



Report on Geotechnical and Hydrogeological Investigation

Proposed Mixed Use Development

33 - 37 Herbert Street, St Leonards NSW

**Prepared for Aqualand St Leonard
Development Pty Ltd**

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

Signature

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1. Introduction

This report prepared by Douglas Partners Pty Ltd (Douglas) presents the results of a geotechnical and hydrogeological investigation undertaken for a mixed use development at 33 - 37 Herbert Street, St Leonards NSW (the site). The investigation was commissioned by email instructing to proceed dated, 30 September 2025 from Celia Mak of Aqualand St Leonard Development Pty Ltd and was undertaken in accordance with Douglas' proposal 237003.00.P.001.Rev0, dated 24 July 2025. This report has been prepared to support a State Significant Development Application (SSDA) SSD – 88511459 for the site.

It is understood from the latest architectural drawings (refer Appendix C) that the proposed mixed use development is in design development phase and will likely comprise the demolition of all buildings on site, retaining the existing one and partial two-level basement at 33 Herbert Street. Additional bulk excavation is planned for the area to the north and west of the existing two-level basement. The existing basement shoring wall for the one-level basement will be retained, except where the basement is extended. Shoring will be required for the new basement extension. The bulk excavation level for the two-level basement extension is assumed to be the same as the existing, around RL 70.8 m, with a Finished Floor Level (FFL) at RL 71.16 m.

The aim of the geotechnical and hydrogeological investigation was to provide preliminary geotechnical advice on the following:

- Method and results of the field work and laboratory tests;
- Description of the subsurface conditions and groundwater;
- Geotechnical model;
- Excavation characteristics;
- Comments on vibration and vibration monitoring;
- Suitable shoring options and retaining structures;
- Ground anchors;
- Suitable foundation systems and design parameters;
- Comments on settlement of footings;
- Other anticipated geotechnical issues, including comments relating to developments near Transport for New South Wales (TfNSW) assets;
- Inspection requirements; and
- Additional geotechnical services required.

The geotechnical investigation included the drilling of twelve boreholes, installation of six groundwater monitoring wells (two wells are intended for gas monitoring) and laboratory testing of selected samples. Hydrogeological investigation works included hydraulic conductivity testing within four groundwater monitoring wells. The details of the field work are presented in this report, together with comments and recommendations on the items listed above.

This report must be read in conjunction with all appendices, including the notes provided in Appendix A. A Preliminary Site Investigation (contamination) was carried out by Douglas during the geotechnical investigation (Douglas ref: 237003.02.R.001.Rv0, dated 10 March 2026). Douglas have also prepared a report on Hazardous Building Materials (HAZMAT) Survey (Douglas ref. 237003.01.R.001.Rev0, dated 5 December 2025).

2. Site Description

The site is located at 33 – 37 Herbert Street, St Leonards on Cammeraygal Country and is legally described as Lots 1 & 2 in DP 744175, Lot 3 in DP 772072, and lot 1 in DP 115615. The site has an irregular shape with a total area of approximately 5,919 m², extending alongside the T1 North Shore and Western Rail Line (refer Figure 1 below and survey drawing provided in Appendix B). No 33 Herbert Street (southern lot) is currently occupied by a three-storey commercial building with a stepped one- and two-level basement. No 37 Herbert Street (northern lot) is occupied by a single-level warehouse (no basement). The site is within 400 m of St Leonards train station which is located to the south. It is bound to the east by the North Shore railway line, to the south by an adjoining residential building, to the west by Herbert Street and to the north by Ella Street.

The site slopes gently from northeast to southwest, with approximately 4 m difference in elevation between the street frontages of Ella Street (RL¹ 80.2 m) and Herbert Street (~RL 76.2 m), based on the survey drawing prepared by LTS Surveyors (refer Appendix B). The survey drawings also indicates that the second basement level at 33 Herbert Street slopes gently down from south (RL 71.2 m) to north (RL 70.4 m).

The closest bodies of water are Woodford Bay and Core Creek, which are situated approximately 1.5 km to the southwest of the site.

An existing stormwater tunnel is shown on the architectural drawing package (refer Appendix B) and TTW annotated drawing package (refer Appendix G) to be positioned behind the internal basement wall between the stepped one and two-level basement of 33 Herbert Street. The stormwater tunnel, visible through the confined space access hatch at basement level two, appears to be brick lined with fill party covering the tunnel (refer Plate 1, Appendix F).

The basement level also has a stormwater sump with a steel grate at RL 70.36 m (lowest floor level) with the sump invert level at RL 67.5 m (refer Appendix B and Plate 2, Appendix F). The stormwater sump appeared to have continuous water inflow, possibly associated with the leaking stormwater tunnel.

¹ Reduced Level (RL) in metres (m) relative to the Australian Height Datum (AHD).

The western basement wall of 33 Herbert Street includes a local extension which is not in full contact with the basement floor slabs (refer Plate 3, Appendix F). Instead, the basement wall appears to be locally propped by a buttress beam.



Figure 1. Proposed Development Boundary (red polygon)

It is understood from the [Sydney Metro Interactive Train Map](#) that the Sydney Metro Northwest tunnels run approximately 100 m to the west of the site, beneath 2 Herbert Street (Australia Post Bulk Post Lodgement Centre).



Figure 2. Aerial Photograph (1943) showing location of site with respect to the quarry; approximate areas of cut face marked in orange.

Historical aerial photography from 1943 (see Figure 2) shows the site is located directly to the east of an old brick quarry (also reflected in the soil landscape section below as disturbed terrain) with Herbert Street forming the eastern boundary of the quarry.

3. Published Data

3.1 Geology

Reference to the Sydney 1:100,000 Geological Series Sheet 9130 indicates that the site is underlain by Triassic aged Wianamatta Group Ashfield Shale (see Figure 3). The Ashfield Shale is underlain by the Mittagong Formation and the Hawkesbury Sandstone. Note, the investigation encountered a thin sequence of the Mittagong Formation over Hawkesbury Sandstone. Ashfield Shale rock was not encountered.

The Mittagong Formation is a transitional formation between the overlying Ashfield Shale and the underlying Hawkesbury Sandstone. The rock typically comprises fine-grained quartzose sandstone with interbeds of siltstone and laminite. The rock contains two orthogonal joint sets, similar to the Hawkesbury Sandstone, though generally more closely spaced (see further on for detail).

Hawkesbury Sandstone typically consists of medium to coarse grained quartz sandstone, with minor shale and laminite lenses, featuring the following orthogonal joint sets:

- Set 1 – NNE striking joints dipping 75° to 90° to the west and east, spaced between 1 to 10 m, but can be spaced closer in the joint swarms. These joints are very prominent and are persistent over many metres, both horizontally and vertically.
- Set 2 – ESE striking joints dipping 75° to 90° to the north and south. These joints are less common, generally strata bound (discontinuous).

Low angle (25° to 30°) thrust faults, commonly dipping to the north and south, are also relatively common. The investigation encountered a number of thin shear zones and crushed seams comprising fragmented rock with clay infill, predominantly near the southern portion of the site (BH07, BH09, BH10, BH11 and BH12).

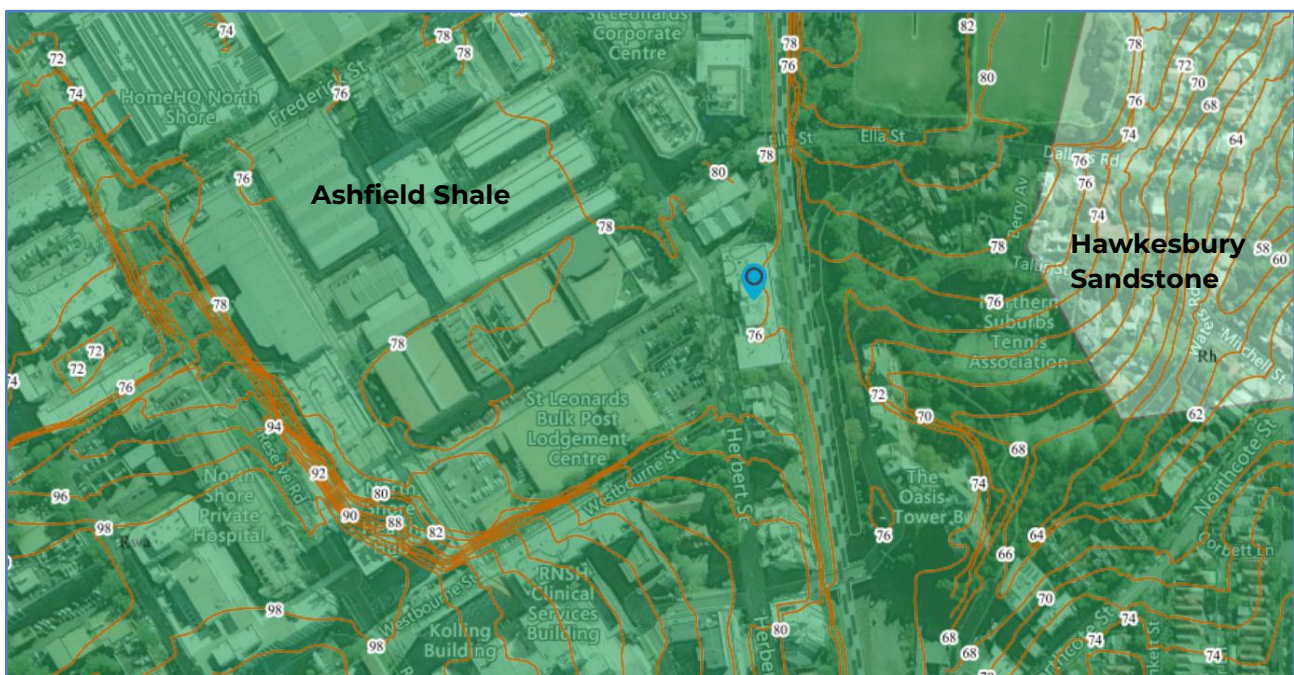


Figure 3. Extract from Sydney 1:100,000 Geological Series Sheet 9130 With 2 m Contour Lines (Blue Pin marks the site location)

It is noted that the site is orientated sub-parallel to north and therefore the eastern and western site boundaries are orientated sub-parallel to Joint Set 1. Based on the investigation results, however, competent rock is not expected to form part of the retained material, apart from the northern portion of the site where some medium strength sandstone is expected.

3.2 Hydrogeology

Registered groundwater bores GW108224 and GW072478 are located approximately 440 m and 520 m to the east and west of the site, respectively. The standing water levels recorded within these groundwater bores are shown to be approximately 35 m (~RL 37 m) and 45 m (~RL 54 m) below the ground level for Bores GW108224 and GW072478, respectively. The groundwater observations from the temporary groundwater monitoring wells installed by Douglas are summarized in Section 5.2.

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

3.3 Soil Landscape

Reference to the Sydney 1:100 000 Soil Landscape Sheet indicates that the site is underlain by shallow to moderately deep and deep erosional soils over bedrock (see Figure 4 below). The sheet also show that disturbed terrain (anthropogenic material) is present along the southwestern boundary of the site.



Figure 4. Extract from Sydney 1:100,000 Soils Landscape Sheet (Blue Pin marks the site location)

3.4 Landslide Risk

Based on the topography of the site (refer Figure 3) and the soil profile the site presents a very low risk to landslide, particularly considering that the proposed development will include a shoring wall around the perimeter of the planned bulk excavation.

3.5 Acid Sulfate Soils

Reference to the regional Acid Sulphate Soils (ASS) Risk map indicates that there is no known occurrence of Acid Sulphate Soils (ASS) at the site.

3.6 Salinity

In reference to the Map of Salinity Potential in Western Sydney, the site is not situated within the mapped salinity boundaries and is therefore not considered to be within an area with potential for dryland salinity. Furthermore, based on the location and elevation of the site, it is within an area that is not likely to be affected by salinity.

4. Field Work Methods

The field work for the geotechnical and hydrogeological investigation was undertaken between 5 November 2025 and 21 November 2025 and comprised:

- On-site electronic service scanning for buried services at proposed borehole locations.
- Drilling twelve boreholes (BH01 and BH12) using both a track-mounted drilling rig (BH01 and BH04 to BH06) and hand-portable drilling equipment (BH02, BH03 and BH07 to BH12). The locations of the boreholes are shown in Drawing 1 in Appendix D. All boreholes were commenced using concrete coring equipment to penetrate (i.e. drill through) the existing concrete slab. Augering and wash boring techniques were used to extend the borehole to material considered suitable for coring (i.e. rock). Boreholes were cased and advanced down to the termination depth using diamond drilling techniques to obtain NMLC sized (51 mm diameter) core samples of the soil and bedrock for geotechnical logging and strength testing.
- Standard penetration tests (SPTs) were undertaken at regular intervals within the soil and weathered rock profile at BH01 and BH04 to BH06. Dynamic Cone Penetrometer (DCP) testing was undertaken down to 1.2 m depths or early refusal at boreholes BH02, BH03, BH07 to BH10 and BH12.
- Pocket Penetrometer tests were carried out on SPT samples and soil material retrieved from coring. Point Load Strength Index ($Is_{(50)}$) tests were conducted in cores at approximately 1 m depths, where the rock core was suitable for testing. Selected rock core samples were sent to a laboratory for Uniaxial Compressive Strength (UCS) testing and aggressivity testing.
- Boreholes BH01, BH05 and BH06 were reamed to 96 mm external diameter and boreholes BH01, BH05, BH06, BH09, BH10 and BH12 were flushed with clean water to remove all rock cuttings.

- Installation of six groundwater monitoring wells (BH01, BH05, BH06, BH09, BH10 and BH12) to allow for the measurement of groundwater levels. The wells in BH09, BH10 and BH12 were constructed using 32 mm external diameter Class 18 un-plasticised poly-vinyl chloride (uPVC). The other wells (BH01, BH05 and BH06) were constructed using a 60 mm external diameter uPVC casing. Slotted screen sections comprised 0.4 mm aperture, machine-slotted, Class 18 uPVC pipe, finished with a bottom cap. A durable single sized (poorly graded) quartzose sand filter was placed around the screened section and sealed with bentonite to prevent any surface water from entering the borehole(s). The remaining section of the borehole(s) was backfilled with sand/spoil. The wells were finished with a steel cover installed flush with the existing surface level. Boreholes BH05 and BH10 were fitted with a proprietary gas cover. The construction details for each well are shown diagrammatically on the borehole logs.
- The six wells were purged following the drilling work and the water level recorded using an electronic dip meter. Douglas installed dataloggers within BH01, BH06, BH09 and BH12 wells on 19 November 2025 to carry out continuous long-term monitoring of the groundwater level. Three permeability tests were carried out within these wells to determine the hydraulic conductivity.
- The ground surface level and borehole coordinates at BH01, BH04 to BH06 were recorded by Douglas using a dGPS. The ground surface levels at the remaining boreholes were inferred from the survey drawings provided (refer Appendix B for survey drawings). The ground surface levels are provided as Reduced Levels (RL) in metres relative to Australian Height Datum. The locations of all remaining boreholes were estimated from existing site features.

The approximate locations of all the boreholes, relative to existing site features, is shown on the Test Location Plan included in Appendix E.

5. Field Work Results

5.1 Subsurface Conditions

Details of the subsurface conditions encountered are given in the borehole logs included in Appendix E, with notes defining classification methods and descriptive terms. Photographs of the rock cores were taken and are presented with the relevant borehole logs.

The following generalised ground profile can be summarised from the borehole logs:

Pavement / Fill soils:	Generally, 120-150 mm thick concrete overlying fill material of between 0.12 m to 3.86 m thickness and including sequences of sandy gravel, gravely sand, sandy clay and clay with deeper fill encountered along the northern retaining wall, north of 33 Herbert Street (BH04 to BH06). The fill appeared to be variably and poorly compacted, with some zones of soft clay encountered (e.g. BH05 at 2.3-4.0 m depth).
Residual Soils:	Generally, 0.2 m to 2.40 m thick residual clay and clayey sand transitioning to extremely weathered sandstone at depths of up to 5 m. The residual soil ranged from a firm to hard consistency.

Sandstone (Mittagong Formation):	Mostly low and medium strength with extremely low and high strength bands, highly weathered with extremely weathered seams, fractured and slightly fractured sandstone, to typical depths of between 5 m and 7.5 m below the ground surface level. Includes bands or high strength, iron-cemented ferruginous sandstone).
Sandstone (Hawkesbury Sandstone):	Mostly medium strength then medium and high strength with occasional extremely weathered seams, slightly weathered then fresh, slightly fractured to unbroken sandstone with occasional highly fractured and fragmented bands.

5.2 Groundwater Readings and Permeability Tests

Groundwater was not observed during auger drilling of the boreholes. The essential use of water as a drilling fluid during wash boring and coring of the boreholes precluded any further groundwater observations. The installed monitoring wells (BH01, BH05, BH06, BH09, BH10 and BH12) were purged dry of drilling fluids (after the completion of drilling) using a downhole pump. Manual checks of the groundwater level were carried out following purging using an electronic dip meter.

Continuous long-term monitoring of groundwater levels was carried out from 19 November 2025 to 23 February 2026 via the use of downhole data loggers recording ground water level measurements at 60 min intervals. Manual checks of the groundwater level were also carried out during the monitoring period. The monitoring results are presented in hydrograph plots in Appendix I.

A summary of the most recent measured groundwater levels following purging and during the monitoring period is provided in Table 1 below.

Table 1: Summary of Manual Groundwater Measurement (BH01, BH05, BH06, BH09, BH10 and BH12)

Manual Groundwater Level Readings						
Borehole ID	Borehole Surface Level (RL, AHD)	Groundwater Level (RL, AHD)				
		19 November 2025	20 November 2025	21 November 2025	21 January 2026	23 February 2026
BH01	76.8	70.6	70.2	70.4	70.2	70.1
BH05	76.8	NE	NE	NE	NE	NE
BH06	76.8	70.7	70.6	70.7	70.2	70.2
BH09	74	71.4	71.3	71.3	71.4	71.3
BH10	71.2	70.9	70.9	70.9	70.9	70.8
BH12	74	71.5	71.5	71.2	71.3	71.4

NE = Not Encountered

It should be noted that groundwater levels are transient and may fluctuate over time, particularly, following periods of heavy rainfall (due to climatic, seasonal and other factors).

Rising head permeability tests were carried out within monitoring wells BH01, BH06, BH09 and BH12 to evaluate the rock mass hydraulic conductivity (or permeability). Permeability testing was carried out between 19 and 21 November 2025. No tests were carried out in BH05 and BH10 as these wells are intended for gas screening (contamination sampling and testing). The rising head test involves removing water and measuring the changes in water level within the well at regular time intervals. The results of the permeability tests using Hvorslev's (1951) method are summarised in Table 2 below.

Table 2: Hydraulic Conductivity Test Results

Borehole	No. of Tests	Hydraulic Conductivity, k (m/s)
BH01	3	7.0×10^{-7} to 3.7×10^{-7}
BH06	3	1.8×10^{-7} to 1.5×10^{-7}
BH09	3	1.8×10^{-7} to 1.3×10^{-7}
BH12	3	1.6×10^{-6} to 1.4×10^{-6}

5.3 Point Load Index Testing

The results of point load strength index testing ($Is_{(50)}$) carried out at regular intervals on rock cores are shown on the respective borehole logs (see Appendix E). The results show $Is_{(50)}$ values in the range of 0.05 to 1.8 MPa, indicating that the rock tested ranged from very low through to high strength. The test results were plotted against depth, as shown in Figure 5. It is noted that point load strength testing can be inaccurate in weathered (leached and ferruginous / iron cemented) rock and very low strength materials (i.e. below $Is_{(50)}$ values of 0.1 MPa).

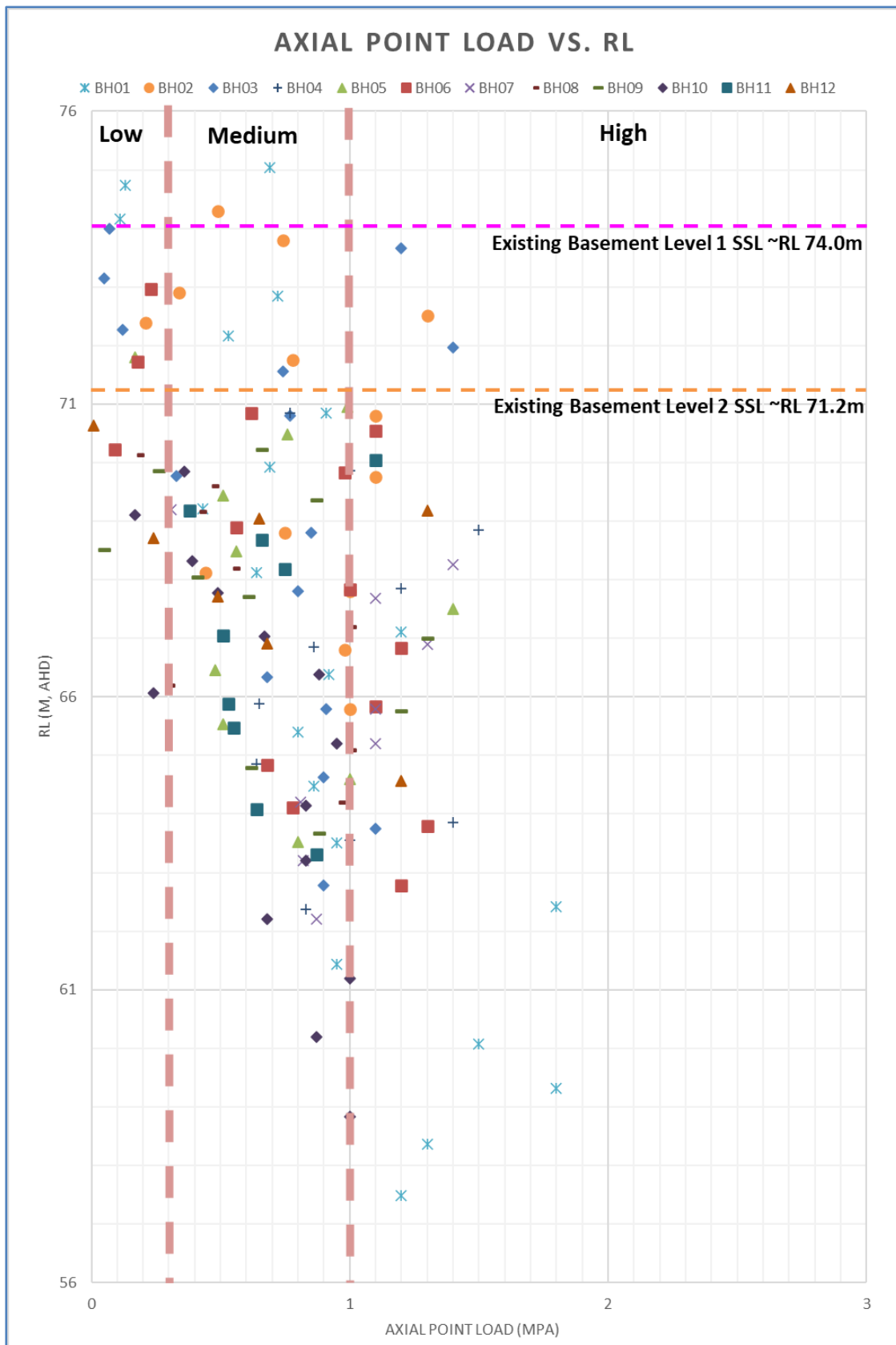


Figure 5. Axial Point Load (MPa) vs RL (m, AHD) Graph

6. Laboratory Testing

6.1 Geotechnical Testing

The geotechnical laboratory testing included testing of eighteen samples (six rock, eight soil and four water) to determine:

- Unconfined Compressive Strength (UCS) and modulus of the rock.
- Soil aggressivity (pH, Electrical Conductivity, Chloride Ion Content and Sulphate Ion Content) for exposure classification of buried concrete and steel elements.
- Water aggressivity (pH, Electrical Conductivity, Chloride Ion Content and Sulphate Ion Content) for exposure classification of buried concrete and steel elements.

The results of the laboratory testing are summarised in Tables 3 and 4. The detailed laboratory test reports are included in Appendix H.

Table 3: Results of UCS and Deformation Testing

Bore	Depth (m)	Uniaxial Compressive Strength (MPa)	Tangent	Secant
			Elastic Modulus (GPa)	Elastic Modulus (GPa)
BH01	4.75-4.95	21.1	4.6	3.7
BH05	6.47-6.78	14.3	4.4	4.4
BH07	5.45-5.65	24.1	2.9	3.0
BH10	5.20-5.39	3.4	0.6	0.6
BH10	12.41-12.61	24.1	-	-
BH11	8.53-8.80	12.9	2.7	2.3

Table 4: Summary of Aggressivity Laboratory Test Results

Borehole	Material*	Depth (m)	pH	Conductivity (µS/cm)	Cl (mg/kg)	SO ₄ (mg/kg)
BH01	CLAY	1.0-1.45	5.1	54	<10	70
BH04	FILL: CLAY	1.8-2.0	5.0	380	20	690
BH04	CLAY	3.0-3.45	4.2	85	<10	110
BH06	FILL: GRAVELLY SAND	1.0-1.45	6.2	82	<10	60
BH07	FILL: CLAYEY SAND	1.4-1.5	6.6	93	<10	130
BH08	SANDY CLAY	0.7-0.8	7.5	86	<10	21
BH09	FILL: CLAY	1.9-2.0	6.6	160	<10	270

Borehole	Material*	Depth (m)	pH	Conductivity (µS/cm)	Cl (mg/kg)	SO ₄ (mg/kg)
BH12	FILL: GRAVELLY SAND	0.3-0.4	8.3	140	<10	99
BH01	Water	-	6.9	1,500	280	90
BH06	Water	-	6.4	1,600	380	110
BH09	Water	-	6.4	1,400	270	180
BH12	Water	-	6.5	1,400	260	160

Notes: Cl = Chloride ion concentration, SO₄ = Sulphate ion concentration

6.2 Environmental Testing

This report does not include results of the environmental testing that was carried out by Douglas. A Preliminary Site Investigation (contamination) report have been prepared (Douglas ref: 237003.02.R.001.Rev0, dated 10 March 2026).

7. Geotechnical Model

Based on the results of the investigation, the northernmost site (37 Herbert Street) is underlain by a surficial layer of fill and residual soil (deepening to the south) over sandstone bedrock. At 33 Herbert Street some cutting and filling is evident at the test locations, as seen by the fill depths observed, with deeper depths of fill present near the retaining wall(s) between the stepped one and two level basement, likely associated with the stormwater tunnel behind the retaining wall (refer Drawing 1, Appendix D and Plate 1, Appendix F). Deeper fill depths were also present near the northern retaining wall (refer BH05). Deeper fill may potentially be associated with the former quarry if it once extended from the western side of Herbert Street across to the site.

Groundwater seepage was generally not observed during the augering (to typical depths of 2 - 3 m), however, perched ephemeral seepage across the top of the rock and along bedding planes / joints within the rock should be anticipated. During the site visit it was noted that the sump within the existing level two basement had a continuous water inflow (refer Drawing 1, Appendix D and Plate 2, Appendix F). Based on the registered groundwater bores the permanent groundwater table is likely to be located well below the existing basement and proposed excavation level, however, it should be noted that groundwater levels are transient and may fluctuate over time, particularly following periods of heavy rainfall. The groundwater levels measured within the monitoring wells (BH01, BH06, BH09 and BH12) indicate the maximum groundwater level measured at RL 71.5 m, which is 0.3 m above the existing Level 2 basement slab level. This groundwater level is considered to be associated with a perched water table, possibly related to leakage from the stormwater tunnel. Any additional excavation is therefore also expected to be below the inferred perched ground water level.

For design purposes, the interpreted subsurface profile during the investigation has been grouped into five geotechnical units. Four geotechnical cross sections (Section A-A', B-B', C-C' and D-D') showing the interpreted subsurface profile between the borehole locations are shown on Drawings 2 to 5, respectively (refer Appendix D). The dashed lines represent the interpreted geotechnical unit boundaries between boreholes. It should be noted that the ground profiles

and geotechnical boundaries are only accurate at the borehole locations and should be expected to vary in between and away from the borehole locations.

A summary of the generalised sequence of geotechnical units encountered across the site is given in Table 5.

The rock encountered in the boreholes has been classified in accordance with Pells et al (2019) "Classification of Sandstone and Shale in the Sydney Region: A Forty Year Review" Aust. Geomechanics Journal, June 2019. There are five classes of sandstone rock (I to V) based on strength, defect spacing and the allowable seams such as sheared zones and clay seams. Class I rock is the best quality (high strength with very few defects) while Class V represents the lowest quality rock (very low strength and/or numerous defects). Note the Pells classification system was developed for the design of footings and foundations. Its use here in this section of the report is for general communication purposes only and it should be noted that it is not specific to a particular rock mass, nor which of the three criteria govern the classification (i.e. UCS, defect spacing and allowable defects).

Table 5: Summary of Interpreted Geotechnical Model

Geotechnical Unit	Description*	Rock Class**	Detailed Description*
Unit 1	Pavement / Fill soil	-	Concrete pavement overlying fill soil comprising sandy gravel, gravely sand, sandy clay and clay.
Unit 2	Residual soil	-	Residual clay and clayey sand transitioning to extremely weathered sandstone at depths of up to 5 m.
Unit 3	Low and medium strength sandstone with high and very low strength bands and clay seams	Class V / IV Sandstone	Sandstone of low and medium strength with high and very low strength bands and seams. Iron-cemented, ferruginous bands of medium and high strength. Mainly highly and moderately weathered with extremely weathered seams with clay soil properties to a metre thickness, generally fractured and slightly fractured.
Unit 4	Medium strength sandstone	Class III Sandstone	Sandstone of mainly medium strength with high strength bands, slightly weathered and fresh, slightly fractured with sheared zones and crushed bands (50 mm to 390 mm thick).
Unit 5	Medium and high strength sandstone	Class II Sandstone	Sandstone and interbedded sandstone and siltstone of medium and high strength, fresh, slightly fractured and unbroken.

Notes: Geotechnical unit determined based on the cored borehole logs provided in Appendix D.

* Strength description based on Australian Standards AS1726

** Rock class in accordance with Pells et al (2019)

Reference should be made to the borehole logs for more detailed information and descriptions of the soil and rock profile.

8. Proposed Mixed Use Development

Based on the supplied architectural Work In Progress (WIP) drawings (refer Appendix C), it is understood that the proposed mixed use development will include the demolition of existing structures on the site followed by the construction of two towers of 39 storeys and 13 storeys at 33 Herbert St and 37 Herbert St, respectively. It is further understood that the existing one and partial two-level basement at 33 Herbert Street will be retained. Excavation is planned at the existing partial two-level basement for a proposed lift core and to extend the basement up to the western and northern boundary (i.e. new shoring walls will be required, refer Appendix D, Drawing 1). A uniform FFL at RL 71.16 m is planned for the future two-level basement. It is therefore assumed that bulk excavation down to around RL 70.8 m is required across the two-level basement footprint with minor local deepening of the existing drainage pit and excavation for new foundations and the lift core.

Based on the supplied structural concept drawings prepared by TTW (refer Appendix G) it is understood that the existing eastern and southern basement walls of 33 Herbert Street will be retained. The drawings show that a 300 mm thick retaining wall is to be constructed in front of the shoring wall for retrofitting of the basement shoring system, to meet current standards for support and durability. It is further understood from the architectural package that a new shoring wall is to be constructed along the western boundary where the existing two-level basement is to be realigned (refer Appendix D, Drawing 1, for local realignment). Given the gently sloping nature of the site and the design bulk excavation level of RL 70.8 m, the excavation height along the western boundary is anticipated to vary between approximately 5.2 m and 6.5 m. It is further understood that the existing northern shoring wall will be demolished to extend the basement.

9. Comments

9.1 Existing Retention Structures and Adjacent Building(s)

Prior to any below ground demolition and excavation it will be necessary to carefully investigate conditions behind the existing retaining walls to ensure that the retained faces and any adjacent structures are not affected by the work. Similarly, material behind the internal wall between the stepped one and two-level basement should be investigated, including the founding conditions of the wall, to inform the proposed core excavation and construction methodology. The project structural engineer and builder should confirm that all existing ground anchors have been destressed prior to commencing with demolition and excavation works.

It will also be necessary to assess the impact that the works will have on the sewer service and stormwater tunnel, located behind the wall (one steel hatch provided access to the existing stormwater tunnel - refer Plate 1, Appendix F). Additionally, the material behind the retaining wall along the northern boundary of 37 Herbert Street should be investigated, including the wall's founding conditions.

The proximity and extent of the neighbouring residential tower to the south (19-23 Herbert Street) should be confirmed, as should the presence of any former basement and shoring walls

associated with the prior development, all of which have potential to constrain the current development scheme.

9.2 Excavation Conditions

Excavation is expected to encounter fill, soil, residual soil and sandstone of predominantly low and medium strength with very low and high strength bands. Medium strength or stronger sandstone is expected to be encountered near the northern boundary of the site, near bulk excavation level.

9.2.1 Excavatability

Excavation of fill and soil (Unit 1), residual soil (Unit 2) and very low and low strength sandstone (weaker material within Unit 3) should be readily achieved using excavators equipped with bucket attachments. However, the assistance of rock hammering or ripping will probably be required for effective removal of any medium to high strength bands (stronger more competent material within Unit 3 and Unit 4).

Medium strength rock is defined as having an unconfined compressive strength (UCS) of 6 to 20 MPa. High strength rock has a UCS of > 20 MPa.

The use of rock breaking equipment (rock hammers and rippers) will generally cause dust, noise and vibration that has the potential to affect adjacent sensitive infrastructure and utilities as well as occupants of nearby buildings.

Heavy-duty piling rigs with high torque heads will generally be required where piles are intended to extend into medium and high strength sandstone.

It is suggested that excavation tenderers make their own assessment of the equipment required to carry out the work. Contractors may inspect the rock core samples at the Douglas office in West Ryde prior to submitting final tenders (rock cores are generally kept for 12 months after drilling unless longer holding times are requested).

9.2.2 Excavation Induced Ground Movement (Stress Relief)

Excavation of up to 8 m is planned, predominantly within soil and weathered rock with only approximately 2 m into medium strength or stronger sandstone likely to be encountered at the northern end of the basement, at 37 Herbert Street.

Locked-in stresses are present within the rock. During excavation, these stresses are released which generally results in lateral movement of the rock mass towards the excavation, dragging the overburden (and any structures) with it. Generally, units of stiffer rock (medium strength or stronger rock) will have higher horizontal locked-in stresses. The amount of displacement that may occur is dependent on the depth of excavation in rock, location of bedding planes and jointing in the rock mass, excavation face length and face orientation. As the maximum principal stress in Sydney is in the north-south direction, the north and south faces can be expected to experience the most stress relief deformation. Although the east-west locked-in stress is less, the east and west faces will still experience substantial stress relief displacement (only relevant to the northeastern and northwestern faces at 37 Herbert Street).

Based on previous experience within Sydney, horizontal stress relief movement can vary from 0.5 to 2 mm /m depth of rock excavated. Maximum movement generally occurs near the crest, midpoint of the face, reducing to near zero in the corners of the excavation. Stress relief movement decreases horizontally with distance away from the excavation. Heave may occur where relatively thin beds of competent rock is left in the base (bed separation due to buckling). Careful consideration should therefore be given to the effects of stress relief on the existing neighbouring structures, buildings and surrounding services. Consideration should also be given to any future neighbouring excavations, particularly where it is in close proximity to the proposed development (this may result in unwanted future rock mass displacement).

9.2.3 Trafficability

Problems may be experienced with site trafficability during wet weather in areas where clay fill material and residual clays are found at the surface or at the bulk excavation level. For general construction machinery, tracked vehicles should be used, or alternatively a layer of good quality granular rockfill, road-base gravel or recycled crushed concrete, could be placed over all or part of the site.

A working platform is likely to be required, especially if larger plant such as piling rigs, heavy cranes, etc. are used on the fill or residual soils. A working platform assessment should be carried out, taking into account the track / wheel loads (to be provided by the contractor).

9.2.4 Vibration

During excavation it will be necessary to use appropriate methods and equipment to keep ground vibration at adjacent buildings, utilities (e.g. existing stormwater tunnel, sewer mains, etc), structures and infrastructure (such as the rail track) within acceptable limits. Excavation through Unit 1 and Unit 2 are not expected to generate excessive vibration. Excavation of Unit 3 to Unit 5 material, however, may generate vibration, which should be monitored and controlled, as necessary.

Similarly, appropriate methods and equipment should be used to keep the vibration related to demolition works within acceptable limits.

The level of acceptable vibration is dependent on various factors including the type of building structure (e.g. reinforced concrete, brick, etc.), its structural condition, founding conditions, the frequency range of vibration produced by the construction equipment, the natural frequency of the building and the vibration transmitting medium. Similar factors apply to the susceptibility of infrastructure and utilities. As the magnitude of vibration transmission is site specific, it is recommended that a vibration trial be undertaken at the commencement of rock excavation and other activities that produce vibration (e.g. piling). The trial may indicate that smaller and/or different types of excavation equipment are needed.

Ground-borne vibration can be strongly perceptible to humans at levels above 2.5 mm / s vector sum peak particle velocity (VSPPV). This is generally much lower than the vibration levels required to cause structural damage to buildings. It is suggested that vibrations be provisionally limited to a VSPPV of 8 mm/s, measured at the foundation level of existing buildings, for human comfort considerations and to protect architectural features.

This provisional level complies with AS/ISO 2631.2-2014 and is below the normal building damage threshold level. This vibration limit may need to be reduced for any sensitive buildings, infrastructure, utilities and structures (i.e., the church buildings to the south and the rail track).

