
**Specialist Advice
Report on Geotechnical Investigation**

Proposed Mixed-Use Hotel Development

153 - 157 Walker Street, North Sydney NSW

**Prepared for Freecity Group Holdings Pty
Ltd**

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The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

Signature

Date

Author

pp

28 August 2025

Reviewer

28 August 2025

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Report on Geotechnical Investigation Proposed Mixed-Use Hotel Development 153 - 157 Walker Street, North Sydney NSW

1. Introduction

This specialist advice report prepared by Douglas Partners Pty Ltd (Douglas) presents the results of a geotechnical investigation undertaken for a proposed mixed-use hotel development at 153 - 157 Walker Street, North Sydney NSW (the site). The report was commissioned by Simon Liang of Freecity Group Holdings Pty Ltd on 5 February 2025 and was undertaken in accordance with Douglas' proposals (233796.00.P.001.Rev1 and 233796.00.P.002.Rev0 dated 21 January and 19 June 2025, respectively).

It is understood that this geotechnical investigation report is to be submitted to the Department of Planning, Housing and Infrastructure (DPHI) on behalf of Freecity Group Holdings Pty Ltd (Freecity) to support State Significant Development Application (SSDA) SSDA-82599709, for a mixed-use hotel development at 153 - 157 Walker Street, North Sydney (the site).

The proposed development includes:

- Site preparation, including ground excavation and the demolition of existing structures at the site.
- Construction of a new fifty-one (51) storey mixed-use tower, which will accommodate:
 - Residential apartments, including a build-to-rent housing component.
 - Nine (9) affordable housing apartments equating to 3% of the total dwellings proposed.
 - A hotel that will be operated by one entity with a central management structure.
 - Ancillary lounge and wellness facilities.
 - Retail floorspace at ground level.
- Eleven (11) basement levels with car parking facilities and plant rooms to service the proposed development.
- One (1) loading zone at the Lower Ground Level;
- Vehicle access from Little Walker Street; and
- Associated building plant, utilities and service connections.

Further reference should be made to the detailed description of the proposed development within the Environmental Impact Assessment (EIS) that has been prepared by Urbis Ltd (Urbis).

Douglas has previously undertaken a Desktop Geotechnical Assessment and Preliminary Site Investigation (Contamination) for the site (217311.00.R.001.Rev1 & 217311.01.R.001.Rev1, both dated 18 November 2022).

The current investigation was undertaken in 2022 for a previous development that did not proceed and has now been used to provide information on the subsurface soil, rock and

groundwater profile to inform design and planning of the proposed structures and to support the SSDA.

The investigation included four cored boreholes, four shallow hand auger boreholes, groundwater well installation for permeability testing and groundwater level monitoring, and laboratory testing of selected samples.

An additional borehole was drilled in August 2025 to supplement the previous borehole data and to meet the minimum NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) requirements for an eleven level basement.

The details of the field work and the results of the laboratory testing are presented in this report, together with comments and recommendations on the geotechnical aspects of the proposed development.

This report must be read in conjunction with all appendices including the notes provided in Appendix A.

1.1 SEARs Requirements

In accordance with section 4.39 of the Environmental Planning & Assessment Act 1979 (EP&A Act), Secretary’s Environmental Assessment Requirements (SEARs) for SSD-82599709 were issued on 15 May 2025. This report has been prepared to respond to the relevant issued SEARs, as set out in the table below.

This geotechnical investigation report has been prepared in accordance with the following directions contained within the Secretary’s Environmental Assessment Requirements (SEARs) that were issued by DPHI for this project [Reference: SSD-82599709], as summarised in Table 1 below.

Table 1: SEARs and Relevant Reference

SEARs Item	Report Reference and Comments
<p><i>Assess potential impacts on soil resources and related infrastructure and riparian lands on and near the site and including soil erosion. Where required provide a Groundwater Impact Assessment in accordance with relevant Groundwater Guidelines. If the proposed development is on land identified as having high salinity or acid sulfate soil potential in an EPI provide a Salinity Management Plan or Acid Sulfate Soil Management Plan that includes appropriate management measures and strategies.</i></p>	<p>Refer to Section 3 and Section 8 of this Geotechnical Report</p>

2. Site description

The site, located at 153 – 157 Walker Street, North Sydney, comprises two rectangular lots situated between Walker Street (to the west) and Little Walker Street (to the east). The total site area is 1,928 m².

The site benefits from dual street frontages:

- Walker Street (west), with a frontage length of 45.5 m; and
- Little Walker Street (east), with a frontage length of 45.9 m.

The site has two side boundaries:

- The northern side boundary, measuring 42.2 metres in length, abuts the property at 161-165 Walker Street.
- The southern side boundary, also measuring 42.2 metres in length, abuts the property at 141 Walker Street.

The topography of the site features a gentle slope towards the south-east, with a total elevation change of approximately 6.7 metres from the north-western to the south-eastern extent of the site.

The legal lot entities within the site are Lot 1 in Deposited Plan (DP) 84729 and Strata Plan (SP) 50411. An aerial of the site is provided within Figure 1 below.



Figure 1 – Site Aerial (Source: Urbis)

Based on the available 'NSW 2 m Elevation Contours' the site level varies from approximately RL 56 m AHD to RL 62 m AHD, falling gently towards the south-east. The closest water body to the site is Lavender Bay which is located about 900 m to the south of the site and about 50-60 m lower.

3. Published data

3.1 Geology

Reference to the Sydney 1:100 000 Series Geological Sheet indicates that the site is underlain by Hawkesbury Sandstone which typically comprises medium to coarse grained quartz sandstone with some shale bands or lenses.

Within the Sydney area the most common defects within the Hawkesbury Sandstone are widely spaced horizontal bedding planes, typically spaced at 1 m to 3 m, and two orthogonal sets of steeply dipping joints. The joints typically have dips of 75 to 90 degrees from horizontal (i.e. close to vertical) and are oriented with strikes just east of north (about 010 degrees) and just south of east (about 110 degrees). Apart from these main defect sets there are likely to be other less common joints or faults with moderate dips of 20 – 30 degrees and 40 – 60 degrees.

3.2 Hydrogeology

No Water NSW registered groundwater bores are located within 500 m of the site that provide useful information on groundwater levels. DP's groundwater observations from previous projects in the area are summarised within the Desktop Geotechnical Assessment (217311.00.R.001.Rev1, dated 18 November 2022) and generally noted groundwater levels between RL 37.8 m to 46.1 m AHD at a number of sites in the vicinity of the subject site.

It is noted that groundwater levels vary over time due to climatic and human influences and will temporarily rise following periods of prolonged rainfall.

3.3 Riparian Lands

A search of the NSW DPHI Riparian Lands and Watercourses map indicates that the site is not located within 2 km from an area of riparian land and watercourse. Riparian lands are therefore not likely to be impacted by the proposed development.

3.4 Acid Sulfate Soils and Salinity

Reference to the regional Acid Sulfate Soils (ASS) Risk map indicates that the site is located within an area with no known occurrence of ASS. As a result, an Acid Sulfate Soil Management Plan is considered to not be required.

The site does not occur within an area mapped for known salinity issues.

4. Field work

4.1 Field Work Methods

Field work for the geotechnical investigation was carried out between 9-22 November 2022 and 7 – 12 August and included:

- Electronic scanning for buried services at the proposed borehole locations;
- Non-destructive digging (NDD) at location BH201;
- Drilling of five (5) cored boreholes (BH01 - BH04 and BH201) using a modular, tight access or tracked drilling rig and four (4) shallow hand auger boreholes (BH05 – BH08) primarily for the contamination assessment. The cored boreholes were drilled down to weathered rock using solid flight augers. The boreholes were then extended to depths of between 16 m and 50.25 m below ground level using NMLC or HQ diamond coring equipment to recover continuous rock core samples. The boreholes BH01, BH02, BH05 and BH06 were drilled from within the existing basement level of No. 153 which is estimated to be about 5.2 m below street level. Boreholes BH03, BH04, BH07 and BH08 were drilled within the carpark of building No. 157 which is approximately at ground level. BH201 was drilled within the northeastern portion of the site within a parking bay just off Little Walker Street;
- Within BH201, four packer tests were carried out to assess to bedrock permeability at various depths;
- The location of BH03 was abandoned due to the presence of secondary concrete layer at a depth of 0.25 m, below the floor slab. Due to the lack of available site service drawings, the possibility that this concrete could be associated with an unknown buried service could not be ruled out and the borehole position was relocated. The borehole was moved to position BH03A which was located adjacent to the contamination borehole BH07; and
- Installation of four groundwater monitoring wells and measurement of water levels in boreholes BH01, BH03A, BH04 and BH201.

All the boreholes with wells were backfilled with sand and sealed with bentonite as part of the groundwater monitoring well construction. The wells were installed with gatic covers and reinstated with concrete at the ground surface. The remaining boreholes were backfilled with drilling spoil and sand with concrete reinstatement at the surface. The locations of the boreholes are shown Drawing 1 in Appendix B.

The borehole positions were measured off site features and ground surface levels inferred from the provided survey plans (Drawing No.: A.DA0001, dated 12/11/22 and Project No. 240626, dated 27/06/25). The approximate coordinates and ground surface levels based on these measurements are shown on the borehole logs.

4.2 Field Work Results

A summary of the encountered subsurface conditions is presented in the following sections. Detailed descriptions of the subsurface conditions encountered are given in the borehole logs included in Appendix C alongside photographs of the rock core. Notes defining classification methods and descriptive terms are also included within in Appendix A.

The general strata encountered in the boreholes is summarised as follows:

- Fill:** Below the concrete floor slab which was generally 0.12 m to 0.15 m thick, the fill generally comprised variable proportions of fine to coarse sand and gravel of sub-angular to sub-rounded, fine to coarse, brick, concrete, sandstone and igneous gravel encountered to depths of between 0.25 m to 0.4 m. BH201 encountered a thin layer of asphaltic concrete over a concrete slab to 0.15 m underlain by gravelly clay fill with gravel inclusions to 0.5 m depth.
- Residual Soil:** Below the fill in BH03A, BH05, BH07 and BH08, residual soil was encountered consisting of fine to coarse, pale grey and orange sand with sandstone gravel to depths of between 0.4 m to 0.65 m.
- Bedrock:** Predominantly medium then high strength, moderately to slightly weathered becoming fresh with depth, slightly fractured to unbroken sandstone.

Bedding planes recorded in the rock cores dip at less than 20° from horizontal, which is typical for the Hawkesbury Sandstone. Fracture spacing (which includes bedding plane partings and joints) indicates that the rock is slightly fractured to unbroken (mostly unbroken). Joint dip angles recorded in the core range from 40° to 80°. Clay seams/decomposed beds up to 30 mm thick, were also encountered. Some sections of massive high strength sandstone were encountered.

4.3 Groundwater

Groundwater was not observed during the augered portion of the boreholes and the necessary use of water as a drilling fluid during the NMLC and HQ coring precluded the observation of groundwater levels.

The groundwater well construction is detailed within the borehole logs presented within Appendix C. A summary of the well construction is presented in Table 2 below.

Table 2: Summary of Groundwater Well Construction

Borehole	Ground Level (m AHD)	Filter Zone Depth (m) [RL m AHD]	Filter Zone Material
BH01	50.5	1.0 – 16.0 [49.5 – 34.5]	Sandstone
BH03A	55.8	6.5 – 22.0 [49.3 – 33.8]	Sandstone
BH04	55.8	7.5 – 21.9 [48.3 – 33.9]	Sandstone
BH201	56.3	21.0 – 39 [35.0 – 17.3]	Sandstone

The manual groundwater levels measured within the monitoring wells taken prior to and following well development sampling visits are summarised in Table 3 below.

Table 3: Manual Groundwater Measurement

Borehole	Water Level m BGL [RL m AHD]	Date	Comment
BH01	6.5 [44.0]	25/11/2022	Reading taken prior to well development
	6.3 [44.2]	30/11/2022	Reading taken prior to sampling
	6.65 [43.85]	04/03/2025	Reading taken prior to well purge
	6.58 [43.92]	21/08/2025	Reading taken following well purge
BH03A	12.5 [42.3]	25/11/2022	Reading taken prior to well development
	11.0 [44.8]	30/11/2022	Reading taken prior to sampling
	10.95 [44.85]	14/02/2025	Reading taken prior to well purge
	10.95 [44.85]	04/03/2025	Reading taken following well purge
	10.83 [44.97]	21/08/2025	Reading taken following well purge
BH04	11.2 [43.5]	25/11/2022	Reading taken prior to well development
	8.0 [47.8]	30/11/2022	Reading taken prior to sampling
	7.82 [47.98]	19/02/2025	Reading taken prior to well purge
	7.75 [48.05]	04/03/2025	Reading taken following well purge
	7.58 [48.22]	21/08/2025	Reading taken following well purge
BH201	22.58 [33.72]	21/08/2025	Reading taken following well purge

Notes: Water levels measured below ground level (BGL) using a dip tape.

A summary of the groundwater results based on continuous monitoring from our installed data loggers within each well are presented in Table 4.

Table 4: Summary of groundwater levels from monitoring

Borehole	Depth to groundwater, m bgl (RL AHD)				Variation (m)
	Lowest	Median	Average	Highest	
BH01	6.8 (43.7)	6.64 (43.86)	6.65 (43.85)	6.3 (44.2)	0.5
BH03a	11.07 (44.73)	10.9 (44.9)	10.89 (44.91)	10.17 (45.63)	0.9
BH04	8 (47.93)	7.7 (48.1)	7.69 (48.11)	6.97 (48.83)	1.03
BH201	22.58 (33.72)	22.58 (33.72)	22.58 (33.72)	22.58 (33.72)	0

Notes: The groundwater level variation is taken as the difference between the highest and lowest water level recorded by Douglas at the site.

4.3.1 Permeability Testing

Rising head permeability testing was undertaken in monitoring wells BH01, BH03A, BH04 and BH201 while packer testing was carried out in BH201 to evaluate the mass hydraulic conductivity (or permeability) of the sandstone material.

The rising head test involves removing water from the well and measuring the corresponding rise in water level at regular time intervals. The results of the permeability tests are interpreted using the methods proposed by Hvorslev (1951) to determine a hydraulic conductivity (k) value. The results of the testing is summarised in Table 5, with well construction details provided in the respective borehole logs attached in Appendix C.

Table 5: Summary of rising head tests

Borehole	Screen Depth (m) [RL m AHD]	Screened Material	Date	Hydraulic Conductivity, k (m/s)
BH01	1.0 – 16.0 [49.5 – 34.5]	Sandstone	Not Accessible	-
BH03a	6.5 – 22.0 [49.3 – 33.8]	Sandstone	14 / 02 / 2025 19 / 02 / 2025	4.10 x 10 ⁻⁸ 3.88 x 10 ⁻⁸
BH04	7.5 – 21.9 [48.3 – 33.9]	Sandstone	19 / 02 / 2025	3.41 x 10 ⁻⁸
BH201	21.0 – 39 [35.0 – 17.3]	Sandstone	19 / 08 / 2025	3.92 x 10 ⁻⁸
			Geometric Mean	3.76 x 10⁻⁸

Wireline permeability (Packer) testing is a method of calculating the permeability and hydraulic conductivity of bedrock formations surrounding a drilled borehole. A rubber packer is inflated using high pressures against the borehole walls creating a watertight seal and isolates sections of the borehole. Water is then injected under pressure directly into the area of interest. During the test, water is injected over three equally stepped increasing pressures, followed by stepping back down over the same pressures. At each pressure step, the corresponding flow rates are recorded and plotted.

A lugeon value is then calculated based on how the bedrock behaves under the various pressures and is then converted into a hydraulic conductivity (k) (m/s).

The results of the packer testing are summarised in Table 6.

Table 6: Summary of Packer Test Results

Borehole	Packer Test Depth Interval (m) [RL m AHD]	Houlsby Lugeon Value	Estimated Hydraulic Conductivity, k (m/s)
BH201	6.0 – 12.0 [50.3 – 44.1]	0.8	1.0×10^7
	12.2 – 18.2 [44.1 – 38.1]	0.1	1.45×10^8
	18 – 23.65 [38.3 – 32.65]	0.2	2.30×10^{-8}
	23.65 – 30.28 [32.65 – 26.02]	0.2	2.11×10^{-8}
		Geometric Mean	2.9×10^{-8}

The results of the testing are consistent with expectations for permeability of the slightly weathered and fresh medium to high strength sandstone profile encountered at borehole test locations.

5. Laboratory testing

Laboratory testing was carried out on selected soil and rock samples. The results are summarised below and detailed laboratory test reports are provided in Appendix D.

5.1 Aggressivity to Buried Concrete and Steel

Three water samples were also taken from the wells installed in BH01, BH03A and BH04 on 25 November 2022 following well development. The results of aggressivity testing on the water samples are presented in Table 7 below.

