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Our Ref: PSM4693-012L REV5

21 January 2025

Project Lead, Major Projects
The Department of Education
Level 8, 259 George Street
Sydney NSW 2000
Sonia.DaSilva1@det.nsw.edu.au

Attention: Sonia Mallos

Dear Sonia

RE: NEW HIGH SCHOOL FOR SCHOFIELDS AND TALLAWONG GEOTECHNICAL INVESTIGATION

1. Introduction

This geotechnical investigation report has been prepared to support a Review of Environmental Factors (REF) for the NSW Department of Education (DoE) for the construction and operation of the new Schofields - Tallawong High School (the activity).

The purpose of the REF is to assess the potential environmental impacts of the activity prescribed by *State Environmental Planning Policy (Transport and Infrastructure) 2021* (T&I SEPP) as "development permitted without consent" on land carried out by or on behalf of a public authority under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The activity is to be undertaken pursuant to Chapter 3, Part 3.4, Section 3.37A of the T&I SEPP.

This document has been prepared in accordance with the relevant aspects of the *Guidelines for Division 5.1 assessments* (the Guidelines) by the Department of Planning, Housing and Infrastructure (DPHI). The purpose of this report is to present the results of the geotechnical investigation undertaken by PSM for The Department of Education (DoE) for the proposed new Schofields - Tallawong High School.

Note, PSM had previously completed a geotechnical investigation for Landcom in 2022 where the proposed Schofields - Tallawong High School boundary is located within the boundary of the previous work, refer to Figure 1 (Ref to PSM4935-006L REV 1, dated 3 November 2022). For completeness, relevant investigation results of the previous investigation are reproduced in this report.

Figure 2 presents the site locality plan of the Schofields - Tallawong High School.

2. Site Description

The site is known as 201 Guntawong Road, Tallawong, NSW, 2762 (the site), and is legally described as part of Lot 1 in Deposited Plan 1283186. The site is located at the corner of Guntawong Road and Clarke Street, Tallawong and is approximately 4 hectares in area. The site has an approximately 100-metre-long frontage to Guntawong Road along its northern boundary. Nirmal Street provides a partial frontage along the eastern boundary of the site with plans to extend Nirmal Street to provide a future connection to Guntawong Road.

The site is predominantly cleared land and consists of grassland with several patches of remnant native vegetation particularly within the northern portion of the site. As a result of precinct wide rezonings, the surrounding locality is currently transitioning from a semi-rural residential area to a highly urbanised area with new low to me-dium density residential development with supporting services. The site is located approximately 1.5km to the north west of Tallawong Metro Station and is also serviced by an existing bus stop along Guntawong Road.

Inset 1 below provides an aerial image of the site.

Inset 1: Aerial Photograph of Site (Source: Urbis, 2024)

3. Proposed Activity Description

The proposed activity is for the construction and operation of a new high school known as Schofields - Tallawong High School. The new high school will accommodate up to 1,000 students. The school will provide 49 permanent teaching spaces (PTS), and 3 support teaching spaces (STS) across three buildings.

The buildings will be three-storey in height and will include teaching spaces, specialist learning hubs, a library, administrative areas and a staff hub. Additional core facilities are also proposed including a standalone school hall, a carpark, a pick up and drop off zone along Nirmal Street, two sports courts and a sports field.

Specifically, the proposal involves the following:

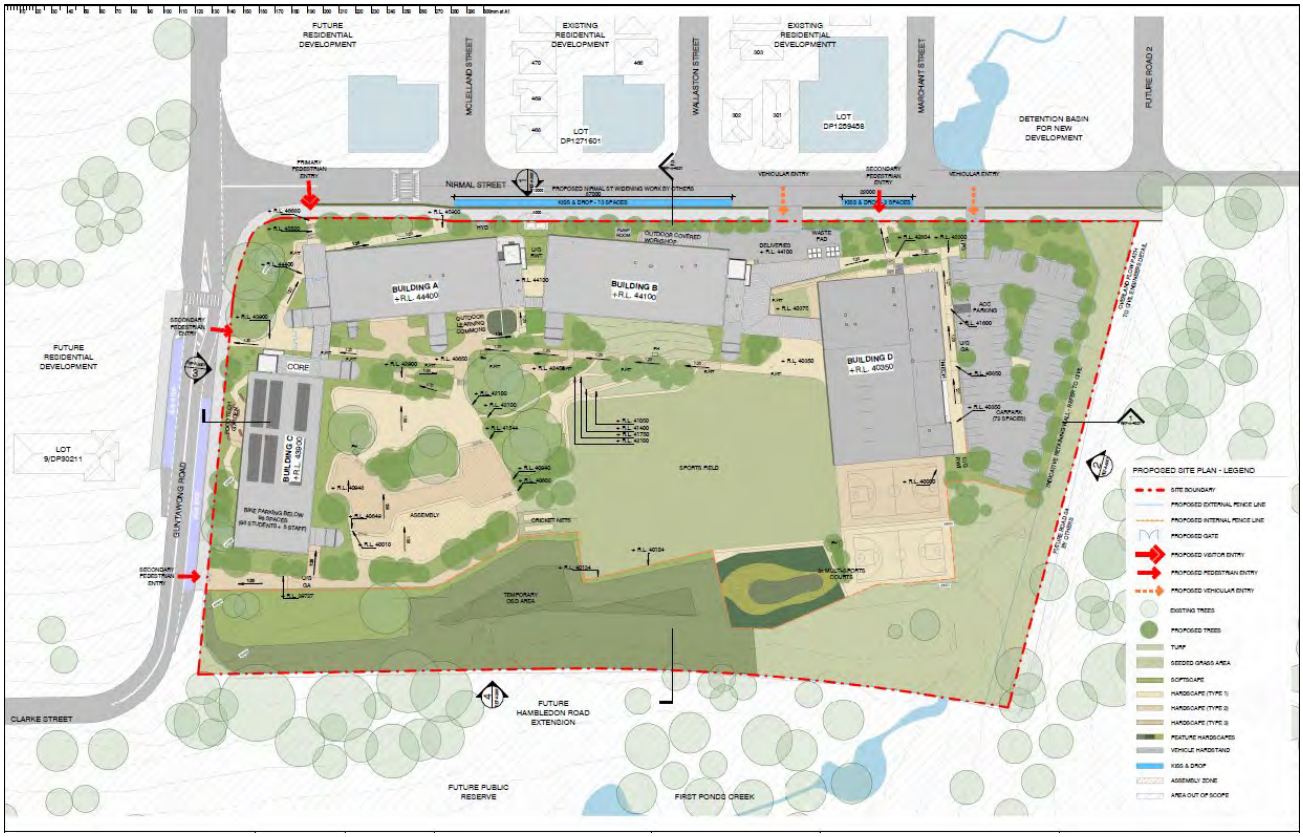
- Three learning hubs (three-storeys in height) accommodating 49 general teaching spaces and 3 support learning units (SLUs).
- Other core facilities including amenities, library, staff hub and administrative areas.
- Standalone school hall.
- Separate carpark with 72 spaces.
- Kiss and drop zone along Nirmal Street.
- Open play space including sports courts and sports field.

- Public domain works.

The proposed site access arrangements are as follows:

- Main pedestrian entrance to be located off Nirmal Street.
- Kiss and drop zone proposed along Nirmal Street.
- Onsite parking access via Nirmal Street.

Inset 2 provides an extract of the proposed site plan.



Inset 2: Proposed Site Plan (Source: djrd Architects, 2024)

4. Site History

4.1 Historical Aerial Photographs

A review of historical aerial photographs from the NSW Government's Historical Imagery database and Nearmap had previously been undertaken to assess the historical land usage of the wider project area. A summary of the historical changes at the site is outlined below:

- 1947: Undeveloped vacant land. Scattered trees and heavy vegetation coverage across site with the outlines of Frist Pounds Creek observed south of The Site.
- 1975: Partial land clearance observed for the site area since 1947 photograph. Small buildings and structures for agricultural use have been constructed in the centre and northeast portions of The Site.

The site environment does not appear to have changed significantly since 1975.

Appendix A presents a compilation of historical aerial photographs between 1947 and 2024 for the previous site area.

5. 2022 Geotechnical Investigation for Landcom

5.1 Fieldwork – 26 to 28 September 2022

The Stage 1 investigation fieldwork was carried out between 26 to 28 September 2022, during which:

- Five (5) boreholes were drilled to depths of between 0.7 m to 7.1 m using a ute mounted rig
- Fifteen (15) testpits were excavated to depths of between 0.65 to 3.0 m using a 5 tonne excavator
- Dynamic Cone Penetrometer (DCP) testings were performed at the majority of the borehole and test pit locations.

Figure 1 presents an overview of the previous project area and the approximate testing locations.

Soil samples collected from the boreholes and testpits were sent to geotechnical laboratories for the following testing:

- 5 x California Bearing Ratio (CBR): Tests were undertaken on 4 day-soaked samples compacted to 98% MDD at OMC, with a 4.5 kg surcharge.
- 4 x Shrink-Swell index tests.
- 4 x Atterberg limit tests.
- 4 x Moisture Content tests.
- 4 x Aggressivity and Salinity tests.

Refer to PSM4693-006L Rev1 for details of the 2022 investigation.

The relevant tabulated borehole and test pit logs, DCP test results, CBR test results, Shrink Swell Index test results, Atterberg Limits Test and moisture content test results and aggressivity and salinity laboratory test certificates from the 2022 investigation are reproduced in Appendices B to G respectively.