A Vibration Monitoring Plan (VMP) should be prepared for the site before works commence. In addition to the VMP, a demolition and excavation plan will also be required. The VMP should take into account the specific vibration levels for the site, including the impact that the works will have on the adjacent rail track infrastructure.

9.2.5 Dilapidation Surveys and Monitoring

Dilapidation surveys should be carried out on adjacent buildings, pavements, utilities and infrastructure, including the Sydney Train railway infrastructure, that may be affected by demolition works, excavation and ground-borne vibration.

Dilapidation surveys should be undertaken before the commencement of any demolition / excavation work, to document any existing defects so that claims for damage due to construction related activities can be accurately assessed.

It should be noted that a dilapidation survey for the Sydney Trains railway may only be possible during a scheduled “shutdown”. Consideration should be given to installing the vibration monitors (if required by the VMP) and any other survey or monitoring equipment (such as survey targets) during such shutdown periods.

9.2.6 Disposal of Excavated Material

All surplus excavated materials will need to be disposed of in accordance with the Protection of the Environment Operations Act 1997 (POEO Act). All materials removed from the site are defined as waste under the POEO Act and must be disposed of in accordance with one of the following:

- Virgin excavated natural materials (VENM) as defined under the POEO Act, which can be reused; or
- A waste category meeting the criteria set out in the NSW EPA Waste Classification Guidelines 2014, with the materials disposed to a landfill licenced to receive the waste under the assigned classification or taken to a recycling facility licenced to receive the waste; or
- Material complying with a Resource Recovery Order (RRO) as defined under the Protection of the Environment Operations (Waste) Regulation 2014, with complying materials able to be reused under certain conditions.

Reference should be made to Douglas’ preliminary site investigation (contamination) report for further information (Douglas ref: 237003.02.R.001.Rev0, dated 10 March 2026).

9.3 Excavation Support

Careful consideration must be given to the planning and design of excavations and excavation retention system(s), especially along boundaries where excessive deformation or failure can cause damage to nearby buildings, rail and road infrastructure, footpaths, services, etc. All surcharge loads from adjacent structures including construction loads, stockpiles etc., should be taken into account when assessing the stability and design of batters and shoring walls.

The extent and level of the adjacent basement along the southern boundary should be confirmed prior to design of the site retention and foundation system (well before demolition commences). Where required, careful consideration will need to be given to the use of ground anchors or struts to support the existing retaining walls including the position and depth of new foundations. The above information should be provided to the project geotechnical engineer for comment during the design phase.

Stability of the existing retaining wall along the northern site boundary should be addressed well before demolition commences.

9.3.1 Batter Slopes

Battering is not expected to be possible for the excavation at 33 Herbert Street. Battering may only be possible for a short section along the western basement cutline of 37 Herbert Street.

Battering of the excavation sides at safe angles may be possible where there is sufficient distance to the boundary, such as along the proposed northwestern basement cutline of 37 Herbert Street. Temporary and permanent batters of <3 m in height in fill / soils (Units 1 and 2) should be cut no steeper than 2:1 (Horizontal:Vertical) and 1.5:1 (H:V), respectively. This should be flattened to 3:1 (H:V) in the unlikely scenario of incorporating permanent batters external to buildings, with vegetation and regular maintenance to protect against erosion of the batter face. Temporary and permanent batters <3 m in height in weathered rock (Unit 3), should be cut no steeper than 0.75:1 (H:V) where they are not adversely affected by joints and where there are no structures closer than 1.5H from the batter crest (where H is the height of the batter).

Temporary and permanent batters over 3 m in height in any material should be designed individually by an experienced geotechnical professional.

The proposed excavation is not expected to encounter competent medium strength or stronger material that is suitable to be cut vertically without support (jointed Unit 4 material).

9.3.2 Retaining Walls

Vertical cuts within the soils (Units 1 and 2) and weathered / jointed rock profile (Unit 3 and Unit 4) will require both temporary and permanent lateral support.

It is understood that most of the existing retaining walls in the 33 Herbert Street basement will be utilised for temporary and permanent retention. New shoring walls, however, will be required for all new realigned walls and where the basement is extended. The existing northern retaining wall will need to be demolished as part of the basement extension works.

All existing retaining walls should be temporarily supported before the current support (floor slabs) is removed. All shoring, including the new shoring walls, should be supported with either anchors or internal props, similar to that suggested in the TTW package (SK02(2), refer Appendix G).

Horizontal core holes and local exposures will be required to investigate the material behind the existing walls along the eastern and southern boundaries. A carefully engineered approach will be required for 33 Herbert Street to systematically remove the old wall, to allow safe installation

of the new wall. This will require a design and construct approach and is generally carried out under close supervision of the geotechnical and structural engineers.

Where props are used to provide internal temporary restraint to the existing retaining walls, the props should be fixed to a “deadman” footing. Existing footings could be considered, but each prop and footing should be individually assessed by the geotechnical and structural engineer to confirm that the system has adequate lateral capacity to support the shoring / retaining wall.

New shoring could comprise anchored soldier pile walls, similar to the existing shoring walls, provided approval is granted from authorities and adjacent property owners for the installation of temporary anchors. These soldier pile walls are often used to provide temporary support for soils and weathered rock. The soldier piles are usually spaced at approximately 2 m to 2.5 m centres, however, more closely spaced piles may be required to reduce wall movements, or prevent collapse of material between piles, particularly where pavements, structures or services are located in close proximity to the excavation. A cantilevered soldier pile wall may be considered where ground anchors is not possible to be utilised. The pile diameters will likely need to increase substantially, and pile spacing will need to be reduced, compared to the existing shoring system, to limit deflection (to be assessed by structural and geotechnical engineer).

Depending on conditions the existing retaining wall(s) between the stepped one and two-level basements may need rectification or replacement, particularly where the new lift core is proposed. Careful consideration should be given to the design, demolition and excavation methodology to ensure that support is maintained, especially for the existing stormwater tunnel and the sewer service.

New shoring piles should extend below the existing and proposed basement excavation levels.

It is suggested that preliminary design of any cantilevered shoring systems (or shoring with one row of anchors or propping) be based on a triangular earth pressure distribution using the ‘active’ earth pressure coefficients provided in Table 6. ‘Active’ earth pressure coefficient (K_a) values are used where some wall movement is acceptable.

‘At rest’ earth pressure (K_o) values should be used where the wall movement needs to be reduced (i.e. adjacent to existing structures, utilities or close to a railway line).

Table 6: Recommended Design Parameters for Shoring Systems

Unit	Material	Unit Weight (kN/m ³)	Earth Pressure Coefficient	
			Active (K_a)	At Rest (K_o)
1	Fill Soil	20	0.35	0.5
2	Residual Soil	20	0.25	0.35
3	L and M strength sandstone with H and VL strength bands and seams	22	0.15	0.25

Unit	Material	Unit Weight (kN/m ³)	Earth Pressure Coefficient	
			Active (K _a)	At Rest (K _o)
4	M Sandstone	24	0*	0*
5	M & H Sandstone	24	0*	0*

Note: VL = Very Low Strength, L = Low Strength, M = Medium Strength, H = High Strength

* Subject to joint assessment by experienced Geotechnical Engineer/Engineering Geologist (earth pressures provided, should a deeper basement excavation be considered).

The design for lateral earth pressures where multiple rows of anchors or propping are used (i.e. two rows or more of anchors or props) may be based on a trapezoidal earth pressure distribution. The following earth pressure magnitudes are considered appropriate, where H is the height of soil and weathered rock to be retained, in metres:

- 4H kPa, where some lateral movement is allowed;
- 6H kPa, where wall movement is to be minimised; and
- 8H kPa, where it is critical that deformation is controlled and lateral movements need to be limited (e.g. next to buildings, services and railway line).

Note these earth pressure distributions are “pressure envelopes”, selected to ensure that no row of anchors is overloaded during the temporary support phase. The actual magnitude and distribution of lateral earth pressures may differ from the uniform distribution given above. Numerical methods can also be used to assess the earth pressure distribution.

In all cases, additional surcharge loads such as new and existing footings, construction loads, traffic loads, etc., must be allowed for in the design, applied as a rectangular earth pressure distribution over the depth of influence.

The earth pressure loading described above does not include earthquake loads or hydrostatic pressures. Unless positive drainage measures are incorporated to prevent water pressure build-up behind the walls, a hydrostatic head taken at RL 73.5 m should be allowed for in design, while at the same time reducing the material unit weight to account for the buoyant condition. Drainage could comprise 150 mm wide strip drains pinned to the face at 1 m to 2 m centres behind shotcrete in-fill panels. The base of the strip drains should extend out from the shoring wall to allow any seepage to flow into a perimeter toe drain which should be connected to the stormwater drainage system.

For new retaining walls and where additional excavation is planned, especially in front of existing walls, a staged inspection (by a suitably qualified geotechnical engineer) and excavation sequence will be required to confirm that the material in front of the wall / pile is not adversely affected by discontinuities and that the material can temporarily bridge between the piles. Shoring piles that are intended to support structural compression loads should be taken to below the bulk excavation, designed based on the allowable foundation pressures given in Section 9.5.

Local earth pressure loading on the shotcrete infill panels should be calculated during detailed design works with input from the project geotechnical engineer. For preliminary design

(assuming cantilevered pile or single row of support) the earth pressure can be based on a triangular earth pressure distribution (soil strata, Unit 1 and 2) and rectangular earth pressure distribution (jointed rock, Unit 3) based on the earth pressure coefficients in Table 6 above.

The final or detailed design of shoring walls is normally undertaken using interactive computer programs such as WALLAP or FLAC/PLAXIS, which can take soil-structure interaction during the progressive stages of wall construction, anchoring and excavation into account.

9.3.3 Passive Resistance

Passive resistance for piles founded in rock below bulk excavation level (including allowance for services and/or footings) may be based on the ultimate passive restraint values provided in Table 7. Passive resistance within Unit 1 and Unit 2 should not be relied upon. The top 0.5 m of the socket or embedment depth should be ignored.

Table 7: Recommended Passive Resistance Values

Unit	Foundation Stratum	Maximum Ultimate Passive Pressure (kPa)
3	L and M strength sandstone with H and VL strength bands and clay seams	400*
4	M Sandstone	1500*
5	M & H Sandstone	2000*

Note: VL = Very Low Strength, L = Low Strength, M = Medium Strength, H = High Strength

* Subject to geotechnical inspection

9.3.4 Ground Anchors

The design of temporary and permanent ground anchors/rockbolts for the support of excavations and/or shoring systems may be carried out on the basis of the maximum bond stresses given in Table 8. Support elements used for lateral support should be bonded in the stronger rock, inclined as required, but preferably not steeper than 30° below the horizontal. The use of permanent anchors, if required, would need careful attention to corrosion protection for which further geotechnical advice should be sought. A detailed specification would need to be prepared for the installation and stressing of all anchors.

Anchors can also be used vertically as hold down anchors to resist temporary or long-term uplift (to be designed in accordance with AS4678). The designer should check the cone-pull-out failure mechanism by assuming a 90° cone in medium to high strength, slightly fractured (or better quality) sandstone. Note that the buoyant weight of the rock should be used below the water table.

Table 8: Recommended Bond Stresses for Rock Anchor Design

Unit	Material Description	Maximum Ultimate Bond Stress (kPa)
3	L and M strength sandstone with H and VL strength bands and clay seams	200
4	M Sandstone	800
5	M & H Sandstone	1500

Note: VL = Very Low Strength, L = Low Strength, M = Medium Strength, H = High Strength

The values in Table 8 should be confirmed by pull-out tests prior to installation of support elements. Ultimately, it is the contractor's responsibility to ensure that the correct design values (specific to the support system and method of installation) are used and that the support element holes are carefully cleaned prior to grouting.

After temporary support elements have been installed, it is recommended that they are tested to 150% of their nominal working load. Where unavoidable movement of the shoring is expected, it is recommended that the support elements are locked off at a lower value than their working loads (if possible) to accommodate the additional movement and subsequent increase in stress in the support elements. Alternatively, the support elements need to be designed to accommodate additional movement. During construction, checks should be carried out to confirm that the load in the support elements is maintained and that losses due to creep or other causes do not occur.

Care should be exercised to ensure that anchors are installed progressively and stressed prior to excavation of the next drop to ensure that stability is maintained at all times.

Shorter support elements (i.e. rockbolts, dowels and pins) may be required to support any unstable rock wedges, slivers or blocks. Short dowels and pins may be required to support feather edges where sub-parallel joints intersect the excavated faces.

It is anticipated that the new structure will support the shoring walls over the long term and therefore support elements are expected to be temporary only.

It should be noted that permission will be required from authorities and adjacent property owners prior to installing rockbolts / ground anchors below their land. Due consideration should also be given to the location and type of below-ground excavations, services, etc.

9.3.5 Excavation and Loading Adjacent to TfNSW Assets

Reference should be made to TfNSW Technical Direction GTD 2020/001, Version No. 01, dated 2 July 2020 for the requirements of TfNSW concurrence for developments where there is a risk that it may affect the TfNSW assets (railway line). An assessment of ground movement and instrumentation and monitoring plans may be required by TfNSW prior to commencing construction.

It is recommended that the design team familiarise themselves with the relevant documents for future consultation with TfNSW.

9.4 Groundwater

The groundwater levels measured within the monitoring wells (BH01, BH06, BH09 and BH12) indicate a groundwater level as high as RL 71.5 m which is ~0.7 m above the proposed bulk excavation level of the two-level basement. This groundwater level is considered to be associated with a perched ephemeral water table, possibly exacerbated or elevated due to leakage from the stormwater tunnel. The underfloor drainage system should take this perched water table into account. Investigation and repair of any leaking services should be carried out prior to pouring of the new floor slab.

The hydrographs in Appendix I show the water levels in BH01, BH06, BH09 and BH12 over fourteen weeks, between 19 November 2025 to 23 February 2026. The recorded water levels range from RL 70.0 m to RL 71.5 m AHD. It should be noted that higher water levels were recorded within BH09 and BH12 which are located in the vicinity of the existing one level basement. The water levels at each monitoring well have remained relatively consistent over the monitoring period. Rainfall is also shown on the graphs.

Elevated groundwater associated with perched water is expected to generally follow the topography (commonly just above the top of the rock), seeping into the rock through a three-dimensional network of discontinuities (joints and bedding planes). Seepage during construction and in the long term can therefore be expected near the top of rock (particularly after periods of wet weather) and through the joints and bedding planes exposed in the rock face. Around the perimeter of the excavation, most inflow is likely to occur through the upslope faces, with some upward flow through the floor (there is currently evidence of seepage (dampness on block walls) on the north side of the existing two-level basement).

As the basement excavation is unlikely to intercept the regional groundwater table, the Aquifer Interference Policy does not apply. As the existing basement level is intercepting a perched water table a risk-based assessment using numerical methods may need to be undertaken, in accordance with the NSW DPIE Groundwater Guidelines.

Douglas carried out a Groundwater Impact Assessment, GIA (Douglas ref: 237003.00.R.003.Rev0, dated 13 March 2026) to predict the groundwater take based on the proposed development and the groundwater levels encountered during the monitoring period. The predicted groundwater take for the proposed development is greater than 3ML/year and therefore a Water Access Licence (WAL) may be required for a drained basement design, following construction. The need for a WAL, however, will depend on the actual annual water volume take and therefore accurate records should be kept during construction and in the long-term. This preliminary assessment of groundwater take was predicated on the assumption that water stored in the quarry backfill, which is at a higher elevation, will influence the groundwater profile on the subject site.

On the basis of the above, Douglas requested that a calibrated flow meter be installed within the existing sump of 33 Herbert Street to measure the actual volume of water that is being extracted. The flow meter was installed on 18 March 2026 and a baseline reading recorded. It was recommended that the flowmeter data be used to calibrate the numerical modelling after three months of continuous measurement. The GIA report will be updated at this time.

Notwithstanding the above, it is noted that drained basements in the St Leonards area are common, including the existing two-level basement at 33 Herbert Street. As such it is expected that drained basement scheme will be feasible for the proposed basement extension at this site.

During construction and in the long-term it is anticipated that seepage into the excavation should be readily controlled by perimeter drains, connected to a "sump-and-pump" system, typically installed for drained basements. Once approved by DCCEEW, a drained basement will require permanent subfloor drainage to direct seepage to the sump for discharge into the stormwater system. The disposal requirements of water collected on-site will be dependent on the chemical composition of the water and compliance with relevant environmental guidelines.

Previous experience in Sydney is that seepage will likely contain relatively high levels of soluble iron that will form a precipitate in the form of a gelatinous 'sludge' when exposed to oxygen. This 'sludge' has the potential to block-up subsoil (gravel) drains and 'seize-up' pumps. Therefore, detailing of subfloor drains, sumps and pumps should incorporate provision for regular maintenance such as flushing and 'rodding' of drains and/or 'baffle' pits.

9.5 Foundations

Based on available information it is understood that the existing foundations for 33 Herbert Street comprise pad footings in the northern portion of the two-level basement with pile foundations in the southern portion of the two-level basement and over the entire footprint of the one level basement. The existing foundation arrangement for the buildings on 37 Herbert Street is unknown but likely comprise shallow footings, given the modest size of the existing building.

It is understood that new foundations will be constructed for both 33 and 37 Herbert Street. Based on the depth to competent medium strength or stronger rock it is expected that both piled foundations and pad / strip foundations will be required to support the proposed development.

Shallow foundations may be possible for the part of the two-level basement, except for the southern portion where sound medium strength (Unit 4) sandstone could be as deep as 3.5 to 4.0 m below.

Typical parameters for the design of pad and piled foundations on sandstone, based on the classification methods of Pells et al. (1998) are shown in Table 9, subject to spoon testing / proof coring, where required. Shaft adhesion values for uplift (tension) in piles may be taken as being equal to 70% of the values for compression, provided that adequate socket roughness is achieved.

Table 9: Recommended Parameters for Foundation Design

Foundation Stratum	Allowable Bearing Pressure		Ultimate Bearing Pressure		Typical E field (MPa)	Vertical Modulus of Subgrade Reaction, for pile with diameter, d, in mm K_v (kPa/mm)	Vertical Modulus of Subgrade Reaction, for square pad footing with dimensions, b, in mm K_{base} (kPa/mm)
	End Bearing (kPa)	Shaft Adhesion ⁽¹⁾ (Compression) (kPa)	End Bearing (kPa)	Shaft Adhesion ⁽¹⁾ (Compression) (kPa)			
Class V/IV– Low & medium strength sandstone, with major weak seams (Unit 3)	1,000	100	4,000	400	50 to 250	(70,000 to 350,000)/d	(48,000 to 240,000)/b
Class III - Medium strength sandstone (Unit 4)	3,500	350	20,000	800	350 to 1,200	(490,000 to 1,700,000)/d	(336,000 to 1,150,000)/b
Class II - Medium to high strength sandstone and interbedded Siltstone (Unit 5)	6,000	600	60,000	1,500	900 to 2,000	(1,250,000 to 2,800,000)/d	(864,000 to 1,920,000)/b

Note:

⁽¹⁾ - Shaft adhesion applicable to the design of bored piles, uncased over the rock socket length, where adequate sidewall cleanliness and roughness are achieved.

Ultimate parameters are mobilised at large settlements (i.e. >5% of pile diameter or foundation width).

d = diameter and b = footing width.

Modulus of subgrade values provided are for isolated footings / piles. Group interaction effects may reduce these values and should be considered in design.

The modulus of subgrade reaction values are strain-dependent and should be used with an appropriate design strain or deflection level.

The foundation design parameters given in Table 9 assume that the foundation excavations are clean and free of loose debris prior to concrete placement. Foundations proportioned on the basis of the allowable bearing pressures in Table 9 would be expected to experience total settlements of less than 1% of the foundation width, with differential settlements between adjacent foundations expected to be less than half of this value.

Existing footings should only be considered for reuse if the allowable bearing capacity of the foundation material is adequate to carry the new loads. This will require detailed investigation for each footing considered for re-use, even if the new load is less than the original load. The structural engineer will also need to confirm that the foundations are sound and have adequate design life from a durability viewpoint. It is Douglas's recommendation that all existing footings, other than those of shoring walls that are to be retained, are removed, replaced with new footings / piles designed based on Table 9 above.

Foundations positioned near the stormwater tunnel (owned by Council) and the existing sewer service (owned by Sydney Water) should be set-back from the service in accordance with Sydney Water requirements. In all cases new footings or piles must be founded below the invert level, designed to not adversely impact the service. A detailed geotechnical and structural assessment may be required as part of a Specialist Engineering Assessment (SEA).

Similarly, the core foundation is shown to be in close proximity to the existing water services referred to in the above. Additional excavation may remove confinement in front of the existing retaining walls and services. A carefully engineered approach will be required to systematically remove old structures, then excavate and install the new structure while maintaining stability and serviceability during the works.

New pad footings should not be designed to be partly founded on an existing foundation and partly on rock unless the existing foundation bearing capacity has been confirmed and the foundation has been designed to accommodate any resulting differential settlement.

9.5.1 **Pad Footings**

To adopt an allowable bearing pressure value of greater than 3.5 MPa for design, a minimum of four cored bores will be required with spoon testing carried out in at least a third of footings across the site during construction. If allowable bearing pressures greater than 6 MPa are used in design, then cored bores at a maximum 10 m grid spacing or cored bores for 50% of footings and spoon testing carried out on the remaining footings are required. Spoon testing, however, will only be possible in shallow footings. For spoon testing, a 50 mm diameter hole is drilled below the base of the footing to a depth of 1.5 times the footing width, followed by testing to check for the presence of defects such as weak layers or clay bands (which should be taken into consideration in the design).

All footings should be founded below the zone of influence of any existing or proposed services / trenches, pits or tanks. Generally, the zone of influence in medium strength sandstone can be defined by a plane extending upwards at 45° from the base of the adjacent service trench, pits or tanks (all footings affected to be assessed individually).

All footings should be inspected by a geotechnical engineer prior to the placement of blinding, steel and concrete to confirm that foundation conditions are suitable for the design parameters, and proof drilled, or spoon tested as appropriate. If the material is not assessed as appropriate to

the design or if weak seams or defects are encountered, footings may need to be deepened until suitable foundation material is reached or enlarged to reduce the bearing pressure to suit the ground conditions.

9.5.2 Piled Foundations

For pile design, a basic geotechnical strength reduction factor, Φ_{gb} , of about 0.56 (or possibly higher) calculated from Table 4.3.2 (A, B, and C) of AS2159-2009: Piling Design and Installation, is considered feasible. However, the structural engineer will need to make their own assessment with the final (Φ_{gb}) number being dependent on the design and installation method (and associated risk rating) adopted by the structural engineer. A higher Φ_g value could be achieved if pile load testing is carried out.

All laterally loaded pile designs should be individually assessed by the geotechnical engineer.

Drilling of all pile sockets should be witnessed by a geotechnical engineer to confirm that foundation conditions are in accordance with the design intent, and proof drilled as appropriate (depending on the design bearing pressures and side friction adopted). If the material is not assessed as appropriate to the design or if weak seams or defects are encountered, piles may need to be deepened until suitable foundation material is reached. The foundation design parameters given above assume that the piles are clean and free of loose debris and water, with pile sockets free of smear and adequately roughened immediately prior to the placement of concrete.

It should be noted that the boreholes within the southern portion of 33 Herbert Street encountered low strength crushed and shear zones with extremely weathered seams at depth which will likely affect foundation performance. The presence of this material should be considered during foundation design. It is recommended that a 3 m proof core hole is drilled at the base of 1/3 of the piles where an allowable bearing pressure greater than 3.5 MPa is adopted for the design. Accordingly, it is recommended that 6 MPa allowable bearing pressure should **not** be adopted for foundation design in this area (for the one level basement).

9.6 Pavements and Engineered Filling

It is expected that the subgrade for the new slab on ground will generally comprise residual clay, for which a preliminary CBR value of 3% may be adopted for pavement design purposes. It is recommended that once the existing slab / pavement levels have been stripped, an inspection be carried out by an experienced geotechnical engineer to confirm the appropriate CBR value to use for design. Any fill that is present will need to be assessed before it can be used as a subgrade material.

Site preparation will be required prior to construction of proposed pavements and driveways. Earthworks recommendations provided in this report should be complemented by reference to AS 3798 – 2007 Guidelines on earthworks for commercial and residential developments.

The following general methodology is suggested for subgrade preparation of pavements and for raising of site levels using engineered fill:

- Strip the existing material down to the design cut levels, removing any topsoil, compressible or other deleterious material.

- Where soil / fill is exposed, proof rolling of the subgrade will be required. Proof rolling of the exposed subgrade should be carried out prior to placement of any fill or the construction of slabs. Proof rolling should comprise six passes of a smooth drum roller (say at least 10 tonne). The final pass should be carried out under the observation of a geotechnical engineer to identify any soft or saturated zones. Any such zones should be over-excavated to a maximum depth of 600 mm and replaced with suitable material.
- If any fill is required to raise surface levels, suitable material should be placed in layers not greater than 200 mm loose thickness and compacted to between 98% to 100% of Standard dry density, with moisture content within $\pm 2\%$ of the optimum moisture content.
- The rock on the site is suitable for reuse as engineered fill construction provided it has a maximum particle size of 75 mm. Reuse should also consider the contamination status and is subject to approval by an environmental consultant. Reuse of the residual soil and existing fill should only be considered following laboratory testing of the material once its exposed.

9.7 Soil and Water Aggressivity

In accordance with AS2159-2009, the results of the chemical laboratory testing indicate that the soils are 'moderately' aggressive and 'non-aggressive' to buried concrete and 'non-aggressive' to buried steel, respectively (refer Table 10 below). Where piles are founded below the water level, the water it is considered to be 'mildly' aggressive to concrete and 'non-aggressive' to steel.

Table 10: Soil and Water Aggressivity Results

Borehole ID	Depth (m)	Material	Aggressivity to Concrete	Aggressivity to Steel
BH01	1.0-1.45	CLAY	Mild	Non-Aggressive
BH04	1.8-2.0	FILL: CLAY	Mild	Non-Aggressive
BH04	3.0-3.45	CLAY	Moderate	Non-Aggressive
BH06	1.0-1.45	FILL: GRAVELLY SAND	Non-Aggressive	Non-Aggressive
BH07	1.4-1.5	FILL: CLAYEY SAND	Non-Aggressive	Non-Aggressive
BH08	0.7-0.8	SANDY CLAY	Non-Aggressive	Non-Aggressive
BH09	1.9-2.0	FILL: CLAY	Non-Aggressive	Non-Aggressive
BH12	0.3-0.4	FILL: GRAVELLY SAND	Mild	Non-Aggressive
BH01	-	Water	Mild	Non-Aggressive
BH06	-	Water	Mild	Non-Aggressive
BH09	-	Water	Mild	Non-Aggressive
BH12	-	Water	Mild	Non-Aggressive
Aggressivity levels as per AS 2159-2009			Very Severe	
			Severe	
			Moderate	
			Mild	
			Non-Aggressive	

9.8 Earthquake Design

A Hazard Factor (Z) of 0.08 would be appropriate for preliminary design in accordance with Australian Standard AS 1170.4 – 2024 *Structural design actions – Part 4: Earthquake actions in Australia*.

The site sub-soil class is considered to be Class C_e as the surface layer of soil and highly or completely weathered rock (i.e. the depth to “engineering bedrock” as defined in AS 1170-.4) exceeds 3 m depth at a number of test locations. Further analyses of the natural site period for this site may enable a lower classification (e.g. B_e) depending on several factors.

9.9 Geotechnical Monitoring and Inspection

It is suggested that the following be carried out either prior to or during the construction phase, as appropriate.

9.9.1 Monitoring

Survey points and inclinometers may be required to monitor the side wall movement of the excavation. The results can then be compared with predicted values (from numerical modelling) to ensure displacements are within the expected range. Note that GTD-2020-001 provides technical directions for excavations adjacent to Transport for NSW (TfNSW) infrastructure and requires the installation of at least two inclinometers adjacent to TfNSW assets such as the railway lines.

It is recommended that survey points are installed (prior to demolition / excavation) at the top of capping beams to monitor wall deflection during the works. Monitoring targets will also be required on any sensitive structures adjacent to the excavation. At least three sets of base readings should be taken prior to proceeding with any demolition / excavation. Readings will need to be taken at regular intervals during and after demolition and excavation works (readings to be forwarded to the geotechnical engineer / structural engineer for assessment).

Dilapidation surveys of adjacent sensitive structures are also recommended to be carried out prior to any demolition or excavation.

Inclinometers may be required as part of TfNSW conditions. Inclinometers will require readings at regular intervals during excavation. Three baseline readings should be taken prior to demolition / excavation commencing.

9.9.2 Geotechnical Inspections

Geotechnical inspections are recommended during construction, such as:

- Inspection of batters every 1.5 m drop in excavation.
- Observing a percentage (% depends on design) of shoring piles or any piles/footings ('deadman') used for temporary restraint of the shoring wall. 100% of shoring piles should be witnessed where they are designed to support permanent building loads.
- Observing a percentage (% depends on design) of temporary ground anchor drilling, installation and stressing.
- Observing a percentage (usually 100%) of permanent ground anchor drilling, installation and stressing.
- Inspection of excavated faces between shoring piles every 1 m drop.
- Inspection of all foundations (pad, strip or pile sockets) and associated cored boreholes / spoon testing.
- Inspection during shoring and related works.
- Earthworks inspection.

A geotechnical Inspection and Test plan (ITP) should be prepared once design has been finalised, prior to construction. A Geotechnical Monitoring Plan (GMP) should also be prepared following the numerical modelling works.

9.9.3 Numerical Modelling

Depending on the requirements of TfNSW, numerical modelling and instrument installation may be required to predict and monitor ground movements for the Sydney Trains (ST) railway line along the eastern boundary. A minimum of three sections is likely required to be assessed.

10. Limitations

Douglas Partners Pty Ltd (Douglas) has prepared this report (or services) for this project at 33 - 37 Herbert Street, St Leonards NSW in line with Douglas' proposal dated 14/07/2025 and acceptance received from Celia Mak of Aqualand St Leonard Development Pty Ltd dated 30 September 2025. The work was carried out under the project terms (Services Contract Standard Form, executed 8 December 2025). This report is provided for the exclusive use of Aqualand St Leonard Development Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of Douglas, does so entirely at its own risk and without recourse to Douglas for any loss or damage. In preparing this report Douglas has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after Douglas' field testing has been completed.

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

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

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

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. Douglas cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by Douglas. This is because this report has been written as advice and opinion rather than instructions for construction.

This report provides specialist advice only and no part of it is considered a Regulated Design under the Design and Building Practitioner Act 2020 (NSW).

Appendix A

About This Report

Introduction

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

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

Copyright

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

Borehole and Test Pit Logs

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

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

Groundwater

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

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

the time of construction as are indicated in the report; and

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

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

Reports

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

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

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

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

continued next page

About this Report

□

Site Anomalies

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

Information for Contractual Purposes

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

Site Inspection

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

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Appendix B

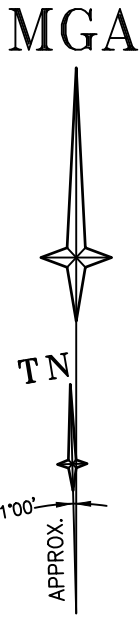
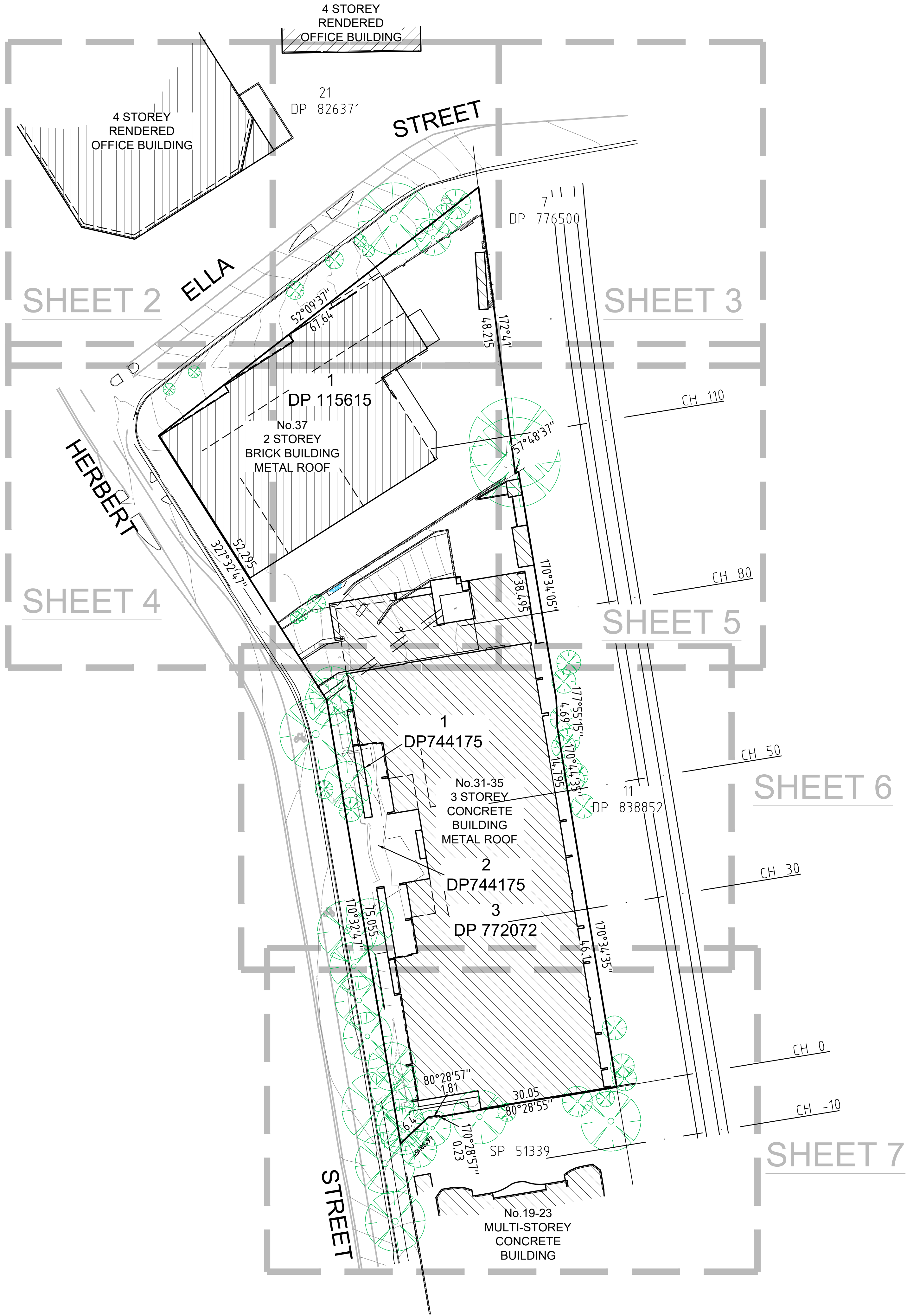
Existing Building Drawings

LEGEND	
BENCH MARK	▲
COMMS PIT	COM
TELSTRA PILLAR	TPIL
ELECTRIC LIGHT POLE	ELP
ELECTRICITY PIT	EPIT
ELECTRICITY BOX	EBOX
POWER POLE	PP
SEWER INSPECTION POINT	SIP
SEWER MANHOLE	SMH
SERVICE PIT	PIT
PIT WITH METAL LID	MLID
STREET SIGN	SS
PARKING METER	PM
VEHICLE CROSSING	(VC)
PRAM CROSSING	(PC)
WINDOW	W
DOOR	D
HEAD/SILL	H/S
COMMUNICATIONS (DBYD)	C
ELECTRICITY (U'GROUND DBYD)	E
ELECTRICITY (OVERHEAD)	P
SEWER (DBYD)	S
WATER (DBYD)	W
GAS (DBYD)	G
GAS (DETECTED)	G(D)
COMMUNICATIONS (DETECTED)	C(D)
WATER (DETECTED)	W(D)
ELECTRICITY (DETECTED)	E(D)
DEPTH TO SERVICES	0:0.5

(A) DEALING I436520 - LEASE TO SYDNEY ELECTRICITY OF SUBSTATION No.6720. (GROUND FLOOR) TOGETHER WITH A RIGHT OF WAY 5 WIDE AND EASEMENT FOR PURPOSES 2 WIDE SHOWN ON PLAN WITH I436520. EXPIRES 29-9-2083.

