

Appendix N

Geotechnical
assessment report



Douglas Partners

Geotechnics | Environment | Groundwater

Report on
Geotechnical Investigation

Buildings B, C and D
11-17 Khartoum Road and 33-39 Talavera Road
Macquarie Park

Prepared for
Stockland Pty Ltd

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Integrated Practical Solutions



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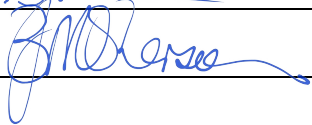
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Report on Geotechnical Investigation

Buildings B, C and D

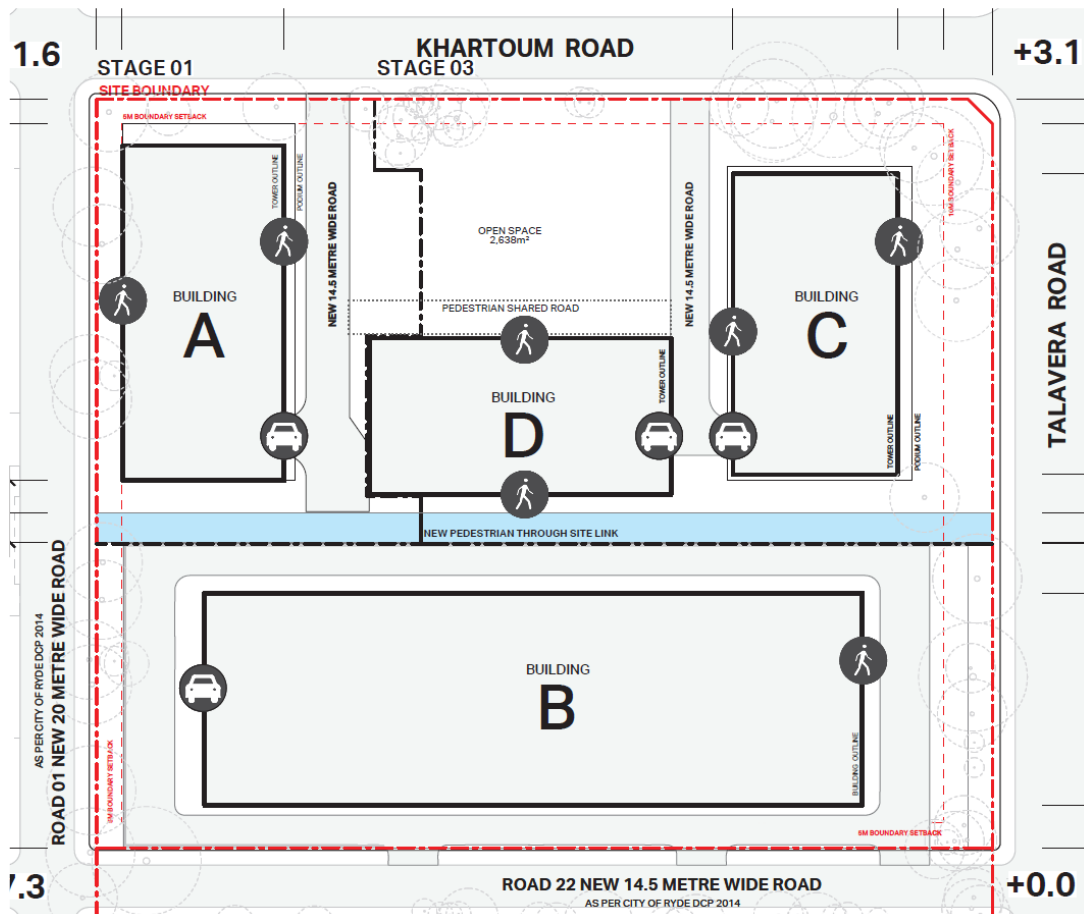
11-17 Khartoum Road and 33-39 Talavera Road

1. Introduction

This report presents the results of a geotechnical investigation undertaken by Douglas Partners Pty Ltd (DP) for a Buildings B, C and D of the proposed mixed use development at 11-17 Khartoum Road and 33-39 Talavera Road, Macquarie Park. The investigation was commissioned in an email dated 5 June 2020 by Ms Maryam Litkouhi of Stockland Pty Ltd (Stockland) and was undertaken in accordance with Douglas Partners' proposal SYD200583.P.001.Rev1 dated 4 June 2020.

The proposed development is located in the western corner of Lot 1 in DP 633221 at 11 – 17 Khartoum Road and 33 - 39 Talavera Road. The development comprises four buildings (A, B, C and D) and is being undertaken in a staged approach. An excerpt from the project architectural plans (Staging Plan by 3XN Australia Pty Ltd, drawing number DA-015, dated 13 May 2020, revision J) showing the proposed building locations is provided in Figure 1 below.

Figure 1: Excerpt from Architectural Staging Plan Showing Building Locations



It is understood that Building B will house a data centre with a proposed bulk excavation level (BEL) of RL 49.0 m, and that Buildings C and D are for mixed use development and have proposed BELs of RL 41.9 m and RL 47.8 m respectively.

The investigation was carried out to provide information on the subsurface conditions for design and planning purposes and included the drilling of nineteen rock cored boreholes, ten hand augered boreholes, the installation of five temporary groundwater monitoring wells, as well as groundwater monitoring, in situ permeability testing and laboratory testing of selected samples. Details of the field work and laboratory testing are given in this report, together with comments on design and construction.

DP has also undertaken investigations for the Building A site (Ref 99609.00, dated April 2020). The information collected during the Building A investigation has been referenced in this report where appropriate.

2. Site Description

The site (lot 1 in DP 633221, 11 – 17 Khartoum Road and 33-39 Talavera Road) is rectangular shaped and covers a plan area of about 30,000 m². Most of the site is occupied by two multi-storey commercial buildings with no basement levels and on-grade carparking. The remainder of the site is covered by garden beds and grassed areas which are interspersed with trees.

The site has a frontage to and is bound by Khartoum Road and Talavera Road on the north west and north east boundaries respectively. The remaining sides of the site are bound by a self-storage facility to the south west (7 Khartoum Road), and the Johnson and Johnson medical device production and dispatch facility to the south east (1-5 Khartoum Road).

The site generally slopes from west to east, from a level of approximately RL 60 m to RL 48 m. There are some batters up to about 4 m high on the site, and a crib wall between the main building and the south east vehicular access.

3. Geology and Acid Sulphate Soils

Reference to the *Sydney 1:100 000 Geological Series Sheet* indicates that the site is underlain by the Ashfield Shale Formation. Ashfield Shale typically comprises black to dark grey shale and laminite (interbedded shale, siltstone and fine-grained sandstone) and typically weathers to form clays of medium to high plasticity.

Ashfield Shale is underlain by Hawkesbury Sandstone which typically consists of medium to coarse grained quartz sandstone with minor shale and laminite lenses. The Mittagong formation is a transitional unit often found between the Ashfield Shale and Hawkesbury Sandstone and typically includes laminite and fine-grained sandstone of variable strength.

The geological mapping was generally consistent with the investigation, which typically encountered shale, siltstone and laminite overlying sandstone.

The Homebush Bay Fault Line is known to run approximately NNE along Lane Cove Road to the east of the site. Rock surrounding the fault line may have more jointing and include zones of variable and weaker rock due to large scale movements experienced in the past.

Reference to Acid Sulphate Soil mapping for the area indicates that the site is in an area of no known occurrence.

4. Building A Investigations

DP has also undertaken investigations for the Building A site (Ref 99609.00, dated April 2020). The investigation included four rock cored boreholes and two hand augered borehole, the installation of two monitoring wells as well as groundwater monitoring and laboratory testing. The information collected during the Building A investigation has been referenced in this report where appropriate.

Additionally, Golder Associates (Golder) has carried out a geotechnical investigation of the Building A site (Ref 1785207-004-R-Rev0, 17 November 2017). The investigation included four rock cored boreholes, the installation of three monitoring wells as well as groundwater monitoring and laboratory testing. The information collected by Golder has been referenced in this report where appropriate.

The approximate locations of the boreholes are shown on the Borehole Location Plan (Appendix B, Drawing 1) and summary logs are shown on the Interpreted Geotechnical Cross-Sections (Appendix B, Drawings 2, 3 and 4), with detailed logs presented in Appendix F and G.

5. Field Work Methods

The field work for the investigation included:

- Drilling of nineteen rock cored boreholes (BH201 to BH219) using geotechnical drilling rigs and ten hand augered boreholes (BH220 to BH229) at the locations shown on Drawing 1 in Appendix B.
- BH201 to BH211, BH212B, and BH213 to BH219 were drilled into the residual clay / weathered rock to depths of between 1.2 m to 4.7 m using solid flight augers and/or rotary wash-boring techniques. The boreholes were then continued to depths of between 8.76 m to 18.28 m using diamond core drilling equipment to obtain continuous core samples of the bedrock. Standard penetration tests (SPTs) were undertaken within the soil strata at regular intervals to obtain samples and to assess the insitu strength of the soils.
- BH212, BH212A and BH212C were drilled using a geotechnical drilling rig, but terminated prior to reaching natural ground due to concrete and steel obstructions.
- BH220 to BH229 were drilled to depth of between 0.75 m and 1.4 m using hand held equipment to recover samples predominately for environmental and waste classification testing purposes.
- Groundwater monitoring wells were installed in BH201, BH203, BH208, BH215 and BH218.
- Measurement of groundwater levels and in situ permeability testing was carried out in all wells. Groundwater levels were also remeasured in the wells at the Building A site.

The boreholes were logged and sampled by a geotechnical engineer. The rock cores recovered from the boreholes were photographed, followed by Point Load Strength Index (IS_{50}) testing on selected samples.

The ground surface levels and coordinates at the borehole locations were measured using a high precision differential GPS with an accuracy of about 0.1 m.

6. Field Work Results

6.1 Subsurface Profile

Details of the subsurface conditions encountered are given in the borehole logs in Appendix C, together with notes explaining descriptive terms and classification methods used. The general sequence of subsurface materials encountered at the borehole locations may be summarised as follows:

- Asphaltic Concrete:** encountered at all borehole locations within the carparks (BH201 to BH204, BH207, BH210 to BH212, BH212A, BH212B, BH212C, BH214, BH217 to BH219) to depths of between 20 mm and 100 mm from the surface.
- Concrete:** Concrete was encountered below the asphaltic concrete in BH207, BH212, BH212A, BH212B and BH212C to depths of 0.24 m to 0.33 m, BH212C was terminated at a depth of 0.26 m on a steel plate below the concrete.
- Fill:** encountered at all locations to depths of between 0.2 m to 3.1 m. The fill was variable in both material composition and consistency. In some of the boreholes drilled through the carpark and pavements the upper fill comprised gravel/sand possibly in the form of a basecourse / roadbase layer. The hand augers BH222 to BH225, BH228 and BH229 were discontinued in fill at depths of between 0.75 m to 1.4 m. BH212 and BH212A were terminated in the fill at depths 1.25 m and 2.1 m due to concrete obstructions.
- Clay / Silty Clay:** encountered below the fill in all boreholes (apart from the boreholes which were discontinued in fill as noted above). The clay / silty clay is inferred to be residual soil and extremely weathered shale / siltstone typically of very stiff to hard consistency, with ironstone gravels and bands. Firm to stiff clays were also present near the surface at some locations. All remaining hand augers (BH220, BH221, BH226 and BH227) were discontinued in the clay / silty clay at depths of between 0.85 m and 1.3 m.
- Shale / Siltstone / Laminite / Sandstone Bedrock** very low to low strength, weathered bedrock was encountered below the clay / silty clay in all boreholes. The bedrock typically became medium strength below depths of between 3.3 m to 7.6 m. Some higher strength iron-cemented bands were encountered within the weathered rock profile. The bedrock was generally high strength below about 7m to 9 m depth, with some very high strength laminite bands encountered.

The bedrock typically comprised shale and siltstone at the bedrock surface (i.e. rock head) transitioning to laminite and then sandstone with depth. There were, however, a number of boreholes where sandstone was encountered towards the rock head level, or zones of laminite / interbedded siltstone and sandstone were encountered below a zone of predominantly sandstone.

6.2 Measured Water Levels

No free water was observed during auger drilling of the boreholes to depths of up to 4 m. A summary of the measured water levels within the five installed monitoring wells and the five previously installed monitoring wells for the Building A site, is provided in Table 1. All water levels were measured on 1 July 2020.

Table 1: Summary of Measured Water Levels and Depths

Location	Surface (m AHD)	Depth (m) Reduced Level (m AHD)
BH1	59.8	9.47 (50.33)
BH3	59.7	9.84 (49.86)
BH4	56.3	6.76 (49.54)
BH102	57.8	8.49 (49.31)
BH104	54.95	6.16 (48.79)
BH201	54.6	6.11 (48.49)
BH203	52.8	9.72 (43.08)
BH208	54.3	7.48 (46.82)
BH215	55.7	6.56 (49.14)
BH218	51.3	5.87 (45.43)

6.3 Permeability Testing

Rising head permeability tests were carried out in all groundwater monitoring wells on site. These were carried out by purging the well then measuring the fall or rise in water level at regular time intervals using a data logger. A summary of the permeability test results is presented in Table 2. The detailed results of the permeability tests area included in Appendix D.

Table 2: Summary of Permeability Test Results

Borehole	Date	Coefficient of Permeability k (m/sec)
BH201	16 June 2020	3.0×10^{-6}
BH203	15 June 2020	1.1×10^{-7}
BH208	19 June 2020	1.5×10^{-7}
BH215	17 June 2020	1.7×10^{-6}
BH218	16 June 2020	3.2×10^{-6}

7. Laboratory Testing

7.1 Soil

Eleven soil samples were tested at an external laboratory to assess aggressivity (pH, chloride and sulphate ion content and electrical conductivity) to buried concrete elements. The results are summarised in Table 3 and are provided in Appendix E.

Table 3: Summary of Laboratory Chemical Analyses

Borehole	Depth (m)	Material	pH	Chloride (mg/kg)	Sulphate (mg/kg)	Electrical Conductivity ($\mu\text{S/cm}$)
203	0.5	FILL / GRAVEL	6.7	<10	87	62
203	1	FILL / Silty CLAY	5.4	67	20	89
203	2.5	Silty CLAY	4.6	82	31	94
208	1.4	FILL / Sandy CLAY	4.7	99	380	300
208	4	Silty CLAY	3.9	420	<10	370
210	0.5	FILL / Silty CLAY	5.1	75	130	170
210	1	Silty CLAY	4.6	61	46	93
212A	0.9	FILL / Silty CLAY	7.9	63	380	370
217	0.5	FILL / Ripped SANDSTONE	9.8	<10	110	160
217	0.9	FILL / Sandy CLAY	8.8	<10	42	120

7.2 Rock

Selected samples of the rock core were tested in the laboratory to determine the Point Load Strength Index (IS_{50}) values to assist with the rock strength classification. The results of the testing are shown on the borehole logs at the appropriate depth. The IS_{50} values for the rock ranged from 0.1 MPa to 3.5 MPa,

indicating that the rock samples tested ranged from equivalent to between very low to low strength, through to very high strength.

8. Geotechnical Model

Three geotechnical cross-sections (Sections A-A', B-B' and CC'), showing the interpreted subsurface profile between selected boreholes, are presented as Drawings 2 to 4 in Appendix B. The sections show interpreted geotechnical divisions of underlying soil and rock together with the proposed basement levels.

It should be noted that the interpreted boundaries shown on the sections are accurate at the borehole locations only and layers shown diagrammatically on these drawings are inferred only. Bands of lower and higher strength rock should be expected within the generalised layers.

The rock units have also been classified in accordance with the procedures given in Reference 1, which use a combination of rock strength and fracture spacing to divide the rock into five classes ranging from Class I (high strength and very few defects) to Class V (extremely low to very low strength and/or highly fractured). In some cases, the classification for the stronger rock has been downgraded due to fracture spacing and the presence of weaker seams.

A summary of the interpreted geotechnical model and typical material descriptions is given in Table 4.

Table 4: Summary of Geotechnical Model

Unit / Classification	Description
Unit 1 – FILL	FILL and pavement materials, variable in composition and consistency. Typically granular material such as ripped sandstone and gravel over the upper metre, grading to predominantly clay fill below.
Unit 2 – Residual Clay	Residual clay and silty clay, typically very stiff to hard, but with zones of firm to stiff consistency encountered.
Unit 3 – Very low to low strength rock (Class V-IV)	Very low to low strength rock, with some clayey and high strength iron-cemented bands
Unit 4 – Low to medium and variable strength fractured rock (Class IV-III)	Typically low to medium strength, with zones of lower strength and fractured rock, as well as some high strength bands
Unit 5 – Medium strength rock (Class III-II)	Medium strength rock
Unit 6 – Medium to high and high strength rock (Class II-I)	Medium to high and high strength or stronger rock, slightly fractured to unbroken

The interpreted depth and Reduced Level (RL) at the top of the various rock units are shown in Tables 5A and 5B, respectively. In some cases, the classification for the stronger rock has been downgraded due to fracture spacing and the presence of weaker seams.

Table 5A: Summary of Depths to Top of Various Rock Strata

Bore	Surface RL (AHD)	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
201	54.6	0	0.3	1.5	2.8	4.1	7.8
202	54.1	0	0.8	1.8	3.7	5.4	9.6
203	52.8	0	2	3	4.1	NE	5.5
204	54.8	0	0.2	1.1	3	7.2	9.5
205	53.6	0	1.8	3.2	NE	NE	7
206	53.1	0	1.8	3.7	NE	NE	6.2
207	54.6	0	0.3	NE	2.7	6.6	10.4
208	54.3	0	3.1	6.2	NE	6.9	9.1
209	53.2	0	2.1	4.9	NE	6.7	9.7
210	58.4	0	0.7	2	5.7	7.6	13
211	54.7	0	0.3	1.3	2.6	NE	7.7
212B	54.6	0	1.5	3	5.8	6	7.5
213	51.1	0	0.6	NE	NE	4.06	7.2
214	49.8	0	0.6	NE	2.95	5	7.5
215	55.7	0	1.3	2.8	NE	4.9	9
216	54.2	0	0.7	2.5	NE	7	7.4
217	54.3	0	2.5	3.2	6	7.2	7.4
218	51.3	0	1.8	2.8	NE	3.5	7.4
219	48.7	0	0.3	1.2	2.5	6	7.7

Note: * NE – Not Encountered

Table 5B: Summary of RL (AHD) to Top of Various Rock Strata

Bore	Surface RL (AHD)	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
201	54.6	54.6	54.3	53.1	51.8	50.5	46.8
202	54.1	54.1	53.3	52.3	50.4	48.7	44.5
203	52.8	52.8	50.8	49.8	48.7	N/A	47.3
204	54.8	54.8	54.6	53.7	51.8	47.6	45.3
205	53.6	53.6	51.8	50.4	N/A	N/A	46.6
206	53.1	53.1	51.3	49.4	N/A	N/A	46.9
207	54.6	54.6	54.3	NA	51.9	48	44.2
208	54.3	54.3	51.2	48.1	N/A	47.4	45.2
209	53.2	53.2	51.1	48.3	N/A	46.5	43.5
210	58.4	58.4	57.7	56.4	52.7	50.8	45.4
211	54.7	54.7	54.4	53.4	52.1	N/A	47
212B	54.6	54.6	53.1	51.6	48.8	48.6	47.1
213	51.1	51.1	50.5	N/A	N/A	47.04	43.9
214	49.8	49.8	49.2	N/A	N/A	44.8	42.3
215	55.7	55.7	54.4	52.9	N/A	50.8	46.7
216	54.2	54.2	53.5	51.7	N/A	47.2	46.8
217	54.3	54.3	51.8	51.1	48.3	47.1	46.9
218	51.3	51.3	49.5	48.5	N/A	47.8	43.9
219	48.7	48.7	48.4	47.5	46.2	42.7	41

Note: * NE – Not Encountered

9. Proposed Development

The proposed development is located in the western corner of Lot 1 in DP 633221 at 11 – 17 Khartoum Road and 33 - 39 Talavera Road and comprises four buildings (A, B, C and D), is being undertaken in a staged approach. This report has been prepared for buildings B, C and D of the proposed development. It is understood that Building B will house a data centre with a proposed bulk excavation level (BEL) of RL 49.0 m, and that Buildings C and D are for mixed-use development and have proposed BELs of RL 41.9 m and RL 47.8 m, respectively. It is understood that the buildings will be up to 10 storeys high, with the deepest basement (for Building C) involving about 10 – 11m of excavation.

At the time of this report no details of column loads are known.

10. Comments

10.1 Excavation Conditions

Excavation for the various basements, is expected to require the removal of soil (Units 1 and 2), very low to low strength rock (Unit 3) to medium to high and high strength rock (Unit 6) in the deeper parts of the excavation in some areas.

Bulk excavation of soil and very low to low strength rock should be achievable using conventional earthmoving equipment, however, the assistance of rock hammering or ripping will probably be required for effective removal of any medium and high strength or, any ironstone bands within the weathered rock profile. Excavation of medium and high strength rock will generally require heavy ripping with a large bulldozer (and tyne) together with the use of large hydraulic rock breakers for effective removal of this material, especially where it is only slightly fractured or unbroken.

Footing and trench excavations at the bulk level will generally be within the medium and high strength, often unbroken rock and should be undertaken using rotary rock saws or milling heads, in conjunction with large hydraulic rock hammer/breaker.

10.2 Vibrations

During excavation, it will be necessary to use appropriate methods and equipment to keep ground vibrations at adjacent buildings and structures within acceptable limits. Excavations within soil and very low to low strength rock using conventional earthmoving equipment are not expected to generate excessive vibrations. The use of heavy ripping and rock hammers in the weathered or underlying strong rock is, however, likely to generate significant vibrations which should be monitored.

Ground vibration can be strongly perceptible to humans at levels above 2.5 mm/s (component) peak particle velocity (PPVi). This is generally much lower than the vibration levels required to cause structural damage to buildings. The Australian Standard AS2670.2-1990 "Evaluation of human exposure to whole-body vibrations – continuous and shock induced vibrations in buildings (1-80 Hz)" indicates an acceptable day time limit of 8 mm/s PPVi for human comfort.

Based on the experience of DP and with reference to AS2670, it is suggested that a maximum PPVi of 8 mm/s (applicable at the foundation level of existing buildings/structures) be provisionally employed at this site for both architectural and human comfort considerations, although this vibration limit may need to be reduced if there are sensitive buildings, structures or equipment in the area.

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

10.3 Dilapidation Surveys

Dilapidation surveys should be carried out on adjacent buildings, pavements and infrastructure that may be affected by the excavation works. The dilapidation surveys should be undertaken before the

commencement of any excavation work in order to document any existing defects so that claims for damage due to construction related activities can be accurately assessed.

10.4 Disposal of Excavated Material

All excavated materials will need to be disposed of in accordance with the provisions of the current legislation and guidelines including the *Waste Classification Guidelines* (EPA, 2014). This includes filling and natural materials that may be removed from the site. Accordingly, environmental testing will need to be carried out to classify spoil prior to transport from the site. Reference should be made to DP's waste classification assessment report (Ref 99609.02.R.002, dated July 2020).

10.5 Excavation Support

Vertical excavations within the soils (fill and clay / silty clay) as well as shale, siltstone and laminite will require both temporary and permanent lateral support during and after excavation. Excavations in shale, siltstone and laminite will also need to consider jointing and potential wedges that may be formed.

10.5.1 Batter Slopes and Vertical Rock Faces

Suggested temporary and permanent batter slopes for unsupported excavations up to a maximum height of 3 m for soils and 4 m for rock are shown in Table 6. If surcharge loads are applied near the crest of the slope, then further specific geotechnical review and probably flatter batters or stabilisation using rock bolts or soil nails may be required.

If vegetation and maintenance of permanent batters is proposed, a flatter permanent batter of 3H:1V is suggested. Erosion control should also be provided for permanent batters, and this may simply include a layer of geofabric covered by grass or vegetation.

Table 6: Recommended Batter Slopes for Exposed Material

Exposed Material	Maximum Temporary Batter Slope (H : V)	Maximum Permanent Batter Slope (H : V)
Soil (Unit 1 and 2)	1 : 1	2 : 1**
Very low to low strength rock and low to medium strength rock (Unit 3 and 4)	0.5 : 1*	1.5 : 1*
Medium strength or stronger rock (Unit 5 and 6)	Vertical*	Vertical*

Note: * Subject to jointing assessment by experienced Geotechnical Engineer/Engineering Geologist

** Permanent batters in soil may need to be reduced to 3H: 1V to facilitate maintenance of grassed slopes, if required

10.5.2 Shoring / Retaining Walls

Where batter slopes cannot be accommodated, shoring / retaining walls will be required to support the soils and rock. Anchored soldier pile walls are often used to provide temporary retaining support in these ground conditions (i.e. clay over rock).

The soldier piles are usually spaced at approximately 2 m to 2.5 m centres and should be founded at least two pile diameters below the lowest excavation level (including detailed excavation). It may be possible to terminate the shoring piles at a higher level where medium or high strength rock (Unit 5 and 6) is present above the proposed BEL, for example in sections of Building C, although this would require specific consideration of defects, possible wedge loading and other loading on the subject shoring wall. More closely spaced piles may be required to reduce wall movements, or prevent collapse of infill materials, particularly where pavements, structures or services are located in close proximity to the excavation.

At the completion of each 1.5 m to 2.0 m drop in excavation level, reinforced shotcrete infill panels should be constructed. At no stage should progressive vertical excavation proceed beyond 2 m without infill panel support being constructed. Regular inspections by a geotechnical professional should be carried out following each progressive drop in excavation level to confirm that the conditions encountered are consistent with the design assumptions.

It is suggested that preliminary design of shoring with one row of anchors or propping (cantilevered shoring systems are not recommended for the proposed excavation depth), where appropriate, be based on a triangular earth pressure distribution using the earth pressure coefficients provided in Table 7.

Table 7: Recommended Design Parameters for Shoring Systems

Material	Unit Weight (kN/m ³)	Earth Pressure Coefficient	
		Active (K _a)	At Rest (K _o)
Soil (Unit 1 and 2)	20	0.4	0.6
Very low to low strength rock (Unit 3)	22	0.2	0.3
Low to medium strength rock (Unit 4)	22	0.2	0.25
Medium strength or stronger rock (Unit 5 and 6)	24	10 kPa uniform	10 kPa uniform

'Active' earth pressure coefficient (K_a) values may be used for a flexible wall where some wall movement is acceptable, and 'at rest' earth pressure (K_o) values should be used where the wall movement needs to be reduced (e.g. adjacent to existing structures or utilities). A uniform pressure of 10 kPa should be adopted for the support of medium strength or stronger rock between soldier piles and/or anchors to account for minor wedges that may become mobilised (i.e. unstable and slip/fall 'out' of the face).

Where multiple rows of anchors or propping are used it is suggested that the preliminary design of shoring walls could be based a trapezoidal earth pressure distribution with a maximum pressure calculated based on 4H kPa where H is equal to the retained height of soil and very low to low strength

rock. The maximum pressure should be increased to 6H where wall movement needs to be reduced. In each case the maximum pressure generally acts over the central 60% of the wall height, reducing to zero at the top and base.

The design of the shoring/retention should allow for all surcharge loads, including building footings, inclined slopes behind the wall, traffic, site sheds, and construction related activities.

Shoring walls should also be designed for hydrostatic pressures considering the range of possible future groundwater levels unless drainage of the ground behind impermeable walls can be provided. Drainage could comprise 150 mm wide strip drains pinned to the face at 1 m to 2 m centres behind the shotcrete in-fill panels. The base of the strip drains should extend out from the shoring wall (via 'spitter' pipes) to allow any seepage to flow into a perimeter toe drain, which directs seepage into the subfloor drainage system that pumps water periodically to the stormwater drainage system, subject to water quality criteria.

