Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on
Geotechnical Investigation

Fiveways
Falcon Street, Pacific Highway and Alexander Street,
Crows Nest

Prepared for
Deicorp Pty Ltd

Project: 86645.03
September 2023

Douglas Partners
Geotechnics / Environment / Groundwater

Document History

Document details

Project No.	86645.03	Document No.	R.001.Rev0
Document title	Report on Geotechnical Investigation Fiveways		
Site address	Falcon Street, Pacific Highway and Alexander Street, Crows Nest		
Report prepared for	Deicorp Pty Ltd		
File name	86645.03.R.001.Rev1.docx		

Document status and review

Status	Prepared by	Reviewed by	Date issued
Revision 0	Jean-Christo Pyper	Charles Marais	4 July 2023
Revision 1	Jean-Christo Pyper	Charles Marais	14 September 2023

Distribution of copies

Status	Electronic	Paper	Issued to
Revision 0	1	-	Greg Colbran, Deicorp Pty Ltd
Revision 1	1	-	Greg Colbran, Deicorp Pty Ltd

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

	Signature	Date
Author		14 September 2023
Reviewer		14 September 2023

Douglas Partners acknowledges Australia's First Peoples as the Traditional Owners of the Land and Sea on which we operate. We pay our respects to Elders past and present and to all Aboriginal and Torres Strait Islander peoples across the many communities in which we live, visit and work. We recognise and respect their ongoing cultural and spiritual connection to Country

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Report on Factual Geotechnical Investigation
Fiveways
Falcon Street, Pacific Highway and Alexander Street, Crows Nest

1. Introduction

This report presents the results of a geotechnical investigation undertaken by Douglas Partners Pty Ltd (DP) for the proposed Fiveways development, bounded by Falcon Street, Pacific Highway and Alexander Street, Crows Nest. The investigation was commissioned by Greg Colbran of Deicorp Pty Ltd and was undertaken in general accordance with Douglas Partners' proposal 86645.03.P.001.Rev1, dated 14 April 2023.

At the time of the investigation DP was informed that the proposed development will include the demolition of the existing buildings and construction of a mixed-use structure (residential with retail uses) with a 5-level basement at approximately RL 80.0 m, across the entire footprint of the site. Subsequently, the proposed development has been changed to include a deeper 7 level basement, with a finish floor level at RL 74.8 m.

The aim of the investigation was to assess the subsurface conditions across the site in order to provide the following:

- Description of the subsurface conditions and groundwater.
- Geotechnical Model.
- Excavation characteristics.
- Comments on vibration and vibration monitoring.
- Suitable shoring options and retaining structures.
- Suitable foundation systems and design parameters.
- Comment on settlement.
- Other anticipated geotechnical issues, including comments relating to developments near to existing rail corridors and potential Transport for New South Wales (TfNSW) requirements.
- Inspection requirements
- Additional geotechnical services required.

The geotechnical investigation included the drilling of six (6) boreholes and laboratory testing of selected samples. The details of the field work are presented in this report, together with comments and recommendations on the items listed above.

2. Site Description

The site is a triangular city block and covers approximately 3,300 m^2, located in the suburb of Crows Nest. The site is bounded by Falcon Street, Pacific Highway and Alexander Street (refer Figure 1). The existing surface slopes gradually from west to east along Falcon Street (from RL 99.1 m to RL 96.7 m) and north to south along Pacific Highway (from RL 99.1 m to RL 96.0 m). Along Alexander Street the existing surface slopes towards the south (from RL 96.7 m to RL 96.0 m).

The site is currently occupied by a number of commercial properties, between 2 and 4 levels high, with some properties having an existing 1 level basement. Most of the properties were vacant at the time of the fieldwork. A number of alleyways exists within the property footprint which contain a large number of active services.

Dual Sydney Metro tunnels pass beneath the site, as shown in Figure 1, with tunnel crown level understood to be between RL 65 m and RL 63 m (refer "for construction" TfNSW Drawing SMCSWTSE-JAB-TPW-AL-DRG-505123-02 attached in Appendix B for further details). The closest cross-passage (XP45) between the two tunnels is shown at the northern site boundary.

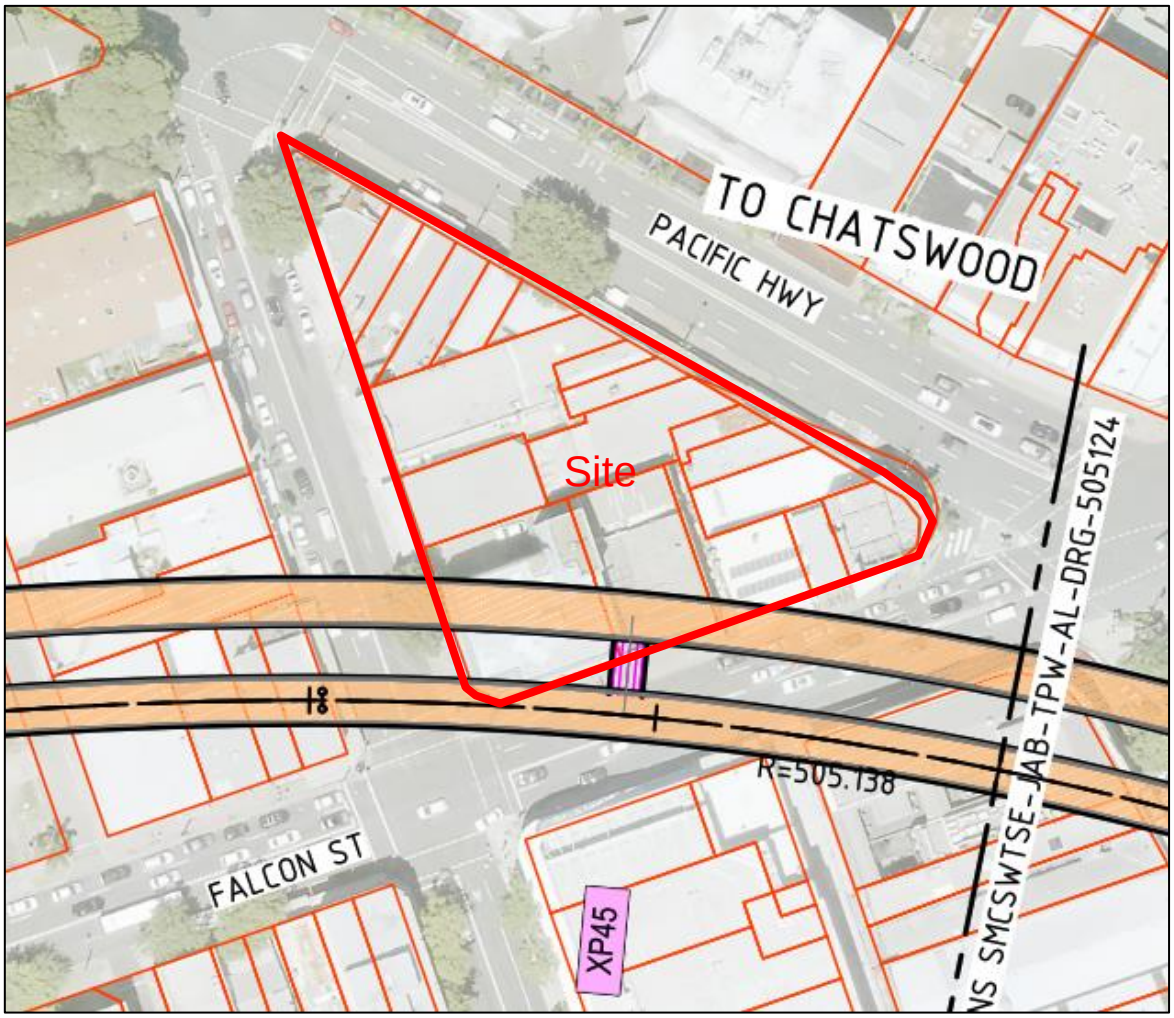

Figure 1: Aerial View of Site with Sydney Metro Tunnel Overlay (note, south up the page)

3. Published Data

3.1 Geology

Reference to the Sydney 1:100 000 Geological Series Sheet indicates that the site in underlain by rock of the lower Ashfield Shale formation, overlying the Mittagong formation, which is a transitional unit between the Ashfield Shale and underlying Hawkesbury Sandstone (refer Figure 2).

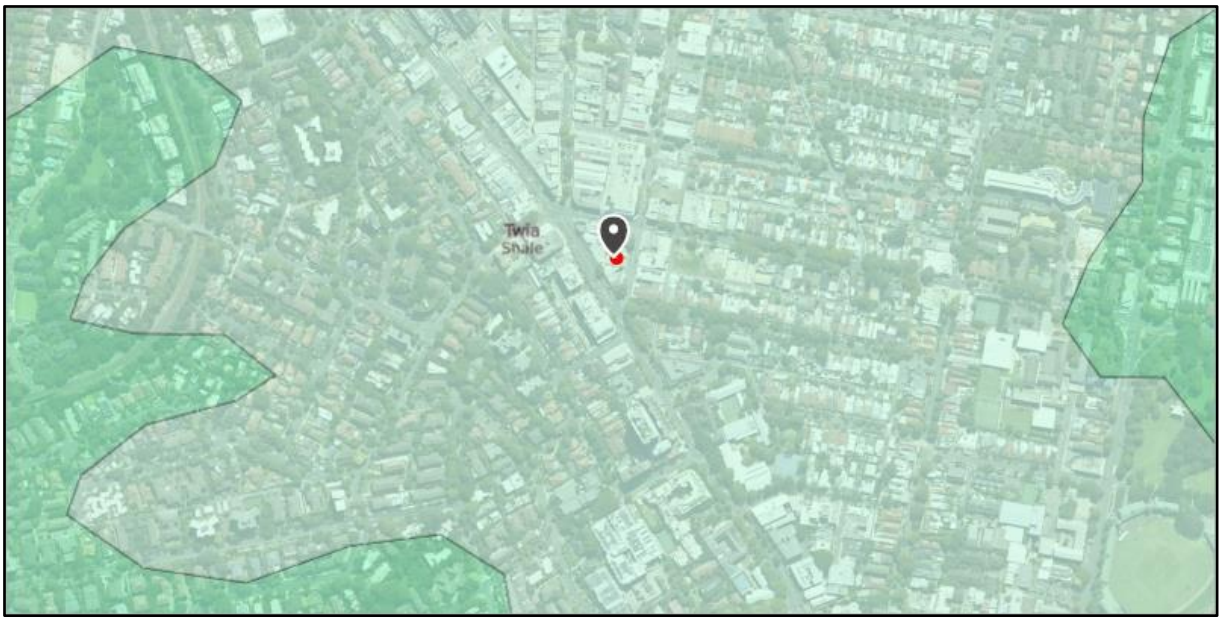

Figure 2: NSW Seamless Geology map with approximate site location

The Ashfield Shale generally comprises black to dark-grey shale and laminite. The predominantly shaly rock is typically closely bedded and contains an orthogonal pair of steeply dipping (70º to 90º) joint sets, typically striking NNE and ESE, spaced at 0.5 m to 10 m. Randomly oriented, 30° to 45° dipping, often slickensided joints, are also ubiquitous.

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, interbedded with siltstone and laminite. The rock formation also contains two orthogonal joint sets, similar to the Ashfield Shale and Hawkesbury Sandstone.

Hawkesbury Sandstone generally comprises medium to coarse grained quartz sandstone with minor shale seams and laminite lenses. Sandstone beds range in thickness from 0.1 m to 5 m, averaging 2 m to 3 m and are separated by bedding planes. As for Ashfield Shale and Mittagong Formation, Hawkesbury Sandstone is generally cut by two near-vertical joint sets, one striking 020°, the other 110°. The sandstone, however, is significantly more massive and is generally not affected by joints dipping flatter than 75°.

3.2 Soil Landscape

Reference to the Sydney 1:100 000 Soils Landscape Sheet, indicates that the site in underlain by Blacktown Soils (moderately reactive, highly plastic residual subsoil).

3.3 Acid Sulfate Soils

The 1:25,000 Acid Sulphate Soil Risk map suggests that the site is not located at or near an area associated with a risk of acid sulphate soils.

4. Field Work Methods

Field work comprised the drilling of six (6) boreholes (BH101 to BH106) at the locations shown on Drawing 1 in Appendix C. Detailed borehole logs and core photographs are provided in Appendix D. BH101 was excavated with non-destructive digging techniques down to refusal at a depth of 1.9 m. As some of the services could not be located, the borehole was not drilled. BH102 to BH106 were drilled to depths between 18.9 m and 30.6 m using a track and bobcat mounted drilling rig.

Boreholes commenced using solid flight auger equipment, with Standard Penetration Tests (SPTs) carried out at regular depths in soil. Boreholes were cased and continued into the underlying rock using diamond drilling to obtain NMLC sized core samples of the bedrock for geotechnical logging and strength testing.

Boreholes BH103, BH104 and BH105 was reamed to a 96 mm diameter to allow installation of temporary observation wells. The wells were constructed using 60 mm external diameter (50 mm internal diameter) Class 18 un-plasticised poly-vinyl (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 a 5.8 m to 10.1 m bentonite seal to prevent any surface water from entering the borehole. The remaining section of the borehole was backfilled with spoil to the collar. The wells at BH103 and BH104 were finished with a gatic cover, installed flush with the surface, whilst the well at BH105 was installed with the protruding PVC pipe and cap (refer Appendix C for well locations and Appendix D for well construction logs).

Groundwater sampling and measurement of groundwater levels were carried out in the temporary observation wells.

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.

The ground surface levels at BH101, BH104 and BH105 were provided by Stantec. The locations of the remaining boreholes were inferred from the survey drawings provided (refer Appendix B for survey drawings). The ground surfaces were provided as Reduced Levels (RL) in metres relative to Australian Height Datum. The locations of the boreholes were estimated from existing site features.

5. Field Work Results

5.1 Subsurface Conditions and Ground Model

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

The sequence of subsurface materials encountered within the boreholes, in increasing depth order, may be summarised as follows:

Pavement / Fill:	Generally, clay, gravelly clay and sandy gravel, with building rubble, plastic and sandstone cobbles to depths of 0.9 m to 2.5 m.
Residual Soil:	Mostly apparently firm silty clay, trace ironstone gravel, increasing to apparently very stiff clay to depths of between 2.0 m and 4.9 m.
Shale (Ashfield Shale):	Generally, very low and low strength, extremely weathered to fresh, fragmented to slightly fractured shale to depths of approximately 13.0 m to 17.4 m.
Siltstone / Sandstone (Mittagong Formation):	Generally, very low, low and medium strength, slightly weathered to fresh, slightly fractured to unbroken siltstone and sandstone to depths of approximately 13.8 m to 19.0 m.
Sandstone (Hawkesbury Sandstone):	Medium to high and high strength, fresh, slightly fractured to unbroken sandstone.

5.2 Groundwater Observations

Free groundwater during auguring was only observed in BH103, at 2.0 m depth. The use of water as a drilling fluid during coring of the boreholes precluded any further groundwater observations.

A summary of the measured groundwater levels is provided in Table 1. The groundwater levels were taken using an electronic dipmeter. It should be noted that the observation holes were purged prior to installation of the wells.

Table 1: Summary of Groundwater Levels Recorded within each Observation Well

Borehole ID	Surface RL (m AHD)	Recorded Groundwater Depth (m) (Reduced Level (m AHD))						
		16 May 2023	19 May 2023	6 June 2023	9 June 2023	11 July 2023	11 August 2023	12 September 2023
BH103	96.0	7.5 (RL 88.5)	-	7.5 (RL 88.5)	-	7.2 (RL 88.8)	7.3 (RL 88.7)	7.4 (RL 88.6)
BH104	93.6	-	4.5 (RL 89.1)	-	5.0 (RL 88.6)	4.7 (RL 88.9)	4.7 (RL 88.9)	4.6 (RL 89.0)
BH105	98.1	-	-	5.0 (RL 93.1)	5.1 (RL 93.0)	5.4 (RL92.7)	5.1 (RL 93.0)	5.4 (RL 92.7)

A downhole data-logger was installed after the initial reading to allow long-term monitoring. Groundwater monitoring within the observation wells of BH103, BH104 and BH105 commenced on 16 May 2023, 19 May 2023 and 9 June 2023, respectively. Data-loggers were removed and monitoring terminated on 12 September 2023. Groundwater level data from the data-loggers together with a plot of daily rainfall records obtained from Weather Station No. 66214 at Sydney (Observatory Hill), NSW (ref: Bureau of Meteorology Station, http://www.bom.gov.au) are provided in Plots 1 to 3 in Appendix G.

5.3 Permeability Testing

Rising head permeability tests, in BH103 and BH105, and a water pressure (packer) test, in BH104, were carried out between 18 May 2023 and 8 June 2023 to estimate the rock mass hydraulic conductivity (or "permeability").

The rising head permeability test involves removing water and measuring the changes in water level within the well at regular time intervals. The packer test involves pumping water into the rock formation below a packer at various pressure. The results of the permeability tests using Hvorslev's (1951) method are summarised in Table 2 below with the full reports provided in Appendix F.

Table 2: Summary of Water Levels in Standpipes

Borehole	Hydraulic Conductivity, k (m/s)
BH103	1.7×10^{-7}
BH104*	3.3×10^{-7}
BH105	3.0×10^{-7}

* Upper bound value recorded.

6. Laboratory Testing

6.1 Aggressivity Testing

Laboratory testing was carried out on three (3) soil samples and three (3) water sample to determine aggressiveness for exposure classification of buried concrete and steel elements.

The results of the laboratory testing are summarised in Table 3. The detailed laboratory test reports are given in Appendix E.

Table 3: Summary of Chemical Laboratory Test Results

Borehole	Material	Depth (m)	Conductivity (µS/cm)	pH	Cl (mg/L or mg/kg)	SO_4 (mg/L or mg/kg)
BH102	Clay	0.9 – 1.0	170	4.9	20	180
BH103	Silty Clay	2.5 – 2.95	27	5.1	22	10
BH105	Clay	1.3 – 1.5	85	4.6	10	62
BH103	Water	-	2,000	6.0	540	97
BH104	Water	-	1,800	7.1	260	320
BH105	Water	-	2,500	6.3	630	190

Notes: Cl = Chloride ion concentration, SO_4 = Sulphate ion concentration, PPM = Parts Per Million

The results of the aggressivity testing have been compared with Australian Standard (AS 2159-2009), Table 6.4.2 (C): "Exposure Classification for Concrete Piles – Piles in Soil and Water". The results indicate the samples are mild to moderately aggressive.

6.2 Point Load Index Testing

The results of point load index testing ($Is_{(50)}$), carried out at regular intervals on rock cores, are shown on the respective borehole logs in Appendix D. The results show $I_{s(50)}$ values in the range of <0.1 to 2.4 MPa, indicating that the rock tested ranged from very low to high strength (refer figure 3 below). Note that point load 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).

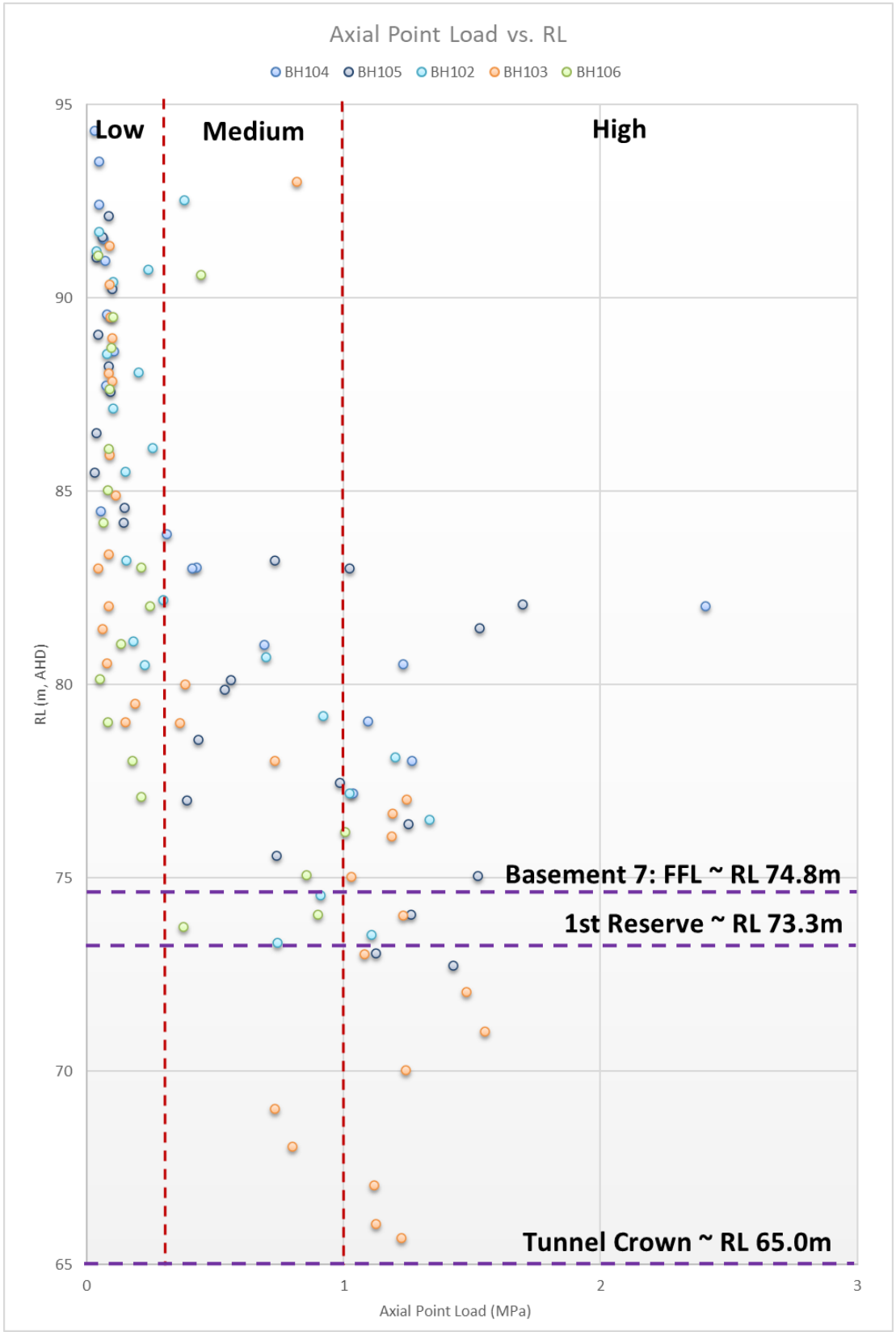

Figure 3: Axial Point Load Values Vs RL (m, AHD)

6.3 Uniaxial Compressive Strength and Deformation Tests

Uniaxial compressive strength (UCS) and deformation testing was carried out on six (6) samples from various boreholes. The sample deformation was recorded during testing to provide data on the elastic modulus and Poisson's ratio.

The results of UCS testing are presented in Table 4 below, with the detailed reports provided in Appendix E.

Table 4: Results of UCS and Deformation Testing

Bore	Depth (m)	Uniaxial Compressive Strength (MPa)	Tangent		Secant	
			Elastic Modulus (GPa)	Poisson's Ratio	Elastic Modulus (GPa)	Poisson's Ratio
BH102	17.0-17.3	12.7	2.9	0.22	2.6	0.12
BH103	19.1–19.3	29.5	6.4	0.39*	5.1	0.21
BH104	16.2-16.5	29.6	6.3	0.40*	4.6	0.24
BH105	12.5-12.8	10.8	1.6	0.12	1.2	0.07
BH105	16.0-16.3	18.1	1.1	0.42*	2.3	0.31*
BH106	21.6-21.9	20.5	4.4	0.31*	3.7	0.25

* Poisson's ratio values should not be relied upon.

7. Geotechnical Model

Geotechnical cross-sections are presented in Sections A-A' to D-D' in Drawings 2 to 4 in Appendix C. The interpreted geotechnical unit boundaries are shown between boreholes. It should be noted that the subsurface conditions are only accurate at the borehole locations. The 'dashed' lines representing the units are inferred from the borehole information, and therefore not necessarily correct.

A summary of the geotechnical units is provided in Table 5.

Table 5: Summary of Geotechnical Model

Geotechnical Unit	Description	Detailed Description
Unit A	Fill / Residual Soils	Fill comprising sandy gravel, sandy and clayey soils / Residual, low to high plasticity, stiff to hard clay soils and dense sands.
Unit B	Class IV and III Shale and Laminite	Shale and laminite bedrock of very low and low strength with some medium strength bands. Mainly highly weathered then fresh, with extremely weathered bands, highly fractured to slightly fractured.
Unit C	Class IV and III Sandstone and Siltstone	Sandstone and siltstone bedrock of generally very low and low strength with medium strength bands, mainly fresh, fractured to slightly fractured.
Unit D	Class II Sandstone	Sandstone of medium to high and high strength. Mainly fresh, slightly fractured to unbroken.

Notes: Rock Class in accordance with Bertuzzi & Pells (2002) Application of Classification To A General Rock Profile

During auguring seepage was only observed in BH103 (at 2.0 m depth). This seepage was likely associated with ephemeral water contained within the soil profile. No seepage was observed in any of the other investigation bores. The groundwater level recorded within the three observation wells (BH103, BH104 and BH105) ranged between RL 93.1 m and RL 88.5 m (4.5 m to 7.5 m below the existing ground surface). Based on the water levels recorded, groundwater is expected to be above the proposed finish floor level of the proposed 7-level basement (RL 74.8 m). The groundwater levels measured within the monitoring wells appears to follow the topography.

8. Proposed Development

It is understood that the proposed development will include demolition of the existing buildings on site and construction of a mixed-use structure (residential with retail uses) with a 7 level basement, with a finish floor level at RL 74.8 m (refer architectural drawings prepared by Turner attached in Appendix B).

The proposed development is also understood to be located partly in the Sydney Metro tunnel second reserve, with the dual tunnels (RT01 and RT02) running beneath the northeastern corner of the site (refer TfNSW “for construction” drawing SMCSWTSE-JAB-TPW-AL-DRG-505123-02 attached in Appendix B). The tunnels are shown to plunge towards the east with the tunnel crown increasing in depth from approximately RL 65 m to RL 63 m. A cross passage is shown between the two tunnels, located just to the north of the site. Both tunnels are shown to be circular with a diameter of approximately 7.05 m (refer sheet 2 to 4 of drawing 3050-01019-001-002-02, prepared by Stantec attached in Appendix B).

9. Comments

9.1 Site Preparation and Earthworks

9.1.1 Excavation Conditions

It is understood that the basement will require excavation to depths between 21 m to 24 m below the existing ground level. Excavation to these depths will likely encounter soils (Unit A) to medium to high strength and high strength sandstone (Unit D).

9.1.2 Excavatibility

Excavation in fill, soil (Unit A) and rock up to very low strength should be readily achievable using conventional earthmoving equipment such as a hydraulic excavator with bucket attachment. Where stronger bands are encountered (Unit C), some light ripping and rock hammering will likely be required to excavate this material.

Excavation of medium and high strength rock (Unit D) will require heavy ripping (D10/D11 Dozer), large excavators equipped with hydraulic rock hammers and excavators with rock saws. The ease of excavation of the sandstone is directly related to the defect spacing and rock strength. Given the rock strength, it is critical that excavation contractors carry out independent excavatability assessments prior to tendering for excavation.

Detailed excavation for footings and service trenches / pits should be achievable using rock hammers, hydraulic rock saws or milling heads. Rock saws may also be required to reduce the risk of vibration affecting adjacent structures and inhabitants.

9.1.3 Excavation Induced Ground Movement (Stress Relief)

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 rock excavation depth, 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.

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. Back from the crest of the excavation, movement can occur (albeit very minor) over a distance of up to three times the excavated rock depth with an initial reduction of approximately 1 to 1.5 mm per metre, reducing with distance from the face. This differential movement will give rise to strain in both the rock mass and the soil beyond the excavation. Most of the movement would be expected to occur progressively during the excavation. Heave may occur where relatively thin beds of competent rock is left in the base (bed separation due to buckling). Careful

consideration should therefore be given to the effects of stress relief on the existing neighbouring structures, buildings and surrounding services.

9.1.4 Trafficability

Problems may be experienced with site trafficability during wet weather in areas where clayey filling or natural clay is exposed after demolition works. A layer of road-base gravel or recycled crushed concrete could be used to improve trackability on site.

A working platform will likely be required for larger plant such as piling rigs, mobile cranes, etc. A working platform assessment should be carried out, based on the loads provided for the different rigs / cranes.

9.1.5 Vibration

The use of heavy excavation equipment in bedrock will generate vibration which could cause damage to nearby structures (including the metro tunnels) and effect building inhabitants. It will be necessary to use appropriate excavation methods and equipment to keep ground vibration at adjacent buildings / structures within acceptable limits. The level of acceptable vibration is dependent on various factors including the type of building structure (e.g., reinforced concrete, brick, etc.), its structural condition, founding conditions, the frequency range of vibration produced by the construction equipment, the natural frequency of the building and the vibration transmitting medium.

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

Based on DP’s experience and with reference to AS / ISO 2631.2, it is suggested that a maximum PPVi of 8 mm/s (measured at the first occupied level of existing buildings) be provisionally employed at this site for both architectural and human comfort considerations, although this vibration limit may need to be reduced if there are sensitive buildings or equipment in the area (such as heritage buildings).

DP maintains an extensive construction vibration database. As a preliminary estimate, Table 6 provides approximate minimum buffer distances for selected equipment, based on a set vibration limit of 8 mm/s.

Table 6: Approximate buffer distances for selected Plant (PPVi 8 mm/s)

Excavation Plant		Distance from plant at which vibration attenuates to 8 mm/s	
Type	**Operating Weight**	**From DP Trial Maxima[1]**	**From DP Trial Average**
Rock saw on excavator[2]	-	1 m	0.5 m
Ripper on 20 t excavator	-	3 m	0.7 m
Rock Hammer	<500 kg	7 m	3 m
	501 – 1000 kg	8 m	3 m
	1001 – 2000 kg	13 m	5 m

Notes:

1. *Smaller distances can generally be determined from individual trials, as indicated by those from trial averages.*
2. *Buffer distances for rock hammers may be slightly reduced by prior saw cutting along, or parallel to, excavation boundaries.*
3. *Loading effects from adjacent buildings may reduce vibration levels, to enable boundary saw cuts with few exceedances.*

As the magnitude of vibration transmission is site specific, it is recommended that a vibration trial be undertaken at the commencement of rock excavation. The trial may indicate that smaller or different types of excavation equipment should be used for bulk (or detailed) excavation purposes.

9.1.6 Dilapidation Surveys

Dilapidation surveys should be carried out on surrounding infrastructure (including underground structures), buildings and pavements that may be affected by the basement excavation. The dilapidation surveys should be undertaken before the commencement of any excavation work in order to document any existing defects so that any claims for damage due to construction related activities can be accurately assessed.

9.1.7 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, permitting beneficial reuse; 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.

Refer to DP's Contamination Investigation Report (Ref. 86645.04.R.001.Rev0) for further information.

9.2 Excavation Support

Careful consideration must be given to the planning and design of excavations and excavation retention system(s), especially along the property boundaries where excessive deformation or failure can cause damage to nearby buildings, road infrastructure, footpaths, services, etc. All surcharge loads from adjacent structures, including construction loads (scaffolding, etc.), traffic loads, etc., should be taken into account when assessing the stability of shoring and rock faces. Temporary surcharges should be kept well clear (at least 3 m) of the crest of any temporary batters that may be constructed during excavation.

We understand that an anchored soldier pile and reinforced shotcrete infill panel wall is proposed as a retention system in the first five basement levels of the excavation with piles extending down RL 79.4 m (refer shoring drawings prepared by ABC Consultants attached in Appendix B – note their units are labelled different to the DP units). Six rows of anchors are proposed to support the shoring wall, with anchor bond lengths shown to extend beyond the 45˚ line, drawn up from the base of the “Unit 3” layer (DP Unit C). The drawings indicate that the “Unit 4” layer (DP unit D) will be covered with reinforced shotcrete with rock bolts to support adversely oriented defects. If these faces are to be covered with shotcrete, it will have to be supported with rockbolts.

9.2.1 Batters / Excavation Faces

Battering of the excavation sides at safe angles will not be possible as the excavation is proposed up to the property boundary. Temporary internal batters, however, may be required during staging of the excavation. Temporary batters of <3 m in height in filling / natural soils should be cut no steeper than 2:1 (H:V). Temporary batters in shale, siltstone and laminate should be cut no steeper than 1:1, but will be subject to inspection to confirm that they are not adversely affected by jointing. Batters over 3 m in height in any material should be designed individually.

All excavation faces along the perimeter of the site within Units A, B and C materials will require temporary and permanent retention. The retention system should be designed to support the soil and rock, taking into account all surcharge loads and allowable deformation limits. Temporary retention is usually provided by shoring, typically supported with anchors, until the building provides the permanent support.

Vertically cut faces in medium strength or stronger sandstone is feasible except where adversely affected by jointing.

All batters and faces should be inspected and mapped every 1.5 m drop in excavation to confirm that stability is maintained.

9.2.2 Retaining / Shoring Walls

Shoring should be designed to support the soil and weak rock, taking into account any surcharge loads. Allowance should be made for ground anchors, rockbolt and shotcrete support. All clay seams and shale layers (>50 mm thick) will be required shotcrete protection to prevent future weathering and regression. Thick seams will, in addition to the shotcrete face protection, require rockbolt or anchor support.

ABC Consultants preliminary structural drawings (refer Appendix B) indicate that the material in Units A, B and C will be supported with an anchored soldier pile and reinforced shotcrete infill panel shoring system. This type of shoring system is considered adequate to support the material above the medium strength or stronger sandstone (Unit D).

Rock mass support in Unit D can only be finalised once face mapping has been completed. It is therefore recommended that all rock faces be inspected by a suitably experienced geotechnical engineer / engineering geologist in maximum drops of 1.5 m to confirm that the site conditions are consistent with the geotechnical model and advise on any rockbolting / anchoring requirements. All face support should be installed in a timely manner (prior to proceeding with the next drop in excavation) to ensure that stability is maintained at all times.

The legal implications of the use of rock anchors extending onto neighbouring properties and public land will need to be considered. Approval should be sought from Council and adjacent property owners prior to installing any anchors. Due consideration should also be given to below-ground excavations, services, etc.

9.2.3 Shoring Design

Design pressures for retaining walls should take into account the requirement to limit movement of the surrounding ground, adjacent structures and services and to ensure an adequate factor of safety is maintained against failure (for temporary and permanent retaining walls).

It is suggested that the design of cantilevered shoring systems (or shoring systems with one row of anchors) be based on a triangular earth pressure distribution using the earth pressure coefficients provided in Table 7. 'Active' earth pressure coefficient (K_a) values may be used where some wall movement is acceptable.

Table 7: Recommended Design Parameters for Shoring Systems

Material	Unit Weight (kN/m^3)	Earth Pressure Coefficient	
		Active (K_a)	At Rest (K_o)
Filling, and residual sand	20	0.30 (0.40)	(0.50)
Very low to low strength Shale / laminate / siltstone	22	0.25 (0.30)	(0.40)
Low to medium strength sandstone / siltstone	22	0.20 (0.25)	(0.35)
Medium strength or stronger sandstone	24	0	0

Notes: The values above assume a level surface behind the wall.

() Permanent earth pressure coefficient shown in brackets.

It is assumed that the rock mass is free of adverse dipping joints and seams.

It should also be noted that the K_a and the K_o designs will not prevent stress relief movement.

Braced walls or walls with two or more rows of anchors, such as proposed by ABC Consultants, can be designed using a rectangular or trapezoidal earth pressure distribution. 'At Rest' earth pressure coefficient (K_o) values should be used where the wall movement needs to be limited.

An alternative approach, where the support pressure is related to the height of soil / weak rock retained could also be used. Where the wall movement is to be minimised (i.e., close to adjacent structures or services) the lateral earth pressure can be calculated using 6H kPa. For movement-sensitive structures, where it is critical that deformation is controlled, it may be necessary to calculate the pressure using 8H kPa.

These pressures can be applied as either rectangular or trapezoidal earth pressure distributions. 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 distributions given above. The actual earth pressure distributions can be assessed using numerical methods.

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, full hydrostatic head should be allowed for in design, while at the same time reducing the unit weight to account for the buoyant condition. Accidental groundwater levels in the vicinity of the retaining structures along the Pacific Highway boundary should also be taken into account in accordance with gtd-2020-001.

Passive resistance for piles founded below bulk excavation level (which is not the case for the proposed shoring concept) may be based on an ultimate passive bearing capacity of 3500 kPa, provided that the sandstone is of at least medium strength and not adversely affected by discontinuities. Higher values may be possible but will depend on the strength and quality of the rock. It should be noted that the ultimate bearing capacity value only applies below a depth of one pile diameter beneath bulk excavation level or 0.5 m, whichever is the greater, and will need to be appropriately factored. Piles should be founded at least one pile diameter or 1.0 m below the lowest level of any nearby excavation (including perimeter drainage trenches and detailed service or footing excavations, etc.), except when required to carry structural load from a building, where longer rock sockets may be required.

Piles may be socketed into the top of free-standing medium strength or stronger sandstone provided the bearing capacity of the rock is adequate and adequate retention and toe support are provided.

