Douglas Partners
Geotechnics / Environment / Groundwater

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# Report on
# Geotechnical Investigation

## The Gables New Primary School
## Fontana Drive, Gables

Prepared for
School Infrastructure NSW

Project 216255.00
November 2024

Douglas Partners
Geotechnics / Environment / Groundwater

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

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# Report on Geotechnical Investigation
# The Gables New Primary School
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## 1. Introduction

### 1.1 General

This Report on a Geotechnical Investigation has been prepared by Douglas Partners Pty Ltd (DP), on behalf of the NSW Department of Education (the Applicant), to assess the geotechnical conditions at the site as well as potential environmental impacts that could arise from the development of The Gables New Primary School, at Lot 301 DP 1287967 on Fontana Drive, Gables (the site).

This report has been prepared to present the results of a geotechnical investigation undertaken by DP, and to assess the subsurface soil, rock and groundwater conditions across the site in order to provide comments on:

- Excavation conditions, including excavatability, excavation stability, shoring and batters;
- General site preparation and earthworks;
- Pavement design parameters;
- Site classification in accordance with AS 2870-2001 – Residential slabs and footings; and
- Suitable foundation types and design parameters.

This report accompanies a Review of Environment Factors (REF) that seeks approval for the construction and operation of a new primary school at the site, which involves the following works:

- Construction of school buildings, including learning hubs, a school hall and an administration and library building;
- Construction and operation of a public preschool;
- Delivery of a sports court and fields;
- Construction of car parking, waste storage and loading area;
- Associated site landscaping and open space improvements; and
- Associated off-site infrastructure works to support the school, including (but not limited to) services, driveways and pedestrian crossings.

For a detailed project description, refer to the Review of Environmental Factors prepared by Ethos Urban.

The geotechnical investigation was carried out under the Standard Form Agreement SINSW03210-22 dated 12 July 2022 and undertaken in accordance with Douglas Partners' proposal SINSW03210-22, dated 24/06/2022. The investigation included the drilling of eight (8) boreholes, and the excavation of

twenty five (25) test pits. The details of the field work are presented in this report, together with relevant comments and recommendations.

Prior to undertaking the geotechnical investigation, a desktop study report was prepared (DP ref: 216255.00.R.001.Rev0). Unless otherwise stated, the findings of this geotechnical investigation report supersede those outlined in the desktop study report.

This geotechnical investigation was carried out in conjunction with a contamination investigation and assessment (Detailed Site Investigation) using the same intrusive test locations. Refer to report 216255.01.R.002 for the results and further contamination related information.

## 1.2 Statement of Significance

Based on the identification of potential issues, and an assessment of the nature and extent of the impacts of the proposed development, it is determined that:

- The extent and nature of potential impacts from the proposed development are low from a geotechnical and hydrogeological engineering perspective, and will not have significant adverse effects on the locality, community and the environment if the comments and recommendations in this report are followed.
- Potential impacts can be appropriately mitigated or managed to ensure that there is minimal effect on the locality, community by following the comments and recommendation in this report.

## 1.3 REF Requirements

The REF requirements relevant to this report are summarised in Table 1.

**Table 1: Summary of Relevant REF Requirements**

| Item | REF Requirement | Relevant Section of Report |
|---|---|---|
| 31a | Provide an assessment of the potential impacts on soil resources, including related infrastructure and riparian lands on and near the site. | 3.1 Geology, 3.2 Soil Landscapes, 3.3 Salinity, 3.4 Acid Sulphate Soils, 3.6 Groundwater Dependent Ecosystems, Watercourses and Riparian Lands, 9.2 Excavation, 9.3 Vibrations, 9.4 Excavation Support, 9.5 Waste Classification, 9.7 Groundwater Dependent Ecosystems, Watercourses and Riparian Lands, 9.10 Aggressivity |
| 31b | Provide an assessment of the potential impacts on surface and groundwater resources (quality and quantity), including related infrastructure, hydrology, aquatic and groundwater dependent ecosystems, drainage lines, downstream | 3.5 Hydrogeology, 3.6 Groundwater Dependent Ecosystems, Watercourses and Riparian Lands, 9.6 Groundwater, 9.7 Groundwater Dependent Ecosystems, Watercourses and Riparian Lands, |

| | | |
|---|---|---|
| | assets and watercourses. | |

## 2. Site Description

The site of the proposed The Gables Primary School (GPS) is located on Cataract Road, Gables, within The Hills Local Government Area (LGA), approximately 50 km northwest of the Sydney CBD and 10 km north of the Rouse Hill Town Centre. It comprises one lot, legally described as Lot 301 DP 1287967, that measures approximately 2.2 ha in area. The site is bound by Pennant Way to the north, Cataract Road to the east, Fontana Drive to the west and a vacant lot to the south.

An aerial image of the site is shown on Figure 1.

The site is located on gently sloping terrain, with existing surface levels of approximately RL 39 m in the northwest and RL 35 m (relative to AHD) in the southeast. The site slopes towards the southeast, with surface runoff appearing to collect to the east of the site (a previous creek tributary) and drains northwards to Cattai Creek. Recent aerial imagery indicates that a council stormwater easement has been constructed between Sundowner Parkway and Cataract Road, which appears to coincide with the location of the original creek tributary.

Prior to 2016, several large farm dams were present within the southern border of the site. Government archive aerial imagery (NSW Department of Customer Service) indicates the presence of a dam within the vicinity of the proposed school site after 1956, which is visible up until the 2011 aerial imagery (Figure 2).

Archive aerial imagery (Metromap) indicates that the site was previously low density residential and used for small market garden farms and agriculture. The site appears to have been cleared for development between April 2015 and October 2016.

**Figure 1: Site aerial imagery (Source: Nearmap, edits by Ethos Urban)**

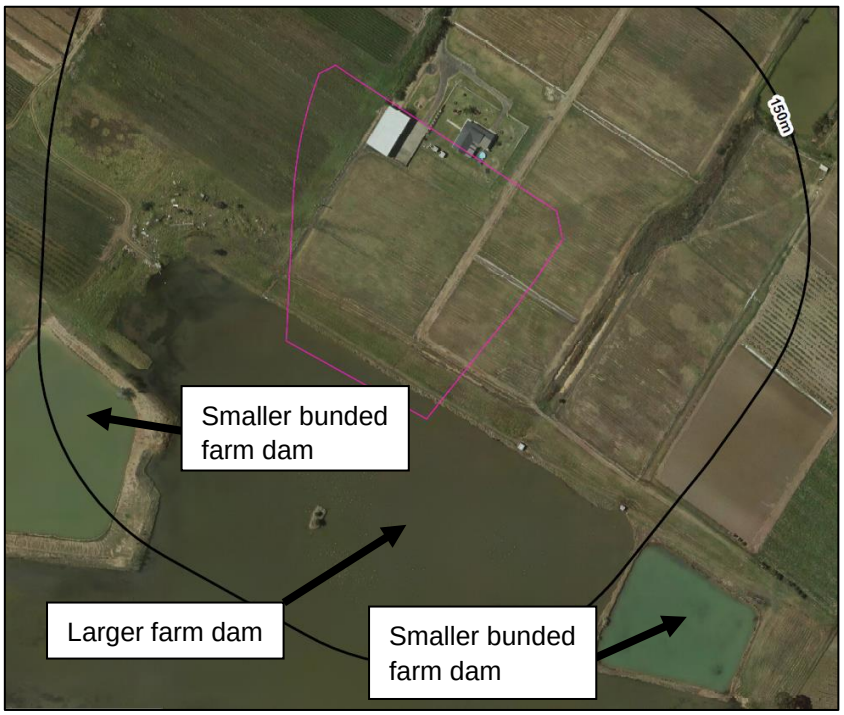


**Figure 2: 2011 Lotsearch Imagery (NSW Government) showing approximate site location (pink), smaller bunded farm dams and larger dam water body.**

## 3. Regional Geology and Mapping

### 3.1 Geology

Reference to the Sydney 1:100 000 Geological Series map indicates that the site is underlain by Ashfield Shale, which typically comprises black to dark grey shale and laminite (finely interbedded sandstones and siltstones) and is part of the Wianamatta Group. Ashfield Shale overlies Hawkesbury Sandstone which is mapped approximately 800 m to the east of the site. An extract of the geological map is shown in Figure 3.


**Figure 3: 1:100 000 Penrith Geology Map, showing location of proposed primary school (red). Rwb = Bringelly Shale, Rwa = Ashfield Shale, Rh = Hawkesbury Sandstone.**

## 3.2 Soil Landscapes

Reference to the Sydney 1:100 000 Landscape Series Sheet indicates that the site is underlain by a soil landscape group known as the Blacktown Soil Landscape.

The Blacktown soil landscape is a residual soil unit, sourced from the progressive weathering of the Ashfield Shale with local relief to 30 m and slopes typically less than 5% gradient. Soils are generally moderately deep (>1 m) and comprise red and brown podzolic soils with some deeper soils on lower slopes and in areas of poor drainage.

As a group, the Blacktown Soils tend to be moderately reactive and subject to seasonal waterlogging.

The main sub-units of the Blacktown Soil Landscape include:

- Bt1 - Friable brownish-black loam
- Bt2 - Hard setting brown clay loam
- Bt3 - Strongly pedal, mottled brown light clay (high shrink swell)
- Bt4 - Light grey plastic mottled clay (high shrink swell)

## 3.3 Salinity

Regional mapping of salinity potential in Western Sydney was undertaken in 2002 by the former Department of Infrastructure, Planning and Natural Resources, now the NSW Office of Environment and Heritage (OEH). The map indicates that the site is located within an area of moderate salinity potential.

### 3.4 Acid Sulphate Soils

Reference to the 1:25 000 Acid Sulphate Soils (ASS) Risk map indicates that the site is in an area of no known occurrence of acid sulphate soils. Given the location of the site and the underlying geology, the risk of acid sulphate soils occurring on the site is considered to be very low.

### 3.5 Hydrogeology

Three registered groundwater bores are located nearby to the GPS, as shown in Figure 4. Relevant information for these wells as obtained from the WaterNSW database is summarised below:

- GW072083 – located 400 m to the west of the site. The well is a functioning private domestic stock water supply bore drilled to 304 m below surface. The WaterNSW Well Summary indicates clay and shale from 0 – 13 m depth, and brown/yellow sandstone below 13 m. The well does not provide information on near surface groundwater.
- GW100182 – located 800 m to the north of the site. The well is a functioning private domestic stock water supply bore drilled to 248 m. The WaterNSW Well Summary indicates clay from 0 – 13 m depth, and white sandstone from 13 – 49 m depth. A standing water level of 30 m below surface is recorded.
- GW069066 – located 700 m to the east of the site. The well is a functioning private domestic bore of unknown purpose. The Well Summary indicates shallow sandstone with shale bands to 13.5 m, and light grey sandstone from 13.5 m. A standing water level of 23 m below surface is recorded.

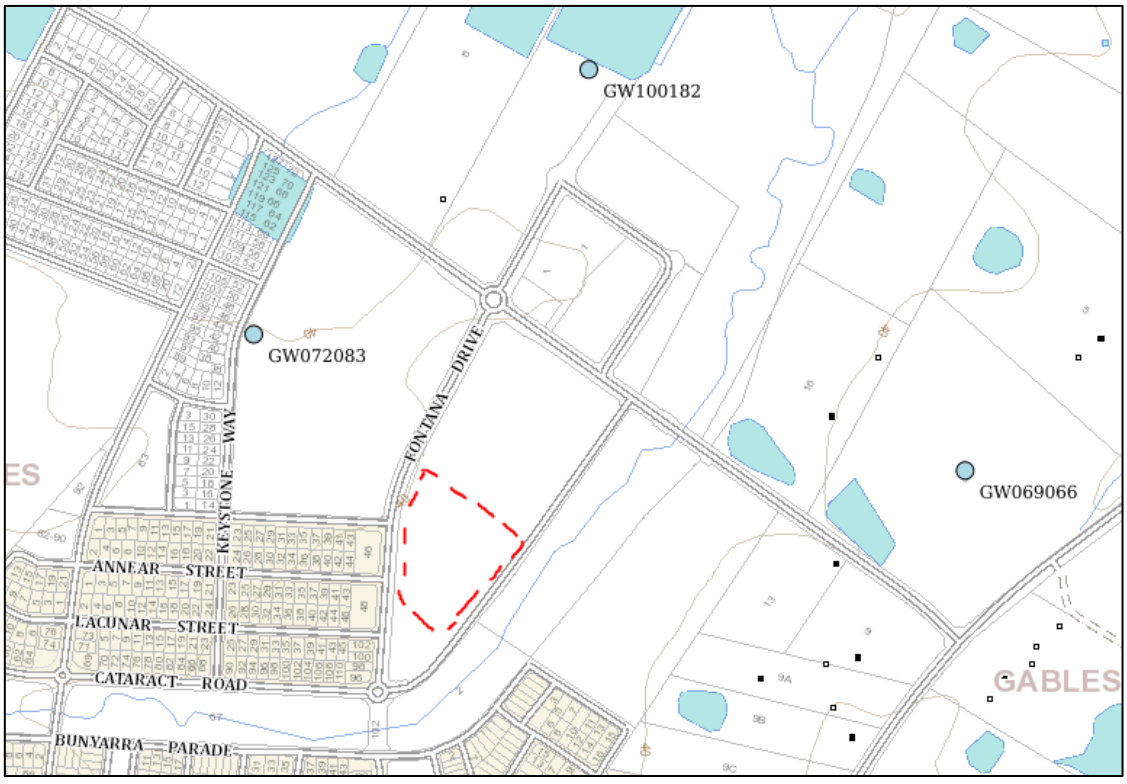


**Figure 4: Location of nearby registered water bores (WaterNSW)**

### 3.6 Groundwater Dependent Ecosystems, Watercourses and Riparian Lands

A search of the Bureau of Meteorology (BoM)'s groundwater dependent ecosystems (GDEs) Atlas suggests there are no GDEs mapped within 500 m of the site. The closest GDE comprises Cumberland Shale Plains vegetation and is located 900 m north-east of the site.

There is an unnamed first order hydroline located on the south-east side of Cataract Road, adjacent to the site. The hydroline is approximately 30 m from the eastern boundary of the site at its closest point, which means the site is considered "waterfront land" under the Water Management Act 2000. The hydroline has not been mapped under the NSW Planning portal as being associated with areas where development implications exist to reduce impacts in riparian lands and watercourses.

No protected riparian lands are present in the vicinity of the site.

## 4. Review of Existing Site Data

### 4.1 Bulk Earthworks Fill Inspection and Testing

As part of the geotechnical assessment for the proposed school site, DP was sent the following documents:

- Geotech Testing, 2019 (Monthly Site Filling Certificate, Precinct B Central – June 2019)
- Geotech Testing, 2019 (Site Filling Certificate – Precinct C Sports Field, Final Report)
- Geotech Testing, 2022 (The Gables Overall Earthworks Testing – Summary of Site Fill Testing – School Site).

DP understands that Geotech Testing Pty Ltd were engaged by the developer as a Level 1 Geotechnical Inspection and Testing Authority (GITA, as defined in AS 3798-2007) for Precincts B and C to verify that the earthworks comply with the specification and drawings provided to them. It should be noted that the proposed school site sits on the edge of where Precinct B Central and Precinct C overlap.

The Geotech Testing reports contain a brief summary of the scope of testing services, the field density testing results for each lot and a plan view of each test location. As shown in the Field Density Result sheets, the fill specification required a minimum 95% and maximum 104% standard density ratio for compaction, and moisture within ± 2% of the Optimimum Moisture Content (OMC). As part of the Level 1 testing, surface proof rolling was undertaken and all soft or yeidling areas were removed. DP have not been provided with the Technical Specification for the earthworks.

Field density testing indicates several metres of engineered fill across the site. Material descriptions on the Field Density Result sheets indicate material descriptions of density tests ranging low to high plasticity clay, with zones of crushed sandstone (17) and ripped sandstone (18) also noted.

The reports indicate earthworks testing from a period of time ranging 28 September 2016 to 11 September 2020. It is understood that these reports encompass the full scope of Level 1 fill testing and inspection undertaken for the proposed school site.

Excerpts from the Level 1 Geotech Testing reports have been superimposed over the site plan, and are shown in Figure 5 below. The conclusions provided in these Level 1 testing and inspection reports have been partially relied on and are referenced throughout this report.

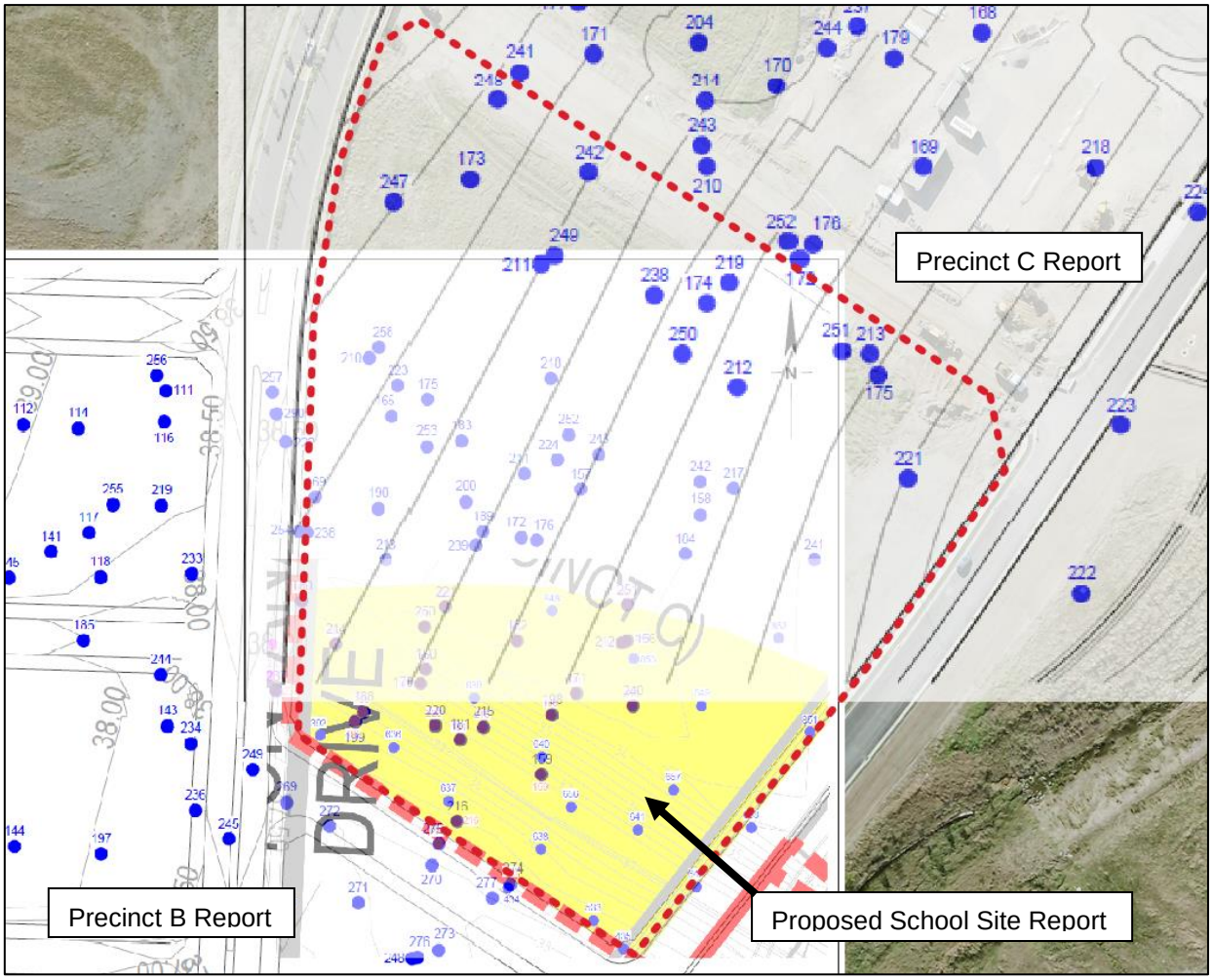


**Figure 5: Field Density Testing locations by Geotech Testing Pty Ltd, showing Precinct C report (top right), Precinct B Central report (bottom left) and School Site Testing report (centre)**

## 5. Field Work

### 5.1 Field Work Methods

The field work for the current investigation included the following:

- Drilling of four boreholes to the top of rock and four boreholes extended into competent rock (BH101 to BH108) using a Comacchio Geo305 drilling rig, to depths ranging 7.05 - 13 m. Drilling was undertaken using 110 mm diameter solid flight augers to the top of weathered rock. Standard penetration tests (SPTs) were carried out and soil samples were collected for laboratory testing in each borehole. Four of the boreholes were then extended into bedrock using HQ3 sized diamond core drilling equipment to obtain continuous core samples of the bedrock.