The design of temporary (and possibly permanent) support will also need to consider the possibility that moderately to steeply dipping joints in the shale/siltstone/laminite will 'daylight' near the base of the excavation leading to wedges of rock requiring support by the temporary (and permanent) shoring/retaining structures. For the temporary case, the required forces are generally provided by temporary 'tie-back' ground anchors and prudent, conservative design of deep excavations in shale generally involves shoring piles extending below the bulk excavation level to provide passive restraint to the shoring/retaining walls. As a guide, an anchor force equal to approximately $4.2H^2$ kN per meter length of wall would be required for a continuous 45 degree joint daylighting at the toe of the excavation.

10.5.3 Passive Resistance

Passive resistance for piles founded in rock below the base of the bulk excavation (including allowance for any extra excavation for services, pits and/or footings) may be based on the ultimate passive restraint values provided in Table 8. This ultimate value represents the pressure mobilised at high displacements and therefore it will be necessary to incorporate a factor of safety of at least 2 to limit wall movements. The top 0.5 m of the socket should be ignored due to possible disturbance and over-excavation.

Table 8: Recommended Passive Resistance Values

Foundation Stratum	Ultimate Passive Pressure (kPa)
Residual soil (very stiff or stronger)	150
Very low to low strength rock (Unit 3)	400
Low to medium strength rock (Unit 4)	1,000
Medium strength or stronger rock (Unit 5 and 6)	4,000*

Note: * subject to geotechnical inspection

10.5.4 Ground Anchors

The design of temporary and permanent ground anchors/rock bolts for the support of excavations and/or shoring systems may be carried out on the basis of the bond stresses given in Table 9.

Table 9: Recommended Bond Stresses for Rock Anchor Design

Material Description	Maximum Allowable Bond Stress (kPa)	Maximum Ultimate Bond Stress (kPa)
Very low to low strength (Unit 3)	50	100
Low to medium strength (Unit 4)	200	400
Medium and high strength (Unit 5 and 6)	500	1,000

The parameters given in Table 9 assume that the drilled holes are clean and adequately flushed. The anchors should be bonded behind a line drawn up at 45 degrees from the base of the shoring and "lift-off" tests should be carried out to confirm the anchor capacities. It is suggested that ground anchors should be proof loaded to 125% of the design Working load and locked-off at no higher than 80% of the Working load.

10.6 In-situ Stress Relief

Based on previous experience in the Sydney area it is estimated that at the midpoint of the crest of a deep excavated face, stress relief may cause a horizontal movement of approximately 0.5 mm/m to 1.5 mm/m depth of excavation in low strength or stronger rock. The amount of horizontal movement may diminish along the crest away from the midpoint, down the excavated face away from the crest and back from the face. The movement would be expected to occur progressively during the excavation with only minor creep expected after completion of the excavation.

The effect of the stress relief on the shallow foundations of the adjacent structures and infrastructure needs to be considered. It is estimated that there could be up to 15 mm of additional lateral movement due to stress relief (in addition to earth pressure induced deflections) at the ground level around basement perimeter.

10.7 Groundwater

It is expected that seepage will occur along the top of the clay and rock and through joints and along bedding planes within the rock exposed in the basement floor and walls. Water levels were measured between approximately 5.8 m and 9.9 m depth (RL 43.1 m AHD to RL 50.4 m AHD) across the site. It is expected that some of the water levels recorded at higher depths represent perched ephemeral water and not the regional groundwater table, which is likely to be at greater depth. An interpreted regional groundwater level at the time of the field investigation is shown on the three cross-sections presented in Appendix B.

Water levels are generally transient and are likely to change with climatic conditions and other factors. It is possible that the water levels will temporarily rise during periods of heavy or prolonged rainfall and fall during dry periods.

Based on water level measurements to date, the proposed bulk excavation levels are generally at or marginally below the interpreted groundwater levels measured during the investigations. However, due

to the expected very low permeability of the soils and rock the seepage inflow to the basement is expected to be relatively minor. Some inflow due to seepage of surface water through the fill and soil profile is expected after rainfall.

During construction and in the long term, it is anticipated that seepage into the excavation could be controlled by perimeter and subfloor drainage connected to a sump-and-pump system. On this basis, it is considered technically feasible to construct a drained basement for this site without any significant adverse impacts to surrounding groundwater systems.

It is possible that seepage into the basement may give rise to precipitation of red brown iron oxide residue from the groundwater and therefore perimeter and subfloor drains, as well as pumps should be designed for easy access to allow for inspection, maintenance and periodic cleaning.

10.8 Foundations

Preferably all foundations should be uniformly founded in the same material to limit potential for differential settlement. Due to variations in levels of the different units across the excavation site and depending on the location of the proposed development this may require a mixture of pad footings and bored piles to reach stronger rock in areas where weaker rock is exposed at the bulk excavation level. If bored piles are used, the selection of piling rigs will need to consider the presence of high and very high strength rock if rock sockets are required to be drilled in these materials. Seepage should be expected within the open piles and therefore allowance for pumping to remove water or the use of tremie methods to place concrete should be considered. Relatively high seepage flows can sometimes occur within the fractured shale/laminite.

Design of footings and piles subject to axial compression loading may be based on the parameters provided in Table 10. For bored piles, if required, shaft adhesion values for uplift (tension) may be taken as being equal to 70% of the shaft adhesion values for compression in Table 10.

Table 10: Design Parameters for Footings and Bored Piles

Foundation Stratum	Maximum Allowable Pressure		Maximum Ultimate Pressure		Elastic Modulus (MPa)
	End Bearing (kPa)	Shaft Adhesion (Compression)* (kPa)	End Bearing (kPa)	Shaft Adhesion (Compression)* (kPa)	
Very low to low strength rock (Unit 3)	700	50	1,500	100	100
Low to medium strength rock (Unit 4)	1,500	150	5,000	300	300
Medium strength rock (Unit 5)	3,500	300	15,000	600	600
Medium to high strength (or stronger) rock (Unit 6)	6,000	500	30,000	1,000	1200

Note: *shaft adhesion parameters assume adequately clean and rough sockets of category "R2", or better

Foundations proportioned on the basis of the allowable bearing pressures in Table 10 would be expected to experience total settlements of less than 1% of the footing width under the applied Working load, with differential settlements between adjacent columns expected to be less than half of this value.

For limit state design, selection of the geotechnical strength reduction factor (ϕ_g) in accordance with Australian piling code AS 2159 – 2009 is based on a series of individual risk ratings (IRR), which are weighted on numerous factors and lead to an average risk rating (ARR). Therefore, it is recommended that an appropriate geotechnical strength reduction factor be calculated by the pile designer. Footing settlements may be calculated for assessment of the serviceability limiting state using the elastic modulus values given in Table 10.

Spoon testing will be required in all high-level (e.g. pad) footings that are designed for an allowable end bearing pressure of 6000 kPa. Similarly, one-third of footings designed for an allowable bearing pressures of between 3500 kPa and 6000 kPa would need to be spoon tested.

All footings should be inspected by a geotechnical engineer to confirm that foundation conditions are suitable for the design parameters.

Footings that are within the zone of influence of adjacent excavations or pits may need to be designed for a reduced bearing pressure. The zone of influence can be considered as an influence line rising at 45 degrees from the base of the adjacent excavation or pit. Specific geotechnical advice should be sought in relation to the design of such footings.

10.9 Pavements and Floor Slabs

The earthworks required for slabs on ground will depend on the loading conditions and settlement tolerances. If the design subgrade level for pavements and the basement are relatively shallow, then uncontrolled fill and natural clay may to be exposed. The existing fill is assumed to be uncontrolled in the absence of compaction records.

10.9.1 Subgrade Preparation and Engineered Fill

Following stripping of topsoil it is suggested that site preparation and engineered fill for lightly loaded pavements and/or raising of site levels should incorporate the following:

- stripping of vegetation, organic topsoil and obvious unsuitable material;
- rolling of the exposed subgrade with at least 8 passes of a vibrating smooth drum roller with a minimum static weight of 10 tonnes. The final pass (proof roll) of the subgrade should be inspected by a geotechnical engineer to detect any soft or heaving areas. Any soft spots detected during proof rolling would generally need to be stripped to a stiff base or depth of approximately 0.5 m, subject to confirmation by a geotechnical engineer, and replaced with engineered fill;
- engineered fill for replacing soft spots or raising site levels should be placed in layers of 300 mm maximum loose thickness and compacted to a dry density ratio of between 98% and 102% relative to Standard compaction with moisture contents strictly within 2% of Standard optimum moisture content (OMC). The density ratio should be increased to between 100% and 102% Standard compaction within 0.3 m of the finished surface. The existing fill and clayey soils on site should generally be suitable for re-use as engineered fill provided it has a maximum particle size of

100 mm and moisture content within 2% of Standard OMC. Reuse of material should also consider the contamination status of the soil, which may require further assessment;

- density testing of each layer of fill should be undertaken in accordance with AS 3798-2007 "Guidelines for Earthworks for Commercial and Residential Developments" to verify that specified density ratios have been achieved.

For more heavily loaded slabs (such as floor slabs) and heavily loaded pavements, the subgrade preparation should be carried out as above however the uncontrolled fill should be removed to at least 0.6 m below the design subgrade level, or to the top of natural stiff or stronger clay, whichever is shallower.

10.9.2 CBR Value

Based on DP's experience in the area, preliminary design of pavements on clayey subgrade could be based on a design California bearing ratio (CBR) of 3%. Further inspection and possibly laboratory testing of the exposed subgrade soils should be carried out by an experienced geotechnical engineer during the earthworks.

11. References

1. Pells, P.J., Mostyn, G. and Walker, B.F. "Foundations on Sandstone and Shale in the Sydney Region". Australian Geomechanics Journal, Vol. No. 33 Part 3, Dec. 1998.

12. Limitations

Douglas Partners (DP) has prepared this report for this project at 11 – 17 Khartoum and 33 – 39 Khartoum Road in accordance with DP's proposal dated SYD200583 and acceptance received from Ms Maryam Litkouhi of Stockland Pty Ltd (Stockland) on 5 June 2020. This report is provided for the exclusive use of Stockland for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

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

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

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

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

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

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of DP. DP may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the geotechnical components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

Douglas Partners Pty Ltd

Appendix A

About This Report

About this Report

Douglas Partners



Introduction

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

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

Copyright

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

Borehole and Test Pit Logs

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

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

Groundwater

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

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;

- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

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

Reports

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

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

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

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

About this Report

Site Anomalies

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

Information for Contractual Purposes

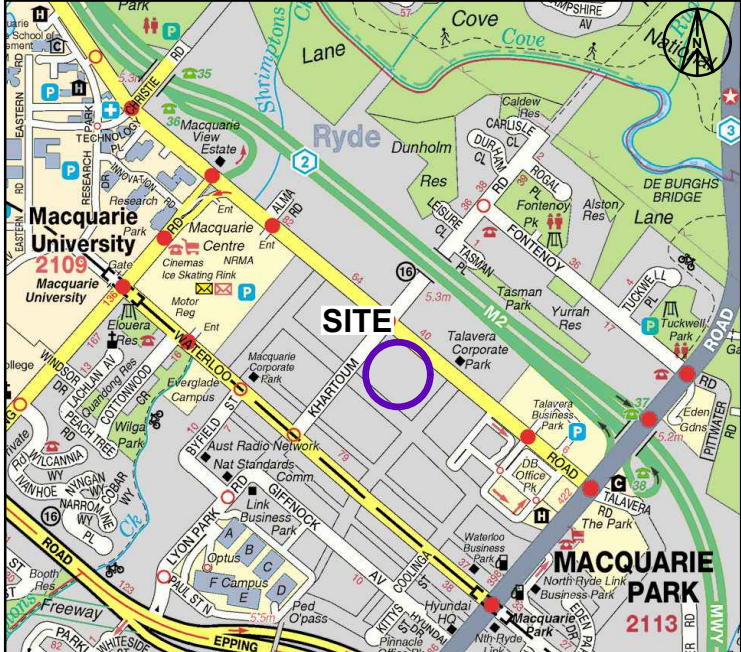
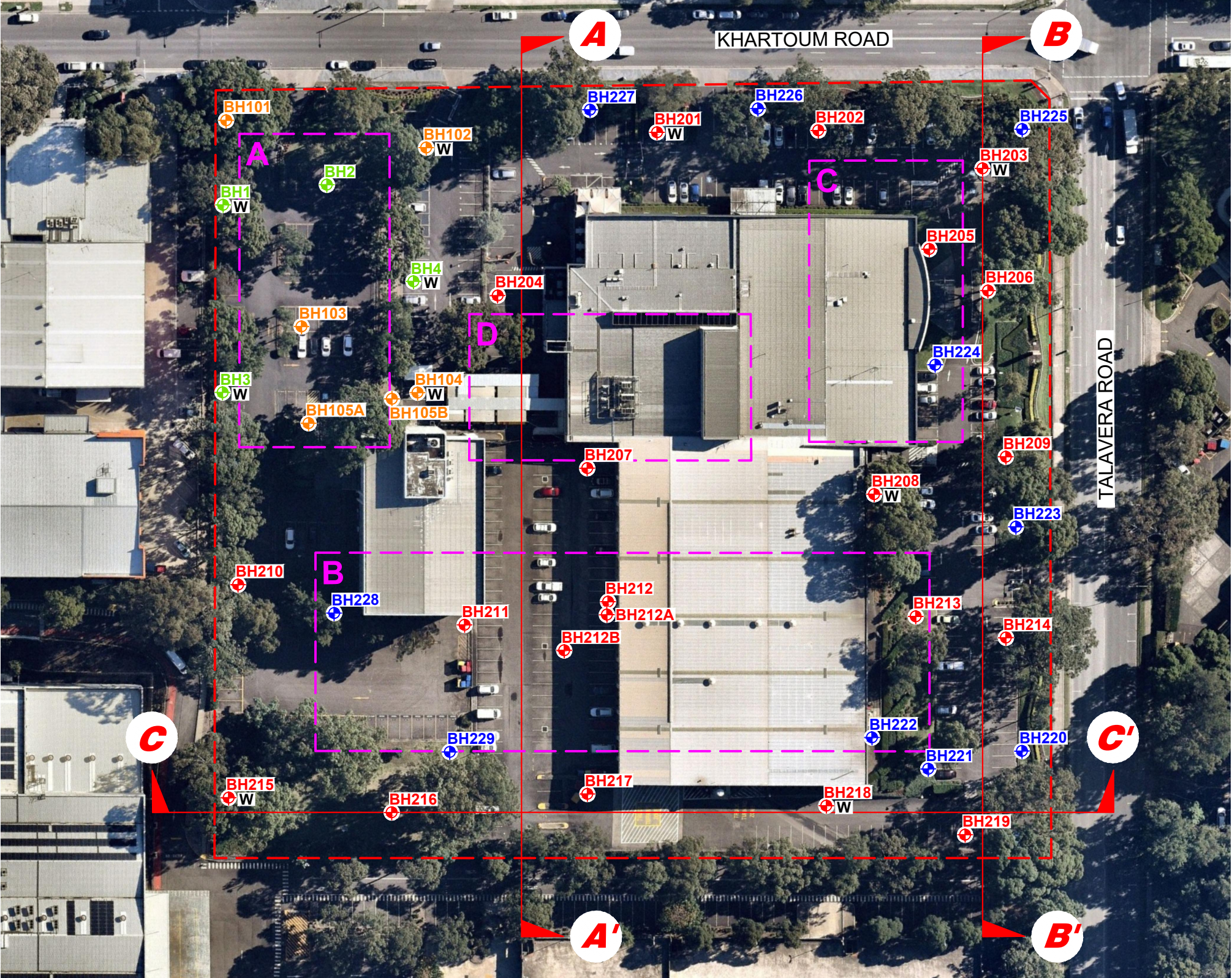
Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate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

Site Inspection

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

Appendix B

Drawings

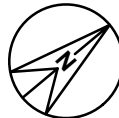


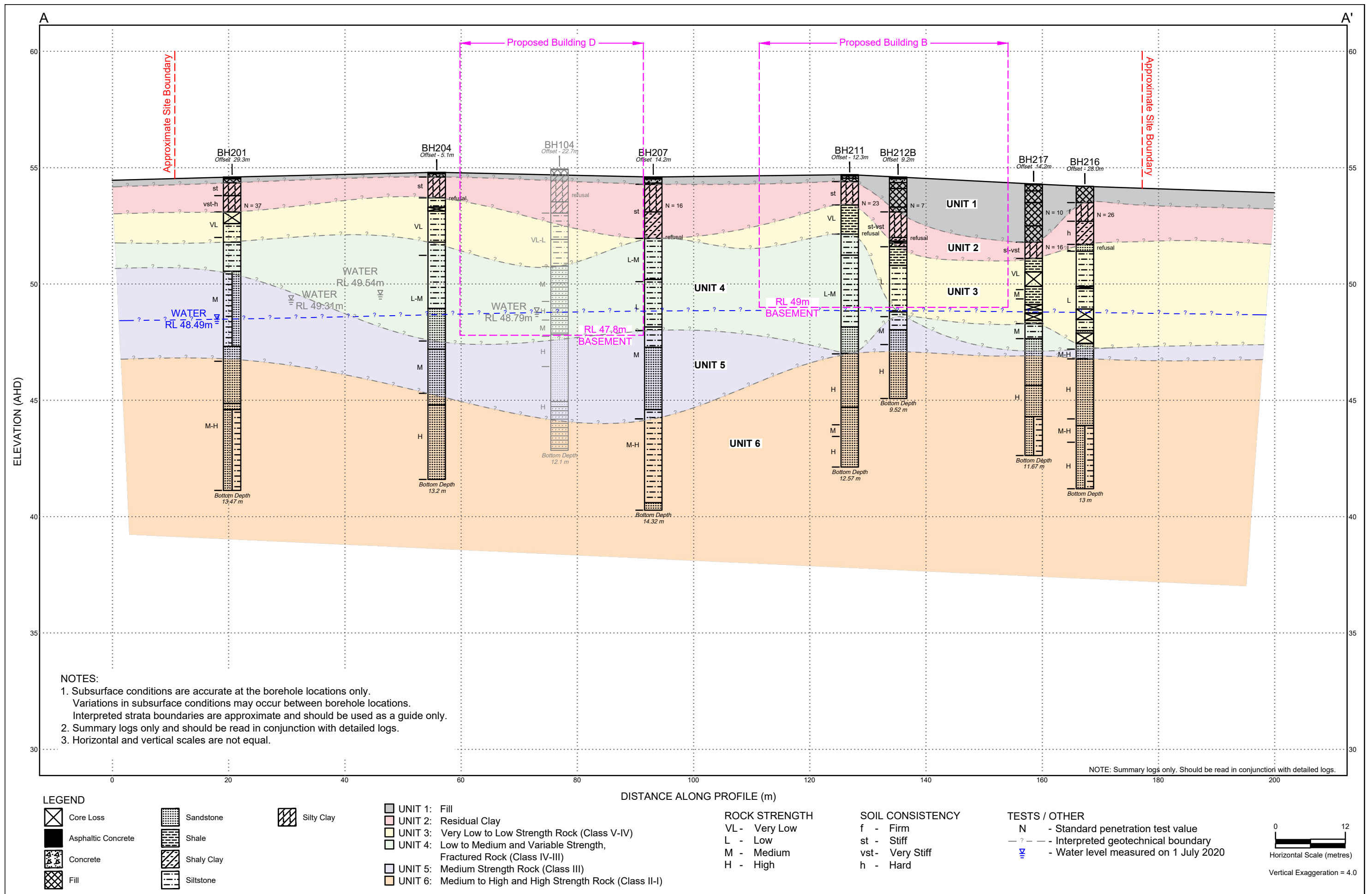
Locality Plan

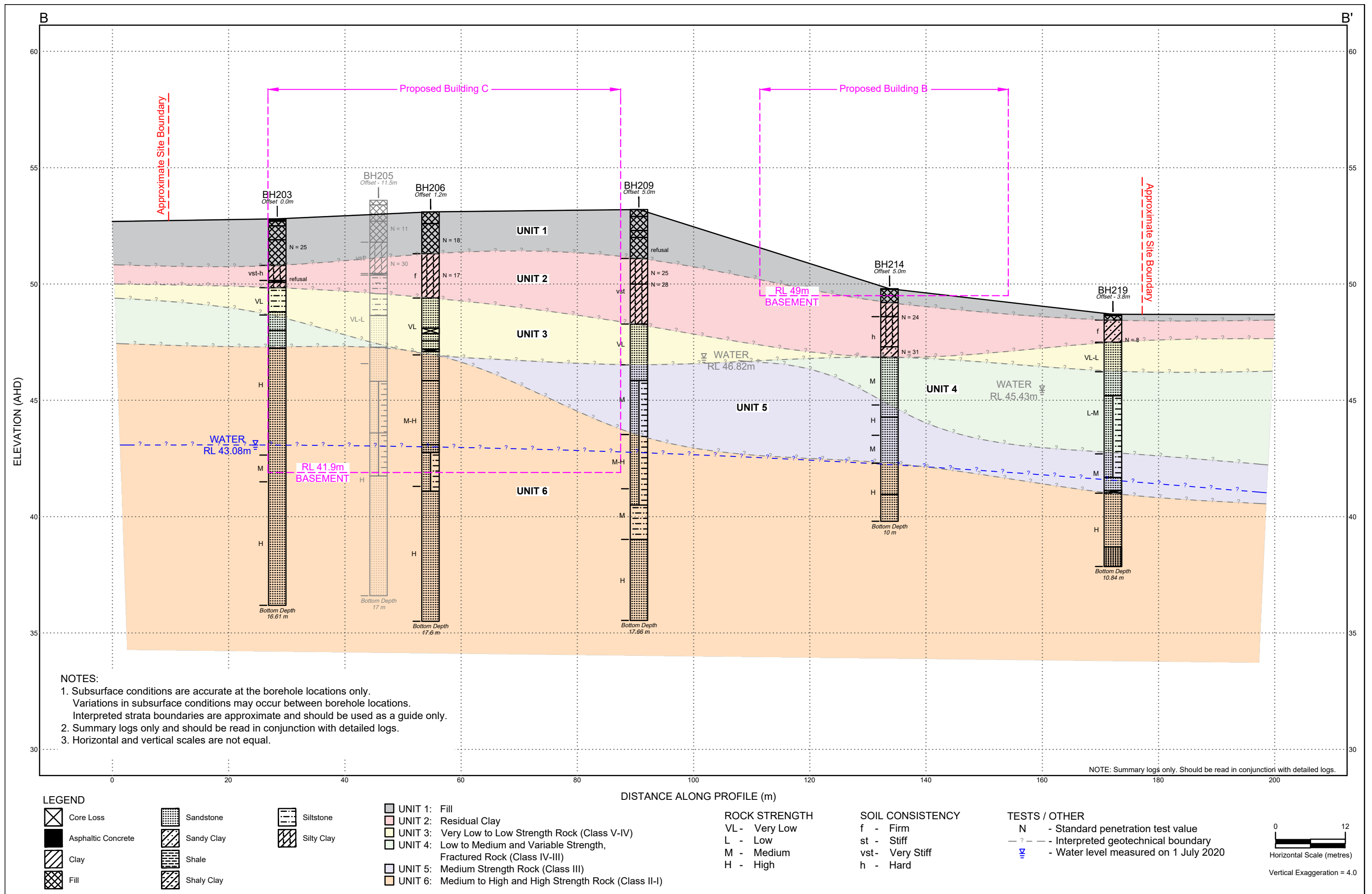
LEGEND

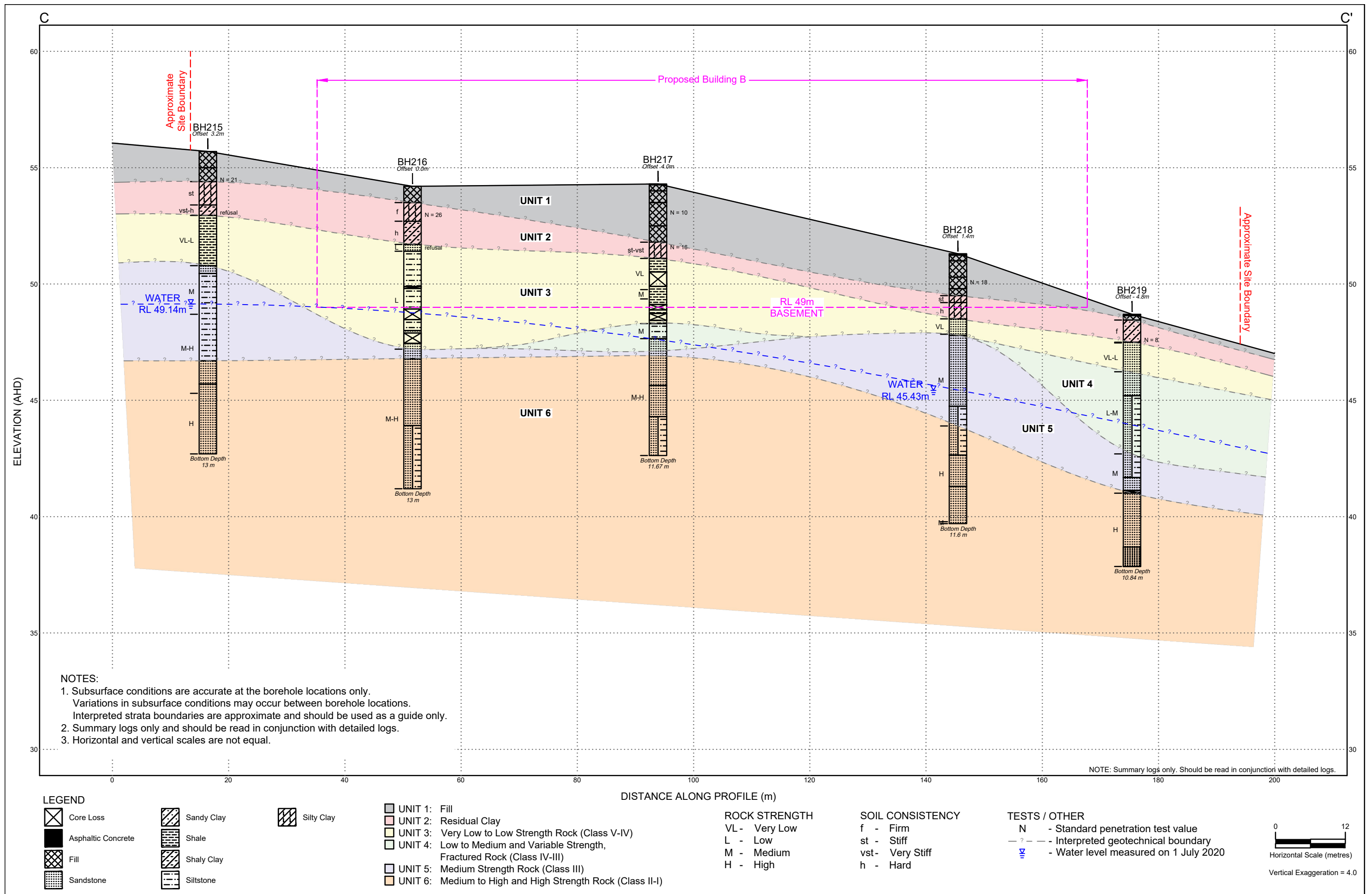
- Current Borehole Location (DP, June 2020)
- Current Hand Augered Borehole Location (DP, June 2020)
- Previous Borehole Location (DP, February 2020)
- Previous Borehole Location (Golder Associates, 2017)
- W Groundwater Monitoring Well
- Geotechnical Cross-Section A-A'
- Approximate Site Boundary
- Approximate Proposed Building Outlines

NOTE:
1: Base image from Nearmap.com (Dated 01.06.2020)
2: Borehole coordinates measured using a high-precision differential GPS









Appendix C

Results of Field Work



Sampling

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

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

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

Test Pits

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

Large Diameter Augers

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

Continuous Spiral Flight Augers

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

reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

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

Continuous Core Drilling

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

Standard Penetration Tests

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

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

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:
4,6,7
N=13
- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:
15, 30/40 mm

Sampling Methods

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

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

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

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



Description and Classification Methods

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

Soil Types

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

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

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

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

Definitions of grading terms used are:

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

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

In fine grained soils (>35% fines)

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

In coarse grained soils (>65% coarse)

- with clays or silts

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

In coarse grained soils (>65% coarse)

- with coarser fraction

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

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

Soil Descriptions

Cohesive Soils

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

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

Cohesionless Soils

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

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

Soil Origin

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

- Residual soil - derived from in-situ weathering of the underlying rock;
- Extremely weathered material – formed from in-situ weathering of geological formations. Has soil strength but retains the structure or fabric of the parent rock;
- Alluvial soil – deposited by streams and rivers;

- Estuarine soil – deposited in coastal estuaries;
- Marine soil – deposited in a marine environment;
- Lacustrine soil – deposited in freshwater lakes;
- Aeolian soil – carried and deposited by wind;
- Colluvial soil – soil and rock debris transported down slopes by gravity;
- Topsoil – mantle of surface soil, often with high levels of organic material.
- Fill – any material which has been moved by man.

