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ELOURA DEVELOPMENTS
LAKEMBA

Hydrogeological Investigation

5-9 Croydon Street, Lakemba, NSW

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11 December 2024

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1. Introduction

1.1 Background

At the request of Ertac Turk on behalf of Eloura Developments Lakemba (the Client), EI Australia (EI) has carried out a Hydrogeological Investigation (HGI) for the proposed development at 5-9 Croydon Street, Lakemba, NSW (the Site).

This HGI report has been prepared to provide advice and recommendations to assist in the preparation of designs for the proposed development, in particular with regards to expected groundwater seepage volumes and hydrogeological design. The investigation has been carried out in accordance with the agreed scope of works outlined in EI's proposal referenced P21802.1_Rev6, dated 2 May 2024, and with the Client's signed authorisation to proceed, dated 2 May 2024.

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 Team2 Architects – Project No. 1136, last revision I, 2 December 2024;
- Preliminary Temporary Shoring System Drawings prepared by Meso Solutions – Job No. 24-103, Drawing Nos. S001 to S006, S100, S110 to S120, revision B, dated 20 September 2024; and
- Geotechnical Investigation Report prepared by JK Geotechnics – Reference 24633Lrpt-rev1, dated 1 June 2021;

Based on the provided documents, EI understands that the proposed development involves the demolition of the existing site structures and the construction of a residential unit development including three tower blocks (Buildings A to C) ranging from 7 to 10 levels high overlying a two level basement. A Bulk Excavation Level (BEL) of RL 18.65m AHD has been assumed to allow for the construction of a concrete basement slab. Excavation depths of about 6m to 10.5m Below Existing Ground Level (BEGL) are expected. Locally deeper excavations may be required for footings, service trenches, lift overrun pits and working platforms.

1.3 Objectives

The objective of the HGI was to assess site's hydrogeological conditions, to provide geotechnical advice and recommendations to assist in the design of the proposed development, and to complete an analysis to estimate the groundwater take volumes during excavation.

1.4 Scope of Works

The scope of works for the HGI included:

- Preparation of a Work Health and Safety Plan;
- Review of relevant hydrogeological and soil landscape maps for the project area;
- Review of all previous reports and plans;

- Site walkover inspection by a Geotechnical Engineer to assess topographical features and site conditions;
- Scanning of proposed borehole locations for buried conductive services using an accredited service locator sub-consultant with reference to Before You Dig Australia (BYDA) plans;
- Mechanical auger drilling of three (3) boreholes (BH101M, BH102M and BH103M) by a track-mounted drill rig using solid flight augers equipped with a 'Tungsten-Carbide' (T-C) bit. The boreholes were auger drilled to depths as shown in **Table1-2** below.
- Standard Penetration Testing (SPT) was carried out (as per AS 1289.6.3.1-2004), where possible, during auger drilling of the boreholes to assess soil strength/relative densities.

Table 1-1 Augering and Rock Coring Depths

Borehole ID	Surface RL (m AHD)	Augering Termination		Rock Coring Termination	
		Depth (m)	RL (m AHD)	Depth (m)	RL (m AHD)
BH101M	29.20	2.70	26.50	24.73	4.47
BH102M	25.10	4.70	20.40	12.15	12.95
BH103M	24.90	6.10	18.80	12.00	12.90

  - Measurements of groundwater seepage/levels, where possible, in the augered sections of the boreholes during and shortly after completion of 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 surveyed by EI. Approximate borehole locations are shown on **Figure 2**;
  - Northing and easting data are presented in the detailed borehole logs in **Appendix A**.
- Continuation of BH101M, BH102M and BH103M using NMLC diamond coring techniques to termination depths shown above in **Table 1-1**. The rock core photographs are presented in **Appendix A**;
- Borehole BH101M, BH102M and BH103M were converted into a groundwater monitoring well to depths as shown in **Table 1-2**, the well installation record can be found in **Appendix A;**

Table 1-2 Well Installation Depths

Borehole ID	Approx. Surface RL (m AHD)	Well Termination Depth		Start of Screen	
		Depth (m)	RL (m AHD)	Depth (m)	RL (m AHD)
BH101M	29.20	15.00	14.20	12.00	17.20
BH102M	25.10	12.00	13.10	9.00	16.10
BH103M	24.90	12.00	12.9	9.00	15.90

- A pump-out test was carried out within monitoring wells BH101M, BH102M and BH103M one week after installation of the monitoring well to determine the groundwater inflows of the surrounding material;
- Rock samples were sent to STS Geotechnics Pty Ltd (STS), which is National Australian Testing Authority (NATA) accredited laboratories, for testing and storage.
- Preparation of this HGI 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

The GI was limited by the intent of the investigation and the presence of existing site structures. The discussions and advice presented in this report are preliminary and intended to assist in the preparation of final designs for the proposed development. Further geotechnical inspections should be carried out during construction to confirm the geotechnical and groundwater models, and the preliminary 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	5-9 Croydon Street, Lakemba, NSW
Lot and Deposited Plan (DP) Identification	Lot A1 in DP372287 Lot A and B in DP357959 Lot B in DP365853 Lot 1 in DP974686 Lot 2 in DP971844
Brief Site Description	At the time of our investigation, the site was vacant land with long grass and was occupied by a small shelter at the south-eastern boundary.
Site Area	The site area is approximately 6,367m^2 (based on the architectural drawing plan referenced above).

Plate 1: Aerial photograph of the site (source: SIX Maps, accessed 17/06/24)

2.2 Local Land Use

The site is situated within an area of mixed use. 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 Croydon Street shall be adopted as the eastern site boundary.

Table 2-2 Summary of Local Land Use

Direction Relative to Site	Land Use Description
North	Properties 212, 212A, 206 and 194-198 Lakemba Street, one to two storey brick commercial buildings with asphalt-paved carpark at the rear.
East	Croydon Street, a two lane asphalt-paved road. Beyond this are one to three-storey brick residential dwelling with no basements.
South	Property at 11 Croydon Street, three to four storey residential units with a concrete-paved carpark at the rear of the property. 54-55 Railway Parade, one to three storey brick residential dwellings.
West	Property at 55A and 57 Railway Parade, three storey brick residential dwelling with concrete-paved car shed. Property at 216 Lakemba Street, four two-storey brick residential dwellings with carparks and garages. Property at 14,14A Bellevue Avenue and 56 Railway Parade, an open Lakemba Community Garden, Jubilee Reserve which was occupied by grassy area and a playground.

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 gently falls down from the eastern site boundary to the western site boundary at an angle of about 2-3°. The site level ranges from about RL 29.1m to 29.2m AHD along the eastern site boundary to RL 24.6m to 24.9m AHD along the western site boundary.
Regional Geology	Information on regional sub-surface conditions, referenced from the Department of Mineral Resources Geological Map Sydney 1:100,000 Geological Series Sheet 9130 (DMR 1983) indicates the site to be underlain by Ashfield Shale (Rwa), which consists of black to dark grey shale and laminite.

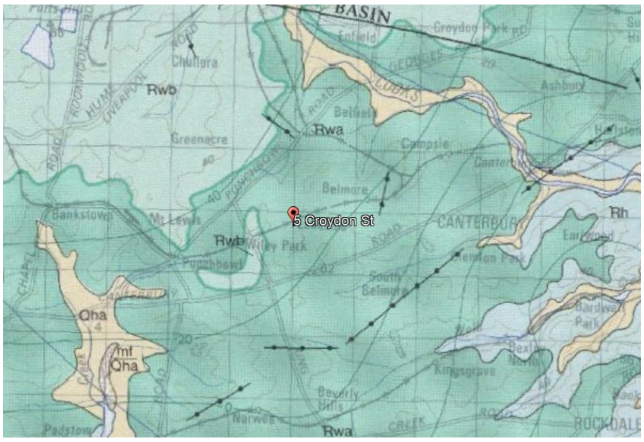


Plate 2: Excerpt of geological map showing location of site.

3. Investigation Results

3.1 Stratigraphy

For the development of a site-specific geotechnical model, the stratigraphy observed in the HGI 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 presented in **Appendix A.** A summary of depth to each unit 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	24.6 to 29.2	0.1 to 1.0	Fill typically consisting of silty CLAY with traces of rootlets and gravel, and various intrusions. Fill was assessed, based on our observations during drilling and SPT N Values to be poorly compacted.
2	**Residual Soil**	0.1 to 1.0	23.9 to 28.9	0.9 to 4.4	Medium to high plasticity, firm to hard silty clay/ sandy clay. SPT values ranged from 5 to 21.
3	**Class V Shale**	1.3 to 4.8	20.0 to 27.7	0.17 to 3.27	Distinctly weathered, very low to low strength shale. SPT refusal in Unit 3.
4	**Class IV Shale/ Laminite**	3.0 to 6.21	18.4 to 26.2	0.45 to 4.0	Low to medium strength shale/shale interbedded with sandstone, distinctly weathered to slightly weathered with occasional high strength laminite The laminite generally consisted of very closely to closely spaced defects consisting of sub-vertical joints, sub-horizontal bedding partings, and fractured/decomposed zones.
5	**Class III Laminite**	5.6 to 7.84	17.95 to 22.62	4.42 [3]	Medium to high strength shale interbedded with sandstone, fresh. The laminite generally consisted of closely to moderately spaced defects consisting of sub-vertical joints, sub-horizontal bedding partings, and fractured/decomposed zones.
6	**Class II Laminite**	11.0	18.2	- [4]	Encountered only in BH101M Medium to high strength shale interbedded with sandstone, fresh. The laminite generally consisted of moderately spaced defects consisting of sub-vertical joints, sub-horizontal bedding parting.

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 Observed up to termination depth in all boreholes.
Note 4 Observed up to termination depth in BH101M only.

Table 3-2 Depth to Units in Boreholes

	Depth of Unit (m BEGL)										
	BH101M	BH102M	BH103M	BH1	BH2	BH3	BH4	BH5	BH6	BH7	BH8
Surface RL (m AHD)	29.2	25.1	24.9	25.0	26.0	28.0	25.5	27.0	29.1	24.6	26.2
Unit 1 Fill	0	0	0	0	0	0	0	0	0	0	0
Unit 2 Residual Soil	0.3	0.1	1.0	0.4	0.5	0.5	0.5	0.4	0.7	0.2	0.2
Unit 3 Class V Shale	1.5	4.5	4.8	4.2	1.5	1.5	3.2	1.3	1.9	4.6	3.3
Unit 4 Class IV Laminite	3.0	4.67	6.21	4.6	4.5	3.84	4.6	4.57	4.02	6.2	4.5
Unit 5 Class III Laminite	6.58	6.37	6.7	5.6	6.5	7.84	6.55	6.4	6.6	6.65	6.0
Unit 6 Class II Laminite	11.0	-	-	-	-	-	-	-	-	-	-

3.2 Groundwater Observations

Groundwater seepage was observed during auger drilling of BH1 and BH103M only. The depth of groundwater seepage during augering is noted on the borehole logs. Water circulation due to coring within the boreholes prevented further observations of groundwater levels within BH101M, BH102M and BH103M. We note that the groundwater levels may not have become evident or stabilised in the augered boreholes within the limited observation period.

Following their completion, groundwater monitoring wells were installed in BH101M, BH102M and BH103M and bailed dry. The groundwater levels were then measured within the monitoring wells as per **Table 3-3**.

Table 3-3 Groundwater Levels

Borehole ID	Measurement Date	Depth to Groundwater (m BEGL)	Groundwater RL (m AHD)
BH101M	30/05/24	8.71	20.49
	06/06/24	8.72	20.48
	26/06/24	8.72	20.48
BH102M	30/05/24	4.82	20.28
	06/06/24	4.88	20.22
	26/06/24	4.90	20.20
BH103M	06/06/24	4.63	20.27
	26/06/24	4.65	20.25

We note that the monitoring wells installed by JK were not able to be found by EI during the HGI.

EI have also completed long-term monitoring in BH101M to BH103M between 29 May to 30 August 2024. A summary of the groundwater monitoring results is shown below in **Table 3-4**, and the report (E26227.G11.GW01, 11 September 2024) is attached to the end of this report.

Table 3-4 Summary of Long-term Groundwater Monitoring

Monitoring Well	Lowest Measured Groundwater Level (m AHD)	Date of Observation	Highest Measured Groundwater Level (m AHD)	Date of Observation
BH101M	21.21	12-Aug-24	21.41	29-May-24
BH102M	21.22	12-Aug-24	21.42	29-May-24
BH103M	21.36	12-Aug-24	21.52	30-May-24

3.2.1 Infiltration test

A Rising Head Test was completed on 6 and 26 June 2024 in the monitoring wells installed in BH101M, BH102M and BH103M, The following procedure was adopted:

- The groundwater level within the well was initially recorded;
- The well was purged using an electrical groundwater pump;
- The rising groundwater level within the temporary well was measured at various time intervals for 1 hour.

The results were then used to estimate the permeability of the shale/laminite bedrock using the Hvorslev Method based on the borehole geometry. The estimated permeability of the laminite bedrock were calculated as the following:

Table 3-5 Monitoring Well Details and Rising Head Test Results

Monitoring Well	Total Well Depth (m BEGL)	Screen Length (m)	Screened Section	Date of Test	Average Calculated Permeability (m/s) [3]
BH101M	15.05	3.00	Class II Laminite	6-June-24 26-June-24	5.6×10^{-6}
BH102M	11.96	3.00	Class III Laminite	6-June-24 26-June-24	8.3×10^{-6}
BH103M	11.75	3.00	Class III Laminite	6-June-24 26-June-24	1.8×10^{-5}

3.3 Test Results

Twelve (12) 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 AError! Reference source not found.). The point load strength index tests correlated reasonably well with our field assessments of the rock strength.

4. Groundwater Seepage Analysis

Groundwater seepage analysis for flow through and beneath the excavation wall system during construction has been undertaken using PLAXIS 3D, finite element analysis software with the capability of simulating hydrological conditions in construction sites. This model estimates the volume of water which will be required to be dewatered during the construction of the basement.

4.1 Subsurface Conditions and Permeability

For the purpose of this HGI, the subsurface conditions encountered in the three boreholes completed by EI have been simplified into four stratigraphy units based on similar permeability properties, as detailed in **Table 4-1** below**.** The depths of each of these units are based on the subsurface conditions encountered in our HGI.

EI has made assumptions based on pump-out tests, in-house data and available literature and therefore variation in soil layers and permeability may affect the results of the groundwater take assessment.

A summary of the subsurface layers, levels, and permeability values which were adopted for the assessment is presented below:

Table 4-1 Summary of Modelled Subsurface Conditions and Adopted Parameters

Material [1]	**BH101M**	**BH102M**	**BH103M**	**Adopted Permeability (m/s)**	**Anisotropy Ky'/Kx'**
	Approximate RL of Top of Unit (m AHD)[2]	**Approximate RL of Top of Unit (m AHD)**[2]	**Approximate RL of Top of Unit (m AHD)**[2]		
Fill or Residual Soil (Silty Clay) [4]	29.2	25.1	24.9	1.0×10^{-8}	1
Class V/IV bedrock [3]	27.7	20.6	20.1	1.0×10^{-8}	0.5
Class III laminite [3]	22.6	18.7	18.2	1.0×10^{-5}	0.3
Class II laminite [4]	18.2	14.3	13.8	5.0×10^{-8}	0.3

Notes:

1 Depths and levels presented in **Table 4-1** above are generalised using the most conservative levels Additional Geotechnical Investigation across the excavation area for the purpose of groundwater seepage modelling.
2 The base of the model was assumed to be at RL 10.0m AHD.
3 Permeability values are based on pump-out test results
4 Permeability values have been correlated for material encountered during the GI using Look (2014).

To account for the groundwater level variation which may occur in the future, a design groundwater level of **RL 21.5mAHD** was modelled, which is the highest recorded groundwater level. We note that BH101M, which was installed at the highest point of the site, had a lower groundwater RL than the design groundwater level, showing that the groundwater level across the site is generally flat.

4.2 Assumed Shoring System

Based on the temporary shoring wall drawings prepared by Meso, sheet pile walls were modelled as shown in the drawings. The sheet pile system was assumed to be impermeable; but the shale bedrock beneath the toe of the sheet piles were modelled to be freely draining into the excavation.

This assessment does not assess the overall stability of the shoring system. Once final designs are made available, this assessment should be revised accordingly.