Staged excavation and inspection by a suitably qualified geotechnical engineer will be required to confirm that the rock in front of the wall / pile is not adversely affected by discontinuities, especially where passive resistance is relied upon. Piles supporting structural compression loads should be taken to below the bulk excavation and designed based on the allowable foundation pressures given in Section 9.4.

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

9.2.4 Ground Anchors and Rockbolts

It is anticipated that the building will support the shoring wall in the long term and therefore any ground anchors are expected to be temporary only. The use of permanent anchors, if required, would need careful attention to corrosion protection for which further geotechnical advice should be sought.

Post-stressed ground anchors, rockbolts and dowels (support elements) can be used to laterally support new shoring, underpinning works or unstable rock masses. Anchors can also be used vertically as hold down anchors to resist temporary or long-term uplift of the core / walls, which should 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. 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.

Table 8 provides ultimate and allowable bond stresses for preliminary design purposes.

Table 8: Anchor Bond Stresses

Material	Allowable Bond Stress (kPa)	Ultimate Bond Stress (kPa)
Very low strength Shale / Siltstone / Laminite	75	150
Low strength Shale / Siltstone / Laminite	150	350
Medium Strength Siltstone / Sandstone	350	600
Medium to High Strength Sandstone	600	1500
High Strength Sandstone	1200	3000

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 support elements have been installed, it is recommended that they are tested to 125% of their nominal working load. Where stress relief or further unavoidable movement of the shoring is expected, it is recommended that the support elements are locked-off at a lower value than their working loads to accommodate the additional movement and subsequent increase in stress in the support elements. 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 face. Shotcrete with mesh (or fibrecrete) may be required where beds / seams of extremely low or very low strength rock are encountered within higher strength sandstone, secured with anchors, rockbolts, dowels or pins, as required.

9.2.5 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 infrastructure. This technical direction supersedes RMS document GTD 2012 / 001. An assessment of ground movement and monitoring requirements as well as instrumentation may be required by TfNSW prior to commencing construction.

Reference should also be made to Sydney Metro Underground Corridor Protection Technical Guideline for the general requirements of TfNSW concurrence for developments located within the second reserve of the Sydney Metro tunnels. The distance from the proposed bulk excavation level to the tunnel crown level beneath the northern portion of the site is estimated to be in the order of ~10 m. As the development is just outside the 'first reserve', detailed numerical analysis will likely be required to assess the potential impacts of the proposed development on the Sydney Metro rail tunnels as part of the approval process of the Sydney Metro Authority. A risk assessment and monitoring strategy may also be required.

Similarly, TfNSW may require detailed numerical analysis to assess the potential impact of the proposed development on Pacific Highway (TfNSW infrastructure). A risk assessment and monitoring strategy may also be required.

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

9.3 Groundwater

The RT01 and RT02 tunnels are not expected to draw the groundwater down in the vicinity of the site as they are understood to be fully lined.

The water level readings in Table 1 shows the water levels in BH103, BH104 and BH105 to range between RL 93.1 m to RL 88.5 m AHD. Comparing the water levels at the three locations indicates the flow would be to the southeast, generally following the falling topography.

Given the depth of the basement (B7 finish floor level at RL 74.8 m), it is expected that the proposed excavation level will extend below the recorded water levels. Seepage during construction and in the long term should be expected along the top of rock (particularly after periods of wet weather) and through the joints and bedding planes in the rock face. Seepage may be relatively minor during dry periods and will increase following and during wet periods. Around the perimeter of the excavation, most seepage inflow is likely to occur through the upslope faces. Initially, higher inflow may be experienced.

It is not possible to provide a reliable estimate of the seepage quantity that may be expected during construction and long-term, based on the available data. The amount of seepage into the excavation

during and just after construction should be monitored as this will give an indication of likely inflows for the long-term condition.

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. Approval from WaterNSW, however, will be required prior to designing and constructing a drained basement. A drained basement, if approved by DPIE Water, will require permanent subfloor drainage to direct seepage to the stormwater drainage system for which Council approval will be required. The disposal requirements of water collected on-site will be dependent on the chemical consumption of the water. Note that a drained basement will act as a low point to which groundwater will flow. Therefore, if present, any contamination within the surrounding groundwater system could flow into the basement and adversely affect the quality of the water collected on site.

A tanked basement would avoid the need for dewatering but is likely to be more expensive than a drained basement. A tanked basement would need to be designed to resist uplift forces associated with groundwater pressure, for which preliminary design should be based on a groundwater level at RL 93.5 m across the footprint of the site.

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 subsoil (gravel) drains and ‘seize’ 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.

Notwithstanding the above, it should be noted that groundwater levels are transient and may fluctuate over time, particularly, following periods of heavy rainfall.

9.4 Foundations

The proposed foundation arrangement is currently not known. The design of new pad or strip footings may be based on the maximum allowable bearing pressure and modulus values given in Table 9. This, however, will have to be confirmed by deeper drilling.

Table 9: Recommended Design Parameters for Foundation Design

Foundation Stratum	Ultimate End Bearing Pressure (kPa)	Allowable End Bearing Pressure (kPa)	Field Elastic Modulus* (MPa)	Allowable Defects	Testing Requirements
Medium strength sandstone (Class III)	20,000	3,500	350 - 1200	< 5%	Minimum 4 cored bores with spoon testing in at least 1/3 of footings.
Medium to high strength sandstone (Class II)	60,000	6,000	900 - 2000	< 3% No seams >10mm in first 250mm or >20mm in first 500mm	Cored bores at max 10 m grid spacing or cored bores for 50% of footings, and spoon testing remainder.

Notes:

- Values for sandstone are in accordance with Pells et al AGS Dec 1998.
- Bearing pressure values assume a minimum embedment of one footing width into the relevant bearing stratum.
- Ultimate parameters are mobilized at large settlements (i.e., >5% foundation width).
- Additional analysis is required to calculate the modulus of subgrade reaction for individual footings.
- Allowable end bearing pressures to cause settlement of less than 1% of minimum footing dimension.

Defects such as bedding planes and weak seams can have a significant impact on the allowable bearing capacity and should be taken into consideration in the design. Spoon testing, if required, should extend below the footing bases to a depth of at least 1.5 times the footing width or 2.5 m, whichever is shallower. Test holes for spoon testing should be at least 40 mm in diameter.

All foundations should be founded below the zone of influence of any existing or proposed service trenches. Generally, the zone of influence can be defined by the zone above a plane extending upwards at 45º from the base of the service trench (all footings affected to be assessed individually).

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 under the applied working load, with differential settlements between adjacent foundations expected to be less than half of this value.

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 bearing pressures, and proof drilled or spoon tested as appropriate. If the material is not assessed as appropriate for 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 Ground Slabs

Floor slabs at basement level can be designed as a slab on ground, assuming proper compaction is given to the subgrade on which the slabs are cast (if not on rock).

If a drained basement is designed, it will be necessary to provide under-floor drainage with subsoil drains and sumps to safeguard against uplift pressures. The drainage layer can comprise a 100 mm thick durable open graded crushed rock.

9.6 Earthquake / Seismic Design and Site Classification

Based on the results of the investigation, and with reference to AS1170.4:2007 Section 4, the site subsoil class has been determined as predominately Class Be (rock). Class Ce (Shallow soil) areas also exist where the soil surface layer is more than 3 m in depth.

AS 1170.4-2007 indicates that a Hazard Factor (*Z*) of 0.08 is appropriate for this area.

9.7 Geotechnical Monitoring and Inspection

Geotechnical monitoring of ground movement associated with the proposed construction works will be required for the site in general, and for adjacent structures (such as Pacific Highway), services (such as Sydney Water assets) and the Sydney Metro tunnels. Monitoring requirements for the Metro Tunnels are contained in Sydney Metro Underground Corridor Protection Technical Guideline. Requirements for retaining structures constructed to support the sides of excavations which are within close proximity to TfNSW roads provided in gtd-2020-001.

Based on the proposed excavation, the requirements in the Sydney Metro Underground Corridor Protection Technical Guideline and in the gtd-2020-001, it is suggested that the following be carried out either prior to or during the demolition and construction phases, as appropriate.

9.7.1 Monitoring

Monitoring associated with Metro Tunnels generally includes:

- Dilapidation surveys of the tunnel lining;
- Tunnel vibration monitoring;
- Crack tell-tales on distinct cracks in the tunnel lining identified in the dilapidation survey (yet to be carried out);
- Site survey markers on the capping beam and on the shoring face at one third and two thirds excavation height to monitor shoring movement along the Falcon Street elevation. Three baseline readings should be taken prior to excavation commencing; and
- 2 arrays of 5 survey markers installed in the tunnel to measure tunnel convergence.

Monitoring associated with gtd-2020-001 includes:

- Survey points and inclinometers. Survey points have been included in the above. A minimum of three (3) inclinometers will likely be required. These can be installed either in the shoring piles or in boreholes drilled in the footpath along Pacific Highway. Three baseline readings should be taken prior to excavation commencing. Note that the inclinometers should be installed at least 3 m below bulk level to ensure the base is fixed in undisturbed rock.

Monitoring associated with the site in general includes:

- Vibration monitoring;
- Survey points to monitor the sidewall deflection during excavation generally around the site and specifically on any sensitive structures adjacent to the excavation (to be confirmed by Structural Engineer). Three baseline readings should be taken prior to excavation commencing; and
- Dilapidation surveys of adjacent buildings / services / road / footpath, etc. (not geotechnical).

Readings will need to be taken at intervals prior to, during and after excavation works (readings to be forwarded to the geotechnical engineer / structural engineer for assessment). Readings should be reviewed regularly for comparison with predicted values (from modelling) to ensure displacements are within the expected range.

Monitoring frequencies will depend on the excavation methodology and staged construction.

Monitoring requirements and frequencies should be provided in a Tunnel Geotechnical Monitoring Plan (TGMP) and in a Geotechnical Monitoring Plan (GMP), to be prepared once design has progressed.

9.7.2 Geotechnical Inspection

Geotechnical inspections are recommended during construction, such as:

- Observing a percentage (% depends on design) of shoring wall piles;
- Observing a percentage (10 to 20%) of temporary ground anchor drilling, installation and stressing;
- Observing a percentage (usually 100%) of permanent ground anchor drilling, installation and stressing;
- Inspection of excavated rock faces every 1.5 m drop. Inspection of the rock face between soldier piles, prior to shotcreting, is recommended. The purpose of these inspections is to identify any adversely dipping joints or defects in the rock face, assess the stability and determine if any additional support is required; and
- Inspection of all foundations (pad, strip or pile sockets) and associated cored boreholes / spoon testing as required.

A geotechnical Inspection and Test plan (ITP) should be prepared once design has been finalised, prior to commencing with construction.

9.7.3 Numerical Modelling

Depending on the requirements of TfNSW, numerical modelling may be required to predict ground movements along the Pacific Highway and the Sydney Metro tunnels.

10. Further Investigation

A geotechnical review of the foundation and shoring design will be required. Additional geotechnical investigation will be required, comprising at least three corded boreholes, drilled to 5 m below the proposed basement level 7 finish floor level (RL 74.8 m). These boreholes can be drilled after the completion of the demolition works.

11. Limitations

Douglas Partners (DP) has prepared this report for this project at Falcon Street, Pacific Highway and Alexander Street, Crows Nest in accordance with DP's proposal and acceptance received from Greg Colbran. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Deicorp 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 DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP 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 DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP 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 / environmental / groundwater) components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP 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 DP. This is because this report has been written as advice and opinion rather than instructions for construction.

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

Appendix A

About This Report

About this Report

Douglas Partners

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

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.

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.

Appendix B

Survey, Architectural, Structural and TfNSW Drawings

BEFORE YOU DIG
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SHORT LINE TABLE		
Number	Bearing	Distance
1	189°25'40"	1.07
2	9°25'40"	4.175
3	189°33'40"	0.025
4	99°26'40"	3.685
5	279°25'40"	0.025
6	189°25'40"	6.655
7	189°25'40"	5.66
8	99°33'40"	0.115
9	189°33'40"	6.94
10	189°21'20"	5.38
11	9°31'20"	3.7
12	9°31'20"	0.825
13	99°33'40"	1.48
14	9°22'40"	1.56
15	189°31'20"	1.655
16	99°40'40"	0.11
17	9°40'40"	2.955
18	101°48'40"	1.055
19	99°31'20"	6.115
20	9°31'40"	1.265
21	99°23'40"	2.005
22	99°25'40"	0.115
23	9°25'40"	2.82
24	99°28'	0.975

NOTES:
1. THE LOCATION OF THE METRO LOT HAS BEEN DERIVED FROM DP1231642
2. THE LOCATION OF THE METRO TUNNELS HAVE BEEN DERIVED FROM 'FOR CONSTRUCTION' DRAWINGS PROVIDED BY TRANSPORT FOR NSW FOR THE SYDNEY METRO CITY & SOUTHWEST PROJECT INDICATING VARIOUS ALIGNMENT COORDINATES AND LEVELS ADJACENT TO THE DEVELOPMENT SITE
3. THE BOUNDARIES OF THE DEVELOPMENT SITE HAVE BEEN DERIVED FROM A PLAN PREPARED BY DAW AND WALTON CONSULTING SURVEYORS TITLED 'DETAIL SURVEY @ PACIFIC HIGHWAY CROWS NEST' DRAFTED 12-04-23, JOB NUMBER 4950-20
4. THE PROPOSED BOREHOLE POINT INDICATED ON THE PLAN AND SECTIONS IS THE CLOSEST PINK PAINT MARK LOCATED ON SITE TO THE METRO TUNNELS

NOTES:
- 'A' DENOTES RIGHT OF CARRIAGEWAY (AS SHOWN IN DP29672)
- 'B' DENOTES RIGHT OF FOOTWAY (AS SHOWN IN DP29672)
- 'C' DENOTES EASEMENT FOR SEWERAGE (AS SHOWN IN DP29672)
- 'D' DENOTES EASEMENT FOR DRAINAGE (AS SHOWN IN DP29672)
- 'E' DENOTES EASEMENT FOR ROOF WATER DRAINAGE (AS SHOWN IN DP29672)
- 'F' DENOTES RIGHT OF WAY (AS SHOWN IN DP29672)
- 'G' DENOTES EASEMENT FOR SULLAGE WATER (AS SHOWN IN DP29672)
- 'H' DENOTES RIGHT OF CARRIAGEWAY (VIDE K770818)
- 'P' DENOTES 0.23 BRICK PARTY WALL

LEGEND
- GULLY PIT & LINTEL

1st RESERVE LINE METRO
2nd RESERVE LINE METRO
CENTRELINE METRO TUNNEL
STREET
ALEXANDER
FALCON
PACIFIC
HIGHWAY
70 DP 1231642 (IN STRATUM)
1 DP 562966
1 DP 127595
11 DP 29672
10 DP 29672
3 DP 29672
2 DP 29672
4 DP 29672
5 DP 29672
6 DP 29672
7 DP 29672
8 DP 29672
9 DP 29672
1 DP 16402
2 DP 16402
3 DP 16402
4 DP 16402
5 DP 16402
6 DP 16402
BH101
BH104
BH105

0 4 6 8 12 16 20
SCALE 1: 200 @ A1

0 8 12 16 24 32 40
SCALE 1: 400 @ A3

Registered Surveyor
Date 05 / 05 / 2023

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IMPORTANT NOTE:
This plan is prepared for DEICORP from a combination of field survey and existing records for the purpose of designing new constructions on the land and should not be used for any other purpose.
The title boundaries shown hereon were not marked by the author at the time of survey and have been determined by plan dimensions only and not by field measurement.

A services search of the area surveyed above has not been undertaken. Visible services shown hereon have been located where possible by field survey. Prior to any demolition, excavation or construction on the site, the relevant authority should be contacted for possible location of further underground services and detailed locations of all services.

REVISION	DATE	DESCRIPTION	CCAD REF	APPROVED
02	05/05/2023	TITLE BLOCK AMENDED	-	A.K.
01	04/05/2023	ORIGINAL ISSUE	-	A.K.

SCALE: HORZ. 1:200 VERT.
A1
CONTOUR INTERVAL: MAJOR 0.0 MINOR 0.0
HORIZONTAL ORIGIN
COORD. SYSTEM: MGA2020
MARK ADOPTED: PM 286
COORDINATES: E 333 681.947 N 6255 172.989
VERTICAL DATUM
DATUM: AHD
BM ADOPTED: PM 286
RL: 96.802

Stantec
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Rockdale NSW 2216
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w: www.stantec.com

SURVEYED	DRAWN	CHECKED	PASSED
L.Z.	A.G.	A.K.	A.K.

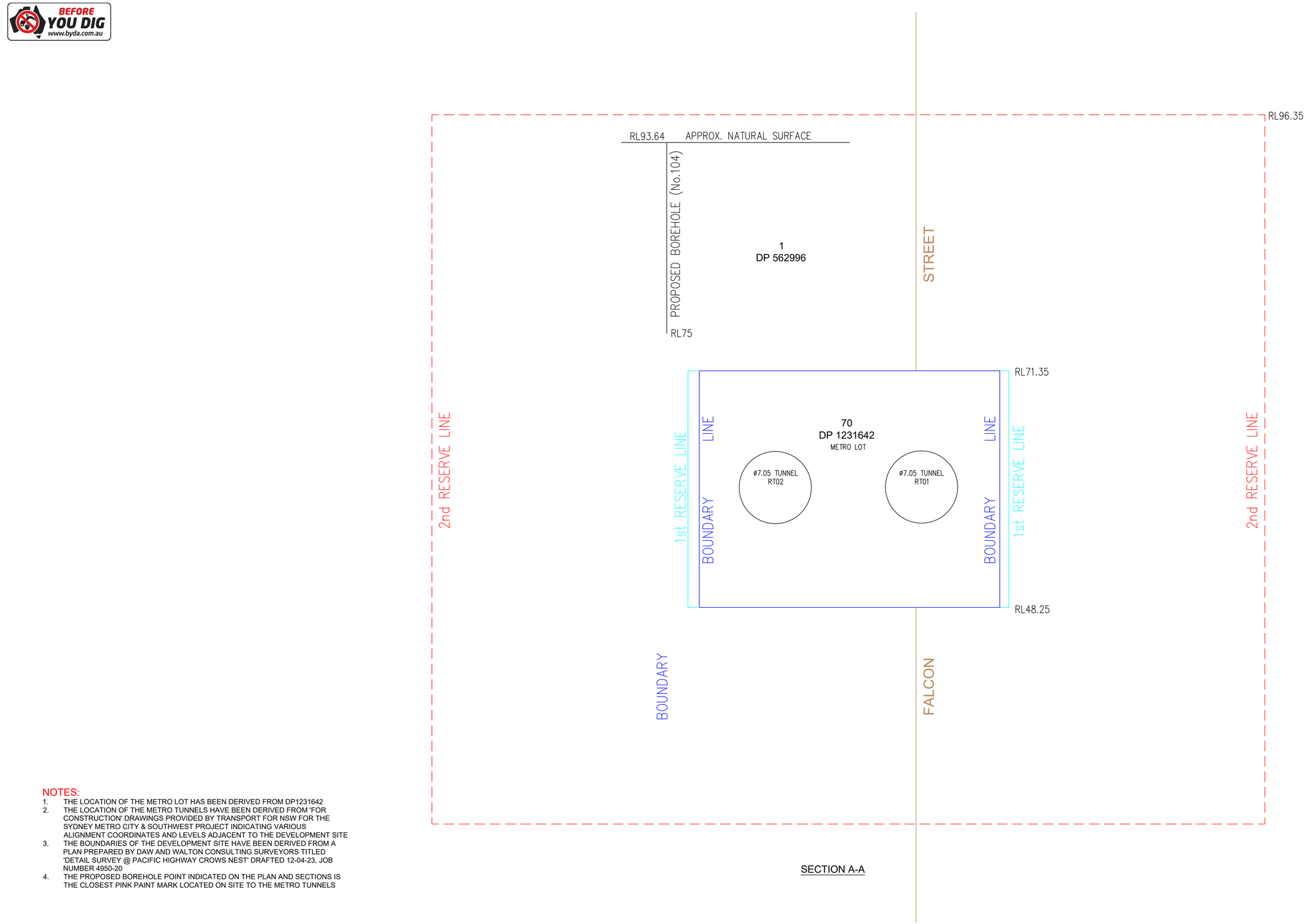
PROJECT: PROJECT

PLAN SHOWING RELATIONSHIP OF PROPOSED BOREHOLES TO SYDNEY METRO TUNNELS AT FIVE WAYS, CROWS NEST

CLIENT: DEICORP

SHEET 1 OF 1

DRAWING NUMBER	REV
3050-01019-001-002	02



NOTES:

1. THE LOCATION OF THE METRO LOT HAS BEEN DERIVED FROM DP1231642
2. THE LOCATION OF THE METRO TUNNELS HAVE BEEN DERIVED FROM 'FOR CONSTRUCTION' DRAWINGS PROVIDED BY TRANSPORT FOR NSW FOR THE SYDNEY METRO CITY & SOUTHWEST PROJECT INDICATING VARIOUS ALIGNMENT COORDINATES AND LEVELS ADJACENT TO THE DEVELOPMENT SITE
3. THE BOUNDARIES OF THE DEVELOPMENT SITE HAVE BEEN DERIVED FROM A PLAN PREPARED BY DAW AND WALTON CONSULTING SURVEYORS TITLED 'DETAIL SURVEY @ PACIFIC HIGHWAY CROWS NEST' DRAFTED 12-04-23, JOB NUMBER 4950-20
4. THE PROPOSED BOREHOLE POINT INDICATED ON THE PLAN AND SECTIONS IS THE CLOSEST PINK PAINT MARK LOCATED ON SITE TO THE METRO TUNNELS

0 4 6 8 12 16 20
SCALE 1: 200 @ A1

0 8 12 16 24 32 40
SCALE 1: 400 @ A3

IMPORTANT NOTE:
This plan is prepared for DEICORP from a combination of field survey and existing records for the purpose of designing new constructions on the land and should not be used for any other purpose.
The title boundaries shown hereon were not marked by the author at the time of survey and have been determined by plan dimensions only and not by field measurement.

A services search of the area surveyed above has not been undertaken.
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REVISION	DATE	DESCRIPTION	CCAD REF	APPROVED
02	05/05/2023	TITLE BLOCK AMENDED	-	A.K.
01	04/05/2023	ORIGINAL ISSUE	-	A.K.

SCALE: HORZ. 1:200 VERT.
A1
CONTOUR INTERVAL: MAJOR 0.0 MINOR 0.0
HORIZONTAL ORIGIN
COORD. SYSTEM: MGA2020
MARK ADOPTED: PM 286
COORDINATES: E 333 681.947 N 6255 172.989
VERTICAL DATUM
DATUM: AHD
BM ADOPTED: PM 286
RL: 96.802

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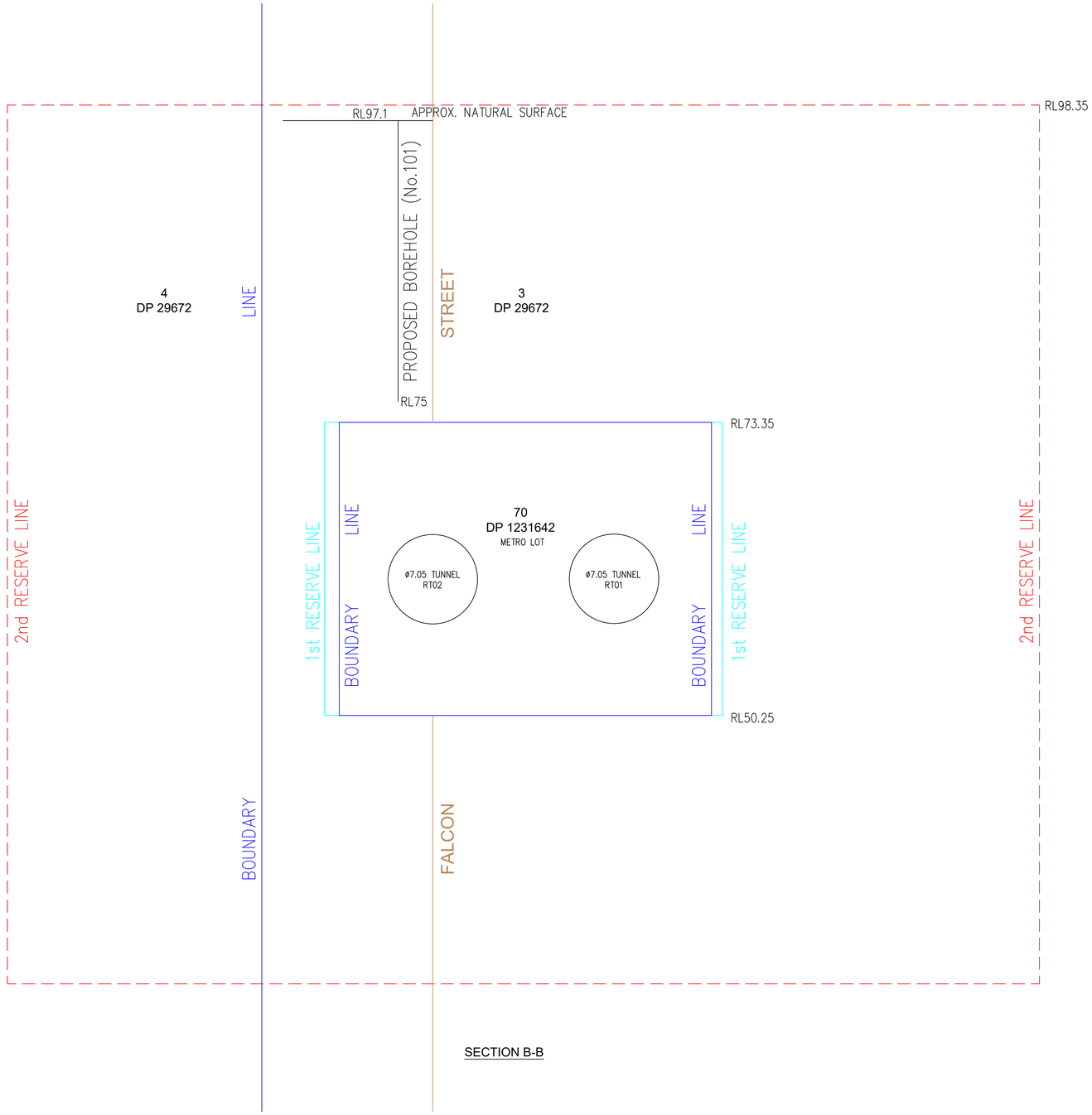
SURVEYED	DRAWN	CHECKED	PASSED
L.Z.	A.G.	A.K.	A.K.

PROJECT: PROJECT

PLAN SHOWING RELATIONSHIP OF PROPOSED BOREHOLES TO SYDNEY METRO TUNNELS AT FIVE WAYS, CROWS NEST

CLIENT: DEICORP

SHEET 2 OF 1
DRAWING NUMBER: 3050-01019-001-002
REV: 02



SECTION B-B

NOTES:

1. THE LOCATION OF THE METRO LOT HAS BEEN DERIVED FROM DP1231642
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0 4 6 8 12 16 20
SCALE 1: 200 @ A1

0 8 12 16 24 32 40
SCALE 1: 400 @ A3

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01	04/05/2023	ORIGINAL ISSUE	-	A.K.

SCALE:
HORZ. 1:200 VERT.
A1
CONTOUR INTERVAL:
MAJOR 0.0 MINOR 0.0
HORIZONTAL ORIGIN
COORD. SYSTEM: MGA2020
MARK ADOPTED: PM 286
COORDINATES:
E 333 681.947
N 6255 172.989
VERTICAL DATUM
DATUM: AHD
BM ADOPTED: PM 286
RL: 96.802

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SURVEYED	DRAWN	CHECKED	PASSED
L.Z.	A.G.	A.K.	A.K.

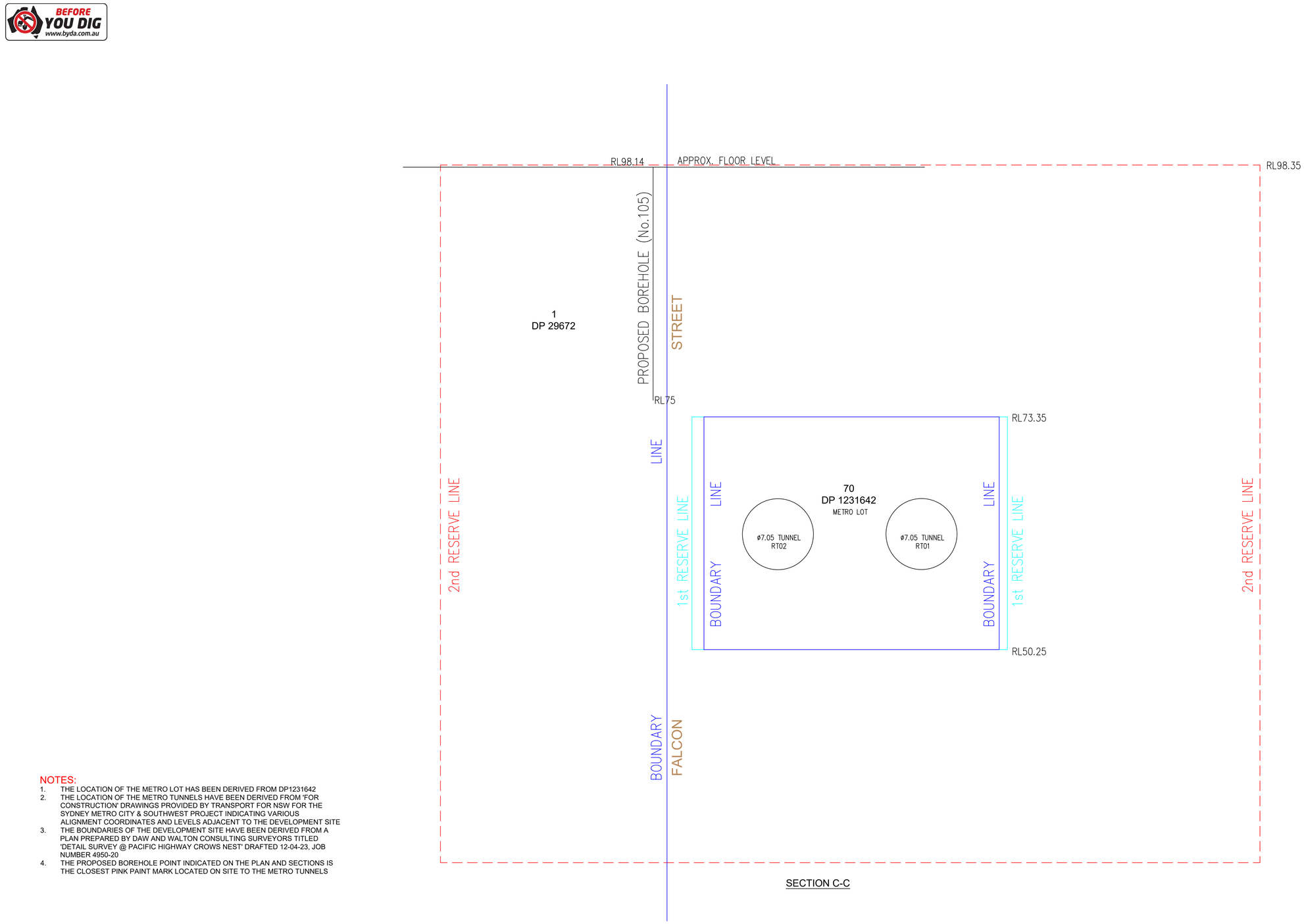
PROJECT: PROJECT

PLAN SHOWING RELATIONSHIP OF PROPOSED BOREHOLES TO SYDNEY METRO TUNNELS AT FIVE WAYS, CROWS NEST

CLIENT: DEICORP

SHEET 3 OF 1

DRAWING NUMBER	REV
3050-01019-001-002	02



SECTION C-C

NOTES:

1. THE LOCATION OF THE METRO LOT HAS BEEN DERIVED FROM DP1231642
2. THE LOCATION OF THE METRO TUNNELS HAVE BEEN DERIVED FROM 'FOR CONSTRUCTION' DRAWINGS PROVIDED BY TRANSPORT FOR NSW FOR THE SYDNEY METRO CITY & SOUTHWEST PROJECT INDICATING VARIOUS ALIGNMENT COORDINATES AND LEVELS ADJACENT TO THE DEVELOPMENT SITE
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0 4 6 8 12 16 20
SCALE 1: 200 @ A1

0 8 12 16 24 32 40
SCALE 1: 400 @ A3

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02	05/05/2023	TITLE BLOCK AMENDED	-	A.K.
01	04/05/2023	ORIGINAL ISSUE	-	A.K.

SCALE:
HORZ. 1:200 VERT.
A1
CONTOUR INTERVAL:
MAJOR 0.0 MINOR 0.0
HORIZONTAL ORIGIN
COORD. SYSTEM: MGA2020
MARK ADOPTED: PM 286
COORDINATES:
E 333 681.947
N 6255 172.989
VERTICAL DATUM
DATUM: AHD
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SURVEYED	DRAWN	CHECKED	PASSED
L.Z.	A.G.	A.K.	A.K.