6. 2024 Investigation for The Department of Education

6.1 Fieldwork

The fieldwork was undertaken between 2 to 4 October 2024 and included the following:

- Drilling of five (5) boreholes with a 6-tonne truck mounted drilling rig to depths of between 8.66 m and 11.1 m below ground level (mbgl). The holes were advanced using a rotary auger drill with a tungsten carbide (Tc) drill bit in some FILL units and typically with a V-shaped drill bit in soil and some weathered rock units until practical refusal. This was followed with triple tube coring in NMLC size to recover bedrock.
- Piezometers were installed in three (3) boreholes: BH06, BH08 and BH09.
- The full-time supervision of a PSM engineer who undertook the following tasks:
  - Direct the service locating and investigation locations.
  - Take photographs of the recovered rock cores.
  - Perform point load tests on the recovered rock cores.
  - Prepare engineering field logs of the material encountered.

Prior to the investigation, the test locations were checked with service plans from Before You Dig Australia (BYDA) and a certified service locator to detect and ensure they were free of any underground services.

Upon completion of BH05 and BH07, the borehole was reinstated by backfilling with cuttings. The investigation locations were measured with a handheld GPS unit with horizontal accuracy up to ± 5 m and surveyed with a real time kinematic (RTK) workflow and corrections from the AUSCORS network base with a vertical accuracy up to 50 mm.

Figure 2 presents the approximate borehole locations.

Figures 3 to 8 present some selected site photographs.

Appendix H presents the engineered borehole logs from the 2024 SI.

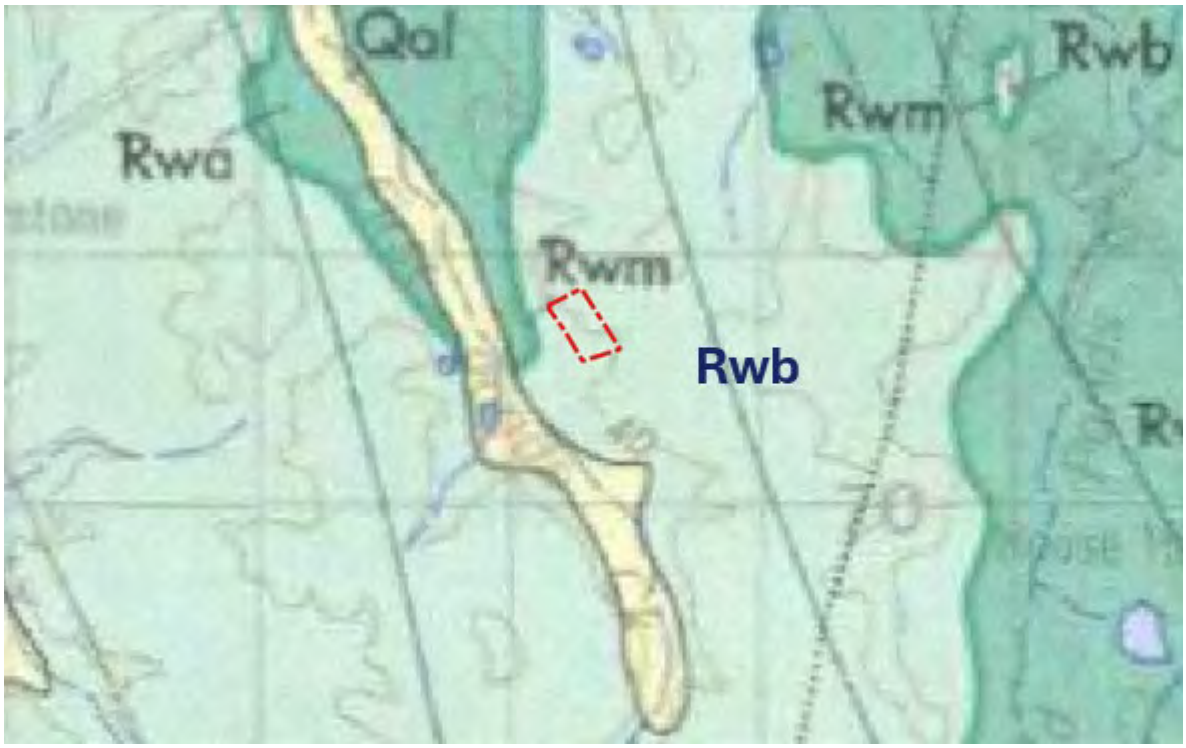
Appendix I presents the piezometer construction records.

Appendix J presents the point load test results.

7. Site Conditions

7.1 Geological Setting

The 1:100,000 Penrith Geological map (1991) indicates the site is primarily underlain by the Wianamatta Group formation (Bringelly Shale – Rwb) comprising shale, carbonaceous claystone, claystone, laminate, fine to medium-grained litic sandstone, rare coal and tuff.



Inset 3: Geological Map of the Proposed The Site, Site Boundary Marked in Red.

7.2 Surface Conditions

At the time of fieldwork, the site mainly consisted of grassed areas with mature sparse trees, abandoned sheds, stockpiles and dirt access tracks.

The overall site is bounded by residential lots to the North, Guntawong road to the West and open grassed areas to the East and South. The site is generally slopping towards the south-westerly direction.

At the of fieldwork the following observations were made:

- Previous agricultural infrastructure was still present on site consisting of sheds, metal and wooden fences and gates, timber utility poles and localised areas with concrete pavements and bricks (Photos 3 and 4 of Figure 4).
- Stockpile observed near BH05 (Photo 4 of Figure 4).
- Mature sparse trees of approximately up to 15 to 20 m throughout Site, mainly towards the north-western portion (Photo 4 of Figure 4).

7.3 Subsurface Conditions

The subsurface conditions encountered within this investigation and the relevant 2022 site investigation testing locations are summarised in Table 1. Borehole logs for this investigation are provided in Appendix H. Relevant borehole and test pit tabulated logs, and DCP testing results in the 2022 site investigation are provided in Appendix B and Appendix C

With regards to the sub-surface conditions PSM notes the following:

- EXISTING FILL is localised and highly variable with maximum observed FILL thickness of 1.9 m. It was mainly encountered near the previous agricultural infrastructure consisting of the following:
  - Some areas with concrete pavements up to 200 mm
  - A brick structure with voids was encountered in BH05 up to 1.2 m depth. Similar unexpected finds may be present around this area.
- A deeper soil cover encountered at BH08.
- The Bringelly Shale bedrock units have been classified in accordance with Pells et al. (2019)[1].

Table 1 – Summary of Inferred Subsurface Conditions Encountered in PSM Boreholes and Test Pits

Inferred Unit	Depth to Top of Inferred Unit (m)	Material Description
TOPSOIL	0.0	CLAY to Silty CLAY trace sand and gravel: low to medium plasticity, brown to dark brown; sand fine to coarse grained, gravel fine to medium grained, sub-angular, up to 10 mm; moist (>PL) to wet, very soft to firm consistency; organic odour and rootlets observed.
EXISTING FILL	0.1 to 0.2	SAND with clay and gravel, fine grained, brown and grey; low plasticity; clay low plasticity; gravel fine to medium grained, sub-angular, up to 10 mm; moist, inferred loose density; brick fragments up to 50 mm observed. CLAY trace gravel to Sandy Gravelly CLAY: medium plasticity, red brown to brown; sand fine to coarse grained, gravel fine to coarse grained, sub-rounded to sub-angular, up to 20 mm; moist (<PL), stiff consistency. Along/near the existing access track areas: Silty Gravelly CLAY; medium plasticity, dark brown; gravel fine to coarse grained, sub-angular, up to 10 mm; moist, stiff consistency, some rootlets. Gravelly SAND trace silt: fine grained, dark brown; gravel fine to coarse grained, sub-angular, up to 30 mm; moist, inferred loose to medium dense. In some localised areas (near BH05): Concrete slabs up to 200 mm thick and brick structures up to 1.2 m. COBBLES comprising of BRICK fragment and VOID, brick structure observed, void existed within the brick structure.
NATURAL SOIL	0.2 – 0.6	CLAY to Gravelly CLAY trace sand: medium to high plasticity, red brown/ brown and pale grey; sand fine to coarse grained; gravel fine to coarse grained, sub-angular to sub-rounded, up to 30mm; dry to moist (<PL), stiff to very stiff consistency; shale fragments

[1] Pells, P.J.N., Mostyn G., Bertuzzi R. and Wong P.K., 2019. Classification of Sandstones and Shales in the Sydney Region: A Forty Year Review. Australian Geomechanics, 54(2), pp. 29-55.

Inferred Unit	Depth to Top of Inferred Unit (m)	Material Description
BEDROCK A – Class IV/V	1.62 – 7.2 [1]	SHALE: pale to dark grey, yellow brown to red brown, moist to dry, extremely weathered, very low to low strength LAMINITE: dark brown to dark grey and pale grey, poorly to well developed, thinly laminated to laminated, distinct rock fabric, highly to moderately weathered, very low to low to medium strength, some iron staining and clay seams throughout; approximately 80-90% SHALE; dark brown and dark grey and 10-20% SANDSTONE; fine to medium grained, brown and pale grey.
BEDROCK B - Class III	5.4 to 8.7	LAMINITE: dark brown to dark grey and pale grey, well developed, thinly laminated to laminated, distinct rock fabric, moderately weathered to fresh, low to medium strength, with some high strength, some iron staining along defects; approximately 80-90% SHALE; dark brown and dark grey and 10-20% SANDSTONE; fine to medium grained, brown and pale grey.
BEDROCK C – Class II or better	7.0 to 9.8	LAMINITE: dark grey and pale grey, well developed thinly laminated to laminated, distinct rock fabric, slightly weathered to fresh, medium strength with some high strength; approximately 60-90% SHALE: dark grey and brown and 10-40% SANDSTONE; fine to medium grained, pale grey.

1 Bedrock was not encountered in all boreholes and test pits

2 Fill was not encountered in all boreholes and test pits

The thickness of each geological unit encountered in the boreholes and test pits are summarised in Table 2.

