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HYECORP

Preliminary Geotechnical Investigation

37 Archer Street, Chatswood NSW

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	Original	13 February 2025	
Rev1	Minor amendments	9 May 2025	JB
Rev2	Update Survey Dwgs	23 May 2025	JB

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1. Introduction

1.1 Background

At the request of Mr. Adrian Giardina on behalf of Hyecorp (the Client), EI Australia (EI) has carried out a Preliminary Geotechnical Investigation (PGI) for the proposed development at 37 Archer Street, Chatswood NSW (the Site).

This PGI report has been prepared to provide advice and recommendations to assist in the preparation of designs for the proposed development. The investigation has been carried out in accordance with the agreed scope of works outlined in EI's proposal referenced P22820.1-Rev1, dated 13 November 2024, and with the Client's signed authorisation to proceed, dated 8 November 2024.

This PGI report has been prepared by EI Australia to accompany a detailed State Significant Development Application (SSDA) for the development of a mixed use residential tower with infill affordable housing at 37 Archer Street, Chatswood NSW 2067. The site consists of attached townhouses within a large rectangular lot. This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued for the project (SSD-73277714).

The application seeks consent for the demolition of existing structures on the site and the development of a residential apartments (including affordable housing), commercial office space, food and beverage uses and retail tenancies with servicing areas and parking contained within the building's basement. A publicly accessible through site-link is also proposed providing a direct connection between Archer and Bertram Streets and allowing opportunities for outdoor dining and passive recreation.

Specifically, the development in this SSDA includes:

- Demolition of existing buildings, structures and trees;
- Excavation of the site to a basement depth of RL 71.85m AHD;
- Construction of a mixed-use building to 28 storeys (highest RL 184.25m AHD) comprising residential and commercial uses; and
- The development of 125 apartments (including 28 affordable housing units) with residential amenities and services, commercial office space, food and beverage tenancies and retail uses.

1.2 Proposed Development

The following documents, supplied by the Client, were used to assist with the preparation of this GI report:

- Architectural drawings prepared by Fuse Architects, Ref. 2332 SSDA, Sheets S001 to S007, S101 to S118, S201 S208, S301 to S309, S401 to S406 and S501 to S516, Rev. A, dated 25 February 2025; and
- Site survey plan prepared by LTS Surveyors, Ref. 52119002DT, Sheets 1 to 6, Rev. C, Dated 11/04/2025.

Based on the provided documents, EI understands that the proposed development involves demolition of the existing residential structures and construction of a 28 storey building overlying 6 levels of basements. The development includes the following uses:

- Residential apartments, comprising a total of 125 apartments (including 28 affordable housing units) comprising 29 x 1 bed apartments, 55 x 2 bed apartments, 30 x 3 bed apartments and 11 x 4 bed apartments with recreational facilities at Level 8;

- Commericial use including office tenancies (occupying levels 2 & 3), retail tenancies (double storey retail units fronting Bertram Street), and food & beverage tenancies at ground level;
- Basement parking includes 154 car spaces, 9 motorbike spaces, 28 bicycle spaces and end of trip facilities;
- Servicing and plant equipment.
- Publicly accessible landscaped through site link.
- The gross floor area (GFA) for the proposed development is described below:
  - Total GFA = 14,230sqm
  - Residential GFA = 12,318sqm
  - Non-residential GFA = 1,912sqm

Affordable housing will be provided in the form of a monetary contribution and floorspace within the proposed development.

The purpose of the project is to provide a high-quality mixed-use development in an accessible location within the Chatswood CBD, providing new market and affordable housing opportunities complemented by commercial and retail uses within this well serviced location.

It is understood that the proposed basement will six (6) levels below existing ground level (BEGL). The proposed basement extends to the northern, southern & south eastern side boundaries, and is setback up to 6.0m from the western and north eastern site boundaries.

The lowest basement level is proposed to have a Finished Floor Level (FFL) of RL 71.85m AHD. A Bulk Excavation Level (BEL) of RL 71.5m AHD is assumed, which includes allowance for the construction of the basement slab. To achieve the BEL, excavation depth of approximately 20.0m BEGL has been estimated. Locally deeper excavations may be required for footings, lift overrun pits, crane pads, and service trenches.

1.3 Objectives

The objective of the PGI was to assess site surface and subsurface conditions at three (3) borehole locations, and to provide geotechnical advice and recommendations to assist in the design of the proposed development.

This PGI report has been prepared in response to the requirements contained within the Secretary's Environmental Assessment Requirements (SEARs) dated 12 July 2024 and issued for the SSDA (SSD-73277714). Specifically, this report has been prepared to respond to the SEARs requirement issued in **Table 1-1** below.

Table 1-1 Legal Description

Item	SEARs Requirement	Section Reference
13. Ground and Water *(partial)*	This report addresses part of: - Assess potential impacts on related infrastructure. - Provide a Surface and Groundwater Impact Assessment that assesses potential impacts on groundwater resources in accordance with the relevant groundwater guidelines	All Sections

1.4 Fieldwork Methodology

The scope of works for the GI included:

- Preparation of a Work Health and Safety Plan;
- Review of relevant geological maps for the project area;
- Site walkover inspection by a Geotechnical Engineer to assess topographical features and site conditions;
- Scanning of proposed borehole locations for buried conductive services using a licensed service locator with reference to Before You Dig Australia (BYDA) plans;
- Auger drilling of two boreholes (BH1M and BH3M) by a track-mounted drill rig using solid flight augers equipped with a 'Tungsten-Carbide' (T-C) bit and hand auger of one borehole (BH2M using a hand tools. The boreholes were auger drilled to depths as shown in **Table 1-2** below:

Table 1-2 Augering and Rock Coring Depths

Borehole ID	Surface RL (m AHD)	Augering		Rock Roll		Rock Coring	
		Depth (m)	RL (m AHD)	Depth (m)	RL (m AHD)	Depth (m)	RL (m AHD)
BH1M	90.40	8.50	81.60	-	-	18.26	71.84
BH2M	88.01	0.87	87.14	-	-	18.00	70.01
BH3M	90.90	2.70	88.20	18.0	72.90	30.15	60.75

  - Standard Penetration Testing (SPT) was carried out (as per AS 1289.6.3.1-2004), where possible, during auger drilling of the boreholes (BH1M and BH3M) to assess soil strength/relative densities.
  - Measurements of groundwater seepage/levels, where possible, in the augered sections of the boreholes during auger drilling;
  - The strength of the bedrock in the augered sections of the boreholes was assessed by observation of the auger penetration resistance using a T-C drill bit and examination of the recovered rock cuttings. It should be noted that rock strengths assessed from augered boreholes are approximate and strength variances can be expected.
  - The approximate surface levels shown on the borehole logs were interpolated from spot levels shown on the supplied survey plan. Approximate borehole locations are shown on **Figure 2**;
- Continuation of all three borehole (BH1M – BH3M) using NMLC diamond coring techniques to termination depths shown above in **Table 1-2**. The rock core photographs are presented in **Appendix A**;
- All boreholes (BH1M – BH3M) were converted into a groundwater monitoring well with a maximum depth of 22.10m BEGL (RL 68.80m AHD) to allow for long-term groundwater monitoring;
- Soil and rock samples were sent to STS Geotechnics Pty Ltd (STS) and SGS Australia (SGS), which are National Australian Testing Authority (NATA) accredited laboratories, for testing and storage;
- Preparation of this GI report.

EI's Geotechnical Engineer was present full-time onsite to set out the borehole locations, direct the testing and sampling, log the subsurface conditions and record groundwater levels.

1.5 Constraints

This PGI was limited by the intent of the investigation and the presence of existing site structures. The discussions and advice presented in this report are intended to assist in the preparation of preliminary designs for the proposed development. Further geotechnical inspections should be carried out during construction to confirm the geotechnical and groundwater models, and the design parameters provided in this report.

2. Site Description

2.1 Site Description and Identification

The site identification details and associated information are presented in **Table 2-1** below while the site locality is shown on **Figure 1.** An aerial photograph of the site is presented in **Plate 1** below.

Table 2-1 Summary of Site Information

Information	Detail
Street Address	37 Archer Street, Chatswood NSW
Local Government Area	Willoughby City Council
Strata Plan (SP) Identification	SP 38605
Brief Site Description	At the time of our investigation, the site was occupied by two separated, two to three storey brick residential structures (multi-unit building) buildings comprising 14 dwellings in total. The existing structures appeared to be in fair condition based on a cursory inspection of the exterior walls The existing development includes an in ground swimming pool fronting Archer Street and single level of basement parking which is accessed from Bertram Street.. The carpark basement has an approximate Finished Floor Level (FFL) of RL 88.01m AHD. Pedestrian entries are available from Bertram and Archer Street. Vegetation within the site includes planter boxes through the central circulation spaces and established trees around the site's perimeter. Street trees, comprising native species, along the site's western frontage form part of a distinctive avenue of trees.
Site Area	The site area is approximately 21201 m^2 (based on the provided survey plan referenced above).

Plate 1 Aerial photograph of the site (source: Sixmaps, accessed on 20 January 2025)

2.2 Local Land Use

The site is situated within an area of mixed-use zone. Current uses on surrounding land at the time of our presence on site are described in **Table 2-2** below. For the sake of this report, the site boundary adjacent to Archer Street shall be adopted as the western site boundary.

Table 2-2 Summary of Local Land Use

Direction Relative to Site	Land Use Description
General	The site is situated on the southern edge of the Chatswood CBD. The immediately surrounding area has been zoned for more intensive development and is intended to support mixed use development including high density residential uses. The existing character of the area is evolving.
North	The site is bounded to the north by low scale residential development including townhouses and single dwelling properties. This land is zoned to support high-rise mixed use development including buildings with heights up to RL246.8m. Along Archer Street proposals for mixed use towers have been lodged for properties at 51-55 Archer Street and 57-61 Archer Street.
East	The site is bound to the east by Bertram Street which comprises a two-way local road and borders the western edge of the South Chatswood Heritage Conservation Area. A locally listed heritage item at 34 Neridah Street is situated directly opposite.
South	A development application for a 14-storey mixed use development has been lodged for 31-44 Archer Street which is situated immediately to the south of the site. This area provides a transition to low scale residential uses contained within the South Willoughby Conservation Area located on the southern side of Johnson Street. There is a locally significant heritage item at 27 Archer Street.
West	To the west the site is bound by Archer Street which comprises a four-lane classified road. Existing development on Archer Street comprises medium density residential towers of 7 storeys and higher. The area has been zoned for taller buildings of up to 90m. Further to the west is the Chatswood transport interchange and Pacific Highway, linking to the CBD and wider Greater Sydney region.

2.3 Regional Setting

The site topography and geological information for the locality is summarised in **Table 2-3** below**.**

Table 2-3 Topographic and Geological Information

Attribute	Description
Topography	The site is located on the eastern side of the road within relatively flat topography with approximate RL 91.10m AHD
Regional Geology	Information on regional sub-surface conditions, referenced NSW Seamless Geology dataset (Colquhoun et al,. 2024, corresponding to the Sydney 1:100,000 Geological Series Sheet) indicates the site to be underlain by Ashfield Shale (Rwa), which consists of black to dark grey shale and laminite. Expected geology at the site and surrounds is presented in **Plate 2** below, Ashfield Shale shown in green.

Plate 2 Excerpt of geological map, showing Ashfield Shale in green

3. Investigation Results

3.1 Stratigraphy

For the development of a site-specific geotechnical model, the stratigraphy observed in the PGI has been grouped into six geotechnical units. A summary of the subsurface conditions across the site, interpreted from the assessment results, is presented in **Table 3-1** below. More detailed descriptions of subsurface conditions at each borehole location are available on the borehole logs presented in **Appendix A**. The details of the methods of soil and rock classifications, explanatory notes and abbreviations adopted on the borehole logs are also in **Appendix A.** A summary of the depth and level of the units observed in each borehole is provided in **Table 3-2.**

Table 3-1 Summary of Subsurface Conditions

Unit	Material[2]	Depth to Top of Unit (m BEGL)[1]	RL of Top of Unit (m AHD)[1]	Observed Thickness (m)	Comments
1	Fill	Surface	88.01 to 90.90	0.13 to 2.0	Concrete pavements of 130mm to 300mm thickness, generally underlain by Silty SAND to Silty CLAY comprising some gravel. Fill is inferred to be uncontrolled and poorly compacted.
2	Residual Soil	0.13 to 1.60	87.88 to 88.50	1.81 to 1.93	Medium to high plasticity, Silty CLAY comprising some iron stone gravel and some weathered shale. Unit 2 was observed to range from stiff to hard with SPT N values of between 10 to practical refusal.
3	Class V Shale	2.0 to 3.41	85.95 to 88.90	2.54 to 9.28	Extremely to slightly weathered SHALE, extremely low to very low strength with some low strength bands. Defects within Unit 3 typically comprise joints inclined up to 40° and weathered seams and clay seams. Maximum core loss of 0.93m thick was encountered within BH1M. Core loss is inferred to be bands of decomposed or highly fractured material. Due to the drilling process for BH3M, EI is not able describe Unit 3 material within BH3M.
4	Class IV Shale / Sandstone	12.69 to 4.6	77.41 to 83.41	5.0 to 6.5	Distinctly to slightly weathered SHALE and SANDSTONE, low to medium strength with some very low strength bands. Defects within Unit 4 typically comprise joints inclined to 5° and weathered seams. Maximum core loss of 0.4m thick was encountered within BH2M. Core loss is inferred to be bands of decomposed or highly fractured material. Due to the drilling process for BH3M, EI is not able describe Unit 3 material within BH3M.

Unit	Material[2]	Depth to Top of Unit (m BEGL)[1]	RL of Top of Unit (m AHD)[1]	Observed Thickness (m)	Comments
5	Class III Sandstone	11.1 to 14.0	76.9 to 76.91	6.0 [3]	Slightly weathered SANDSTONE, medium to high strength. Defects within Unit 5 typically comprise joints inclined to 10°. Unit 5 was encountered in BH2M and BH3M only. Unit 5 observed within BH3M is estimated from drilling resistance only. Defects within BH3M were not observed.
6	Class II Sandstone	20.00	70.90	-	Slightly weathered to fresh SANDSTONE, high strength. Defects within Unit 6 typically comprise joints inclined to 40° and weathered seams. Unit 6 was encountered in BH3M only.