PROJECT: PROJECT

PLAN SHOWING RELATIONSHIP OF PROPOSED BOREHOLES TO SYDNEY METRO TUNNELS AT FIVE WAYS, CROWS NEST

CLIENT: DEICORP

SHEET 4 OF 1
DRAWING NUMBER: 3050-01019-001-002
REV: 02

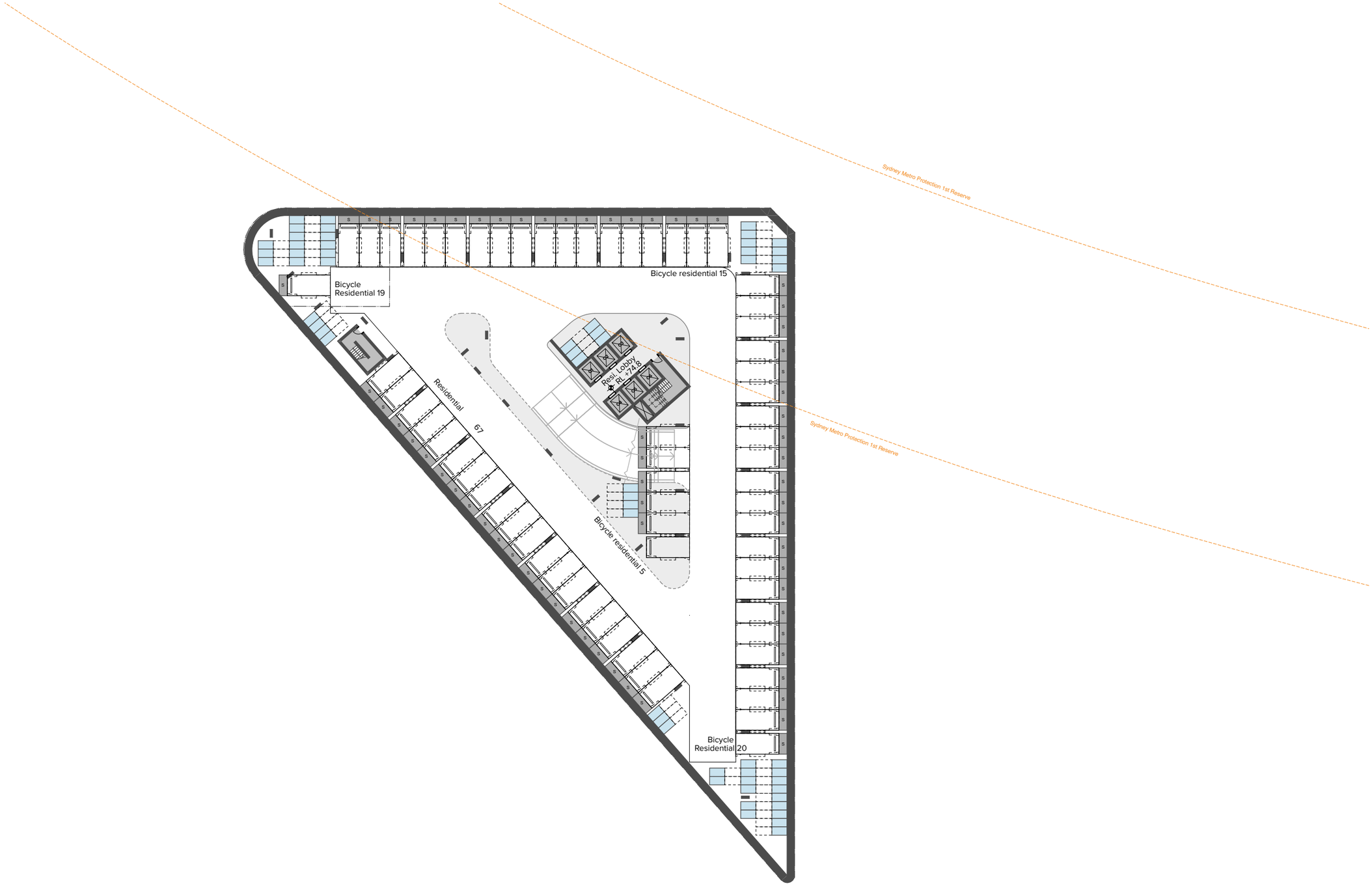
TURNER SILVESTERFULLER

Ground Level

PP-110-001 1:500 @ A3

0 5 10 15m

Rev. B _ 14.05.20



- Residential
- Residential Adaptable
- Car Share
- Residential Visitors
- Non Residential
- Bicycle Residents
- Bicycle Residents Visitors
- Bicycle Commercial
- Bicycle Commercial Visitors
- Bicycle Retail
- Bicycle Retail Visitors

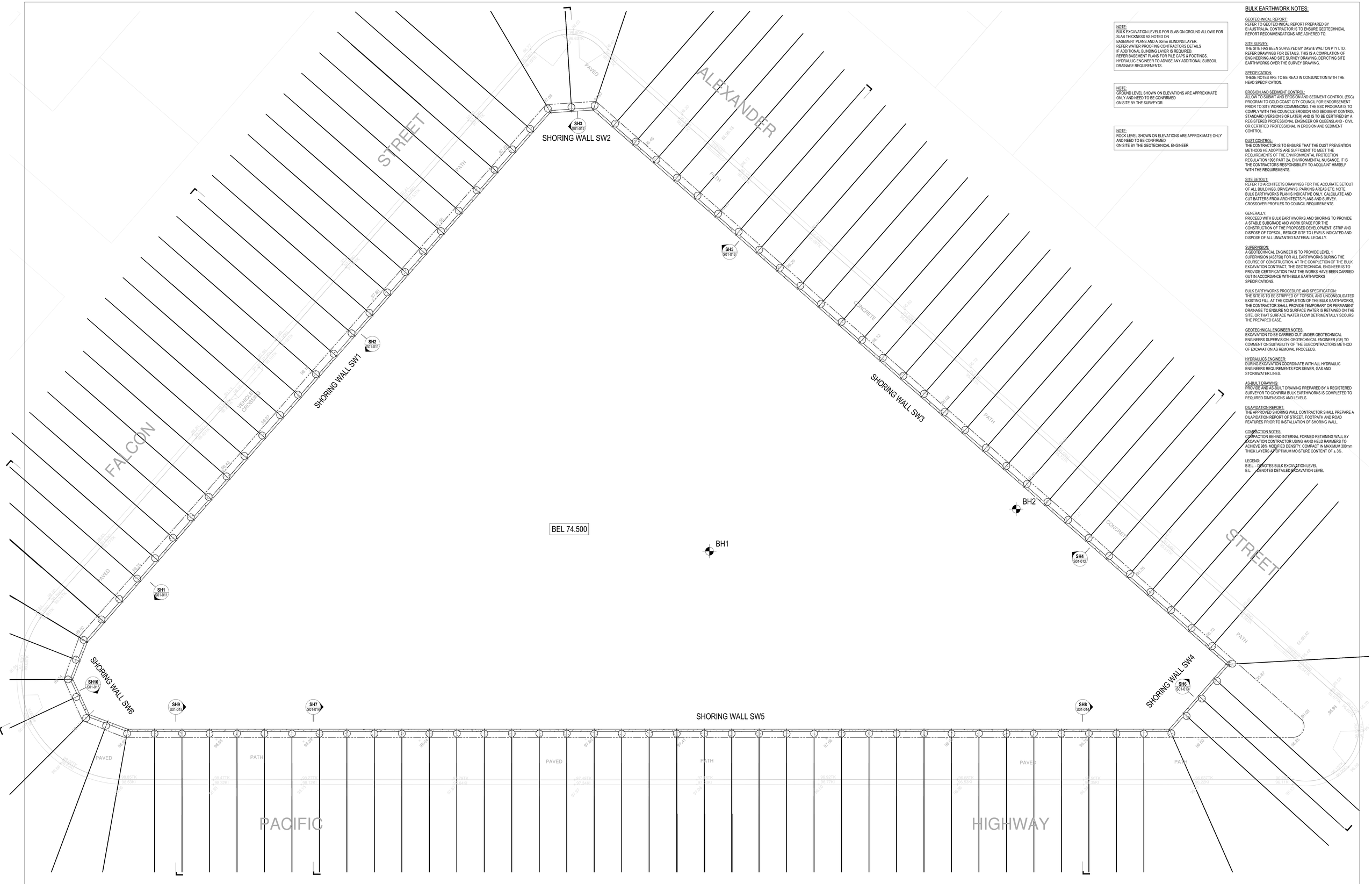
TURNER SILVESTERFULLER

Basement 07

PP-110-008 1:500, 1:200 @ A3

0 5 10 15m

Rev. B _ 14.05.20



NOTE:
BULK EXCAVATION LEVELS FOR SLAB ON GROUND ALLOWS FOR SLAB THICKNESS AS NOTED ON BASEMENT PLANS AND A 50mm BLINDING LAYER.
REFER WATER PROOFING CONTRACTORS DETAILS
IF ADDITIONAL BLINDING LAYER IS REQUIRED.
REFER BASEMENT PLANS FOR PILE CAPS & FOOTINGS.
HYDRAULIC ENGINEER TO ADVISE ANY ADDITIONAL SUBSOIL DRAINAGE REQUIREMENTS.

NOTE:
GROUND LEVEL SHOWN ON ELEVATIONS ARE APPROXIMATE ONLY AND NEED TO BE CONFIRMED ON SITE BY THE SURVEYOR

NOTE:
ROCK LEVEL SHOWN ON ELEVATIONS ARE APPROXIMATE ONLY AND NEED TO BE CONFIRMED ON SITE BY THE GEOTECHNICAL ENGINEER

BULK EARTHWORK NOTES:

GEOTECHNICAL REPORT:
REFER TO GEOTECHNICAL REPORT PREPARED BY EI AUSTRALIA. CONTRACTOR IS TO ENSURE GEOTECHNICAL REPORT RECOMMENDATIONS ARE ADHERED TO.

SITE SURVEY:
THE SITE HAS BEEN SURVEYED BY DAW & WALTON PTY LTD. REFER DRAWINGS FOR DETAILS. THIS IS A COMPILATION OF ENGINEERING AND SITE SURVEY DRAWING, DEPICTING SITE EARTHWORKS OVER THE SURVEY DRAWING.

SPECIFICATION:
THESE NOTES ARE TO BE READ IN CONJUNCTION WITH THE HEAD SPECIFICATION.

EROSION AND SEDIMENT CONTROL:
ALLOW TO SUBMIT AND EROSION AND SEDIMENT CONTROL (ESC) PROGRAM TO GOLD COAST CITY COUNCIL FOR ENDORSEMENT PRIOR TO SITE WORKS COMMENCING. THE ESC PROGRAM IS TO COMPLY WITH THE COUNCILS EROSION AND SEDIMENT CONTROL STANDARD (VERSION 9 OR LATER) AND IS TO BE CERTIFIED BY A REGISTERED PROFESSIONAL ENGINEER OR QUEENSLAND - CIVIL OR CERTIFIED PROFESSIONAL IN EROSION AND SEDIMENT CONTROL.

DUST CONTROL:
THE CONTRACTOR IS TO ENSURE THAT THE DUST PREVENTION METHODS HE ADOPTS ARE SUFFICIENT TO MEET THE REQUIREMENTS OF THE ENVIRONMENTAL PROTECTION REGULATION 1998 PART 2A, ENVIRONMENTAL NUISANCE. IT IS THE CONTRACTORS RESPONSIBILITY TO ACQUAINT HIMSELF WITH THE REQUIREMENTS.

SITE SETOUT:
REFER TO ARCHITECTS DRAWINGS FOR THE ACCURATE SETOUT OF ALL BUILDINGS, DRIVEWAYS, PARKING AREAS ETC. NOTE BULK EARTHWORKS PLAN IS INDICATIVE ONLY. CALCULATE AND CUT BATTERS FROM ARCHITECTS PLANS AND SURVEY. CROSSOVER PROFILES TO COUNCIL REQUIREMENTS.

GENERALLY:
PROCEED WITH BULK EARTHWORKS AND SHORING TO PROVIDE A STABLE SUBGRADE AND WORK SPACE FOR THE CONSTRUCTION OF THE PROPOSED DEVELOPMENT. STRIP AND DISPOSE OF TOPSOIL, REDUCE SITE TO LEVELS INDICATED AND DISPOSE OF ALL UNWANTED MATERIAL LEGALLY.

SUPERVISION:
A GEOTECHNICAL ENGINEER IS TO PROVIDE LEVEL 1 SUPERVISION (AS3798) FOR ALL EARTHWORKS DURING THE COURSE OF CONSTRUCTION. AT THE COMPLETION OF THE BULK EXCAVATION CONTRACT, THE GEOTECHNICAL ENGINEER IS TO PROVIDE CERTIFICATION THAT THE WORKS HAVE BEEN CARRIED OUT IN ACCORDANCE WITH BULK EARTHWORKS SPECIFICATIONS.

BULK EARTHWORKS PROCEDURE AND SPECIFICATION:
THE SITE IS TO BE STRIPPED OF TOPSOIL AND UNCONSOLIDATED EXISTING FILL. AT THE COMPLETION OF THE BULK EARTHWORKS, THE CONTRACTOR SHALL PROVIDE TEMPORARY OR PERMANENT DRAINAGE TO ENSURE NO SURFACE WATER IS RETAINED ON THE SITE, OR THAT SURFACE WATER FLOW DETRIMENTALLY SCOURS THE PREPARED BASE.

GEOTECHNICAL ENGINEER NOTES:
EXCAVATION TO BE CARRIED OUT UNDER GEOTECHNICAL ENGINEERS SUPERVISION. GEOTECHNICAL ENGINEER (GE) TO COMMENT ON SUITABILITY OF THE SUBCONTRACTORS METHOD OF EXCAVATION AS REMOVAL PROCEEDS.

HYDRAULICS ENGINEER:
DURING EXCAVATION COORDINATE WITH ALL HYDRAULIC ENGINEERS REQUIREMENTS FOR SEWER, GAS AND STORMWATER LINES.

AS-BUILT DRAWING:
PROVIDE AND AS-BUILT DRAWING PREPARED BY A REGISTERED SURVEYOR TO CONFIRM BULK EARTHWORKS IS COMPLETED TO REQUIRED DIMENSIONS AND LEVELS.

DILAPIDATION REPORT:
THE APPROVED SHORING WALL CONTRACTOR SHALL PREPARE A DILAPIDATION REPORT OF STREET, FOOTPATH AND ROAD FEATURES PRIOR TO INSTALLATION OF SHORING WALL.

COMPACTION NOTES:
COMPACTION BEHIND INTERNAL FORMED RETAINING WALL BY EXCAVATION CONTRACTOR USING HAND HELD RAMMERS TO ACHIEVE 98% MODIFIED DENSITY. COMPACT IN MAXIMUM 300mm THICK LAYERS AT OPTIMUM MOISTURE CONTENT OF ± 3%.

LEGEND:
B.E.L. - DENOTES BULK EXCAVATION LEVEL
E.L. - DENOTES DETAILED EXCAVATION LEVEL

PRELIMINARY ISSUE

NOTE: DO NOT SCALE OFF DRAWINGS. REFER TO ARCHITECTURAL PLANS. VERIFY DIMENSIONS ON SITE.

REV	DATE	REVISION DESCRIPTION	BY
P2	09.05.23	ISSUED FOR PRELIMINARY INFORMATION	RCL
P1	22.05.23	ISSUED FOR PRELIMINARY INFORMATION	RCL

CLIENT: DEICORP

abc CONSULTANTS
structural & civil engineers
Contact
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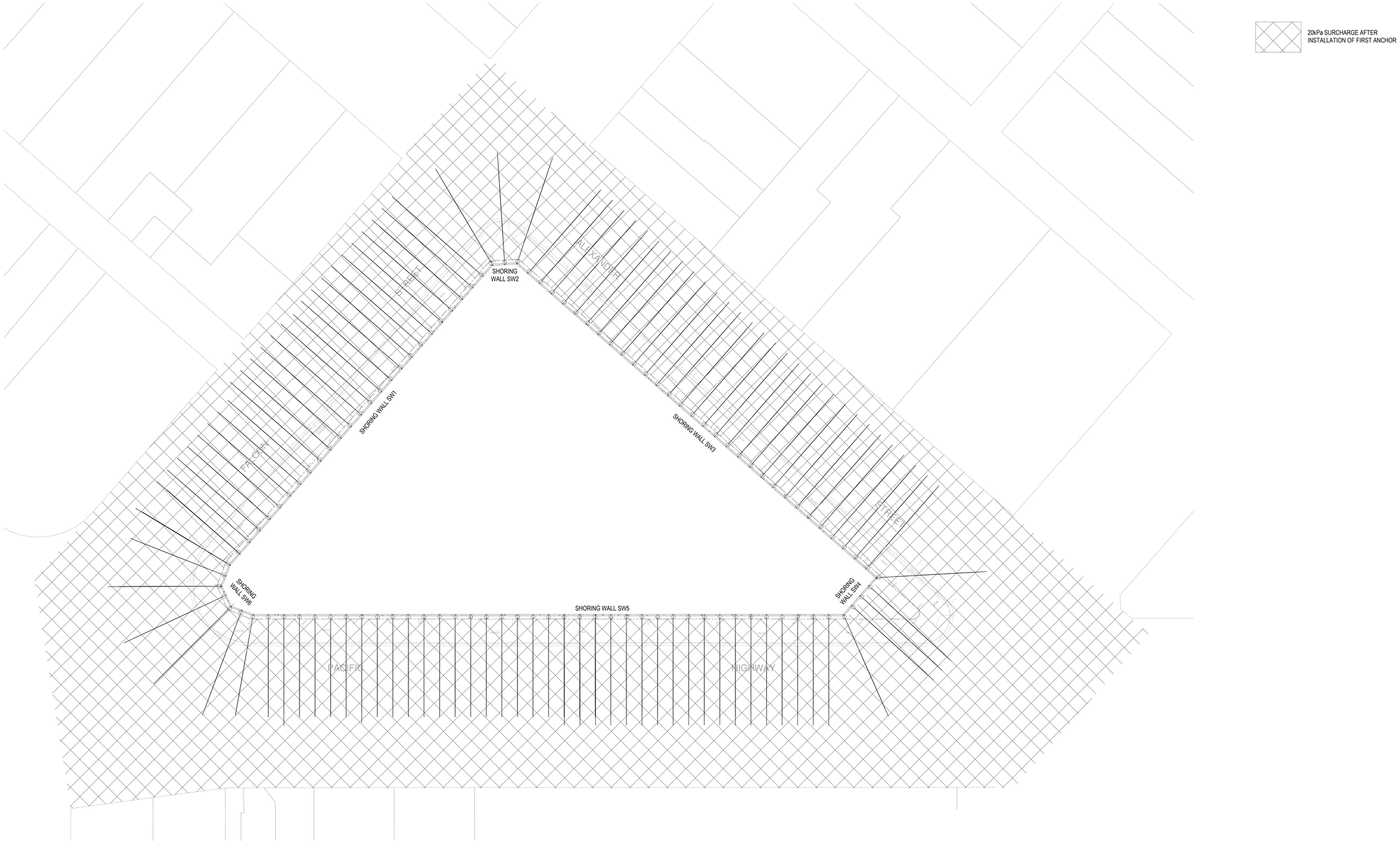
Email: mail@abc-consultants.com.au
Web: www.abc-consultants.com.au
Street Address
Suite 2.02, Level 2
3 Thomas Holt Drive
MACQUARIE PARK NSW 2113
Postal Address
PO Box 77
NORTH RYDE BC NSW 1670

PROJECT: **FIVEWAYS CROWS NEST**
391423 PACIFIC HIGHWAY
CROWS NEST NSW 2065

TITLE: **SITE RETENTION PLAN**

JOB NUMBER:	DRG NUMBER:	
23012	S01-001	
DESIGNED BY: RC	DATE:	
DRAWN BY: RCL	SCALE: 1:100 @ A0	SIZE: A0 REV: P2

9/06/2023 1:55:31 PM



SHORING SURCHARGE LOADING PLAN

SCALE 1 : 200

PRELIMINARY ISSUE

NOTE: DO NOT SCALE OFF DRAWINGS. REFER TO ARCHITECTURAL PLANS. VERIFY DIMENSIONS ON SITE.

REV	DATE	REVISION DESCRIPTION	BY
P2	09.06.23	ISSUED FOR PRELIMINARY INFORMATION	RCL
P1	22.05.23	ISSUED FOR PRELIMINARY INFORMATION	RCL

CLIENT: DEICORP

abc CONSULTANTS
structural & civil engineers
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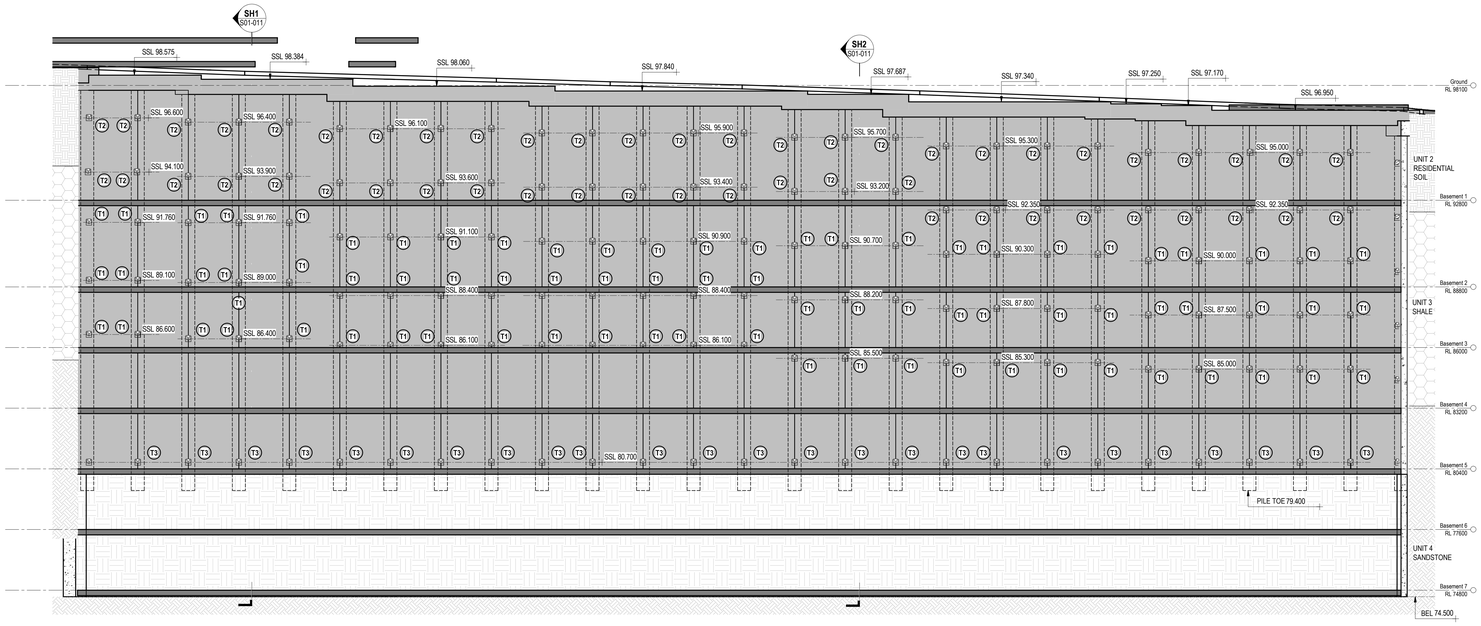
Email: info@abc-consultants.com.au
Web: www.abc-consultants.com.au
Street Address
Suite 2.02, Level 2
3 Thomas Holt Drive
MACQUARIE PARK NSW 2113
Postal Address
PO Box 77
NORTH RYDE BC NSW 1670

PROJECT: **FIVEWAYS CROWS NEST**
391/423 PACIFIC HIGHWAY
CROWS NEST NSW 2065

TITLE: **SHORING SURCHARGE LOADING PLAN**

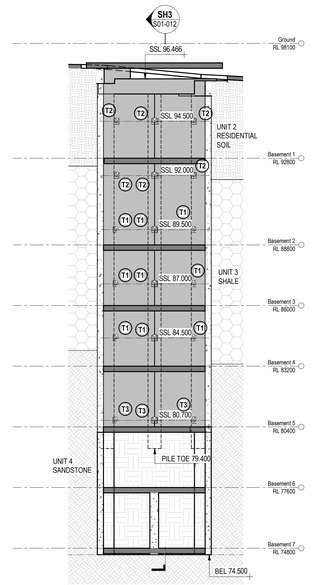
JOB NUMBER:	DRG NUMBER:	
23012	S01-002	
DESIGNED BY: RC	DATE:	
DRAWN BY: RCL	SCALE: 1:200 @ A0	SIZE: A0 / REV: P2

9/06/2023 1:13:12 PM



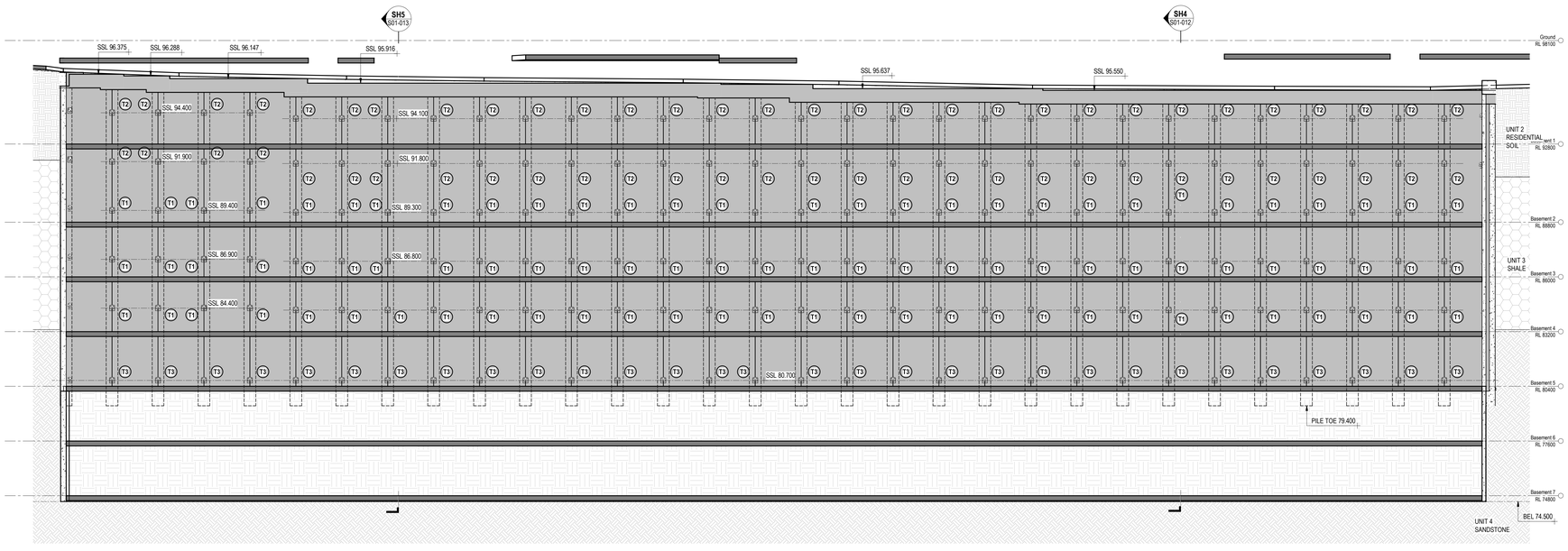
SHORING WALL SW1

SCALE 1 : 100



SHORING WALL SW2

SCALE 1 : 100



SHORING WALL SW3

SCALE 1 : 100

SHORING WALL SW4

SCALE 1 : 100

ANCHOR SCHEDULE				
MARK	SWL	LO	INCLINATION	MIN. BOND LENGTH
T1	1030kN	690kN	30°	11m
T2	990kN	675kN	30°	11m
T3	600kN	400kN	30°	5m

'SWL' DENOTES SAFE WORKING LOAD
'LO' DENOTES LOCK OFF LOAD

SHORING ANCHOR NOTES:
BOND LENGTH NOMINATED IN SHORING ANCHOR SCHEDULE FOR COORDINATION PURPOSES ONLY. SHORING CONTRACTOR IS RESPONSIBLE FOR FINAL ANCHOR DESIGN. BOND LENGTHS MAY NEED TO BE VARIED DEPENDING ON SITE CONDITIONS ENCOUNTERED.
BOND LENGTH BASED ON A 130mm HOLE WITH ALLOWABLE BOND STRESS OF 300 kPa.

HATCH DENOTES EXTENT OF 200 THICK SHOTCRETE BETWEEN SHORING PILES

HATCH DENOTES EXPOSED ROCK FACE TO BE RETAINED WITH SHOTCRETE AND ROCKBOLTS TO GEOTECHNICAL ENGINEER'S DETAILS

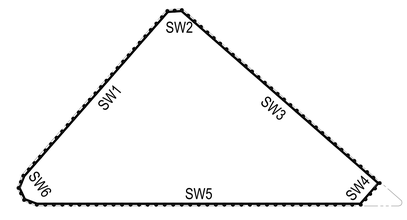
NOTE:
GROUND LEVEL SHOWN ON ELEVATIONS ARE APPROXIMATE ONLY AND NEED TO BE CONFIRMED ON SITE BY THE SURVEYOR

NOTE:
ROCK LEVEL SHOWN ON ELEVATIONS ARE APPROXIMATE ONLY AND NEED TO BE CONFIRMED ON SITE BY THE GEOTECHNICAL ENGINEER

NOTE:
MAXIMUM 500mm EXCAVATION BELOW ANCHOR HEIGHT PERMITTED PRIOR TO INSTALLING ANCHOR

GEOTECHNICAL ENGINEER TO INSPECT EXPOSED SHALE FACE REGULARLY DURING EXCAVATION AND NOMINATE APPROPRIATE ROCK BOLTS AND SHOTCRETE AS REQUIRED TO ENSURE STABILITY AT ALL TIMES.

THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH DRAWING S01-001 - SITE RETENTION PLAN FOR SHORING PILE SETOUT DIMENSIONS.



SHORING KEY PLAN

SCALE 1 : 600

PRELIMINARY ISSUE

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P2	09.06.23	ISSUED FOR PRELIMINARY INFORMATION	RCL
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CLIENT: DEICORP

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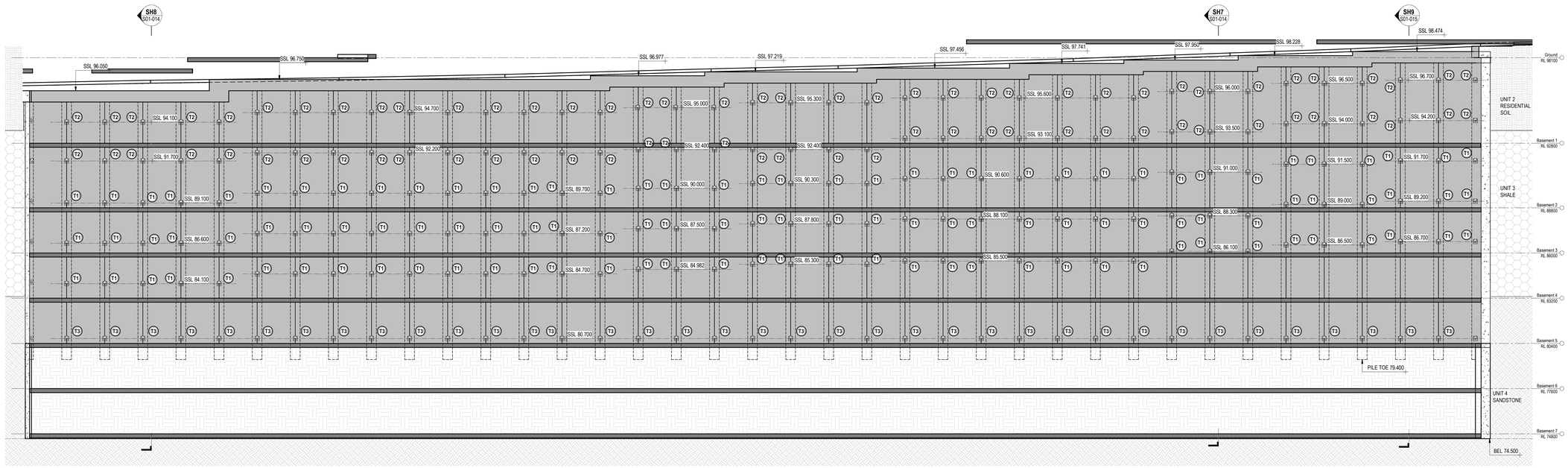
MACQUARIE PARK NSW 2113
Postal Address
PO Box 77
NORTH RYDE BC NSW 1670

PROJECT:
FIVEWAYS CROWS NEST
391/423 PACIFIC HIGHWAY
CROWS NEST NSW 2065

TITLE:
SHORING WALL ELEVATIONS - SHEET 1

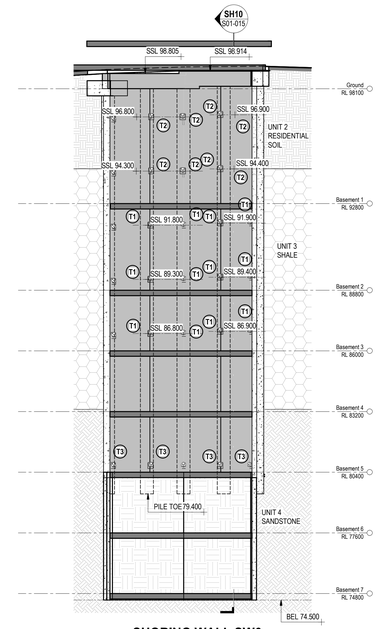
JOB NUMBER:	DRG NUMBER:	REV:
23012	S01-005	P2
DESIGNED BY: RC	DATE:	
DRAWN BY: RCL	SCALE: 1:100, 1:600 @ A0	SIZE: A0

9/06/2023 1:13:16 PM



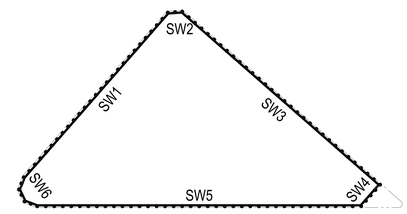
SHORING WALL SW5

SCALE 1 : 100



SHORING WALL SW6

SCALE 1 : 100



SHORING KEY PLAN

SCALE 1 : 600

ANCHOR SCHEDULE				
MARK	SWL	LO	INCLINATION	MIN. BOND LENGTH
T1	1030kN	690kN	30°	11m
T2	990kN	675kN	30°	11m
T3	600kN	400kN	30°	5m

'SWL' DENOTES SAFE WORKING LOAD
'LO' DENOTES LOCK OFF LOAD

SHORING ANCHOR NOTES:
BOND LENGTH NOMINATED IN SHORING ANCHOR SCHEDULE FOR COORDINATION PURPOSES ONLY. SHORING CONTRACTOR IS RESPONSIBLE FOR FINAL ANCHOR DESIGN. BOND LENGTHS MAY NEED TO BE VARIED DEPENDING ON SITE CONDITIONS ENCOUNTERED.
BOND LENGTH BASED ON A 130mm HOLE WITH ALLOWABLE BOND STRESS OF 300 kPa.

HATCH DENOTES EXTENT OF 200 THICK SHOTCRETE BETWEEN SHORING PILES

HATCH DENOTES EXPOSED ROCK FACE TO BE RETAINED WITH SHOTCRETE AND ROCKBOLTS TO GEOTECHNICAL ENGINEER'S DETAILS

NOTE:
GROUND LEVEL SHOWN ON ELEVATIONS ARE APPROXIMATE ONLY AND NEED TO BE CONFIRMED ON SITE BY THE SURVEYOR

NOTE:
ROCK LEVEL SHOWN ON ELEVATIONS ARE APPROXIMATE ONLY AND NEED TO BE CONFIRMED ON SITE BY THE GEOTECHNICAL ENGINEER

NOTE:
MAXIMUM 500mm EXCAVATION BELOW ANCHOR HEIGHT PERMITTED PRIOR TO INSTALLING ANCHOR

GEOTECHNICAL ENGINEER TO INSPECT EXPOSED SHALE FACE REGULARLY DURING EXCAVATION AND NOMINATE APPROPRIATE ROCK BOLTS AND SHOTCRETE AS REQUIRED TO ENSURE STABILITY AT ALL TIMES.

THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH DRAWING S01-001 - SITE RETENTION PLAN FOR SHORING PILE SETOUT DIMENSIONS.

PRELIMINARY ISSUE

NOTE: DO NOT SCALE OFF DRAWINGS. REFER TO ARCHITECTURAL PLANS. VERIFY DIMENSIONS ON SITE.