NOTES

1. THE BOUNDARIES HAVE NOT BEEN MARKED ON GROUND
2. THE BOUNDARY SURVEY (DIMENSIONS AND AREA) HAVE BEEN SURVEYED IN ACCORDANCE WITH SURVEYING AND SPATIAL INFORMATION REGULATION 2017 CLAUSE 10 "IDENTIFICATION SURVEYS" AND ARE SUBJECT TO FINAL SURVEY
3. ORIGIN OF MGA2020 COORDINATES IS TAKEN FROM SSM 85259 - E:332721.678, N:6256554.913 IN HERBERT & ELLA STREETS (24/07/2025)
4. ORIGIN OF LEVELS ON A.H.D. IS TAKEN FROM SSM 85259 R.L. 76.928 (A.H.D.) IN HERBERT & ELLA STREETS
5. CONTOUR INTERVAL 0.25 m
6. CONTOURS ARE INDICATIVE ONLY. ONLY SPOT LEVELS SHOULD BE USED FOR CALCULATIONS OF QUANTITIES WITH CAUTION
7. ONLY SPOT LEVELS SHOULD BE USED FOR CALCULATIONS OF QUANTITIES WITH CAUTION
8. KERB LEVELS ARE TO THE TOP OF KERB UNLESS SHOWN OTHERWISE
9. FLOOR LEVELS SHOWN ARE THRESHOLD LEVELS. NO INVESTIGATION OF INTERNAL FLOOR LEVELS HAS BEEN UNDERTAKEN
10. NO INVESTIGATION OF UNDERGROUND SERVICES HAS BEEN MADE. SERVICES HAVE BEEN PLOTTED FROM RELEVANT AUTHORITIES INFORMATION AND HAVE NOT BEEN SURVEYED. ALL RELEVANT AUTHORITIES SHOULD BE NOTIFIED PRIOR TO ANY EXCAVATION ON OR NEAR THE SITE
11. 8/4/7 DENOTES TREE SPREAD OF 8m, TRUNK DIAMETER OF 0.4m & APPROX HEIGHT OF 7m
12. SHOWS APPROXIMATE POSITION OF ROAD LINEMARKING AND IS INDICATIVE ONLY
13. BEARINGS SHOWN ARE MGA (MAP GRID OF AUSTRALIA) ADD APPROX. 1°00' FOR TRUE NORTH



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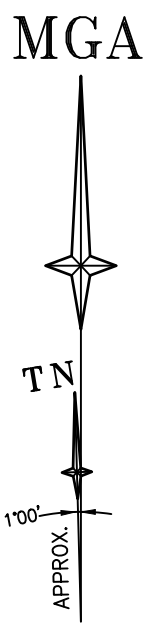
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A	08/10/25	PITS DIAGRAMS AND DETECTED SERVICES ADDED	002
Revision	Date	Description	Reference



THIS IS THE PLAN REFERRED TO IN MY LETTER DATED:
.....
Registered Surveyor NSW

Client AQUALAND ST LEONARDS DEVELOPMENT PTY LTD
Drawing title
PLAN OF DETAIL AND LEVELS OVER 1 DP 115615, LOTS 1 & 2
DP 744175 & LOT 3 DP 772072 AT No.31-35 & 37 HERBERT STREET, ST LEONARDS

datum AHD
site Area 5927 m²
LGA WILLOUGHBY
reference number 52609 001DT
scale 1:400 @A1
date of survey 08/08/2025
SHEET 1 OF 10



21
DP 826371

4 STOREY
RENDERED OFFICE BUILDING

STREET

WINDOWS
GROUND FLOOR H:83.95 S:79.75
1st FLOOR H:87.95 S:84.81
2nd FLOOR H:91.55 S:88.84
3rd FLOOR H:95.15 S:92.49

PARAPET RL97.10

ELLA

SEE SHEET 1 FOR LEGEND & NOTES

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datum AHD

site Area 5927 m²

LGA WILLOUGHBY

reference number 52609 001DT

scale 1:100 @ A1

date of survey 08/08/2025

SHEET 2 OF 10

4 STOREY
RENDERED OFFICE BUILDING

PARAPET RL96.61

WINDOWS
GROUND FLOOR H:83.96 S:....
1st FLOOR H:87.95 S:84.86
2nd FLOOR H:91.55 S:88.84
3rd FLOOR H:95.15 S:92.06

21
DP 826371

MGA

TN

APPROX.

STREET

7
DP 776500

ELLA

SEE SHEET 1 FOR LEGEND & NOTES



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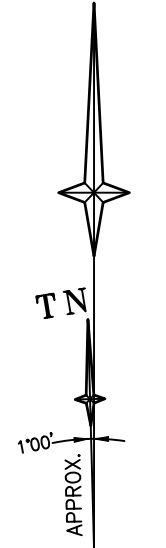


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STREET, ST LEONARDS

datum
AHD
site Area
5927 m²
LGA
WILLOUGHBY
reference
number
52609 001DT
scale
1:100 @A1
date of survey
08/08/2025
SHEET
OF 10
3

MGA



HERBERT

STREET

No.37
2 STOREY
BRICK BUILDING
METAL ROOF

1
DP 115615

SCALE 1:100 @ A1

SEE SHEET 1 FOR LEGEND & NOTES

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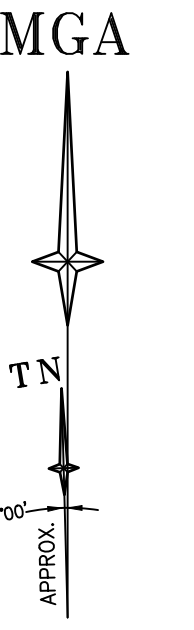
www.lts.com.au | P 1300 587 000

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datum
AHD
site Area
5927 m²
LGA
WILLOUGHBY

reference number 52609 001DT
scale 1:100
date of survey 08/08/2025
SHEET 4
OF 10



1
DP 115615

No.37
2 STOREY
BRICK BUILDING
METAL ROOF

CH 110

11
DP 838852

CH 80

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8

12

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SEE SHEET 1 FOR LEGEND & NOTES

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www.lts.com.au

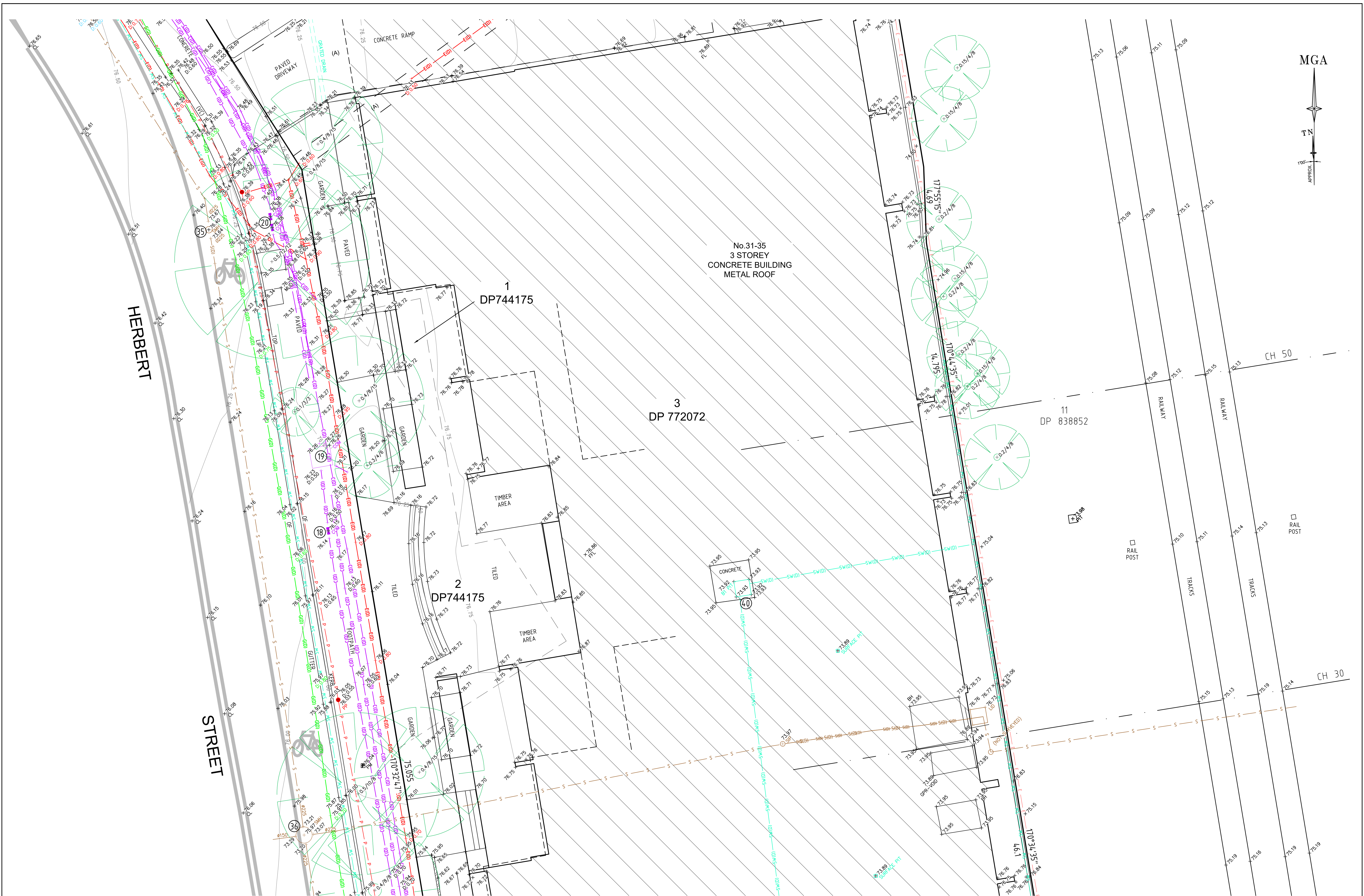
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AHD
site Area
5927 m²
LGA
WILLOUGHBY

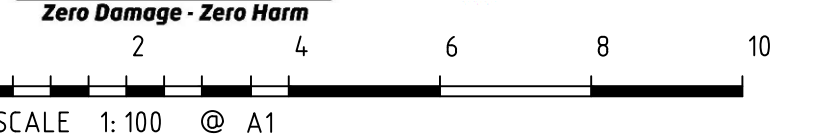
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date of survey 08/08/2025
SHEET 5
OF 10





Zero Damage - Zero Harm





SCALE 1:100 @ A1

SEE SHEET 1 FOR LEGEND & NOTES

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datum AHD

site Area 5927 m²

LGA WILLOUGHBY

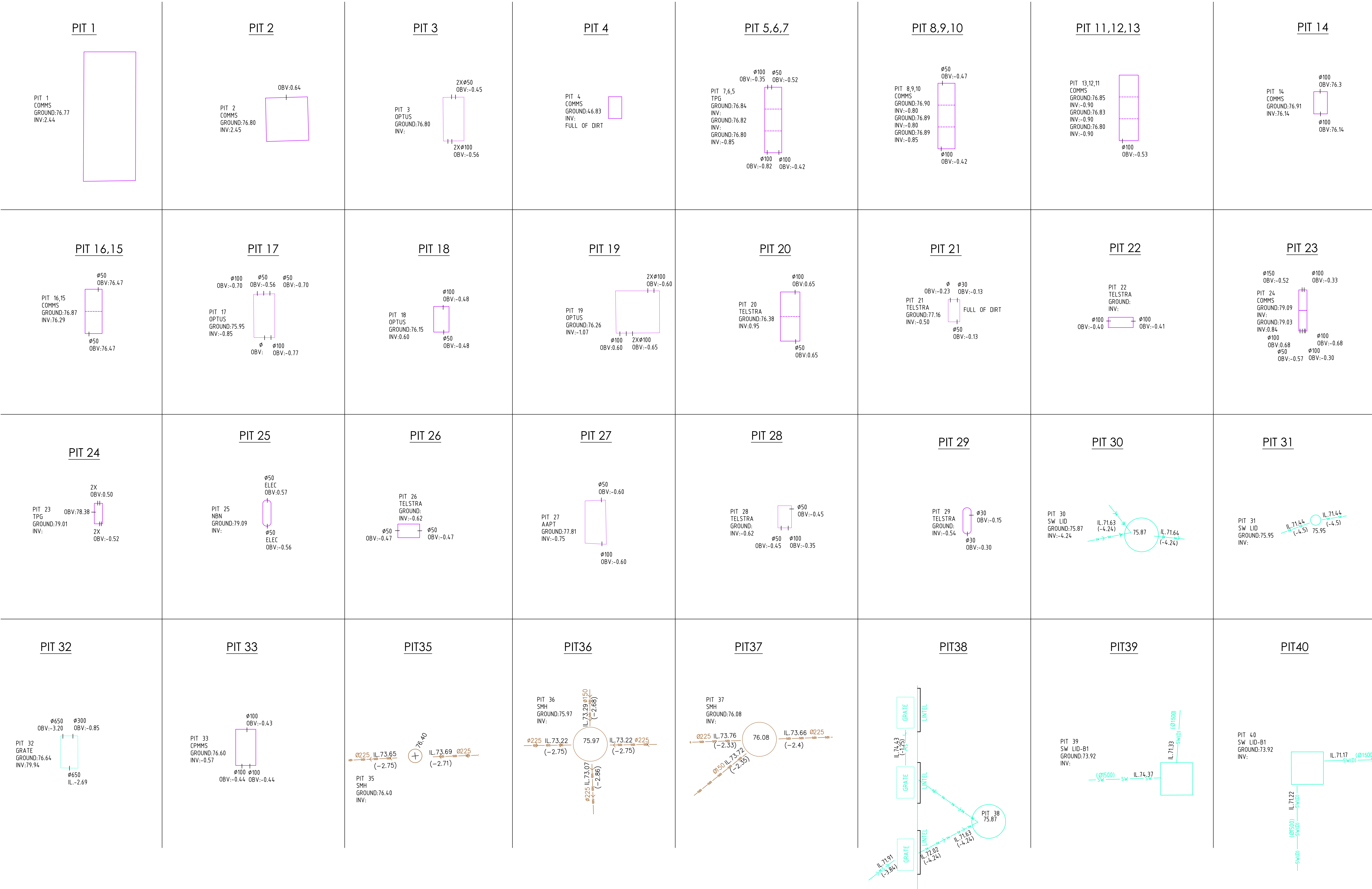
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date of survey 08/08/2025

SHEET 6

PIT DIAGRAMS



SEE SHEET 1 FOR LEGEND & NOTES

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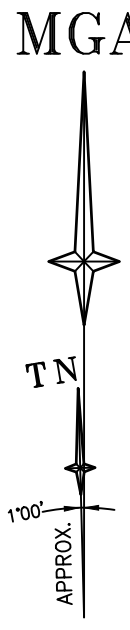
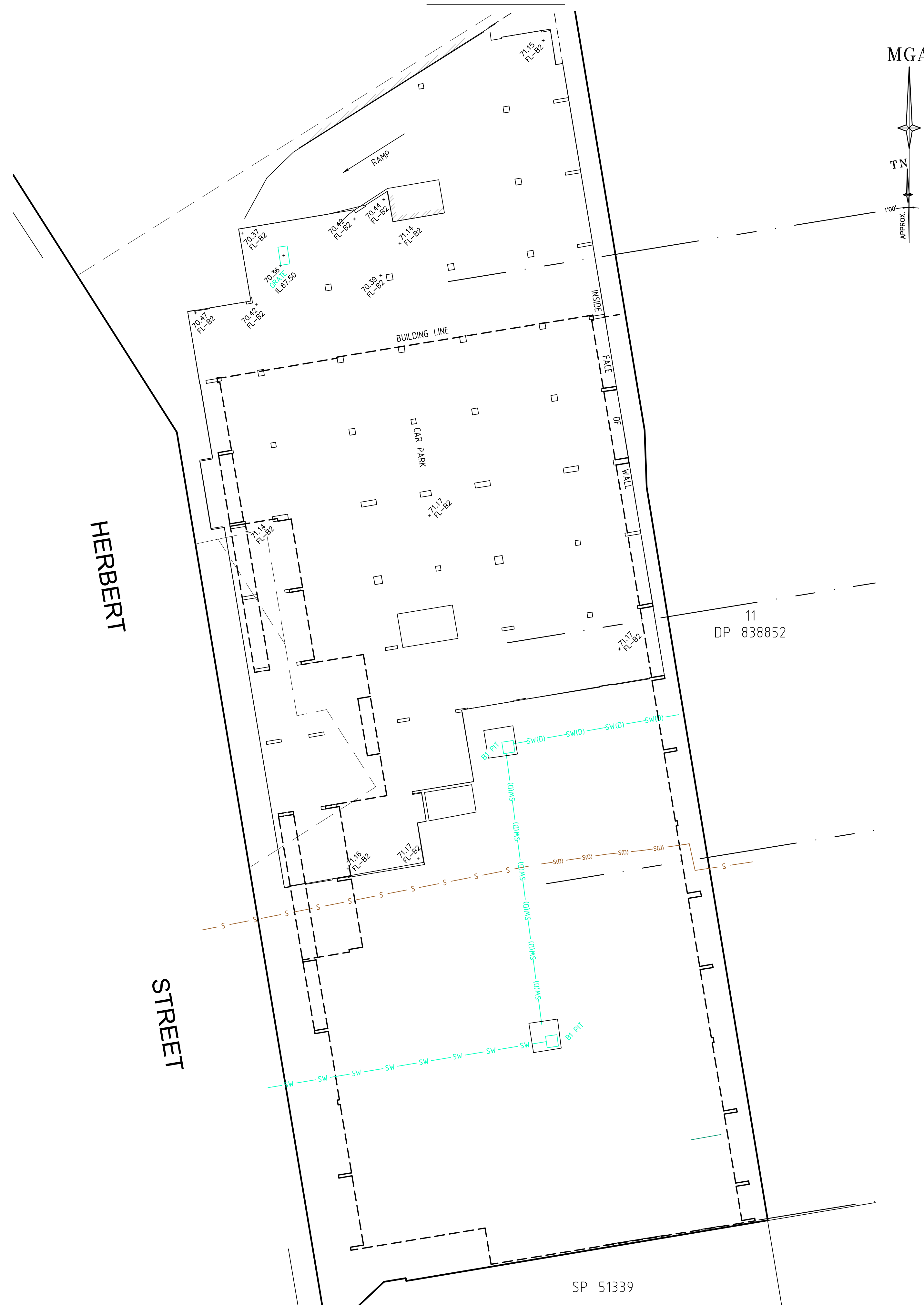
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DP 744175 & LOT 3 DP 772072 AT No.31-35 & 37 HERBERT STREET, ST LEONARDS

datum AHD
site Area 5927 m²
LGA WILLOUGHBY
reference number 52609 001DT
scale 1:50
date of survey 08/08/2025
SHEET 8
OF 10

BASEMENT 1

BASEMENT 2



BEFORE YOU DIG
Zero Damage - Zero Harm
www.beyoudig.com.au

GDA2020

SCALE 1:400 @ A1

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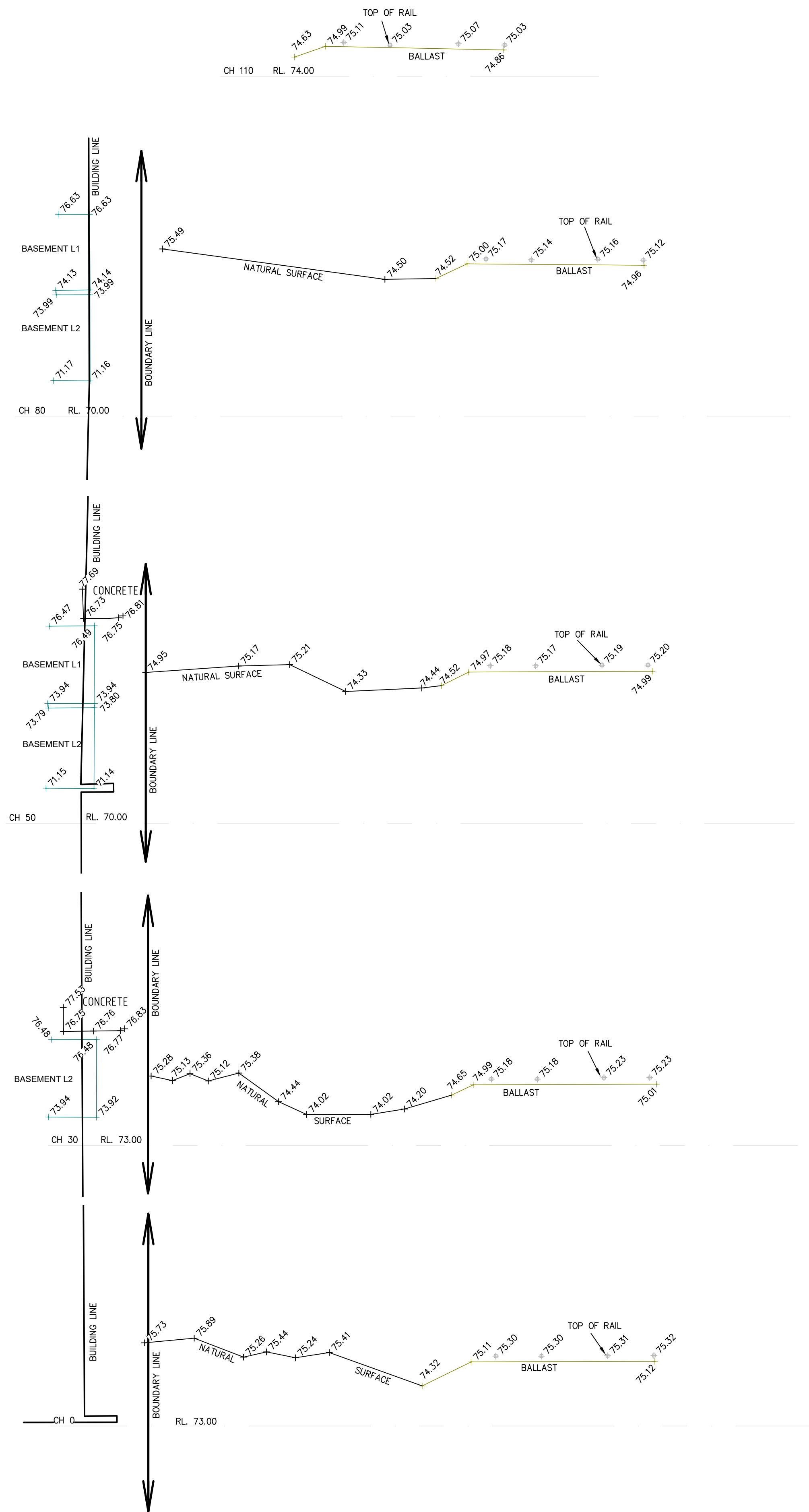
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datum AHD
site Area 5927 m²
LGA WILLOUGHBY

reference number 52609 001DT
scale 1:200 @A1
date of survey 08/08/2025

SHEET 9
OF 10

RAIL CROSS SECTIONS



H	00/00/00	-	00	D	00/00/00	-	00
G	00/00/00	-	00	C	00/00/00	-	00
F	00/00/00	-	00	B	29/10/25	BASEMENT 1 AND BASEMENT 2 ADDED	002
E	00/00/00	-	00	A	08/10/25	PIITS DIAGRAMS AND DETECTED SERVICES ADDED	002
Revision	Date	Description	Reference	Revision	Date	Description	Reference

Appendix C

Proposed Development Drawings

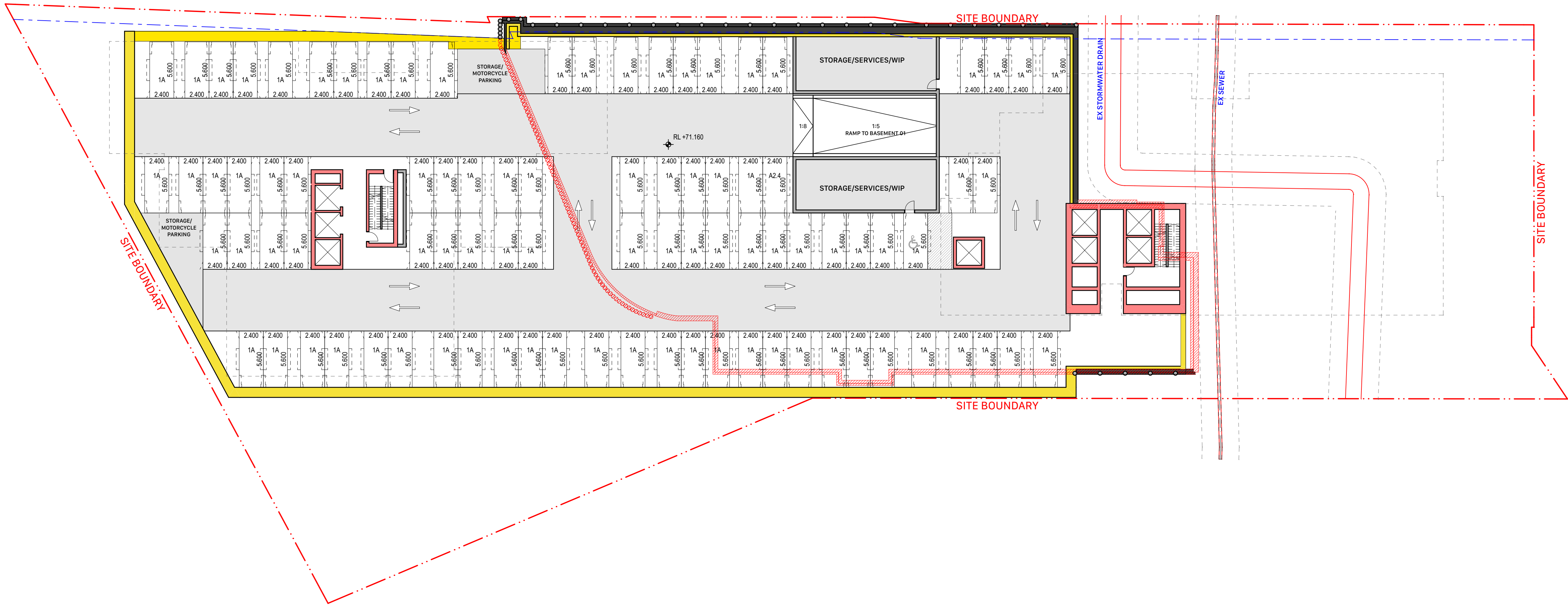


- General notes**
- All dimensions and existing conditions shall be checked and verified by the contractor before proceeding with the work.
 - All levels relative to 'Australian Height Datum'.
 - Do not scale drawings.
 - Use figured dimensions only.

Legend

Carpark Requirement		
1 Bedroom Apartment	0.5/Unit	60.5
1 Bedroom Apartment - AH	0.4/Unit	12.4
2 Bedroom Apartment	1.0/Unit	228
2 Bedroom Apartment - AH	0.5/Unit	7.5
3 Bedroom Apartment	1.5/Unit	27
3 Bedroom Apartment - AH	1.0/Unit	0
Visitor	1/7 Dwellings	0
Retail/Commercial	1/100 of Commercial GFA	42
Car Share		3
Car Wash Bay		2
Total		383

Floor	Quantity
Basement B2	
	88
	88
Basement B1	
	100
	100
Level 02	
	106
	106
Level 03	
	108
	108
	402



1 PLAN Basement B2
1:250

WIP - STATUS UPDATE ONLY

04	27/2/2026	For Information	SLG
03	11/2/2026	For Information	SLG
02	4/2/2026	For Information	SLG
01	30/1/2026	For Information	SD

Rev	Date	Description	By	Chk
-----	------	-------------	----	-----

33 Herbert St, St. Leonards
Cammeraygal
33 Herbert Sty. St. Leonards 2065
Sydney NSW 2065

GA Floor Plans 1:250 **Scale**
Basement 2 Floor Plan GA 1:250 @ A1

Project Code **First Issued**
AQHS 30/1/2026

Sheet No. **Rev**
20B2 04

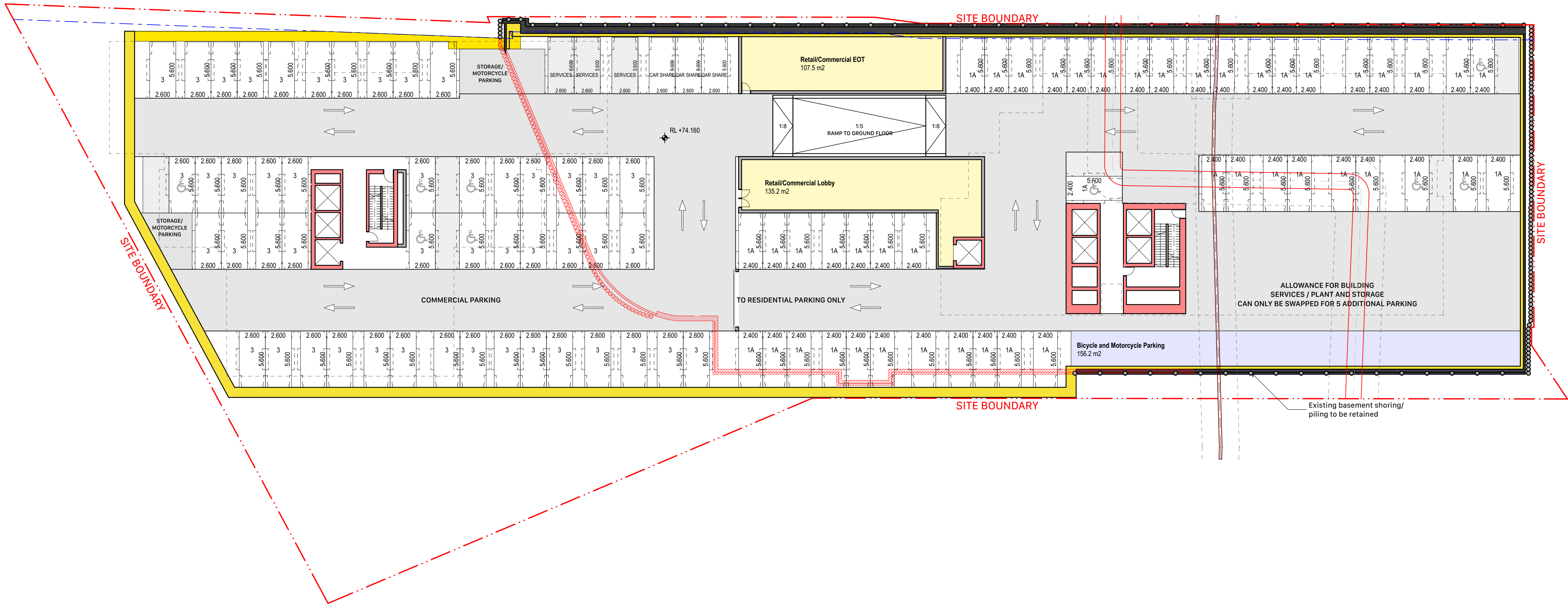


- General notes
- All dimensions and existing conditions shall be checked and verified by the contractor before proceeding with the work.
 - All levels relative to 'Australian Height Datum'.
 - Do not scale drawings.
 - Use figured dimensions only.

Legend

Carpark Requirement		
1 Bedroom Apartment	0.5/Unit	60.5
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2 Bedroom Apartment	1.0/Unit	228
2 Bedroom Apartment - AH	0.5/Unit	7.5
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3 Bedroom Apartment - AH	1.0/Unit	0
Visitor	1/7 Dwellings	0
Retail/Commercial	1/100 of Commercial GFA	42
Car Share		3
Car Wash Bay		2
Total		383

Floor	Quantity
Basement B2	
	88
	88
Basement B1	
	100
	100
Level 02	
	106
	106
Level 03	
	108
	108
	402



1 PLAN Basement B1
1:250

WIP - STATUS UPDATE ONLY

04	27/2/2026	For Information	SLG
03	11/2/2026	For Information	SLG
02	4/2/2026	For Information	SLG
01	30/1/2026	For Information	SD

Rev	Date	Description	By	Chk
-----	------	-------------	----	-----

33 Herbert St, St. Leonards
Cammeraygal
33 Herbert Sty. St. Leonards 2065
Sydney NSW 2065

GA Floor Plans 1:250
Basement 1 Floor Plan GA

Scale
1:250 @ A1

Project Code
AQHS

First Issued
30/1/2026

Sheet No.
20B1

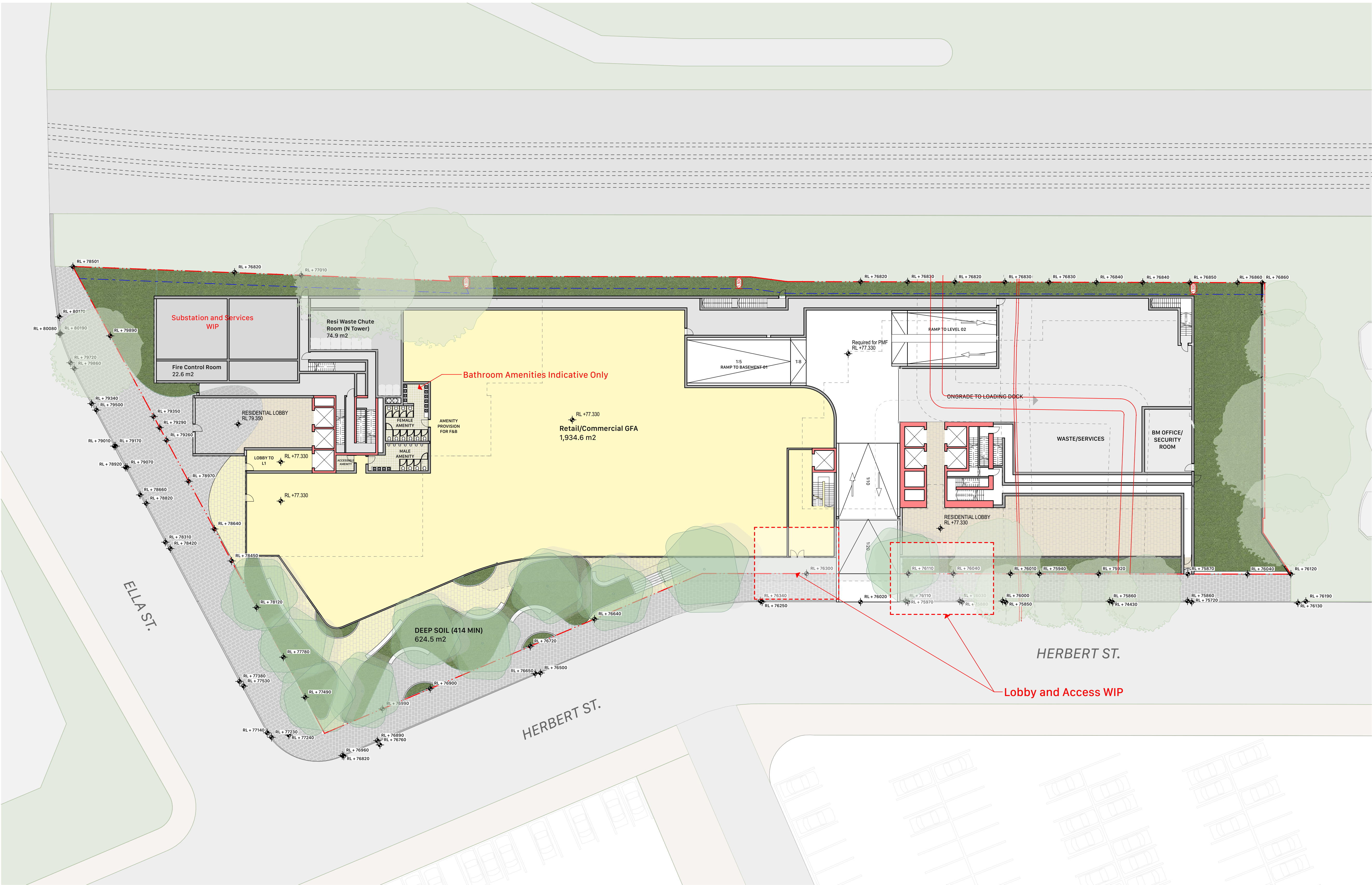
Rev
04



General notes

- All dimensions and existing conditions shall be checked and verified by the contractor before proceeding with the work.
- All levels relative to 'Australian Height Datum'.
- Do not scale drawings.
- Use figured dimensions only.

Legend



1 PLAN Ground Floor
1:250

WIP - STATUS UPDATE ONLY

04	27/2/2026	For Information	SLG
03	11/2/2026	For Information	SLG
02	4/2/2026	For Information	SLG
01	30/1/2026	For Information	SD

Rev	Date	Description	By	Chk
-----	------	-------------	----	-----

33 Herbert St, St. Leonards
Cammeraygal
33 Herbert Sty. St. Leonards 2065
Sydney NSW 2065

GA Floor Plans 1:250 **Scale**
Ground Floor Plan GA 1:250 @ A1

Project Code **First Issued**
AQHS 30/1/2026

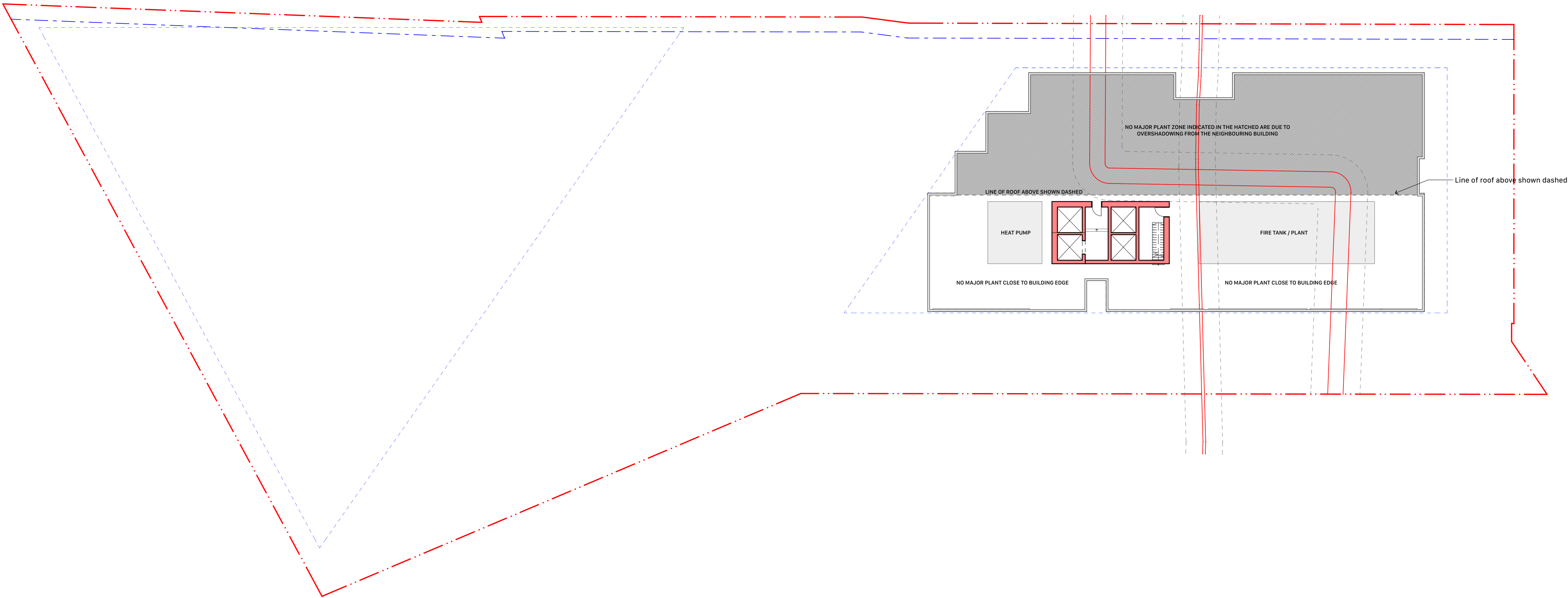
Sheet No. **Rev**
2000 04



General notes

- All dimensions and existing conditions shall be checked and verified by the contractor before proceeding with the work.
- All levels relative to 'Australian Height Datum'.
- Do not scale drawings.
- Use figured dimensions only.