4.3 Results

For the purpose of this modelling, it has been assumed that:

- The subsurface conditions from **Table 4-1** were applied along the site of the proposed basement excavation.
- The permeability values presented in **Table 4-1** above were adopted for each unit.
- The sheet pile wall was modelled to be impermeable, with the excavation in bedrock below modelled to be freely draining.
- For the simplicity of this model, temporary dewatering will be undertaken within the basement retaining wall perimeter to the BEL or about RL 18.65m AHD.
- The designed groundwater levels as adopted in **Section 3.2** of this report were assumed to be constant at 30 m away from the shoring wall, this number has considered the radius of influence for radial flow based on Sichardt's (2007) formula, taking into account unconfined aquifer conditions. Sichardt's formula predicts the effective drawdown radius based on the permeability of the subsoil material. EI has adopted the most conservative drawdown radius based on the observed permeability's outlined in **Table 4-1** and Sichardt's formula.
- The shale layer encountered within the boreholes extended down to the bottom of model boundaries up to RL 10.0m.
- Considering the site contours, geometry, and the shape of the proposed basement excavation, EI is of the opinion that using a PLAXIS 3D model is appropriate for estimating the seepage volumes.

The PLAXIS 3D model is presented in **Appendix D. Table 4-2** below provides the estimated groundwater inflow rate into the basement.

Table 4-2 Summary of Groundwater Seepage Analysis Results using permeability value from pump out test

Inflow into Excavation (m^3/day)	Total Inflow per year (ML/year)
123	44.9

Hence, a total volume of about 44.9 ML is expected per year during excavation and construction. Based on the PLAXIS results, the anticipated maximum water drawdown surrounding the site due to dewatering is 2.9m within silty clay and the bedrock and the maximum predicted ground settlements occur immediately outside of the shoring wall is approximately 1.2mm. As a result, the drawdown of the dewatering will have marginal effect and will not pose any adverse impact on the neighbouring properties.

5. Recommendations

5.1 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 to limit lateral deflections and ground loss as a result of excavations, resulting in damage to nearby structures;
- Groundwater within the depth of the excavation;
- High estimated groundwater flows through bedrock;
- Rock excavation and vibration;
- Foundation design for building loads.

5.2 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 and protect the client against spurious claims of damage. 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.

5.3 Excavation Methodology

5.3.1 Excavation Assessment

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

EI assumes that the proposed development will require a BEL of RL 18.65m for the basement, or an excavation depth of between about 6m and 10.5m 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 extend through unit 1, 2, 3, 4 and 5 as outlined in **Table 3-1** above. As such, an engineered retention system must be installed prior to excavation commencing to support the excavation.

Units 1 and 2 could be excavated using buckets of large earthmoving Hydraulic Excavators, particularly if fitted with ‘Tiger Teeth’ in Unit 3 (Class V Shale). Excavation of Units 4, 5 and 6 (where encountered) may present hard or 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.

The primary issues associated with the excavation will be controlling the groundwater and provide adequate support to adjoining structures/infrastructures. Groundwater is expected to be encountered during excavation. Therefore, to allow for the construction of the basement slab, lift pits and service trenches in ‘dry’ condition, temporary dewatering will be required. In this regards, it is anticipated that the groundwater table will be maintained at bulk excavation level and potentially deeper around lift pits or working platforms (if required). Should rock hammers be used for the excavation of the bedrock, excavation 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.

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.

5.3.2 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 excavation to determine the baseline readings. Two independent sets of measurements must be taken confirming measurement consistency;
- 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.

5.4 Groundwater Considerations

Groundwater was observed in all monitoring wells as detailed in **Table 3-3**.

Based on the results of the PLAXIS 3D analysis by EI as outlined in **Section 4**, the estimated yearly dewatering volumes of 44.9ML/year are not manageable.

EI note that the estimated volumes are uncharacteristically high, and may be due to clean, open defects within the Class III/II laminite allowing high flows. It is likely that the initial flows into the excavation will be high, and will slow down over time as the defects are drained. However, this reduction of flow, if any, is hard to predict.

The volume of groundwater entering the basement excavation (which will require dewatering) decreases as the depth of embedment of the perimeter shoring system increases.

Council and the NSW Department of Primary Industries (DPI) may not allow permanent dewatering of high volumes; therefore, the basement must be designed as a tanked structure. Temporary dewatering for construction purposes is normally allowed provided it is properly designed and managed to ensure that the likely drawdown will have no adverse impact on adjoining structures/infrastructures. A dewatering licence may also be required. Groundwater quality testing, particularly with regard to acidity generated as a result of acid sulfate soils, will be required to permit discharge into the stormwater.

Internal wells will need to be installed internally around the perimeter of the retention system, as well as possibly internally for the lift overrun pits. The wells should be connected with a header pipe to allow the pumped water to discharge into the stormwater system, or to the recharge wells/infiltration trenches.

Since dewatering is occurring within the laminite bedrock, EI is of the opinion that the temporary dewatering and its associated drawdown, will not result in adverse ground settlements. A critical factor relating to dewatering of the site is maintenance of the depressed groundwater levels until such a time as the building has significant weight to prevent movement should the pump system fail and the groundwater level rise.

A detailed monitoring program should be implemented to identify the risks and trigger levels decided for when the contingency measures need to be taken.

Trafficability problems could arise locally during wet weather, or if water is allowed to pond on these materials.

5.5 Excavation Retention

5.5.1 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 proposed basement outline has a minimum setback of approximately 8.9 from the northern, 8.9m from the western boundary, 2.1m to 3.0m to the southern boundary and 0.6m from the eastern side of the boundary. Given the depth of the excavation, EI does not recommend the use of temporary batters on this site.

For this site, a suitable retention system will be required for the support of the excavation. The following options may be considered:

- Anchored or propped secant pile wall with mass concrete in between the piles will be required to support the excavation and provide groundwater cut-off from the high expected groundwater flows through the bedrock. To allow the groundwater cut-off, the piles must be installed below bulk excavation levels. Anchors/props must be installed progressively as excavation proceeds. Only grout injected CFA piles should be used for this site for the secant piles. Due to the presence of high groundwater flows, bored piers may not be feasible and test piles are recommended. The proposed pile locations should take into account the presence of any neighbouring anchors and/or the presence of buried services. Further advice should be sought from prospective piling contractors who should be provided with a copy of this report.
- Alternatively, sheet piles may be used to retain the upper residual soil and Class V to IV Shale, with unsupported vertical excavation in the Class III to II Laminite below, provided vibration issues during installation can be addressed and can be pre-drilled to the top of Class III to II Laminite. Excavation within Class III to II Laminite should generally be able to be cut vertically and without support, provided an anchor is installed at the toe of the sheet pile wall. Anchors/props must be installed progressively as excavation proceeds.

  Some high flows are to be expected within the shale and laminite during excavation, and must be managed until the completion of the tanked basement.

  For vertical cuts, the excavations must be inspected by a 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.

The aggressivity of natural soils and groundwater should be taken into consideration in the design to assess exposure classification to steel and concrete structures.

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 the laminite 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.

5.5.2 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, Ko.
- Full hydrostatic pressures should be taken into consideration in the design of the retaining walls, assuming an external water level, say at least 1.0m, above the highest groundwater level measured to date. The hydrostatic pressure should extend to the base of the perimeter cut-off.
- For piles embedded into Unit 5 or better, the allowable lateral toe resistance values outlined in **Table 5-1** 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 5 or better. For the design of anchors bonded into Unit 5 or better, the allowable bond stress value outlined in **Table 4-1** below may be used, subject to the following conditions:
    1. Anchor bond lengths of at least 3m behind the 'active' zone of the excavation (taken as a 45 degree zone above Class III sandstone) is provided;
    2. Overall stability, including anchor group interaction, is satisfied;
    3. All anchors should be proof loaded to at least 1.33 times the design working load before locked off at working load. Such proof loading is to be witnessed by and engineer independent of the anchoring contractor. We recommend that only experienced contractors be considered for anchor installation with appropriate insurances;
    4. If permanent anchors are to be used, these must have appropriate corrosion provisions for longevity.

Table 5-1 Geotechnical Design Parameters

Material [1]		Unit 1 Fill	Unit 2 Residual Soil	Unit 3 Class V Shale	Unit 4 Class IV Shale/ Laminite	Unit 5 Class III Laminite	Unit 6 Class II Laminite
Bulk Unit Weight (kN/m^3)		**17**	**18**	**24**	**24**	**24**	**24**
Friction Angle, ϕ' (°)		**25**	**28**	**30**	**35**	**40**	**45**
Earth Pressure Coefficients	At rest, K_o [3]	0.58	0.53	0.5	0.43	-	-
	Active, K_a [3]	0.41	0.36	0.33	0.27	-	-
	Passive, K_p [3]	-	-	3.00	3.69	-	-
Allowable Bearing Pressure (kPa) [5]		-	-	700	1000	3500	- [6]
Allowable Shaft Adhesion (kPa) [4, 5]	Compression	-	-	70	100	350	- [6]
	Uplift	-	-	35	50	175	- [6]
Allowable Toe Resistance (kPa)		-	-	-	-	500	- [6]
Allowable Bond Stress (kPa)		-	-	-	-	250	- [6]
Earthquake Site Risk Classification	▪ AS 1170.4:2007 indicates an earthquake subsoil class of Class C_e.(Shallow Soil) ▪ AS 1170.4:2007 indicates that the hazard factor (z) for Sydney is 0.08.						

Notes:

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

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

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

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.

5 To adopt these parameters we have assumed that:

- Footings have a nominal socket of at least 0.3m, into the relevant founding material;
- For piles, there is intimate contact between the pile and foundation material (a clean socket roughness category of R2 or better);
- Potential soil and groundwater aggressivity will be considered in the design of piles and footings;
- 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;
- 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;
- The concrete is poured on the same day as drilling, inspection and cleaning.
- 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).

6 Unit 6 was observed in BH101M only and hence the recommended parameters for foundation and shoring design is for up to Unit 5 only.

5.6 Foundations

Due to the dipping nature of site topography and the bedrock surface, bulk excavation will likely expose majority of Unit 5 and Unit 4 near the western basement perimeter. In order to account for this variability pad or strip footings will need to be designed for varying rock strengths across the basement excavation.

Pad or strip footings founded within Unit 5 may be preliminarily designed for an allowable bearing capacity of 3500kPa, based on serviceability, while pad or strip footings founded within Unit 4 may be preliminarily designed for an allowable bearing capacity of 1000kPa, based on serviceability.

A second option is a combination of shallow and deep foundations, where pad or strip footings founded within into Unit 5 are adopted for the majority of areas of the basement, while pile footings founded into Unit 5 rock are utilized where Unit 4 undelay the basement at BEL.

For piles founded in Unit 5 bedrock, these must be embedded a minimum of 0.5m into bedrock, and can be designed for a maximum allowable bearing pressure of 3500kPa. The allowable shaft adhesion in shale bedrock may be designed as 10% of the allowable bearing pressure (or 5% for uplift) for the socket length in excess of 0.5m.

Only grout injected CFA piles should be used for this site for the secant piles. Due to the presence of high groundwater flows, bored piers are not recommended for this site. The proposed pile locations should take into account the presence of any neighbouring anchors and/or the presence of buried services. Further advice should be sought from prospective piling contractors who should be provided with a copy of this report.

As the strength of rock varies significantly across the site, it is crucial that geotechnical inspections of foundations are carried out to determine that the required bearing capacity has been achieved and to determine any variations that may occur between the boreholes and inspected locations. This is of particular importance if shallow pad and strip footings are adopted for entire site as the transitions from Unit 5 to Unit 4 are only approximated at this stage.

If piles are adopted, the initial drilling of piles should be completed in the presence of a geotechnical engineer to verify that ground conditions meet design assumptions.

The aggressivity of natural soils and groundwater (if encountered) should be taken into consideration in the design.

5.7 Basement Floor Slab

Following bulk excavations for the proposed basements, laminite bedrock below groundwater are expected to be exposed at BEL. We recommend that the lower basement floor slab should be designed fully tanked and the design is likely to be controlled by the hydrostatic uplift pressures. However, for construction purposes, the slab will likely overly shale and laminite bedrock, but if a pile rig working platform is proposed, we recommend it be placed as early as possible to reduce disturbance.

6. Further Geotechnical Inputs

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

- Dilapidation surveys;
- Design of working platforms (if required) for construction plant by an experienced and qualified geotechnical engineer;
- Classification of all excavated material transported off site;
- Witnessing installation of support measures and proof-testing of anchors (if required).
- 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 the bulk excavation;

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

7. Statement of Limitations

This report has been prepared for the exclusive use of Ertac Turk and Eloura Developments Lakemba 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 Ertac Turk and Eloura Developments Lakemba

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 F** 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.

AS3600:2009, *Concrete Structures,* Standards Australia

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

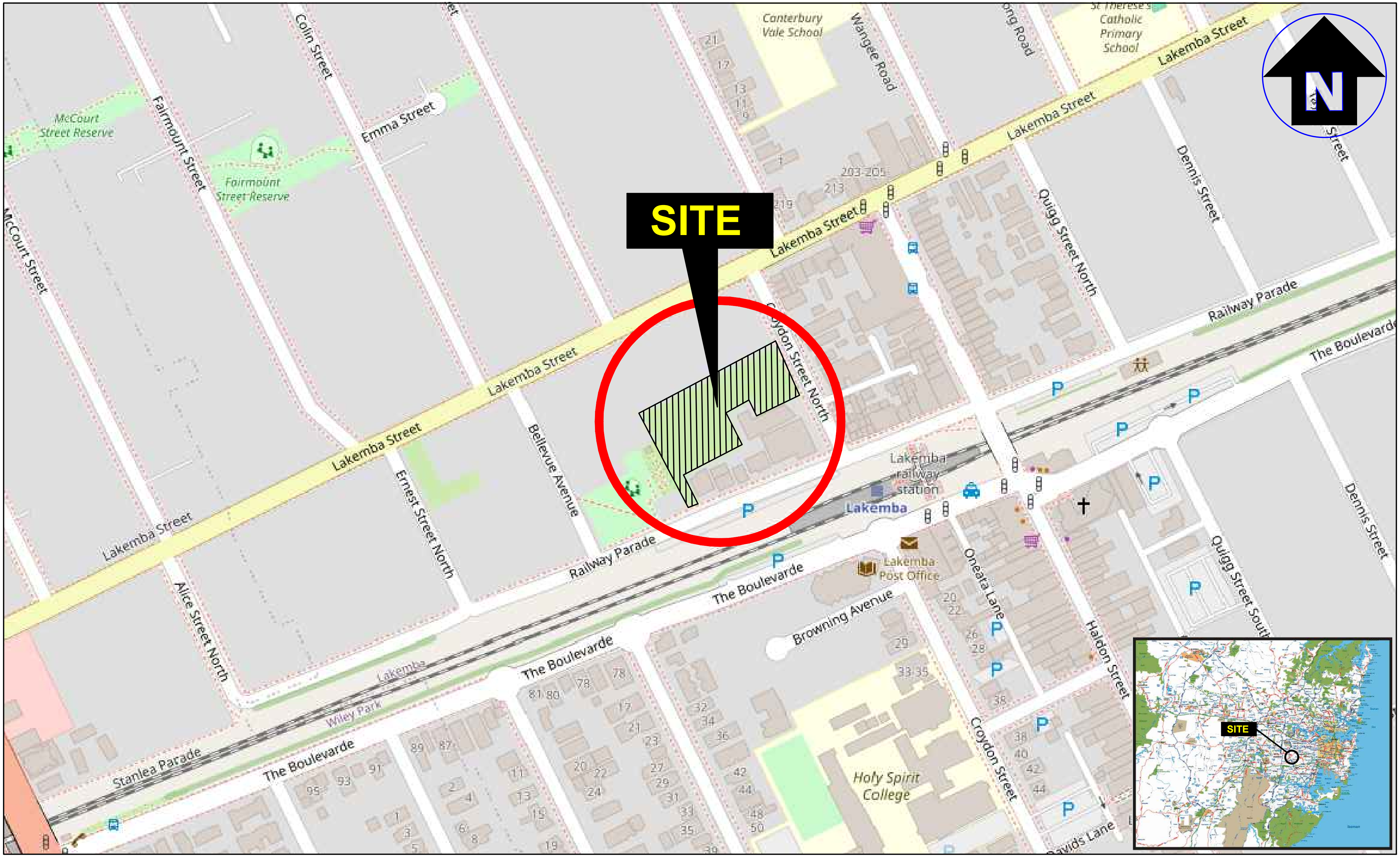
NSW Department of Finance and Service, Spatial Information Viewer, maps.six.nsw.gov.au.

NSW Department of Mineral Resources (1983) Sydney 1:100,000 Geological Series Sheet 9130 (Edition 1). Geological Survey of New South Wales, Department of Mineral Resources.