Table 2 – Summary of Inferred Subsurface Conditions Encountered in PSM Boreholes

TESTING ID	Depth / RL to Top of Inferred Geological Units (Depth m BGL/ RL m AHD)						
	TOPSOIL	FILL	NATURAL SOIL	BEDROCK UNITS			EOH [1]
				A	B	C	
BH05[4]	0 / 44.6	0.1 / 44.5	N.E.[2]	2.0 / 42.7	5.4 / 39.2	7.0 / 37.6	8.7 / 36.0
BH06[4]	0 / 44.8	N.E.	0.2 / 44.6	2.1 / 42.7	5.9 / 38.9	7.7 / 37.1	10.6 / 34.2
BH07[4]	0 / 39.7	N.E.	0.2 / 39.5	2.2 / 37.5	5.4 / 34.3	7.7 / 32.0	10.6 / 29.1
BH08[4]	0 / 38.6	N.E.	0.2 / 38.4	7.2 / 31.4	8.7 / 29.9	9.5 / 29.1	11.1 / 27.5
BH09[4]	0 / 41.9	0.2 / 41.7	0.5 / 41.4	1.6 / 40.3	7.4 / 34.5	9.8 / 32.1	10.5 / 31.4
BH_02[5]	0.0	N.E.	0.4	2.3	N.E.	N.E.	3.2
BH_03[5]	0.2	0.0	0.4	N.E.	N.E.	N.E.	3
BH_04[5]	N.E.	0.0	0.25	N.E.	N.E.	N.E.	1.4
TP_01[5]	N.E.	0.0	0.6	N.E.	N.E.	N.E.	3.0
TP_02[5]	0.0	N.E.	0.3	2.8	N.E.	N.E.	3.0
TP_15[5]	0.0	N.E.	0.2	N.E.	N.E.	N.E.	3.0

1 EOH = End of Hole.

[2] Table is in the format: Depth (metres below ground level) / RL (m AHD).

[3] N.E. = Not Encountered.

[4] Boreholes undertaken in this 2024 investigation

[5] Boreholes and testpits undertaken in 2022 investigation. The surface RL of testing locations was not measured during the time of investigation.

Table 3 presents the inferred RL to top of BEDROCK units for each proposed building. We note that this is for initial planning and costing purposes and the founding conditions will need to be confirmed based on inspections during piling.

Table 3 – Approximate RL to top of Inferred BEDROCK units for respective buildings

Building	Relevant BH(s)	INFERRED APPROXIMATE RL (m AHD) TO TOP OF BEDROCK UNIT		
		BEDROCK A – SHALE CLASS V/IV	BEDROCK B – SHALE CLASS III	BEDROCK C- SHALE CLASS II or better
Building A	BH06	42.7	38.9	37.1
Building B	BH05/BH09	41.5	36.9	34.9
Building C	BH06/BH07	40.1	36.6	34.6
Building D	BH09	40.3	34.5	32.1

7.4 Groundwater

Groundwater was observed in all three piezometers. Table 4 summarises the measured groundwater levels within the constructed piezometers.

Table 4 – Groundwater Levels

Borehole ID	Screened Material	Date of Measurement	Depth to groundwater (m BGL)	Measured groundwater level (RL m AHD)
BH06	NATURAL SOIL & BEDROCK A TO C	3/10/2024	3.5	41.3
BH08	BEDROCK A TO C	4/10/2024	1.0	37.6
BH09	NATURAL SOIL & BEDROCK A TO C	4/10/2024	1.2	40.7

8. Laboratory Testing Results

8.1 CBR Test Results

Table 5 presents a summary of the CBR test results. These test results are included in Appendix D, Table 5.

Table 5 – Summary of PSM CBR Test Results

Borehole ID	Depth (m)	Material Description	Soaked CBR (%)	OMC (%)	Standard Maximum Dry Density (t/m^3)	Swell (%)
TP_01	0.9 – 1.2	NATURAL – CLAY trace gravel	1.5 *	19.0	1.64	2.0
TP_02	0.5 – 0.8	NATURAL – CLAY trace gravel	2.5 *	20.6	1.66	2.0

Notes: * Indicates Soaked CBR value at 2.5 mm penetration

8.2 Shrink Swell Index Test Results

Table 6 presents a summary of the Shrink Swell index test results. These test results are included in Appendix E.

Table 6 – Summary of Shrink Swell Index Test Results

Borehole ID	Depth (m)	Material Description	Swell on Saturation (%)	Shrinkage (%)	Shrink Swell Index (%/pF)
BH_02	0.5	NATURAL – CLAY with gravel	0.5	3.2	1.90
BH_03	0.5	NATURAL – Sandy CLAY trace gravel	0.0	2.2	1.20
BH_04	0.5	NATURAL – CLAY trace gravel	1.9	4.8	3.21

8.3 Atterberg Limit Test and Moisture Content Test Results

Table 7 presents a summary of the Atterberg limit test results and moisture content test results. These test results are included in Appendix F.

Table 7 - Summary of Atterberg Limit Test Results and Moisture Content Test Results

Borehole ID	Depth (m)	Material Description	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)
TP_02	0.9	NATURAL – CLAY trace gravel	22.7	39	14	25	9.5
TP_03	0.5	NATURAL – CLAY trace gravel	22.7	52	15	37	14

8.4 Aggressivity and Salinity Test Results

Table 8 presents a summary of the analytical laboratory testing results. All completed tests from the previous SI were provided for a wider array of data and to mitigate any effects of outliers. Detailed results are provided in Appendix G.

Table 8 – Summary of Analytical PSM Laboratory Test Results

Borehole ID – Depth	Material Description	pH	Moisture Content [%]	Chloride by Discrete Analyser [mg/kg]	Soluble Sulphate [mg/kg]	Electrical Conductivity [µS/cm]	Resistivity ohm.cm	Exchangeable Cations [meq/100g]					ESP [%]
								Ca	Mg	K	Na	CEC	
BH_04 – 0.25 m	NATURAL – CLAY trace gravel	6.0	18.1	220	70	142	2170	2.1	6.2	0.4	1.4	10.1	14.0
TP_06 – 0.5 m	NATURAL – CLAY trace gravel	5.2	20.8	30	50	42	5020	0.7	3.7	0.4	0.5	7.3	9.9
BH_01 – 3.0 m	NATURAL – CLAY trace gravel	8.8	17.0	250	100	280	880	0.4	6.9	<0.2	3.6	11.1	32.6
TP_08 – 0.5 m	NATURAL – CLAY trace gravel	5.4	17.4	30	80	67	3730	0.4	6.4	0.3	1.2	9.0	14.4

9. Salinity and Aggressivity Assessment

9.1 Soil Chemistry

The salinity and aggressivity test results summarised in Table 8 indicate the following:

- pH of the soil samples analysed to be in the range of 5.2 to 8.8
- Concentrations of chlorides in samples analysed to be in the range of 30 mg/kg to 250 mg/kg
- Concentrations of sulphates in samples analysed to be in the range of 50 mg/kg to 100 mg/kg
- The 1:5 soil to water extraction and subsequent electrical conductivity (EC1:5) of the soil samples analysed to be in the range of 42 µS/cm to 280 µS/cm.

9.2 Salinity

Site Investigations for Urban Salinity (DLWC 2002) classify soil salinity based on electrical conductivity (ECe) as per Richards (1954). The method of conversion from EC1:5 to ECe (electrical conductivity of saturated extract) is based on DLWC (2002) and given by ECe = EC1:5 x M, where M is the multiplication factor based on "Soil Texture Group".

The "Soil Texture Group" of the samples tested has been assessed as "Medium clay" or "Heavy clay" with a corresponding M of 7 or 6 respectively. The salinity classification for the soil samples that were tested is presented in Table 9.

Table 9 – Salinity Classification

Sample ID & Depth	$EC_{1:5}$ (dS/m)	Soil Type	M	EC_e (dS/m)	Salinity Class
BH_04 – 0.25 m	0.142	Heavy clay	6	0.852	Non-saline
TP_06 – 0.5 m	0.042	Heavy clay	6	0.252	Non-saline
BH_01 – 3.0 m	0.280	Medium clay	7	1.960	Non-saline
TP_08 – 0.5 m	0.067	Heavy clay	6	0.402	Non-saline

It is assessed that soils tested on site are classified as "Non-Saline".

Table 4.8.2 of Australian Standard AS3600-2009 "Concrete Structures" provides an exposure classification for concrete structures in saline soils based on soil electrical conductivity (EC_e). We assess the exposure classification for this site is "A2".

9.3 Aggressivity / Corrosivity

Table 4.8.1 of Australian Standard AS 3600 (2018) Concrete Structures provides criteria for exposure classification for concrete in sulphate soils based on sulphate content and acidity in the soil and groundwater. Based on the laboratory results of the soil testing completed, we assess the exposure classification for concrete in the soil to be "A2".

Table 6.4.2(C) of Australian Standard AS 2159 (2009) "Piling Design and Installation" provides criteria for exposure classification for concrete piles based on sulphates in the soil and groundwater, soil and groundwater pH, and chlorides in groundwater. Based on laboratory results of the soil testing completed and previous testing, we assess the exposure classification for concrete piles in the soil to be "Non-aggressive" to "Mild".

Table 6.5.2(C) of Australian Standard AS 2159 (2009) “Piling – Design and Installation” provides criteria for exposure classification for steel piles based on soil and groundwater pH, chlorides in soil and groundwater and resistivity. Based on laboratory results of the soil testing completed and previous testing, we assess the exposure classification for steel piles in the soil to be “Non-aggressive” to “Moderately aggressive”.

9.4 Sodicity

Sodicity provides a measure of the likely dispersion on wetting and to shrink / swell properties of a soil. Soil sodicity is classified based on the Exchangeable Sodium Percentage (ESP) which is the amount of exchangeable sodium as a percentage of the Cation Exchange Capacity (DLWC, 2002).