Moisture Condition – Coarse Grained Soils

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

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

Moisture Condition – Fine Grained Soils

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

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



Rock Strength

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

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

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

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

Degree of Weathering

The degree of weathering of rock is classified as follows:

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

Rock Descriptions

Degree of Fracturing

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

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

Rock Quality Designation

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

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

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

Stratification Spacing

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

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

Symbols & Abbreviations

Douglas Partners



Introduction

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

Drilling or Excavation Methods

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

Water

▷	Water seep
▽	Water level

Sampling and Testing

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

Description of Defects in Rock

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

Defect Type

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

Orientation

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

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

Coating or Infilling Term

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

Coating Descriptor

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

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

Symbols & Abbreviations

Graphic Symbols for Soil and Rock

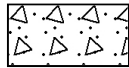
General



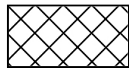
Asphalt



Road base



Concrete

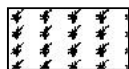


Filling

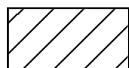
Soils



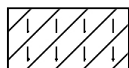
Topsoil



Peat



Clay



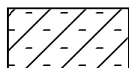
Silty clay



Sandy clay



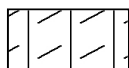
Gravelly clay



Shaly clay



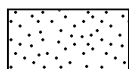
Silt



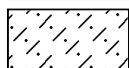
Clayey silt



Sandy silt



Sand



Clayey sand



Silty sand



Gravel



Sandy gravel



Cobbles, boulders



Talus

Sedimentary Rocks



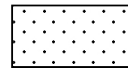
Boulder conglomerate



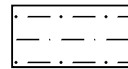
Conglomerate



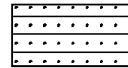
Conglomeratic sandstone



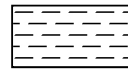
Sandstone



Siltstone



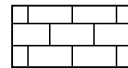
Laminite



Mudstone, claystone, shale

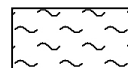


Coal

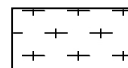


Limestone

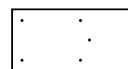
Metamorphic Rocks



Slate, phyllite, schist

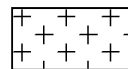


Gneiss

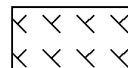


Quartzite

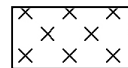
Igneous Rocks



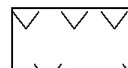
Granite



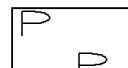
Dolerite, basalt, andesite



Dacite, epidote



Tuff, breccia



Porphyry

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 54.6 AHD
EASTING: 326402
NORTHING: 6260744
DIP/AZIMUTH: 90°/-

BORE No: BH201
PROJECT No: 99609.02
DATE: 11 - 12/6/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		Ex Low	Very Low	Low	Medium	High	Very High		B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %	Test Results & Comments
	0.08	ASPHALTIC CONCRETE																A/E			6,15,22 N = 37
	0.25	FILL/Gravelly SAND: fine to medium, grey, fine to coarse igneous gravel, dry																A/E			
	0.8	Silty CLAY Cl: medium plasticity, red-brown, with fine to medium ironstone gravel, w<PL, apparently stiff, residual																A/E			
	1.5	Silty CLAY Cl: medium plasticity, pale grey and red-brown, with fine to medium ironstone gravel, w~PL, very stiff to hard, residual																S			
	2.0	SILTSTONE: pale grey and red-brown, very low strength with medium strength ironstone bands, highly weathered with extremely weathered bands, highly fractured and fractured, Ashfield Shale																			PL(A) = 0.5
	2.14-2.38m																	C	62	0	
	2.55-2.60m: Cs, 50mm 2.65-2.68m: Cs, 30mm 2.73-2.75m: Cs, 20mm 2.95-3.00m: Ds, 50mm 3.15-3.26m: fg, 110mm																				
	3.55m: J40°, pl, ro, fe stn 3.6m: J70°, pl, ro, fe stn 3.85-3.90m: Ds, 50mm 4.04m: J50°, pl, ti																	C	100	55	
	4.05	SILTSTONE: dark grey and pale grey, with 20-40% fine grained sandstone beds and laminations, medium and high strength, slightly weathered and fresh, slightly fractured, Ashfield Shale																			PL(A) = 0.6
	4.45m: B0°, pl, ro, cly co 2mm																				
	5.17-5.20m: Ds, 30mm, fe stn 5.28-5.30m: Cs, 20mm 5.34m: J40°, pl, ro, cly co 2mm 5.75m: B0°, pl, cly co 4mm 5.85-5.95m: B(x3), 0-10°, pl, ro, cly co 2-4mm 6.05-6.08m: Cs, 30mm 6.22m: J60-80°, un, ro, fe stn, partially he 6.35m: J80°, pl, ro, fe stn, partially he 6.45-6.50m: B(x2), 10-20°, pl, ro, fe stn 6.82-6.83m: Cs, 10mm 6.89-6.94m: Ds, 50mm 7.05-7.07m: Cs, 20mm 7.07-7.26m: Ds, 190mm 7.91-7.93m: Ds, 20mm																				
	8.35m: J70°, un, he 8.40-8.59m: J70°, un, ro, cly vn																				
	7.28	SANDSTONE: fine to medium grained, pale grey, medium and high strength, slightly weathered, slightly fractured, Mittagong Formation																			PL(A) = 1.1
	8.35m: J70°, un, he 8.40-8.59m: J70°, un, ro, cly vn																				
	9.80-10.12m: B(x5),																				
	9.73																				
	10.0	SANDSTONE: (see next page)																			

RIG: Hanjin D&B **DRILLER:** BG Drilling **LOGGED:** JB **CASING:** HW to 1.5m

TYPE OF BORING: Solid flight auger (TC Bit) to 1.5m, NMLC coring to 13.47

WATER OBSERVATIONS: No free groundwater observed whilst augering.

REMARKS: Well installed upon completion, Screen 13.47-1.5m, Blank 1.5-0.1m, Gravel 13.47-1.2m, Bentonite plug 1.2-0.5m, Gravel backfill to surface, gatic installed flush with road surface

SAMPLING & IN SITU TESTING LEGEND

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



Douglas Partners
 Geotechnics | Environment | Groundwater

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 54.6 AHD
EASTING: 326402
NORTHING: 6260744
DIP/AZIMUTH: 90°/-

BORE No: BH201
PROJECT No: 99609.02
DATE: 11 - 12/6/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering						Graphic Log	Rock Strength						Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
			EW	HW	MW	SW	FS	FR		Ex Low	Very Low	Low	Medium	High	Very High			Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %	Test Results & Comments																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
	44	SANDSTONE: fine to medium grained, pale grey and dark grey, with 10-30% siltstone laminations and beds, medium and high strength, fresh, slightly fractured, Mittagong Formation																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																

RIG: Hanjin D&B **DRILLER:** BG Drilling **LOGGED:** JB **CASING:** HW to 1.5m
TYPE OF BORING: Solid flight auger (TC Bit) to 1.5m, NMLC coring to 13.47
WATER OBSERVATIONS: No free groundwater observed whilst augering.
REMARKS: Well installed upon completion, Screen 13.47-1.5m, Blank 1.5-0.1m, Gravel 13.47-1.2m, Bentonite plug 1.2-0.5m, Gravel backfill to surface, gatic installed flush with road surface

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

BORE: 201

PROJECT: MACQUARIE PARK

JUNE 2020



1.50-6.0m

BORE: 201

PROJECT: MACQUARIE PARK

JUNE 2020



6.0-11.0m

BORE: 201

PROJECT: MACQUARIE PARK

JUNE 2020



Douglas Partners
Geotechnics | Environment | Groundwater

Project No: 99609.02
BH ID: 201
Depth: 11.00 - 13.47 m
Core Box No.: 3/3



11.0-13.47m

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 54.1 AHD
EASTING: 326424
NORTHING: 6260771
DIP/AZIMUTH: 90°/-

BORE No: BH202
PROJECT No: 99609.02
DATE: 11/6/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type
54	0.1	ASPHALTIC CONCRETE																A/E			7,14,21 N = 35
	0.2	FILL/Gravelly SAND: fine to coarse, grey, fine to coarse sandstone gravel, dry																A/E			
	0.8	FILL/Silty CLAY: medium plasticity, brown, trace sand, rootlets and glass fragments, w~PL, apparently firm																A/E*			
53	1	0.60m: with sand, trace fine ironstone gravel, steel rebar																A/E			
	1.8	Silty CLAY Cl: medium plasticity, red mottled grey, trace fine to medium ironstone gravel, w~PL, very stiff to hard, residual																S			PL(A) = 0.5
52	2	SILTSTONE: pale grey and red-brown, very low strength with medium strength ironstone bands, highly weathered, fractured, Ashfield Shale																			
	3																				
51	3.72	SANDSTONE: fine to medium grained, pale grey and dark grey, with 30-40% dark grey siltstone beds and laminations, medium strength, moderately then slightly weathered, slightly fractured, Mittagong Formation																C	100	10	
50	4																				PL(A) = 1.1
49	5																	C	100	75	
	5.95	SANDSTONE: fine to medium, pale grey, medium strength, fresh, slightly fractured and unbroken, Mittagong Formation																			
48	6																				
	7																				PL(A) = 0.8
47	8																	C	100	98	
	9																				
46	9.45-9.68m	dark grey, medium strength siltstone																C	100	98	
	10.0																				PL(A) = 1.5

RIG: Hanjin D&B **DRILLER:** BG Drilling **LOGGED:** JB **CASING:** HW to 2.0m
TYPE OF BORING: Solid flight auger (TC Bit) to 2.0m, NMLC coring to 18.0m
WATER OBSERVATIONS: No free groundwater observed whilst augering.
REMARKS: *BD3/20200611 taken from 0.5-0.6m

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test ls(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test ls(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	> Water seep	S Standard penetration test	
E Environmental sample	≡ Water level	V Shear vane (kPa)	

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 54.1 AHD
EASTING: 326424
NORTHING: 6260771
DIP/AZIMUTH: 90°/--

BORE No: BH202
PROJECT No: 99609.02
DATE: 11/6/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing					
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low			Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %
44		SANDSTONE: fine to medium, pale grey, high strength, fresh, slightly fractured and unbroken, Mittagong Formation																				
11	10.95	SANDSTONE: fine to medium grained, pale grey and dark grey, with 30% siltstone beds and laminations, medium to high strength, fresh, slightly fractured, Mittagong Formation																C	100	98	PL(A) = 0.7 PL(A) = 0.2 PL(A) = 1.2	
12																						PL(A) = 0.6
12.65		SANDSTONE: fine to medium grained, pale grey, bedding dipping 0-20°, medium then high strength, fresh, unbroken, Hawkesbury Sandstone																C	100	100		PL(A) = 0.5
14																						PL(A) = 1.5
15																						PL(A) = 1.1
16																		C	100	100		PL(A) = 1.4
17																						PL(A) = 1.5
18	18.0	Bore discontinued at 18.0m Target depth reached																				PL(A) = 2.3
19																						

RIG: Hanjin D&B **DRILLER:** BG Drilling **LOGGED:** JB **CASING:** HW to 2.0m
TYPE OF BORING: Solid flight auger (TC Bit) to 2.0m, NMLC coring to 18.0m
WATER OBSERVATIONS: No free groundwater observed whilst augering.
REMARKS: *BD3/20200611 taken from 0.5-0.6m

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test ls(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test ls(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	> Water seep	S Standard penetration test	
E Environmental sample	≡ Water level	V Shear vane (kPa)	

BORE: 202

PROJECT: MACQUARIE PARK

JUNE 2020



Douglas Partners
Geotechnics | Environment | Groundwater

Project No: 99609.02
BH ID: 202
Depth: 2.00 - 6.00 m
Core Box No.: 1/4



2.0-6.0m

BORE: 202

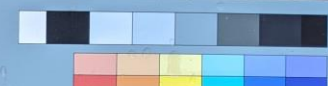
PROJECT: MACQUARIE PARK

JUNE 2020



Douglas Partners
Geotechnics | Environment | Groundwater

Project No: 99609.02
BH ID: 202
Depth: 6.00 - 11.00 m
Core Box No.: 2/4



6.0-11.0m

BORE: 202

PROJECT: MACQUARIE PARK

JUNE 2020



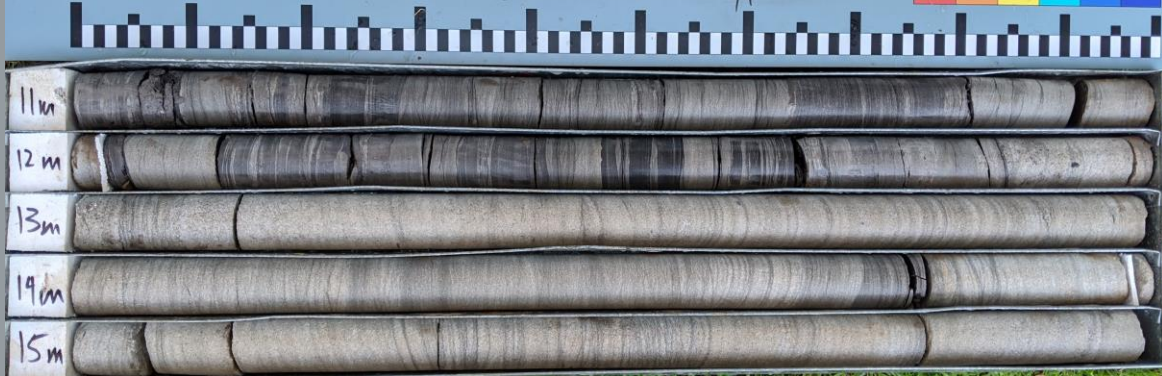
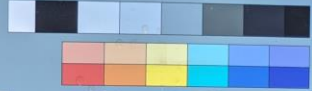
Douglas Partners
Geotechnics | Environment | Groundwater

Project No: 99609.02

BH ID: 202

Depth: 11.00 - 16.00 m

Core Box No.: 3/4



11.0-16.0m

BORE: 202

PROJECT: MACQUARIE PARK

JUNE 2020



Douglas Partners
Geotechnics | Environment | Groundwater

Project No: 99609.02

BH ID: 202

Depth: 16.00 - 18.00 m

Core Box No.: 4/4



16.0-18.0m

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 52.8 AHD
EASTING: 326453
NORTHING: 6260793
DIP/AZIMUTH: 90°/-

BORE No: BH203
PROJECT No: 99609.02
DATE: 11/6/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering EW HW MW SW FS FR	Graphic Log	Rock Strength Ex Low Very Low Low Medium High Very High Ex High	Water	Fracture Spacing (m) 0.01 0.05 0.10 0.50 1.00	Discontinuities B - Bedding J - Joint S - Shear F - Fault		Sampling & In Situ Testing			
										Type	Core Rec. %	RQD %	Test Results & Comments
	0.1	ASPHALTIC CONCRETE								A/E			
	0.3	FILL/Gravelly SAND: fine to medium, dark grey, fine to medium, igneous gravel, dry, roadbase								A/E			
	0.9	FILL/GRAVEL: medium to coarse ripped sandstone, pale yellow-brown, trace clay and fine to medium ironstone and igneous gravel, dry, appears loose								A/E*			
	2.0	FILL/Silty CLAY: medium plasticity, red-brown, trace fine to medium ironstone gravel, w<PL, appears stiff to very stiff, (possible natural) 1.50m: trace fine to medium sand								S			11,11,14 N = 25
	2.73	Silty CLAY CI/CH: medium to high plasticity, pale grey mottled red-brown, with fine ironstone gravel, w<PL, very stiff, residual								A/E			
	2.96	2.50m: pale grey, hard								S			25/150 refusal
	4.15	SILTSTONE: pale grey and brown, very low strength with medium to high strength ironstone bands, highly weathered with extremely weathered bands, fractured, Ashfield Shale								C	95	15	PL(A) = 1.4
	4.8	SANDSTONE: fine to medium grained, pale grey and brown, high strength with very low strength bands, highly to moderately weathered, slightly fractured, Mittagong Formation											PL(A) = 1.2
	5.56	SANDSTONE: medium to coarse grained, orange-brown, high strength, moderately weathered, slightly fractured, Hawkesbury Sandstone								C	100	94	PL(A) = 1
	8.00-11.22m	30-40% siltstone interbeds								C	100	100	PL(A) = 1.5 PL(A) = 0.4
	9.16-9.70m												PL(A) = 1

RIG: Commachio 305

DRILLER: CT

LOGGED: YB

CASING: HW to 2.60m

TYPE OF BORING: Solid flight auger (TC Bit) to 2.65m, NMLC coring from 2.65m to 16.61m

WATER OBSERVATIONS: No free groundwater observed whilst augering.

REMARKS: *BD1/20200611 taken at 0.9-1.00m. Groundwater well installed to 16.61m; screen (16.61-3.0m), blank (3.0-0.1m), gravel (16.61- 2.5m), bentonite plug (2.5-1.5m), gravel backfill to ground level, gatic installed flush with surface level.

SAMPLING & IN SITU TESTING LEGEND

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

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 52.8 AHD
EASTING: 326453
NORTHING: 6260793
DIP/AZIMUTH: 90°/--

BORE No: BH203
PROJECT No: 99609.02
DATE: 11/6/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing									
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low			Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %	Test Results & Comments		
		SANDSTONE: medium to coarse grained, pale grey, high strength with medium strength bands, fresh, unbroken, Hawkesbury Sandstone (continued)																							PL(A) = 2.3	
	11																									PL(A) = 0.3
																										PL(A) = 0.5
	12																									PL(A) = 2.4
	13																									PL(A) = 1.7
	14																									PL(A) = 1.4
	15																									PL(A) = 1.6
	16																								PL(A) = 1.4	
	16.61	Bore discontinued at 16.61m Target depth reached																								
	17																									
	18																									
	19																									
	33																									

RIG: Commachio 305

DRILLER: CT

LOGGED: YB

CASING: HW to 2.60m

TYPE OF BORING: Solid flight auger (TC Bit) to 2.65m, NMLC coring from 2.65m to 16.61m

WATER OBSERVATIONS: No free groundwater observed whilst augering.

REMARKS: *BD1/20200611 taken at 0.9-1.00m. Groundwater well installed to 16.61m; screen (16.61-3.0m), blank (3.0-0.1m), gravel (16.61- 2.5m), bentonite plug (2.5-1.5m), gravel backfill to ground level, gatic installed flush with surface level.

SAMPLING & IN SITU TESTING LEGEND

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

BORE: 203

PROJECT: MACQUARIE PARK

JUNE 2020



2.65-7.0m

BORE: 203

PROJECT: MACQUARIE PARK

JUNE 2020



7.0-12.0m

BORE: 203

PROJECT: MACQUARIE PARK

JUNE 2020



12.0-16.61m

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 54.8 AHD
EASTING: 326407
NORTHING: 6260695
DIP/AZIMUTH: 90°/-

BORE No: BH204
PROJECT No: 99609.02
DATE: 12/6/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing				
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint F - Fault	Type
	0.06	ASPHALTIC CONCRETE																				A/E			
	0.2	FILL/Gravelly SAND: fine to medium, grey-brown, fine to coarse igneous gravel, dry																				A/E*			
54		Silty CLAY Cl: medium plasticity, red-brown, trace sand and rootlets, w<PL, apparently stiff, residual																				A/E			
1	1.1	0.80m: hard, with fine ironstone gravel																				S			12,20/50 refusal
	1.66	SILTSTONE: pale grey, very low strength, Ashfield Shale																							
63		SILTSTONE: dark grey and brown, very low to low strength with medium and high strength ironstone bands, highly weathered, fractured, Ashfield Shale																				C	89	10	PL(A) = 2.3
2																									
52																									
3	3.0	SILTSTONE: dark grey and grey, with 5-10% fine grained sandstone beds and laminations, medium strength with very low strength bands, moderately weathered, fractured to slightly fractured, Ashfield Shale																							PL(A) = 0.4
51																									
4																									
50		4.55m: becoming slightly weathered																							
5																									
49																									
6	5.85	SANDSTONE: fine to medium grained, pale grey and red-brown, high strength with low strength bands, slightly weathered, fractured to slightly fractured, Mittagong Formation																							PL(A) = 0.3
48																									
7																									

RIG: Hanjin D&B **DRILLER:** BG Drilling **LOGGED:** JB **CASING:** HW to 1.4m

TYPE OF BORING: Solid flight auger (TC Bit) to 1.0m, Rotary washbore to 1.5m, NMLC coring to 13.2m

WATER OBSERVATIONS: No free groundwater observed whilst augering.

REMARKS: *BD4/20200612 taken from 0.5-0.6m

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test Is(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test Is(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	> Water seep	sp Standard penetration test	
E Environmental sample	≡ Water level	V Shear vane (kPa)	

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 54.8 AHD
EASTING: 326407
NORTHING: 6260695
DIP/AZIMUTH: 90°/--

BORE No: BH204
PROJECT No: 99609.02
DATE: 12/6/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering						Graphic Log	Rock Strength						Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
			EW	HW	MW	SW	FS	FR		Ex Low	Very Low	Low	Medium	High	Very High			Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %	Test Results & Comments																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
		SANDSTONE: fine to medium grained, pale grey and dark grey, with 20-30% siltstone beds and laminations, high strength, fresh, slightly fractured and unbroken, Mittagong Formation																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	

RIG: Hanjin D&B **DRILLER:** BG Drilling **LOGGED:** JB **CASING:** HW to 1.4m
TYPE OF BORING: Solid flight auger (TC Bit) to 1.0m, Rotary washbore to 1.5m, NMLC coring to 13.2m
WATER OBSERVATIONS: No free groundwater observed whilst augering.
REMARKS: *BD4/20200612 taken from 0.5-0.6m

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test ls(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test ls(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	> Water seep	S Standard penetration test	
E Environmental sample	≡ Water level	V Shear vane (kPa)	

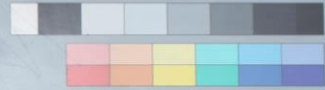
BORE: 204

PROJECT: MACQUARIE PARK

JUNE 2020



Project No: 99609.02
BH ID: 204
Depth: 1.50-6.00m
Core Box No.: 11/3



1.5-6.0m

BORE: 204

PROJECT: MACQUARIE PARK

JUNE 2020



Project No: 99609.02
BH ID: 204
Depth: 6.00-11.00m
Core Box No.: 12/3



6.0-11.0m

BORE: 204

PROJECT: MACQUARIE PARK

JUNE 2020



11.0-13.27m

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 53.6 AHD
EASTING: 326459
NORTHING: 6260773
DIP/AZIMUTH: 90°/-

BORE No: BH205
PROJECT No: 99609.02
DATE: 17/6/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing						
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low			Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %
53 1 52	0.2	FILL/Silty CLAY: medium to high plasticity, dark brown, w~PL, topsoil																A/E			4,5,6 N = 11		
	0.6	FILL/Sandy CLAY: low plasticity, brown, fine to medium sand, w~PL																A/E					
	0.9	FILL/Sandy CLAY: low to medium plasticity, red mottled pale grey, fine to medium sand, with silt, w~PL, apparently very stiff																S					
	1.8	FILL/ CLAY: medium to high plasticity, brown mottled red-brown, w<PL, apparently stiff																A/E					
	2	Silty CLAY CI-CH: medium to high plasticity, pale grey mottled red-brown, w<PL, very stiff, residual																A/E			8,13,17 N = 30		
	51																	A/E					
3																		S					
50 4 49 5 48 6 47 7 46 8 45 9 44	3.22	SILTSTONE: grey and brown, very low strength with hard clay bands and medium strength ironstone bands, highly weathered, highly fractured and fractured, Mittagong Formation																C	100	0	PL(A) = 0.1		
	4																		C	95		0	PL(A) = 0.4
	4.95		SANDSTONE: fine to medium grained, pale grey and brown, low to medium strength, highly weathered, fractured to slightly fractured, Mittagong Formation																	C	100	15	PL(A) = 0.2
	6																					PL(A) = 0.2	
	6.32	SANDSTONE: medium to coarse grained, pale grey and red-brown, high strength with very low strength bands, moderately to slightly weathered, slightly fractured, Mittagong Formation																			PL(A) = 0.1		
	7																				PL(A) = 0.5		
	7.78	SANDSTONE: fine to medium grained, pale grey and dark grey, interbedded and interlaminated with approximately 20% siltstone, high strength, fresh, slightly fractured to unbroken, Mittagong Formation																	C	100	86	PL(A) = 1.9	
	8																				PL(A) = 1.5		
	9																				PL(A) = 0.8		
	10.0																		C	100	97	PL(A) = 2.1	

RIG: Hanjin D&B **DRILLER:** BG Drilling **LOGGED:** TM/JB **CASING:** HW to 2.5m
TYPE OF BORING: Hand auger to 0.7m, Solid flight auger to 2.95m, NMLC coring to 17.0m
WATER OBSERVATIONS: No free groundwater observed whilst augering.
REMARKS:

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test ls(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test ls(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	> Water seep	S Standard penetration test	
E Environmental sample	≡ Water level	V Shear vane (kPa)	

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 53.6 AHD
EASTING: 326459
NORTHING: 6260773
DIP/AZIMUTH: 90°/--

BORE No: BH205
PROJECT No: 99609.02
DATE: 17/6/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low			Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %	Test Results & Comments																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
43	11	SANDSTONE: fine to medium grained, pale grey and dark grey, interbedded and interlaminated with approximately 20% siltstone, high strength, fresh, slightly fractured to unbroken, Mittagong Formation																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															

RIG: Hanjin D&B **DRILLER:** BG Drilling **LOGGED:** TM/JB **CASING:** HW to 2.5m
TYPE OF BORING: Hand auger to 0.7m, Solid flight auger to 2.95m, NMLC coring to 17.0m
WATER OBSERVATIONS: No free groundwater observed whilst augering.
REMARKS:

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

BORE: 205

PROJECT: MACQUARIE PARK

JUNE 2020



BORE: 205

PROJECT: MACQUARIE PARK

JUNE 2020



BORE: 205

PROJECT: MACQUARIE PARK

JUNE 2020



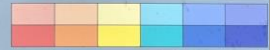
Douglas Partners
Geotechnics | Environment | Groundwater

Project No: 99609.02

BH ID: BH205

Depth: 12.00 - 17.00

Core Box No.: 3/3



12.0-17.0m

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 53.1 AHD
EASTING: 326474
NORTHING: 6260777
DIP/AZIMUTH: 90°/-

BORE No: BH206
PROJECT No: 99609.02
DATE: 11 - 12/6/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing							
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low		Medium	High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %
53	0.5	FILL/CLAY: medium to high plasticity, dark brown, trace rootlets and fine to coarse igneous gravel, w~PL, appears soft																									10,10,8 N = 18
		FILL/GRAVEL: medium to coarse ripped sandstone, pale grey and brown, trace clay and fine to medium ironstone and igneous gravel, appears loose to medium dense, dry																				A/E					
52																						A/E					
51																						S					
	1.8	Silty CLAY CI/CH: medium to high plasticity, red-brown, with fine ironstone gravel, w<PL, apparently firm, residual																				A/E*				3,7,10 N = 17	
2		2.50m: pale grey and mottled orange-brown, trace roots, very stiff																									
50																						S					
49																											
48	3.7	SANDSTONE: fine to medium grained, pale grey, very low strength with low to medium strength ironstone bands, extremely weathered, Mittagong Formation																								PL(A) = 0.6 PL(A) = 1 PL(A) = 0.8 PL(A) = 1.6 PL(A) = 0.6 PL(A) = 1	
47	5.23	5.23-5.54m: highly weathered																									
46	5.54	SANDSTONE: medium to coarse grained, pale grey and orange-brown, medium then high strength, moderately weathered with extremely weathered band, slightly fractured, Mittagong Formation																									
45	6.0																										
44	7.25	SANDSTONE: medium to coarse grained, pale grey, bedding dipping 0-10°, medium and high strength, fresh, unbroken, Mittagong Formation																									
43		8.50-8.75m: with 90% dark grey siltstone																									
42																											
41																											
40																											
39																											
38																											

RIG: Commachio 305 **DRILLER:** CT **LOGGED:** YB **CASING:** HW to 2.60m
TYPE OF BORING: Solid flight auger (TC Bit) to 2.50m, wash boring from 2.50m to 3.70m, NMLC coring from 3.70m to 17.60m
WATER OBSERVATIONS: No free groundwater observed whilst augering.
REMARKS: *BD2/20200611 taken at 1.50-1.60m.