Abbreviations

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

Figures



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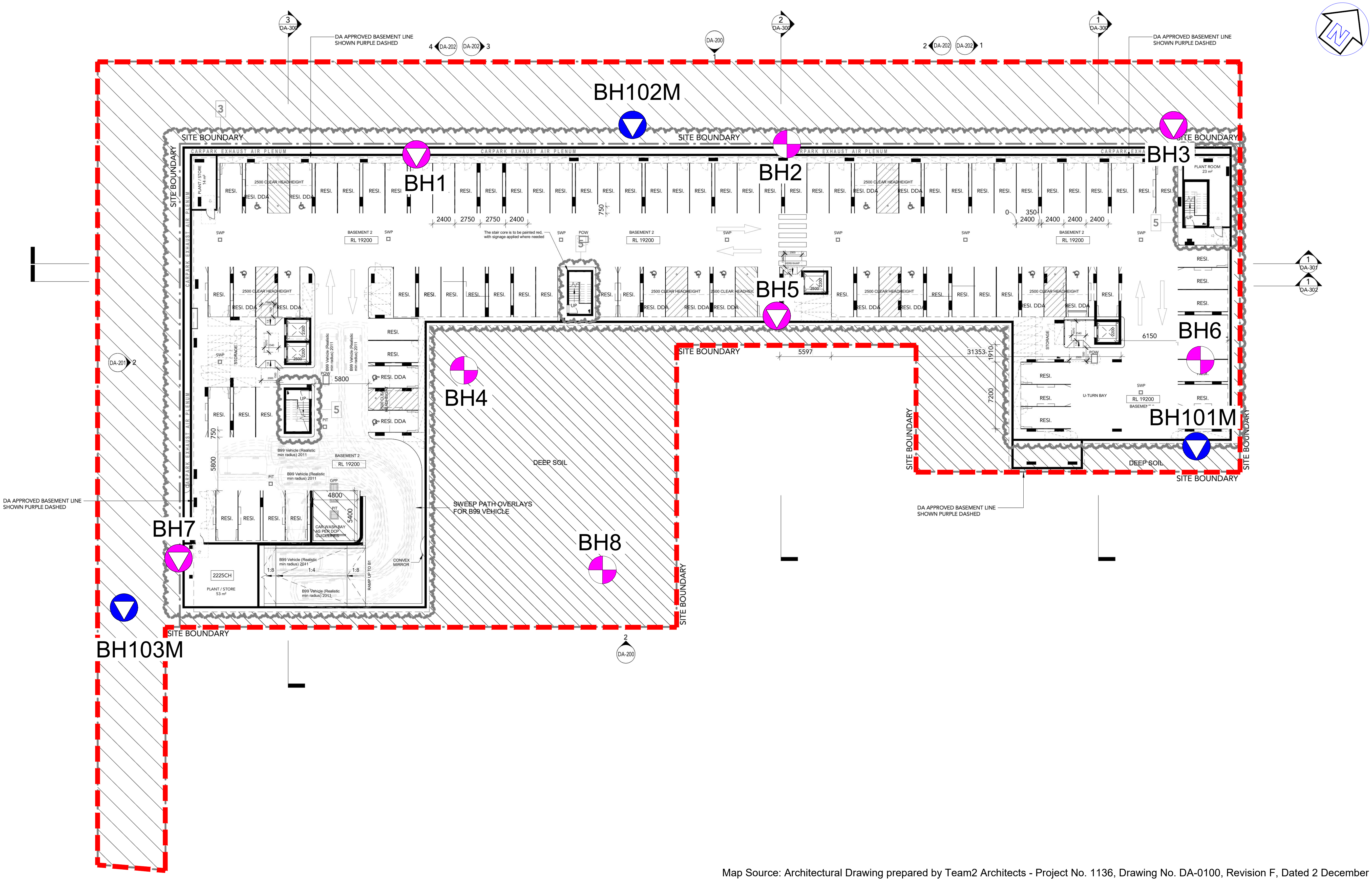
Drawn:	J.O.
Approved:	S.K.
Date:	03-12-24
Scale:	Not To Scale

Eloura Developments Lakemba
Hydrogeological Investigation
5-9 Croydon Street, Lakemba NSW

Site Locality Plan

Figure:
1

Project: E26227.G04



Map Source: Architectural Drawing prepared by Team2 Architects - Project No. 1136, Drawing No. DA-0100, Revision F, Dated 2 December 2024

LEGEND (All Locations are Approximate)

- - - Site boundary
▼ Monitoring well locations (EI Australia, 2024)
▼ Monitoring well locations (JK Geotechics, 2013)
◕ Borehole locations (JK Geotechics, 2013)

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Approved:	S.K.
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Eloura Developments Lakemba

Hydrogeotechnical Investigation
5-9 Croydon Street, Lakemba NSW

Borehole Location Plan

Figure:
2

Project:
E26227.G04_Rev1

Appendix A – Borehole Logs And Explanatory Notes

BOREHOLE LOG

BH ID: BH101M

Location	5-9 Croydon Street, Lakemba, NSW	**Started**	28 May 2024		
Client	Eloura Developments Lakemba	**Completed**	29 May 2024		
Job No.	E26227.G04	**Logged By**	KP	**Date**	29 May 2024
Sheets	1 of 4	**Review By**	SK	**Date**	29 June 2024

Drilling Contractor	Geosense Drilling and Engineering	**Surface RL**	≈29.20 m (AHD)	**Northing**	6245114.7356 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	322060.8201 (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			0.00		29.20	FILL: Silty CLAY: low plasticity, dark brown trace fine to coarse, sub-angular to angular gravels and rootlets	M < PL	-	FILL
		BH101M _0.50-0.95 SPT 0.50-0.95 4,3,4 N=7		0.30		28.90	Silty CLAY: medium plasticity, brown / grey mottled red, trace fine to medium, sub-angular ironstone gravels.	M < PL	F	RESIDUAL SOIL
				1.00		28.20	Silty CLAY: high plasticity, grey / orange brown			
		BH101M _1.50-1.65 SPT 1.50-1.65 13/150 mm HB N=R		1.50		27.70	SHALE: grey / orange brown, distinctly weathered, low strength.	-	-	WEATHERED ROCK
				2.70		26.50	*Log continued on next page.*			

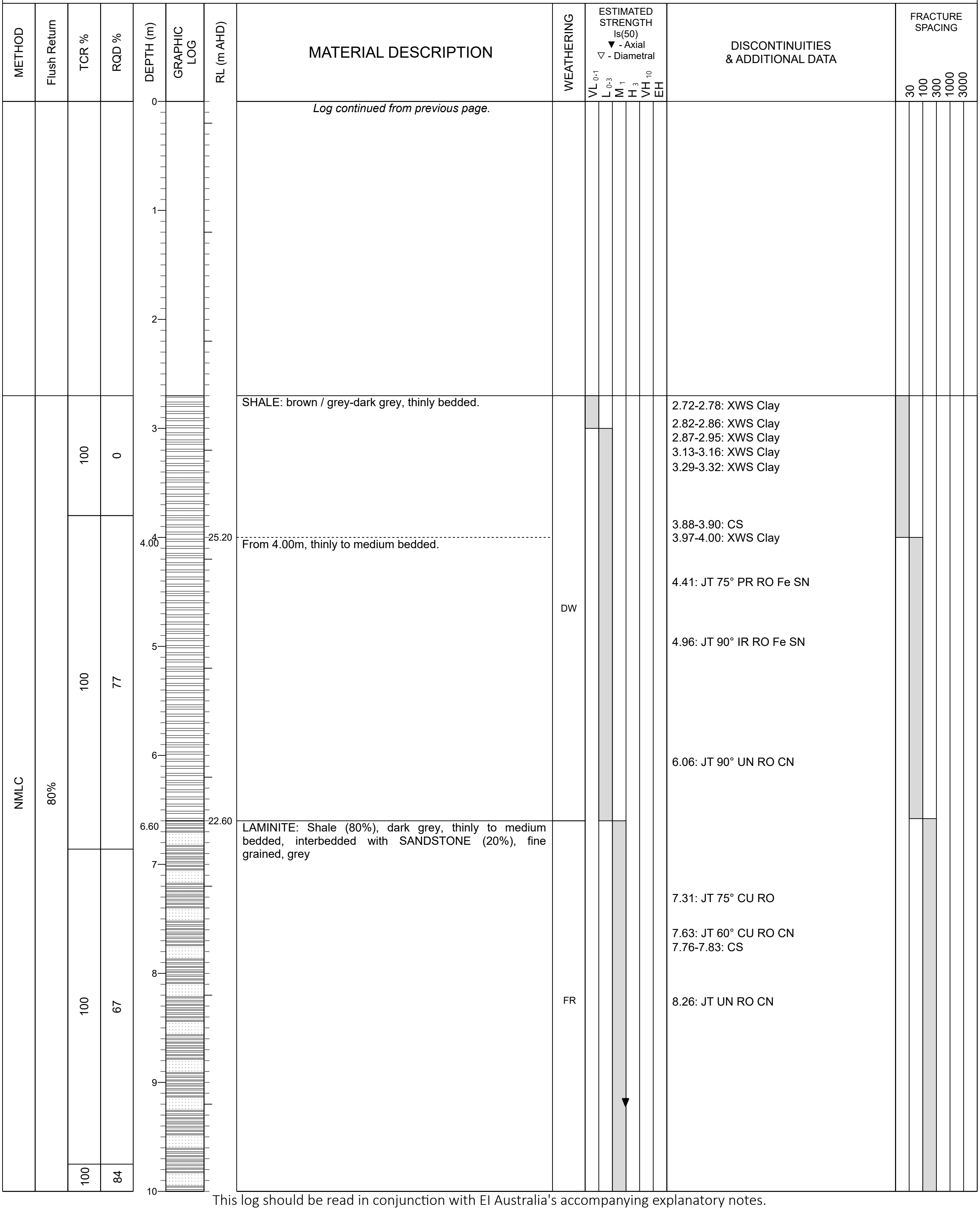
BOREHOLE CORE LOG

BH ID: BH101M

Location 5-9 Croydon Street, Lakemba, NSW
Client Eloura Developments Lakemba
Job No. E26227.G04
Sheets 2 of 4

Started 28 May 2024
Completed 29 May 2024
Logged By KP **Date** 29 May 2024
Review By SK **Date** 29 June 2024

Drilling Contractor Geosense Drilling and Engineering
Plant Comacchio Geo 205
Surface RL ≈29.20 m (AHD)
Inclination 90°
Northing 6245114.7356 (MGA 2020 Zone 56)
Easting 322060.8201 (MGA 2020 Zone 56)



METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	DISCONTINUITIES & ADDITIONAL DATA
						Log continued from previous page.		
NMLC	80%	100	0			SHALE: brown / grey-dark grey, thinly bedded.	DW	2.72-2.78: XWS Clay 2.82-2.86: XWS Clay 2.87-2.95: XWS Clay 3.13-3.16: XWS Clay 3.29-3.32: XWS Clay 3.88-3.90: CS 3.97-4.00: XWS Clay
		100	77	4.00	25.20	From 4.00m, thinly to medium bedded.		4.41: JT 75° PR RO Fe SN 4.96: JT 90° IR RO Fe SN 6.06: JT 90° UN RO CN
		100	67	6.60	22.60	LAMINITE: Shale (80%), dark grey, thinly to medium bedded, interbedded with SANDSTONE (20%), fine grained, grey	FR	7.31: JT 75° CU RO 7.63: JT 60° CU RO CN 7.76-7.83: CS 8.26: JT UN RO CN
		100	84					

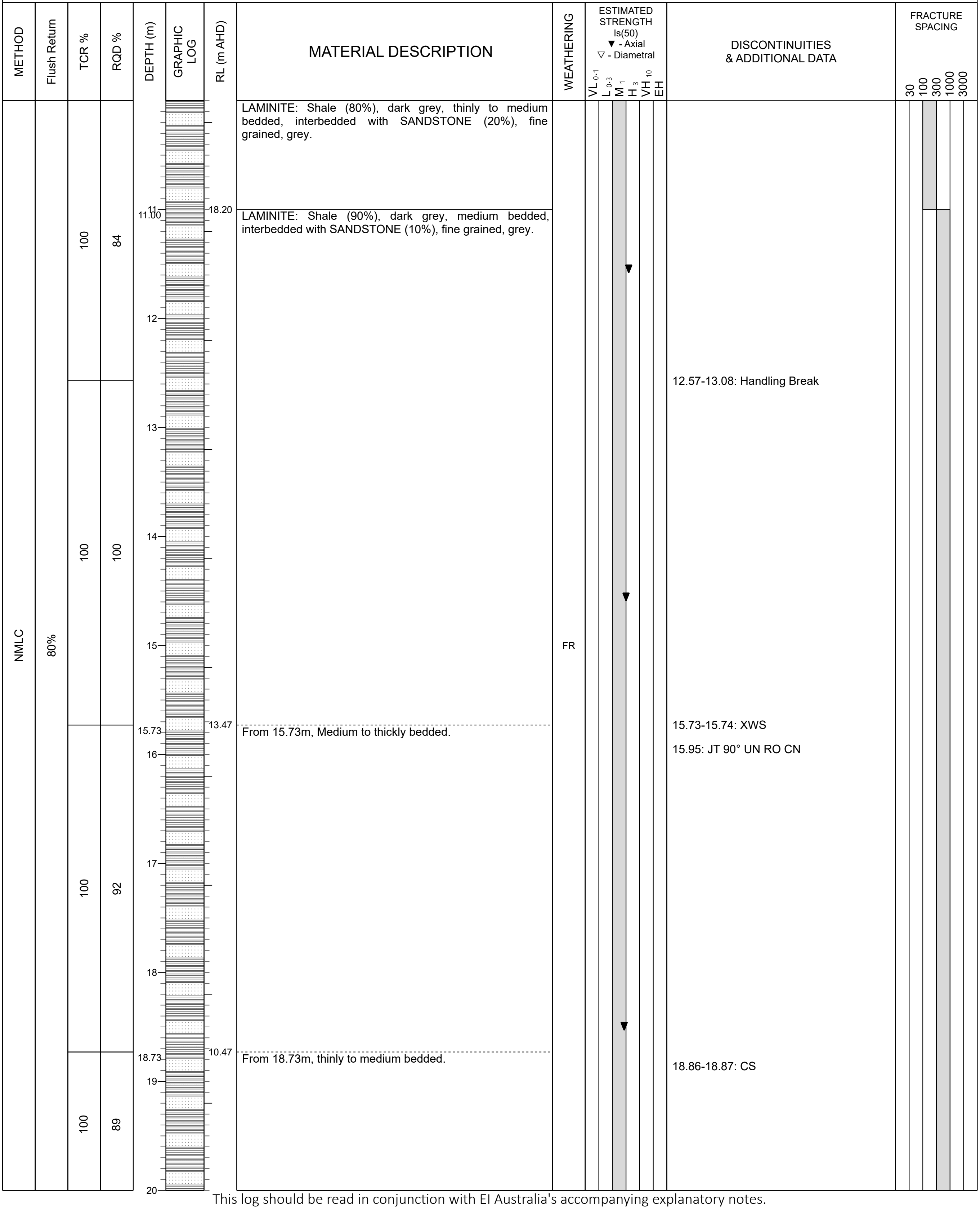
This log should be read in conjunction with EI Australia's accompanying explanatory notes.