- Excavation of twenty five (25) test pits (TP109 – TP133) using a 3.5 tonne excavator up to 3 m depth, primarily for contamination assessment. The test pit results have been used in this report to indicate the composition and depth of fill. Several Dynamic Cone Penetrometer (DCP) tests were undertaken adjacent to the test pits to allow for an estimation of soil strength.
- Supervision of the drilling and logging of the boreholes by an experienced geotechnical engineer.

Coordinates and surface levels for all borehole locations were determined using a differential Global Positioning System (dGPS) receiver, which has a specified accuracy of 0.1 m. Coordinates are in GDA94/MGA Zone 56 format (Geocentric Datum of Australia 1994 base with Map Grid of Australia projection) and levels are relative to Australian Height Datum (AHD). The test locations are shown on Drawing 1 in Appendix B.

Refer to Table 2 below, for further details for each test location.

**Table 2: Details of geotechnical test locations**

| Test Location | Easting (GDA94) | Northing (GDA94) | Surface level (m AHD) | End depth (m BGL) |
|---|---|---|---|---|
| BH101 | 305775 | 6277166 | 39.1 | 11.55 |
| BH102 | 305833 | 6277128 | 36.9 | 8.7 |
| BH103 | 305880 | 6277088 | 35.2 | 11.5 |
| BH104 | 305859 | 6277046 | 35.3 | 8.4 |
| BH105 | 305825 | 6277003 | 35.8 | 13 |
| BH106 | 305767 | 6277037 | 37.6 | 7.05 |
| BH107 | 305764 | 6277098 | 38.3 | 9.73 |
| BH108 | 305817 | 6277072 | 36.7 | 7.19 |
| TP109 | 305770 | 6277179 | 39.3 | 0.7 |
| TP110 | 305789 | 6277162 | 38.6 | 3.1 |
| TP111 | 305812 | 6277146 | 37.8 | 3.1 |
| TP112 | 305851 | 6277122 | 36.4 | 3.1 |
| TP113 | 305873 | 6277110 | 35.6 | 1.6 |
| TP114 | 305899 | 6277090 | 34.4 | 2.2 |
| TP115 | 305762 | 6277142 | 38.9 | 2.6 |
| TP116 | 305788 | 6277129 | 38.2 | 3.1 |
| TP117 | 305822 | 6277102 | 36.8 | 2.6 |
| TP118 | 305846 | 6277086 | 36.0 | 1.6 |
| TP119 | 305873 | 6277068 | 35.2 | 2.8 |
| TP120 | 305759 | 6277118 | 38.6 | 2.7 |
| TP121 | 305785 | 6277091 | 37.8 | 1.5 |
| TP122 | 305809 | 6277093 | 37.2 | 1.6 |
| TP123 | 305840 | 6277059 | 35.9 | 1.6 |
| TP124 | 305876 | 6277052 | 35.0 | 3.5 |
| TP125 | 305754 | 6277067 | 38.2 | 1.6 |
| TP126 | 305782 | 6277052 | 37.4 | 1.6 |
| TP127 | 305805 | 6277038 | 36.6 | 1.6 |
| TP128 | 305829 | 6277025 | 36.0 | 1.7 |
| TP129 | 305850 | 6277018 | 35.3 | 1.2 |
| TP130 | 305751 | 6277026 | 37.8 | 1.6 |

| Test Location | Easting (GDA94) | Northing (GDA94) | Surface level (m AHD) | End depth (m BGL) |
|---|---|---|---|---|
| TP131 | 305782 | 6277017 | 36.9 | 3.1 |
| TP132 | 305802 | 6276998 | 36.2 | 3 |
| TP133 | 305828 | 6276987 | 35.5 | 1.3 |

### 5.2 Field Work Results

The detailed subsurface conditions encountered at each borehole and test pit are presented in the borehole and test pit logs in Appendix C, together with notes defining descriptive terms and classification methods.

The general subsurface profile encountered at the borehole and test pit locations may be summarised as follows:

- **FILL:** encountered within all boreholes and test pits to depths of between 2.6 m and 7.2 m and was generally deeper in the northern half of the site. The fill appeared generally apparently well compacted and typically consisted of low and low to medium plasticity sandy clay, silty clay and clay, with moisture content less than or equal to the plastic limit. Zones of crushed sandstone were frequently encountered in the test pits with sandstone cobble/boulder sizes typically ranging 50 – 150 mm, with occasional boulders up to 600-700 mm diameter. Standard Penetration Testing (SPT) results indicate the fill is generally of apparently stiff or very stiff consistency, although some zones of only loose to medium dense or firm to stiff soil were indicated by the DCP results (at test pit locations).
- **RESIDUAL CLAY:** medium and high plasticity silty clay and clay, with some gravelly clay layers. The consistency of the residual clay generally ranged from stiff to hard. Residual soil was typically encountered to depths of 5 – 8.5 m.
- **SHALE AND SANDSTONE BEDROCK:** low to high strength, highly weathered to fresh grey-brown to grey shale and low to high strength, moderately weathered to slightly weathered medium to coarse grained sandstone. The shale/sandstone interface was encountered on the eastern side of the site and was interpreted as being the boundary between Ashfield Shale and Hawkesbury Sandstone. The depth of encountered shale/sandstone rock (ranging from 5 m to 8 m) indicated a slight undulating profile but appears to roughly align with the sloping topography, grading down to the southeast.

Groundwater was not encountered during the drilling of the boreholes, except for BH102 which indicated water seepage (ie. inflow) at 5 m depth.

## 6. Laboratory Testing

### 6.1 Rock

Testing for axial point load strength index ($Is_{50}$) was undertaken at approximately 1 m spaced intervals. The individual results are shown on the relevant borehole logs in Appendix C.

## 6.2 Soil

Geotechnical soil testing was undertaken on several samples for Atterberg limits, California Bearing Ratio (CBR), Linear Shrinkage and Shrink-Swell Index ($I_{ss}$) testing. The results are summarised in Table 3, and the detailed laboratory test reports are included in Appendix D.

**Table 3: Geotechnical soil test results**

| Borehole/ Depth (m) | Material Description | LL/PL/PI (%) | USCS | LS (%) | Iss (%/pF) | CBR at 5 mm (%) |
|---|---|---|---|---|---|---|
| BH101/ 4-4.45 | Silty CLAY Fill | 38/18/20 | CI | 10.5 | - | - |
| BH102/ 2.5-2.9 | CLAY Fill | 36/14/22 | CI | 11.5 | - | - |
| BH103/ 0.9-1 | CLAY Fill | 35/15/20 | CL-CI | 11.5 | - | - |
| BH104/ 2.5-2.95 | Residual CLAY | 43/16/27 | CI | 14 | - | - |
| BH105/ 0.2-1 | Sandy CLAY Fill | - | - | - | - | 6 |
| BH105/ 2.5-2.9 | Residual Silty CLAY | - | - | - | 2.6 | - |
| BH106/ 0.3-1 | Sandy CLAY Fill | - | - | - | - | 7 |
| BH107/ 2.5-2.95 | Sandy CLAY Fill | 34/15/19 | CL | 10.5 | - | - |

Notes: 1. LL/PL/PI = Liquid Limit/Plastic Limit/Plastic Index 2. USCS = Unified Soil Classification System
3. LS = Linear Shrinkage 4. CBR = California Bearing Ratio
5. Iss = Shrink Swell Index

Six soil samples were sent to a NATA accredited analytical laboratory and were analysed to assess the aggressivity to steel and concrete below ground in accordance with AS 2159-2009. The aggressivity test results are summarised in Table 4 and the detailed results are included in Appendix D.

**Table 4: Analytical Results for Aggressivity in Soil**

| Borehole/ Depth (m) | Material | pH | EC (µS/cm) | Chloride (mg/kg) | Sulphate (mg/kg) |
|---|---|---|---|---|---|
| BH101 / 0.9-1 | Sandy Clay Fill | 4.7 | 250 | 300 | 52 |
| BH102 / 1.9-2 | Clay Fill | 5.9 | 250 | 260 | 67 |
| BH103 / 4-4.45 | Sandy Clay Fill | 5.3 | 300 | 340 | 77 |
| BH104 / 0.1-0.2 | Sandy Clay Fill | 6.5 | 270 | 200 | 170 |
| BH106 / 2.5-2.95 | Sandy Clay Fill | 6 | 680 | 810 | 190 |
| BH107 / 1-1.45 | Gravelly Sandy Clay Fill | 5.7 | 96 | 91 | 30 |

## 7. Geotechnical Model

The site is underlain by variable depths of apparently controlled fill, typically deeper in the northern portion of the site. Fill was encountered in all the boreholes and test pits. The fill was predominantly logged as low or low to medium plasticity clay (inferred to be cut surplus material sourced from nearby earthworks) with some layers of gravelly clayey sand or crushed sandstone of 1 m to 2 m thickness. SPT testing within the fill generally indicated this material was apparently stiff or very stiff in consistency at all of the boreholes, although the DCP results at a few test pit locations indicated some zones of only loose to medium dense or firm to stiff clay (e.g. TP113; upper 0.5 m).

In some of the boreholes and most of the test pits, crushed/ripped sandstone gravel, cobbles and boulders were encountered in the fill unit. In several test pits, sandstone boulders larger than 200 mm and up to 700 mm were observed. Cobbles and boulders of this size are typically considered oversized for controlled, engineered fill due to the inherent issues with compaction caused by such obstructions.

As outlined in Section 3.1, DP has been provided with earthworks testing documentation that shows the site has been modified by bulk earthworks consisting of leveling of the site and Level 1 earthworks testing. The Level 1 earthworks testing report indicates several metres of placed fill across most of the site, consistent with the borehole and test pit findings.

A variable thickness residual clay layer underlies the fill, which is soil derived from weathering of the parent Ashfield Shale and Hawkesbury Sandstone. The residual clays were generally stiff to hard, of medium to high plasticity and graded into extremely and highly weathered rock.

The fill and residual clays are underlain by a weathered Ashfield Shale and Hawkesbury Sandstone profile which presents as low to medium strength close to the top of the unit (ie. ‘bedrock’ surface). The shale and sandstone bedrock typically graded to medium to high strength with depth and was observed to the termination depths of the rock-cored boreholes

Table 5 summarises the levels at which different materials were encountered in the boreholes. The rock classifications refer to a system developed by Pells et al (1978 & 1998) which classifies rock on the basis of strength, fracturing and defects. Class V sandstone, for example, is typically very low strength and fractured whereas Class III sandstone is typically medium strength and slightly fractured. Lower classifications may, however, contain strong rock with significant defects and/or fracturing, thus resulting in the 'down-rating' of the rock to a lower 'class'.

**Table 5: Encountered lithology and rock class interpretation**

| Stratum | Depth (m) [RL (m, AHD)] of Top of Stratum | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | BH101 | BH102 | BH103 | BH104 | BH105 | BH106 | BH107 | BH108 |
| Ground Surface (Fill) | [39.1] | [36.9] | [35.2] | [35.3] | [35.8] | [37.6] | [38.3] | [36.7] |
| Residual Clay | 7.0 (32.1) | 7.2 (29.7) | 4.8 (30.4) | 2.6 (32.7) | 2.3 (33.5) | 3.0 (34.6) | 4.0 (34.3) | 4.0 (32.7) |
| Class IV Shale[1] | - | 8.5 (28.4) | - | 7.8 (27.5) | 8.0 (27.8) | 6.8 (30.8) | 5.0 (33.3) | 6.8 (29.9) |
| Class III Shale[1] | 7.3 (31.8) | - | - | - | 8.72 (27.08) | - | 5.75 (32.55) | - |
| Class II Shale or better[1] | 8.6 (30.5) | - | - | - | - | - | 6.6 (31.7) | - |
| Class IV Sandstone[1] | - | - | 7.0 (28.2) | - | 10.15 (25.65) | - | - | - |
| Class III Sandstone[1] | - | - | 7.2 (28.0) | - | 10.5 (25.3) | - | - | - |
| Class II Sandstone or better[1] | - | - | 7.9 (27.3) | - | 11.0 (24.8) | - | - | - |
| Base of hole | 11.55 | 8.7 | 11.5 | 8.4 | 13.0 | 7.05 | 9.73 | 7.19 |

Notes: 1. Rock class as per Pells et. al. 1978 and 1998 2. ' – ' = not encountered

## 8. Proposed Development

It is understood that the proposed development will include:

- Construction of three-storey school buildings, including learning hubs, a school hall and an administration and library building;
- Construction and operation of a public preschool;
- Delivery of a sports court and fields;
- Construction of car parking, waste storage and loading area;
- Associated site landscaping and open space improvements; and
- Associated off-site infrastructure works to support the school, including (but not limited to) services, driveways and pedestrian crossings.

It is understood that below ground basement structures are not currently proposed for the development, however, limited excavation may be necessary for foundations, localised leveling, landscaping and for the installation of buried services.

# 9. Comments

## 9.1 Site Preparation & Earthworks

As outlined previously, Level 1 earthworks testing and inspection has been undertaken for fill placement on the proposed school site. The results of DP's geotechnical investigation indicate that the consistency of the existing fill at the site is generally consistent with controlled engineered fill, except for some inclusions of oversized (>100 – 150 mm) material (e.g. rock fragments). DP is not aware of the earthworks specification for the existing fill placed at the site but note that it is normal practice to specify a maximum particle size of half the (loose) layer thickness of the fill as it is placed in layers, for subsequent compaction. With layer thicknesses typically limited to about 300 mm, particle size is usually limited to 100 – 150 mm. Oversize material inhibits the uniform compaction of soils and it is the responsibility of the Geotechnical Inspection and Testing Authority (GITA) to 'police' or control the earth-fill to ensure it is removed prior to compaction.

The observed presence of sandstone cobbles and boulders to 700 mm size and possibly greater suggests that there is likely to be some zones of poorly compacted earth-fill. The DCP testing at a few test pit locations encountered some zones of 'less-than-stiff' soil, in the loose or firm range of density/consistency.

In summary, DP is concerned about the quality of the fill that has been placed and do not consider it appropriate for the support of high-level footings and floor slabs without considerable further investigation and testing. It is expected that the main building superstructure would necessarily be supported on footings bearing on the underlying shale bedrock, but subject to further assessment floor slabs and discrete footings for isolated structures (i.e. not buildings) could potentially be supported in the existing fill material.

It is also noted that there are limitations in the testing of fill and that 'soft spots' could be present between test locations, both during the Level 1 compaction testing and between DP's geotechnical investigation test locations. To reduce the risks associated with 'soft' spots and the resultant unacceptable total or differential settlements of structures, it is recommended that a comprehensive programme of investigation is undertaken prior to construction and that a robust soil testing regime is implemented during construction.

It is recommended that a programme of cone penetration testing (CPT) be conducted across the site, where fill has been placed to greater than 1.5 m deep. CPT provides continuous repeatable data on the properties of the soil at 20 mm depth intervals, so that an assessment of the compaction status of the "Level 1" fill can be made and the risk of settlement of new structures can be evaluated. A grid spacing of 20 m could be adopted as a 'starting point' after which the need for additional testing (i.e. closer grid spacing) can be assessed.

Subject to the results of the further investigation of the fill, the following procedure could be followed in areas of existing fill to support structures (eg. footings, floor slabs, etc.) or pavements:

- Strip any organic-rich topsoil and other deleterious materials from areas of the site in which fill, structures and/or pavements are proposed;
- Compact the exposed surface and proof-roll using a roller of minimum 10 tonnes deadweight (or equivalent) in the presence of a geotechnical engineer. Any areas exhibiting unacceptable movements (e.g. heave or depression) during the proof-roll may require further rectification

involving removal and replacement with appropriate 'select' fill material compacted to an appropriate specification; and

- Undertake dynamic cone penetrometer (DCP) or cone penetration testing (CPT) at all footings (to be supported in the fill) to confirm the bearing capacity/settlement performance and identify areas for further rectification.

If new fill is to be placed on site, the above steps should be undertaken as well as the following:

- Place suitable 'select' fill in maximum 250 mm thick layers, with a maximum 100 mm particle size and compact to achieve a dry density ratio of between 98% and 102% relative to Standard compaction. The upper 0.5 m of pavement subgrade areas should be compacted to achieve a dry density ratio of between 100% and 102% relative to Standard compaction;
- The moisture content should be within 2% of the Standard optimum moisture content of the material if it exhibits clay-like properties;
- A layer of granular product (e.g. roadbase, recycled crushed concrete etc.) should be considered as the top layer of fill to improve trafficability on site, particularly during and following periods of wet weather;
- Density testing should be undertaken in accordance with the requirements of AS 3798 – 2007 *Guidelines on earthworks for commercial and residential developments*.

It should be noted that even well compacted fill has the potential to experience consolidation or 'creep' related settlements over the longer term. Creep rates in the order of 0.5% (of the fill height) per log cycle of time are typically reported for clay fills. Creep is discussed in further detail in Section 9.8.2.

## 9.2 Excavation

The provided development drawings do not show basement excavation. Shallow excavations for services trenches and discrete footings that are remote to the building are expected.

It is anticipated that the proposed excavation across the site will predominantly intersect fill and mainly stiff to hard residual clay. Due to the previous bulk earthworks at the site, and the borehole findings, rock is expected to be deeper than any excavations other than pile foundations (i.e. deeper than say 4m).

Excavation of the fill and residual clay should be readily achievable using conventional earthmoving equipment such as bulldozers and excavators. Excavation of low strength or stronger rock will require heavy ripping. Further advice can be provided if deeper excavations are added to the proposed development requiring the excavation of rock.

## 9.3 Vibrations

It is anticipated that the excavation within fill and soil overburden will generally result in relatively minor vibrations. Compaction of earth-fill, however, will generate significant vibrations.

The existing proposed school site and surrounding area is relatively undeveloped. However, in the time between writing this report and construction for the proposed school commencing, it is likely the vacant land to the west of Fontana Drive will be occupied by residual dwellings. Furthermore, a childcare centre is proposed to the south of the proposed school site. Vibration limits should consider land use and surrounding receptors at the time of construction.

During earthworks it may be necessary to use appropriate methods and equipment to keep ground vibrations within acceptable limits, so as to reduce the potential for causing damage to buildings, utilities and other structures. The standards listed below are considered appropriate documents on which to base the management of ground vibration:

- German Standard DIN 4150-3 – 1999, "Structural Vibration – Part 3: Effects of Vibration on Structures"; and
- Australian Standard AS 2670.2 – 1990, "Evaluation of human exposure to whole-body vibrations – Part 2: Continuous and shock-induced vibrations in buildings (1 to 80 Hz)".

Ground vibrations can be strongly perceptible to humans at levels above 3 mm/s component peak particle velocity (PPV). AS 2670.2 – 1990 indicates an acceptable day time limit of 8 mm/s component PPV for human comfort (for daytime occupants of residential buildings). A provisional (PPV) vibration limit of 5 mm/s is suggested at adjacent buildings or utilities of concern until appropriate enquiries can be made about the proximity and vulnerability of any sensitive structures/utilities.

## 9.4 Excavation Support

### 9.4.1 Batters

Vertical excavations in fill and residual soil are not expected to be stable. The maximum batter slopes given in Table 6 are recommended for the design of temporary and permanent excavations for cuts in fill and residual soil up to 3 m deep with a horizontal ground surface at the crest and with no surcharge loadings (e.g. existing structures, stockpiled material or construction plant and equipment).

**Table 6: Maximum batter slopes for cuts up to 3 m deep**

| Material | Batter Slopes (Horizontal:Vertical) | |
|---|---|---|
| | Temporary (During Construction) | Permanent |
| Engineered Fill | 1.5:1 | 2:1# |
| Residual Soil | 1:1 | 2:1# |

Note: #Permanent batters in soil that will be vegetated should be no steeper than 3:1, to enable regular maintenance. Steeper batters would generally require (reinforced) shotcrete and dowel support.

Deeper excavations may need to incorporate intermediate benches to reduce the overall slope angle. Advice on batter slopes for weathered rock can be provided, if required.

### 9.4.1 Earth Pressures

Although not indicated for the current scheme, if a basement or OSD tank is incorporated at a later date, then it is noted that excavations retained either temporarily or permanently will be subjected to earth pressures. Table 6 outlines material and strength parameters that could be used for the design of excavation support structures. Due to the depth of rock at the site, all excavations currently proposed for the development are expected to be within fill.

**Table 7: Material and strength parameters for excavation support structures**

| Material | Bulk Density (kN/m3) | Coefficient of Active Earth Pressure (Ka) | Coefficient of Earth Pressure at Rest (Ko) | Ultimate Passive Earth Pressure (kPa) |
|---|---|---|---|---|
| Engineered Fill | 20 | 0.35 | 0.55 | - |
| Very Stiff to Hard Residual Clay | 20 | 0.3 | 0.45 | 150[1] |
| Very Low Strength Rock (Class V) | 22 | 0.25 | 0.35 | 400[1,2] |
| Low Strength Rock or Stronger (Class IV or better) | 23 | 0.15[2] | 0.25[2] | 2000[1,2] |

Notes: [1]Only below bulk/detailed excavation level
[2]Provided that adverse jointing is not encountered

The lateral earth pressure distribution for a multi-anchored or propped wall could be assumed to be trapezoidal; the maximum lateral earth pressure acting over the central 60% of the wall, decreasing to zero at the top and base. The lateral earth pressure distribution for a cantilevered wall could be assumed to be triangular. Cantilevered walls should not be used to support adjacent structures.