Legend



1 PLAN Level 38 Floor Plan
1:250

WIP - STATUS UPDATE ONLY

03	27/2/2026	For Information	SLG
02	11/2/2026	For Information	SLG
01	30/1/2026	For Information	SD

Rev	Date	Description	By	Chk
-----	------	-------------	----	-----

33 Herbert St, St. Leonards
Cammeraygal
33 Herbert Sty. St. Leonards 2065
Sydney NSW 2065

GA Floor Plans 1:250 **Scale**
Level 38 Floor Plan GA 1:250 @ A1

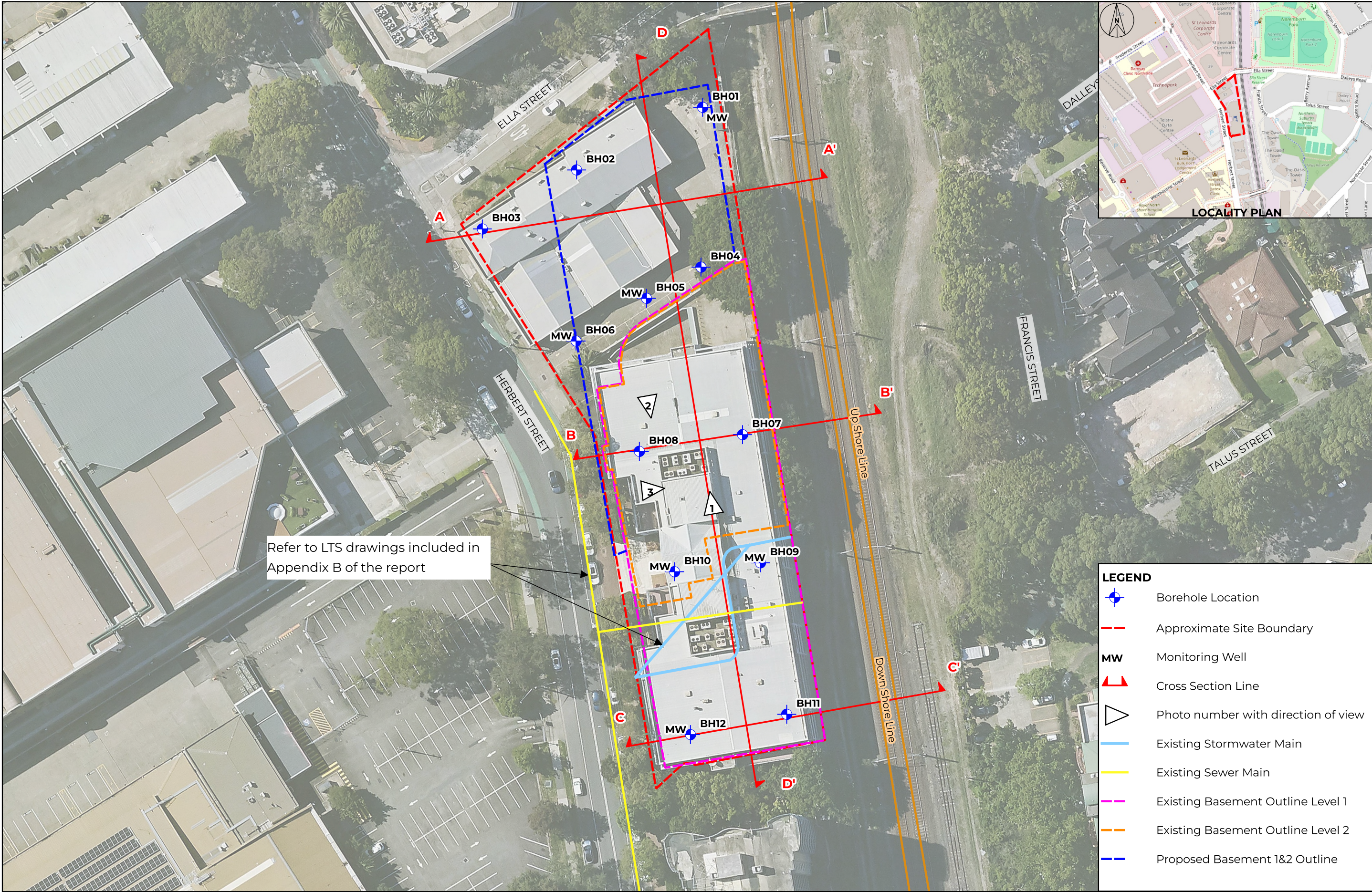
Project Code **First Issued**
AQHS 30/1/2026

Sheet No. **Rev**
2038 03

Appendix D

Douglas Drawings

\\dps\haso2\Projects\237003.00 - ST LEONARDS, 33 & 37 Herbert Street\7.0 Drawings\7.3 QGIS\237003.00.qgz



REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	Initial Issue	07.11.2025	MN
1	Basement Outline Updates	05.03.2026	MN

SCALE: 0 7.5 15 22.5 30 m

1:750 @ A3

Douglas
PARTNERS

OFFICE: SYDNEY
96-98 Hermitage Rd, West Ryde NSW 2114
(02)9809 0666

CLIENT:

Aqualand St Leonard Development Pty Ltd

NOTE:

1: Basemap from Metromap (Dated 02.10.2025)
2: Basement outlines from LTS, Reference 52609001DT, Revision A (Dated 11.08.2025)
3: Proposed basement outlines from FJC, Reference Basement 2 floor Plan GA, Sheet 20B2, Rev4 (Dated 27.02.2026)

COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 56

PROJECT NAME:
Proposed Residential Development
PROJECT ADDRESS:
33 & 37 Herbert Street St Leonards

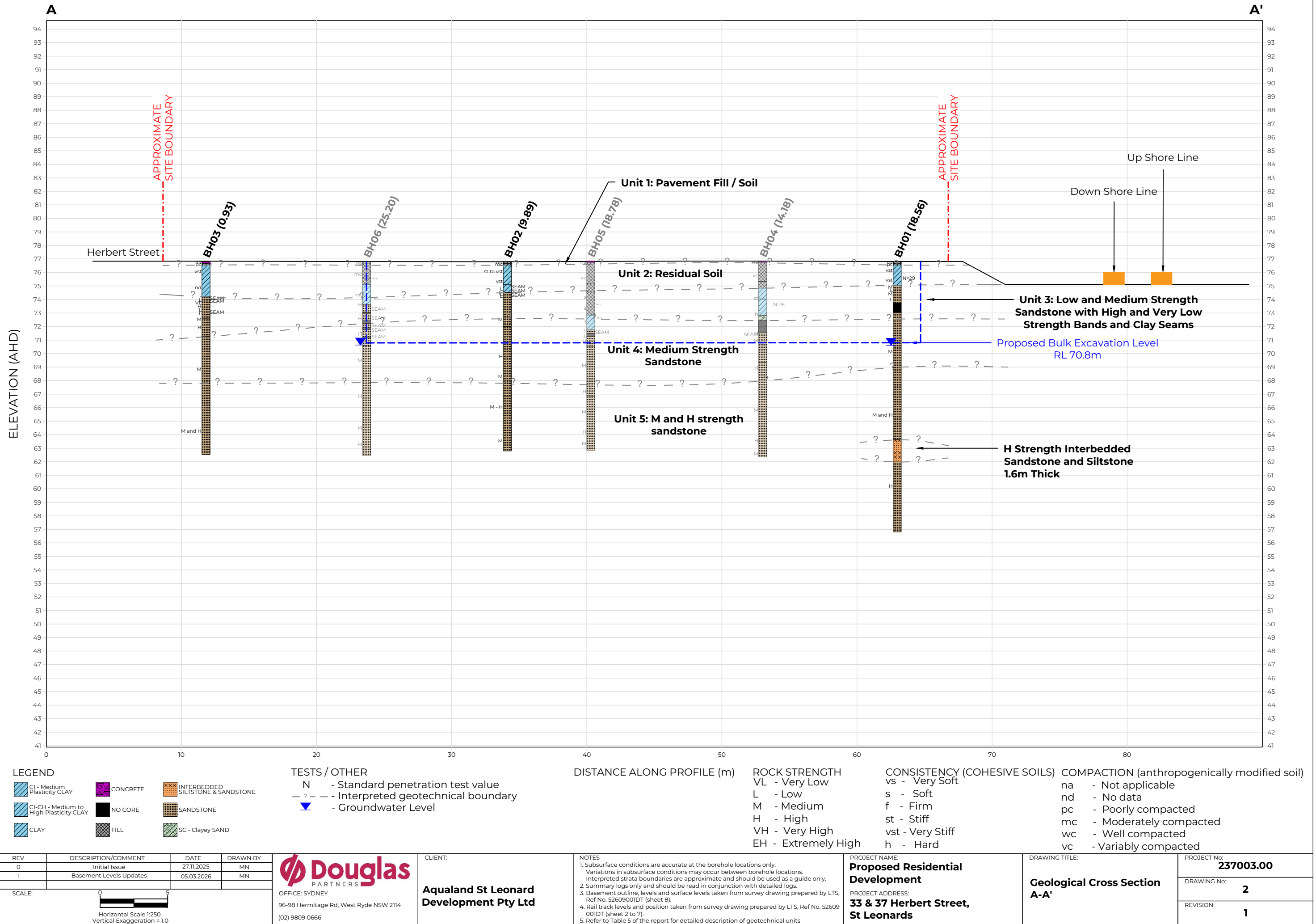
DRAWING TITLE:
Test Location Plan

PROJECT NO:
237003.00

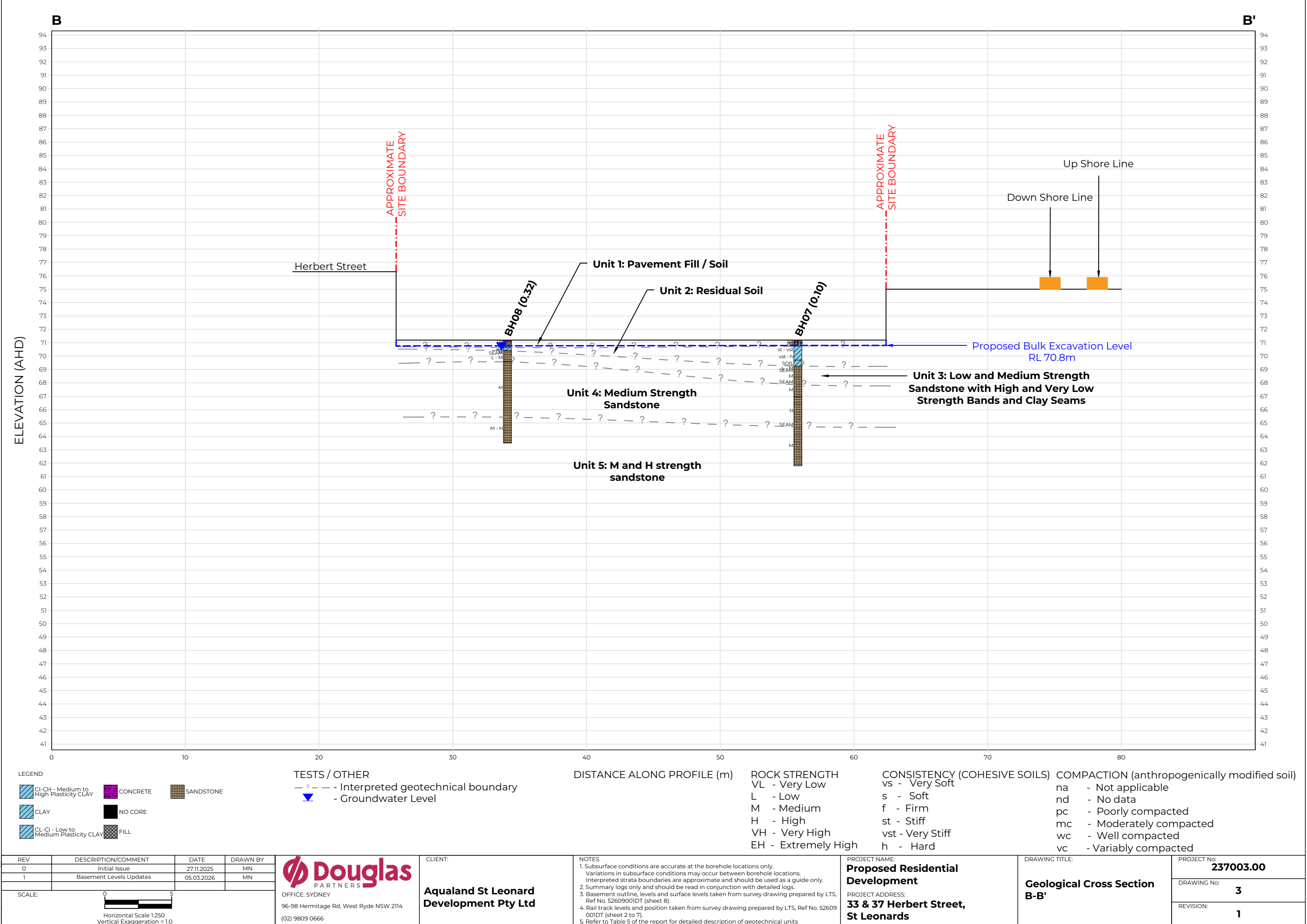
DRAWING NO:
1

REVISION:
1

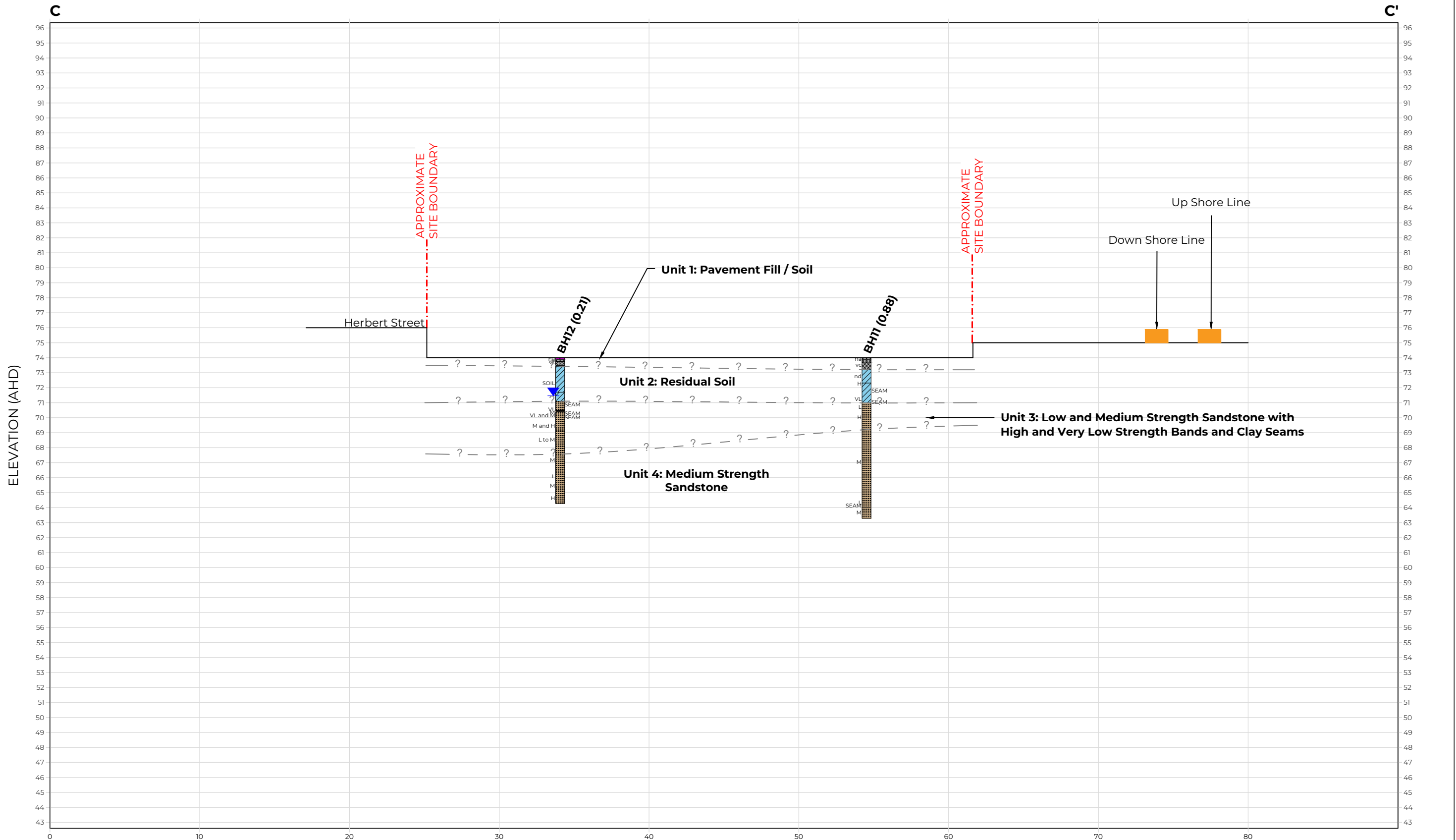
\\psdysnas2\Projects\237003.00 - ST LEONARDS, 33 & 37 Herbert Street\7.0 Drawings\7.2 Out\237003.00 D.002.5 Rev0_Cross Sections.dwg



\\dps\sydnas2\Projects\237003.00 - ST LEONARDS, 33 & 37 Herbert Street\7.0 Drawings\7.2 Out\237003.00.D.002.5.Rev0_Cross Sections.dwg



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LEGEND

CI - Medium Plasticity CLAY

CLAY

CONCRETE

NO CORE

FILL

SANDSTONE

TESTS / OTHER

— ? —

Interpreted geotechnical boundary

▼

Groundwater Level

ROCK STRENGTH

VL

 - Very Low

L

 - Low

M

 - Medium

H

 - High

VH

 - Very High

EH

 - Extremely High

CONSISTENCY (COHESIVE SOILS)

vs

 - Very Soft

s

 - Soft

f

 - Firm

st

 - Stiff

vst

 - Very Stiff

h

 - Hard

COMPACTION (anthropogenically modified soil)

na

 - Not applicable

nd

 - No data

pc

 - Poorly compacted

mc

 - Moderately compacted

wc

 - Well compacted

vc

 - Variably compacted

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	Initial Issue	27.11.2025	MN

SCALE:

0

5

Horizontal Scale 1:250
Vertical Exaggeration = 1.0

Douglas

PARTNERS

OFFICE: SYDNEY
96-98 Hermitage Rd, West Ryde NSW 2114
(02) 9809 0666

CLIENT:

Aqualand St Leonard Development Pty Ltd

NOTES

1. Subsurface conditions are accurate at the borehole locations only. Variations in subsurface conditions may occur between borehole locations. Interpreted strata boundaries are approximate and should be used as a guide only.

2. Summary logs only and should be read in conjunction with detailed logs.

3. Basement outline, levels and surface levels taken from survey drawing prepared by LTS, Ref No. 52609001DT (sheet 8).

4. Rail track levels and position taken from survey drawing prepared by LTS, Ref No. 52609001DT (sheet 2 to 7).

5. Refer to Table 5 of the report for detailed description of geotechnical units

PROJECT NAME:

Proposed Residential Development

PROJECT ADDRESS:

33 & 37 Herbert Street, St Leonards

DRAWING TITLE:

Geological Cross Section C-C'

PROJECT No:

237003.00

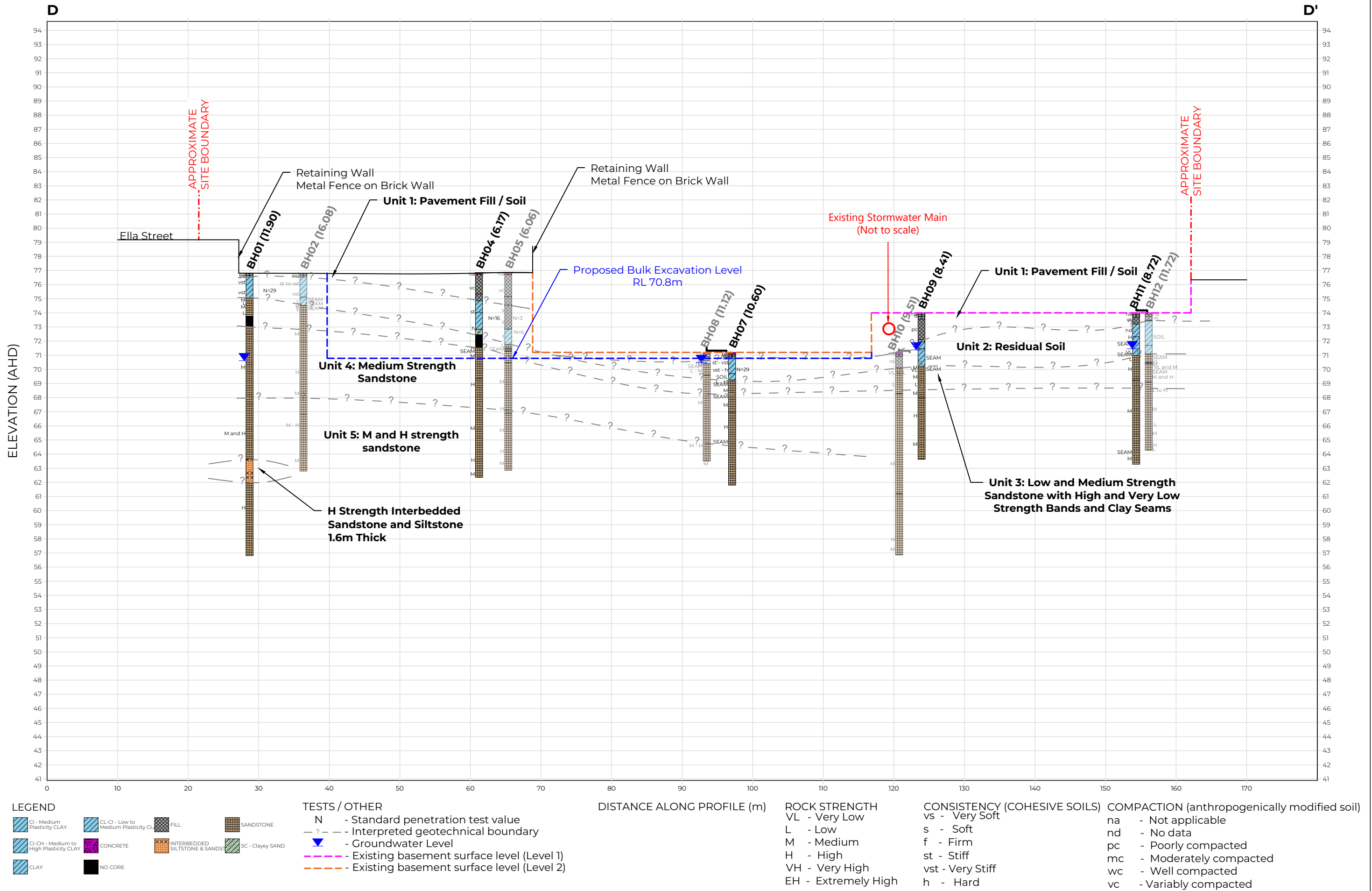
DRAWING No:

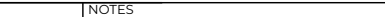
4

REVISION:

0

\\dps\sydnas2\Projects\237003.00 - ST LEONARDS, 33 & 37 Herbert Street\7.0 Drawings\7.2 Out\237003.00 D.002.5 Rev0_Cross Sections.dwg



REV		DESCRIPTION/COMMENT	DATE	DRAWN BY	 OFFICE: SYDNEY 96-98 Hermitage Rd, West Ryde NSW 2114 (02) 9809 0666	CLIENT: Aqualand St Leonard Development Pty Ltd	NOTES 1. Subsurface conditions are accurate at the borehole locations only. Variations in subsurface conditions may occur between borehole locations. Interpreted strata boundaries are approximate and should be used as a guide only. 2. Summary logs only and should be read in conjunction with detailed logs. 3. Horizontal and vertical scales are not equal. 4. Basement outline, levels and surface levels taken from survey drawing prepared by LTS, Ref No. 52609001DT (sheet 8). 5. Rail track levels and position taken from survey drawing prepared by LTS, Ref No. 52609001IDT (sheet 2 to 7). 6. Refer to Table 5 of the report for detailed description of geotechnical units.	PROJECT NAME: Proposed Residential Development PROJECT ADDRESS: 33 & 37 Herbert Street, St Leonards	DRAWING TITLE: Geological Cross Section D-D'	PROJECT No: 237003.00 DRAWING No: 5 REVISION: 1
0	Initial Issue	27.11.2025	MN							
1	Basement Levels Updates	05.03.2026	MN							
SCALE:  Horizontal Scale 1:500 Vertical Exaggeration = 2.0										

Appendix E

Explanatory Notes, Borehole Logs and Core Photographs

Introduction to Terminology, Symbols and Abbreviations

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

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

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

Abbreviation Codes

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

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

Data Integrity Codes

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

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

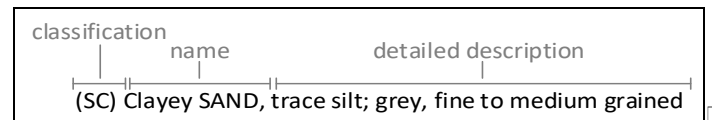
Graphic Symbols

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

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Introduction

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



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

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

Particle size designation and Behaviour Model

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

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

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

¹ – refer grain size subdivision descriptions below

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

Component proportions

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

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

¹ As defined in AS1726-2017 6.1.4.4

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

Composite Materials

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



Classification

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

Soil Name

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

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

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

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

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

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

Identification of minor components

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

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

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

Soil Composition

Plasticity

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

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

Grain Size

Type	Particle size (mm)	
	Gravel	Sand
Gravel	Coarse	19 - 63
	Medium	6.7 - 19
	Fine	2.36 - 6.7
Sand	Coarse	0.6 - 2.36
	Medium	0.21 - 0.6
	Fine	0.075 - 0.21

Grading

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

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



Soil Condition

Moisture

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

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

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

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

Consistency/Density/Compaction/Cementation/Extremely Weathered Material

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

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

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

Consistency (fine grained soils)

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

Relative Density (coarse grained soils)

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

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

Soil Descriptions

Terminology
Symbols
Abbreviations

□

Compaction (anthropogenically modified soil)

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

Cementation (natural and anthropogenic)

Cementation Term	Abbreviation Code
Moderately cemented	MOD
Weakly cemented	WEK

Extremely Weathered Material

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

Soil Origin

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

Cobbles and Boulders

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

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

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□

Rock Strength

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

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

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

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

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

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

Degree of Weathering

The degree of weathering of rock is classified as follows:

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

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



Degree of Alteration

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

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

Degree of Fracturing

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

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

Rock Quality Designation

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

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

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

Stratification Spacing

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

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



Rock Descriptions

Terminology
Symbols
Abbreviations

□

Defect Descriptions

Defect Type

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

Rock Defect Orientation

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

Rock Defect Coating

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

Rock Defect Infill

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

□

□

Rock Defect Shape/Planarity

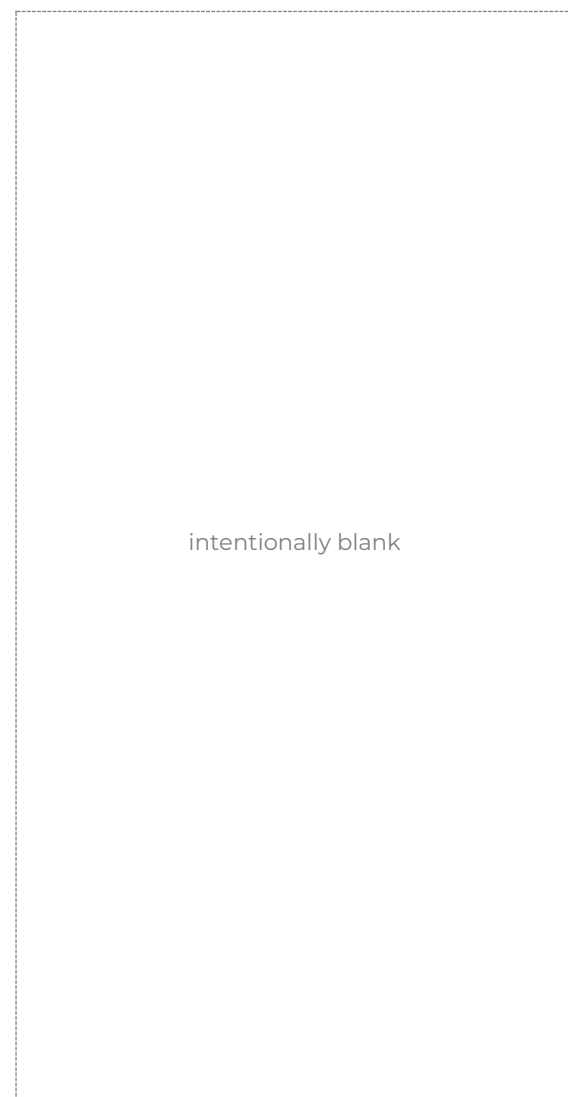
Term	Abbreviation Code
Curved	CU
Discontinuous	DIS
Irregular	IR
Planar	PR
Stepped	ST
Undulating	UN

Rock Defect Roughness

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

Defect Orientation

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



□

□

□

Sampling and Testing

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

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

Sampling

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

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

¹ – numeric suffixes indicate tube diameter/width in mm

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

Field and Laboratory Testing

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

Test Type	Code
Pocket penetrometer (kPa)	PP
Photo ionisation detector (ppm)	PID
Standard Penetration Test x/y = x blows for y mm penetration HB = hammer bouncing HW = fell under weight of hammer	SPT
Shear vane (kPa)	V
Unconfined compressive strength, (MPa)	UCS
Point load test, (MPa), axial (A), diametric (D), irregular (I)	PLT(-)
Dynamic cone penetrometer, followed by blow count penetration increment in mm (cone tip, generally in accordance with AS1289.6.3.2)	DCP9/150
Perth sand penetrometer, followed by blow count penetration increment in mm (flat tip, generally in accordance with AS1289.6.3.3)	PSP/150
Dynamic probe super heavy, followed by blow count penetration increment in mm	DPSH/100

Groundwater Observations

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



Drilling or Excavation Methods/Tools

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

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

¹□ numeric suffixes indicate tool diameter/width in mm□



BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD
COORDINATE: E:332775.2, N:6256575.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 237003.00
DATE: 10/11/25
SHEET: 1 of 3

CONDITIONS ENCOUNTERED						SAMPLE			TESTING AND REMARKS					
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	0.15	FILL / CONCRETE; 150mm thick; reinforced.		FILL	NA	NA		ES		0.15				
	0.26	FILL / Sandy GRAVEL: dark grey; medium to coarse, blue metal; fine to coarse sand; with brick fragments (70mm); trace 10mm rounded concrete fragments (roadbase).		FILL	PC	NDF		ES		0.26				
	1	CLAY (CI): pale grey mottled red-brown; medium plasticity.		RS	(Vst)	w<PL		D/ES		0.90				
		From 1.10m: Pale grey with bands of medium sand; possibly extremely weathered sandstone			VSt			SPT		1.45	SPT	8,16,13 N=29		
	1.75	Continued as rock log									PP	450kPa		
	2									2				
	3									3				
	4									4				
	5									5				
	6									6				
	7									7				
	8									8				
	9									9				

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

PLANT: Comacchio Geo 305

OPERATOR: Ground Test (L. Cooper)

LOGGED: E. Benjamin

METHOD: DT to 0.15m, then AD to 1.6m, then WB to 1.75m, then NMLC to 20m

CASING: HWT to 2m

REMARKS: Replicate sample *BD01101125 taken from 0.4-0.5m

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD
COORDINATE: E:332775.2, N:6256575.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 237003.00
DATE: 10/11/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED											SAMPLE			TESTING					
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (where encountered)	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
RL (m)	TEST TYPE														RESULTS AND REMARKS				
	76																		
	1	Continued from soil log																	
	75	SANDSTONE: red-brown, pale grey and orange-brown, medium grained; slightly fractured to fractured with extremely weathered seams.				1.75	M									PLT	PL(A)=0.69MPa		
	2					2.06	L				2.11m: EW, 20mm					PLT	PL(A)=0.13MPa		
						2.20	M												
	74					2.54	L	66	67		2.63m: EW, 30mm					PLT	PL(A)=0.11MPa		
	3																		
	3.07																		
	73					3.79													
	4										3.87m: JT, 20°, UN, SN Fe, RF					PLT	PL(A)=0.72MPa		
	4.25	SANDSTONE: pale grey, fine to medium grained, thickly bedded; slightly fractured. Hawkesbury Sandstone.				4.25		92	83		4.04-4.09m: JT x2, 30°, UN, SN Fe, RF								
	72					4.77					4.11m: B, 0°, UN, SN Fe, RF								
	5										4.21-4.24m: B x2, 0-5°, UN, SN Fe, RF					PLT	PL(A)=0.53MPa		
											4.66-4.75m: B x3, 0-10°, UN, SN Fe, RF								
	71										4.76m: B, 0-5°, UN, CT Clay, RF								
	6	From 5.85m: Crossbedding at 10-30°									5.69m: B, 10°, PR, CN, RF					PLT	PL(A)=0.91MPa		
	70										6.33-6.43m: B x2, 10°, PR, VNR CBS, RF								
	7						M	100	100		6.71m: B, 10°, PR, CN, RF					PLT	PL(A)=0.69MPa		
											6.93m: B, 0-10°, ST, VNR CBS, RF								
	69															PLT	PL(A)=0.43MPa		
	8																		
	68										8.57m: B, 0°, PR, CN, RF					PLT	PL(A)=0.64MPa		
	9																		
	67					9.50	N and H	100	99		9.52m: B, 10°, UN, VNR CBS, RF					PLT	PL(A)=1.2MPa		

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

PLANT: Comacchio Geo 305

OPERATOR: Ground Test (L. Cooper)

LOGGED: E. Benjamin

METHOD: DT to 0.15m, then AD to 1.6m, then WB to 1.75m, then NMLC to 20m

CASING: HWT to 2m

REMARKS: Replicate sample *BD01101125 taken from 0.4-0.5m

BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD
COORDINATE: E:332775.2, N:6256575.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 237003.00
DATE: 10/11/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED										SAMPLE				TESTING							
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (where encountered)	SOIL MOISTURE	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE	
	66	[CONT] SANDSTONE: pale grey, fine to medium grained, thickly bedded; slightly fractured. Hawkesbury Sandstone.				FR			100	99		10.41m: B, 0°, PR, TI Clay 10.43m: B, 0°, PR, VNR Clay, RF					PLT	PL(A)=0.92MPa			
	11												11.12m: B, 0°, PR, VNR CBS, RF					PLT	PL(A)=0.80MPa		
	65							M and H					11.56m: B, 10°, PR, VNR CBS, RF 11.80-11.82m: B x2, 0-10°, UN, VNR CBS, RF					PLT	PL(A)=0.86MPa		
	12	INTERBEDDED SANDSTONE AND SILTSTONE: light grey and dark grey, laminated to thinly bedded; fine to medium grained sandstone. Hawkesbury Sandstone.							100	99											
	13																				
	13.17																				
	13.20	SANDSTONE: pale grey, fine to medium grained, thickly bedded; slightly fractured. Hawkesbury Sandstone.					13.20					13.20m: Water loss					PLT	PL(A)=0.95MPa			
	63											13.60m: B, 0°, PR, VNR CBS, RF 13.76m: B, 10°, PR, VNR Clay, RF									
	14											14.11m: B, 5°, PR, VNR CBS, RF 14.26m: B, 5°, PR, CN, RF					PLT	PL(A)=1.8MPa			
	14.82	14.81m-18.53m: Unbroken										14.81m: B, 10°, PR, CN, SM									
	15									100	100						PLT	PL(A)=0.95MPa			
	16						FR		H								PLT	PL(A)=1.5MPa			
	60	Borehole discontinued at 20.00m depth. Target Depth Reached.																			
	17																PLT	PL(A)=1.8MPa			
	18									100	100		18.39m: B, 5°, UN, VNR CBS, RF 18.53m: JT, 40°, UN, CN, RF				PLT	PL(A)=1.3MPa			
	59																				
	58																				
	19																PLT	PL(A)=1.2MPa			
	57																				

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

PLANT: Comacchio Geo 305

OPERATOR: Ground Test (L. Cooper)

LOGGED: E. Benjamin

METHOD: DT to 0.15m, then AD to 1.6m, then WB to 1.75m, then NMLC to 20m

CASING: HWT to 2m

REMARKS: Replicate sample *BD01101125 taken from 0.4-0.5m

CORE PHOTO LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD
COORDINATE: E:332775.2, N:6256575.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 237003.00
DATE: 10/11/25
SHEET: 1 of 2



1.75-5.00 m depth



5.00-10.00 m depth

CORE PHOTO LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD
COORDINATE: E:332775.2, N:6256575.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH01
PROJECT No: 237003.00
DATE: 10/11/25
SHEET: 2 of 2



10.00-15.00 m depth



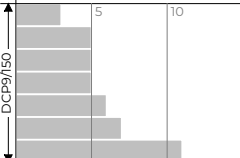
15.00-20.00 m depth

BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD
COORDINATE: E:332749.0, N:6256562.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 237003.00
DATE: 06/11/25
SHEET: 1 of 3

CONDITIONS ENCOUNTERED						SAMPLE			TESTING AND REMARKS					
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*) DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS		
06/11/25 No Free Groundwater Observed Whilst Augering	0.13	FILL / CONCRETE; 130mm thick; reinforced.		FILL	ND	NA		ES	0.13	0.13				
	0.26	FILL / Sandy GRAVEL: dark grey; medium to coarse, blue metal; fine to coarse sand; with brick fragments (70mm) and trace 10mm rounded concrete fragments.		FILL	MC	NDF		ES	0.20	0.30				
	1	CLAY (Cl): pale brown mottled grey and orange-brown; medium plasticity.		RS	St to VSt	w=PL		D/ES	0.50	0.60				
		From 0.50m: Pale grey mottled orange-brown			(VSt)	w<PL		D	1.00	1.10				
	1.68	Continued as rock log				NDF								
	2												2	
	3												3	
	4												4	
	5												5	
	6												6	
	7												7	
	8												8	
	9												9	

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

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

PLANT: Proline
METHOD: DT to 0.13m, then HA to 1.56m, then WB to 1.68m, then NMLC to 14m
REMARKS: Surface level extrapolated from BH01 GPS level. Borehole location determined from site features.