BOREHOLE CORE LOG

BH ID: BH101M

Location	5-9 Croydon Street, Lakemba, NSW	**Started**	28 May 2024		
Client	Eloura Developments Lakemba	**Completed**	29 May 2024		
Job No.	E26227.G04	**Logged By**	KP	**Date**	29 May 2024
Sheets	3 of 4	**Review By**	SK	**Date**	29 June 2024

Drilling Contractor	Geosense Drilling and Engineering	**Surface RL**	≈29.20 m (AHD)	**Northing**	6245114.7356 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	322060.8201 (MGA 2020 Zone 56)



METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	DISCONTINUITIES & ADDITIONAL DATA
NMLC	80%	100	84			LAMINITE: Shale (80%), dark grey, thinly to medium bedded, interbedded with SANDSTONE (20%), fine grained, grey.	FR	
				11.00	18.20	LAMINITE: Shale (90%), dark grey, medium bedded, interbedded with SANDSTONE (10%), fine grained, grey.		
		100	100					12.57-13.08: Handling Break
		100	92	15.73	13.47	From 15.73m, Medium to thickly bedded.		15.73-15.74: XWS 15.95: JT 90° UN RO CN
		100	89	18.73	10.47	From 18.73m, thinly to medium bedded.		18.86-18.87: CS

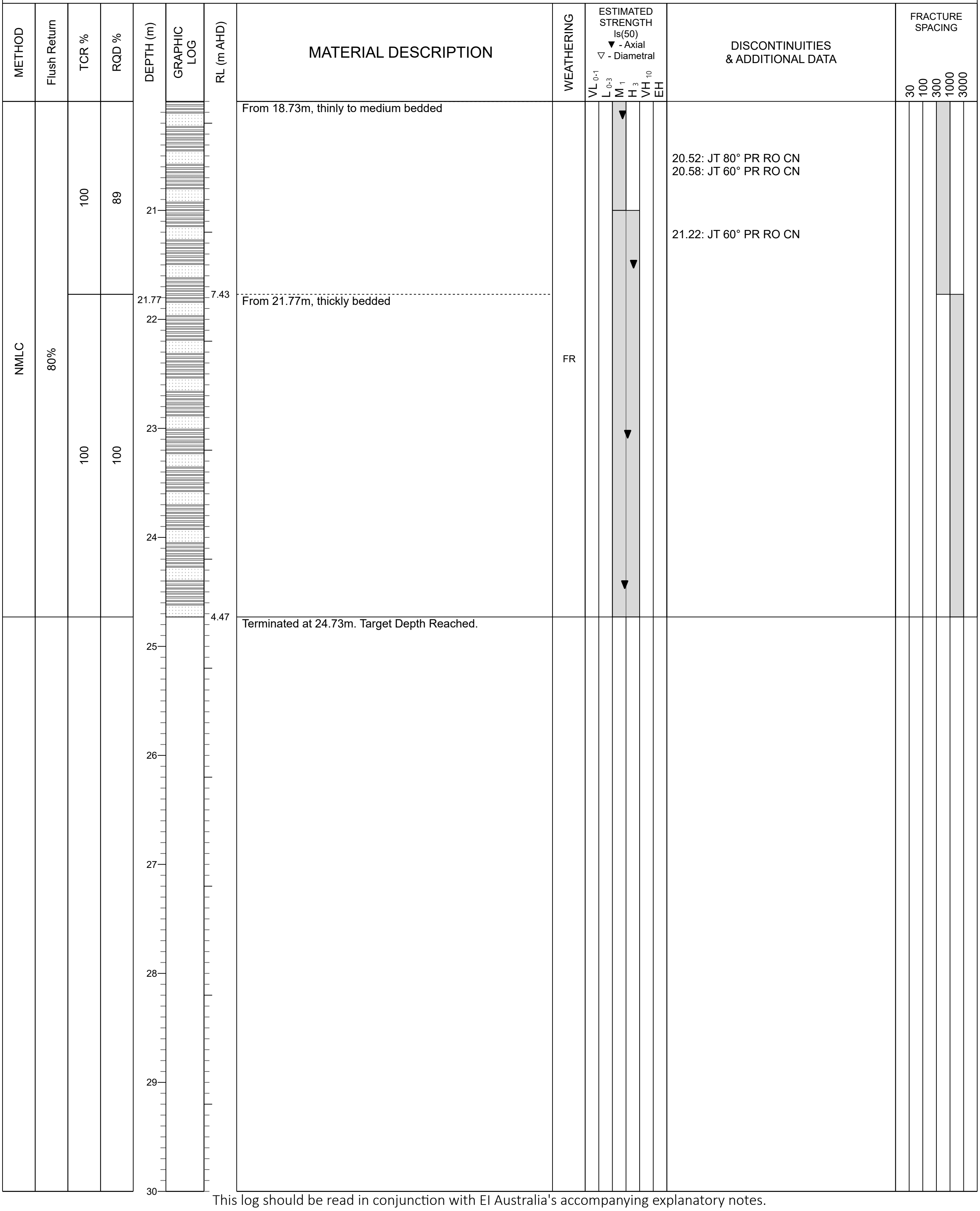
This log should be read in conjunction with EI Australia's accompanying explanatory notes.

BOREHOLE CORE LOG

BH ID: BH101M

Location	5-9 Croydon Street, Lakemba, NSW	**Started**	28 May 2024		
Client	Eloura Developments Lakemba	**Completed**	29 May 2024		
Job No.	E26227.G04	**Logged By**	KP	**Date**	29 May 2024
Sheets	4 of 4	**Review By**	SK	**Date**	29 June 2024

Drilling Contractor	Geosense Drilling and Engineering	**Surface RL**	≈29.20 m (AHD)	**Northing**	6245114.7356 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	322060.8201 (MGA 2020 Zone 56)



From 18.73m, thinly to medium bedded

From 21.77m, thickly bedded

Terminated at 24.73m. Target Depth Reached.

20.52: JT 80° PR RO CN
20.58: JT 60° PR RO CN

21.22: JT 60° PR RO CN

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

CORE PHOTOGRAPH OF BOREHOLE: BH101M

Project	Proposed Development	**East**	322060.8201	**Depth Range**	2.70m to 11.00m BEGL		
Location	5-9 Croydon Street, Lakemba NSW	**North**	6245114.7356	**Contractor**	GeoSense Drilling & Engineering Pty Ltd		
Position	See Figure 2	**Surface RL**	≈ 29.20m	**Drill Rig**	Comachhio Geo 205		
Job No.	E26227.G04	**Inclination**	-90°	**Logged**	KP	**Date**	29 / 5 / 2024
Client	Eloura Developments Pty Ltd	**Box**	1 & 2 of 5	**Checked**	SK	**Date**	5 / 7 / 2024

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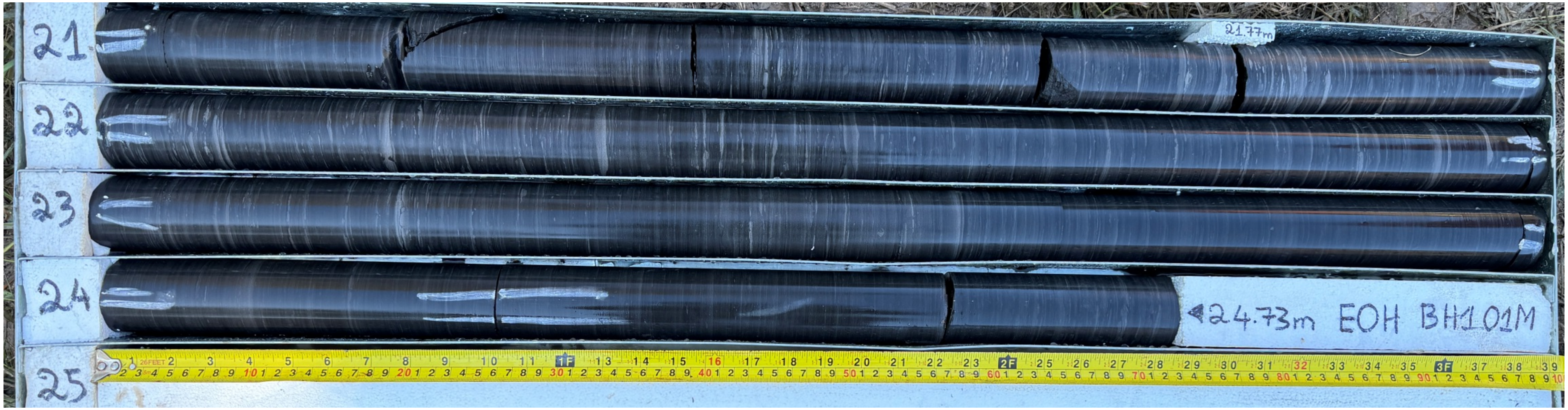
CORE PHOTOGRAPH OF BOREHOLE: BH101M

Project	Proposed Development	**East**	322060.8201	**Depth Range**	11.00m to 21.00m BEGL		
Location	5-9 Croydon Street, Lakemba NSW	**North**	6245114.7356	**Contractor**	GeoSense Drilling & Engineering Pty Ltd		
Position	See Figure 2	**Surface RL**	≈ 29.20m	**Drill Rig**	Comachhio Geo 205		
Job No.	E26227.G04	**Inclination**	-90°	**Logged**	KP	**Date**	29 / 5 / 2024
Client	Eloura Developments Pty Ltd	**Box**	3 & 4 of 5	**Checked**	SK	**Date**	5 / 7 / 2024

CORE PHOTOGRAPH OF BOREHOLE: BH101M

Project	Proposed Development	**East**	322060.8201	**Depth Range**	21.00m to 24.73m BEGL		
Location	5-9 Croydon Street, Lakemba NSW	**North**	6245114.7356	**Contractor**	GeoSense Drilling & Engineering Pty Ltd		
Position	See Figure 2	**Surface RL**	≈ 29.20m	**Drill Rig**	Comachhio Geo 205		
Job No.	E26227.G04	**Inclination**	-90°	**Logged**	KP	**Date**	29 / 5 / 2024
Client	Eloura Developments Pty Ltd	**Box**	5 of 5	**Checked**	SK	**Date**	5 / 7 / 2024



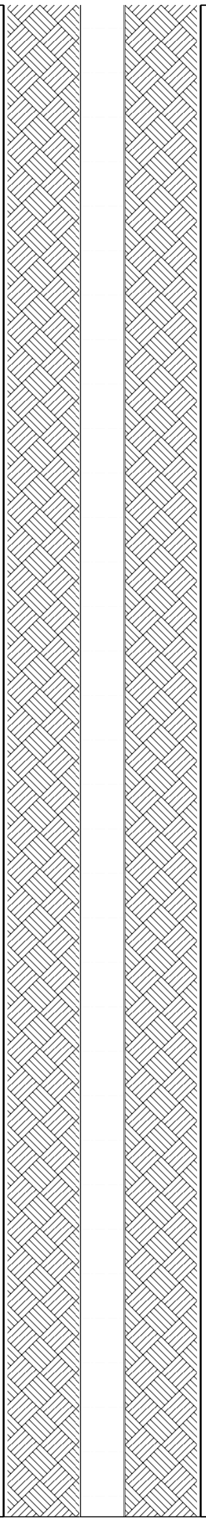
MONITORING WELL LOG

BH ID: BH101M

Location	5-9 Croydon Street, Lakemba, NSW	**Started**	28 May 2024		
Client	Eloura Developments Lakemba	**Completed**	29 May 2024		
Job No.	E26227.G04	**Logged By**	KP	**Date**	29 May 2024
Sheets	1 of 3	**Review By**	SK	**Date**	29 June 2024

Drilling Contractor	Geosense Drilling and Engineering	**Surface RL**	≈29.20 m (AHD)	**Northing**	6245114.7356 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	322060.8201 (MGA 2020 Zone 56)

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
GWNE		0.00	29.20	FILL: Silty CLAY: low plasticity, dark brown trace fine to coarse, sub-angular to angular gravels and rootlets.	M < PL	Cuttings 0.00m - 10.50m	Well Stickup =0.0m (RL 29.20m)
	BH101M _0.50-0.95 SPT 0.50-0.95 4,3,4 N=7	0.30	28.90	Silty CLAY: medium plasticity, brown / grey mottled red, trace fine to medium, sub-angular ironstone gravels.			
		1.00	28.20	Silty CLAY: high plasticity, grey / orange brown.			
	BH101M _1.50-1.65 SPT 1.50-1.65 13/150 mm HB N=R	1.50	27.70	SHALE: grey / orange brown, distinctly weathered, low strength.	-		
80%		2.70	26.50	SHALE: brown / grey-dark grey, thinly bedded.			
		4.00	25.20	From 4.00m, thinly to medium bedded.			0.0m - 12.0m PVC casing (50mm Ø)
		6.60	22.60	LAMINITE: Shale (80%), dark grey, thinly to medium bedded, interbedded with SANDSTONE (20%), fine grained, grey.			



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

MONITORING WELL LOG

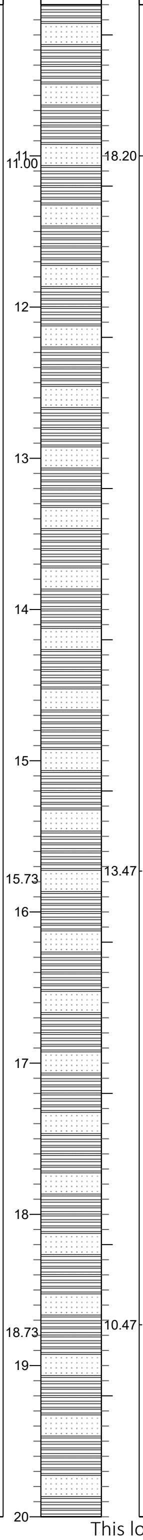
BH ID: BH101M

Location	5-9 Croydon Street, Lakemba, NSW	**Started**	28 May 2024
Client	Eloura Developments Lakemba	**Completed**	29 May 2024
Job No.	E26227.G04	**Logged By**	KP **Date** 29 May 2024
Sheets	2 of 3	**Review By**	SK **Date** 29 June 2024

Drilling Contractor	Geosense Drilling and Engineering	**Surface RL**	≈29.20 m (AHD)	**Northing**	6245114.7356 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	322060.8201 (MGA 2020 Zone 56)

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION
80%				LAMINITE: Shale (80%), dark grey, thinly to medium bedded, interbedded with SANDSTONE (20%), fine grained, grey.	
		11.00	18.20	LAMINITE: Shale (90%), dark grey, medium bedded, interbedded with SANDSTONE (10%), fine grained, grey.	
		15.73	13.47	From 15.73m, Medium to thickly bedded.	
		18.73	10.47	From 18.73m, thinly to medium bedded.	

GRAPHIC LOG



BACKFILL DETAILS

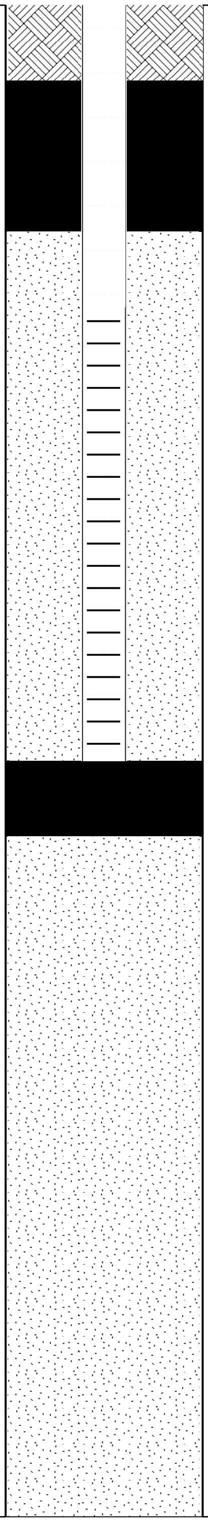
Bentonite
10.50m - 11.50m

Sand
11.50m - 15.00m

Bentonite
15.00m - 15.50m

STANDPIPE DETAILS

12.0m - 15.0m
PVC screen (50mm Ø)



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

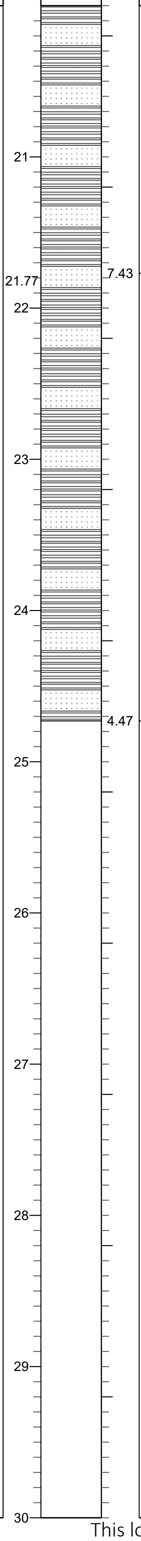
MONITORING WELL LOG

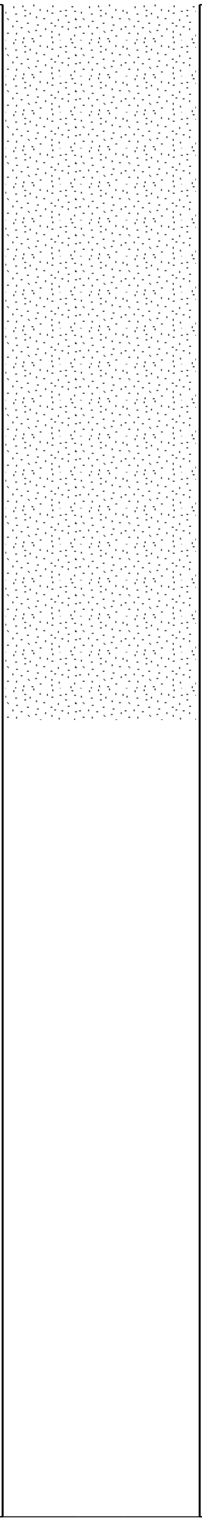
BH ID: BH101M

Location	5-9 Croydon Street, Lakemba, NSW	**Started**	28 May 2024		
Client	Eloura Developments Lakemba	**Completed**	29 May 2024		
Job No.	E26227.G04	**Logged By**	KP	**Date**	29 May 2024
Sheets	3 of 3	**Review By**	SK	**Date**	29 June 2024

Drilling Contractor	Geosense Drilling and Engineering	**Surface RL**	≈29.20 m (AHD)	**Northing**	6245114.7356 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	322060.8201 (MGA 2020 Zone 56)

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
80%					From 18.73m, thinly to medium bedded.		Sand 15.50m - 24.73m	
		21.77		7.43	From 21.77m, thickly bedded.			
				4.47	Terminated at 24.73m. Target Depth Reached.			