Table 7: Groundwater Aggressivity Test Results

Borehole	Material	pH	SO ₄ [mg/L]	Chloride [mg/L]	Electrical Conductivity (µS/cm)	Electrical Resistivity (Ω cm)
BH01	Water	4.8	140	62	560	1,786
BH03A	Water	6.0	86	33	380	2,362
BH04	Water	6.1	160	42	560	1,786

Notes: SO₄ – Sulfate Ions

5.2 Uniaxial Compressive Strength, Young's Modulus and Poisson's Ratio

Four samples of rock core were tested to confirm the UCS of the rock and to ascertain the Young's modulus and Poisson's ratio of these materials. The results of the testing are presented in Table 8.

Table 8: UCS, Young’s Modulus and Poisson’s Ratio Test Results

Borehole		BH01	BH02	BH03A	BH04
Depth (m)		12.24 – 12.5	21.07 – 21.35	15.5 – 15.81	3.5 – 3.8
Material		Sandstone	Sandstone	Sandstone	Sandstone
Moisture Content (%)		6.6	6.2	7.5	4.5
UCS (MPa)		38	46	30	49
Secant Modulus	Youngs Modulus (GPa)	9.1	10.0	5.0	12.0
	Poisson’s Ratio	0.11	0.16	0.17	0.12
Tangent Modulus	Youngs Modulus (GPa)	16.0	19.0	8.9	22.0
	Poisson’s Ratio	0.12	0.18	0.20	0.14

5.3 Point Load Strength Index Testing

The results of point load strength index testing ($I_{s(50)}$), carried out at regular intervals on rock cores, are shown on the borehole logs in Appendix C. The $I_{s(50)}$ results range from 0.1 MPa to 3.2 MPa in the underlying bedrock. The results of point load strength index testing against depth are shown in Figure 2 below.

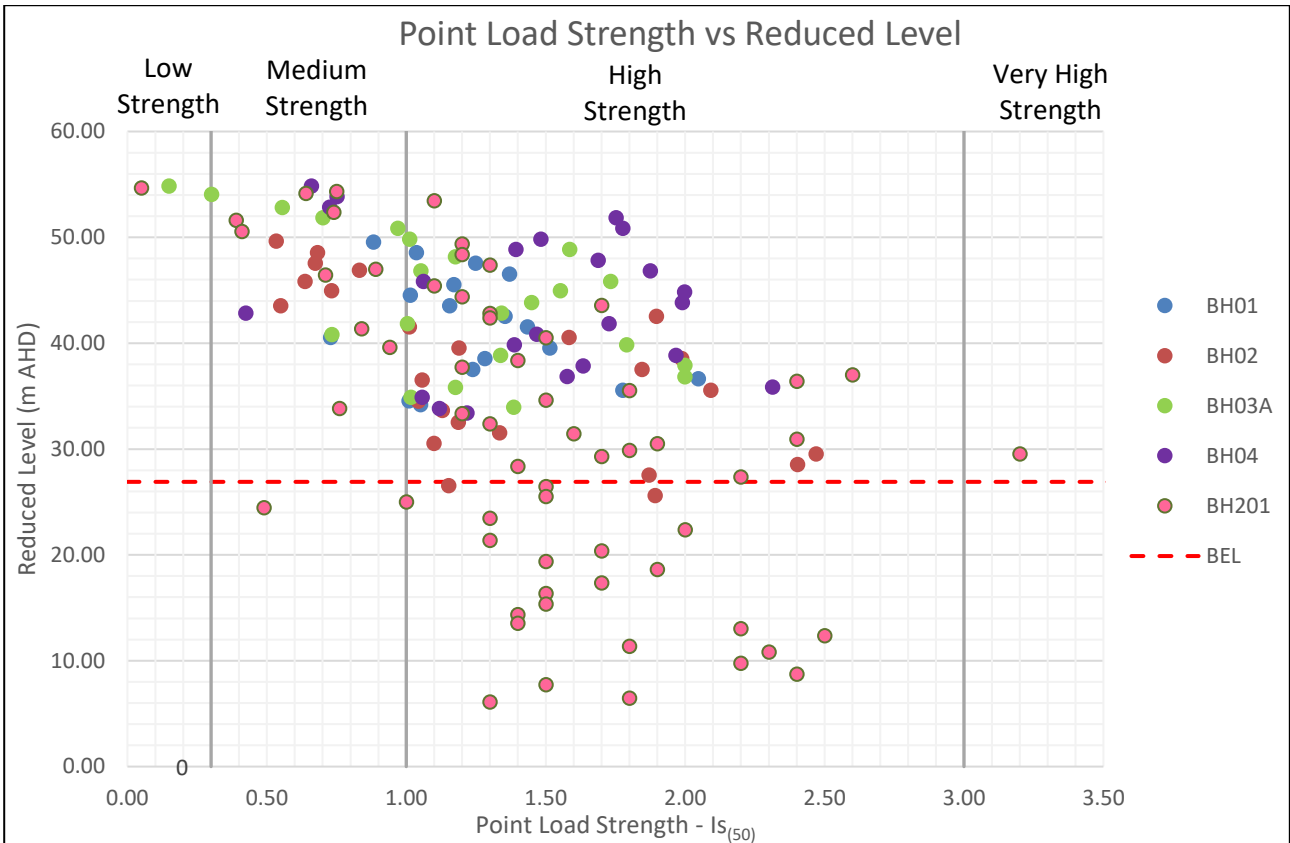


Figure 2- Axial Point Load Values vs RL

The $I_{s(50)}$ values were used to provide an estimate of the Uniaxial Compressive Strength (UCS) of the rock, based on a UCS: $I_{s(50)}$ ratio of 20:1. The estimated UCS values for the sandstone typically ranged from 1 MPa to 64 MPa, indicating that the rock tested ranged from very low to very high strength.

6. Geotechnical Model

Based on the geotechnical investigation, the site (below the existing basement slab) is generally underlain by thin layers of fill (less than 0.5 m) and residual soils which combined are generally less than 1 m deep and overlying sandstone bedrock. It should be noted that deeper fill and residual soil depths may be present beyond the boundaries of the existing basements (i.e. from street level to the existing basement level). The expected subsurface profile at the site and the RL of the various units is summarised in Table 9 and Table 10 below.

The geotechnical model for the site is summarised on four interpreted geotechnical cross-sections A-A' to D-D' in Appendix B (Drawings 2 to 5). The cross-sections show the interpreted geotechnical units across the site and the current development concept for the site has been superimposed onto the cross-sections, with the approximate finished floor levels shown. Reference should be made to the borehole logs for more detailed information and for descriptions of the soil and rock.

Table 9 – Geotechnical Model

Unit	Name	Description
1	Fill	Concrete over fill comprised of variable proportions of sand and gravel of brick, concrete, sandstone and igneous rock
2	Residual Soil	Fine to coarse, pale grey and orange sand and clay with sandstone gravel
3	Weathered Sandstone	Grey, dark brown, dark grey-brown and orange-brown, variably very low to medium strength
4	Medium Strength Sandstone (Class III)	Dark brown, red-brown, pale grey-yellow or pale grey, medium to coarse grained, medium strength, moderately to slightly weathered, fractured to unbroken
5	High Strength Sandstone (Class II/I)	Pale grey and dark brown, medium to coarse grained, high strength with some medium and very high strength bands, moderately weathered to fresh, slightly fractured to unbroken.

Table 10 - Geotechnical Model Stratum levels

Unit	Material	Top of Unit (m) [m AHD]								
		BH01	BH02	BH03A	BH04	BH05*	BH06*	BH07*	BH08*	BH201
1	Concrete /Fill	0.0 [50.5]	0.0 [50.5]	0.0 [55.8]	0.0 [55.8]	0.0 [50.5]	0.0 [50.5]	0.0 [55.8]	0.0 [55.8]	0.0 [56.3]
2	Residual Soil	NE	NE	0.3 [55.5]	NE	0.3 [50.2]	NE	0.4 [55.4]	0.25 [55.55]	NE
3	Weathered Sandstone	0.3 [50.2]	0.3 [50.2]	0.65 [55.2]	0.3 [55.5]	0.4 [50.1]	0.4 [50.1]	0.65 [55.2]	0.4 [55.5]	0.5 [55.8]
4	Medium Strength Sandstone	0.5 [50.0]	0.65 [49.9]	2.16 [53.6]	0.55 [55.3]	NE	NE	NE	NE	1.8 ¹ [54.5]

Unit	Material	Top of Unit (m) [m AHD]								
		BH01	BH02	BH03A	BH04	BH05*	BH06*	BH07*	BH08*	BH201
5	High Strength Sandstone	1.2 [49.3]	7.6 [42.9]	5.8 [50.6]	3.50 [52.3]	NE	NE	NE	NE	17.5 [38.8]

Note: NE: Not Encountered

*Rock level inferred from hand auger refusal

†Varies between medium and high strength.

Due to the orientation of the site, it is likely that the prominent NE striking joints will run near parallel to the east and west site boundaries, potentially forming wedges of rock that could become unstable and will require progressive assessment and stabilisation as excavation progresses.

Within the installed groundwater wells, water levels following well development were measured to be between RL 43.9 m and RL 48.2 m AHD in BH01, BH03A, and BH04 and at RL33.7 in BH201. The water levels indicate a much deeper groundwater level in the deeper BH201 which was screened below 21.0 m depth (RL35.0). This suggests that the shallower groundwater observed in BH01, 03A and 04 may be associated with perched seepage in the rock fractures that is not directly connected to a deeper groundwater system in sandstone bedrock. Based on water level measurements and reference to experience from neighbouring sites, groundwater seepage can be expected to occur along the soil/rock interface and through defects in the rock mass, especially along the bedding planes, joints and faults, and particularly after prolonged rainfall.

It should be noted that groundwater levels can vary over time due to climatic and human influences and will temporarily rise following periods of prolonged rainfall.

7. Proposed development

It is understood that the project involves the demolition of the existing buildings and the construction of a 51-storey mixed-use tower over eleven basement levels.

Based on the supplied architectural drawings, it is understood that the lowest basement level is designed with a stepped finished floor level (FFL) of RL 27.3 m AHD and 28.7 m AHD, with localised lift core at FFL RL 22.3 m AHD. Bulk excavations levels (BEL) are anticipated to about RL 26.9 m AHD for the lowest basement level and RL 22 for the localise lift core. Therefore, it is anticipated that excavations to depths up to about 35 m for the proposed basements and an additional 5 m for the lift core will be required.

Column or other footing loads for the building were not provided at the time of reporting. This will be confirmed before a Construction Certificate is issued in line with accepted industry practice for works of this scale and nature.

8. Comments

8.1 Geotechnical Constraints

The main geotechnical constraints anticipated during the design and construction of the proposed development are summarised below:

- Productivity of the bulk excavation through competent rock;
- Monitoring and mitigation of ground vibrations due to rock excavation to reduce the risk of structural damage to the adjacent structures;
- Stress release of the Hawkesbury Sandstone and associated lateral deflection of the shoring walls, rock faces and adjacent ground;
- Potential rock wedges formed by prominent NE striking joints (and possibly other joints) requiring stabilisation;
- Possible presence of adjacent footings within the zone of influence of the bulk excavation; and
- Restriction of anchor installation if adjoining basements are present.

8.2 Earthworks

8.2.1 Excavation

Excavation across the site and below the existing basement is likely to encounter all of the units outlined within Table 8. Based on the conditions observed in the boreholes, it is expected that the majority of the excavation works will be through either medium or high strength, slightly fractured to unbroken rock. The ease of excavation of the sandstone is directly dependent on the defect spacing and rock strength. Based on the expected conditions, productivity in such bedrock may be slow however, the earthworks contractors should make their own assessment of the equipment required and productivity that may be achieved within the rock.

Excavation of fill, soil and very low and low strength sandstone should be achievable using conventional earthmoving equipment, such as a 20t excavator fitted with a toothed bucket. Excavations in sandstone of medium and high strength will require the use of hydraulic rock hammers and rock saws, which can be fitted to an excavator. Detailed excavation for footings and service trenches/pits should be achievable using rock hammers, hydraulic rotary rock saws, or milling heads. Rock saws will also be required around the boundaries to reduce the risk of vibration induced damage to adjacent structures and also to reduce the risk of overbreak in loose rock.

Bulk excavation works will need regular inspections by a suitably qualified geotechnical engineer or engineering geologist to check for geological hazards that may be present but could not be observed during the investigation borehole drilling. Typical hazards for such an excavation include (but are not limited to) joints and fractures dipping into the excavation, which may form unstable wedges in the bedrock, and, the presence of near vertical clay seams, which can again form large blocks which may topple into the excavation.

8.2.2 Vibration

During excavation, it will be necessary to use appropriate methods and equipment to keep ground vibrations at neighbouring buildings and structures within acceptable limits. The level of acceptable vibration is dependent on various factors including the type of building structure (e.g. reinforced concrete, brick, etc.), its structural condition, founding conditions, the frequency range of vibrations produced by the construction equipment, the natural frequency of the building and the vibration transmitting medium.

Ground vibration can be strongly perceptible to humans at levels above 2.5 mm/s peak particle velocity (PPV). This is generally much lower than the vibration levels required to cause structural damage to most buildings. The Standard AS/ISO 2631.2 – 2014 “Mechanical vibration and shock – Evaluation of human exposure to whole-body vibration – Vibration in buildings (1 Hz to 80 Hz)” suggests an acceptable daytime limit of 8 mm/s PPV for human comfort.

Based on DP’s experience and with reference to AS/ISO 2631.2, it is suggested that a maximum PPV of 8 mm/s (measured at the first occupied level of neighbouring buildings) be adopted at this site for both architectural and human comfort considerations for ‘modern buildings’. Sydney Water and other providers may impose lower vibration levels and this will also need to be confirmed.

As the magnitude of vibration transmission is site specific, it is recommended that a vibration trial be carried out at the commencement of rock excavation. These trials may indicate that smaller or different types of excavation equipment are required to reduce vibration to acceptable levels.

To reduce the effects of vibration from hydraulic rock hammers, the work method should allow for:

- Rock sawing around the perimeter of the excavation and perimeter of pad/strip footings;
- Use of rock hammers in short burst to prevent generation of resonant frequencies;
- Positioning the direction of hammering away from adjacent building; and
- Using large size excavator capable of absorbing more energy.

8.2.3 Disposal of Excavated Material

All excavated materials will need to be disposed of in accordance with the provisions of the current legislation and guidelines including the *Waste Classification Guidelines* (EPA, 2014). This includes fill and natural materials that may be removed from the site. Further details regarding the disposal of excavated material are presented within Douglas’ Report on Supplementary Site Investigation (Project 233796.01 Rev1 dated 16 June 2025) issued separately to this document.

8.3 Excavation Induced Ground Movement

Locked-in stresses are present within the rock. During excavation, these stresses are released which generally results in lateral movement of the rock mass face towards the excavation, dragging the soil (and any shoring) with it as movement occurs. Generally, units of stiffer rock (medium strength or stronger rock) will have higher horizontal locked-in stresses and experience more displacement. The degree of displacement is also dependent on rock excavation depth, bedding planes and jointing in the rock mass, excavation face length and face orientation. As the

maximum principal stress in Sydney is in the north-south direction, the north and south faces can be expected to experience the most stress relief deformation. Although the east-west locked-in stress is less, the east and west faces may still experience stress relief displacement.

From monitoring (and supported by numerical modelling within the Sydney CBD), horizontal stress relief movements are typically between 0.5 mm and 2 mm per metre depth of rock excavation. Maximum movement typically occurs at the top of the midpoint of the face and reduces to near zero in the corners of the excavation. For excavation say 25 m deep in medium strength or stronger sandstone this equates to potential stress relief movements of 13 mm to 50 mm. In-situ stress testing and 3D modelling incorporating adjacent basements/excavations may be required to provide more accurate assessments of stress relief movements and impacts.

Back from the crest of the excavation, movement can occur over a distance of up to three times the excavated rock depth. The movement would be expected to reduce with horizontal distance away from the excavation face and would initially be reduced by approximately 1 to 1.5 mm per metre back from the crest of the excavation. This differential movement will give rise to strain in both the rock mass and the soil beyond the excavation. Most of the movement would be expected to occur progressively during the excavation. Heave may occur where relatively thin beds of competent rock is left in the base (bed separation due to buckling).

It is generally not possible/practical to provide restraint (i.e. anchoring) for the relatively high in-situ horizontal stresses associated with stress relief movements. Therefore, it is recommended that appropriate allowance be made for such movement in the design, planning and construction of shoring walls and the basement excavation. Note that stress relief movements may also increase loads on any ground support anchors installed.