The Exchangeable Sodium Percentages calculated from the laboratory results was compared to the criteria provided in “Site Investigations for Urban Salinity”, DLWC (2002). In the inferred NATURAL SOIL unit, the laboratory testing shows ESP ranges from 9.9% to 32.6%, indicating that the NATURAL SOIL on the site is classified as “sodic” to “highly sodic”, as per DLWC (2002).

10. Geotechnical Design Advice

10.1 General

We note that details of the proposed earthworks (e.g., depth of fill) are not known to PSM. The design advice provided in the following sections has been prepared on the following basis:

- The subsurface conditions are as described in Section 7.3.
- The earthworks are to be completed in accordance with the PSM DRAFT bulk earthworks specification (**the Specification)** (ref. PSM4693-013S DRAFT) or an approved equivalent. We note that local Council may have its own earthworks specification. When completing the subdivisional works, the contractor shall consider these requirements as additional to the ones in the Specification. Where opposing requirements are present further advice should be sought.

10.2 Excavation Conditions

Excavation of the TOPSOIL, EXISTING FILL, NATURAL SOIL and BEDROCK units should be achievable using conventional earth moving equipment with some rock breaking using rippers or impact hammers possibly required in the BEDROCK unit.

Prospective contractors should make their own assessment of excavatability based on the borehole and test pit logs and their site inspection and experience. It is our experience that excavatability is heavily dependent on both the operator and the plant used. Any contractor should satisfy itself regarding excavatability, especially in the BEDROCK units.

We note the presence of concrete slabs and the possibility of unexpected finds e.g. brick structure. around the previous agricultural infrastructure.

Please note that during our geotechnical investigation the 6-tonne truck mounted drill rig encountered practical refusal while augering with a V-bit in four boreholes.

Rock breaking equipment will generate vibrations that may impact on neighbouring structures. Where controls on vibrations are required, the contractor should consider the use of smaller hammers, rock saws and grinders to undertake the excavation.

10.3 Groundwater

Where excavations deeper than 1 m are proposed these may encounter perched water/groundwater.

We expect that seepage is likely to occur through joints/defects in the bedrock during excavation. Further, inflow may occur through the soil units in transient conditions. Based on our experience with projects in a similar geological environment such seepage should be able to be controllable during construction by conventional sump and pump systems.

Should higher localised inflows be encountered localised grouting can be undertaken to reduce the inflows.

In the permanent condition, typically basements these units will be designed as drained structures (if permitted by the relevant authorities).

Should a drained basement be adopted, provision will need to be made for permanent and effective drainage. Such permanent drainage systems will need to be able to be maintained throughout the life of the structures and thus allow for access to flushing to remove chemical deposits that may build up over time or include redundancy in the system to allow for possible reduction in capacity in the future.

Details of the drainage system are a matter of design but would typically include a sub-floor drainage blanket with slotted drainage pipes within drainage aggregate, plus strip drains behind the shotcreted / concreted walls (or a plenum space between the rock face and an internal dry-wall where shotcrete is not required), and sump and pump system with the ability to effectively back flush the system for long-term maintenance. The BEDROCK units may degrade with time if left exposed with ongoing groundwater seepage. It is recommended that shotcrete facing be provided to protect against degradation.

Disposal of water from the sumps, during construction and particularly in the permanent condition, into the stormwater or sewer system may be possible but will be subject to regulatory approvals and sediment controls. These should be negotiated with the relevant authorities (e.g., council, Sydney Water, NSW Office of Water). Particularly for permanently drained structures we note the requirements of the NSW Aquifer Interference Policy apply, as a drained basement will permanently affect the groundwater levels at the site and surrounding area.

We note that groundwater drawdown can result in settlement of soft and firm ground. Given the current elevation of the water table and the stiffness of the ground, we consider that the effects of drawdown on neighbouring structures would be negligible.

Alternatively, a tanked basement can be adopted. Where a tanked basement is proposed, the retaining walls and floor slabs will need to be designed to resist full hydrostatic pressures. Uplift pressures on the slab and building may require tension piles or anchors to resist the loads.

Should a drained basement be adopted, we recommend prior to excavation, we will return to site to install hobo data loggers (which record daily groundwater levels) in the existing piezometers near the proposed basement footprint to enable continuous long-term groundwater monitoring. This will assist in the confirmation of design groundwater levels and inform long-term inflows. The groundwater monitoring results will be collected from the hobo data loggers after 3-6 months of being installed.

10.4 Site Classification (AS2870)

We note that the proposed high school (multi storey buildings) is outside the scope of AS2870-2011 “Residential slabs and footings”. Nevertheless we provide the following advice regarding site classification:

1. In cut areas within the NATURAL SOIL unit, structures that are within the scope of AS2870-2011 be designed for a site classification of Class “H1” with the characteristic surface movement, ys, in the range 40 mm to 60 mm in accordance with Table 2.1 of AS2870-2011 following reclassification.
2. In fill areas, further assessment of the site classification would be required and will depend on the fill materials, depth of fill and the manner in which it was placed.
    a. Where existing fill is present and there is no earthworks documentation (records), the fill cannot be considered as “controlled fill” and thus the site is classified as Class “P” in accordance with AS2870-2011. Further detailed investigation and assessment should be undertaken to allow for reclassification. Alternatively, Fill encountered on site can be removed and replaced as part of the bulk earthworks. Following removal, structures that are within the scope of AS2870-2011 be designed for a site classification of Class “H1” in accordance with Table 2.1 of AS2870-2011 following reclassification.
    b. Where new fill will be placed in accordance with PSM bulk earthworks specification or an approved equivalent, the site can be reclassified from Class “P” to Class “H1”., provided the fill is placed in accordance with PSM bulk earthworks specification or an approved equivalent.

Should a 300mm inert material be placed as Engineering FILL forming t the surface of the landform, this would reduce the reactivity and a Class “M” classification can be adopted. Typical inert material comprises sandstone fill, that is fill won from excavations in slightly weathered and fresh sandstone.

The dwelling and surrounds should be maintained in accordance with the recommendations in AS2870-2011 as reflected in CSIRO Information Sheet BTF18 titled “Foundation Maintenance and Footing Performance: A Homeowners Guide” (i.e. CSIRO Information Sheet).

10.5 Earthquake Site Classification

Throughout the Site, the depth to the top of BEDROCK varies from 1.6 to 7.2 m. We note, the proposed pad levels (bulk earthworks levels) of the Site is currently unknown.

In accordance with Clause 4.1 of AS1170.4-2007 (Earthquake actions in Australia):

- Where the depth to BEDROCK is:
  - Less than 3 m, a site can be classified as a Class B_e (rock) site and
  - Between 3 and 20 m, a site can be classified as a Class C_e (shallow soil) site.

There is generally a deeper soil profile around the vicinity of BH08.

Based on the BEDROCK levels, we note that the buildings could span multiple classifications. We note that for some structures a B_e classification can be more adverse than a C_e classification and given that particular regions of the Site are in between the boundary of both classifications, the designer should satisfy itself that its design is suitable for the borderline classification.

10.6 Foundations

10.6.1 Shallow Foundations

It is expected that the part of foundations used for the proposed high school at the sites would typically include strip, pad, or other shallow footings.

Pad footings can be proportioned on the basis of an allowable bearing pressure (ABP) for centric vertical loads provided in Table 10. Further advice should be sought if the footings are located adjacent to a batter or wall.

We note that an allowable bearing pressure (ABP) is not a soil property. It depends on many factors such as the size of the footings, the embedment depth, the load direction and eccentricity, the stiffness of the footing, the adopted factor of safety (FOS), as well as the soil properties. As footings get bigger or deeper the capacity increases rapidly, and as the load gains eccentricity or becomes inclined, the capacity reduces rapidly.

Settlements in the NATURAL SOIL unit can be estimated using the elastic moduli provided in Table 10.

When assessing the settlement of the shallow footings, the designer needs to consider the additional ground settlement due to the total building load on both shallow and deeper units. The differential settlement due to the building load shall also be assessed.

Foundation conditions at the proposed shallow pad footing locations should be inspected by a suitably qualified geotechnical engineer prior to the pouring of concrete.

Table 10 – Foundation Parameters of Inferred Geotechnical Units

Inferred Unit	Bulk Unit Weight (kN/m^3)	Soil Effective Strength Parameters		Ultimate Bearing Pressure under Vertical Centric Loading (kPa)	Allowable Bearing Pressure (ABP) under Vertical Centric Loading (kPa)	Ultimate Shaft Adhesion (kPa)	Allowable Shaft Adhesion (kPa)	Elastic Parameters		
		c' (kPa)	φ' (deg)					Long Term Youngs Modulus (MPa)	Long Term Shear Modulus (MPa)	Poisson's Ratio
ENGINEERED FILL / NATURAL SOIL	18	0	30	420	100 [1]	20[6]	10[6]	10	3	0.3
BEDROCK A – Class IV/V	22	5	30	3,000 [2]	700 [3]	50 [4][5]	25 [4][5]	100	40	0.25
BEDROCK B – Class III	24	150	30	6,000 [2]	2,000 [3]	350 [4][5]	175 [4][5]	300	125	0.2
BEDROCK C – Class II	24	250	35	10,500 [2]	3,500 [3]	600 [4][5]	300 [4][5]	700	290	0.2

1 Pad footings (for ABP of 100 kPa) should have a minimum horizontal dimension of 0.5 m and a minimum embedment depth of 0.5 m

2 Ultimate values occur at large settlement (>5% of minimum footing dimensions)

3 ABP is an end bearing pressure to cause settlement of <1% of minimum footing dimensions

4 Clean socket of roughness category R2 or better.

5 Ultimate and allowable shaft adhesion values applied for piles in tension and compression

6 Ultimate and allowable shaft adhesion values applied for piles in compression, and no shaft adhesion for piles in tension.

10.6.2 Piled Foundation

Piled foundations should be founded within the BEDROCK units.