REV	DATE	REVISION DESCRIPTION	BY
P2	09.06.23	ISSUED FOR PRELIMINARY INFORMATION	RCL
P1	22.05.23	ISSUED FOR PRELIMINARY INFORMATION	RCL

CLIENT: DEICORP

abc CONSULTANTS
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Postal Address
PO Box 77
NORTH RYDE BC NSW 1670

PROJECT:
FIVEWAYS CROWS NEST
391/423 PACIFIC HIGHWAY
CROWS NEST NSW 2065

TITLE:
SHORING WALL ELEVATIONS - SHEET 2

JOB NUMBER:	DRG NUMBER:	
23012	S01-006	
DESIGNED BY: RC	DATE:	
DRAWN BY: RCL	SCALE: 1:100, 1:600 @ A0	SIZE: A0 / REV: P2

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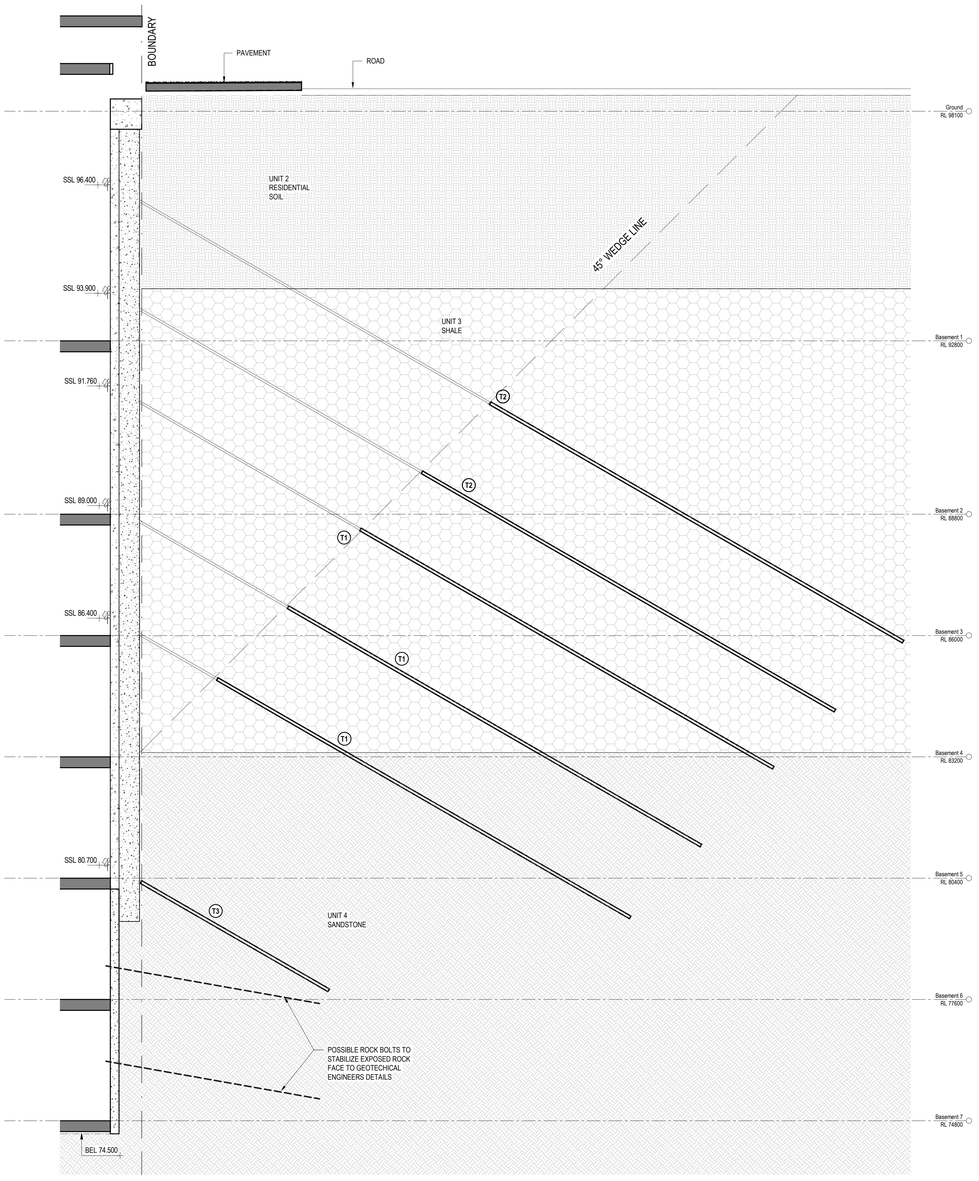

SECTION SH1 (S01-001)
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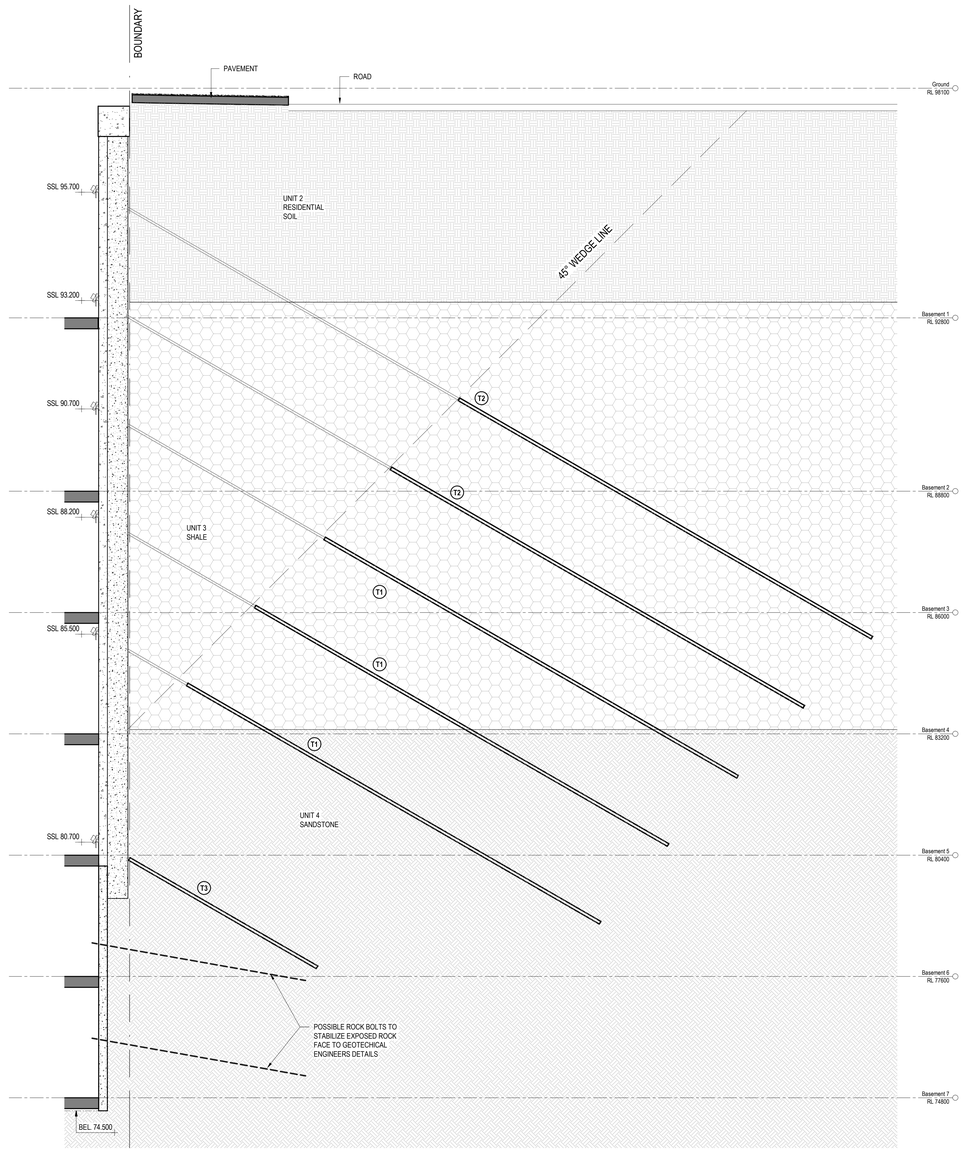

SECTION SH2 (S01-001)
Scale 1 : 50

NOTE:
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NOTE:
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NOTES:
REFER TO DRAWING S01-001 FOR SHORING AND BULK EX PLAN

PRELIMINARY ISSUE

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PROJECT: **FIVEWAYS CROWS NEST**
391/423 PACIFIC HIGHWAY
CROWS NEST NSW 2065

TITLE: **SHORING WALL SECTIONS - SHEET 1**

JOB NUMBER:	DRG NUMBER:	
23012	S01-011	
DESIGNED BY:	DATE:	
RC		
DRAWN BY:	SCALE:	SIZE: / REV:
RCL	1:50 @ A0	A0 / P2

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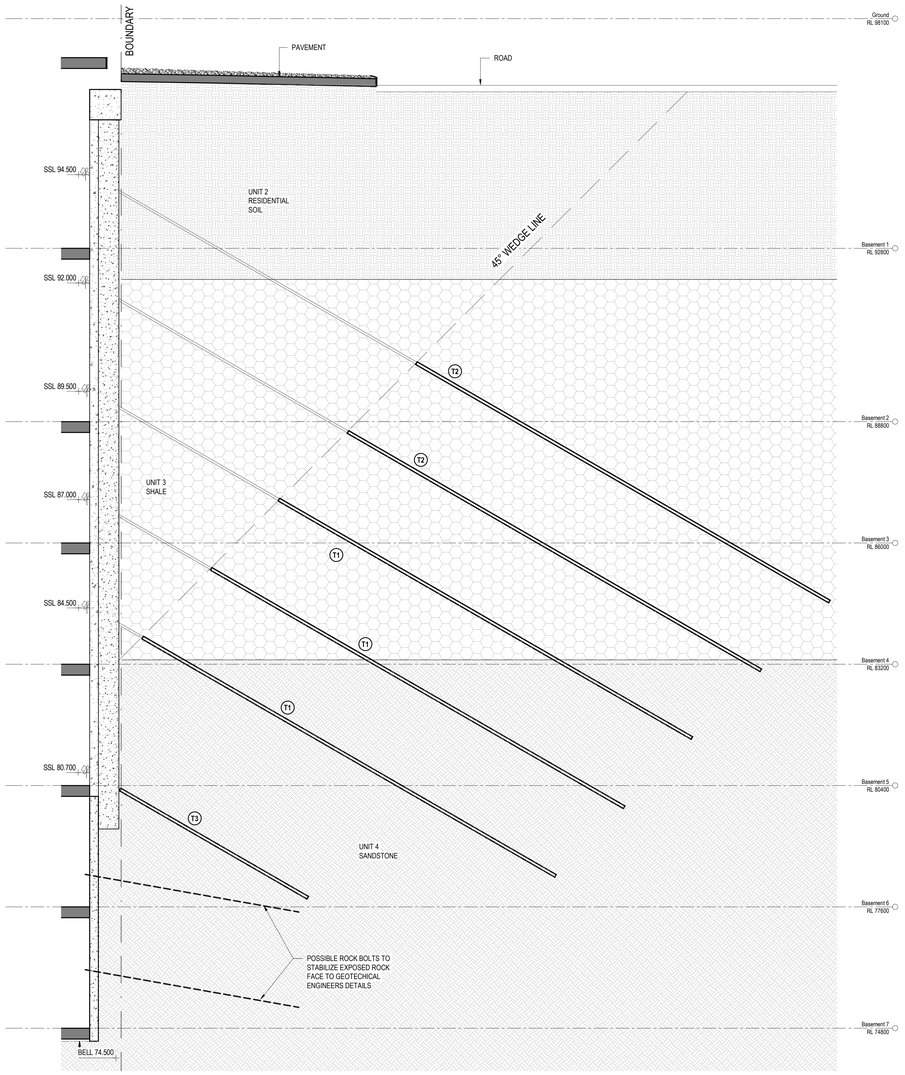

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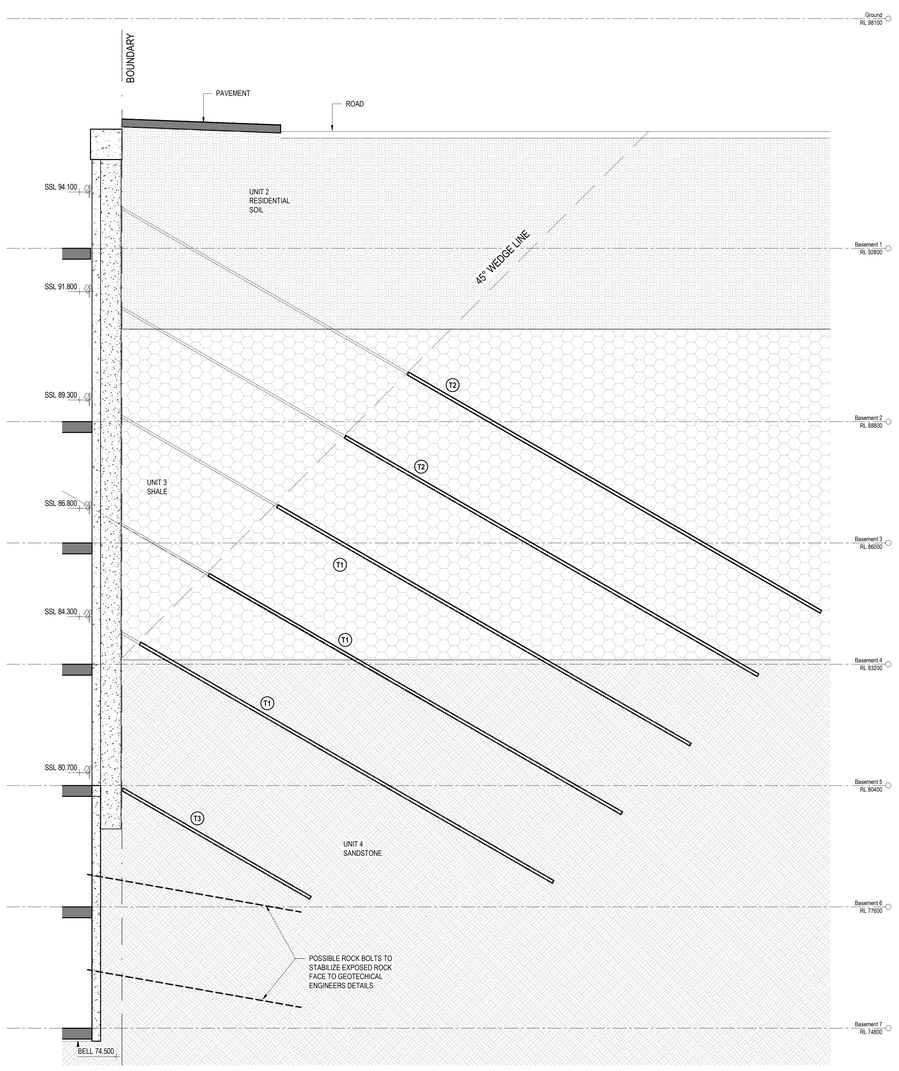

SECTION SH4 (S01-001)
Scale 1 : 50

NOTE:
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NOTES:
REFER TO DRAWING S01-001 FOR SHORING AND BULK EX PLAN

PRELIMINARY ISSUE

NOTE: DO NOT SCALE OFF DRAWINGS. REFER TO ARCHITECTURAL PLANS. VERIFY DIMENSIONS ON SITE.

REV	DATE	REVISION DESCRIPTION	BY
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NORTH RYDE BC NSW 1670

PROJECT:
FIVEWAYS CROWS NEST
391/423 PACIFIC HIGHWAY
CROWS NEST NSW 2065

TITLE:
SHORING WALL SECTIONS - SHEET 2

JOB NUMBER:	DRG NUMBER:	
23012	S01-012	
DESIGNED BY: RC	DATE:	
DRAWN BY: RCL	SCALE: 1:50 @ A0	SIZE: A0 / REV: P2

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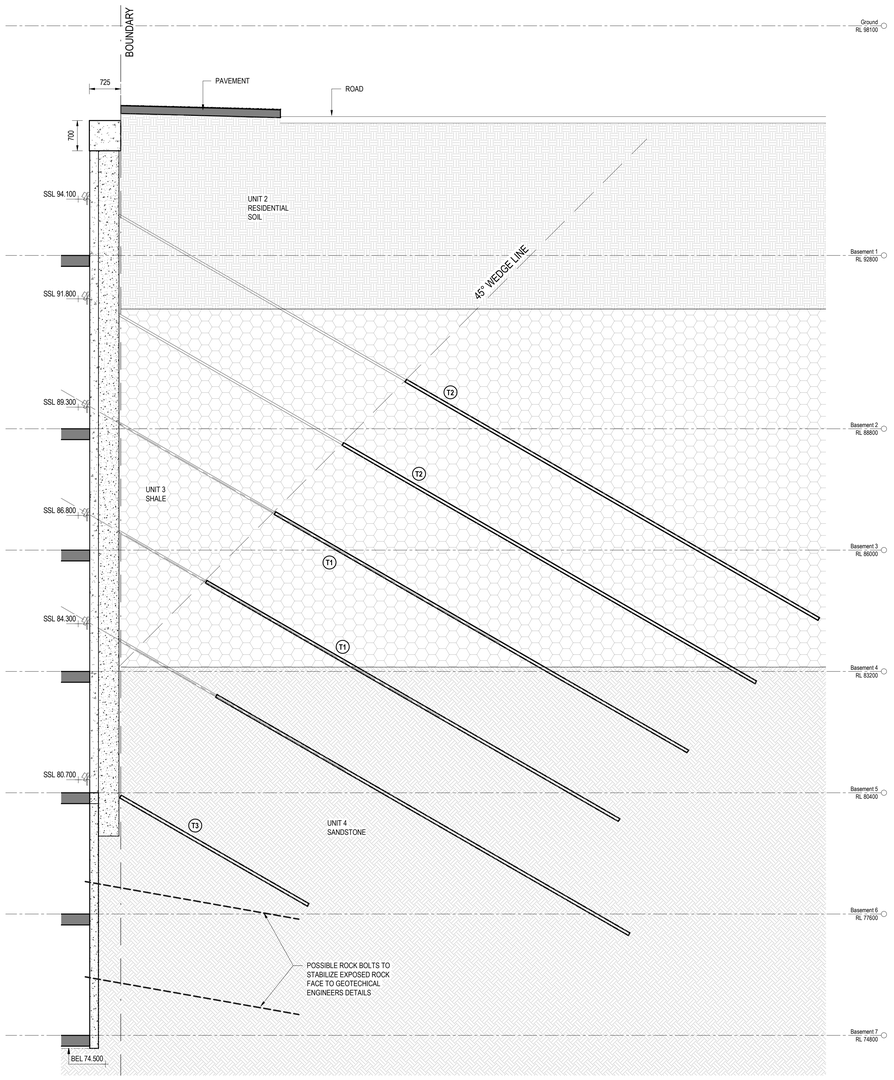

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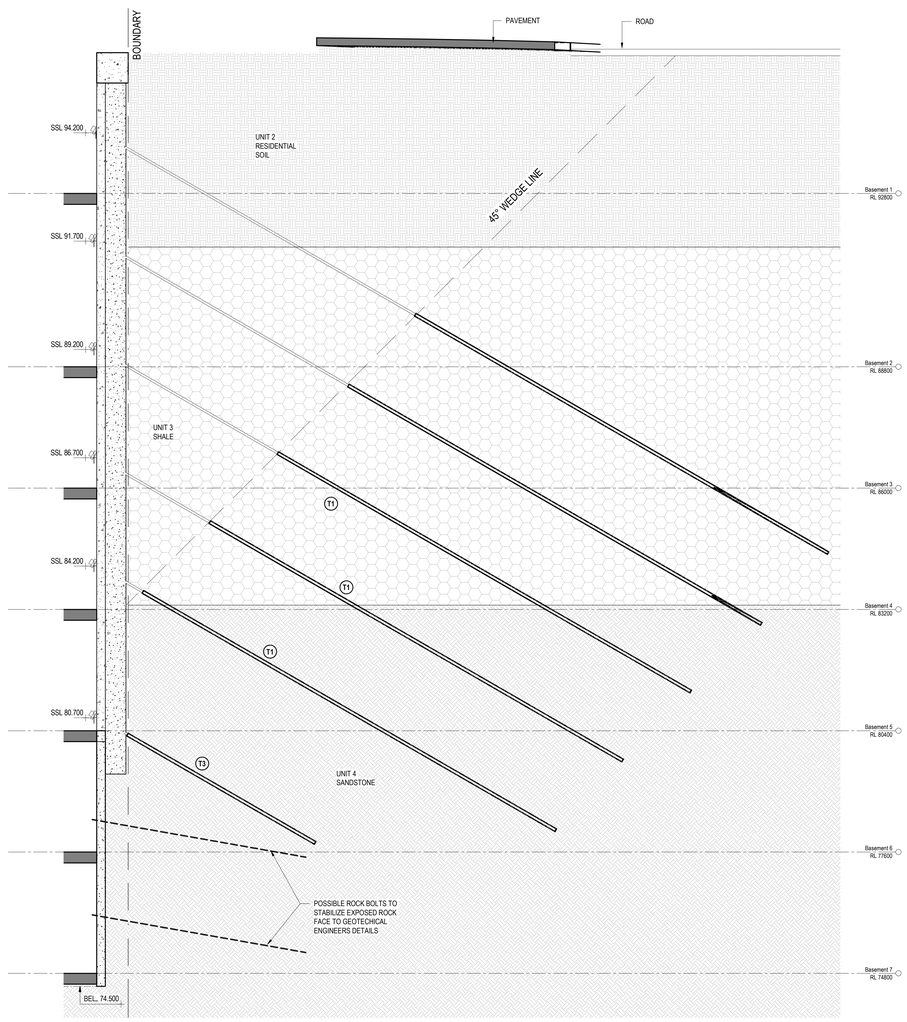

SECTION SH6 (S01-001)
Scale 1 : 50

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NOTES:
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PRELIMINARY ISSUE

NOTE: DO NOT SCALE OFF DRAWINGS. REFER TO ARCHITECTURAL PLANS. VERIFY DIMENSIONS ON SITE.

REV	DATE	REVISION DESCRIPTION	BY
P2	09.06.23	ISSUED FOR PRELIMINARY INFORMATION	RCL
P1	22.05.23	ISSUED FOR PRELIMINARY INFORMATION	RCL

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NORTH RYDE BC NSW 1670

PROJECT:
FIVEWAYS CROWS NEST
391/423 PACIFIC HIGHWAY
CROWS NEST NSW 2065

TITLE:
SHORING WALL SECTIONS - SHEET 3

JOB NUMBER:	DRG NUMBER:	
23012	S01-013	
DESIGNED BY:	DATE:	
RC		
DRAWN BY:	SCALE:	SIZE: / REV:
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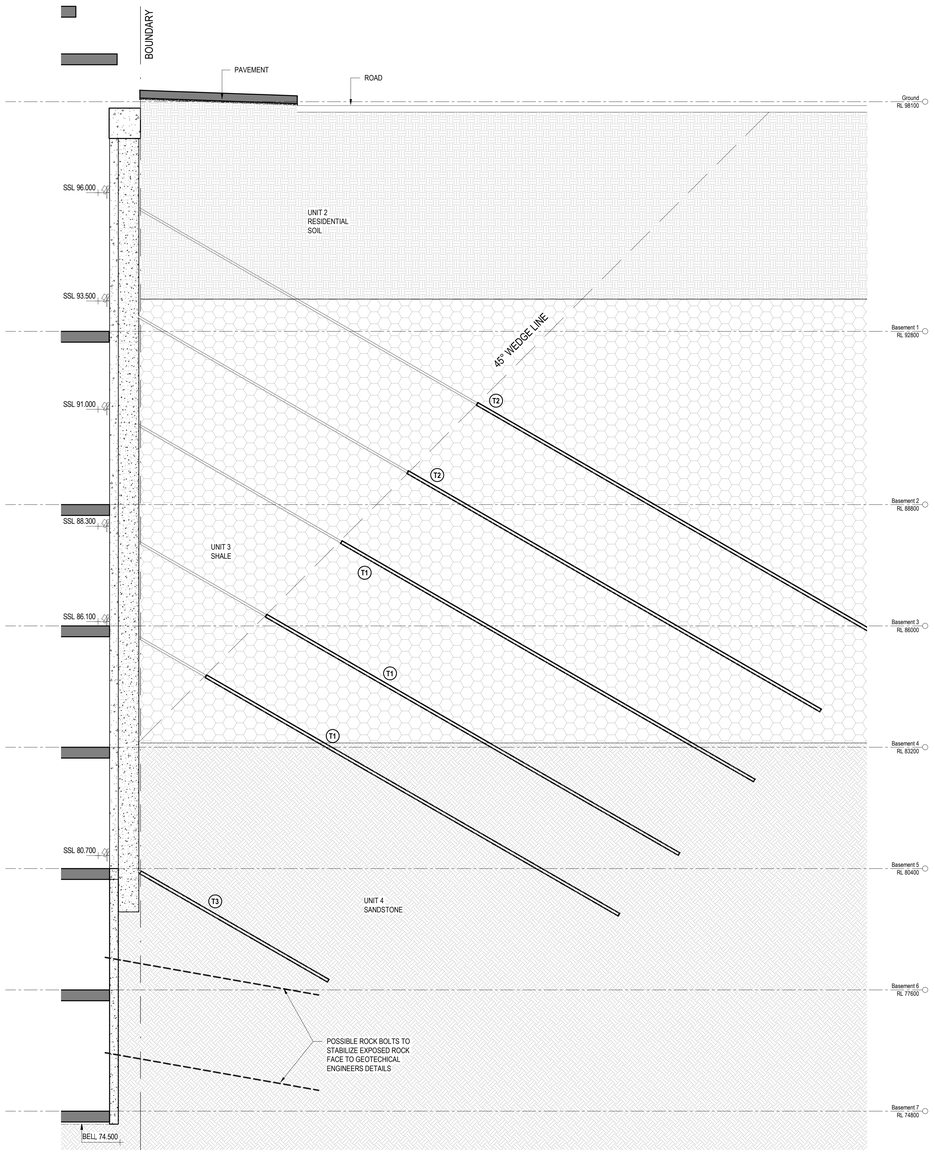

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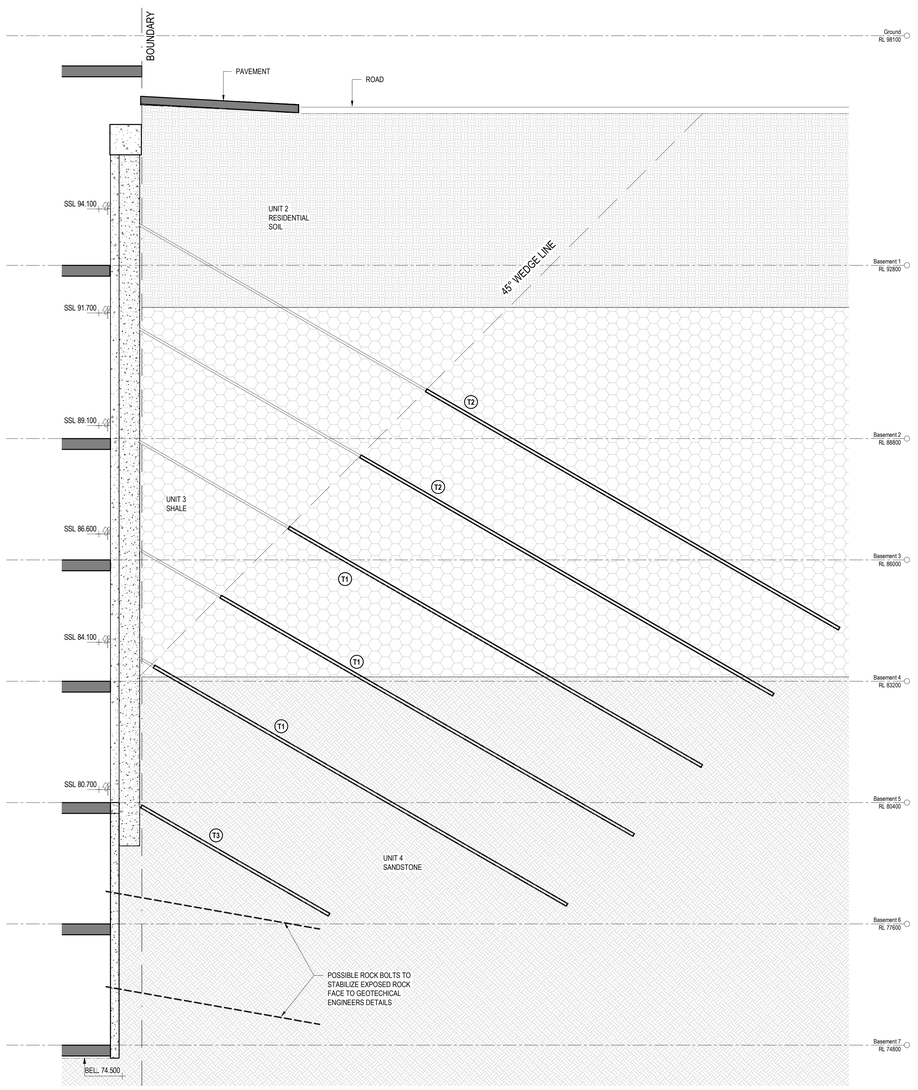

SECTION SH8 (S01-001)
Scale 1 : 50

PRELIMINARY ISSUE

NOTE: DO NOT SCALE OFF DRAWINGS. REFER TO ARCHITECTURAL PLANS. VERIFY DIMENSIONS ON SITE.

REV	DATE	REVISION DESCRIPTION	BY
P2	09.06.23	ISSUED FOR PRELIMINARY INFORMATION	RCL
P1	22.05.23	ISSUED FOR PRELIMINARY INFORMATION	RCL

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NORTH RYDE BC NSW 1670

PROJECT: **FIVEWAYS CROWS NEST**
391/423 PACIFIC HIGHWAY
CROWS NEST NSW 2065

TITLE: **SHORING WALL SECTIONS - SHEET 4**

JOB NUMBER:	DRG NUMBER:	
23012	S01-014	
DESIGNED BY:	DATE:	
RC		
DRAWN BY:	SCALE:	SIZE: / REV:
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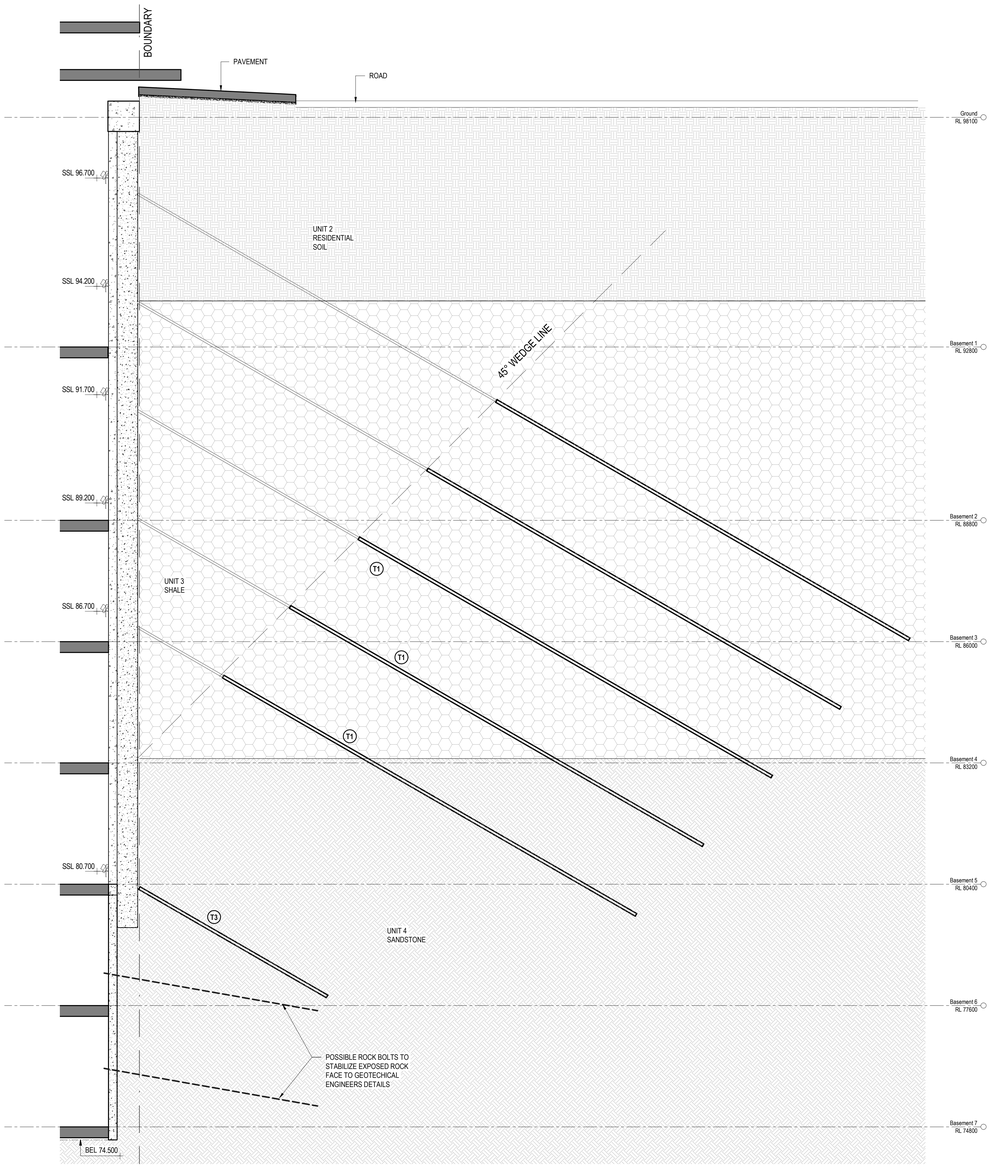
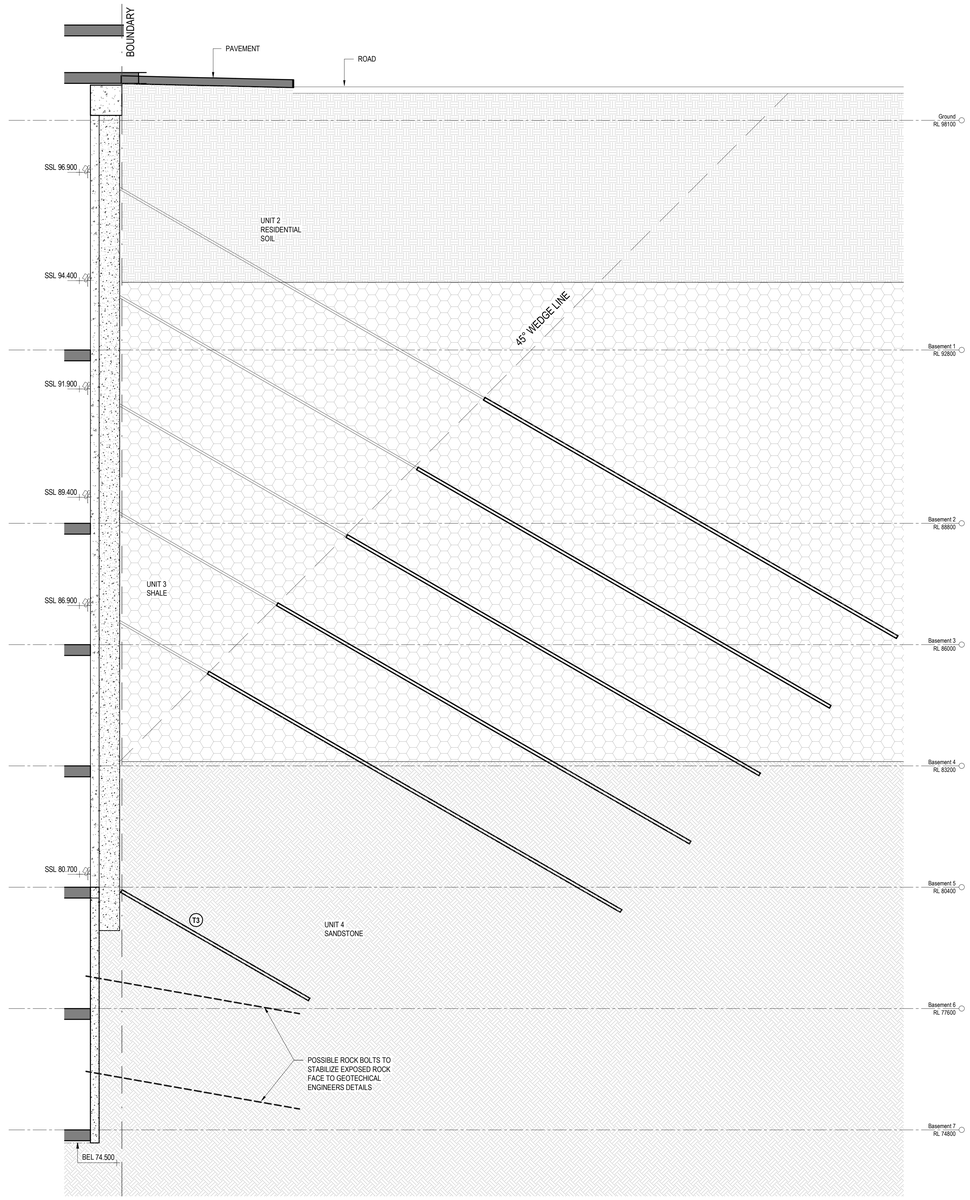


SECTION SH9 (S01-001)
Scale 1 : 50



SECTION SH10 (S01-001)
Scale 1 : 50

PRELIMINARY ISSUE

NOTE: DO NOT SCALE OFF DRAWINGS. REFER TO ARCHITECTURAL PLANS. VERIFY DIMENSIONS ON SITE.

REV	DATE	REVISION DESCRIPTION	BY
P2	09.06.23	ISSUED FOR PRELIMINARY INFORMATION	RCL
P1	22.05.23	ISSUED FOR PRELIMINARY INFORMATION	RCL

CLIENT: DEICORP

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PO Box 77
NORTH RYDE BC NSW 1670

PROJECT:
FIVEWAYS CROWS NEST
3914/23 PACIFIC HIGHWAY
CROWS NEST NSW 2065

TITLE:
SHORING WALL SECTIONS - SHEET 5

JOB NUMBER:	DRG NUMBER:	
23012	S01-015	
DESIGNED BY:	DATE:	
RC		
DRAWN BY:	SCALE:	SIZE: / REV:
RCL	1:50 @ A0	A0 / P2

9/06/2023 1:13:21 PM

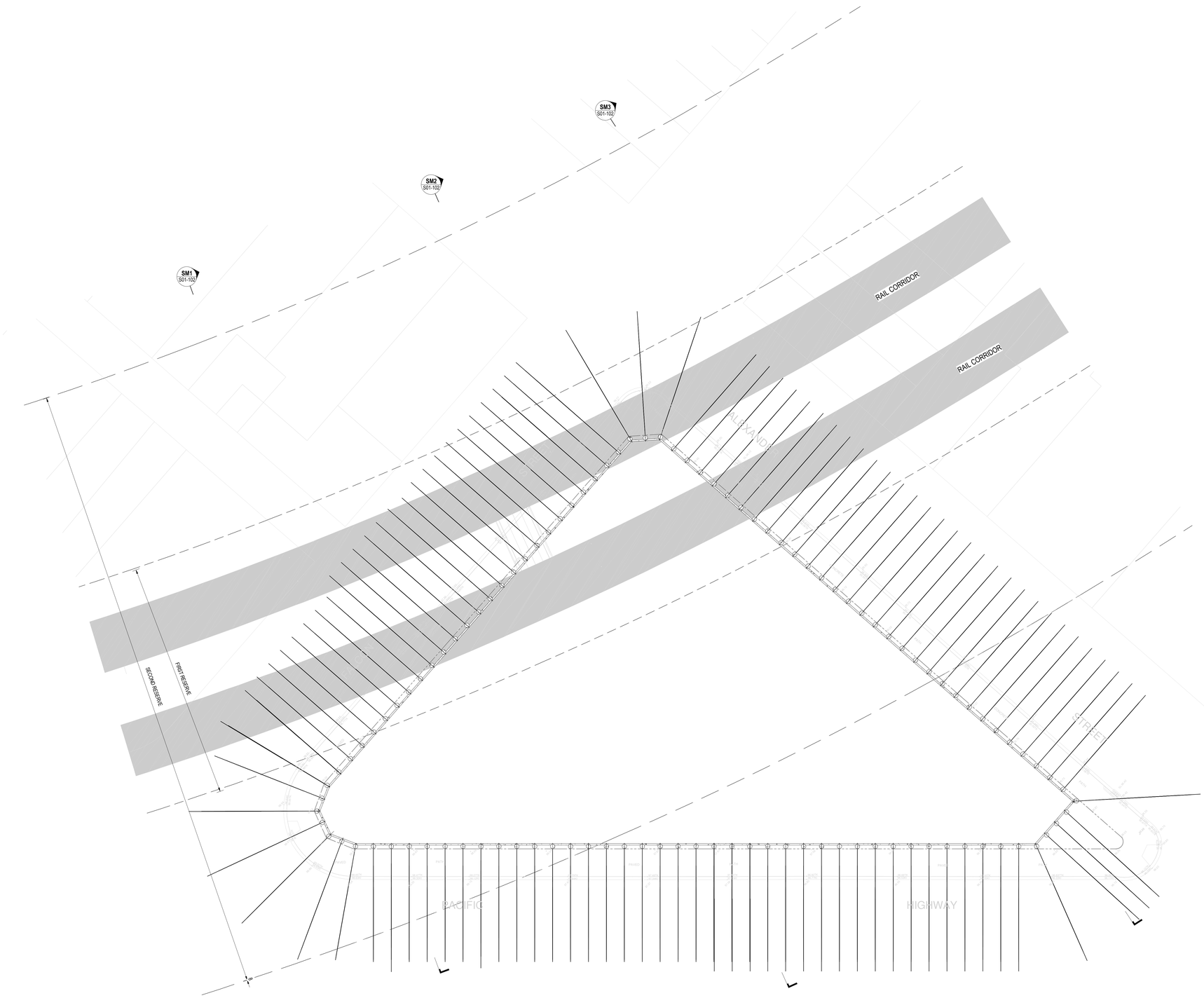
REFERENCED DRAWINGS

SURVEY - JOB NUMBER 4950-20 REVISION 02 DATE 23-04-20 BY DAW & WALTON CONSULTING SURVEYORS

DESIGN APPROACH BASEMENT DRAWINGS BY TURNER
DESIGN APPROACH METRO SECTION DRAWING BY TURNER

SWCSWTSE-JAB-TPW-AL-DRG-505123 REVISION 02 DATE 17-05-19, CLIENT TRANSPORT FOR NSW

SYDNEY METRO UNDERGROUND CORRIDOR PROTECTION TECHNICAL GUIDELINES, REFERENCE iCentral SM-20-00081444 VERSION 2 DATE APRIL 2021 BY WSP



SITE RETENTION PLAN WITH METRO RAIL TUNNEL

SCALE 1 : 200

PRELIMINARY ISSUE

NOTE: DO NOT SCALE OFF DRAWINGS. REFER TO ARCHITECTURAL PLANS. VERIFY DIMENSIONS ON SITE.