OPERATOR: Tightsite (B. Bakker)

LOGGED: E. Benjamin
CASING: HQ to 1.56m

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd

PROJECT: Proposed Mixed Use Development

LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD

COORDINATE: E:332749.0, N:6256562.7

DATUM/GRID: MGA2020 Zone 56

DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02

PROJECT No: 237003.00

DATE: 06/11/25

SHEET: 2 of 3

GROUNDWATER	CONDITIONS ENCOUNTERED												SAMPLE			TESTING					
	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (where encountered) SOIL MOISTURE	GRAPHIC	BS XW HW MW SW FR	WEATH. DW	DEPTH (m)	STRENGTH VL M H VH EH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
06/11/25 No Free Groundwater Observed Whilst Augering	76	1															1				
	75	2	Continued from soil log CLAY (CI): pale grey; medium plasticity; with ironstone bands and pockets of very low strength sandstone.			XW		1.68 2.09 2.28 2.37 2.47 2.57	SEAM SEAM H L	100	0	SEAM SEAM	1.68-2.28m: EW, some ironstone bands				2	PP	190kPa		
	74	3	SANDSTONE: pale grey and red-brown, fine to coarse grained, bands of siltstone laminations, fractured. Mittagong Formation.			HW				100	78		2.39m: EW, 20mm 2.47-2.51m: EW 2.79m: B, 0°, UN, CN, RF				3	PLT	PL(A)=0.74MPa		
	73	4				SW		3.64 4.00					3.65-3.68m: B x2, 10°, UN, SN Fe, RF 3.70m: EW, 20° 3.81m: B, 0°, UN, SN Fe, RF				4	PLT	PL(A)=0.34MPa		
	72	5	SANDSTONE: pale grey, fine to medium grained, thickly bedded, carbonaceous laminations, fractured then slightly fractured. Hawkesbury Sandstone.			SW FR				100	84		3.90-3.94m: B x2, 0°, UN, SN Fe, RF 4.15m: B, 0°, CU, SN Fe, SM 4.18m: B, 5°, CU, VNR Clay, SM 4.27m: B, 0-5°, CU, SN Fe, RF 4.64m: B, 0-20°, IR, CN, SM 4.77-4.79m: EW, 20mm 5.09m: B, 5°, UN, SN Fe, RF				5	PLT	PL(A)=0.78MPa		
	71	6						6.00		100	99		5.22-5.31m: B, 0-20°, IR, SN Fe, RF 5.24-5.34m: JT x3, 20-40°, UN, CN, RF 5.38m: JT, 50°, UN, SN Fe, RF 5.57m: B, 0-5°, UN, SN Fe, RF 5.81m: B, 0-10°, PR, SN Fe, RF				6	PLT	PL(A)=1.1MPa		
	70	7						6.46					6.44-6.46m: B x2, 0-5°, UN, SN Fe, RF 6.54m: B, 0-5°, UN, CN, RF				7	PLT	PL(A)=1.1MPa		
	69	8				FR		8.00		100	100						8	PLT	PL(A)=0.75MPa		
	68	9	8.66m-8.91m: Siltstone bed (possible clast) From 8.90m: Unbroken						M H	100	90		8.78m: JT, 20°, PR, CN, SM 8.79-8.81m: JT x2, 20°, PR, TI 8.82m: B, 0-5°, UN, CN, SM 8.90m: F, 40°, UN, CN, SL				9	PLT	PL(A)=0.44MPa PL(A)=1.0MPa		
	67									100	100							PLT	PL(A)=0.98MPa		
NOTES: # Soil origin is "probable" unless otherwise stated.																					

PLANT: Proline

OPERATOR: Tightsite (B. Bakker)

LOGGED: E. Benjamin

METHOD: DT to 0.13m, then HA to 1.56m, then WB to 1.68m, then NMLC to 14m

CASING: HQ to 1.56m

REMARKS: Surface level extrapolated from BH01 GPS level. Borehole location determined from site features.

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD
COORDINATE: E:332749.0, N:6256562.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 237003.00
DATE: 06/11/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED													SAMPLE			TESTING					
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (where encountered)	SOIL MOISTURE	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE	
	9.99	[CONT] SANDSTONE: pale grey, fine to medium grained, thickly bedded, carbonaceous laminations; unbroken. Hawkesbury Sandstone. 12.00m-12.26m: Siltstone bed							100	100											
	11														C		11.05	PLT	PL(A)=1.0MPa		
	12									100	100						11.41				
	12																12	PLT	PL(A)=1.1MPa		
	13						12.50														
	13							M	100	100							13	PLT	PL(A)=0.60MPa		
	14	Borehole discontinued at 14.00m depth. Target Depth Reached.																			
	15																				
	16																				
	17																				
	18																				
	19																				

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

PLANT: Proline
METHOD: DT to 0.13m, then HA to 1.56m, then WB to 1.68m, then NMLC to 14m
REMARKS: Surface level extrapolated from BH01 GPS level. Borehole location determined from site features.

OPERATOR: Tightsite (B. Bakker)

LOGGED: E. Benjamin
CASING: HQ to 1.56m

Refer to explanatory notes for symbol and abbreviation definitions



CORE PHOTO LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD
COORDINATE: E:332749.0, N:6256562.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02
PROJECT No: 237003.00
DATE: 06/11/25
SHEET: 1 of 2



1.68-6.00 m depth



6.00-10.00 m depth

CORE PHOTO LOG

CLIENT: Aqualand St Leonard Development Pty Ltd

PROJECT: Proposed Mixed Use Development

LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD

COORDINATE: E:332749.0, N:6256562.7

DATUM/GRID: MGA2020 Zone 56

DIP/AZIMUTH: 90°/---°

LOCATION ID: BH02

PROJECT No: 237003.00

DATE: 06/11/25

SHEET: 2 of 2



10.00-14.00 m depth

BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD
COORDINATE: E:332729.4, N:6256550.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 237003.00
DATE: 05/11/25
SHEET: 1 of 3

CONDITIONS ENCOUNTERED						SAMPLE			TESTING AND REMARKS					
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*) DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	
05/11/25 09:00 No Free Groundwater Observed During Hand Augering	0.13		FILL / CONCRETE; 130mm thick, reinforced.		FILL	NA	NA	Glass + PFAS Glass	ES		0.13	DCP9/150		
	0.25		FILL / Sandy GRAVEL; fine to coarse, bluemetal; fine to coarse sand; trace brick fragment; (roadbase).		FILL	PC	NDF		D/ES		0.25			
			CLAY (Cl): yellow-brown mottled red-brown and grey; medium plasticity.		RS	VSt	w<PL				0.50			
	1		From 0.60m: Orange-brown mottled grey						D		0.80			
			From 1.70m: Pale grey mottled red								1.00			
			From 2.00m: With ironstone gravel								1.20			
			From 2.40m: With sand, possibly extremely weathered sandstone			NDF	D			1.40				
	2				ND					2				
	2.60		Continued as rock log											2.60
														3
										4				
										5				
										6				
										7				
										8				
										9				

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

PLANT: Proline **OPERATOR:** Tightsite (B. Bakker) **LOGGED:** E. Benjamin
METHOD: DT to 0.13m, then HA to 2m, then WB to 2.6m, then NMLC to 14.26m **CASING:** HQ to 2m
REMARKS: Surface level extrapolated from BH01 GPS level. Borehole location determined from site features.

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD
COORDINATE: E:332729.4, N:6256550.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 237003.00
DATE: 05/11/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED										SAMPLE				TESTING					
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (where encountered) SOIL MOISTURE	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
RL (m)																			
05/11/25 09:00 No Free Groundwater Observed During Hand Augering	76 75 74 73 72 71 70 69 68 67																		
	1																		
	2																		
	3	Continued from soil log SANDSTONE: pale grey and dark red-brown, fine to medium grained; slightly fractured, with extremely weathered seams. Mittagong Formation.		XW XW HW	2.60 2.80 2.95 3.15 3.44	SEAM SEAM VL H L	100	49		SEAM SEAM SEAM	2.60-2.80m: EW 2.85-2.90m: EW 3.05-3.07m: EW 3.10-3.12m: EW 3.50-3.54m: EW						PP — 160-170kPa PLT — PL(A)=0.07MPa PLT — PL(A)=1.2MPa		
	4			XW HW	3.70 3.78 3.92	SEAM L				SEAM	3.70-3.78m: EW 3.88m: JT, 30°, PR, CN, RF						PLT — PL(A)=0.05MPa		
	4.22	SANDSTONE: pale and dark grey, fine grained, with siltstone bands (20%). Mittagong Formation.			4.30	M	100	68			4.01-4.04m: B x2, 0-10°, UN, SN Fe, RF 4.06-4.10m: EW 4.27-4.29m: EW 4.38-4.52m: JT, 80°, UN, TI						PLT — PL(A)=0.12MPa		
	5			MW to SW	4.60	H					4.53-4.57m: B x3, 0-10°, UN, SN Fe, RF 4.72m: B, 0-10°, IR, CN, SM						PLT — PL(A)=1.4MPa		
	5.53	SANDSTONE: pale grey, medium grained, horizontally bedded with zones of cross-bedding; slightly fractured. Hawkesbury Sandstone.			5.10						4.77m: B, 0-5°, UN, SN Fe, RF 4.86m: B, 10°, ST, CN, RF 4.95-4.97m: EW						PLT — PL(A)=0.74MPa		
	6			FR	5.53		100	97			5.10-5.13m: JT x2, 40°, PR, CN, RF 5.45m: EW, 10mm 5.48m: B, 10°, PR, CN, RF 5.49m: JT, 20°, PR, CN, RF 5.50m: B, 10°, PR, CN, RF						PLT — PL(A)=0.77MPa		
	7	7.00m-7.25m: Siltstone band From 7.25m: With carbonaceous laminations		SW	6.92 7.03						6.93-7.03m: B x4, 0-10°, UN, SN Fe, RF						PLT — PL(A)=0.33MPa		
	8					M	100	94			7.92m: B, 20°, PR, VNR CBS, RF						PLT — PL(A)=0.85MPa		
	9			FR							8.59m: B, 20°, PR, CN, RF						PLT — PL(A)=0.80MPa		
							100	100											

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

PLANT: Proline
METHOD: DT to 0.13m, then HA to 2m, then WB to 2.6m, then NMLC to 14.26m
REMARKS: Surface level extrapolated from BH01 GPS level. Borehole location determined from site features.

OPERATOR: Tightsite (B. Bakker)

LOGGED: E. Benjamin
CASING: HQ to 2m

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD
COORDINATE: E:332729.4, N:6256550.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 237003.00
DATE: 05/11/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED											SAMPLE			TESTING						
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (where encountered)	SOIL MOISTURE	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	66	[CONT] SANDSTONE: pale grey, medium grained, horizontally bedded with zones of cross-bedding; slightly fractured. Hawkesbury Sandstone.				FR	10.80	M	100	100		10.07-10.21m: B x2, 0-5°, PR, VNR CBS, RF					PLT	PL(A)=0.68MPa		
	11																PLT	PL(A)=0.91MPa		
	65																			
	12	From 12.06m: Siltstone bands 30mm to 360mm thick				FR											PLT	PL(A)=0.90MPa		
	64							M and H	100	100		12.35m: B, 20°, PR, VNR CBS, RF								
	13																PLT	PL(A)=1.1MPa		
	63								100	100		13.79m: JT, 30°, PR, CN, SM					PLT	PL(A)=0.90MPa		
	14																			
	62	Borehole discontinued at 14.26m depth. Target Depth Reached.																		
	15																			
	61																			
	16																			
	60																			
	17																			
	59																			
	18																			
	58																			
	19																			
	57																			

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

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

PLANT: Proline
METHOD: DT to 0.13m, then HA to 2m, then WB to 2.6m, then NMLC to 14.26m
REMARKS: Surface level extrapolated from BH01 GPS level. Borehole location determined from site features.

OPERATOR: Tightsite (B. Bakker)

LOGGED: E. Benjamin
CASING: HQ to 2m

Refer to explanatory notes for symbol and abbreviation definitions



CORE PHOTO LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD
COORDINATE: E:332729.4, N:6256550.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 237003.00
DATE: 05/11/25
SHEET: 1 of 2



2.60-7.00 m depth



7.00-11.00 m depth

CORE PHOTO LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD
COORDINATE: E:332729.4, N:6256550.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH03
PROJECT No: 237003.00
DATE: 05/11/25
SHEET: 2 of 2



11.00-14.26 m depth

BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd

PROJECT: Proposed Mixed Use Development

LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD

COORDINATE: E:332774.9, N:6256542.5

DATUM/GRID: MGA2020 Zone 56

DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04

PROJECT No: 237003.00

DATE: 10/11/25 - 11/11/25

SHEET: 1 of 3

[illegible]

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

PLANT: Comacchio 305

OPERATOR: Ground Test (L. Cooper)

LOGGED: E. Benjamin

METHOD: DT to 0.13m, then AD to 3m, then WB to 4.4m, then NMLC to 14.48m

CASING: HWT to 3m

REMARKS: Replicate sample *BD02101125 taken from 1.3-1.5m

BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd

PROJECT: Proposed Mixed Use Development

LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD

COORDINATE: E:332774.9, N:6256542.5

DATUM/GRID: MGA2020 Zone 56

DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04

PROJECT No: 237003.00

DATE: 10/11/25 - 11/11/25

SHEET: 2 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (kN/m ² (unconfined))	SOIL MOISTURE	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
10/1/25 No Free Groundwater Observed During Augering																					
Continued from soil log																					
CORELOSS: 900mm.																					
SANDSTONE: pale grey, orange-brown and red-brown, fine to medium grained; slightly fractured. Mittagong Formation.																					
SANDSTONE: pale grey, fine to medium grained, indistinctly cross-bedded at 30°; slightly fractured to unbroken. Hawkesbury Sandstone.																					
NOTES: #Soil origin is "probable" unless otherwise stated.																					

PLANT: Comacchio 305

OPERATOR: Ground Test (L. Cooper)

LOGGED: E. Benjamin

METHOD: DT to 0.13m, then AD to 3m, then WB to 4.4m, then NMLC to 14.48m

CASING: HWT to 3m

REMARKS: Replicate sample *BD02101125 taken from 1.3-1.5m

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD
COORDINATE: E:332774.9, N:6256542.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 237003.00
DATE: 10/11/25 - 11/11/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED														SAMPLE			TESTING					
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (where encountered)	SOIL MOISTURE	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE	
	66	11	[CONT] SANDSTONE: pale grey, fine to medium grained, indistinctly cross-bedded at 30°; slightly fractured to unbroken. Hawkesbury Sandstone.				FR		M	100	100		10.24m: B, 0-10°, UN, CN, RF				11	PLT	PL(A)=0.65MPa			
	65	12															12	PLT	PL(A)=0.64MPa			
	64	13	From 13.04m: slightly fractured					12.50		100	99		13.04m: B, 5°, PR, VNR CBS, RF				13	PLT	PL(A)=1.4MPa			
	63	14						14.00	M				13.30m: B, 5°, UN, CN, RF 13.53-13.57m: B x2, 10°, PR, VNR CBS, RF 13.86m: B, 10°, CU, CN, RF				14	PLT	PL(A)=1.0MPa			
	62	15	Borehole discontinued at 14.48m depth. Target Depth Reached.															14.48	PLT	PL(A)=0.83MPa		
	61	16																				
	60	17																				
	59	18																				
	58	19																				
	57																					

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

PLANT: Comacchio 305

OPERATOR: Ground Test (L. Cooper)

LOGGED: E. Benjamin

METHOD: DT to 0.13m, then AD to 3m, then WB to 4.4m, then NMLC to 14.48m

CASING: HWT to 3m

REMARKS: Replicate sample *BD02101125 taken from 1.3-1.5m

Refer to explanatory notes for symbol and abbreviation definitions



CORE PHOTO LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD
COORDINATE: E:332774.9, N:6256542.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 237003.00
DATE: 10/11/25 - 11/11/25
SHEET: 1 of 2



4.40-8.00 m depth



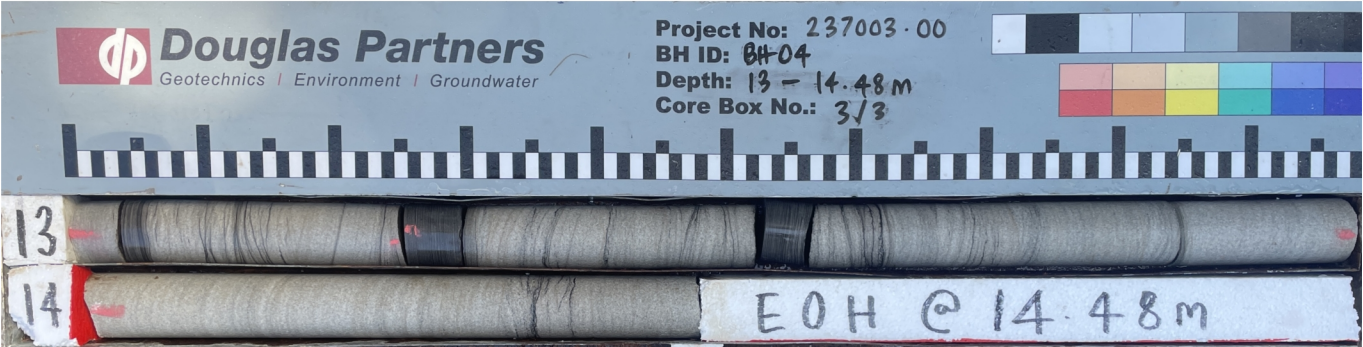
8.00-13.00 m depth

CORE PHOTO LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD
COORDINATE: E:332774.9, N:6256542.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH04
PROJECT No: 237003.00
DATE: 10/11/25 - 11/11/25
SHEET: 2 of 2



13.00-14.48 m depth

BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.9 AHD
COORDINATE: E:332763.5, N:6256536.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 237003.00
DATE: 11/11/25
SHEET: 1 of 3

CONDITIONS ENCOUNTERED						SAMPLE			TESTING AND REMARKS					
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*) DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
21/1/25 Dry	0.14	FILL / CONCRETE; 140mm thick, reinforced.		FILL	NA	NA								
	0.30	FILL / Gravelly SAND: brown; fine to coarse; fine to coarse, igneous gravel; with rounded concrete fragments and trace brick fragments up to 60mm.					jar + pfas	ES	0.20					
	0.50						jar	D/ES	0.30					
	0.80													
	1.00	From 0.30m: with gravel		FILL		M		*	D/ES	0.80				
	1.37													
	1.50	1.45m-1.60m: possible cobble												
	1.70													
	2.00	FILL / Silty SAND: dark grey; fine; low plasticity silt; trace fine to coarse quartz and igneous gravel.		FILL		w<PL	jar + pfas	D/ES	1.80					
	2.30													
	2.50	FILL / CLAY: grey mottled yellow-brown; medium plasticity.												
	3.00													
	3.45			FILL	(S)	w=PL		D	2.30					
	4.00													
	4.45	CLAY (CI) with sand: grey; medium plasticity; fine sand.												
	5.10			RS	F	NDF								
	5.50	Continued as rock log												
	6.00													
	7.00													
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Backfill

Bentonite

Sand

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

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

PLANT: Comacchio 305
METHOD: DT to 0.13m, then AD to 3m, then WB to 5.1m, then NMLC to 14m
REMARKS: Replicate sample *BD03111125 taken from 0.8-1.0m
Monitoring Well fitted with a proprietary gas cover

OPERATOR: Ground Test (L. Cooper)
LOGGED: E. Benjamin
CASING: HWT to 3m

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.9 AHD
COORDINATE: E:332763.5, N:6256536.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 237003.00
DATE: 11/11/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED														SAMPLE		TESTING			
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (where encountered)	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
21/11/25 Dry	RL (m)				RS XW HW SW FR		VL L M H VH	EH											
	76																		
	1																		
	2																		
	3																		
	4																		
	5	Continued from soil log																	
	5.34	SANDSTONE: pale grey, orange brown and red-brown, fine to medium grained; slightly fractured. Mittagong Formation.																	
	5.59																		
	6																		
	6.36	SANDSTONE: pale grey, fine to medium grained, indistinctly cross-bedded at 30°; slightly fractured to fractured. Hawkesbury Sandstone.																	
	7																		
	8	From 7.92m: mostly unbroken																	
	9																		
	9.30																		
	9.30																		

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

PLANT: Comacchio 305

OPERATOR: Ground Test (L. Cooper)

LOGGED: E. Benjamin

METHOD: DT to 0.13m, then AD to 3m, then WB to 5.1m, then NMLC to 14m

CASING: HWT to 3m

REMARKS: Replicate sample *BD03111125 taken from 0.8-1.0m
Monitoring Well fitted with a proprietary gas cover

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.9 AHD
COORDINATE: E:332763.5, N:6256536.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 237003.00
DATE: 11/11/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED																			SAMPLE			TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (where encountered) SOIL MOISTURE	GRAPHIC	WEATH.		DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE				
						DS	SW	HW	DW	TMW	CSW	FR		VL	L	M	H	VH	EH						
	9.99		[CONT] SANDSTONE: pale grey, fine to medium grained, indistinctly cross-bedded at 30°; unbroken. Hawkesbury Sandstone.					10.00																	
	66	11	From 10.00m: siltstone and carbonaceous laminations							100	100								PLT	PL(A)=0.48MPa					
	65	12																	PLT	PL(A)=0.51MPa					
	64	13	12.90m-13.30m: slightly fractured					12.30											PLT	PL(A)=1.0MPa					
										100	97														
	63	14						13.00											PLT	PL(A)=0.80MPa					
	62	15	Borehole discontinued at 14.00m depth. Target Depth Reached.																						
	61	16																							
	60	17																							
	59	18																							
	58	19																							
	57																								

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

PLANT: Comacchio 305

OPERATOR: Ground Test (L. Cooper)

LOGGED: E. Benjamin

METHOD: DT to 0.13m, then AD to 3m, then WB to 5.1m, then NMLC to 14m

CASING: HWT to 3m

REMARKS: Replicate sample *BD03111125 taken from 0.8-1.0m
Monitoring Well fitted with a proprietary gas cover

Refer to explanatory notes for symbol and abbreviation definitions



CORE PHOTO LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.9 AHD
COORDINATE: E:332763.5, N:6256536.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH05
PROJECT No: 237003.00
DATE: 11/11/25
SHEET: 1 of 1



5.10-9.00 m depth



9.00-14.00 m depth

BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD
COORDINATE: E:332748.9, N:6256527.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 237003.00
DATE: 12/11/25
SHEET: 1 of 3

CONDITIONS ENCOUNTERED						SAMPLE			TESTING AND REMARKS					
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS.(%)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	0.15	FILL / CONCRETE; 150mm thick; reinforced.		FILL	NA	NA		ES	0.25					
		FILL / Gravelly SAND trace silt: dark brown; fine to coarse; fine to coarse, igneous gravel; with concrete gravel fragments; trace brick fragments up to 60mm.		FILL		M		D/ES	0.30					
										0.50				
	1				MC			ES	0.90					
	1.20							SPT	1.00		SPT	7,9,7 N=16		
		FILL / Sandy CLAY trace gravel: dark brown; low plasticity; fine sand; fine to coarse, quartz gravel.		FILL				ES	1.20					
	1.70									1.50				
		CLAY (Cl): yellow-brown; medium plasticity.						D/ES	1.80					
	2					w<PL				2.00				
		From 2.30m: Dark grey mottled red-brown		RS	VSt			ES	2.40					
								SPT	2.50		SPT	6,9,12 N=21		
	3.15					NDF				2.95				
		Continued as rock log												
	4									4				
	5									5				
	6									6				
	7									7				
	8									8				
	9									9				

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

PLANT: Comacchio Geo 305

OPERATOR: Ground Test (L. Cooper)

LOGGED: E. Benjamin

METHOD: DT to 0.15m, then AD to 2.5m, then WB to 3.15m, then NMLC to 14.32m

CASING: HQ to 1.56m

REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD
COORDINATE: E:332748.9, N:6256527.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 237003.00
DATE: 12/11/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED														SAMPLE		TESTING			
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (where encountered)	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	76																		
	75																		
	74																		
	73	Continued from soil log																	
	3.76	SANDSTONE: dark red-brown, red-brown and pale grey, fine to medium grained, large extremely weathered seams. Mittagong Formation.															PP	290kPa	
	3.84																PP	210kPa	
	4.00																PP	520kPa	
	4.30																PP	490kPa	
	4.56																PLT	PL(A)=0.23MPa	
	4.88																PP	410kPa	
	5.00																PP	590kPa	
	5.55																PP	310kPa	
	5.65																PP	530kPa	
	6.00																PP	240kPa	
	6.21	SANDSTONE: pale grey and pale orange, fine to medium grained, indistinct, with siltstone and carbonaceous laminations, mostly slightly fractured and unbroken; cross-bedded at 30°. Hawkesbury Sandstone.															PLT	PL(A)=0.18MPa	
	6.48																PLT	PL(A)=0.62MPa	
	6.62																PLT	PL(A)=1.1MPa	
	6.73																PLT	PL(A)=0.09MPa	
	7.00																PLT	PL(A)=0.98MPa	
	7.55																PLT	PL(A)=0.56MPa	
	8.00																PLT	PL(A)=1.0MPa	
	9.36																PLT	PL(A)=1.2MPa	

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

PLANT: Comacchio Geo 305

OPERATOR: Ground Test (L. Cooper)

LOGGED: E. Benjamin

METHOD: DT to 0.15m, then AD to 2.5m, then WB to 3.15m, then NMLC to 14.32m

CASING: HQ to 1.56m

REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD
COORDINATE: E:332748.9, N:6256527.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 237003.00
DATE: 12/11/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED																			SAMPLE				TESTING			
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (where encountered)	SOIL MOISTURE	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE						
	66	[CONT] SANDSTONE: pale grey and pale orange, fine to medium grained, indistinct, with siltstone and carbonaceous laminations, mostly slightly fractured and unbroken; cross-bedded at 30°. Hawkesbury Sandstone. 12.69m-13.00m: Laminite bands				PS SW FW MW SW FR			100	100							11	PLT	PL(A)=1.1MPa							
	65						FR	11.90					11.58m: B, 0-5°, UN, VNR CBS, RF				12	PLT	PL(A)=0.68MPa							
	64							12.70		100	100								PLT	PL(A)=0.78MPa						
	63																	13	PLT	PL(A)=1.3MPa						
	62	Borehole discontinued at 14.32m depth. Target Depth Reached.																								
	61																									
	60																									
	59																									
	58																									
	57																									

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

PLANT: Comacchio Geo 305

OPERATOR: Ground Test (L. Cooper)

LOGGED: E. Benjamin

METHOD: DT to 0.15m, then AD to 2.5m, then WB to 3.15m, then NMLC to 14.32m

CASING: HQ to 1.56m

REMARKS:

Refer to explanatory notes for symbol and abbreviation definitions



CORE PHOTO LOG

CLIENT: Aqualand St Leonard Development Pty Ltd

PROJECT: Proposed Mixed Use Development

LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD

COORDINATE: E:332748.9, N:6256527.1

DATUM/GRID: MGA2020 Zone 56

DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06

PROJECT No: 237003.00

DATE: 12/11/25

SHEET: 1 of 2



3.15-7.00 m depth



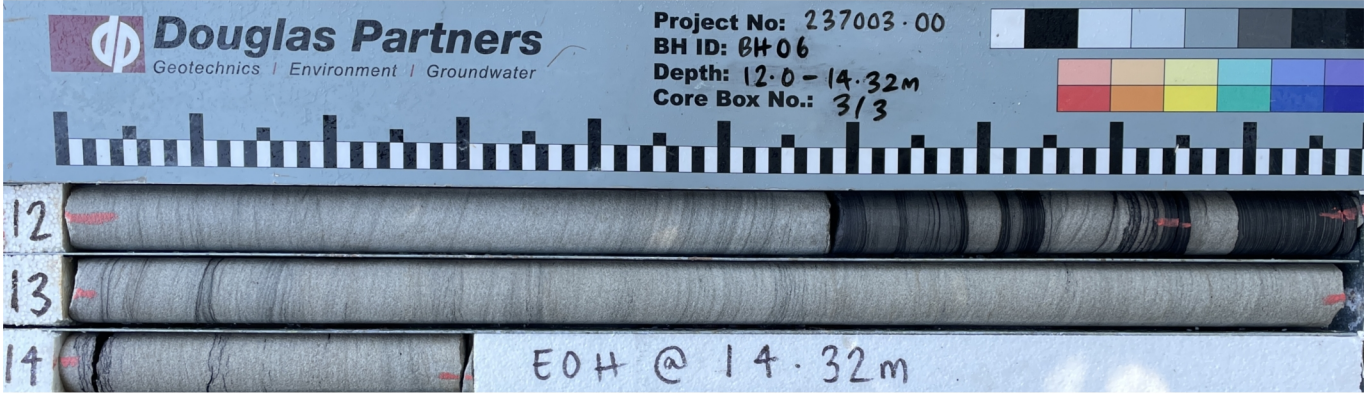
7.00-12.00 m depth

CORE PHOTO LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 76.8 AHD
COORDINATE: E:332748.9, N:6256527.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH06
PROJECT No: 237003.00
DATE: 12/11/25
SHEET: 2 of 2



12.00-14.32 m depth

BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 71.2 AHD
COORDINATE: E:332783.5, N:6256507.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH07
PROJECT No: 237003.00
DATE: 17/11/25
SHEET: 1 of 2

CONDITIONS ENCOUNTERED						SAMPLE			TESTING AND REMARKS					
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*) DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	
17/11/25 No Free Groundwater Observed Whilst Augering	71	0.14	FILL / CONCRETE; 140mm thick, reinforced.		FILL	NA	NA		ES	0.14	0.14	DCP9/150 SPT 8,16,13 N=29 PP 450kPa		
	70	0.20	FILL / Sandy GRAVEL: dark grey; igneous; road base.		FILL	VC	ND		ES	0.20	0.20			
	69	0.30			FILL	(ND)	ND		ES	0.30	0.30			
	68	0.45	FILL / SAND with gravel: pale yellow; coarse; igneous gravel; carbonaceous material			St			ES	0.45	0.45			
	67	1	From 1.40m: Grey; trace red-brown; trace sandstone gravel		RS	VSt	w<PL		ES	0.90	1.10			
	66	1.50	FILL / Clayey SAND with gravel: pale grey and yellow; medium to coarse, sandstone gravel; trace concrete cobbles.			VSt								
	65	2	CLAY (CI-CH) with gravel: red-brown and grey; medium to high plasticity; fine, ironstone gravel.			H			ES	1.40	1.50			
	64	2	Continued as rock log											
	63	3												
	62	4												
NOTES: [#] Soil origin is "probable" unless otherwise stated. ^(*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.														

PLANT: Proline
METHOD: DT to 0.14m, then AD to 1.5m, then NMLC to 9.4m
REMARKS: Surface level taken from LTS drawing 52609 001DT and borehole location determined from site features.

OPERATOR: Tightsite (B. Bakker)
LOGGED: C. Lambert-Bridges
CASING: HQ to 1.5m

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd

PROJECT: Proposed Mixed Use Development

LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 71.2 AHD

COORDINATE: E:332783.5, N:6256507.7

DATUM/GRID: MGA2020 Zone 56

DIP/AZIMUTH: 90°/---°

LOCATION ID: BH07

PROJECT No: 237003.00

DATE: 17/11/25

SHEET: 2 of 2

CONDITIONS ENCOUNTERED															SAMPLE			TESTING																	
GROUNDWATER	DEPTH (m)		DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE																
RL (m)																																			
17/11/25 No Free Groundwater Observed Whilst Augering	71		Continued from soil log Sandy CLAY (CL): pale grey and pale red; low plasticity; coarse sand. SANDSTONE: pale grey and red-brown, medium to coarse grained, bedded, 0 to 20°, thinly bedded. Hawkesbury Sandstone. 2.70m-3.05m: Siltstone clasts and laminations 5.70m-6.39m: trace siltstone clasts		BS XW HW MW SW FR	1.50 1.95 2.24 2.31 3.05 3.20 3.60 4.23 6.31 6.38	L M SEAM M SEAM M H SEAM	100 50 98 100 100 100	50 50 90 100 85 100	SOIL SOIL SEAM SEAM SEAM SEAM SEAM SEAM SEAM SEAM	1.90-1.95m: EW 2.24-2.31m: EW 2.38m: JT, 90°, PR, CN, RF, (2.31-2.44m) 2.54m: B, 20°, PR, CN, RF 2.68m: B, 0°, PR, CN, RF 2.81m: B, 0°, PR, CT Clay 10mm, RF 2.84m: B, 0°, PR, CN, RF 3.05m: B, 0°, PR, CT Clay, RF 3.05-3.20m: EW 3.57m: B, 0°, PR, SN Fe, RF 3.81m: JT x2, 30°, PR, SN Fe, TI 3.84m: JT, 30°, PR, SN Fe, RF 4.19m: B, 0°, PR, SN Fe, TI 4.20m: B, 0°, PR, SN Fe, TI 4.21m: B, 0°, PR, SN Fe, CT, Clay, TI 4.95-5.45m: B x4, 0-20°, PR, CN, RF 6.26m: B, 0°, IR, CT Clay, SM 6.31-6.38m: SZ 6.43-7.20m: B x4, 0°, PR, CN, RF	24.1MPa C	5.45 5.65	PLT	PL(A)=0.31MPa PL(A)=1.4MPa PL(A)=1.1MPa PL(A)=1.3MPa PL(A)=1.1MPa PL(A)=1.1MPa PL(A)=0.81MPa PL(A)=0.82MPa PL(A)=0.87MPa																				
	70	1																																	
	69	1.95																																	
	68	2																																	
	67	3																																	
	66	4																																	
	65	4.21																																	
	64	4.23																																	
	63	5																																	
	62	6																																	
Borehole discontinued at 9.40m depth. Target Depth Reached.																																			
NOTES: #Soil origin is "probable" unless otherwise stated.																																			

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

PLANT: Proline

OPERATOR: Tightsite (B. Bakker)

LOGGED: C. Lambert-Bridges

METHOD: DT to 0.14m, then AD to 1.5m, then NMLC to 9.4m

CASING: HQ to 1.5m

REMARKS: Surface level taken from LTS drawing 52609 001DT and borehole location determined from site features.