Piles should be designed in accordance with the requirements in AS 2159 (2009), *Piling – Design and Installation.* Selection of the pile system depends on many considerations and should be undertaken by the designer in conjunction with the Principal and contractor/builder. The parameters provided in Table 10 may be adopted in the design of piles founded in the BEDROCK units.

The foundation designer should note the following with regards to the pile design:

- The ABP needs to be confirmed by a geotechnical engineer during a pile inspection
- Under permanent load, the contribution of side adhesion for soils including soil units should be ignored
- Pile settlement needs to be checked using the recommended elastic parameters in Table 10.

The bearing capacities provided are contingent on piles or footings being vertically and centrally loaded. Further advice should be sought if the footings are not vertically and centrically loaded. Should higher bearing capacities be required in Table 10, further advice should be sought from PSM. The bearing capacity in the Bedrock unit is expected to increase with depth.

Where piles are proposed near vertical excavations the ultimate and allowable bearing capacities will be significantly reduced and further particular advice should be sought.

With regards to the pile design, we recommend that:

- A geotechnical strength reduction factor, ϕ_g = 0.60 (AS2159-2009 CL 4.3.2) be adopted for a high redundancy for an assessed average risk rating (ARR) of 3.0. This should be reviewed to suit the specific design and construction methods proposed by the structural designers.
- It may be possible to increase the pile reduction factors, if the details of the proposed pile installation procedures indicate a high level of quality control with regards to concrete placement, base cleanliness, etc.
- A geotechnical strength reduction factor ϕ_g = 0.40 is adopted from then no pile testing will be required (AS2159-2009 CL 8.2.4 (b)).

Where the pile is sized using the allowable bearing capacity in Table 10 (i.e., assuming all serviceability load is carried by the base), the settlement would be expected to be less than 1% of the pile diameter plus elastic shortening of the pile itself.

Although the building loads are not given, we expect the piles to be founded at least in Class III BEDROCK. For initial sizing, we recommend that Class III be assumed to occur below the top of Class III levels presented in Table 3 for each building.

Further advice should be sought if piles are to be founded within a unit other than BEDROCK.

Piling is likely to extend below the groundwater table. This should be considered when making decisions regarding the piling methodology to adopt.

10.7 Permanent and Temporary Slopes

The batter slope angles shown in Table 11 are recommended for the design of batters up to 3 m height and above the groundwater table, subject to the following recommendations:

1. The batters shall be protected from erosion.
2. Permanent batters shall be drained.
3. Temporary batters shall not be left unsupported for more than 1 month without further advice, and inspection by a geotechnical engineer should be undertaken following significant rain events.
4. Where loads are imposed or structures/services are located within on batter height of the crest of the batter, further advice should be sought.

Steeper batters may be possible subject to further advice, typically including inspection during construction.

Where Fill is not engineered/controlled fill, batter slope angles should be assessed by a geotechnical engineer.

Table 11 – Design Batter Slope Angles

Unit	Temporary	Permanent
SOIL UNITS, e.g., ENGINEEERED FILL, NATURAL SOIL	2H : 1V	2.5H : 1V
BEDROCK A TO C	1H : 1V	1.5H : 1V

10.8 Slabs

The design of slabs on ground can be based on a subgrade with a long-term Young's Modulus (E) presented in Table 10.

We note that the environmental effects (e.g. drying or wetting up of the finished surface) affecting the land prior to the proposed high school works should be taken into account by the various designers of the proposed high school.

The civil and structural engineers should consider likely heave / settlement due to the effect of climatic factors in their designs.

For Class "H1" areas we assess that, for the natural site, cut and fill placed in accordance with the Specification, the characteristic surface movement, y_s, would be in the range 40 mm to 60 mm.

We recommend that all structures and services be detailed such that they preclude any local wetting up or drying out of the subgrade after initial equilibrium is reached following construction of the slab and that the subgrade be within specification at the time of construction of the slab. We note that normal mounding or sagging away from the perimeter of covered areas will still occur and perimeters, or open joints, will still respond to environmental changes.

For effectively sealed areas away from the perimeter, the design should allow for the following:

- Differential mound movement, $y_m = 0.35y_s$ (e.g., 14mm to 20 mm for Class H1). We note that this is not the total heave or settlement but the estimated local heave or settlement due to fill variability.
- Local tilts of up to approximately 1 in 400.

Mounds at perimeters or penetrations of slabs open to the environment can be taken to be as per AS2870-2011 for y_s stated above.

Further mitigation of these movements can include construction of an external pavement around the perimeter of the warehouse, a cut off wall and/ or placement of at least 0.3 m of well compacted non-reactive fill material such as Sandstone Fill.

We note that desiccation and/or wetting up of the pad surface is possible should it be exposed to the elements for an extended period of time, particularly at completion of the bulk earthworks prior to the builder taking responsibility for the pad. To reduce the likelihood of this and preserve the pad condition we recommend the following should be:

- Placement of a sacrificial layer comprising road base or other equivalent material
- Grade the pad surface to reduce the extent and severity of standing water during and after weather events
- Minimise the time between the completion of earthworks and the builder commencing construction of the building.

Where suspended slabs are proposed, and the Designer would like to isolate the suspended ground slab from reactive soil movement a void former between the slab and the ground could be adopted. In assessing the thickness of void former, the designer shall consider the advice regarding site classification and design slab on ground for reactivity in this section.

10.9 Pavements

Subgrade CBR for pavement design depends on the material at the finished subgrade levels. The CBR tests undertaken by PSM (refer to Table 5) indicate a CBR value between 1.5% and 2.5%.

A CBR of 2.0% can be adopted for subgrade and fill formed in bulk earthworks constructed in accordance with the Specification.

Subgrade CBR for pavement design depends on the material at the finished subgrade levels.

We recommend that specific CBR testing be undertaken at subgrade level when pavement layouts are finalised. CBR testing shall be undertaken for any new imported material within the pavement subgrade (e.g., within 1 m below pavement).

10.10 Excavation Support and Retaining Walls

Permanent cuts in the units steeper than the recommended permanent slopes in Section 10.7 will need to be supported by some form of retaining structure.

The selection of the appropriate retaining wall is a matter of design. The designer should consider the following factors in making its selection:

- Technical factors:
  - Performance
  - Ground conditions (this is addressed with the design parameters)
  - Groundwater
  - Surcharge loading and
  - The proximity of structures, buildings, roads, etc.
- Non-technical factors:
  - Cost (to build and to maintain)
  - Other constraints such as real estate, neighbouring site/boundary, aesthetics, legislation, etc.

The design of these structures should be based on the following:

- Proposed wall geometry.
- Effective strength parameters in Table 10 when assessing the earth pressure on retaining structures
- Lateral earth pressures of soil units, and a lateral pressure of 10 kPa for vertical cuts in the BEDROCK units. This is to allow for blocks and rock wedges formed due to adverse defects that may exist within the units.
- Surcharge loads behind retention.
- Water pressure (depending on the type of structure).

Further we note that the advice given in this report is in terms of working pressures and actions, and the designer needs to apply appropriate load and strength reduction factors, etc., in its design.

Note that the design of the retaining wall may be based either K_a or K_0 earth pressures for soil units where the design earth pressure coefficients are summarised in Table 12. Design using active earth pressures provides the minimum lateral earth pressure that must be supported to avoid failure and requires a wall that can rotate or translate to allow the pressures to reduce to these values (vertical and lateral movements up to 2% of height may occur, typical movements will be much less).

Where the design is based on K_0 earth pressures, construction should be carefully controlled to avoid unwanted effects. It should be noted that designing for K_0 pressures does not ensure that movement does not occur. Movements are controlled by the construction method, especially sequence.

Table 12 – Design Batter Slope Angles

Inferred Unit	Bulk Unit Weight (kN/m^3)	Poisson's Ratio	Lateral Earth Pressure Coefficient at Rest K_0	Active Lateral Earth Pressure Coefficient K_a	Passive Lateral Earth Pressure Coefficient K_p
ENGINEERED FILL / NATURAL SOIL	18	0.3	0.5	0.33	3

Both surface and sub-surface drainage need to be designed and constructed properly to prevent pore water pressures from building up behind the retaining walls or appropriate water pressures must be included in the design.

Where basement deeper than a single level is proposed within the BEDROCK unit further advice should be sought.

11. Potential Geotechnical Risks

11.1 Buried Structures

As discussed, it was observed from historical imageries and site investigations that in the north-east and central portion of the site, there are buildings and structures for agricultural use. It is thus likely that the following structures are still present below ground:

- Structure foundations including concrete slabs on ground, concrete footings. It is PSM opinion that these structures present risks to the proposed high school works including:
  - Risk of "hard spots" resulting in differential settlements of overlying structures. If the feature is not removed, this risk can be mitigated by minimum cover over such features. Specific advice should be sought. In our experience minimum covers of 0.8 m are required to mitigate their effect on overlying structures.
  - Construction risks with regards to installation of new services, shallow footings and pile foundations. That is these could present as obstructions particularly to piles.
  - Concrete slabs also reduce the ability of the underlying materials to be assessed as part of the site preparation works.
- Decommissioned services. A number of services including pipes varying dimensions are likely to be present within the site. These present a low risk for future settlement caused by future collapse of the pipes, poor backfilling of pipe trenches and pits and preferential/uncontrolled transmittal of water. Review of historical photos, and subgrade preparation in accordance with the DRAFT Specification can mitigate these risks to where they are acceptable. Water carrying services not intended to be used will need to be decommissioned either by removal or grouting. Grouting is recommended where these are located more than 2.0 m down and more likely to intersect groundwater.

When selecting appropriate foundation systems particular consideration shall be given to the possible presence of such buried structures.

It should be noted that quantifying possible buried structures is difficult to achieve prior to the proposed high school works and intensive investigations may be required. The site preparation will need to address the possible presence of buried slabs, footings, and services associated with historical land use. The majority of this work is typically undertaken as part of the demolition stage prior to the site preparation and earthworks stage.