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

BOREHOLE LOG

BH ID: BH102M

Location	5-9 Croydon Street, Lakemba, NSW	**Started**	29 May 2024		
Client	Eloura Developments Lakemba	**Completed**	29 May 2024		
Job No.	E26227.G04	**Logged By**	KP	**Date**	29 May 2024
Sheets	1 of 3	**Review By**	SK	**Date**	29 June 2024

Drilling Contractor	Geosense Drilling and Engineering	**Surface RL**	≈25.10 m (AHD)	**Northing**	6245115.8197 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	321991.0430 (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			0.00		25.10	FILL: Silty CLAY: low plasticity, dark brown, trace rootlets.	M < PL	-	FILL
				0.10		25.00	Silty CLAY: medium plasticity, brown / orange brown-red, trace fine to medium, sub-angular to angular ironstone gravels.	M < PL	F	RESIDUAL SOIL
		BH102M_0.50-0.95 SPT 0.50-0.95 4,3,3 N=6								
				1.00		24.10	From 1.00m, high plasticity, grey-brown.			
		BH102M_1.50-1.95 SPT 1.50-1.95 5,6,8 N=14							St	
				2.70		22.40	From 2.70m, brown.			
		BH102M_3.00-3.45 SPT 3.00-3.45 7,10,11 N=21							VSt	
				3.30		21.80	From 3.30m, grey-orange brown.			
		BH102M_4.50-4.65 SPT 4.50-4.65 7/150 mm HB N=R		4.50		20.60	SHALE: grey-brown, distinctly weathered, low strength.	-	-	WEATHERED ROCK
				4.67		20.43	*Log continued on next page.*			

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

BOREHOLE CORE LOG

BH ID: BH102M

Location	5-9 Croydon Street, Lakemba, NSW	**Started**	29 May 2024		
Client	Eloura Developments Lakemba	**Completed**	29 May 2024		
Job No.	E26227.G04	**Logged By**	KP	**Date**	29 May 2024
Sheets	2 of 3	**Review By**	SK	**Date**	29 June 2024

Drilling Contractor	Geosense Drilling and Engineering	**Surface RL**	≈25.10 m (AHD)	**Northing**	6245115.8197 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	321991.0430 (MGA 2020 Zone 56)

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	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.*				
NMLC	80%	100	43			SHALE: grey-brown, thinly bedded.	DW	L	5.14: JT 10° PR RO CN 5.19: JT 90° PR RO CN 5.47: JT 60° IR RO CN 5.65-5.70: XWS 5.83-5.85: CS	30–100
				5.85	19.25	LAMINITE: Shale (80%), dark grey, thinly bedded, interbedded with SANDSTONE (20%), fine grained, grey.	FR	M	7.18-7.19: CS	100–300
		100	90	7.30	17.80	From 7.30m, thinly to medium bedded.			8.71: JT 75° UN RO CN	
				10						

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

BOREHOLE CORE LOG

BH ID: BH102M

Location	5-9 Croydon Street, Lakemba, NSW	**Started**	29 May 2024		
Client	Eloura Developments Lakemba	**Completed**	29 May 2024		
Job No.	E26227.G04	**Logged By**	KP	**Date**	29 May 2024
Sheets	3 of 3	**Review By**	SK	**Date**	29 June 2024

Drilling Contractor	Geosense Drilling and Engineering	**Surface RL**	≈25.10 m (AHD)	**Northing**	6245115.8197 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	321991.0430 (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)
NMLC	80%	100	90				From 7.30m, thinly to medium bedded.	FR	▼ M		100–300
		100	81	11					▼ M	10.77: JT 75° PR RO CN 10.97: JT 65° PR RO CN 11.05: JT 65° PR RO CN 11.23: JT 80° PR RO CN	
				12		12.95	Terminated at 12.15m. Target Depth Reached.				
				13							
				14							
				15							
				16							
				17							
				18							
				19							
				20							

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

CORE PHOTOGRAPH OF BOREHOLE: BH102M

Project	Proposed Development	**East**	321991.0430	**Depth Range**	4.67m to 12.15m BEGL		
Location	5-9 Croydon Street, Lakemba NSW	**North**	6245115.8197	**Contractor**	GeoSense Drilling & Engineering Pty Ltd		
Position	See Figure 2	**Surface RL**	≈ 25.10m	**Drill Rig**	Comachhio Geo 205		
Job No.	E26227.G04	**Inclination**	-90°	**Logged**	KP	**Date**	29 / 5 / 2024
Client	Eloura Developments Pty Ltd	**Box**	1 & 2 of 2	**Checked**	SK	**Date**	5 / 7 / 2024

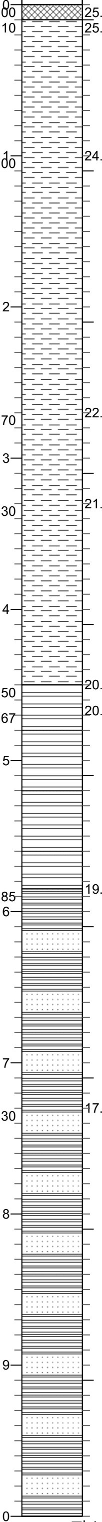
MONITORING WELL LOG

BH ID: BH102M

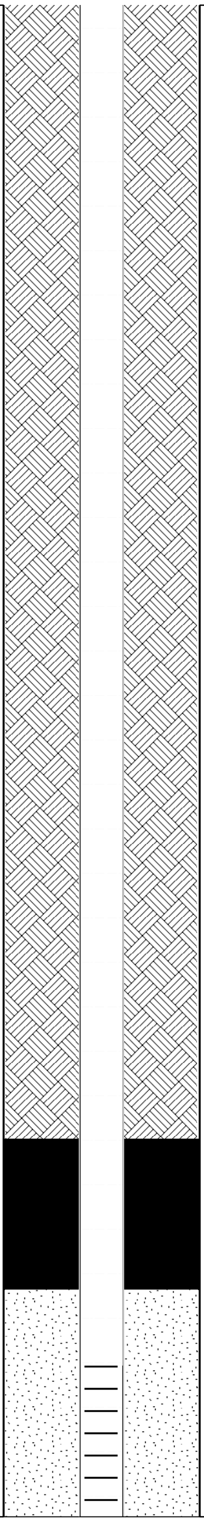
Location	5-9 Croydon Street, Lakemba, NSW	**Started**	29 May 2024		
Client	Eloura Developments Lakemba	**Completed**	29 May 2024		
Job No.	E26227.G04	**Logged By**	KP	**Date**	29 May 2024
Sheets	1 of 2	**Review By**	SK	**Date**	29 June 2024

Drilling Contractor	Geosense Drilling and Engineering	**Surface RL**	≈25.10 m (AHD)	**Northing**	6245115.8197 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	321991.0430 (MGA 2020 Zone 56)

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION
GWNE		0.00	25.10	FILL: Silty CLAY: low plasticity, dark brown, trace rootlets	
	BH102M_0.50-0.95 SPT 0.50-0.95 4,3,3 N=6	0.10	25.00	Silty CLAY: medium plasticity, brown / orange brown-red, trace fine to medium, sub-angular to angular ironstone gravels	M < PL
	BH102M_1.50-1.95 SPT 1.50-1.95 5,6,8 N=14	1.00	24.10	From 1.00m, high plasticity, grey-brown	
	BH102M_3.00-3.45 SPT 3.00-3.45 7,10,11 N=21	2.70	22.40	From 2.70m, brown	
		3.30	21.80	From 3.30m, grey-orange brown	
	BH102M_4.50-4.65 SPT 4.50-4.65 7/150 mm HB N=R	4.50	20.60	SHALE: grey-brown, distinctly weathered, low strength	-
80%		4.67	20.43	SHALE: grey-brown, thinly bedded	
		5.85	19.25	LAMINITE: Shale (80%), dark grey, thinly bedded, interbedded with SANDSTONE (20%), fine grained, grey	
		7.30	17.80	From 7.30m, thinly to medium bedded	



BACKFILL DETAILS	STANDPIPE DETAILS
Cuttings 0.00m - 7.50m	Well Stickup =0.0m (RL 25.10m)
Bentonite 7.50m - 8.50m	0.0m - 9.0m PVC casing (50mm Ø)



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

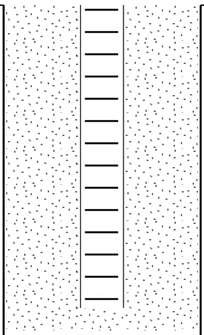
MONITORING WELL LOG

BH ID: BH102M

Location	5-9 Croydon Street, Lakemba, NSW	**Started**	29 May 2024		
Client	Eloura Developments Lakemba	**Completed**	29 May 2024		
Job No.	E26227.G04	**Logged By**	KP	**Date**	29 May 2024
Sheets	2 of 2	**Review By**	SK	**Date**	29 June 2024

Drilling Contractor	Geosense Drilling and Engineering	**Surface RL**	≈25.10 m (AHD)	**Northing**	6245115.8197 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	321991.0430 (MGA 2020 Zone 56)

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
80%		11 12			From 7.30m, thinly to medium bedded		Sand 8.50m - 12.15m	9.0m - 12.0m PVC screen (50mm Ø)
		13 14 15 16 17 18 19 20		12.95	Terminated at 12.15m. Target Depth Reached.			



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

BOREHOLE LOG

BH ID: BH103M

Location	5-9 Croydon Street, Lakemba, NSW	**Started**	30 May 2024		
Client	Eloura Developments Lakemba	**Completed**	30 May 2024		
Job No.	E26227.G04	**Logged By**	KP	**Date**	30 May 2024
Sheets	1 of 3	**Review By**	SK	**Date**	29 June 2024

Drilling Contractor	Geosense Drilling and Engineering	**Surface RL**	≈24.90 m (AHD)	**Northing**	6245044.8211 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	321966.1116 (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		BH103M_0.50-0.95 SPT 0.50-0.95 2,2,3 N=5	■	0.00		24.90	FILL: Clayey SAND: fine to medium grained, brown, with fine to coarse, sub-angular to angular gravels.	D	-	FILL
		BH103M_1.50-1.95 SPT 1.50-1.95 4,4,5 N=9	■	1.00		23.90	Silty CLAY: medium plasticity, orange brown-grey.	M < PL	- St	RESIDUAL SOIL
	▷	BH103M_3.00-3.45 SPT 3.00-3.45 4,8,9 N=17 BH103M_4.50-4.80 SPT 4.50-4.80 7,17/150 mm N=R	■	2.50		22.40	Silty CLAY: yellow brown, trace fine to medium, sub-angular to angular ironstone gravels.	M < PL M > PL	VSt	
		BH103M_6.00-6.10 SPT 6.00-6.10 10/100 mm HB N=R	■	4.80		20.10	SHALE: grey-orange brown, distinctly weathered, low strength.	-	-	WEATHERED ROCK
				6.10		18.80	*Log continued on next page.*			

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

BOREHOLE CORE LOG

BH ID: BH103M

Location	5-9 Croydon Street, Lakemba, NSW	**Started**	30 May 2024		
Client	Eloura Developments Lakemba	**Completed**	30 May 2024		
Job No.	E26227.G04	**Logged By**	KP	**Date**	30 May 2024
Sheets	2 of 3	**Review By**	SK	**Date**	29 June 2024

Drilling Contractor	Geosense Drilling and Engineering	**Surface RL**	≈24.90 m (AHD)	**Northing**	6245044.8211 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	321966.1116 (MGA 2020 Zone 56)

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	DISCONTINUITIES & ADDITIONAL DATA
				0		*Log continued from previous page.*		
NMLC	80% Water	96	16			NO CORE: 110mm thick	-	
				6.21	18.69	SHALE: Shale (80%), dark grey / brown, thinly bedded, interbedded with SANDSTONE (20%), fine grained, grey.	DW	
							FR	6.97: JT 85° PR RO CN 7.67: JT 90° PR RO 8.16: JT 85° PR RO CN 8.25-8.26: CS 8.80: JT 90° UN RO CN
		100	87	9.10	15.80	From 9.10m, thinly to medium bedded.		9.88: JT 75° PR RO CN
				10				

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

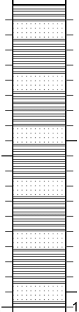
This log should be read in conjunction with EI Australia's accompanying explanatory notes.

BOREHOLE CORE LOG

BH ID: BH103M

Location	5-9 Croydon Street, Lakemba, NSW	**Started**	30 May 2024		
Client	Eloura Developments Lakemba	**Completed**	30 May 2024		
Job No.	E26227.G04	**Logged By**	KP	**Date**	30 May 2024
Sheets	3 of 3	**Review By**	SK	**Date**	29 June 2024

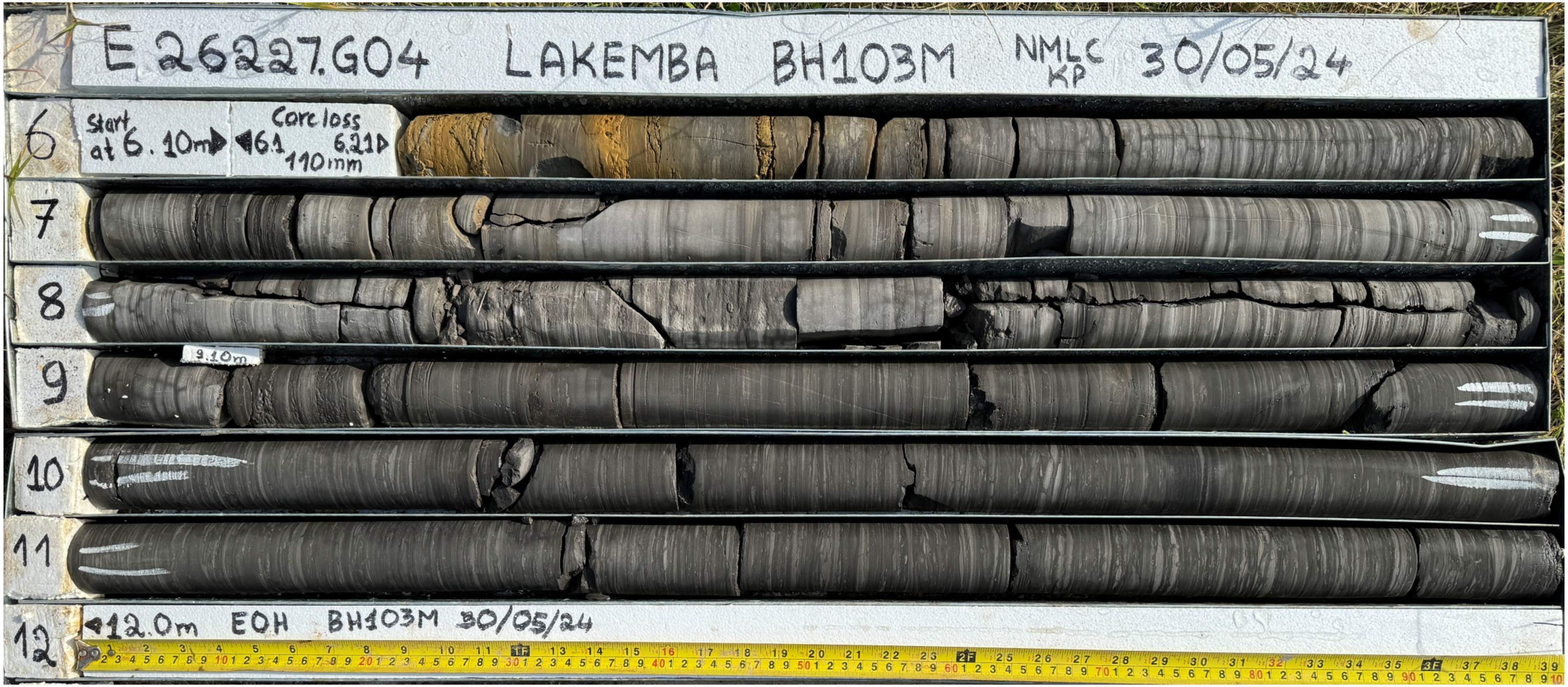
Drilling Contractor	Geosense Drilling and Engineering	**Surface RL**	≈24.90 m (AHD)	**Northing**	6245044.8211 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	321966.1116 (MGA 2020 Zone 56)