Consideration should be given to re-entrant corners that can attract stress relief movement as well as any slender rock masses (rock "walls" or "Plinths") that may be left in place between basements as they are likely to attract additional stress. Consideration should also be given to the locations of columns, connections with perimeter walls and other structural elements to ensure that future stress relief movements e.g., from adjacent basements do not affect the building.

Precise survey and/or inclinometer monitoring of excavation faces and nearby buildings/structures should be carried out to assess vertical and horizontal movements during excavation. The survey and/or inclinometer monitoring should commence prior to excavation to provide a baseline and should continue every 1.5 m drop of the excavation. If deflections show an increase in the rate of movement or exceed the predicted movements, then the structural engineer and geotechnical engineer should be contacted for immediate review.

If a more accurate assessment of predicted ground movements at surrounding buildings as a result of the proposed excavations is required then numerical modelling (using Plaxis or FLAC) of the proposed excavation adjacent to the neighbouring buildings may be required.

8.4 Excavation Support

Battering of the sides of the excavation will not be possible and both temporary and permanent lateral support will therefore be required for all vertical excavation faces in Units 1, 2 and 3.

The depth and founding conditions for adjacent footings must be established prior to bulk excavation and the details will be required to inform the detailed design.

Soil/weathered rock to depths of less than 1.0 m may be retained using a conventional gravity retaining wall, provided that space permits. Anchored soldier piles with concrete infill panels can be used to provide the lateral support of deeper soil/weathered rock profile.

It may be possible to terminate the shoring piles within unsupported medium strength or stronger sandstone above the bulk excavation level. In this case it will be important for a geotechnical engineer to assess the stability of the rock directly beneath each pile. The toe of the piles which terminate above bulk excavation level will also need to be restrained with rock bolts or anchors. The design for the excavation support should take all surcharge loads into account, including the neighbouring building loads, traffic loads, construction surcharge loads, etc.

Vertical excavations within Units 4 and 5 rock are considered feasible. A number of steeply dipping NNE-SSW trending joints may be present and have been encountered on other nearby excavations in North Sydney. The joints can form unstable rock slivers, blocks and wedges which may require additional support. Bedding planes and soft seams are also common in the Hawkesbury Sandstone, even in higher strength rock. Thick seams may require shotcrete and rock bolt support to protect the seams over the long term. Excavated faces in medium strength or stronger sandstone (i.e. Units 4 and 5) can therefore only be considered self-supporting once mapping has confirmed that they are not adversely affected by discontinuities or soft seams. Rock faces should be inspected by an experienced geotechnical professional at least every 1.5 m drop in excavation to assess stability and advise on stabilisation requirements.

Given the anticipated shallow depth to rock, it is likely that footings for the neighbouring buildings to the south and the north of the site are founded on medium strength or stronger rock, however, this will need to be confirmed. In some cases it may be necessary to support adversely jointed rock with pattern rock bolts and in some cases strand anchors and some allowance for this stabilisation work must be made in the programme and budget.

8.4.1 Earth Pressures for Shoring Design

It is suggested that the design of cantilevered shoring systems (or shoring systems with one row of anchors) be based on a triangular earth pressure distribution using the earth pressure coefficients provided in Table 11. 'Active' earth pressure coefficient (K_a) values may be used where some wall movement is acceptable. 'At Rest' earth pressure coefficient (K_0) values should be used where the wall movement needs to be limited. The recommended values assume a level surface behind the shoring walls. These parameters do not take into account stress relief movement of vertical cuts in medium and high strength rock.

Table 11: Recommended Design Parameters for Shoring Systems

Unit	Material	Unit Weight (kN/m ³)	Earth Pressure Coefficient ⁽¹⁾	
			Active (K _a)	At Rest (K _o)
1 & 2	Fill / Residual Soil	20	0.3	0.4
3	Weathered Sandstone	22	0.2	0.25
4	Medium Strength Sandstone	22	0 ⁽²⁾	0 ⁽²⁾
5	High Strength Sandstone	22	0 ⁽²⁾	0 ⁽²⁾

Notes: (1) It should also be noted that the K_a and the K_o designs will not prevent stress relief movement.

(2) Subject to assessment by a Geotechnical Engineer/Engineering Geologist and assuming that the rock mass is free of adverse dipping joints and seams.

For braced walls or where two or more rows of anchors are used, the shoring can be designed using a rectangular or trapezoidal earth pressure distribution.

Additional surcharge loads such as new and existing footings, construction loads, etc., must be allowed for in the design, and applied as a rectangular earth pressure distribution over the depth of influence. The earth pressure loading described above does not include either earthquake loads or hydrostatic pressures.

Passive resistance for piles founded below the base of the bulk excavation may be based on a working passive bearing pressure of at least 3,000 kPa, provided that the rock comprises medium strength or stronger sandstone which is not adversely affected by discontinuities. The passive restraint of the first 0.5 m of rock socket below the bulk excavation level should be ignored. The minimum socket depth should be equal to the greater of one pile diameter or 1.0 m below the lowest level of any nearby excavation (including any detailed excavations for footing and lift pits, etc), but subject to analysis. This is also relevant where toe anchors are installed, just prior to fully exposing the toe of the pile.

Staged excavation and inspection by a suitably qualified geotechnical engineer or engineering geologist will be required to confirm that the rock in front of the wall/pile is not adversely affected by discontinuities, especially where passive resistance is relied upon.

8.4.2 Anchor Design

Where adjoining basements are not present, post-stressed ground anchors, rock bolts and dowels (support elements) can be used to laterally support new shoring, underpinning works or unstable rock blocks and wedges. Anchors could also be used vertically as hold down anchors. Support elements used for lateral support should be bonded in the stronger rock, inclined as required, but preferably not steeper than 30° below the horizontal. The conditions of the adjacent basements and footings should be investigated, and their levels should be established for the proposed anchor design.

The design of temporary and permanent ground anchors/rockbolts/dowels may be carried out using the allowable bond stresses given in Table 12.

Table 12: Recommended Bond Stresses for Ground Anchor and Rockbolt Design

Unit	Material Description	Allowable Bond Stress (kPa)	
		Temporary	Permanent
4	Medium Strength Sandstone	400	300
5	High Strength Sandstone	1200	1000

These values should be confirmed by pull-out tests, carried out prior to installation of support elements, which may also justify slightly higher values. Ultimately, it is the anchoring contractor's responsibility to ensure that the correct design values (specific to the support system and method of installation) are used and that the support element holes are carefully cleaned prior to grouting.

After temporary support elements have been installed, it is recommended that they are tested to 125% of their nominal working load. Where stress relief or further unavoidable movement of the shoring is expected, it is recommended that the support elements are locked-off between 60% and 80% of their working loads to accommodate the additional movement and subsequent increase in stress in the support elements. Checks should be carried out to confirm that the load in the support elements has been maintained and that losses due to creep effects or other causes have not occurred.

Shorter support elements (i.e. rock bolts, dowels and pins) may be required to support any unstable rock wedges, slivers or blocks. Short dowels and pins may be required to support feather edges where sub-parallel joints intersect the face. Shotcrete with mesh (or fibrecrete) may be required where beds/seams of extremely weathered and very low strength rock are encountered within higher strength sandstone, secured with rock bolts or dowels, as required. Care should be exercised to ensure that anchors are installed progressively during excavation and stressed prior to excavation of the next drop to ensure that stability is maintained at all times.

It is anticipated that the new structure will support the shoring walls over the long term and therefore the support elements are expected to be temporary only. The use of permanent rock bolts and ground anchors, if required, will need careful attention to corrosion protection. It should be noted that permission will be required from authorities and adjacent property owners prior to installing rock bolts/ground anchors below their land. Due consideration should also be given to below-ground excavations, services, etc.

8.5 Foundations

Based on the borehole logs, it is expected that high strength sandstone (Class II or I) will be exposed across most of the base of the bulk excavation. Typical parameters for the design of foundations on sandstone are shown in Table 13. Shaft adhesion values for uplift (tension) in piles may be taken as being equal to 70% of the values for compression, provided that adequate socket roughness is achieved. Cone pull out will also need to be checked for uplift piles or anchors.

Table 13: Recommended Parameters for Foundation Design

Foundation Stratum	Allowable (Serviceability)		Ultimate		Young's Modulus (MPa)
	End Bearing (kPa)	Shaft Adhesion (Compression) (kPa)	End Bearing (kPa)	Shaft Adhesion (Compression) (kPa)	
Medium strength sandstone (Class III)	3,500	350	20,000	800	350
Medium to high strength sandstone (Class II)	6,000	800	40,000	1,500	900
High strength or stronger sandstone (Class I)	8,000	1,000	80,000	2,000	2000

Note: Shaft adhesion applicable to the design of bored piles, uncased over the rock socket length, where adequate sidewall cleanliness and roughness are achieved

Foundations proportioned on the basis of the allowable bearing pressures in Table 13 would be expected to experience total settlements of less than 1% of the pile diameter or footing width under the applied working load, with differential settlements between adjacent columns expected to be less than half of this value.

To use a bearing pressure value for design of greater than 3.5 MPa, a minimum of six cored bores are required with spoon testing carried out in one third of footings across the site during construction. If bearing pressures greater than 6 MPa are used in design, then additional cored bores and spoon testing will be required. For spoon testing, a 50 mm diameter hole is drilled below the base of the footing to a depth of 1.5 times the footing width, followed by testing to check for the presence of weak layers or clay bands.

For design using the ultimate values provided in Table 13, a geotechnical strength reduction factor (ϕ_g) should be determined by the designer. The serviceability assessment should be based on using geotechnical parameters that are appropriately selected and to which no reduction factor is applied.

Footings (i.e. pads or piles) founded on the edge or within the zone of influence of vertical rock excavations, would be subject to assessment of jointing in the rock. Examples of where such a scenario could occur include:

- Foundation adjacent to the vertical face of the stepped portion of the lowest basement levels;

- Footings founded outside of basement excavation and near the vertical cut face for the basement excavation; and
- Shoring piles (if adopted) terminated above the bulk excavation level.

Generally, the allowable bearing pressure for footings founded near the edge of vertical rock excavations on Unit 4 or 5 Sandstone should be limited to about 1,500 kPa. If deeper excavation exposes adverse jointing in the rock below the footings, then stabilisation using rock bolts/anchors/shotcrete and/or underpinning may be required. Alternatively, the footings may be taken down below the zone of influence of a vertical cut face, in which case there would be no need to reduce the bearing pressure.

Consideration should be given to the existing footings of two neighbouring buildings to the north and south of the site, as they are within the zone of influence of the proposed excavation at the site. The zone of influence may be taken as a 45° line drawn up from the base of the proposed bulk excavation level. An assessment of the bearing capacity beneath these neighbouring footings should be undertaken to ensure the foundation remains within their serviceability design limits. Progressive inspections of the excavated face below the neighbouring footings will be necessary in 1.0 m drops to check whether there are defects or adversely dipping joints that may affect the neighbouring foundation performance.

All foundations should be inspected by a geotechnical engineer to confirm that foundation conditions are suitable for the design parameters, and proof drilled or spoon tested as appropriate. If weak seams or defects are encountered, footings may need to be deepened until suitable foundation material is reached. Alternatively, the footing can be enlarged, or redesigned for a lower bearing pressure.

8.6 Groundwater

Based on the measurements taken within the installed groundwater wells following development, water levels are noted to be between RL 33.72 m and RL 48.83 m AHD within the sandstone bedrock profile. Data loggers have captured continuous groundwater levels within BH01, BH03a and BH04 from 14 February (BH03a and BH04) and 4 March 2025 (BH01) to assess standing water levels and variations that may arise from climatic events (i.e. rainfall).

The groundwater monitoring results presented in Table 4 indicate that monitoring wells BH01, BH03a and BH04 have captured seepage from perched groundwater within the sandstone bedrock between RL 43.9 m and RL 48.2 m AHD that is not directly connected to deeper groundwater measured at RL 35.0 m in BH201.

Based on the assumed bulk excavation level of RL 26.9 m AHD and RL 28.3 m AHD, it is anticipated that groundwater seepage will occur into the excavation and, given the expected low permeability of the rock, could be readily controlled by perimeter drains connected to a "sump-and-pump" system. An inflow assessment and Groundwater Impact Assessment will be required to inform inflows and basement design. Long term dewatering of a drained basement will require permanent sub-floor drainage below the basement floor slab to direct seepage to the stormwater drainage system. It is imperative that excavations for drainage trenches and sumps are located outside the zone of influence of any foundations.

Groundwater seepage through Hawkesbury sandstone into the basement may give rise to iron precipitate/sludge which will require management and removal. Some form of treatment to groundwater may be required prior to disposal to stormwater.

8.7 Dilapidation Surveys and Monitoring

Dilapidation surveys should be carried out on adjacent buildings, pavements and sensitive structures that may be affected by the excavation. A baseline (reference) survey should be carried out before the commencement of any demolition or excavation work in order to document existing defects so that any claims for damage due to construction related activities can be accurately assessed.

Survey points and inclinometers may also be used to monitor the side wall movement of the excavation.

8.8 Earthquake Design

A Hazard Factor (Z) of 0.08 would be appropriate for preliminary design in accordance with Australian Standard AS 1170.4 – 2007 *Structural design actions – Part 4: Earthquake actions in Australia*. The site sub-soil class is considered to be Class B_e.

It is recommended that the structure is not designed to rely on any passive resistance from the excavated rock faces surrounding the site as there is the potential for the removal of this rock by future neighbouring developments.

8.9 Aggressivity to Buried Concrete and Steel

In accordance with Table 6.4.2(C) and Table 6.5.2(C) in AS2159-2009, the results of the chemical laboratory testing indicate that the ground water present at the site is Mild to Moderate to buried concrete and Mild to Moderate to buried steel.

9. Limitations

Douglas Partners Pty Ltd (Douglas) has prepared this report for this project at 153 - 157 Walker Street, North Sydney NSW in line with Douglas' proposal dated 21 January 2025 and acceptance received from Simon Liang of Freecity Group Holdings Pty Ltd on 5 February 2025 and was undertaken in accordance with Douglas' proposals (233796.00.P.001.Rev1 and 233796.00.P.002.Rev0 dated 21 January and 19 June 2025, respectively). This report is provided for the exclusive use of Freecity Group Holdings Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of Douglas, does so entirely at its own risk and without recourse to Douglas for any loss or damage. In preparing this report Douglas has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable

geological processes and also as a result of human influences. Such changes may occur after Douglas' field testing has been completed.

Douglas' advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by Douglas in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the geotechnical components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. Douglas cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report. This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by Douglas. This is because this report has been written as advice and opinion rather than instructions for construction.

The scope of work for this report did not include the assessment of surface or sub-surface materials or groundwater for contaminants, within or adjacent to the site. Should evidence of fill of unknown origin be noted in the report, and in particular the presence of building demolition materials, it should be recognised that there may be some risk that such fill may contain contaminants and hazardous building materials.

Appendix A

About this Report

Terminology, Symbols and Abbreviations

Soil Descriptions

Rock Descriptions

Sampling, Testing and Excavation Methodology

Introduction

These notes have been provided to amplify Douglas' report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

Douglas' reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Engagement Terms for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather

changes. They may not be the same at the time of construction as are indicated in the report; and

- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, Douglas will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, Douglas cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, Douglas will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, Douglas requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. Douglas would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

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Introduction to Terminology, Symbols and Abbreviations

Douglas Partners' reports, investigation logs, and other correspondence may use terminology which has quantitative or qualitative connotations. To remove ambiguity or uncertainty surrounding the use of such terms, the following sets of notes pages may be attached Douglas Partners' reports, depending on the work performed and conditions encountered:

- Soil Descriptions;
- Rock Descriptions; and
- Sampling, insitu testing, and drilling methodologies

In addition to these pages, the following notes generally apply to most documents.

Abbreviation Codes

Site conditions may also be presented in a number of different formats, such as investigation logs, field mapping, or as a written summary. In some of these formats textual or symbolic terminology may be presented using textual abbreviation codes or graphic symbols, and, where commonly used, these are listed alongside the terminology definition. For ease of identification in these note pages, textual codes are presented in these notes in the following style **XW**. Code usage conforms with the following guidelines:

- Textual codes are case insensitive, although herein they are generally presented in upper case; and
- Textual codes are contextual (i.e. the same or similar combinations of characters may be used in different contexts with different meanings (for example `PL` is used for plastic limit in the context of soil moisture condition, as well as in `PL(A)` for point load test result in the testing results column)).