Where footings or services are removed careful attention shall be given to limit the amount of ground that is disturbed and backfill the void in accordance with the Specification adjusted for the use of smaller compaction

equipment. It would be prudent to backfill using material less susceptible to water and that can be compacted with smaller equipment. Sandstone VENM, recycled concrete and to a lesser extent fresh shale VENM would be ideal materials for completing this detailed backfilling."

11.2 Variable Depths to Top of BEDROCK units

The investigation result of the Site shows variable depths to the top of BEDROCK units. The range of depths to the top of BEDROCK units from the surface level is summarised:

- BEDROCK A (Class IV/V) – 1.6 m to 7.2 m
- BEDROCK B (Class III) – 5.4 m to 8.7 m
- BEDROCK C (Class II or better) – 7.0 to 9.8m.

The designer should recognise this degree of variability in the planning, costing and design phases. The founding conditions will need to be confirmed based on inspections during piling.

11.3 Localised Existing FILL

Existing FILL as uncontrolled FILL was observed to be highly localised and variable across the site with maximum depth of 2.0m. The existing FILL will need to be addressed as part of the subgrade preparation works. The PSM DRAFT Earthwork Specification PSM4693-013S provides an approach to the treatment of existing FILL in the subgrade.

11.4 Trafficability

The natural clay is observed to have poor trafficability during and following periods of wet weather. Track mounted plant would be expected to be able to traffic the site under most conditions. Should large pilling rigs be proposed, these would need specific assessment depending on the plant type, track geometries and required bearing capacities. It is possible that in some areas, a working platform may be required to provide consistent all weather accessible surface. For initial planning and estimating purposes a working platform comprising 100mm to 300mm of Sandstone FILL should be allowed for. Tyred vehicles and dump trucks would likely need designated routes with temporary all weathered haul roads.

12. Mitigation Measures

Table 13 summarises the mitigation measures to be implemented for the activity.

Table 13 - Mitigation Measures

Mitigation Number/Name	Aspect/Section	Mitigation Measure	Reason for Mitigation Measure
1. Buried Structures	Before / during construction	Site preparation and associated earthworks works shall be undertaken in accordance with PSM in accordance with PSM DRAFT Earthwork Specification PSM4693-013S. For more details, please refer to Section 11.1 of this report.	Reduce uncertainties during site preparation and construction risk.
2. Variable Depths to Top of BEDROCK units	During design stage and construction stage	The designer should recognise this degree of variability in the planning, costing and design phases. The founding conditions will need to be confirmed based on inspections during piling.	Reduce construction and subsurface risks and any potential damages.
3. Treatment of localised Existing FILL	During construction / excavation	Treatment of Existing FILL shall be undertaken in accordance with The PSM DRAFT Earthwork Specification PSM4693-013S.	Reduce geotechnical uncertainty and construction risk.
4. Improve Site Trafficability	During construction	For initial planning and estimating purposes a working platform in some areas comprising 100mm to 300mm of Sandstone FILL should be allowed for to provide a consistent all weather accessible surface. Tyred vehicles and dump trucks would likely need designated routes with temporary all weathered haul roads.	Improve constructability and traffic accessibility throughout the site.
5. Prepare / review hazardous material register	Prior to demolition works	Demolition works should be undertaken by licenced contractors with appropriate asbestos removal accreditation. If the building is demolished a site clearance certificate must be provided on completion of the works. If a hazardous material register for the site is not present, a hazardous materials management inspections and surveys is to be conducted by a qualified consultant prior to demolition of a building.	Identify and remove hazardous materials to eliminate the risk of exposure to workers and the surrounding environment.
6. Encountering any unidentified potentially contaminated soils	During excavation or construction activities	Notify / contact Environmental consultant immediately.	Reduce / eliminate potential contamination of soils or watercourses.

Mitigation Number/Name	Aspect/Section	Mitigation Measure	Reason for Mitigation Measure
			Eliminate risks to works and the surrounding environment.
7. Exporting any material off site (VENM & ENM assessments)	During excavation or construction activities	Material exported off site should be assessed in accordance with EPA (Environmental Protection Authority) guidelines for Excavated Natural Material (ENM) and Virgin Excavated Natural Material (VENM). Notify / contact Environmental consultant regarding sampling, testing, reviewing and documenting.	To ensure compliance with environmental regulations set by the NSW EPA and to contribute to sustainable land and construction uses. This also prevents environmental harm by ensuring the soils are free from contaminants.
8. Salinity assessment	During excavation or construction activities	Salinity testing has been undertaken for the site and all samples indicated “non-saline” conditions.	To assess the salinity of soils within the site and if management of saline soil is required. Ensure the appropriate concrete exposure classification is adopted.
9. Erosion control and surface flow	During excavation or construction activities	We understand that the civil designer has designed or will design the stormwater system, surface gradients and landscaping requirements to control surface flows and minimise soil erosion and the effects of soil erosion on adjacent waterways. We understand that appropriate erosion control will also be included during construction.	To control surface flows and minimise soil erosion
10. Groundwater Inflow control	During excavation or construction activities and operation	Based on the geotechnical investigation the groundwater levels are observed to be 1 m to 3.5 m below the ground surface levels. Where excavations deeper than 1 m are proposed these may encounter perched water/groundwater. From our experience with projects in a similar geological environment such seepage should be able to be controllable during construction by conventional sump and pump systems. Disposal of water from the sumps, during construction and particularly in the permanent condition, into the stormwater or sewer system may be possible but will be subject to regulatory	To control groundwater inflow and assess the impact of groundwater resources

Mitigation Number/Name	Aspect/Section	Mitigation Measure	Reason for Mitigation Measure
		approvals and sediment controls. These should be negotiated with the relevant authorities (e.g., council, Sydney Water, NSW Office of Water). Particularly for permanently drained structures we note the requirements of the NSW Aquifer Interference Policy apply, as a drained basement will permanently affect the groundwater levels at the site and surrounding area. Should a drained basement be adopted, we recommend prior to excavation, we will return to site to install hobo data loggers (which record daily groundwater levels) in the existing piezometers near the proposed basement footprint to enable continuous long-term groundwater monitoring. This will assist in the confirmation of design groundwater levels and inform long-term inflows. The groundwater monitoring results will be collected from the hobo data loggers after 3-6 months of being installed. For details, please refer to Section 10.3 of this report.	

13. Evaluation of Environmental Impacts

From a geotechnical perspective, the potential impacts of the activity can be appropriately mitigated or managed in accordance with the recommended measures presented in Table 13.

The extent and nature of the potential impacts are low and will not have significant impact on the locality, community and/or the environment.

Should there be any queries, do not hesitate to contact the undersigned.

Yours Sincerely

HENRY ZHANG
GEOTECHNICAL ENGINEER

WILLIAM WEI
SENIOR GEOTECHNICAL ENGINEER

DAVID PICCOLO
PRINCIPAL

Encl.	Figure 1	Overview of Locality Plan (Site and Landcom SI)
	Figure 2	Site Locality Plan
	Figure 3 to 8	Selected Site Photographs
	Appendix A	Historical Aerial Photographs
	Appendix B	Tabulated Borehole and Test Pit Logs
	Appendix C	DCP Results
	Appendix D	CBR Results
	Appendix E	Shrink Swell Index Results
	Appendix F	Atterberg Limit Test and Moisture Content Results
	Appendix G	Aggressivity and Salinity Results
	Appendix H	Engineered Borehole Logs: BH05 to BH09
	Appendix I	Piezometer Construction Records
	Appendix J	Point Load Test Results
	Appendix K	Bulk Earthworks Specification (PSM4693-013S REV1 DRAFT)

304000

304500

6271000

6270500

TP_15
Building C
Building A
BH_02
Assembly
TP_11
BH_01
TP_01
Building B
BH_04
Sports Field
TP_02
Building D
3x Multi-Sports Courts
BH_03
Carpark
TP_14
TP_03
TP_09
TP_10
TP_08
TP_12
TP_04
TP_07
TP_13
TP_06
TP_05
BH_05

Legend

- Approximate Site Extents - Schofields - Tallawong High School
- 2022 Landcom Site Investigation - Project Boundary
- Proposed Site Plan
- Approximate Test Pits Undertaken (2022 Landcom Site Investigation)
- Approximate Boreholes Undertaken (2022 Landcom Site Investigation)

Note:
Aerial imagery from Nearmap of site conditions on 28 October 2024.

Scale 1:3,000

N

0 30 60 90 120 150 m

Map Projection:
Horizontal Datum:
Grid: EPSG:7856

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Created By:	Revision:
PSM	A
Date: 29 Nov 2024	Paper Size: A3

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Guntawong Road

OVERVIEW OF LOCALITY PLAN
(SITE AND LANDCOM SI)

PSM4693-012L | Figure 1

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TP_15
BH06
Building A
Building C
BH_02
BH07
BH05
Assembly
TP_11
BH_01
Building B
TP_01
BH_04
BH08
Sports Field
BH09
Building D
TP_02
3x Multi-Sports Courts
Carpark
BH_03
TP_14
TP_03
TP_09
TP_10
TP_08

6271000

304500

Legend

- Approximate Site Extents - Schofields - Tallawong High School
- 2022 Landcom Site Investigation - Project Boundary
- Proposed Site Plan
- Approximate Borehole Locations (2024 Oct)
- Approximate Test Pits Undertaken (2022 Landcom Site Investigation)
- Approximate Boreholes Undertaken (2022 Landcom Site Investigation)

Note:
Aerial imagery from Nearmap of site conditions on 28 October 2024.