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
NMLC	80% Water	100	87	11			From 9.10m, thinly to medium bedded.	FR	▼ ▼	10.30: JT 75° PR RO CN 11.34-11.35: FS	
				12		12.90	Terminated at 12.00m. Target Depth Reached.				
				13							
				14							
				15							
				16							
				17							
				18							
				19							
				20							

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

CORE PHOTOGRAPH OF BOREHOLE: BH103M

Project	Proposed Development	**East**	321966.1116	**Depth Range**	6.10m to 12.00m BEGL		
Location	5-9 Croydon Street, Lakemba NSW	**North**	6245044.8211	**Contractor**	GeoSense Drilling & Engineering Pty Ltd		
Position	See Figure 2	**Surface RL**	≈ 24.90m	**Drill Rig**	Comachhio Geo 205		
Job No.	E26227.G04	**Inclination**	-90°	**Logged**	KP	**Date**	29 / 5 / 2024
Client	Eloura Developments Pty Ltd	**Box**	1 & 2 of 2	**Checked**	SK	**Date**	5 / 7 / 2024



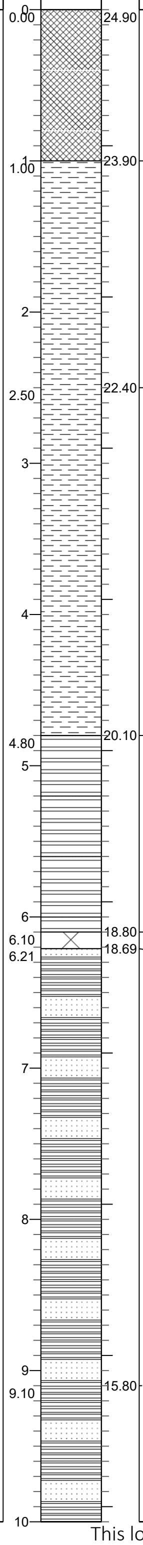
MONITORING WELL LOG

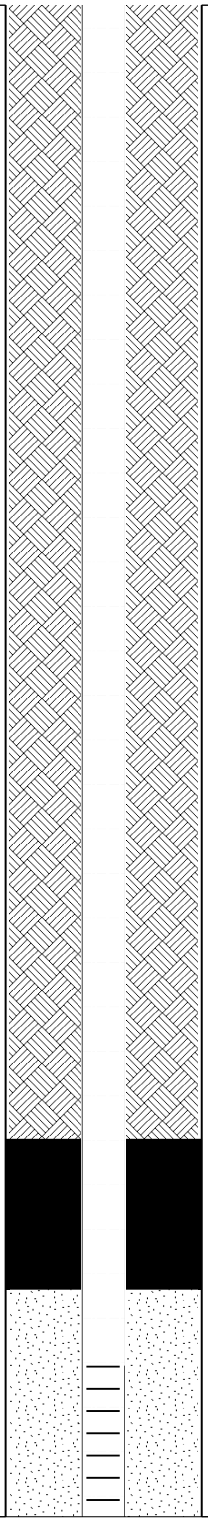
BH ID: BH103M

Location	5-9 Croydon Street, Lakemba, NSW	**Started**	30 May 2024
Client	Eloura Developments Lakemba	**Completed**	30 May 2024
Job No.	E26227.G04	**Logged By**	KP **Date** 30 May 2024
Sheets	1 of 2	**Review By**	SK **Date** 29 June 2024

Drilling Contractor	Geosense Drilling and Engineering	**Surface RL**	≈24.90 m (AHD)	**Northing**	6245044.8211 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	321966.1116 (MGA 2020 Zone 56)

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
	BH103M_0.50-0.95 SPT 0.50-0.95 2,2,3 N=5	0.00	24.90	FILL: Clayey SAND: fine to medium grained, brown, with fine to coarse, sub-angular to angular gravels.	D		Well Stickup =0.0m (RL 24.90m)
	BH103M_1.50-1.95 SPT 1.50-1.95 4,4,5 N=9	1.00	23.90	Silty CLAY: medium plasticity, orange brown-grey.	M < PL		
	BH103M_3.00-3.45 SPT 3.00-3.45 4,8,9 N=17	2.50	22.40	Silty CLAY: yellow brown, trace fine to medium, sub-angular to angular ironstone gravels.		Cuttings 0.00m - 7.50m	
▷	BH103M_4.50-4.80 SPT 4.50-4.80 7,17/150 mm N=R				M > PL		0.0m - 9.0m PVC casing (50mm Ø)
		4.80	20.10	SHALE: grey-orange brown, distinctly weathered, low strength.	-		
	BH103M_6.00-6.10 SPT 6.00-6.10 10/100 mm HB N=R						
80% Water		6.10	18.80	NO CORE: 110mm thick			
		6.21	18.69	SHALE: Shale (80%), dark grey / brown, thinly bedded, interbedded with SANDSTONE (20%), fine grained, grey.			
						Bentonite 7.50m - 8.50m	
		9.10	15.80	From 9.10m, thinly to medium bedded.			





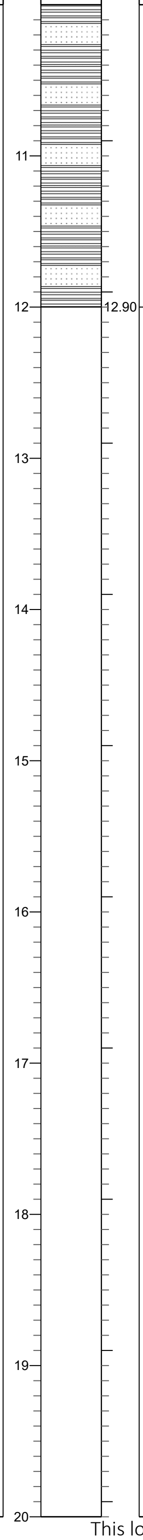
This log should be read in conjunction with EI Australia's accompanying explanatory notes.

MONITORING WELL LOG

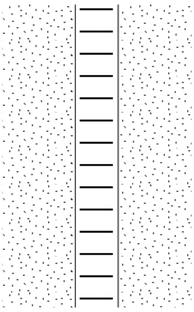
BH ID: BH103M

Location	5-9 Croydon Street, Lakemba, NSW		**Started**	30 May 2024		
Client	Eloura Developments Lakemba		**Completed**	30 May 2024		
Job No.	E26227.G04		**Logged By**	KP	**Date**	30 May 2024
Sheets	2 of 2		**Review By**	SK	**Date**	29 June 2024

Drilling Contractor	Geosense Drilling and Engineering	**Surface RL**	≈24.90 m (AHD)	**Northing**	6245044.8211 (MGA 2020 Zone 56)
Plant	Comacchio Geo 205	**Inclination**	90°	**Easting**	321966.1116 (MGA 2020 Zone 56)



WATER	SAMPLES & FIELD TESTS	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
80% Water				From 9.10m, thinly to medium bedded		Sand 8.50m - 12.00m	9.0m - 12.0m PVC screen (50mm Ø)
		12	12.90	Terminated at 12.00m. Target Depth Reached.			



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

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 (%)

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

RQD = Rock Quality Designation (%)

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

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)
⁰	GRAVEL (GP or GW)	Combinations of these basic symbols may be used to indicate mixed materials such as sandy clay			

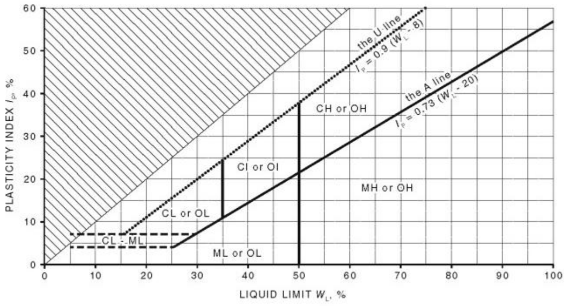
CLASSIFICATION AND INFERRED STRATIGRAPHY

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

Term	Description
Massive	No layering apparent
Indistinct	Layering just visible; little effect on properties
Distinct	Layering (bedding, foliation, cleavage) distinct; rock breaks more easily parallel to layering

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

Accredited for Compliance with ISO/IEC 17025 - Testing No. 2750

Point Load Strength Index Report

Project: E26227.G04: 5-9 Croydon Street, Lakemba, 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.: 31380/8822D-L
Report No.: 24/1476
Report Date: 07/06/2024
Page: 1 of 1

Borehole / Sample No.	Depth (m)	Date Sampled	Date Tested	Test Type	**Is (MPa)**	**$Is_{(50)}$ (MPa)**	Rock Type	Failure Type	Moisture
BH101M	9.19	28-30/05/2024	07/06/2024	A	**0.91**	**0.92**	SH	3	M
BH101M	11.55	28-30/05/2024	07/06/2024	A	**1.2**	**1.2**	SH	3	M
BH101M	14.56	28-30/05/2024	07/06/2024	A	**0.95**	**0.96**	SH	3	M
BH101M	18.50	28-30/05/2024	07/06/2024	A	**0.79**	**0.82**	SH	3	M
BH101M	20.13	28-30/05/2024	07/06/2024	A	**0.75**	**0.72**	SH	3	M
BH101M	21.50	28-30/05/2024	07/06/2024	A	**1.8**	**1.8**	SH	3	M
BH101M	23.06	28-30/05/2024	07/06/2024	A	**1.1**	**1.1**	SH	3	M
BH101M	24.44	28-30/05/2024	07/06/2024	A	**0.85**	**0.86**	SH	3	M
BH102M	10.47	28-30/05/2024	07/06/2024	A	**0.77**	**0.8**	SH	3	M
BH102M	11.85	28-30/05/2024	07/06/2024	A	**0.68**	**0.68**	SH	3	M
BH103M	10.13	28-30/05/2024	07/06/2024	A	**0.91**	**0.89**	SH	3	M
BH103M	11.80	28-30/05/2024	07/06/2024	A	**1.5**	**1.5**	SH	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: FV

Manager - Mrigesh Tamang

Appendix C – Vibration Limits

German Standard DIN 4150 – Part 3: 1999 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.

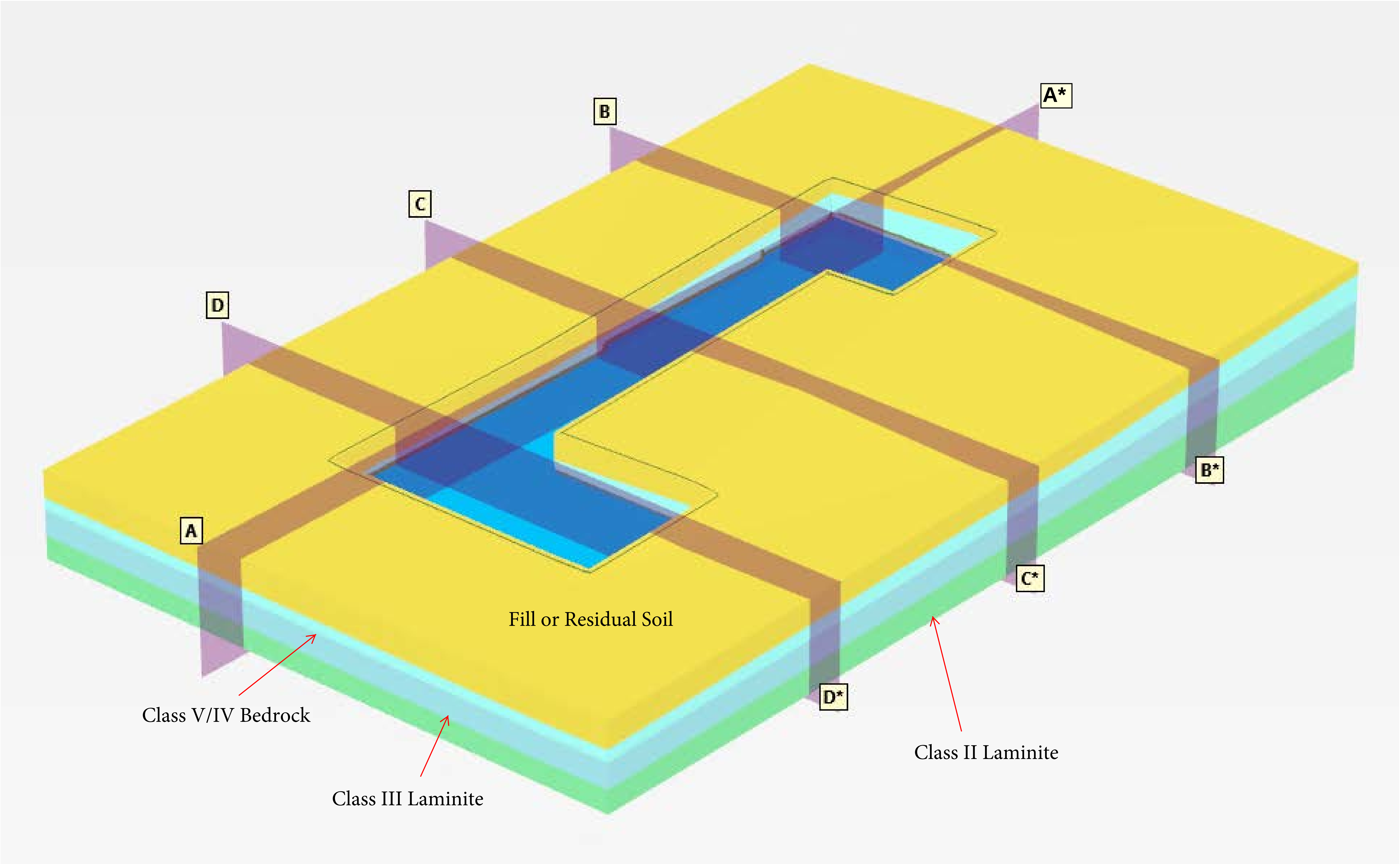
It should also be noted that these levels are ‘safe limits’, up to which no damage due to vibration effects has been observed for the particular class of building. ‘Damage’ is defined by DIN 4150 to include even minor non-structural cracking in cement render, the enlargement of cracks already present, 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.