Note 1 Approximate depth and level at the time of our assessment. Depths and levels may vary across the site.
Note 2 For more detailed descriptions of the subsurface conditions, reference should be made to the borehole logs attached to Appendix A.
Note 3 Thickness of Unit 5 was only observed within BH3M.

Table 3-2 Depths to Top of Units in Boreholes (mBEGL *[RLm AHD]*)

Unit	Material	BH1M	BH2M	BH3M
1	Fill	0.0 *[90.10]*	0.0 *[88.01]*	0.0 *[90.90]*
2	Residual Soil	1.60 *[88.50]*	0.13 *[87.88]*	-
3	Class V Shale	3.41 *[86.69]*	2.06 *[85.95]*	2.0 *[88.90]*
4	Class IV Shale & Sandstone	12.69 *[77.41]*	4.60 *[83.41]*	9.0 *[81.90]*
5	Class III Sandstone	-	11.10 *[76.91]*	14.0 *[76.90]*
6	Class II Sandstone	-	-	20.00 *[70.90]*

3.2 Groundwater Observations

Due to the introduction of drilling fluids during coring and wash boring techniques, groundwater was not observed. Groundwater seepage however, was observed during auger drilling of BH2M at a depth of 0.7m BEGL (RL 89.7m AHD). The depth of groundwater seepage during augering is noted on the borehole logs in **Appendix A**.

Following completion of drilling, groundwater monitoring wells were installed in the boreholes, an attempt to bail the wells dry was not successful due to high recharge. Groundwater levels were measured within the monitoring wells during follow up groundwater monitoring events on 23 January & 17 February 2025, per **Table 3-3** below. Three data loggers were installed for detailed long term groundwater monitoring.

Table 3-3 Standing Groundwater Measurements Within Monitoring Wells

Borehole ID	Groundwater Levels		
	Measurement Date	m BEGL	RL (m AHD)
BH1M	23/01/2025	4.58	85.52
	17/02/2025	4.51	85.59
BH2M	23/01/2025	1.5	86.51
	17/02/2025	1.45	86.56
BH3M	17/02/2025	9.95	80.95

3.3 Test Results

Three soil samples were selected for laboratory testing to assess the following:

- Soil aggressivity (pH, chloride and sulfate content and electrical conductivity).

A summary of the soil test results is provided in **Table 3-4** below. Laboratory test certificates are presented in **Appendix B**.

Table 3-4 Summary of Soil Laboratory Test Results

Test / Sample ID	BH1M_0.5-0.95	BH1M_1.5-1.95	BH2M_0.3-0.4
Borehole ID	BH1M	BH1M	BH2M
Sample Depth (mBEGL)	0.5-0.95	1.5-1.95	0.3-0.4
Unit	1	1/2	2
Material[1]	Fill	Fill/Residual Soil	Residual Soil
USCS Description	Silty SAND / Silty CLAY	Silty CLAY	Silty CLAY
Aggressivity			
Chloride Cl (ppm)	34	110	50
Sulfate SO_4 (ppm)	60	97	86
pH	4.5	4.6	5.3
Electrical Conductivity (µS/cm)	130	96	79
Moisture Content (%)	19.5	21.4	24.3

Note 1 More detailed descriptions of the subsurface conditions at each borehole location are available on the borehole logs presented in Appendix A.

The assessment indicated low permeability soil was present above the groundwater table. In accordance with Tables 6.4.2(C) and 6.5.2(C) of AS 2159:2009 'Piling – Design and Installation', the results of the pH, chloride and sulfate content and electrical conductivity of the soil provided the following exposure classifications:

- 'Mild' for buried concrete structural elements; and
- 'Non-Aggressive' for buried steel structural elements.

Thirty-six (36) selected rock core samples were tested by STS Geotechnics Pty Ltd to estimate the Point Load Strength Index (Is_{50}) values to assist with rock strength assessment. The results of the testing are presented in the laboratory test reports (**Appendix B**) and reproduced on the attached borehole logs (**Appendix A**).

4. Recommendations

4.1 Geotechnical Considerations

Based on the results of the assessment, we consider the following to be the main geotechnical issues for the proposed development:

- Basement excavation and retention;
- Rock excavation and vibration;
- Groundwater within the depth of the excavation; and
- Foundation design for building loads.

4.2 Dilapidation Surveys

Prior to excavation and construction, we recommend that detailed dilapidation surveys be carried out on all structures and infrastructures surrounding the site that falls within the zone of influence of the excavation to allow assessment of the recommended vibration limits. The zone of influence of the excavation is defined by a distance back from the excavation perimeter of twice the total depth of the excavation. The reports would provide a record of existing conditions prior to commencement of the work. A copy of each report should be provided to the adjoining property owner who should be asked to confirm that it represents a fair assessment of existing conditions. The reports should be carefully reviewed prior to demolition and construction.

4.3 Excavation Methodology

4.3.1 Excavation Assessment

Prior to any excavation commencing, we recommend that reference be made to the Safe Work Australia Excavation Work Code of Practice, dated January 2020.

EI assumes that the proposed development will require a BEL of RL 71.5m AHD for the basement, or an excavation depth of about 18.60m BEGL. Locally deeper excavations for footings, service trenches, crane pads and lifts overrun pits may be required.

Based on the borehole logs, the proposed basement excavations will therefore extend through Unit 1 Fill to Unit 5. As such, an engineered retention system must be installed prior to excavation commencing to support the overburden profile, Unit 1 & Unit 2, and the weathered rock (Unit 3 & Unit 4). Unit 5 (Class III Sandstone) and Unit 6 (Class II Sandstone) will be allowed to stand vertically unsupported provided the following:

- The excavation face is absent of adversely oriented defects that may result in instability;
- Inspections be carried out by an experienced geotechnical engineer progressively during basement excavations to assess rock quality and absence of adversely oriented defects;
- Where adversely oriented defects are present which may form slip planes, wedges or unstable blocks, such areas be stabilised prior to further excavations.
- Further groundwater measurements, long term groundwater monitoring and Groundwater Seepage Analyses (GSA) be carried out to determine whether the water table is within the depth of proposed excavations and seepage flow rates which if sufficiently high would preclude unsupported cuts in competent sandstone and the potential need for tanking of the basement. We understand that EI carried out long term groundwater monitoring and permeability testing of groundwater within the installed groundwater wells, and is in the process of preparing the relevant reports.

Unit 1 and Unit 2 may be excavated using buckets of large earthmoving Hydraulic Excavators, particularly if fitted with 'Tiger Teeth' for excavations in Unit 3 (Class V Shale) and Unit 4 (Class IV Shale & Sandstone). Excavation of Unit 5 (Class III Sandstone) and Unit 6 (Class II Sandstone) may present heavy ripping, or "hard rock" excavation conditions. Ripping would require a high capacity and heavy bulldozer for effective production. Wear and tear should also be allowed for. The use of a smaller size bulldozer will result in lower productivity and higher wear and tear, and this should be allowed for. Alternatively, hydraulic rock breakers, rock saws, ripping hooks or rotary grinders could be used, though productivity would be lower and equipment wear increased, and this should be allowed for.

Use of rock hammer should commence away from the adjoining structures and the transmitted vibrations monitored to assess how close the hammer can operate to the adjoining structures while maintaining transmitted vibrations within acceptable limits. To fall within these limits, we recommend that the size of rock hammers do not exceed a medium sized rock hammer, say 900 kg, such as a Krupp 580, and be trialled prior to use. The transmitted vibrations from rock hammers should be measured to determine how close each individual hammer can operate to the adjoining buildings.

The vibration measurements can be carried out using either an attended or an unattended vibration monitoring system. An unattended vibration monitoring system must be fitted with an alarm in the form of a strobe light or siren or alerts sent directly to the site supervisor to make the plant operator aware immediately when the vibration limit is exceeded. The vibration monitor must be set to trigger the alarm when the overall Peak Particle Velocity (PPV) exceeds set limits outlined by a vibration monitoring plan. Reference should be made to **Appendix C** for a guide to acceptable limits of transmitted vibrations.

If it is found that the transmitted vibrations by the use of rock hammers are unacceptable, then it would be necessary to change to a smaller excavator with a smaller rock hammer, or to a rotary grinder, rock saws, jackhammers, ripping hooks, chemical rock splitting and milling machines. Although these are likely to be less productive, they would reduce or possibly eliminate risks of damage to adjoining properties through vibration effects transmitted via the ground. Such equipment would also be required for detailed excavation, such as footings or service trenches, and for trimming of faces. Final trimming of faces may also be completed using a grinder attachment rather than a rock breaker in order to assist in limiting vibrations. The use of rotary grinders generally generates dust and this may be supressed by spraying with water.

To assist in reducing vibrations and over-break of the sandstone, we recommend that initial saw cutting of the excavation perimeters through the bedrock may be provided using rock saw attachments fitted to the excavator. Rock sawing of the excavation perimeter has several advantages as it often reduces the need for rock bolting as the cut faces generally remain more stable and require a lower level of rock support than hammer cut excavations, ground vibrations from rock saws are minimal and the saw cuts will provide a slight increase in buffer distance for use of rock hammers. However, the effectiveness of such approach must be confirmed by the results of vibration monitoring.

Also, there is a potential for poorly oriented defects within the excavated bedrock to result in localized rock slide/topple failure with potential impact to the work site or the adjacent structures. However through selection of suitable excavation equipment, geotechnical inspections and mapping during the excavation works along with the installation of support measures as determined necessary by the inspections, the risk from the proposed works can be maintained within 'Acceptable' levels. In addition, we recommend that only excavation contractors with appropriate insurances and experience on similar projects be used. The contractor should also be provided with a copy of this report to make his own judgement on the most appropriate excavation equipment.

Groundwater seepage monitoring should be carried out during bulk excavation works and prior to finalising the design of a pump out facility. Outlets into the stormwater system will require Council approval.

Furthermore, any existing buried services, which run below the site, will require diversion prior to the commencement of excavation or alternatively be temporarily supported during excavation, subject to permission or other instructions from the relevant service authorities. Enquiries should also be made for further information and details, such as invert levels, on the buried services.

4.3.2 Excavation Monitoring

Consideration should be made to the impact of the proposed development upon neighbouring structures, roadways and services. Basement excavation retention systems should be designed so as to limit lateral deflections.

Contractors should also consider the following limits associated with carrying out excavation and construction activities:

- Limit lateral deflection of temporary or permanent retaining structures;
- Limit vertical settlements of ground surface at common property boundaries and services easement; and
- Limit Peak Particle Velocities (PPV) from vibrations, caused by construction equipment or excavation, experienced by any nearby structures and services.

Monitoring of deflections of retaining structures and surface settlements should be carried out by a registered surveyor at agreed points along the excavation boundaries and along existing building foundations / services / pavements and other structures located within or near the zone of influence of the excavation. Owners of existing services adjacent to the site should be consulted to assess appropriate deflection limits for their infrastructures. Measurements should be taken in the following sequence:

- Before commencing installation of retaining structures where appropriate to determine the baseline readings. Two independent sets of measurements must be taken confirming measurement consistency;
- After installation of the retaining structures, but before commencement of excavation;
- After excavation to the first row of supports or anchors, but prior to installation of these supports or anchors;
- After excavation to any subsequent rows of supports or anchors, but prior to installation of these supports or anchors;
- After excavation to the base of the excavation;
- After de-stressing and removal of any rows of supports or anchors; and
- One month after completion of the permanent retaining structure or after three consecutive measurements not less than a week apart showing no further movements, whichever is the latter.

4.4 Groundwater Considerations

Groundwater was observed in all monitoring wells as detailed in **Table 3-2**, all of which are above the assumed BEL RL of 71.5m AHD.

EI note that based on the measured water level being within the soil and rock profiles, and is expected to be perched groundwater. Hence, we expect some minor seepage inflows into the excavation along the soil/rock interface and through defects within the underlying bedrock (such as jointing, and bedding planes, etc.) particularly following a period of heavy rainfall. Due to the relatively low permeability of the soil and rock profiles, any groundwater inflows into the excavation are not expected to have any adverse impact on the proposed development or on the neighbouring sites, and should be manageable. The initial flows into the excavation may be locally high, but would be expected to decrease considerably with time as any bedding

seams/joints are drained. We recommend that monitoring of seepage be implemented during the excavation works to confirm the capacity of the drainage system.

We expect that any seepage that does occur will be able to be controlled by a conventional sump and pump system. We recommend that a sump-and-pump system be used both during construction and for permanent groundwater control below the basement floor slab.

In the long term, drainage should be provided behind all basement retaining walls, around the perimeter of the basement and below the basement slab. The completed excavation should be inspected by the hydraulic engineer to confirm that adequate drainage has been allowed for. Drainage should be connected to the sump-and-pump system and discharging into the stormwater system. The permanent groundwater control system should take into account any possible soluble substances in the groundwater which may dictate whether or not groundwater can be pumped into the stormwater system. On-going maintenance of the drainage and pump systems should be allowed for.

The design of drainage and pump systems should take the above issues into account along with careful ongoing inspections and maintenance programs.

Reference should be made to Department of Planning and Environment (DPE) guidelines “Minimum requirements for building site groundwater investigation and reporting”, dated October 2022. EI should be contacted for further advice for the approval process for a drained basement.

4.4.1 Drawdown and Settlement

We would suggest that advice on dewatering is sought from a specialised contractor. However, it should be noted that lowering groundwater levels outside the site perimeters could affect settlement of foundations of nearby structures and infrastructures. It is recommended that groundwater levels outside the excavation in the vicinity of the adjacent properties be monitored and kept to within 1.0m of the baseline groundwater levels.

4.5 Excavation Retention

4.5.1 Support Systems

From a geotechnical perspective, it is critical to maintain the stability of all adjacent structures and infrastructures during demolition, excavation and construction works.