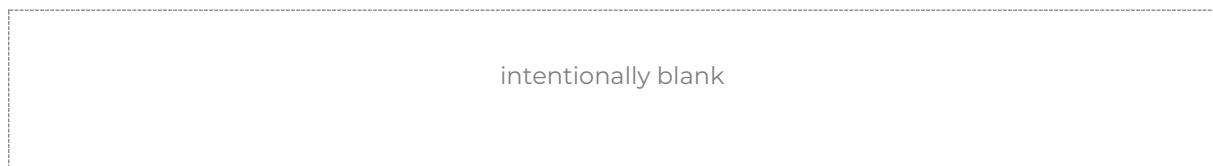
Data Integrity Codes

Subsurface investigation data recorded by Douglas Partners is generally managed in a highly structured database environment, where records "span" between a top and bottom depth interval. Depth interval "gaps" between records are considered to introduce ambiguity, and, where appropriate, our practice guidelines may require contiguous data sets. Recording meaningful data is not always appropriate (for example assigning a "strength" to a concrete pavement) and the following codes may be used to maintain contiguity in such circumstances.

Term	Description	Abbreviation Code
Core loss	No core recovery	KL
Unknown	Information was not available to allow classification of the property. For example, when auguring in loose, saturated sand auger cuttings may not be returned.	UK
No data	Information required to allow classification of the property was not available. For example if drilling is commenced from the base of a hole predrilled by others	ND
Not Applicable	Derivation of the properties not appropriate or beyond the scope of the investigation. For example providing a description of the strength of a concrete pavement	NA

Graphic Symbols

Douglas Partners' logs contain a "graphic" column which provides a pictorial representation of the basic composition of the material. The symbols used are directly representing the material name stated in the adjacent "Description of Strata" column, and as such no specific graphic symbology legend has been provided in these notes.





Introduction

All materials which are not considered to be “in-situ rock” are described in general accordance with the soil description model of AS 1726-2017 Part 6.1.3, and can be broken down into the following description structure:



The “classification” comprises a two character “group symbol” providing a general summary of dominant soil characteristics. The “name” summarises the particle sizes within the soil which most influence its behaviour. The detailed description presents more information about composition, condition, structure, and origin of the soil.

Classification, naming and description of soils require the relative proportion of particles of different sizes within the whole soil mixture to be considered.

Particle size designation and Behaviour Model

Solid particles within a soil are differentiated on the basis of size.

The engineering behaviour properties of a soil can subsequently be modelled to be either “fine grained” (also known as “cohesive” behaviour) or “coarse grained” (“non cohesive” behaviour), depending on the relative proportion of fine or coarse fractions in the soil mixture.

Particle Size Designation	Particle Size (mm)	Behaviour Model	
		Behaviour	Approximate Dry Mass
Boulder	>200	Excluded from particle behaviour model as “oversize”	
Cobble	63 - 200		
Gravel ¹	2.36 - 63	Coarse	>65%
Sand ¹	0.075 - 2.36		
Silt	0.002 - 0.075	Fine	>35%
Clay	<0.002		

¹ – refer grain size subdivision descriptions below

The behaviour model boundaries defined above are not precise, and the material behaviour should be assumed from the name given to the material (which considers the particle fraction which dominates the behaviour, refer “component proportions” below), rather than strict observance of the proportions of particle sizes. For example, if a material is named a “Sandy CLAY”, this is indicative that the material exhibits fine grained behaviour, even if the dry mass of coarse grained material may exceed 65%.

Component proportions

The relative proportion of the dry mass of each particle size fraction is assessed to be a “primary”, “secondary”, or “minor” component of the soil mixture, depending on its influence over the soil behaviour.

Component Proportion Designation	Definition ¹	Relative Proportion	
		In Fine Grained Soil	In Coarse Grained Soil
Primary	The component (particle size designation, refer above) which dominates the engineering behaviour of the soil	The clay/silt component with the greater proportion	The sand/gravel component with the greater proportion
Secondary	Any component which is not the primary, but is significant to the engineering properties of the soil	Any component with greater than 30% proportion	Any granular component with greater than 30%; or Any fine component with greater than 12%
Minor ²	Present in the soil, but not significant to its engineering properties	All other components	All other components

¹ As defined in AS1726-2017 6.1.4.4

² In the detailed material description, minor components are split into two further sub-categories. Refer “identification of minor components” below.

Composite Materials

In certain situations, a lithology description may describe more than one material, for example, collectively describing a layer of interbedded sand and clay. In such a scenario, the two materials would be described independently, with the names preceded or followed by a statement describing the arrangement by which the materials co-exist. For example, “INTERBEDDED Silty CLAY AND SAND”.

Classification

The soil classification comprises a two character group symbol. The first character identifies the primary component. The second character identifies either the grading or presence of fines in a coarse grained soil, or the plasticity in a fine grained soil. Refer AS1726-2017 6.1.6 for further clarification.

Soil Name

For most soils, the name is derived with the primary component included as the noun (in upper case), preceded by any secondary components stated in an adjective form. In this way, the soil name also describes the general composition and indicates the dominant behaviour of the material.

Component ¹	Prominence in Soil Name
Primary	Noun (eg "CLAY")
Secondary	Adjective modifier (eg "Sandy")
Minor	No influence

¹ – for determination of component proportions, refer component proportions on previous page

For materials which cannot be disaggregated, or which are not comprised of rock or mineral fragments, the names "ORGANIC MATTER" or "ARTIFICIAL MATERIAL" may be used, in accordance with AS1726-2017 Table 14.

Commercial or colloquial names are not used for the soil name where a component derived name is possible (for example "Gravelly SAND" rather than "CRACKER DUST").

Materials of "fill" or "topsoil" origin are generally assigned a name derived from the primary/secondary component (where appropriate). In log descriptions this is preceded by uppercase "FILL" or "TOPSOIL". Origin uncertainty is indicated in the description by the characters (?), with the degree of uncertainty described (using the terms "probably" or "possibly" in the origin column, or at the end of the description).

Identification of minor components

Minor components are identified in the soil description immediately following the soil name. The minor component fraction is usually preceded with a term indicating the relative proportion of the component.

Minor Component Proportion Term	Relative Proportion	
	In Fine Grained Soil	In Coarse Grained Soil
With	All fractions: 15-30%	Clay/silt: 5-12% sand/gravel: 15-30%
Trace	All fractions: 0-15%	Clay/silt: 0-5% sand/gravel: 0-15%

The terms "with" and "trace" generally apply only to gravel or fine particle fractions. Where cobbles/boulders are encountered in minor proportions (generally less than about 12%) the term "occasional" may be used. This term describes the sporadic distribution of the material within the confines of the investigation excavation only, and there may be considerable variation in proportion over a wider area which is difficult to factually characterise due to the relative size of the particles and the investigation methods.

Soil Composition

Plasticity

Descriptive Term	Laboratory liquid limit range	
	Silt	Clay
Non-plastic materials	Not applicable	Not applicable
Low plasticity	≤50	≤35
Medium plasticity	Not applicable	>35 and ≤50
High plasticity	>50	>50

Note, Plasticity descriptions generally describe the plasticity behaviour of the whole of the fine grained soil, not individual fine grained fractions.

Grain Size

Type	Particle size (mm)	
	Gravel	Coarse
	Medium	6.7 - 19
	Fine	2.36 - 6.7
Sand	Coarse	0.6 - 2.36
	Medium	0.21 - 0.6
	Fine	0.075 - 0.21

Grading

Grading Term	Particle size (mm)
Well	A good representation of all particle sizes
Poorly	An excess or deficiency of particular sizes within the specified range
Uniformly	Essentially of one size
Gap	A deficiency of a particular size or size range within the total range

Note, AS1726-2017 provides terminology for additional attributes not listed here.

Soil Condition

Moisture

The moisture condition of soils is assessed relative to the plastic limit for fine grained soils, while for coarse grained soils it is assessed based on the appearance and feel of the material. The moisture condition of a material is considered to be independent of stratigraphy (although commonly these are related), and this data is presented in its own column on logs.

Applicability	Term	Tactile Assessment	Abbreviation code
Fine	Dry of plastic limit	Hard and friable or powdery	w<PL
	Near plastic limit	Can be moulded	w=PL
	Wet of plastic limit	Water residue remains on hands when handling	w>PL
	Near liquid limit	"oozes" when agitated	w=LL
	Wet of liquid limit	"oozes"	w>LL
Coarse	Dry	Non-cohesive and free running	D
	Moist	Feels cool, darkened in colour, particles may stick together	M
	Wet	Feels cool, darkened in colour, particles may stick together, free water forms when handling	W

The abbreviation code **NDF**, meaning "not-assessable due to drilling fluid use" may also be used.

Note, observations relating to free ground water or drilling fluids are provided independent of soil moisture condition.

Consistency/Density/Compaction/Cementation/Extremely Weathered Material

These concepts give an indication of how the material may respond to applied forces (when considered in conjunction with other attributes of the soil). This behaviour can vary independent of the composition of the material, and on logs these are described in an independent column and are generally mutually exclusive (i.e it is inappropriate to describe both consistency and compaction at the same time). The method by which the behaviour is described depends on the behaviour model and other characteristics of the soil as follows:

- In fine grained soils, the "consistency" describes the ease with which the soil can be remoulded, and is generally correlated against the materials undrained shear strength;
- In granular materials, the relative density describes how tightly packed the particles are, and is generally correlated against the density index;
- In anthropogenically modified materials, the compaction of the material is described qualitatively;
- In cemented soils (both natural and anthropogenic), the cemented "strength" is described qualitatively, relative to the difficulty with which the material is disaggregated; and
- In soils of extremely weathered material origin, the engineering behaviour may be governed by relic rock features, and expected behaviour needs to be assessed based the overall material description.

Quantitative engineering performance of these materials may be determined by laboratory testing or estimated by correlated field tests (for example penetration or shear vane testing). In some cases, performance may be assessed by tactile or other subjective methods, in which case investigation logs will show the estimated value enclosed in round brackets, for example **(VS)**.

Consistency (fine grained soils)

Consistency Term	Tactile Assessment	Undrained Shear Strength (kPa)	Abbreviation Code
Very soft	Extrudes between fingers when squeezed	<12	VS
Soft	Mouldable with light finger pressure	>12 - ≤25	S
Firm	Mouldable with strong finger pressure	>25 - ≤50	F
Stiff	Cannot be moulded by fingers	>50 - ≤100	St
Very stiff	Indented by thumbnail	>100 - ≤200	VSt
Hard	Indented by thumbnail with difficulty	>200	H
Friable	Easily crumbled or broken into small pieces by hand	-	Fr

Relative Density (coarse grained soils)

Relative Density Term	Density Index	Abbreviation Code
Very loose	<15	VL
Loose	>15 - ≤35	L
Medium dense	>35 - ≤65	MD
Dense	>65 - ≤85	D
Very dense	>85	VD

Note, tactile assessment of relative density is difficult, and generally requires penetration testing, hence a tactile assessment guide is not provided.

Compaction (anthropogenically modified soil)

Compaction Term	Abbreviation Code
Well compacted	WC
Poorly compacted	PC
Moderately compacted	MC
Variably compacted	VC

Cementation (natural and anthropogenic)

Cementation Term	Abbreviation Code
Moderately cemented	MOD
Weakly cemented	WEK

Extremely Weathered Material

AS1726-2017 considers weathered material to be soil if the unconfined compressive strength is less than 0.6 MPa (i.e. less than very low strength rock). These materials may be identified as “extremely weathered material” in reports and by the abbreviation code **XWM** on log sheets. This identification is not correlated to any specific qualitative or quantitative behaviour, and the engineering properties of this material must therefore be assessed according to engineering principles with reference to any relic rock structure, fabric, or texture described in the description.

Soil Origin

Term	Description	Abbreviation Code
Residual	Derived from in-situ weathering of the underlying rock	RS
Extremely weathered material	Formed from in-situ weathering of geological formations. Has strength of less than ‘very low’ as per as1726 but retains the structure or fabric of the parent rock.	XWM
Alluvial	Deposited by streams and rivers	ALV
Fluvial	Deposited by channel fill and overbank (natural levee, crevasse splay or flood basin)	FLV
Estuarine	Deposited in coastal estuaries	EST
Marine	Deposited in a marine environment	MAR
Lacustrine	Deposited in freshwater lakes	LAC
Aeolian	Carried and deposited by wind	AEO
Colluvial	Soil and rock debris transported down slopes by gravity	COL
Slopewash	Thin layers of soil and rock debris gradually and slowly deposited by gravity and possibly water	SW
Topsoil	Mantle of surface soil, often with high levels of organic material	TOP
Fill	Any material which has been moved by man	FILL
Littoral	Deposited on the lake or seashore	LIT
Unidentifiable	Not able to be identified	UID

Cobbles and Boulders

The presence of particles considered to be “oversize” may be described using one of the following strategies:

- Oversize encountered in a minor proportion (when considered relative to the wider area) are noted in the soil description; or
- Where a significant proportion of oversize is encountered, the cobbles/boulders are described independent of the soil description, in a similar manner to composite soils (described above) but qualified with “MIXTURE OF”.

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Rock Strength

Rock strength is defined by the unconfined compressive strength, and it refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects.

The Point Load Strength Index $I_{s(50)}$ is commonly used to provide an estimate of the rock strength and site specific correlations should be developed to allow UCS values to be determined. The point load strength test procedure is described by Australian Standard AS4133.4.1-2007. The terms used to describe rock strength are as follows:

Strength Term	Unconfined Compressive Strength (MPa)	Point Load Index ¹ $I_{s(50)}$ MPa	Abbreviation Code
Very low	0.6 - 2	0.03 - 0.1	VL
Low	2 - 6	0.1 - 0.3	L
Medium	6 - 20	0.3 - 1.0	M
High	20 - 60	1 - 3	H
Very high	60 - 200	3 - 10	VH
Extremely high	>200	>10	EH

¹ Rock strength classification is based on UCS. The UCS to $I_{s(50)}$ ratio varies significantly for different rock types and specific ratios may be required for each site. The point load Index ranges shown above are as suggested in AS1726 and should not be relied upon without supporting evidence.

The following abbreviation codes are used for soil layers or seams of material “within rock” but for which the equivalent UCS strength is less than 0.6 MPa.

Scenario	Abbreviation Code
The material encountered has an equivalent UCS strength of less than 0.6 MPa, and therefore is considered to be soil (as per Note 1 of Table 20 of AS 1726-2017). The properties of the material encountered over this interval are described in the “Description of Strata” and soil properties columns.	SOIL
The material encountered has an equivalent UCS strength of less than 0.6 MPa, and therefore is considered to be soil (as per Note 1 of Table 20 of AS 1726-2017). The prominence of the material is such that it can be considered to be a seam (as defined in Table 22 of AS1726-2017) and the properties of the material are described in the defect column.	SEAM

Degree of Weathering

The degree of weathering of rock is classified as follows:

Weathering Term	Description	Abbreviation Code
Residual Soil ¹	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported.	RS
Extremely weathered ¹	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible	XW
Highly weathered	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching or may be decreased due to deposition of weathering products in pores.	HW
Moderately weathered	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable but shows little or no change of strength from fresh rock.	MW
Slightly weathered	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.	SW
Fresh	No signs of decomposition or staining.	FR
Note: If HW and MW cannot be differentiated use DW (see below)		
Distinctly weathered	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching or may be decreased due to deposition of weathered products in pores.	DW

¹ The parent rock type, of which the residual/extremely weathered material is a derivative, will be stated in the description (where discernible).

