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ENVIRONMENTAL - REMEDIATION - GEOTECHNICAL ENGINEERING - WORK HEALTH & SAFETY - LABORATORIES - DRILLING

ADDITIONAL GEOTECHNICAL INVESTIGATION REPORT

23-25 Church St & 16-18 John Street Mascot, NSW, 2020

Prepared for

C &V Engineering Services Pty Ltd

Report No. GS8023-3A

17/11/2020

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TABLE OF CONTENTS

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LIST OF APPENDICES

APPENDIX A IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL REPORT

APPENDIX B SITE PLAN (FIGURE 1)/ SITE PLANS FROM PREVIOUS GEOTECHNICAL WORKS

APPENDIX C ENGINEERING BOREHOLE LOGS FOR ADDITIONAL GEOTECHNICAL WORKS AND PREVIOUS GEOTECHNICAL WORKS

APPENDIX D POINT LOAD TEST RESULTS FOR ADDITIONAL GEOTECHNICAL WORKS

APPENDIX E ROCK CORE PHOTOGRAPHS FOR ADDITONAL GEOTECHNICAL WORKS

References

1. Australian Standard – AS 1726-2017 Geotechnical Site Investigation.
2. Australian Standard – AS 1170.4-2007 Structural Design Actions – Part 4: Earthquake actions in Australia.
3. Australian Standard – AS3798-2007 Guidelines on Earthworks for Commercial and Residential Developments.
4. Australian Standard – AS 2870-2011 Residential slabs and footings.
5. Australian Standard – AS 2159-2009 Piling - Design and installation.
6. Australian Standard – AS 1289 5.4.1-2007 Soil Compaction and Density Tests – Compaction Control Test – Dry Density Ratio, Moisture Variation and Moisture Ratio.
7. Assessing Vibration: A Technical Guideline, Department of Environment and Conservation NSW, February 2006

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1. INTRODUCTION

Aargus Pty Ltd (Aargus) has been commissioned by **C&V Engineering Services Pty Ltd** to carry out an additional geotechnical site investigation at 23-25 Church Avenue, Mascot, NSW 2020 to fulfil the council requirements.

Aargus has previously carried out the site investigation work at the subject site on 27th and 28th August 2020. Additional site investigation was carried out from 02 Nov 2020 to 04 Nov 2020 and was followed by geotechnical interpretation, assessment and preparation of a geotechnical report.

This report presents the results of the additional geotechnical site investigation, laboratory testing, interpretation, and assessment of the site's existing geotechnical conditions, as a basis to provide recommendations for design and construction of ground structures for the proposed development.

To assist in reading the report, reference should be made to the "Important Information about Your Geotechnical Report" attached as Appendix A.

2. AVAILABLE INFORMATION

Prior to preparation of this report, the following information was made available to Aargus:

- Borehole location plan with drawing number 9349-GR-1-A, Drawing Date: 24/07/2019.
- Geotechnical Review at 23-25 Church Avenue & 16-18 John Street, Mascot, NSW, 2020 with report number E24340.GO1_Rev1.
- Stage II detailed site investigation by A.D.E Pty Ltd at 16-18 John Street, Mascot, NSW, 2020.
- Alliance Geotechnical borehole logs at 1-5 Bourke Street, Mascot, with job number 9349, dated on 23/07/2019.
- Geotechnical report by Jeffery & Katauskas Pty Ltd with reference number 22451SBrpt.
- Site Survey plan prepared by Lts Lockley for DA Vito Ferro Apartments PTY LTD with reference number 50641 001DT_B dated on 20/3/2019.
- Architectural plans prepared by Squilllace Architects Interior designers with job number P1Z1807, dated on 28.08.2020.

- Geotechnical Investigation report by Aargus Pty Ltd at 27 Church Avenue, Mascot, NSW, 2020, with job no. GS5614/1A dated 20 Nov 2013.
- Geotechnical Investigation report by Aargus Pty Ltd at 23-25 Church Avenue, Mascot, NSW, 2020, with job no. GS8023-1A dated 04/09/2020.
- DA-2019/359 by Bayside council issued to Mario Pizzolato C/O Da Vito Ferro Apartments Pty Ltd, dated on 01st October 2020.
- Structural Report – Proposed Basement Design by NORTHROP with job number SY200476-SR02 dated on 30.10.2020.
- Structural drawings by NORTHROP with job no. SY200474 for DA VITO FERRO APARTMENTS PTY LTD dated on 04.11.2020.
- WALLAP output draft report by NORTHROP with job no. SY200476, dated 29.10.2020

3. SCOPE OF WORK

Additional geotechnical investigation was carried out assuming that there would be three basements on Church Avenue and four basements on John Street, with multi storey levels in the new development. Additional geotechnical works were undertaken to drill 3 deep boreholes to determine the competent rock depth suitable for the proposed development.

The reason for undertaking additional geotechnical investigation is to understand the depth of the competent rock and to further understand the behaviour of the ground conditions in detail, this additional site investigation also helps in determining the groundwater levels across the site.

In accordance with the brief, fieldwork for the additional geotechnical site investigation was carried out by an experienced Geotechnical Engineer from Aargus; following in general the guidelines provided in Australian Standard AS 1726-2017 (Reference 1) and comprised the following:

- A site walk-over inspection by a Geotechnical Engineer in order to determine the overall surface conditions and to identify relevant site features.
- Review of DBYD plans and service locating carried out by a specialist sub-contractor to ensure that the investigation area is free from underground utilities.
- Machine auger drilling of three boreholes to depths of 22.9m and 25.30m below ground level (bgl), to log the soils and to retrieve samples for testing.

- Installation of three groundwater wells for measurements of groundwater. BH3/GW3 and BH4/GW4 were installed to a depth of approximately 14.0m below the ground level and BH5/GW5 was installed to a depth of 23.0m below the ground level.
- Standard Penetration Tests (SPT) were undertaken on-site in the borehole locations to assess the density of the underlying Aeolian/Marine Sands known as the "Botany Sands".
- Testing of soil samples for the presence of Salinity & aggressivity testing.

The approximate location of the boreholes completed during the geotechnical site investigation is shown on "Figure 1 - Site Plan" attached in Appendix B.

Boreholes BH3, BH4 & BH5 were augured to termination depths of 22.92m, 24.70m & 25.30m respectively.

Based on the results of the site investigation, Aargus carried out geotechnical interpretation and assessment of the main potential geotechnical issues that may be associated with the proposed development. A geotechnical report (this report) was prepared to summarise the results of the geotechnical site investigation and to provide relevant comments and recommendations.

4. Summary of Geotechnical Works with respect to Council requirements:

Geotechnical Investigation works carried out in chronological order:

1) JK Geotechnics has carried out the Geotechnical Investigation (GI) in October 2008. JK has drilled 2 boreholes named BH1 and BH2. The two boreholes were terminated at 8.0m depth and the borehole logs are attached in Appendix C.

2) Alliance Geotechnical Pty Ltd has carried out the GI in July 2019. Alliance has drilled 3 boreholes named BH3, BH4 and BH4 A. BH3 and BH4 were drilled to 5.0m depth and groundwater wells were installed at BH3 & BH4. BH4 A was drilled to 19.26m. borehole logs are attached in Appendix C.
3) Aargus Pty Ltd has carried out the GI in August 2020 and Nov 2020. Aargus has drilled 5 boreholes named BH1 to BH5 and all the holes were drilled into shale bedrock and all the boreholes are drilled below finished basement level. Aargus has installed 4 groundwater wells in boreholes BH2 to BH5.

Table 1: Brief Details of drilled boreholes:

COMPANY	YEAR OF INVESTIGATION	NUMBER OF BOREHOLES	NUMBER OF BOREHOLES DRILLED BELOW FINISHED BASEMENT LEVEL
JK Geotechnics Pty Ltd	2008	2	0
Alliance Geotechnical Pty Ltd	2019	3	1
Aargus Pty Ltd	2020	5	5

Based on the Geotechnical investigations performed by JK Geotechnics Pty Ltd, Alliance Geotech and Aargus Pty Ltd the following observations are made:

a) Aargus Pty Ltd has performed investigation in the months of August and November 2020, and a borehole by Alliance Geotechnics has been drilled to 19.26m below the ground level which is identified as BH 4A in July 2019. All these deep boreholes are drilled more than 1.0m below the finished basement floor level and the bedrock level. The boreholes are located on the site plan and the defects encountered in the profile are mentioned in the geotechnical borehole logs (attached). The surface and depth of the borehole logs are represented in Australian Height Datum and are evenly spread out across the development site.

b) Appropriate means of excavation/shoring in light of point (a) above and proximity to adjacent property and structures is obtained through the following:
A cutter soil mix (CSM) wall is proposed to be constructed to form the basement shoring wall. A CSM wall is a retention wall constructed by mixing self-hardening slurries with the native excavated soil. A trench cutting rig with mixing tool excavates vertical panels of soil and mixes the soil with the binders as the cutting heads extend down. Once the design depth has been reached, (in this case into the bedrock), the cutting head is extracted and continuously mixes cement into the wall mix. Prior to hardening, structural steel soldiers are embedded in the wall matrix to provide the structural frame. The primary advantages of this method are

- Low vibrations induced in construction of the wall;
- Highly accurate;
- Generally watertight (extremely low permeability); and
- Very little generation of spoil

c) Methods to temporarily and permanently support the excavation for the basement adjacent to adjoining property, structures and road reserve if nearby has been addressed below:

The basement is proposed to be constructed via a top-down construction process. Through top-down construction, the temporary and permanent support for the basement walls are both provided by the basement slabs.

All basement walls and foundation piles are constructed from existing ground level and the supporting slabs are constructed prior to the next stage of excavation below the slab. By constructing the internal supports (the permanent slabs) prior to the next stage of excavating, the horizontal settlements of the basement walls are minimised

d) The groundwater levels determined are mentioned in the boreholes logs presented by Aargus Pty Ltd, Alliance Geotechnical Pty Ltd and JK Pty Ltd .

Based on results from geotechnical investigation, the ground water level is expected to be at approximately RL 5.0m (2.0m to 6.0m below existing ground level). The basement excavation level is proposed to be at approximately RL-3.0m which is below the ground water level.

The basement walls are proposed to be socketed into the bedrock strata to create a cut-off wall and during construction, it is proposed to locally dewater within the site. The cut-off walls will create a finite volume of water to remove and will not affect the ground water level at adjacent properties.

It is expected that long term seepage through the bedrock and wall will result in hydrostatic pressures being imposed on the structure. The base slabs are proposed to be constructed over a waterproof membrane and are designed to withstand the hydrostatic uplift pressures associated with a groundwater level of RL5.0m

5. SITE CONDITIONS

The site comprises the property at 23-25 Church Avenue, Mascot, NSW 2020 with lot number DP405064, & 16-18 John Street Mascot, NSW 2020 with lot numbers DP 360656 & DP 316950,. The site is located within the Bayside Council.

The site is a rectangular shaped lot approximately 137m by 23m with an approximate area of 3153m^2. At the time of the site investigation there were single storey offices and sheds on the the site.

The site is bounded by the following properties, public roads and infrastructure:

- Church Avenue to the north.
- PM Realty (19-21 Church Avenue)to the east,
- 27 Church Avenue to the west.
- 16-18 John Street is located on the southern part of the site.

The site was occupied by a brick and a metal panel warehouse. A concrete driveway provided access along the western side of the warehouse to a rear storage yard. A metal awning was located at the rear of the property. The warehouse and awning appeared to be in good external condition.

6. PROPOSED DEVELOPMENT

The proposed project encompasses 23-25 Church Avenue and 16-18 John Street, creating a throughblock with a public pedestrian accessway at ground level. The development consists of a three-to-four storey basement car park, a two-storey mixed-use podium and two 13-storey residential towers. An existing industrial warehouse will also be incorporated into the podium level.

7. SUBSURFACE CONDITIONS

7.1. Geology

Reference to the Sydney 1:100,000 Geological Series Sheet 9130 Edition 1, dated 1983, by the Geological Survey of New South Wales, Department of Mineral Resources, indicates that the site is located within a geological area underlain by Quaternary Unconsolidated Sediments (Qhd) described as “Medium to fine-grained “marine” sands with podsols” of a “Transgressive Dunes” environment.

Assessment of the subsurface materials, discussed in Section 6.2, confirms the published geology. It should be noted that the published geological profile does not take into account any residual soils derived from in-situ weathering of the bedrock, or the presence of fill that may have been generated from previous earthworks.

7.2. Ground Profile

The subsoil conditions encountered within the boreholes are summarised in Tables 1 and are described in detail on the attached Engineering Borehole Logs presented in Appendix C. Reference should be made to the logs and/or specific test results for design purposes.