Scale 1:2,000

N 0 20 40 60 80 100 m

Map Projection:
Horizontal Datum:
Grid: EPSG:7856

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	Date: 29 Nov 2024	Paper Size: A3	

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SITE LOCALITY PLAN

PSM4693-012L | Figure 2

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Photo 1 - General Site Photo facing West near BH09 (2 October 2024)

Photo 2 - General Site Photo facing North-East near BH08 (3 October 2024)

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SELECTED SITE PHOTOGRAPHS (1 OF 6)

PSM4693-012L	Figure 3

Photo 3 - Previous agricultural infrastructure near BH05 (2 October 2024)

Photo 4 - Mature sparse trees up to 15-20 m height, a stockpile and timber power poles located immediately north of BH05 (2 October 2024)

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SELECTED SITE PHOTOGRAPHS (2 OF 6)

PSM4693-012L	Figure 4

Photo 5 - 6-tonne track mounted drill rig used for BH05, BH06 & BH09 (photo taken at BH06)

Photo 6 - 6-tonne track mounted drill rig used for BH07 & BH08 (photo taken at BH08)

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SELECTED SITE PHOTOGRAPHS (3 OF 6)

PSM4693-012L	Figure 5

Photo 7 - Brick structure and void encountered whilst drilling BH05

Photo 8 - Typical soil photo board - BH06 from 0 to 2.1 m

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SELECTED SITE PHOTOGRAPHS (4 OF 6)

PSM4693-012L	Figure 6

Photo 9 - Completed standpipe piezometer (BH09)

Photo 10 - Specialised Sand' material used for gravel pack/filter pack in piezometers

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SELECTED SITE PHOTOGRAPHS (5 OF 6)

PSM4693-012L	Figure 7

Photo 11 - Bentonite pellets used as an annular seal & backfill for piezometers (BH09)

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SELECTED SITE PHOTOGRAPHS (6 OF 6)

PSM4693-012L	Figure 8

Appendix A
Historical Aerial Photographs

Legend

Approximate Site Boundary Extents

Approximate Boundary of 2022 Landcom Sl

NOTES:
1. HISTORICAL IMAGERY DATED 1947

Scale 1:5,000

N

0 50 100 150 200 m

Map Projection:
Horizontal Datum:
Grid: EPSG:7856

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	Date: 10 Oct 2024	Paper Size: A3

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Guntawong Road
HISTORICAL AERIAL IMAGERY - 1947

PSM4693-012L | Appendix A1

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Legend

- Approximate Site Boundary Extents
- Approximate Boundary of 2022 Landcom SI

NOTES:
1. HISTORICAL IMAGERY DATED 1975

Scale 1:5,000

N

0 50 100 150 200 m

Map Projection:
Horizontal Datum:
Grid: EPSG:7856

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	Date: 10 Oct 2024	Paper Size: A3	

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HISTORICAL AERIAL IMAGERY - 1975

PSM4693-012L | Appendix A2

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Legend

Approximate Site Boundary Extents

Approximate Boundary of 2022 Landcom SI

NOTES:
1. HISTORICAL IMAGERY DATED 1998

Scale 1:5,000

N

0 50 100 150 200 m

Map Projection:
Horizontal Datum:
Grid: EPSG:7856

P S M	Created By: PSM	Revision: 0	
	Date: 10 Oct 2024	Paper Size: A3	

The Department of Education
Geotechnical Investigation
Schofields - Tallawong High School
Guntawong Road
HISTORICAL AERIAL IMAGERY - 1998

PSM4693-012L | Appendix A3

Legend

- Approximate Site Boundary Extents
- Approximate Boundary of 2022 Landcom SI

NOTES:
1. HISTORICAL IMAGERY DATED 2024

Scale 1:5,000

N

0 50 100 150 200 m

Map Projection:
Horizontal Datum:
Grid: EPSG:7856

P S M	Created By: PSM	Revision: 0
	Date: 10 Oct 2024	Paper Size: A3

The Department of Education
Geotechnical Investigation
Schofields - Tallawong High School
Guntawong Road
HISTORICAL AERIAL IMAGERY - 2024

PSM4693-012L | Appendix A4

\\psmbiobarchive.file.core.windows.net\archive\4000\PSM4693\Eng\QGIS\02_Workspace\01_Masterfile\PSM4693-Site 1 Masterfile.qgz Layout: Historical Aerial Photos

Appendix B
Tabulated Borehole and Test Pit Logs

Borehole ID	Approximate Depth (m)	Material Encountered	Notes
BH_02	0 – 0.4	Silty CLAY trace gravel; medium plasticity, dark brown; sub-angular gravel up to 10 mm; moist wet, very soft to soft, rootlets	Grassed surface area TOPSOIL
	0.4 – 2.3	CLAY trace gravel; high plasticity, red brown; sub-angular gravel up to 10 mm; moist, soft At 0.5 m: becoming stiff to very stiff At 1.0 m: becoming very stiff to hard, dry At 2.3 m: V-bit auger refusal	NATURAL SOIL Shrink-swell sample at 0.5 m
	2.3 – 3.2	SHALE: pale to dark grey and red brown, dry, extremely weathered, very low strength At 2.7 m: becoming low strength At 3.2 m: TC-bit auger refusal	BEDROCK
	3.2	Borehole terminated at 3.0 m	Target Depth

Borehole ID	Approximate Depth (m)	Material Encountered	Notes
BH_03	0 – 0.2	Gravelly SAND trace silt; fine grained, dark brown; sub-angular gravel up to 30 mm; moist, firm to stiff	Access track area FILL
	0.2 – 0.4	Silty CLAY trace gravel; low to medium plasticity, dark brown; sub-angular gravel up to 5 mm; dry, stiff	TOPSOIL
	0.4 – 0.8	Sandy CLAY; medium plasticity, red mottled grey; fine to medium grained sand; dry, stiff	NATURAL SOIL Shrink-swell sample at 0.5 m
	0.8 – 3.0	CLAY trace gravel; high plasticity, red brown; sub-angular gravel up to 10 mm; dry, stiff to very stiff At 1.7 m: becoming pale red and brown At 2.5 m: becoming medium to high plasticity, red mottled grey, very stiff	NATURAL SOIL
	3.0	Borehole terminated at 3.0 m	Target Depth

Borehole ID	Approximate Depth (m)	Material Encountered	Notes
BH_04	0 – 0.25	Silty gravelly CLAY; medium plasticity, dark brown; sub-angular gravel up to 10 mm; moist, stiff, rootlets	Grassed surface area / access track area FILL
	0.25 – 1.4	CLAY trace gravel; medium to high plasticity, red brown; sub-angular gravel up to 10 mm; moist, stiff At 0.6 m: becoming pale grey and red At 0.9 m: becoming very stiff to hard At 1.4 m: V-bit auger refusal	NATURAL SOIL Disturbed sample at 0.25 m Shrink-swell sample at 0.3 m
	1.4	Borehole terminated at 1.4 m	Target Depth

Test Pit ID	Approximate Depth (m)	Material Encountered	Notes
TP_01	0 – 0.3	Gravelly silty CLAY; medium plasticity, dark brown; sub-angular gravel up to 10 mm; brick fragments observed up to 30mm; moist, very soft to soft, rootlets	Grassed surface area FILL
	0.3 – 0.6	SAND with clay and gravel, fine grained, brown and grey; low plasticity; sub-angular gravel up to 10 mm; brick fragments observed up to 50mm; stiff to very stiff, soft to firm	FILL
	0.6 – 3.0	CLAY trace gravel; medium plasticity, red brown; sub-angular gravel up to 10 mm; dry to moist, stiff, pp 190 kPa At 2.0 m: becoming red mottled grey, very stiff, pp 220 - 300 kPa At 2.8 m: becoming dark red mottled grey, very stiff to hard pp 350 – 400 kPa	NATURAL SOIL CBR sample at 0.9 m
	3.0	Test pit terminated at 3.0	Target Depth

Note: PP = Pocket Penetrometer

Test Pit ID	Approximate Depth (m)	Material Encountered	Notes
TP_02	0 – 0.3	Silty CLAY trace gravel; low to medium plasticity, dark brown; sub-angular gravel up to 10 mm; wet, very soft to soft, rootlets	Grassed surface area TOPSOIL
	0.3 – 2.8	CLAY trace gravel; medium to high plasticity, red brown; sub-angular gravel up to 10 mm; moist, firm to stiff At 0.5 m: becoming stiff to very stiff At 1.0 m: pp 200 kPa At 2.0 m: becoming grey mottled red, very stiff, pp 220 to 300 kPa, rock fragments observed At 2.5 m: rock fabric visible	NATURAL SOIL CBR sample at 0.5 m
	2.8 – 3.0	SHALE: grey and yellow brown with dark grey bands, moist, extremely weathered, very low to low strength	BEDROCK
	3.0	Test pit terminated at 3.0	Target Depth

Note: PP = Pocket Penetrometer

Test Pit ID	Approximate Depth (m)	Material Encountered	Notes
TP_15	0 – 0.2	Silty CLAY; low plasticity, dark brown; moist, soft to firm, rootlets	Grassed surface area, ponding water at the surface level adjacent to test pit TOPSOIL
	0.2 – 3.0	CLAY; high plasticity, yellow brown; dry to moist, stiff At 0.7 m: becoming CLAY trace gravel, red brown; sub-rounded gravel up to 8 mm; very stiff At 0.8 m: PP 200 – 290 kPa At 1.5 m: PP 200 – 280 kPa	NATURAL SOIL
	3.0	Test pit terminated at 3.0 m	Target Depth

Note: PP = Pocket Penetrometer

Appendix C
DCP Results

Pells Sullivan Meynink

DYNAMIC CONE PENETROMETER TEST RESULTS

Job No.	PSM4693	**Sheet**	1 **of** 1
Project	Landcom Guntawong Road, Schofields	**Date Tested**	26-28/09/2022

Test Method	*AS 1289.6.3.2. - 1997 Methods of Testing Soils for Engineering Purposes - 9 kg Dynamic Cone Penetrometer Test*	Drop Height	*510 mm*
		Hammer Mass	*9 kg*
Tested by	*WW/HZ*	Tip Type	*CONICAL*