'Active' earth pressure coefficient ($K_a$) values may be used for walls 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 (i.e. adjacent to existing structures or utilities).

Lateral pressures due to surcharge loads from adjacent buildings, existing road corridors, sloping ground surfaces and construction machinery should be included where relevant. Hydrostatic pressure acting on the shoring walls should also be included in the design where adequate drainage is not provided behind the full height of the wall.

## 9.5 Waste Classification

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 fill and natural materials that may be removed from the site. Refer to DP's Detailed Site Investigation (DSI) Contamination Report (ref: 216255.01.R.002) for further details.

## 9.6 Groundwater

Groundwater was not encountered during the test pitting or auger drilling in any of the geotechnical boreholes, except for one. Water seepage was encountered only in BH102 at approximately 5 m depth, however, this is likely to be perched, ephemeral water within the fill soil. The use of water as a drilling fluid for core drilling in the rock precluded the opportunity for water level measurement in this stratum. The regional groundwater table is expected to be well below the ground surface.

During periods of heavy rainfall, shallow seepage flow within the fill is expected.

During construction, stormwater runoff and seepage inflow into excavations can probably be controlled using a 'sump-and-pump' collection system. A pump (or pumps) will be required to periodically remove stored water from the lowest part of any excavation. Pumping may also be needed to remove seepage from footing/pile excavations prior to the placement of concrete.

Given the limited proposed excavations, it is expected that the proposed development at the site will not penetrate an aquifer or groundwater system, and therefore a dewatering management plan (DMP) is not considered necessary for the proposed development. Extraction of water from rivers, lakes and aquifers is not proposed for the development, and therefore licences and approvals (e.g. Water Supply Works Approval, Water Access Licence) are not required. It is expected that the proposed development will have no significant impact on groundwater resources beneath and surrounding the site and no impact on the surrounding registered groundwater bores identified in Section 3.5.

## 9.7 Groundwater Dependent Ecosystems, Watercourses and Riparian Lands

As no GDEs are present in the vicinity of the site and the development is unlikely to intercept the water table, impacts to GDEs are not expected.

Similarly, no protected riparian lands are mapped in the vicinity of the site. Impacts from the proposed development on riparian lands are therefore unlikely.

Due to the proximity of the first order hydroline to the south-east (less than 40 m away), the site is considered "waterfront land" under the Water Management Act 2000. Since there is a public road (Cataract Road) between the site and the first order hydroline, development of the site is exempt from Controlled Activity Approval (exemption under Schedule 4 Clause 31 of the Water Management (General) Regulation 2018). A Controlled Activity Approval exemption also applies to public authorities (e.g. NSW Department of Education, SINSW) under Clause 41 of the Water Management (General) Regulation 2018. It is expected that there will be no significant impacts from the proposed development on the hydroline.

## 9.8 Foundations

### 9.8.1 Site Classification

As outlined in Table 2.1 of AS2870 – 2011, the site is classified as Class P due to the presence of fill deeper than 0.4 m (outlined in detail in Clause 2.5.3a(ii)), and therefore slabs and footings should be designed in accordance with engineering principles. The site soils are indicated to generally range from

low to high plasticity and as such would be expected to be at least moderately susceptible to soil moisture changes. The classification of the final (engineered fill) platform will depend on the nature of earthworks that is undertaken, and the type of materials used.

As per Clause 2.5.3(c) of AS 2870 – 2011, filled sites may be reclassified provided the fill has been placed under controlled ("Level 1") conditions. The single Shrink-Swell Index (Iss) test result of 2.6 %/pF was used to estimate the characteristic free surface movement ($y_s$) and a value of approximately 50 mm was obtained, which would result in a "H1" site classification. As noted previously, some concerns remain about the uniformity of compaction of the fill given the presence of oversize boulders noted in this material and these would need to be resolved before this alternative site classification could be adopted. Also, further Iss testing would generally be required to confirm a site classification.

### 9.8.2 Spread Footings

Given the relatively deep depth to rock and proposed excavation depth, it is likely that shallow spread footings will be directly founded within existing fill, subject to confirming the uniformity and compaction status of the as-placed material. It is expected that footings for the main superstructure will need to be supported on the underlying bedrock. Discrete footings for isolated structures may, however, be supported in the fill. As noted in Section 9.1, there is an increased risk of unacceptable settlements for structures founded on fill and it is recommended that dynamic cone penetrometer (DCP) tests is undertaken within all footing excavations to confirm that the material is suitably compacted.

Spread footings for structures such as pad and strip footings could be designed using the parameters given in Table 8.

**Table 8: Design bearing pressures for spread footings**

| Material | Allowable Bearing Pressure (kPa) |
|---|---|
| Engineered Fill[1] | 100 |
| Residual Soil (stiff) | 150 |
| Residual Soil (very stiff or better) | 250 |
| Class V Rock | 700 |
| Class IV Rock (Very Low Strength) | 1000 |
| Class III Rock or Better (Low Strength or stronger) | 2000 |

Notes: [1] Subject to confirmation of the adequacy and uniformity of the fill

The settlement of a spread footing is dependent on the loads applied to the footing and the foundation conditions below the footing. The total settlement of a spread footing designed using the parameters provided in Table 8 would be limited to 1% of the width of the footing upon application of the Working load. Differential settlements between adjacent columns/footings are expected to be less than 50% of the value of total settlement.

As noted previously 'creep' movements of the existing clayey fill will also occur over time and are expected to be in the order of 0 to 0.5 % of fill height per log cycle (e.g. for a 5 m deep fill, the creep movement in the first 10 years is expected to be in the order of 0 to 25 mm, and then further movement

of 0 to 25 mm from 10 to 100 years). Due allowance should be made in the design for long-term creep settlements.

Spread footings will not be able to be used within the zone of influence of any existing batters, retaining walls or existing/proposed excavations. The zone of influence can be described as a line drawn up at 1.5(H):1(V) from the base of the excavation or batter/wall.

All spread footing excavations should be inspected by an experienced geotechnical professional to check the adequacy of the foundation material.

### 9.8.3 Piles

Given the depth of rock across the site, pile foundations are likely to be required to support the loads of the proposed school buildings. Bored piles or piers could be used to support significant column loads using the parameters provided in For tension or uplift loading, the shaft adhesion parameters in Table 8 should be reduced by 30% and due consideration should be given to ‘cone pull-out’ failure mechanisms.

All bored pile excavations should be inspected by an experienced geotechnical professional to check the adequacy of the foundation material and socket roughness/cleanliness. For CFA piling, it is recommended that additional cored boreholes are drilled across the building footprint(s) to establish rock and design pile levels.

Table 9. As outlined in Section 7 of this report, both sandstone and shale rock units were encountered at the site. To simplify the foundation design and allow for uncertainty with interpreted geological units, parameters for shale have been adopted.

The presence of occasional seepage inflows and boulders in the as-placed fill material is such that open pile holes could collapse and experience water inflows during boring and prior to concrete/steel placement. Temporary casings or liners will likely be required to support the open pile holes. Consideration should be given to continuous flight auger (CFA), concrete-injected piling as an alternative, which would not require temporary casing or the management/dewatering of seepage inflows.

The settlement of a pile is dependent on the loads applied to the pile and the foundation conditions below the pile toe and within the socket zone. The total settlement of a pile designed using the allowable parameters provided in this report would be limited to 1% of the diameter of the pile. Differential settlements between adjacent piles would be less than 50% of the value of total settlement.

If a limit state design approach is adopted, then it should be noted that the serviceability limit-state is likely to govern the design of the piles and the ultimate bearing pressures provided in For tension or uplift loading, the shaft adhesion parameters in Table 8 should be reduced by 30% and due consideration should be given to ‘cone pull-out’ failure mechanisms.

All bored pile excavations should be inspected by an experienced geotechnical professional to check the adequacy of the foundation material and socket roughness/cleanliness. For CFA piling, it is recommended that additional cored boreholes are drilled across the building footprint(s) to establish rock and design pile levels.

Table 9 are unlikely to be able to be achieved in practice. An appropriate geotechnical strength reduction factor ($Ø_g$) should be applied when using the limit-state approach as outlined in AS 2159 – 2009 Piling – Design and installation. An initial $Ø_g$ value of 0.4 could be adopted for preliminary design purposes. Serviceability analysis using the Young's modulus values provided should be undertaken to consider the Serviceability limit state.

For tension or uplift loading, the shaft adhesion parameters in Table 8 should be reduced by 30% and due consideration should be given to 'cone pull-out' failure mechanisms.

All bored pile excavations should be inspected by an experienced geotechnical professional to check the adequacy of the foundation material and socket roughness/cleanliness. For CFA piling, it is recommended that additional cored boreholes are drilled across the building footprint(s) to establish rock and design pile levels.

**Table 9: Design parameters for bored and CFA piles**

| Material[3] | Allowable End-Bearing Pressure[2] (kPa) | Allowable Shaft Adhesion (kPa)[1] | Ultimate End-Bearing Pressure[2] (kPa) | Ultimate Shaft Adhesion (kPa)[1] | Young's Modulus (MPa) |
|---|---|---|---|---|---|
| Class V Rock | 700 | 50 | 2000 | 70 | 100 |
| Class IV Rock (Very Low Strength) | 1000 | 100 | 3000 | 150 | 300 |
| Class III Rock (Low Strength) | 2000 | 200 | 6000 | 350 | 700 |
| Class II Rock (Medium Strength) | 3500 | 350 | 30,000 | 600 | 1,200 |

Notes: [1] Pile socket should be clean and roughened to at least "R2" as defined in Pells et al (1998) to achieve these shaft adhesion values
[2] End bearing pressures assume that piles are at least 4 pile diameters in total length and socketed at least 2 pile diameters in the nominated founding stratum, and are adequately clean, as defined in Pells et al (1998)
[3] Parameters for shale rock have been adopted

## 9.9 Pavements

The proposed development includes on-site, at-grade carparking and driveways from Cataract Road.

Geotechnical lab testing for two fill soil samples indicated CBR values of 6% and 7% at 5 mm penetration, respectively.

On the basis of the lab testing and subsurface conditions encountered on the site, a design subgrade CBR of 5% may be adopted for the as-placed fill material at the site, subject to the site preparation and earthworks recommendations given in Section 9.1. This value also assumes that good surface and subsurface drainage measures are incorporated to all pavements.

## 9.10 Aggressivity

The laboratory test results indicate 'non-aggressive' to 'mildly' aggressive conditions for buried concrete and 'non-aggressive' aggressive conditions for buried steel as outlined in Australian Standard AS 2159 – 2009 Piling – Design and installation. The 'mildly' aggressive classification for buried concrete is due to two clay fill soil samples with pH values of less than 5.5. Further soil sampling and aggressivity testing could be considered where more data is needed to substantiate a less conservative concrete exposure classification.

## 9.11 Seismicity

A Hazard Factor (Z) of 0.08 would be appropriate for the development site in accordance with Australian Standard AS 1170.4 – 2024 Structural design actions – Part 4: Earthquake actions in Australia. The site sub-soil class would be Class $C_e$ (Shallow Soil).

# 10. REF Risk Mitigation Measures

The geotechnical and hydrogeological risk mitigation measures relevant to the REF requirements for the proposed development at the site, as discussed in previous sections of this report, are summarised in Table 10.

**Table 10: Summary of REF Geotechnical and Hydrogeological Risk Mitigation Measures**

| Project Stage Design (D) Construction (C) Operation (O) | Mitigation Measures | Relevant Section of Report |
|---|---|---|
| D | Undertake a programme of CPTs where fill is greater than 1.5 m deep to assess the compaction status of the fill, as discussed in Section 9.1. | Section 9.1 |
| C | Undertake vibration monitoring for earthworks activities to ensure vibrations are within the acceptable limits described in Section 9.3. | Sections 9.2, 9.3 |
| C | Undertake waste classification for any material requiring off-site disposal, as described in Section 9.5. | Section 9.5 |
| C | Inspection of excavations for footings, piles and services by a geotechnical professional to assess foundation conditions and impacts of seepage water (if present). | Sections 9.6, 9.7, 9.8 |
| C | Seepage water in excavations, if present, should be retained on site or undergo testing and treatment prior to offsite disposal. | Sections 9.6, 9.7 |
| D | Assuming mildly aggressive conditions for subsurface elements, as described in Section 9.10. | Section 9.10 |

# 11. References

AS1170.4 – 2024, Earthquake Actions in Australia

AS2159 – 2009, Piling – Design and Installation

AS2870 – 2011, Residential Slabs and Footings

Pells, P. J., Mostyn, G., & Walker, B. F. (1998). Foundations on Sandstone and Shale in the Sydney Region. *Australian Geomechanics, No 33 Part 3*, 17-29.

## 12. Limitations

Douglas Partners (DP) has prepared this report (or services) for this project at Lot 301 Fontana Drive in accordance with DP's proposal dated 24/06/2022 and acceptance received from SINSW. The work was carried out under contract SINSW0310-22. This report is provided for the exclusive use of School Infrastructure NSW for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

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

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

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

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

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

The scope of work for this specific 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.

**Douglas Partners Pty Ltd**

# Appendix A

About This Report

# About this Report

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## Introduction

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

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

## Copyright



## Borehole and Test Pit Logs

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

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

## Groundwater

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

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

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

## Reports

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

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

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

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

# *About this Report*

## Site Anomalies

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

## Information for Contractual Purposes

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

## Site Inspection

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

# Sampling Methods

Douglas Partners

## Sampling

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

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

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

## Test Pits

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

## Large Diameter Augers

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

## Continuous Spiral Flight Augers

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

## Non-core Rotary Drilling

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

## Continuous Core Drilling

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

## Standard Penetration Tests

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

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

The test results are reported in the following form.

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

  4,6,7
  N=13

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

  15, 30/40 mm

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

### Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

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

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

## Description and Classification Methods

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

## Soil Types

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

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

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

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

Definitions of grading terms used are:

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

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

In fine grained soils (>35% fines)

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

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

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

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

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

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

# Soil Descriptions

## Cohesive Soils

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

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

## Cohesionless Soils

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

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

## Soil Origin

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

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

## Moisture Condition – Coarse Grained Soils

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

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

## Moisture Condition – Fine Grained Soils

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

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

## Rock Strength

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

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

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

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

## Degree of Weathering

The degree of weathering of rock is classified as follows:

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

# *Rock Descriptions*

## Degree of Fracturing

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

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

## Rock Quality Designation

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

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

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

## Stratification Spacing

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

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

# Symbols & Abbreviations

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 |

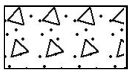
# *Symbols & Abbreviations*

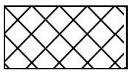
## Graphic Symbols for Soil and Rock

### General

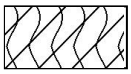

Asphalt

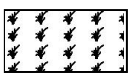

Road base

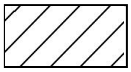

Concrete

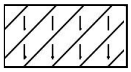

Filling

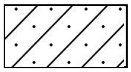
### Soils


Topsoil

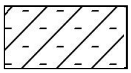

Peat

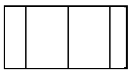

Clay

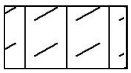

Silty clay

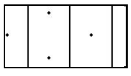

Sandy clay

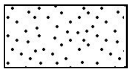

Gravelly clay

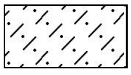

Shaly clay

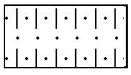

Silt


Clayey silt


Sandy silt

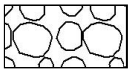

Sand

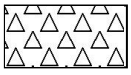

Clayey sand


Silty sand


Gravel

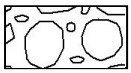

Sandy gravel


Cobbles, boulders

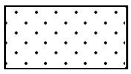

Talus

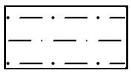
### Sedimentary Rocks

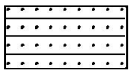

Boulder conglomerate

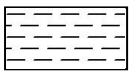

Conglomerate


Conglomeratic sandstone

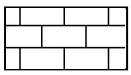

Sandstone


Siltstone

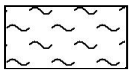

Laminite

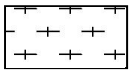

Mudstone, claystone, shale

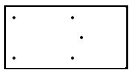

Coal


Limestone

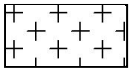
### Metamorphic Rocks

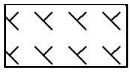

Slate, phyllite, schist

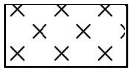

Gneiss

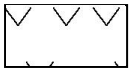

Quartzite

### Igneous Rocks


Granite


Dolerite, basalt, andesite

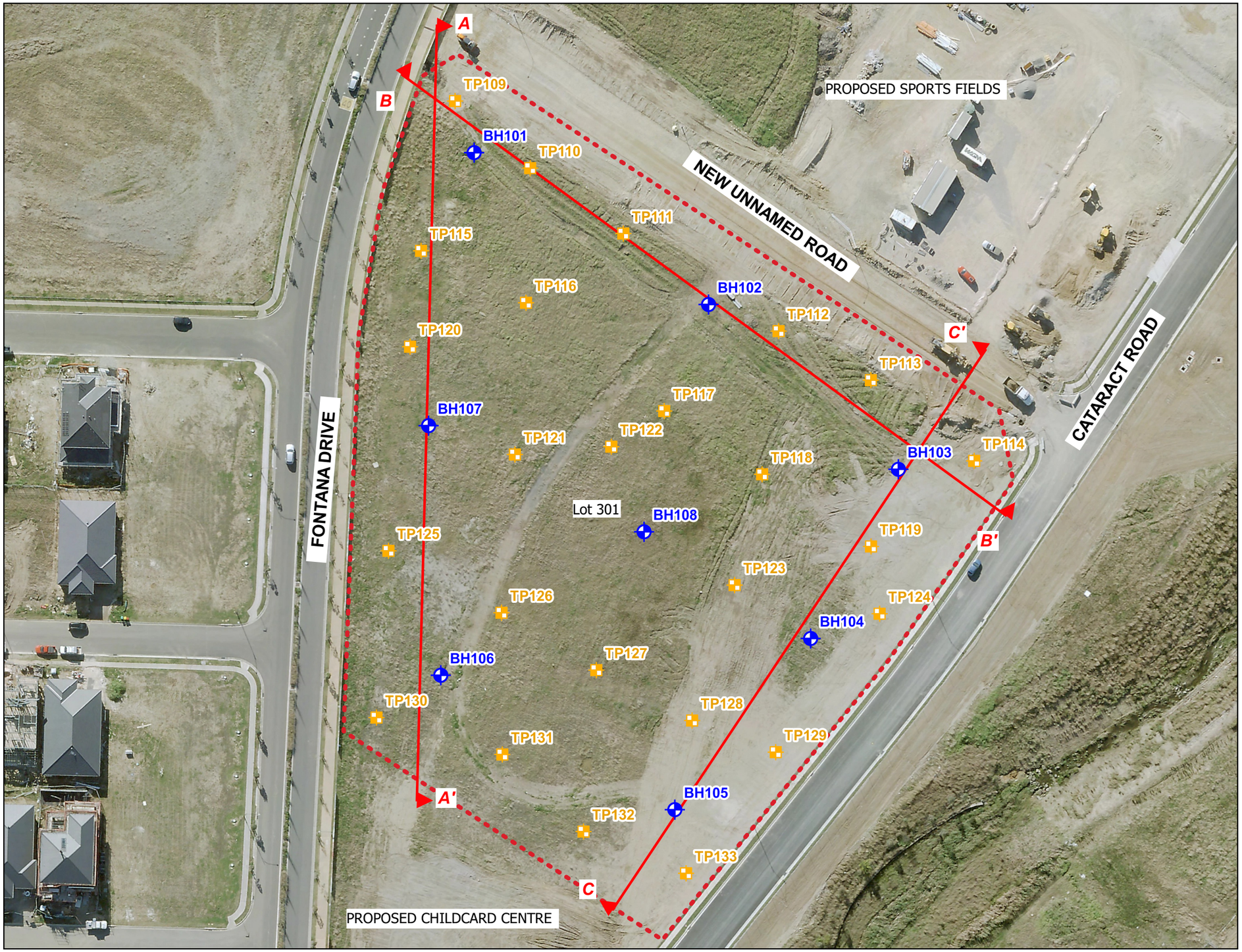

Dacite, epidote


Tuff, breccia


Porphyry

# Appendix B

Drawings




Locality Plan

NOTE:
1. Drawing adapted from aerial imagery from MetroMap (Dated 06.06.2022)
2. Test locations captured using DGPS, accurate to within approx. 100mm