Table 2. Summary of Subsurface Conditions based on Additional Geotechnical Investigations:

Units	Lithological Unit Description	BH3 (m bgl)	BH4 (m bgl)	BH5 (m bgl)
Pavement	Concrete.	0.0-0.1	0.0-0.10	0-0.15
Fill	SAND, fine to medium grained, dark brown, pieces of bricks, concrete & gravel.	0.1-1.80	0.1-2.8	0.15-1.8
Alluvial Soil	Clayey SAND, fine to medium grained, pale grey to dark brown to black.	1.8-4.0		
	SAND, fine to medium grained, dark brown to pale brown, with silt.	4.0-6.0	2.8-7.0	1.8-5.5
	Silty SAND, black to pale grey to dark brown to pale grey.	6.0-16.0		5.5-13.0
	Clayey SAND, fine to medium grained, pale brown to dark brown, trace of silt.		7.0-17.5	13.0-15.0
BEDROCK	Clayey SHALE, dark grey, extremely weathered, very low estimated strength, with clay.	16.0-17.65	17.5-19.15	15.0-16.3
	SHALE, laminated, extremely weathered, extremely low estimated strength, estimated Class V Shale		19.15-20.15	16.3-19

	SHALE, pale grey to dark grey, regular horizontal bedding changing to class III from 21.50m.	17.65-22.92		
	SHALE, pale grey to dark grey, regular horizontal bedding changing to class III from 22.50m.		20.15-24.7	
	SHALE, pale grey to dark grey, regular horizontal bedding changing to class III from 23.0m.			19-25.3

Refer to engineering logs for detailed explanation of the subsurface conditions.

7.3. Groundwater

Groundwater was encountered during borehole drilling on 02nd of Nov 2020 in borehole BH3 at a depth of 3.0m, and in borehole BH4 at a depth of 5.0m on 03rd Nov 2020, in BH5 groundwater was encountered at a depth of 2.50m on 04th Nov of 2020.

It should be noted that groundwater levels may be associated with surface water infiltration through soils and may be subject to seasonal and daily fluctuations influenced by factors such as heavy rainfall, broken services and future development of the surrounding land. Soil moisture within the site may be influenced by events within the adjacent infrastructure such as breakage of water mains, or stormwater pipes.

BH3/GW3 & BH4/GW4 (Refer to site plan, GS8023-3A) were installed to a depth of approximately 14.0m below the ground level, the well was constructed in such way that it has been slotted from 2.0m to 14.0m for allowing the water inside the pipe. The wells in BH3 and BH4 provides information about water movement in the Aeolian sandy soils.

BH5/GW5 (Refer to site plan, GS8023-3A) is installed to a depth of approximately 23.0m below the ground level, the well was constructed in such way that it has been slotted from 17.0m to 23.0m for allowing the water inside the pipe. The well in BH5 a provides information about water movement in the shale bedrock. (Refer to Engineering borehole logs from the additional investigation (GS8023-3A) for groundwater well details).

7. GEOTECHNICAL ASSESSMENT

7.1. General

Consideration needs to be given to specific geotechnical issues including excavation support, groundwater and foundation conditions. Geotechnical commentary regarding these and other geotechnical constraints and associated recommendations for the proposed development is presented in the following sections.

7.2. Excavation Conditions

The observations made during the investigation indicate that excavation will be through very loose to loose sandy soils to followed by generally medium dense to dense sand and dense to very dense sands. Excavation within these soils is expected to be readily achieved using a large hydraulic excavator. Excavation is expected to be readily achieved using conventional excavation equipment. Contractors should refer to the engineering logs when assessing the suitability of their excavation equipment.

7.3. Vibration Control

It is recommended that a vibration monitoring plan be developed to monitor the potential vibration effects from the demolition works on existing buildings within adjoining properties and road reserves and carriageways along the site boundary.

Recommended Maximum Peak Particle Velocity (PPV) for different types of building or structures is summarised in Table 3.Induced vibrations in structures adjacent to the excavation should not exceed.

Table 3. Recommended Maximum Peak Particle Velocity for Structures

Type of Building or Structure	Max. PPV (mm/sec)
Historical or structures in sensitive conditions	2
Residential and low rise buildings	5
Brick or unreinforced structures in good condition	10
Commercial and industrial buildings or structures of reinforced concrete or steel construction.	25

It is recommended that monitoring is carried out during excavation and pile installation using a vibration monitoring instrument (seismograph) and alarm levels (being the appropriate PPV)

selected in accordance with the type of structures and places present within the zone of influence of the proposed excavation.

If vibrations in adjacent structures or places exceed the above values or appear excessive during construction, excavation should cease and the project Geotechnical Engineer should be contacted immediately for appropriate reviews.

It is recommended a dilapidation survey of the existing buildings within adjoining properties and infrastructure is conducted. Preparation of a dilapidation survey report and vibration monitoring plan together with vibration monitoring should constitute as "Hold Points".

7.4. Stability of Excavation

As maximum excavation of the proposed basements will extend to approximately 12.0m depth below the existing ground level and due to the close proximity of the basement with the boundaries and the sandy nature of the soils, the use of temporary batter slopes is not considered and therefore temporary shoring should be provided. Shoring design should consider both short term (construction) and permanent conditions as well as the presence of adjacent buildings and roads.

From the information provided by NORTHROP, it is understood that the proposed shoring wall system is a Cutter Soil Mix (CSM) wall, which is a 600-800mm wide concrete wall constructed in panels and reinforced with structural steel posts.

Following the installation of the CSM wall, can be used from' top to down' approach, where ground floor is constructed prior to excavation, with voids left out for removal of excavated material. This provides a restraint to the top of the wall, limiting movement of the wall, while the first basement level is excavated. B1 slab is subsequently installed before excavating to B2. This staged approach provides regular support to the shoring wall as well as removing the need for anchors through the walls. A Finite Element Analysis modelling to determine stresses imposed on proposed shoring wall by existing buildings

A dilapidation survey may be required prior to excavation for the existing buildings within the adjoining properties and the section of road carriageway and road reserve adjoining the site.

The sequence of basement construction shall be strictly followed as per Northrop Structural Report---Proposed Basement Design with appropriate "Hold Points" created to ensure previous step has been completed and accepted before moving to next step. Such Hold Points shall be reviewed and inspected by qualified Structural and Geotechnical Engineer where appropriate

to confirm release of the Hold Point. An appropriate monitoring plan is recommended in order to monitor impact on surrounding structures and assets and verify design predictions etc.

7.5. Earth Pressures

Earth retaining structures should be designed to withstand the lateral earth pressure, hydrostatic and earthquake (if applicable) pressures, and the applied surcharge loads in their zone of influence, including existing structures, traffic and construction related activities.

For the design of flexible retaining structures, where some lateral movement is acceptable, it is recommended the design should be based on active lateral earth pressure. Should it be critical to limit the horizontal deformation of a retaining structure, use of an earth pressure coefficient "at rest" should be considered such as the case when the shoring wall is in the final permanent state and is restrained by the concrete slab in its final state. Recommended parameters for the design of earth retaining structures in the soil horizons underlying the site are presented in Table 4.

Table 4. Preliminary Geotechnical Design Parameters for Retaining Walls

Units	Unit Weight (kN/m^3)	Effective Cohesion c' (kPa)	Angle of Friction ϕ'(°)	Modulus of Elasticity E_{sh} (MPa)
Fill and Very Loose to Loose SAND	17	0	28	20
Medium Dense SAND	18	0	35	40
Dense to Very Dense SAND	20	0	38	65
Class V Shale	22	10	26	50
Class IV Shale	22	50	28	200
Class III Shale	24	100	30	350

Table 5 below provides preliminary coefficients of lateral earth pressure for the soils encountered during the geotechnical investigation. The coefficients provided are based on horizontal ground surface and fully drained conditions.

Table 5. Preliminary Coefficients of Lateral Earth Pressure

Units	Coefficient of Active Lateral Earth Pressure K_a	Coefficient of Lateral Earth Pressure at Rest K_0	Coefficient of Passive Lateral Earth Pressure K_p
Fill and Sand (Very Loose to Loose)	0.36	0.53	2.78
Sand (Medium Dense)	0.27	0.43	3.70
Sand (Dense to Very Dense)	0.24	0.38	4.17
Class V/IV Shale	0.3	0.5	3.0
Class III Shale	0.25	0.4	5.0

- Coefficient of active and passive lateral earth pressure K_a and K_p, respectively, can be calculated using Rankine's or Coulomb's equations, as appropriate.
- Coefficient of lateral earth pressure at rest K_o for soils, can be calculated using Jacky's equation.

The coefficients of lateral earth pressure should be verified by the project Structural Engineer prior to use in the design of retaining walls. Simplified calculations of lateral active (or at rest) earth pressures can be carried out for braced retaining walls using a uniform lateral earth pressure as follows;

$P_a = 0.65\ K\ \gamma\ H$ For calculation of earth pressure

Where,

P_a = Active (or at rest) Earth Pressure (kN/m^2)

P_p = Passive Earth Pressure (kN/m^2)

□ = Bulk density (kN/m^3)

K = Coefficient of Earth Pressure (K_a or K_o)

K_p = Coefficient of Passive Earth Pressure

H = Retained height (m)

c = Effective Cohesion (kN/m^2)

7.6. Pile Foundations for Building Load

Installation of piles may be required in cases where axial loads on columns and walls exceeding the bearing pressure of the bearing stratum. Piles may also be required to increase the resistance against lateral seismic and wind loads. Table 6 provides geotechnical parameters recommended for design of piled foundations.

Table 6. Preliminary Geotechnical Foundation Design Capacities

Unit	Allowable Capacity Values (kPa)		Ultimate Capacity Values	
	End Bearing Pressure[1]	Shaft Adhesion Compression (Tension)[2]	End Bearing Pressure (MPa)	Shaft Adhesion Compression (Tension)[2] (kPa)
Residual Clay Soils (Stiff to Very Stiff)	100	10 (5)	N/A	N/A
Class V Shale[4]	700	25 (15)	Max 2	50-100
Class IV Shale	1500	100 (50)	2-5	150
Class III Shale	3000	200 (100)	10-20	350-450
Class II Shale	5000	400	30-50	550-700

1 With a minimum embedment depth of 1.0m for deep foundations and 0.4m for shallow foundations.

2 Clean rock socket of roughness of at least R2 category (refer to Pells et al (1998)), grooves of depth 1mm to 4mm and width greater than 5mm at spacing of 50mm to 200mm. Shaft Adhesion in Tension is 50% of Compression, applicable to piles only.
3 N/A, Not Applicable, not recommended for the proposed building of this development.

4 Rock classes based on the criteria in Pells et al (1998) paper "Foundations on Shale and Sandstone in the Sydney Region". Bearing capacity values are also from Pells et al (1998).

Shaft adhesion may only be applied to socketed piles in rock adopted for foundations provided socket shaft lengths conform to appropriate classes of Shale and accepted levels of shaft sidewall cleanliness and roughness.

Additional attention to cleanliness of socket sidewalls may be required where presence of clay seams and weathered Shale bands is evident over socket lengths. Where the piles penetrate soils that are susceptible to shrinkage and swelling, we recommend that the shaft adhesion be ignored in the zone of seasonal moisture variations due to the potential of shrinkage cracking.

The selection of a suitable piling rig should consider its suitability in penetrating high strength rock Class III Shale or better (after depths of 23.0m depth), should this be required for bearing capacity purposes.

Any groundwater seepage or surface water run-off should be removed from the excavation prior to concrete pouring. Any loose debris and wet soils should also be removed from excavations.

An experienced Geotechnical Engineer should review foundation designs to ensure compliance with the recommendations in the geotechnical report and assess foundation excavations to ensure suitable materials of appropriate bearing capacity have been reached. The presence of water within foundation excavations may negate satisfactory examination of founding surfaces and certification of founding materials quality. Foundation inspections should only be undertaken under conditions satisfying WHS requirements.

Piles may also be required to increase the resistance against lateral seismic and wind loads. Design of pile foundations should be carried out in accordance with Australian Standards AS 2159-2009 (Reference 3).

Pile Design using an empirical CPT correlation developed by the de Ruiter and Beringen F.L. (1979), a preliminary estimate of ultimate skin friction of piles within sands (only) can be derived from cone resistance as follows:

$$\boldsymbol{f_p} = q_c/300 \quad <=70kPa$$

Where f_p = ultimate pile skin friction

q_c = cone resistance

The empirical equation outlined above has been used to provide preliminary estimates of ultimate skin friction (qs) from the CPT carried out during the geotechnical investigation. The results are provided in Figure 1 below. A suitable Factor of Safety (FoS) should be applied to the ultimate skin friction (qs) in accordance with AS 2159-2009 (reference 5).

Suitable pile options include the following:

- Cast in situ reinforced concrete bored piles: Due to the presence of high groundwater levels within the marine sand, bored piles would require casing over their full length to prevent collapse of the saturated sands during pile installation. As high groundwater

are expected to be encountered within pile excavations, it is recommended that the excavations are dewatered prior to concrete pouring, or that appropriate underwater placement techniques are adopted. It is considered that bored piles may be unsuitable as a pile option due to high groundwater levels and the difficulty expected in dewatering the pile prior to concreting as well as potential reduction of skin friction values.

- Continuous Flight Auger (CFA) piles: CFA piles can be installed relatively quickly and generally generate lower noise and vibration than bored and driven piles. The use of CFA piles require an assessment of the potential effects on the natural groundwater regime and construction of CFA piles usually is associated with deviation of piles from vertical with potential for pile necking, honey-combing, and requires strict quality control procedures.

Foundation design drawings and inspect the pile foundation excavations to confirm the design assumptions and ensure that the recommendations of the geotechnical report have been adopted. Pile testing may be required and should be carried out under supervision of an experienced geotechnical practitioner.

Verification of the capacity of the shallow and pile foundations by inspections would be required and inspections should constitute as “Hold Points”.

7.7. Groundwater Management:

Groundwater levels encountered from additional geotechnical site investigation during drilling in BH3, BH4 & BH5 are shown below. Three Groundwater wells have been additionally installed and identified as GW3, GW4 & GW5.