Degree of Alteration

The degree of alteration of the rock material (physical or chemical changes caused by hot gasses or liquids at depth) is classified as follows:

Term	Description	Abbreviation Code
Extremely altered	Material is altered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.	XA
Highly altered	The whole of the rock material is discoloured, usually by staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is changed by alteration. Some primary minerals are altered to clay minerals. Porosity may be increased by leaching or may be decreased due to precipitation of secondary materials in pores.	HA
Moderately altered	The whole of the rock material is discoloured, usually by staining or bleaching to the extent that the colour of the original rock is not recognisable but shows little or no change of strength from fresh rock.	MA
Slightly altered	Rock is slightly discoloured but shows little or no change of strength from fresh rock	SA
Note: If HA and MA cannot be differentiated use DA (see below)		
Distinctly altered	Rock strength usually changed by alteration. The rock may be highly discoloured, usually by staining or bleaching. Porosity may be increased by leaching or may be decreased due to precipitation of secondary minerals in pores.	DA

Degree of Fracturing

The following descriptive classification apply to the spacing of natural occurring fractures in the rock mass. It includes bedding plane partings, joints and other defects, but excludes drilling breaks. These terms are generally not required on investigation logs where fracture spacing is presented as a histogram, and where used are presented in an unabbreviated format.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with occasional fragments
Fractured	Core lengths of 30-100 mm with occasional shorter and longer sections
Slightly Fractured	Core lengths of 300 mm or longer with occasional sections of 100-300 mm
Unbroken	Core contains very few fractures

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$RQD \% = \frac{\text{cumulative length of 'sound' core sections} > 100 \text{ mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or stronger. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e., drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

These terms may be used to describe the spacing of bedding partings in sedimentary rocks. Where used, these terms are generally presented in an unabbreviated format

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Defect Descriptions

Defect Type

Term	Abbreviation Code
Bedding plane	B
Cleavage	CL
Crushed seam	CS
Crushed zone	CZ
Drilling break	DB
Decomposed seam	DS
Drill lift	DL
Extremely Weathered seam	EW
Fault	F
Fracture	FC
Fragmented	FG
Handling break	HB
Infilled seam	IS
Joint	JT
Lamination	LAM
Shear seam	SS
Shear zone	SZ
Vein	VN
Mechanical break	MB
Parting	P
Sheared Surface	S

Rock Defect Orientation

Term	Abbreviation Code
Horizontal	H
Vertical	V
Sub-horizontal	SH
Sub-vertical	SV

Rock Defect Coating

Term	Abbreviation Code
Clean	CN
Coating	CT
Healed	HE
Infilled	INF
Stained	SN
Tight	TI
Veneer	VNR

Rock Defect Infill

Term	Abbreviation Code
Calcite	CA
Carbonaceous	CBS
Clay	CLAY
Iron oxide	FE
Manganese	MN
Pyrite	Py
Secondary material	MS
Silt	M
Quartz	Qz
Unidentified material	MU

Rock Defect Shape/Planarity

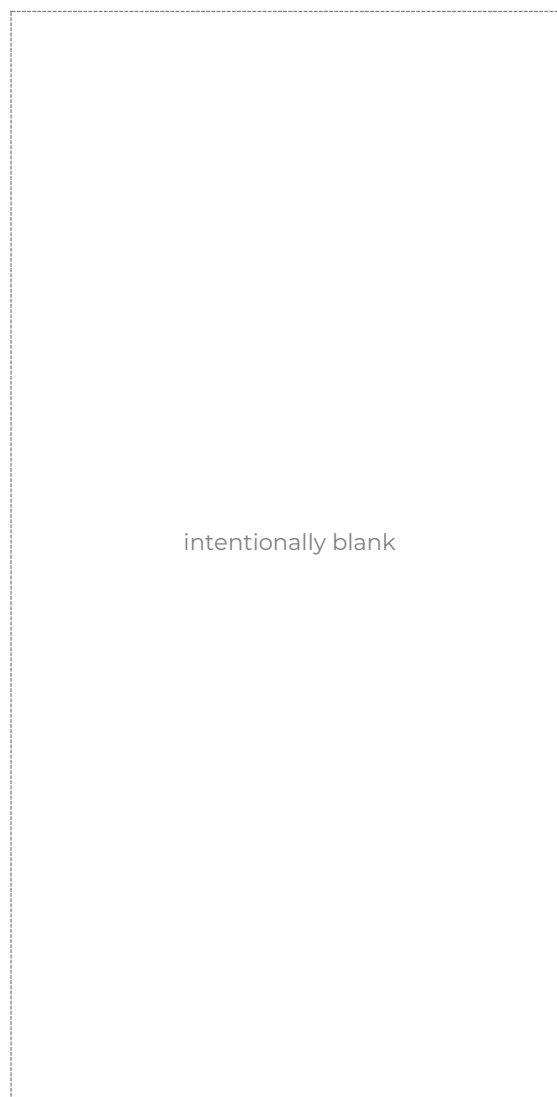
Term	Abbreviation Code
Curved	CU
Discontinuous	DIS
Irregular	IR
Planar	PR
Stepped	ST
Undulating	UN

Rock Defect Roughness

Term	Abbreviation Code
Polished	PO
Rough	RF
Smooth	SM
Slickensided	SL
Very rough	VR

Defect Orientation

The inclination of defects is always measured from the perpendicular to the core axis.





Sampling and Testing

A record of samples retained, and field testing performed is usually shown on a Douglas Partners' log with samples appearing to the left of a depth scale, and selected field and laboratory testing appearing to the right of the scale, as illustrated below:

SAMPLE			DEPTH (m)	TESTING	
SAMPLE REMARKS	TYPE	INTERVAL		TEST TYPE	RESULTS AND REMARKS
	SPT		1.0 1.45	SPT	4,9,11 N=20

Sampling

The type or intended purpose for which a sample was taken is indicated by the following abbreviation codes.

Sample Type	Code
Auger sample	A
Acid Sulfate sample	ASS
Bulk sample	B
Core sample	C
Disturbed sample	D
Environmental sample	ES
Driven Tube sample	DT
Gas sample	G
Piston sample	P
Sample from SPT test	SPT
Undisturbed tube sample	U ¹
Water sample	W
Material Sample	MT
Core sample for unconfined compressive strength testing	UCS

¹ – numeric suffixes indicate tube diameter/width in mm

The above codes only indicate that a sample was retained, and not that testing was scheduled or performed.

Field and Laboratory Testing

A record that field and laboratory testing was performed is indicated by the following abbreviation codes.

Test Type	Code
Pocket penetrometer (kPa)	PP
Photo ionisation detector (ppm)	PID
Standard Penetration Test x/y = x blows for y mm penetration HB = hammer bouncing HW = fell under weight of hammer	SPT
Shear vane (kPa)	V

Unconfined compressive strength, (MPa)	UCS
--	-----

Field and laboratory testing (continued)

Test Type	Code
Point load test, (MPa), axial (A), diametric (D), irregular (I)	PLT(L)
Dynamic cone penetrometer, followed by blow count penetration increment in mm (cone tip, generally in accordance with AS1289.6.3.2)	DCP9/150
Perth sand penetrometer, followed by blow count penetration increment in mm (flat tip, generally in accordance with AS1289.6.3.3)	PSP/150

Groundwater Observations

▷	seepage/inflow
▽	standing or observed water level
NFGWO	no free groundwater observed
OBS	observations obscured by drilling fluids

Drilling or Excavation Methods/Tools

The drilling/excavation methods used to perform the investigation may be shown either in a dedicated column down the left-hand edge of the log, or stated in the log footer. In some circumstances abbreviation codes may be used.

Method	Abbreviation Code
Direct Push	DP
Solid flight auger. Suffixes: /T = tungsten carbide tip, /V = v-shaped tip	AD ¹
Air Track	AT
Diatube	DT ¹
Hand auger	HA ¹
Hand tools (unspecified)	HAND
Existing exposure	X
Hollow flight auger	HSA ¹
HQ coring	HQ3
HMLC series coring	HMLC
NMLC series coring	NMLC
NQ coring	NQ3
PQ coring	PQ3
Predrilled	PD
Push tube	PT ¹
Ripping tyne/ripper	R
Rock roller	RR ¹
Rock breaker/hydraulic hammer	EH
Sonic drilling	SON ¹
Mud/blade bucket	MB ¹
Toothed bucket	TB ¹
Vibrocore	VC ¹
Vacuum excavation	VE
Wash bore (unspecified bit type)	WB ¹

¹ – numeric suffixes indicate tool diameter/width in mm

Appendix B

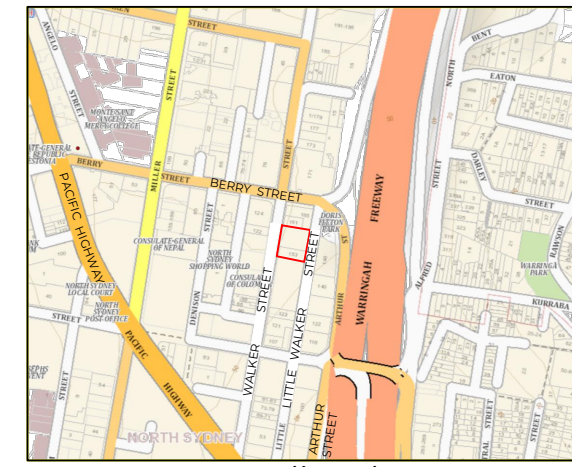
Test Location Plan

Interpreted Geotechnical Cross Section A-A'

Interpreted Geotechnical Cross Section B-B'

Interpreted Geotechnical Cross Section C-C'

Interpreted Geotechnical Cross Section D-D'



Locality Plan

NOTE:
 1: Base image from MetroMap (Dated 13.06.2022)
 2: Basement footprint from Architectus, Project No.240626, Drawing No. A.DA0096, Issue P6 (18.12.2024)



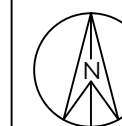
LEGEND

- Borehole Test Location
- Site Boundary
- Proposed Basement Level Outline
- Existing Basement Level of 153 Building Outline
- Geological Cross Section

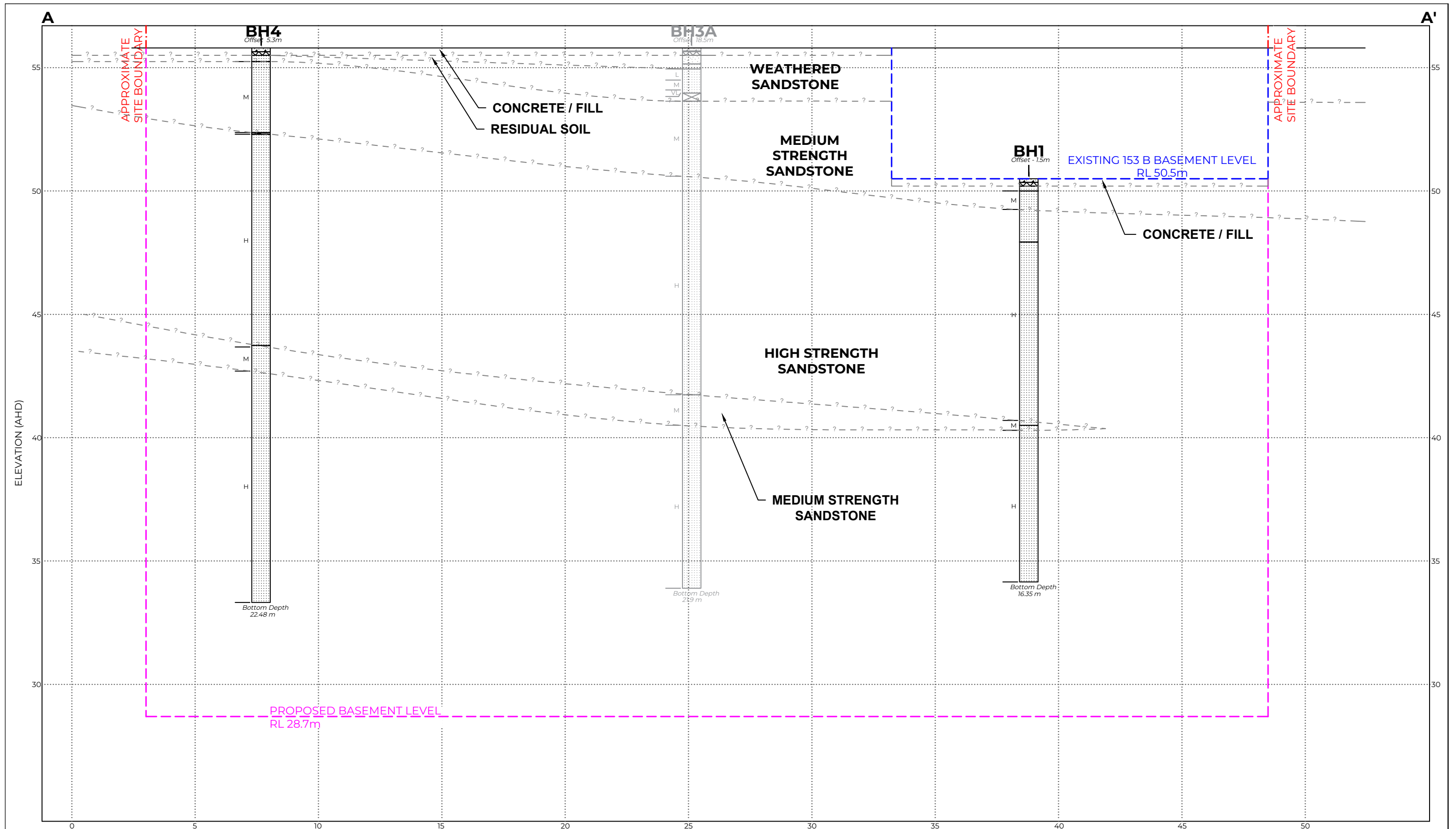


CLIENT: Freecity Group Holdings Pty Ltd
 OFFICE: Sydney DRAWN BY: MN/EC
 SCALE: 1:300 @ A3 DATE: 20.08.2025

TITLE: **Test Location Plan**
Proposed Residential Development
153-157 Walker Street, North Sydney



PROJECT No: 233796.00
 DRAWING No: 1
 REVISION: 0



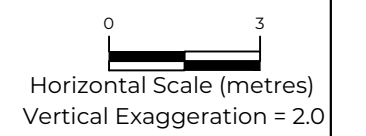
- LEGEND**
- Core Loss
 - Concrete
 - Filling
 - Sand

Sandstone

- NOTES:**
- Subsurface conditions are accurate at the borehole locations only. Variations in subsurface conditions may occur between borehole locations. Interpreted strata boundaries are approximate and should be used as a guide only.
 - Summary logs only and should be read in conjunction with detailed logs.
 - Horizontal and vertical scales are not equal.

- ROCK STRENGTH**
- EL - Extremely Low
 - VL - Very Low
 - L - Low
 - M - Medium
 - H - High
 - VH - Very High

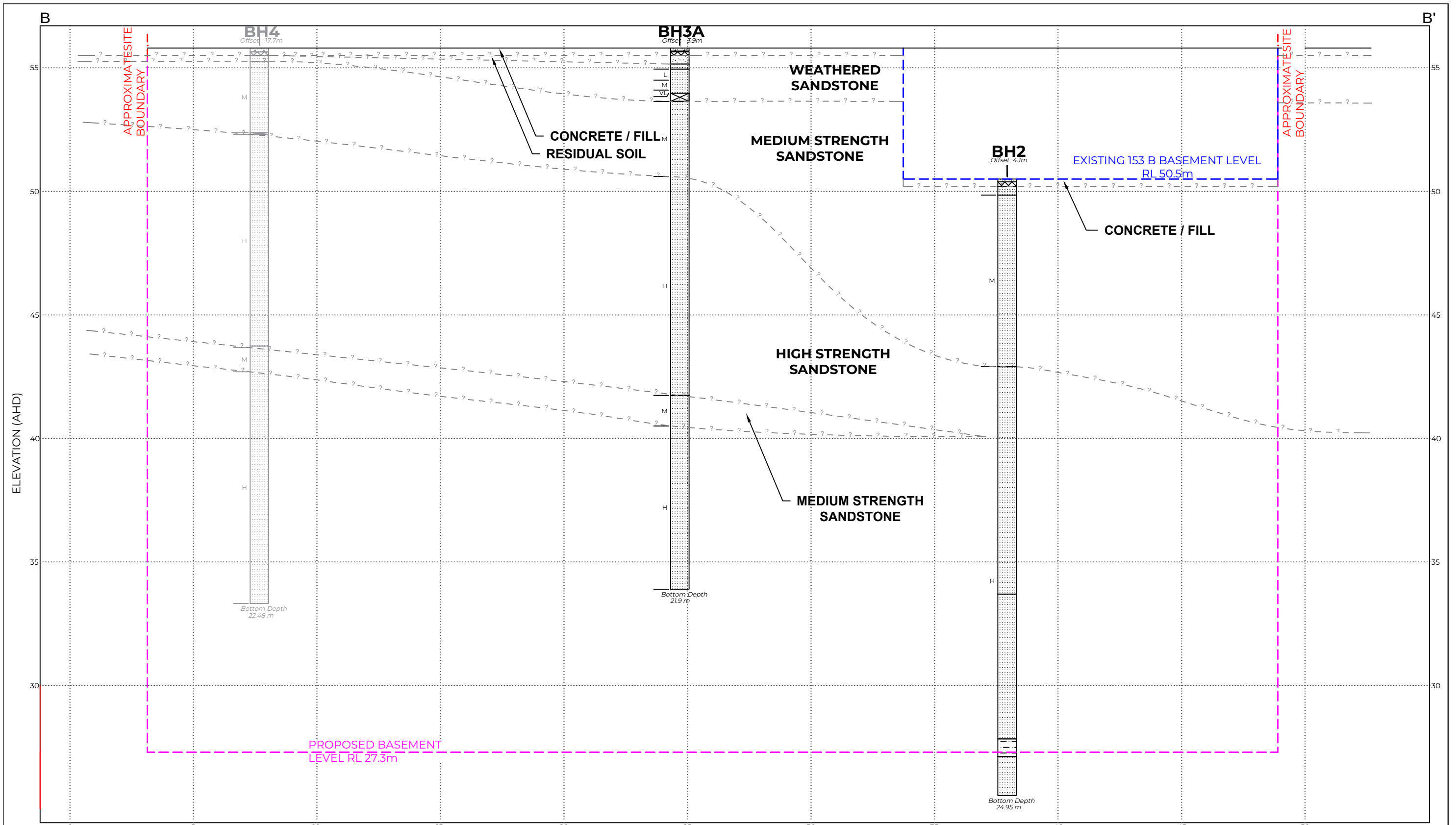
- TESTS / OTHER**
- ? - - - Interpreted geotechnical boundary



CLIENT: Freecity Group Holdings Pty Ltd
 OFFICE: Sydney DRAWN BY: MN
 SCALE: 1:150 (H) @ A3 DATE: 12.06.2025
 1:150 (V)

TITLE: **Interpreted Geotechnical Cross-Section A-A'**
 Propose Mixed Use Development
 153 - 157 Walker Street, North Sydney

PROJECT No: 233796.00
 DRAWING No: 2
 REVISION: 0



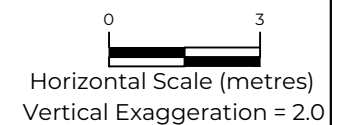
- LEGEND**
- Core Loss
 - Concrete
 - Filling
 - Sand

Sandstone

- NOTES:**
- Subsurface conditions are accurate at the borehole locations only. Variations in subsurface conditions may occur between borehole locations. Interpreted strata boundaries are approximate and should be used as a guide only.
 - Summary logs only and should be read in conjunction with detailed logs.
 - Horizontal and vertical scales are not equal.

