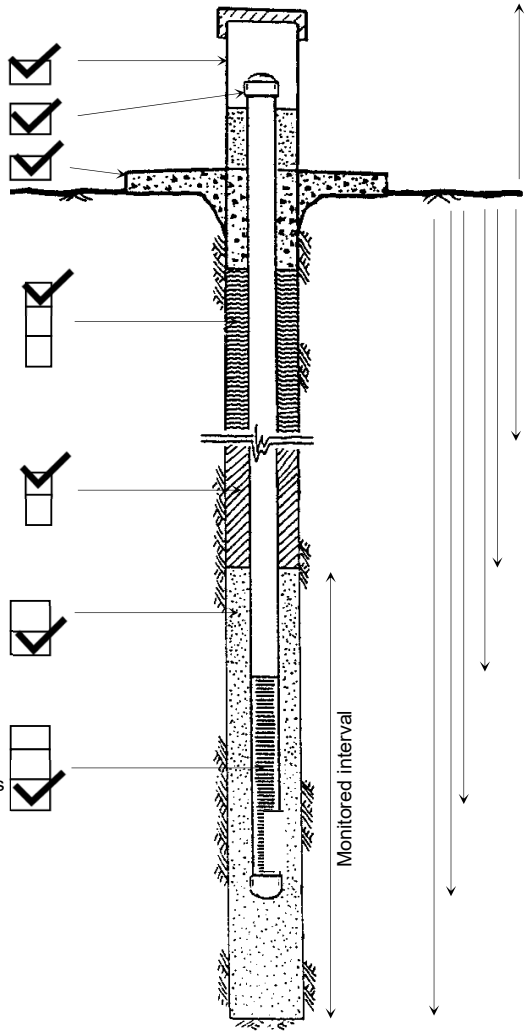
Steel protective well cover ☑
PVC cap ☑
Concrete collar ☑

Back fill type:
☑ Cement bentonite
☐ Soil
☐ None

Seal:
☑ Bentonite pellets
☐ Other

Gravel type:
☐ 2-5mm gravel
☑ Other - sand

Perforation type:
☐ Drill holes
☐ Hack saw cuts
☑ 40um machine slots



Complete dimensions if appropriate

Height of stickup (m)	0 m
Diameter of PVC	60 mm
Depth to top of seal	0.2 m
Depth to top of sand	3.2 m
Depth to top of screen	4.0 m
Depth to base of screen	22.70 m
Depth to base of piezo	22.75 m
Depth to base of sand	22.75 m

COMMENTS:
Depth of groundwater monitoring device installed in piezometer = 21.05 m

Appendix D
Salinity and Aggressivity Laboratory Test Results

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2134718**	Page	: 1 of 3
Client	: **PELLS SULLIVAN MEYNINK T/A PSM Admin PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JANE SHEN	Contact	: Customer Services ES
Address	: G3, 56 DELHI ROAD NORTH RYDE NSW, AUSTRALIA 2113	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: PSM4580	Date Samples Received	: 24-Sep-2021 20:38
Order number	: ----	Date Analysis Commenced	: 29-Sep-2021
C-O-C number	: ----	Issue Date	: 01-Oct-2021 17:41
Sampler	: ----		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 3		
No. of samples analysed	: 3		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Dian Dao	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- ED045G:LOR raised due to sample matrix.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH03-0.4m	BH04-1.8m	BH01-7m	----	----
			Sampling date / time	22-Sep-2021 00:00	24-Sep-2021 00:00	22-Sep-2021 00:00	----	----
Compound	CAS Number	LOR	Unit	ES2134718-001	ES2134718-002	ES2134718-003	--------	--------
				Result	Result	Result	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**6.7**	**5.5**	**6.8**	**----**	**----**
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**76**	**38**	**235**	**----**	**----**
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**17.3**	**18.0**	**9.0**	**----**	**----**
EA080: Resistivity								
Resistivity at 25°C	----	1	ohm cm	**13200**	**26300**	**4260**	**----**	**----**
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	**7.2**	**0.2**	**0.4**	**----**	**----**
Exchangeable Magnesium	----	0.1	meq/100g	**1.3**	**3.0**	**4.3**	**----**	**----**
Exchangeable Potassium	----	0.1	meq/100g	**0.4**	**0.2**	**0.4**	**----**	**----**
Exchangeable Sodium	----	0.1	meq/100g	**0.5**	**1.0**	**3.8**	**----**	**----**
Cation Exchange Capacity	----	0.1	meq/100g	**9.4**	**8.7**	**8.9**	**----**	**----**
Exchangeable Sodium Percent	----	0.1	%	**5.2**	**22.7**	**42.6**	**----**	**----**
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	**30**	**30**	**70**	**----**	**----**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	<50	<10	**160**	**----**	**----**