Table 7. Groundwater Levels

Location	Total well depth (m bgl)	Groundwater level (m bgl) Recorded date
BH3/GW3	15.0	3.50m, 02 Nov 2020
BH4/GW4	15.0	5.0m, 03rd Nov 2020
BH5/GW5	23.0	2.20m, 04th Nov 2020

Note:

A dewatering system may be required as well as a dewatering management plan. A fully tanked basement may be required. Seasonal variations resulting in elevated groundwater levels (e.g. due to heavy rainfall, broken services, etc.) may increase seepage flows through the soils during excavation and in the long term during the design life of the building. It would therefore be prudent to give consideration to waterproofing design and precautionary drainage measures in the design and construction of the proposed development.

Such measures could include the following:

- Waterproof treatment on CSM wall surface as required to prevent water seepage. A skin wall is recommended on top of CSM surface with strip drains installed between the walls and connected to building stormwater system.. A temporary storage tank and pump system may be required.
- Groundwater seepage and surface water infiltration should be controlled by a sump and pump methods during construction, although a full dewatering system may be required, dependent on seepage rates into the excavation.
- A well-designed reliable drainage system constructed below the basement floor slab, to collect and remove groundwater, may provide a suitable alternative to waterproofing of the basement slab and walls.

7.8. Preliminary Site Earthquake Classification

The results of the site investigation indicate the presence of sandy Aeolian soil extending to at least 10m depth (the extent of the geotechnical investigation). In accordance with Australian Standard AS 1170.4-2007 (Reference 2) the site may be classified as a "Shallow Soil Site" (Class C_e) for design of foundations and retaining walls embedded in the underlying soils. The Hazard Factor (Z) for Sydney, in accordance with AS 1170.4-2007 is considered to be 0.08.

8.0 Further Geotechnical Input

Below is a summary of the additional works that should be carried out:

- Prepare the Ground Movement and Vibration Monitoring Management Plan to ensure no impact to the adjoining properties and infrastructures during the construction.

9.0 LIMITATIONS

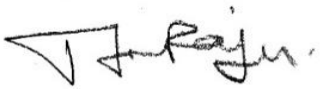
The geotechnical assessment of the subsurface profile and geotechnical conditions within the proposed development area and the conclusions and recommendations presented in this report have been based on available information obtained during the work carried out by Aargus and in the provided documents listed in Section 2 of this report. Inferences about the nature and continuity of ground conditions away from and beyond the locations of field exploratory tests are made, but cannot be guaranteed.

It is recommended that should ground conditions including subsurface and groundwater conditions, encountered during construction and excavation vary substantially from those presented within this report, Aargus Pty Ltd be contacted immediately for further advice and any necessary review of recommendations. Aargus does not accept any liability for site conditions not observed or accessible during the time of the inspection.

This report and associated documentation and the information herein have been prepared solely for the use of **C & V Engineering Services Pty Ltd** and any reliance assumed by third parties on this report shall be at such parties' own risk. Any ensuing liability resulting from use of the report by third parties cannot be transferred to Aargus Pty Ltd, directors or employees.

For and on behalf of

Aargus Pty Ltd



Sai Turlapati
Geotechnical Engineer
M.Eng, MIEAust

Reviewed By

Xin Cao
Senior Geotechnical Engineer
BEng, MEng, NER, ID 3698125

Attachments

Appendix A - Important Information

Appendix B - Site Plans (Site plans showing borehole locations for Additional (GS8023-3A) and previous investigations)

Appendix C - Engineering Borehole Logs for Current and Previous Geotechnical Investigations

Appendix D- Rock Core Photographs for additional Geotechnical Investigation (GS8023-3A)

Appendix E-Point Load Test Results for additional Geotechnical Investigation (GS8023-3A)

APPENDIX A

Information About Geotech Report

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT

More construction problems are caused by site subsurface conditions than any other factor. As troublesome as subsurface problems can be, their frequency and extent have been lessened considerably in recent years, due in large measure to programs and publications of ASFE/ The Association of Engineering Firms Practicing in the Geosciences.

The following suggestions and observations are offered to help you reduce the geotechnical-related delays, cost-overruns and other costly headaches that can occur during a construction project.

A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

A geotechnical engineering report is based on a subsurface exploration plan designed to incorporate a unique set of project-specific factors. These typically include the general nature of the structure involved, its size and configuration, the location of the structure on the site and its orientation, physical concomitants such as access roads, parking lots, and underground utilities, and the level of additional risk which the client assumed by virtue of limitations imposed upon the exploratory program.

To help avoid costly problems, consult the geotechnical engineer to determine how any factors which change subsequent to the date of the report may affect its recommendations.

Unless your consulting geotechnical engineer indicates otherwise, *your geotechnical engineering report should NOT be used:*

- when the nature of the proposed structure is changed: for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an un-refrigerated one,
- when the size or configuration of the proposed structure is altered,
- when the location or orientation of the proposed structure is modified,
- when there is a change of ownership, or

for application to an adjacent site.

Geotechnical engineers cannot accept responsibility for problems which may develop if they are not consulted after factors considered in their report's development have changed.

Geotechnical reports present the results of investigations carried out for a specific project and usually for a specific phase of the project. The report may not be relevant for other phases of the project, or where project details change.

The advice herein relates only to this project and the scope of works provided by the Client.

Soil and Rock Descriptions are based on AS1726-1993, using visual and tactile assessment except at discrete locations where field and/or laboratory tests have been carried out. Refer to the attached terms and symbols sheets for definitions.

MOST GEOTECHNICAL "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site exploration identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are extrapolated by geotechnical engineers who then render an opinion about overall subsurface conditions, their likely reaction to proposed construction activity, and appropriate foundation design. Even under optimal circumstances actual conditions may differ from those inferred to exist, because no geotechnical engineer, no matter how

qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. *Nothing can be done to prevent the unanticipated, but steps can be taken to help minimize their impact. For this reason, most experienced owners retain their geotechnical consultants through the construction stage,* to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

SUBSURFACE CONDITIONS CAN CHANGE

Subsurface conditions may be modified by constantly changing natural forces. Because a geotechnical engineering report is based on conditions which existed at the time of subsurface exploration, *construction decisions should not be based on a geotechnical engineering report whose adequacy may have been affected by time.* Speak with the geotechnical consultant to learn if additional tests are advisable before construction starts.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations may also affect subsurface conditions, and thus, the continuing adequacy of a geotechnical report. The geotechnical engineer should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

Subsurface conditions can change with time and can vary between test locations. Construction activities at or adjacent to the site and natural events such as flood, earthquake or groundwater fluctuations can also affect the subsurface conditions.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS

Geotechnical engineers' reports are prepared to meet the specific needs of specific individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor, or even some other consulting civil engineer. Unless indicated otherwise, this report was prepared expressly for the client involved and expressly for purposes indicated by the client. Use by any other persons for any purpose, or by the client for a different purpose, may result in problems.
No individual other than the client should apply this report for its intended purpose without first conferring with the geotechnical engineer. No person should apply this report for any purpose other than that originally contemplated without first conferring with the geotechnical engineer.

A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Costly problems can occur when other design professional develop their plans based on misinterpretations of a geotechnical engineering report. To help avoid these problems, the geotechnical engineer should be retained to work with other appropriate design professionals to explain relevant geotechnical findings and to review the adequacy of their plans and specifications relative to geotechnical issues.

The interpretation of the discussion and recommendations contained in this report are based on extrapolation/interpretation from data obtained at discrete locations. Actual conditions in areas not sampled or investigated may differ from those predicted

BORING LOGS SHOULD NOT BE SEPARATED FROM THE ENGINEERING REPORT

Final boring logs are developed by geotechnical engineers based upon their interpretation of field logs (assembled by site personnel) and laboratory evaluation of field samples. Only final boring logs customarily are included in geotechnical engineering reports. These logs should not under any circumstances be redrawn for inclusion in architectural or other design drawings because drafters may commit errors or omissions in the

transfer process. Although photographic reproduction eliminates this problem, it does nothing to minimize the possibility of contractors misinterpreting the logs during bid preparation. When this occurs, delays, disputes and unanticipated costs are the all-too-frequent result.

To minimise the likelihood of boring log misinterpretation, give contractors ready access in the complete geotechnical engineering report prepared or authorized for their use. Those who do not provide such access may proceed under mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes which aggravate them to disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY

Because geotechnical engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against geotechnical consultants. To help prevent this problem, geotechnical engineers have developed model clauses for use in written transmittals. These are not exculpatory clauses designed to foist geotechnical engineers' liabilities onto someone else. Rather, they are definitive clauses which identify where geotechnical engineers' responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your geotechnical engineering report, and you are encouraged to read them closely. Your geotechnical engineer will be pleased to give full and frank answers to your questions.

OTHER STEPS YOU CAN TAKE TO REDUCE RISK

Your consulting geotechnical engineer will be pleased to discuss other techniques which can be employed to mitigate risk. In addition, ASFE has developed a variety of materials which may be beneficial. Contact ASFE for a complimentary copy of its publications directory.

FURTHER GENERAL NOTES

Groundwater levels indicated on the logs are taken at the time of measurement and may not reflect the actual groundwater levels at those specific locations. It should be noted that groundwater levels can fluctuate due to seasonal and tidal activities.

APPENDIX B

Site Plans From All Geotechnical works

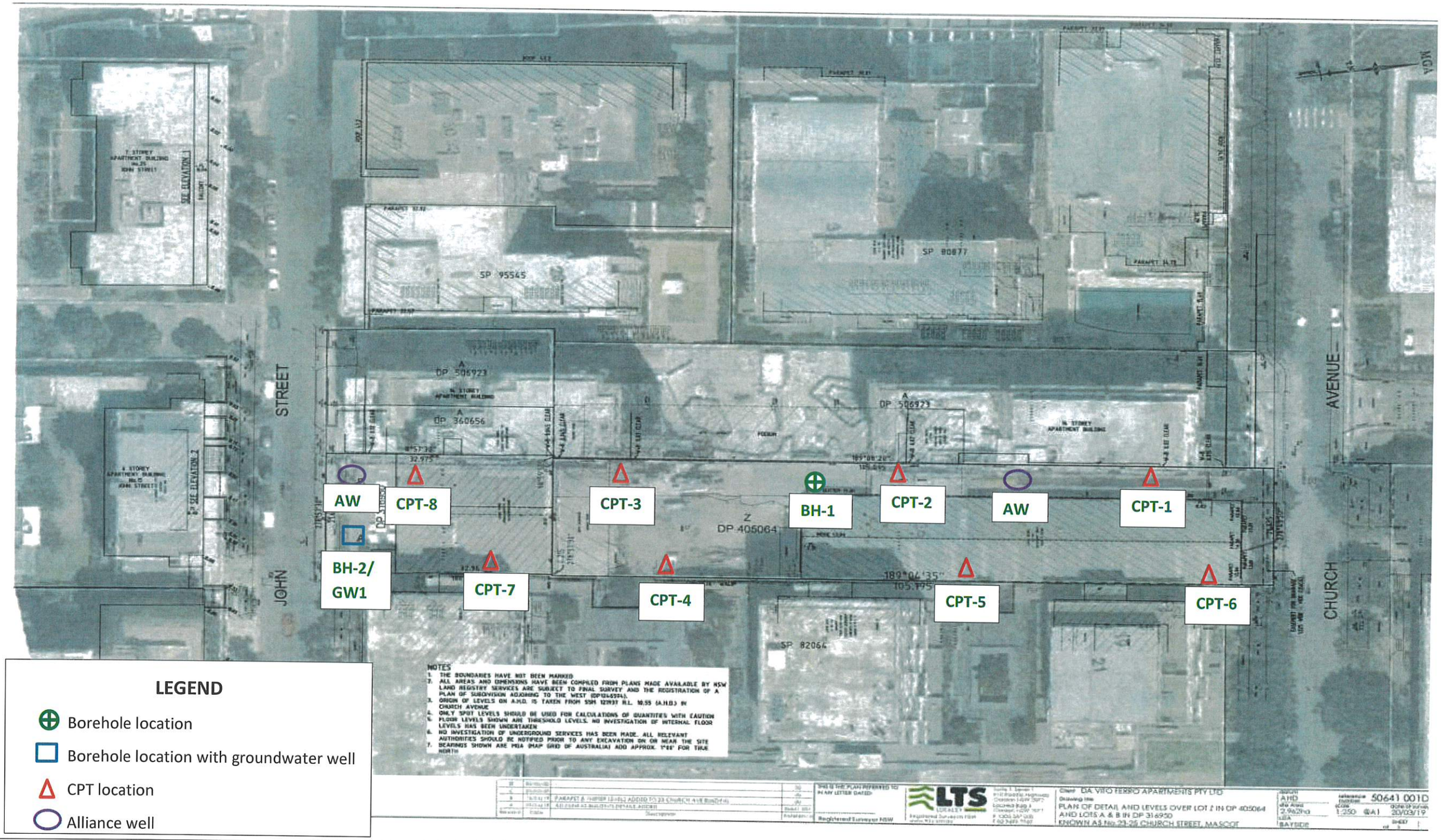


Image Source

Aargus ENVIRONMENTAL - ENGINEERING - DRILLING - LABORATORIES - ASBESTOS

Drawn	SP
Checked	SG
Date	3 September 2020
Scale @ A3	NTS

C & V Engineering Services Pty Ltd
Geotechnical Investigation
23-25 Church Avenue, Mascot, NSW