Based on the provided architectural plans, the basement extends up to the northern, southern and south eastern side boundaries, and is setback from 6.0m from the western and north eastern site boundary. Based on the above, the close proximity of the surrounding buildings, the encountered subsurface conditions, the shallow groundwater, and the required excavation depth, full depth temporary batters are not recommended for this site. Unsupported vertical cuts of the soil are not recommended for this site as these carry the risk of potential slumping/collapse especially after a period of wet weather. Slumping/Collapse of the material may result in injury to personnel and/or damage to nearby structures/infrastructures and equipment. Temporary batters at the site, where room for full batter construction is available, may be excavated to a safe batter angle of 1V:1H. Temporary batters must be constructed above the groundwater table.

Where space for temporary batters is not available, a suitable retention system will be required to be installed prior to commencement of excavation for the support of the entire depth of the excavation. For this site, we consider that an anchored and/or propped soldier pile wall with reinforced shotcrete panels in between the piles to be the most suitable. Anchors/props and reinforced shotcrete must be installed progressively as excavation proceeds. Appropriate subsurface drainage should be installed to mitigate against the build-up of hydrostatic pressures behind the retaining wall.

The retention system will be required for the support soil material (Unit 1 & Unit 2), and the weathered rock (Unit 3 & Unit 4). Bored piles are considered to be the most suitable for this site. Tremie pumps may be required where high groundwater seepage inflows are present during the drilling of the bored piles. However, relatively large capacity piling rigs will be required for drilling through the sandstone bedrock. The proposed pile locations should take into account the presence of buried services. Further advice should be sought from prospective piling contractors who should be provided with a copy of this report.

Consideration may be made for some piers, which are not supporting the vertical structural loads of the building, to be terminated at least 1.0m, into Unit 5 (Class III Sandstone) or better, above the base of the bulk excavation levels. Excavation within Unit 5 (Class III Sandstone) should generally be able to be cut vertically and without support, provided an anchor is installed near the toe of the solider pile wall to provide adequate lateral toe support. Anchors/props and reinforced shotcrete must be installed progressively as excavation proceeds.

Due to the presence of the basement structures to the north of the site (property at 45 Archer Street), anchor installation may not be possible and internal props may be required. Details of nearby basements, shoring pile walls and anchors must be obtained prior to final structural design of the basement.

For vertical cuts within Unit 5 (Class III Sandstone) and Unit 6 (Class II Sandstone), the excavations must be inspected by a suitably qualified geotechnical engineer at regular intervals to check for any inclined joints or weak seams that require stabilisation. Such geotechnical inspections should be carried out at depth intervals of no more than 1.5m. If adverse defects are encountered, the stabilisation measures may comprise rock bolts, shotcrete and mesh or dental treatment of thin weak seams using non-shrink grout, and this should be allowed for.

Permanently exposed rock faces should expect water seepage from defects and the rock mass itself. Exposed rock faces must be treated as ‘wet walls’ and should allow water seepage to collect in spoon drains.

The existence of significant horizontal in-situ stresses in bedrock, particularly in the Sydney basin, is well established. The release of such stresses during the basement excavation may cause adverse impact on the stability of the excavation faces and thus increase the movements. Monitoring of several deep excavations within sandstone and shale in the Sydney region indicates that the lateral displacement at the top of the excavation is generally between 0.5mm to 2mm per meter depth of excavation. As the maximum depth of excavation into sandstone is of about 10m, a lateral deflection at the crest of the excavation between 5mm to 20mm can be expected which will reduce in a stepped fashion to zero at the bulk excavation level. Monitoring of the lateral movement as the excavation progresses is recommended. An assessment of such movements and their impact can be carried out using finite element software such as PLAXIS.

4.5.2 Retaining Wall Design Parameters

The following parameters may be used for static design of temporary and permanent retaining walls at the subject site. EI note that the below parameters, particularly with determining lateral earth pressures, are for preliminary planning purposes. We recommend that detailed analysis such as the use of finite element analysis software be used to design retaining walls.

- For progressively anchored or propped walls where minor movements can be tolerated (provided there are no buried movement sensitive services), we recommend the use of a trapezoidal earth pressure distribution of 5H kPa for soil, where H is the retained height in meters. These pressures should be assumed to be uniform over the central 50% of the support system, tapering to nil at top and bottom;
- For progressively anchored or propped walls which support areas which are highly sensitive to movement (such as areas where movement sensitive structures or infrastructures or buried services are located in close proximity), we recommend the use of a trapezoidal earth pressure distribution of 8H kPa for soil, where ‘H’ is the retained height

in meters. These pressures should be assumed to be uniform over the central 50% of the support system, tapering to nil at top and bottom;

- All surcharge loading affecting the walls (including from construction equipment, construction loads, adjacent high level footings, etc.) should be adopted in the retaining wall design as an additional surcharge using an 'at rest' earth pressure coefficient, K_o.
- The retaining walls should be designed as drained and measures are to be taken to provide complete and permanent drainage behind the walls. Strip drains protected with a non-woven geotextile fabric should be used behind the reinforced shotcrete infill panels for soldier pile walls;
- For pile socket design, the allowable lateral toe resistance values outlined in **Table 4-1** below may be adopted. These values assume excavation is not carried out within the zone of influence of the wall toe and the rock does not contain adverse defects etc. The upper 0.3m depth of the socket should not be taken into account to allow for tolerance and disturbance effects during excavation.
- If temporary anchors extend beyond the site boundaries, then permission from the neighbouring properties would need to be obtained prior to installation. Also, the presence of neighbouring basements and/or services and their levels must be confirmed prior to finalising anchor design**.**
- Anchors should have their bond length within Unit 4 (Class IV Shale and Sandstone) or better. For the design of anchors bond lengths, the allowable bond stress values outlined in **Table 4-1** below may be used, subject to the following conditions:
  - Anchor bond lengths of at least 3m behind the 'active' zone of the excavation (taken as a 45 degree zone above the base of the excavation) is provided;
  - Overall stability, including anchor group interaction, is satisfied;
  - All anchors should be proof loaded to at least 1.33 times the design working load before locking off at the appropriate working load. Such proof loading is to be witnessed by a suitably qualified geotechnical engineer independent of the anchoring contractor. Lift-off tests should be carried out on at least 10% of the anchors 48 hours following locking off to confirm that the anchors are holding their load. Usually anchors are commissioned on design and construct basis so that failure of anchors to hold their load does not then become a contractual issue. We recommend that only experienced contractors be considered for anchor design, specification and installation with appropriate insurances;
  - If permanent anchors are to be used, these must have appropriate corrosion provisions for longevity.

Table 4-1 Geotechnical Design Parameters

Material [1]	Unit 1 Fill	Unit 2 Residual Soil	Unit 3 Class V Shale	Unit 4 Class IV Shale & Sandstone	Unit 5 Class III Sandstone	Unit 6 Class II Sandstone
RL of Top of Unit (m AHD) [2]	88.01 to 90.90	87.88 to 88.50	85.95 to 88.9	77.41 to 83.41	76.90 to 76.91	70.90
Bulk Unit Weight (kN/m^3)	18	19	22	23	24	24
Friction Angle, ϕ' (°)	26	26	28	30	40	45
Young's Modulus, E' (MPa)	5	15	100	200	600	1000
Earth Pressure at rest, K_o [3]	0.56	0.56	0.53	0.50	0.36	0.29
Active Earth Pressure, K_a [3]	0.39	0.39	0.36	0.33	0.22	0.17
Passive Earth Pressure, K_p [3]	2.56	2.56	2.77	3.00	4.60	5.83
Allowable Bearing Pressure (kPa) [5]	-	-	700	1000	3000	5000
Allowable Shaft Adhesion in Compression (kPa)	-	-	70	100	300	500
Allowable Shaft Adhesion in Uplift (kPa)	-	-	35	50	150	250
Allowable Toe Resistance (kPa)	-	-	-	100	300	600
Earthquake Site Risk Classification	AS 1170.4:2007 indicates earthquake subsoil Class B_e (Rock) AS 1170.4:2007 indicates the hazard factor (z) for Sydney is 0.08					

Note 1 More detailed descriptions of subsurface conditions are available on the borehole logs in Appendix A.

Note 2 Approximate levels of top of unit at the time of our investigation. Levels may vary across the site.

Note 3 Earth pressures are provided on the assumption that the ground behind the retaining walls is horizontal.

Note 4 Side adhesion values given assume there is intimate contact between the pile and foundation material and should achieve a clean socket roughness category R2 or better. Design engineer to check both 'piston pull-out' and 'cone liftout' mechanics in accordance with AS4678-2002 Earth Retaining Structures.

Note 5 To adopt these parameters we have assumed that:

a. Footings have a nominal socket of at least 0.3m, into the relevant founding material;
b. For piles, there is intimate contact between the pile and foundation material (a clean socket roughness category of R2 or better);
c. Potential soil and groundwater aggressivity will be considered in the design of piles and footings;
d. Piles should be drilled in the presence of a Geotechnical Engineer prior to pile construction to verify that ground conditions meet design assumptions. Where groundwater ingress is encountered during pile excavation, concrete is to be placed as soon as possible upon completion of pile excavation. Pile excavations should be pumped dry of water prior to pouring concrete, or alternatively a tremmie system could be used;

e. The bases of all pile, pad and strip footing excavations are cleaned of loose and softened material and water is pumped out prior to placement of concrete;
f. The concrete is poured on the same day as drilling, inspection and cleaning.

Note 6 The allowable bearing pressures given above are based on serviceability criteria of settlements at the footing base/pile toe of less than or equal to 1% of the minimum footing dimension (or pile diameter).

4.6 Foundations

Considering the scale of the proposed buildings, it is expected that building loads would need to be transferred to Unit 5 (Class III Sandstone) and Unit 6 (Class II Sandstone). Hence, there is a potential for shallow spread footings founded below the BEL.

It is recommended that all footings for the building be founded within the material with comparable stiffnesses & bearing capacities to minimise the potential for differential settlements.

For footings designed for to found on or within Unit 6 (Class II Sandstone) EI recommends that spoon tests are completed on at least 25% of the footings. Spoon tests involve the drilling of a small core hole through the base of the footing to a depth of 1.5 times the minimum footing width, and a “spoon” instrument is used to measure the locations and thicknesses of defects within the rock mass to confirm the class of sandstone.

Geotechnical inspections of foundations are recommended to determine that the required bearing capacity has been achieved and to determine any variations that may occur between the boreholes and inspected locations. Such inspection of footings must be carried out by a suitably qualified geotechnical engineer.

4.7 Basement Floor Slab

Following bulk excavations for the proposed basement, sandstone bedrock is expected to be exposed at the basement floor BEL.

Following the removal of all loose and softened materials, we recommend that for a drained basement design, underfloor drainage be provided and should comprise a strong, durable, single sized washed aggregate such as ‘blue metal gravel’. Joints in the concrete floor slab should be designed to accommodate shear forces but not bending moments by using dowelled and keyed joints and adequate waterproofing. The basement floor slab should be isolated from columns. The completed excavation should be inspected by the hydraulic engineer to confirm the extent of the drainage required.

For the design of a drained basement, permission may need to be obtained from Council and WaterNSW for any permanent discharge of seepage into the drainage system. If permission for discharge is not obtained, the basement may need to be designed as a tanked basement.

5. Conclusion and Mitigation Measures

This report concludes that the proposed development is suitable and warrants approval subject to the implementation of the following mitigation measures:

Below is a summary of the recommended additional work that needs to be carried out:

- Additional geotechnical investigation (GI) comprising the drilling of at least 3 boreholes across the site to at least 3.0 m below BEL to confirm observations and recommendations in this PGI report;
- Groundwater monitoring to confirm groundwater levels and volumes of water expected to be removed from site during excavation works and over the life of the basement. At the time of writing, EI has carried out long term groundwater monitoring in preparation of a GSA report;
- Dilapidation surveys of neighbouring structures prior to excavation works at the site;
- Classification of all excavated material transported off site;
- Geotechnical inspections of installation of support measures and proof-testing of anchors at the time of installation/testing (if required).
- Geotechnical inspections of rock faces during excavation by an experienced geotechnical professional at depths of no greater than 1.5m within medium to high strength bedrock, if vertical cuts are adopted;
- Geotechnical inspections of all new footings/piles by an experienced geotechnical professional before concrete or steel are placed to verify their bearing capacity and the in-situ nature of the founding strata; and
- Ongoing monitoring of groundwater inflows into site during bulk excavation works until slab on ground is constructed.

Following the implementation of the items listed above, EI is satisfied that the geotechnical impacts of the proposed development will be kept to a minimum.

We recommend that a meeting be held between the client, project structural engineer and project geotechnical engineer after initial the structural design has been completed to confirm that our recommendations have been correctly interpreted. We also recommend a meeting be held between the client, construction consultants and project geotechnical engineer, at the commencement of construction to discuss the primary geotechnical issues and inspection requirements.

6. Statement of Limitations

This report has been prepared for the exclusive use of Mr. Adrian Giardine and Hyecorp who is the only intended beneficiary of EI's work. The scope of the assessment carried out for the purpose of this report is limited to those agreed with Mr. Adrian Giardine and Hyecorp

No other party should rely on the document without the prior written consent of EI, and EI undertakes no duty, or accepts any responsibility or liability, to any third party who purports to rely upon this document without EI's approval.

EI has used a degree of care and skill ordinarily exercised in similar investigations by reputable members of the geotechnical industry in Australia as at the date of this document. No other warranty, expressed or implied, is made or intended. Each section of this report must be read in conjunction with the whole of this report, including its appendices and attachments.

The conclusions presented in this report are based on a limited investigation of conditions, with specific sampling and test locations chosen to be as representative as possible under the given circumstances.

EI's professional opinions are reasonable and based on its professional judgment, experience, training and results from analytical data. EI may also have relied upon information provided by the Client and other third parties to prepare this document, some of which may not have been verified by EI.

EI's professional opinions contained in this document are subject to modification if additional information is obtained through further investigation, observations, or validation testing and analysis during construction. In some cases, further testing and analysis may be required, which may result in a further report with different conclusions.