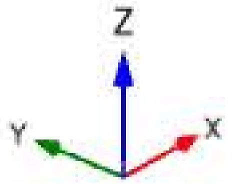
Table A **DIN 4150 – Structural Damage – Safe Limits for Building Vibration**

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 – PLAXIS 3D Results

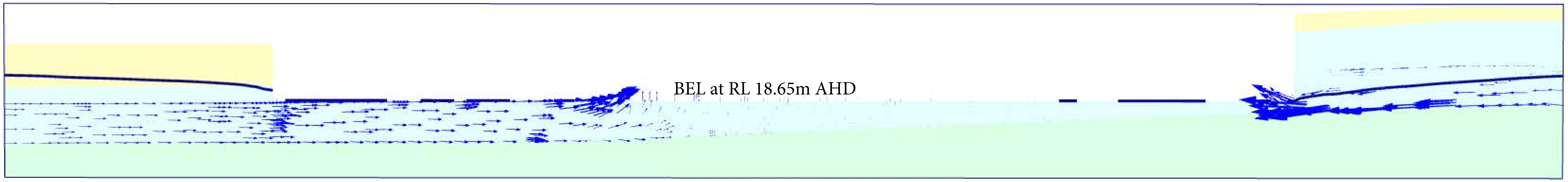


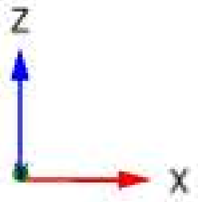


PLAXIS® 3D

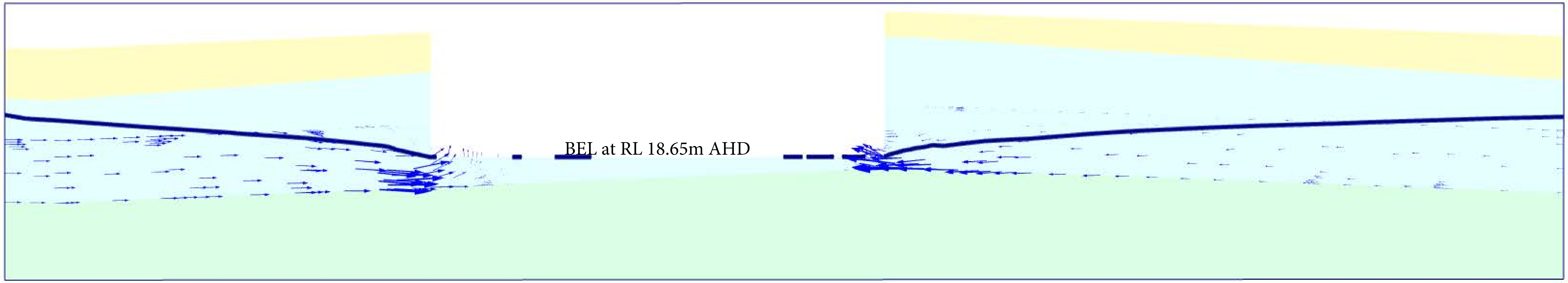
Project description	Date
5-9 Croydon Street, Lakemba NSW	11/12/2024

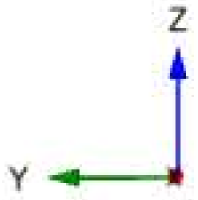
Project filename	Step	Company
E26227.G04 - HGI with MESO drawings with BEL ...	4	EI Australia





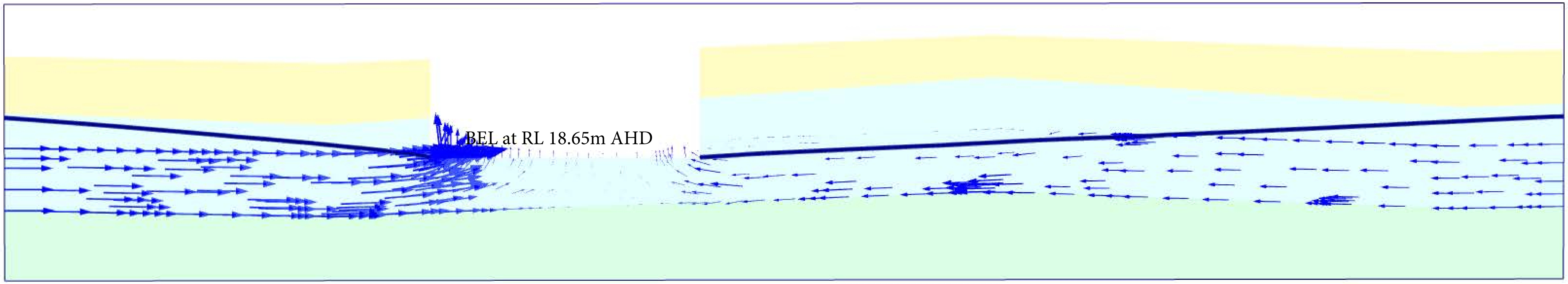
PLAXIS® 3D	Project description 5-9 Croydon Street, Lakemba NSW (Section A-A*)		Date 11/12/2024
	Project filename E26227.G04 - HGI with MESO drawings with BEL ...	Step 4	Company EI Australia

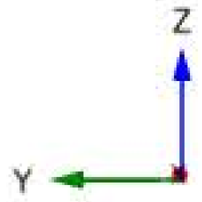




PLAXIS® 3D

Project description			Date
5-9 Croydon Street, Lakemba NSW (Section B-B*)			11/12/2024
Project filename	Step	Company	
E26227.G04 - HGI with MESO drawings with BEL ...	4	EI Australia	





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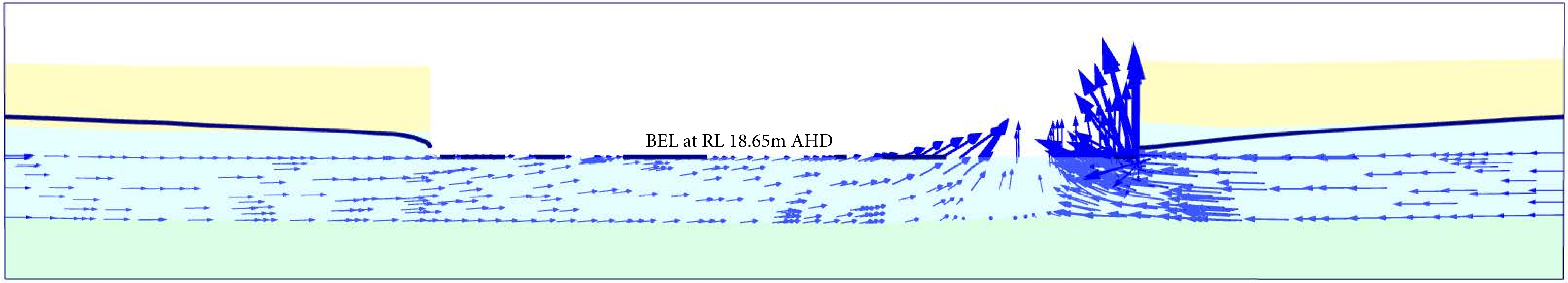
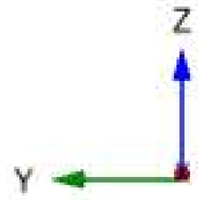
	Project filename E26227.G04 - HGI with MESO drawings with BEL ...	*Step* 4	*Company* EI Australia

Output Version 2024.2.0.1144





PLAXIS® 3D	*Project description* 5-9 Croydon Street, Lakemba NSW (Section D-D*)		*Date* 11/12/2024
	Project filename E26227.G04 - HGI with MESO drawings with BEL ...	*Step* 4	*Company* EI Australia

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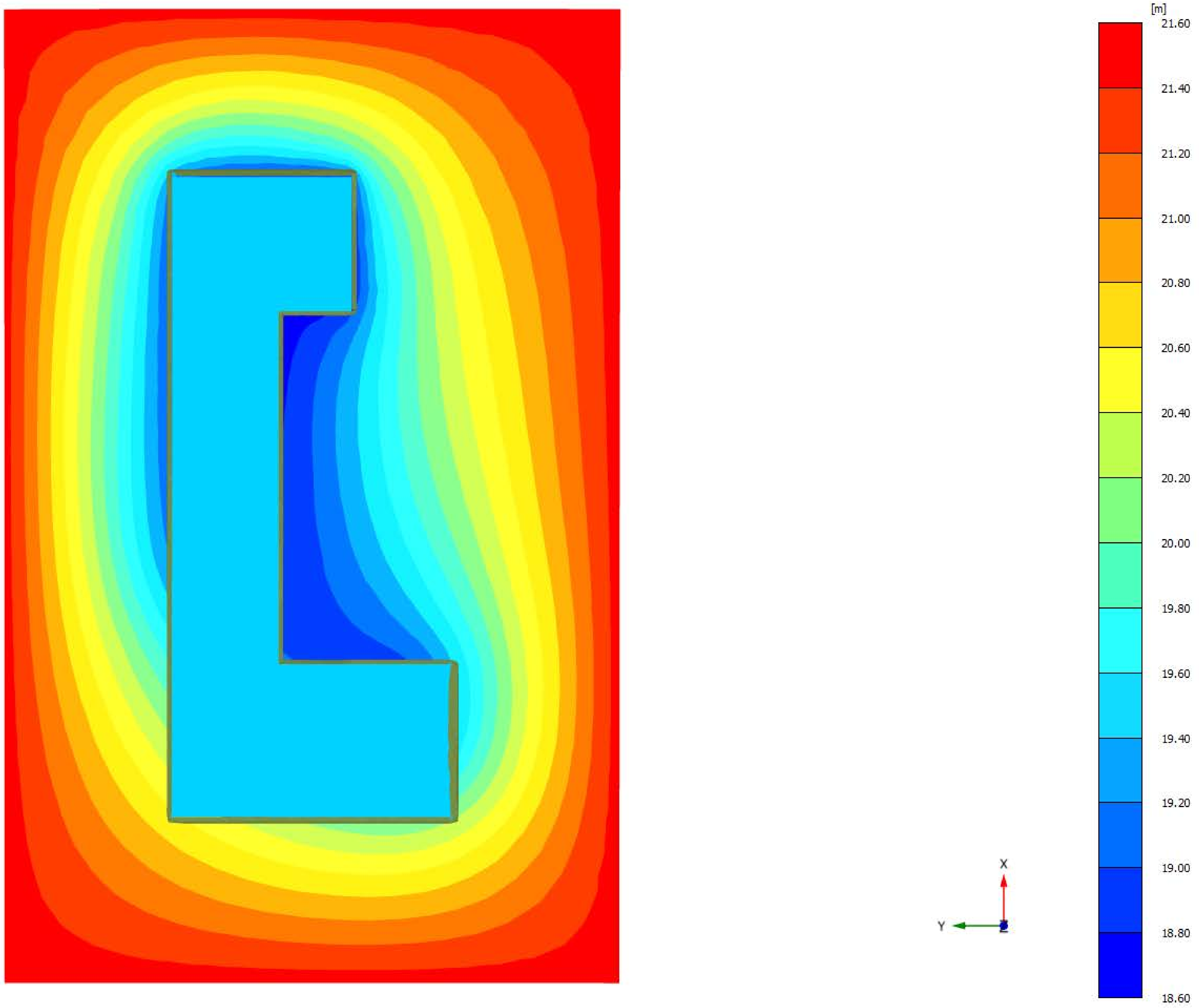

Groundwater head (scaled up 0.200 times)

Maximum value = 21.51 m (Element 37882 at Node 431)

Minimum value = 18.65 m (Element 39513 at Node 23147)

PLAXIS® 3D	*Project description* 5-9 Croydon Street, Lakemba NSW		*Date* 11/12/2024
	Project filename E26227.G04 - HGI with MESO drawings with BEL ...	*Step* 4	*Company* EI Australia

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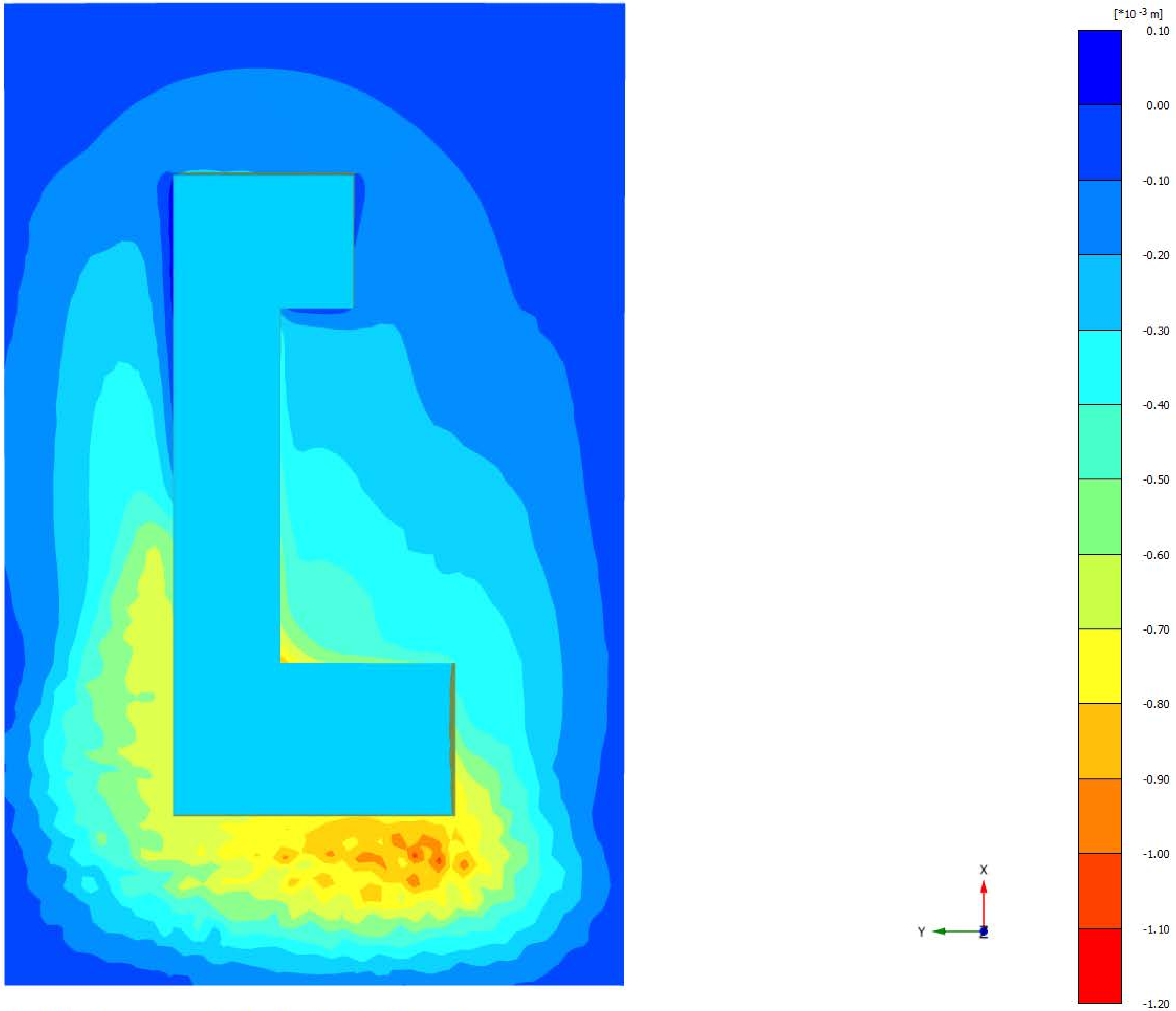

Total displacements u_z (scaled up $5.00*10^3$ times)

Maximum value = $0.07174*10^{-3}$ m (Element 2620 at Node 6354)

Minimum value = $-1.178*10^{-3}$ m (Element 2159 at Node 51979)

Project description
5-9 Croydon Street, Lakemba NSW

Date
11/12/2024

Project filename
E26227.G04 - HGI with MESO drawings with BEL ...

Step
4

Company
EI Australia

Appendix E – Groundwater Level Monitoring Report

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Suite 6.01, 55 Miller Street
PYRMONT NSW 2009
www.eiaustralia.com.au
02 9516 0722

11 September 2024
E26227.G11.GW01

Ertac Turk
Eloura Developments Lakemba
Building A, Level 1, 65 Roberts Road
GREENACRE NSW 2190

Groundwater Level Monitoring Report No. 1
5-9 Croydon Street, Lakemba, NSW

EI Australia (EI) has been engaged to prepare this factual letter report to provide continual groundwater levels at the above site. The monitoring period in this report is from Wednesday 29 May 2024 to Friday 30 August 2024.

Groundwater levels were collected during the monitoring period using data loggers installed within the monitoring wells. The data logger / monitoring well details and the groundwater levels observed during the monitoring period are summarised in Table 1 & 2 below.

Table 1 Summary of Data Logger & Well Installation Details

Monitoring Well ID	Top of Well RL (mAHD)	Existing Ground RL (mAHD)	Well Stickup (m)	Well Depth Below Ground (m)	Sensor RL (mAHD)
BH101M	30.10	29.17	0.93	15.00	14.25
BH102M	26.20	25.02	1.18	12.00	13.34
BH103M	26.00	24.87	1.13	11.80	13.25

Table 2 Summary of Groundwater Levels

Monitoring Well ID	Average Groundwater RL (mAHD)	Highest Groundwater RL (mAHD)	Lowest Groundwater RL (mAHD)	Highest Groundwater Depth (m Below Ground)	Lowest Groundwater Depth (m Below Ground)
BH101M	21.28	21.41	21.21	7.76	7.96
BH102M	21.30	21.42	21.22	3.60	3.80
BH103M	21.43	21.52	21.36	3.35	3.51

Please do not hesitate to contact the undersigned should you have any questions.