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

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 53.1 AHD
EASTING: 326474
NORTHING: 6260777
DIP/AZIMUTH: 90°/-

BORE No: BH206
PROJECT No: 99609.02
DATE: 11 - 12/6/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing					
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low			Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %
43		SANDSTONE: As above																				
10.34		SANDSTONE: fine to medium grained, pale grey and dark grey, bedding dipping 0-10°, interbedded with approximately 40% siltstone, medium and high strength, fresh, unbroken, Mittagong Formation.															10.35m: Ds, 20mm 10.42m: Cs.10mm				PL(A) = 0.9	
11																		11.28m: Ds, 20mm				PL(A) = 2.1
12	12.0																	11.97m: B0°, pl, ro, cly vn	C	100	98	PL(A) = 0.7
13		SANDSTONE: medium to coarse grained, pale grey, bedding dipping 0-10°, high strength, fresh, unbroken, Hawkesbury Sandstone																			PL(A) = 2.1	
14																		13.28m: B0°, pl, he, cly vn 13.29m: B0°, pl, ro, cly vn				PL(A) = 1.4
15																						PL(A) = 1.4
16																						PL(A) = 2.1
17																						PL(A) = 1.9
17.6		Bore discontinued at 17.6m Target depth reached																				PL(A) = 1.6
18																						
19																						

RIG: Commachio 305 **DRILLER:** CT **LOGGED:** YB **CASING:** HW to 2.60m
TYPE OF BORING: Solid flight auger (TC Bit) to 2.50m, wash boring from 2.50m to 3.70m, NMLC coring from 3.70m to 17.60m
WATER OBSERVATIONS: No free groundwater observed whilst augering.
REMARKS: *BD2/20200611 taken at 1.50-1.60m.

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test ls(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test ls(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	> Water seep	S Standard penetration test	
E Environmental sample	≡ Water level	V Shear vane (kPa)	

BORE: 206

PROJECT: MACQUARIE PARK

JUNE 2020



Douglas Partners
Geotechnics | Environment | Groundwater

Project No: 99609.02

BH ID: BH 206

Depth: 3.70-8.00 m

Core Box No.: Box 1



99609.02 Macq Park BH 206 12/06/20 Start at 3.70 m



3.7-8.0m

BORE: 206

PROJECT: MACQUARIE PARK

JUNE 2020



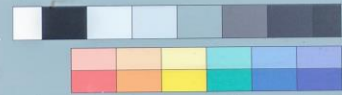
Douglas Partners
Geotechnics | Environment | Groundwater

Project No: 99609.02

BH ID: BH 206

Depth: 8.00-13.00 m

Core Box No.: Box 2



8.0-13.0m

BORE: 206

PROJECT: MACQUARIE PARK

JUNE 2020



Douglas Partners

Geotechnics | Environment | Groundwater

Project No: 99609.02

BH ID: BH 206

Depth: 13.00 - 17.60 m

Core Box No.: Box 3/3



13.0-17.6m

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 54.6 AHD
EASTING: 326448
NORTHING: 6260686
DIP/AZIMUTH: 90°/-

BORE No: BH207
PROJECT No: 99609.02
DATE: 17/6/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing					
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %
54 1 53 2 52	0.09	ASPHALTIC CONCRETE																A/E			2,5,11 N = 16		
	0.26	CONCRETE																A/E					
	0.31	FILL/Ripped SANDSTONE: fine to medium gravel, pale yellow-grey, dry																A/E*					
	1	Silty CLAY Cl/CH: medium to high plasticity, pale grey and red-brown, trace fine to medium ironstone gravel, w<PL, appears firm to stiff, residual																S					
	1.5	1.00m: becoming stiff to very stiff																A/E					
	51 4 50 5 49 6 48 7 47 8 46 9 45	2	Shaly CLAY Cl/CH: high plasticity, pale grey, with fine ironstone gravel, w<PL, stiff, residual																A/E			25/140 refusal	
		2.64	2.50m: becoming hard																S				
		3	SILTSTONE: pale grey and grey with red-brown bands, low to medium strength then medium strength with very low strength bands, highly then moderately weathered, highly fractured, Ashfield Shale																C	100	30		PL(A) = 0.7
		4																					
		4.4	SILTSTONE: grey, with 5% fine grained sandstone laminations, low strength, slightly weathered, fractured, Ashfield Shale																	C	100		30
49 6 48 7 47 8 46 9 45	5																				PL(A) = 0.2		
	6	6.04-6.32m: highly weathered																					
	6.45	SILTSTONE: dark grey and pale grey, with 20-30% fine grained sandstone laminations and beds, medium strength, fresh, slightly fractured and unbroken, Ashfield Shale																	C	100	70	PL(A) = 0.6	
	7																					PL(A) = 0.3	
	7.32	SANDSTONE: fine to medium grained, pale grey, medium strength with high strength bands, fresh, slightly fractured and unbroken, Mittagong Formation																					
	8																						PL(A) = 0.4
	9	8.7-9.35m: with with approximately 50% siltstone beds and laminations, high strength																	C	100	100	PL(A) = 1.3	
																							PL(A) = 0.3

RIG: Commachio 305 **DRILLER:** CT **LOGGED:** YB **CASING:** HW to 2.60m
TYPE OF BORING: Solid flight auger (TC Bit) to 2.64m, NMLC coring from 2.64m to 14.32m
WATER OBSERVATIONS: No free groundwater observed whilst augering.
REMARKS: *BD10/20200617 taken at 0.90-1.00m.

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test Is(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test Is(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	> Water seep	SP Standard penetration test	
E Environmental sample	≡ Water level	V Shear vane (kPa)	

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 54.6 AHD
EASTING: 326448
NORTHING: 6260686
DIP/AZIMUTH: 90°/-

BORE No: BH207
PROJECT No: 99609.02
DATE: 17/6/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low			Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %	Test Results & Comments																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
	44	SILTSTONE: dark grey and pale grey, with 20-30% fine grained sandstone laminations and beds, high strength with medium strength bands, fresh, slightly fractured and unbroken, Mittagong Formation																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					

RIG: Commachio 305

DRILLER: CT

LOGGED: YB

CASING: HW to 2.60m

TYPE OF BORING: Solid flight auger (TC Bit) to 2.64m, NMLC coring from 2.64m to 14.32m

WATER OBSERVATIONS: No free groundwater observed whilst augering.

REMARKS: *BD10/20200617 taken at 0.90-1.00m.

SAMPLING & IN SITU TESTING LEGEND

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

BORE: 207

PROJECT: MACQUARIE PARK

JUNE 2020



2.64-7.0m

BORE: 204

PROJECT: MACQUARIE PARK

JUNE 2020



7.0-12.0m

BORE: 207

PROJECT: MACQUARIE PARK

JUNE 2020



12.0-14.32m

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 54.3 AHD
EASTING: 326492
NORTHING: 6260730
DIP/AZIMUTH: 90°/-

BORE No: BH208
PROJECT No: 99609.02
DATE: 19/6/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type
54	0.3	FILL/Silty SAND: fine to medium, brown, with fine to coarse igneous gravel, trace rootlets, w<PL																A/E			9,9,9 N = 18
	0.6	FILL/Silty SAND: fine to medium, pale brown, with fine to medium, sandstone gravel, trace sandstone and igneous cobbles, trace brick fragments, w<PL, appears moderately compacted																A/E			
1																		A/E*			
53	1.35	FILL/ Gravelly SAND: fine to medium, pale brown, fine to coarse sandstone gravel, trace clay, dry, appears well compacted																A/E			
1.5																		S			
2		FILL/Sandy CLAY: medium plasticity, pale grey and orange-brown, fine to medium sand, trace fine to coarse ironstone and igneous gravel, w<PL																A/E			8,13,23 N = 36
52																					
		FILL/Silty CLAY: medium plasticity, pale grey and red brown, with fine to coarse igneous gravel, w<PL, apparently very stiff to hard																S			
3	3.1																	A/E			
51		Silty CLAY CI/CH: high plasticity, pale yellow-brown and orange-brown, trace fine ironstone gravel, w<PL, hard, residual																A			
4																					9,14,20 N = 34
50																		S			
4.7		SHALY CLAY: high plasticity, pale grey, hard with low strength ironstone gravel, residual soil / extremely weathered Ashfield Shale																			4.70-6.90m: PP=50 to 150 kPa PL(A) = 1.2
5																		C	64	0	
5.53																		C	19	0	
6																					
6.22		SHALE: pale grey, low strength with bands of very low strength, extremely weathered, Ashfield Shale																C	54	0	
6.68																		C	100	0	PL(A) = 1.9
6.89		SANDSTONE: medium to coarse grained, red-brown and orange-brown, high strength, moderately weathered, slightly fractured, Mittagong Formation																			
7																					
47																					
8																					PL(A) = 1
46																					
8.91		INTERBEDDED SANDSTONE AND SILTSTONE: medium to coarse grained sandstone interbedded with, dark grey siltstone, high strength, fresh stained then fresh, unbroken, Mittagong Formation																			
45																					
10.0																					

RIG: Commachio 305 **DRILLER:** CT **LOGGED:** YB **CASING:** HW to 4.10m

TYPE OF BORING: Solid flight auger (TC Bit) to 4.00m, wash boring from 4.00m to 4.70m, NMLC coring from 4.70m to 18.28m

WATER OBSERVATIONS: No free groundwater observed whilst augering.

REMARKS: *BD13/20200618 taken at 0.90-1.00m. Groundwater well installed to 18.20m; screen (18.20-4.6m), blank (4.6-0.1m), gravel (18.20-4.10m), bentonite plug (4.10-3.5m), gravel backfill to ground level, gatic installed flush with surface level.

SAMPLING & IN SITU TESTING LEGEND

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



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BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 54.3 AHD
EASTING: 326492
NORTHING: 6260730
DIP/AZIMUTH: 90°/-

BORE No: BH208
PROJECT No: 99609.02
DATE: 19/6/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing				
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %
44		INTERBEDDED SANDSTONE AND SILTSTONE: medium to coarse grained sandstone interbedded with, dark grey siltstone, high strength, fresh stained then fresh, unbroken, Mittagong Formation																				
43																						
42																						
41																						
40																						
39																						
38																						
37																						
36																						
35																						
14.8		SANDSTONE: medium to coarse grained, pale grey, high strength, fresh stained then fresh, unbroken, Hawkesbury Sandstone																				
15																						
14																						
13																						
12																						
11																						
44																						
43																						
42																						
41																						
40																						
39																						
38																						
37																						
36																						
35																						
18.28																						
19																						
35																						

RIG: Commachio 305

DRILLER: CT

LOGGED: YB

CASING: HW to 4.10m

TYPE OF BORING: Solid flight auger (TC Bit) to 4.00m, wash boring from 4.00m to 4.70m, NMLC coring from 4.70m to 18.28m

WATER OBSERVATIONS: No free groundwater observed whilst augering.

REMARKS: *BD13/20200618 taken at 0.90-1.00m. Groundwater well installed to 18.20m; screen (18.20-4.6m), blank (4.6-0.1m), gravel (18.20-4.10m), bentonite plug (4.10-3.5m), gravel backfill to ground level, gatic installed flush with surface level.

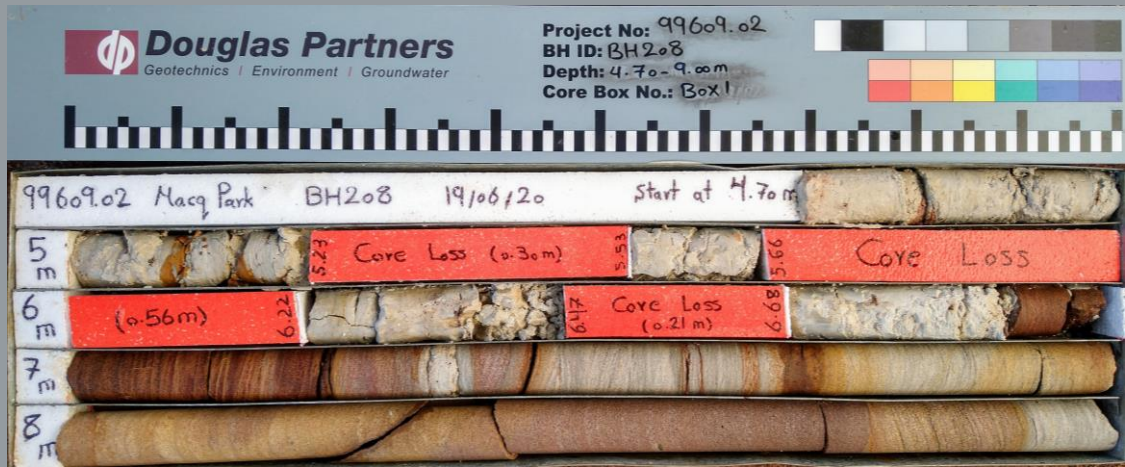
SAMPLING & IN SITU TESTING LEGEND

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

BORE: 208

PROJECT: MACQUARIE PARK

JUNE 2020



4.7-9.0m

BORE: 208

PROJECT: MACQUARIE PARK

JUNE 2020



9.0-14.0m

BORE: 208

PROJECT: MACQUARIE PARK

JUNE 2020



Douglas Partners
Geotechnics | Environment | Groundwater

Project No: 99609.02

BH ID: BH208

Depth: 14.00 - 18.28 m

Core Box No.: Box 3 / 3



14.0-18.28m

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
Macquarie Park

SURFACE LEVEL: 53.2 AHD
EASTING: 326504
NORTHING: 6260757
DIP/AZIMUTH: 90°/--

BORE No: BH209
PROJECT No: 99609.02
DATE: 16/6/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing							
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low		Medium	High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %
53	0.3	FILL/Sandy CLAY: high plasticity, dark brown, fine sand, with silt, trace rootlets, w~PL, topsoil																					A/E			4,5,5 N = 10	
	0.9	FILL/Silty CLAY CH: high plasticity, dark brown, with sand, trace fine sandstone gravel, w~PL, apparently firm																					A/E*				
1	1.2	FILL/GRAVEL GW: fine to coarse, ripped sandstone, with sand, trace clay, dry, appears well compacted																					A/E				
52	2.1	FILL/Clayey SAND SC: fine to medium, pale grey-brown, trace fine to medium sandstone gravel, dry, apparently loose																					A				
																							A/E				
2		Silty CLAY CI: medium plasticity, pale grey mottled brown, trace rootlets and fine ironstone gravel, w<PL, very stiff, residual																					A/E				
51	3.2																						S			8,12,13 N = 25	
3	3.2	Silty CLAY CL-CI: low to medium plasticity, pale grey mottled red-brown, with medium strength ironstone bands and very low strength siltstone bands, w<PL, hard, extremely weathered siltstone																						S			8,13,15 N = 28
50																											
4																							C	100	0	PL(A) = 0.1	
49																							C	100	11		
	4.92	4.77-4.90m: low strength siltstone																									
5		SANDSTONE: fine to medium grained, low strength with very low strength bands, highly to moderately weathered, fractured and slightly fractured, Mittagong Formation																					C	100	13		
48																											
6		6.67m: becoming medium strength																									
47																											
7	7.35	SANDSTONE: fine to medium grained, pale grey and dark grey, with 20-30% siltstone beds and laminations, medium strength, fresh, slightly fractured to unbroken, Mittagong Formation																					C	100	95	PL(A) = 0.3	
46																											
8																											
9																											
45																											
44																							C	100	96	PL(A) = 0.7	

RIG: Hanjin D&B **DRILLER:** BG Drilling **LOGGED:** JB **CASING:** HW to 3.3m

TYPE OF BORING: Solid flight auger to 3.0m. Rotary washbore to 3.45m. NMLC coring to 17.66m

WATER OBSERVATIONS: No free groundwater observed whilst augering.

REMARKS: *BD3/20200616 taken from 0.5-0.6m

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



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BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 53.2 AHD
EASTING: 326504
NORTHING: 6260757
DIP/AZIMUTH: 90°/-

BORE No: BH209
PROJECT No: 99609.02
DATE: 16/6/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low			Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %	Test Results & Comments																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
43		SANDSTONE: fine to medium grained, pale grey and dark grey, with 20-30% siltstone beds and laminations, medium strength, fresh, slightly fractured to unbroken, Mittagong Formation <i>(continued)</i>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											</

RIG: Hanjin D&B **DRILLER:** BG Drilling **LOGGED:** JB **CASING:** HW to 3.3m
TYPE OF BORING: Solid flight auger to 3.0m, Rotary washbore to 3.45m, NMLC coring to 17.66m
WATER OBSERVATIONS: No free groundwater observed whilst augering.
REMARKS: *BD3/20200616 taken from 0.5-0.6m

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

BORE: 209

PROJECT: MACQUARIE PARK

JUNE 2020



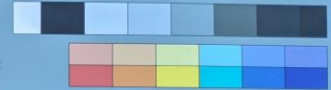
Douglas Partners
Geotechnics | Environment | Groundwater

Project No: 99609-02

BH ID: BH209

Depth: 3.45 - 8.00m

Core Box No.: 1/5



3.45-8.0m

BORE: 209

PROJECT: MACQUARIE PARK

JUNE 2020



Douglas Partners
Geotechnics | Environment | Groundwater

Project No: 99609-02

BH ID: BH209

Depth: 8.00 - 13.00m

Core Box No.: 2/3

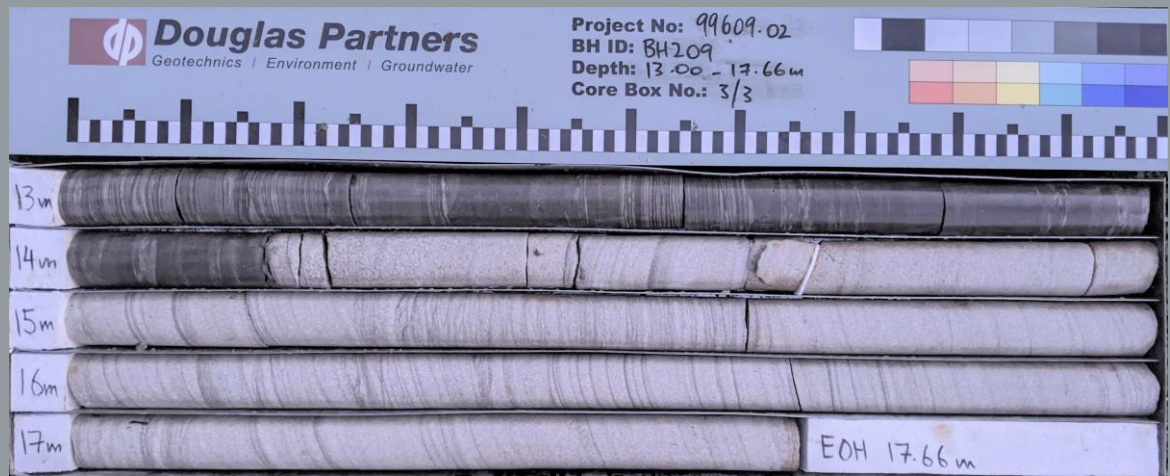


9.0-13.0m

BORE: 209

PROJECT: MACQUARIE PARK

JUNE 2020



27.18-31.0m

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 58.4 AHD
EASTING: 326419
NORTHING: 6260612
DIP/AZIMUTH: 90°/-

BORE No: BH210
PROJECT No: 99609.02
DATE: 17/6/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type
58	0.02	ASPHALTIC CONCRETE																A/E			7,15,13 N = 28
	0.3	FILL/Silty SAND: fine to medium, grey-brown, fine to medium, igneous gravel, dry, roadbase																A/E			
1	0.7	FILL/Silty CLAY: medium plasticity, red-brown, trace fine to medium ironstone gravel, w<PL, appears stiff, (possible natural)																A/E*			
	1.45	Silty CLAY: medium plasticity, red-brown, trace fine to medium ironstone gravel, w<PL, stiff to very stiff, residual																S			
57	2.0	1.00m: becoming pale grey mottled orange-brown																C	100	0	PL(A) = 0.2
56		SHALY CLAY: high plasticity, pale grey with orange-brown bands, hard with low strength ironstone bands, residual soil / extremely weathered Ashfield Shale																			PL(A) = 0.3
55	3	SILTSTONE: pale grey, with red-brown bands, very low strength with low to medium strength bands, highly weathered, fractured, Ashfield Shale																C	100	0	PL(A) = 0.5
54	4																				
53	5																	C	100	0	PL(A) = 0.2
52	5.73	SILTSTONE: dark grey, with orange-brown bands, low to medium strength, moderately then slightly weathered, highly fractured, Ashfield Shale																			PL(A) = 0.3
51	6																				PL(A) = 0.1
50	7																	C	100	65	PL(A) = 0.5
49	7.62	SILTSTONE: dark grey, with 5% fine grained sandstone laminations, medium strength, fresh stained then fresh, slightly fractured, Ashfield Shale																			PL(A) = 1
	8																				PL(A) = 0.8
	9																	C	100	87	
	10.0																				PL(A) = 0.8

RIG: Commachio 305

DRILLER: CT

LOGGED: YB

CASING: HW to 1.10m

TYPE OF BORING: Solid flight auger (TC Bit) to 1.45m, NMLC coring from 1.45m to 14.20m

WATER OBSERVATIONS: No free groundwater observed whilst augering.

REMARKS: *BD9/20200617 taken at 0.90-1.00m.

SAMPLING & IN SITU TESTING LEGEND

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



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BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 58.4 AHD
EASTING: 326419
NORTHING: 6260612
DIP/AZIMUTH: 90°/-

BORE No: BH210
PROJECT No: 99609.02
DATE: 17/6/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing							
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low			Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %	Test Results & Comments
48	10.6	SILTSTONE: dark grey, with 5% fine grained sandstone laminations, medium strength, fresh stained then fresh, slightly fractured, Ashfield Shale													0.01	0.05	0.10	0.50	1.00	stn	C	100	87	PL(A) = 0.3
11	47	SANDSTONE: medium to coarse grained, pale grey and grey, medium then high strength with very low strength bands, fresh, unbroken, Mittagong Formation																		10.41m: J45°, pl, ro, cln 10.52m: J80°, pl, ro, cly vn 10.85m: J80°, pl, ti 10.91m: J80°, pl, ro cbs vn 11.03m: J45°, pl, ro, cln 11.43m: Cs, 20mm				
12	46																			11.81m: J45°, pl, ro, cln 11.83m: Fg, 130mm 12.03m: J45°, pl, ro, cly vn	C	100	87	PL(A) = 0.8 PL(A) = 0.9
13	45	13.00-14.15m: 70-80% Siltstone laminations and beds																						
14	14.2	Bore discontinued at 14.2m Target depth reached																		13.46-13.61m: F45°, pl, partially he, cln 13.71-13.79m: J(x2), 45°, pl, partially he, cln 14.01-14.12m: J(x3), 45°, pl, he 14.12m: Ds, 20mm				PL(A) = 1.4
15	44																							
16	43																							
17	42																							
18	41																							
19	40																							
39	39																							

RIG: Commachio 305 **DRILLER:** CT **LOGGED:** YB **CASING:** HW to 1.10m
TYPE OF BORING: Solid flight auger (TC Bit) to 1.45m, NMLC coring from 1.45m to 14.20m
WATER OBSERVATIONS: No free groundwater observed whilst augering.
REMARKS: *BD9/20200617 taken at 0.90-1.00m.

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test ls(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test ls(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	> Water seep	S Standard penetration test	
E Environmental sample	≡ Water level	V Shear vane (kPa)	

BORE: 210

PROJECT: MACQUARIE PARK

JUNE 2020



Douglas Partners
Geotechnics | Environment | Groundwater

Project No: 99609.02

BH ID: BH 210

Depth: 1.45 - 6.00 m

Core Box No.: Box 1



99609.02 Macq Park BH210 17/06/20 1.45m



27.18-31.0m

BORE: 210

PROJECT: MACQUARIE PARK

JUNE 2020



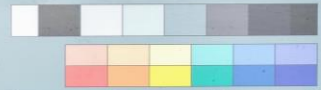
Douglas Partners
Geotechnics | Environment | Groundwater

Project No: 99609.02

BH ID: BH 210

Depth: 6.00 - 11.00 m

Core Box No.: Box 2



31.0-34.0m

BORE: 210

PROJECT: MACQUARIE PARK

JUNE 2020



27.18-31.0m

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 54.7 AHD
EASTING: 326457
NORTHING: 6260644
DIP/AZIMUTH: 90°/-

BORE No: BH211
PROJECT No: 99609.02
DATE: 15/6/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing				
			EW	HW	MW	SW	FS		Ex Low	Very Low	Low	Medium	High	Very High		B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %	Test Results & Comments	
	0.05	ASPHALTIC CONCRETE																	A/E			6,9,14 N = 23
	0.15	FILL/Gravelly SAND: fine to medium, dark grey, fine to medium, igneous gravel, dry, roadbase																	A/E			
	0.3	FILL/Clayey SAND: fine to medium, yellow-brown, trace fine to medium igneous gravel, appears poorly compacted																	A/E			
	1	Silty CLAY CI/CH: medium to high plasticity, pale grey mottled red-brown, trace fine to medium, ironstone gravel, w<PL, stiff to very stiff residual																	S			
	1.3	SHALE: pale grey and red-brown, with fine to medium, ironstone gravel, very low strength, Ashfield Shale																	A/E*			
	2																		A/E			25/50 refusal PL(A) = 0.5
	2.55	SILTSTONE: grey with red-brown bands, low strength with medium strength ironstone bands, highly weathered, highly fractured, Ashfield Shale																	S			
	3																					PL(A) = 0.3
	3.46	SILTSTONE: dark grey with orange-brown bands, with 5-10% fine grained sandstone laminations and beds, low to medium strength, moderately weathered, highly fractured, Ashfield Shale																	C	100	53	
	4																					PL(A) = 0.3
	5																					
	6																					PL(A) = 0.2
	6.54	SANDSTONE: medium to coarse grained, pale grey with yellow-grey bands, low to medium strength with very low strength bands, moderately weathered, fractured, Mittagong Formation																	C	100	66	
	7																					PL(A) = 0.7
	7.68	SANDSTONE: medium to coarse grained, pale grey, distinctly bedded at 0°-10°, high strength with a low strength band, fresh, unbroken, Mittagong Formation																				
	8																		C	100	98	PL(A) = 1.3
	9																					
	9.60-9.68m	silt and quartz clasts																	C	100	99	PL(A) = 1.8

RIG: Commachio 305 **DRILLER:** CT **LOGGED:** YB **CASING:** HW to 2.50m
TYPE OF BORING: Solid flight auger (TC Bit) to 2.50m, NMLC coring from 2.55m to 12.57m
WATER OBSERVATIONS: No free groundwater observed whilst augering.
REMARKS: *BD6/20200615 taken at 1.50-1.60m.