- ROCK STRENGTH**
- EL - Extremely Low
 - VL - Very Low
 - L - Low
 - M - Medium
 - H - High
 - VH - Very High

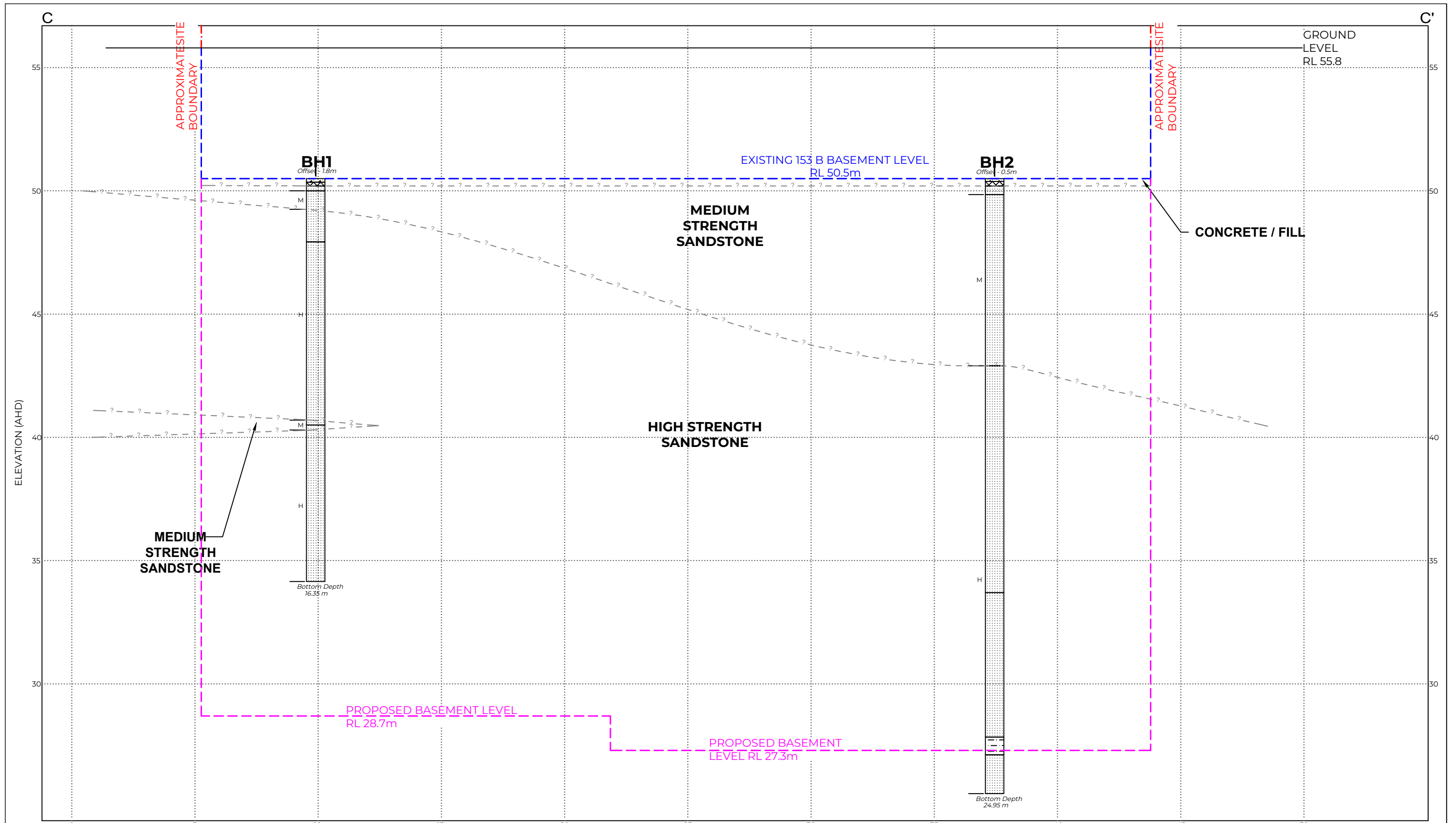
- TESTS / OTHER**
- ? - - - Interpreted geotechnical boundary



CLIENT: Freecity Group Holdings Pty Ltd
 OFFICE: Sydney DRAWN BY: MN
 SCALE: 1:150 (H) @ A3 DATE: 12.06.2025
 1:150 (V)

TITLE: **Interpreted Geotechnical Cross-Section B-B'**
 Propose Mixed Use Development
 153 - 157 Walker Street, North Sydney

PROJECT No: 233796.00
 DRAWING No: 3
 REVISION: 0



ELEVATION (AHD)

- LEGEND**
- Concrete
 - Filling
 - Sandstone
 - Siltstone

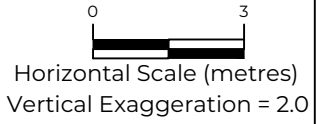
NOTES:

- Subsurface conditions are accurate at the borehole locations only. Variations in subsurface conditions may occur between borehole locations. Interpreted strata boundaries are approximate and should be used as a guide only.
- Summary logs only and should be read in conjunction with detailed logs.
- Horizontal and vertical scales are not equal.

- ROCK STRENGTH**
- EL - Extremely Low
 - VL - Very Low
 - L - Low
 - M - Medium
 - H - High
 - VH - Very High

TESTS / OTHER

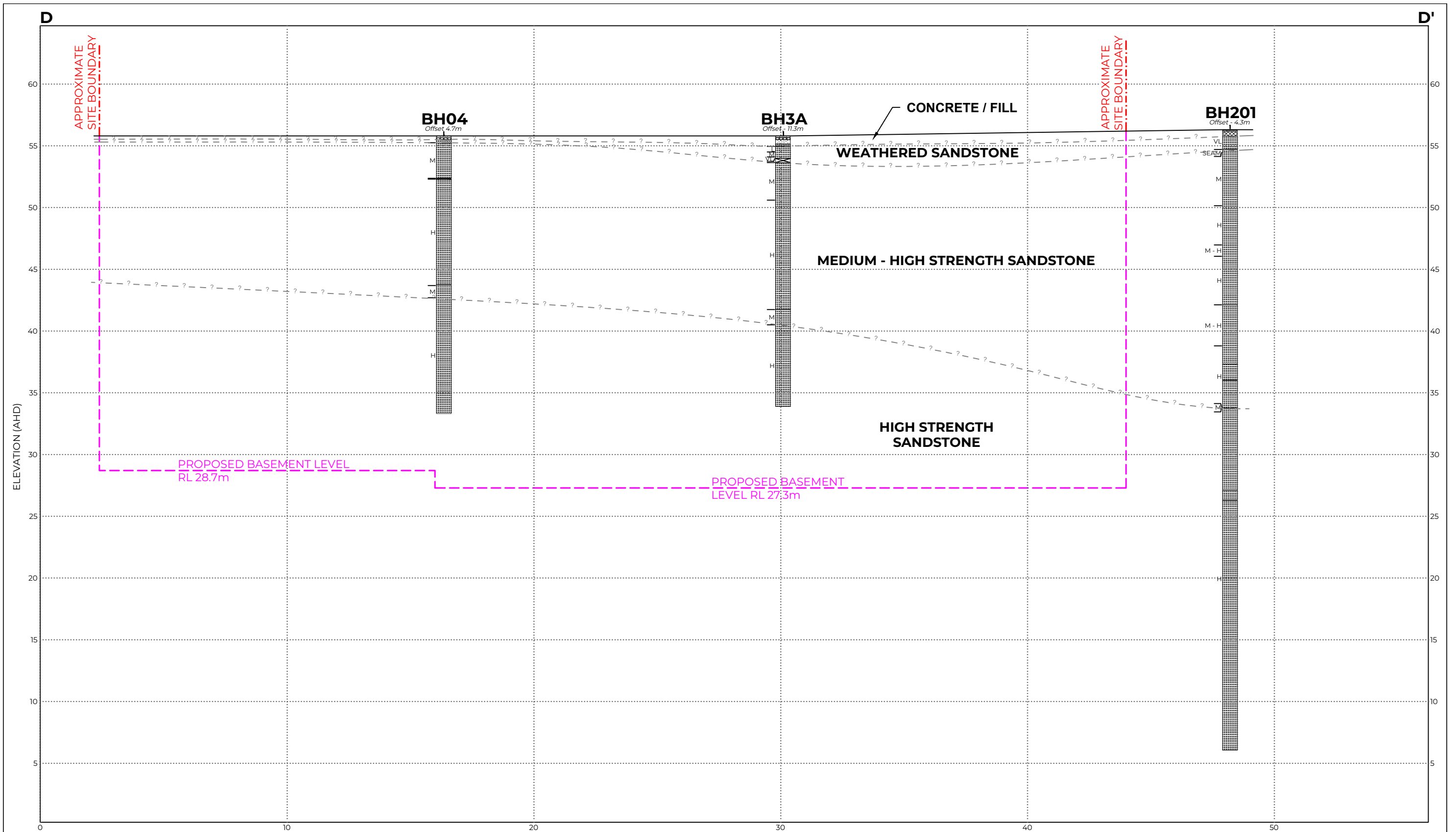
- ? - - - Interpreted geotechnical boundary



CLIENT: Freecity Group Holdings Pty Ltd
 OFFICE: Sydney DRAWN BY: MN
 SCALE: 1:150 (H) @ A3 DATE: 12.06.2025
 1:150 (V)

TITLE: **Interpreted Geotechnical Cross-Section C-C'**
 Propose Mixed Use Development
 153 - 157 Walker Street, North Sydney

PROJECT No: 233796.00
 DRAWING No: 4
 REVISION: 0



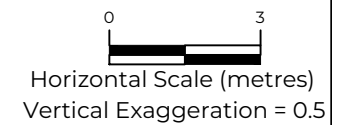
LEGEND

	Concrete		Core Loss
	Filling		
	Sandstone		
	Sand		

NOTES:

- Subsurface conditions are accurate at the borehole locations. Variations in subsurface conditions may occur between borehole locations. Interpreted strata boundaries are approximate and should be used as a guide only.
- Summary logs only and should be read in conjunction with detailed logs.
- Horizontal and vertical scales are not equal.

ROCK STRENGTH	TESTS / OTHER
EL - Extremely Low	- ? - - Interpreted geotechnical boundary
VL - Very Low	
L - Low	
M - Medium	
H - High	
VH - Very High	



CLIENT: Freecity Group Holdings Pty Ltd	
OFFICE: Sydney	DRAWN BY: EC
SCALE: 1:150 (H) 1:300 (V) @ A3	DATE: 20.08.2025

TITLE: Interpreted Geotechnical Cross-Section D-D'
Proposed Commercial Development
153-157 Walker St, North Sydney

PROJECT No:	233796.00
DRAWING No:	5
REVISION:	0

Appendix C

Borehole Logs (BH01, BH02, BH03a, BH04 and BH201)

BOREHOLE LOG

CLIENT: Freecity Group Holdings Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 153 Walker Street, North Sydney, NSW 2060

SURFACE LEVEL: 50.5 AHD
COORDINATE: E:334307.0, N:6254383.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 233796.00
DATE: 09/11/22 - 11/11/22
SHEET: 2 of 2

CONDITIONS ENCOUNTERED										SAMPLE				TESTING								
GROUNDWATER RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL				ROCK						SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS			
				ORIGIN (#)	CONSIS. (°)	DENSITY (°)	MOISTURE	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)							DEFECTS & REMARKS		
10.00		SANDSTONE: medium to coarse grained, pale grey, distinctly bedded at 0-10°, medium then high strength, fresh, unbroken, Hawkesbury Sandstone 13.90m: 13.90-15.44m: dark brown, moderately weathered																				
10.00																						
11.00																						
11.44																						
12.10																						
12.85																						
13.90																						
15.44																						
15.48																						
15.54																						
16.35																						
16.35		Borehole discontinued at 16.35m depth. Target depth reached.																				

NOTES: ⁽¹⁾ Soil origin is "probable" unless otherwise stated. ⁽²⁾ Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DP710P

OPERATOR: BS

LOGGED: YB

METHOD: Diacore to 0.15m, Solid Flight Auger (TC-bit) to 0.50m, NMLC coring to 16.35m. HW to 0.5 m.

CASING: Uncased

REMARKS: Standpipe installed to 16.35m (sump: 16.0 to 16.35, screen: 1.5m to 16.0m, Solid PVC 0.1m to 1.5m, Gravel 1.0m to 16.35m, Bentonite Backfill 0.1m to 1.0m, Gatic Cover at top). BH co-ordinates have been approximated. Refer to explanatory notes for symbol and abbreviation definitions



CORE PHOTO LOG

CLIENT: Freecity Group Holdings Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 153 Walker Street, North Sydney, NSW 2060

SURFACE LEVEL: 50.5 AHD
COORDINATE: E:334307.0, N:6254383.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 233796.00
DATE: 09/11/22 - 11/11/22
SHEET: 1 of 1



0.50-16.35 m depth

BOREHOLE LOG

CLIENT: Freecity Group Holdings Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 153 Walker Street, North Sydney, NSW 2060

SURFACE LEVEL: 50.5 AHD
COORDINATE: E:334334.0, N:6254380.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 233796.00
DATE: 11/11/22 - 16/11/22
SHEET: 2 of 3

CONDITIONS ENCOUNTERED										SAMPLE				TESTING						
GROUNDWATER RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL				ROCK				DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS		
				ORIGIN (#)	CONSIS. (°) DENSITY (°)	MOISTURE	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD								FRACTURE SPACING (m)	
40	11	[CONT] SANDSTONE: medium to coarse grained, pale grey and dark brown, distinctly and indistinctly bedded at 0-20°, high strength, slightly to moderately weathered, unbroken, Hawkesbury Sandstone																		
39	12			MW									11.70m: . B5° pl,ro, cly inf 5 mm						PLT PL(A)=1.2MPa	
38	13												12.37m: . B5° pl,ro, fe strn 12.58m: . Cs, 10 mm							PLT PL(A)=2.0MPa
37	14																			PLT PL(A)=1.9MPa
36	15																			PLT PL(A)=1.0MPa
35	16																		PLT PL(A)=2.0MPa	
34	17	SANDSTONE: medium to coarse grained, pale grey, massive, medium then high strength, fresh, unbroken, Hawkesbury Sandstone																		
33	18			SW																PLT PL(A)=1.0MPa
32	19			MW																PLT PL(A)=1.1MPa
31	20			FR																PLT PL(A)=1.2MPa
	21																		PLT PL(A)=1.3MPa	
	22																		PLT PL(A)=1.1MPa	
	23																		PLT PL(A)=1.1MPa	

NOTES: ° Soil origin is "probable" unless otherwise stated. ° Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DP710P

OPERATOR: BS

LOGGED: YB

METHOD: Diacore to 0.15m, Solid Flight Auger (TC-bit) to 0.65m, NMLC coring to 24.95m. HW to 1.0 m.