We draw your attention to the document "Important Information", which is included in **Appendix D** of this report. The statements presented in this document are intended to advise you of what your realistic expectations of this report should be. The document is not intended to reduce the level of responsibility accepted by EI, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

Should you have any queries regarding this report, please do not hesitate to contact EI.

References

AS1289.6.3.1:2004, Methods of Testing Soils for Engineering Purposes, Standards Australia.

AS1726:2017, *Geotechnical Site Investigations*, Standards Australia.

AS2159:2009, *Piling – Design and Installation*, Standards Australia.

AS3600:2018, *Concrete Structures,* Standards Australia

Safe Work Australia Excavation Work Code of Practice, dated January 2020 – WorkCover NSW

NSW Department of Finance and Service, Spatial Information Viewer, maps.six.nsw.gov.au.

Abbreviations

AHD	Australian Height Datum
AS	Australian Standard
BEL	Bulk Excavation Level
BEGL	Below Existing Ground Level
BH	Borehole
BYD	Before You Dig Australia
DP	Deposited Plan
EI	EI Australia
NATA	National Association of Testing Authorities, Australia
PGI	Preliminary Geotechnical Investigation
RL	Reduced Level
SPT	Standard Penetration Test
T-C	Tungsten-Carbide
UCS	Unconfined Compressive Strength

Figures

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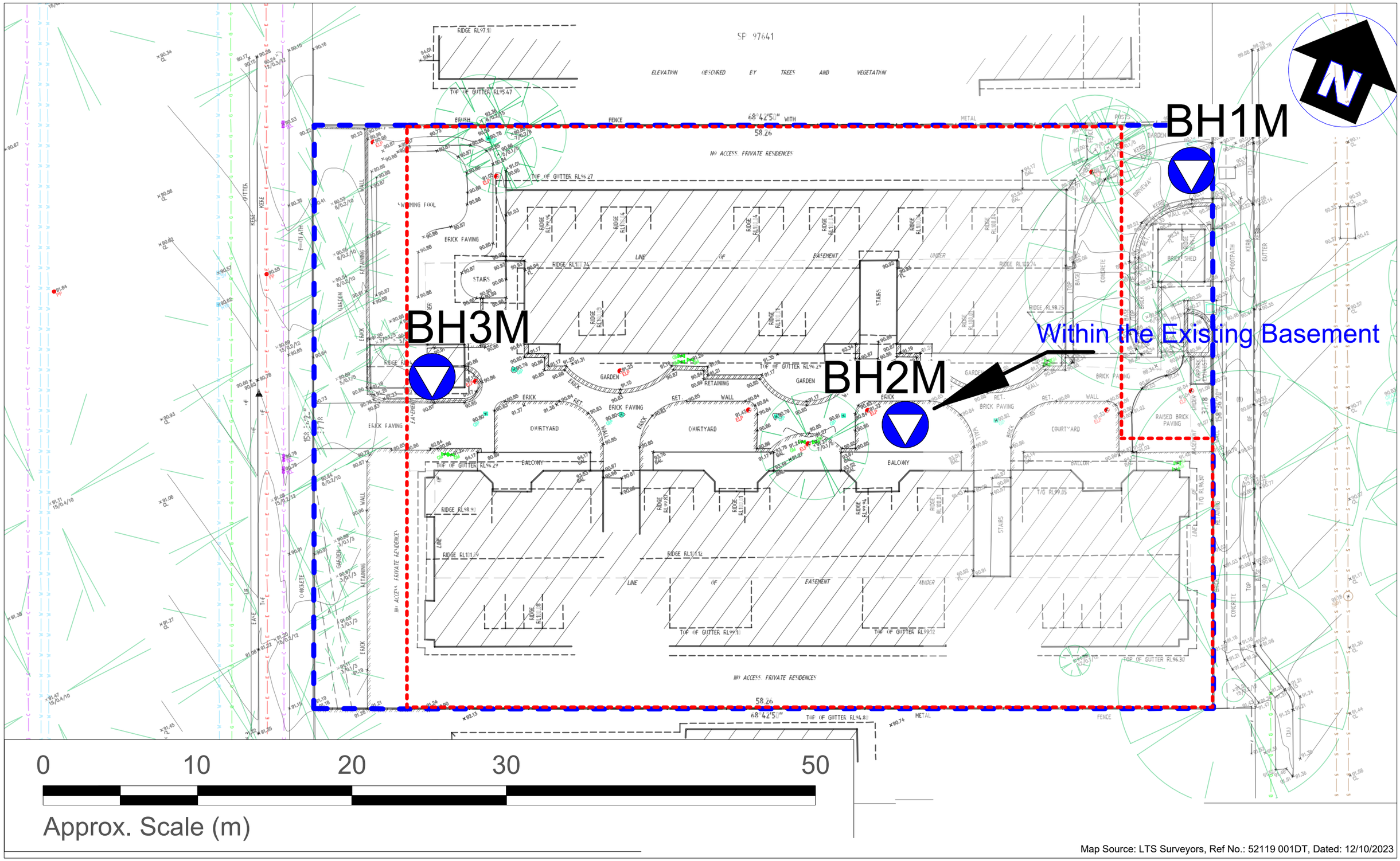
Drawn:	PS
Approved:	J2
Date:	21/01/2025
Scale:	Not To Scale

Hyecorp Property Group
Geotechical Investigation
No.37 Archer Street, Chatswood
Site Locality Plan

Figure:
1

Project: E26577.G03



Map Source: LTS Surveyors, Ref No.: 52119 001DT, Dated: 12/10/2023

LEGEND (All Locations are Approximate)

- Site Boundary
- Borehole Location with Monitoring Well

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Drawn:	P.S
Approved:	J2
Date:	20/01/2025

Hyecorp Property Group
Geotechical Investigation
No.37 Archer Street, Chatswood
Borehole Location

Figure: 2

Project: E26577.G03

Appendix A Borehole Logs And Explanatory Notes

BOREHOLE LOG

BH ID: BH1M

Location	37 Archer Street,Chatswood,NSW			**Started**	18 December 2024
Client	Heritage House Pty Ltd			**Completed**	18 December 2024
Job No.	E26577.G03			**Logged By**	S2 **Date** 18 December 2024
Sheets	1 of 3			**Review By**	J2 **Date** 12 Feburary 2025
Drilling Contractor	BG Drilling Pty Ltd	**Surface RL**	≈90.40 m (AHD)	**Northing**	6258745.7216 (MGA 2020 Zone 56)
Plant	Hanjin D&B 8-D	**Inclination**	90°	**Easting**	332183.1712 (MGA 2020 Zone 56)

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
AD/T	GWNE	B1M_0.20-0.30		0.00		90.40	CONCRETE: 160mm thick	-		CONCRETE
				0.16		90.24	FILL: Silty SAND: fine to medium grained,light brown and grey,trace of clay nodules	M		FILL
		B1M_0.50-0.95 SPT 0.50-0.95 3,3,5 N=8		0.60		89.80	FILL: Silty CLAY: low plasticity, dark grey, with fine to medium grained sand, and trace of fine to medium grained igneous gravel	M > PL	-	
		B1M_1.50-1.95 SPT 1.50-1.95 3,4,6 N=10		1.60		88.80	Silty CLAY: medium plasticity, grey mottled red brown	M > PL	St	RESIDUAL SOIL
		B1M_3.00-3.41 SPT 3.00-3.41 6,14,14/110 mm N=R		3.00		87.40	From 3.00m to 3.41m, high plasticity,grey, grading into weathered shale		H	
				3.41		86.99	SHALE: dark grey,distinctly weathered, very low to low strength.			WEATHERED ROCK
				8.50		81.90	*Log continued on next page.*			

BOREHOLE CORE LOG

BH ID: BH1M

Location	37 Archer Street,Chatswood,NSW			**Started**	18 December 2024
Client	Heritage House Pty Ltd			**Completed**	18 December 2024
Job No.	E26577.G03			**Logged By**	S2 **Date** 18 December 2024
Sheets	2 of 3			**Review By**	J2 **Date** 12 Feburary 2025
Drilling Contractor	BG Drilling Pty Ltd	**Surface RL**	≈90.40 m (AHD)	**Northing**	6258745.7216 (MGA 2020 Zone 56)
Plant	Hanjin D&B 8-D	**Inclination**	90°	**Easting**	332183.1712 (MGA 2020 Zone 56)

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50) ▼ - Axial ▽ - Diametral	DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING
				0			*Log continued from previous page.*				
				8.63		81.77	NO CORE: 130mm thick				
		88	0	8.83		81.57	SHALE: dark grey, extremely weathered SANDSTONE: fine to medium grained, with extremely weathered bands .	XW			
				9.55		80.85	NO CORE: 560mm thick				
				10							

BOREHOLE CORE LOG

BH ID: BH1M

Location	37 Archer Street,Chatswood,NSW			**Started**	18 December 2024
Client	Heritage House Pty Ltd			**Completed**	18 December 2024
Job No.	E26577.G03			**Logged By**	S2 **Date** 18 December 2024
Sheets	3 of 3			**Review By**	J2 **Date** 12 Feburary 2025
Drilling Contractor	BG Drilling Pty Ltd	**Surface RL**	≈90.40 m (AHD)	**Northing**	6258745.7216 (MGA 2020 Zone 56)
Plant	Hanjin D&B 8-D	**Inclination**	90°	**Easting**	332183.1712 (MGA 2020 Zone 56)

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	DISCONTINUITIES & ADDITIONAL DATA
NMLC		75	65	10.11	80.29	NO CORE: 560mm thick SANDSTONE: fine to medium grained,pale grey with. dark grey laminate and extremely weathered bands,very thinly bedded		10.15: JT 40° UN RO CN 10.71-11.25: XWZ 11.55-11.77: XWZ
		100	51	11.76 12 12.69 13 14	78.64 77.71	NO CORE: 930mm thick SANDSTONE: fine to medium grained, pale grey with dark grey laminate and extremely weathered bands	DW	13.11: JT 30° PR RO Clay Infilled 13.25: JT 35° PR SM Clay Infilled 13.49: BP 5° PR SM Clay Infilled 13.58-13.62: XWS VR 14.34: JT 90° PR SM Clay Infilled 14.38: JT 85° PR SM Clay Infilled
		97	97	14.60 14.68 15 16 17	75.80 75.72	NO CORE: 80mm thick SANDSTONE: fine to medium grained,pale grey with. dark grey laminate and extremely weathered bands,very thinly bedded		17.43: JT 45° PR RO CN 17.72: JT 35° PR RO CN
		100	26	18	72.14	Terminated at 18.26m. Target Depth Reached.		
				19 20				

ESTIMATED STRENGTH Is(50) ▼ - Axial ▽ - Diametral: VL (0-1), L (0-3), M (1), H (3), VH (10), EH

FRACTURE SPACING: 30, 100, 300, 1000, 3000

MONITORING WELL LOG

BH ID: BH1M

Location	37 Archer Street,Chatswood,NSW			**Started**	18 December 2024
Client	Heritage House Pty Ltd			**Completed**	18 December 2024
Job No.	E26577.G03			**Logged By**	S2 **Date** 18 December 2024
Sheets	1 of 2			**Review By**	J2 **Date** 12 Feburary 2025
Drilling Contractor	BG Drilling Pty Ltd	**Surface RL**	≈90.40 m (AHD)	**Northing**	6258745.7216 (MGA 2020 Zone 56)
Plant	Hanjin D&B 8-D	**Inclination**	90°	**Easting**	332183.1712 (MGA 2020 Zone 56)

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
GWNE	B1M_0.20-0.30 B1M_0.50-0.95 SPT 0.50-0.95 3,3,5 N=8 B1M_1.50-1.95 SPT 1.50-1.95 3,4,6 N=10 B1M_3.00-3.41 SPT 3.00-3.41 6,14,14/110 mm N=R	0.00	90.40	CONCRETE: 160mm thick	-		Well Stickup =0.0m (RL 90.40m)
		0.16	90.24	FILL: Silty SAND: fine to medium grained,light brown and grey,trace of clay nodules	M		
		0.60	89.80	FILL: Silty CLAY: low plasticity, dark grey, with fine to medium grained sand, and trace of fine to medium grained igneous gravel			
		1.60	88.80	Silty CLAY: medium plasticity, grey mottled red brown	M > PL	Grout 0.00m - 4.00m	
		3.00	87.40	From 3.00m to 3.41m, high plasticity,grey, grading into weathered shale			
		3.41	86.99	SHALE: dark grey,distinctly weathered, very low to low strength.			0.0m - 12.26m PVC casing (50mm Ø)
		8.50	81.90	NO CORE: 130mm thick			
		8.63	81.77	SHALE: dark grey, extremely weathered			
		8.83	81.57	SANDSTONE: fine to medium grained, with extremely weathered bands .			
		9.55	80.85	NO CORE: 560mm thick			

MONITORING WELL LOG

BH ID: BH1M

Location	37 Archer Street,Chatswood,NSW			**Started**	18 December 2024
Client	Heritage House Pty Ltd			**Completed**	18 December 2024
Job No.	E26577.G03			**Logged By**	S2 **Date** 18 December 2024
Sheets	2 of 2			**Review By**	J2 **Date** 12 Feburary 2025
Drilling Contractor	BG Drilling Pty Ltd	**Surface RL**	≈90.40 m (AHD)	**Northing**	6258745.7216 (MGA 2020 Zone 56)
Plant	Hanjin D&B 8-D	**Inclination**	90°	**Easting**	332183.1712 (MGA 2020 Zone 56)

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
		10.11		80.29	NO CORE: 560mm thick SANDSTONE: fine to medium grained,pale grey with. dark grey laminate and extremely weathered bands,very thinly bedded		Bentonite 10.00m - 11.00m Sand 4.00m - 18.00m	
		11.76		78.64	NO CORE: 930mm thick			
		12.69		77.71	SANDSTONE: fine to medium grained, pale grey with dark grey laminate and extremely weathered bands			
		14.60		75.80	NO CORE: 80mm thick		Sand 11.00m - 18.26m	12.26m - 18.26m PVC screen (50mm Ø)
		14.68		75.72	SANDSTONE: fine to medium grained,pale grey with. dark grey laminate and extremely weathered bands,very thinly bedded			
		18.26		72.14	Terminated at 18.26m. Target Depth Reached.			