0 10 20 30 40 50 60 m

1:1000 @ A3

**LEGEND**

- Approximate Site Boundary
- Borehole Location
- Test Pit Location
- Cross section

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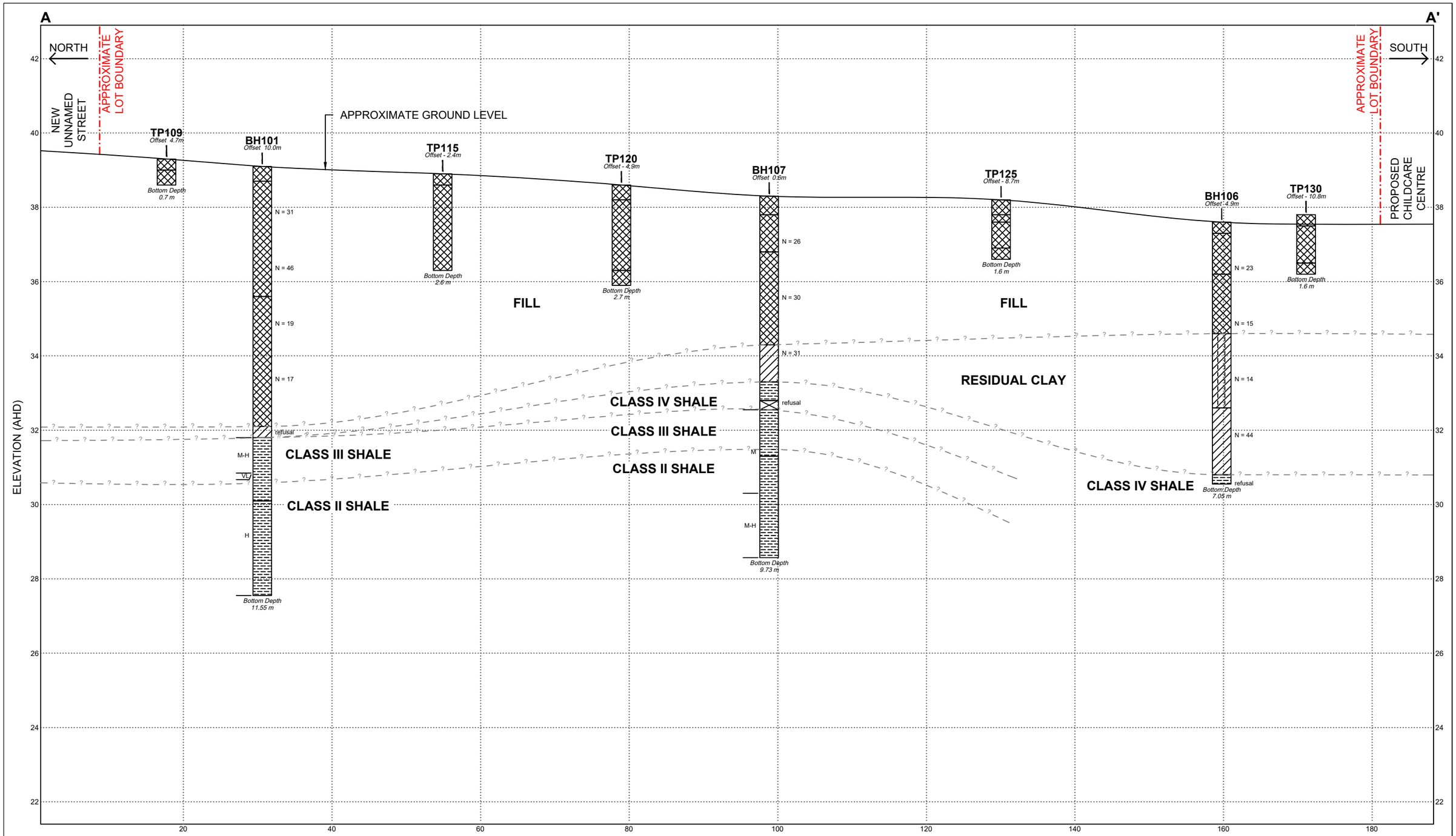
*Geotechnics / Environment / Groundwater*

| | | | |
|---|---|---|---|
| CLIENT: | School Infrastructure NSW | | |
| OFFICE: | Sydney | DRAWN BY: | JV |
| SCALE: | 1:1000 @ A3 | DATE: | 31.08.2022 |

TITLE: **Test Location Plan**
**Geotechnical Investigation**
**Proposed Gables Public School, Gables, NSW**

| | |
|---|---|
| PROJECT No: | 216255.00 |
| DRAWING No: | 1 |
| REVISION: | 0 |




LEGEND

- Core Loss
- Clay
- Filling
- Shale
- Silty Clay

NOTES:

1. Subsurface conditions are accurate at the borehole locations only. Variations in subsurface conditions may occur between borehole locations. Interpreted strata boundaries are approximate and should be used as a guide only.
2. Summary logs only and should be read in conjunction with detailed logs.
3. Horizontal and vertical scales are not equal.

ROCK STRENGTH

- EL - Extremely Low
- VL - Very Low
- L - Low
- M - Medium
- H - High
- VH- Very High

TESTS / OTHER

- N - Standard penetration test value
- — ? — - Interpreted geotechnical boundary

0 10

Horizontal Scale (metres)

Vertical Exaggeration = 5.0

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| | | | |
|---|---|---|---|
| CLIENT: School Infrastructure NSW | | TITLE: **Interpreted Geotechnical Cross-Section A-A'** | PROJECT No: 216255.00 |
| OFFICE: Sydney | DRAWN BY: JV/MG | **Proposed Gables Public School** | DRAWING No: 2 |
| SCALE: 1:500 (H) 1:100 (V) @ A3 | DATE: 06.09.2022 | **Fontana Drive, Gables** | REVISION: 0 |

B

B'

WEST

EAST

FONTANA DRIVE

APPROXIMATE LOT BOUNDARY

APPROXIMATE LOT BOUNDARY

CATARACT ROAD

APPROXIMATE GROUND LEVEL

ELEVATION (AHD)

**TP109** *Offset 2.2m* — *Bottom Depth 0.7 m*

**BH101** *Offset - 5.4m* — N = 31; N = 46; N = 19; N = 17; refusal — *Bottom Depth 11.55 m*

**TP110** *Offset - 0.3m* — *Bottom Depth 3.1 m*

**TP111** *Offset 0.3m* — *Bottom Depth 3.1 m*

**BH102** *Offset - 1.8m* — N = 10; N = 10; N = 20; N = 27; N = 45 — *Bottom Depth 8.7 m*

**TP112** *Offset 3.9m* — *Bottom Depth 3.1 m*

**TP113** *Offset 7.2m* — *Bottom Depth 1.6 m*

**BH103** *Offset - 6.4m* — refusal; N = 14; N = 16; N = 26; refusal — *Bottom Depth 11.5 m*

**TP114** *Offset 6.4m* — *Bottom Depth 2.2 m*

FILL

FILL

CLASS III SHALE (M-H, VL)

CLASS II SHALE (H)

CLASS III SHALE

CLASS IV SHALE

RESIDUAL CLAY

CLASS IV SANDSTONE

CLASS III SANDSTONE (M, VL)

CLASS II SANDSTONE OR SETTER (M-H, EL, H)

LOCATION OF SANDSTONE/SHALE INTERFACE IS NOT KNOWN

DISTANCE ALONG PROFILE (m)

LEGEND

- Filling
- Clay
- Shale
- Sandstone

NOTES:

1. Subsurface conditions are accurate at the borehole locations only. Variations in subsurface conditions may occur between borehole locations. Interpreted strata boundaries are approximate and should be used as a guide only.
2. Summary logs only and should be read in conjunction with detailed logs.
3. Horizontal and vertical scales are not equal.

ROCK STRENGTH

- EL - Extremely Low
- VL - Very Low
- L - Low
- M - Medium
- H - High
- VH- Very High

TESTS / OTHER

- N - Standard penetration test value
- — ? — - Interpreted geotechnical boundary

0 10

Horizontal Scale (metres)

Vertical Exaggeration = 5.0

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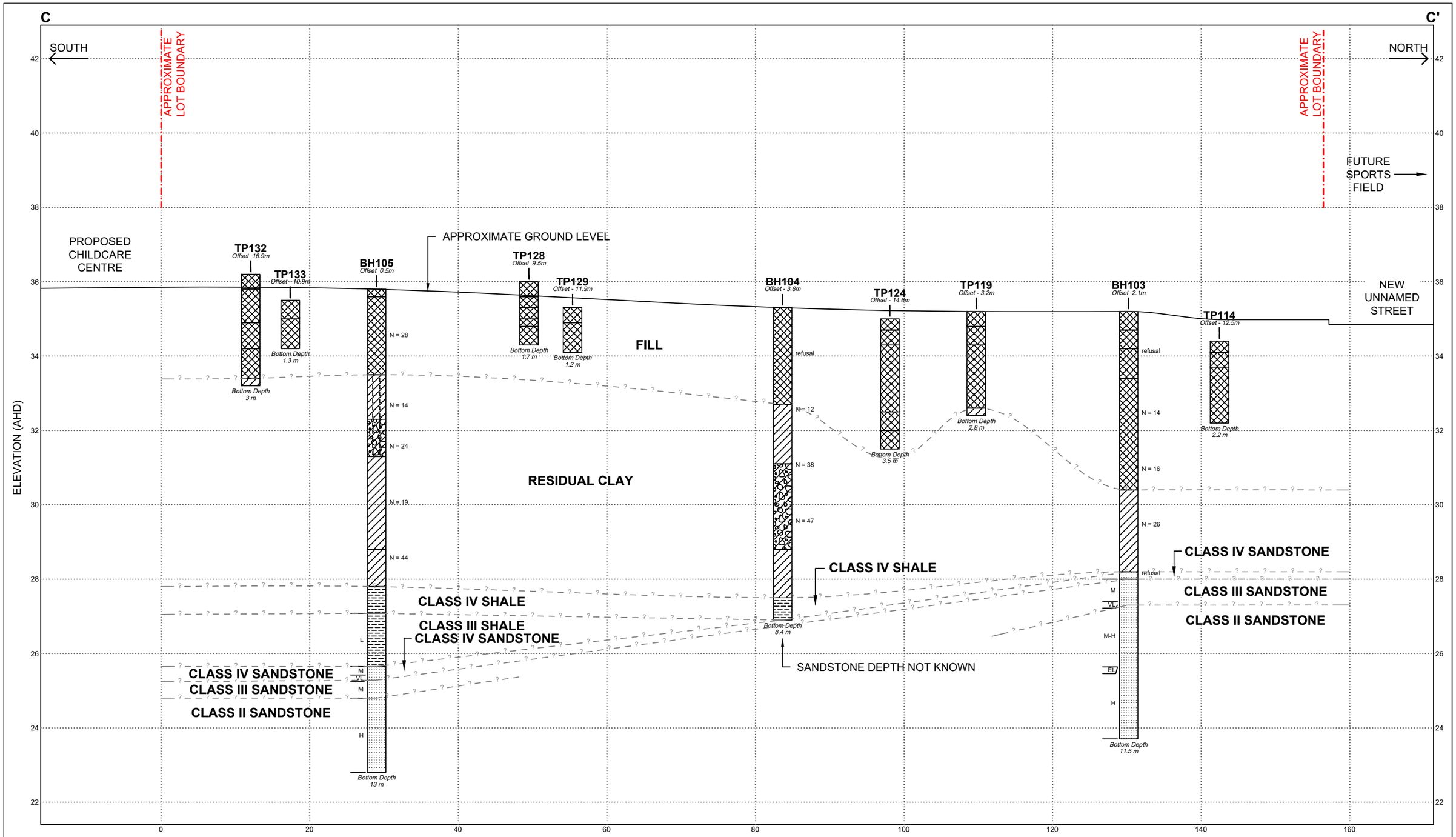
| | | | |
|---|---|---|---|
| CLIENT: School Infrastructure NSW | | TITLE: **Interpreted Geotechnical Cross-Section B-B'** | PROJECT No: 216255.00 |
| OFFICE: Sydney | DRAWN BY: JV/MG | **Proposed Gables Public School** | DRAWING No: 3 |
| SCALE: 1:500 (H) 1:100 (V) @ A3 | DATE: 06.09.2022 | **Fontana Drive, Gables** | REVISION: 0 |




LEGEND

- Filling
- Clay
- Sandstone
- Gravelly Silty Clay
- Shale
- Silty Clay
- Gravelly Silty Clay

NOTES:

1. Subsurface conditions are accurate at the borehole locations only. Variations in subsurface conditions may occur between borehole locations. Interpreted strata boundaries are approximate and should be used as a guide only.
2. Summary logs only and should be read in conjunction with detailed logs.
3. Horizontal and vertical scales are not equal.

ROCK STRENGTH

- EL - Extremely Low
- VL - Very Low
- L - Low
- M - Medium
- H - High
- VH- Very High

TESTS / OTHER

- N - Standard penetration test value
- — ? — - Interpreted geotechnical boundary

0 10

Horizontal Scale (metres)
Vertical Exaggeration = 5.0

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| | | | |
|---|---|---|---|
| CLIENT: School Infrastructure NSW | | TITLE: **Interpreted Geotechnical Cross-Section C-C'** | PROJECT No: 216255.00 |
| OFFICE: Sydney | DRAWN BY: JV/MG | **Proposed Gables Public School** | DRAWING No: 4 |
| SCALE: 1:500 (H) 1:100 (V) @ A3 | DATE: 06.09.2022 | **Fontana Drive, Gables** | REVISION: 0 |

# Appendix C

Results of Field Work

# BOREHOLE LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 39.1 AHD
**EASTING:** 305775
**NORTHING:** 6277166
**DIP/AZIMUTH:** 90°/--

**BORE No:** BH101
**PROJECT No:** 216255.00
**DATE:** 8/8/2022
**SHEET** 1 OF 2

| RL | Depth (m) | Description of Strata | Degree of Weathering | Graphic Log | Rock Strength | Water | Fracture Spacing (m) | Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault) | Sampling & In Situ Testing: Type | Core Rec. % | RQD % | Test Results & Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 39 | 0.0 | FILL/Sandy CLAY: low plasticity, brown, trace roadbase gravel, w<PL, moist, apparently firm | | | | | | | A/E | | | |
| | 0.4 | FILL/Sandy CLAY: low plasticity, orange-brown, trace ironstone gravel, sandstone boulders, w~PL, apparently stiff to hard | | | | | | | A/E | | | |
| 38 | 1 | | | | | | | | A/E | | | |
| | | | | | | | | | S | | | 4,15,16 N = 31 |
| | | | | | | | | | A/E | | | |
| 37 | 2 | | | | | | | | A/E | | | |
| | | | | | | | | | S | | | 8,25,21 N = 46 |
| 36 | 3 | | | | | | | | | | | |
| | 3.5 | FILL/Silty CLAY: medium plasticity, pale brown, trace ironstone, w~PL, apparently very stiff | | | | | | | | | | |
| 35 | 4 | | | | | | | | S | | | 7,9,10 N = 19 |
| 34 | 5 | | | | | | | | | | | |
| | | | | | | | | | S | | | 4,8,9 N = 17 |
| 33 | 6 | | | | | | | | | | | |
| 32 | 7 | | | | | | | | S | | | 4,25/150 refusal |
| | 7.0 | CLAY CL: low plasticity, pale brown, w~PL, hard, residual | | | | | | | | | | |
| | 7.3 | SHALE: grey-brown, medium to high strength with low strength band, slightly weathered, fractured and slightly fractured, Ashfield Shale | | | | | | 7.38m: J45°, pl, cln<br>7.55m: J45°, pl, cln<br>7.59m: J45°, pl, fe stn<br>7.62m: J35°, pl, ro, fe stn<br>7.77m: J45°, pl, ro, fe stn<br>7.81-7.83m: fg, cly<br>7.98m: J45°, pl, sm, fe stn<br>8.14m: J35°, pl, sm, fe stn<br>8.22m: J60°, pl, sm, cln<br>8.25-8.30m: Ds<br>8.35m: J60°, pl, sm, cly<br>8.56-8.61m: fg, fe stn<br>8.80-8.83m: fg<br>9.13m: J60°, pl, sm, cln<br>9.25m: J25°, pl, sm, cln | C | 100 | 75 | PL(A) = 1 |
| 31 | 8 | | | | | | | | | | | PL(A) = 2 |
| 30 | 9.0 | SHALE: grey, high strength, fresh, slightly fractured and unbroken, Ashfield Shale | | | | | | | C | 100 | 99 | PL(A) = 1.3 |

**RIG:** Comacchio Geo 305 **DRILLER:** Matrix Drilling **LOGGED:** SI/RS **CASING:** HW to 7.3m

**TYPE OF BORING:** Solid Flight Auger (TC-bit) to 7.3m, NMLC Coring to 11.55m

**WATER OBSERVATIONS:** No free groundwater observed whilst augering

**REMARKS:** Location coordinates are in MGA94 Zone 56.

**SAMPLING & IN SITU TESTING LEGEND**

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

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# BOREHOLE LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 39.1 AHD
**EASTING:** 305775
**NORTHING:** 6277166
**DIP/AZIMUTH:** 90°/--

**BORE No:** BH101
**PROJECT No:** 216255.00
**DATE:** 8/8/2022
**SHEET** 2 OF 2

| RL | Depth (m) | Description of Strata | Degree of Weathering (EW HW MW SW FS FR) | Graphic Log | Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High) | Water | Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00) | Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault) | Sampling & In Situ Testing: Type | Core Rec. % | RQD % | Test Results & Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | | SHALE: grey, high strength, fresh, slightly fractured and unbroken, Ashfield Shale *(continued)* | | | | | | 9.33m: J25°, pl, sm, cln<br>9.5m: J30°, pl, sm, cln<br>9.64m: J30°, pl, sm, cly<br>10.63m: B0°, fe stn<br>10.94m: J45°, pl, sm, cln | C | 100 | 99 | PL(A) = 1.4<br>PL(A) = 1.6 |
| 28 | 11 | | | | | | | | | | | |
| | 11.55 | Bore discontinued at 11.55m<br>Target Depth Reached | | | | | | | | | | |
| 27 | 12 | | | | | | | | | | | |
| 26 | 13 | | | | | | | | | | | |
| 25 | 14 | | | | | | | | | | | |
| 24 | 15 | | | | | | | | | | | |
| 23 | 16 | | | | | | | | | | | |
| 22 | 17 | | | | | | | | | | | |
| 21 | 18 | | | | | | | | | | | |
| 20 | 19 | | | | | | | | | | | |

**RIG:** Comacchio Geo 305 **DRILLER:** Matrix Drilling **LOGGED:** SI/RS **CASING:** HW to 7.3m

**TYPE OF BORING:** Solid Flight Auger (TC-bit) to 7.3m, NMLC Coring to 11.55m

**WATER OBSERVATIONS:** No free groundwater observed whilst augering

**REMARKS:** Location coordinates are in MGA94 Zone 56.

**SAMPLING & IN SITU TESTING LEGEND**

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

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**BORE: BH101 PROJECT: 216255.00 AUGUST 2022**


**7.30 – 11.55m**

# BOREHOLE LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 36.9 AHD
**EASTING:** 305833
**NORTHING:** 6277128
**DIP/AZIMUTH:** 90°/--

**BORE No:** BH102
**PROJECT No:** 216255.00
**DATE:** 10/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Degree of Weathering (EW HW MW SW FS FR) | Graphic Log | Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High) | Water | Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00) | Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault) | Sampling & In Situ Testing: Type | Core Rec. % | RQD % | Test Results & Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 36 | 0 | FILL/Sandy CLAY: low plasticity, grey-brown, trace roadbase gravel, w<PL, moist, apparently stiff | | | | | | | A/E | | | |
| | 0.5 | FILL/Sandy CLAY: low plasticity, grey-brown, w<PL, apparently stiff | | | | | | | A/E | | | |
| | 1 | | | | | | | | A/E | | | |
| | | | | | | | | | S | | | 5,5,5<br>N = 10 |
| 35 | 1.9 | FILL/CLAY: medium plasticity, pale brown, trace silt, w~PL, apparently stiff | | | | | | | A/E* | | | pp >=350 |
| | 2 | | | | | | | | $U_{75}$ | | | |
| 34 | 3 | | | | | | | | S | | | 4,4,6<br>N = 10 |
| 33 | 4 | | | | | | | | | | | |
| | 4.0 | FILL/CLAY: high plasticity, pale grey mottled brown, trace ironstone gravel, w~PL, apparently very stiff | | | | | | | S | | | 5,9,11<br>N = 20 |
| 32 | 5 | | | | | ▽ | | | | | | |
| 31 | 6 | | | | | | | | S | | | 4,10,17<br>N = 27 |
| 30 | 7 | | | | | | | | A/E | | | |
| | 7.2 | CLAY CI: medium plasticity, orange-brown, trace ironstone, w<PL, hard, residual | | | | | | | S | | | 11,18,27<br>N = 45 |
| 29 | 8 | | | | | | | | | | | |
| | 8.5 | SHALE: grey, very low and low strength, Ashfield Shale | | | | | | | A | | | |
| | 8.7 | Bore discontinued at 8.7m<br>Target Depth Reached | | | | | | | | | | |
| 28 | 9 | | | | | | | | | | | |
| 27 | | | | | | | | | | | | |