CASING: Uncased

REMARKS: 20% water loss from 8.76 to 16.67 m. BH co-ordinates have been approximated from GIS program

Refer to explanatory notes for symbol and abbreviation definitions



CORE PHOTO LOG

CLIENT: Freecity Group Holdings Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 153 Walker Street, North Sydney, NSW 2060

SURFACE LEVEL: 50.5 AHD
COORDINATE: E:334334.0, N:6254380.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 233796.00
DATE: 11/11/22 - 16/11/22
SHEET: 1 of 1



0.65-24.95 m depth

BOREHOLE LOG

CLIENT: Freecity Group Holdings Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 153 Walker Street, North Sydney, NSW 2060

SURFACE LEVEL: 55.8 AHD
COORDINATE: E:334328.0, N:6254395.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03A
PROJECT No: 233796.00
DATE: 17/11/22 - 22/11/22
SHEET: 2 of 3

CONDITIONS ENCOUNTERED										SAMPLE			TESTING					
GROUNDWATER RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL				ROCK				DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
				ORIGIN (#)	CONSIS. (°) DENSITY (°)	MOISTURE	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD							
45	11	[CONT] SANDSTONE: medium to coarse grained, pale grey-yellow then dark brown, medium then high strength, moderately to slightly weathered, unbroken, Hawkesbury Sandstone					SW	10.80			100	100	10.10m: B0-5°;pl,he,fe stn				PLT	PL(A)=1.6MPa
44	12						MW				100	99	10.99m: B0-5°;pl,he,fe stn 11.39m: B0-5°;pl,he,fe stn				PLT	PL(A)=1.5MPa
43	13										100	100	12.10m: 12.10-12.11m: B(x2) 0-5°;pl,he, cly vnr				PLT	PL(A)=1.3MPa
42	14							14.06			100	100	13.06m: B0-5°;pl,he,fe stn 13.21m: B0-5°;pl,ro, cly vn				PLT	PL(A)=1.0MPa
41	15	SANDSTONE: medium to coarse grained, pale grey, medium then high strength, fresh, slightly fractured to unbroken, Hawkesbury Sandstone									100	97	14.90m: B0-5°;pl,ro, cly vn 15.04m: Cs, 40 mm				PLT	PL(A)=0.70MPa
40	16							15.30			100	98	16.30m: B0-5°;pl,ro, cly vn				PLT	PL(A)=1.8MPa
39	17						FR				100	100	16.85m: Cs, 20 mm				PLT	PL(A)=1.3MPa
38	18										100	100	17.99m: B0-5°;pl,ro, cly vn 18.10m: B0-5°;pl,ro, cly inf 5 mm				PLT	PL(A)=2.0MPa
37	19										100	97	18.53m: B0-5°;pl,ro, cly vn				PLT	PL(A)=2.0MPa
36	19.35	19.35m: 19.35-20.55m: moderately weathered					MW	19.35			100	97	19.35m: B0-5°;pl,ro, fe stn				PLT	PL(A)=1.2MPa

NOTES: ¹Soil origin is "probable" unless otherwise stated. ²Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DP710P **OPERATOR:** BS **LOGGED:** YB
METHOD: Diacore to 0.12m, Solid Flight Auger (TC-bit) to 0.85m, NMLC coring to 21.90m. HW to 0.9 m. **CASING:** Uncased
REMARKS: Standpipe installed to 21.90m (sump: 21.50 to 21.90, screen: 8.00m to 21.5m, Solid PVC 0.1m to 8.00m, Gravel 7.5m to 21.90m, Bentonite Backfill 6.5m to 7.5m, Gravel 0.1m to 6.5m, Gatic Cover at top). BH co-Refer to explanatory notes for symbol and abbreviation definitions



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CORE PHOTO LOG

CLIENT: Freecity Group Holdings Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 153 Walker Street, North Sydney, NSW 2060

SURFACE LEVEL: 55.8 AHD
COORDINATE: E:334328.0, N:6254395.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03A
PROJECT No: 233796.00
DATE: 17/11/22 - 22/11/22
SHEET: 1 of 1



0.85-21.90 m depth

BOREHOLE LOG

CLIENT: Freecity Group Holdings Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 153 Walker Street, North Sydney, NSW 2060

SURFACE LEVEL: 55.8 AHD
COORDINATE: E:334317.0, N:6254413.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 233796.00
DATE: 16/11/22 - 18/11/22
SHEET: 1 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	CONDITIONS ENCOUNTERED										SAMPLE				TESTING					
					SOIL				ROCK						DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS			
					ORIGIN (#)	CONSIS. (%)	DENSITY (%)	MOISTURE	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)										
	0.15	0.30	CONCRETE																			PID	PID= 3.5 ppmppm	
	0.30	0.55	FILL/Gravelly SAND: fine to medium, dark grey-brown, medium to coarse, angular to sub-angular igneous gravel, moist																				PID	PID= 3.9 ppmppm
	0.55	1.00	SANDSTONE: orange-brown, inferred very low to low strength																				PLT	PL(A)=0.70MPa
	1.00	2.00	SANDSTONE: medium to coarse grained, red-brown then pale grey, medium strength, moderately then slightly weathered, unbroken, Hawkesbury Sandstone																				PLT	PL(A)=0.80MPa
	2.00	3.00																					PLT	PL(A)=0.70MPa
	3.00	3.43	CORE LOSS																				PLT	PL(A)=1.8MPa
	3.43	4.00	SANDSTONE: medium to coarse grained, pale grey-yellow and dark brown, high strength, moderately weathered then fresh, slightly fractured then unbroken, Hawkesbury Sandstone																				PLT	PL(A)=1.8MPa
	4.00	5.00																					PLT	PL(A)=1.8MPa
	5.00	6.00																					PLT	PL(A)=1.5MPa
	6.00	7.00																					PLT	PL(A)=1.4MPa
	7.00	8.00																					PLT	PL(A)=1.7MPa
	8.00	9.00																					PLT	PL(A)=1.9MPa
	9.00	10.00																					PLT	PL(A)=1.0MPa

NOTES: #Soil origin is "probable" unless otherwise stated. %Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DP710P **OPERATOR:** BS **LOGGED:** YB
METHOD: Diacore to 0.15m, Solid Flight Auger (TC-bit) to 0.55m, NMLC coring to 22.48m. HW to 0.9m. **CASING:** Uncased
REMARKS: Standpipe installed to 22.48m (sump: 22.00 to 22.48, screen: 7.00m to 22.00m, Solid PVC 0.1m to 7.00m, Gravel 6.5m to 22.48m, Bentonite Backfill 5.5m to 6.5m, Gravel 0.1m to 5.5m, Gatic Cover at top). BH co-Refer to explanatory notes for symbol and abbreviation definitions



Generated with CORE-GS by Geroc - Combined Log

BOREHOLE LOG

CLIENT: Freecity Group Holdings Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 153 Walker Street, North Sydney, NSW 2060

SURFACE LEVEL: 55.8 AHD
COORDINATE: E:334317.0, N:6254413.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 233796.00
DATE: 16/11/22 - 18/11/22
SHEET: 2 of 3

CONDITIONS ENCOUNTERED										SAMPLE				TESTING						
GROUNDWATER RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL				ROCK				DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS		
				ORIGIN (#)	CONSIS. (°) DENSITY (°)	MOISTURE	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD								FRACTURE SPACING (m)	
45	11	[CONT] SANDSTONE: medium to coarse grained, pale grey-yellow and dark brown, high strength, moderately weathered then fresh, slightly fractured then unbroken, Hawkesbury Sandstone					SW													
44	12	SANDSTONE: medium to coarse grained, pale grey, medium then high strength, fresh, unbroken, Hawkesbury Sandstone					MW													
12.06	12																			
43	13																			
42	14																			
41	15																			
40	16						FR													
39	17																			
38	18	17.63m: 17.63-17.65m: fine to medium grained, dark grey																		
37	19																			
36																				

Generated with CORE-GS by Geroc - Combined Log

NOTES: [#]Soil origin is "probable" unless otherwise stated. [°]Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DP710P **OPERATOR:** BS **LOGGED:** YB
METHOD: Diacore to 0.15m, Solid Flight Auger (TC-bit) to 0.55m, NMLC coring to 22.48m. HW to 0.9 m. **CASING:** Uncased
REMARKS: Standpipe installed to 22.48m (sump: 22.00 to 22.48, screen: 7.00m to 22.0m, Solid PVC 0.1m to 7.00m, Gravel 6.5m to 22.48m, Bentonite Backfill 5.5m to 6.5m, Gravel 0.1m to 5.5m, Gatic Cover at top). BH co-Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Freecity Group Holdings Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 153 Walker Street, North Sydney, NSW 2060

SURFACE LEVEL: 55.8 AHD
COORDINATE: E:334317.0, N:6254413.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 233796.00
DATE: 16/11/22 - 18/11/22
SHEET: 3 of 3

CONDITIONS ENCOUNTERED														SAMPLE				TESTING	
GROUNDWATER RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL				ROCK						SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
				ORIGIN (#)	CONSIS. (°) DENSITY (°)	MOISTURE	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS						
35	21	[CONT] SANDSTONE: medium to coarse grained, pale grey, medium then high strength, fresh, unbroken, Hawkesbury Sandstone																	
	21.15m: 21.15-21.39m:	siltstone band				FR													
34	22																		
	22																		
	22.48	Borehole discontinued at 22.48m depth. Target depth reached.																	
	23																		
	24																		
	25																		
	26																		
	27																		
	28																		
	29																		

NOTES: ^(#) Soil origin is "probable" unless otherwise stated. ^(°) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: DP710P

OPERATOR: BS

LOGGED: YB

METHOD: Diacore to 0.15m, Solid Flight Auger (TC-bit) to 0.55m, NMLC coring to 22.48m. HW to 0.9 m.

CASING: Uncased

REMARKS: Standpipe installed to 22.48m (sump: 22.00 to 22.48, screen: 7.00m to 22.0m, Solid PVC 0.1m to 7.00m, Gravel 6.5m to 22.48m, Bentonite Backfill 5.5m to 6.5m, Gravel 0.1m to 5.5m, Gatic Cover at top). BH co-Refer to explanatory notes for symbol and abbreviation definitions



CORE PHOTO LOG

CLIENT: Freecity Group Holdings Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 153 Walker Street, North Sydney, NSW 2060

SURFACE LEVEL: 55.8 AHD
COORDINATE: E:334317.0, N:6254413.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 233796.00
DATE: 16/11/22 - 18/11/22
SHEET: 1 of 1



0.55-22.48 m depth

BOREHOLE LOG

CLIENT: Freecity Group Holdings Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 153 Walker Street, North Sydney, NSW 2060

SURFACE LEVEL: 56.3 AHD
COORDINATE: E:334347.0, N:6254399.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH201
PROJECT No: 233796.00
DATE: 07/08/25 - 12/08/25
SHEET: 1 of 7

CONDITIONS ENCOUNTERED						SAMPLE			TESTING AND REMARKS					
GROUNDWATER RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. (°) DENSITY (°)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
0.05	0.05	ASPHALTIC CONCRETE.		NA										
0.15	0.15	CONCRETE.		FILL	ND									
0.50	0.50	FILL / Gravelly CLAY: pale brown; rounded gravel; 5mm-20mm diameter.												
1.00	1.00	SANDSTONE: orange-brown, red-brown. Hawkesbury Sandstone.			(VL)	ND				1				
1.60	1.60	Continued as rock log								2				
2.00	2.00									3				
3.00	3.00									4				
4.00	4.00									5				
5.00	5.00									6				
6.00	6.00									7				
7.00	7.00									8				
8.00	8.00									9				
9.00	9.00													

NOTES: #Soil origin is "probable" unless otherwise stated. °Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Commachio Geo 305

OPERATOR: Ground Test (JJ/HJ)

LOGGED: R. Taylor/Z. Faiz

METHOD: DT to 0.15m, NDD to 1.6m, HQ to 50.25

CASING: HWT to 1.55m

REMARKS: Subsurface conditions based on side wall observations of non destructive drilling excavation to 1.6m

BOREHOLE LOG

CLIENT: Freecity Group Holdings Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 153 Walker Street, North Sydney, NSW 2060

SURFACE LEVEL: 56.3 AHD
COORDINATE: E:334347.0, N:6254399.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH201
PROJECT No: 233796.00
DATE: 07/08/25 - 12/08/25
SHEET: 2 of 7

CONDITIONS ENCOUNTERED										SAMPLE			TESTING						
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (Where encountered)	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
RL (m)	56																		
	1																		
	2	Continued from soil log SANDSTONE: brown, red-brown, medium to coarse grained, bedded, 0 to 20%; 0-20% iron-indurated bands. Hawkesbury Sandstone.			HW XW	1.60 1.75 1.83	VL SEAM		100	88	1.63m: B, 0°, PR, INF Clay 20mm, SM 1.75-1.83m: EW, 80mm 1.90m: B, 0°, PR, Clay, RF					PLT PP	PL(A)=0.05MPa 260kPa		
	3				HW											PLT	PL(A)=0.75MPa PL(A)=0.64MPa		
	4					3.40										PLT	PL(A)=1.1MPa		
	5										4.66m: B, 0°, PR, VNR Clay, SM					PLT	PL(A)=0.39MPa		
	6	6.15m: becoming pale brown and pale red-brown			MW						5.27m: B, 0°, PR, CN, SM 5.43m: B, 10°, PR, CN, SM 5.63m: JT, 30°, PR, CN, RF					PLT	PL(A)=0.41MPa		
	7					6.15					6.15m: B, 0°, PR, CN, RF					PLT	PL(A)=1.2MPa		
	8	From 7.50m: becoming pale grey				7.80	H		100	100						PLT	PL(A)=1.2MPa		
	9				SW											PLT	PL(A)=1.3MPa		
						9.33	M H		100	100	9.33m: B, 5°, PR, SN Fe, SM					PLT	PL(A)=0.89MPa		
																PLT	PL(A)=0.71MPa		

NOTES: #Soil origin is "probable" unless otherwise stated.

PLANT: Commachio Geo 305

OPERATOR: Ground Test (JJ/HJ)

LOGGED: R. Taylor/Z. Faiz

METHOD: DT to 0.15m, NDD to 1.6m, HQ to 50.25

CASING: HWT to 1.55m

REMARKS: Subsurface conditions based on side wall observations of non destructive drilling excavation to 1.6m

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Freecity Group Holdings Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 153 Walker Street, North Sydney, NSW 2060

SURFACE LEVEL: 56.3 AHD
COORDINATE: E:334347.0, N:6254399.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH201
PROJECT No: 233796.00
DATE: 07/08/25 - 12/08/25
SHEET: 3 of 7

CONDITIONS ENCOUNTERED										SAMPLE			TESTING					
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
RL (m)	46	[CONT] SANDSTONE: brown, red-brown, medium to coarse grained, bedded, 0 to 20°; 0-20% iron-indurated bands. Hawkesbury Sandstone.		SW	10.25													
	11						100	100							PLT	PL(A)=1.1MPa		
	12	11.80m: becoming purple-brown			11.70	H				11.65m: B, 0°, PR, VNR Clay, SM					PLT	PL(A)=1.2MPa		
	13	12.80m: becoming red-brown		MW						12.25m: B, 0°, PR, CN, RF					PLT	PL(A)=1.7MPa		
	14						100	100		12.78m: B, 0-5°, CU, CT Clay 2mm, RF				PLT	PL(A)=1.3MPa			
	14.18	SANDSTONE: pale grey, medium to coarse grained, bedded, 0 to 20°; cross-bedding. Hawkesbury Sandstone.			14.18					13.71m: B, 0°, PR, SN Fe, SM					PLT	PL(A)=1.3MPa		
	15									14.35m: B, 10°, PR, CN, RF					PLT	PL(A)=0.84MPa		
	16									16.00m: B, 5°, PR, VNR Clay, SM					PLT	PL(A)=1.5MPa		
	17			FR			100	100							PLT	PL(A)=0.94MPa		
	18				17.50										PLT	PL(A)=1.4MPa		
	18.96	SANDSTONE: red-brown, medium to coarse grained, bedded, 0 to 20°; iron-indurated. Hawkesbury Sandstone.		HW	18.96		100	100		18.58m: B, 0°, PR, VNR Clay, SM					PLT	PL(A)=1.2MPa		
	19														PLT	PL(A)=2.6MPa		
										19.71m: B, 0°, PR, CN, SM					PLT	PL(A)=2.4MPa	Bentonite	

NOTES: #Soil origin is "probable" unless otherwise stated.