CORE PHOTOGRAPH OF BOREHOLE: BH1M

Project	New Development			**Depth Range**	8.50m to 17.0m BEGL		
Location	No. 37 Archer Street, Chatswood, NSW			**Contractor**	BG Drilling		
Position	See Figure 2	**Surface RL**	≈ 90.10m (AHD)	**Drill Rig**	Hanjin D&B 8D		
Job No.	E26577.G03	**Inclination**	-90°	**Logged**	S2	**Date**	18 / 12 / 2024
Client	Hyecorp Property Group	**Box**	1-2 of 3	**Checked**		**Date**	

CORE PHOTOGRAPH OF BOREHOLE: BH1M

Project	New Development			**Depth Range**	17.0 m to 18.26m BEGL		
Location	No. 37 Archer Street, Chatswood, NSW			**Contractor**	BG Drilling		
Position	See Figure 2	**Surface RL**	≈ 90.10m (AHD)	**Drill Rig**	Hanjin D&B 8D		
Job No.	E26577.G03	**Inclination**	-90°	**Logged**	S2	**Date**	18 / 12 / 2024
Client	Hyecorp Property Group	**Box**	3 of 3	**Checked**		**Date**	

BOREHOLE LOG

BH ID: BH2M

Location	37 Archer Street,Chatswood,NSW	**Started**	18 December 2024
Client	Heritage House Pty Ltd	**Completed**	19 December 2024
Job No.	E26577.G03	**Logged By**	PS **Date** 19 December 2024
Sheets	1 of 3	**Review By**	J2 **Date** 12 Feburary 2025
Drilling Contractor	Tight Access	**Surface RL**	≈88.01 m (AHD) **Northing** 6258741.5430 (MGA 2020 Zone 56)
Plant	Hand Auger and Man Portable Rig	**Inclination**	90° **Easting** 332171.1810 (MGA 2020 Zone 56)

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
DT				0.00		88.01	CONCRETE: 130mm thick	-	-	CONCRETE
				0.13		87.88	FILL: Silty GRAVEL: dark grey to brown with blue metals	M		FILL
HA	▽	BH2M_0.30-0.40	■	0.25		87.76	Silty CLAY: medium to high plasticity, pale grey to reddish brown, Slight punget odour			RESIDUAL SOIL
				0.38		87.63	From 0.38m, with small to medium iron stain gravels	M > PL		
				0.87		87.14	*Log continued on next page.*			

BOREHOLE CORE LOG

BH ID: BH2M

Location	37 Archer Street,Chatswood,NSW	**Started**	18 December 2024		
Client	Heritage House Pty Ltd	**Completed**	19 December 2024		
Job No.	E26577.G03	**Logged By**	PS	**Date**	19 December 2024
Sheets	2 of 3	**Review By**	J2	**Date**	12 Feburary 2025
Drilling Contractor	Tight Access	**Surface RL**	≈88.01 m (AHD)	**Northing**	6258741.5430 (MGA 2020 Zone 56)
Plant	Hand Auger and Man Portable Rig	**Inclination**	90°	**Easting**	332171.1810 (MGA 2020 Zone 56)

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50) ▼ - Axial ▽ - Diametral	DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING
				0		*Log continued from previous page.*				
NMLC	95%	100	17	1		Silty CLAY: medium to high plasticity, pale grey with iron stained gravels	RS			
				2						
				2.06	85.95	SILTSTONE: dark grey with pale grey cross beddings	DW		2.25: JT 0° SM CN	
		100	83	3			SW		2.64: JT 40° SM CN 2.77: JT 5° RO OP 2.94-3.07: SSU CU RO SN 3.36-3.42: FS IR VR Infilled	
				4					3.82-3.86: XWS 45° VR Fractured siltstone and clay Clay VN 4.05-4.08: FS 5° SM CN	
		100	73	4.23	83.78	From 4.23m to 5.37m, bands of pale grey claytone	DW		4.22: JT 5° SM CN 4.49: JT 5° SM CN 4.53-4.76: XWZ RO Factured siltstone and clay Clay VN	
				5					5.29: Handling Break	
		100	45	6					5.60-5.87: FZ 5° VR Extremely weathered siltstone and clay Clay VN	
				6.67	81.34	SANDSTONE: fine grained, pale grey	DW - SW		6.18: JT 5° PR RO OP 6.30: XWS 5° SM Clay Clay VN 6.43-6.45: XWS 10° CU SM Clay VN 6.61: JT PR RO OP	
		100	91	7					6.93-7.05: FS 5-45° IR VR Extremely weathered sandstone Clay VN	
				8					7.83: JT 10° RO OP 8.00-8.04: XWS 5° UN SM Clay VN	
				8.85	79.16				8.43-8.50: XWS RO Clay VN	
		76	53	9		NO CORE: 400mm thick	-			
				9.25	78.76	SANDSTONE: medium to coarse grained, pale grey with thin dark grey cross beddings	DW		9.25-9.58: FZ 5-20° PR VR Weathered sandstone and clay SN	
				10						

BOREHOLE CORE LOG

BH ID: BH2M

Location	37 Archer Street,Chatswood,NSW			**Started**	18 December 2024
Client	Heritage House Pty Ltd			**Completed**	19 December 2024
Job No.	E26577.G03			**Logged By**	PS **Date** 19 December 2024
Sheets	3 of 3			**Review By**	J2 **Date** 12 Feburary 2025
Drilling Contractor	Tight Access	**Surface RL**	≈88.01 m (AHD)	**Northing**	6258741.5430 (MGA 2020 Zone 56)
Plant	Hand Auger and Man Portable Rig	**Inclination**	90°	**Easting**	332171.1810 (MGA 2020 Zone 56)

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50) ▼ - Axial ▽ - Diametral (VL 0-1, L 0-3, M 1, H 3, VH 10, EH)	DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING (30, 100, 300, 1000, 3000)
						77.42	SANDSTONE: medium to coarse grained, pale grey with thin dark grey cross beddings			10.14: JT 40° CU RO OP 10.24-10.59: FZ 5-10° PR RO OP	
				10.59						10.53: JT 5° CU RO OP	
				10.64		77.37	NO CORE: 50mm thick	-			
		97	64	11			SANDSTONE: fine to coarse grained, pale grey with thin dark grey beddings	SW		10.86: XWS 10° RO Clay Infilled	
										11.74: JT PR RO OP	
		100	94	12				SW - FR		12.49: JT PR RO OP 12.62: JT 5° PR RO OP	
				13						13.21: Handling Break	
	95%	100	100	14							
		100	100	15				FR			
				16						16.89: JT 10° CU RO OP 16.96-17.08: FZ 5-15° PR VR Infilled	
		76	100	17							
				18		70.01	Terminated at 18.00m. Target Depth Reached.			17.87-17.82: XWZ VR Extremely weathered and clay Clay VN 17.87-17.96: FS 5-15° RO OP	
				19							
				20							

MONITORING WELL LOG

BH ID: BH2M

Location	37 Archer Street,Chatswood,NSW			**Started**	18 December 2024
Client	Heritage House Pty Ltd			**Completed**	19 December 2024
Job No.	E26577.G03			**Logged By**	PS **Date** 19 December 2024
Sheets	1 of 2			**Review By**	J2 **Date** 12 Feburary 2025
Drilling Contractor	Tight Access	**Surface RL**	≈88.01 m (AHD)	**Northing**	6258741.5430 (MGA 2020 Zone 56)
Plant	Hand Auger and Man Portable Rig	**Inclination**	90°	**Easting**	332171.1810 (MGA 2020 Zone 56)

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
		0.00	88.01	CONCRETE: 130mm thick	-		Well Stickup =0.0m (RL 88.01m)
	BH2M_0.30-0.40	0.13	87.88	FILL: Silty GRAVEL: dark grey to brown with blue metals	M		
		0.25	87.76				
▽		0.38	87.63	Silty CLAY: medium to high plasticity, pale grey to reddish brown, Slight punget odour From 0.38m, with small to medium iron stain gravels	M > PL		
		0.87	87.14	Silty CLAY: medium to high plasticity, pale grey with iron stained gravels			
		1					
		2	85.95	SILTSTONE: dark grey with pale grey cross beddings			
		2.06					
		3					
		4					
		4.23	83.78	From 4.23m to 5.37m, bands of pale grey claytone			
		5					
95%						Cuttings 0.00m - 11.00m	
		6					0.0m - 12.0m PVC casing (50mm Ø)
		6.67	81.34	SANDSTONE: fine grained, pale grey			
		7					
		8					
		8.85	79.16	NO CORE: 400mm thick			
		9					
		9.25	78.76	SANDSTONE: medium to coarse grained, pale grey with thin dark grey cross beddings			
		10					

MONITORING WELL LOG

BH ID: BH2M

Location	37 Archer Street,Chatswood,NSW			**Started**	18 December 2024
Client	Heritage House Pty Ltd			**Completed**	19 December 2024
Job No.	E26577.G03			**Logged By**	PS **Date** 19 December 2024
Sheets	2 of 2			**Review By**	J2 **Date** 12 Feburary 2025
Drilling Contractor	Tight Access	**Surface RL**	≈88.01 m (AHD)	**Northing**	6258741.5430 (MGA 2020 Zone 56)
Plant	Hand Auger and Man Portable Rig	**Inclination**	90°	**Easting**	332171.1810 (MGA 2020 Zone 56)

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
95%		10.59	77.42	SANDSTONE: medium to coarse grained, pale grey with thin dark grey cross beddings			
		10.64	77.37	NO CORE: 50mm thick			
				SANDSTONE: fine to coarse grained, pale grey with thin dark grey beddings		Bentonite 11.00m - 12.00m	
						Sand 12.00m - 18.00m	12.0m - 18.0m PVC screen (50mm Ø)
		18	70.01	Terminated at 18.00m. Target Depth Reached.			

This log should be read in conjunction with EI Australia's accompanying explanatory notes.

CORE PHOTOGRAPH OF BOREHOLE: BH2M

Project	New Development			**Depth Range**	0.87m – 4.0m BEGL		
Location	No. 37 Archer Street, Chatswood, NSW			**Contractor**	Hard Access Drilling		
Position	See Figure 2	**Surface RL**	≈ 88.01m (AHD)	**Drill Rig**	Man Portable Rig		
Job No.	E26577.G03	**Inclination**	-90°	**Logged**	PS	**Date**	18 / 12 / 2024
Client	Hyecorp Property Group	**Box**	1 of 4	**Checked**		**Date**	

CORE PHOTOGRAPH OF BOREHOLE: BH2M

Project	New Development			**Depth Range**	4.0m to 9.0m BEGL		
Location	No. 37 Archer Street, Chatswood, NSW			**Contractor**	Hard Access Drilling		
Position	See Figure 2	**Surface RL**	≈ 88.01m (AHD)	**Drill Rig**	Man Portable Rig		
Job No.	E26577.G03	**Inclination**	-90°	**Logged**	PS	**Date**	18 / 12 / 2024
Client	Hyecorp Property Group	**Box**	2 of 4	**Checked**		**Date**	

CORE PHOTOGRAPH OF BOREHOLE: BH2M

Project	New Development			**Depth Range**	9.0m to 14.0m BEGL		
Location	No. 37 Archer Street, Chatswood, NSW			**Contractor**	Hard Access Drilling		
Position	See Figure 2	**Surface RL**	≈ 88.01m (AHD)	**Drill Rig**	Man Portable Rig		
Job No.	E26577.G03	**Inclination**	-90°	**Logged**	PS	**Date**	18 / 12 / 2024
Client	Hyecorp Property Group	**Box**	3 of 4	**Checked**		**Date**	

CORE PHOTOGRAPH OF BOREHOLE: BH2M

Project	New Development			**Depth Range**	14.0m to 18.0m BEGL		
Location	No. 37 Archer Street, Chatswood, NSW			**Contractor**	Hard Access Drilling		
Position	See Figure 2	**Surface RL**	≈ 88.01m (AHD)	**Drill Rig**	Man Portable Rig		
Job No.	E26577.G03	**Inclination**	-90°	**Logged**	PS	**Date**	19 / 12 / 2024
Client	Hyecorp Property Group	**Box**	4 of 4	**Checked**		**Date**	

BOREHOLE LOG

BH ID: BH3M

Location	37 Archer Street,Chatswood,NSW			**Started**	23 January 2025
Client	Heritage House Pty Ltd			**Completed**	23 January 2025
Job No.	E26577.G03			**Logged By**	S2 **Date** 23 January 2025
Sheets	1 of 5			**Review By**	J2 **Date** 12 Feburary 2025
Drilling Contractor	Stratacore Pty Ltd	**Surface RL**	≈90.90 m (AHD)	**Northing**	6258734.5346 (MGA 2020 Zone 56)
Plant	Comacchio Geo 300	**Inclination**	90°	**Easting**	332143.1838 (MGA 2020 Zone 56)

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
AD/T	GWNE	BH3M_0.10-0.20		0.00 0.05		90.90 90.85	BRICK: 50mm thick FILL: Silty SAND: fine to medium grained,brown,trace of roots	- M		BRICK FILL
				0.30		90.60	CONCRETE: 300mm thick	-		CONCRETE
		BH3M_0.80-0.90		0.60		90.30	FILL: Silty CLAY: low to medium plasticity, grey a d brown, with fine to medium grained sand,trace of fine to medium grained igneous gravel and ash.	M > PL	-	FILL
		BH3M_1.00-1.45 SPT 1.00-1.45 4,5,4 N=9		1						
				2.00		88.90	SHALE: grey,very low with extremely weathered bands,distinctly weathered.			WEATHERED ROCK
				2.70		88.20	*Log continued on next page.*			
				3						
				4						
				5						
				6						
				7						
				8						
				9						
				10						