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test ls(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test ls(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	> Water seep	S Standard penetration test	
E Environmental sample	≡ Water level	V Shear vane (kPa)	

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
Macquarie Park

SURFACE LEVEL: 54.7 AHD
EASTING: 326457
NORTHING: 6260644
DIP/AZIMUTH: 90°/--

BORE No: BH211
PROJECT No: 99609.02
DATE: 15/6/2020
SHEET 2 OF 2

[illegible]

CASING: HW to 2.50m

TYPE OF BORING: Solid flight auger (TC Bit) to 2.50m, NMLC coring from 2.55m to 12.57m

WATER OBSERVATIONS: No free groundwater observed whilst augering.

REMARKS: *BD6/20200615 taken at 1.50-1.60m.

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



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BORE: 211

PROJECT: MACQUARIE PARK

JUNE 2020



2.55-7.0m

BORE: 211

PROJECT: MACQUARIE PARK

JUNE 2020



7.0-12.0m

BORE: 211

PROJECT: MACQUARIE PARK

JUNE 2020



12.0-12.57m

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 54.6 AHD
EASTING: 326473
NORTHING: 6260671
DIP/AZIMUTH: 90°/--

BORE No: BH212
PROJECT No: 99609.02
DATE: 15/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
	0.1	ASPHALTIC CONCRETE								
	0.3	CONCRETE								
	0.7	FILL/GRAVEL: medium to coarse, ripped sandstone, grey-brown, trace clay and fine to medium ironstone and igneous gravel, dry, appears loose		A/E	0.5 0.6					
	1.0	FILL/Silty CLAY: medium plasticity, orange-brown, with fine to coarse, angular to sub-angular ironstone and igneous gravel, w<PL, appears firm		A/E S	0.9 1.0		0.25/100 refusal	1		
	1.25	Bore discontinued at 1.25m Terminated due to obstructions (concrete) in fill			1.25					
	2									
	3									
	4									
	5									
	6									
	7									
	8									
	9									

RIG: Commachio 305

DRILLER: CT

LOGGED: YB

CASING: None

TYPE OF BORING: Solid flight auger (TC Bit) to 1.00m

WATER OBSERVATIONS: No free groundwater observed whilst augering.

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 54.6 AHD
EASTING: 326475
NORTHING: 6260669
DIP/AZIMUTH: 90°/--

BORE No: BH212A
PROJECT No: 99609.02
DATE: 18/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
	0.1	ASPHALTIC CONCRETE								
	0.33	CONCRETE: 4xN16 rebar with a plastic membrane at base								
		FILL/Silty CLAY: medium plasticity, brown, with fine to coarse, angular to sub-angular ironstone and igneous gravel and concrete rubble, w<PL, appears firm								
	1			A/E	0.5					
					0.6					
				A/E*	0.9					
				S	1.0		2.2,5 N = 7			
				A/E	1.45					
					1.5					
					1.6					
	2			A/E	2.0					
					2.1					
	2.1	Bore discontinued at 2.1m Terminated due to obstructions (concrete) in fill								
	3									
	4									
	5									
	6									
	7									
	8									
	9									

RIG: Commachio 305

DRILLER: CT

LOGGED: YB

CASING: None

TYPE OF BORING: Solid flight auger (TC Bit) to 2.10m

WATER OBSERVATIONS: No free groundwater observed whilst augering.

REMARKS: *BD12/20200618 taken at 0.90-1.00m.

SAMPLING & IN SITU TESTING LEGEND

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

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 54.6 AHD
EASTING: 326475
NORTHING: 6260657
DIP/AZIMUTH: 90°/-

BORE No: BH212B
PROJECT No: 99609.02
DATE: 19/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing					
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %
54 1 53 2 52 3 51 4 50 5 49 5.8 6 48 6.57 7 47 8 46 9 45	0.08	ASPHALTIC CONCRETE																					
	0.24	CONCRETE																					
	0.5	FILL/Ripped SANDSTONE: fine to medium, yellow-grey and dark grey, trace fine to coarse sandstone and ironstone, wet, appears moderately compacted																A/E			1,2,5 N = 7		
	1.3	FILL/Silty CLAY: medium plasticity, brown with red-brown, with fine to coarse, angular to sub-angular igneous and ironstone gravel, w<PL, apparently soft to firm																A/E*					
	1.5																	S					
																		A/E					
	2.6	FILL/SAND: fine to medium, brown and dark grey, trace fine to medium igneous gravel, dry, appears poorly compacted																A/E					
	2.84	Silty CLAY CI/CH: high plasticity, orange-brown, trace fine ironstone, w<PL, stiff to very stiff																			16,25/100 refusal		
	3.0	1.70m: pale grey mottled red-brown																	S				
	3.8	Shaly CLAY: CI/CH: pale grey, high plasticity, with fine ironstone gravel, w<PL, stiff, residual																	C	90	61	PL(A) = 0.1	
4	SHALE: pale grey, low strength with bands of very low strength, extremely weathered, highly fractured, Ashfield Shale																				PL(A) = 0.2		
5	SILTSTONE: dark grey with orange-brown bands, with 5-10% fine grained sandstone laminations, low strength, highly to moderately weathered, highly fractured, Ashfield Shale																	C	100	44		PL(A) = 0.1	
5.8	6	SILTSTONE: dark grey and pale grey, low to medium strength, slightly weathered, highly fractured, Ashfield Shale																				PL(A) = 0.2	
6.57	7	SANDSTONE: medium to coarse grained, pale grey with yellow-grey bands, distinctly bedded at 0°-10°, medium then high strength with very low strength bands, fresh stained then fresh, unbroken, Hawkesbury Sandstone / Mittagong Formation																	C	100	82	PL(A) = 0.3 PL(A) = 0.8	
8																						PL(A) = 1.1	
9																							
9.52		Bore discontinued at 9.52m																					PL(A) = 1.2

RIG: Commachio 305 **DRILLER:** CT **LOGGED:** YB **CASING:** HW to 2.60m
TYPE OF BORING: Solid flight auger (TC Bit) to 2.50m, NMLC coring from 2.75m to 9.52m
WATER OBSERVATIONS: No free groundwater observed whilst augering.
REMARKS: *BD14/20200618 taken at 0.90-1.00m.

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test ls(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test ls(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	> Water seep	S Standard penetration test	
E Environmental sample	≡ Water level	V Shear vane (kPa)	

BORE: 212B

PROJECT: MACQUARIE PARK

JUNE 2020



Douglas Partners
Geotechnics | Environment | Groundwater

Project No: 99609.02
BH ID: BH 212B
Depth: 2.75 - 7.00m
Core Box No.: Box 1



99609.02 Macq Park BH212B 19/06/20 Start at 2.75m

Core Loss (0.09) m



2.75-7.0m

BORE: 212B

PROJECT: MACQUARIE PARK

JUNE 2020



Douglas Partners
Geotechnics | Environment | Groundwater

Project No: 99609.02
BH ID: BH 212B
Depth: 7.00 - 9.52
Core Box No.: Box 2/2



31.0-34.0m

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 54.6 AHD
EASTING: 326476
NORTHING: 6260668
DIP/AZIMUTH: 90°/--

BORE No: BH212C
PROJECT No: 99609.02
DATE: 19/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
	0.09	ASPHALTIC CONCRETE								
	0.26	CONCRETE: 3xN6+steel plate at base								
		Bore discontinued at 0.26m								
		Terminated on steel plate								
	1									
	2									
	3									
	4									
	5									
	6									
	7									
	8									
	9									

RIG: Commachio 305

DRILLER: CT

LOGGED: YB

CASING: None

TYPE OF BORING: Diacore to 0.26m

WATER OBSERVATIONS: No free groundwater observed.

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 51.1 AHD
EASTING: 326518
NORTHING: 6260720
DIP/AZIMUTH: 90°/-

BORE No: BH213
PROJECT No: 99609.02
DATE: 16/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing							
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %	Test Results & Comments
51	0.6 1 50	FILL/Sandy CLAY: low plasticity, dark grey-brown, fine to medium sand, trace ironstone gravel and brick fragments above 0.3m, w~PL, apparently firm Silty CLAY CI-CH: medium to high plasticity, brown, w~PL, stiff, residual below 1.0m: w<PL Silty CLAY CI-CH: medium to high plasticity, pale grey and red-brown, w<PL, very stiff, residual below 2.3m: trace red-brown ironstone gravel																									4,7,8 N = 15	
																							A/E					
	1.8 2 49																										7,11,10 N = 21	
	2.85 3 48																										PL(A) = 1.2 PL(A) = 0.8 PL(A) = 0.1 PL(A) = 0.2 PL(A) = 0.8 PL(A) = 2.4 PL(A) = 1.1 PL(A) = 2.1	
	3.89 4 47																											
	4.06 5 46	SANDSTONE: medium to coarse grained, pale grey and red-brown, medium to high strength, moderately weathered, slightly fractured to unbroken, Mittagong Formation																										
	5.6 6 45	SANDSTONE: fine to medium, pale grey with siltstone bands, low and medium strength, moderately weathered then slightly weathered, slightly fractured, Mittagong Formation																										
	7 44	7.20m: high strength																										
	7.55 8 43	SILTSTONE: dark grey, with 10-20% fine grained sandstone lamianitions, high strength, fresh, slightly fractured, Mittagong Formation																										
	8.76 9 42	Bore discontinued at 8.76m Target depth reached																										

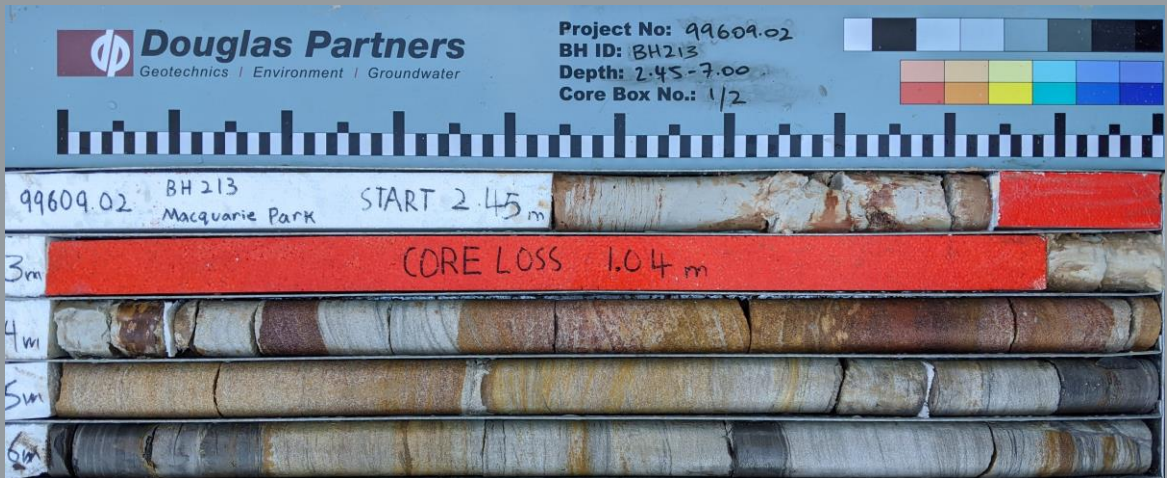
RIG: Hanjin D&B **DRILLER:** BG Drilling **LOGGED:** TM **CASING:** HW to 2.3m
TYPE OF BORING: Solid flight auger to 2.45m, NMLC coring to 8.76m
WATER OBSERVATIONS: No free groundwater observed whilst augering.
REMARKS:

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test ls(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test ls(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	> Water seep	SP Standard penetration test	
E Environmental sample	≡ Water level	V Shear vane (kPa)	

BORE: 213

PROJECT: MACQUARIE PARK

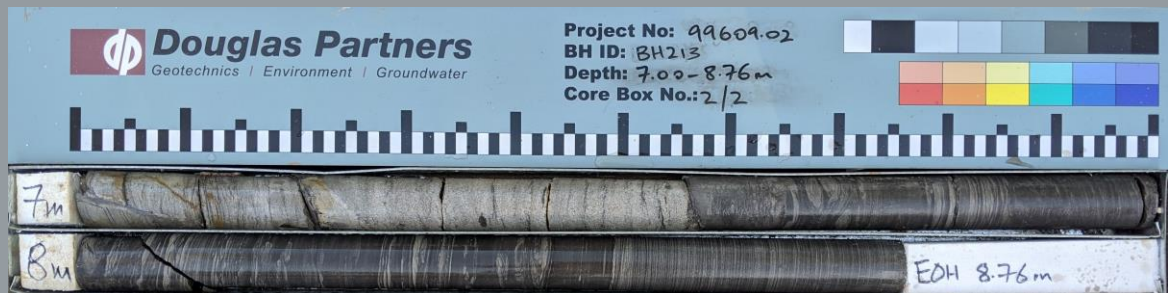
JUNE 2020



BORE: 213

PROJECT: MACQUARIE PARK

JUNE 2020



BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 49.8 AHD
EASTING: 326534
NORTHING: 6260732
DIP/AZIMUTH: 90°/-

BORE No: BH214
PROJECT No: 99609.02
DATE: 12/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing				
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low			Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type
	0.03	ASPHALTIC CONCRETE																A/E			6,11,13 N = 24
	0.3	FILL/Gravelly SAND: fine to medium, dark grey, fine to medium, igneous gravel, trace silt, dry, roadbase																A/E			
49	0.6																	A/E*			
1	1.2	FILL/Silty CLAY CI: medium plasticity, red-brown, trace fine ironstone gravel, w<PL, appears stiff, (possible natural)																S			
		Silty CLAY CI/CH: medium to high plasticity, red-brown mottled yellow-brown, w<PL, apparently stiff to very stiff, residual																A/E			
48																					17,10,21 N = 31
2	2.5	Silty CLAY CI/CH: pale grey mottled orange-brown, w<PL, hard, residual soil / extremely weathered rock																A/E			
47	2.95	Sandy CLAY: medium plasticity, medium to coarse grained sand, pale grey mottled orange-brown, hard, residual soil / extremely weathered rock																S			
3																					
46		SANDSTONE: medium to coarse grained, pale grey with red-brown bands, medium then high strength with very low strength bands, slightly weathered, slightly fractured to fractured, Mittagong Formation																C	100	64	PL(A) = 0.8
4																					PL(A) = 0.7
45																					
5																					
5.52		SANDSTONE: pale grey, distinctly bedded at 0°, with 30-40% dark grey siltstone laminations and bedded, medium and high strength with very low strength bands, fresh stained then fresh, unbroken, Mittagong Formation																C	100	83	PL(A) = 1.8
44																					PL(A) = 0.8
6																					
43																					
7																					
		7.09-7.41m: tree root																			PL(A) = 0.7
42																		C	100	100	
8																					PL(A) = 1.1
41																					PL(A) = 1.4
9																					
		SANDSTONE: medium to coarse grained, pale grey, distinctly bedded at 0°, high strength, fresh stained then fresh, unbroken, Hawkesbury Sandstone																C	100	100	
40																					

Bore discontinued at 10.0m

RIG: Commachio 305 **DRILLER:** CT **LOGGED:** YB **CASING:** HW to 2.60m
TYPE OF BORING: Solid flight auger (TC Bit) to 2.50m, wash boring from 2.50m to 2.95m, NMLC coring from 2.95m to 10.00m
WATER OBSERVATIONS: No free groundwater observed whilst augering.
REMARKS: *BD5/20200612 taken at 0.90-1.00m.

SAMPLING & IN SITU TESTING LEGEND

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



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BORE: 214

PROJECT: MACQUARIE PARK

JUNE 2020



2.95-7.0m

BORE: 214

PROJECT: MACQUARIE PARK

JUNE 2020



7.0-10.0m

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 55.7 AHD
EASTING: 326453
NORTHING: 6260581
DIP/AZIMUTH: 90°/-

BORE No: BH215
PROJECT No: 99609.02
DATE: 16/6/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing				
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low			Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type
55	0.7	FILL/Sandy CLAY: medium plasticity, dark grey, fine to medium sand, trace rootlets, fine to coarse igneous gravel, w<PL, appears firm																A/E			7,10,11 N = 21
1		FILL/Silty CLAY: medium plasticity, dark red-brown, trace fine to medium ironstone and igneous gravel, w<PL, apparently stiff to very stiff																A/E			
1.3		Silty CLAY CI/CH: high plasticity, dark red-brown, trace fine ironstone gravel, w<PL, stiff, residual																A/E*			
2		1.80m: orange-brown																S			
2.3		SHALY CLAY: high plasticity, pale grey mottled red-brown, trace fine to medium ironstone gravel, w<PL, residual soil / extremely weathered																A/E			8,25/100 refusal
2.75		Ashfield Shale																S			
3		SHALE: pale grey, very low to low strength with medium strength sandstone bands, highly weathered, Ashfield Shale													2.75m: Cs, 60mm 2.85m: Cs, 20mm 3.10-4.77m: J(x5), 45°, pl, ro, cly vn 3.13m: Cs, 20mm 3.27m: Cs, 60mm 3.42m: Cs, 20mm 3.64m: Cz, 40mm		C	100	0	PL(A) = 0.2	
4															4.15m: Ds, 110mm 4.3m: Cs, 20mm		C	100	11	PL(A) = 0.5	
4.91		SANDSTONE: fine to medium grained, pale grey and red-brown, medium strength, moderately weathered, slightly fractured to fractured, Ashfield Shale													5.05m: J40°, pl, ro, fg 5.12m: Cs, 20mm 5.35m: J30°, pl, he, fe/cal stn					PL(A) = 0.6	
5.25		SILTSTONE: dark grey with orange-brown bands, with 5-10% fine grained sandstone laminations, medium to high and high strength, moderately weathered, fractured, Ashfield Shale																		PL(A) = 0.5	
6																				PL(A) = 0.4	
7															6.55-6.58m: J(x2), 20-45°, pl, he, fe stn 6.78m: J45°, pl, ro, fe stn 7.13-7.92m: J(x8), 20-80°, pl, partially he, fe stn		C	100	60	PL(A) = 1.7	
8																				PL(A) = 0.7	
9		SANDSTONE: medium to coarse grained, pale grey, high strength, fresh stained then fresh, unbroken, Mittagong Formation													8.86m: B0°, pl, he, cly co 3mm 8.9m: J45°, pl, ro, fe stn, cly vn 9.46m: B0°, pl, ro, cly inf 10mm 9.51m: Ds, 20mm 9.64m: B0° pl ti		C	100	92	PL(A) = 2.1	
10.0																					

RIG: Commachio 305

DRILLER: CT

LOGGED: YB

CASING: HW to 2.60m

TYPE OF BORING: Solid flight auger (TC Bit) to 2.50m, wash boring from 2.50m to 2.75m, NMLC coring from 2.75m to 13.00m

WATER OBSERVATIONS: No free groundwater observed whilst augering.

REMARKS: *BD7/20200616 taken at 0.90-1.00m. Groundwater well installed to 13.00m; screen (13.00-3.0m), blank (3.0-0.1m), gravel (13.00-2.5m), bentonite plug (2.5-1.5m), gravel backfill to ground level, gatic installed flush with surface level.

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test ls(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test ls(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	> Water seep	S Standard penetration test	
E Environmental sample	≡ Water level	V Shear vane (kPa)	

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 55.7 AHD
EASTING: 326453
NORTHING: 6260581
DIP/AZIMUTH: 90°/--

BORE No: BH215
PROJECT No: 99609.02
DATE: 16/6/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %	Test Results & Comments																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
	45	SANDSTONE: medium to coarse grained, pale grey, high strength, fresh stained then fresh, unbroken, Mittagong Formation																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								

RIG: Commachio 305

DRILLER: CT

LOGGED: YB

CASING: HW to 2.60m

TYPE OF BORING: Solid flight auger (TC Bit) to 2.50m, wash boring from 2.50m to 2.75m, NMLC coring from 2.75m to 13.00m

WATER OBSERVATIONS: No free groundwater observed whilst augering.

REMARKS: *BD7/20200616 taken at 0.90-1.00m. Groundwater well installed to 13.00m; screen (13.00-3.0m), blank (3.0-0.1m), gravel (13.00-2.5m), bentonite plug (2.5-1.5m), gravel backfill to ground level, gatic installed flush with surface level.

SAMPLING & IN SITU TESTING LEGEND

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



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BORE: 215

PROJECT: MACQUARIE PARK

JUNE 2020



2.75-7.0m

BORE: 215

PROJECT: MACQUARIE PARK

JUNE 2020



7.0-12.0m

BORE: 215

PROJECT: MACQUARIE PARK

JUNE 2020



12.0-13.0m

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 54.2 AHD
EASTING: 326478
NORTHING: 6260606
DIP/AZIMUTH: 90°/-

BORE No: BH216
PROJECT No: 99609.02
DATE: 16/6/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing				
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low			Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type
54		FILL/SAND: fine to medium, dark grey, trace rootlets, clay, fine to coarse angular to sub-angular igneous and ironstone gravel, dry, appears poorly compacted 0.30m: brown																A/E			8,11,15 N = 26
0.7																		A/E			
1		Silty CLAY CI/CH: medium to high plasticity, orange-brown, trace fine to medium ironstone and shale, w<PL, appears firm, residual 1.00m: becoming very stiff																A/E*			
1.5																		S			
2		SHALY CLAY: high plasticity, pale grey mottled red-brown, w<PL, residual soil / extremely weathered Ashfield Shale																A/E			18,25/140 refusal
2.5																					
2.79		SANDSTONE: fine to medium grained, pale grey, low strength, extremely weathered																S			
3																					
51		SILTSTONE: dark grey and grey with orange-brown bands, low strength, highly to moderately weathered, fractured, Ashfield Shale																C	94	68	PL(A) = 0.1 PL(A) = 0.2
4																					PL(A) = 0.2
4.39		SILTSTONE: dark grey, with 5-10% fine grained sandstone laminations, low strength, moderately weathered, Ashfield Shale																			
5																					
5.73		5.37-6.20m: extremely weathered																C	65	61	
6																					PL(A) = 0.1
6.2		SANDSTONE: medium to coarse grained, pale grey, low strength, extremely weathered, Mittagong Formation																			PL(A) = 0.4
6.3																					
6.75		SANDSTONE: medium to coarse grained, pale grey, low then medium to high strength, extremely then slightly weathered, unbroken, Mittagong Formation																			
7																					
7.42		SANDSTONE: medium to coarse grained, pale grey, high strength, slightly weathered then fresh, unbroken, Hawkesbury Sandstone / Mittagong Formation																			PL(A) = 1.6
8																					PL(A) = 1.7
9																					
8.37-8.51m																		C	100	99	
9.58m																					
10.0																					

RIG: Commachio 305 **DRILLER:** CT **LOGGED:** YB **CASING:** HW to 2.60m
TYPE OF BORING: Solid flight auger (TC Bit) to 2.50m, wash boring from 2.50m to 2.79m, NMLC coring from 2.79m to 13.00m
WATER OBSERVATIONS: No free groundwater observed whilst augering.
REMARKS: *BD8/20200616 taken at 0.90-1.00m.

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test ls(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test ls(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	> Water seep	SP Standard penetration test	
E Environmental sample	≡ Water level	V Shear vane (kPa)	

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 54.2 AHD
EASTING: 326478
NORTHING: 6260606
DIP/AZIMUTH: 90°/--

BORE No: BH216
PROJECT No: 99609.02
DATE: 16/6/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing					
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low			Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %
44	10.28	SANDSTONE: as above																				PL(A) = 0.9
		INTERBEDDED AND INTERLAMINATED SANDSTONE AND SILTSTONE: pale grey and dark grey siltstone, medium to high strength, slightly weathered then fresh, unbroken, Mittagong Formation																				PL(A) = 0.6
11																						
43																						
42	12																	C	100	99		PL(A) = 1.2
41	13	Bore discontinued at 13.0m Target depth reached																				PL(A) = 1.3
41	13.0																					
41																						
14																						
40																						
15																						
39																						
16																						
38																						
17																						
37																						
18																						
36																						
19																						
35																						

RIG: Commachio 305 **DRILLER:** CT **LOGGED:** YB **CASING:** HW to 2.60m
TYPE OF BORING: Solid flight auger (TC Bit) to 2.50m, wash boring from 2.50m to 2.79m, NMLC coring from 2.79m to 13.00m
WATER OBSERVATIONS: No free groundwater observed whilst augering.
REMARKS: *BD8/20200616 taken at 0.90-1.00m.

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test ls(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test ls(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	> Water seep	S Standard penetration test	
E Environmental sample	= Water level	V Shear vane (kPa)	

BORE: 216

PROJECT: MACQUARIE PARK

JUNE 2020



27.18-31.0m

BORE: 216

PROJECT: MACQUARIE PARK

JUNE 2020



7.0-12.0m

BORE: 216

PROJECT: MACQUARIE PARK

JUNE 2020



12.0-13.0m

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 54.3 AHD
EASTING: 326502
NORTHING: 6260641
DIP/AZIMUTH: 90°/--

BORE No: BH217
PROJECT No: 99609.02
DATE: 18/6/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing				
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %
54 1 53 52 3 51 50 49 6 48 7 47 8 46 9 45 10.0	0.04	ASPHALTIC CONCRETE																				
	0.3	FILL/Gavelly SAND: fine to medium, dark grey, fine to coarse, igneous gravel, dry, roadbase																A/E				
	0.8	FILL/Ripped SANDSTONE: medium to coarse grained, pale yellow-grey, trace clay, fine to coarse, ironstone, dry, appears loose																A/E				
	1																	A/E*				
	1.8	FILL/Sandy CLAY: medium plasticity, brown and orange-brown, fine to medium, trace fine to coarse ironstone, sandstone and igneous gravel, w<PL, appears firm to stiff																S				2,4,6 N = 10
	2																	A/E				
	2.5	FILL/Silty CLAY: high plasticity, orange-brown, trace fine to medium ironstone and igneous gravel, w<PL, stiff to very stiff, possible reworked natural																				
	3																					
	3.2	Silty CLAY CI/CH: high plasticity, pale grey and orange-brown, trace fine to medium, ironstone, w<PL, stiff to very stiff, residual																S				2,6,10 N = 16
	4	SHALE: pale grey, very low strength with fine to coarse ironstone gravel, extremely weathered, Ashfield Shale																				
4.4 5 5.42 5.86 6 6.65 7 8 8.66 9 10.0	4.4	SHALE: pale grey, medium strength with bands of very low strength, moderately weathered with extremely weathered bands, Ashfield Shale																				
	5																					
	5.42	SHALE: pale grey, very low strength, extremely weathered, Ashfield Shale																				
	5.86																					
	6	SILTSTONE: dark grey with orange-brown bands, with 5-10% fine grained sandstone laminations, medium strength, moderately weathered, fractured, Ashfield Shale																				
	6.65																					
	7	SANDSTONE: medium to coarse grained, pale grey and orange-brown, distinctly bedded at 10°, medium to high then high strength, moderately weathered, fractured, Mittagong Formation																				
	8																					
	8.66																					
	9	SANDSTONE: medium to coarse grained, pale grey, distinctly bedded at 10°, high strength, fresh, slightly fractured, Mittagong Formation																				
10.0																						

RIG: Commachio 305 **DRILLER:** CT **LOGGED:** YB **CASING:** HW to 2.70m
TYPE OF BORING: Solid flight auger (TC Bit) to 2.50m, wash boring from 2.50m to 3.00m, NMLC coring from 3.00m to 12.00m
WATER OBSERVATIONS: No free groundwater observed whilst augering.
REMARKS: *BD11/20200618 taken at 0.90-1.00m.