CORE PHOTO LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 71.2 AHD
COORDINATE: E:332783.5, N:6256507.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH07
PROJECT No: 237003.00
DATE: 17/11/25
SHEET: 1 of 1



1.50-6.00 m depth



6.00-9.40 m depth

BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 71.2 AHD
COORDINATE: E:332762.1, N:6256504.2
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH08
PROJECT No: 237003.00
DATE: 14/11/25
SHEET: 1 of 2

CONDITIONS ENCOUNTERED						SAMPLE			TESTING AND REMARKS					
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*)	DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
14/11/25 Dry	71	0.12	FILL / CONCRETE; 120mm thick, reinforced.		FILL	NA				ES		0.12	↓ DCP9/ISO ↓ HB 11/50mm	
	70	0.30	FILL / Sandy GRAVEL: pale brown; fine to coarse, igneous; dark grey sand; charcoal; road base.		FILL	VC		NA		ES		0.20		
	69	0.56			FILL					ES		0.32		
	68	0.80	FILL / Clayey SAND with gravel: pale yellow-brown; fine to coarse, sandstone gravel.		XWM	ND	w=PL			ES		0.51		
	67	1	Sandy CLAY (CL-CI) trace gravel: pale grey, red-brown and dark grey; low to medium plasticity; coarse sand; fine to medium, ironstone and sandstone gravel.							ES		0.60		
			Continued as rock log									0.70		
												0.80		
		1										1		
		2										2		
		3										3		
		4										4		
		5										5		
		6										6		
		7										7		
		8										8		
		9										9		

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

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

PLANT: Proline **OPERATOR:** Tightsite (B. Bakker) **LOGGED:** C. Lambert-Bridges
METHOD: DT to 0.12m, then AD to 0.8m, then NMLC to 7.7m **CASING:** HQ to 0.8m
REMARKS: Replicate sample *BD5141125 taken from 0.49-0.51m

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

PROJECT: Proposed Mixed Use Development

LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

COORDINATE: E:332762.1, N:6256504.2

DATUM/GRID: MGA2020 Zone 56

DIP/AZIMUTH: 90°/---°

PROJECT No: 237003.00

DATE: 14/11/25

SHEET: 2 of 2

CONDITIONS ENCOUNTERED														SAMPLE			TESTING						
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (kN/m ²) SOIL MOISTURE		GRAPHIC	WEATH. RS XW HW MW SW FR		DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE	
14/1/25 Dry	71		Continued from soil log SANDSTONE: brown, brown-red and pale grey, fine to medium grained, distinct, bedded, 0 to 20°, thinly bedded; iron stained. Hawkesbury Sandstone.																				
	70	1					HW		0.80	M					0.89-0.91m: EW, Clay 0.93m: B, 0°, PR, CT Clay, SM 0.95-1.00m: EW, Clay 1.11m: B, 0°, PR, TI Fe 1.19-1.22m: B x2, 20°, PR, SN Fe, RF 1.26m: JT, 30-40°, IR, SN Fe, RF 1.25-1.37m: B x3, 0-20°, IR, SN Fe, RF 1.49m: B, 0°, PR, VNR Clay, RF 1.53-1.59m: B x4, 0°, PR, SN Fe, RF 2.03m: B, 0°, PR, CN, RF 2.52m: B, 20°, PR, VNR Clay, RF 2.80-3.05m: B x7, 10°, PR, SN Fe, RF 3.07m: B, 10°, PR, TI Clay 3.31m: B, 20°, PR, CN, RF					PLT	PL(A)=0.18MPa		
	69	1.60						1.60	L M	100	70									PLT	PL(A)=0.47MPa		
	68	2	SANDSTONE: pale grey, fine grained, distinct, bedded, 0 to 20°, thinly bedded; mostly slightly fractured. Hawkesbury Sandstone.				SW													PLT	PL(A)=0.42MPa		
	67	3						3.00		100	85									PLT	PL(A)=0.55MPa		
	66	4							M														
	65	5								100	98			4.06-4.22m: B x5, 0°, PR, CN, RF 4.55-4.85m: B x2, 0°, PR, CN, RF					PLT	PL(A)=1.0MPa			
	64	6						5.50		100	98			5.39-5.42m: B x2, 20°, PR, CN, RF 6.02-6.05m: B x2, 0°, IR, CN, RF 6.33m: B, 20°, PR, CN, RF					PLT	PL(A)=1.0MPa			
	63	7							M H	100	100									PLT	PL(A)=0.96MPa		
	62	8	Borehole discontinued at 7.70m depth. Target Depth Reached.																				
		9																					

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

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

METHOD: DT to 0.12m, then AD to 0.8m, then NMLC to 7.7m

REMARKS: Replicate sample *BD5141125 taken from 0.49-0.51m

CASING: HQ to 0.8m

Refer to explanatory notes for symbol and abbreviation definitions

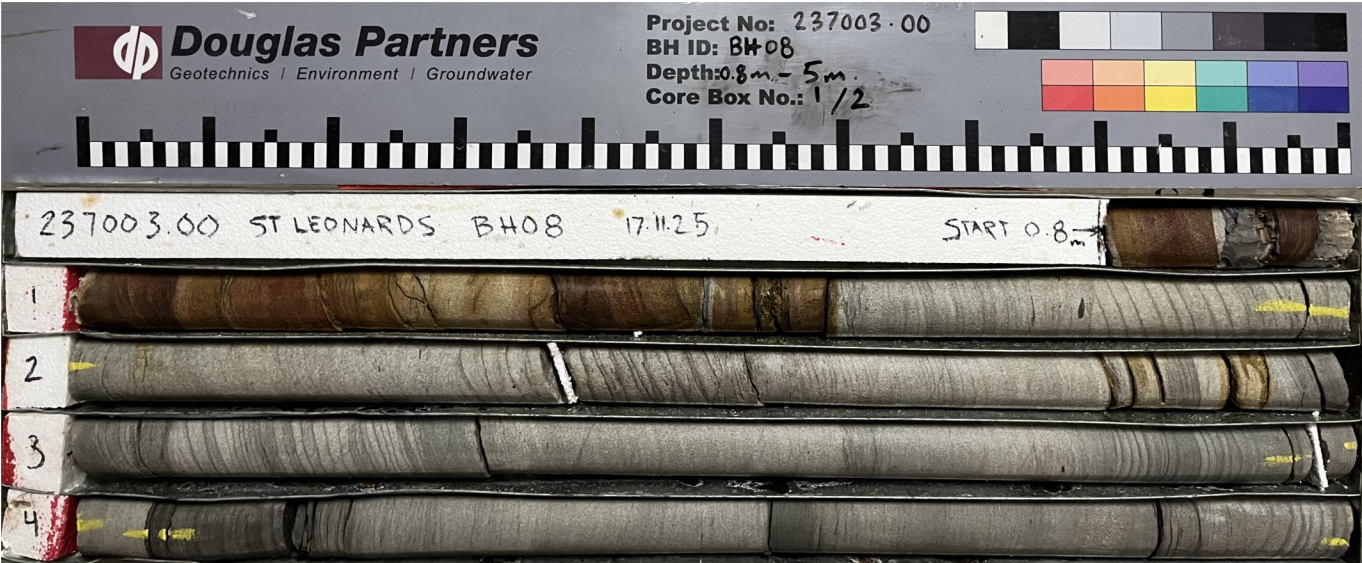


CORE PHOTO LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 71.2 AHD
COORDINATE: E:332762.1, N:6256504.2
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH08
PROJECT No: 237003.00
DATE: 14/11/25
SHEET: 1 of 1



0.80-5.00 m depth



5.00-7.70 m depth

BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 74.0 AHD
COORDINATE: E:332787.2, N:6256481.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH09
PROJECT No: 237003.00
DATE: 10/11/25 - 11/11/25
SHEET: 1 of 3

CONDITIONS ENCOUNTERED						SAMPLE			TESTING AND REMARKS							
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*)	DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
19/1/25 19/1/25	0.13		FILL / CONCRETE; 130mm thick; reinforced.		FILL	NA	NA	NA						DCP9/150		

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

PLANT: Proline

OPERATOR: Tightsite (B. Bakker)

LOGGED: E. Benjamin

METHOD: DT to 0.13m, then HA to 2.54m, then NMLC to 10.37m

CASING: HQ to 1.56m

REMARKS: Surface level taken from LTS drawing 52609 001DT and borehole location determined from site features.

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd

PROJECT: Proposed Mixed Use Development

LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 74.0 AHD

COORDINATE: E:332787.2, N:6256481.0

DATUM/GRID: MGA2020 Zone 56

DIP/AZIMUTH: 90°/---°

LOCATION ID: BH09

PROJECT No: 237003.00

DATE: 10/11/25 - 11/11/25

SHEET: 2 of 3

[illegible]

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

PLANT: Proline

OPERATOR: Tightsite (B. Bakker)

LOGGED: E. Benjamin

METHOD: DT to 0.13m, then HA to 2.54m, then NMLC to 10.37m

CASING: HQ to 1.56m

REMARKS: Surface level taken from LTS drawing 52609 001DT and borehole location determined from site features.

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 74.0 AHD
COORDINATE: E:332787.2, N:6256481.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH09
PROJECT No: 237003.00
DATE: 10/11/25 - 11/11/25
SHEET: 3 of 3

GROUNDWATER		CONDITIONS ENCOUNTERED												SAMPLE			TESTING				
RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (where encountered)	SOIL MOISTURE	GRAPHIC	WEATH.		DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
						RS	DW														
		[CONT] SANDSTONE: pale grey and grey, fine to medium grained, indistinctly cross-bedded at 30-40°, with laminite bands; sheared seams; ; slightly fractured. Hawkesbury Sandstone. Borehole discontinued at 10.37m depth. Target Depth Reached.				FR			M	100	68		9.94m: B, 0-10°, UN, VNR CBS, RF 10.03m: JT, 40°, PR, CN, RF					PLT	PL(A)=0.88MPa		
														</							

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

PLANT: Proline

OPERATOR: Tightsite (B. Bakker)

LOGGED: E. Benjamin

METHOD: DT to 0.13m, then HA to 2.54m, then NMLC to 10.37m

CASING: HQ to 1.56m

REMARKS: Surface level taken from LTS drawing 52609 001DT and borehole location determined from site features.

Refer to explanatory notes for symbol and abbreviation definitions



CORE PHOTO LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 74.0 AHD
COORDINATE: E:332787.2, N:6256481.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH09
PROJECT No: 237003.00
DATE: 10/11/25 - 11/11/25
SHEET: 1 of 1



2.54-7.00 m depth



7.00-10.37 m depth

BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 71.2 AHD
COORDINATE: E:332769.4, N:6256479.2
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH10
PROJECT No: 237003.00
DATE: 13/11/25
SHEET: 1 of 3

CONDITIONS ENCOUNTERED						SAMPLE			TESTING AND REMARKS										
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*)	DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE			
03/17/25	71	0.12	FILL / CONCRETE; 120mm thick, reinforced.		FILL	NA	NA	NA		3x	ES	0.23	DCP9/150	5/100mm 5 10 15 25 29 25/130mm					
	0.20	FILL / GRAVEL with sand: pale brown; coarse, igneous; coarse sand.	FILL			NDF	2x	ES									0.25		
	0.30	FILL / Sandy GRAVEL: dark-brown to dark grey; coarse, igneous; medium to coarse sand; trace carbonaceous flakes.	FILL		VC	D											0.45		
	1	FILL / Clayey SAND with gravel: pale grey; fine to coarse; medium to coarse, sandstone gravel.				NDF											1		
	70	1.10	Continued as rock log																
		2																	
	69																		
		3																	
	68																		
		4																	
	67																		
		5																	
	66																		
		6																	
	65																		
		7																	
	64																		
		8																	
	63																		
		9																	
	62																		

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

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

PLANT: Proline **OPERATOR:** Tightsite (B. Bakker) **LOGGED:** C. Lambert-Bridges
METHOD: DT to 0.12m, then HA to 0.53m, then WB to 1.1m, then NMLC to 14.35m **CASING:** HQ to 1.1m
REMARKS: Surface level taken from LTS drawing 52609 001DT and borehole location determined from site features.
Monitoring Well fitted with a proprietary gas cover

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 71.2 AHD
COORDINATE: E:332769.4, N:6256479.2
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH10
PROJECT No: 237003.00
DATE: 13/11/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED										SAMPLE				TESTING										
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (kN/m ² (psi))		GRAPHIC	WEATH.						RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
				SW	FR		PS	XW	HW	LW	SW	FR												
	03/7/25	71																						
		1	Continued from soil log																					
		2	SANDSTONE: pale grey, grey, red-brown and orange-brown, fine grained, distinct bedding 0 to 20°, thinly bedded to medium bedded; fractured then slightly fractured. Mittagong Formation.																					
		3	SANDSTONE: pale grey, fine to coarse grained, bedded, 0 to 20°, thinly bedded to medium bedded; slightly fractured to fractured. Hawkesbury Sandstone.																					
		4																						
		5	4.20m-4.44m: siltstone laminations From 4.56m: fine grained																					
		6	6.30m: slightly fractured																					
		7																						
		8	8.00m: mostly unbroken																					
		9																						
NOTES: ■ Soil origin is "probable" unless otherwise stated.																								

NOTES: (H) Soil origin is "probable" unless otherwise stated.

PLANT: Proline

OPERATOR: Tightsite (B. Bakker)

LOGGED: C. Lambert-Bridges

METHOD: DT to 0.12m, then HA to 0.53m, then WB to 1.1m, then NMLC to 14.35m

CASING: HQ to 1.1m

REMARKS: Surface level taken from LTS drawing 52609 001DT and borehole location determined from site features.
Monitoring Well fitted with a proprietary gas cover

Monitoring Well fitted with a proprietary gas cover

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 71.2 AHD
COORDINATE: E:332769.4, N:6256479.2
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH10
PROJECT No: 237003.00
DATE: 13/11/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED																			SAMPLE				TESTING												
GROUNDWATER	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE																	
RL (m)	10.00	[CONT] SANDSTONE: pale grey, fine to coarse grained, distinctly bedded at 0 to 20°, thinly bedded to medium bedded; trace carbonaceous and siltstone laminations, mostly unbroken. Hawkesbury Sandstone. From 11.50m: siltstone bands and laminations 11.40m-11.46m: microfaulting								11.40-11.45m: SS 11.49-11.75m: F, 70°, PR, CN, SM 12.62m: JT, 30°, PR, CN, RF 13.69m: JT, 30°, PR, VNR Clay, RF	24.1MPa	C		11	PLT	PL(A)=0.87MPa																			
61																																			
11																																			
60																																			
12																																			
59																																			
13																																			
58																																			
14																																			
57																																			
Borehole discontinued at 14.35m depth. Target Depth Reached.																																			
15																																			
56																																			
16																																			
55																																			
17																																			
54																																			
18																																			
53																																			
19																																			
52																																			

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

PLANT: Proline

OPERATOR: Tightsite (B. Bakker)

LOGGED: C. Lambert-Bridges

METHOD: DT to 0.12m, then HA to 0.53m, then WB to 1.1m, then NMLC to 14.35m

CASING: HQ to 1.1m

REMARKS: Surface level taken from LTS drawing 52609 001DT and borehole location determined from site features.
Monitoring Well fitted with a proprietary gas cover

Refer to explanatory notes for symbol and abbreviation definitions



CORE PHOTO LOG

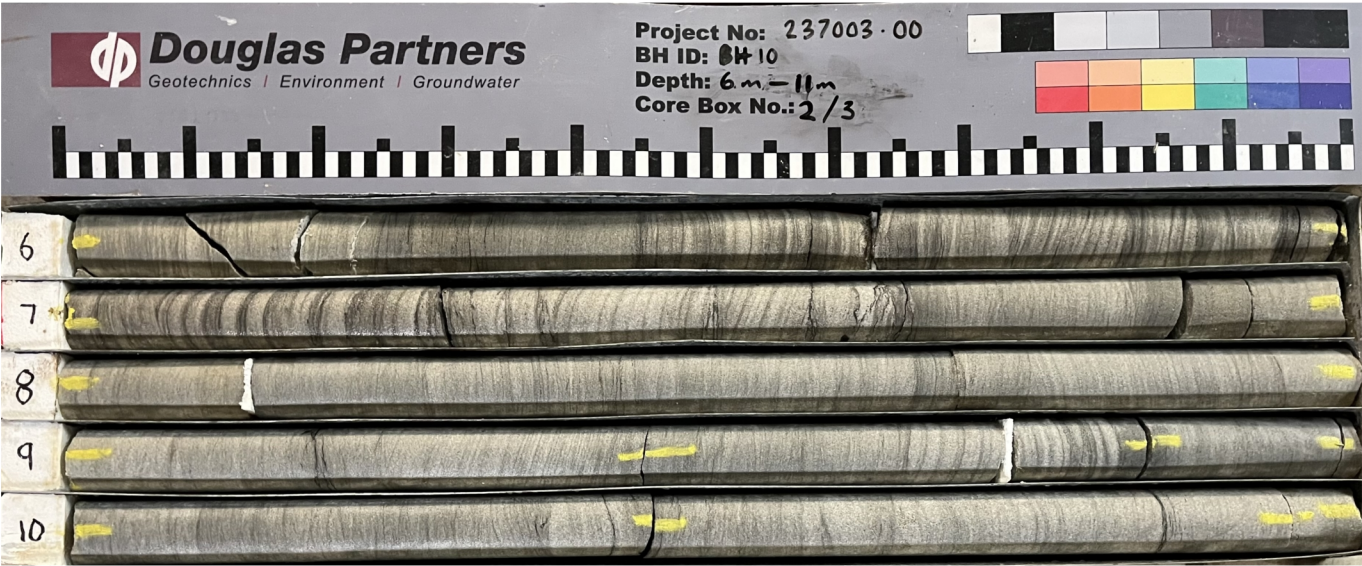
CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 71.2 AHD
COORDINATE: E:332769.4, N:6256479.2
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH10
PROJECT No: 237003.00
DATE: 13/11/25
SHEET: 1 of 2



1.10-6.00 m depth



6.00-11.00 m depth

CORE PHOTO LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 71.2 AHD
COORDINATE: E:332769.4, N:6256479.2
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH10
PROJECT No: 237003.00
DATE: 13/11/25
SHEET: 2 of 2



11.00-14.35 m depth

BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 74.0 AHD
COORDINATE: E:332792.7, N:6256449.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH11
PROJECT No: 237003.00
DATE: 10/11/25
SHEET: 1 of 3

CONDITIONS ENCOUNTERED						SAMPLE			TESTING AND REMARKS						
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*) DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS		
10/11/25 No Free Groundwater Observed Whilst Augering	0.13		FILL / CONCRETE; 130mm thick; reinforced.		FILL	NA	NA		ES		0.12				
	0.30	FILL / GRAVEL with sand with cobbles: dark grey; medium to coarse, igneous; fine sand; igneous cobbles; (up to 80mm).	FILL		VC	NDF	D/ES		0.30						
									0.40						
							0.50								
	0.80		FILL / SAND with clay with gravel: pale brown-grey; medium; fine to coarse, sandstone gravel.		FILL				ES		0.70				
	1		CLAY (Cl): red-brown mottled grey; medium plasticity.		RS	ND	ND				1				
	1.69		Continued as rock log												
	2													2	
	3													3	
	4													4	
	5													5	
	6													6	
	7													7	
8										8					
9										9					

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

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

PLANT: Proline **OPERATOR:** Tightsite (B. Bakker) **LOGGED:** E. Benjamin
METHOD: DT to 0.13m, then HA to 0.75m, then WB to 1.69m, then NMLC to 10.72m **CASING:** HQ to 1.5m
REMARKS: Surface level taken from LTS drawing 52609 001DT and borehole location determined from site features.

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd

PROJECT: Proposed Mixed Use Development

LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 74.0 AHD

COORDINATE: E:332792.7, N:6256449.5

DATUM/GRID: MGA2020 Zone 56

DIP/AZIMUTH: 90°/---°

LOCATION ID: BH11

PROJECT No: 237003.00

DATE: 10/11/25

SHEET: 2 of 3

GROUNDWATER	CONDITIONS ENCOUNTERED										SAMPLE			TESTING								
	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (where encountered) SOIL MOISTURE	GRAPHIC	WEATH. BS XW HW NW SW FR	DEPTH (m)	STRENGTH VL M H VH EH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE		
10/1/25 No Free Groundwater Observed Whilst Augering	73	1	Continued from soil log														1					
	72	2	CLAY (Cl): pale grey; medium plasticity; with red-brown ironstone gravel / bands; with bands of very low strength sandstone.			XW	1.69 1.76	SEAM	100	9	SEAM	1.75-2.65m: EW, 900mm					2	PP	250-320kPa			
																		PP	150-280kPa			
																		PP	410kPa			
						HW	2.63	VL										PP	140kPa			
	71	3.02	SANDSTONE: pale grey, orange-brown and red-brown, fine to medium grained; fractured. Mittagong Formation.			XW	2.86 3.02	SEAM			SEAM	2.77-2.79m: EW, 20mm 2.84-2.87m: EW, 30mm 2.91-3.03m: EW, 120mm 3.14m: JT, 10°, UN, VNR Clay, RF 3.18m: JT, 40°, UN, CN, RF					3	PP	420kPa			
																		PP	170kPa			
	70	4				HW	3.56	L	100	66		3.21m: JT, 20°, UN, CT Clay, RF 3.25-3.42m: JT, 10°, PR, VNR Clay, RF 3.49-3.53m: EW, 40mm 3.84m: JT x2, 0-10°, UN, SN Fe					4	PLT	PL(A)=1.1MPa			
							4.39					4.44-4.53m: JT, 20-40°, IR, CT Clay 15mm, RF										
	4.76 4.78		From 5.00m: Mostly pale grey				5.00		100	69		4.91m: EW, 10mm 4.95m: B, 0-5°, UN, SN Fe, RF 5.30m: B, 0-5°, IR, VNR Clay, RF 5.46m: B, 30°, PR, SN Fe, RF 5.53m: EW, 20mm 5.77m: B, 10°, UN, VNR Clay, SM 5.83m: B, 0-5°, UN, SN Fe, RF 5.99m: JT, 70°, UN, SN Fe, RF 6.20m: B, 0-5°, UN, CN, RF					5	PLT	PL(A)=0.38MPa			
	6.5					SW						6.24-6.26m: B x2, 0-5°, UN, SN Fe, RF 6.32m: B, 0-5°, CU, VNR CBS, RF 6.72m: B, 0-5°, UN, VNR Clay, SM						6	PLT	PL(A)=0.66MPa		
	6.8	6					6.27					7.32-7.34m: CS, 20mm 7.42-7.45m: B x2, 0-5°, UN, CN, SM 7.61-7.72m: JT, 60°, PR, VNR Clay, RF, Fe, SN 7.77-7.87m: B x2, 20°, PR, VNR CBS, RF 8.12-8.15m: B x2, 0°, PR, VNR CBS, RF						7	PLT	PL(A)=0.51MPa		
	6.7	7	From 7.42m: With siltstone / bands			FR			100	84												
	6.6	8							100	98								8	PLT	PL(A)=0.53MPa		
	6.5	9	9.50m-9.90m: Shear zone				9.51	L	100	60		8.80-9.45m: JT x5, 50°, PR, TI 9.52m: JT, 40°, PR, CT Clay 10mm, RF 9.52-9.91m: SZ, Clay	12.9MPa	C		8.53	PLT	PL(A)=0.55MPa				
						XW	9.81 9.91	SEAM			SEAM								PLT	PL(A)=0.64MPa		

NOTES: (#) Soil origin is "probable" unless otherwise stated

PLANT: Proline

OPERATOR: Tightsite (B. Bakker)

LOGGED: E. Benjamin

METHOD: DT to 0.13m, then HA to 0.75m, then WB to 1.69m, then NMLC to 10.72m

CASING: HQ to 1.5m

REMARKS: Surface level taken from LTS drawing 52609 001DT and borehole location determined from site features.

Refer to explanatory notes for symbol and abbreviation definitions



BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 74.0 AHD
COORDINATE: E:332792.7, N:6256449.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH11
PROJECT No: 237003.00
DATE: 10/11/25
SHEET: 3 of 3

GROUNDWATER	CONDITIONS ENCOUNTERED													SAMPLE			TESTING			
	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE	
	10.00		[CONT] SANDSTONE: pale grey, orange-brown and red-brown, fine to medium grained; fractured. Mittagong Formation		FR		M	100	60		10.13m: JT, 30°, PR, VNR Clay, RF 10.20m: B, 10°, PR, VNR Clay, RF 10.31-10.40m: JT x2, 40°, PR, CN, SM						PLT	PL(A)=0.87MPa		
	11		10.10m-10.40m: Shear zone																	
	12		Borehole discontinued at 10.72m depth. Target Depth Reached.																	
	13																			
	14																			
	15																			
	16																			
	17																			
	18																			
	19																			

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

PLANT: Proline
METHOD: DT to 0.13m, then HA to 0.75m, then WB to 1.69m, then NMLC to 10.72m
REMARKS: Surface level taken from LTS drawing 52609 001DT and borehole location determined from site features.

OPERATOR: Tightsite (B. Bakker)

LOGGED: E. Benjamin
CASING: HQ to 1.5m

Refer to explanatory notes for symbol and abbreviation definitions



CORE PHOTO LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 74.0 AHD
COORDINATE: E:332792.7, N:6256449.5
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH11
PROJECT No: 237003.00
DATE: 10/11/25
SHEET: 1 of 1



1.69-6.00 m depth



6.00-10.72 m depth

BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 74.0 AHD
COORDINATE: E:332772.7, N:6256445.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH12
PROJECT No: 237003.00
DATE: 11/11/25 - 12/11/25
SHEET: 1 of 2

CONDITIONS ENCOUNTERED						SAMPLE			TESTING AND REMARKS						
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN (#)	CONSIS. ^(*) DENSITY. ^(*)	MOISTURE	REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
		0.13	FILL / CONCRETE; 130mm thick.		FILL	NA	NA								
		0.25	FILL / GRAVEL with sand: dark grey; coarse, igneous; with concrete fragments.		FILL	VC	NDF		* D/ES		0.30				
		0.52	FILL / Gravelly SAND with clay: red-brown; fine to medium; fine to coarse, igneous and sandstone gravel; with concrete fragments, trace sandstone cobble.				NDF				0.40				
		1	Continued as rock log								1				
		2									2				
		3									3				
		4									4				
		5									5				
		6									6				
		7									7				
		8									8				
		9									9				

20/17/25

73

72

71

70

69

68

67

66

65

5

10

15

25

25

Bentonite

Sand

Bentonite

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

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

PLANT: Proline
METHOD: DT to 0.13m, then HA to 0.43m, then WB to 0.52m, then NMLC to 9.73m
REMARKS: Surface level taken from LTS drawing 52609 001DT and borehole location determined from site features. Replicate sample *BD04111125 taken from 0.3-0.4m

OPERATOR: Tightsite (B. Bakker)
LOGGED: E. Benjamin
CASING: HQ to 0.43m

Refer to explanatory notes for symbol and abbreviation definitions

BOREHOLE LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 74.0 AHD
COORDINATE: E:332772.7, N:6256445.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH12
PROJECT No: 237003.00
DATE: 11/11/25 - 12/11/25
SHEET: 2 of 2

CONDITIONS ENCOUNTERED										SAMPLE			TESTING							
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (where encountered) SOIL MOISTURE	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
						RS XW HW NW SW FR														
		0.57	Continued from soil log				0.52													
	73	1	FILL / Gravelly SAND with clay; see previous page.						100	0							PP	170-210kPa		
			CLAY (Cl): dark grey mottled red-brown; medium plasticity.														PP	290kPa		
		2						SOIL	100	0							PP	190kPa		
	72																PP	330kPa		
		2.30	CLAY (Cl) with sand: pale grey with minor red mottling; medium plasticity; fine sand.				2.30										PP	200-230kPa		
		2.90				XW											PP	560kPa		
	71		SANDSTONE: pale grey, red-brown and orange-brown, fine to medium grained; with extremely weathered bands, fractured. Mittagong Formation.					SEAM	92	0		SEAM	2.90-3.36m: EW				PP	>600kPa		
		3.51				HW	3.36	VL									PP	200-300kPa		
		3.62				HW	3.62	SEAM					3.65m: JT, 30-40°, ST, TI Fe				PLT	PL(A)=0.01MPa		
						XW	3.68	SEAM					3.68-3.78m: EW				PP	220kPa		
						HW	3.78	SEAM					3.82m: JT, 20°, PR, SN Fe, RF				PP	350kPa		
	70	4				XW	3.94	SEAM					3.94-4.03m: EW							
			3.10m-3.30m: strong smell of sulphur				4.03						4.20m: 10							
						HW		M and H	100	77			4.37-4.53m: JT, 60-80°, IR, SN Fe, RF				PLT	PL(A)=1.3MPa		
		4.89					4.86						4.63m: EW, 40				PLT	PL(A)=0.65MPa		
			SANDSTONE: pale grey, fine to medium grained; slightly fractured. Hawkesbury Sandstone.				5.05	L to M					4.75-4.87m: F, microfault, reverse and normal slip				PLT	PL(A)=0.24MPa		
		6				MW to SW							5.20-5.66m: JT x3, 0-40°, IR, SN Fe, RF							
							5.90						5.07-5.94m: JT x11, 20-60°, UN, TI Fe							
	68	6					6.00		100	69			5.57-5.66m: JT x2, 40°, PR, SN Fe, RF, + CT Clay							
						SW							5.69-5.74m: SS							
													5.83-5.86m: JT, 90°, IR, SN Fe, RF				PLT	PL(A)=0.49MPa		
													5.87m: JT, 20°, IR, SN Fe, RF							
		7					7.05	M					6.00m: EW, 10							
													6.18-6.23m: B x2, 0-10°, PR, SN Fe, RF, + VNR Clay							
													6.34m: B, 5°, UN, SN Fe, RF				PLT	PL(A)=0.68MPa		
													6.37m: JT, 20°, PR, TI Clay							
													6.72-6.79m: JT x2, 20-40°, UN, TI Fe							
													7.41m: B, 0-5°, UN, VNR Clay, RF							
		8					7.76	L					7.84-7.88m: SS							
							8.08						8.02-8.08m: SS							
						FR							8.22-8.28m: B x2, 20°, PR, CN, RF							
													8.32-8.40m: JT, 60°, PR, TI							
													8.54m: B, 20°, PR, CT Clay, RF							
													8.63-8.77m: JT, 50-90°, IR, TI							
		9					9.00	H	100	87			8.88m: B, 10°, PR, CN, RF				PLT	PL(A)=1.2MPa		
			Borehole discontinued at 9.73m depth. Target Depth Reached.																	

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

PLANT: Proline
METHOD: DT to 0.13m, then HA to 0.43m, then WB to 0.52m, then NMLC to 9.73m
REMARKS: Surface level taken from LTS drawing 52609 001DT and borehole location determined from site features. Replicate sample *BD04111125 taken from 0.3-0.4m

OPERATOR: Tightsite (B. Bakker)

LOGGED: E. Benjamin
CASING: HQ to 0.43m

Refer to explanatory notes for symbol and abbreviation definitions



CORE PHOTO LOG

CLIENT: Aqualand St Leonard Development Pty Ltd
PROJECT: Proposed Mixed Use Development
LOCATION: 33 & 37 Herbert Street, St Leonards, NSW

SURFACE LEVEL: 74.0 AHD
COORDINATE: E:332772.7, N:6256445.3
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH12
PROJECT No: 237003.00
DATE: 11/11/25 - 12/11/25
SHEET: 1 of 1



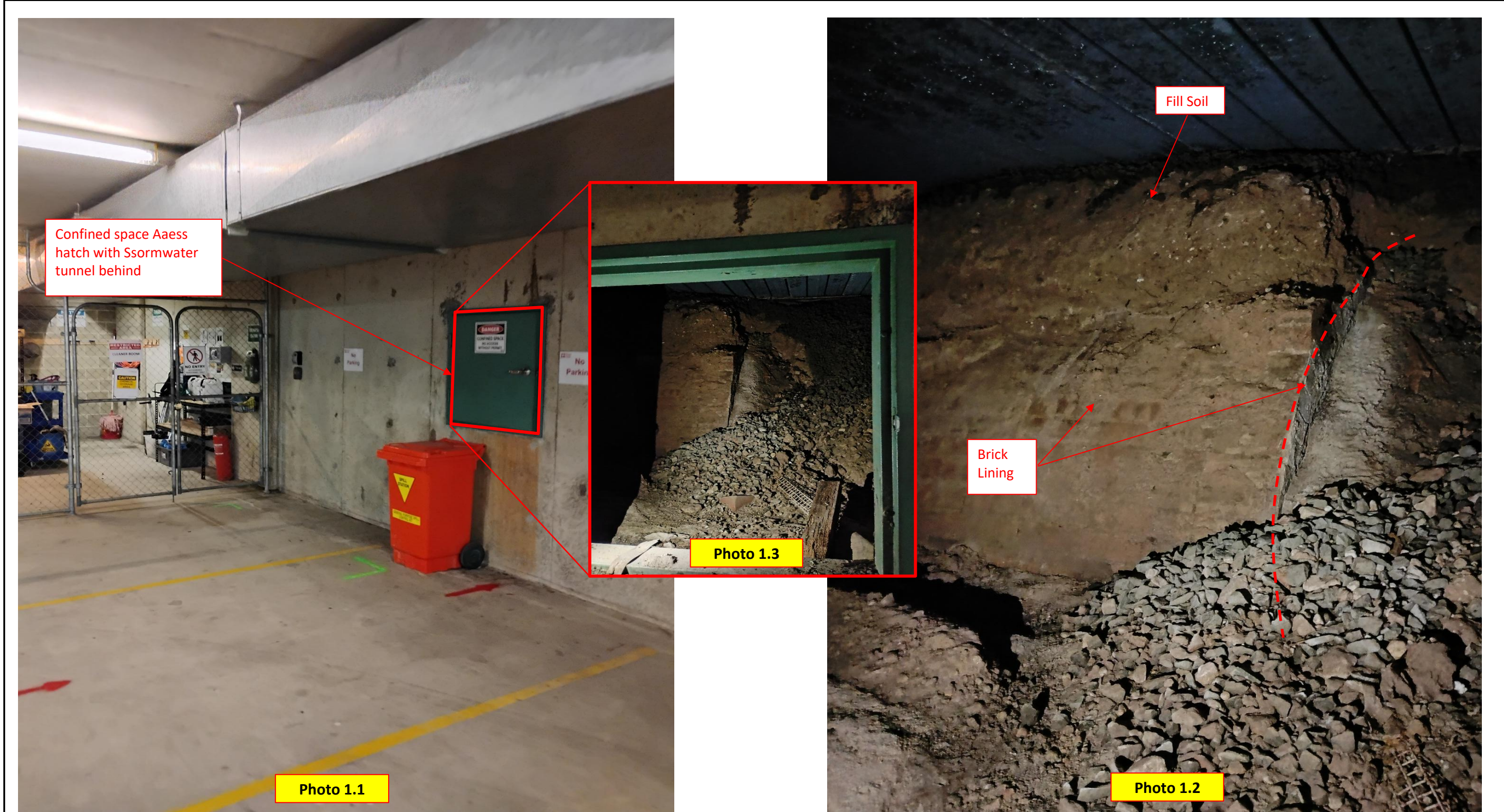
0.52-5.00 m depth



5.00-9.73 m depth

Appendix F

Site Photographs



 DOUGLAS PARTNERS GROUND ED EXPERTISE	CLIENT: Aqualand		TITLE: Geotechnical Investigation Existing Stormwater Tunnel 33 Herbert Street, St Leonards	PROJECT No: 204549.02
	OFFICE: Sydney	DRAWN BY: JCP		PLATE No: 1
	SCALE: NA	DATE: Dec-25		REVISION: 0



Stormwater grate (sump below) at the lowest end of the 2nd level basement (down slope)

Photo 2.1



Photo 2.2

 GROUND ED EXPERTISE	CLIENT: Aqualand		TITLE: Geotechnical Investigation Existing Stormwater Grate with Sump 33 Herbert Street, St Leonards	PROJECT No: 204549.02
	OFFICE: Sydney	DRAWN BY: JCP		PLATE No: 2
	SCALE: NA	DATE: Dec-25		REVISION: 0



Photo 3.1

Floor slabs do not have full contact with the



Photo 3.2

Appendix G

Structural Mark-up

[illegible]

East

South

North

	CL = 14.0m. BL = 6.0m.		CL = 10.5m. BL = 2.5m.		CL = 15.0m. BL = 3.5m.
(C)	3 Strand. WL = 260kN. CL = 14.0m. BL = 6.0m.	3 Strand. WL = 300 kN. CL = 10.0 m. BL = 7.0 m.	(I)	1 Strand. WL = 110 kN. CL = 15.5m BL = 2.5m.	
(D)	2 Strand. WL = 100 kN. CL = 10.5m. BL = 2.5m.	2 Strand. WL = 150 kN. CL = 6.5 m. BL = 3.5m.	(J)	1 Strand. WL = 100kN. CL = 10.5m. BL = 2.5m.	2 Strands. WL = 150kN. CL = 7.5m. BL = 3.5m.
(E)	1 Strand. WL = 75 kN. CL = 10.5m. BL = 2.5m.	1 Strand. WL = 110 kN. CL = 6.5m BL = 2.5m.	(K)	1 Strand. WL = 50kN. CL = 9.5m. BL = 1.5m.	1 Strand. WL 75 kN. CL = 6.0m. BL = 2.0m.
(F)	1 Strand. WL = 60 kN. CL = 15.5 m. BL = 2.5m.				

West

we need to verify if the adjacent building basement is in proximity of ours.

and 33% greater
released

1 sewer line and
are indicative only
to determine the
2 located so as to

Eastern shoring interface with rail line +
North,south,west elevation approach

Job 251667 33 Herbert S
By David Morgan
Date 22-10-2025

GENERAL:

1. Carry out all concrete work in accordance with AS 1480 and the Specification. Keep a copy of both of these documents on site.
2. Verify all setting out dimensions with the Architect.
3. Do not obtain dimensions by staking the structural elements.
4. IN CASE OF DOUBT - ASK.

DESIGN LOAD:

Pier allowable bearing 3500 kPa.
 Surcharge 10 kPa.
 $K_a = 0.3$ For clay temporary support.
 $K_a = 0.4$ For clay permanent support.
 Back anchor side shear sandstone (max) 20 kN/m.
 Soil anchor capacity clay (max) 30 kN/m.