Aargus

Figure	1
Title	Site Plan
Job No	GS8023-1A

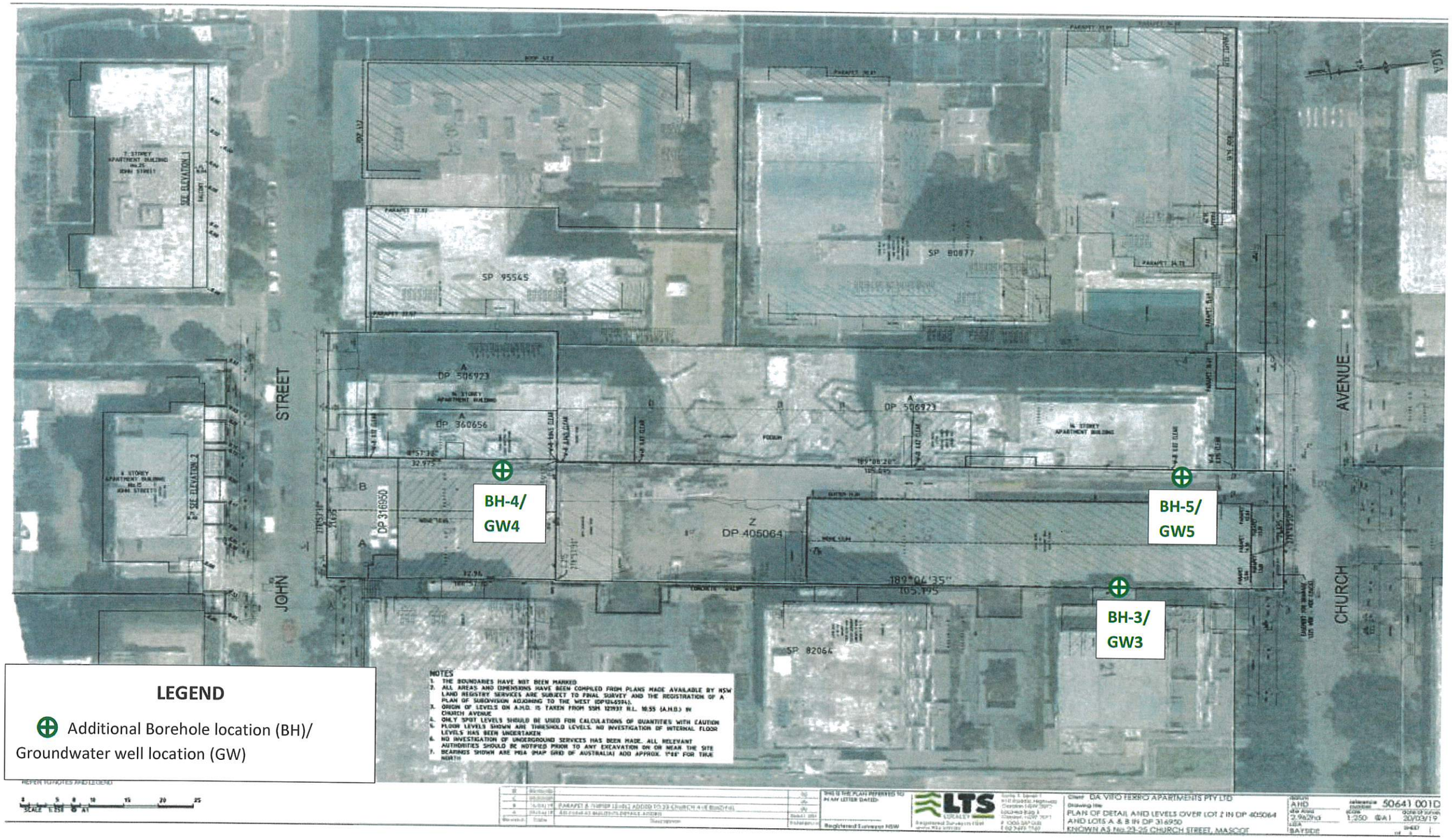


Image Source

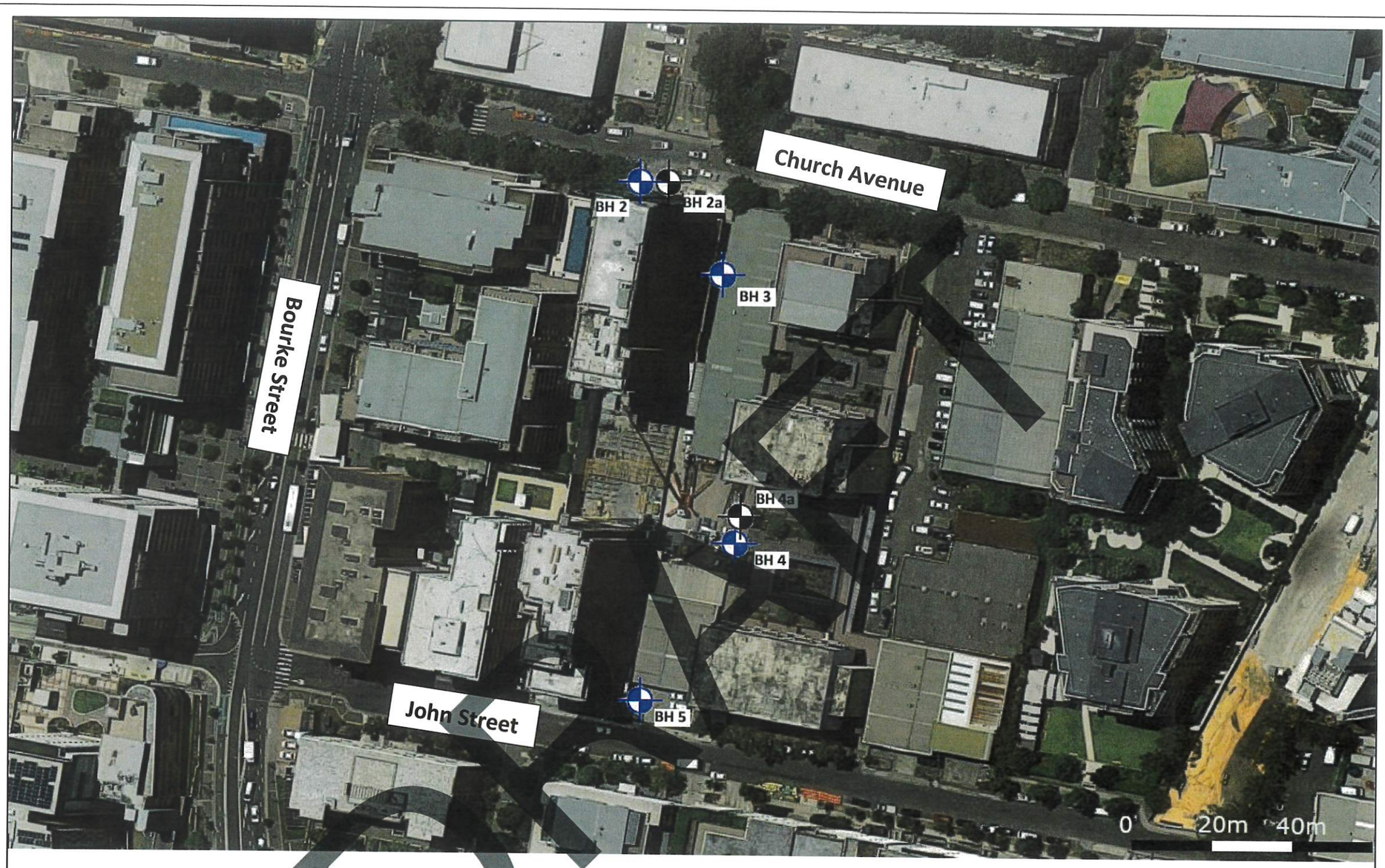
Aargus ENVIRONMENTAL - ENGINEERING - DRILLING - LABORATORIES - ASBESTOS

Drawn	SP
Checked	SG
Date	5th November 2020
Scale @ A3	NTS

C & V Engineering Services Pty Ltd
Additional Geotechnical Investigation
23-25 Church Avenue, Mascot, NSW

Aargus

Figure	1
Title	Site Plan
Job No	GS8023-3A



Legend

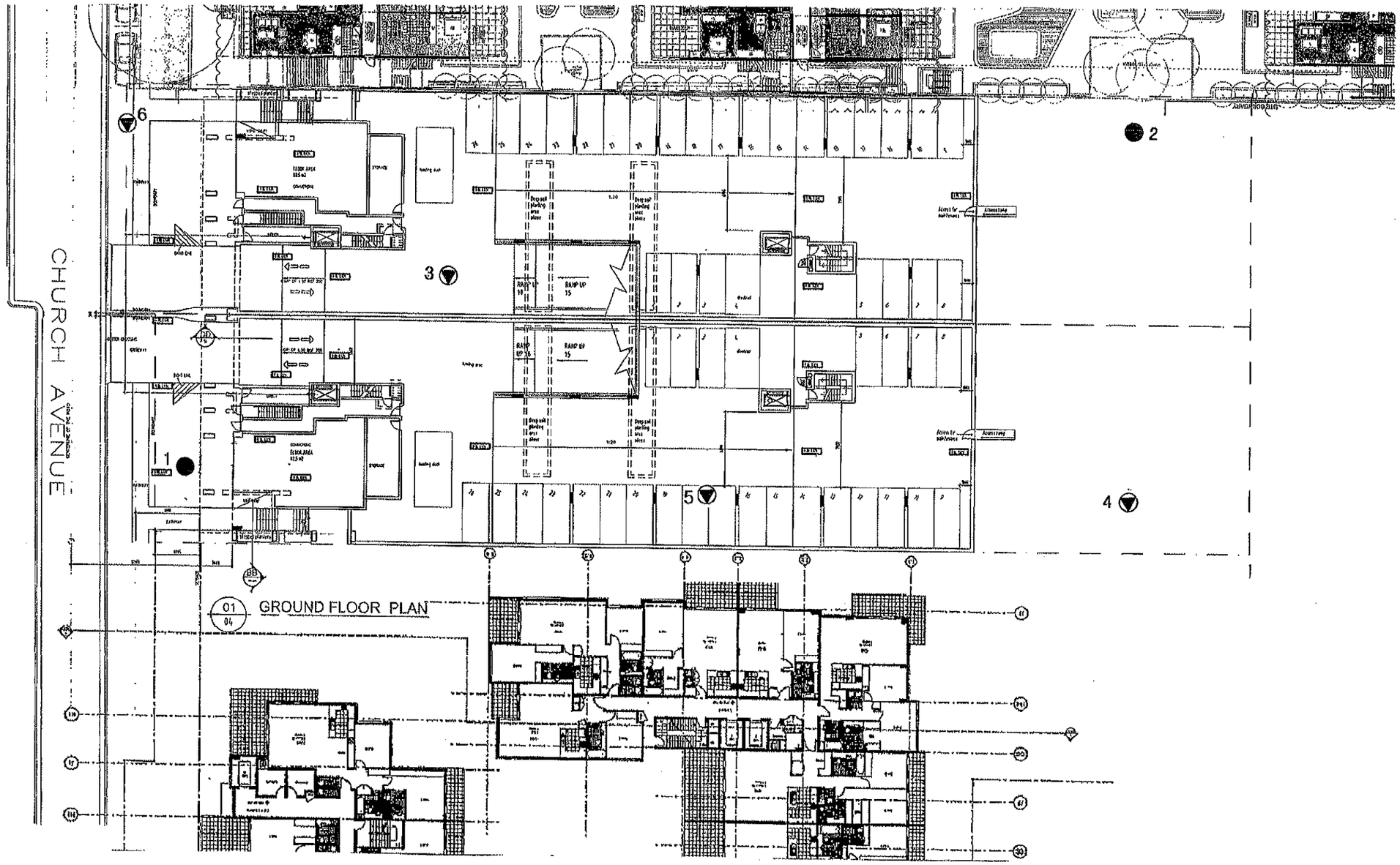
- Indicates Deep Borehole Location

- Indicates Borehole with Piezometer Location

Alliance Geotechnical
ENGINEERING | ENVIRONMENTAL | TESTING
Manage the earth, eliminate the risk

Borehole Location Plan

Client Name:	The Owners Corporation SP 80877 c/o SCE	N	Figure / Drawing Number:	9349-GR-1-A
Project Name:	Mascot Towers		Figure / Drawing Date:	24/07/2019
Project Location:	1 – 5 Bourke Street, Mascot NSW 2020		Report Number:	9349-GR-1-1



LEGEND

- BOREHOLE AND ELECTRICAL FRICTION CONE PENETROMETER TEST
- ELECTRICAL FRICTION CONE PENETROMETER TEST

SCALE (m)

0 20

INVESTIGATION LOCATION PLAN

Jeffery and Katauskas Pty Ltd
CONSULTING GEOTECHNICAL & ENVIRONMENTAL ENGINEERS

Report No. 22451SB Figure No. 1

APPENDIX C

Engineering Borehole Logs

Aargus Pty Ltd
6 Carter Street
Lidcombe
Telephone: 1300 137 038
Fax: 1300 136 038

BOREHOLE NUMBER BH1

CLIENT C & V Engineering Services Pty Ltd **PROJECT NAME** Geotechnical Investigation

PROJECT NUMBER GS8023-1A **PROJECT LOCATION** 23-25 Church Avenue & 16-18 John Street, Mascot, NSW

DATE STARTED 27/8/20 **COMPLETED** 27/8/20 **R.L. SURFACE** 7.00 **DATUM** m AHD

DRILLING CONTRACTOR Stratacore **SLOPE** 90° **BEARING** N.A.