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test ls(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test ls(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	> Water seep	SP Standard penetration test	
E Environmental sample	≡ Water level	V Shear vane (kPa)	

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 54.3 AHD
EASTING: 326502
NORTHING: 6260641
DIP/AZIMUTH: 90°/--

BORE No: BH217
PROJECT No: 99609.02
DATE: 18/6/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing					
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low			Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %
44		INTERBEDDED AND INTERLAMINATED SANDSTONE AND SILTSTONE: medium to coarse grained, pale grey (80%) interbedded and interlaminated with dark grey siltstone (20%), high strength, slightly weathered then fresh, unbroken, Mittagong Formation																				PL(A) = 0.9 PL(A) = 1.3
11																						
43																						
11.67		Bore discontinued at 11.67m Target depth reached																				
12																						
42																						
13																						
41																						
14																						
40																						
15																						
39																						
16																						
38																						
17																						
37																						
18																						
36																						
19																						
35																						

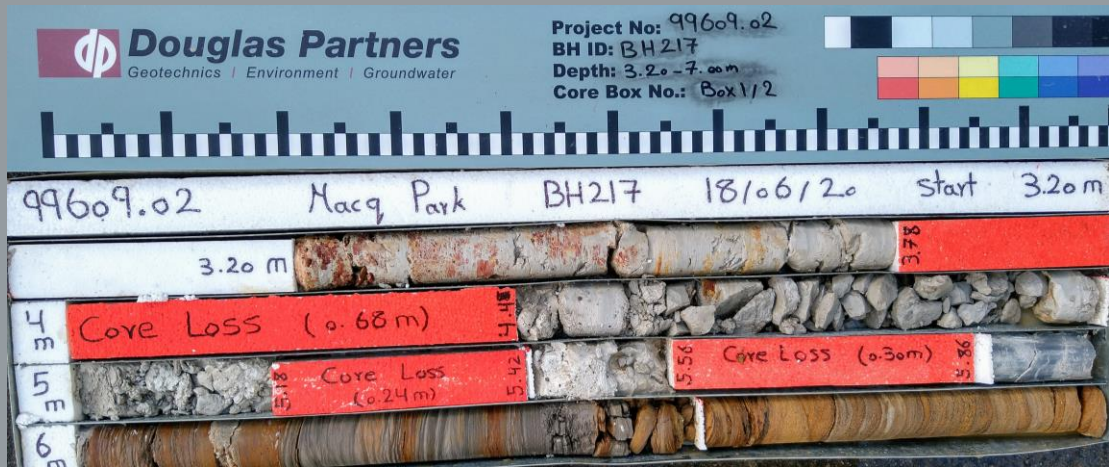
RIG: Commachio 305 **DRILLER:** CT **LOGGED:** YB **CASING:** HW to 2.70m
TYPE OF BORING: Solid flight auger (TC Bit) to 2.50m, wash boring from 2.50m to 3.00m, NMLC coring from 3.00m to 12.00m
WATER OBSERVATIONS: No free groundwater observed whilst augering.
REMARKS: *BD11/20200618 taken at 0.90-1.00m.

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test ls(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test ls(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	> Water seep	S Standard penetration test	
E Environmental sample	≡ Water level	V Shear vane (kPa)	

BORE: 217

PROJECT: MACQUARIE PARK

JUNE 2020



BORE: 217

PROJECT: MACQUARIE PARK

JUNE 2020



BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 51.3 AHD
EASTING: 326537
NORTHING: 6260679
DIP/AZIMUTH: 90°/-

BORE No: BH218
PROJECT No: 99609.02
DATE: 15/6/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing				
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %
51	0.06	ASPHALTIC CONCRETE																A/E			5,9,9 N = 18	
	0.3	FILL/Gravelly SAND: fine to medium, grey-brown, fine to medium igneous gravel, dry																A/E*				
		FILL/SAND: fine to medium, pale brown, with fine to coarse sandstone gravel, trace sandstone cobbles, dry, apparently moderately compacted																A/E				
	1.0																S					
	1.5	FILL/Sandy CLAY CL: low plasticity, brown, fine to medium sand, with silt, trace fine sandstone and ironstone gravel, w<PL, stiff, possibly reworked natural																A/E				
50	1.8																	A/E				
	2.1																	A/E				
49	2.8	FILL/Clayey SAND SC: fine to medium, brown, dry, apparently medium dense																C	100	0	pp >600	
3	3.5	Silty CLAY CL: medium plasticity, grey and red-brown, with fine to coarse ironstone gravel, w<PL, stiff, residual																			PL(A) = 3.5	
		Silty CLAY CL-CI: low to medium plasticity, pale grey mottled red-brown, ironstained, with very low strength siltstone and medium strength ironstone bands, w<PL, hard, extremely weathered siltstone																				
4	4.7	SANDSTONE: pale grey and red-brown, very low strength with medium strength iron-indurated bands, highly weathered, Mittagong Formation																C	100	71	PL(A) = 0.8	
5	5.0	SANDSTONE: fine to medium grained, grey and pale brown, medium then high strength, moderately then slightly weathered, slightly fractured, Mittagong Formation																			PL(A) = 0.9	
	5.5																					
6	6.05	6.05m: fresh																			PL(A) = 1	
7	6.55	SANDSTONE: grey and dark grey, fine to medium grained, with 30-50% siltstone laminations, medium then high strength, fresh, unbroken, Mittagong formation																	C	100	95	PL(A) = 0.5
	7.0																				PL(A) = 1.4	
8	8.0																					
43	8.65	SANDSTONE: pale grey, fine to medium grained, high strength, fresh, unbroken, Hawkesbury Sandstone																			PL(A) = 1.1	
42	9.0																				PL(A) = 1.2	
41	9.75																				PL(A) = 1.6	

RIG: Hanjin D&B **DRILLER:** BG Drilling **LOGGED:** JB **CASING:** HW to 2.1m

TYPE OF BORING: Solid flight auger to 2.0m, Rotary washbore to 2.17m, NMLC coring to 11.6m

WATER OBSERVATIONS: No free groundwater observed whilst augering.

REMARKS: *BD1/20200615 taken from 0.5-0.6m. Well installed upon completion, Screen 11.60-2.0m, Blank 2.0-0.1m, Gravel 11.60-1.8m, Bentonite plug 1.8-0.8m, Gravel backfill to surface, gatic installed flush with road surface.

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test ls(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test ls(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	> Water seep	S Standard penetration test	
E Environmental sample	≡ Water level	V Shear vane (kPa)	

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 51.3 AHD
EASTING: 326537
NORTHING: 6260679
DIP/AZIMUTH: 90°/--

BORE No: BH218
PROJECT No: 99609.02
DATE: 15/6/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %	Test Results & Comments																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
41		SANDSTONE: pale grey, fine to medium grained, high strength, fresh, slightly fractured, Hawkesbury Sandstone																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																

RIG: Hanjin D&B **DRILLER:** BG Drilling **LOGGED:** JB **CASING:** HW to 2.1m

TYPE OF BORING: Solid flight auger to 2.0m, Rotary washbore to 2.17m, NMLC coring to 11.6m

WATER OBSERVATIONS: No free groundwater observed whilst augering.

REMARKS: *BD1/20200615 taken from 0.5-0.6m. Well installed upon completion, Screen 11.60-2.0m, Blank 2.0-0.1m, Gravel 11.60-1.8m, Bentonite plug 1.8-0.8m, Gravel backfill to surface, gatic installed flush with road surface.

SAMPLING & IN SITU TESTING LEGEND

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



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BORE: 218

PROJECT: MACQUARIE PARK

JUNE 2020



2.17-7.0m

BORE: 218

PROJECT: MACQUARIE PARK

JUNE 2020



7.0-11.6m

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 48.7 AHD
EASTING: 326561
NORTHING: 6260698
DIP/AZIMUTH: 90°/-

BORE No: BH219
PROJECT No: 99609.02
DATE: 15/6/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type
48	0.06	ASPHALTIC CONCRETE																A/E			1,5,3 N = 8
	0.25	FILL/ Gravelly SAND: fine to medium, grey, fine to medium igneous gravel, dry, apparently well compacted																A/E			
	1	Sandy CLAY: low plasticity, red-brown, fine to medium sand, w<PL, apparently firm, residual 0.8m: becoming very stiff																A/E S			
	2	SANDSTONE: fine to medium grained, grey and red-brown very low to medium strength with bands of extremely low strength, highly weathered, fractured, Mittagong Formation																C	100	35	PL(A) = 0.9
	3																				PL(A) = 0.7
	4	INTERBEDDED AND INTERLAMINATED SANDSTONE AND SILTSTONE: fine to medium, pale grey and orange-brown sandstone (60%) interbedded and interlaminated with dark grey siltstone (40%) low and medium strength with bands of very low and extremely low strength, moderately weathered, slightly fractured, Mittagong Formation																C	100	84	PL(A) = 0.4
	5																				PL(A) = 0.5
	6																				PL(A) = 0.2
	7																				PL(A) = 0.2
	8																				
39	7.02	SANDSTONE: fine to medium, pale grey with some orange brown, medium then high strength, slightly weathered then fresh, unbroken, Hawkesbury Sandstone																C	97	97	PL(A) = 0.7
	7.69																				
	9	8.32 - 8.54m: 220mm bed of interlaminated siltstone (60%) and sandstone (40%)																	100	100	PL(A) = 0.4
	10.0																				PL(A) = 2.1

RIG: Hanjin D&B **DRILLER:** BG Drilling **LOGGED:** JB/TM **CASING:** HW to 1.2m

TYPE OF BORING: Solid flight auger to 1.0m, Rotary washbore to 1.23m, NMLC to 10.82m

WATER OBSERVATIONS: No free groundwater observed whilst augering. 50% water loss at 7.6m.

REMARKS:

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test ls(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test ls(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	> Water seep	S Standard penetration test	
E Environmental sample	≡ Water level	V Shear vane (kPa)	

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 48.7 AHD
EASTING: 326561
NORTHING: 6260698
DIP/AZIMUTH: 90°/--

BORE No: BH219
PROJECT No: 99609.02
DATE: 15/6/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low		Medium	High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %	Test Results & Comments																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
	38	SANDSTONE: fine to medium, pale grey with some orange brown, high strength, fresh, unbroken																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				

RIG: Hanjin D&B **DRILLER:** BG Drilling **LOGGED:** JB/TM **CASING:** HW to 1.2m
TYPE OF BORING: Solid flight auger to 1.0m, Rotary washbore to 1.23m, NMLC to 10.82m
WATER OBSERVATIONS: No free groundwater observed whilst augering. 50% water loss at 7.6m.
REMARKS:

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test ls(50) (MPa)
		PL(D)	Point load diametral test ls(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

BORE: 219

PROJECT: MACQUARIE PARK

JUNE 2020



Project No: 99609.02
BH ID: BH219
Depth: 1.23-6.0 m
Core Box No.: 1/2



1.23-6.0m

BORE: 219

PROJECT: MACQUARIE PARK

JUNE 2020



Project No: 99609.02
BH ID: BH219
Depth: 6.0-10.84 m
Core Box No.: 2/2



6.0-10.84m

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 49.2 AHD
EASTING: 326555
NORTHING: 6260719
DIP/AZIMUTH: 90°/--

BORE No: BH220
PROJECT No: 99609.02
DATE: 17/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
49.2	0.2	FILL/Silty CLAY CH: high plasticity, dark brown, with sand, trace rootlets, w~PL, firm, topsoil		A/E	0.1 0.2					
	0.65	FILL/Silty CLAY CH: high plasticity, dark brown, trace sand, rootlets, fine to coarse igneous gravel and glass fragments, w~PL, apparently firm		A/E	0.5 0.6					
1	1.1	Silty CLAY CI-CH: medium to high plasticity, orange mottled brown, trace sand and fine ironstone gravel, w~PL, stiff, residual		A/E	0.9 1.0				1	
		Bore discontinued at 1.1m								
48										
47										
3										
46										
4										
45										
5										
44										
6										
43										
7										
42										
8										
41										
9										
40										

RIG: Hand tools **DRILLER:** JB **LOGGED:** JB **CASING:** None
TYPE OF BORING: Hand auger to 1.1m
WATER OBSERVATIONS: No free groundwater observed whilst augering.
REMARKS:

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

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 50.0 AHD
EASTING: 326545
NORTHING: 6260701
DIP/AZIMUTH: 90°/--

BORE No: BH221
PROJECT No: 99609.02
DATE: 17/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
49.8	0.3	FILL/Silty CLAY CH: high plasticity, dark brown mottled orange-brown, with sand, trace rootlets, w~PL, firm, topsoil		A/E	0.1 0.2					
				A/E*	0.5 0.6					
49.9	0.9	FILL/Silty CLAY CI: medium plasticity, dark orange-brown, trace sand and fine to coarse ironstone gravel, w~PL, apparently stiff, probably reworked natural		A/E	0.9 1.0				1	
49.9	1.3	Silty CLAY CI: medium plasticity, orange-grey mottled brown, trace fine to medium ironstone gravel, w~PL, stiff, residual Bore discontinued at 1.3m								
49.8	2								2	
49.7	3								3	
49.6	4								4	
49.5	5								5	
49.4	6								6	
49.3	7								7	
49.2	8								8	
49.1	9								9	

RIG: Hand tools

DRILLER: JB

LOGGED: JB

CASING: None

TYPE OF BORING: Hand auger to 1.3m

WATER OBSERVATIONS: No free groundwater observed whilst augering.

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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



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BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 54.3 AHD
EASTING: 326532
NORTHING: 6260696
DIP/AZIMUTH: 90°/--

BORE No: BH222
PROJECT No: 99609.02
DATE: 17/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
54.3	0.3	FILL/Silty SAND: fine to medium, brown, with fine to coarse igneous gravel, trace rootlets, dry, appears moderately compacted		A/E	0.1 0.2					
54.6	0.6	FILL/Silty SAND: fine to medium, pale brown, with fine to medium sandstone gravel, trace brick fragments, dry, appears moderately compacted		A/E	0.5 0.6					
55.1	1.05	FILL/ Gravelly SAND: fine to medium, pale brown, fine to coarse sandstone gravel, trace sandstone cobbles, dry, appears well compacted Bore discontinued at 1.05m		A/E	0.9 1.0					
55.2										
55.3										
55.4										
55.5										
55.6										
55.7										
55.8										
55.9										
56.0										
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59.7										
59.8										
59.9										
60.0										

RIG: Hand tools **DRILLER:** JB **LOGGED:** JB **CASING:** None
TYPE OF BORING: Hand auger to 1.05m
WATER OBSERVATIONS: No free groundwater observed whilst augering.
REMARKS:

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

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 51.2 AHD
EASTING: 326517
NORTHING: 6260749
DIP/AZIMUTH: 90°/--

BORE No: BH223
PROJECT No: 99609.02
DATE: 17/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
51.2	0.3	FILL/Sandy CLAY: high plasticity, dark brown, fine sand, with silt, trace rootlets, w~PL, apparently soft, topsoil	[X]	A/E	0.1					
					0.2					
	0.6	FILL/Silty CLAY CH: high plasticity, dark brown, with sand, trace fine sandstone gravel, w~PL, apparently firm		A/E	0.5					
	0.75	FILL/GRAVEL GW: fine to coarse, sub-angular to sub-rounded, ripped sandstone, with sand, trace clay, dry, appears well compacted		A/E	0.6					
		Bore discontinued at 0.75m			0.7					
50	1									
49	2									
48	3									
47	4									
46	5									
45	6									
44	7									
43	8									
42	9									

RIG: Hand tools **DRILLER:** JB **LOGGED:** JB **CASING:** None
TYPE OF BORING: Hand auger to 0.75m
WATER OBSERVATIONS: No free groundwater observed whilst augering.
REMARKS:

SAMPLING & IN SITU TESTING LEGEND					
A	Auger sample	G	Gas sample	PLD	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	>	Water seep	S	Standard penetration test
E	Environmental sample	≡	Water level	V	Shear vane (kPa)

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 53.6 AHD
EASTING: 326479
NORTHING: 6260758
DIP/AZIMUTH: 90°/--

BORE No: BH224
PROJECT No: 99609.02
DATE: 17/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
	0.2	FILL/Silty CLAY: medium to high plasticity, dark brown, with rootlets, w~PL, apparently firm		A/E	0.1					
					0.2					
	0.6	FILL/Sandy CLAY: low plasticity, brown, fine to medium sand, w~PL, apparently firm		A/E	0.5					
	0.75	FILL/Silty CLAY: low to medium plasticity, red mottled pale grey, with sand, w~PL, apparently very stiff		A/E	0.6					
		Bore discontinued at 0.75m			0.7					
	1									
	2									
	3									
	4									
	5									
	6									
	7									
	8									
	9									

RIG: Hand tools **DRILLER:** JB **LOGGED:** JB **CASING:** None
TYPE OF BORING: Hand auger to 0.75m
WATER OBSERVATIONS: No free groundwater observed whilst augering.
REMARKS:

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

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 52.8 AHD
EASTING: 326452
NORTHING: 6260805
DIP/AZIMUTH: 90°/--

BORE No: BH225
PROJECT No: 99609.02
DATE: 17/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Dynamic Penetrometer Test (blows per 150mm)
				Type	Depth	Sample	Results & Comments		
52.8 52.7 52.6 52.5 52.4 52.3 52.2 52.1 52.0 51.9 51.8 51.7 51.6 51.5 51.4 51.3 51.2 51.1 51.0 50.9 50.8 50.7 50.6 50.5 50.4 50.3 50.2 50.1 50.0 49.9 49.8 49.7 49.6 49.5 49.4 49.3 49.2 49.1 49.0 48.9 48.8 48.7 48.6 48.5 48.4 48.3 48.2 48.1 48.0 47.9 47.8 47.7 47.6 47.5 47.4 47.3 47.2 47.1 47.0 46.9 46.8 46.7 46.6 46.5 46.4 46.3 46.2 46.1 46.0 45.9 45.8 45.7 45.6 45.5 45.4 45.3 45.2 45.1 45.0 44.9 44.8 44.7 44.6 44.5 44.4 44.3 44.2 44.1 44.0 43.9 43.8 43.7 43.6 43.5 43.4 43.3 43.2 43.1 43.0	0.3	FILL/Silty CLAY: medium plasticity, dark brown, with sand, bark and rootlets, w~PL, soft, topsoil	[Cross-hatched pattern]	A/E	0.1 0.2				1
		FILL/Silty SAND: fine to medium, dark brown, with rootlets, moist, apparently loose to medium dense		A/E	0.5 0.6				
	0.9	FILL/Silty CLAY: medium plasticity, orange-brown, trace fine ironstone gravel, w<PL, apparently stiff to very stiff, possible natural		A/E	0.9 1.0				
	1.4	Bore discontinued at 1.4m							
	2								2
	3								3
	4								4
	5								5
	6								6
	7								7
	8								8
	9								9

RIG: Hand tools

DRILLER: JB

LOGGED: JB

CASING: None

TYPE OF BORING: Hand auger to 1.4m

WATER OBSERVATIONS: No free groundwater observed whilst augering.

REMARKS:

- ☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

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

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 54.8 AHD
EASTING: 326412
NORTHING: 6260764
DIP/AZIMUTH: 90°/--

BORE No: BH226
PROJECT No: 99609.02
DATE: 17/6/2020
SHEET 1 OF 1

[illegible]

RIG: Hand tools

DRILLER: JB

LOGGED: JB

CASING: None

TYPE OF BORING: Hand auger to 0.85m

WATER OBSERVATIONS: No free groundwater observed whilst augering.

REMARKS:

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



BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 55.4 AHD
EASTING: 326389
NORTHING: 6260736
DIP/AZIMUTH: 90°/--

BORE No: BH227
PROJECT No: 99609.02
DATE: 17/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
55.0 54.5 54.0 53.5 53.0	0.2	FILL/Silty CLAY: medium plasticity, dark brown, with bark and rootlets, w~PL, apparently firm, topsoil		A/E	0.1 0.2					
	0.6	FILL/Silty SAND: fine to medium, dark grey-brown, with rootlets, moist, apparently loose		A/E	0.5 0.6					
	1.0	Silty CLAY CI: medium plasticity, orange-brown, trace sand and fine ironstone gravel, w<PL, apparently stiff, possibly fill		A/E	0.9 1.0					
		Bore discontinued at 1.0m								
52.5 52.0 51.5 51.0 50.5 50.0 49.5 49.0 48.5 48.0 47.5 47.0 46.5 46.0	2 3 4 5 6 7 8 9									

RIG: Hand tools

DRILLER: JB

LOGGED: JB

CASING: None

TYPE OF BORING: Hand auger to 1.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering.

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 57.0 AHD
EASTING: 326437
NORTHING: 6260624
DIP/AZIMUTH: 90°/--

BORE No: BH228
PROJECT No: 99609.02
DATE: 17/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
	0.2	FILL/Clayey SAND: fine to medium, dark brown, with silt, with rootlets, trace igneous gravel, moist, apparently loose, topsoil		A/E	0.1					
	0.2				0.2					
	0.6	FILL/Clayey SAND: fine to medium, pale brown, with silt, trace igneous gravel, moist, apparently loose		A/E	0.5					
	0.6				0.6					
	0.8	FILL/Silty CLAY: medium plasticity, orange-brown, trace fine ironstone gravel, w<PL, apparently stiff, possibly natural Bore discontinued at 0.8m		A/E	0.7					
	0.8				0.8					
	1									
	2									
	3									
	4									
	5									
	6									
	7									
	8									
	9									

RIG: Hand tools

DRILLER: JB

LOGGED: JB

CASING: None

TYPE OF BORING: Hand auger to 0.8m

WATER OBSERVATIONS: No free groundwater observed whilst augering.

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

BOREHOLE LOG

CLIENT: Stockland Pty Ltd
PROJECT: Mixed Use Development
LOCATION: 11-17 Khartoum Rd and 33 Talavera Rd,
 Macquarie Park

SURFACE LEVEL: 54.6 AHD
EASTING: 326476
NORTHING: 6260624
DIP/AZIMUTH: 90°/--

BORE No: BH229
PROJECT No: 99609.02
DATE: 17/6/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing				Water	Well Construction Details	
				Type	Depth	Sample	Results & Comments			
	0.3	FILL/Clayey SAND: fine to medium, dark brown, with silt, trace rootlets, moist, apparently loose, topsoil		A/E	0.1					
					0.2					
	0.6	FILL/Sandy GRAVEL: fine to coarse, igneous, grey-brown, fine to medium sand, dry, apparently loose		A/E	0.5					
					0.6					
	0.8	FILL/Clayey SAND: fine to medium, pale brown, moist, apparently medium dense		A/E	0.7					
					0.8					
	1.1	FILL/Silty CLAY: medium plasticity, orange-brown, trace sand, w<PL, apparently stiff, possibly natural		A/E	0.9					
		Bore discontinued at 1.1m			1.0					
	2									
	3									
	4									
	5									
	6									
	7									
	8									
	9									

RIG: Hand tools

DRILLER: JB

LOGGED: JB

CASING: None

TYPE OF BORING: Hand auger to 1.1m

WATER OBSERVATIONS: No free groundwater observed whilst augering.

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

Appendix D

Results of Insitu Permeability Testing

Permeability Testing - Rising Head Test Report

[illegible]

Permeability Testing - Rising Head Test Report

[illegible]

Permeability Testing - Rising Head Test Report

Client: Stockland Development Pty Ltd		Project No: 99609.02	
Project: Mixed Use Development		Test date: 19.6.2020	
Location: 11-17 Khartoum Rd & 33 Talavera Rd, Macquarie Park		Tested by: JDB / TM	
Test Location		Test No. BH208	
Description: Standpipe in borehole		Easting: 326492	m
Material type: Siltstone and sandstone		Northing: 6260730	m
		Surface Level: 54.3	m AHD
Details of Well Installation			
Well casing diameter (2r)	76	mm	Depth to water before test 7.72 m
Well screen diameter (2R)	76	mm	Depth to water at start of test 16.57 m
Length of well screen (Le)	10.56	m	
Comments:	Effective screen length reduced due to standing water level		
Test Results			
Time (min)	Depth (m)	Change in Head δH (m)	δH/Ho
0	16.57	8.85	1.000
1	16.41	8.69	0.982
5	15.78	8.06	0.910
10	15.09	7.37	0.832
20	13.66	5.94	0.671
30	12.40	4.68	0.529
42	11.08	3.36	0.380
50	10.41	2.69	0.304
60	9.82	2.10	0.238
75	9.26	1.54	0.174
90	8.88	1.16	0.131

Permeability Testing - Rising Head Test Report

[illegible]

Permeability Testing - Rising Head Test Report

Client:	Stockland Development Pty Ltd	Project No:	99609.02
Project:	Mixed Use Development	Test date:	16.6.2020
Location:	11-17 Khartoum Rd & 33 Talavera Rd, Macquarie Park	Tested by:	JDB

Test Location

Description: Standpipe in borehole
Material type: Siltstone and sandstone

Test No. BH218
Easting: 326492 m
Northing: 6260730 m
Surface Level: 54.3 m AHD

Details of Well Installation

Well casing diameter (2r)	76 mm	Depth to water before test	6.4 m
Well screen diameter (2R)	76 mm	Depth to water at start of test	8.51 m
Length of well screen (Le)	5.2 m		

Comments: Effective screen length reduced due to standing water level

Test Results

Time (min)	Depth (m)	Change in Head δH (m)	δH/Ho
0	8.52	2.12	1.005
1	8.11	1.71	0.810
2	7.77	1.37	0.649
3	7.35	0.95	0.450
4	7.10	0.70	0.332
5	6.94	0.54	0.256
6	6.85	0.45	0.213
7	6.81	0.41	0.194
8	6.77	0.37	0.175
9	6.75	0.35	0.166
10	6.73	0.33	0.156

To = 3.6 mins
 216 secs

Theory:

Falling Head Permeability calculated using equation by Hvorslev
 $k = [r^2 \ln(Le/R)] / 2Le To$

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

Hydraulic Conductivity

k =

3.2E-06 m/sec

 = 1.138 cm/hour

Appendix E

Results of Laboratory Testing

CERTIFICATE OF ANALYSIS 245605

Client Details

Client	Douglas Partners Pty Ltd
Attention	Sam Balian
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	<u>99609.02, Macquarie Park</u>
Number of Samples	11 soil
Date samples received	25/06/2020
Date completed instructions received	25/06/2020

Analysis Details

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

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

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

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

Report Details

Date results requested by	02/07/2020
Date of Issue	02/07/2020
NATA Accreditation Number 2901. This document shall not be reproduced except in full.	
Accredited for compliance with ISO/IEC 17025 - Testing. Tests not covered by NATA are denoted with *	

Results Approved By

Priya Samarawickrama, Senior Chemist

Authorised By



Nancy Zhang, Laboratory Manager

Soil Aggressivity

Our Reference		245605-1	245605-2	245605-3	245605-4	245605-5
Your Reference	UNITS	203	203	203	208	208
Depth		0.5	1	2.5	1.4	4
Date Sampled		11/06/2020	11/06/2020	11/06/2020	19/06/2020	19/06/2020
Type of sample		soil	soil	soil	soil	soil
pH 1:5 soil:water	pH Units	6.7	5.4	4.6	4.7	3.9
Electrical Conductivity 1:5 soil:water	µS/cm	62	89	94	300	370
Chloride, Cl 1:5 soil:water	mg/kg	<10	67	82	99	420
Sulphate, SO4 1:5 soil:water	mg/kg	87	20	31	380	<10

Soil Aggressivity

Our Reference		245605-6	245605-7	245605-8	245605-9	245605-10
Your Reference	UNITS	210	210	212A	217	217
Depth		0.5	1	0.9	0.5	0.9
Date Sampled		17/06/2020	17/06/2020	18/06/2020	18/06/2020	18/06/2020
Type of sample		soil	soil	soil	soil	soil
pH 1:5 soil:water	pH Units	5.1	4.6	7.9	9.8	8.8
Electrical Conductivity 1:5 soil:water	µS/cm	170	93	370	160	120
Chloride, Cl 1:5 soil:water	mg/kg	75	61	63	<10	<10
Sulphate, SO4 1:5 soil:water	mg/kg	130	46	380	110	42

Soil Aggressivity

Our Reference		245605-11
Your Reference	UNITS	217
Depth		2.5
Date Sampled		18/06/2020
Type of sample		soil
pH 1:5 soil:water	pH Units	5.0
Electrical Conductivity 1:5 soil:water	µS/cm	58
Chloride, Cl 1:5 soil:water	mg/kg	10
Sulphate, SO4 1:5 soil:water	mg/kg	50

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

QUALITY CONTROL: Soil Aggressivity					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	245605-2
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	1	6.7	6.6	2	101	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	1	62	66	6	100	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	1	<10	<10	0	92	87
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	1	87	94	8	99	#

QUALITY CONTROL: Soil Aggressivity					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	11	5.0	4.8	4	[NT]	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	11	58	61	5	[NT]	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	11	10	10	0	[NT]	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	[NT]	11	50	49	2	[NT]	[NT]

Result Definitions

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

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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

Report Comments

pH / EC

Samples were out of the recommended holding time for this analysis.