2. Use "A.C.S.E. Specification Type A" cement.
3. All concrete shall be subject to project control sample and testing to AS 1480.
4. Consolidate by vibration. Cure all concrete surfaces as directed in the Specification.

REINFORCEMENT:

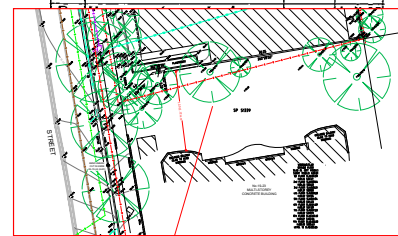
1. Fix reinforcement as shown on drawings. The type and grade is indicated by a symbol as shown below. On the drawings this is followed by a numeral which indicates the size in millimetres. A mark number (if used) follows this numeral.
- Y. Hot rolled deformed bar, grade 410Y
- S. Hot rolled deformed bar, grade 230S
- R. Plain round bar, grade 230R

2. Provide bar supports or spacers to give the following concrete cover to all reinforcement unless otherwise noted on the drawings.

Footings	— 75 bottom, 65 top and sides.
Slabs	— 20 top and bottom, 30 where exposed to weather.
Beams	— 40 bottom and sides — 10 to stirrups. T-p cover as detailed.
Columns	— 40 to ties and spirals. — 50 when exposed to weather or ground.
Walls	— 20 generally. — 30 when cast in forms but later exposed to weather or ground. — 65 when cast directly in contact with ground.

* Pneumatically applied concrete.
Refer to drg No. **existing brick building replaced by new residential tower.**

NOTE:
Depth of Footings of existing building assumed to be 600 below ground level. Footing level is to be checked with site engineer.



LUCAS & TAIT (SALES) PTY. LTD.
REAL ESTATE DEVELOPMENT
AND SALES

e Daubney
hitects
Pacific Highway North Sydney
Australia 2060
Phone (02) 9290577
: AA75717 Fax (02) 9593015

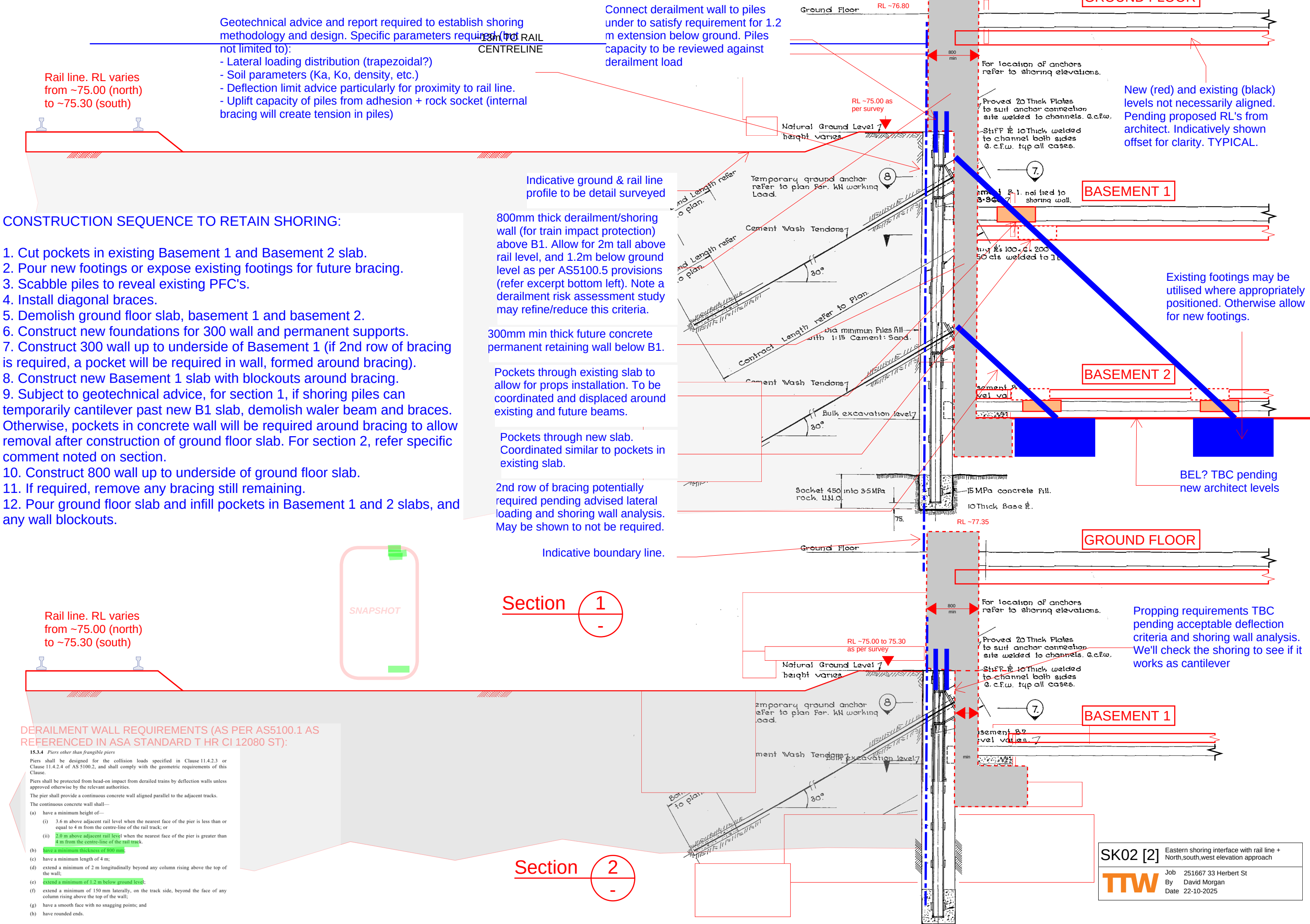
PROJECT NAME
33 HERBERT STREET
ST. LEONARDS

DRAWING NAME

SITE PLAN

SCALE	1:200	JOB No. 8611Z
-------	-------	---------------

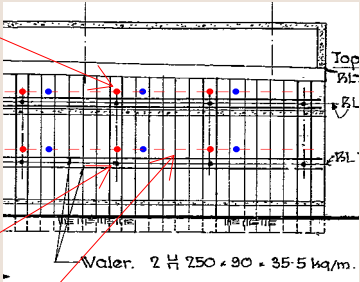
DRAWING No.	ISSUE
S1	B



Option 1 (red) - install new temp anchors above the existing ones, on same pile.
Option 2 : install new temp anchors on a different pile

existing anchors (likely de-stressed but not removed)

Steel water beam to support shoring horizontally between anchors



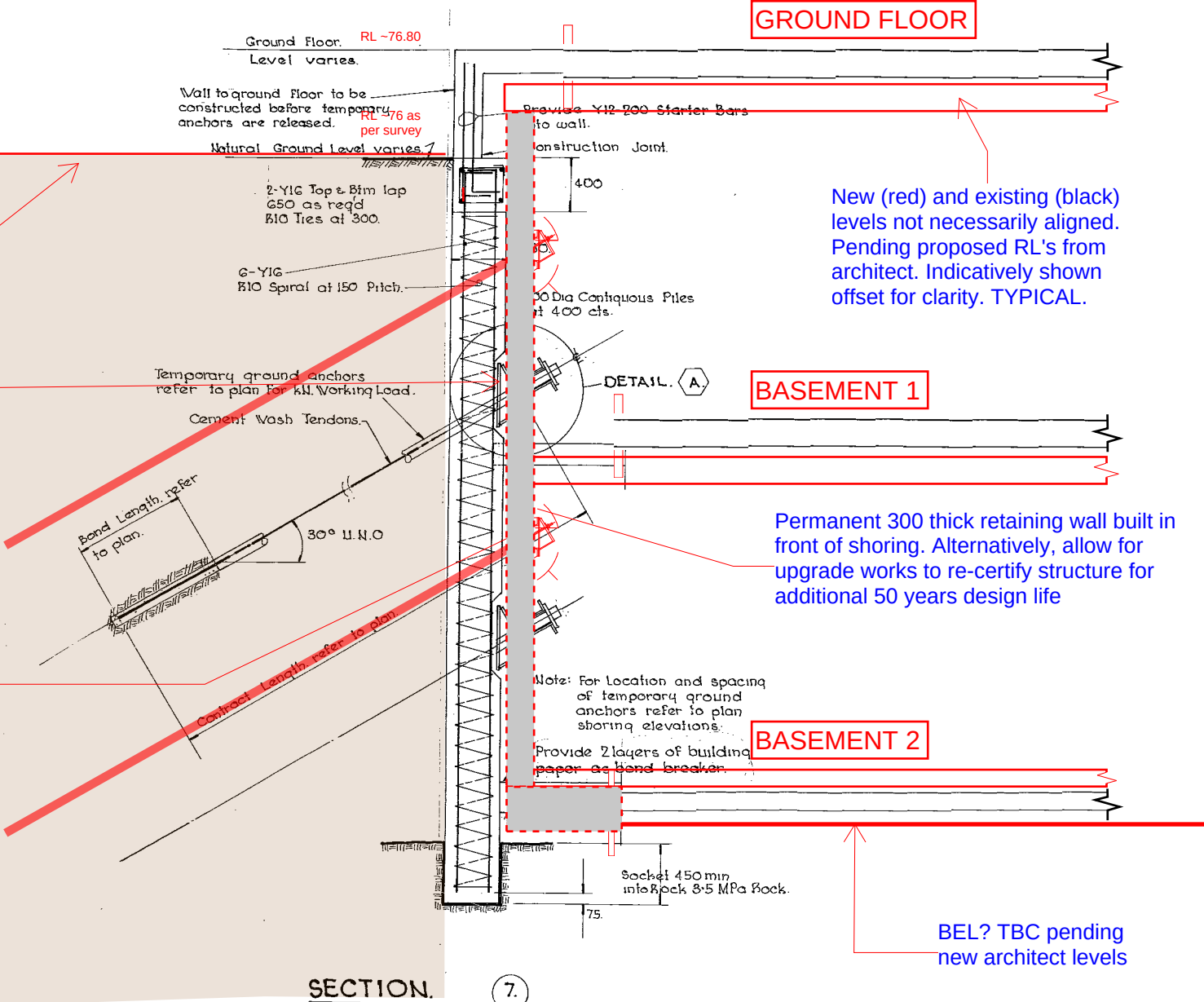
Indicative ground profile to be detail surveyed

Existing pockets and anchor wholes to be located and scabbled out to allow new ground anchor to be installed.

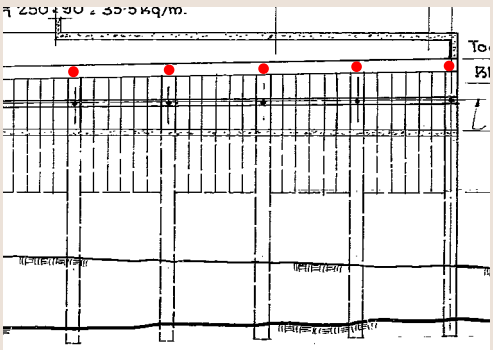
New water beams similar to original design required.

300mm thick future concrete permanent retaining wall below B1.

Section 3

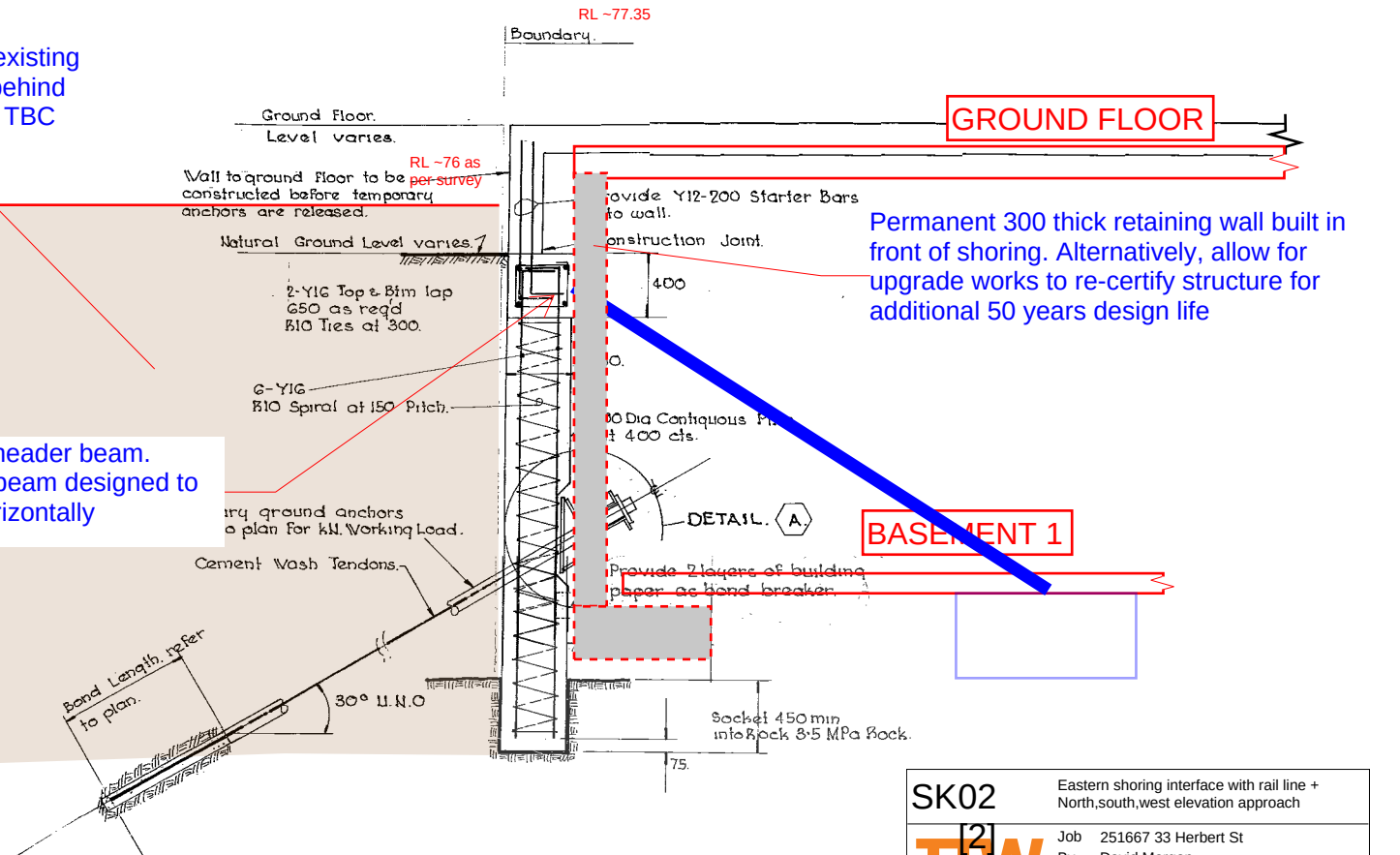


Present of existing basement behind our shoring TBC



Prop to header beam. Header beam designed to span horizontally

Section 4

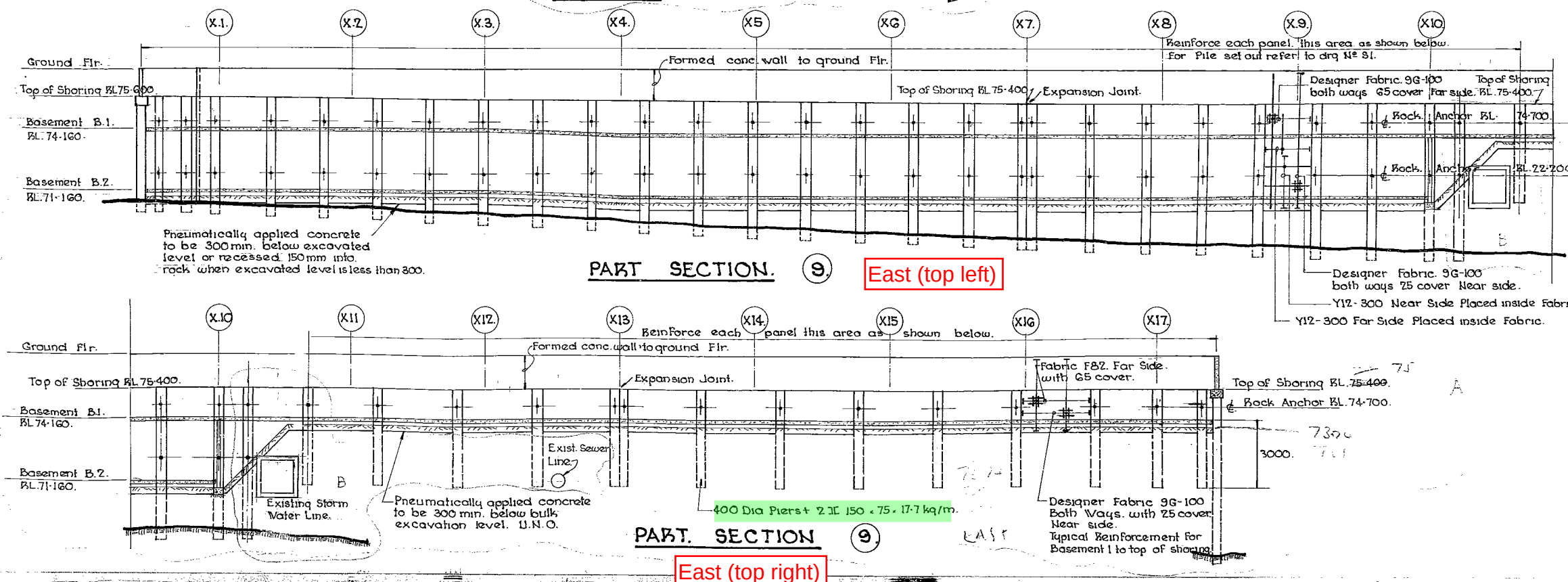
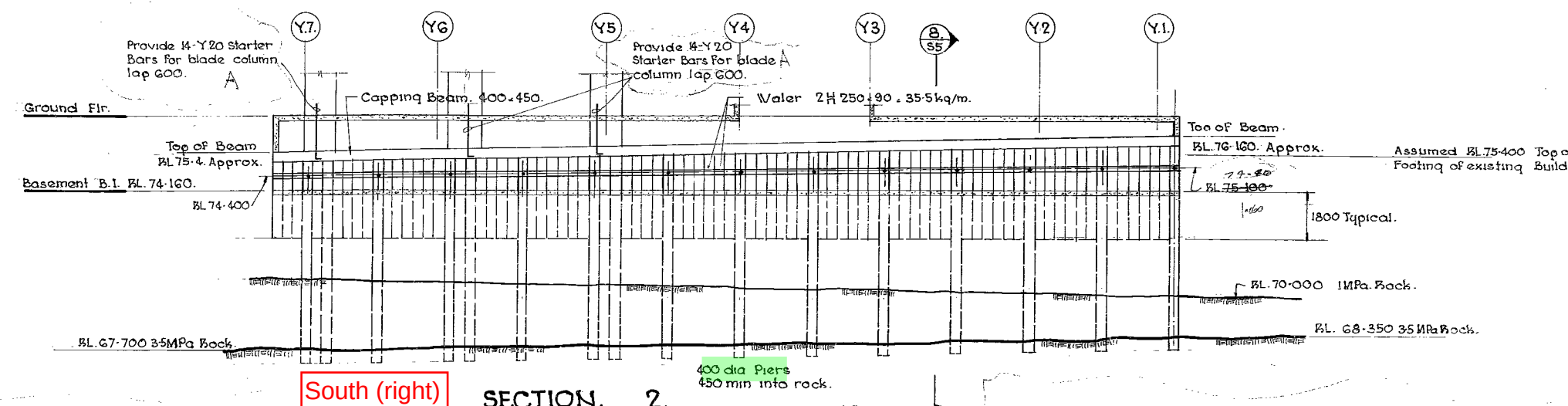
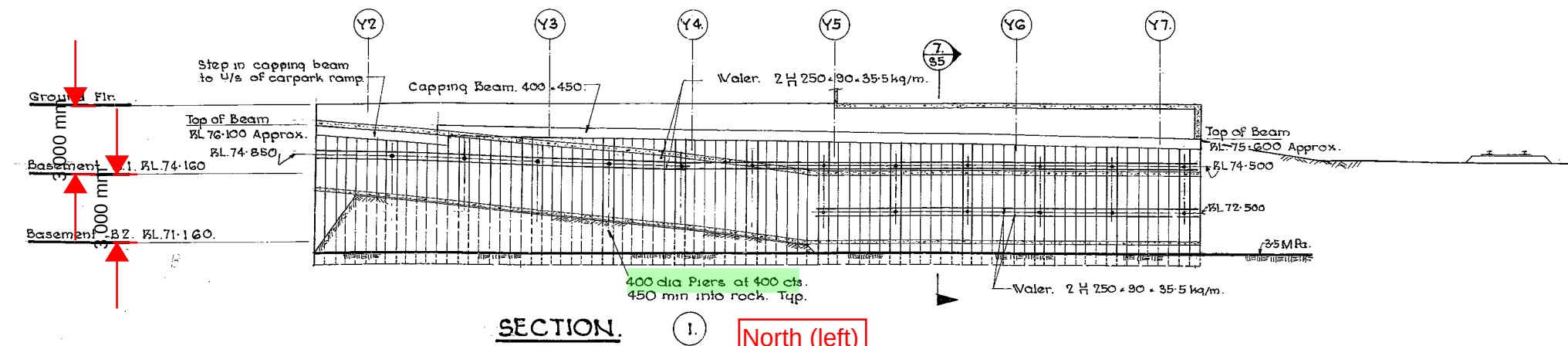


[illegible]

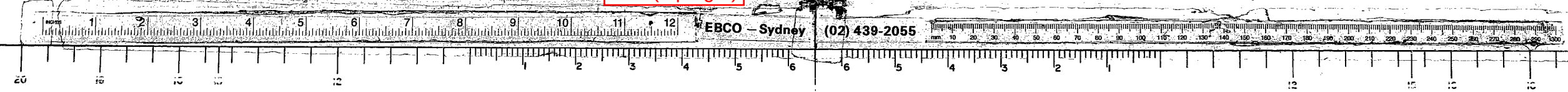
Site plan overlay,
aligned with
previous page

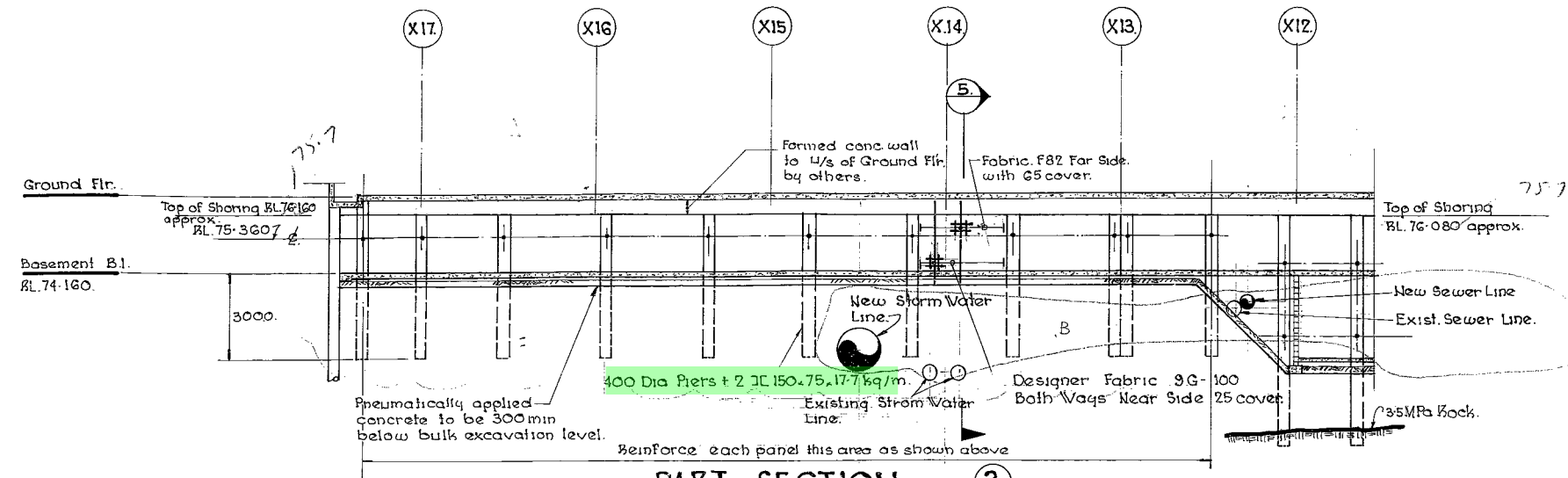


- GENERAL NOTES.**
1. Test records shall be provided for the test loading of all anchors.
 2. Any variation in location or inclination of anchors shall be submitted to the engineer for approval.
 3. Working loads shown are forces required after all losses of prestress including shrinkage.
 4. All anchors shall be located so as to avoid all services.
 5. Soldiers may be unprotected when the cover is 65mm, if 40 cover is used then a class 2 1/2 blasting with 75 microns of S.P. Zincanone 304 shall be required.
 6. Cure walls by keeping continuously wet over a period of not less than 7 (seven) days after placement, or by other means approved by the engineer.
 7. When the basement and ground floor have been completed, and when instructed by the engineer the temporary anchors shall be stressed.
- CONSTRUCTION SEQUENCE.**
1. Set out & drill piers.
 2. Plumb & encase soldiers as detailed.
 3. Excavate down to anchor points.
 4. Stress up anchors to design loads.
 5. Shotcrete wall as shown on drawings.
 6. Continue on next stage of excavation - excavate, stress anchors, shotcrete wall.
- Note:**
- Excavate down to depths recommended by the Geotechnical engineer. Excavate below wall a minimum of 3 days after shotcreting.



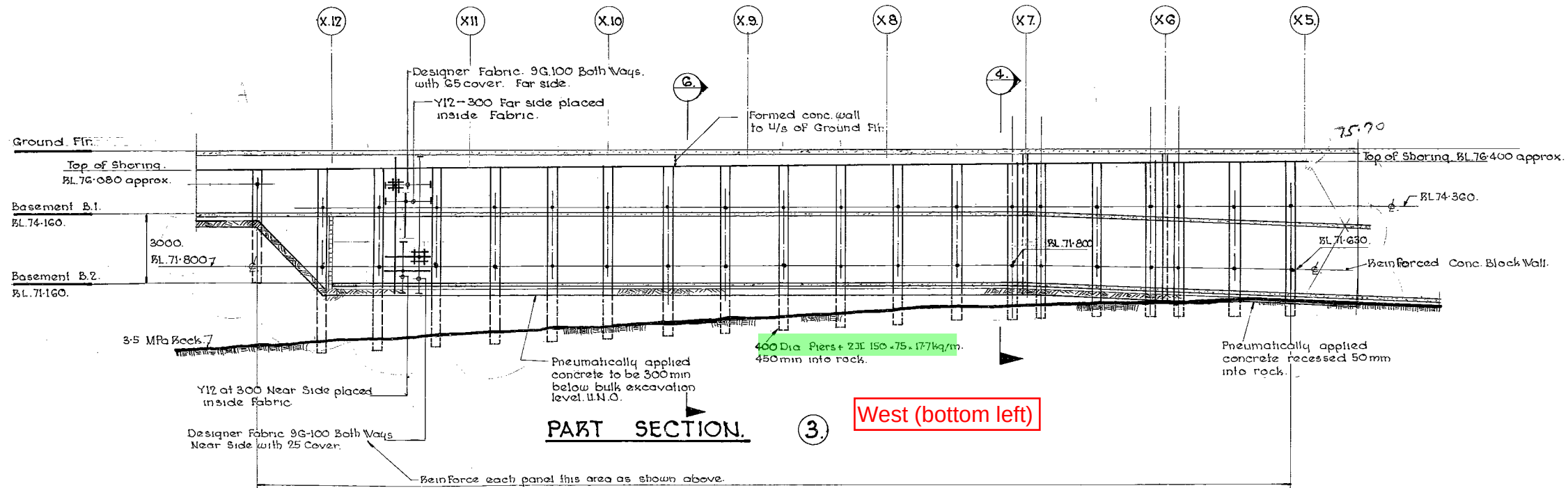
B.	Storm Water & Sewer Lines shown on sect 9. Piers relocated.	4-11-87.
A.	Section 9 added.	28-10-87
No	AMENDMENT	APP'D DATE
CONSULTING STRUCTURAL ENGINEERS TAYLOR THOMSON WHITTING Pty Ltd 48 CHANDOS STREET ST. LEONARDS 2065 PH 439 7286		
LUCAS & YAT (SALES) PTY. LTD. REAL ESTATE DEVELOPMENT AND SALES		
Rice Daubney Architects 97 Pacific Highway North Sydney N.S.W. Australia 2060 Telephone (02) 9290577 Telex APT5117 Fax (02) 9530215		
PROJECT NAME		
33 HERBERT STREET ST. LEONARDS		
DRAWING NAME		
SECTIONS SHEET 1 OF 2		
SCALE 1:100		JOB No. 86300
DRAWING No.		ISSUE
S.2.		B.





PART SECTION. (3)

West (bottom right)



PART SECTION. (3)

West (bottom left)

B.	Storm water & Sewer Lines added.	4-11-87.
A.	Pier setout amended.	26-10-87.
No.	AMENDMENT	APPD DATE
CONSULTING STRUCTURAL ENGINEERS TAYLOR THOMSON WHITTING Pty Ltd 48 CHANDOS STREET ST LEONARD 2065		
LUCAS & TAIT (SALES) PTY. LTD. REAL ESTATE DEVELOPMENT AND SALES		
Rice Daubney Architects 97 Pacific Highway North Sydney N.S.W. Australia 2060 Telephone (02) 9280577 Telex AAT5117 Fax (02) 9530015		
PROJECT NAME 33 HERBERT STREET ST. LEONARDS		
DRAWING NAME SECTIONS SHEET 2 OF 2		
SCALE	1:100	JOB No. 86112.
DRAWING No.	S.3.	ISSUE B.

Appendix H

Laboratory Results

RESULTS OF UNIAXIAL COMPRESSIVE STRENGTH OF ROCK CORES YOUNG'S MODULUS AND POISSON'S RATIO

Client: Aqualand St Leonard Development Pty Ltd
Project: Proposed Mixed Use Development
Location: 33 & 37 Herbert St, St Leonards NSW



[Signature]

Project No: 237003.00
Report No: 237003.00_14156
Report Date: 28.11.2025
Date of Testing: 28.11.2025
Date Sampled: 18.11.2025

Approved Signatory: Peter Gorseski
peter.gorseski@douglaspartners.com.au

Accredited for Compliance with ISOIEC 17025 - Testing
NATA Accredited Laboratory Number: 828

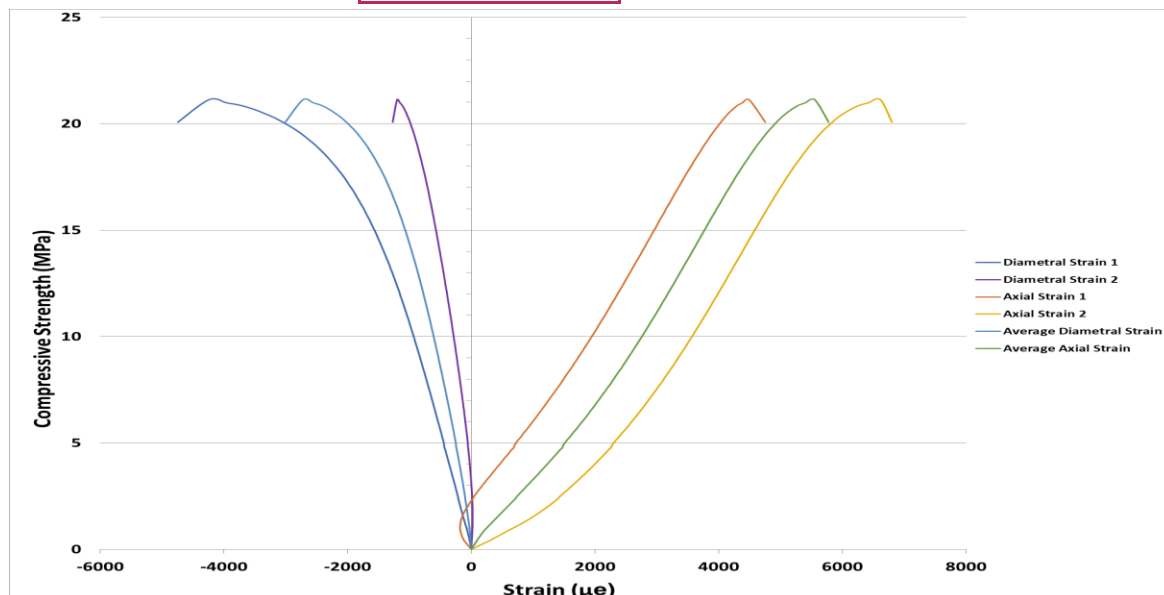
Young's Modulus + Poisson Ratio and UCS (< 50 MPa) AS 4133.4.3.2

Lab Sample Number	NC-14156A
Sample Location	BH01
Depth (m)	4.75 - 4.95
Rock Description	Sandstone
Storage History	Wrapped in Plastic
Conditioning	Tested as Received
Compression Machine	Automax Multitest
Measurement	Electric Strain Gauges
Specimen Diameter / Height (mm)	51.7 143
Height to Diameter Ratio	2.8 : 1
Moisture Content (%)	3.0
Wet Mass / Unit Volume (t/m ³)	2.38
Dry Mass / Unit Volume (t/m ³)	2.31
Test Duration (sec)	221
Rate of Displacement (kN/sec)	0.20
Failure Mode	Mixed
Uniaxial Compressive Strength (MPa)	21.1
SECANT MODULUS (50% load)	
Young's modulus (GPa)	3.7
Poisson's ratio	0.23
TANGENT MODULUS (35 - 65% load)	
Young's modulus (GPa)	4.6
Poisson's ratio	0.38

Before



After



RESULTS OF UNIAXIAL COMPRESSIVE STRENGTH OF ROCK CORES YOUNG'S MODULUS AND POISSON'S RATIO

Client: Aqualand St Leonard Development Pty Ltd
Project: Proposed Mixed Use Development
Location: 33 & 37 Herbert St, St Leonards NSW



[Signature]

Project No: 237003.00
Report No: 237003.00_14156
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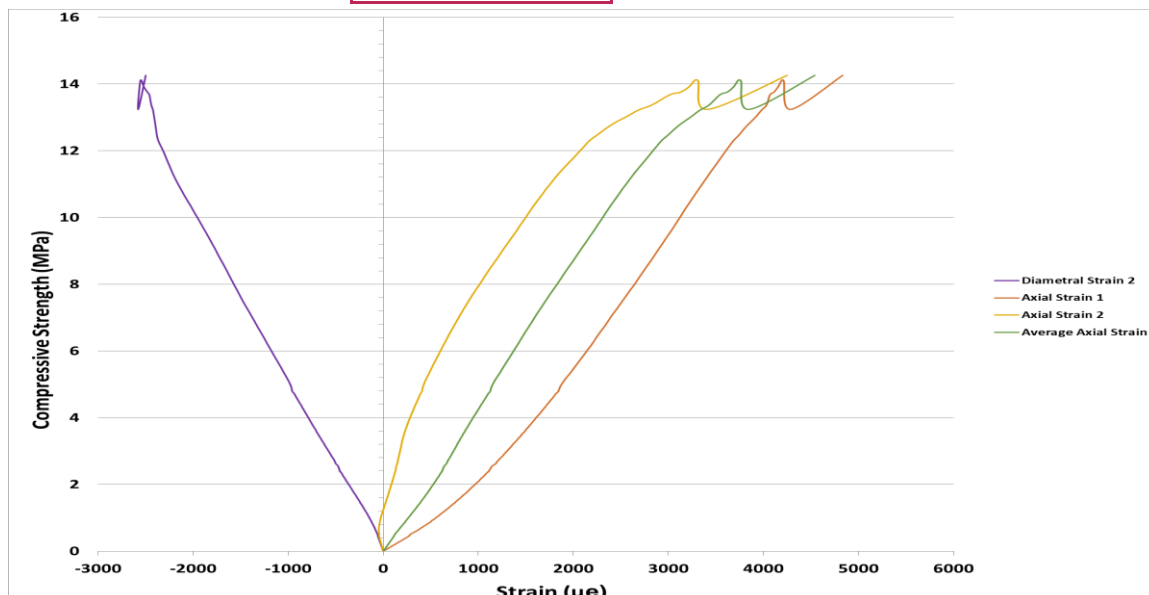
Young's Modulus + Poisson Ratio and UCS (< 50 MPa) AS 4133.4.3.2

Lab Sample Number	NC-14156B
Sample Location	BH05
Depth (m)	6.47 - 6.78
Rock Description	Sandstone
Storage History	Wrapped in Plastic
Conditioning	Tested as Received
Compression Machine	Automax Multitest
Measurement	Electric Strain Gauges
Specimen Diameter / Height (mm)	51.6 140
Height to Diameter Ratio	2.7 : 1
Moisture Content (%)	2.9
Wet Mass / Unit Volume (t/m ³)	2.40
Dry Mass / Unit Volume (t/m ³)	2.33
Test Duration (sec)	181
Rate of Displacement (kN/sec)	0.17
Failure Mode	Shear
Uniaxial Compressive Strength (MPa)	14.3
SECANT MODULUS (50% load)	
Young's modulus (GPa)	4.4
Poisson's ratio	0.39
TANGENT MODULUS (35 - 65% load)	
Young's modulus (GPa)	4.4
Poisson's ratio	0.41