EQUIPMENT Truck mounted drill rig **HOLE LOCATION** Refer to Figure 1 - Site Plan

HOLE SIZE 150mm **LOGGED BY** ST **CHECKED BY** SG

NOTES Surface levels and depths of subsurface conditions are approximate.

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture	Cons./Dens.	Additional Observations
ADT						CONCRETE. 135mm.				PAVEMENT
		6	1			SAND, fine to medium grained, dark brown, pieces of gravel.				FILL
					SP	SAND, fine to medium grained, dark brown, very less trace of clay.		M		ALLUVIAL SOIL
	27/08/2020	5	2							
		4	3							
		3	4							
		2	5							
		1	6		SP	Clayey SAND, fine to medium grained, dark brown to pale brown, trace of silt, 70% sand, 30% clay.	SPT 1, 0, 4 N=4	W	Loose	
		0	7							
		-1	8							

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BOREHOLE NUMBER BH1

CLIENT C & V Engineering Services Pty Ltd **PROJECT NAME** Geotechnical Investigation

PROJECT NUMBER GS8023-1A **PROJECT LOCATION** 23-25 Church Avenue & 16-18 John Street, Mascot, NSW

DATE STARTED 27/8/20 **COMPLETED** 27/8/20 **R.L. SURFACE** 7.00 **DATUM** m AHD

DRILLING CONTRACTOR Stratacore **SLOPE** 90° **BEARING** N.A.

EQUIPMENT Truck mounted drill rig **HOLE LOCATION** Refer to Figure 1 - Site Plan

HOLE SIZE 150mm **LOGGED BY** ST **CHECKED BY** SG

NOTES Surface levels and depths of subsurface conditions are approximate.

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture	Cons./Dens.	Additional Observations
ADT					SP	Clayey SAND, fine to medium grained, dark brown to pale brown, trace of silt, 70% sand, 30% clay. *(continued)*		W	Loose	
		-2	9		SP	Clayey SAND, fine to medium grained, dark brown to pale brown, trace of silt, 70% sand, 30% clay.	SPT 7, 13, 18 N=31	W	Dense	
		-3	10							
		-4	11							
		-5	12							
		-6	13							
		-7	14							
		-8	15							
		-9	16							

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BOREHOLE NUMBER BH1

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DATE STARTED 27/8/20 **COMPLETED** 27/8/20 **R.L. SURFACE** 7.00 **DATUM** m AHD

DRILLING CONTRACTOR Stratacore **SLOPE** 90° **BEARING** N.A.

EQUIPMENT Truck mounted drill rig **HOLE LOCATION** Refer to Figure 1 - Site Plan

HOLE SIZE 150mm **LOGGED BY** ST **CHECKED BY** SG

NOTES Surface levels and depths of subsurface conditions are approximate.

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture	Cons./Dens.	Additional Observations
ADT		-10	17		SP	Clayey SAND, fine to medium grained, dark brown to pale brown, trace of silt, 70% sand, 30% clay. *(continued)*		W	Dense	
		-11	18			Borehole BH1 continued as cored hole				
		-12	19							
		-13	20							
		-14	21							
		-15	22							
		-16	23							
		-17	24							

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BOREHOLE NUMBER BH1

CLIENT C & V Engineering Services Pty Ltd **PROJECT NAME** Geotechnical Investigation

PROJECT NUMBER GS8023-1A **PROJECT LOCATION** 23-25 Church Avenue & 16-18 John Street, Mascot, NSW

DATE STARTED 27/8/20 **COMPLETED** 27/8/20 **R.L. SURFACE** 7.00 **DATUM** m AHD

DRILLING CONTRACTOR Stratacore **SLOPE** 90° **BEARING** N.A.

EQUIPMENT Truck mounted drill rig **HOLE LOCATION** Refer to Figure 1 - Site Plan

HOLE SIZE 150mm **LOGGED BY** ST **CHECKED BY** SG

NOTES Surface levels and depths of subsurface conditions are approximate.

Method	Water	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength (EL VL L M H VH EH)	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	Defect Spacing mm (30 100 300 1000 3000)	Defect Description
		-10	17								
					Continued from non-cored borehole						
NMLC coring		-11	18		Effective TC bit refusal @17.4m. Clayey SHALE, estimated class 5, pale grey to pale yellow to dark brown, extremely weathered.	EW					
					SHALE, dark grey to pale brown, extremely weathered, continuously bedded laminations.						18.59m. JT, 0-50°, stepped, CN, SM. 18.60-18.70m. FZ
		-12	19		SHALE, estimated class 5, dark grey to pale grey, moderately weathered, irregularly bedded laminations.	MW					18.86-19.19m. CZ
											19.30m. JT, 0-30°, PL, CN, SM.
		-13	20		SHALE, estimated class 4, pale grey, regular bedding of horizontal laminations.	FR		D A 0.34 0.29	79		19.75m. BP, 2mm, 0-10°, PL, CN, SM.
								D A 0.08 0.5			20.13m. BP, 1mm, 0-10°, PL, CN, SM.
											20.49m. BP, 1mm, 0-10°, PL, CN, SM. 20.63m. BP, 0-30°, 2mm, PL, CN, SM.
		-14	21					D A 0.18 0.21 D A 0.04 0.3			21.075m. BP, 1mm, 0-10°, PL, CN, SM.
											21.40-21.50m. CZ.
									83		21.60m. BP, 1mm, 0-10°, PL, CN, SM. 21.73m. JT, 0-30°, PL, CN, SM.
		-15	22		CORE LOSS. 150mm.						
					SHALE, estimated class 4, pale grey, regular bedding of horizontal laminations.						22.10m. JT, 0-30°, PL, CN, SM. 22.11-22.33m. Drilling induced and handling breaks. 22.33-22.50m. Clay seam, weak zone.
					BH1 terminated at 22.5m						
		-16	23								
		-17	24								

Aargus Pty Ltd
6 Carter Street
Lidcombe
Telephone: 1300 137 038
Fax: 1300 136 038

BOREHOLE NUMBER BH2

CLIENT C & V Engineering Services Pty Ltd
PROJECT NAME Geotechnical Investigation
PROJECT NUMBER GS8023-1A
PROJECT LOCATION 23-25 Church Avenue & 16-18 John Street, Mascot, NSW

DATE STARTED 28/8/20 **COMPLETED** 28/8/20 **R.L. SURFACE** 8.40 **DATUM** m AHD
DRILLING CONTRACTOR Stratacore **SLOPE** 90° **BEARING** N.A.
EQUIPMENT Truck mounted drill rig **HOLE LOCATION** Refer to Figure 1 - Site Plan
HOLE SIZE 150mm **LOGGED BY** ST **CHECKED BY** SG
NOTES Surface levels and depths of subsurface conditions are approximate.

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture	Cons./Dens.	Additional Observations
ADT			8	1			CONCRETE. 100mm.				CONCRETE
							SAND, fine to medium grained, dark brown, with filled gravelly material.		M		FILL
			7	2		SP	SAND, fine to medium grained, dark brown to pale brown, with minute traces of clay.		M	Loose	ALLUVIAL SOIL
	03/09/2020		6								
	28/08/2020		5	3				SPT 3, 3, 4 N=7			
				4		SP	SAND, fine to medium grained, dark brown to pale brown, trace of silt, color change to pale brown from around 9.0m, with trace of clay.		W	Medium dense	
			4	5							
			3	6							
			2	7							
			1	8							

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Fax: 1300 136 038

BOREHOLE NUMBER BH2

CLIENT C & V Engineering Services Pty Ltd **PROJECT NAME** Geotechnical Investigation

PROJECT NUMBER GS8023-1A **PROJECT LOCATION** 23-25 Church Avenue & 16-18 John Street, Mascot, NSW

DATE STARTED 28/8/20 **COMPLETED** 28/8/20 **R.L. SURFACE** 8.40 **DATUM** m AHD

DRILLING CONTRACTOR Stratacore **SLOPE** 90° **BEARING** N.A.

EQUIPMENT Truck mounted drill rig **HOLE LOCATION** Refer to Figure 1 - Site Plan

HOLE SIZE 150mm **LOGGED BY** ST **CHECKED BY** SG

NOTES Surface levels and depths of subsurface conditions are approximate.

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture	Cons./Dens.	Additional Observations
ADT			0	9		SP	SAND, fine to medium grained, dark brown to pale brown, trace of silt, color change to pale brown from around 9.0m, with trace of clay. *(continued)*	SPT 5, 11, 15 N=26	W	Medium dense	
			-1	10							
			-2	11							
			-3	12							
			-4	13							
			-5	14							
			-6	15							
			-7	16							

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BOREHOLE NUMBER BH2

CLIENT C & V Engineering Services Pty Ltd **PROJECT NAME** Geotechnical Investigation

PROJECT NUMBER GS8023-1A **PROJECT LOCATION** 23-25 Church Avenue & 16-18 John Street, Mascot, NSW

DATE STARTED 28/8/20 **COMPLETED** 28/8/20 **R.L. SURFACE** 8.40 **DATUM** m AHD

DRILLING CONTRACTOR Stratacore **SLOPE** 90° **BEARING** N.A.

EQUIPMENT Truck mounted drill rig **HOLE LOCATION** Refer to Figure 1 - Site Plan

HOLE SIZE 150mm **LOGGED BY** ST **CHECKED BY** SG

NOTES Surface levels and depths of subsurface conditions are approximate.

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture	Cons./Dens.	Additional Observations
ADT			-8	17		SP	SAND, fine to medium grained, dark brown to pale brown, trace of silt, color change to pale brown from around 9.0m, with trace of clay. *(continued)*		W	Medium dense	
			-9	18							
			-10								
				19			Borehole BH2 continued as cored hole				
			-11								
				20							
			-12								
				21							
			-13								
				22							
			-14								
				23							
			-15								
				24							

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CLIENT C & V Engineering Services Pty Ltd **PROJECT NAME** Geotechnical Investigation

PROJECT NUMBER GS8023-1A **PROJECT LOCATION** 23-25 Church Avenue & 16-18 John Street, Mascot, NSW

DATE STARTED 28/8/20 **COMPLETED** 28/8/20 **R.L. SURFACE** 8.40 **DATUM** m AHD

DRILLING CONTRACTOR Stratacore **SLOPE** 90° **BEARING** N.A.

EQUIPMENT Truck mounted drill rig **HOLE LOCATION** Refer to Figure 1 - Site Plan

HOLE SIZE 150mm **LOGGED BY** ST **CHECKED BY** SG

NOTES Surface levels and depths of subsurface conditions are approximate.

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength (EL VL L M H VH EH)	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	Defect Spacing mm (30 100 300 1000 3000)	Defect Description
			-8	17								
			-9	18								
			-10			Continued from non-cored borehole						
NMLC coring				19		Effective TC bit refusal @ 18.70m. CORE LOSS. 300mm.						
			-11			CLAY, very high plasticity, orange to pale grey, mottled, with ironstone gravel. 19.0m-20.0m. Residual very high plasticity clay.						18.70-20.2m. Clayey zone.
				20								
			-12			Clayey SHALE, 50% clay, 50% shale, mix of locally ironstone gravel. 20.0m-21.50m. Class 5 SHALE.	EW					20.2-21.0m. Clay seam 800mm.
				21		SHALE, dark grey, locally mixed ironstone gravel.						21.06-21.3m. CZ.
			-13			CORE LOSS. 160mm.						
						SHALE, estimated class 4, pale grey, continuously bedded laminations.	MW		D 0.28 A 0.32			21.55m. BP, 0-10°, 2mm, PL, CN, SM. 21.60m. BP, PL, CN, SM. 21.79m. BP, 2mm, PL, CN, SM.
				22								
			-14									22.24m. BP, 1mm, 0-10°, PL, CN, SM. 22.42m. BP, 1mm, PL, CN, SM. 22.50m. BP, 2mm, PL, CN, SM.
									D 0.38 A 0.41	87		22.66m. BP, 1mm, PL, CN, SM. 22.77m. BP, PL, CN, SM. 22.90m. BP, PL, CN, SM.
				23								23.10m. BP, 2mm, PL, CN, SM. 23.20m. JT, 0-45°, PL, CN, SM.
			-15						D 1.8 A 2.46			23.36m. BP, 1mm, 0-10°, PL, CN, SM. 23.50m. BP, 2mm, PL, CN, SM. 23.62m. BP, 0-20°, 3mm, PL, CN, SM.
				24								23.80m. JT, 0-45°, PL, CN, SM. 23.90m. BP, 2mm, PL, CN, SM.

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6 Carter Street
Lidcombe
Telephone: 1300 137 038
Fax: 1300 136 038

BOREHOLE NUMBER BH2

CLIENT C & V Engineering Services Pty Ltd **PROJECT NAME** Geotechnical Investigation

PROJECT NUMBER GS8023-1A **PROJECT LOCATION** 23-25 Church Avenue & 16-18 John Street, Mascot, NSW

DATE STARTED 28/8/20 **COMPLETED** 28/8/20 **R.L. SURFACE** 8.40 **DATUM** m AHD

DRILLING CONTRACTOR Stratacore **SLOPE** 90° **BEARING** N.A.

EQUIPMENT Truck mounted drill rig **HOLE LOCATION** Refer to Figure 1 - Site Plan

HOLE SIZE 150mm **LOGGED BY** ST **CHECKED BY** SG

NOTES Surface levels and depths of subsurface conditions are approximate.