**RIG:** Comacchio Geo 305 **DRILLER:** Matrix Drilling **LOGGED:** SI/RS **CASING:** Uncased

**TYPE OF BORING:** Solid Flight Auger (TC-bit) to 8.7m

**WATER OBSERVATIONS:** Water seep observed at 5.0m (probably perched water)

**REMARKS:** Location coordinates are in MGA94 Zone 56. *Field Replicate BD410082022 taken at 1.9-2.0m depth

**SAMPLING & IN SITU TESTING LEGEND**

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

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# BOREHOLE LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 35.2 AHD
**EASTING:** 305880
**NORTHING:** 6277088
**DIP/AZIMUTH:** 90°/--

**BORE No:** BH103
**PROJECT No:** 216255.00
**DATE:** 10/8/2022
**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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 35 | 0.0 | FILL/Sandy CLAY: low plasticity, grey-brown, trace roadbase gravel, w<PL, apparently firm | | | | | | | A/E | | | |
| | 0.5 | FILL/CLAY: low to medium plasticity, brown, w~PL, apparently stiff | | | | | | | A/E* | | | |
| 34 | 1.0 | FILL/RIPPED SANDSTONE: brown to red-brown, ripped sandstone gravel and boulder, dry, apparently well compacted | | | | | | | A/E<br>S | | | 25/100<br>refusal |
| | 1.8 | FILL/Sandy CLAY: low plasticity, grey-brown and red-brown, w~PL, apparently stiff to very stiff | | | | | | | A/E | | | |
| 33 | 2.0 | | | | | | | | S | | | 5,7,7<br>N = 14 |
| 32 | 3.0 | | | | | | | | | | | |
| 31 | 4.0 | | | | | | | | S | | | 3,8,8<br>N = 16 |
| | 4.8 | CLAY CH: high plasticity, pale brown, trace ironstone gravel, w~PL, very stiff, residual | | | | | | | | | | |
| 30 | 5.0 | | | | | | | | | | | |
| 29 | 6.0 | | | | | | | | S | | | 6,11,15<br>N = 26 |
| | 7.0 | | | | | | | | S | | | 25/50<br>refusal |
| 28 | 7.2 | SANDSTONE: medium grained, brown, very low strength, Hawkesbury Sandstone | | | | | | | | | | PL(A) = 1.6 |
| | | SANDSTONE: medium grained, brown then pale grey-brown, medium to high strength, moderately weathered then slightly weathered, slightly fractured and unbroken, Hawkesbury Sandstone | | | | | | 7.3m: B10°, cly vn, ti<br>7.75m: B0°, cly 5mm<br>7.80-7.90m: Cs | C | 100 | 90 | |
| 27 | 8.0 | | | | | | | 8.5m: B15°, cly vn, ti<br>8.8m: B0°, fe | | | | PL(A) = 1 |
| 26 | 9.0 | | | | | | | 9.4m: B0°, cly co 2mm<br>9.56m: B5°, cly 5mm | C | 100 | 99 | PL(A) = 1.2 |

**RIG:** Comacchio Geo 305 **DRILLER:** Matrix Drilling **LOGGED:** SI **CASING:** HW to 7.2m

**TYPE OF BORING:** Solid Flight Auger (TC-bit) to 7.2m, NMLC Coring to 11.50m

**WATER OBSERVATIONS:** No free groundwater observed whilst augering

**REMARKS:** Location coordinates are in MGA94 Zone 56. *Field Replicate BD310082022 taken at 0.4-0.5m depth

**SAMPLING & IN SITU TESTING LEGEND**

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

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# BOREHOLE LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 35.2 AHD
**EASTING:** 305880
**NORTHING:** 6277088
**DIP/AZIMUTH:** 90°/--

**BORE No:** BH103
**PROJECT No:** 216255.00
**DATE:** 10/8/2022
**SHEET** 2 OF 2

| RL | Depth (m) | Description of Strata | Degree of Weathering (EW HW MW SW FS FR) | Graphic Log | Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High) | Water | Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00) | Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault) | Sampling & In Situ Testing: Type | Core Rec. % | RQD % | Test Results & Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 | 11 | SANDSTONE: medium grained, brown then pale grey-brown, medium to high strength, moderately weathered then slightly weathered, slightly fractured and unbroken, Hawkesbury Sandstone *(continued)* | | | | | | 11.1m: B0°, fe<br>11.4m: B5°, fe | C | 100 | 99 | PL(A) = 1.1<br>PL(A) = 1.1 |
| | 11.5 | Bore discontinued at 11.5m<br>Target Depth Reached | | | | | | | | | | |

**RIG:** Comacchio Geo 305 **DRILLER:** Matrix Drilling **LOGGED:** SI **CASING:** HW to 7.2m

**TYPE OF BORING:** Solid Flight Auger (TC-bit) to 7.2m, NMLC Coring to 11.50m

**WATER OBSERVATIONS:** No free groundwater observed whilst augering

**REMARKS:** Location coordinates are in MGA94 Zone 56. *Field Replicate BD310082022 taken at 0.4-0.5m depth

**SAMPLING & IN SITU TESTING LEGEND**

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

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Geotechnics / Environment / Groundwater

**BORE: BH103 PROJECT: 216255.00 AUGUST 2022**


**7.20 – 11.50m**

# BOREHOLE LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 35.3 AHD
**EASTING:** 305859
**NORTHING:** 6277046
**DIP/AZIMUTH:** 90°/--

**BORE No:** BH104
**PROJECT No:** 216255.00
**DATE:** 9/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Degree of Weathering (EW HW MW SW FS FR) | Graphic Log | Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High) | Water | Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00) | Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault) | Sampling & In Situ Testing: Type | Core Rec. % | RQD % | Test Results & Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 35 | 0 | FILL/Sandy CLAY: low plasticity, pale grey and brown, trace ripped sandstone gravel and boulder, w<PL, apparently very stiff and hard | | | | | | | A/E* | | | |
| | | | | | | | | | A/E | | | |
| 34 | 1 | | | | | | | | A/E | | | |
| | | | | | | | | | S | | | 10,25/20 refusal |
| 33 | 2 | | | | | | | | A/E | | | |
| | 2.6 | CLAY CH: medium plasticity, pale brown, w~PL, stiff, residual | | | | | | | S | | | 3,4,8 N = 12 |
| | 3 | | | | | | | | A/E | | | |
| 32 | 4 | | | | | | | | | | | |
| 31 | 4.2 | Gravelly CLAY CL: low plasticity, red-brown, fine ironstone gravel, w~PL, hard, residual | | | | | | | S | | | 7,15,23 N = 38 |
| | 5 | | | | | | | | | | | |
| 30 | 6 | | | | | | | | S | | | 11,20,27 N = 47 |
| 29 | 6.5 | CLAY CI: medium plasticity, pale grey and orange-brown, w<PL, hard, residual | | | | | | | | | | |
| 28 | 7 | At 7.2m: extremely low strength shale | | | | | | | | | | |
| | 7.8 | SHALE: grey, very low and low strength, Ashfield Shale | | | | | | | | | | |
| 27 | 8 | | | | | | | | | | | |
| | 8.4 | Bore discontinued at 8.4m Target Depth Reached | | | | | | | | | | |
| 26 | 9 | | | | | | | | | | | |

**RIG:** Comacchio Geo 305 **DRILLER:** Matrix Drilling **LOGGED:** SI **CASING:** Uncased

**TYPE OF BORING:** Solid Flight Auger (TC-bit) to 8.4m

**WATER OBSERVATIONS:** No free groundwater observed whilst augering

**REMARKS:** Location coordinates are in MGA94 Zone 56. *Field Replicate BD209082022 taken at 0.1-0.2m depth

**SAMPLING & IN SITU TESTING LEGEND**

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

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# BOREHOLE LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 35.8 AHD
**EASTING:** 305825
**NORTHING:** 6277003
**DIP/AZIMUTH:** 90°/--

**BORE No:** BH105
**PROJECT No:** 216255.00
**DATE:** 9/8/2022
**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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 35 | 0.2 | FILL/CLAY: low plasticity, pale grey-brown, w<PL, apparently stiff | | | | | | | A/E | | | |
| | | FILL/Sandy CLAY: low plasticity, pale grey-brown, fine sand, trace sandstone gravel and boulders, w<PL, apparently very stiff | | | | | | | A/E<br>B | | | |
| 34 | 1 | | | | | | | | A/E<br>S | | | 14,13,15<br>N = 28 |
| | 2 | | | | | | | | A/E | | | |
| 33 | 2.3 | Silty CLAY CI: medium plasticity, pale brown, w~PL, stiff, residual | | | | | | | $U_{75}$ | | | pp = 150 |
| | 3 | | | | | | | | S | | | 5,6,8<br>N = 14 |
| 32 | 3.5 | Gravelly Silty CLAY: low plasticity, red-brown to brown, fine ironstone gravel, w<PL, very stiff, residual | | | | | | | | | | |
| | 4 | | | | | | | | S | | | 11,10,14<br>N = 24 |
| 31 | 4.5 | CLAY CH: high plasticity, pale grey-brown, w~PL, very stiff, residual | | | | | | | | | | |
| | 5 | | | | | | | | | | | |
| 30 | | | | | | | | | S | | | 8,4,15<br>N = 19 |
| | 6 | | | | | | | | | | | |
| 29 | 7 | | | | | | | | | | | |
| | 7.0 | CLAY CI: medium plasticity, pale grey and orange-brown, trace ironstone, w<PL, hard, residual | | | | | | | S | | | 11,19,25<br>N = 44 |
| 28 | 8 | | | | | | | | | | | |
| | 8.0 | SHALE: grey, very low and low strength, Ashfield Shale | | | | | | | | | | |
| 27 | 8.72 | SHALE: grey-brown, low strength, highly to moderately weathered, slightly fractured, Ashfield Shale | | | | | | 8.75m: J30°, he, cly<br>8.87m: J70°, he, cly<br>9m: J30°, pl, sm, cln<br>9.24m: J90°, un, ro, cln<br>9.3m: J45°, ???, cly<br>9.33m: B, cly 10mm<br>9.39m: J45°, pl, sm, cln<br>9.47m: B0°, cln | C | 100 | 71 | PL(A) = 0.2<br>PL(A) = 0.7 |
| 26 | 9 | | | | | | | | | | | |

**RIG:** Comacchio Geo 305 **DRILLER:** Matrix Drilling **LOGGED:** SI **CASING:** HW to 8.5m

**TYPE OF BORING:** Solid Flight Auger (TC-bit) to 8.5m, NMLC Coring to 13.00m

**WATER OBSERVATIONS:** No free groundwater observed whilst augering

**REMARKS:** Location coordinates are in MGA94 Zone 56.

**SAMPLING & IN SITU TESTING LEGEND**

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

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# BOREHOLE LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 35.8 AHD
**EASTING:** 305825
**NORTHING:** 6277003
**DIP/AZIMUTH:** 90°/--

**BORE No:** BH105
**PROJECT No:** 216255.00
**DATE:** 9/8/2022
**SHEET** 2 OF 2

| RL | Depth (m) | Description of Strata | Degree of Weathering (EW HW MW SW FS FR) | Graphic Log | Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High) | Water | Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00) | Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault) | Type | Core Rec. % | RQD % | Test Results & Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 10.15 | SANDSTONE: medium to coarse grained, brown then pale grey, trace carbonaceous laminations, cross bedded 10°-20°, medium then high strength, moderately weathered then fresh, slightly fractured and unbroken, Hawkesbury Sandstone | | | | | | 9.51-9.54m: Cs<br>9.66m: J30°, pl, sm, cln<br>9.84m: J75°, pl, sm, cln<br>10.04m: B0°, cly<br>10.16m: B0°, cly and fe stn<br>10.18m: J60°, he, un,<br>10.39m: B0°, fe stn<br>10.43-10.47m: Ds<br>10.50-10.52m: B0°, cly<br>10.76m: J30°, pl, ro, cln<br>12.22m: B10°, cln<br>12.3m: B0°, cly | C | 100 | 88 | PL(A) = 0.8<br>PL(A) = 1.5<br>PL(A) = 1.6 |
| 24 | 11 | | | | | | | | | | | |
| 23 | 12 | | | | | | | | | | | |
| 22 | 13 13.0 | Bore discontinued at 13.0m<br>Target Depth Reached | | | | | | | | | | |
| 21 | 14 | | | | | | | | | | | |
| 20 | 15 | | | | | | | | | | | |
| 19 | 16 | | | | | | | | | | | |
| 18 | 17 | | | | | | | | | | | |
| 17 | 18 | | | | | | | | | | | |
| 16 | 19 | | | | | | | | | | | |

**RIG:** Comacchio Geo 305 **DRILLER:** Matrix Drilling **LOGGED:** SI **CASING:** HW to 8.5m

**TYPE OF BORING:** Solid Flight Auger (TC-bit) to 8.5m, NMLC Coring to 13.00m

**WATER OBSERVATIONS:** No free groundwater observed whilst augering

**REMARKS:** Location coordinates are in MGA94 Zone 56.

**SAMPLING & IN SITU TESTING LEGEND**

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

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**BORE: BH105 PROJECT: 216255.00 AUGUST 2022**


**8.72 – 13.00m**

# BOREHOLE LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 37.6 AHD
**EASTING:** 305767
**NORTHING:** 6277037
**DIP/AZIMUTH:** 90°/--

**BORE No:** BH106
**PROJECT No:** 216255.00
**DATE:** 9/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Degree of Weathering (EW HW MW SW FS FR) | Graphic Log | Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High) | Water | Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00) | Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault) | Sampling & In Situ Testing: Type | Core Rec. % | RQD % | Test Results & Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 37 | 0.3 | FILL/CLAY: low plasticity, pale grey-brown, trace roadbase gravel and grass roots, w<PL, apparently stiff | | | | | | | A/E | | | |
| | | | | | | | | | A/E | | | |
| | | FILL/Sandy CLAY CL: low plasticity, mottled brown pale grey, fine sand, w~PL, apparently stiff | | | | | | | B | | | |
| 1 | | | | | | | | | A/E | | | |
| | 1.4 | | | | | | | | S | | | 5,9,14 N = 23 |
| 36 | | FILL/Sandy CLAY: low plasticity, brown, trace iron-cemented sandstone gravel, w<PL, apparently hard | | | | | | | | | | |
| 2 | | | | | | | | | | | | |
| 35 | | | | | | | | | S | | | 3,7,8 N = 15 |
| 3 | 3.0 | Silty CLAY CI: medium plasticity, grey-brown, trace fine sand, w~PL, stiff, residual | | | | | | | | | | |
| 34 | | | | | | | | | | | | |
| 4 | | | | | | | | | S | | | 3,6,8 N = 14 |
| 33 | | | | | | | | | | | | |
| 5 | 5.0 | CLAY CI: medium plasticity, pale grey and brown, trace ironstone gravel and fine sand, w~PL, hard, residual | | | | | | | | | | |
| 32 | | | | | | | | | S | | | 5,19,25 N = 44 |
| 6 | | | | | | | | | | | | |
| 31 | 6.8 | SHALE: grey, very low and low strength, Ashfield Shale | | | | | | | | | | |
| 7 | 7.05 | Bore discontinued at 7.05m Target Depth Reached | | | | | | | S | | | 25/50 refusal |
| 30 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | |

**RIG:** Comacchio Geo 305 **DRILLER:** Matrix Drilling **LOGGED:** SI **CASING:** Uncased

**TYPE OF BORING:** Solid Flight Auger (TC-bit) to 7.05m

**WATER OBSERVATIONS:** No free groundwater observed whilst augering

**REMARKS:** Location coordinates are in MGA94 Zone 56.

**SAMPLING & IN SITU TESTING LEGEND**

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

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# BOREHOLE LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 38.3 AHD
**EASTING:** 305764
**NORTHING:** 6277098
**DIP/AZIMUTH:** 90°/--

**BORE No:** BH107
**PROJECT No:** 216255.00
**DATE:** 8/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Degree of Weathering | Graphic Log | Rock Strength | Water | Fracture Spacing (m) | Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault) | Sampling & In Situ Testing: Type | Core Rec. % | RQD % | Test Results & Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 38 | 0.5 | FILL/Sandy CLAY: low plasticity, brown and grey-brown, trace roadbase gravel and grass roots, w~PL, apparently firm to stiff | 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 | | A/E* | | | |
| | | | | | | | | | A/E | | | |
| 37 | 1 | FILL/Gravelly Sandy CLAY: low plasticity, orange-brown, ripped sandstone gravel and boulders, w~PL, apparently very stiff to hard | | | | | | | A/E | | | |
| | | | | | | | | | S | | | 10,17,9 N = 26 |
| | 1.5 | FILL/Sandy CLAY: low plasticity, pale grey and brown, w~PL, apparently very stiff to hard | | | | | | | | | | |
| 36 | 2 | | | | | | | | | | | |
| | | | | | | | | | S | | | 5,12,18 N = 30 |
| 35 | 3 | | | | | | | | | | | |
| 34 | 4 | | | | | | | | | | | |
| | 4.0 | CLAY Cl: medium plasticity, pale grey and brown, w~PL, hard, residual | | | | | | | S | | | 3,12,19 N = 31 |
| 33 | 5 | | | | | | | | | | | |
| | 5.0 | SHALE: grey, very low strength, Ashfield Shale | | | | | | | | | | |
| | 5.5 | | | | | | | 5.5m: CORE LOSS: 250mm | S | | | ~~20/120~~ refusal |
| | 5.75 | SHALE: grey-brown, laminated, approximately 20% fine grained sandstone lamination, medium strength, moderately weathered, slightly fractured, Ashfield Shale | | | | | | 5.92m: B5°, cly<br>6.1m: J45°, pl, sm, cln<br>6.33-6.47m: J70°, pl, sm, cly | C | 83 | 83 | PL(A) = 0.4<br>PL(A) = 0.8 |
| 32 | 6 | | | | | | | | | | | |
| 31 | 7 | | | | | | | | | | | |
| | 7.0 | SHALE: grey-brown, laminated, 20%-25% fine grained sandstone lamination, medium and high strength, moderately then slightly weathered, fractured and slightly fractured, Ashfield Shale | | | | | | 6.94m: J45°, un, ro, fe stn<br>7.16m: J45°, ti<br>7.52m: B0°, fe stn, cly 5mm<br>8.1m: B5°, cly 5mm<br>8.4m: J30°, ti<br>8.52m: J70°, pl, sm, cln<br>8.68-8.88m: J45° x 5, pl, sm, cly or cln<br>9.20-9.29m: B5°, fe stn<br>9.42-9.47m: J30-45°, pl<br>9.54-9.65m: J80°, pl, ro | C | 100 | 82 | PL(A) = 1.1<br>PL(A) = 1.7<br>PL(A) = 0.8 |
| 30 | 8 | | | | | | | | | | | |
| 29 | 9 | | | | | | | | | | | |
| | 9.73 | Bore discontinued at 9.73m<br>Target Depth Reached | | | | | | 9.71m: J45°, pl, sm, cln | | | | |

**RIG:** Comacchio Geo 305 **DRILLER:** Matrix Drilling **LOGGED:** SI **CASING:** HW to 5.5m

**TYPE OF BORING:** Solid Flight Auger (TC-bit) to 5.5m, NMLC Coring to 9.73m

**WATER OBSERVATIONS:** No free groundwater observed whilst augering

**REMARKS:** Location coordinates are in MGA94 Zone 56. *Field Replicate BD108082022 taken at 0.1-0.2m depth

**SAMPLING & IN SITU TESTING LEGEND**

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

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**BORE: BH107 PROJECT: 216255.00 AUGUST 2022**


**5.50 – 9.73m**

# BOREHOLE LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 36.7 AHD
**EASTING:** 305817
**NORTHING:** 6277072
**DIP/AZIMUTH:** 90°/--