BOREHOLE CORE LOG

BH ID: BH3M

Location	37 Archer Street,Chatswood,NSW			**Started**	23 January 2025
Client	Heritage House Pty Ltd			**Completed**	23 January 2025
Job No.	E26577.G03			**Logged By**	S2 **Date** 23 January 2025
Sheets	2 of 5			**Review By**	J2 **Date** 12 Feburary 2025
Drilling Contractor	Stratacore Pty Ltd	**Surface RL**	≈90.90 m (AHD)	**Northing**	6258734.5346 (MGA 2020 Zone 56)
Plant	Comacchio Geo 300	**Inclination**	90°	**Easting**	332143.1838 (MGA 2020 Zone 56)

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50) ▼ - Axial ▽ - Diametral VL 0-1 L 0-3 M 1 H 3 VH 10 EH	DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING 30 100 300 1000 3000
				0			*Log continued from previous page.*				
				1							
				2							
WB	95%			3			SHALE: grey,very low to low strength,distinctly weathered				
				4							
				5							
				6							
				7							
				8.00		82.90	SHALE: grey, low to medium strength,distinctly weathered				
				9.00		81.90	SANDSTONE: fine to medium grained,grey, low to medium strength, distinctly weathered				
				10							

BOREHOLE CORE LOG

BH ID: BH3M

Location	37 Archer Street,Chatswood,NSW			**Started**	23 January 2025
Client	Heritage House Pty Ltd			**Completed**	23 January 2025
Job No.	E26577.G03			**Logged By**	S2 **Date** 23 January 2025
Sheets	3 of 5			**Review By**	J2 **Date** 12 Feburary 2025
Drilling Contractor	Stratacore Pty Ltd	**Surface RL**	≈90.90 m (AHD)	**Northing**	6258734.5346 (MGA 2020 Zone 56)
Plant	Comacchio Geo 300	**Inclination**	90°	**Easting**	332143.1838 (MGA 2020 Zone 56)

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50) ▼ - Axial ▽ - Diametral VL 0-1 L 0-3 M 1 H 3 VH 10 EH	DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING 30 100 300 1000 3000
				11			SANDSTONE: fine to medium grained,grey, low to medium strength, distinctly weathered				
				12							
				13							
				14		76.90					
				14.00			From 14.00m, medium to high strength				
				15							
				16							
				17							
				18		72.90					
				18.00		72.86	NO CORE: 40mm thick				
				18.04			SANDSTONE: fine medium to grained,grey with dark grey laminate, with occasional carbonaceous and siltstone lenses,thickly bedded				
	95%	95	95	19							
		100	100	20							

BOREHOLE CORE LOG

BH ID: BH3M

Location	37 Archer Street,Chatswood,NSW			**Started**	23 January 2025
Client	Heritage House Pty Ltd			**Completed**	23 January 2025
Job No.	E26577.G03			**Logged By**	S2 **Date** 23 January 2025
Sheets	4 of 5			**Review By**	J2 **Date** 12 Feburary 2025
Drilling Contractor	Stratacore Pty Ltd	**Surface RL**	≈90.90 m (AHD)	**Northing**	6258734.5346 (MGA 2020 Zone 56)
Plant	Comacchio Geo 300	**Inclination**	90°	**Easting**	332143.1838 (MGA 2020 Zone 56)

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50) ▼ - Axial ▽ - Diametral (VL 0-1, L 0-3, M 1, H 3, VH 10, EH)	DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING (30, 100, 300, 1000, 3000)
HQ	95%	100	100	21–30			SANDSTONE: fine medium to grained,grey with dark grey laminate, with occasional carbonaceous and siltstone lenses,thickly bedded	SW - FR		20.20: BP 10° PR SM Clay Infilled 22.72: BP 5° PR SM Clay Infilled 23.33: BP 5° PR RO Clay VN 24.53: BP 5° PR RO Clay VN 27.36-27.39: XWS 28.80: BP 5° PR RO Clay VN 28.84: JT 15° Incipient CL 28.90: JT 35° PR RO Clay,OP Infilled 29.08: JT 25° PR RO OP CN 29.11: JT 25° PR RO CN OP 29.31: JT 20° PR RO Incipient CL 29.41: JT 40° IR RO Clay VN	
		100	100								
		100	92								

BOREHOLE CORE LOG

BH ID: BH3M

Location	37 Archer Street,Chatswood,NSW	**Started**	23 January 2025
Client	Heritage House Pty Ltd	**Completed**	23 January 2025
Job No.	E26577.G03	**Logged By**	S2 **Date** 23 January 2025
Sheets	5 of 5	**Review By**	J2 **Date** 12 Feburary 2025
Drilling Contractor	Stratacore Pty Ltd	**Surface RL**	≈90.90 m (AHD)
Plant	Comacchio Geo 300	**Inclination**	90°
Northing	6258734.5346 (MGA 2020 Zone 56)		
Easting	332143.1838 (MGA 2020 Zone 56)		

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50) ▼ - Axial ▽ - Diametral (VL 0-1, L 0-3, M 1, H 3, VH 10, EH)	DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING (30, 100, 300, 1000, 3000)
	95 %					60.75	SANDSTONE: fine medium to grained,grey with dark grey laminate, with occasional carbonaceous and siltstone lenses,thickly bedded Terminated at 30.15m. Target Depth Reached.		▼ H		

31 32 33 34 35 36 37 38 39 40

This log should be read in conjunction with EI Australia's accompanying explanatory notes.

MONITORING WELL LOG

BH ID: BH3M

Location	37 Archer Street,Chatswood,NSW			**Started**	23 January 2025
Client	Heritage House Pty Ltd			**Completed**	23 January 2025
Job No.	E26577.G03			**Logged By**	S2 **Date** 23 January 2025
Sheets	1 of 4			**Review By**	J2 **Date** 12 Feburary 2025
Drilling Contractor	Stratacore Pty Ltd	**Surface RL**	≈90.90 m (AHD)	**Northing**	6258734.5346 (MGA 2020 Zone 56)
Plant	Comacchio Geo 300	**Inclination**	90°	**Easting**	332143.1838 (MGA 2020 Zone 56)

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION
	BH3M_0.10-0.20	0.00	90.90	BRICK: 50mm thick	-
		0.05	90.85	FILL: Silty SAND: fine to medium grained,brown,trace of roots	M
		0.30	90.60	CONCRETE: 300mm thick	-
	BH3M_0.80-0.90	0.60	90.30	FILL: Silty CLAY: low to medium plasticity, grey a d brown, with fine to medium grained sand,trace of fine to medium grained igneous gravel and ash.	M > PL
	BH3M_1.00-1.45 SPT 1.00-1.45 4,5,4 N=9	1			
		2.00	88.90	SHALE: grey,very low with extremely weathered bands,distinctly weathered.	
		2.70	88.20	SHALE: grey,very low to low strength,distinctly weathered	
		8.00	82.90	SHALE: grey, low to medium strength,distinctly weathered	
		9.00	81.90	SANDSTONE: fine to medium grained,grey, low to medium strength, distinctly weathered	

BACKFILL DETAILS: Grout 0.00m - 0.50m; Bentonite 0.50m - 14.80m

STANDPIPE DETAILS: Well Stickup =0.0m (RL 90.90m); 0.0m - 16.10m PVC casing (50mm Ø)

MONITORING WELL LOG

BH ID: BH3M

Location	37 Archer Street,Chatswood,NSW			**Started**	23 January 2025
Client	Heritage House Pty Ltd			**Completed**	23 January 2025
Job No.	E26577.G03			**Logged By**	S2 **Date** 23 January 2025
Sheets	2 of 4			**Review By**	J2 **Date** 12 Feburary 2025
Drilling Contractor	Stratacore Pty Ltd	**Surface RL**	≈90.90 m (AHD)	**Northing**	6258734.5346 (MGA 2020 Zone 56)
Plant	Comacchio Geo 300	**Inclination**	90°	**Easting**	332143.1838 (MGA 2020 Zone 56)

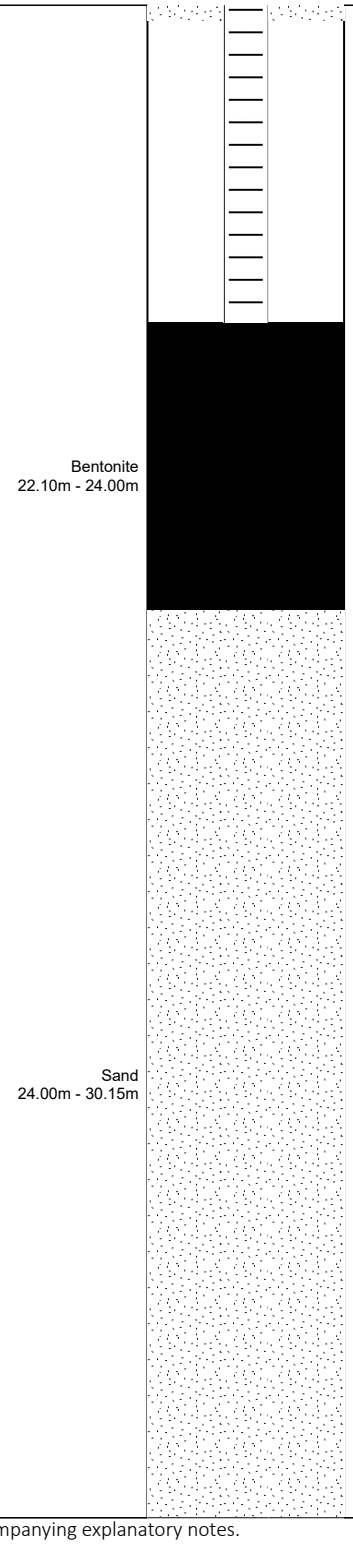
WATER	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
					SANDSTONE: fine to medium grained,grey, low to medium strength, distinctly weathered			
		14.00		76.90	From 14.00m, medium to high strength			
		18.00		72.90	NO CORE: 40mm thick		Sand 14.80m - 20.10m	
		18.04		72.86	SANDSTONE: fine medium to grained,grey with dark grey laminate, with occasional carbonaceous and siltstone lenses,thickly bedded			
95%								16.10m - 22.10m PVC screen (50mm Ø)

MONITORING WELL LOG

BH ID: BH3M

Location	37 Archer Street,Chatswood,NSW			**Started**	23 January 2025
Client	Heritage House Pty Ltd			**Completed**	23 January 2025
Job No.	E26577.G03			**Logged By**	S2 **Date** 23 January 2025
Sheets	3 of 4			**Review By**	J2 **Date** 12 Feburary 2025
Drilling Contractor	Stratacore Pty Ltd	**Surface RL**	≈90.90 m (AHD)	**Northing**	6258734.5346 (MGA 2020 Zone 56)
Plant	Comacchio Geo 300	**Inclination**	90°	**Easting**	332143.1838 (MGA 2020 Zone 56)

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
95%		21–30			SANDSTONE: fine medium to grained,grey with dark grey laminate, with occasional carbonaceous and siltstone lenses,thickly bedded		Bentonite 22.10m - 24.00m Sand 24.00m - 30.15m	



MONITORING WELL LOG

BH ID: BH3M

Location	37 Archer Street,Chatswood,NSW			**Started**	23 January 2025
Client	Heritage House Pty Ltd			**Completed**	23 January 2025
Job No.	E26577.G03			**Logged By**	S2 **Date** 23 January 2025
Sheets	4 of 4			**Review By**	J2 **Date** 12 Feburary 2025
Drilling Contractor	Stratacore Pty Ltd	**Surface RL**	≈90.90 m (AHD)	**Northing**	6258734.5346 (MGA 2020 Zone 56)
Plant	Comacchio Geo 300	**Inclination**	90°	**Easting**	332143.1838 (MGA 2020 Zone 56)

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
95 %				60.75	SANDSTONE: fine medium to grained,grey with dark grey laminate, with occasional carbonaceous and siltstone lenses,thickly bedded Terminated at 30.15m. Target Depth Reached.			

CORE PHOTOGRAPH OF BOREHOLE: BH3M

Project	New Development			**Depth Range**	18.0m to 25.0m BEGL		
Location	No. 37 Archer Street, Chatswood, NSW			**Contractor**	Stratacore Pty Ltd		
Position	See Figure 2	**Surface RL**	≈ 90.90m	**Drill Rig**	Comacchio Geo 300		
Job No.	E26577.G03	**Inclination**	-90°	**Logged**	S2	**Date**	23/ 01/ 2025
Client	Hyecorp Property Group	**Box**	1 of 2	**Checked**		**Date**	

CORE PHOTOGRAPH OF BOREHOLE: BH3M

Project	New Development			**Depth Range**	25.0m to 30.15m BEGL		
Location	No. 37 Archer Street, Chatswood, NSW			**Contractor**	Stratacore Pty Ltd		
Position	See Figure 2	**Surface RL**	≈ 90.90m	**Drill Rig**	Comacchio Geo 300		
Job No.	E26577.G03	**Inclination**	-90°	**Logged**	S2	**Date**	23/ 01/ 2025
Client	Hyecorp Property Group	**Box**	2 of 2	**Checked**		**Date**	

EXPLANATION OF NOTES, ABBREVIATIONS & TERMS USED ON BOREHOLE AND TEST PIT LOGS

DRILLING/EXCAVATION METHOD

HA	Hand Auger	**ADH**	Hollow Auger	**NQ**	Diamond Core - 47 mm
DT	Diatube Coring	**RT**	Rotary Tricone bit	**NMLC**	Diamond Core - 52 mm
NDD	Non-destructive digging	**RAB**	Rotary Air Blast	**HQ**	Diamond Core - 63 mm
AD*	Auger Drilling	**RC**	Reverse Circulation	**HMLC**	Diamond Core - 63 mm
***V**	V-Bit	**PT**	Push Tube	**EX**	Tracked Hydraulic Excavator
***T**	TC-Bit, e.g. AD/T	**WB**	Washbore	**HAND**	Excavated by Hand Methods

PENETRATION RESISTANCE

L	**Low Resistance**	Rapid penetration/ excavation possible with little effort from equipment used.
M	**Medium Resistance**	Penetration/ excavation possible at an acceptable rate with moderate effort from equipment used.
H	**High Resistance**	Penetration/ excavation is possible but at a slow rate and requires significant effort from equipment used.
R	**Refusal/Practical Refusal**	No further progress possible without risk of damage or unacceptable wear to equipment used.