Sulphate

High spike recovery was obtained for this sample. Sample matrix interference is suspected. However, an acceptable recovery was obtained for the LCS

Appendix F

Results of Building A Field Work by Douglas Partners

BOREHOLE LOG

CLIENT: Stockland Developments Pty Ltd
PROJECT: Macquarie Park Stage 1
LOCATION: 11-17 Khartoum Road and 33 - 39 Talavera Road, Macquarie Park

SURFACE LEVEL: 60.0 AHD
EASTING: 326340
NORTHING: 6260674
DIP/AZIMUTH: 90°/-

BORE No: BH101
PROJECT No: 99609.00
DATE: 27/2/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering						Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing				
			EW	HW	MW	SW	FS	FR		Ex Low	Very Low	Low	Medium	High		Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %
60		FILL/SAND: fine to medium, dark brown, trace of fine to medium sub-angular igneous gravel and plant roots, dry																				A				
	0.5																					A				
59	1	CLAY CL: low plasticity, dark orange-brown, trace of fine ironstone gravel, w<PL, firm, residual																				A				
	1.00m	grading to medium plasticity, orange-brown, firm to stiff																				A				
	1.50m	grading to pale grey mottled red-brown, hard																				S				7,14,24 N = 38
58	2																									
	1.95																									
	2.17	CLAY CL: high plasticity, pale grey mottled red-brown, with bands of ironstone and Shale (30-50mm thick), w>PL, hard, extremely weathered shale																				C	82	0		PL(A) = 0.4
57	3																									
56	4																					C	100	0		
	4.2	SHALE: pale grey-brown, very low strength, highly weathered with hard clay bands, fragmented, Ashfield Shale																				C	100	0		PL(A) = 0.2
55	5																									
	5.27																					C	100	0		PL(A) = 0.01
54	6																									
	6.16	SHALE: pale grey-brown and grey, very low strength, highly weathered, fragmented, Ashfield Shale																				C	100	75		PL(A) = 0.2
53	7	SHALE: grey and pale grey, trace fine sandstone laminations, medium to high strength, slightly weathered then fresh, fractured to slightly fractured then unbroken, Ashfield Shale																								PL(A) = 0.1
	6.9																									
52	8																					C	100	65		PL(A) = 0.7
51	9																									PL(A) = 1

RIG: DT250

DRILLER: CT

LOGGED: YB/SI

CASING: HW to 2.25m

TYPE OF BORING: Solid Flight Auger to 1.50m, rotary (water) to 1.95m, NMLC to 17.27m

WATER OBSERVATIONS: No free groundwater observed during augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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



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BOREHOLE LOG

CLIENT: Stockland Developments Pty Ltd
PROJECT: Macquarie Park Stage 1
LOCATION: 11-17 Khartoum Road and 33 - 39 Talavera Road, Macquarie Park

SURFACE LEVEL: 60.0 AHD
EASTING: 326340
NORTHING: 6260674
DIP/AZIMUTH: 90°/-

BORE No: BH101
PROJECT No: 99609.00
DATE: 27/2/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type
50		SHALE - as above																			PL(A) = 1.2
49	10.45	SANDSTONE: fine to medium, pale grey, interlaminated and bedded with 20% dark grey siltstone, high strength, slightly fractured and unbroken, Mittagong Formation																C	100	80	PL(A) = 1
48	11																				PL(A) = 1.4
47	12																				PL(A) = 1.9
46	13																				PL(A) = 1.4
45	14																				PL(A) = 1.5
44	16.0	Interbedded SILTSTONE and SANDSTONE: grey and pale grey, 60% siltstone interbedded/laminated with 40% fine grained sandstone, high strength, fresh, unbroken, Mittagong Formation																C	100	90	PL(A) = 1.5
43	17																				PL(A) = 1.6 PL(A) = 2.4
42	17.27	Bore discontinued at 17.27m Target depth achieved																			
41	18																				
	19																				

RIG: DT250

DRILLER: CT

LOGGED: YB/SI

CASING: HW to 2.25m

TYPE OF BORING: Solid Flight Auger to 1.50m, rotary (water) to 1.95m, NMLC to 17.27m

WATER OBSERVATIONS: No free groundwater observed during augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

BORE: 101

PROJECT: MACQUARIE PARK

FEBRUARY 2020



Project No: 99609.00
BH ID: BH 101
Depth: 1.95 - 6.00 m
Core Box No.: 1/4



99609.00 Mac Park BH 101 27/02/20 Start at 1.95 m



1.95 - 6.00m

BORE: 101

PROJECT: MACQUARIE PARK

FEBRUARY 2020



Project No: 99609.00
BH ID: BH 101
Depth: 6.00 - 11.00 m
Core Box No.: 2/4



6.00 - 11.00m

BORE: 101

PROJECT: MACQUARIE PARK

FEBRUARY 2020



Project No: 99609.00
BH ID: BH 101
Depth: 11.00 - 16.00 m
Core Box No.: 3 / 4



11.00 – 16.00 m

BORE: 101

PROJECT: MACQUARIE PARK

FEBRUARY 2020



Project No: 99609.00
BH ID: BH 101
Depth: 16 - 17.27 m
Core Box No.: 4 / 4



16.00 – 17.27 m

BOREHOLE LOG

CLIENT: Stockland Developments Pty Ltd
PROJECT: Macquarie Park Stage 1
LOCATION: 11-17 Khartoum Road and 33 - 39 Talavera Road, Macquarie Park

SURFACE LEVEL: 57.8 AHD
EASTING: 326372
NORTHING: 6260703
DIP/AZIMUTH: 90°/-

BORE No: BH102
PROJECT No: 99609.00
DATE: 27/2/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		Ex Low	Very Low	Low	Medium	High	Very High		B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %	RQD %	Test Results & Comments
	0.045	ASPHALTIC CONCRETE																E			
	0.1	FILL/Sandy GRAVEL: fine to medium, igneous gravel, grey, fine to coarse sand, dry, apparently compacted																A/E			
	0.95	FILL/SAND: fine to coarse sand, yellow-brown, with sandstone cobbles and gravel, dry, apparently compacted																A/E			19,25,R refusal
	1.15	SILTY CLAY CH: high plasticity, pale grey-brown, w<PL, very stiff to hard, residual																			
	2	SILTSTONE: pale grey with orange-brown bands, with some sandstone beds, very low strength with medium strength and clay bands, extremely to highly weathered, fractured and slightly fractured, Ashfield Shale																C	100	0	PL(A) = 0.2
	3																				PL(A) = 0.4
	3.8	SILTSTONE: orange-brown, very low to high strength, highly weathered, fractured and slightly fractured, Ashfield Shale																			PL(A) = 0.6
	4																				PL(A) = 0.3
	5																				PL(A) = 1.1
	5.35	SILTSTONE: dark grey and pale grey, with 10% sandstone laminations, medium and medium to high strength, slightly weathered, slightly fractured and unbroken, Ashfield Shale																C	100	40	PL(A) = 1.1
	6																				
	6.8	LAMINITE: dark grey with pale grey laminations, siltstone (75%), sandstone (25%), medium strength, slightly weathered, slightly fractured and unbroken, Ashfield Shale																			PL(A) = 0.9
	7																				PL(A) = 0.9
	8																				
	8.84	SANDSTONE: fine, pale grey, high strength, slightly weathered, slightly fractured and then fresh stained, unbroken, Mittagong Formation																C	100	92	PL(A) = 0.8
	9																				PL(A) = 1.2
	10.0																				

RIG: Scout 1 **DRILLER:** JE **LOGGED:** LS/SI **CASING:** HQ to 1.0m
TYPE OF BORING: Solid Flight Auger to 1.00m, rotary (water) to 1.43m, NMLC to 14.0m
WATER OBSERVATIONS: No free groundwater observed during augering
REMARKS: Well installed blank 3.0m, screen 12.1m, bentonite 0.1m-2.5m, sand 2.5m-12.1m

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test ls(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test ls(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	> Water seep	S Standard penetration test	
E Environmental sample	≡ Water level	V Shear vane (kPa)	

BOREHOLE LOG

CLIENT: Stockland Developments Pty Ltd
PROJECT: Macquarie Park Stage 1
LOCATION: 11-17 Khartoum Road and 33 - 39 Talavera Road, Macquarie Park

SURFACE LEVEL: 57.8 AHD
EASTING: 326372
NORTHING: 6260703
DIP/AZIMUTH: 90°/--

BORE No: BH102
PROJECT No: 99609.00
DATE: 27/2/2020
SHEET 2 OF 2

[illegible]

RIG: Scout 1

DRILLER: JE

LOGGED: LS/SI

CASING: HQ to 1.0m

TYPE OF BORING: Solid Flight Auger to 1.00m, rotary (water) to 1.43m, NMLC to 14.0m

WATER OBSERVATIONS: No free groundwater observed during augering

REMARKS: Well installed blank 3.0m. screen 12.1m. bentonite 0.1m-2.5m. sand 2.5m-12.1m

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



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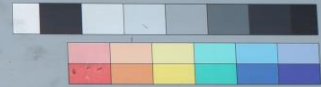
BORE: 102

PROJECT: MACQUARIE PARK

FEBRUARY 2020



Project No: 99609.00
BH ID: BH 102
Depth: 1.43 - 6.00 m
Core Box No.: 1/3



99609.00 Macquarie Park 27-2-20
BH 102 Start: 1.43m



1.43 - 6.00m

BORE: 102

PROJECT: MACQUARIE PARK

FEBRUARY 2020



Project No: 99609.00
BH ID: BH 102
Depth: 6.00 - 11.00 m
Core Box No.: 2/3



6.00 - 11.00m

BORE: 102

PROJECT: MACQUARIE PARK

FEBRUARY 2020



Project No: 99609.00
BH ID: BH 102
Depth: 11.00 - 14.00 m
Core Box No.: 3/3



11.00 - 14.00m

BOREHOLE LOG

CLIENT: Stockland Developments Pty Ltd
PROJECT: Macquarie Park Stage 1
LOCATION: 11-17 Khartoum Road and 33 - 39 Talavera Road, Macquarie Park

SURFACE LEVEL: 58.9 AHD
EASTING: 326385
NORTHING: 6260658
DIP/AZIMUTH: 90°/-

BORE No: BH103
PROJECT No: 99609.00
DATE: 28/2/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type
	0.04	ASPHALTIC CONCRETE																A/E			13,17,25/145 refusal
	0.3	FILL/Gravelly SAND: fine to coarse, grey, fine to medium igneous gravel, angular to sub angular, well graded, with silt, dry																A/E			
	0.5	FILL/Silty CLAY: high plasticity, brown, trace fine to coarse sand, apparently compacted, dry																A			
58	1	Silty CLAY CH: high plasticity, red-brown, w<PL, very stiff grading to hard, residual																A/E			
	1.65	1.1m: grading dark grey mottled red-brown																S			
57	1.68	1.2m: with rock texture																			
	2	Silty CLAY CH: high plasticity, pale grey, with some high strength ironstone bands and very low strength shale bands, extremely weathered shale, w<PL																C	92	0	
56	3																				
	3.24	SILTSTONE: pale grey and red-brown, very low strength with medium and high strength bands, highly weathered to extremely weathered, fractured and fragmented, Ashfield Shale																			
55	4																				
	5																	C	100	0	PL(A) = 0.4
54	5																				
	5.43	SILTSTONE: dark grey, low and medium strength, slightly weathered, fractured and slightly fractured, Ashfield Shale																			
53	6																				
	7																				
	7.42	LAMINITE: dark grey with pale grey laminations, 70% siltstone, 30% sandstone, high strength, slightly weathered, slightly fractured and unbroken, Ashfield Shale																C	100	98	PL(A) = 1.3
51	8																				
	9	8.6m: grading to 50% siltstone 50% sandstone																			
50																					
	10.0																	C	100	96	
49																					PL(A) = 1.3
																		</			

RIG: Scout 1 **DRILLER:** JE **LOGGED:** LS **CASING:** HQ to 1.0m
TYPE OF BORING: Solid Flight Auger to 1.00m, rotary (water) to 1.65m, NMLC to 16.0m
WATER OBSERVATIONS: No free groundwater observed during augering
REMARKS:

SAMPLING & IN SITU TESTING LEGEND			
A Auger sample	G Gas sample	PID Photo ionisation detector (ppm)	
B Bulk sample	P Piston sample	PL(A) Point load axial test ls(50) (MPa)	
BLK Block sample	U Tube sample (x mm dia.)	PL(D) Point load diametral test ls(50) (MPa)	
C Core drilling	W Water sample	pp Pocket penetrometer (kPa)	
D Disturbed sample	> Water seep	S Standard penetration test	
E Environmental sample	≡ Water level	V Shear vane (kPa)	

BOREHOLE LOG

CLIENT: Stockland Developments Pty Ltd
PROJECT: Macquarie Park Stage 1
LOCATION: 11-17 Khartoum Road and 33 - 39 Talavera Road, Macquarie Park

SURFACE LEVEL: 58.9 AHD
EASTING: 326385
NORTHING: 6260658
DIP/AZIMUTH: 90°/--

BORE No: BH103
PROJECT No: 99609.00
DATE: 28/2/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering				Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing				
			EW	HW	MW	SW		FS	FR	Ex Low	Very Low	Low			Medium	High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type
	10.36	LAMINITE - as above																			
	11	SANDSTONE: fine to medium, grey-brown, high strength with medium strength bands, slightly weathered, slightly fractured and unbroken, Mittagong Formation																C	100	96	PL(A) = 1.2
	12	10.96m-11.2m: laminite, 50% sandstone 50% siltstone																			PL(A) = 0.7
	13																	C	100	99	PL(A) = 1.8
	14	SANDSTONE: fine, pale grey, bedded and thickly laminated with siltstone laminations, high strength, fresh, slightly fractured and unbroken																			PL(A) = 1.1
	15																				PL(A) = 2.8
	16	Bore discontinued at 16.0m Target depth achieved																			PL(A) = 2.1
	17																				
	18																				
	19																				
	20																				

RIG: Scout 1 **DRILLER:** JE **LOGGED:** LS **CASING:** HQ to 1.0m
TYPE OF BORING: Solid Flight Auger to 1.00m, rotary (water) to 1.65m, NMLC to 16.0m
WATER OBSERVATIONS: No free groundwater observed during augering
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

BORE: 103

PROJECT: MACQUARIE PARK

FEBRUARY 2020



Project No: 99609.00
BH ID: BH103
Depth: 1.65-6.00m
Core Box No.: 10F3



1.65 – 6.00m

BORE: 103

PROJECT: MACQUARIE PARK

FEBRUARY 2020



Project No: 99609.00
BH ID: BH103
Depth: 6.00-11.00m
Core Box No.: 20F3



6.00 – 11.00m

BORE: 103

PROJECT: MACQUARIE PARK

FEBRUARY 2020



BOREHOLE LOG

CLIENT: Stockland Developments Pty Ltd
PROJECT: Macquarie Park Stage 1
LOCATION: 11-17 Khartoum Road and 33 - 39 Talavera Road, Macquarie Park

SURFACE LEVEL: 54.95 AHD
EASTING: 326412
NORTHING: 6260668
DIP/AZIMUTH: 90°/--

BORE No: BH104
PROJECT No: 99609.00
DATE: 26/2/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type
	0.04	ASPHALTIC CONCRETE																A/E			15,25/100 refusal
	0.3	FILL/Gravelly SAND: fine to coarse, brown, fine gravel, angular to sub-angular, trace silt, dry, apparently compacted																A/E*			
54	1	Silty CLAY CH: high plasticity, pale orange-brown and pale grey, trace fine iron stone gravel, w<PL, very stiff to hard, residual																A			
	1.42	0.7m: grading to pale grey, extremely weathered siltstone																S			
53	2	Silty CLAY CH: high plasticity, pale grey with red-brown extremely weathered shale ironstone bands (20mm-30mm)																C	100	0	PL(A) = 0.06
52	3	SILTSTONE: grey-brown with red-brown and orange-brown bands, very low and low strength, highly and extremely weathered, fractured, Ashfield Shale																			PL(A) = 0.1
51	4	SILTSTONE: dark-grey with orange-brown bands, very low and low strength with medium strength bands, highly weathered, Ashfield Shale																C	100	11	PL(A) = 0.4
50	5	LAMINITE: dark grey with pale grey laminations, 50% siltstone 50% sandstone, laminated, medium to high strength, fresh stained, slightly fractured, Ashfield Shale																			PL(A) = 0.09
49	6	6.2m-6.52m: 70% sandstone 30% siltstone																			PL(A) = 0.9
48	7	6.51m: DS, 30mm																C	100	93	PL(A) = 1.2
47	8	SANDSTONE: fine, pale-grey, thickly bedded, medium then high strength, fresh, slightly fractured, Mittagong Formation																			PL(A) = 0.8
46	9	8.2m: fine to medium, high strength																			PL(A) = 0.5
		9.2m-9.35m: siltstone, dark grey																C	100	98	PL(A) = 1.8
	10.0																				PL(A) = 1.4

RIG: Scout 1 **DRILLER:** JE **LOGGED:** LS **CASING:** HQ to 1.00m

TYPE OF BORING: Solid Flight Auger to 1.00m, rotary (water) to 1.42m, NMLC to 12.10m

WATER OBSERVATIONS: No free groundwater observed during augering

REMARKS: Well installed blank 3.0m, screen 14.0m, bentonite 0.8m-2.4m, sand 2.4m-14.0m. *BD26022020-1

SAMPLING & IN SITU TESTING LEGEND

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



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BOREHOLE LOG

CLIENT: Stockland Developments Pty Ltd
PROJECT: Macquarie Park Stage 1
LOCATION: 11-17 Khartoum Road and 33 - 39 Talavera Road, Macquarie Park

SURFACE LEVEL: 54.95 AHD
EASTING: 326412
NORTHING: 6260668
DIP/AZIMUTH: 90°/--

BORE No: BH104
PROJECT No: 99609.00
DATE: 26/2/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)	Discontinuities		Sampling & In Situ Testing			
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium			High	Very High	Ex High	B - Bedding S - Shear	J - Joint F - Fault	Type
	10.22	SANDSTONE - as above																			
44	11	LAMINITE: grey and pale-grey, laminated to thickly bedded, sandstone (70%) siltstone (30%), high strength, fresh, slightly fractured and unbroken, Mittagong Formation																C	100	99	PL(A) = 3
43	12	11.63m: grading to 50% sandstone 50% siltstone																			PL(A) = 1.1
12.1		Bore discontinued at 12.1m Target depth achieved																			
	13																				
	14																				
	15																				
	16																				
	17																				
	18																				
	19																				

RIG: Scout 1 **DRILLER:** JE **LOGGED:** LS **CASING:** HQ to 1.0m

TYPE OF BORING: Solid Flight Auger to 1.00m, rotary (water) to 1.42m, NMLC to 12.10m

WATER OBSERVATIONS: No free groundwater observed during augering

REMARKS: Well installed blank 3.0m, screen 14.0m, bentonite 0.8m-2.4m, sand 2.4m-14.0m. *BD26022020-1

SAMPLING & IN SITU TESTING LEGEND

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

BORE: 104

PROJECT: MACQUARIE PARK

FEBRUARY 2020



Project No: 99609.00
BH ID: BH104
Depth: 1.42 - 6.00 m
Core Box No.: 1/3



1.42 - 6.00m

BORE: 104

PROJECT: MACQUARIE PARK

FEBRUARY 2020



Project No: 99609.00
BH ID: BH104
Depth: 6.00 - 11.00 m
Core Box No.: 2/3



6.00 - 11.00m

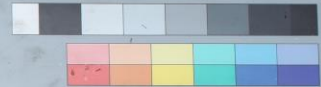
BORE: 104

PROJECT: MACQUARIE PARK

FEBRUARY 2020



Project No: 99609.00
BH ID: BH104
Depth: 11.00 - 12.1 m
Core Box No.: 3/3



11.00 - 12.10m

BOREHOLE LOG

CLIENT: Stockland Developments Pty Ltd
PROJECT: Macquarie Park Stage 1
LOCATION: 11-17 Khartoum Road and 33 - 39 Talavera Road, Macquarie Park

SURFACE LEVEL: 58.7 AHD
EASTING: 326402
NORTHING: 6260646
DIP/AZIMUTH: 90°/--

BORE No: BH105A
PROJECT No: 99609.00
DATE: 27/2/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing					
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint F - Fault	Type	Core Rec. %
	0.05	FILL/TOPSOIL: bark, red-brown																								
	0.1		FILL/TOPSOIL: silty SAND, brown																				E			
	0.45	FILL/Silty CLAY: high plasticity, pale grey, with ironstone gravel 3mm-25mm, w<PL, apparently compacted																								
		Bore discontinued at 0.45m																								
		Refusal on concrete																								
	58																									
	1																									
	57																									
	2																									
	56																									
	3																									
	55																									
	4																									
	54																									
	5																									
	53																									
	6																									
	52																									
	7																									
	51																									
	8																									
	50																									
	9																									
	49																									

RIG: Hand Tools **DRILLER:** LS **LOGGED:** LS **CASING:** Nil
TYPE OF BORING: Hand Auger to 0.45m
WATER OBSERVATIONS: No free groundwater observed during augering
REMARKS:

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

BOREHOLE LOG

CLIENT: Stockland Developments Pty Ltd
PROJECT: Macquarie Park Stage 1
LOCATION: 11-17 Khartoum Road and 33 - 39 Talavera Road, Macquarie Park

SURFACE LEVEL: 57.5 AHD
EASTING: 326409
NORTHING: 6260663
DIP/AZIMUTH: 90°/--

BORE No: BH105B
PROJECT No: 99609.00
DATE: 27/2/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering					Graphic Log	Rock Strength					Water	Fracture Spacing (m)				Discontinuities		Sampling & In Situ Testing				
			EW	HW	MW	SW	FS		FR	Ex Low	Very Low	Low	Medium		High	Very High	Ex High	0.01	0.05	0.10	0.50	1.00	B - Bedding S - Shear	J - Joint F - Fault	Type
		FILL/TOPSOIL: silty SAND, brown																							
57	0.3	Silty CLAY CH: high plasticity, red-brown, w<PL, very stiff grading to hard, residual																				E			
0.7																							E		
1		Bore discontinued at 0.7m Practical refusal																							
56																									
2																									
55																									
3																									
54																									
4																									
53																									
6																									
52																									
6																									
51																									
7																									
50																									
8																									
49																									
9																									
48																									

RIG: Hand Tools **DRILLER:** LS **LOGGED:** LS **CASING:** Nil
TYPE OF BORING: Hand Auger to 0.7m
WATER OBSERVATIONS: No free groundwater observed during augering
REMARKS:

SAMPLING & IN SITU TESTING LEGEND			
A	Auger sample	G	Gas sample
B	Bulk sample	P	Piston sample
BLK	Block sample	U	Tube sample (x mm dia.)
C	Core drilling	W	Water sample
D	Disturbed sample	>	Water seep
E	Environmental sample	≡	Water level
		PID	Photo ionisation detector (ppm)
		PL(A)	Point load axial test ls(50) (MPa)
		PL(D)	Point load diametral test ls(50) (MPa)
		pp	Pocket penetrometer (kPa)
		S	Standard penetration test
		V	Shear vane (kPa)

Appendix G

Results of Building A Field Work by Golder Associates



REVISION A REPORT OF BOREHOLE: BH1

SHEET: 1 OF 4

CLIENT: Stockland
PROJECT: Macquarie Park Development
LOCATION: 11-17 Khartoum Road
JOB NO: 1785207

COORDS: 326354 m E 6260662 m N MGA94 56
SURFACE RL: 59.8 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 12.00 m

DRILL RIG: FG101
CONTRACTOR: Fico Group
LOGGED: KC DATE: 6/10/17
CHECKED: GKS DATE: 24/10/17

Drilling				Sampling		Field Material Description						
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA	DTC	H	0.0	59.78				CH	FILL: ASPHALT dark grey, with some fine to coarse, sub-rounded to sub-angular gravel	D		FILL
			0.13	0.22								0.15m: Rootlets up to 5mm thick
M	59.58	RESIDUAL SOIL										
NDD			0.5									
						FILL: Gravelly SAND fine to coarse grained, yellow-brown, fine to coarse grained, sub-angular to angular gravel						
						CLAY high plasticity, grey mottled red-brown, with some silt, trace fine grained sand						
			1.0				D					
			1.5	001 Rec = 450/450 mm SPT 1.50-1.95 m 17, 33, 40 N=73 PP 1.50 m >500 kPa							V-bit refusal at 1.50m. Continued with TC bit	
			2.0									
			2.5									
			3.0	002 Rec = 3375/375 mm SPT 3.00-3.38 m 6, 22, 30/75mm N>52 PP 3.00 m >500 kPa								
			3.5									
			4.0									
4.5												

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GAP gINT FN. F01a
RL3



REVISION A REPORT OF BOREHOLE: BH1

SHEET: 2 OF 4

DRILL RIG: FG101

CONTRACTOR: Fico Group

LOGGED: KC DATE: 6/10/17

CHECKED: GKS DATE: 24/10/17

CLIENT: Stockland

COORDS: 326354 m E 6260662 m N MGA94 56

PROJECT: Macquarie Park Development

SURFACE RL: 59.8 m DATUM: AHD

LOCATION: 11-17 Khartoum Road

INCLINATION: -90°

JOB NO: 1785207

HOLE DEPTH: 12.00 m

Drilling					Field Material Description				Defect Information			
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $I_{s(50)}$ MPa	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm)	
								EL 0.03 VL 0.1 L 0.1 M 0.3 H 1 VH 3 EH 10			10 20 50 100 200 500 1000 3000	
				0.0								
				0.5								
				1.0								
				1.5								
				2.0								
				2.5								
				3.0								
				3.5	3.50 56.30		Continuation of Sheet 1 CORE LOSS					
				4.0								
				4.5	4.32 55.48 4.48 55.32		RESIDUAL CLAY medium to high plasticity, brown, with some fine to coarse siltstone gravel					
				5.0	5.00		SILTSTONE dark grey, pale grey and brown, laminated at 0 to 5 degrees, abundant iron staining	HW		4.52 m: DS, 5-10°, Un, clay Ct, 5 mm 4.55 m: B, 5°, Pl, Sm, iron Sn 4.57 m: DS, 5°, Pl, clay Ct, 3 mm 4.61-4.68 m: DS, 0-5°, clay filled with fine to coarse siltstone gravel, 70 mm 4.71 m: B, 10°, Pl, Sm, clay Ct 4.75-4.77 m: DS, 0-5°, clay filled with fine to coarse siltstone gravel, 20 mm		