**BORE No:** BH108
**PROJECT No:** 216255.00
**DATE:** 9/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Degree of Weathering (EW HW MW SW FS FR) | Graphic Log | Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High) | Water | Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00) | Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault) | Sampling & In Situ Testing: Type | Core Rec. % | RQD % | Test Results & Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 36 | 0.3 | FILL/Sandy CLAY: low plasticity, pale grey and brown, trace roadbase gravel, w<PL, apparently stiff | | | | | | | A/E | | | |
| | | | | | | | | | A/E | | | |
| 35 | 1.0 | FILL/Sandy CLAY: low plasticity, brown, fine sand, w~PL, apparently stiff | | | | | | | A/E | | | |
| | | | | | | | | | S | | | 25/100 refusal |
| | | FILL/RIPPED SANDSTONE: fine grained, ripped sandstone gravel and boulder, with sandy clay, apparently well compacted | | | | | | | | | | |
| 34 | 2.5 | FILL/Sandy CLAY: low plasticity, brown and pale brown, fine sand, w~PL, apparently very stiff | | | | | | | A/E | | | |
| | | | | | | | | | S | | | 5,7,12 N = 19 |
| 33 | 4.0 | CLAY CH: high plasticity, pale grey and orange-brown, w~PL, very stiff, residual | | | | | | | A/E | | | |
| | | | | | | | | | S | | | 4,8,12 N = 20 |
| 32 | | | | | | | | | $U_{50}$ | | | |
| 31 | 5.7 | CLAY CI: medium plasticity, pale brown, trace ironstone, w<PL, hard, residual | | | | | | | S | | | 8,22,25 N = 47 |
| 30 | 6.8 | SHALE: pale grey and grey-brown, very low and low strength, Ashfield Shale | | | | | | | S | | | 17,25/40 refusal |
| 29 | 7.19 | Bore discontinued at 7.19m Target Depth Reached | | | | | | | | | | |

**RIG:** Comacchio Geo 305 **DRILLER:** Matrix Drilling **LOGGED:** SI **CASING:** Uncased

**TYPE OF BORING:** Solid Flight Auger (TC-bit) to 7.19m

**WATER OBSERVATIONS:** No free groundwater observed whilst augering

**REMARKS:** Location coordinates are in MGA94 Zone 56.

**SAMPLING & IN SITU TESTING LEGEND**

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

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# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 39.3 AHD
**EASTING:** 305770
**NORTHING:** 6277179

**PIT No:** TP109
**PROJECT No:** 216255.00
**DATE:** 11/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per mm) |
|---|---|---|---|---|---|---|---|---|---|
| 39 | 0.3 | FILL/Sandy CLAY: dark grey-brown, medium to coarse sand, dry | | E | 0.1<br>0.2 | | | | |
| | 0.7 | FILL/Crushed SANDSTONE: orange-brown, with sandy clay, dry | | E | 0.5<br>0.6 | | | | |
| | | Pit discontinued at 0.7m<br>Refusal on Sandstone Boulder | | | | | | | |

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 38.6 AHD
**EASTING:** 305789
**NORTHING:** 6277162

**PIT No:** TP110
**PROJECT No:** 216255.00
**DATE:** 11/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per mm) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 5 10 15 20 |
| | | FILL/Sandy CLAY: dark grey-brown, medium to coarse sand, trace roots/rootlets, apparently loose | | E | 0.1 | | | | |
| | | | | | 0.2 | | | | |
| | 0.3 | | | | | | | | |
| | | FILL/Crushed SANDSTONE: orange-brown, with clayey sand | | E | 0.4 | | | | |
| | | | | | 0.5 | | | | |
| 38 | | | | | | | | | |
| | 1 | | | | | | | | 1 |
| | | At 1.0m: approximately 600-700mm diameter sandstone boulder | | E | 1.0 | | | | |
| | | | | | 1.1 | | | | |
| | | | | | | | | | |
| | | | | E | 1.5 | | | | |
| 37 | | | | | 1.6 | | | | |
| | 1.8 | | | | | | | | |
| | | FILL/CLAY: orange-brown, with sandstone and igneous gravel | | | | | | | |
| | 2 | | | E | 2.0 | | | | 2 |
| | | | | | 2.1 | | | | |
| | | | | | | | | | |
| 36 | | | | E | 2.5 | | | | |
| | | | | | 2.6 | | | | |
| | 3 | | | | | | | | 3 |
| | | | | E | 3.0 | | | | |
| | 3.1 | Pit discontinued at 3.1m<br>Target Depth Reached | | | 3.1 | | | | |
| 35 | | | | | | | | | |
| | 4 | | | | | | | | 4 |
| 34 | | | | | | | | | |

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 37.8 AHD
**EASTING:** 305812
**NORTHING:** 6277146

**PIT No:** TP111
**PROJECT No:** 216255.00
**DATE:** 11/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per 150mm) |
|---|---|---|---|---|---|---|---|---|---|
| 37 | 0.0 | FILL/Sandy CLAY: dark grey-brown, with sandstone and igneous gravel, trace roots/rootlets, moist, apparently very stiff | | E | 0.1 | | | | |
| | | | | | 0.2 | | | | |
| | 0.4 | FILL/Clayey SAND: orange-brown, with sandstone and igneous gravel, apparently medium dense to dense | | E | 0.5 | | | | |
| | | | | | 0.6 | | | | |
| | 1 | | | E | 1.0 | | | | 1 |
| | | | | | 1.1 | | | | |
| | | | | E | 1.5 | | | | |
| | | At 1.8m: trace sand | | | 1.6 | | | | |
| 36 | 2.0 | FILL/CLAY: pale grey-orange | | E | 2.0 | | | | 2 |
| | | | | | 2.1 | | | | |
| | | At 2.8m: trace crushed sandstone | | | | | | | |
| 35 | 3 | | | | | | | | 3 |
| | 3.1 | Pit discontinued at 3.1m<br>Target Depth Reached | | | | | | | |
| 34 | 4 | | | | | | | | 4 |
| 33 | | | | | | | | | |

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 36.4 AHD
**EASTING:** 305851
**NORTHING:** 6277122

**PIT No:** TP112
**PROJECT No:** 216255.00
**DATE:** 11/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per mm) |
|---|---|---|---|---|---|---|---|---|---|
| 36 | 0.0 | FILL/Sandy CLAY: dark grey-brown, medium to coarse sand, trace roots/rootlets, dry, apparently loose | | E | 0.1 | | | | |
| | | | | | 0.2 | | | | |
| | 0.3 | FILL/Clayey SAND: with sandstone and igneous gravel, dry | | | | | | | |
| | | | | E | 0.5 | | | | |
| | | | | | 0.6 | | | | |
| | 1 | | | E | 1.0 | | | | 1 |
| | | | | | 1.1 | | | | |
| 35 | 1.4 | FILL/CLAY: pale orange-brown, with fine sandstone gravel | | E | 1.5 | | | | |
| | | | | | 1.6 | | | | |
| | 1.9 | FILL/CLAY: pale grey-orange, with fine sandstone gravel, moist | | E | 2.0 | | | | |
| | 2 | | | | 2.1 | | | | 2 |
| 34 | | | | E | 2.5 | | pp = 135-140 | | |
| | | At 2.6m: grading to orange-brown, dry | | | 2.6 | | | | |
| | 3 | | | E | 3.0 | | pp = 450-520 | | 3 |
| | 3.1 | Pit discontinued at 3.1m<br>Target Depth Reached | | | 3.1 | | | | |
| 33 | | | | | | | | | |
| | 4 | | | | | | | | 4 |
| 32 | | | | | | | | | |

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 35.6 AHD
**EASTING:** 305873
**NORTHING:** 6277110

**PIT No:** TP113
**PROJECT No:** 216255.00
**DATE:** 11/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per 150mm) |
|---|---|---|---|---|---|---|---|---|---|
| 35 | 0.0 | FILL/Sandy CLAY: dark grey-brown, apparently firm to stiff. | | E | 0.1 | | | | |
| | | | | | 0.2 | | | | |
| | 0.3 | FILL/Clayey SAND: orange-brown, with crushed sandstone, moist, apparently loose to medium dense. | | E | 0.5 | | | | |
| | | | | | 0.6 | | | | |
| | 1 | | | E | 1.1 | | | | 1 |
| | | | | | 1.2 | | | | |
| | 1.3 | FILL/Crushed SANDSTONE: orange-brown | | E | 1.5 | | | | |
| 34 | 1.6 | At 1.5m: boulders<br>Pit discontinued at 1.6m on sandstone boulder | | | 1.6 | | | | |
| | 2 | | | | | | | | 2 |
| 33 | | | | | | | | | |
| | 3 | | | | | | | | 3 |
| 32 | | | | | | | | | |
| | 4 | | | | | | | | 4 |
| 31 | | | | | | | | | |

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 34.4 AHD
**EASTING:** 305899
**NORTHING:** 6277090

**PIT No:** TP114
**PROJECT No:** 216255.00
**DATE:** 10/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per 150mm) |
|---|---|---|---|---|---|---|---|---|---|
| 34 | 0.0 | FILL/Sandy CLAY: dark grey-brown, medium to coarse sand, with igneous and sandstone gravel (small), dry, apparently very stiff | | E | 0.1 | | | | |
| | | | | | 0.2 | | | | |
| | 0.3 | FILL/Clayey SAND: medium to coarse, orange-grey, dry, apprently dense | | E | 0.5 | | | | |
| | | | | | 0.6 | | | | |
| | 0.7 | FILL/Sandy CLAY: with sandstone boulders larger than 100 mm | | E | 1.0 | | | | |
| 33 | 1 | | | | 1.1 | | | | |
| | | | | E | 1.5 | | | | |
| | | | | | 1.6 | | | | |
| | 2 | | | E | 2.0 | | | | |
| | | | | | 2.1 | | | | |
| | 2.2 | Pit discontinued at 2.2m<br>Refusal on Sandstone Boulder | | | | | | | |
| 32 | 3 | | | | | | | | |
| 31 | 4 | | | | | | | | |
| 30 | | | | | | | | | |

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** DCP refusal at 0.45m depth

☐ 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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 38.9 AHD
**EASTING:** 305762
**NORTHING:** 6277142

**PIT No:** TP115
**PROJECT No:** 216255.00
**DATE:** 11/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per 150mm) |
|---|---|---|---|---|---|---|---|---|---|
| 38 | 0.0 | FILL/Sandy CLAY: dark grey-brown, medium to coarse sand, trace roots/rootlets, moist, apparently firm to stiff. | | E | 0.1 | | *PFAS | | |
| | | | | | 0.2 | | | | |
| | 0.3 | FILL/CLAY: orange-grey, with sandstone and igneous gravel, dry, apparently stiff to very stiff. | | E | 0.5 | | *PFAS | | |
| | | | | | 0.6 | | | | |
| | 1 | | | E | 1.0 | | | | 1 |
| | | | | | 1.1 | | | | |
| | | At 1.5m: approximately 300-400mm diameter sandstone boulders | | E | 1.5 | | | | |
| 37 | | | | | 1.6 | | | | |
| | 2 | | | E | 2.0 | | | | 2 |
| | | | | | 2.1 | | | | |
| | | | | E | 2.5 | | | | |
| | 2.6 | Pit discontinued at 2.6m<br>Refusal on Sandstone Boulder | | | 2.6 | | | | |
| 36 | 3 | | | | | | | | 3 |
| 35 | 4 | | | | | | | | 4 |
| 34 | | | | | | | | | |

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** *PFAS sample collected

☐ 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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 38.2 AHD
**EASTING:** 305788
**NORTHING:** 6277129

**PIT No:** TP116
**PROJECT No:** 216255.00
**DATE:** 11/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per 150mm) |
|---|---|---|---|---|---|---|---|---|---|
| 38 | 0.0 | FILL/Sandy CLAY: dark grey-brown, medium to coarse sand, trace roots/rootlets, apparently firm to stiff. | | E | 0.1 | | | | |
| | | | | | 0.2 | | | | |
| | 0.3 | FILL/CLAY: orange-brown, with sandstone gravel, dry, apparently stiff to very stiff | | E | 0.5 | | | | |
| | | | | | 0.6 | | | | |
| | 1 | | | E | 1.0 | | | | 1 |
| | | | | | 1.1 | | | | |
| 37 | 1.2 | FILL/Clayey SAND: orange-grey, with sandstone and igneous gravel, dry | | E | 1.5 | | | | |
| | | | | | 1.6 | | | | |
| | 2 | | | E | 2.0 | | | | 2 |
| 36 | | | | | 2.1 | | | | |
| | | | | E | 2.5 | | | | |
| | | | | | 2.6 | | | | |
| | 2.8 | FILL/Clayey SAND: brown-red, trace shale, dry (possibly natural) | | | | | | | |
| | 3 | | | E | 3.0 | | | | 3 |
| 35 | 3.1 | Pit discontinued at 3.1m<br>Target Depth Reached | | | 3.1 | | | | |
| | 4 | | | | | | | | 4 |
| 34 | | | | | | | | | |

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 36.8 AHD
**EASTING:** 305822
**NORTHING:** 6277102

**PIT No:** TP117
**PROJECT No:** 216255.00
**DATE:** 11/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per mm) |
|---|---|---|---|---|---|---|---|---|---|
| 36 | 0.0 | FILL/Sandy CLAY: dark grey-brown, medium to coarse sand, trace sandstone gravel, moist | | E* | 0.1<br>0.2 | | | | |
| | 0.3 | FILL/Clayey SAND: orange-brown, with crushed sandstone, dry | | E | 0.5<br>0.6 | | | | |
| | 1 | | | E | 1.0<br>1.1 | | | | 1 |
| | 1.3 | FILL/Clayey SAND: dark grey-brown, with 100 mm sized sandstone cobbles | | E | 1.4<br>1.5 | | | | |
| 35 | 2 | | | E | 2.0<br>2.1 | | | | 2 |
| | 2.3 | FILL/Clayey SAND: orange-grey, with sandstone gravel, dry | | E | 2.4<br>2.5 | | | | |
| | 2.6 | Pit discontinued at 2.6m<br>Refusal on Sandstone Boulder | | | | | | | |
| 34 | 3 | | | | | | | | 3 |
| 33 | 4 | | | | | | | | 4 |
| 32 | | | | | | | | | |

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** *Field Replicate BD06 taken at 0.1-0.2m depth

☐ 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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 36.0 AHD
**EASTING:** 305846
**NORTHING:** 6277086

**PIT No:** TP118
**PROJECT No:** 216255.00
**DATE:** 11/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per 150mm) |
|---|---|---|---|---|---|---|---|---|---|
| 36 | 0.0 | FILL/Crushed SANDSTONE: pale grey-brown, with medium gravel, apparently medium dense | | E | 0.1 | | | | |
| | | | | | 0.2 | | | | |
| | | | | E | 0.5 | | | | |
| | | | | | 0.6 | | | | |
| | 0.7 | FILL/CLAY: orange-brown, moist, apprently stiff to very stiff | | | | | | | |
| 35 | 1 | | | E | 1.0 | | | | 1 |
| | | | | | 1.1 | | | | |
| | 1.3 | FILL/Crushed SANDSTONE: with sandstone cobbles larger than 100 mm | | E | 1.5 | | | | |
| | 1.6 | Pit discontinued at 1.6m<br>Refusal on compacted material | | | 1.6 | | | | |
| 34 | 2 | | | | | | | | 2 |
| 33 | 3 | | | | | | | | 3 |
| 32 | 4 | | | | | | | | 4 |

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** DCP refusal at 0.9m

☐ 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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 35.2 AHD
**EASTING:** 305873
**NORTHING:** 6277068

**PIT No:** TP119
**PROJECT No:** 216255.00
**DATE:** 11/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per mm) |
|---|---|---|---|---|---|---|---|---|---|
| 35 | 0.0 | FILL/Clayey SAND: dark grey-brown, medium to coarse grained sand, trace roots and rootlets, sandstone and igneous gravel, dry | | E | 0.1 | | | | |
| | | | | | 0.2 | | | | |
| | 0.4 | FILL/CLAY: orange-brown, with medium sized crushed sandstone cobbles and gravel, dry | | E | 0.5 | | | | |
| | | | | | 0.6 | | | | |
| | 0.9 | FILL/Sandy CLAY: grey-brown, with crushed sandstone, dry | | E | 1.0 | | | | |
| 34 | 1 | | | | 1.1 | | | | 1 |
| | | | | E | 1.5 | | | | |
| | | | | | 1.6 | | | | |
| | 2 | | | E | 2.0 | | | | 2 |
| 33 | | | | | 2.1 | | | | |
| | 2.6 | CLAY: orange-grey (possibly fill) | | E | 2.7 | | | | |
| | 2.8 | Pit discontinued at 2.8m<br>Target Depth Reached | | | 2.8 | | | | |
| 32 | 3 | | | | | | | | 3 |
| 31 | 4 | | | | | | | | 4 |

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 38.6 AHD
**EASTING:** 305759
**NORTHING:** 6277118

**PIT No:** TP120
**PROJECT No:** 216255.00
**DATE:** 11/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per mm) |
|---|---|---|---|---|---|---|---|---|---|
| 38 | 0.0 | FILL/Sandy CLAY: dark grey-brown, trace roots/rootlets and sandstone gravel, dry | | E | 0.1 | | | | |
| | | | | | 0.2 | | | | |
| | 0.4 | FILL/Crushed SANDSTONE: pale grey-orange, with sand and clay, dry | | E | 0.5 | | | | |
| | | | | | 0.6 | | | | |
| | 1 | | | E | 1.0 | | | | 1 |
| | | | | | 1.1 | | | | |
| 37 | | | | E | 1.5 | | | | |
| | | | | | 1.6 | | | | |
| | 2 | | | E | 2.0 | | | | 2 |
| | | | | | 2.1 | | | | |
| | 2.3 | FILL/CLAY: orange-grey, with sandstone and igneous gravel, dry | | E | 2.5 | | | | |
| 36 | | | | | 2.6 | | | | |
| | 2.7 | Pit discontinued at 2.7m<br>Refusal on compacted material | | | | | | | |
| | 3 | | | | | | | | 3 |
| 35 | | | | | | | | | |
| | 4 | | | | | | | | 4 |
| 34 | | | | | | | | | |

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 37.8 AHD
**EASTING:** 305785
**NORTHING:** 6277091

**PIT No:** TP121
**PROJECT No:** 216255.00
**DATE:** 11/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per mm) |
|---|---|---|---|---|---|---|---|---|---|
| 37 | 0.0 | FILL/Sandy CLAY: dark grey-brown, medium to coarse sand, trace roots/rootlets | | E* | 0.1<br>0.2 | | | | |
| | 0.4 | FILL/Crushed SANDSTONE: pale grey-brown, with sandstone cobbles larger than 100mm | | E | 0.5<br>0.6 | | | | |
| | 1.0 | FILL/CLAY: orange-brown, dry | | E | 1.0<br>1.1 | | | | |
| | 1.3 | FILL/Crushed SANDSTONE: pale grey-brown | | E | 1.4 | | | | |
| | 1.5 | Pit discontinued at 1.5m<br>Refusal on compacted material | | | 1.5 | | | | |

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** *Field Replicate BD07 taken at 0.1-0.2m depth

☐ 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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 37.2 AHD
**EASTING:** 305809
**NORTHING:** 6277093

**PIT No:** TP122
**PROJECT No:** 216255.00
**DATE:** 11/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per mm) 5 10 15 20 |
|---|---|---|---|---|---|---|---|---|---|
| 37 | 0.1 | FILL/Sandy CLAY: dark grey-brown, medium to coarse sand, trace roots/rootlets, moist | | E | 0.1 | | | | |
| | 0.2 | | | | 0.2 | | | | |
| | 0.4 | FILL/Clayey SAND: pale grey-brown, with crushed sandstone, dry | | | | | | | |
| | 0.5 | | | E | 0.5 | | | | |
| | 0.6 | | | | 0.6 | | | | |
| 36 | 1 | | | | | | | | 1 |
| | 1.0 | | | E | 1.0 | | | | |
| | 1.1 | | | | 1.1 | | | | |
| | 1.5 | | | E | 1.5 | | | | |
| | 1.6 | Pit discontinued at 1.6m<br>Refusal on apparently well compacted crushed sandstone and boulders | | | 1.6 | | | | |
| 35 | 2 | | | | | | | | 2 |
| 34 | 3 | | | | | | | | 3 |
| 33 | 4 | | | | | | | | 4 |

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 35.9 AHD
**EASTING:** 305840
**NORTHING:** 6277059

**PIT No:** TP123
**PROJECT No:** 216255.00
**DATE:** 11/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per mm) |
|---|---|---|---|---|---|---|---|---|---|
| 35 | 0.0 | FILL/Sandy CLAY: dark grey-brown, medium to coarse sand, moist | | E | 0.1<br>0.2 | | | | |
| | 0.4 | FILL/Clayey SAND: grey-brown, with sandstone and igneous gravel, dry | | E | 0.5<br>0.6 | | | | |
| 1 | 1.0 | FILL/CLAY: orange-brown, with sandstone gravel, dry | | E* | 1.0<br>1.1 | | *PFAS | | 1 |
| | 1.3 | FILL/Crushed SANDSTONE: ranging fine gravel to boulder size | | E | 1.5 | | | | |
| | 1.6 | Pit discontinued at 1.6m<br>Target Depth Reached | | | 1.6 | | | | |
| 34 | 2 | | | | | | | | 2 |
| 33 | 3 | | | | | | | | 3 |
| 32 | 4 | | | | | | | | 4 |
| 31 | | | | | | | | | |