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

WATER

Standing Water Level — **Partial water loss**

Water Seepage — **Complete Water Loss**

GWNO	GROUNDWATER NOT OBSERVED - Observation of groundwater, whether present or not, was not possible due to drilling water, surface seepage or cave-in of the borehole/ test pit.
GWNE	GROUNDWATER NOT ENCOUNTERED - Borehole/ test pit was dry soon after excavation. However, groundwater could be present in less permeable strata. Inflow may have been observed had the borehole/ test pit been left open for a longer period.

SAMPLING AND TESTING

SPT	Standard Penetration Test to AS1289.6.3.1-2004
4,7,11 N=18	4,7,11 = Blows per 150mm. N = Blows per 300mm penetration following a 150mm seating drive
30/80mm	Where practical refusal occurs, the blows and penetration for that interval are reported, N is not reported
RW	Penetration occurred under the rod weight only, N<1
HW	Penetration occurred under the hammer and rod weight only, N<1
HB	Hammer double bouncing on anvil, N is not reported
Sampling	
DS	Disturbed Sample
ES	Sample for environmental testing
BDS	Bulk disturbed Sample
GS	Gas Sample
WS	Water Sample
U50	Thin walled tube sample - number indicates nominal sample diameter in millimetres
Testing	
FP	Field Permeability test over section noted
FVS	Field Vane Shear test expressed as uncorrected shear strength (sv= peak value, sr= residual value)
PID	Photoionisation Detector reading in ppm
PM	Pressuremeter test over section noted
PP	Pocket Penetrometer test expressed as instrument reading in kPa
WPT	Water Pressure tests
DCP	Dynamic Cone Penetrometer test
CPT	Static Cone Penetration test
CPTu	Static Cone Penetration test with pore pressure (u) measurement

GEOLOGICAL BOUNDARIES

———— = Observed Boundary (position known)

– – – – – – – – – – = Observed Boundary (position approximate)

– –?– –?– –?– – = Boundary (interpreted or inferred)

ROCK CORE RECOVERY

TCR=Total Core Recovery (%)

$$= \frac{\textit{Length of core recovered}}{\textit{Length of core run}} \times 100$$

RQD = Rock Quality Designation (%)

$$= \frac{\sum \textit{Axial lengths of core} > 100mm}{\textit{Length of core run}} \times 100$$

METHOD OF SOIL DESCRIPTION USED ON BOREHOLE AND TEST PIT LOGS

	FILL		ORGANIC SOILS (OL, OH or Pt)		CLAY (CL, CI or CH)
	COUBLES or BOULDERS		SILT (ML or MH)		SAND (SP or SW)
	GRAVEL (GP or GW)	Combinations of these basic symbols may be used to indicate mixed materials such as sandy clay			

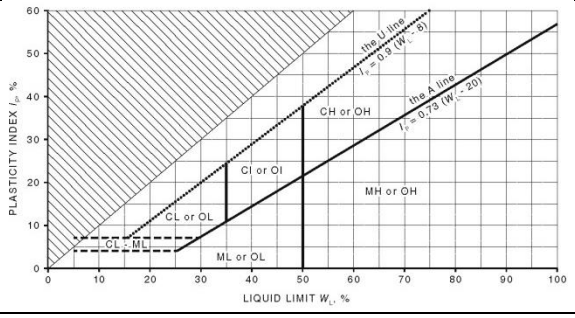
CLASSIFICATION AND INFERRED STRATIGRAPHY

Soil is broadly classified and described in Borehole and Test Pit Logs using the preferred method given in AS 1726:2017, Section 6.1 – Soil description and classification.

PARTICLE SIZE CHARACTERISTICS

Fraction	Components	Sub Division	Size mm
Oversize	BOULDERS		>200
	COBBLES		63 to 200
Coarse grained soil	GRAVEL	Coarse	19 to 63
		Medium	6.7 to 19
		Fine	2.36 to 6.7
	SAND	Coarse	0.6 to 2.36
		Medium	0.21 to 0.6
		Fine	0.075 to 0.21
Fine grained soil	SILT		0.002 to 0.075
	CLAY		<0.002

PLASTICITY PROPERTIES



GROUP SYMBOLS

Major Divisions		Symbol	Description
COARSE GRAINED SOILS More than 65% of soil excluding oversize fraction is greater than 0.075mm	GRAVEL More than 50% of coarse fraction is >2.36mm	GW	Well graded gravel and gravel-sand mixtures, little or no fines, no dry strength.
		GP	Poorly graded gravel and gravel-sand mixtures, little or no fines, no dry strength.
		GM	Silty gravel, gravel-sand-silt mixtures, zero to medium dry strength.
		GC	Clayey gravel, gravel-sand-clay mixtures, medium to high dry strength.
	SAND More than 50% of coarse fraction is <2.36 mm	SW	Well graded sand and gravelly sand, little or no fines, no dry strength.
		SP	Poorly graded sand and gravelly sand, little or no fines, no dry strength.
		SM	Silty sand, sand-silt mixtures, zero to medium dry strength.
		SC	Clayey sand, sandy-clay mixtures, medium to high dry strength.
FINE GRAINED SOILS More than 35% of soil excluding oversized fraction is less than 0.075mm	Liquid Limit less < 50%	ML	Inorganic silts of low plasticity, very fine sands, rock flour, silty or clayey fine sands, zero to medium dry strength.
		CL, CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, medium to high dry strength.
		OL	Organic silts and organic silty clays of low plasticity, low to medium dry strength.
	Liquid Limit > than 50%	MH	Inorganic silts of high plasticity, high to very high dry strength.
		CH	Inorganic clays of high plasticity, high to very high dry strength.
		OH	Organic clays of medium to high plasticity, medium to high dry strength.
Highly Organic soil		PT	Peat muck and other highly organic soils.

MOISTURE CONDITION

Symbol	Term	Description
D	Dry	Non- cohesive and free-running.
M	Moist	Soils feel cool, darkened in colour. Soil tends to stick together.
W	Wet	Soils feel cool, darkened in colour. Soil tends to stick together, free water forms when handling.

Moisture content of cohesive soils shall be described in relation to plastic limit (PL) or liquid limit (LL) for soils with higher moisture content as follows: Moist, dry of plastic limit (w < PL); Moist, near plastic limit (w ≈ PL); Moist, wet of plastic limit (w < PL); Wet, near liquid limit (w ≈ LL), Wet, wet of liquid limit (w > LL),

CONSISTENCY

Symbol	Term	Undrained Shear Strength (kPa)	SPT "N" #
VS	Very Soft	≤ 12	≤ 2
S	Soft	>12 to ≤ 25	>2 to ≤ 4
F	Firm	>25 to ≤ 50	>4 to 8
St	Stiff	>50 to ≤ 100	>8 to 15
VSt	Very Stiff	>100 to ≤ 200	>15 to 30
H	Hard	>200	>30
Fr	Friable	-	

DENSITY

Symbol	Term	Density Index %	SPT "N" #
VL	Very Loose	≤ 15	0 to 4
L	Loose	>15 to ≤ 35	4 to 10
MD	Medium Dense	>35 to ≤ 65	10 to 30
D	Dense	>65 to ≤ 85	30 to 50
VD	Very Dense	>85	Above 50

In the absence of test results, consistency and density may be assessed from correlations with the observed behaviour of the material.
SPT correlations are not stated in AS1726:2017, and may be subject to corrections for overburden pressure, moisture content of the soil, and equipment type.

MINOR COMPONENTS

Term	Assessment Guide	Proportion by Mass
Add 'Trace'	Presence just detectable by feel or eye but soil properties little or no different to general properties of primary component	Coarse grained soils: ≤ 5% Fine grained soil: ≤ 15%
Add 'With'	Presence easily detectable by feel or eye but soil properties little or no different to general properties of primary component	Coarse grained soils: 5 - 12% Fine grained soil: 15 - 30%
Prefix soil name	Presence easily detectable by feel or eye in conjunction with the general properties of primary component	Coarse grained soils: >12% Fine grained soil: >30%

TERMS FOR ROCK MATERIAL STRENGTH AND WEATHERING

CLASSIFICATION AND INFERRED STRATIGRAPHY

Rock is broadly classified and described in Borehole and Test Pit Logs using the preferred method given in AS1726 – 2017, Section 6.2 – Rock identification, description and classification.

ROCK MATERIAL STRENGTH CLASSIFICATION

Symbol	Term	Point Load Index, $Is_{(50)}$ (MPa) #	Field Guide
VL	Very Low	0.03 to 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30 mm can be broken by finger pressure.
L	Low	0.1 to 0.3	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blows of pick point; has dull sound under hammer. A piece of core 150 mm long by 50 mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
M	Medium	0.3 to 1	Readily scored with a knife; a piece of core 150 mm long by 50 mm diameter can be broken by hand with difficulty.
H	High	1 to 3	A piece of core 150 mm long by 50 mm diameter cannot be broken by hand but can be broken with pick with a single firm blow; rock rings under hammer.
VH	Very High	3 to 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
EH	Extremely High	>10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

 # Rock Strength Test Results

▼ Point Load Strength Index, $Is_{(50)}$, Axial test (MPa)

● Point Load Strength Index, $Is_{(50)}$, Diametral test (MPa)

Relationship between rock strength test result ($Is_{(50)}$) and unconfined compressive strength (UCS) will vary with rock type and strength, and should be determined on a site-specific basis. However UCS is typically 20 x $Is_{(50)}$.

ROCK MATERIAL WEATHERING CLASSIFICATION

Symbol		Term	Field Guide
RS		Residual Soil	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.
XW		Extremely Weathered	Rock is weathered to such an extent that it has soil properties - i.e. it either disintegrates or can be remoulded, in water.
DW	HW	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 weathering products in pores. In some environments it is convenient to subdivide into Highly Weathered and Moderately Weathered, with the degree of alteration typically less for MW.
	MW		
SW		Slightly Weathered	Rock slightly discoloured but shows little or no change of strength relative to fresh rock.
FR		Fresh	Rock shows no sign of decomposition or staining.

ABBREVIATIONS AND DESCRIPTIONS FOR ROCK MATERIAL AND DEFECTS

CLASSIFICATION AND INFERRED STRATIGRAPHY
Rock is broadly classified and described in Borehole and Test Pit Logs using the preferred method given in AS1726 – 2017, Section 6.2 – Rock identification, description and classification.

DETAILED ROCK DEFECT SPACING

Defect Spacing

Spacing/width (mm)	Descriptor	Symbol
<20	Extremely Close	EC
20-60	Very Close	VC
60-200	Close	C
200-600	Medium	M
600-2000	Wide	W
2000-6000	Very Wide	VW

Bedding Thickness (Stratification)

Term	Spacing (mm)
Thinly laminated	<6
Laminated	6 – 20
Very thinly bedded	20 – 60
Thinly bedded	60 – 200
Medium bedded	200 – 600
Thickly bedded	600 – 2,000
Very thickly bedded	> 2,000

ABBREVIATIONS AND DESCRIPTIONS FOR DEFECT TYPES

Defect Type	Abbr.	Description
Joint	JT	Surface of a fracture or parting, formed without displacement, across which the rock has little or no tensile strength. May be closed or filled by air, water or soil or rock substance, which acts as cement.
Bedding Parting	BP	Surface of fracture or parting, across which the rock has little or no tensile strength, parallel or sub-parallel to layering/ bedding. Bedding refers to the layering or stratification of a rock, indicating orientation during deposition, resulting in planar anisotropy in the rock material.
Contact	CO	The surface between two types or ages of rock.
Sheared Surface	SSU	A near planar, curved or undulating surface which is usually smooth, polished or slickensided.
Sheared Seam/ Zone (Fault)	SS/SZ	Seam or zone with roughly parallel almost planar boundaries of rock substance cut by closely spaced (often <50 mm) parallel and usually smooth or slickensided joints or cleavage planes.
Crushed Seam/ Zone (Fault)	CS/CZ	Seam or zone composed of disoriented usually angular fragments of the host rock substance, with roughly parallel near-planar boundaries. The brecciated fragments may be of clay, silt, sand or gravel sizes or mixtures of these.
Extremely Weathered Seam/ Zone	XWS/XWZ	Seam of soil substance, often with gradational boundaries, formed by weathering of the rock material in places.
Infilled Seam	IS	Seam of soil substance, usually clay or clayey, with very distinct roughly parallel boundaries, formed by soil migrating into joint or open cavity.
Vein	VN	Distinct sheet-like body of minerals crystallised within rock through typically open-space filling or crack-seal growth.

NOTE: Defects size of <100mm SS, CS and XWS. Defects size of >100mm SZ, CZ and XWZ.

ABBREVIATIONS AND DESCRIPTIONS FOR DEFECT SHAPE AND ROUGHNESS

Shape	Abbr.	Description	Roughness	Abbr.	Description
Planar	PR	Consistent orientation	Polished	POL	Shiny smooth surface
Curved	CU	Gradual change in orientation	Slickensided	SL	Grooved or striated surface, usually polished
Undulating	UN	Wavy surface	Smooth	SM	Smooth to touch. Few or no surface irregularities
Stepped	ST	One or more well defined steps	Rough	RO	Many small surface irregularities (amplitude generally <1mm). Feels like fine to coarse sandpaper
Irregular	IR	Many sharp changes in orientation	Very Rough	VR	Many large surface irregularities, amplitude generally >1mm. Feels like very coarse sandpaper

Orientation: **Vertical Boreholes –** The dip (inclination from horizontal) of the defect.
Inclined Boreholes – The inclination is measured as the acute angle to the core axis.