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength (EL VL L M H VH EH)	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	Defect Spacing mm (30 100 300 1000 3000)	Defect Description
NMLC coring			-16	25		SHALE, estimated class 4, pale grey, continuously bedded laminations. *(continued)*	MW			87		24.17m. BP, 2mm, PL, CN, SM. 24.25m. JT, 0-30°, PL, CN, SM. 24.40-24.54m. FZ.
			-17	26		SHALE, dark grey to pale grey, continuously bedded horizontal laminations. 24.50m-26.25m. Class 3 SHALE. 26.25m-27.52m. Class 2 SHALE.			D A 0.36 0.36 D A 0.3 0.41 D A 0.08 0.19	97		24.80m. JT, 0-40°, PL, CN, SM. 25.05m. BP, 1mm, PL, CN, SM. 25.14m. BP, 1mm, PL, CN, SM. 25.60m. JT, 0-30°, PL, CN, SM. 25.82m. BP, 2mm, PL, CN, SM. 25.99m. BP, 1mm, PL, CN, SM. 26.16m. BP, 1mm, PL, CN, SM. 26.52m. BP, 2mm, PL, CN, SM. 26.63m. BP, 3mm, PL, CN, SM.
			-18	27								27.25m. BP, 2mm, PL, CN, SM. 27.36m. BP, 1mm, PL, CN, SM.
			-19			BH2 terminated at 27.52m						
			-20	28								
			-21	29								
			-22	30								
			-23	31								
				32								

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DRAFT LOGS

BOREHOLE NUMBER BH3

CLIENT C & V Engineering Services Pty Ltd
PROJECT NAME Additional Geotechnical Investigation
PROJECT NUMBER GS8023-3A
PROJECT LOCATION 23-25 Church Avenue & 16-18 John Street, Mascot, NSW

DATE STARTED 2/11/20 **COMPLETED** 2/11/20 **R.L. SURFACE** 7.20 **DATUM** m AHD
DRILLING CONTRACTOR Stratacore **SLOPE** 90° **BEARING** N.A.
EQUIPMENT Truck mounted drill rig **HOLE LOCATION** Refer to Figure 1 - Site Plan
HOLE SIZE 150mm **LOGGED BY** ST **CHECKED BY** SG
NOTES Surface levels and depths of subsurface conditions are approximate.

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture	Cons./Dens.	Additional Observations
ADT			7	1			CONCRETE. 100mm.				PAVEMENT
							SAND, fine to medium grained, dark brown, pieces of bricks & gravel.		M		FILL
			6	2		SC	Clayey SAND, fine to medium grained, pale grey to dark brown to black.		M	Loose	ALLUVIAL SOIL
	02/11/2020		5	3				SPT 1, 2, 3 N=5			
			4	4		SP	SAND, fine to medium grained, black to pale brown, trace of clay.		W	Medium dense	
			3	5							
			2	6				SPT 2, 4, 8 N=12			
			1	7		SP	Silty SAND, black to pale grey to dark brown to pale grey.		W	Dense	
			0	8							

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DATE STARTED 2/11/20 **COMPLETED** 2/11/20 **R.L. SURFACE** 7.20 **DATUM** m AHD
DRILLING CONTRACTOR Stratacore **SLOPE** 90° **BEARING** N.A.
EQUIPMENT Truck mounted drill rig **HOLE LOCATION** Refer to Figure 1 - Site Plan
HOLE SIZE 150mm **LOGGED BY** ST **CHECKED BY** SG
NOTES Surface levels and depths of subsurface conditions are approximate.

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture	Cons./Dens.	Additional Observations
ADT			-1	9		SP	Silty SAND, black to pale grey to dark brown to pale grey. *(continued)*	SPT 8, 18, 25 N=43	W	Dense	
			-2	10							
			-3	11							
			-4	12		SP	Silty SAND, fine to medium grained, dark grey, with 80% sand, 20% clay.	SPT 16, 28/B	W		
			-5	13							
			-6	14							
			-7	15				SPT 7, 27/B			
			-8	16							

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PROJECT NUMBER GS8023-3A **PROJECT LOCATION** 23-25 Church Avenue & 16-18 John Street, Mascot, NSW

DATE STARTED 2/11/20 **COMPLETED** 2/11/20 **R.L. SURFACE** 7.20 **DATUM** m AHD

DRILLING CONTRACTOR Stratacore **SLOPE** 90° **BEARING** N.A.

EQUIPMENT Truck mounted drill rig **HOLE LOCATION** Refer to Figure 1 - Site Plan

HOLE SIZE 150mm **LOGGED BY** ST **CHECKED BY** SG

NOTES Surface levels and depths of subsurface conditions are approximate.

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture	Cons./Dens.	Additional Observations
ADT			-9	17			Clayey SHALE, dark grey, extremely weathered, very low estimated strength, with clay.		W		BEDROCK
			-10				Borehole BH3 continued as cored hole				
			-11	18							
			-12	19							
			-13	20							
			-14	21							
			-15	22							
			-16	23							
				24							

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BOREHOLE NUMBER BH3

CLIENT C & V Engineering Services Pty Ltd
PROJECT NAME Additional Geotechnical Investigation
PROJECT NUMBER GS8023-3A
PROJECT LOCATION 23-25 Church Avenue & 16-18 John Street, Mascot, NSW

DATE STARTED 2/11/20 **COMPLETED** 2/11/20 **R.L. SURFACE** 7.20 **DATUM** m AHD
DRILLING CONTRACTOR Stratacore **SLOPE** 90° **BEARING** N.A.
EQUIPMENT Truck mounted drill rig **HOLE LOCATION** Refer to Figure 1 - Site Plan
HOLE SIZE 150mm **LOGGED BY** ST **CHECKED BY** SG
NOTES Surface levels and depths of subsurface conditions are approximate.

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength (EL VL L M H VH EH)	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	Defect Spacing mm (30 100 300 1000 3000)	Defect Description
			-9	17		Continued from non-cored borehole						
			-10									
NMLC coring			-11	18		TC bit refusal at 17.65m. SHALE, pale grey to dark grey, regular horizontal bedding.	EW					17.65-18.52m. Co of Clay. 18.43-18.52m. Fe indurated.
			-12	19		SHALE, dark grey to pale grey, regular horizontal bedding.	MW		D 0.24 A 0.27	90		18.84m. BP, 2mm separation, PL, CN, SM. 18.9-18.92m. Clay seam. 19.10m. Jt, 0-60°, SM, PL, CN.
			-13	20		SHALE, laminated, dark grey to pale grey, regular horizontal bedding.	FR					19.91m. BP, 2mm separation, PL, CN, SM.
			-14	21					D 0.26 A 0.33	92		20.51m. BP, PL, CN, SM. 20.725m. BP, 3mm separation, PL, CN, SM.
			-15	22		SHALE, laminated, dark grey.	FR		D 0.2 A 0.26			21.06m. Jt, 0-40°, PL, CN, SM. 21.17m. Jt, 0-40°, PL, CN, SM. 21.39m. BP, PL, CN, SM. 21.391-21.75m. FZ with Clay seams. 21.80m. Jt, PL, CN, SM, 0-60°.
			-16	23		BH3 terminated at 22.92m			D 0.3 A 0.34	74		22.10m. BP, PL, CN, SM. 22.70m. Jt, 0-50°, PL, CN, SM.
				24								

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BOREHOLE NUMBER BH4

CLIENT C & V Engineering Services Pty Ltd
PROJECT NAME Additional Geotechnical Investigation
PROJECT NUMBER GS8023-3A
PROJECT LOCATION 23-25 Church Avenue & 16-18 John Street, Mascot, NSW

DATE STARTED 3/11/20 **COMPLETED** 3/11/20 **R.L. SURFACE** 7.30 **DATUM** m AHD
DRILLING CONTRACTOR Stratacore **SLOPE** 90° **BEARING** N.A.
EQUIPMENT Truck mounted drill rig **HOLE LOCATION** Refer to Figure 1 - Site Plan
HOLE SIZE 150mm **LOGGED BY** ST **CHECKED BY** SG
NOTES Surface levels and depths of subsurface conditions are approximate.

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture	Cons./Dens.	Additional Observations
ADT							CONCRETE. 160mm.				PAVEMENT
			7	1			SAND, fine to medium grained, dark brown, pieces of gravel, bricks, concrete etc.		M		FILL
			6	2				SPT 2, 2, 2 N=4			
			5	3		SP	SAND, fine to medium grained, dark brown to pale brown, with silt.		M	Loose	ALLUVIAL SOIL
	3/11/2020		4	4							
			3	5							
			2	6			Saturated from 6.0m.				
			1	7		SC	Clayey SAND, fine to medium grained, pale brown to dark brown, trace of silt.	SPT 3, 8, 10 N=18	W	Medium dense	
			0	8							

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BOREHOLE NUMBER BH4

CLIENT C & V Engineering Services Pty Ltd **PROJECT NAME** Additional Geotechnical Investigation

PROJECT NUMBER GS8023-3A **PROJECT LOCATION** 23-25 Church Avenue & 16-18 John Street, Mascot, NSW

DATE STARTED 3/11/20 **COMPLETED** 3/11/20 **R.L. SURFACE** 7.30 **DATUM** m AHD

DRILLING CONTRACTOR Stratacore **SLOPE** 90° **BEARING** N.A.

EQUIPMENT Truck mounted drill rig **HOLE LOCATION** Refer to Figure 1 - Site Plan

HOLE SIZE 150mm **LOGGED BY** ST **CHECKED BY** SG

NOTES Surface levels and depths of subsurface conditions are approximate.

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture	Cons./Dens.	Additional Observations
ADT			-1	9		SC	Clayey SAND, fine to medium grained, pale brown to dark brown, trace of silt. *(continued)*		W	Medium dense	
			-2	10							
			-3	11							
			-4	12		SC	Clayey SAND, fine to medium grained, dark brown to pale brown, with silt.	SPT 10, 25/B	W		
			-5	13							
			-6	14							
			-7	15							
			-8	16							

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DATE STARTED 3/11/20 **COMPLETED** 3/11/20 **R.L. SURFACE** 7.30 **DATUM** m AHD

DRILLING CONTRACTOR Stratacore **SLOPE** 90° **BEARING** N.A.

EQUIPMENT Truck mounted drill rig **HOLE LOCATION** Refer to Figure 1 - Site Plan

HOLE SIZE 150mm **LOGGED BY** ST **CHECKED BY** SG

NOTES Surface levels and depths of subsurface conditions are approximate.

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture	Cons./Dens.	Additional Observations
ADT			-9	17		SC	Clayey SAND, fine to medium grained, dark brown to pale brown, with silt. *(continued)*	SPT 4, 7, 9 N=16	W		
			-10				Clayey SHALE, dark brown, extremely weathered, extremely low estimated strength.				BEDROCK
			-11	18							
			-12	19			SHALE, laminated, extremely weathered, extremely low estimated strength, estimated Class V Shale.				
			-13	20			Borehole BH4 continued as cored hole				
			-14	21							
			-15	22							
			-16	23							
				24							

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DATE STARTED 3/11/20 **COMPLETED** 3/11/20 **R.L. SURFACE** 7.30 **DATUM** m AHD

DRILLING CONTRACTOR Stratacore **SLOPE** 90° **BEARING** N.A.

EQUIPMENT Truck mounted drill rig **HOLE LOCATION** Refer to Figure 1 - Site Plan

HOLE SIZE 150mm **LOGGED BY** ST **CHECKED BY** SG

NOTES Surface levels and depths of subsurface conditions are approximate.

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength (EL VL L M H VH EH)	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	Defect Spacing mm (30 100 300 1000 3000)	Defect Description
			-9	17								
			-10	18								
			-11	19								
			-12	20		Continued from non-cored borehole						
NMLC Coring			-13	21		TC bit refusal at 20.15m. SHALE, dark grey, continuously bedded.	MW			91		20.34m. BP, 2mm, PL, CN, SM. 20.425m. BP, 3mm, PL, CN, SM. 20.55m. BP, 3mm, PL, CN, SM. 20.61m. Jt, 0-45°, RO, IR. 20.78m. BP, 2mm, PL, CN, SM. 20.91m. BP, 2mm, PL, CN, SM.
			-14			SHALE, dark grey to pale grey, continuously bedded.	FR		D 0.44 A 0.41			21.4m. Jt, 0-50°, PL, CN, SM.
				22		SHALE, pale grey, continuously bedded.	FR					21.97-22.10m. Co of Clay.
			-15						D 0.12 A 0.24	78		22.10m. Jt, 0-60°, stepped, SM, CN. 22.20m. BP, 1mm, PL, CN, SM. 22.28m. BP, 1mm, PL, CN, SM. 22.33m. BP, 1mm, PL, CN, SM. 22.39m. BP, 1mm, PL, CN, SM.
				23								
			-16						D 0.38 A 1.7			23.67m. BP, 1mm, PL, CN, SM.
				24								

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BOREHOLE NUMBER BH4

CLIENT C & V Engineering Services Pty Ltd **PROJECT NAME** Additional Geotechnical Investigation

PROJECT NUMBER GS8023-3A **PROJECT LOCATION** 23-25 Church Avenue & 16-18 John Street, Mascot, NSW

DATE STARTED 3/11/20 **COMPLETED** 3/11/20 **R.L. SURFACE** 7.30 **DATUM** m AHD

DRILLING CONTRACTOR Stratacore **SLOPE** 90° **BEARING** N.A.