For and on behalf of:
EI AUSTRALIA

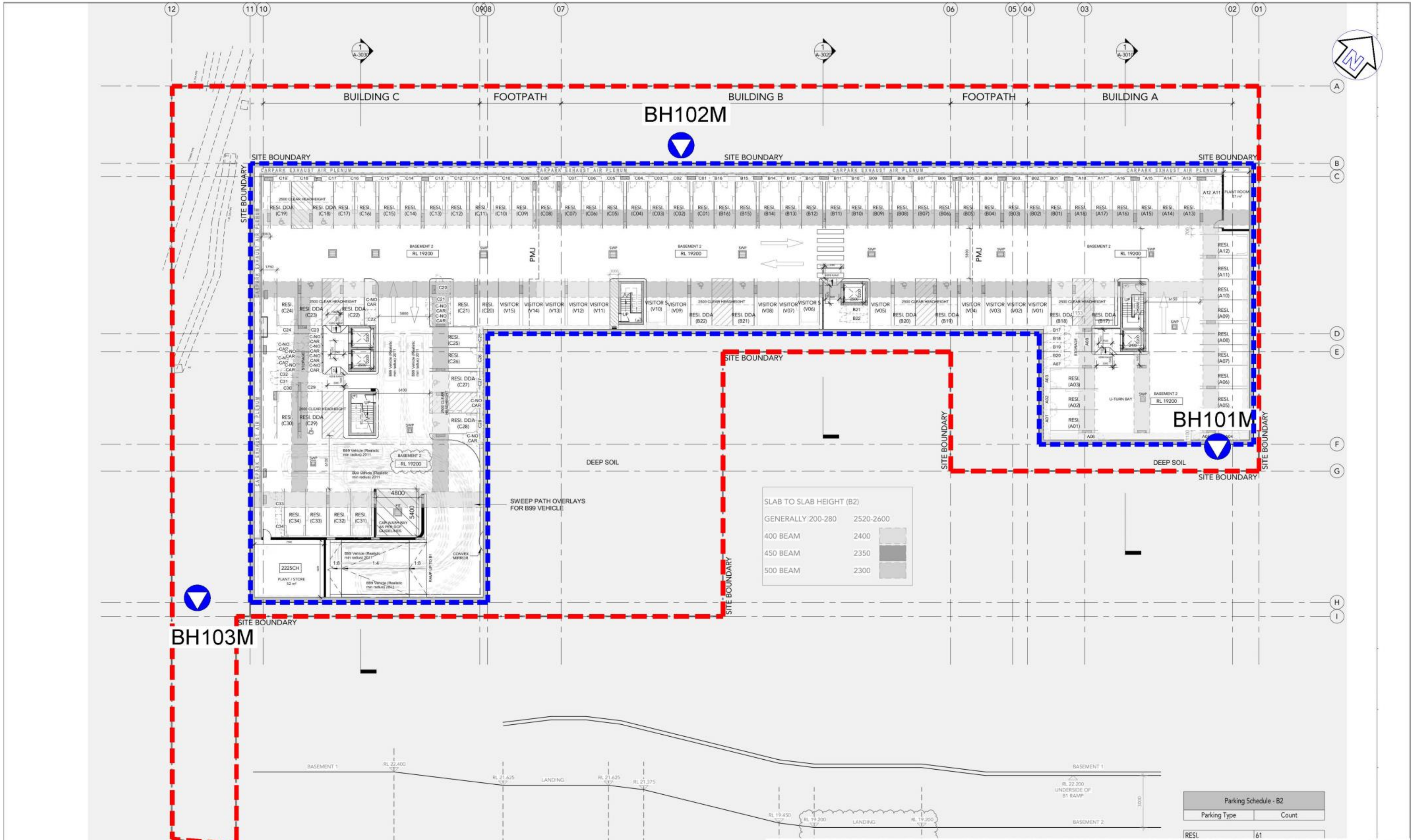
Author

Kiengseng Pung
Geotechnical Engineer

Reviewer

Stephen Kim
Senior Geotechnical Engineer

Attachments:
Figure 1: Data Logger Location Plan
Figure 2-4: Groundwater Level, Daily Rainfall vs. Time From 29 May 2024 to 30 August 2024
Important Information



Map Source: Architectural Drawing prepared by Team2 Architects - Project No. 1136, Drawing No. A-0100, Revision 8, Dated 20 December 2023

LEGEND (All Locations are Approximate)

🟥 – –	Site boundary
🟦 – –	Basement boundary
▼	Monitoring well and data logger locations (EI Australia, 2024)

eiaustralia
Contamination | Remediation | Geotechnical
Suite 6.01, 55 Miller Street, PYRMONT 2009
Ph (02) 9516 0722 Fax (02) 9518 5088

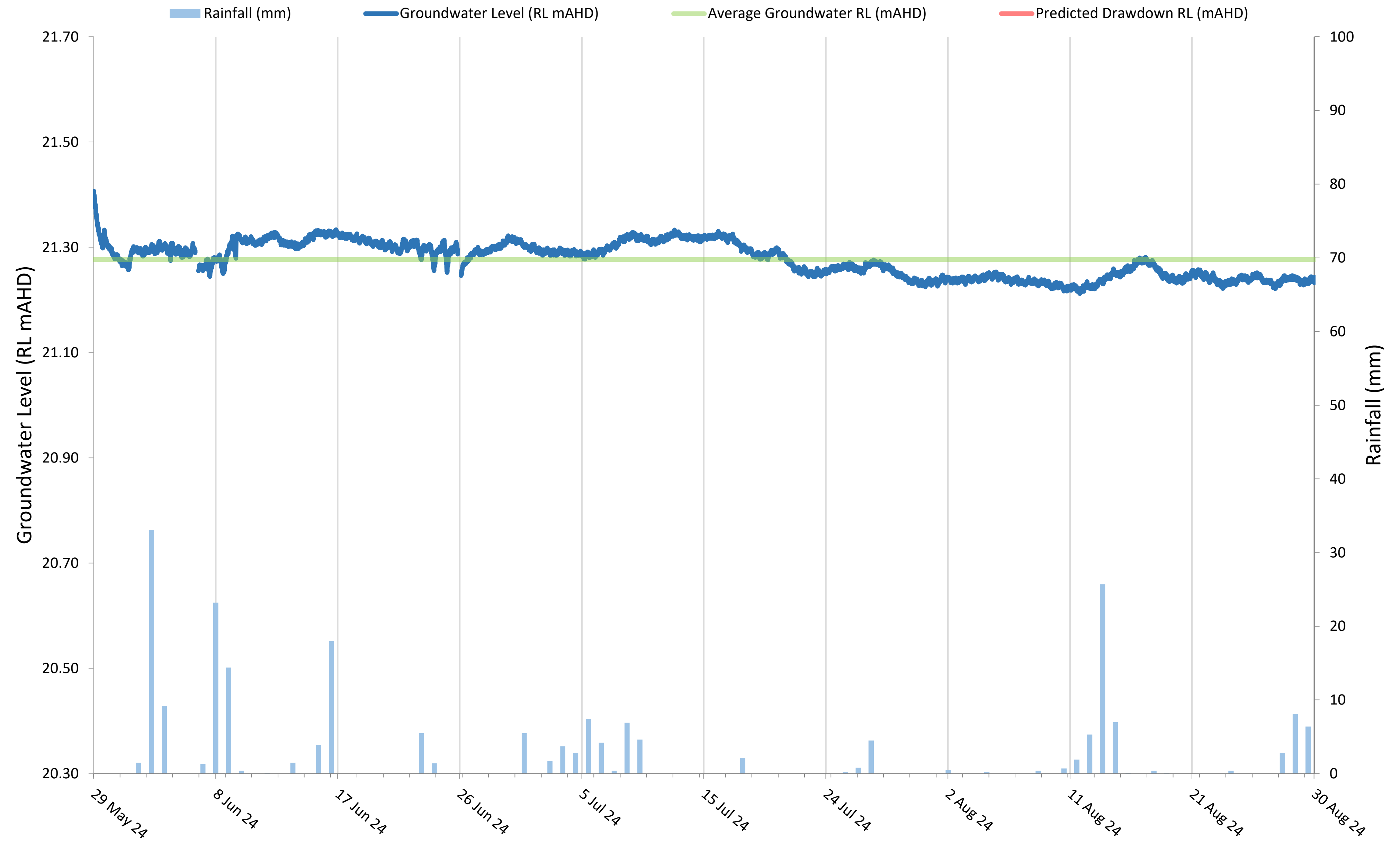
Drawn:	K.P.
Approved:	S.K.
Date:	11-09-24

Eloura Developments Pty Ltd
Groundwater Level Monitoring
5-9 Croydon Street, Lakemba NSW

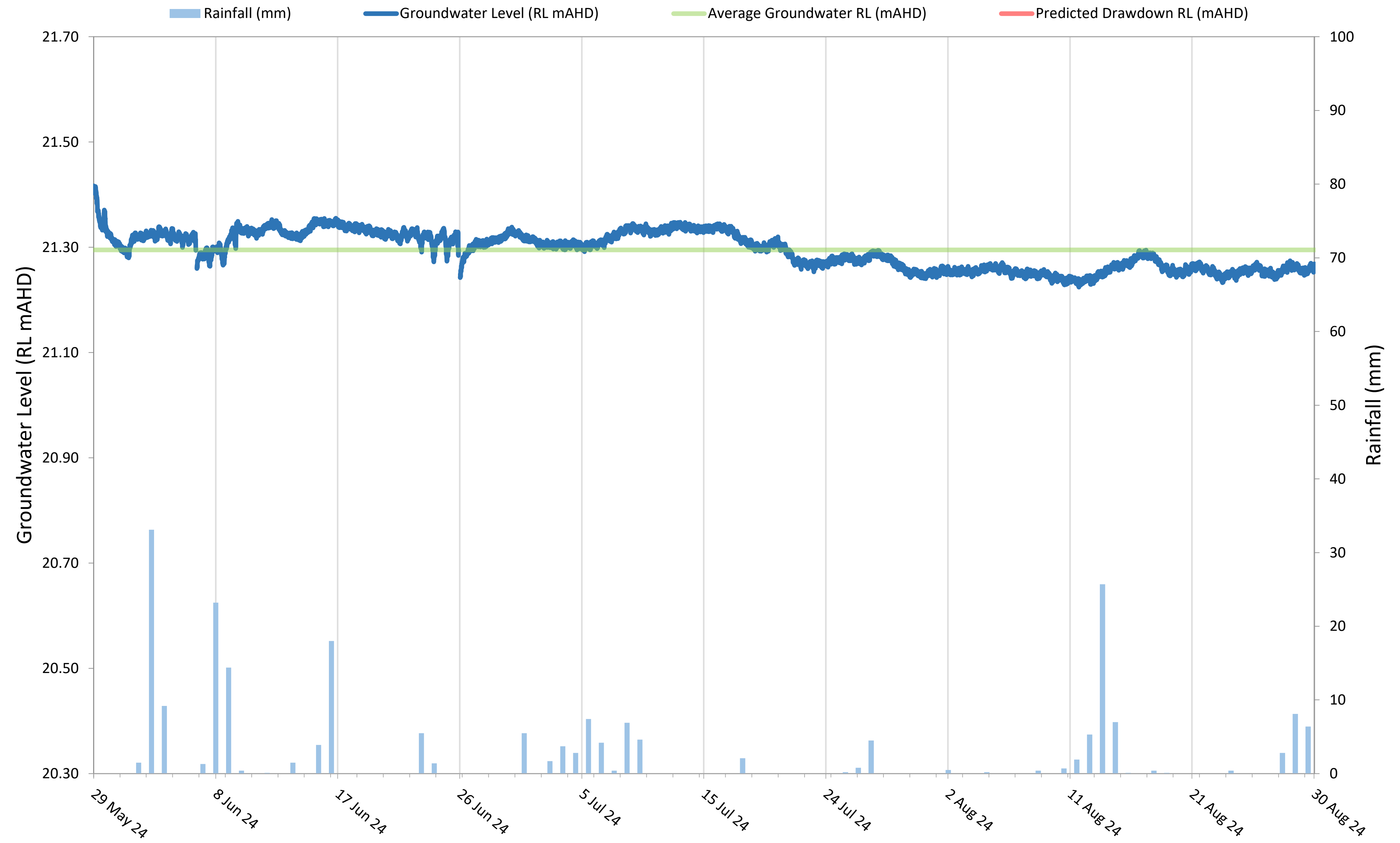
Data Logger Location Plan

Figure:
1

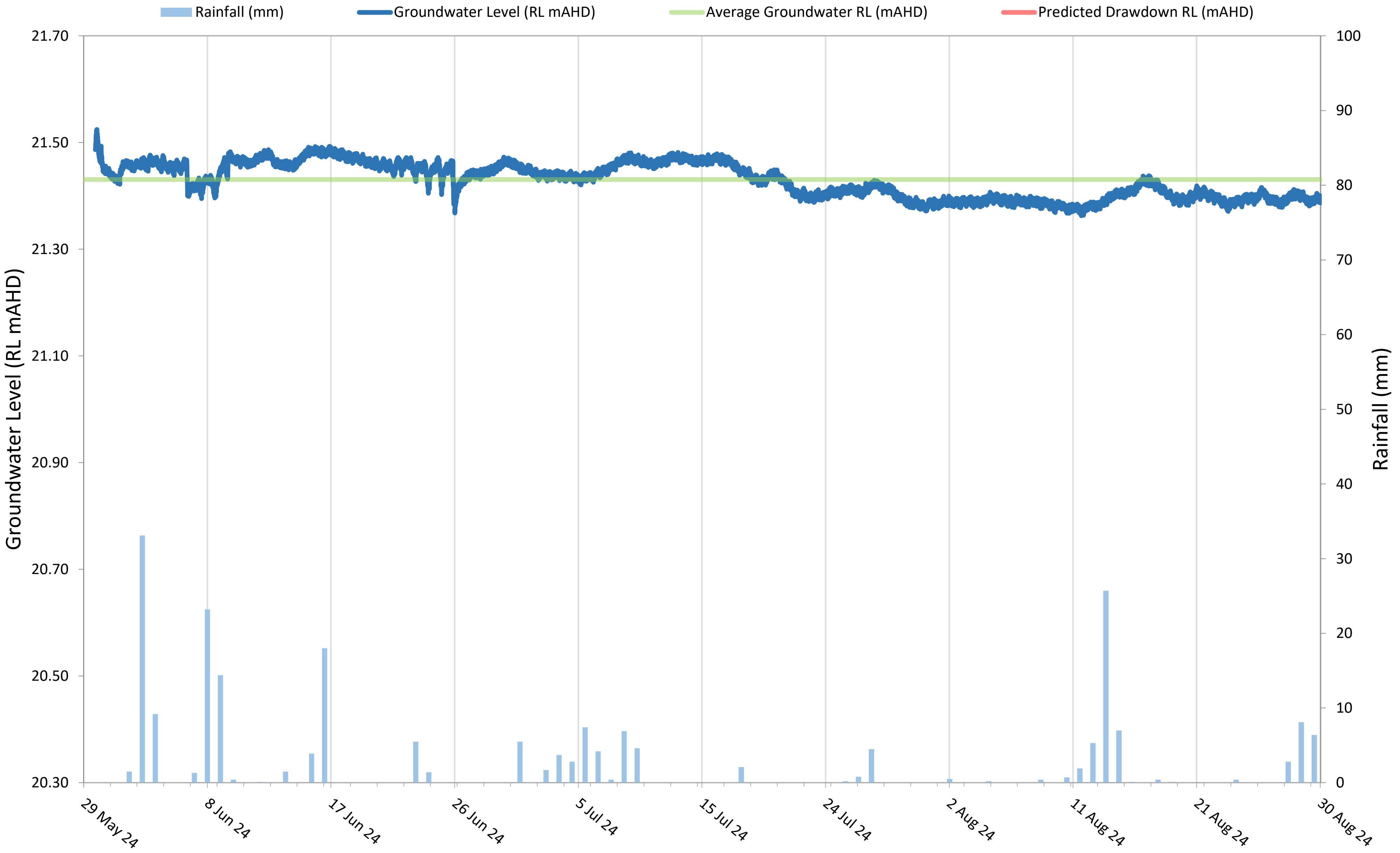
Project: E26227.G11.GW01



eiaustralia Contamination | Remediation | Geotechnical Suite 6.01, 55 Miller Street, PYRMONT 2009 Ph. (02) 9516 0722 Fax (02) 9518 5088	Drawn:	KP	**Eloura Developments Lakemba** Groundwater Level Monitoring 5-9 Croydon Street, Lakemba, NSW BH101M	Figure: **2**
	Approved:	SK		
	Date:	11/09/2024		Project: E26227.G11.GW01



eiaustralia Contamination | Remediation | Geotechnical Suite 6.01, 55 Miller Street, PYRMONT 2009 Ph. (02) 9516 0722 Fax (02) 9518 5088	Drawn:	KP	**Eloura Developments Lakemba** Groundwater Level Monitoring 5-9 Croydon Street, Lakemba, NSW BH102M	Figure: **3**
	Approved:	SK		
	Date:	11/09/2024		Project: E26227.G11.GW01



eiaustralia
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Drawn:	KP
Approved:	SK
Date:	11/09/2024

Eloura Developments Lakemba

Groundwater Level Monitoring

5-9 Croydon Street, Lakemba, NSW

BH103M

Figure:

4

Project: E26227.G11.GW01

Appendix F – 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

This report is the subject of copyright and shall not be reproduced either totally or in part without the express permission of this Company. 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.