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** *Field Replicate BD05 taken at 1.0-1.1m depth

☐ 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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 35.0 AHD
**EASTING:** 305876
**NORTHING:** 6277052

**PIT No:** TP124
**PROJECT No:** 216255.00
**DATE:** 10/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per mm) |
|---|---|---|---|---|---|---|---|---|---|
| 35 | 0.0 | FILL/Sandy CLAY: dark grey-brown, trace roots and rootlets | | E | 0.1<br>0.2 | | pp = 400-500 | | |
| | 0.3 | FILL/Clayey SAND: brown-grey, with crushed sandstone gravel, dry | | E | 0.5<br>0.6 | | | | |
| | 0.7 | FILL/Clayey SAND: grey-brown, with sandstone and igneous gravel, dry | | E | 1.0<br>1.1 | | | | |
| 34 | 1 | At 1.4m: with 200mm sized sandstone boulders | | E | 1.5<br>1.6 | | | | 1 |
| 33 | 2 | | | E | 2.0<br>2.1 | | | | 2 |
| | 2.5 | FILL/Clayey SAND: orange-brown | | E | 2.5<br>2.6 | | | | |
| 32 | 3 | | | | | | | | 3 |
| | 3.0 | FILL/CLAY: orange-red, decomposed roots, trace transparent plastic wrapping | | E | 3.2<br>3.3 | | *PFAS<br>pp = 150-180 | | |
| | 3.5 | Pit discontinued at 3.5m<br>Target Depth Reached | | | | | | | |
| 31 | 4 | | | | | | | | 4 |

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** *PFAS sample collected

☐ 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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 38.2 AHD
**EASTING:** 305754
**NORTHING:** 6277067

**PIT No:** TP125
**PROJECT No:** 216255.00
**DATE:** 10/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per mm) |
|---|---|---|---|---|---|---|---|---|---|
| 38 | 0.0 | FILL/Sandy CLAY: dark grey-black, dry | | E* | 0.1 | | | | |
| | | | | | 0.2 | | | | |
| | 0.4 | FILL/Clayey SAND: medium to coarse, pale grey-brown | | E | 0.5 | | | | |
| | 0.6 | FILL/Crushed SANDSTONE: pale grey-orange | | | 0.6 | | | | |
| 37 | 1 | | | E | 1.0 | | | | 1 |
| | | | | | 1.1 | | | | |
| | 1.3 | FILL/CLAY: orange-brown | | E | 1.5 | | | | |
| | 1.6 | Pit discontinued at 1.6m on sandstone boulder | | | 1.6 | | | | |
| 36 | 2 | | | | | | | | 2 |
| 35 | 3 | | | | | | | | 3 |
| 34 | 4 | | | | | | | | 4 |

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** *Field Replicate BD02 taken at 0.1-0.2m depth

☐ 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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 37.4 AHD
**EASTING:** 305782
**NORTHING:** 6277052

**PIT No:** TP126
**PROJECT No:** 216255.00
**DATE:** 10/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per mm) 5 10 15 20 |
|---|---|---|---|---|---|---|---|---|---|
| 37 | 0.1 | FILL/Sandy CLAY: dark grey-brown, with crushed sandstone, trace roots and rootlets | | E* | 0.1<br>0.2 | | | | |
| | 0.4 | FILL/Crushed SANDSTONE | | | | | | | |
| | 0.5 | FILL/CLAY: orange-brown, dry | | E | 0.5<br>0.6 | | | | |
| 36 | 1.0 | FILL/Crushed SANDSTONE: orange-brown, dry | | E | 1.0<br>1.1 | | | | |
| | | | | E | 1.5 | | | | |
| | 1.6 | Pit discontinued at 1.6m on sandstone boulder | | | 1.6 | | | | |
| 35 | | | | | | | | | |
| 34 | | | | | | | | | |
| 33 | | | | | | | | | |

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** *Field Replicate BD03 taken at 0.1-0.2m depth

☐ 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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 36.6 AHD
**EASTING:** 305805
**NORTHING:** 6277038

**PIT No:** TP127
**PROJECT No:** 216255.00
**DATE:** 10/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per mm) 5 10 15 20 |
|---|---|---|---|---|---|---|---|---|---|
| 36 | 0.1 | FILL/Sandy CLAY: dark grey-brown, trace roots and rootlets, dry | | E | 0.1 | | | | |
| | 0.2 | | | | 0.2 | | | | |
| | 0.4 | FILL/Clayey SAND: grey-brown, dry | | | | | | | |
| | 0.5 | | | E | 0.5 | | | | |
| | 0.6 | | | | 0.6 | | | | |
| | 1.0 | FILL/CLAY: orange-brown, with sandstone boulders | | E | 1.0 | | | | |
| | 1.1 | | | | 1.1 | | | | |
| | 1.5 | | | E | 1.5 | | | | |
| 35 | 1.6 | Pit discontinued at 1.6m due to sandstone boulder | | | 1.6 | | | | |

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 36.0 AHD
**EASTING:** 305829
**NORTHING:** 6277025

**PIT No:** TP128
**PROJECT No:** 216255.00
**DATE:** 10/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per mm) |
|---|---|---|---|---|---|---|---|---|---|
| 36 | 0.0 | FILL/Sandy CLAY: dark grey-brown, medium to coarse sand, trace roots and rootlets, moist | | | | | | | |
| | 0.4 | FILL/Clayey SAND: orange-brown, with crushed sandstone | | | | | | | |
| | 0.7 | FILL/Crushed SANDSTONE: pale grey-brown | | | | | | | |
| 35 | 1.0 | FILL/CLAY: orange-brown, dry | | | | | | | 1 |
| | 1.2 | FILL/Crushed SANDSTONE BOULDERS | | | | | | | |
| | 1.7 | Pit discontinued at 1.7m on sandstone boulder | | | | | | | |
| 34 | 2 | | | | | | | | 2 |
| 33 | 3 | | | | | | | | 3 |
| 32 | 4 | | | | | | | | 4 |

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 35.3 AHD
**EASTING:** 305850
**NORTHING:** 6277018

**PIT No:** TP129
**PROJECT No:** 216255.00
**DATE:** 10/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per mm) 5 10 15 20 |
|---|---|---|---|---|---|---|---|---|---|
| 35 | 0.1 | FILL/Sandy CLAY: dark grey-brown, with sandstone and igneous gravel, dry | | E | 0.1<br>0.2 | | | | |
| | 0.4 | FILL/Clayey SAND: orange-brown, dry | | E | 0.5<br>0.6 | | | | |
| | 1 | | | E* | 1.1 | | | | 1 |
| 34 | 1.2 | Pit discontinued at 1.2m on sandstone boulder | | | 1.2 | | | | |
| | 2 | | | | | | | | 2 |
| 33 | | | | | | | | | |
| | 3 | | | | | | | | 3 |
| 32 | | | | | | | | | |
| | 4 | | | | | | | | 4 |
| 31 | | | | | | | | | |

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** *Field Replicate BD04 taken at 1.1-1.2m depth

☐ 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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

Douglas Partners
Geotechnics / Environment / Groundwater

# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 37.8 AHD
**EASTING:** 305751
**NORTHING:** 6277026

**PIT No:** TP130
**PROJECT No:** 216255.00
**DATE:** 10/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per mm) |
|---|---|---|---|---|---|---|---|---|---|
| 37 | 0.0 | FILL/Sandy CLAY: dark grey-brown, medium to coarse sand, with sandstone and igneous gravel, moist | | E | 0.1 | | | | |
| | | | | | 0.2 | | | | |
| | 0.3 | FILL/Clayey SAND: medium to coarse, with sandstone gravel, dry | | E | 0.5 | | | | |
| | | | | | 0.6 | | | | |
| | 1 | | | E | 1.0 | | | | 1 |
| | | | | | 1.1 | | | | |
| | 1.3 | FILL/Crushed SANDSTONE: pale grey-brown, with sandstone boulders | | E | 1.5 | | | | |
| 36 | 1.6 | Pit discontinued at 1.6m due to refusal on sandstone boulder | | | 1.6 | | | | |
| | 2 | | | | | | | | 2 |
| 35 | 3 | | | | | | | | 3 |
| 34 | 4 | | | | | | | | 4 |
| 33 | | | | | | | | | |

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 36.9 AHD
**EASTING:** 305782
**NORTHING:** 6277017

**PIT No:** TP131
**PROJECT No:** 216255.00
**DATE:** 10/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per mm) |
|---|---|---|---|---|---|---|---|---|---|
| 36 | 0.0 | FILL/Sandy CLAY: dark grey-brown, medium to coarse sand, with sandstone and igneous gravel, moist | | E | 0.1 | | *PFAS | | |
| | | | | | 0.2 | | | | |
| | 0.3 | FILL/Clayey SAND: grey-brown, with crushed sandstone gravel | | | | | | | |
| | | | | E | 0.5 | | | | |
| | | | | | 0.6 | | | | |
| | 1.0 | FILL/Crushed SANDSTONE: pale grey-brown, with sandstone boulders | | E | 1.0 | | | | 1 |
| | | | | | 1.1 | | | | |
| | | | | E | 1.5 | | | | |
| | | | | | 1.6 | | | | |
| 35 | 2.0 | | | E | 2.0 | | | | 2 |
| | | | | | 2.1 | | | | |
| | 2.2 | FILL/Clayey SAND: grey-brown, with crushed sandstone gravel | | | | | | | |
| 34 | 3.0 | | | E | 3.0 | | *PFAS | | 3 |
| | 3.1 | Pit discontinued at 3.1m<br>Target Depth Reached | | | 3.1 | | | | |
| 33 | 4.0 | | | | | | | | 4 |
| 32 | | | | | | | | | |

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 36.2 AHD
**EASTING:** 305802
**NORTHING:** 6276998

**PIT No:** TP132
**PROJECT No:** 216255.00
**DATE:** 10/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per mm) |
|---|---|---|---|---|---|---|---|---|---|
| 36 | 0.0 | FILL/Sandy CLAY: grey-brown, medium to coarse sand, with sandstone and igneous gravel, trace roots and rootlets, dry | | E | 0.1<br>0.2 | | | | |
| | 0.4 | FILL/Clayey SAND: grey-orange, with sandstone gravel | | E | 0.5<br>0.6 | | | | |
| 35 | 1 | | | E | 1.0<br>1.1 | | | | 1 |
| | 1.3 | FILL/Crushed SANDSTONE: orange-pale grey | | E | 1.5<br>1.6 | | | | |
| 34 | 2 | | | E | 2.0<br>2.1 | | * PFAS | | 2 |
| | 2.0 | FILL/Clayey SAND: medium to coarse, pale grey-brown, dry | | | | | | | |
| | 2.8 | CLAY: orange-brown | | | | | | | |
| 33 | 3 | | | | | | | | 3 |
| | 3.0 | Pit discontinued at 3.0m<br>Target Depth Reached | | | | | | | |
| 32 | 4 | | | | | | | | 4 |

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** *PFAS sample collected

☐ 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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# TEST PIT LOG

**CLIENT:** School Infrastructure NSW
**PROJECT:** Proposed Gables Public School
**LOCATION:** Fontana Drive, Gables

**SURFACE LEVEL:** 35.5 AHD
**EASTING:** 305828
**NORTHING:** 6276987

**PIT No:** TP133
**PROJECT No:** 216255.00
**DATE:** 10/8/2022
**SHEET** 1 OF 1

| RL | Depth (m) | Description of Strata | Graphic Log | Sampling & In Situ Testing: Type | Depth | Sample | Results & Comments | Water | Dynamic Penetrometer Test (blows per mm) |
|---|---|---|---|---|---|---|---|---|---|
| 35 | 0.0 | FILL/Sandy CLAY: grey-brown, with sandstone and igneous gravel, dry | | E* | 0.1–0.2 | | | | |
| | 0.5 | FILL/Clayey SAND: brown-grey, with crushed sandstone and igneous rock, dry | | E | 0.5–0.6 | | | | |
| | 1 | | | E | 1.0–1.1 | | | | |
| | 1.3 | Pit discontinued at 1.3m due to refusal on sandstone boulder and well compacted sandstone | | | | | | | |
| 34 | 2 | | | | | | | | |
| 33 | 3 | | | | | | | | |
| 32 | 4 | | | | | | | | |
| 31 | | | | | | | | | |

**RIG:** 3.5t Excavator with 450mm bucket

**LOGGED:** VV

**SURVEY DATUM:** MGA94 Zone 56

**WATER OBSERVATIONS:** No free groundwater observed

**REMARKS:** *Field Replicate BD01 taken at 0.1-0.2m depth

☐ 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 | $U_x$ | Tube sample (x mm dia.) | PL(D) | Point load diametral test Is(50) (MPa) |
| C | Core drilling | W | Water sample | pp | Pocket penetrometer (kPa) |
| D | Disturbed sample | ▷ | Water seep | S | Standard penetration test |
| E | Environmental sample | ▼ | Water level | V | Shear vane (kPa) |

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# Appendix D

Laboratory Test Results

# Material Test Report

Douglas Partners
Geotechnics / Environment / Groundwater
Douglas Partners Pty Ltd
Sydney Laboratory
96 Hermitage Road West Ryde NSW 2114
Phone: (02) 9809 0666
Email: andrew.hutchings@douglaspartners.com.au

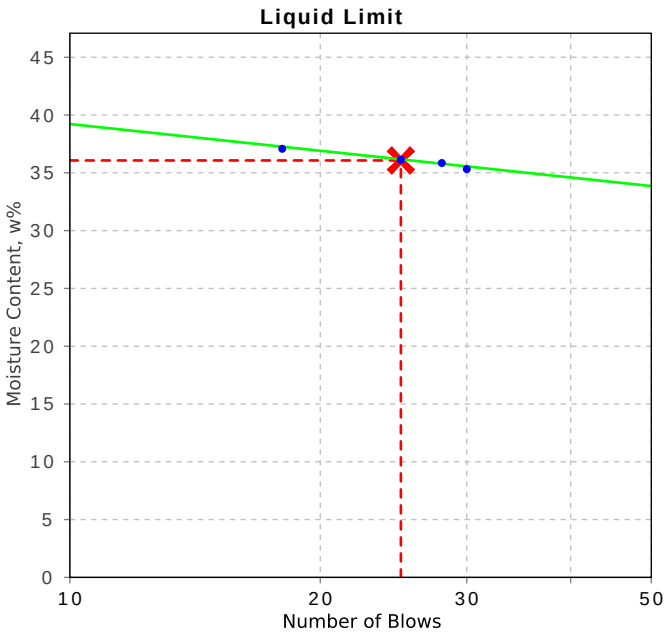
Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Andrew Hutchings
Laboratory Manager
Laboratory Accreditation Number: 828

| | |
|---|---|
| **Report Number:** | **216255.00-1** |
| **Issue Number:** | 1 |
| **Date Issued:** | 31/08/2022 |
| **Client:** | School Infrastructure NSW<br>Level 8, SYDNEY NSW 2000 |
| **Contact:** | Richard Moyle |
| **Project Number:** | 216255.00 |
| **Project Name:** | Box Hill (The Gables) New Public School |
| **Project Location:** | Lot 301, Fontana Drive, Box Hill NSW |
| **Work Request:** | 9463 |
| **Sample Number:** | SY-9463A |
| **Date Sampled:** | 11/08/2022 |
| **Dates Tested:** | 12/08/2022 - 23/08/2022 |
| **Sampling Method:** | Sampled by Engineering Department<br>*The results apply to the sample as received* |
| **Sample Location:** | **BH102 (2.5-2.9m)** |
| **Material:** | FILL/CLAY: pale brown, trace silt |

| Atterberg Limit (AS1289 3.1.1 & 3.2.1 & 3.3.1) | | Min | Max |
|---|---|---|---|
| Sample History | Oven Dried | | |
| Preparation Method | Dry Sieve | | |
| Liquid Limit (%) | 36 | | |
| Plastic Limit (%) | 14 | | |
| **Plasticity Index (%)** | **22** | | |

| Linear Shrinkage (AS1289 3.4.1) | | Min | Max |
|---|---|---|---|
| Moisture Condition Determined By | AS 1289.3.1.1 | | |
| Linear Shrinkage (%) | 11.5 | | |
| Cracking Crumbling Curling | None | | |



# Material Test Report

Douglas Partners
Geotechnics / Environment / Groundwater
Douglas Partners Pty Ltd
Sydney Laboratory
96 Hermitage Road West Ryde NSW 2114
Phone: (02) 9809 0666
Email: andrew.hutchings@douglaspartners.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

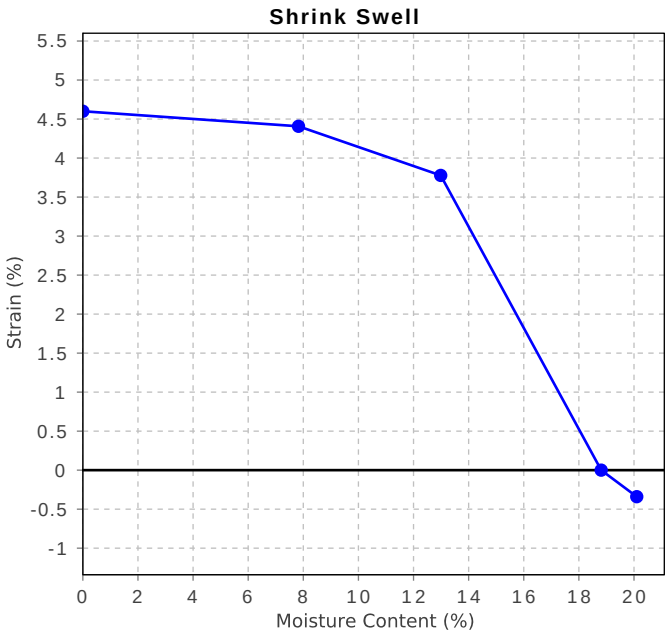
Approved Signatory: Andrew Hutchings
Laboratory Manager
Laboratory Accreditation Number: 828

| | |
|---|---|
| **Report Number:** | **216255.00-1** |
| **Issue Number:** | 1 |
| **Date Issued:** | 31/08/2022 |
| **Client:** | School Infrastructure NSW<br>Level 8, SYDNEY NSW 2000 |
| **Contact:** | Richard Moyle |
| **Project Number:** | 216255.00 |
| **Project Name:** | Box Hill (The Gables) New Public School |
| **Project Location:** | Lot 301, Fontana Drive, Box Hill NSW |
| **Work Request:** | 9463 |
| **Sample Number:** | SY-9463B |
| **Date Sampled:** | 11/08/2022 |
| **Dates Tested:** | 12/08/2022 - 22/08/2022 |
| **Sampling Method:** | Sampled by Engineering Department<br>*The results apply to the sample as received* |
| **Sample Location:** | **BH105 (2.5-2.9m)** |
| **Material:** | Silty CLAY: pale brown |

| Shrink Swell Index (AS 1289 7.1.1 & 2.1.1) | |
|---|---|
| **Iss (%)** | **2.6** |
| Visual Description | Silty CLAY: pale brown |
| * Shrink Swell Index (Iss) reported as the percentage vertical strain per pF change in suction. | |

| Core Shrinkage Test | |
|---|---|
| **Shrinkage Strain - Oven Dried (%)** | **4.6** |
| Estimated % by volume of significant inert inclusions | 1 |
| Cracking | Slightly Cracked |
| Crumbling | No |
| Moisture Content (%) | 18.8 |

| Swell Test | |
|---|---|
| Initial Pocket Penetrometer (kPa) | >400 |
| Final Pocket Penetrometer (kPa) | 390 |
| Initial Moisture Content (%) | 17.6 |
| Final Moisture Content (%) | 20.1 |
| **Swell (%)** | **0.3** |
| * NATA Accreditation does not cover the performance of pocket penetrometer readings. | |



# Material Test Report

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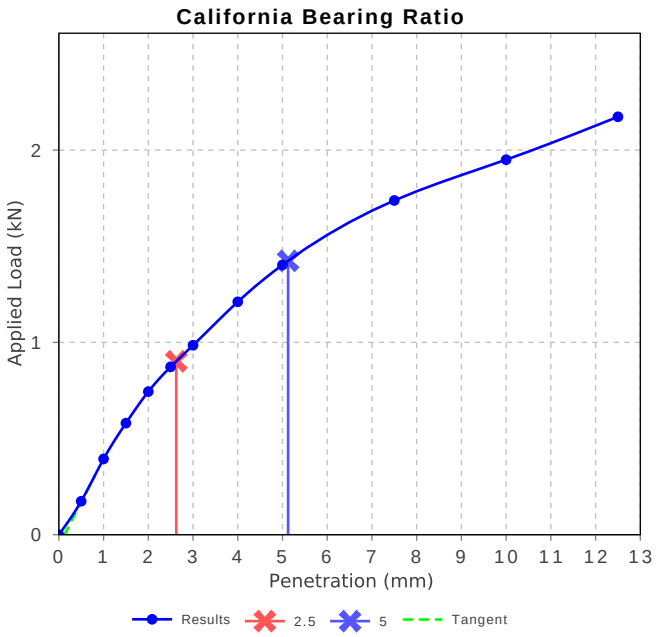
Approved Signatory: Andrew Hutchings
Laboratory Manager
Laboratory Accreditation Number: 828