REV	DATE	REVISION DESCRIPTION	BY
P2	09.06.23	ISSUED FOR PRELIMINARY INFORMATION	RCL
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NORTH RYDE BC NSW 1670

PROJECT: **FIVEWAYS CROWS NEST**
391/423 PACIFIC HIGHWAY
CROWS NEST NSW 2065

TITLE: **SITE RETENTION PLAN WITH METRO RAIL TUNNEL**

JOB NUMBER:	DRG NUMBER:	
23012	S01-101	
DESIGNED BY:	DATE:	
RC		
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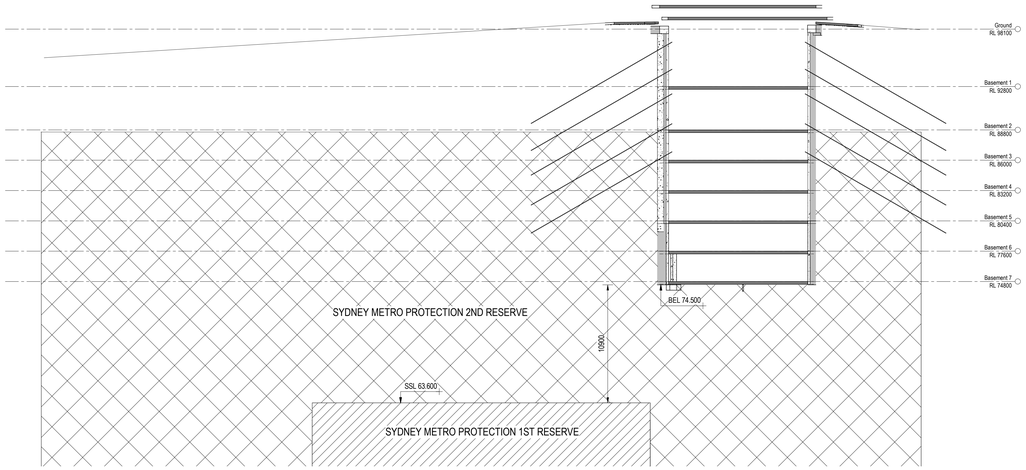

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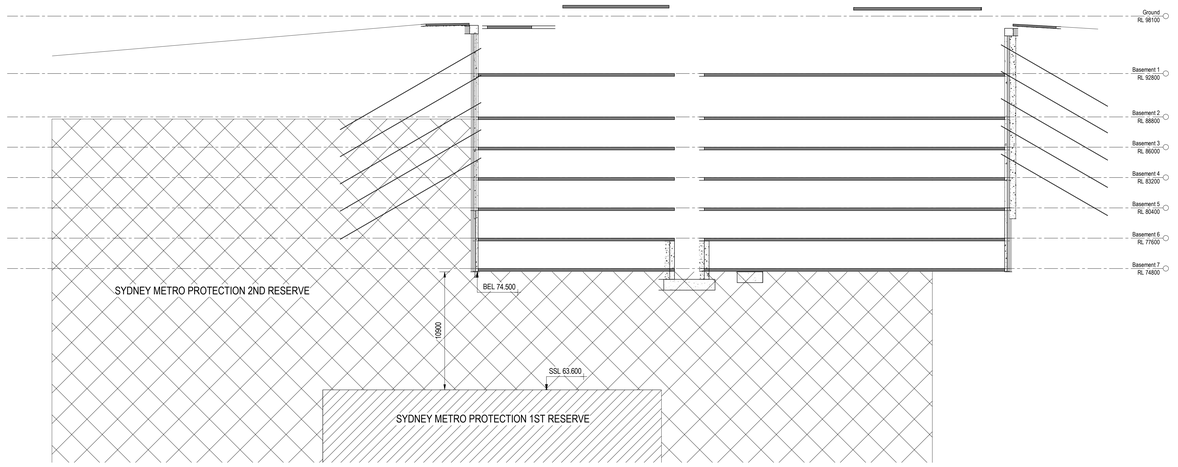

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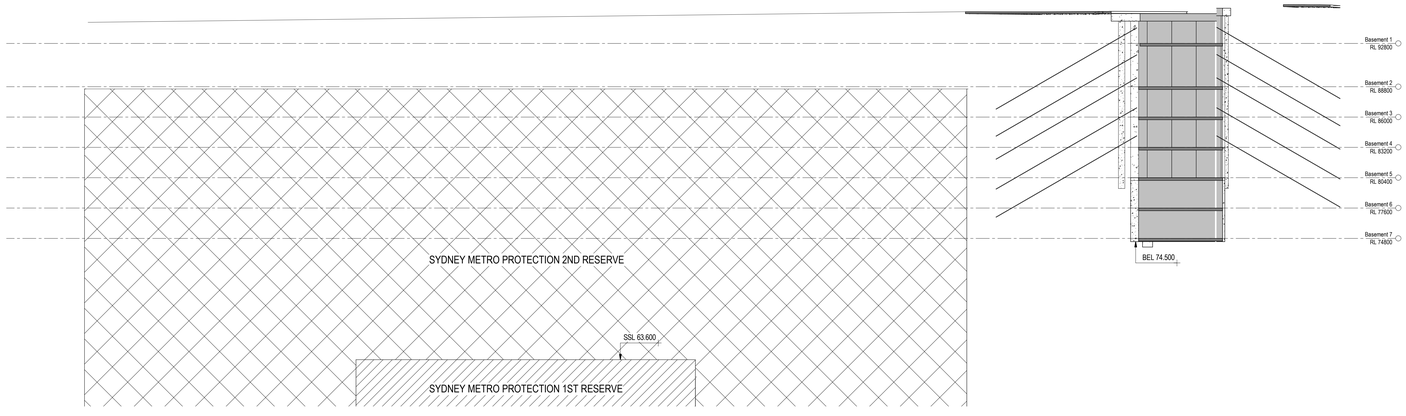

SECTION SM3
Scale 1 : 200 S01-101

PRELIMINARY ISSUE

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PROJECT:
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391/423 PACIFIC HIGHWAY
CROWS NEST NSW 2065

TITLE:
SITE SECTIONS WITH METRO RAIL TUNNEL

JOB NUMBER:	DRG NUMBER:	
23012	S01-102	
DESIGNED BY:	DATE:	
RC		
DRAWN BY:	SCALE:	SIZE: / REV:
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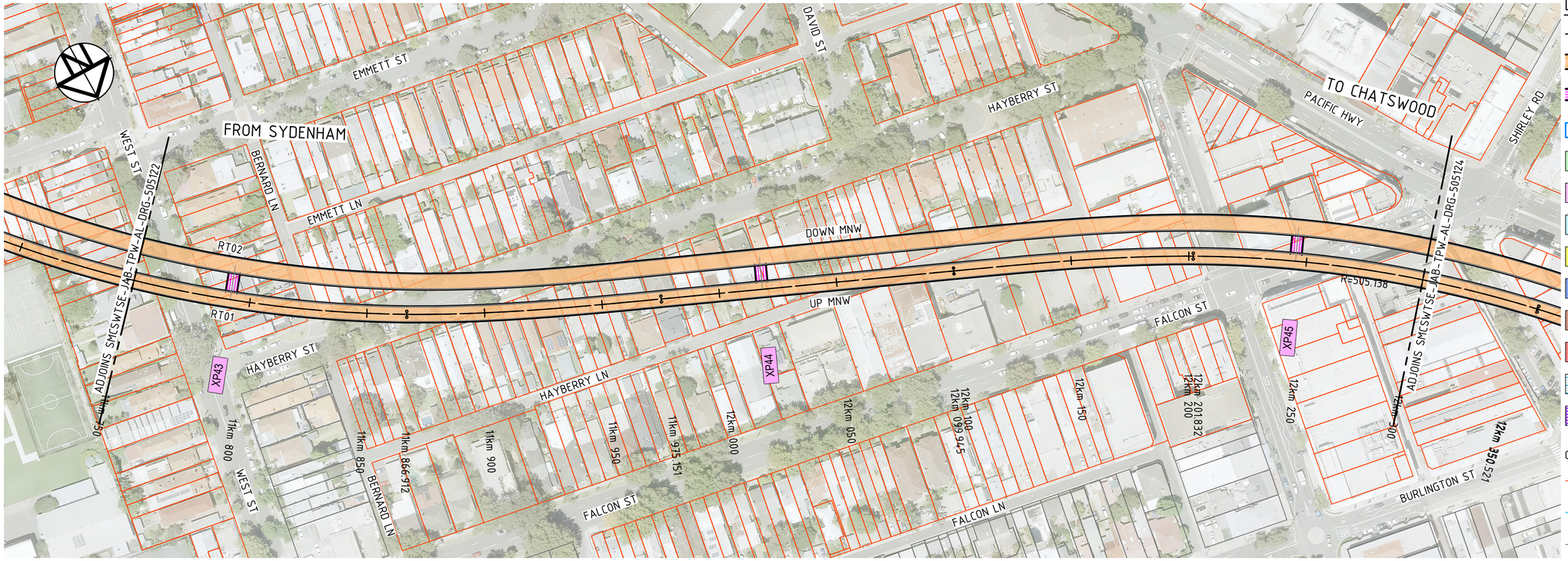
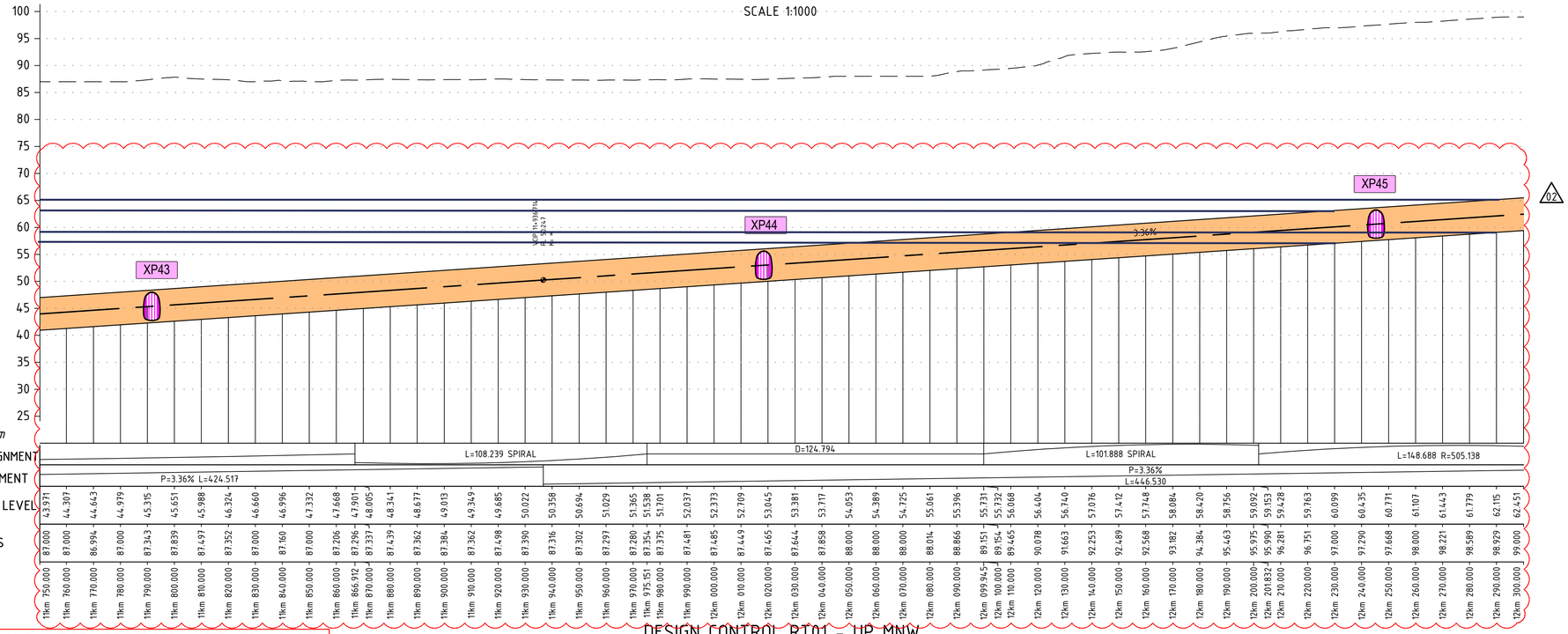


PLAN
SCALE 1:1000



DATUM R.L 20.0m

HORIZONTAL ALIGNMENT

VERTICAL ALIGNMENT

TUNNEL CENTRE LEVEL

EXISTING LEVELS

KILOMETRAGE

11km 750.000	11km 760.000	11km 770.000	11km 780.000	11km 790.000	11km 800.000	11km 810.000	11km 820.000	11km 830.000	11km 840.000	11km 850.000	11km 860.000	11km 866.912	11km 870.000	11km 880.000	11km 890.000	11km 900.000	11km 910.000	11km 920.000	11km 930.000	11km 940.000	11km 950.000	11km 960.000	11km 970.000	11km 975.151	11km 980.000	11km 990.000	12km 000.000	12km 010.000	12km 020.000	12km 030.000	12km 040.000	12km 050.000	12km 060.000	12km 070.000	12km 080.000	12km 090.000	12km 099.945	12km 100.000	12km 110.000	12km 120.000	12km 130.000	12km 140.000	12km 150.000	12km 160.000	12km 170.000	12km 180.000	12km 190.000	12km 200.000	12km 201.832	12km 210.000	12km 220.000	12km 230.000	12km 240.000	12km 250.000	12km 260.000	12km 270.000	12km 280.000	12km 290.000	12km 300.000
43.971	44.307	44.643	44.979	45.315	45.651	45.988	46.324	46.660	46.996	47.332	47.668	47.901	48.005	48.341	48.677	49.013	49.349	49.685	50.022	50.358	50.694	51.029	51.365	51.538	51.701	52.037	52.373	52.709	53.045	53.381	53.717	54.053	54.389	54.725	55.061	55.396	55.731	55.732	56.068	56.404	56.740	57.076	57.412	57.748	58.084	58.420	58.756	59.092	59.153	59.428	59.763	60.099	60.435	60.771	61.107	61.443	61.779	62.115	62.451
87.000	87.000	86.994	87.000	87.343	87.839	87.497	87.352	87.000	87.160	87.000	87.206	87.296	87.337	87.439	87.362	87.384	87.362	87.498	87.390	87.316	87.302	87.297	87.280	87.354	87.375	87.481	87.485	87.449	87.465	87.644	87.858	88.000	88.000	88.000	88.014	88.866	89.151	89.154	89.465	90.078	91.663	92.253	92.489	92.568	93.182	94.384	95.463	95.975	95.990	96.281	96.751	97.000	97.290	97.668	98.000	98.221	98.589	98.929	99.000

DESIGN CONTROL RT01 - UP MNW
SCALE - HORIZ. 1:1000, VERT. 1:500

DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR

LEGEND

- TUNNEL ALIGNMENT CONTROL LINE
- RUNNING TUNNELS
- CROSS PASSAGES AND CROSS PASSAGES WITH SUMP
- STUB TUNNEL
- DIVE STRUCTURES
- STATION EXCAVATIONS
- NOZZLE ENLARGEMENTS
- CROSSOVER CAVERN
- STATION SHAFTS
- STATION CAVERNS
- STATION ADITS
- SHAFT
- LIFT SHAFTS

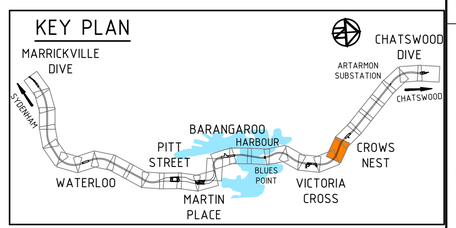
CADASTRAL MODEL (BASED ON PR124656-SACM-001-E)

- SURVEY ACCURATE CADASTRAL MODEL
- NEAR SURVEY ACCURATE CADASTRE
- DIGITAL CADASTRAL DATABASE

NOTE

1. FOR ALL ALIGNMENT NOTES REFER DRAWING NO. SMCSWTSE-JAB-TPW-AL-DRG-505005.

KEY PLAN



FOR CONSTRUCTION

AMD	DESCRIPTION	DESIGNER SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
02	AMENDMENTS TO VERTICAL ALIGNMENT DESIGN FOR RT01 AND RT02	17.05.19	17.05.19	17.05.19
01	ASSURED FOR CONSTRUCTION	17.04.19	17.04.19	17.04.19
00	ASSURED FOR CONSTRUCTION	09.01.18	09.01.18	09.01.18

CO-ORDINATE SYSTEM: MGA | HEIGHT DATUM: AHD | SCALE: AS SHOWN

SCALES
0 10 20 30 40 50 60m
SCALE 1:1000 AT A1 SIZE
0 5 10 15 20 25 30m
SCALE 1:500 AT A1 SIZE

IC CERTIFIED - IC CERTIFICATE SMCSWTSE-IC-CER-B2-008

CLIENT
NSW GOVERNMENT Transport for NSW

SERVICE PROVIDERS: Metro city & southwest | John Holland | CPB | Ghella | Arcadis | BG&E | NOMA Consulting | Hochtief | PSM | McMullen Jacobs Associates

DRAWN	E. ESTORES JR.	17.05.19
DESIGNED	TfNSW	-
DRG CHECK	F. BATHAN	17.05.19
DESIGN CHECK	N/A	-
APPROVED	D.ROBERTSON	17.05.19

SYDNEY METRO CITY & SOUTHWEST

TSE PROJECT WIDE

ALIGNMENT

GA PLAN AND LONGITUDINAL SECTION

TUNNEL ALIGNMENT CONTROL LINE RT01 - SHEET 23

FILE No. | SHEET: 39 OF 76 | A1

STATUS: FOR CONSTRUCTION ©

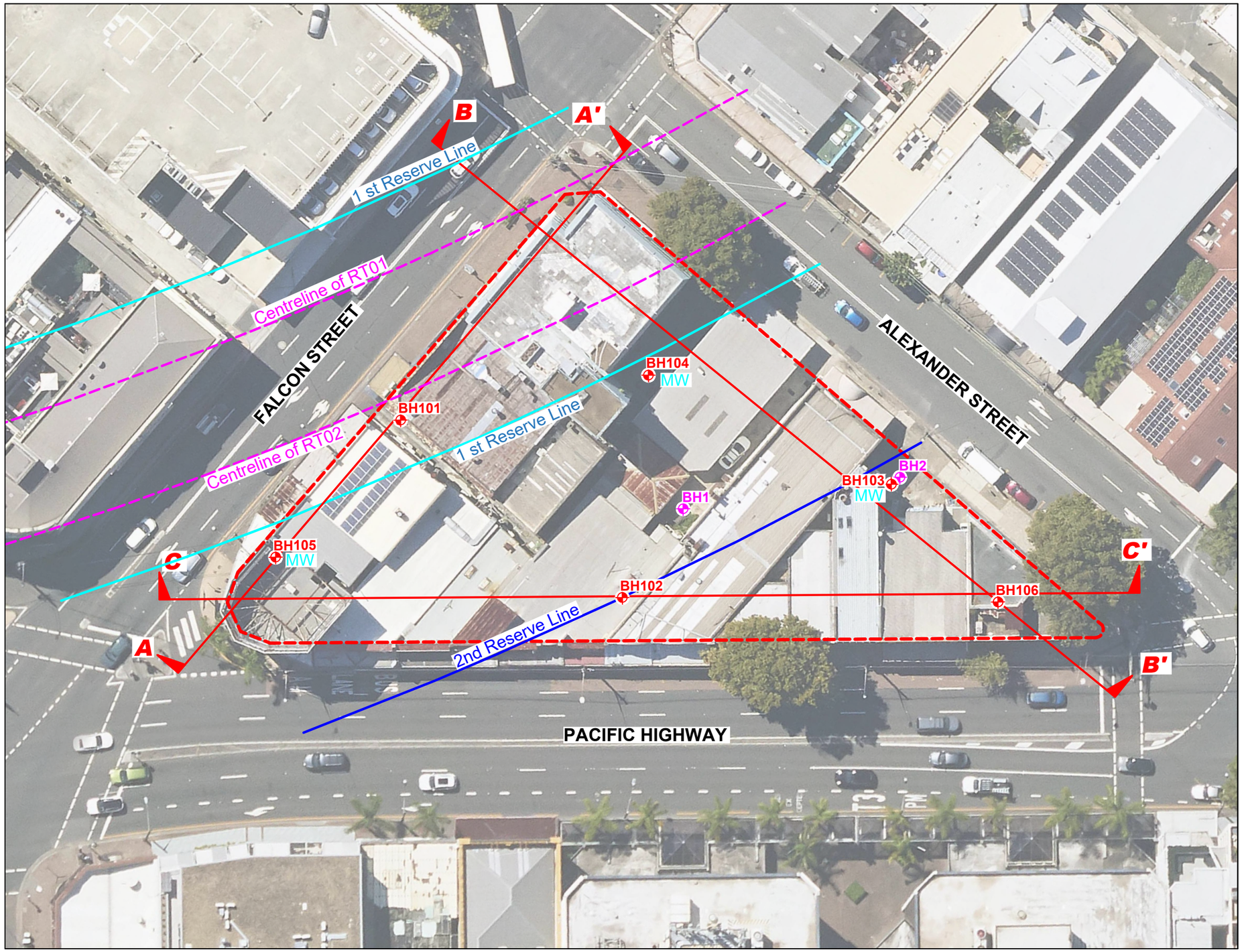
DRG No. SMCSWTSE-JAB-TPW-AL-DRG-505123 | 02 | EDMS No.

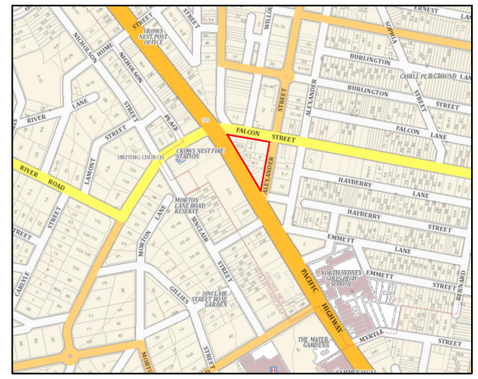
DF 801*554

File Plotted C:\SMCSW-TSE-Export\ | Plot Date & Time 5/17/2019 12:27 PM | Plotted by EEAZ4049

Appendix C

DP Location Plan and Cross Sections





Locality Plan

NOTE:
1: Base image from Metromap (Dated (01.03.2023)
2: Base Plan from Stantec, Drawing No.3050-01019-001-002, Revision 02 (Dated 05.05.2023)

0 5 10 15 20 30 40 50m

1:500 @ A3

LEGEND

- DP Borehole Location
- EI Australia Borehole Location
- MW Temporary Observation Well
- Site Boundary

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Geotechnics / Environment / Groundwater

CLIENT: Deicorp Pty Ltd		TITLE: **Test Location Plan**
OFFICE: Sydney	DRAWN BY: MN	**Fiveways, Crows Nest**
SCALE: 1:500 @ A3	DATE: 29.06.2023	**391-423 Pacific Hwy, 3-15 Falcon St and 8 Alexander St, Crows Nest**

PROJECT No: 86645.03
DRAWING No: 1
REVISION: 0

A

A'

APPROXIMATE SITE BOUNDARY

APPROXIMATE SITE BOUNDARY

BH105
Offset 0.1m

BH101
Offset - 0.6m

BH104
Offset - 20.0m

UNIT A: FILL/SOIL

UNIT B: CLASS IV/III SHALE / LAMINITE

UNIT C: CLASS IV/III SILTSTONE / SANDSTONE

UNIT D: CLASS II SANDSTONE

B07 BASEMENT FFL
RL 74.8 m

Bottom Depth
1.9 m

Bottom Depth
23.31 m

Bottom Depth
18.85 m

ELEVATION (m AHD)

100
95
90
85
80
75
70
65

0
20
40
60
80
100
120
140

DISTANCE ALONG PROFILE (m)

LEGEND

- Core Loss
- Clay
- Concrete
- Wood
- Filling
- Gravel
- Gravelly Silty Clay
- Pavers
- Sand
- Sandstone
- Shale
- Siltstone
- Silty Clay

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.

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

TESTS / OTHER
- Interpreted geotechnical boundary
- Water level

0 8
Horizontal Scale (metres)
Vertical Exaggeration = 2.0

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Deicorp Pty Ltd		TITLE: **Interpreted Geotechnical Cross-Section A-A'**	PROJECT No: 86645.03
OFFICE: Sydney	DRAWN BY: MN	**Fiveways Crows Nest**	DRAWING No: 2
SCALE: 1:400 (H) 1:200 (V) @ A3	DATE: 03.07.2023	**391-423 Pacific Hwy, 3-15 Falcon St and 8 Alexander St, Crows Nest**	REVISION: 0

B

B'

APPROXIMATE SITE BOUNDARY

APPROXIMATE SITE BOUNDARY

BH104
Offset - 5.5m

BH103
Offset 3.0m

BH106
Offset 0.0m

UNIT A: FILL/SOIL

UNIT B: CLASS IV/III SHALE / LAMINITE

UNIT C: CLASS IV/III SILTSTONE / SANDSTONE

UNIT D: CLASS II SANDSTONE

B07 BASEMENT FFL
RL 74.8 m

N = 3

refusal

Bottom Depth 18.85 m

Bottom Depth 30.57 m

Bottom Depth 22.3 m

ELEVATION (m AHD)

DISTANCE ALONG PROFILE (m)

LEGEND

- Core Loss
- Clay
- Concrete
- Silty Clay
- Filling
- Gravel
- Pavers
- Sandstone
- Shale
- Siltstone
- Silty Clay

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.

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

TESTS / OTHER
- N - Standard penetration test value
- — ? — — - Interpreted geotechnical boundary
- ▽ - Water level

0 8
Horizontal Scale (metres)
Vertical Exaggeration = 2.0

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Deicorp Pty Ltd		
OFFICE: Sydney	DRAWN BY: MN	
SCALE: 1:400 (H) 1:200 (V) @ A3	DATE: 03.07.2023	

TITLE: **Interpreted Geotechnical Cross-Section B-B'**
Fiveways Crows Nest
391-423 Pacific Hwy, 3-15 Falcon St and 8 Alexander St, Crows Nest

PROJECT No:	86645.03
DRAWING No:	3
REVISION:	0

C

C'

APPROXIMATE SITE BOUNDARY

APPROXIMATE SITE BOUNDARY

BH105
Offset 5.0m

BH102
Offset - 0.3m

BH106
Offset - 1.5m

UNIT A: FILL/SOIL

UNIT B: CLASS IV/III SHALE / LAMINITE

UNIT C: CLASS IV/III SILTSTONE / SANDSTONE

UNIT D: CLASS II SANDSTONE

B07 BASEMENT FFL RL 74.8 m

Bottom Depth 23.31 m

Bottom Depth 23.25 m

Bottom Depth 22.3 m

ELEVATION (m AHD)

DISTANCE ALONG PROFILE (m)

LEGEND

- Core Loss
- Concrete
- Wood
- Filling
- Pavers
- Sandstone
- Shale
- Siltstone
- Silty Clay

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.

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

TESTS / OTHER
- — ? — — - Interpreted geotechnical boundary
- ▽ - Water level

Horizontal Scale (metres)
Vertical Exaggeration = 2.0

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Deicorp Pty Ltd		TITLE: **Interpreted Geotechnical Cross-Section C-C'**	PROJECT No: 86645.03
OFFICE: Sydney	DRAWN BY: MN	**Fiveways Crows Nest**	DRAWING No: 4
SCALE: 1:400 (H) 1:200 (V) @ A3	DATE: 03.07.2023	**391-423 Pacific Hwy, 3-15 Falcon St and 8 Alexander St, Crows Nest**	REVISION: 0

Appendix D

Explanatory Notes, Borehole Logs and Core Photographs

Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are generally based on Australian Standard AS1726:2017, Geotechnical Site Investigations. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	19 - 63
Medium gravel	6.7 - 19
Fine gravel	2.36 – 6.7
Coarse sand	0.6 - 2.36
Medium sand	0.21 - 0.6
Fine sand	0.075 - 0.21

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

The proportions of secondary constituents of soils are described as follows:

In fine grained soils (>35% fines)

Term	Proportion of sand or gravel	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	>30%	Sandy Clay
With	15 – 30%	Clay with sand
Trace	0 - 15%	Clay with trace sand

In coarse grained soils (>65% coarse)
- with clays or silts

Term	Proportion of fines	Example
And	Specify	Sand (70%) and Clay (30%)
Adjective	>12%	Clayey Sand
With	5 - 12%	Sand with clay
Trace	0 - 5%	Sand with trace clay

In coarse grained soils (>65% coarse)
- with coarser fraction

Term	Proportion of coarser fraction	Example
And	Specify	Sand (60%) and Gravel (40%)
Adjective	>30%	Gravelly Sand
With	15 - 30%	Sand with gravel
Trace	0 - 15%	Sand with trace gravel

The presence of cobbles and boulders shall be specifically noted by beginning the description with ‘Mix of Soil and Cobbles/Boulders’ with the word order indicating the dominant first and the proportion of cobbles and boulders described together.

Soil Descriptions

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	VS	<12
Soft	S	12 - 25
Firm	F	25 - 50
Stiff	St	50 - 100
Very stiff	VSt	100 - 200
Hard	H	>200
Friable	Fr	-

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	Density Index (%)
Very loose	VL	<15
Loose	L	15-35
Medium dense	MD	35-65
Dense	D	65-85
Very dense	VD	>85

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Extremely weathered material – formed from in-situ weathering of geological formations. Has soil strength but retains the structure or fabric of the parent rock;
- Alluvial soil – deposited by streams and rivers;
- Estuarine soil – deposited in coastal estuaries;
- Marine soil – deposited in a marine environment;
- Lacustrine soil – deposited in freshwater lakes;
- Aeolian soil – carried and deposited by wind;
- Colluvial soil – soil and rock debris transported down slopes by gravity;
- Topsoil – mantle of surface soil, often with high levels of organic material.
- Fill – any material which has been moved by man.

Moisture Condition – Coarse Grained Soils

For coarse grained soils the moisture condition should be described by appearance and feel using the following terms:

- Dry (D) Non-cohesive and free-running.
- Moist (M) Soil feels cool, darkened in colour.
  Soil tends to stick together.
  Sand forms weak ball but breaks easily.
- Wet (W) Soil feels cool, darkened in colour.
  Soil tends to stick together, free water forms when handling.

Moisture Condition – Fine Grained Soils

For fine grained soils the assessment of moisture content is relative to their plastic limit or liquid limit, as follows:

- 'Moist, dry of plastic limit' or 'w <PL' (i.e. hard and friable or powdery).
- 'Moist, near plastic limit' or 'w ≈ PL (i.e. soil can be moulded at moisture content approximately equal to the plastic limit).
- 'Moist, wet of plastic limit' or 'w >PL' (i.e. soils usually weakened and free water forms on the hands when handling).
- 'Wet' or 'w ≈LL' (i.e. near the liquid limit).
- 'Wet' or 'w >LL' (i.e. wet of the liquid limit).

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

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$. It should be noted that the UCS to $Is_{(50)}$ ratio varies significantly for different rock types and specific ratios should be determined for each site.

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Residual Soil	RS	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.
Extremely weathered	XW	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
Highly weathered	HW	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.
Moderately weathered	MW	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.
Slightly weathered	SW	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.
Fresh	FR	No signs of decomposition or staining.
Note: If HW and MW cannot be differentiated use DW (see below)		
Distinctly weathered	DW	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.