ABBREVIATIONS AND DESCRIPTIONS FOR DEFECT COATING

Coating	Abbr.	Description
Clean	CN	No visible coating or infilling
Stain	SN	No visible coating but surfaces are discoloured by staining, often limonite (orange-brown)
Veneer	VNR	A visible coating of soil or mineral substance, usually too thin to measure (< 1 mm); may be patchy

DEFECT APERTURE

Aperture	Abbr.	Description
Closed	CL	Closed.
Open	OP	Without any infill material.
Infilled	-	Soil or rock i.e. clay, silt, talc, pyrite, quartz, etc.

Appendix B Laboratory Certificates

STS GEOTECHNICS PTY LTD
CONSULTING GEOTECHNICAL ENGINEERS

STS Geotechnics Pty Ltd
14/1 Cowpasture Place, Wetherill Park NSW 2164
Phone: (02)9756 2166 | Email: enquiries@stsgeo.com.au

Point Load Strength Index Report

Project: E26577.G03: 37 Archer Street, Chatswood,NSW
Client: EI AUSTRALIA
Address: Suite 6.01, 55 Miller St. PYRMONT, NSW
Test Method: AS 4133.4.1
Sampling Procedure: Samples Supplied By Client (Not covered under NATA Scope of Accreditation)

Project No.: 31380/9488D-L
Report No.: 25/0336
Report Date: 29/01/2025

Borehole / Sample No.	Depth (m)	Date Sampled	Date Tested	Test Type	Is (MPa)	$Is_{(50)}$ (MPa)	Rock Type	Failure Type	Moisture
BH1M	10.34	18/12/2024	28/01/2025	A	**0.25**	**0.25**	SS	3	M
BH1M	11.36	18/12/2024	28/01/2025	A	**0.086**	**0.087**	SS	3	M
BH1M	12.78	18/12/2024	28/01/2025	A	**0.18**	**0.17**	SS	3	M
BH1M	14.10	18/12/2024	28/01/2025	A	**0.15**	**0.14**	SS	3	M
BH1M	15.45	18/12/2024	28/01/2025	A	**0.053**	**0.053**	SS	3	M
BH1M	16.83	18/12/2024	28/01/2025	A	**0.11**	**0.11**	SS	3	M
BH1M	18.17	18/12/2024	28/01/2025	A	**0.27**	**0.28**	SS	3	M
BH2M	2.55	18/12/2024	28/01/2025	A	**0.097**	**0.098**	SH	3	M
BH2M	3.72	18/12/2024	28/01/2025	A	**0.12**	**0.12**	SH	3	M
BH2M	4.42	18/12/2024	28/01/2025	A	**0.13**	**0.13**	SH	3	M
BH2M	5.93	18/12/2024	28/01/2025	A	**0.14**	**0.14**	SH	3	M
BH2M	6.57	18/12/2024	28/01/2025	A	**0.12**	**0.12**	SH/SS	3	M
BH2M	7.68	18/12/2024	28/01/2025	A	**0.26**	**0.27**	SS	3	M
BH2M	8.70	18/12/2024	28/01/2025	A	**0.051**	**0.05**	SS	3	M
BH2M	9.68	18/12/2024	28/01/2025	A	**0.49**	**0.49**	SS	3	M
BH2M	10.69	18/12/2024	28/01/2025	A	**0.2**	**0.2**	SS	3	M
BH2M	11.50	18/12/2024	28/01/2025	A	**0.69**	**0.69**	SS	3	M
BH2M	12.84	18/12/2024	28/01/2025	A	**0.87**	**0.87**	SS	3	M
BH2M	13.67	18/12/2024	28/01/2025	A	**1.7**	**1.8**	SS	3	M
BH2M	14.54	18/12/2024	28/01/2025	A	**1.1**	**1.1**	SS	3	M
BH2M	15.33	18/12/2024	28/01/2025	A	**1.1**	**1.1**	SS	3	M
BH2M	16.71	18/12/2024	28/01/2025	A	**0.9**	**0.89**	SS	3	M
BH2M	17.41	18/12/2024	28/01/2025	A	**0.74**	**0.75**	SS	3	M

Failure Type
1 = Fracture through bedding or weak plane
2 = Fracture along bedding
3 = Fracture through rock mass
4 = Fracture influenced by natural defect or drilling
5 = Partial fracture or chip (invalid result)

Test Type
A = Axial
D = Diametrial
I = Irregular
C = Cube

Moisure Condition
W = Wet
M = Moist
D = Dry

Rock Type
SS = Sandstone
ST = Siltstone
SH = Shale
YS = Claystone
IG = Igneous

Remarks:

Approved Signatory.....

Technician: NL

Manager - Mrigesh Tamang

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Point Load Strength Index Report

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Test Method: AS 4133.4.1
Sampling Procedure: Samples Supplied By Client (Not covered under NATA Scope of Accreditation)

Project No.: 31380/9488D-L
Report No.: 25/0336
Report Date: 29/01/2025

Borehole / Sample No.	Depth (m)	Date Sampled	Date Tested	Test Type	Is (MPa)	$Is_{(50)}$ (MPa)	Rock Type	Failure Type	Moisture
BH3M	18.42	23/01/2025	29/01/2025	A	**0.98**	**1**	SS	3	M
BH3M	19.63	23/01/2025	29/01/2025	A	**0.93**	**0.97**	SS	3	M
BH3M	20.79	23/01/2025	29/01/2025	A	**1.2**	**1.2**	SS	3	M
BH3M	21.61	23/01/2025	29/01/2025	A	**1**	**1**	SS	3	M
BH3M	22.55	23/01/2025	29/01/2025	A	**1.2**	**1.3**	SS	3	M
BH3M	23.71	23/01/2025	29/01/2025	A	**1.8**	**1.9**	SS	3	M
BH3M	24.52	23/01/2025	29/01/2025	A	**1.4**	**1.5**	SS	3	M
BH3M	25.63	23/01/2025	29/01/2025	A	**1.1**	**1.2**	SS	3	M
BH3M	26.73	23/01/2025	29/01/2025	A	**1.8**	**1.9**	SS	3	M
BH3M	27.51	23/01/2025	29/01/2025	A	**1.4**	**1.5**	SS	3	M
BH3M	28.45	23/01/2025	29/01/2025	A	**1.6**	**1.6**	SS	3	M
BH3M	29.71	23/01/2025	29/01/2025	A	**1.7**	**1.8**	SS	3	M
BH3M	30.10	23/01/2025	29/01/2025	A	**1.4**	**1.4**	SS	3	M

Failure Type
1 = Fracture through bedding or weak plane
2 = Fracture along bedding
3 = Fracture through rock mass
4 = Fracture influenced by natural defect or drilling
5 = Partial fracture or chip (invalid result)

Test Type
A = Axial
D = Diametrial
I = Irregular
C = Cube

Moisure Condition
W = Wet
M = Moist
D = Dry

Rock Type
SS = Sandstone
ST = Siltstone
SH = Shale
YS = Claystone
IG = Igneous

Remarks:

Approved Signatory.....

Technician: NL

Manager - Mrigesh Tamang

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Salah Khalifa
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	salah.khalifa@eiaustralia.com.au
Project	**E26577.G03 37 Archer Street, Chatswood,N**
Order Number	**E26577.G03**
Samples	3

LABORATORY DETAILS

Manager	Shane McDermott
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE276500 R0**
Date Received	9/1/2025
Date Reported	16/1/2025

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(4354).

SIGNATORIES

Dong LIANG
Metals/Inorganics Team Leader

Shane MCDERMOTT
Laboratory Manager

pH in soil (1:5) [AN101] Tested: 14/1/2025

PARAMETER	UOM	LOR	BH1M_0.5-0.95 SOIL - 18/12/2024 SE276500.001	BH1M_1.5-1.95 SOIL - 18/12/2024 SE276500.002	BH2M_0.3-0.4 SOIL - 18/12/2024 SE276500.003
pH	pH Units	0.1	**4.5**	**4.6**	**5.3**

Conductivity and TDS by Calculation - Soil [AN106] Tested: 14/1/2025

PARAMETER	UOM	LOR	BH1M_0.5-0.95 SOIL - 18/12/2024 SE276500.001	BH1M_1.5-1.95 SOIL - 18/12/2024 SE276500.002	BH2M_0.3-0.4 SOIL - 18/12/2024 SE276500.003
Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	**130**	**96**	**79**

Soluble Anions (1:5) in Soil/Solids by Ion Chromatography [AN245] Tested: 15/1/2025

PARAMETER	UOM	LOR	BH1M_0.5-0.95 SOIL - 18/12/2024 SE276500.001	BH1M_1.5-1.95 SOIL - 18/12/2024 SE276500.002	BH2M_0.3-0.4 SOIL - 18/12/2024 SE276500.003
Chloride	mg/kg	0.25	34	110	50
Sulfate	mg/kg	5	60	97	86

Moisture Content [AN002] Tested: 13/1/2025

PARAMETER	UOM	LOR	BH1M_0.5-0.95 SOIL - 18/12/2024 SE276500.001	BH1M_1.5-1.95 SOIL - 18/12/2024 SE276500.002	BH2M_0.3-0.4 SOIL - 18/12/2024 SE276500.003
% Moisture	%w/w	1	**19.5**	**21.4**	**24.3**

METHOD SUMMARY

SE276500 R0

METHOD	METHODOLOGY SUMMARY
AN002	The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode and is calibrated against 3 buffers purchased commercially. For soils, sediments and sludges, an extract with water (or 0.01M CaCl2) is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN106	Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos /cm or µS/cm @ 25°C. For soils, an extract of as received sample with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Salinity can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. Reference APHA 2510 B.
AN245	Anions by Ion Chromatography: A water sample is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO2, NO3 and SO4 are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
**	Indicative data, theoretical holding time exceeded.	NVL	Not validated.	LOR	Limit of Reporting.
***	Indicates that both * and ** apply.	IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

Appendix C Vibration Limits

German Standard DIN 4150 – Part 3: 2016-12 provides guideline levels of vibration velocity for evaluating the effects of vibration in structures. The limits presented in this standard are generally considered to be conservative.

The DIN 4150 values (maximum levels measured in any direction at the foundation, OR, maximum levels measured in (x) or (y) directions, in the plane of the uppermost floor), are summarised in **Table A** below.

It should be noted that peak vibration velocities higher than the minimum figures in Table A for low frequencies may be quite 'safe', depending on the frequency content of the vibration and the actual conditions of the structures.

It should also be noted that these levels are 'safe limits', up to which no damage due to vibration effects has been observed for the particular class of building. 'Damage' is defined by DIN 4150 to include even minor non-structural cracking in cement render, the enlargement of cracks already present, and the separation of partitions or intermediate walls from load bearing walls. Should damage be observed at vibration levels lower than the 'safe limits', then it may be attributed to other causes. DIN 4150 also states that when vibration levels higher than the 'safe limits' are present, it does not necessarily follow that damage will occur. Values given are only a broad guide.

Table A DIN 4150 – Structural Damage – Safe Limits for Building Vibration

Group	Type of Structure	Peak Vibration Velocity (mm/s)			
		At Foundation Level at a Frequency of:			Plane of Floor of Uppermost Storey
		Less than 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz	All Frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Group 1 and 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

Note: For frequencies above 100 Hz, the higher values in the 50 Hz to 100 Hz column should be used.

Appendix D Important Information

Important Information

SCOPE OF SERVICES

The geotechnical report ("the report") has been prepared in accordance with the scope of services as set out in the contract, or as otherwise agreed, between the Client And EI Australia ("EI"). The scope of work may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

RELIANCE ON DATA

EI has relied on data provided by the Client and other individuals and organizations, to prepare the report. Such data may include surveys, analyses, designs, maps and plans. EI has not verified the accuracy or completeness of the data except as stated in the report. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations ("conclusions") are based in whole or part on the data, EI will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to EI.

GEOTECHNICAL ENGINEERING

Geotechnical engineering is based extensively on judgment and opinion. It is far less exact than other engineering disciplines. Geotechnical engineering reports are prepared for a specific client, for a specific project and to meet specific needs, and may not be adequate for other clients or other purposes (e.g. a report prepared for a consulting civil engineer may not be adequate for a construction contractor). The report should not be used for other than its intended purpose without seeking additional geotechnical advice. Also, unless further geotechnical advice is obtained, the report cannot be used where the nature and/or details of the proposed development are changed.

LIMITATIONS OF SITE INVESTIGATION

The investigation programme undertaken is a professional estimate of the scope of investigation required to provide a general profile of subsurface conditions. The data derived from the site investigation programme and subsequent laboratory testing are extrapolated across the site to form an inferred geological model, and an engineering opinion is rendered about overall subsurface conditions and their likely behaviour with regard to the proposed development. Despite investigation, the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies. The engineering logs are the subjective interpretation of subsurface conditions at a particular location and time, made by trained personnel. The actual interface between materials may be more gradual or abrupt than a report indicates.

SUBSURFACE CONDITIONS ARE TIME DEPENDENT

Subsurface conditions can be modified by changing natural forces or man-made influences. The report is based on conditions that existed at the time of subsurface exploration. Construction operations adjacent to the site, and natural events such as floods, or ground water fluctuations, may also affect subsurface conditions, and thus the continuing adequacy of a geotechnical report. EI should be kept appraised of any such events, and should be consulted to determine if any additional tests are necessary.

VERIFICATION OF SITE CONDITIONS

Where ground conditions encountered at the site differ significantly from those anticipated in the report, either due to natural variability of subsurface conditions or construction activities, it is a condition of the report that EI be notified of any variations and be provided with an opportunity to review the recommendations of this report. Recognition of change of soil and rock conditions requires experience and it is recommended that a suitably experienced geotechnical engineer be engaged to visit the site with sufficient frequency to detect if conditions have changed significantly.

REPRODUCTION OF REPORTS

 Where information from the accompanying report is to be included in contract documents or engineering specification for the project, the entire report should be included in order to minimize the likelihood of misinterpretation from logs.

REPORT FOR BENEFIT OF CLIENT

The report has been prepared for the benefit of the Client and no other party. EI assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of EI or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own inquiries and obtain independent advice in relation to such matters.

OTHER LIMITATIONS

EI will not be liable to update or revise the report to take into account any events or emergent circumstances or fact occurring or becoming apparent after the date of the report.