EQUIPMENT Truck mounted drill rig **HOLE LOCATION** Refer to Figure 1 - Site Plan

HOLE SIZE 150mm **LOGGED BY** ST **CHECKED BY** SG

NOTES Surface levels and depths of subsurface conditions are approximate.

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength (EL VL L M H VH EH)	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	Defect Spacing mm (30 100 300 1000 3000)	Defect Description
NMLC Coring			-17			SHALE, pale grey, continuously bedded. *(continued)*	FR					
						CORE LOSS. 150mm.						
						SHALE, pale grey, continuously bedded.		M	D 0.2 A 0.3	78		
						CORE LOSS. 180mm.						
						BH4 terminated at 24.7m						
			-18	25								
			-19	26								
			-20	27								
			-21	28								
			-22	29								
			-23	30								
			-24	31								
				32								

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BOREHOLE NUMBER BH5

CLIENT C & V Engineering Services Pty Ltd
PROJECT NAME Additional Geotechnical Investigation
PROJECT NUMBER GS8023-3A
PROJECT LOCATION 23-25 Church Avenue & 16-18 John Street, Mascot, NSW

DATE STARTED 4/11/20 **COMPLETED** 4/11/20 **R.L. SURFACE** 6.86 **DATUM** m AHD
DRILLING CONTRACTOR Stratacore **SLOPE** 90° **BEARING** N.A.
EQUIPMENT Truck mounted drill rig **HOLE LOCATION** Refer to Figure 1 - Site Plan
HOLE SIZE 150mm **LOGGED BY** ST **CHECKED BY** SG
NOTES Surface levels and depths of subsurface conditions are approximate.

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture	Cons./Dens.	Additional Observations
ADT							CONCRETE. 150mm.				PAVEMENT
			6	1			SAND, fine to medium grained, dark brown, pieces of gravel.				FILL
	4/11/2020		5	2		SP	SAND, fine to medium grained, dark brown, trace of silt.		W		ALLUVIAL SOIL
			4	3				SPT 3, 5, 6 N=11			
			3	4							
			2	5							
			1	6		SM	Silty SAND, fine to medium grained, pale grey to pale brown.	SPT 2, 3, 4 N=7	W		
			0	7							
			-1	8							

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BOREHOLE NUMBER BH5

CLIENT C & V Engineering Services Pty Ltd **PROJECT NAME** Additional Geotechnical Investigation

PROJECT NUMBER GS8023-3A **PROJECT LOCATION** 23-25 Church Avenue & 16-18 John Street, Mascot, NSW

DATE STARTED 4/11/20 **COMPLETED** 4/11/20 **R.L. SURFACE** 6.86 **DATUM** m AHD

DRILLING CONTRACTOR Stratacore **SLOPE** 90° **BEARING** N.A.

EQUIPMENT Truck mounted drill rig **HOLE LOCATION** Refer to Figure 1 - Site Plan

HOLE SIZE 150mm **LOGGED BY** ST **CHECKED BY** SG

NOTES Surface levels and depths of subsurface conditions are approximate.

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture	Cons./Dens.	Additional Observations
ADT						SM	Silty SAND, fine to medium grained, pale grey to pale brown. *(continued)*		W		
			-2	9		SM	Silty SAND, fine to medium grained, pale grey to pale brown, trace of clay.	SPT 3, 6, 11 N=17	W		
			-3	10							
			-4	11		SM	Silty SAND, fine to medium grained, pale grey to dark brown, with trace of clay.	SPT 1, 2, 2 N=4	W		
			-5	12							
			-6	13		SC	Clayey SAND, fine to medium grained, dark brown, trace of silt.				
			-7	14				SPT 7, 14, 17 N=31			
			-8	15			Clayey SHALE, dark brown to black, extremely weathered, extremely low estimated strength.				BEDROCK
			-9	16							

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DATE STARTED 4/11/20 **COMPLETED** 4/11/20 **R.L. SURFACE** 6.86 **DATUM** m AHD

DRILLING CONTRACTOR Stratacore **SLOPE** 90° **BEARING** N.A.

EQUIPMENT Truck mounted drill rig **HOLE LOCATION** Refer to Figure 1 - Site Plan

HOLE SIZE 150mm **LOGGED BY** ST **CHECKED BY** SG

NOTES Surface levels and depths of subsurface conditions are approximate.

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture	Cons./Dens.	Additional Observations
ADT							Clayey SHALE, dark brown to black, extremely weathered, extremely low estimated strength. *(continued)*				
							Borehole BH5 continued as cored hole				
			-10	17							
			-11	18							
			-12	19							
			-13	20							
			-14	21							
			-15	22							
			-16	23							
			-17	24							

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BOREHOLE NUMBER BH5

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DATE STARTED 4/11/20 **COMPLETED** 4/11/20 **R.L. SURFACE** 6.86 **DATUM** m AHD
DRILLING CONTRACTOR Stratacore **SLOPE** 90° **BEARING** N.A.
EQUIPMENT Truck mounted drill rig **HOLE LOCATION** Refer to Figure 1 - Site Plan
HOLE SIZE 150mm **LOGGED BY** ST **CHECKED BY** SG
NOTES Surface levels and depths of subsurface conditions are approximate.

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength (EL VL L M H VH EH)	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	Defect Spacing mm (30 100 300 1000 3000)	Defect Description
						Continued from non-cored borehole						
NMLC coring			-10	17		TC bit refusal at 16.3m. Clayey SHALE, laminated, pale grey to dark grey.	EW			96		16.30-17.10m. Clayey Shale.
						SHALE, dark grey, regular horizontal bedding.	MW					17.25m. BP, 3mm, PL, CN, SM.
						CORE LOSS. 50mm.						17.58m. BP, 2mm, PL, CN, SM.
						SHALE, dark grey, regular horizontal bedding.						17.80m. BP, 2mm, PL, CN, SM.
			-11	18		SHALE, pale grey, regular horizontal bedding.						17.90m. Jt, 0-45°, PL, CN, SM. 17.95m. BP, 2mm, PL, CN, SM. 18.07m. BP, 1mm, PL, CN, SM. 18.20m. Jt, 0-45°, PL, CN, SM. 18.35m. Jt, 0-40°, PL, CN, SM. 18.50m. Jt, 0-45°, PL, CN, SM.
									D 0.16 A 0.12	91		
			-12	19								18.75m. Jt, 0-30°, PL, CN, SM.
						SHALE, pale grey, regular horizontal bedding, estimated Class III.	FR					19.33m. BP, 2mm, PL, CN, SM. 19.45m. Jt, 0-45°, stepped, CN, SM. 19.5m. Jt, 0-60°, stepped, CN, SM. 19.59-19.61m. Clay Seam. 19.66m. BP, PL, CN, SM.
			-13	20					D 0.08 A 0.17			
									D 0.18 A 0.23	70		20.2m. BP, PL, CN, SM. 20.35m. BP, PL, CN, SM.
			-14	21								20.62m. Jt, 0-45°, PL, CN, SM.
												21.15-21.3m. FZ.
						CORE LOSS. 400mm.						
			-15	22		SHALE, pale grey, regular horizontal bedding, estimated Class III.			D 0.12 A 0.44			21.97m. BP, PL, CN, SM.
									D 0.16 A 0.42	54		22.32m. BP, 2mm, PL, CN, SM.
			-16	23								22.75-23.55m. FZ.
						CORE LOSS. 150mm.						
			-17	24		SHALE, pale grey, regular horizontal bedding, estimated Class III.				72		23.9-24.0m. Clay Seam.

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BOREHOLE NUMBER BH5

CLIENT C & V Engineering Services Pty Ltd **PROJECT NAME** Additional Geotechnical Investigation

PROJECT NUMBER GS8023-3A **PROJECT LOCATION** 23-25 Church Avenue & 16-18 John Street, Mascot, NSW

DATE STARTED 4/11/20 **COMPLETED** 4/11/20 **R.L. SURFACE** 6.86 **DATUM** m AHD

DRILLING CONTRACTOR Stratacore **SLOPE** 90° **BEARING** N.A.

EQUIPMENT Truck mounted drill rig **HOLE LOCATION** Refer to Figure 1 - Site Plan

HOLE SIZE 150mm **LOGGED BY** ST **CHECKED BY** SG

NOTES Surface levels and depths of subsurface conditions are approximate.

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength (EL VL L M H VH EH)	$Is_{(50)}$ MPa (D- diametral A- axial)	RQD %	Defect Spacing mm (30 100 300 1000 3000)	Defect Description
NMLC coring			-18	25		SHALE, pale grey, regular horizontal bedding, estimated Class III. *(continued)*	FR		D 0.22 A 0.38	72		24.23m. BP, 2mm, PL, CN, SM. 24.84-24.95m. Clay Seam. 25.26m. BP, 2mm, PL, CN, SM.
			-19	26		BH5 terminated at 25.3m						
			-20	27								
			-21	28								
			-22	29								
			-23	30								
			-24	31								
			-25	32								

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BH No: BH 3
Sheet: 1 of 1
Job No: 9349

Borehole Log

Client: The Owners Corporation SP 80877 C-SCE
Project: Mascot Towers
Location: 1-5 Bourke Street, Mascot NSW 2020

Started: 23/7/19
Finished: 23/7/19
Borehole Size: 110m

Rig Type: Hanjin D&B 8D
Hole Location: Refer to drawing 9349-GR-1-A
Driller: CB
Logged: AA
RL Surface:
Contractor: BG Drilling Pty Ltd
Bearing: ---
Checked:

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
DT						--	Concrete Pavement, 150mm thickness.		--	--	PAVEMENT
ADT						--	FILL: SAND, fine to medium grained, brown, trace gravel.		M	--	FILL
						SP	SAND, fine to medium grained, brown, poorly graded.		M	VL - L	ALLUVIUM
				1			At 1.0m, as above but light grey to grey.	SPT 1, 2, 2 N=4			
	Ground Water Table at 2.2m.			2			At 2.2m, fine grained, grey, trace silt and rootlets, poorly graded.		W	L	
				3			At 3.2m, as above but light brown.	SPT 2, 3, 4 N=7			
				4				SPT 2, 2, 4 N=6			
				5			Borehole BH 3 terminated at 5m				
				6							

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BH No: BH 4
Sheet: 1 of 1
Job No: 9349

Borehole Log

Client: The Owners Corporation SP 80877 C-SCE
Project: Mascot Towers
Location: 1-5 Bourke Street, Mascot NSW 2020

Started: 23/7/19
Finished: 23/7/19
Borehole Size: 110m

Rig Type: Hanjin D&B 8D
Hole Location: Refer to drawing 9349-GR-1-A
Driller: CB
Logged: AA
RL Surface:
Contractor: BG Drilling Pty Ltd
Bearing: ---
Checked:

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
ADT						--	FILL: SAND, fine to medium grained, brown, trace gravel.		M	--	FILL
						SP	SAND, fine to medium grained, brown, trace silt, poorly graded.		M	(VL - L)	ALLUVIUM
	▼ Ground Water Table at 3.0m.			3			At 3.0m, as above but dark brown-grey, wet.		W	(L)	
				5			Borehole BH 4 terminated at 5m				

BOREHOLE / TEST PIT 9349 LOGS.GPJ GINT STD AUSTRALIA.GDT 2/8/19

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BH No: BH 4A
PAGE 1 OF 5
Job No: 9349

Borehole Log

Client: The Owners Corporation SP 80877 C-SCE
Project: Mascot Towers
Location: 1-5 Bourke Street, Mascot NSW 2020

Started: 22/7/19
Finished: 22/7/19
Borehole Size: 110m

Rig Type: Hanjin D&B 8D
Hole Location: Refer to drawing 9349-GR-1-A
Driller: CB
Logged: TD
RL Surface:
Contractor: BG Drilling Pty Ltd
Bearing: ---
Checked:

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
ADT					--	FILL: SAND, fine to medium grained, brown, trace gravel.		--	--	FILL
			1		SM	Silty SAND, fine to medium grained, dark grey, trace fine gravel, rounded.		M	L	ALLUVIUM
			2		SP	SAND, fine to medium grained, dark grey to grey, trace silt.	SPT 3, 3, 4 N=7	M	L	
	▼ Ground Water Table at 3.1m.		3						VL	
			4		SM	Silty SAND, fine to medium grained, dark brown.	SPT 2, 2, 2 N=4	W	L	
H			5		SC	Clayey SAND, dark grey to black, with organics.	SPT 2, 5, 9 N=14	W	MD	
					SM	Silty SAND, fine to medium grained, dark brown.		W	MD	
			6							

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Borehole Log

Client: The Owners Corporation SP 80877 C-SCE
Project: Mascot Towers
Location: 1-5 Bourke Street, Mascot NSW 2020
Started: 22/7/19
Finished: 22/7/19
Borehole Size: 110m

Rig Type: Hanjin D&B 8D **Hole Location:** Refer to drawing 9349-GR-1-A **Driller:** CB **Logged:** TD
RL Surface: **Contractor:** BG Drilling Pty Ltd **Bearing:** --- **Checked:**

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Push Tube					SM	Silty SAND, fine to medium grained, dark brown. *(continued)*		W	MD	ALLUVIUM
						At 6.3m, as above but dark grey.				
					SP	SAND, fine grained, brown, poorly graded.		W	MD	
			7							
					SP	SAND/PEAT, fine to medium grained, dark grey.		W	MD	
			8		SP	SAND, fine to medium grained, brown.		W	MD	
	W						SPT 3, 9, 18 N=27			
			9				SPT 3, 10, 19 N=29			
			10		SP	At 10.0m, as above but light grey to grey.	SPT 11, 19, 24 N=43		D	
			11			At 11.0m, as above but light grey.	SPT 6, 16, 20 N=36			
			12		SC	Clayey SAND, fine grained, dark grey to black, with silt.		W	L	