Rock Descriptions

Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

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:

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

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

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

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

Symbols & Abbreviations

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Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	Lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

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

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

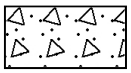
Symbols & Abbreviations

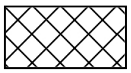
Graphic Symbols for Soil and Rock

General


Asphalt


Road base

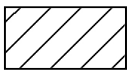

Concrete

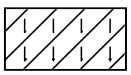

Filling

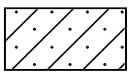
Soils


Topsoil

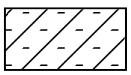

Peat

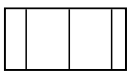

Clay

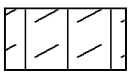

Silty clay

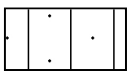

Sandy clay

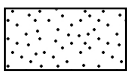

Gravelly clay

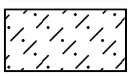

Shaly clay

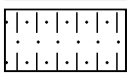

Silt


Clayey silt


Sandy silt

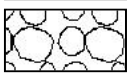

Sand

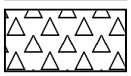

Clayey sand


Silty sand


Gravel

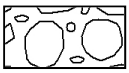

Sandy gravel


Cobbles, boulders

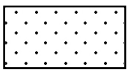

Talus

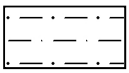
Sedimentary Rocks

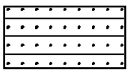

Boulder conglomerate

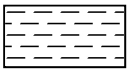

Conglomerate


Conglomeratic sandstone

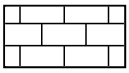

Sandstone


Siltstone

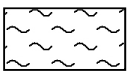

Laminite

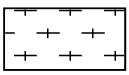

Mudstone, claystone, shale


Coal


Limestone

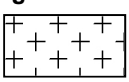
Metamorphic Rocks

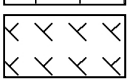

Slate, phyllite, schist

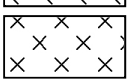

Gneiss

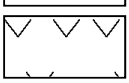

Quartzite

Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 97.1 m AHD
EASTING: 333557
NORTHING: 6255475
DIP/AZIMUTH: 90°/--

BORE No: BH101
PROJECT No: 86645.03
DATE: 1/6/2023
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
97	0.05	BASALT PAVERS - 50mm thick										
	0.1	BEDDING SAND - 50mm thick										
		FILL/Gravelly CLAY: low to medium plasticity, grey and mottled orange-brown, sub-angular brick, concrete and bluemetal gravel, trace fine to medium sand, w = PL, apparently firm										
96	1											
	1.8											
	1.9	Gravelly CLAY Cl: medium plasticity, grey and pale orange, sub-angular shale gravel, w = PL, extremeley weathered shale										
95	2	Bore discontinued at 1.9m - discontinued due to sewer position unconfirmed.										
94	3											
93	4											
92	5											
91	6											
90	7											
89	8											
88	9											

RIG: Vac-Truck **DRILLER:** AUM **LOGGED:** JCP **CASING:** None

TYPE OF BORING: Non Destructive Digging

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Borehole discontinued to due to unknown location of sewer pipe.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 96.5 m AHD
EASTING: 333552
NORTHING: 6255441.3
DIP/AZIMUTH: 90°/--

BORE No: BH102
PROJECT No: 86645.03
DATE: 15 - 17/5/2023
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
96	0.9	FILL/Sandy SILT: low plasticity, pale brown and brown, fine sand, with gravel, brick and gyprock cobbles, trace fabric, wood, plastic fines, w < PL, apparently loose							E			
									E			
95	1	Silty CLAY CI: low plasticity, pale orange-brown and grey mottled orange, w < PL, ironstone gravel, apparently dense, residual							E			
		Below 1.48m: ironstone gravel lenses										
94	2 2.0	SHALE: pale grey, grey and orange-brown, thinly laminated, very low strength, extremely weathered, fractured, Ashfield Shale						Unless otherwise stated, discontinuities are bedding, 0-5°, pl, sm, cly vn or fe stn	C	100	0	
93	3	Below 3.0m: highly weathered						3.02m: J40°, pl, sm, cln 3.06m: Fg 40mm 3.1m: J60°, pl, he, cly vn 3.19m: J30°, pl, sm, cln, roots 3.21m: J60°, pl-ir, sm, cln 3.26-3.35m: J60-80°, pl-ir, sm, cln	C	93	9	PL(A) = 0.4
92	4 4.34	Below 4.34m: very low to low strength						3.36m: J85-90°, pl-un, sm, cln, 50mm 3.45m: J30°, un, sm, cln 3.48m: J60°, pl, he, fe stn 3.53m: B0°, pl-un, sm, cly vn and roots 3.54m: J40°, pl, he, cly vn 3.66-3.81m: J70-90°, ir, sm, cln 3.82-3.92m: 2x J50°, pl, he	C	100	0	PL(A) = <0.1 PL(A) = <0.1 PL(A) = 0.2
91	5							4.06-4.14m: J60°, pl, sm, cly vn 4.19m: Ds 50mm 4.24m: CORE LOSS: 100mm	C	100	52	PL(A) = 0.1
90	6 6.8	SHALE: dark grey, thinly laminated, very low to low strength, slightly weathered to fresh, slightly fractured, Ashfield Shale						4.35m: J75°, pl, sm, cly vn 4.59m: J30°, pl, sm, cln 4.7m: J75°, pl, sm, cly vn 4.78m: J40°, pl, sm, cln				
89	7							4.82m: J40°, pl, sm, cln 4.84m: J60°, pl-un, sm, cln, 60mm 4.94m: J40° pl, sm, cln 5.02m: B10°, pl, he, cly vn 5.1m: J10°, pl, he, cly vn 5.17m: Ds 60mm 5.33m: Ds 30mm 5.37m: B10°, pl, cly ctg 2mm	C	92	21	PL(A) = 0.1 PL(A) = 0.2
88	8	Below 8.0m: low strength										
87	9							5.48m: J55°, pl, sm, cln 5.76-5.96m: 3x B10°, pl, sm, cly vn and fe stn 6.02m: J20°, pl, sm, cln 6.06m: J80°, pl, sm, cln, 30mm 6.28m: J15°, pl, he, fe	C	91	12	PL(A) = 0.1
	10.0											

RIG: Proline **DRILLER:** Tightsite **LOGGED:** ECB **CASING:** HQ to 1.5m

TYPE OF BORING: Hand auger to 1.5m, NMLC Coring to 23.25m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▽	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 96.5 m AHD
EASTING: 333552
NORTHING: 6255441.3
DIP/AZIMUTH: 90°/--

BORE No: BH102
PROJECT No: 86645.03
DATE: 15 - 17/5/2023
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
86	10.76	SHALE: dark grey, thinly laminated, low strength, fresh, slightly fractured, Ashfield Shale Below 10.15m: fractured, steeply dipping joints						stn 6.44m: J10°, pl, he, fe stn 6.72m: J20°, pl, sm, cln 6.82-6.91m: J90°, pl-ir, sm, cln 6.91m: J30°, pl, sm, cln, 70mm 6.97m: J20°, pl, sm, cln 7.06m: J70°, pl-un, sm, cln, 70mm 7.14-7.41m: 5x J40°, pl, sm, cln 7.5-8.0m: 2x J85°, pl, sm, cln 8.19-8.67m: 8x J20-30°, pl, sm, cln 8.60-9.04m: J85°, pl, sm, cln 9.18m: J85°, pl, sm, cln 9.20-10.09m: 12x J15-30°, pl, sm, cln 10.1-10.2m: J70° pl, sm, cln, 100mm 10.46m: Fg 40mm 10.51-10.73m: J60°, pl, sm, cln 10.73m: CORE LOSS: 30mm 11.07-11.65m: J85°, pl, sm, cln 11.88m: Fg 300mm 11.66-12.23m: J85-90°, pl, sm, cln 12.29-12.83m: 2x J85-90°, pl, sm, cl 12.9m: J70°, pl, sm, cln 12.96m: J30°, pl, sm, cln 13.09m: J50°, pl, sm, cln 13.14m: J20°, pl, sm, cln 13.14-13.38m: 3x J20-30°, pl, sm, cln 13.49-13.66m: 2x J50-60°, pl, cm, cln 13.86m: J30°, pl, sm, cln 13.86-14.01m: 2x J25-30°, pl sm, cln 14.22-14.54m: J15-40°, pl, sm, cln 14.66-14.88m: 11x J40°, pl, sm, cln 14.94-15.04m: J60° pl, sm, cln, 100mm 15.35m: J25°, pl, sm, cln 15.49m: J40°, pl, sm, cln 15.59-16.09m: 4x J15-30°, pl, sm, cln 16.21m: J70°, pl, sm, cln 16.27-16.59m: 4x J25-40°, pl, ro, cln 17.28-17.71m: 5x J15-30°, pl, ro, cln 19.17m: B20°, pl, ro, cln 19.37m: B0-5°, un, ro, cln	C	91	12	PL(A) = 0.3
85	11	At 11.76m: tuff layer, 10mm thick							C	97	90	PL(A) = 0.2
84	12											
83	13								C	100	90	PL(A) = 0.2
82	14								C	100	94	PL(A) = 0.3
81	15											
	15.34	SILTSTONE: dark grey and pale grey, thickly laminated, low strength, fresh, slightly fractured, Mittagong Formation										PL(A) = 0.2
	16								C			PL(A) = 0.7 PL(A) = 0.2
80	16.1	SANDSTONE: fine grained, pale grey and grey, distinct and indistinctly cross-bedded medium strength, fresh, slightly fractured, Mittagong Formation										
79	17 17.0	SANDSTONE: fine to medium grained, pale grey and grey, thinly cross-bedded, with siltstone laminations, high strength, fresh, unbroken, Hawkesbury Sandstone							C	100	68	PL(A) = 0.9
78	18											PL(A) = 1.2
77	19								C	100	93	PL(A) = 1
	20.0											

RIG: Proline **DRILLER:** Tightsite **LOGGED:** ECB **CASING:** HQ to 1.5m

TYPE OF BORING: Hand auger to 1.5m, NMLC Coring to 23.25m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 96.5 m AHD
EASTING: 333552
NORTHING: 6255441.3
DIP/AZIMUTH: 90°/--

BORE No: BH102
PROJECT No: 86645.03
DATE: 15 - 17/5/2023
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
76	21	SANDSTONE: fine to medium grained, pale grey and grey, thinly cross-bedded, with siltstone laminations, high strength, fresh, unbroken, Hawkesbury Sandstone						20.57m: B20°, pl, ro, cln	C	100	100	PL(A) = 1.3
75	22								C	100	100	PL(A) = 0.9
74	23											PL(A) = 1.1
	23.25											PL(A) = 0.7
73	24	Bore discontinued at 23.25m - target depth reached										
72	25											
71	26											
70	27											
69	28											
68	29											
67												

RIG: Proline **DRILLER:** Tightsite **LOGGED:** ECB **CASING:** HQ to 1.5m

TYPE OF BORING: Hand auger to 1.5m, NMLC Coring to 23.25m

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BORE: BH102 PROJECT: 86645.03 MAY 2023

1.48 – 6.0m

BORE: BH102 PROJECT: 86645.03 MAY 2023

6.0 – 11.0m

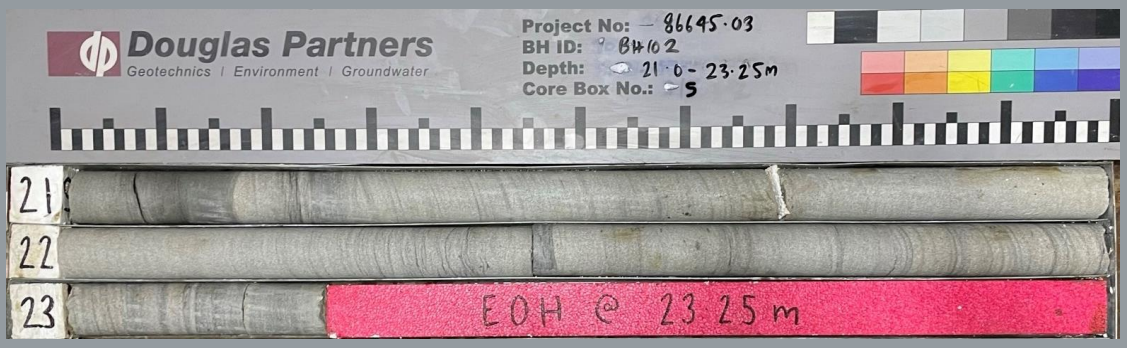
BORE: BH102 PROJECT: 86645.03 MAY 2023

11.0 – 16.0m

BORE: BH102 PROJECT: 86645.03 MAY 2023

16.0 – 21.0m

BORE: BH102 **PROJECT: 86645.03** **MAY 2023**



21.0 – 23.25m

BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 96.0 m AHD
EASTING: 333581
NORTHING: 6255420.4
DIP/AZIMUTH: 90°/--

BORE No: BH103
PROJECT No: 86645.03
DATE: 11 - 15/5/2023
SHEET 1 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
96	0.1	CONCRETE: 100mm thick							E			
		FILL/Sandy GRAVEL: sub-angular to sub-rounded gravel, grey, fine to medium sand, plastic fines, trace cobbles, moist, apparently loose							E			
95	1								E			
									S			1,1,2 N = 3
	1.8	FILL/CLAY: low to medium plasticity, grey, trace fine to medium sand, w = PL, firm							E			
94	2											
	2.3	Below 2.0m: w > PL CLAY CI: medium plasticity, grey and pale grey, w = PL, firm, residual						Unless otherwise stated, all discontinuities are bedding, 0-5°, pl, sm, cln, cly vn or fe stn	S			2,4,25/140mm refusal
	2.9	LAMINITE: pale grey, thinly laminated, grey and brown, medium strength then very low strength, highly weathered, highly fractured, Ashfield Shale										
93	3							3.07-3.19m: J55°, pl, sm, cln, 120mm 3.26m: J20°, he, pl, cly vn 3.56m: J20°, pl, sm, cln	C	100	0	PL(A) = 0.8
92	4							3.91m: B0°, pl, sm, cly ctg 20mm 3.95m: Ds 50mm 4.26m: J0-5°, ir, sm, fe stn 4.31m: Fg 40mm 4.35-4.77m: 4x Ds 20-60mm 4.85m: J20°, pl, sm, fe stn				PL(A) = <0.1
91	5								C	100	25	
								5.56m: J70°, pl, sm, cln 5.15-6.12m: 4x B0°, pl, sm, cly ctg 2-30mm				PL(A) = <0.1
90	6							6.16m: J30°, pl, he 6.27-6.32m: 3x J70-80°, pl, sm, fe stn 6.47m: Fg 80mm 6.49m: J20°, pl, sm, cln 6.65m: J10°, pl, sm, cln				PL(A) = <0.1
89	7							6.75-6.9m: J85-90°, pl, sm, fe stn 6.89m: Ds 40mm 6.96m: J15°, pl, sm, cln 7.16m: B0, pl, sm, cly ctg 20mm 7.05-7.36m: 3x J30°, pl, sm, cln or fe stn 7.39m: Ds 40mm 7.43-7.53m: 2x J70°, pl, sm, cly vn 8.37-8.44m: 2x J60°, pl, he, fe stn 8.62m: J60°, pl, sm, fe stn 8.64-8.79m: Fg 150mm 9m: CORE LOSS: 910mm				PL(A) = 0.1
88	8					16-05-23			C	69	5	PL(A) = <0.1 PL(A) = 0.1
87	9											
	9.0											
	9.91											

RIG: Bobcat **DRILLER:** Ground Test **LOGGED:** ECB **CASING:** HWT to 2.5m

TYPE OF BORING: Diatube to 0.1m, Solid flight augering to 2.5m, NMLC Coring to 30.57m

WATER OBSERVATIONS: Free groundwater observed at 2.0m.

REMARKS: Groundwater well installed to 30.1m. Screen 18.1m - 30.1m. Solid PVC 0.1m-18.1m. Sand to 17.3m. Bentonite to 3.3m. Backfill to 0.1m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 96.0 m AHD
EASTING: 333581
NORTHING: 6255420.4
DIP/AZIMUTH: 90°/--

BORE No: BH103
PROJECT No: 86645.03
DATE: 11 - 15/5/2023
SHEET 2 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
86	10.0	SHALE: dark grey, thinly laminated, very low to low strength, slightly weathered, highly fractured, Ashfield Shale						9.92m: J90°, pl, sm, cln 9.93m: J40°, pl, sm, cln 9.96m: J65°, pl, sm, cln	C	91	22	PL(A) = <0.1
85	11							10.12-10.3m: 4x J20-45°, pl, sm, cln 10.45m: J35°, pl, sm, cln 10.38-10.58m: J85°, pl, sm, cly vn	C	91	22	
	11.05											PL(A) = 0.1
84	12							10.7m: J60°, pl, he 10.86m: Fg 20mm 11m: CORE LOSS: 50mm 11.15m: J60°, pl, sm, cln 11.25m: J30°, pl, sm, cln	C	98	36	
	12.44							11.37-11.48m: J60°, pl, sm, cln				
83	13							11.64m: J35°, pl, sm, cln 11.8-11.95m: 2x J60°, pl, sm, cln				PL(A) = <0.1 PL(A) = <0.1
	13.28	SILTSTONE: pale grey and grey, very low strength, sandstone laminations, slightly weathered, unbroken, Mittagong Formation						12.05-12.13m: 3x J50°, pl, sm, cln 12.25-12.35m: J75°, pl, sm, cln 12.41m: CORE LOSS: 30mm	C	100	0	
82	14							12.73m: J20°, pl, sm, cln 12.74-12.84m: 2x J40°, he, pl 13.25m: J20°, pl, sm, cln				PL(A) = <0.1 PL(A) = <0.1
81	15								C	100	0	
	15.0	SANDSTONE: fine grained, pale grey and grey, low strength, thinly cross-bedded, siltstone laminations, slightly weathered then fresh, slightly fractured, Mittagong Formation Below 15.75m: low to medium strength										PL(A) = <0.1
80	16							16.05m: Fg 60mm				PL(A) = 0.4
								16.27-16.55m: 2x Ds 20mm				PL(A) = 0.2
79	17							17.13m: J45°, st, ro, cln				PL(A) = 0.2 PL(A) = 0.4
								17.34m: Fg 40mm	C	100	85	
	17.8							17.62m: J30°, pl-ir, ro, cln				
78	18	SANDSTONE: medium grained, pale grey, high strength, thinly cross-bedded, siltstone laminations, fresh, slightly fractured, Hawkesbury Sandstone										PL(A) = 0.7
77	19											PL(A) = 1.3
									C	100	100	PL(A) = 1.2
	20.0											PL(A) = 1.2

RIG: Bobcat **DRILLER:** Ground Test **LOGGED:** ECB **CASING:** HWT to 2.5m

TYPE OF BORING: Diatube to 0.1m, Solid flight augering to 2.5m, NMLC Coring to 30.57m

WATER OBSERVATIONS: Free groundwater observed at 2.0m.

REMARKS: Groundwater well installed to 30.1m. Screen 18.1m - 30.1m. Solid PVC 0.1m-18.1m. Sand to 17.3m. Bentonite to 3.3m. Backfill to 0.1m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 96.0 m AHD
EASTING: 333581
NORTHING: 6255420.4
DIP/AZIMUTH: 90°/--

BORE No: BH103
PROJECT No: 86645.03
DATE: 11 - 15/5/2023
SHEET 3 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
76		SANDSTONE: medium grained, pale grey, high strength, thinly cross-bedded, siltstone laminations, fresh, unbroken, Hawkesbury Sandstone						20.52m: B5°, pl-ir, ro, cly ctg 2mm 20.71m: J20°, pl, ro, cly vn	C	100	100	PL(A) = 1
75	21											
74	22											PL(A) = 1.2
73	23	Between 23.1 and 27.0m: medium to coarse grained						23.21m: B0°, pl-un, ro, cly ctg 2mm	C	100	97	PL(A) = 1.1
72	24							24.21m: J40°, pl, ro, cln				PL(A) = 1.5
71	25											PL(A) = 1.6
70	26								C	100	100	PL(A) = 1.2
69	27							27.23m: B5°, pl, ro, cly vn				PL(A) = 0.7
68	28											PL(A) = 0.8
67	29							28.63-29.57m: 3x B15-20°, pl, ro, cbs vn and cly vn 29.64m: J30°, pl, ro, cln 29.67m: B5°, pl, ro, cly	C	100	96	PL(A) = 1.1
	30.0											PL(A) = 1.1

RIG: Bobcat **DRILLER:** Ground Test **LOGGED:** ECB **CASING:** HWT to 2.5m

TYPE OF BORING: Diatube to 0.1m, Solid flight augering to 2.5m, NMLC Coring to 30.57m

WATER OBSERVATIONS: Free groundwater observed at 2.0m.

REMARKS: Groundwater well installed to 30.1m. Screen 18.1m - 30.1m. Solid PVC 0.1m-18.1m. Sand to 17.3m. Bentonite to 3.3m. Backfill to 0.1m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 96.0 m AHD
EASTING: 333581
NORTHING: 6255420.4
DIP/AZIMUTH: 90°/--

BORE No: BH103
PROJECT No: 86645.03
DATE: 11 - 15/5/2023
SHEET 4 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
66		SANDSTONE: As above						vn	C	100	96	PL(A) = 1.2
	30.57	Bore discontinued at 30.57m - target depth reached										
65	31											
64	32											
63	33											
62	34											
61	35											
60	36											
59	37											
58	38											
57	39											

RIG: Bobcat **DRILLER:** Ground Test **LOGGED:** ECB **CASING:** HWT to 2.5m

TYPE OF BORING: Diatube to 0.1m, Solid flight augering to 2.5m, NMLC Coring to 30.57m

WATER OBSERVATIONS: Free groundwater observed at 2.0m.

REMARKS: Groundwater well installed to 30.1m. Screen 18.1m - 30.1m. Solid PVC 0.1m-18.1m. Sand to 17.3m. Bentonite to 3.3m. Backfill to 0.1m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 96.0 m AHD
EASTING: 333581
NORTHING: 6255420.4
DIP/AZIMUTH: 90°/--

BORE No: BH103
PROJECT No: 86645.03
DATE: 11 - 15/5/2023
SHEET 1 OF 4

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
96	0.1	CONCRETE: 100mm thick		E	0.1				Gatic cover
		FILL/Sandy GRAVEL: sub-angular to sub-rounded gravel, grey, fine to medium sand, plastic fines, trace cobbles, moist, apparently loose		E	0.2 0.5				
95	1			E	0.6 0.9				Blank pipe 0.1-12.1m
				S	1.0 1.45		1,1,2 N = 3		
	1.8	FILL/CLAY: low to medium plasticity, grey, trace fine to medium sand, w = PL, firm		E	1.9 2.0				Backfill 0.0-3.8m
94	2	Below 2.0m: w > PL							
	2.3	CLAY CI: medium plasticity, grey and pale grey, w = PL, firm, residual		S	2.5		2,4,25/140mm refusal		
93	2.9	LAMINITE: pale grey, thinly laminated, grey and brown, medium strength then very low strength, highly weathered, highly fractured, Ashfield Shale			2.94 3.0		PL(A) = 0.8		
				C	3.1 3.89				
92	4				4.66		PL(A) = <0.1		
91	5			C	5.65		PL(A) = <0.1		
90	6				6.49		PL(A) = <0.1		
89	7				6.96 7.05		PL(A) = 0.1		
								16-05-23	Bentonite 3.8-11.6m
88	8				7.95		PL(A) = <0.1		
				C	8.16		PL(A) = 0.1		
87	9								
	9.0								
	9.91				9.91				

RIG: Bobcat **DRILLER:** Ground Test **LOGGED:** ECB **CASING:** HWT to 2.5m

TYPE OF BORING: Diatube to 0.1m, Solid flight augering to 2.5m, NMLC Coring to 30.57m

WATER OBSERVATIONS: Free groundwater observed at 2.0m.

REMARKS: Groundwater well installed to 30.1m. Screen 18.1m - 30.1m. Solid PVC 0.1m-18.1m. Sand to 17.3m. Bentonite to 3.3m. Backfill to 0.1m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 96.0 m AHD
EASTING: 333581
NORTHING: 6255420.4
DIP/AZIMUTH: 90°/--

BORE No: BH103
PROJECT No: 86645.03
DATE: 11 - 15/5/2023
SHEET 2 OF 4

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
96	10.0	SHALE: dark grey, thinly laminated, very low to low strength, slightly weathered, highly fractured, Ashfield Shale		C	10.07		PL(A) = <0.1		
				C					
85	11 11.05				11.05		PL(A) = 0.1		11
					11.1				
				C					
84	12								12
	12.44				12.45				
					12.62		PL(A) = <0.1		
83	13				13.0		PL(A) = <0.1		13
	13.28			C					
		SILTSTONE: pale grey and grey, very low strength, sandstone laminations, slightly weathered, unbroken, Mittagong Formation			13.9		PL(A) = <0.1		
82	14				13.97				14
					14.56		PL(A) = <0.1		
				C					
81	15 15.0	SANDSTONE: fine grained, pale grey and grey, low strength, thinly cross-bedded, siltstone laminations, slightly weathered then fresh, slightly fractured, Mittagong Formation			15.45		PL(A) = <0.1		15
		Below 15.75m: low to medium strength							
80	16				15.95		PL(A) = 0.4		16
					16.0				
					16.5		PL(A) = 0.2		
79	17				16.96		PL(A) = 0.2		17
					17.0		PL(A) = 0.4		
				C					
	17.8								
78	18	SANDSTONE: medium grained, pale grey, high strength, thinly cross-bedded, siltstone laminations, fresh, slightly fractured, Hawkesbury Sandstone			17.97		PL(A) = 0.7		18
					18.89		PL(A) = 1.3		
77	19				18.96				19
					19.34		PL(A) = 1.2		
				C					
	20.0				19.92		PL(A) = 1.2		

RIG: Bobcat **DRILLER:** Ground Test **LOGGED:** ECB **CASING:** HWT to 2.5m

TYPE OF BORING: Diatube to 0.1m, Solid flight augering to 2.5m, NMLC Coring to 30.57m

WATER OBSERVATIONS: Free groundwater observed at 2.0m.

REMARKS: Groundwater well installed to 30.1m. Screen 18.1m - 30.1m. Solid PVC 0.1m-18.1m. Sand to 17.3m. Bentonite to 3.3m. Backfill to 0.1m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 96.0 m AHD
EASTING: 333581
NORTHING: 6255420.4
DIP/AZIMUTH: 90°/--

BORE No: BH103
PROJECT No: 86645.03
DATE: 11 - 15/5/2023
SHEET 3 OF 4

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
76		SANDSTONE: medium grained, pale grey, high strength, thinly cross-bedded, siltstone laminations, fresh, unbroken, Hawkesbury Sandstone							
75	21			C	20.96		PL(A) = 1		Gravel 11.6-30.57m; Machine slotted PVC screen 12.1-30.1m
					21.87				
74	22				21.96		PL(A) = 1.2		
73	23	Between 23.1 and 27.0m: medium to coarse grained			22.96		PL(A) = 1.1		
				C					
72	24				23.95		PL(A) = 1.5		
					24.91				
71	25				24.96		PL(A) = 1.6		
70	26				25.96		PL(A) = 1.2		
				C					
69	27				26.96		PL(A) = 0.7		
					27.83				
68	28				27.95		PL(A) = 0.8		
67	29			C	28.95		PL(A) = 1.1		
	30.0				29.95		PL(A) = 1.1		

RIG: Bobcat **DRILLER:** Ground Test **LOGGED:** ECB **CASING:** HWT to 2.5m

TYPE OF BORING: Diatube to 0.1m, Solid flight augering to 2.5m, NMLC Coring to 30.57m

WATER OBSERVATIONS: Free groundwater observed at 2.0m.

REMARKS: Groundwater well installed to 30.1m. Screen 18.1m - 30.1m. Solid PVC 0.1m-18.1m. Sand to 17.3m. Bentonite to 3.3m. Backfill to 0.1m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 96.0 m AHD
EASTING: 333581
NORTHING: 6255420.4
DIP/AZIMUTH: 90°/--

BORE No: BH103
PROJECT No: 86645.03
DATE: 11 - 15/5/2023
SHEET 4 OF 4

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
66		SANDSTONE: As above		C	30.31		PL(A) = 1.2		End cap
	30.57	Bore discontinued at 30.57m - target depth reached			30.57				
65	31								31
64	32								32
63	33								33
62	34								34
61	35								35
60	36								36
59	37								37
58	38								38
57	39								39

RIG: Bobcat **DRILLER:** Ground Test **LOGGED:** ECB **CASING:** HWT to 2.5m

TYPE OF BORING: Diatube to 0.1m, Solid flight augering to 2.5m, NMLC Coring to 30.57m

WATER OBSERVATIONS: Free groundwater observed at 2.0m.

REMARKS: Groundwater well installed to 30.1m. Screen 18.1m - 30.1m. Solid PVC 0.1m-18.1m. Sand to 17.3m. Bentonite to 3.3m. Backfill to 0.1m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BORE: BH103 PROJECT: 86645.03 MAY 2023

3.0 – 7.0m

BORE: BH103 PROJECT: 86645.03 MAY 2023

7.0 – 12.0m

BORE: BH103 PROJECT: 86645.03 MAY 2023

13.0 – 17.0m

BORE: BH103 PROJECT: 86645.03 MAY 2023

17.0 – 22.0m

BORE: BH103 PROJECT: 86645.03 MAY 2023

22.0 – 27.0m

BORE: BH103 PROJECT: 86645.03 MAY 2023

27.0 – 30.57m

BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 93.6 m AHD
EASTING: 333577
NORTHING: 6255452.5
DIP/AZIMUTH: 90°/--

BORE No: BH104
PROJECT No: 86645.03
DATE: 17 - 19/5/2023
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
93	0.1	CONCRETE: 100mm thick										
	0.25	FILL/GRAVEL: sub-angular bluemetal gravel, grey, with plastic fines, moist							E			
		Silty CLAY CI: medium plasticity, pale grey, grey and red, trace non-plastic fines, w~PL, apparently hard, extremely weathered shale						Unless otherwise stated, all disconformities are bedding, 0-5°, pl, sm or ro, cln or cly vn or fe stn	E			
1	1.3	SHALE: brown, thinly laminated, very low strength, highly weathered then slightly weathered, fractured, Ashfield Shale						1.45m: B0°, pl, sm, cly ctg 10mm				PL(A) = <0.1
92								1.72m: B0°, pl, sm, cly ctg 10mm				
2								1.92m: Cs 80mm				
								2.05-2.16m: 5x B0°, pl, he, fe stn				
91								2.19m: Cs 20mm				PL(A) = <0.1
								2.33m: B0°, pl, sm, cly ctg 3mm	C	100		
3								2.43m: J50°, pl, sm, cln				
								2.51m: J45°, pl, sm, fg				
90								2.61m: Fg 50mm				
								2.81m: J30°, pl, sm, fg 20mm				
								3.22m: Cs 50mm				PL(A) = <0.1
4								3.29m: B0°, pl, sm, cly ctg 10mm				
								3.32m: J50°, pl, sm, cln				
								3.41m: Cs 70mm				
89								3.38-3.48m: J70-80°, pl, sm, cly ctg 10mm				PL(A) = <0.1
						17-05-23		3.5-3.56m: 2x J30°, pl, sm, ctg 10mm				
5								3.58m: B0°, pl, sm, cly ctg 10mm	C	76		
								3.70-4.16m: 3x J70-80°, pl, sm, cln				PL(A) = <0.1
								4.23m: Cs 40mm				
	5.12	SHALE: brown, thinly laminated, very low strength, highly weathered then slightly weathered, fractured, Ashfield Shale						4.88-5.06m: J70-80°, pl, sm, cln				
88	5.61							5.08m: J70°, pl, sm, cln				
								5.12m: CORE LOSS: 490mm				
6								5.61-5.83m: Cz 220mm				
								5.93-6.83m: 5x J30-55°, pl, sm, cln				
87		Below 6.42m: very low to low										PL(A) = <0.1
								6.89m: J80-90°, ir, sm, cln	C			
7								6.96m: B0°, pl, sm, cly ctg 10mm				PL(A) = 0.1
86								7.17m: J90°, pl, sm, cln				
								7.37-7.41m: 2x Ds 20-30mm				
								7.19-7.82m: 3x J30-50°, pl, sm, cln				
8								7.89m: Cs 20mm				
	8.27							8m: B0°, pl, sm, cly ctg 10mm				PL(A) = <0.1
	8.41	Below 8.41m: fresh						8.04m: Ds 20mm				
85								8.27m: CORE LOSS: 140mm				
								8.44-8.57m: 3x 45-60°, pl, sm, cln				
9								8.71m: J60°, pl ,sm, cln	C			
								8.78-9.11m: J70-80°, pl, sm, cln				
84								9.09-9.15m: 2xJ25-40°, pl, sm, cln				
	10.0							9.33m: B0°, pl, sm, cly				

RIG: Bobcat **DRILLER:** Ground Test **LOGGED:** ECB **CASING:** HWT to 1.3m

TYPE OF BORING: Diatube to 0.1m, Solid flight augering to 1.3m, NMLC Coring to 18.85m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Groundwater well installed to 18.8m. Screen 6.8m - 18.8m. Solid PVC 0.1m - 6.8m. Sand to 5.8m. Bentonite to 0.5m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 93.6 m AHD
EASTING: 333577
NORTHING: 6255452.5
DIP/AZIMUTH: 90°/--

BORE No: BH104
PROJECT No: 86645.03
DATE: 17 - 19/5/2023
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
83	10.48	SHALE: dark grey, thinly laminated, very low to low strength, fresh, fragmented to fractured, Ashfield Shale						ctg 5mm 9.40-9.49m: 4x J20-30°, pl, sm, cln 9.47-9.74m: Clay band 270mm 9.77m: J40°, pl, sm, cln 9.8-10.47m: Clay band 670mm 10.48m: CORE LOSS: 110mm 10.58m: J30°, pl, sm, cly ctg 20mm 10.69-11.18m: 7x 20-40°, pl, sm, cln 11m: CORE LOSS: 50mm 11.2-11.64m: 6x J60-70°, pl, sm, cln, 2x he 11.36-11.59m: J30-40°, pl, sm, cln 11.72m: Cs 60mm 11.89-12.16m: 3x J25-35°, pl, sm, cln 12.25m: Fg 40mm 12.35m: Fg 40mm 12.4m: J30°, pl ,sm, cln 12.45-12.56m: Ds 110mm 12.58-12.7m: 2x J70-80°, pl, sm, cln 13.25-13.35m: Clay band 100mm 13.74m: Fg 20mm 14.52-14.79m: Cz 270mm 14.74m: B15°, pl, sm, cbs vn 15.59-15.64m: Cz 150mm 15.77m: CORE LOSS: 450mm 17.16-17.19m: 3x B15°, pl, he	C			PL(A) = <0.1
82	11 11.05	Below 11.6m: medium strength										PL(A) = 0.3
81	12								C			PL(A) = 0.4
80	13 13.0	SILTSTONE: pale grey, thickly laminated, medium strength, fresh, fractured, Mittagong Formation										PL(A) = 0.4
79	13.75	SANDSTONE: fine grained, grey and pale grey, very thinly cross-bedded, medium to high strength, fresh, fractured, Hawkesbury Sandstone							C			PL(A) = 2.4
78	14 15								C			PL(A) = 0.7 PL(A) = 1.2
77	15.77 16 16.22	SANDSTONE: fine to medium grained, grey and pale grey, cross-bedded, high strength, fresh, unbroken, Hawkesbury Sandstone							C	100		PL(A) = 1.1
76	17											PL(A) = 1.3
75	18	Below 18.2m: coarse grained										
74	18.85 19	Bore discontinued at 18.85m - target depth reached										PL(A) = 1.1

RIG: Bobcat **DRILLER:** Ground Test **LOGGED:** ECB **CASING:** HWT to 1.3m

TYPE OF BORING: Diatube to 0.1m, Solid flight augering to 1.3m, NMLC Coring to 18.85m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Groundwater well installed to 18.8m. Screen 6.8m - 18.8m. Solid PVC 0.1m - 6.8m. Sand to 5.8m. Bentonite to 0.5m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 93.6 m AHD
EASTING: 333577
NORTHING: 6255452.5
DIP/AZIMUTH: 90°/--

BORE No: BH104
PROJECT No: 86645.03
DATE: 17 - 19/5/2023
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
93	0.1	CONCRETE: 100mm thick							Gatic cover
	0.25	FILL/GRAVEL: sub-angular bluemetal gravel, grey, with plastic fines, moist		E	0.2–0.3				
				E	0.4–0.5				
		Silty CLAY CI: medium plasticity, pale grey, grey and red, trace non-plastic fines, w~PL, apparently hard, extremely weathered shale							Blank pipe 0.0-6.8m
92	1.3	SHALE: brown, thinly laminated, very low strength, highly weathered then slightly weathered, fractured, Ashfield Shale			1.3				
					1.67		PL(A) = <0.1		
91				C	2.48		PL(A) = <0.1		Bentonite 3.7-5.8m
90					3.58		PL(A) = <0.1		
					3.87				
89				C	4.47		PL(A) = <0.1	17-05-23	
	5.12	SHALE: brown, thinly laminated, very low strength, highly weathered then slightly weathered, fractured, Ashfield Shale			5.04		PL(A) = <0.1		
88	5.61								
					5.87				
87		Below 6.42m: very low to low		C	6.42		PL(A) = <0.1		
86				C	7.39		PL(A) = 0.1		
	8.27				8.26		PL(A) = <0.1		
85	8.41	Below 8.41m: fresh			8.41				
84				C					
	10.0								

RIG: Bobcat **DRILLER:** Ground Test **LOGGED:** ECB **CASING:** HWT to 1.3m

TYPE OF BORING: Diatube to 0.1m, Solid flight augering to 1.3m, NMLC Coring to 18.85m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Groundwater well installed to 18.8m. Screen 6.8m - 18.8m. Solid PVC 0.1m - 6.8m. Sand to 5.8m. Bentonite to 0.5m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 93.6 m AHD
EASTING: 333577
NORTHING: 6255452.5
DIP/AZIMUTH: 90°/--

BORE No: BH104
PROJECT No: 86645.03
DATE: 17 - 19/5/2023
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
83	10.48	SHALE: dark grey, thinly laminated, very low to low strength, fresh, fragmented to fractured, Ashfield Shale		C	10.6				
	10.59	At 10.03m: tuff layer, 10mm							
	11.05				11.52		PL(A) = <0.1		
82		Below 11.6m: medium strength			12.1		PL(A) = 0.3		Gravel 5.8-18.8m
81					12.67				
				C	12.96		PL(A) = 0.4		Machine slotted PVC screen 6.8-18.8,
	13.0	SILTSTONE: pale grey, thickly laminated, medium strength, fresh, fractured, Mittagong Formation			13.0		PL(A) = 0.4		
80	13.75	SANDSTONE: fine grained, grey and pale grey, very thinly cross-bedded, medium to high strength, fresh, fractured, Hawkesbury Sandstone		C	13.97		PL(A) = 2.4		
79					14.58				
					14.96		PL(A) = 0.7		
78				C	15.48		PL(A) = 1.2		
	15.77	SANDSTONE: fine to medium grained, grey and pale grey, cross-bedded, high strength, fresh, unbroken, Hawkesbury Sandstone			16.22				
77	16.22				16.95		PL(A) = 1.1		
76				C					
					17.96		PL(A) = 1.3		
75		Below 18.2m: coarse grained							
	18.85				18.81		PL(A) = 1.1		End cap
74		Bore discontinued at 18.85m - target depth reached			18.85				

RIG: Bobcat **DRILLER:** Ground Test **LOGGED:** ECB **CASING:** HWT to 1.3m

TYPE OF BORING: Diatube to 0.1m, Solid flight augering to 1.3m, NMLC Coring to 18.85m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Groundwater well installed to 18.8m. Screen 6.8m - 18.8m. Solid PVC 0.1m - 6.8m. Sand to 5.8m. Bentonite to 0.5m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BORE: BH104 PROJECT: 86645.03 MAY 2023

1.3 – 6.0m

BORE: BH104 PROJECT: 86645.03 MAY 2023

6.0 – 11.0m

BORE: BH104 PROJECT: 86645.03 MAY 2023

11.0 – 16.0m

BORE: BH104 PROJECT: 86645.03 MAY 2023

16.0 – 18.85m

BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 98.1 m AHD
EASTING: 333534.6
NORTHING: 6255480
DIP/AZIMUTH: 90°/--

BORE No: BH105
PROJECT No: 86645.03
DATE: 31/5 - 6/6/2023
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
98	0.02	FLOORBOARDS: wooden flooring, 20mm										
		VOID: 480mm										
	0.5	FILL/Gravelly Silty SAND: fine, pale grey, angular concrete and brick gravel, non-plastic fines, with concrete cobbles, wood fragments, metal sheeting, plastic, fluorescent lights, brick and wire, dry, apparently loose							E			
97	0.9								A			
	1	Silty CLAY (CL): low plasticity, orange-brown, non-plastic fines, trace gravel, w < PL, apparently stiff, residual							A			
96	2	Below 1.2m: red and pale grey, with ironstone gravel										
		Below 2.5m: extremely weathered shale										
95	3											
	3.6	SHALE: dark grey and mottled orange, thinly laminated, very low to low strength, highly weathered then moderately weathered, highy fractured, Ashfield Shale						3.68m: B0°, pl, sm, fe stn 3.75m: B0°, pl, sm, fe stn, cly ctg 10mm 4.1m: CORE LOSS: 270mm	C	100	62	PL(A) = 0.1
94	4											
	4.37											PL(A) = 0.1
93	5	Below 5.0m: pale to dark grey, slightly weathered				06-06-23		4.86m: J60°, pl, sm, cln 4.89m: J40°, pl, sm, cln 4.91m: B0, pl, sm, cly vn 5.03m: Fg 60mm 5.13m: J85°, pl, sm, cln 5.29m: Fg 20mm	C	82	80	PL(A) = <0.1
92	6	Below 6.0m: fresh						5.46m: B, pl, sm, cly ctg 5mm 5.49m: Ds 30mm 5.53m: J55°, pl, sm, cln 6.11m: J40°, pl, sm, cln 6.20-6.30m: J60°, pl, sm, cln 6.29m: J40°, pl, sm, cln 6.35m: Fg 30mm 6.42m: Fg 40mm	C	100	61	PL(A) = 0.1 PL(A) = <0.1
91	7							6.52-6.77m: 2x J40°, pl, sm, cln 6.83m: Cs 30mm 6.89m: J40°, pl, sm, cln 7.1m: J30°, pl, sm, cln 7.12m: Cs 30mm 7.22m: J40°, pl, sm, cln 7.33-7.52m: Fg 190mm 7.90-7.97m: 2x J45°, pl, sm, cln 8m: J30°, pl, sm, cly vn 8.09m: Cs 20mm	C	100	63	PL(A) = 0.1 PL(A) = 0.1
90	8							8.21m: B0°, pl, sm, cly vn 8.66m: Fg 30mm 8.86m: B0°, pl, sm, cly ctg 20mm 8.89m: J60°, pl, sm, cln 8.95-9.14m: J60-70°, pl, sm, cln 9.23m: J75°, pl, sm, cln 9.3m: B0°, pl, sm, cly	C	100	52	PL(A) = <0.1
89	9											
	10.0											