**Report Number:** **216255.00-1**
**Issue Number:** 1
**Date Issued:** 31/08/2022
**Client:** School Infrastructure NSW
Level 8, SYDNEY NSW 2000
**Contact:** Richard Moyle
**Project Number:** 216255.00
**Project Name:** Box Hill (The Gables) New Public School
**Project Location:** Lot 301, Fontana Drive, Box Hill NSW
**Work Request:** 9463
**Sample Number:** SY-9463C
**Date Sampled:** 11/08/2022
**Dates Tested:** 12/08/2022 - 29/08/2022
**Sampling Method:** Sampled by Engineering Department
*The results apply to the sample as received*
**Sample Location:** **BH106 (0.3-1.0m)**
**Material:** Sandy CLAY: mottled brown pale grey, fine sand

| California Bearing Ratio (AS 1289 6.1.1 & 2.1.1) | | Min | Max |
|---|---|---|---|
| CBR taken at | 5 mm | | |
| CBR % | **7** | | |
| Method of Compactive Effort | Standard | | |
| Method used to Determine MDD | AS 1289 5.1.1 & 2.1.1 | | |
| Method used to Determine Plasticity | Visual Assessment | | |
| Maximum Dry Density (t/m$^3$) | 1.89 | | |
| Optimum Moisture Content (%) | 14.5 | | |
| Laboratory Density Ratio (%) | 100.5 | | |
| Laboratory Moisture Ratio (%) | 98.0 | | |
| Dry Density after Soaking (t/m$^3$) | 1.88 | | |
| Field Moisture Content (%) | 13.8 | | |
| Moisture Content at Placement (%) | 14.0 | | |
| Moisture Content Top 30mm (%) | 15.7 | | |
| Moisture Content Rest of Sample (%) | 15.1 | | |
| Mass Surcharge (kg) | 4.5 | | |
| Soaking Period (days) | 4 | | |
| Curing Hours | 135.7 | | |
| Swell (%) | 0.5 | | |
| Oversize Material (mm) | 19 | | |
| Oversize Material Included | Excluded | | |
| Oversize Material (%) | 0.7 | | |



# Material Test Report

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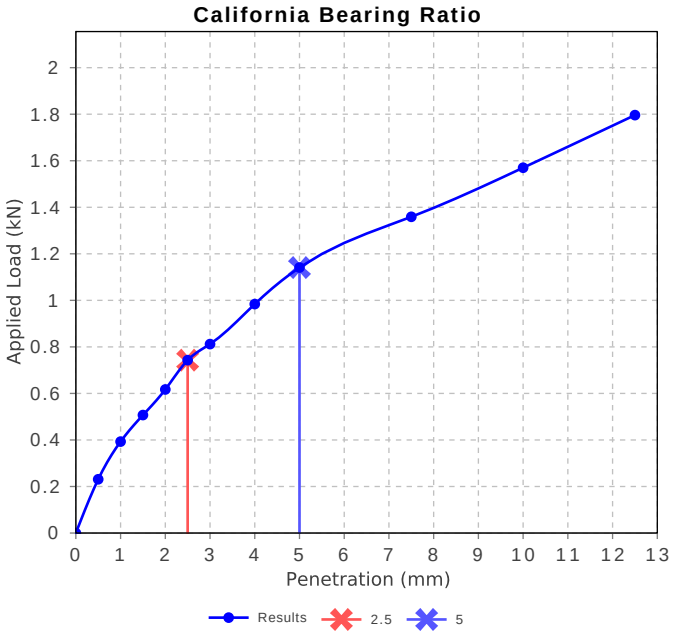
Approved Signatory: Andrew Hutchings
Laboratory Manager
Laboratory Accreditation Number: 828

**Report Number:** **216255.00-1**
**Issue Number:** 1
**Date Issued:** 31/08/2022
**Client:** School Infrastructure NSW
Level 8, SYDNEY NSW 2000
**Contact:** Richard Moyle
**Project Number:** 216255.00
**Project Name:** Box Hill (The Gables) New Public School
**Project Location:** Lot 301, Fontana Drive, Box Hill NSW
**Work Request:** 9463
**Sample Number:** SY-9463D
**Date Sampled:** 11/08/2022
**Dates Tested:** 12/08/2022 - 29/08/2022
**Sampling Method:** Sampled by Engineering Department
*The results apply to the sample as received*
**Sample Location:** **BH105 (0.2-1.0m)**
**Material:** FILL/Sandy CLAY: pale grey-brown, find sand, trace sandstone gravel and boulders

| California Bearing Ratio (AS 1289 6.1.1 & 2.1.1) | | Min | Max |
|---|---|---|---|
| CBR taken at | 5 mm | | |
| CBR % | **6** | | |
| Method of Compactive Effort | Standard | | |
| Method used to Determine MDD | AS 1289 5.1.1 & 2.1.1 | | |
| Method used to Determine Plasticity | Visual Assessment | | |
| Maximum Dry Density (t/m$^3$) | 1.92 | | |
| Optimum Moisture Content (%) | 13.0 | | |
| Laboratory Density Ratio (%) | 100.0 | | |
| Laboratory Moisture Ratio (%) | 99.0 | | |
| Dry Density after Soaking (t/m$^3$) | 1.91 | | |
| Field Moisture Content (%) | 11.6 | | |
| Moisture Content at Placement (%) | 12.9 | | |
| Moisture Content Top 30mm (%) | 15.4 | | |
| Moisture Content Rest of Sample (%) | 14.9 | | |
| Mass Surcharge (kg) | 4.5 | | |
| Soaking Period (days) | 4 | | |
| Curing Hours | 49.1 | | |
| Swell (%) | 0.5 | | |
| Oversize Material (mm) | 19 | | |
| Oversize Material Included | Excluded | | |
| Oversize Material (%) | 1.2 | | |



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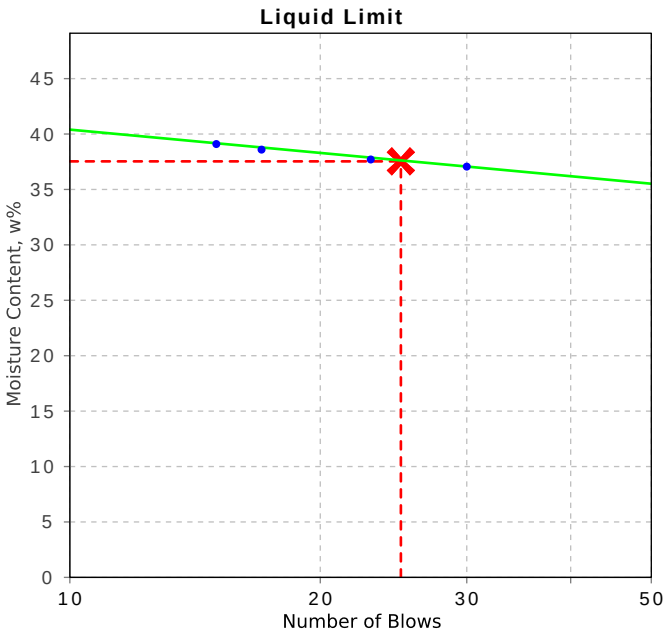
**Report Number:** **216255.00-1**
**Issue Number:** 1
**Date Issued:** 31/08/2022
**Client:** School Infrastructure NSW
Level 8, SYDNEY NSW 2000
**Contact:** Richard Moyle
**Project Number:** 216255.00
**Project Name:** Box Hill (The Gables) New Public School
**Project Location:** Lot 301, Fontana Drive, Box Hill NSW
**Work Request:** 9463
**Sample Number:** SY-9463E
**Date Sampled:** 11/08/2022
**Dates Tested:** 12/08/2022 - 17/08/2022
**Sampling Method:** Sampled by Engineering Department
*The results apply to the sample as received*
**Sample Location:** **BH101 (4-4.45m)**
**Material:** FILL/Silty CLAY: pale brown, trace ironstone

| Atterberg Limit (AS1289 3.1.1 & 3.2.1 & 3.3.1) | | Min | Max |
|---|---|---|---|
| Sample History | Oven Dried | | |
| Preparation Method | Dry Sieve | | |
| Liquid Limit (%) | 38 | | |
| Plastic Limit (%) | 18 | | |
| **Plasticity Index (%)** | **20** | | |

| Linear Shrinkage (AS1289 3.4.1) | | Min | Max |
|---|---|---|---|
| Moisture Condition Determined By | AS 1289.3.1.1 | | |
| Linear Shrinkage (%) | 10.5 | | |
| Cracking Crumbling Curling | None | | |



# Material Test Report

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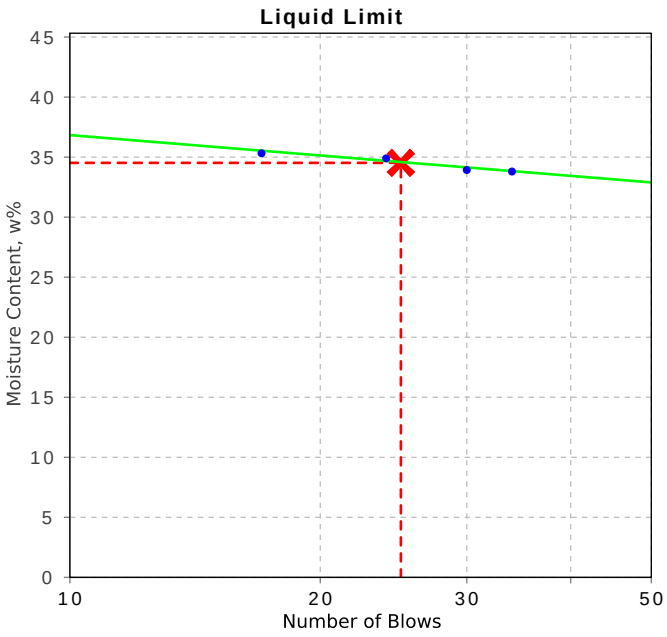
Approved Signatory: Andrew Hutchings
Laboratory Manager
Laboratory Accreditation Number: 828

**Report Number:** **216255.00-1**
**Issue Number:** 1
**Date Issued:** 31/08/2022
**Client:** School Infrastructure NSW
Level 8, SYDNEY NSW 2000
**Contact:** Richard Moyle
**Project Number:** 216255.00
**Project Name:** Box Hill (The Gables) New Public School
**Project Location:** Lot 301, Fontana Drive, Box Hill NSW
**Work Request:** 9463
**Sample Number:** SY-9463F
**Date Sampled:** 11/08/2022
**Dates Tested:** 12/08/2022 - 17/08/2022
**Sampling Method:** Sampled by Engineering Department
*The results apply to the sample as received*
**Sample Location:** **BH103 (0.9-1.0m)**
**Material:** FILL/CLAY: brown

| Atterberg Limit (AS1289 3.1.1 & 3.2.1 & 3.3.1) | | Min | Max |
|---|---|---|---|
| Sample History | Oven Dried | | |
| Preparation Method | Dry Sieve | | |
| Liquid Limit (%) | 35 | | |
| Plastic Limit (%) | 15 | | |
| **Plasticity Index (%)** | **20** | | |

| Linear Shrinkage (AS1289 3.4.1) | | Min | Max |
|---|---|---|---|
| Moisture Condition Determined By | AS 1289.3.1.1 | | |
| Linear Shrinkage (%) | 11.5 | | |
| Cracking Crumbling Curling | None | | |



# Material Test Report

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Sydney Laboratory
96 Hermitage Road West Ryde NSW 2114
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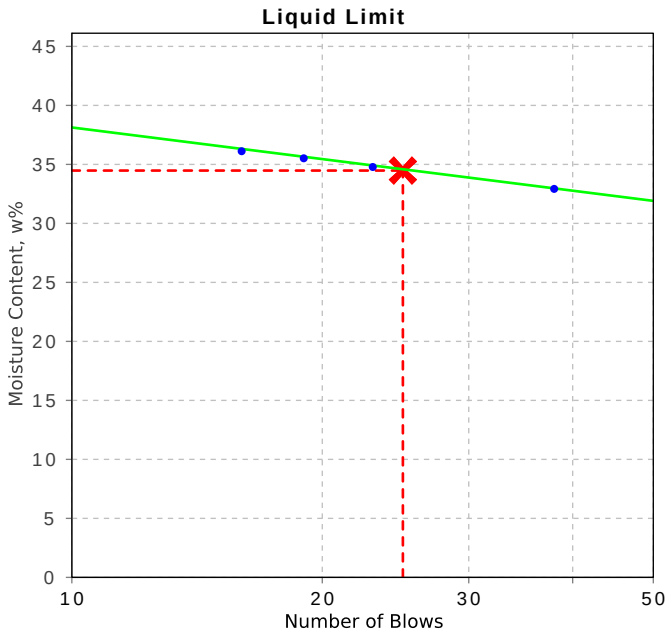
Approved Signatory: Andrew Hutchings
Laboratory Manager
Laboratory Accreditation Number: 828

**Report Number:** **216255.00-1**
**Issue Number:** 1
**Date Issued:** 31/08/2022
**Client:** School Infrastructure NSW
Level 8, SYDNEY NSW 2000
**Contact:** Richard Moyle
**Project Number:** 216255.00
**Project Name:** Box Hill (The Gables) New Public School
**Project Location:** Lot 301, Fontana Drive, Box Hill NSW
**Work Request:** 9463
**Sample Number:** SY-9463G
**Date Sampled:** 11/08/2022
**Dates Tested:** 12/08/2022 - 16/08/2022
**Sampling Method:** Sampled by Engineering Department
*The results apply to the sample as received*
**Sample Location:** **BH107 (2.5-2.95m)**
**Material:** FILL/Sandy CLAY: pale grey and brown

| Atterberg Limit (AS1289 3.1.1 & 3.2.1 & 3.3.1) | | Min | Max |
|---|---|---|---|
| Sample History | Oven Dried | | |
| Preparation Method | Dry Sieve | | |
| Liquid Limit (%) | 34 | | |
| Plastic Limit (%) | 15 | | |
| **Plasticity Index (%)** | **19** | | |

| Linear Shrinkage (AS1289 3.4.1) | | Min | Max |
|---|---|---|---|
| Moisture Condition Determined By | AS 1289.3.1.1 | | |
| Linear Shrinkage (%) | 10.5 | | |
| Cracking Crumbling Curling | Curling | | |



# Material Test Report

Douglas Partners
Geotechnics / Environment / Groundwater
Douglas Partners Pty Ltd
Sydney Laboratory
96 Hermitage Road West Ryde NSW 2114
Phone: (02) 9809 0666
Email: andrew.hutchings@douglaspartners.com.au

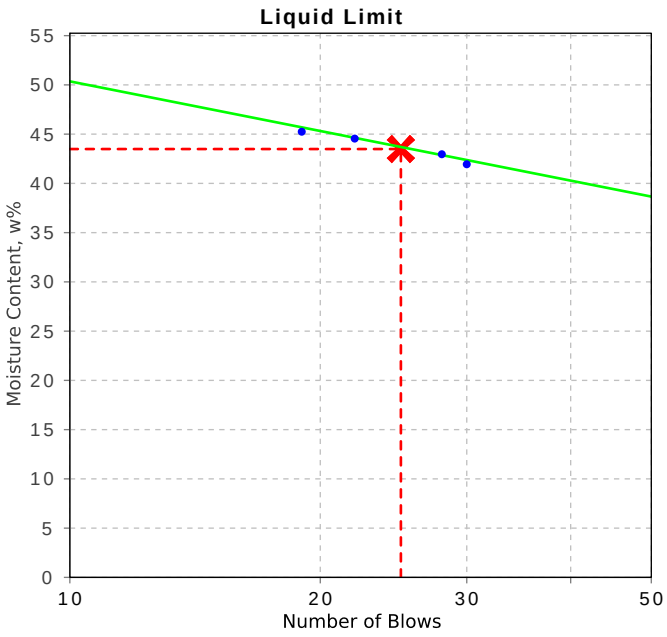
Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Andrew Hutchings
Laboratory Manager
Laboratory Accreditation Number: 828

**Report Number:** **216255.00-1**
**Issue Number:** 1
**Date Issued:** 31/08/2022
**Client:** School Infrastructure NSW
Level 8, SYDNEY NSW 2000
**Contact:** Richard Moyle
**Project Number:** 216255.00
**Project Name:** Box Hill (The Gables) New Public School
**Project Location:** Lot 301, Fontana Drive, Box Hill NSW
**Work Request:** 9463
**Sample Number:** SY-9463H
**Date Sampled:** 11/08/2022
**Dates Tested:** 12/08/2022 - 16/08/2022
**Sampling Method:** Sampled by Engineering Department
*The results apply to the sample as received*
**Sample Location:** **BH104 (2.5-2.95m)**
**Material:** CLAY: pale brown

| Atterberg Limit (AS1289 3.1.1 & 3.2.1 & 3.3.1) | | Min | Max |
|---|---|---|---|
| Sample History | Oven Dried | | |
| Preparation Method | Dry Sieve | | |
| Liquid Limit (%) | 43 | | |
| Plastic Limit (%) | 16 | | |
| **Plasticity Index (%)** | **27** | | |

| Linear Shrinkage (AS1289 3.4.1) | | Min | Max |
|---|---|---|---|
| Moisture Condition Determined By | AS 1289.3.1.1 | | |
| Linear Shrinkage (%) | 14.0 | | |
| Cracking Crumbling Curling | Curling | | |



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www.envirolab.com.au

# CERTIFICATE OF ANALYSIS 302987

## Client Details

| | |
|---|---|
| **Client** | Douglas Partners Pty Ltd |
| **Attention** | Joshua Valencic |
| **Address** | 96 Hermitage Rd, West Ryde, NSW, 2114 |

## Sample Details

| | |
|---|---|
| **Your Reference** | **216255.00 - The Gables Public School** |
| **Number of Samples** | 6 Soil |
| **Date samples received** | 12/08/2022 |
| **Date completed instructions received** | 12/08/2022 |

## 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.

## Report Details

| | |
|---|---|
| **Date results requested by** | 19/08/2022 |
| **Date of Issue** | 18/08/2022 |

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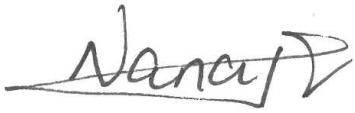
Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

**Results Approved By**
Priya Samarawickrama, Senior Chemist

**Authorised By**



Nancy Zhang, Laboratory Manager

| Soil Aggressivity | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference | | 302987-1 | 302987-2 | 302987-3 | 302987-4 | 302987-5 |
| Your Reference | UNITS | BH101 | BH102 | BH103 | BH104 | BH106 |
| Depth | | 0.9-1 | 1.9-2 | 4-4.45 | 0.1-0.2 | 2.5-2.95 |
| Date Sampled | | 11/08/2022 | 12/08/2022 | 13/08/2022 | 14/08/2022 | 15/08/2022 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| pH 1:5 soil:water | pH Units | 4.7 | 5.9 | 5.3 | 6.5 | 6.0 |
| Electrical Conductivity 1:5 soil:water | µS/cm | 250 | 250 | 300 | 270 | 680 |
| Chloride, Cl 1:5 soil:water | mg/kg | 300 | 260 | 340 | 200 | 810 |
| Sulphate, SO4 1:5 soil:water | mg/kg | 52 | 67 | 77 | 170 | 190 |

| Soil Aggressivity | | |
|---|---|---|
| Our Reference | | 302987-6 |
| Your Reference | UNITS | BH107 |
| Depth | | 1-1.45 |
| Date Sampled | | 16/08/2022 |
| Type of sample | | Soil |
| pH 1:5 soil:water | pH Units | 5.7 |
| Electrical Conductivity 1:5 soil:water | µS/cm | 96 |
| Chloride, Cl 1:5 soil:water | mg/kg | 91 |
| Sulphate, SO4 1:5 soil:water | mg/kg | 30 |

| 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.<br>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 | [NT] |
| pH 1:5 soil:water | pH Units | | Inorg-001 | [NT] | 1 | 4.7 | 4.7 | 0 | 101 | [NT] |
| Electrical Conductivity 1:5 soil:water | µS/cm | 1 | Inorg-002 | <1 | 1 | 250 | 280 | 11 | 104 | [NT] |
| Chloride, Cl 1:5 soil:water | mg/kg | 10 | Inorg-081 | <10 | 1 | 300 | 320 | 6 | 97 | [NT] |
| Sulphate, SO4 1:5 soil:water | mg/kg | 10 | Inorg-081 | <10 | 1 | 52 | 56 | 7 | 89 | [NT] |

## Result Definitions

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

## Quality Control Definitions

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

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

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

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

## Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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