PLANT: Commachio Geo 305

OPERATOR: Ground Test (JJ/HJ)

LOGGED: R. Taylor/Z. Faiz

METHOD: DT to 0.15m, NDD to 1.6m, HQ to 50.25

CASING: HWT to 1.55m

REMARKS: Subsurface conditions based on side wall observations of non destructive drilling excavation to 1.6m

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Freecity Group Holdings Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 153 Walker Street, North Sydney, NSW 2060

SURFACE LEVEL: 56.3 AHD
COORDINATE: E:334347.0, N:6254399.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH201
PROJECT No: 233796.00
DATE: 07/08/25 - 12/08/25
SHEET: 4 of 7

CONDITIONS ENCOUNTERED										SAMPLE			TESTING									
GROUNDWATER RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (where encountered) SOIL MOISTURE	GRAPHIC	WEATH.			DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE	
					RS	XW	DW															FR
20.28	20.28	(CONT) SANDSTONE: red-brown, medium to coarse grained, bedded, 0 to 20°; iron-indurated. Hawkesbury Sandstone.			HW				100	100								PLT	PL(A)=1.8MPa			
	21	SANDSTONE: pale grey, medium to coarse grained, bedded, 0 to 20°; cross-bedding. Hawkesbury Sandstone.						H										PLT	PL(A)=1.5MPa			
	22								100	100								PLT	PL(A)=0.76MPa			
	22.55	SANDSTONE: pale grey, medium to coarse grained, massive. Hawkesbury Sandstone.																PLT	PL(A)=1.2MPa			
	23																	PLT	PL(A)=1.3MPa			
	24								100	100								PLT	PL(A)=1.6MPa			
	25	24.96m-26.58m: occasional siltstone and quartz clast			FR													PLT	PL(A)=2.4MPa			
	26																	PLT	PL(A)=1.9MPa			
	27							H										PLT	PL(A)=1.8MPa			
	27																	PLT	PL(A)=3.2MPa			
	27																	PLT	PL(A)=1.7MPa			
	28												27.42m: B, 0°, PR, VNR Clay, SM					PLT	PL(A)=1.4MPa			
	28	28.50m-28.54m: siltstone band																				
	29	29.12m-29.18m: siltstone band																				
	29.18	SANDSTONE: pale grey, medium to coarse grained, bedded, 0 to 20°; cross-bedding. Hawkesbury Sandstone.																	PLT	PL(A)=2.2MPa		
	29.18												28.52m: B, 15°, PR, CN, RF									
													28.56m: B, 0°, UN, CN, RF									
													29.12m: B, 0°, PR, CN, RF									
													29.17m: B, 15°, PR, CN, VR									
																			PLT	PL(A)=1.5MPa		

NOTES: #Soil origin is "probable" unless otherwise stated.

PLANT: Commachio Geo 305

OPERATOR: Ground Test (JJ/HJ)

LOGGED: R. Taylor/Z. Faiz

METHOD: DT to 0.15m, NDD to 1.6m, HQ to 50.25

CASING: HWT to 1.55m

REMARKS: Subsurface conditions based on side wall observations of non destructive drilling excavation to 1.6m

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Freecity Group Holdings Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 153 Walker Street, North Sydney, NSW 2060

SURFACE LEVEL: 56.3 AHD
COORDINATE: E:334347.0, N:6254399.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH201
PROJECT No: 233796.00
DATE: 07/08/25 - 12/08/25
SHEET: 5 of 7

CONDITIONS ENCOUNTERED										SAMPLE			TESTING							
GROUNDWATER RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (Where encountered) SOIL MOISTURE	GRAPHIC	WEATH. RS XW HW EW FR	DEPTH (m)	STRENGTH VL L M H VH EH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS		BACKFILL	WELL PIPE
																	PL	PL(A)		
30.00	26	SANDSTONE: pale grey, medium to coarse grained, bedded, 0 to 20°; cross-bedding. Hawkesbury Sandstone.						100	94							PLT	PL(A)=1.5MPa			
31	25																			
32	24	31.28m-33.44m: fine to medium grained						100	100		31.28m: B, 0°, PR, CN, SM 31.70m: B, 0°, PR, CN, SM 31.73m: CS, 5mm					PLT	PL(A)=0.49MPa			
33	23	31.70m-32.00m: Siltstone band														PLT	PL(A)=1.3MPa			
34	22															PLT	PL(A)=2.0MPa			
35	21				FR		H	100	100							PLT	PL(A)=1.3MPa			
36	20	35.96m-37.50m: fine to medium grained, massive														PLT	PL(A)=1.7MPa			
37	19										37.17m: JT, 40°, PR, VNR Clay, SM					PLT	PL(A)=1.5MPa			
38	18	38.18m-40.10m: fine to medium grained, massive						100	100							PLT	PL(A)=1.9MPa			
39	17															PLT	PL(A)=1.7MPa			
								100	100							PLT	PL(A)=1.5MPa			

NOTES: #Soil origin is "probable" unless otherwise stated.

PLANT: Commachio Geo 305

OPERATOR: Ground Test (JJ/HJ)

LOGGED: R. Taylor/Z. Faiz

METHOD: DT to 0.15m, NDD to 1.6m, HQ to 50.25

CASING: HWT to 1.55m

REMARKS: Subsurface conditions based on side wall observations of non destructive drilling excavation to 1.6m

BOREHOLE LOG

CLIENT: Freecity Group Holdings Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 153 Walker Street, North Sydney, NSW 2060

SURFACE LEVEL: 56.3 AHD
COORDINATE: E:334347.0, N:6254399.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH201
PROJECT No: 233796.00
DATE: 07/08/25 - 12/08/25
SHEET: 6 of 7

CONDITIONS ENCOUNTERED										SAMPLE			TESTING					
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
RL (m)	6	[CONT] SANDSTONE: pale grey, medium to coarse grained, bedded, 0 to 20°; cross-bedding. Hawkesbury Sandstone.								40.63m: siltstone clasts				41	PLT	PL(A)=1.5MPa		
	41						100	100		41.13m: B, 0°, PR, VNR Clay, SM				42	PLT	PL(A)=1.4MPa		
	42									41.51m: B, 0°, PR, CN, VR				43	PLT	PL(A)=1.4MPa		
	43									43.16m: B, 5°, PR, VNR Clay, SM				44	PLT	PL(A)=2.2MPa		
	44						100	100						45	PLT	PL(A)=2.5MPa		
	45			FR		H								46	PLT	PL(A)=1.8MPa		
	46	45.66m-45.97m: Partial shale band								45.66-45.97m: JT, 85-90°, IR, CN, VR				47	PLT	PL(A)=2.3MPa		
	47	46.55m-47.55m: fine to medium grained, massive					100	95						48	PLT	PL(A)=2.2MPa		
	48									47.92m: siltstone clasts				49	PLT	PL(A)=2.4MPa		
	49						100	100						50	PLT	PL(A)=1.5MPa		
	49									49.35m: B, 10°, PR, VNR Clay, SM				51	PLT	PL(A)=1.8MPa		

NOTES: #Soil origin is "probable" unless otherwise stated.

PLANT: Commachio Geo 305

OPERATOR: Ground Test (JJ/HJ)

LOGGED: R. Taylor/Z. Faiz

METHOD: DT to 0.15m, NDD to 1.6m, HQ to 50.25

CASING: HWT to 1.55m

REMARKS: Subsurface conditions based on side wall observations of non destructive drilling excavation to 1.6m

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Freecity Group Holdings Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 153 Walker Street, North Sydney, NSW 2060

SURFACE LEVEL: 56.3 AHD
COORDINATE: E:334347.0, N:6254399.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH201
PROJECT No: 233796.00
DATE: 07/08/25 - 12/08/25
SHEET: 7 of 7

GROUNDWATER		CONDITIONS ENCOUNTERED										SAMPLE			TESTING					
		RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	6		[CONT] SANDSTONE: pale grey, medium to coarse grained, bedded, 0 to 20°; cross-bedding. Hawkesbury Sandstone.		FR			100	100							PLT	PL(A)=1.3MPa	Gravel	150mm	
	51		Borehole discontinued at 50.25m depth. Target depth reached.																	
	52																			
	53																			
	54																			
	55																			
	56																			
	57																			
	58																			
	59																			

NOTES: #Soil origin is "probable" unless otherwise stated.

PLANT: Commachio Geo 305

OPERATOR: Ground Test (JJ/HJ)

LOGGED: R. Taylor/Z. Faiz

METHOD: DT to 0.15m, NDD to 1.6m, HQ to 50.25

CASING: HWT to 1.55m

REMARKS: Subsurface conditions based on side wall observations of non destructive drilling excavation to 1.6m

Refer to explanatory notes for symbol and abbreviation definitions



CORE PHOTO LOG

CLIENT: Freecity Group Holdings Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 153 Walker Street, North Sydney, NSW 2060

SURFACE LEVEL: 56.3 AHD
COORDINATE: E:334347.0, N:6254399.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH201
PROJECT No: 233796.00
DATE: 07/08/25 - 12/08/25
SHEET: 1 of 7



1.60-5.00 m depth



5.00-9.00 m depth

CORE PHOTO LOG

CLIENT: Freecity Group Holdings Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 153 Walker Street, North Sydney, NSW 2060

SURFACE LEVEL: 56.3 AHD
COORDINATE: E:334347.0, N:6254399.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH201
PROJECT No: 233796.00
DATE: 07/08/25 - 12/08/25
SHEET: 2 of 7



9.00-13.00 m depth



13.00-17.00 m depth

CORE PHOTO LOG

CLIENT: Freecity Group Holdings Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 153 Walker Street, North Sydney, NSW 2060

SURFACE LEVEL: 56.3 AHD
COORDINATE: E:334347.0, N:6254399.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH201
PROJECT No: 233796.00
DATE: 07/08/25 - 12/08/25
SHEET: 3 of 7



17.00-21.00 m depth



21.00-25.00 m depth

CORE PHOTO LOG

CLIENT: Freecity Group Holdings Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 153 Walker Street, North Sydney, NSW 2060

SURFACE LEVEL: 56.3 AHD
COORDINATE: E:334347.0, N:6254399.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH201
PROJECT No: 233796.00
DATE: 07/08/25 - 12/08/25
SHEET: 4 of 7



25.00-29.00 m depth



29.00-33.00 m depth

CORE PHOTO LOG

CLIENT: Freecity Group Holdings Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 153 Walker Street, North Sydney, NSW 2060

SURFACE LEVEL: 56.3 AHD
COORDINATE: E:334347.0, N:6254399.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH201
PROJECT No: 233796.00
DATE: 07/08/25 - 12/08/25
SHEET: 5 of 7



33.00-37.00 m depth



37.00-41.00 m depth

CORE PHOTO LOG

CLIENT: Freecity Group Holdings Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 153 Walker Street, North Sydney, NSW 2060

SURFACE LEVEL: 56.3 AHD
COORDINATE: E:334347.0, N:6254399.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH201
PROJECT No: 233796.00
DATE: 07/08/25 - 12/08/25
SHEET: 6 of 7



41.00-45.00 m depth



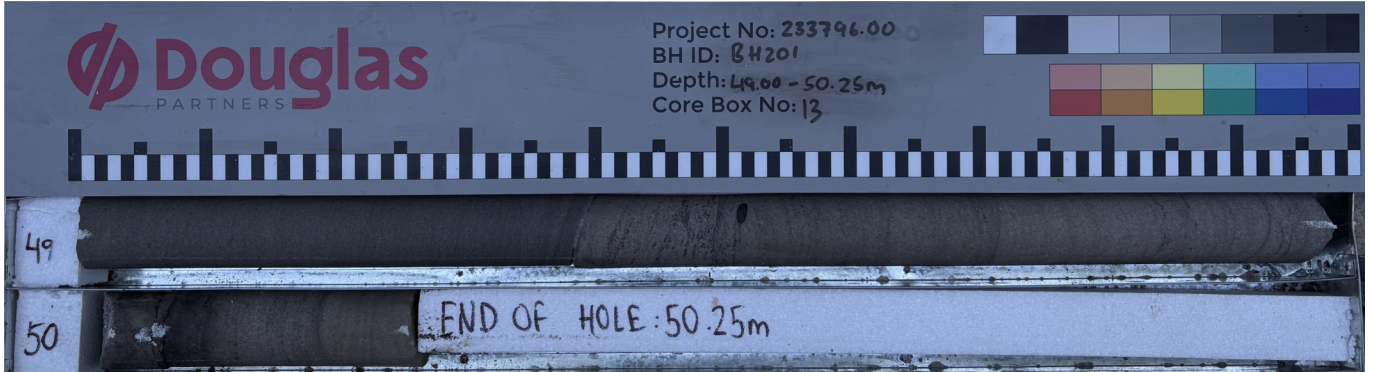
45.00-49.00 m depth

CORE PHOTO LOG

CLIENT: Freecity Group Holdings Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 153 Walker Street, North Sydney, NSW 2060

SURFACE LEVEL: 56.3 AHD
COORDINATE: E:334347.0, N:6254399.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH201
PROJECT No: 233796.00
DATE: 07/08/25 - 12/08/25
SHEET: 7 of 7



49.00-50.25 m depth

Appendix D

Laboratory Results

Deformability of Rock Materials in Uniaxial Compression

Client	Douglas Partners	Sample Source	BH01 12.24-12.50m
Address	PO Box 472 West Ryde NSW 1685	Sample Description	Sandstone
Project	NORTH SYDNEY (217311 00)	Report #	S82460-MOD
Job #	S22145-1	Sample #	S82460

Test Procedure	AS 4133.4.3.2 Deformability of rock materials in uniaxial compression-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	Date Sampled	24/11/2022
Storage History	Sealed	Storage Environment	Sealed at as received moisture condition

Average Specimen Diameter (mm)	51.7	Moisture Content (%)	6.6
Average Specimen Height (mm)	147.2	Wet Density (t/m³)	2.38
Length to Diameter Ratio	2.8	Dry Density (t/m³)	2.24
Duration of Test (min)	15.88	Rate of Displacement (mm/min):	< 0.1
Date of Test:	25/11/22	Specimen Curing	-
Mode of Failure	Mixed mode	Test Apparatus	Matest Compression Machine with Axial and Circumferential Extensometers.



Before Test



After Test

Uniaxial Compressive Strength		38	MPa
	<u>Young's Modulus</u>	<u>Poisson's Ratio</u>	
Tangent	16 GPa	0.12	from 42 % to 58 % of Max UCS
Secant	9.1 GPa	0.11	from 0 % to 50 % of Max UCS



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

Date: 28/11/2022



Macquarie Geotechnical
14 Carter Street
Lidcombe NSW 2141

Deformability of Rock Materials in Uniaxial Compression

Client	Douglas Partners	Sample Source	BH03A 15.50-15.81m
Address	PO Box 472 West Ryde NSW 1685	Sample Description	Sandstone
Project	NORTH SYDNEY (217311 00)	Report #	S82462-MOD
Job #	S22145-1	Sample #	S82462

Test Procedure	AS 4133.4.3.2 Deformability of rock materials in uniaxial compression-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	Date Sampled	24/11/2022
Storage History	Sealed	Storage Environment	Sealed at as received moisture condition

Average Specimen Diameter (mm)	51.8	Moisture Content (%)	7.5
Average Specimen Height (mm)	148.2	Wet Density (t/m³)	2.35
Length to Diameter Ratio	2.9	Dry Density (t/m³)	2.19
Duration of Test (min)	12.58	Rate of Displacement (mm/min):	< 0.1
Date of Test:	25/11/22	Specimen Curing	-
Mode of Failure	Single shear plane	Test Apparatus	Matest Compression Machine with Axial and Circumferential Extensometers.



Before Test



After Test

Uniaxial Compressive Strength		30	MPa
	<u>Young's Modulus</u>	<u>Poisson's Ratio</u>	
Tangent	8.9 GPa	0.20	from 42 % to 58 % of Max UCS
Secant	5.0 GPa	0.17	from 0 % to 50 % of Max UCS



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NATA Accredited Laboratory Number: 14874

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Chris Lloyd

Date: 28/11/2022



Macquarie Geotechnical
14 Carter Street
Lidcombe NSW 2141



Envirolab Services Pty Ltd

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www.envirolab.com.au

CERTIFICATE OF ANALYSIS 311626

Client Details

Client	Douglas Partners Pty Ltd
Attention	James Connaughton
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	<u>217311.00, North Sydney, 153-157 Walker St</u>
Number of Samples	3 Water
Date samples received	25/11/2022
Date completed instructions received	28/11/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by 29/11/2022

Date of Issue 29/11/2022

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By

Diego Bigolin, Inorganics Supervisor

Authorised By

Nancy Zhang, Laboratory Manager

Miscellaneous Inorganics				
Our Reference		311626-1	311626-2	311626-3
Your Reference	UNITS	BH01	BH04	BH03A
Date Sampled		25/11/2022	25/11/2022	25/11/2022
Type of sample		Water	Water	Water
Date prepared	-	25/11/2022	25/11/2022	25/11/2022
Date analysed	-	25/11/2022	25/11/2022	25/11/2022
pH	pH Units	4.8	6.1	6.0
Electrical Conductivity	µS/cm	560	560	380
Chloride, Cl	mg/L	62	42	33
Sulphate, SO4	mg/L	140	160	89

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.

Client Reference: 217311.00, North Sydney, 153-157 Walker St

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			25/11/2022	[NT]	[NT]	[NT]	[NT]	25/11/2022	[NT]
Date analysed	-			25/11/2022	[NT]	[NT]	[NT]	[NT]	25/11/2022	[NT]
pH	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	98	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	<1	[NT]	[NT]	[NT]	[NT]	101	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	[NT]	[NT]	[NT]	[NT]	92	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.