RIG: Geo 205 **DRILLER:** Ground Test **LOGGED:** ECB **CASING:** PVC to 3.4m

TYPE OF BORING: Diatube to 0.02m, Solid flight augering to 1.5m, Wash boring to 3.6m, NMLC coring to 23.31m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Groundwater well installed to 23.3m. Screen 11.3m - 22.3m. Solid PVC 0.5m - 11.3m. Sand to 10.3m. Bentonite to 0.5m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 98.1 m AHD
EASTING: 333534.6
NORTHING: 6255480
DIP/AZIMUTH: 90°/--

BORE No: BH105
PROJECT No: 86645.03
DATE: 31/5 - 6/6/2023
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
88	10.24	SHALE: pale to dark grey, thinly laminated, very low to low strength,fresh, highy fractured, Ashfield Shale						ctg 10mm 9.38m: J55°, pl, sm, cln 9.41m: B0°, pl, sm, cly cn 9.57m: J50°, pl, sm, cln 9.82m: J90°, pl, sm, cln 10.06m: J60°, pl, sm, cln 10.11m: Ds 50mm 10.19m: CORE LOSS: 50mm 10.28m: Cs 30mm 10.86m: Fg 20mm 10.98m: B0°, pl, sm, cly ctg 5mm 11.06-11.12m: 2x J30°, pl, sm, cln 11.25m: J50°, pl, sm, cln 11.41m: J30°, pl, sm, fg 11.48m: B0°, pl, sm, cly ctg 5mm 11.50-11.60m: 4x J30°, ir, sm, cln 11.76m: J50°, pl, sm, cln 11.84-11.94m: J70°, pl, sm, cln 12.52m: J30°, pl, he 13.35-13.74m: 3x J35-55°, pl, sm, cln 14.04m: J45°, pl, sm, cln 14.23m: J30°, pl, he 14.23-14.28m: 2x J30°, pl, he 14.31m: J85°, pl, p he 14.33m: J50°, pl, sm, cln 14.45-14.49m: 2x J20-30°, pl, sm, cln, fg 14.68m: J40°, pl, sm, cln 14.74m: F40°, pl, sm, slickenside, 14.84m: J25°, pl, sm, cln 14.94-15.08m: J75°, pl, sm, cln 15.08m: B0°, pl, sm, cly ctg 2mm 15.11m: J10°, pl, sm, cln 15.36m: J25°, pl, sm, cln 15.55m: J20°, pl, sm, cln 15.98m: J30°, pl, sm, cln 17.06m: B0°, pl, sm, cly vn 17.27m: J60°, pl, sm, cly vn 17.36m: J30°, pl, sm, cln 17.45-17.52m: slickensides 17.57m: Fg 40mm 17.64m: B0°, pl, sm, cly vn 17.7m: Fg 50mm 17.76-17.88m: J85°, pl, sm, cln, p he 18.18m: J20°, pl, sm,	C	100	52	
87	11								C	97	55	PL(A) = <0.1 PL(A) = 0.2
86	12	Below 11.5m: low strength, slightly fractured							C	100	91	PL(A) = 0.1 PL(A) = 0.7 PL(A) = 1
85	13	Below 12.5m: medium and high strength										
84	14								C	100	57	PL(A) = 1.7 PL(A) = 1.5
83	15	Between 14.67 and 14.77m: pyrite inclusions							C	100	0	
									C	100	27	
82	16								C	100	86	PL(A) = 0.6 PL(A) = 0.5
81	17								C	100	65	
	17.41	SILTSTONE: grey, thickly laminated, medium strength, fresh, fractured, Mittagong Formation										PL(A) = 0.4
80	17.9 18	SANDSTONE: fine to medium grained, pale grey and grey, thinly cross-bedded, with siltstone laminations (40%), medium to high and high strength, fresh, slightly fractured then unbroken, Hawkesbury Sandstone							C	100	75	PL(A) = 1
79	19											PL(A) = 0.4
	20.0								C	100	76	PL(A) = 1.3

RIG: Geo 205 **DRILLER:** Ground Test **LOGGED:** ECB **CASING:** PVC to 3.4m

TYPE OF BORING: Diatube to 0.02m, Solid flight augering to 1.5m, Wash boring to 3.6m, NMLC coring to 23.31m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Groundwater well installed to 23.3m. Screen 11.3m - 22.3m. Solid PVC 0.5m - 11.3m. Sand to 10.3m. Bentonite to 0.5m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 98.1 m AHD
EASTING: 333534.6
NORTHING: 6255480
DIP/AZIMUTH: 90°/--

BORE No: BH105
PROJECT No: 86645.03
DATE: 31/5 - 6/6/2023
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
78		SANDSTONE: refer above						cln 18.19m: J55°, pl, sm, cln 18.39m: Fg 50mm 18.62m: J40°, pl, ro, cln 18.76m: B0°, pl, ro, cly vn 18.77m: B0°, pl, ro, cly ctg 10mm 18.81m: J30°, pl, ro, cln 19.03m: B0°, pl, ro, cly vn 19.52m: J20°, pl, sm, cln 19.92m: J60°, pl-ir, ro, cly and fg 20.13m: J60°, pl-ir, ro, cln 20.54m: Fg and Cly 80mm	C	100	76	PL(A) = 0.7
	20.6	SANDSTONE: medium grained, pale grey, cross-bedded, trace siltstone laminations, high strength, fresh, unbroken, Hawkesbury Sandstone Below 20.61m: minor siltstone laminations							C	100	100	PL(A) = 1.5
77	21											
76	22											PL(A) = 1.3
75	23								C	100	100	PL(A) = 1.1
	23.31	Bore discontinued at 23.31m - target depth reached										PL(A) = 1.4
74	24											
73	25											
72	26											
71	27											
70	28											
69	29											

RIG: Geo 205 **DRILLER:** Ground Test **LOGGED:** ECB **CASING:** PVC to 3.4m

TYPE OF BORING: Diatube to 0.02m, Solid flight augering to 1.5m, Wash boring to 3.6m, NMLC coring to 23.31m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Groundwater well installed to 23.3m. Screen 11.3m - 22.3m. Solid PVC 0.5m - 11.3m. Sand to 10.3m. Bentonite to 0.5m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▽	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 98.1 m AHD
EASTING: 333534.6
NORTHING: 6255480
DIP/AZIMUTH: 90°/--

BORE No: BH105
PROJECT No: 86645.03
DATE: 31/5 - 6/6/2023
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
98	0.02	FLOORBOARDS: wooden flooring, 20mm							
		VOID: 480mm							
	0.5	FILL/Gravelly Silty SAND: fine, pale grey, angular concrete and brick gravel, non-plastic fines, with concrete cobbles, wood fragments, metal sheeting, plastic, fluorescent lights, brick and wire, dry, apparently loose		E	0.5 0.6				Stopcock
97	0.9	Silty CLAY (CL): low plasticity, orange-brown, non-plastic fines, trace gravel, w < PL, apparently stiff, residual		A	0.9 1.0				Blank pipe 0.0-11.31m
	1	Below 1.2m: red and pale grey, with ironstone gravel		A	1.3 1.5				
96	2	Below 2.5m: extremely weathered shale							
95	3								
	3.6	SHALE: dark grey and mottled orange, thinly laminated, very low to low strength, highly weathered then moderately weathered, highy fractured, Ashfield Shale			3.6				
94	4			C	3.88		PL(A) = 0.1		
	4.37				4.1 4.43		PL(A) = 0.1		
93	5	Below 5.0m: pale to dark grey, slightly weathered		C	4.94		PL(A) = <0.1	06-06-23	Bentonite 0.5-10.6m
					5.6 5.77		PL(A) = 0.1		
92	6	Below 6.0m: fresh		C					
91	7				6.94 7.15		PL(A) = <0.1		
				C	7.77		PL(A) = 0.1		
90	8				8.42 8.62		PL(A) = 0.1		
89	9			C	9.49		PL(A) = <0.1		
	10.0								

RIG: Geo 205 **DRILLER:** Ground Test **LOGGED:** ECB **CASING:** PVC to 3.4m

TYPE OF BORING: Diatube to 0.02m, Solid flight augering to 1.5m, Wash boring to 3.6m, NMLC coring to 23.31m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Groundwater well installed to 23.3m. Screen 11.3m - 22.3m. Solid PVC 0.5m - 11.3m. Sand to 10.3m. Bentonite to 0.5m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 98.1 m AHD
EASTING: 333534.6
NORTHING: 6255480
DIP/AZIMUTH: 90°/--

BORE No: BH105
PROJECT No: 86645.03
DATE: 31/5 - 6/6/2023
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
88	10.24	SHALE: pale to dark grey, thinly laminated, very low to low strength,fresh, highy fractured, Ashfield Shale		C	10.19				
					10.51		PL(A) = <0.1		
87	11			C					11
					11.42		PL(A) = 0.2		
		Below 11.5m: low strength, slightly fractured			11.67				
					11.81		PL(A) = 0.1		
86	12			C					12
		Below 12.5m: medium and high strength			12.78		PL(A) = 0.7		
85	13				13.0		PL(A) = 1		13
					13.22				
84	14			C	13.92		PL(A) = 1.7		14
					14.53		PL(A) = 1.5		
		Between 14.67 and 14.77m: pyrite inclusions		C	14.79				
83	15				14.84				15
				C					
					15.44				
82	16			C	15.88		PL(A) = 0.6		16
					16.13		PL(A) = 0.5		
					16.31				
81	17			C					17 Gravel 10.3-23.31m
	17.41	SILTSTONE: grey, thickly laminated, medium strength, fresh, fractured, Mittagong Formation			17.42		PL(A) = 0.4		Machine slotted PVC screen 11.31-23.31m
	17.9				17.91				
80	18	SANDSTONE: fine to medium grained, pale grey and grey, thinly cross-bedded, with siltstone laminations (40%), medium to high and high strength, fresh, slightly fractured then unbroken, Hawkesbury Sandstone		C	18.53		PL(A) = 1		18
79	19				19.0		PL(A) = 0.4		19
					19.43				
				C	19.6		PL(A) = 1.3		
	20.0								

RIG: Geo 205 **DRILLER:** Ground Test **LOGGED:** ECB **CASING:** PVC to 3.4m

TYPE OF BORING: Diatube to 0.02m, Solid flight augering to 1.5m, Wash boring to 3.6m, NMLC coring to 23.31m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Groundwater well installed to 23.3m. Screen 11.3m - 22.3m. Solid PVC 0.5m - 11.3m. Sand to 10.3m. Bentonite to 0.5m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 98.1 m AHD
EASTING: 333534.6
NORTHING: 6255480
DIP/AZIMUTH: 90°/--

BORE No: BH105
PROJECT No: 86645.03
DATE: 31/5 - 6/6/2023
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
78		SANDSTONE: refer above							
				C	20.43		PL(A) = 0.7		
	20.6	SANDSTONE: medium grained, pale grey, cross-bedded, trace siltstone laminations, high strength, fresh, unbroken, Hawkesbury Sandstone			20.87				
77	21	Below 20.61m: minor siltstone laminations			20.95		PL(A) = 1.5		21
				C					
76	22				21.95		PL(A) = 1.3		22
					22.3				
				C					
75	23				22.95		PL(A) = 1.1		23
	23.31				23.26		PL(A) = 1.4		End cap
		Bore discontinued at 23.31m - target depth reached			23.31				
74	24								24
73	25								25
72	26								26
71	27								27
70	28								28
69	29								29

RIG: Geo 205 **DRILLER:** Ground Test **LOGGED:** ECB **CASING:** PVC to 3.4m

TYPE OF BORING: Diatube to 0.02m, Solid flight augering to 1.5m, Wash boring to 3.6m, NMLC coring to 23.31m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Groundwater well installed to 23.3m. Screen 11.3m - 22.3m. Solid PVC 0.5m - 11.3m. Sand to 10.3m. Bentonite to 0.5m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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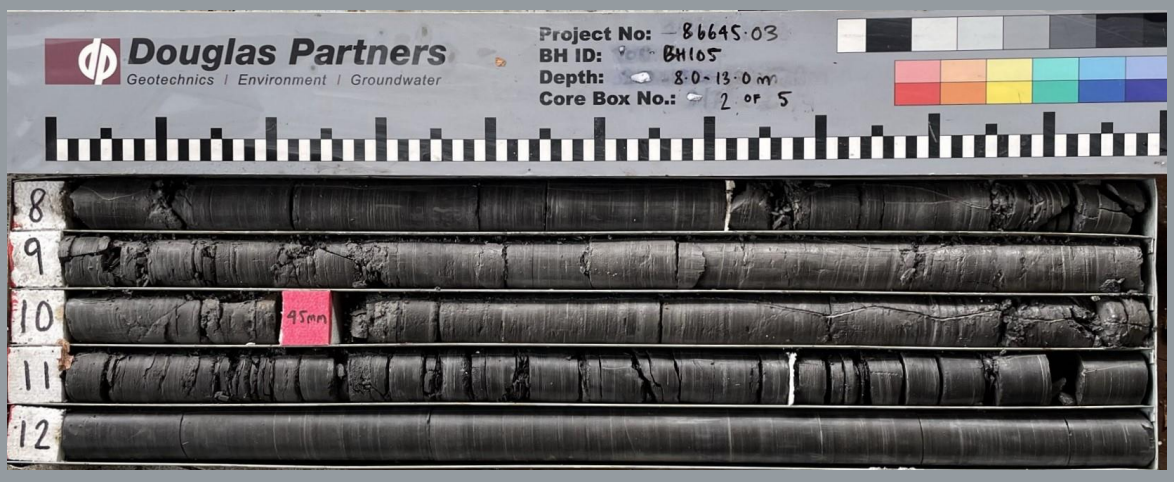
BORE: BH105 PROJECT: 86645.03 JUNE 2023

3.6 – 8.0m

BORE: BH105 PROJECT: 86645.03 JUNE 2023



8.0 – 13.0m

BORE: BH105 PROJECT: 86645.03 JUNE 2023

13.0 – 18.0m

BORE: BH105 PROJECT: 86645.03 JUNE 2023

18.0 – 23.0m

BORE: BH105 PROJECT: 86645.03 JUNE 2023

23.0 –23.31m

BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 96.8 m AHD
EASTING: 333580
NORTHING: 62255395
DIP/AZIMUTH: 90°/--

BORE No: BH106
PROJECT No: 86645.03
DATE: 7 - 15/6/2023
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
96	0.02	TILE: 20mm thick										
	0.25	FILL/CONCRETE: 230mm thick with steel reinforcement										
		VOID: 750mm										
95	1.0	FILL/Silty SAND: fine to medium, brown-grey, with sub-angular to sub-rounded brick, ceramic and igneous gravel, dry, apparently loose							E			
		At 1.5m: asbestos fragment observed							E			
	1.9	FILL/GRAVEL: dark grey, sub-angular igneous gravel, dry, apparently medium dense							C			
94	2.5	Silty CLAY CL: medium plasticity, brown, with rootlet, w > PL, apparently firm, residual							C			
		Below 3.2m: brown and red mottled grey, with ironstone gravel, apparently very stiff										
93	3.7	Silty CLAY CL: medium to high plasticity, pale grey and red, with ironstone gravel, w~PL, apparently hard, residual						Unless otherwise stated, discontinuities comprise (B0-10°, pl/un, sm/ro/he, cln or fe stn, cly vn) and (J20-60°, pl, sm/he, cln or fe stn or cly vn)				
92	4.9	SHALE: pale grey, grey and pale brown, thinly laminated, very low to low strength, highly weathered with extremely weathered bands, highly fractured, Ashfield Shale						4.98m: J75°, pl, sm, cln 5.11-5.34m: J65°, pl, sm, fe stn and fg 5.38m: J70°, pl, sm, cln 5.51-5.69m: J70-75°, pl, sm, fe stn, cly vn 5.73m: J90°, ir, sm, fe stn 5.83m: Cs 70mm 5.92m: J70°, pl, sm, fe stn 6.02-6.13m: J80-85°, pl, sm, fe stn 6.33m: Cs 30mm 6.77-6.87m: J80°, pl, sm, cln	C	100	43	PL(A) = <0.1 PL(A) = 0.4
91	6	Below 6.5m: pale grey and dark grey, moderately weathered							C	100	85	PL(A) = 0.1
90	7											PL(A) = 0.1
89	7.8	SHALE: dark grey and pale grey, thinly laminated, very low strength, slightly weathered with an extremely weathered band, highly fractured, Ashfield Shale						7.63-7.80m: Fg 170mm 7.8m: CORE LOSS: 130mm 8.02m: Cs 20mm 8.28-8.38m: J60-80°, pl, sm, cln 8.57m: Cs 20mm 8.71m: J80°, pl, sm, cln 8.75m: Cs 20mm 8.8m: J60°, pl, sm, cln 8.96m: B5°, pl, he, cly ctg 5mm	C	89	49	PL(A) = 0.1
88	9											
87	9.8	SHALE: *refer next page*						9.04-10.00m: J80°(x2), pl, sm, cly 9.67m: Cs 10mm	C	100	57	PL(A) = 0.1
	10.0											

RIG: Geo 205 **DRILLER:** Ground Test **LOGGED:** ECB/YB **CASING:** PVC to 1.9m

TYPE OF BORING: Diatube to 0.25m, Hand auger to 1.9m, NMLC to 3.6m, Wash boring to 4.5m, NMLC to 22.30m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 100% water loss after 13.45m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 96.8 m AHD
EASTING: 333580
NORTHING: 62255395
DIP/AZIMUTH: 90°/--

BORE No: BH106
PROJECT No: 86645.03
DATE: 7 - 15/6/2023
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
86		SHALE: dark grey and pale grey, thinly laminated, very low to low strength, fresh with extremely weathered bands, fractured, Ashfield Shale At 10.03m: tuff layer, 5mm						10.21-10.34m: J70-80°, pl, sm, cly vn 10.34m: Cs 20mm 10.53m: B0°, pl, sm, cly ctg 5mm 10.49-10.63m: J70-80°, cu, sm, cly vn 10.56m: Ds 70mm 11.08m: Cs 20mm 11.10-11-30: J45-80°(x4), pl, sm, cln 11.46m: Cs 20mm	C	100	57	
	11								C	100	74	PL(A) = 0.1 PL(A) = 0.1
85	12							11.8m: J70-80°, pl, sm, cln 11.77-12.00m: J70-80°, pl, sm, cln 12.18m: J50°, pl, he, cln 12.25m: Cs 50mm 12.25-12.66m: J70-80°(x2), pl, sm, cln 12.76m: B0°, pl, he, cly ctg 5mm 12.78m: Cs 80mm	C	100	76	PL(A) = 0.2
84	13											
83	14							13.66m: Cs 20mm 13.73m: J70-80°, pl, sm, cln 13.70-14.22m: J70-80°(x2), pl, sm, cln 14.22-14.34m: Ds 120mm 14.57m: B0°, pl, he, cly inf 5mm	C	100	78	PL(A) = 0.2 PL(A) = 0.1
	14.3	SILTSTONE: dark grey and pale grey, thickly laminated, low strength, fresh, slightly fractured, Mittagong Formation										
82	15											
	15.62	SANDSTONE: fine to medium grained, pale grey, distinctly and indistinctly bedded, with siltstone laminations, very low and low strength, fresh with extremely weathered bands, slightly fractured, Mittagong Formation						15.62-15.88m: Ds 260mm 16.16m: J45°, pl, ro, cly inf 5mm	C	100	84	PL(A) = <0.1
81	16											
	17							17.25m: B10°, pl, ro, cbs vn 17.36m: Ds 80mm 17.38-17.40m: B5°(x2), pl, he, cbs vn 17.55m: B5°, pl, he, cly inf 5mm 17.62m: Ds 40mm 17.66-17.92m: J70-80°, pl, ro, cln 17.84m: Ds 40mm 18.22m: Ds 50mm 18.46m: J45°, pl, ro, cly inf 5mm 18.91m: B5°, pl, ro, cbs vn 19.18m: B5°, pl, he, cbs vn	C	100	81	PL(A) = 0.1
80	18								C	100	91	PL(A) = 0.2 PL(A) = 0.2
79	19											
	19.0	SANDSTONE: fine to medium grained, pale grey, distinctly and indistinctly bedded, with siltstone laminations, high then medium to high strength, fresh, unbroken, Hawkesbury Sandstone						19.5m: Cs 20mm	C	100	99	PL(A) = 1
78												
77												

RIG: Geo 205 **DRILLER:** Ground Test **LOGGED:** ECB/YB **CASING:** PVC to 1.9m

TYPE OF BORING: Diatube to 0.25m, Hand auger to 1.9m, NMLC to 3.6m, Wash boring to 4.5m, NMLC to 22.30m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 100% water loss after 13.45m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Deicorp Pty Ltd
PROJECT: Fiveways Crows Nest
LOCATION: Pacific Highway, Alexander St, Falcon St, Crows Nest

SURFACE LEVEL: 96.8 m AHD
EASTING: 333580
NORTHING: 62255395
DIP/AZIMUTH: 90°/--

BORE No: BH106
PROJECT No: 86645.03
DATE: 7 - 15/6/2023
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
76	21	SANDSTONE: fine to medium grained, pale grey, distinctly and indistinctly bedded, with siltstone laminations, high then medium to high strength, fresh, unbroken, Hawkesbury Sandstone *(continued)*							C	100	99	PL(A) = 0.9
								21.13m: Ds 40mm				
75	22								C	100	97	PL(A) = 0.9
	22.3	Bore discontinued at 22.3m - target depth reached										PL(A) = 0.4
74	23											
73	24											
72	25											
71	26											
70	27											
69	28											
68	29											
67												

RIG: Geo 205 **DRILLER:** Ground Test **LOGGED:** ECB/YB **CASING:** PVC to 1.9m

TYPE OF BORING: Diatube to 0.25m, Hand auger to 1.9m, NMLC to 3.6m, Wash boring to 4.5m, NMLC to 22.30m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 100% water loss after 13.45m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BORE: BH106 PROJECT: 86645.03 JUNE 2023

4.5 – 9.0m

BORE: BH106 PROJECT: 86645.03 JUNE 2023

9.0 – 14.0m

BORE: BH106 PROJECT: 86645.03 JUNE 2023

13.0 – 18.0m

BORE: BH106 PROJECT: 86645.03 JUNE 2023

19.0 – 22.3m

Appendix E

Laboratory Test Results

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 325574

Client Details

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

Sample Details

Your Reference	**86645.03 Crows Nest**
Number of Samples	3 Water, 3 Soil
Date samples received	14/06/2023
Date completed instructions received	14/06/2023

Analysis Details

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

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

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

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

Report Details

Date results requested by	21/06/2023
Date of Issue	21/06/2023

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

Results Approved By
Diego Bigolin, Inorganics Supervisor

Authorised By
Nancy Zhang, Laboratory Manager

Miscellaneous Inorganics				
Our Reference		325574-1	325574-2	325574-3
Your Reference	UNITS	BH103	BH104	BH105
Depth		-	-	-
Date Sampled		14/06/2023	25/05/2023	09/06/2023
Type of sample		Water	Water	Water
Date prepared	-	14/06/2023	14/06/2023	14/06/2023
Date analysed	-	14/06/2023	14/06/2023	14/06/2023
pH	pH Units	6.0	7.1	6.3
Electrical Conductivity	µS/cm	2,000	1,800	2,500
Chloride, Cl	mg/L	540	260	630
Sulphate, SO4	mg/L	97	320	190

Misc Inorg - Soil				
Our Reference		325574-4	325574-5	325574-6
Your Reference	UNITS	BH102	BH103	BH105
Depth		0.9-1	2.5-2.95	1.3-1.5
Date Sampled		15/05/2023	11/05/2023	31/05/2023
Type of sample		Soil	Soil	Soil
Date prepared	-	19/06/2023	19/06/2023	19/06/2023
Date analysed	-	19/06/2023	19/06/2023	19/06/2023
pH 1:5 soil:water	pH Units	4.9	5.1	4.6
Electrical Conductivity 1:5 soil:water	µS/cm	170	27	85
Chloride, Cl 1:5 soil:water	mg/kg	20	22	10
Sulphate, SO4 1:5 soil:water	mg/kg	180	10	62

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

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			14/06/2023	2	14/06/2023	14/06/2023		14/06/2023	[NT]
Date analysed	-			14/06/2023	2	14/06/2023	14/06/2023		14/06/2023	[NT]
pH	pH Units		Inorg-001	[NT]	2	7.1	7.1	0	101	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	<1	2	1800	1800	0	100	[NT]
Chloride, Cl	mg/L	1	Inorg-081	<1	2	260	[NT]		99	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	2	320	[NT]		91	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			19/06/2023	4	19/06/2023	19/06/2023		19/06/2023	[NT]
Date analysed	-			19/06/2023	4	19/06/2023	19/06/2023		19/06/2023	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	4	4.9	4.9	0	100	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	4	170	180	6	104	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	4	20	22	10	99	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	4	180	180	0	91	[NT]

Result Definitions

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

Quality Control Definitions

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

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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

Report Comments

Samples received in good order: Holding time exceedance

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

Client: Delcorp Pty Ltd
Project: Fiveways
Location: Falcon Street, Crows Nest NSW

Project No: 86645.03
Report No: 86645.03_10155
Report Date: 06.06.2023
Date of Testing: 31.05.2023
Date Sampled: 15, 17, 19.05.2023

Approved Signatory:

Peter Gorseski
peter.gorseski@douglaspartners.com.au

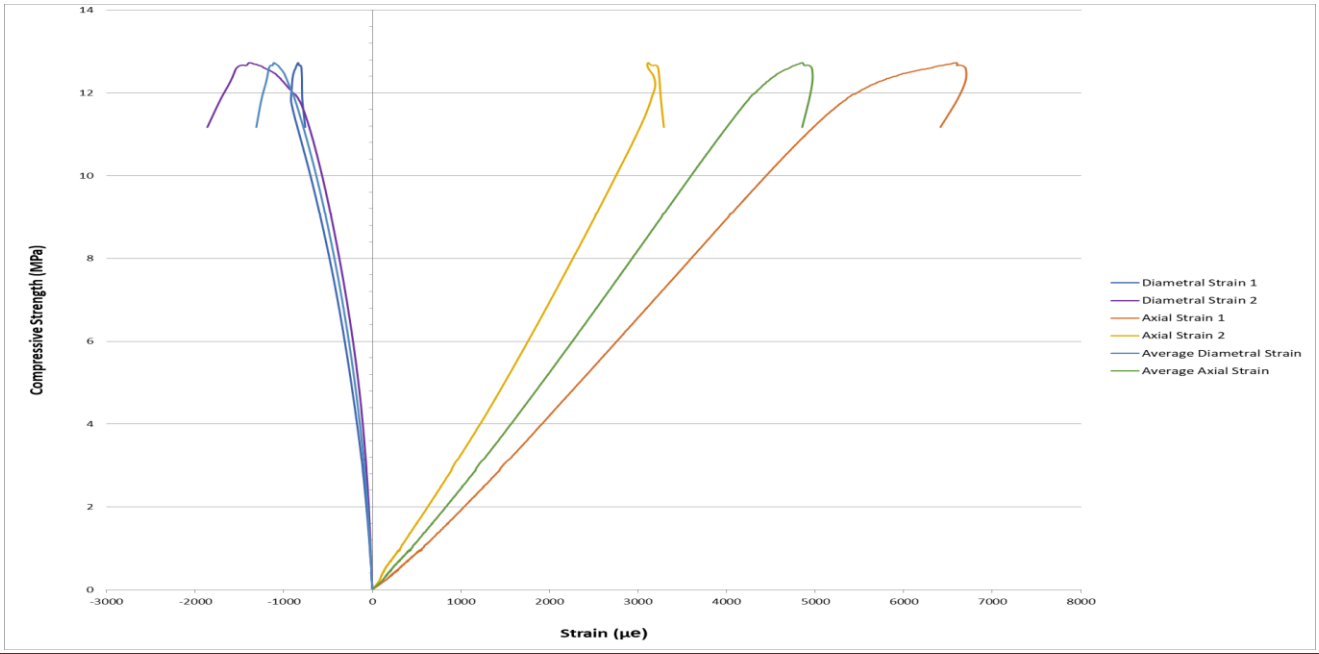
Accredited for Compliance with ISOIEC 17025 - Testing
NATA Accredited Laboratory Number: 828

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

Sample Number	NC-10155A	
Sample Location	BH102	
Depth (m)	17.0 - 17.3	
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	136
Height to Diameter Ratio	2.6 : 1	
Moisture Content (%)	6.5	
Wet Mass / Unit Volume (t/m3)	2.36	
Dry Mass / Unit Volume (t/m3)	2.22	
Test Duraton (sec)	386	
Load Rate - kN/sec	0.07	
Failure Mode	Mixed Mode	
Uniaxial Compressive Strength (MPa)	**12.7**	
SECANT MODULUS (50% load)		
Young's modulus (Gpa)	**2.6**	
Poisson's ratio	**0.12**	
TANGENT MODULUS (35 - 65% load)		
Young's modulus (Gpa)	**2.9**	
Poisson's ratio	**0.22**	

Before

After



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

Client: Delcorp Pty Ltd
Project: Fiveways
Location: Falcon Street, Crows Nest NSW

Project No: 86645.03
Report No: 86645.03_10155
Report Date: 06.06.2023
Date of Testing: 31.05.2023
Date Sampled: 15, 17, 19.05.2023

Approved Signatory:

Peter Gorseski
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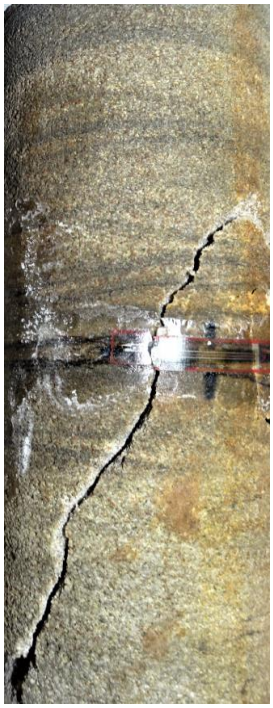
NATA Accredited Laboratory Number: 828

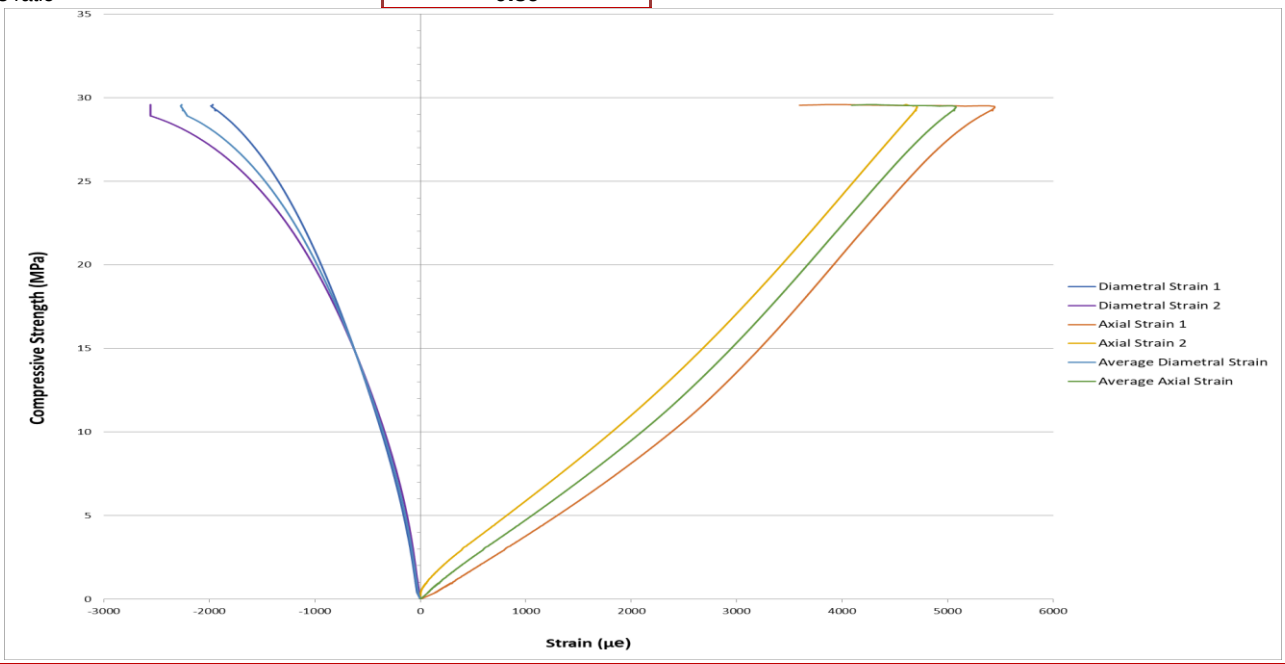
Young's Modulus + Poisson Ratio and UCS (<50 MPa) AS 4133.4.3.2

Sample Number	NC-10155B	
Sample Location	BH103	
Depth (m)	19.12 - 19.34	
Rock Description	Sandstone	
Storage History	Wrapped in Plastic	
Conditioning	Tested as Received	
Compression Machine	Automax Multitest	
Measurement	Electric Strain Gauges	
Specimen Diameter / Height (mm)	52.0	140
Height to Diameter Ratio	2.7 : 1	
Moisture Content (%)	2.9	
Wet Mass / Unit Volume (t/m3)	2.47	
Dry Mass / Unit Volume (t/m3)	2.41	
Test Duraton (sec)	740	
Load Rate - kN/sec	0.08	
Failure Mode	Shear	
Uniaxial Compressive Strength (MPa)	**29.5**	
SECANT MODULUS (50% load)		
Young's modulus (Gpa)	**5.1**	
Poisson's ratio	**0.21**	
TANGENT MODULUS (35 - 65% load)		
Young's modulus (Gpa)	**6.4**	
Poisson's ratio	**0.39**	

Before

After





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

Client: Delcorp Pty Ltd
Project: Fiveways
Location: Falcon Street, Crows Nest NSW

Project No: 86645.03
Report No: 86645.03_10155
Report Date: 06.06.2023
Date of Testing: 31.05.2023
Date Sampled: 15, 17, 19.05.2023

Approved Signatory:

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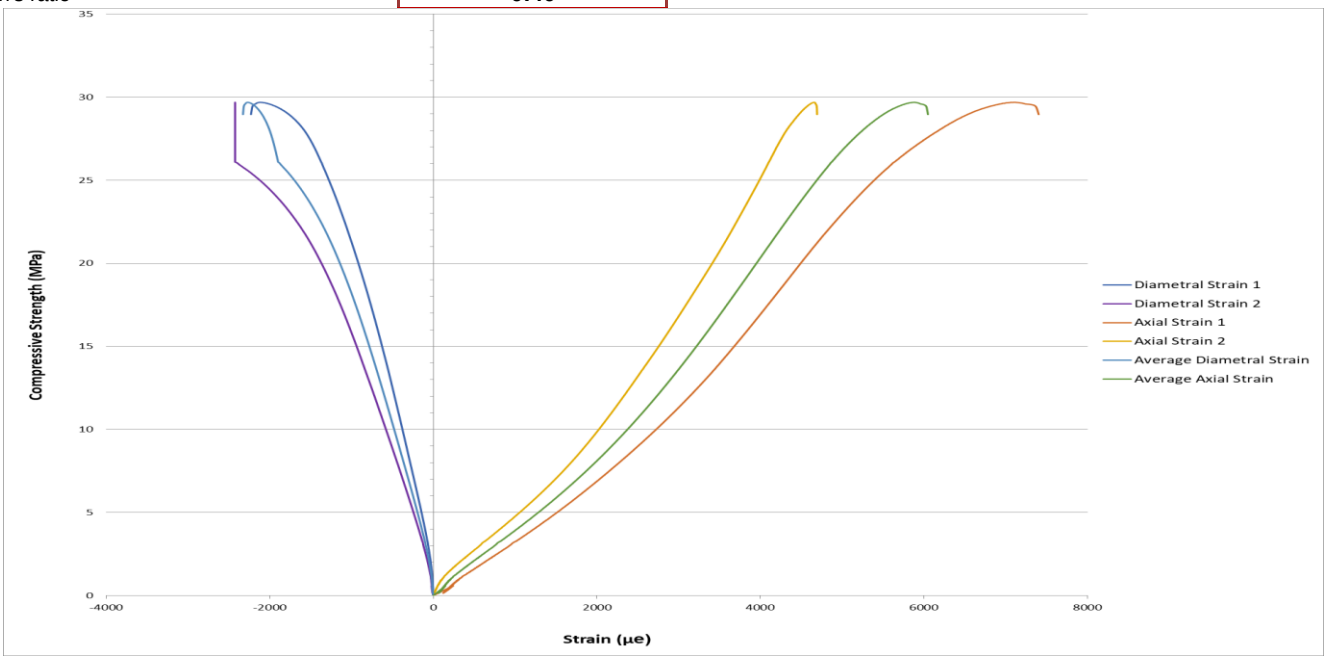
NATA Accredited Laboratory Number: 828