Before



After



RESULTS OF UNIAXIAL COMPRESSIVE STRENGTH OF ROCK CORES YOUNG'S MODULUS AND POISSON'S RATIO

Client: Aqualand St Leonard Development Pty Ltd
Project: Proposed Mixed Use Development
Location: 33 & 37 Herbert St, St Leonards NSW



[Signature]

Project No: 237003.00
Report No: 237003.00_14156
Report Date: 28.11.2025
Date of Testing: 28.11.2025
Date Sampled: 18.11.2025

Approved Signatory: Peter Gorseski
peter.gorseski@douglaspartners.com.au

Accredited for Compliance with ISOIEC 17025 - Testing
NATA Accredited Laboratory Number: 828

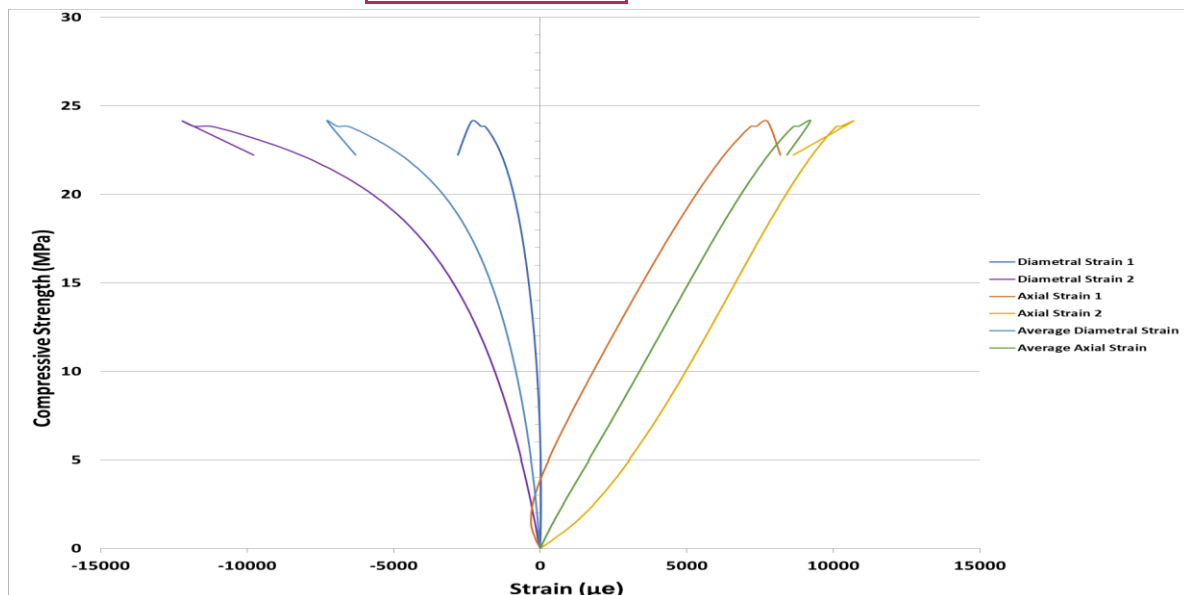
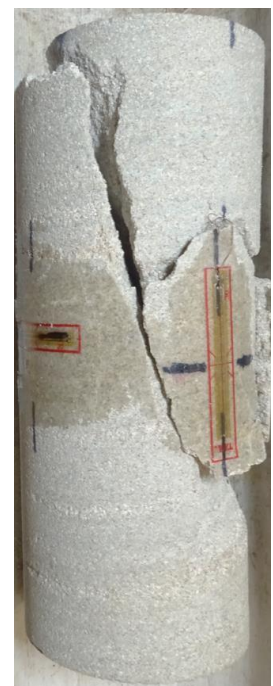
Young's Modulus + Poisson Ratio and UCS (< 50 MPa) AS 4133.4.3.2

Lab Sample Number	NC-14156C
Sample Location	BH07
Depth (m)	5.45 - 5.65
Rock Description	Sandstone
Storage History	Wrapped in Plastic
Conditioning	Tested as Received
Compression Machine	Automax Multitest
Measurement	Electric Strain Gauges
Specimen Diameter / Height (mm)	51.2 141
Height to Diameter Ratio	2.7 : 1
Moisture Content (%)	2.1
Wet Mass / Unit Volume (t/m ³)	2.44
Dry Mass / Unit Volume (t/m ³)	2.39
Test Duration (sec)	237
Rate of Displacement (kN/sec)	0.21
Failure Mode	Shear
Uniaxial Compressive Strength (MPa)	24.1
SECANT MODULUS (50% load)	
Young's modulus (GPa)	3.0
Poisson's ratio	0.28
TANGENT MODULUS (35 - 65% load)	
Young's modulus (GPa)	2.9
Poisson's ratio	0.41

Before



After



RESULTS OF UNIAXIAL COMPRESSIVE STRENGTH OF ROCK CORES YOUNG'S MODULUS AND POISSON'S RATIO

Client: Aqualand St Leonard Development Pty Ltd
Project: Proposed Mixed Use Development
Location: 33 & 37 Herbert St, St Leonards NSW



[Signature]

Project No: 237003.00
Report No: 237003.00_14156
Report Date: 28.11.2025
Date of Testing: 28.11.2025
Date Sampled: 18.11.2025

Approved Signatory: Peter Gorseski
peter.gorseski@douglaspartners.com.au

Accredited for Compliance with ISOIEC 17025 - Testing
NATA Accredited Laboratory Number: 828

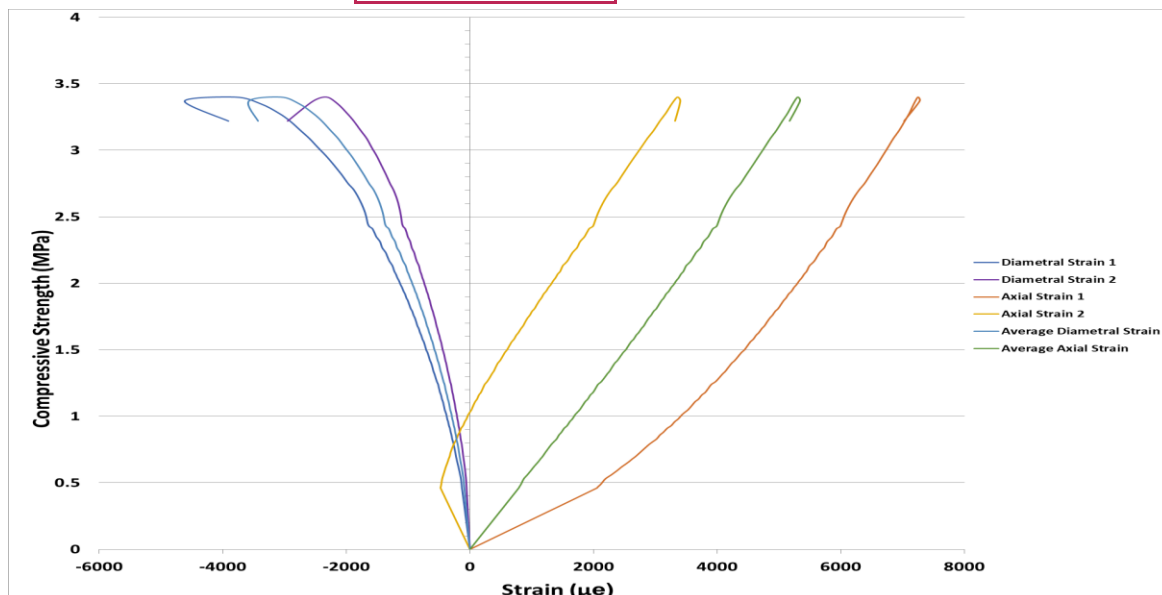
Young's Modulus + Poisson Ratio and UCS (< 50 MPa) AS 4133.4.3.2

Lab Sample Number	NC-14156D
Sample Location	BH10
Depth (m)	5.20 - 5.39
Rock Description	Sandstone
Storage History	Wrapped in Plastic
Conditioning	Tested as Received
Compression Machine	Automax Multitest
Measurement	Electric Strain Gauges
Specimen Diameter / Height (mm)	51.3 139
Height to Diameter Ratio	2.7 : 1
Moisture Content (%)	8.2
Wet Mass / Unit Volume (t/m ³)	2.15
Dry Mass / Unit Volume (t/m ³)	1.99
Test Duration (sec)	100
Rate of Displacement (kN/sec)	0.07
Failure Mode	Shear
Uniaxial Compressive Strength (MPa)	3.4
SECANT MODULUS (50% load)	
Young's modulus (GPa)	0.6
Poisson's ratio	0.25
TANGENT MODULUS (35 - 65% load)	
Young's modulus (GPa)	0.6
Poisson's ratio	0.45

Before



After



RESULTS OF UNIAXIAL COMPRESSIVE STRENGTH OF ROCK CORES YOUNG'S MODULUS AND POISSON'S RATIO

Client: Aqualand St Leonard Development Pty Ltd
Project: Proposed Mixed Use Development
Location: 33 & 37 Herbert St, St Leonards NSW




Project No: 237003.00
Report No: 237003.00_14156
Report Date: 28.11.2025
Date of Testing: 28.11.2025
Date Sampled: 18.11.2025

Approved Signatory: Peter Gorseski
peter.gorseski@douglaspartners.com.au

Accredited for Compliance with ISOIEC 17025 - Testing
NATA Accredited Laboratory Number: 828

Young's Modulus + Poisson Ratio and UCS (< 50 MPa) AS 4133.4.3.2

Lab Sample Number	NC-14156E
Sample Location	BH10
Depth (m)	12.41 - 12.61
Rock Description	Sandstone
Storage History	Wrapped in Plastic
Conditioning	Tested as Received
Compression Machine	Automax Multitest
Measurement	Electric Strain Gauges
Specimen Diameter / Height (mm)	51.5 142
Height to Diameter Ratio	2.8 : 1
Moisture Content (%)	3.0
Wet Mass / Unit Volume (t/m ³)	2.35
Dry Mass / Unit Volume (t/m ³)	2.28
Test Duration (sec)	239
Rate of Displacement (kN/sec)	0.21
Failure Mode	Tensile
Uniaxial Compressive Strength (MPa)	24.1
SECANT MODULUS (50% load)	
Young's modulus (GPa)	Failure at strain gauge
Poisson's ratio	Unable to test
TANGENT MODULUS (35 - 65% load)	
Young's modulus (GPa)	Failure at strain gauge
Poisson's ratio	Unable to test

Before



After



RESULTS OF UNIAXIAL COMPRESSIVE STRENGTH OF ROCK CORES YOUNG'S MODULUS AND POISSON'S RATIO

Client: Aqualand St Leonard Development Pty Ltd
Project: Proposed Mixed Use Development
Location: 33 & 37 Herbert St, St Leonards NSW



[Signature]

Project No: 237003.00
Report No: 237003.00_14156
Report Date: 28.11.2025
Date of Testing: 28.11.2025
Date Sampled: 18.11.2025

Approved Signatory: Peter Gorseski
peter.gorseski@douglaspartners.com.au

Accredited for Compliance with ISOIEC 17025 - Testing
NATA Accredited Laboratory Number: 828

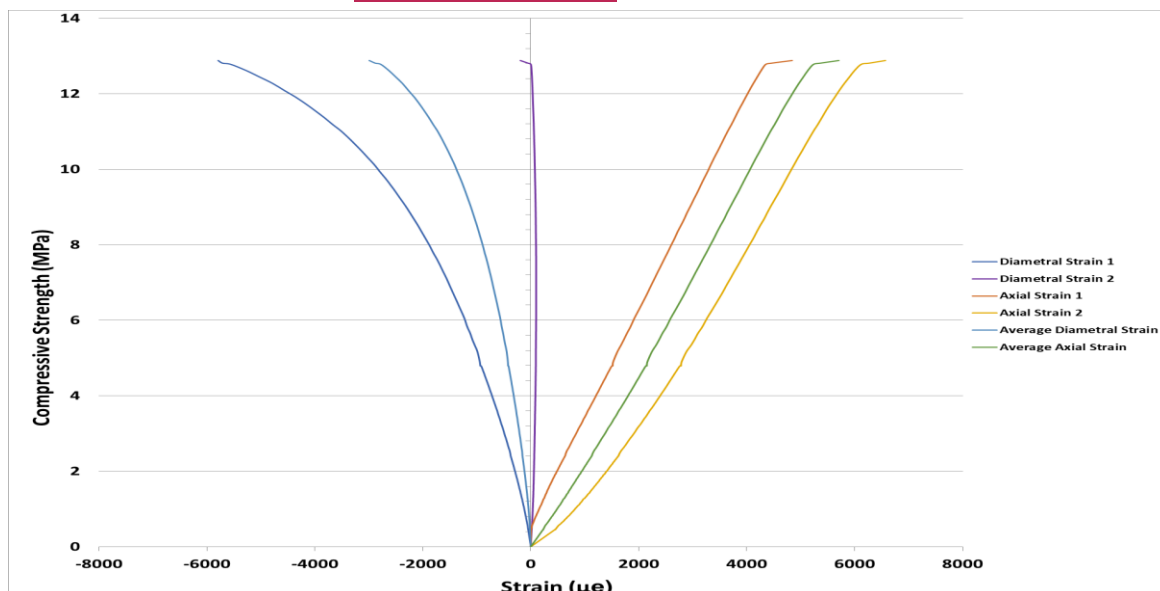
Young's Modulus + Poisson Ratio and UCS (< 50 MPa) AS 4133.4.3.2

Lab Sample Number	NC-14156F
Sample Location	BH11
Depth (m)	8.53 - 8.80
Rock Description	Sandstone
Storage History	Wrapped in Plastic
Conditioning	Tested as Received
Compression Machine	Automax Multitest
Measurement	Electric Strain Gauges
Specimen Diameter / Height (mm)	51.3 141
Height to Diameter Ratio	2.7 : 1
Moisture Content (%)	2.4
Wet Mass / Unit Volume (t/m ³)	2.38
Dry Mass / Unit Volume (t/m ³)	2.32
Test Duration (sec)	173
Rate of Displacement (kN/sec)	0.15
Failure Mode	Shear
Uniaxial Compressive Strength (MPa)	12.9
SECANT MODULUS (50% load)	
Young's modulus (GPa)	2.3
Poisson's ratio	0.23
TANGENT MODULUS (35 - 65% load)	
Young's modulus (GPa)	2.7
Poisson's ratio	0.37

Before



After



CERTIFICATE OF ANALYSIS 395942

Client Details

Client	Douglas Partners Pty Ltd
Attention	Jean-Christo Pyper
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	<u>237003.00 St Leonards</u>
Number of Samples	8 Soil
Date samples received	19/11/2025
Date completed instructions received	19/11/2025

Analysis Details

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

Samples were analysed as received from the client unless as indicated below in the method summaries. Results relate specifically to the samples as received.

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

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	26/11/2025
Date of Issue	26/11/2025

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

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

Results Approved By

Nancy Zhang, Laboratory Manager, Sydney

Authorised By

Nancy Zhang, Laboratory Manager

Misc Inorg - Soil

Our Reference		395942-1	395942-2	395942-3	395942-4	395942-5
Your Reference	UNITS	BH01	BH04	BH04	BH06	BH07
Depth		1-1.45	1.8-2	3-3.45	1-1.45	1.4-1.5
Date Sampled		10/11/2025	10/11/2025	10/11/2025	12/11/2025	17/11/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	21/11/2025	21/11/2025	21/11/2025	21/11/2025	21/11/2025
Date analysed	-	21/11/2025	21/11/2025	21/11/2025	21/11/2025	21/11/2025
pH 1:5 soil:water	pH Units	5.1	5.0	4.2	6.2	6.6
Electrical Conductivity	µS/cm	54	380	85	82	93
Chloride, Cl 1:5 soil:water	mg/kg	<10	20	<10	<10	<10
Sulphate, SO4 1:5 soil:water	mg/kg	70	690	110	60	130

Misc Inorg - Soil

Our Reference		395942-6	395942-7	395942-8
Your Reference	UNITS	BH08	BH09	BH12
Depth		0.7-0.8	1.9-2	0.3-0.4
Date Sampled		14/11/2025	11/11/2025	12/11/2025
Type of sample		Soil	Soil	Soil
Date prepared	-	21/11/2025	21/11/2025	21/11/2025
Date analysed	-	21/11/2025	21/11/2025	21/11/2025
pH 1:5 soil:water	pH Units	7.5	6.6	8.3
Electrical Conductivity	µS/cm	86	160	140
Chloride, Cl 1:5 soil:water	mg/kg	<10	<10	<10
Sulphate, SO4 1:5 soil:water	mg/kg	21	270	99

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

QUALITY CONTROL: Misc Inorg - Soil					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	395942-2
Date prepared	-			21/11/2025	1	21/11/2025	21/11/2025		21/11/2025	21/11/2025
Date analysed	-			21/11/2025	1	21/11/2025	21/11/2025		21/11/2025	21/11/2025
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	1	5.1	5.1	0	99	[NT]
Electrical Conductivity	µS/cm	2	Inorg-002	<2	1	54	53	2	96	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	1	<10	<10	0	85	90
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	1	70	69	1	94	#

Result Definitions

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

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

Air volumes are typically provided by customers (often as flow rate(s) and sampling time(s) and/or simply volumes) sampled or exposure times (determines 'volume' passive badges are exposed to)). Hence in such circumstances the volume measurement is inevitably not covered by Envirolab's NATA accreditation. An exception may occur where Envirolab Newcastle does the sampling where accreditation exists for certain types of sampling and hence volume determination(s). Note air volumes are often used to determine concentrations for dust and/or analyses on filters, sorbents and in impingers. For canister sampling, the air volume is covered by Envirolab's NATA accreditation.

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

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

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

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

Measurement Uncertainty estimates can be downloaded from the [Envirolab Resources website](#) or obtained directly by contacting the laboratory.

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

For Dust Deposit Gauge (DDG) analysis the sampling, sampling period and funnel exposure area do not fall under Envirolab's NATA accreditation (unless the Newcastle laboratory where responsible for the sampling), hence the annotation on the DDG units of reporting.

Urine Analysis - The BEI values listed are taken from the 2022 edition of "TLVs and BEIs Threshold Limits" by ACGIH.

Report Comments

MISC_INORG_DRY: # Percent recovery not reported due to matrix interferences. However, an acceptable recovery was obtained for the LCS.

CERTIFICATE OF ANALYSIS 396093

Client Details

Client	Douglas Partners Pty Ltd
Attention	Jean-Christo Pyper
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	<u>237003.00, St Leonards</u>
Number of Samples	4 Water
Date samples received	20/11/2025
Date completed instructions received	20/11/2025

Analysis Details

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

Samples were analysed as received from the client unless as indicated below in the method summaries. Results relate specifically to the samples as received.

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

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	27/11/2025
Date of Issue	25/11/2025

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Results Approved By

Priya Samarawickrama, Senior Chemist

Authorised By

Nancy Zhang, Laboratory Manager

Miscellaneous Inorganics					
Our Reference		396093-1	396093-2	396093-3	396093-4
Your Reference	UNITS	BH01	BH06	BH09	BH12
Date Sampled		20/11/2025	20/11/2025	19/11/2025	19/11/2025
Type of sample		Water	Water	Water	Water
Date prepared	-	21/11/2025	21/11/2025	21/11/2025	21/11/2025
Date analysed	-	21/11/2025	21/11/2025	21/11/2025	21/11/2025
pH	pH Units	6.9	6.4	6.4	6.5
Electrical Conductivity	µS/cm	1,500	1,600	1,400	1,400
Chloride, Cl	mg/L	280	380	270	260
Sulphate, SO ₄	mg/L	90	110	180	160

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

Client Reference: 237003.00, St Leonards

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	396093-2
Date prepared	-			21/11/2025	1	21/11/2025	21/11/2025		21/11/2025	21/11/2025
Date analysed	-			21/11/2025	1	21/11/2025	21/11/2025		21/11/2025	21/11/2025
pH	pH Units		Inorg-001	[NT]	1	6.9	[NT]		100	[NT]
Electrical Conductivity	µS/cm	2	Inorg-002	<2	1	1500	[NT]		108	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	1	280	290	4	84	#
Sulphate, SO4	mg/L	1	Inorg-081	<1	1	90	90	0	85	81

Result Definitions

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

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

Air volumes are typically provided by customers (often as flow rate(s) and sampling time(s) and/or simply volumes) sampled or exposure times (determines 'volume' passive badges are exposed to)). Hence in such circumstances the volume measurement is inevitably not covered by Envirolab's NATA accreditation. An exception may occur where Envirolab Newcastle does the sampling where accreditation exists for certain types of sampling and hence volume determination(s). Note air volumes are often used to determine concentrations for dust and/or analyses on filters, sorbents and in impingers. For canister sampling, the air volume is covered by Envirolab's NATA accreditation.

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

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

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

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

Measurement Uncertainty estimates can be downloaded from the [Envirolab Resources website](#) or obtained directly by contacting the laboratory.

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

For Dust Deposit Gauge (DDG) analysis the sampling, sampling period and funnel exposure area do not fall under Envirolab's NATA accreditation (unless the Newcastle laboratory where responsible for the sampling), hence the annotation on the DDG units of reporting.

Urine Analysis - The BEI values listed are taken from the 2022 edition of "TLVs and BEIs Threshold Limits" by ACGIH.

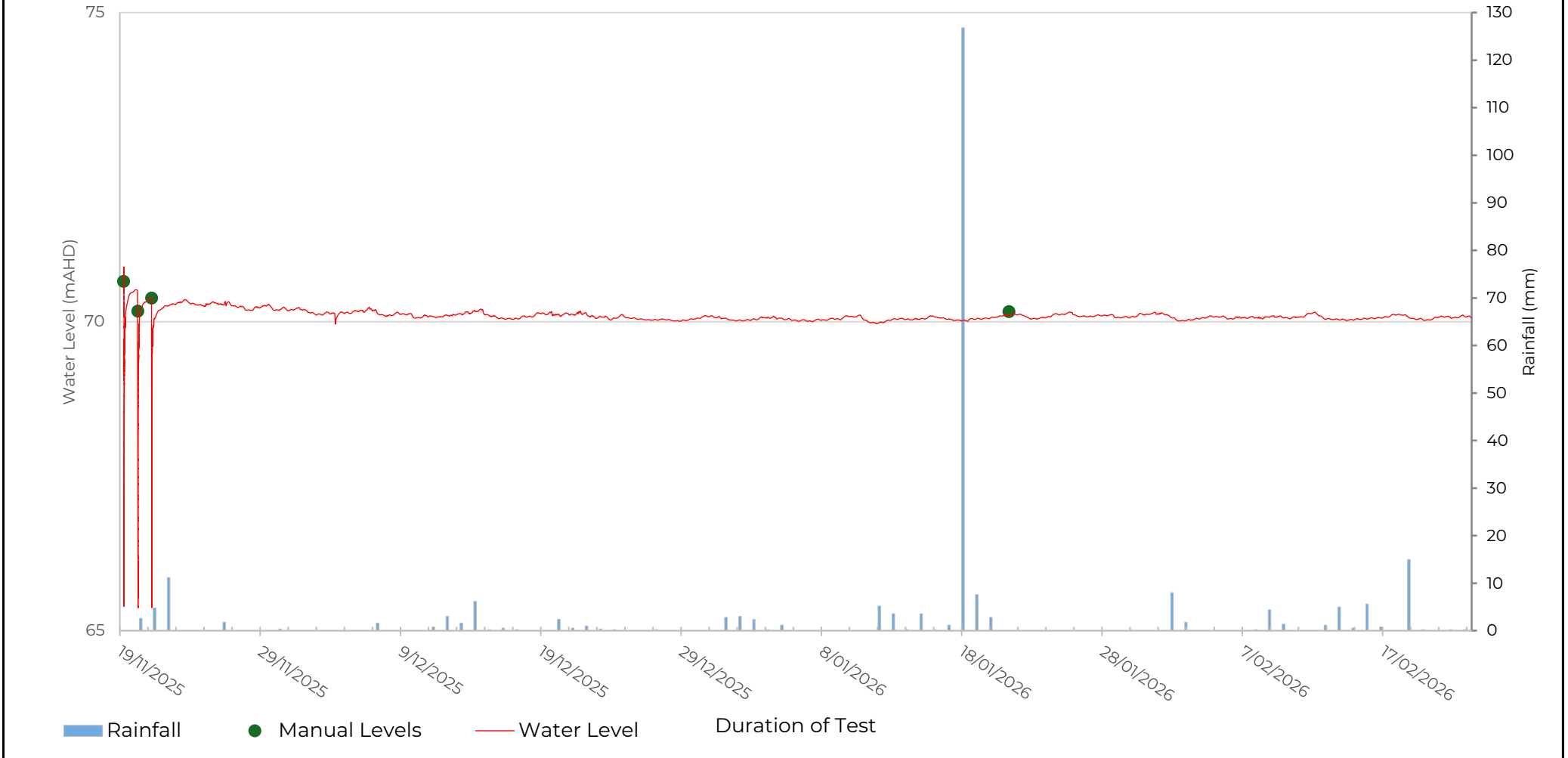
Report Comments

Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Appendix I

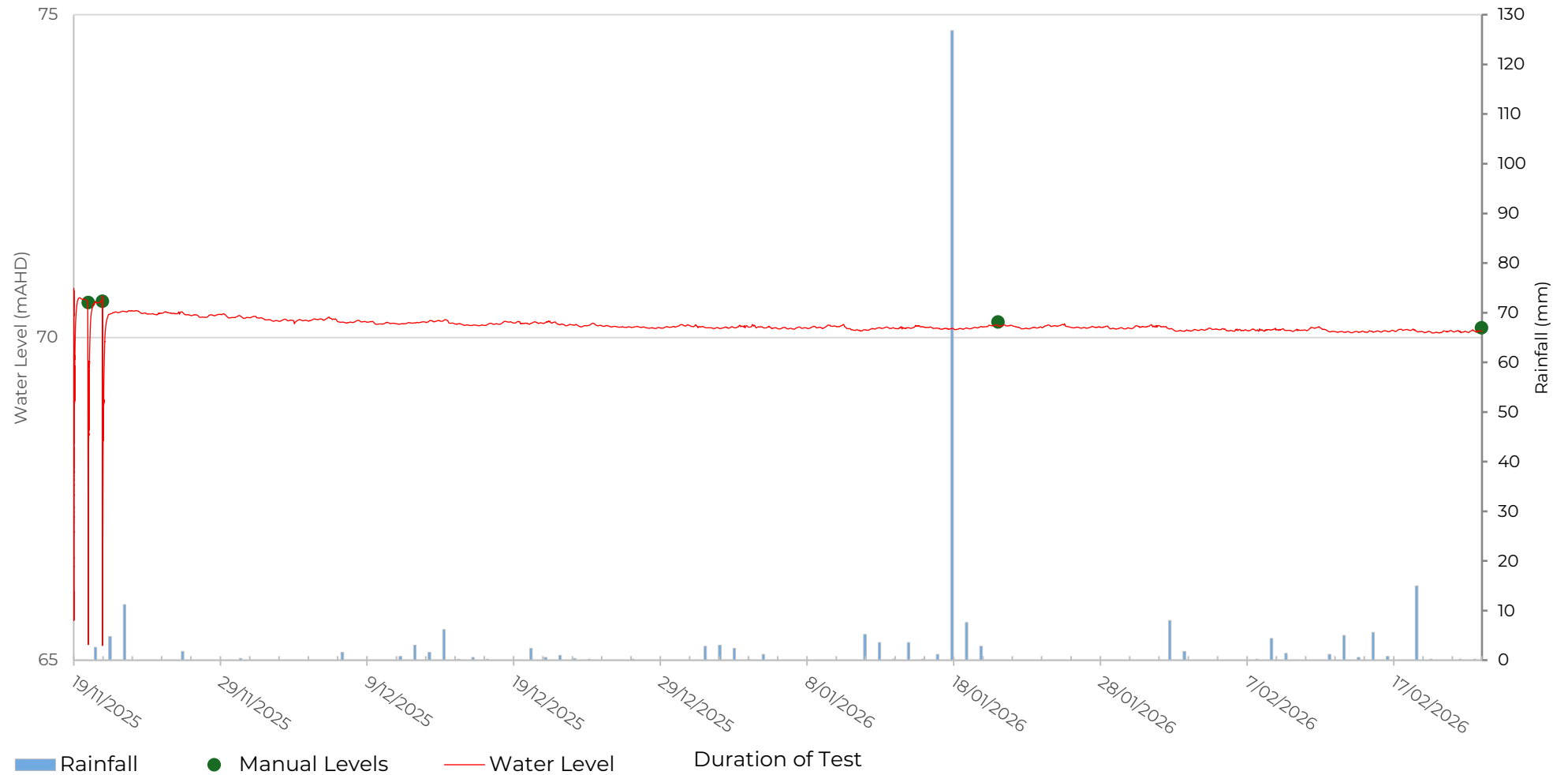
Hydrographs

BH01 Groundwater Monitoring



 GROUND EXPERTISE	Borehole:	Well Depth: (mBGL)	From:	Drawn:
	BH01	12.8	19.11.25	CLB
	Project:	Surface RL: (mAHD)	To:	Checked:
	237003	76.8	23.02.26	JCP/WS

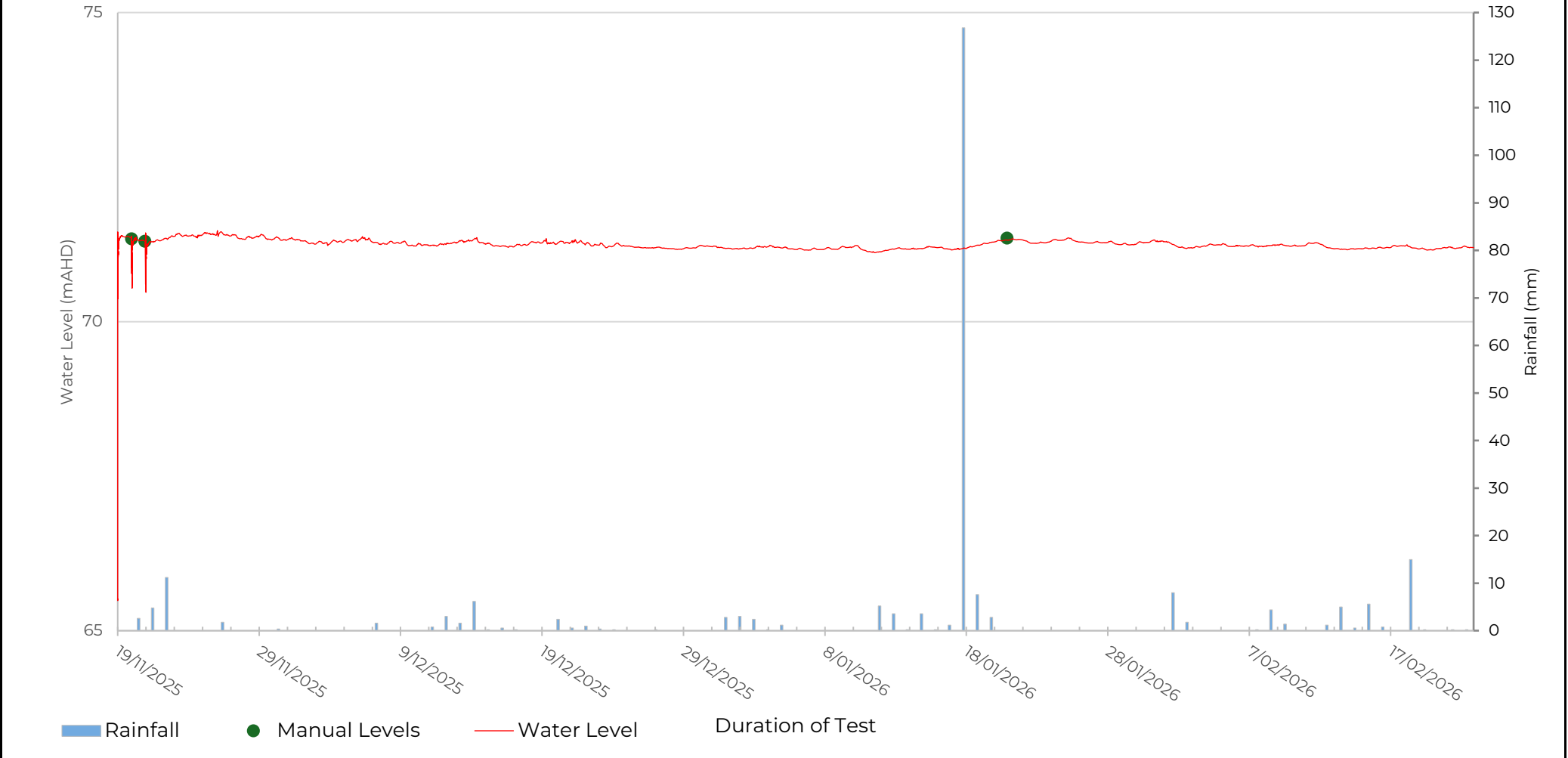
BH06 Groundwater Monitoring



GROUND
EXPERTISE

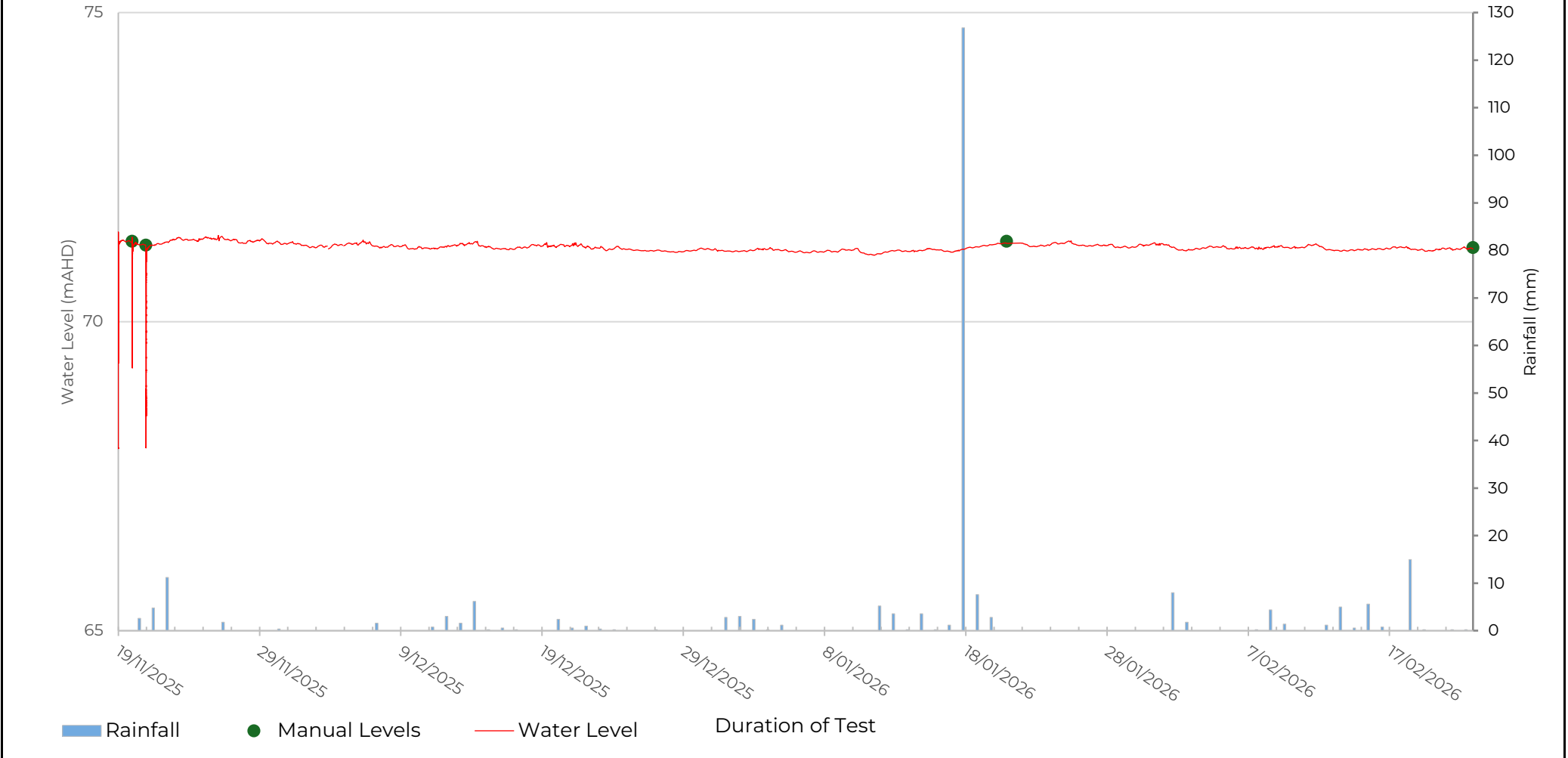
Borehole:	Well Depth: (mBGL)	From:	Drawn:
BH06	12.5	19.11.25	CLB
Project:	Surface RL: (mAHD)	To:	Checked:
237003	76.8	23.02.26	JCP/WS

BH09 Groundwater Monitoring



 GROUND EXPERTISE	Borehole:	Well Depth: (mBGL)	From:	Drawn:
	BH09	10.4	19.01.25	CLB
	Project:	Surface RL: (mAHD)	To:	Checked:
	237003	74	23.02.26	JCP/WS

BH12 Groundwater Monitoring



 GROUND EXPERTISE	Borehole:	Well Depth: (mBGL)	From:	Drawn:
	BH12	6.5	19.11.25	CLB
	Project:	Surface RL: (mAHD)	To:	Checked:
	237003	74	23.02.26	JCP/WS