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Borehole Log

Client: The Owners Corporation SP 80877 C-SCE
Project: Mascot Towers
Location: 1-5 Bourke Street, Mascot NSW 2020
Started: 22/7/19
Finished: 22/7/19
Borehole Size: 110m

Rig Type: Hanjin D&B 8D **Hole Location:** Refer to drawing 9349-GR-1-A **Driller:** CB **Logged:** TD
RL Surface: **Contractor:** BG Drilling Pty Ltd **Bearing:** --- **Checked:**

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
W			13		SC	Clayey SAND, fine grained, dark grey to black, with silt. *(continued)*	SPT 2, 3, 4 N=7	W	L	ALLUVIUM
			14		SP	SAND, fine to medium grained, grey, thin layering, with silt.	SPT 7, 11, 7 N=18	W	MD	
							SPT 8, 17, 23 N=40		D	
			15		SM	Silty SAND, fine to medium grained, dark brown to grey.	SPT 3, 11, 18 N=29	W	MD	
			16		CI-CH	CLAY, medium to high plasticity, light grey to yellow.		M	St - VSt	RESIDUAL
			17							
			18			Borehole BH 4A continued as cored hole				

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Cored Borehole Log

Client: The Owners Corporation SP 80877 C-SCE
Project: Mascot Towers
Location: 1-5 Bourke Street, Mascot NSW 2020

Started: 22/7/19
Finished: 22/7/19
Borehole Size: 110m

Rig Type: Hanjin D&B 8D
Hole Location: Refer to drawing 9349-GR-1-A
Driller: CB
Logged: TD

RL Surface:
Contractor: BG Drilling Pty Ltd
Bearing: ---
Checked:

Method	Water	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	Defect Spacing mm (30, 100, 300, 1000, 3000)	Additional Data
			13								
			14								
			15								
			16								
			17		Continued from non-cored borehole						
NMLC					CORE LOSS	EW					
					Clay Band, 180mm.	HW					17.42-17.54 - Clay Seam, 120mm.
					SHALE, extremely to highly weathered, extremely low to low strength, dark grey, thinly laminated, 0°, iron staining, with clay bands.			D 0.03 A 0.04	45		17.71-17.79 - JT, 50°, stepped, rough, FE.
			18								17.92 - JT, 0°, undulating, rough, FE.

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Cored Borehole Log

Client: The Owners Corporation SP 80877 C-SCE
Project: Mascot Towers
Location: 1-5 Bourke Street, Mascot NSW 2020

Started: 22/7/19
Finished: 22/7/19
Borehole Size: 110m

Rig Type: Hanjin D&B 8D **Hole Location:** Refer to drawing 9349-GR-1-A **Driller:** CB **Logged:** TD
RL Surface: **Contractor:** BG Drilling Pty Ltd **Bearing:** --- **Checked:**

Method	Water	RL (m)	Depth (m)	Graphic Log	Material Description	Weathering	Estimated Strength (EL -0.03, VL -0.1, L -0.3, M -1, H -3, VH -10, EH)	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	Defect Spacing mm (30, 100, 300, 1000, 3000)	Additional Data
NMLC						EW					17.95 - JT, 0°, undulating, rough, FE.
					CORE LOSS						18.15-18.19 - Core Loss 40mm.
					Shale as above.	HW					18.24-18.30 - JT, sub vertical joint, undulating, rough, CY.
											18.33-18.35 - Clay Seam, 20mm.
											18.45 - JT, 15°, curved, rough, FE.
											18.52 - BP, 0°, planar, CY.
								D 0.02 A 0.01	45		
								A 0.14			18.8-18.81 - Clay Seam, 10mm.
			19								18.97 - BP, 0°, planar, rough, FE.
						EW		D 0.07 A 0.04			19.09 - 19.11 - JT, 0-10°, undulating, rough, FE.
											19.11-12.26: Clay Seam, 150mm.
					BH 4A terminated at 19.26m						End of BH4A at 19.26m.
			20								
			21								
			22								
			23								
			24								

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BOREHOLE LOG

Borehole No. 1 1/2

Client: TELPOJ PTY LTD AND TELPOB PTY LTD
Project: PROPOSED COMMERCIAL AND RESIDENTIAL DEVELOPMENT
Location: 23-27 CHURCH AVENUE, MASCOT, NSW

Job No. 22451SB
Date: 2-10-08
Method: SPIRAL AUGER JK250
R.L. Surface: ≈ 6.4m
Datum: AHD
Logged/Checked by: J.P.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0			FILL: Silty sand, fine to coarse grained, dark grey, with slag gravel.	D			APPEARS MODERATELY COMPACTED
					N = 13 5,7,6	1		SM	SILTY SAND: fine to medium grained, dark grey, with organic matter.	D	VL	-	
ON 10-10-08 ▼					N = 3 1,2,1			SP	SAND: fine to medium grained, light grey and brown.	M			
▼ ON COMPLETION						2							
					N = 10 5,5,5	3					L		
						4				W			
					N = 26 5,10,16	5					MD		
					N = 27 8,10,17	6							
						7							

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BOREHOLE LOG

Borehole No. 1 2/2

Client: TELPOJ PTY LTD AND TELPOB PTY LTD

Project: PROPOSED COMMERCIAL AND RESIDENTIAL DEVELOPMENT

Location: 23-27 CHURCH AVENUE, MASCOT, NSW

Job No. 22451SB **Method:** SPIRAL AUGER JK250 **R.L. Surface:** ≈ 6.4m

Date: 2-10-08 **Datum:** AHD

Logged/Checked by: J.P./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0		SP	SAND: fine to medium grained, brown.	W	MD		
						8			END OF BOREHOLE AT 8.0m				PVC STANDPIPE INSTALLED ON COMPLETION TO 7m DEPTH, BOTTOM 3m SLOTTED
						9							
						10							
						11							
						12							
						13							
						14							

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BOREHOLE LOG

Borehole No. 2 1/2

Client: TELPOJ PTY LTD AND TELPOB PTY LTD
Project: PROPOSED COMMERCIAL AND RESIDENTIAL DEVELOPMENT
Location: 23-27 CHURCH AVENUE, MASCOT, NSW

Job No. 22461SB **Method:** SPIRAL AUGER JK250 **R.L. Surface:** ≈ 7.1m
Date: 2-10-08 **Datum:** AHD
Logged/Checked by: J.P./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0			FILL: Silty sand, fine to coarse grained, dark grey, with slag gravel.	D			APPEARS POORLY COMPACTED
					N = 5 3,3,2	1			FILL: Gravelly clayey sand, fine to coarse grained, brown, with sandstone gravel.	M			
ON COMPLET-ION ▼					N = 16 7,8,8	2		SP	SAND: fine to medium grained, brown.	M	MD		
ON 9-10-08 ▼					N = 17 7,7,10	3							
						4				W			
					N = 10 1,1,9	5		SM	SILTY SAND: fine grained, dark grey, with clay and silt lumps, peat and organic matter.		L		
					N = 9 2,2,7	6							
						7							

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Borehole No. **2** 2/2

BOREHOLE LOG

Client: TELPOJ PTY LTD AND TELPOB PTY LTD

Project: PROPOSED COMMERCIAL AND RESIDENTIAL DEVELOPMENT

Location: 23-27 CHURCH AVENUE, MASCOT, NSW

Job No. 22451SB **Method:** SPIRAL AUGER **R.L. Surface:** ≈ 7.1m

Date: 2-10-08 JK250 **Datum:** AHD

Logged/Checked by: J.P./

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						0		SM	SILTY SAND: fine grained, dark grey, with clay and silt lumps, peat and organic matter.	W	L		
						8			END OF BOREHOLE AT 8.0m				PVC STANDPIPE INSTALLED ON COMPLETION TO 7m DEPTH, BOTTOM 3m SLOTTED
						9							
						10							
						11							
						12							
						13							
						14							

APPENDIX D

Rock Core Photographs

Rock Core Photographs: BH3, 17.65m-22.92m.

100mm

Aargus ENVIRONMENTAL - ENGINEERING - DRILLING - LABORATORIES - ASBESTOS

Drawn	SP	**C & V Engineering Services Pty Ltd Additional Geotechnical Site Investigation 23-25 Church Avenue, Mascot, NSW**	Aargus	Figure	**2**
Checked	SG			Title	**BH3 Rock Core Photograph**
Date	5th November 2020			Job No	**GS8023-3A**
Scale	As shown				

Rock Core Photographs: BH4, 20.15m-24.70m.

100mm

Aargus ENVIRONMENTAL - ENGINEERING - DRILLING - LABORATORIES - ASBESTOS

Drawn	SP	**C & V Engineering Services Pty Ltd Additional Geotechnical Site Investigation 23-25 Church Avenue, Mascot, NSW**	Aargus	Figure	**2**
Checked	SG			Title	**BH4 Rock Core Photograph**
Date	5th November 2020			Job No	**GS8023-3A**
Scale	As shown				

Rock Core Photographs: BH5, 16.30m-25.30m.

100mm

Aargus ENVIRONMENTAL - ENGINEERING - DRILLING - LABORATORIES - ASBESTOS

Drawn	SP	**C & V Engineering Services Pty Ltd Additional Geotechnical Site Investigation 23-25 Church Avenue, Mascot, NSW**	Aargus	Figure	**2**
Checked	SG			Title	**BH5 Rock Core Photograph**
Date	5th November 2020			Job No	**GS8023-3A**
Scale	As shown				

APPENDIX E

Point Load Test Results

Aargus POINT LOAD STRENGTH INDEX REPORT

Client:	C & V Engineering Services Pty Ltd	**Date Tested:**	6/11/2020
Address:	23-25 Church Avenue, Mascot, NSW	**Job No:**	GS8023-3A

Borehole ID	Depth (m)	Sample Description	Test Type	Point Load Index $Is_{(50)}$	UCS (MPa)	Notes
BH3	19.30	SHALE	Diametral	0.24	4.70	Moist Sample
			Axial	0.27	5.40	Moist Sample
BH3	20.5	SHALE	Diametral	0.26	5.10	Moist Sample
			Axial	0.33	6.60	Moist Sample
BH3	21.30	SHALE	Diametral	0.2	3.90	Moist Sample
			Axial	0.26	5.10	Moist Sample
BH3	22.40	SHALE	Diametral	0.3	5.90	Moist Sample
			Axial	0.34	6.90	Moist Sample

Comments:
UCS –Unconfined Compressive Test.
Multiplication Factor of 20 was used to calculate UCS.

Sheet 1 of 1

Tested By:	ST
Checked By:	SG

Aargus Pty Ltd

Australia (NSW, QLD, VIC, SA), South Korea, Greece, Spain, Lebanon
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Aargus POINT LOAD STRENGTH INDEX REPORT

Client:	C & V Engineering Services Pty Ltd	**Date Tested:**	6/11/2020
Address:	23-25 Church Avenue, Mascot, NSW	**Job No:**	GS8023-3A

Borehole ID	Depth (m)	Sample Description	Test Type	Point Load Index $Is_{(50)}$	UCS (MPa)	Notes
BH4	21.50	SHALE	Diametral	0.44	8.70	Moist Sample
			Axial	0.41	8.20	Moist Sample
BH4	22.35	SHALE	Diametral	0.12	2.30	Moist Sample
			Axial	0.24	4.80	Moist Sample
BH4	23.70	SHALE	Diametral	0.38	7.50	Moist Sample
			Axial	1.70	34.00	Moist Sample
BH4	24.40	SHALE	Diametral	0.20	3.90	Moist Sample
			Axial	0.30	6.00	Moist Sample

Comments:
UCS –Unconfined Compressive Test.
Multiplication Factor of 20 was used to calculate UCS.

Sheet 1 of 1

Tested By: ST

Checked By: SG

Aargus Pty Ltd

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Aargus POINT LOAD STRENGTH INDEX REPORT

Client:	C & V Engineering Services Pty Ltd	**Date Tested:**	6/11/2020
Address:	23-25 Church Avenue, Mascot, NSW	**Job No:**	GS8023-3A

Borehole ID	Depth (m)	Sample Description	Test Type	Point Load Index $Is_{(50)}$	UCS (MPa)	Notes
BH5	18.70	SHALE	Diametral	0.16	3.10	Moist Sample
			Axial	0.12	2.40	Moist Sample
BH5	19.90	SHALE	Diametral	0.08	1.50	Moist Sample
			Axial	0.17	3.40	Moist Sample
BH5	20.30	SHALE	Diametral	0.18	3.50	Moist Sample
			Axial	0.23	4.50	Moist Sample
BH5	21.90	SHALE	Diametral	0.12	2.30	Moist Sample
			Axial	0.44	8.80	Moist Sample
BH5	22.30	SHALE	Diametral	0.16	3.10	Moist Sample
			Axial	0.42	8.50	Moist Sample
BH5	25.20	SHALE	Diametral	0.22	4.30	Moist Sample
			Axial	0.38	7.60	Moist Sample

Comments:
UCS –Unconfined Compressive Test.
Multiplication Factor of 20 was used to calculate UCS.

Sheet 1 of 1	Tested By:	ST
	Checked By:	SG

Aargus Pty Ltd

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