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GAP gINT FN. F02a
RL3



REVISION A REPORT OF BOREHOLE: BH1

SHEET: 3 OF 4

CLIENT: Stockland
PROJECT: Macquarie Park Development
LOCATION: 11-17 Khartoum Road
JOB NO: 1785207

COORDS: 326354 m E 6260662 m N MGA94 56
SURFACE RL: 59.8 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 12.00 m

DRILL RIG: FG101
CONTRACTOR: Fico Group
LOGGED: KC DATE: 6/10/17
CHECKED: GKS DATE: 24/10/17

Drilling						Field Material Description				Defect Information			
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $I_{s(50)}$ MPa	DEFECT DESCRIPTION & Additional Observations		AVERAGE DEFECT SPACING (mm)	
									EL 0.03 VL 0.1 J 0.1 L 0.3 M 0.3 H 1 VH 3 EH 10			10 20 30 100 300 1000 3000	
100% Water RETURN	55	0 (30)		5.0	54.80		CORE LOSS			4.83-4.90 m: DB, likely drilling break - sharp, angular siltstone fragments with little to no weathering 4.91-4.93 m: DS, 0-5°, clay filled with fine to coarse siltstone gravel Ct, 20 mm 4.95-5.00 m: HB, handling break from removing core from the catcher			
				5.5	54.14		SILTSTONE dark grey and brown, laminated at 0 to 5 degrees, iron staining along bedding	HW		5.66-5.70 m: DS, 0-5°, clay filled with fine to coarse siltstone gravel Ct, 40 mm 5.70-6.00 m: DS, 0-5°, clay and medium to coarse, angular siltstone gravel, 20 mm, x7			
				6.0				MW		6.02 m: J, 25°, Pl, iron Sn, <1 mm, intact 6.05 m: DS, 0-10°, clay Ct, 10 mm 6.13-6.17 m: DS, 0-10°, clay filled with fine to coarse siltstone gravel Ct 6.21-6.26 m: DS, 0-5°, clay Ct, 50 mm 6.29 m: CS, 0-5°, fine to coarse, angular siltstone gravel with clay, 20 mm 6.37 m: B, 5°, Pl, Sm, clay Vr			
				6.5	6.50		CORE LOSS	MW		6.39-6.41 m: HB, handling break from removing core from the catcher 6.45-6.48 m: HB, handling break from removing core from the catcher 6.58 m: B, 5-10°, Pl, Sm, iron Sn 6.61-6.68 m: B, 0-5°, Pl, Sm, clay with iron staining Vr, x6 6.72 m: B, 0-5°, Pl, Sm, clay with iron staining Vr 6.74 m: B, 0-5°, Pl, Sm, clay with iron staining Vr			
100% Water RETURN	90	70 (75)		6.5	53.26		INTERLAMINATED SILTSTONE (70%) AND SANDSTONE (30%) dark grey and pale grey, thin sandstone laminations (up to 5mm) at 0 to 10 degrees	FR		7.25-7.53 m: DB, Core from previous run was left in the hole. Core broken upon drilling the next run. Insitu rock intact			
				7.0									
				7.5									
				8.0						8.13 m: CS, 5°, Pl, medium to coarse, angular siltstone fragments Ct, 5 mm 8.15 m: B, 5-10°, Pl, Sm, Cn 8.20 m: B, 5°, Pl, Cn 8.26 m: B, 5°, Pl, Cn			
100% Water RETURN	100	100 (100)		8.5									
				9.0									
				9.5						9.50 m: B, 5°, Pl, Sm, Cn 9.60 m: B, 0-5°, Pl-Un, Sm, clay Vr			
				10.0									

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GAP gINT FN. F02a
RL3



REVISION A REPORT OF BOREHOLE: BH1

SHEET: 4 OF 4

CLIENT: Stockland
PROJECT: Macquarie Park Development
LOCATION: 11-17 Khartoum Road
JOB NO: 1785207

COORDS: 326354 m E 6260662 m N MGA94 56
SURFACE RL: 59.8 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 12.00 m

DRILL RIG: FG101
CONTRACTOR: Fico Group
LOGGED: KC DATE: 6/10/17
CHECKED: GKS DATE: 24/10/17

Drilling					Field Material Description					Defect Information				
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $I_{s(50)}$ MPa	DEFECT DESCRIPTION & Additional Observations			AVERAGE DEFECT SPACING (mm)	
									EL 0.03 VL 0.1 J 0.1 L 0.3 M 0.3 H 1 VH 3 EH 10				10 20 30 100 300 1000 3000	
NMLC	100% Water RETURN		100	95 (100)	10.0			FR						
					10.23									
					49.57		As above with increasing sandstone content (50% sandstone and 50% siltstone)			10.25 m: J, 5-40°, St, Sm, Cn 10.29 m: J, 20-40°, Un, Sm, Cn				
					10.5									
					10.82									
					48.98			HW		10.78-10.82 m: DS, 0-5°, Pl, clay Ct, 40 mm				
					10.93		CORE LOSS							
					48.87		SANDSTONE fine grained, pale grey, indistinctly bedded at 0 to 5 degrees, trace siltstone laminae and flecks	HW SW		10.93-11.00 m: DS, 0-5°, Pl, clay Ct, 50 mm 11.05-11.36 m: J, 75-85°, Un, Ro, iron Sn				
					11.40					11.24 m: B, 5°, Pl, Ro, iron Sn				
					48.40		INTERLAMINATED SILTSTONE (50%) AND SANDSTONE (50%) pale grey and dark grey, fine grained sandstone interbedded at 0 to 10 degrees			11.40 m: C, 50°, Pl, Ro, iron Sn				
					11.61									
					48.19		SANDSTONE fine to medium grained, pale grey, with some siltstone laminae (10%) laminated at 0 to 10 degrees			11.70-12.00 m: DB, series of drill breaks at approx 50mm spacing. Core diameter was reduced with very low penetration resistance - inferred clay bands or loose sand				
					12.00		END OF BOREHOLE @ 12.00 m TARGET DEPTH STANDPIPE INSTALLED							
					47.80									
					12.5									
					13.0									
					13.5									
					14.0									
					14.5									
					15.0									

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GAP gINT FN. F02a
RL3



REVISION A REPORT OF CORE PHOTOGRAPHS: BH1

CLIENT: Stockland
PROJECT: Macquarie Park Development
LOCATION: 11-17 Khartoum Road
JOB NO: 1785207

COORDS: 326354 m E 6260662 m N MGA94 56
SURFACE RL: 59.8 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 12.00 m

SHEET: 1 OF 1
DRILL RIG: FG101
CONTRACTOR: Fico Group
LOGGED: KC DATE: 6/10/17
CHECKED: GKS DATE: 24/10/17



This report of core photographs must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F28
RL1



REVISION A REPORT OF BOREHOLE: BH2

SHEET: 1 OF 4

DRILL RIG: FG101

CONTRACTOR: Fico Group

LOGGED: KC DATE: 10/10/17

CHECKED: GKS DATE: 24/10/17

CLIENT: Stockland

COORDS: 326365 m E 6260682 m N MGA94 56

PROJECT: Macquarie Park Development

SURFACE RL: 58.8 m DATUM: AHD

LOCATION: 11-17 Khartoum Road

INCLINATION: -90°

JOB NO: 1785207

HOLE DEPTH: 11.90 m

Drilling				Sampling		Field Material Description						
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA	DTC		0.0	0.07					FILL: ASPHALT dark grey, with some fine to coarse, sub-rounded to sub-angular gravel	D		FILL
	H		58.73									
	M		0.30	58.50				CI	FILL: Sandy GRAVEL fine to coarse grained, sub-angular to angular, grey, fine to coarse grained sand			RESIDUAL SOIL
ADV	NDD	M	0.5						Silty CLAY medium plasticity, grey mottled red-brown, trace fine grained sand	VSt		
	M											
	H		1.5		001 Rec = 450/450 mm SPT 1.50-1.95 m 7, 30, 35 N=65 PP 1.50 m >500 kPa							
ADT	M		2.0							D		V-bit refusal at 1.90m. Continued with TC bit
			2.5									
			3.0		002 Rec = 220/220 mm SPT 3.00-3.22 m 15, 30/70mm HB N>30 PP 3.00 m >500 kPa						H	
			3.5									
			4.0									
			4.5		003 Rec = 290/290 mm SPT 4.50-4.79 m 13, 26/140mm HB N>26 PP 4.50 m >500 kPa							
			5.0									

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GAP gINT FN. F01a
RL3



REVISION A REPORT OF BOREHOLE: BH2

SHEET: 2 OF 4

DRILL RIG: FG101

CONTRACTOR: Fico Group

LOGGED: KC DATE: 10/10/17

CHECKED: GKS DATE: 24/10/17

CLIENT: Stockland

PROJECT: Macquarie Park Development

LOCATION: 11-17 Khartoum Road

JOB NO: 1785207

COORDS: 326365 m E 6260682 m N MGA94 56

SURFACE RL: 58.8 m DATUM: AHD

INCLINATION: -90°

HOLE DEPTH: 11.90 m

Drilling				Sampling		Field Material Description							
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION		MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT	M		5.0	5.50 53.30			<						

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GAP gINT FN. F01a
RL3



REVISION A REPORT OF BOREHOLE: BH2

SHEET: 3 OF 4

DRILL RIG: FG101

CONTRACTOR: Fico Group

LOGGED: KC DATE: 10/10/17

CHECKED: GKS DATE: 24/10/17

CLIENT: Stockland

COORDS: 326365 m E 6260682 m N MGA94 56

PROJECT: Macquarie Park Development

SURFACE RL: 58.8 m DATUM: AHD

LOCATION: 11-17 Khartoum Road

INCLINATION: -90°

JOB NO: 1785207

HOLE DEPTH: 11.90 m

Drilling						Field Material Description				Defect Information			
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $I_{s(50)}$ MPa	DEFECT DESCRIPTION & Additional Observations		AVERAGE DEFECT SPACING (mm)	
								EL 0.03 VL 0.1 L 0.1 M 0.3 H 1 VH 3 EH 10				10 20 100 300 1000 3000	
				5.0									
				5.5									
				6.0									
				6.08	52.72		Continuation of Sheet 2						
							INTERBEDDED SILTSTONE (60%) AND SANDSTONE (40%) dark grey, pale grey and brown, fine grained sandstone interbedded at 0 to 10 degrees within siltstone, with patchy and irregularly bedding between 6.6m to 7.0m, some iron staining	SW		6.15 m: J, 20°, Pl, Ro, iron Sn 6.19 m: B, 0°, Pl, Ro, clay Vr			
				6.5				MW SW		6.54 m: B, 5°, Pl-Un, Ro, clay Vr			
				7.0				MW SW		7.12 m: DS, 5-15°, Pl, iron stained clay Ct, 10 mm 7.23 m: DS, 0-5°, Pl, clay Ct, 5 mm			
				7.40	51.40		As above with no iron staining	FR		7.77 m: J, 25°, Pl, Ro, iron Sn 7.81 m: B, 5°, Pl, Ro, iron Sn 7.84 m: B, 5°, Pl, Ro, Cn			
				8.0						8.17 m: J, 35°, Pl, Ro, Cn			
				8.5						8.37 m: J, 20°, Un, Ro, Cn 8.38-8.41 m: CS, 0-20°, fine to coarse, siltstone gravel with some clay Ct 8.50 m: B, 0-10°, Un, Ro, clay with fine to medium siltstone gravel Vr 8.62 m: J, 35-55°, Un, Ro, iron Sn			
				8.90	49.90		INTERBEDDED SILTSTONE (50%) AND SANDSTONE (50%) dark grey and grey, fine grained sandstone interbedded at 0 to 10 degrees			9.06 m: J, 40°, Pl, Ro, Cn 9.13 m: J, 55°, Pl-Un, Ro, Cn 9.18 m: J, 10-40°, Un, Ro, Cn			
				9.5						9.38 m: J, 40°, Pl, Ro, Cn 9.47 m: J, 45-55°, Un, Ro, Cn 9.52 m: J, 10-50°, St, Ro, iron Sn 9.63 m: B, 10-15°, St, Ro, clay Vr			
				10.0									

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GAP gINT FN. F02a
RL3



REVISION A REPORT OF BOREHOLE: BH2

SHEET: 4 OF 4

DRILL RIG: FG101

CONTRACTOR: Fico Group

LOGGED: KC DATE: 10/10/17

CHECKED: GKS DATE: 24/10/17

CLIENT: Stockland

COORDS: 326365 m E 6260682 m N MGA94 56

PROJECT: Macquarie Park Development

SURFACE RL: 58.8 m DATUM: AHD

LOCATION: 11-17 Khartoum Road

INCLINATION: -90°

JOB NO: 1785207

HOLE DEPTH: 11.90 m

Drilling					Field Material Description				Defect Information			
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $I_{s(50)}$ MPa	DEFECT DESCRIPTION & Additional Observations		AVERAGE DEFECT SPACING (mm)
									EL 0.03 VL 0.1 J 0.1 L 0.3 M 0.3 H 1 VH 3 EH 10			10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
90% Water RETURN				10.0			INTERBEDDED SILTSTONE (50%) AND SANDSTONE (50%) dark grey and grey, fine grained sandstone interbedded at 0 to 10 degrees	FR		10.34 m: B, 5-10°, Pl, iron Sn, 5 mm, intact 10.51-10.54 m: DS, 0-5°, Pl, clay with fine to medium siltstone gravel Ct, 30 mm 10.73-10.82 m: J, 70-80°, Un, iron Sn, <1 mm, intact 10.82 m: C, 5°, Pl, Ro, clay Vr 11.17 m: DS, 5-10°, Pl, clay with fine siltstone gravel Ct, 5 mm		
				10.33	48.47		SANDSTONE fine to medium grained, pale grey and dark grey, indistinctly bedded with siltstone laminae (10%) dipping at 5 to 15 degrees	SW				
				10.5				FR				
				10.82	47.98		INTERBEDDED SILTSTONE (65%) AND SANDSTONE (35%) dark grey and pale grey, fine grained sandstone thinly interbedded at 5 to 10 degrees					
				11.0								
				11.18	47.62		SANDSTONE fine to medium grained, pale grey and dark grey, indistinctly bedded with siltstone laminae (20%) dipping at 5 to 15 degrees	SW				
				11.5				FR				
				11.75	47.05		As above becoming coarse grained					
				11.90	46.90		END OF BOREHOLE @ 11.90 m TARGET DEPTH BACKFILLED WITH BENTONITE					
				12.0								
				12.5								
				13.0								
				13.5								
				14.0								
				14.5								
				15.0								

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GAP gINT FN. F02a
RL3



REVISION A REPORT OF CORE PHOTOGRAPHS: BH2

CLIENT: Stockland
PROJECT: Macquarie Park Development
LOCATION: 11-17 Khartoum Road
JOB NO: 1785207

COORDS: 326365 m E 6260682 m N MGA94 56
SURFACE RL: 58.8 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 11.90 m

SHEET: 1 OF 1
DRILL RIG: FG101
CONTRACTOR: Fico Group
LOGGED: KC DATE: 10/10/17
CHECKED: GKS DATE: 24/10/17



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GAP gINT FN. F28
RL1



REVISION A REPORT OF BOREHOLE: BH3

SHEET: 1 OF 4

DRILL RIG: FG101

CONTRACTOR: Fico Group

LOGGED: KC DATE: 5/10/17

CHECKED: GKS DATE: 24/10/17

CLIENT: Stockland

COORDS: 326385 m E 6260636 m N MGA94 56

PROJECT: Macquarie Park Development

SURFACE RL: 59.7 m DATUM: AHD

LOCATION: 11-17 Khartoum Road

INCLINATION: -90°

JOB NO: 1785207

HOLE DEPTH: 12.75 m

Drilling				Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA	DTC		0.0	59.67				FILL: ASPHALT dark grey, with some fine to coarse, sub-rounded to sub-angular gravel	D	FILL
	H		0.16	59.54				FILL: Sandy GRAVEL fine to coarse grained, sub-angular to angular, grey, fine to coarse grained sand		0.20m: Rootlets up to 5mm thick
	M		0.30	59.40				FILL: Gravelly SAND fine to coarse grained, yellow-brown, fine to coarse grained, sub-angular to angular gravel, with some sub-angular to angular sandstone cobbles up to 100mm		RESIDUAL SOIL
			0.5					Silty CLAY medium plasticity, grey mottled brown, trace fine grained sand	VSt	Consistency inferred from drilling resistance
NDD	L		1.0							
			1.5							V-bit refusal at 1.50m. Continued with TC bit
			2.0							
			2.5							
			3.0							
ADT	M		3.5							
			4.0							
			4.5							
			5.0	5.00						

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GAP gINT FN. F01a
RL3



REVISION A REPORT OF BOREHOLE: BH3

SHEET: 2 OF 4

DRILL RIG: FG101

CONTRACTOR: Fico Group

LOGGED: KC DATE: 5/10/17

CHECKED: GKS DATE: 24/10/17

CLIENT: Stockland

PROJECT: Macquarie Park Development

LOCATION: 11-17 Khartoum Road

JOB NO: 1785207

COORDS: 326385 m E 6260636 m N MGA94 56

SURFACE RL: 59.7 m DATUM: AHD

INCLINATION: -90°

HOLE DEPTH: 12.75 m

Drilling				Sampling		Field Material Description						
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT	M		5.0	54.70	001 Rec = 170/170 mm SPT 5.00-5.17 m 25, 17/20mm HB N>17				SILTSTONE grey-brown, extremely weathered, inferred extremely low to low strength			WEATHERED ROCK
			5.5						For Continuation Refer to Sheet 3			
			6.0									
			6.5									
			7.0									
			7.5									
			8.0									
			8.5									
			9.0									
			9.5									
			10.0									

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GAP gINT FN. F01a
RL3



REVISION A REPORT OF BOREHOLE: BH3

SHEET: 4 OF 4

DRILL RIG: FG101

CONTRACTOR: Fico Group

LOGGED: KC DATE: 5/10/17

CHECKED: GKS DATE: 24/10/17

CLIENT: Stockland

COORDS: 326385 m E 6260636 m N MGA94 56

PROJECT: Macquarie Park Development

SURFACE RL: 59.7 m DATUM: AHD

LOCATION: 11-17 Khartoum Road

INCLINATION: -90°

JOB NO: 1785207

HOLE DEPTH: 12.75 m

Drilling					Field Material Description				Defect Information			
METHOD	WATER	TCR	RQD (SCR)	DEPTH (metres)	DEPTH RL	GRAPHIC LOG	ROCK / SOIL MATERIAL DESCRIPTION	WEATHERING	INFERRED STRENGTH $I_{s(50)}$ MPa	DEFECT DESCRIPTION & Additional Observations	AVERAGE DEFECT SPACING (mm)	
								EL 0.03 VL 0.01 J 0.1 L 0.3 M 0.3 H 1 VH 3 EH 10			10 20 30 40 50 60 70 80 90 100 110 120 130 140 150	10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
100% Water RETURN	100	75 (95)		10.0			INTERLAMINATED SILTSTONE (70%) AND SANDSTONE (30%) fine grained, dark grey with pale grey, thin sandstone laminations (<5mm) dipping at 10 to 20 degrees, iron stained bedding between 8.5m to 8.6m	FR		9.90 m: B, 5°, Pl, Sm, clay Vr 9.95-9.97 m: CS, 5°, angular siltstone and sandstone gravel with clay, 30 mm 10.20 m: B, 10°, Pl, Sm, Cn 10.42 m: J, 55°, Pl-Un, Sm, Cn 10.78 m: B, 10°, Pl, Sm, Cn 10.88-10.94 m: CS, 5-15°, medium to coarse sandstone gravel with some clay 10.92 m: J, 40°, Pl, Ro, Cn 11.04 m: DS, 5°, Pl, clay Ct, 5 mm 11.08 m: B, 0-5°, Pl-Un, Cn		
				10.90	48.80		SANDSTONE fine to medium grained, pale grey, indistinctly bedded at 0 to 5 degrees with 5% siltstone laminations					
				11.50	48.20		INTERLAMINATED SANDSTONE (60%) AND SILTSTONE (40%) fine grained, pale grey and dark grey, thinly laminated at 0 to 5 degrees			11.52 m: DS, 0-5°, clay Ct, 10 mm 11.53 m: B, 5°, Pl, Ro, Cn 11.56 m: B, 5°, Pl, Ro, Cn 11.80-11.88 m: J, 55-80°, Un, clay Ct		
				11.88	47.82		SANDSTONE fine to medium grained, pale grey, indistinctly bedded at 5 to 10 degrees, trace carbonaceous flecks and laminae					
100% Water RETURN	100	95 (100)		12.0								
				12.5						12.64 m: B, 5°, Pl, Ro, Cn		
				12.75	46.95		END OF BOREHOLE @ 12.75 m TARGET DEPTH STANDPIPE INSTALLED					
				13.0								
				13.5								
				14.0								
				14.5								
				15.0								

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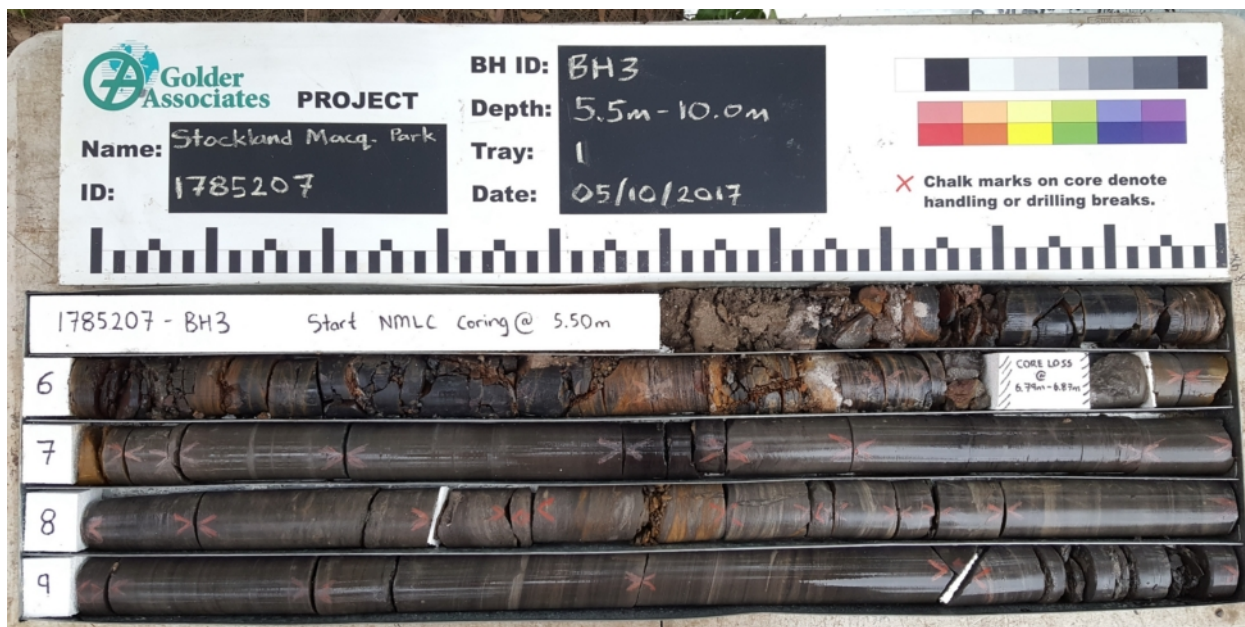
GAP gINT FN. F02a
RL3

REVISION A REPORT OF CORE PHOTOGRAPHS: BH3

CLIENT: Stockland
PROJECT: Macquarie Park Development
LOCATION: 11-17 Khartoum Road
JOB NO: 1785207

COORDS: 326385 m E 6260636 m N MGA94 56
SURFACE RL: 59.7 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 12.75 m

SHEET: 1 OF 1
DRILL RIG: FG101
CONTRACTOR: Fico Group
LOGGED: KC DATE: 5/10/17
CHECKED: GKS DATE: 24/10/17



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REVISION A REPORT OF BOREHOLE: BH4

SHEET: 1 OF 3

DRILL RIG: FG101

CONTRACTOR: Fico Group

LOGGED: KC DATE: 9/10/17

CHECKED: GKS DATE: 24/10/17

CLIENT: Stockland

COORDS: 326393 m E 6260683 m N MGA94 56

PROJECT: Macquarie Park Development

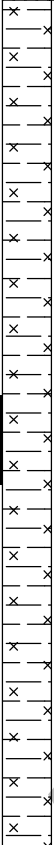
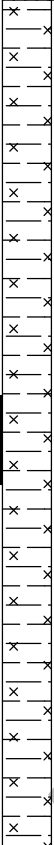
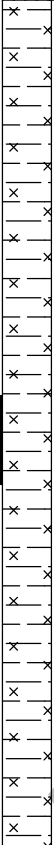
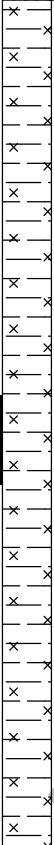
SURFACE RL: 56.3 m DATUM: AHD

LOCATION: 11-17 Khartoum Road

INCLINATION: -90°

JOB NO: 1785207

HOLE DEPTH: 8.35 m

Drilling				Sampling		Field Material Description						
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA	DTC		0.0	56.27					FILL: ASPHALT dark grey, with some fine to coarse, sub-rounded to sub-angular gravel	D		FILL
	H											
	M			0.19				CI	FILL: Sandy GRAVEL fine to coarse grained, to 30 mm, sub-angular to angular, brown, fine to coarse grained sand	D		RESIDUAL SOIL
NDD			0.5	56.11					Silty CLAY medium plasticity, pale brown mottled grey, trace fine to medium grained sand		VSt	NDD refusal
ADV			1.0									
	M		1.5		001 Rec = 290/290 mm SPT 1.50-1.79 m 12, 30/140mm HB N>30 PP 1.50 m >500 kPa							V-bit refusal at 1.50m. Continued with TC bit
	H		2.0									
			2.5									
			3.0	3.00	002 DS 3.00-3.20 m Rec = 200/200 mm			CH	CLAY high plasticity, brown mottled grey, trace silt	D	H	
ADT			3.5	53.30								
	M		4.0									
			4.5									

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GAP gINT FN. F01a
RL3



REVISION A REPORT OF BOREHOLE: BH4

SHEET: 2 OF 3

DRILL RIG: FG101

CONTRACTOR: Fico Group

LOGGED: KC DATE: 9/10/17

CHECKED: GKS DATE: 24/10/17

CLIENT: Stockland
PROJECT: Macquarie Park Development
LOCATION: 11-17 Khartoum Road
JOB NO: 1785207

COORDS: 326393 m E 6260683 m N MGA94 56
SURFACE RL: 56.3 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 8.35 m

Drilling				Sampling		Field Material Description						
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED GRAPHIC LOG	USCS SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION		MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT	M		5.0									

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GAP gINT FN. F01a
RL3



REVISION A REPORT OF CORE PHOTOGRAPHS: BH4

CLIENT: Stockland
PROJECT: Macquarie Park Development
LOCATION: 11-17 Khartoum Road
JOB NO: 1785207

COORDS: 326393 m E 6260683 m N MGA94 56
SURFACE RL: 56.3 m DATUM: AHD
INCLINATION: -90°
HOLE DEPTH: 8.35 m

SHEET: 1 OF 1
DRILL RIG: FG101
CONTRACTOR: Fico Group
LOGGED: KC DATE: 9/10/17
CHECKED: GKS DATE: 24/10/17



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GAP gINT FN. F28
RL1