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

Sample Number	NC-10155C	
Sample Location	BH104	
Depth (m)	16.22 - 16.46	
Rock Description	Sandstone	
Storage History	Wrapped in Plastic	
Conditioning	Tested as Received	
Compression Machine	Automax Multitest	
Measurement	Electric Strain Gauges	
Specimen Diameter / Height (mm)	52.0	138
Height to Diameter Ratio	2.7 : 1	
Moisture Content (%)	3.8	
Wet Mass / Unit Volume (t/m3)	2.44	
Dry Mass / Unit Volume (t/m3)	2.35	
Test Duraton (sec)	744	
Load Rate - kN/sec	0.08	
Failure Mode	Shear	
Uniaxial Compressive Strength (MPa)	**29.6**	
SECANT MODULUS (50% load)		
Young's modulus (Gpa)	**4.6**	
Poisson's ratio	**0.24**	
TANGENT MODULUS (35 - 65% load)		
Young's modulus (Gpa)	**6.3**	
Poisson's ratio	**0.40**	

Before

After



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

Client: Delcorp Pty Ltd
Project: Fiveways
Location: Falcon Street, Crows Nest NSW

Project No: 86645.03
Report No: 86645.03_10287
Report Date: 27.06.2023
Date of Testing: 23.06.2023
Date Sampled: -

Approved Signatory:

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Accredited for Compliance with ISOIEC 17025 - Testing
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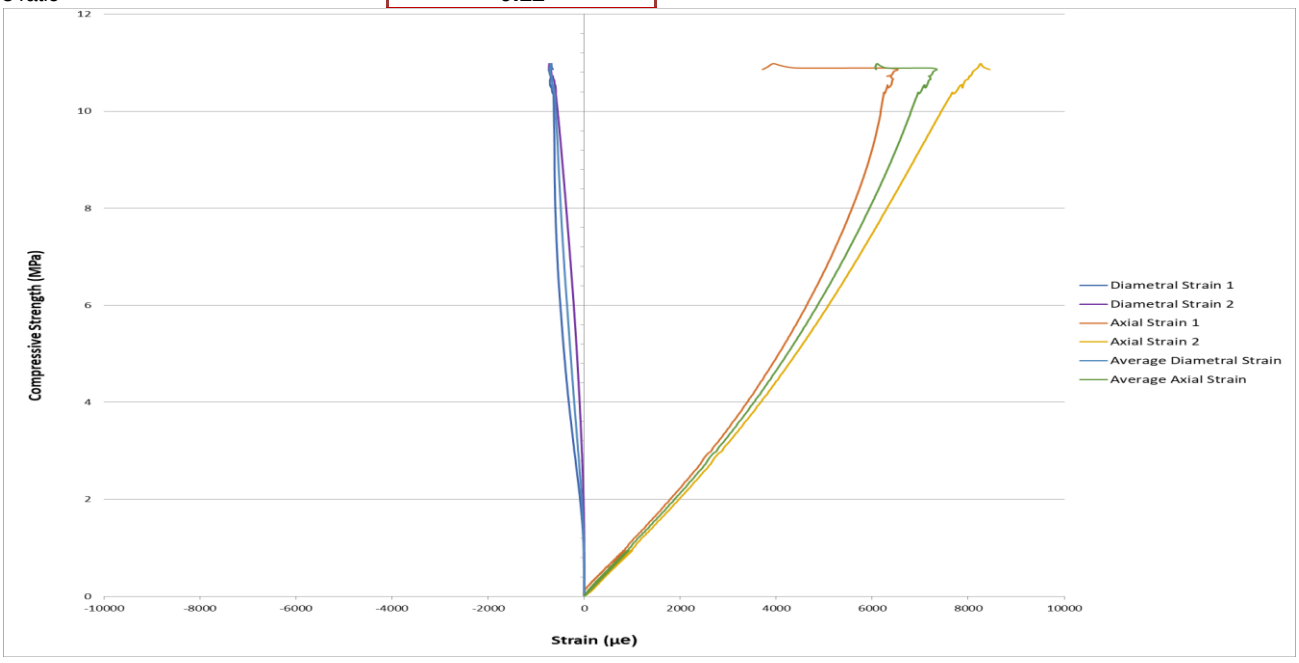
Young's Modulus + Poisson Ratio and UCS (<50 MPa) AS 4133.4.3.2

Sample Number	NC-10287D	
Sample Location	BH105	
Depth (m)	12.47 - 12.79	
Rock Description	Siltstone	
Storage History	Wrapped in Plastic	
Conditioning	Tested as Received	
Compression Machine	Automax Multitest	
Measurement	Electric Strain Gauges	
Specimen Diameter / Height (mm)	51.9	143
Height to Diameter Ratio	2.8 : 1	
Moisture Content (%)	3.9	
Wet Mass / Unit Volume (t/m3)	2.54	
Dry Mass / Unit Volume (t/m3)	2.45	
Test Duraton (sec)	366	
Load Rate - kN/sec	0.06	
Failure Mode	Shear	
Uniaxial Compressive Strength (MPa)	**10.8**	
SECANT MODULUS (50% load)		
Young's modulus (Gpa)	**1.2**	
Poisson's ratio	**0.07**	
TANGENT MODULUS (35 - 65% load)		
Young's modulus (Gpa)	**1.6**	
Poisson's ratio	**0.12**	

Before

After



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

Client: Delcorp Pty Ltd
Project: Fiveways
Location: Falcon Street, Crows Nest NSW

Project No: 86645.03
Report No: 86645.03_10287
Report Date: 27.06.2023
Date of Testing: 23.06.2023
Date Sampled: -

Approved Signatory:

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Accredited for Compliance with ISOIEC 17025 - Testing
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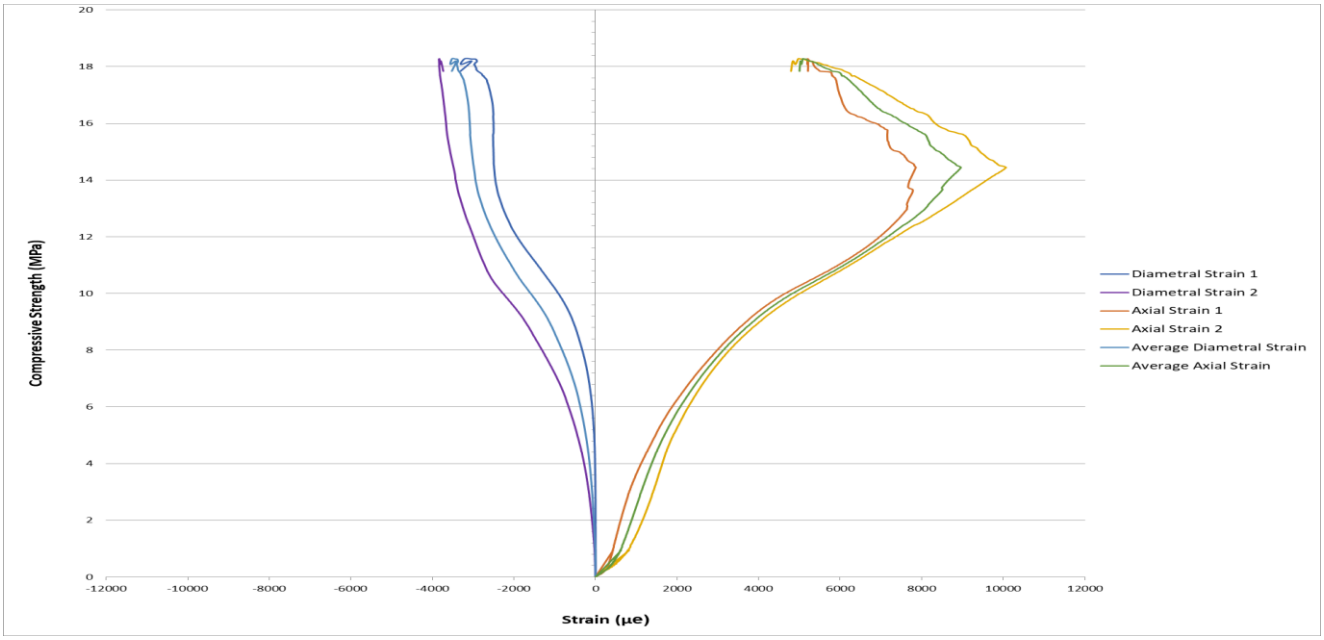
Young's Modulus + Poisson Ratio and UCS (<50 MPa) AS 4133.4.3.2

Sample Number	NC-10287C	
Sample Location	BH105	
Depth (m)	16.02 - 16.31	
Rock Description	Siltstone	
Storage History	Wrapped in Plastic	
Conditioning	Tested as Received	
Compression Machine	Automax Multitest	
Measurement	Electric Strain Gauges	
Specimen Diameter / Height (mm)	51.9	116
Height to Diameter Ratio	2.2 : 1	
Moisture Content (%)	3.3	
Wet Mass / Unit Volume (t/m3)	2.61	
Dry Mass / Unit Volume (t/m3)	2.53	
Test Duraton (sec)	522	
Load Rate - kN/sec	0.07	
Failure Mode	Tensile	
Uniaxial Compressive Strength (MPa)	**18.1**	
SECANT MODULUS (50% load)		
Young's modulus (Gpa)	**2.3**	
Poisson's ratio	**0.31**	
TANGENT MODULUS (35 - 65% load)		
Young's modulus (Gpa)	**1.1**	
Poisson's ratio	**0.42**	

Before

After



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

Client: Delcorp Pty Ltd
Project: Fiveways
Location: Falcon Street, Crows Nest NSW

Project No: 86645.03
Report No: 86645.03_10287
Report Date: 27.06.2023
Date of Testing: 23.06.2023
Date Sampled: -

Approved Signatory:

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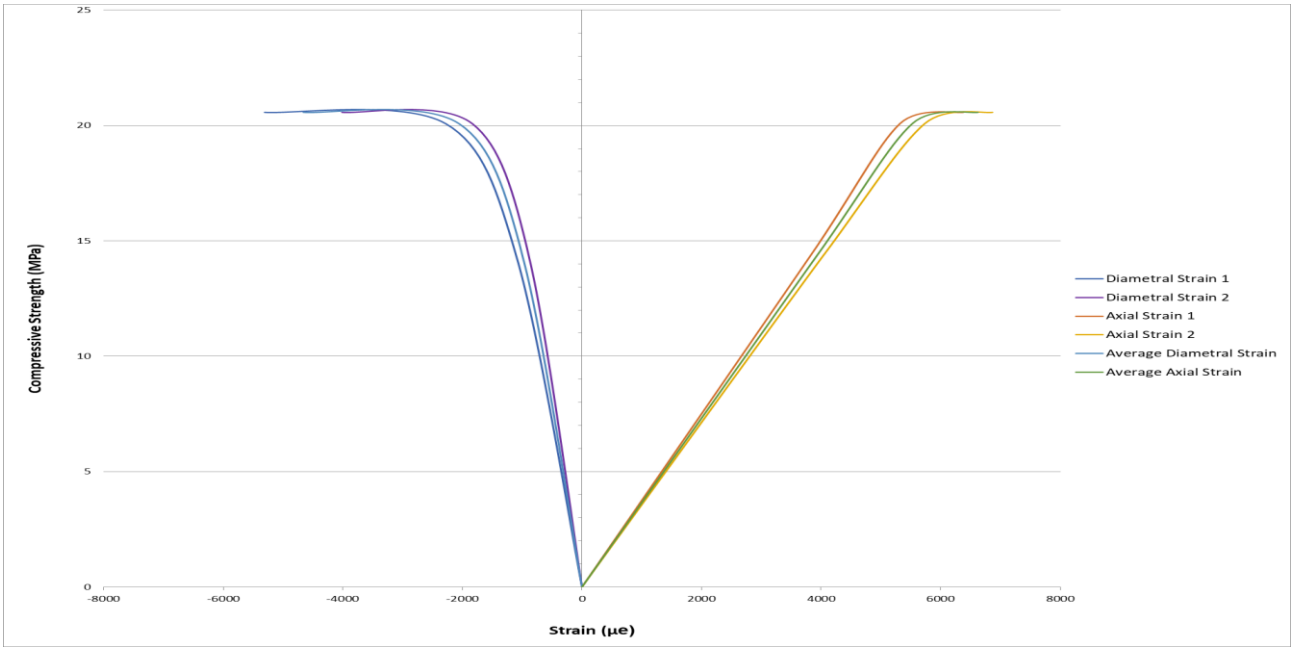
Accredited for Compliance with ISOIEC 17025 - Testing
NATA Accredited Laboratory Number: 828

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

Sample Number	NC-10287B	
Sample Location	BH106	
Depth (m)	21.63 - 21.93	
Rock Description	Sandstone	
Storage History	Wrapped in Plastic	
Conditioning	Tested as Received	
Compression Machine	Automax Multitest	
Measurement	Electric Strain Gauges	
Specimen Diameter / Height (mm)	51.9	140
Height to Diameter Ratio	2.7 : 1	
Moisture Content (%)	5.4	
Wet Mass / Unit Volume (t/m3)	2.34	
Dry Mass / Unit Volume (t/m3)	2.22	
Test Duraton (sec)	548	
Load Rate - kN/sec	0.07	
Failure Mode	Shear	
Uniaxial Compressive Strength (MPa)	**20.5**	
SECANT MODULUS (50% load)		
Young's modulus (Gpa)	**3.7**	
Poisson's ratio	**0.25**	
TANGENT MODULUS (35 - 65% load)		
Young's modulus (Gpa)	**4.4**	
Poisson's ratio	**0.31**	

Before

After



Appendix F

Permeability Test Results

Douglas Partners
Geotechnics / Environment / Groundwater

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising or Falling Head Test Report

Client:	Deicorp Properties	Project No:	86645.03
Project:	Proposed Residential Development	Test date:	09.06.2023
Location:	391-423 Pacific Hwy, 3-15 Falson Street	Tested by:	YB

Test Location

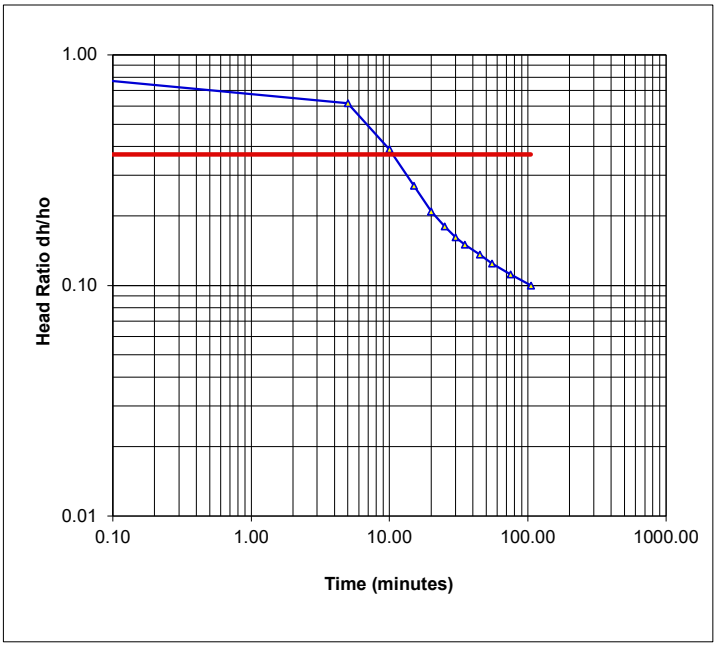
Description:	Standpipe in borehole	**Test No.**	BH103	
Material type:	Clay over Siltstone over Sandstone	Easting:	333582	m
		Northing	6255420	m
		Surface Level:	96	m AHD

Details of Well Installation

Well casing diameter (2r)	50	mm	Depth to water before test	7.8	m
Well screen diameter (2R)	96	mm	Depth to water at start of test	16.4	m
Length of well screen (Le)	18	m			

Test Results

Time (min)	Depth (m)	Change in Head: δH (m)	δH/Ho
0.00	16.40	8.60	1.000
5.00	13.1	5.30	0.616
10.00	11.15	3.35	0.390
15.00	10.13	2.33	0.271
20.00	9.6	1.80	0.209
25.00	9.35	1.55	0.180
30.00	9.19	1.39	0.162
35.00	9.09	1.29	0.150
45.00	8.97	1.17	0.136
55.00	8.87	1.07	0.124
75.00	8.76	0.96	0.112
105.00	8.66	0.86	0.100



To = 10 mins
600 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**1.7E-07**	m/sec
	=	**0.062**	cm/hour

Douglas Partners
Geotechnics / Environment / Groundwater

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Permeability Testing - Rising or Falling Head Test Report

Client:	Deicorp Properties	Project No:	86645.03
Project:	Proposed Residential Development	Test date:	09.06.2023
Location:	391-423 Pacific Hwy, 3-15 Falson Street	Tested by:	YB

Test Location

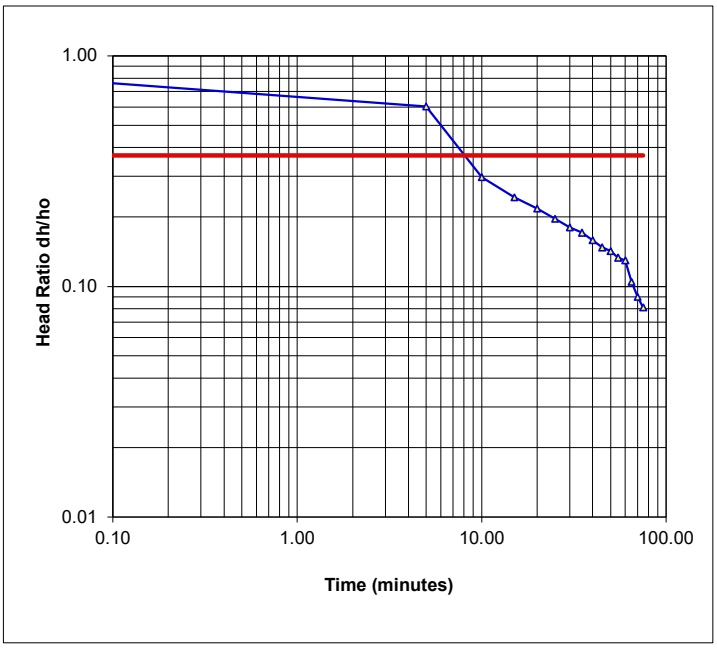
Description:	Standpipe in borehole	**Test No.**	BH105	
Material type:	Silty Clay over Siltstone	Easting:	333534	m
		Northing	6255480	m
		Surface Level:	98.1	m AHD

Details of Well Installation

Well casing diameter (2r)	50	mm	Depth to water before test	5.11	m
Well screen diameter (2R)	96	mm	Depth to water at start of test	10.66	m
Length of well screen (Le)	12	m			

Test Results

Time (min)	Depth (m)	Change in Head: δH (m)	δH/Ho
0.00	10.66	5.55	1.000
5.00	8.46	3.35	0.604
10.00	6.76	1.65	0.297
15.00	6.46	1.35	0.243
20.00	6.32	1.21	0.218
25.00	6.2	1.09	0.196
30.00	6.11	1.00	0.180
35.00	6.06	0.95	0.171
40.00	5.99	0.88	0.159
45.00	5.93	0.82	0.148
50.00	5.9	0.79	0.142
55.00	5.85	0.74	0.133
60.00	5.83	0.72	0.130
65.00	5.69	0.58	0.105
70.00	5.61	0.5	0.090
75.00	5.56	0.45	0.081



To = 8 mins
480 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**3.0E-07**	m/sec
	=	**0.108**	cm/hour

WATER PRESSURE TEST RESULTS

Client :	Deicorp Pty Ltd	Field input sheet only	**Project No. :**	86645.03
Project :	Fiveways, Crows Nest		**Bore :**	BH104
Location :	8 Alexander St, Crows Nest		**Test section :**	14.5 m - 18.85 m

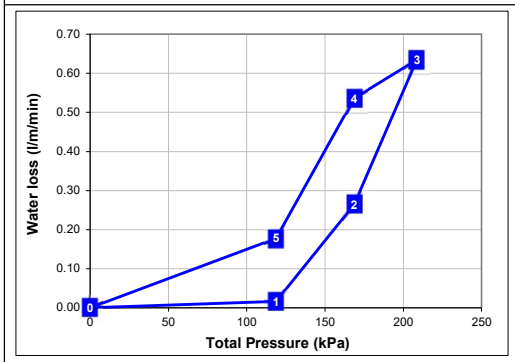
Test Details

Date:	18-May-23	Bottom of packer (m):	14.50	Height of pressure gauge (m):	1.0	Drum Area (m^2):	
Bore diameter (mm):	56	Bore depth (m):	18.85	Vertical Depth to groundwater (m):	6.0		0.264
Bore inclination (deg):	90	Section length (m):	4.35	(or depth to base of packer)			

Hg = gauge pressure, Hl = head loss in rods and packer, Hw = (gauge height + groundwater depth)x 9.81, Total = Hg+Hw-Hl

PRESSURE			Test	FLOW RATES								Water	Lugeons	Approx
				Flowmeter			Drum readings			Leakage	Assigned	Loss		Permeability
Hg	Hl	Total	Duration	Initial	Final	Total	Initial	Final	Equivalent		Flow		(l/m/min at	
(kPa)	(kPa)	(kPa)	(min)	(litres)	(litres)	(litres)	(mm)	(mm)	litres	(litres)	(litres)	(l/m/min)	1000 kPa)	(m/sec)
50	0	119	5	250882.2	250883.6	1.4	780.0	775.0	1		1.4	0.1	0.5	5.4E-08
50	0	119	5	250883.6	250884.1	0.5	775.0	775.0	0		0.0	0.0	0.0	0.0E+00
50	0	119	5	250884.1	250884.2	0.1	775.0	775.0	0		0.0	0.0	0.0	0.0E+00
50	0	119	6	250884.2	250884.2	0.0	775.0	775.0	0		0.0	0.0	0.0	0.0E+00
100	0	169	5	250887.0	250893.2	6.2	765.0	740.0	7		6.2	0.3	1.7	1.7E-07
100	0	169	5	250893.2	250898.5	5.3	740.0	720.0	5		5.3	0.2	1.4	1.4E-07
100	0	169	5	250898.5	250904.2	5.7	720.0	700.0	5		5.7	0.3	1.6	1.6E-07
100	0	169	5	250904.2	250910.3	6.1	700.0	690.0	3		6.1	0.3	1.7	1.7E-07
100	0	169	5	250910.3	250915.8	5.5	690.0	670.0	5		5.5	0.3	1.5	1.5E-07
140	0	209	5	250932.6	250946.9	14.3	605.0	550.0	15		14.3	0.7	3.2	3.2E-07
140	0	209	5	250946.9	250961.1	14.2	550.0	500.0	13		14.2	0.7	3.1	3.1E-07
140	0	209	5	250961.1	250974.4	13.3	500.0	460.0	11		13.3	0.6	2.9	2.9E-07
140	0	209	5	250974.4	250987.8	13.4	460.0	410.0	13		13.4	0.6	3.0	3.0E-07
100	0	169	5	250992.1	251004.1	12.0	390.0	340.0	13		12.0	0.6	3.3	3.3E-07
100	0	169	5	251004.1	251015.6	11.5	340.0	300.0	11		11.5	0.5	3.1	3.1E-07
100	0	169	5	251015.6	251027.1	11.5	300.0	260.0	11		11.5	0.5	3.1	3.1E-07
50	0	119	5	251046.5	251050.4	3.9	500.0	480.0	3		3.9	0.2	1.5	1.5E-07
50	0	119	5	251050.4	251054.2	3.8	480.0	460.0	3		3.8	0.2	1.5	1.5E-07
50	0	119	5	251054.2	251058.1	3.9	460.0	460.0	3		3.9	0.2	1.5	1.5E-07

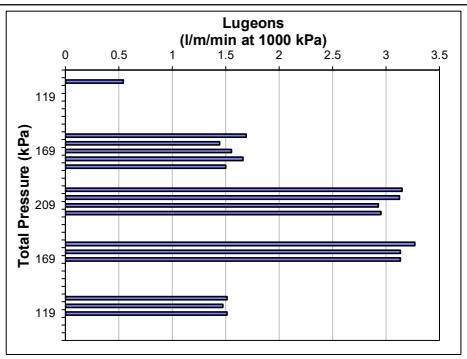
Notes



Averages			
Stage	Pressure (kPa)	Water Loss (l/m/min)	Lugeons (l/m/min at 1000kPa)
1	119	0.02	0.14
2	169	0.26	1.57
3	209	0.63	3.04
4	169	0.54	3.18
5	119	0.18	1.50

Note: If flowmeter readings are less than 1 litre in 5 minutes the drum readings have been used

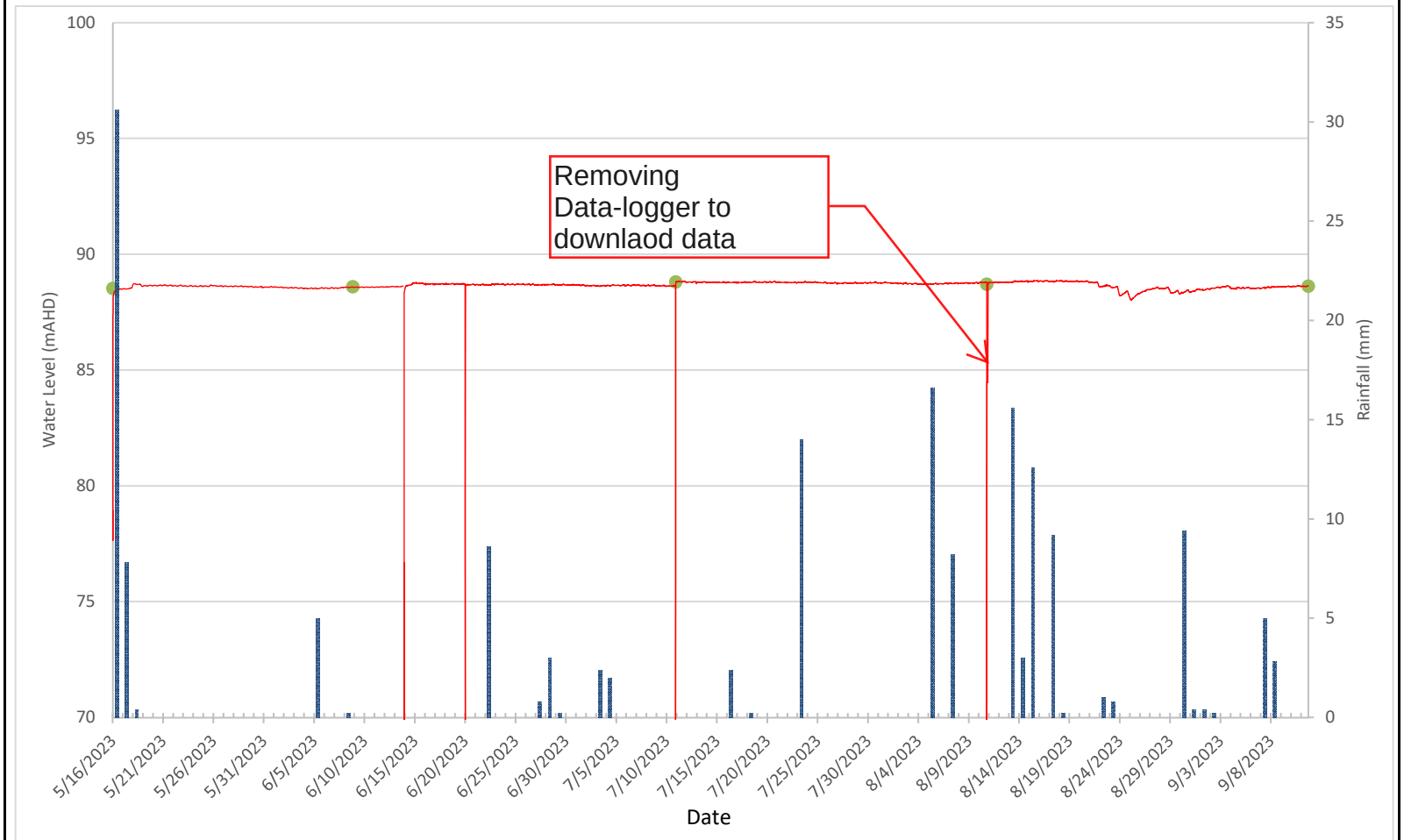
Calculated: YB/EM
Checked:
Date:



Appendix G

Groundwater Monitoring Plots

BH103



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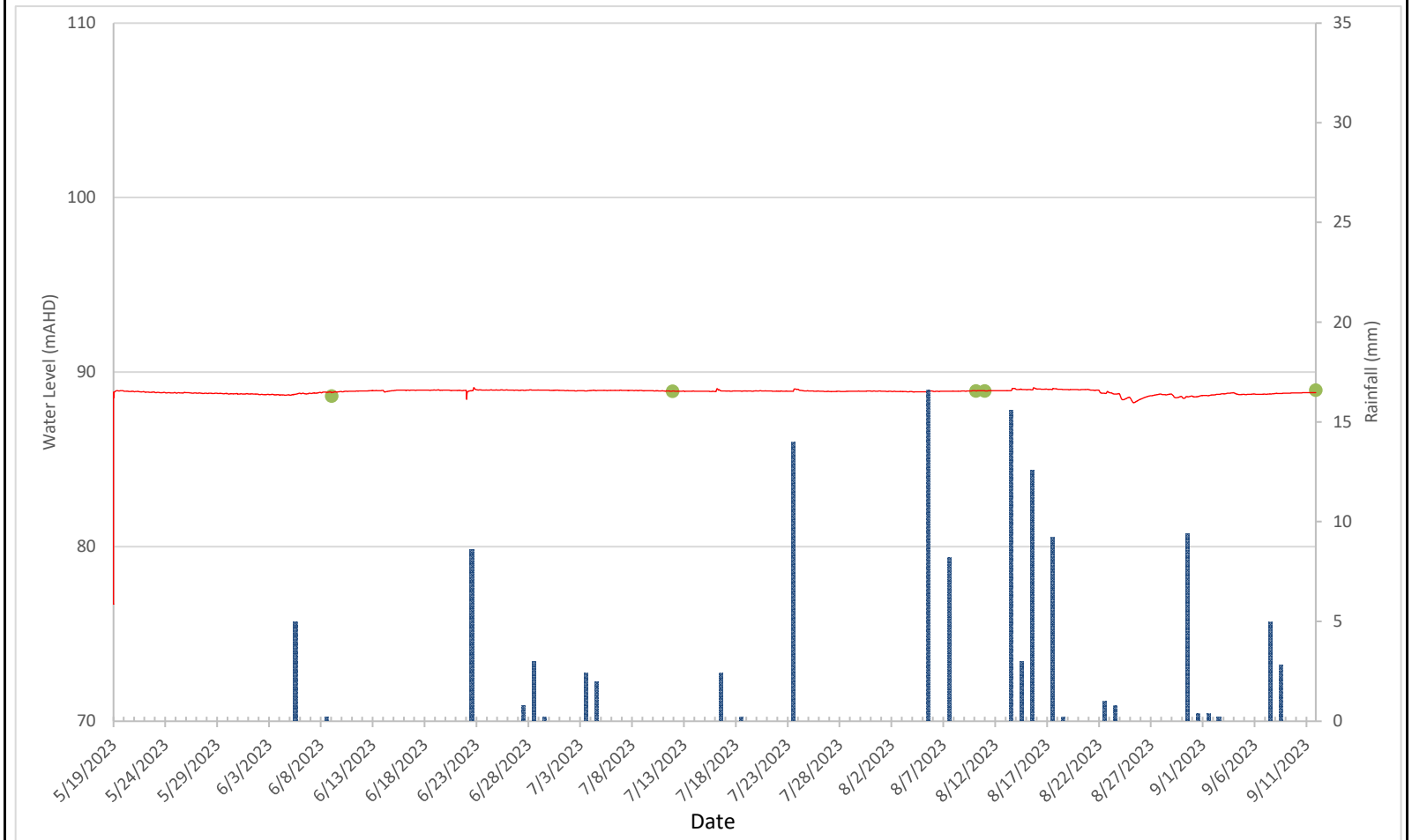
Manual Levels
Water Level
Rainfall data (ST: 66214)

Date:	From	Drawn:
12/09/2023	16/05/2023	ECB
Project:	**To**	**PLOT NR**
86645.03	12/09/2023	1

BH104



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Manual Levels
Water Level
Rainfall data (ST: 66214)

Date:	From	Drawn:
12/09/2023	16/05/2023	ECB
Project:	**To**	**PLOT NR**
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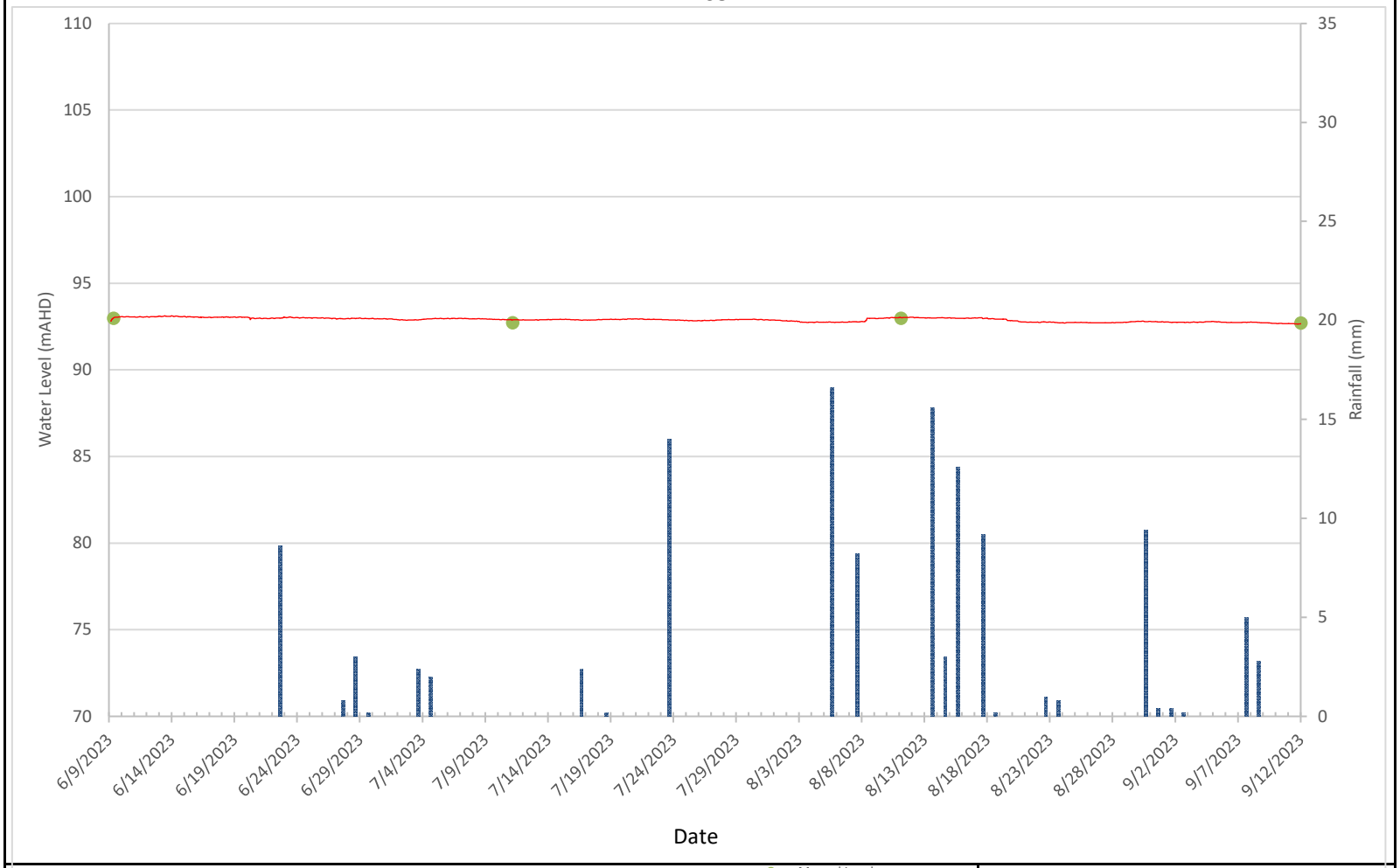
BH05



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Date:	From	Drawn:
12/09/2023	16/05/2023	ECB
Project:	**To**	**PLOT NR**
86645.03	12/09/2023	3