Test Depth Location	*DCP02* *BH02*	*DCP03* *BH03*	*DCP04* *BH04*	*DCP05* *TP01*	*DCP06* *TP02*	*DCP17* *TP15*
0.10	1	3	5	1	1	1
0.20	0	7	5	1	0	1
0.30	1	7	5	1	1	1
0.40	0	5	3	1	2	3
0.50	1	3	4	3	3	3
0.60	3	3	4	5	6	5
0.70	6	3	4	8	8	7
0.80	7	5	TD	7	TD	TD
0.90	7	6		7		
1.00	12	8		TD		
1.10	14	12				
1.20	TD	TD				
1.30						
1.40						
1.50						
1.60						
1.70						
1.80						
1.90						
2.00						
2.10						
2.20						
2.30						
2.40						
2.50						
2.60						
2.70						
2.80						
2.90						
3.00						
3.10						
3.20						
3.30						
3.40						
3.50						
3.60						
3.70						
3.80						
3.90						
4.00						

Comments: TD - Terminated Depth

Appendix D
CBR Results

115 Wicks Road
Macquarie Park, NSW 2113
Telephone: 02 9888 5000
Facsimile: 02 9888 5001

SOIL TEST SERVICES
ABN 43 002 145 173

FOUR DAY SOAKED CALIFORNIA BEARING RATIO TEST REPORT

Client: Pells Sullivan Meynink
PSM Job No.: PSM4693

Report No.: L4829 - 1
Report Date: 5/10/2022
Page 1 of 1

Should be 0.4m

TESTPIT NUMBER		TP 01	TP 02	TP 03	TP 0.4	TP 05
DEPTH (m)		0.9	0.5	0.5	~~0.5~~	0.5
Surcharge (kg)		4.5	4.5	4.5	4.5	4.5
Maximum Dry Density (t/m^3)		1.64 STD	1.66 STD	1.66 STD	1.53 STD	1.48 STD
Optimum Moisture Content (%)		19.0	20.6	21.5	25.1	28.0
Moulded Dry Density (t/m^3)		1.61	1.64	1.63	1.49	1.44
Sample Density Ratio (%)		98	98	98	98	98
Sample Moisture Ratio (%)		101	96	99	101	102
Moisture Contents						
Insitu (%)		22.7	22.6	27.3	27.3	30.5
Moulded (%)		19.1	19.7	21.2	25.3	28.5
After soaking and						
After Test, Top 30mm(%)		32.7	29.6	31.9	34.1	39.5
Remaining Depth (%)		23.3	21.4	22.6	26.8	31.5
Material Retained on 19mm Sieve (%)		0	0	8*	0	0
Swell (%)		2.0	2.0	1.5	1.5	1.5
C.B.R. value:	@2.5mm penetration	1.5	2.5			
	@5.0mm penetration			3.5	2.0	4.0

NOTES: Sampled and supplied by client. Samples tested as received.

- Refer to appropriate Test Pit logs for soil descriptions
- Test Methods : AS 1289 6.1.1, 5.1.1 & 2.1.1.
- Date of receipt of sample: 29/09/2022.
- TP02 & TP03 dried back prior to testing as too saturated.
- * Denotes not used in test sample.

NATA Accredited Laboratory Number:1327

Accredited for compliance with ISO/IEC 17025 - Testing.
This document shall not be reproduced except
In full without approval of the laboratory. Results relate only to the items tested or sampled.

05/10/2022
Authorised Signature / Date
(D. Treweek)

Appendix E
Shrink-Swell Index Test Results

115 Wicks Road
Macquarie Park, NSW 2113
PO Box 976
North Ryde, Bc 1670
Telephone: 02 9888 5000
Facsimile: 02 9888 5001

SOIL TEST SERVICES

ABN 43 002 145 173

SHRINK - SWELL TEST REPORT
TEST METHOD: AS1289 7.1.1

Client: Pells Sullivan Meynink
PSM Job No.: PSM4693

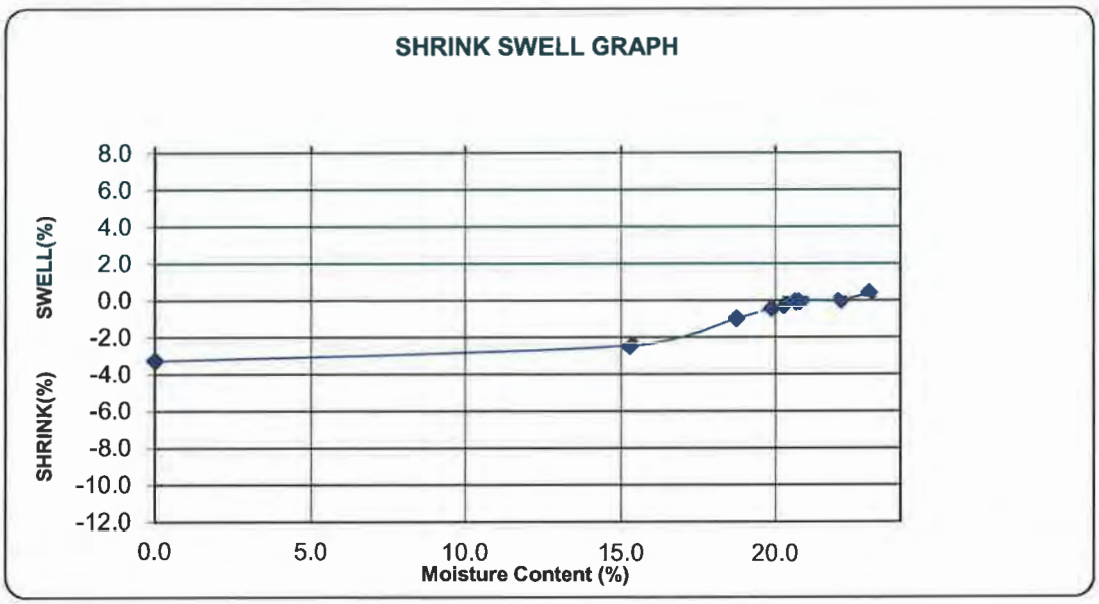
Report No.: L4829 - 1
Report Date: 7/10/2022
Page 1 of 4

Should be BH_02

~~Testpit No.: 02~~ Depth: 0.5m

MOISTURE CONTENT (SWELL)		ESTIMATED UNCONFINED COMPRESSIVE STRENGTH	
BEFORE TEST	AFTER TEST	BEFORE TEST	AFTER TEST
22.1%	23.1%	380.470 kPa	340.400 kPa

LOAD	SETTLEMENT UNDER LOAD BEFORE SATURATION	SWELL ON SATURATION	SHRINKAGE
25	0.0%	0.5%	3.2%



SHRINK SWELL INDEX
1.90 %/pF

Notes: Sampled and supplied by client. Sample tested as received.
- Suction Value used in calculation = 1.8pF
- Volume Change Coefficient (α) was assumed = 2
- Visually estimated inclusions by volume = 0-5%
- Shrinkage Cracking = Moderate
- Soil Crumbling = none
- Date of receipt of sample: 29/09/2022.

NATA Accredited Laboratory Number:1327

Authorised Signature / Date
(D. Treweek)
7/10/22

115 Wicks Road
Macquarie Park, NSW 2113
PO Box 976
North Ryde, Bc 1670
Telephone: 02 9888 5000
Facsimile: 02 9888 5001

SOIL TEST SERVICES

ABN 43 002 145 173

SHRINK - SWELL TEST REPORT
TEST METHOD: AS1289 7.1.1

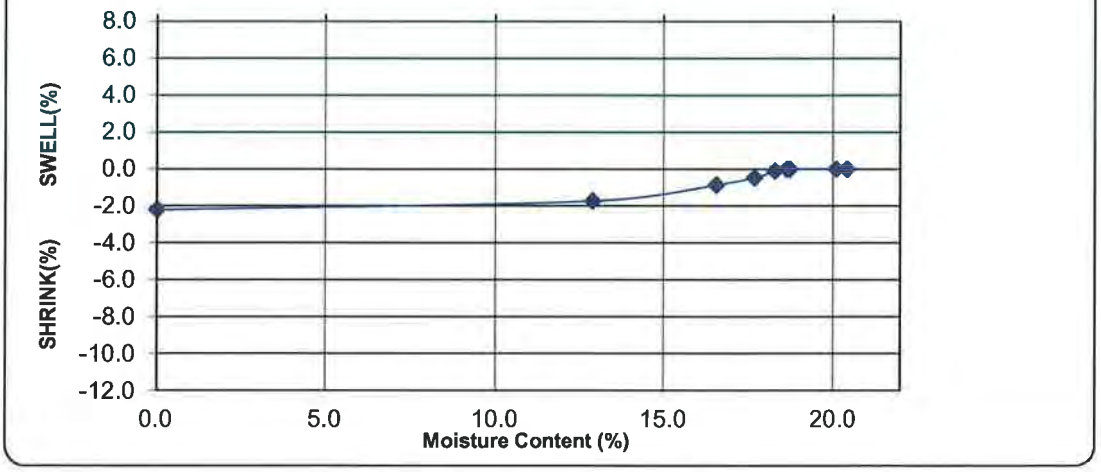
Client: Pells Sullivan Meynink
PSM Job No.: PSM4693

Report No.: L4829 - 1
Report Date: 7/10/2022
Page 2 of 4

Should be BH_03

~~Testpit No.: 03~~		Depth: 0.5m			
MOISTURE CONTENT (SWELL)		ESTIMATED UNCONFINED COMPRESSIVE STRENGTH			
BEFORE TEST	AFTER TEST	BEFORE	TEST	AFTER	TEST
20.1%	20.4%	310	kPa	340	kPa
LOAD	SETTLEMENT UNDER LOAD BEFORE SATURATION		SWELL ON SATURATION		SHRINKAGE
25	0.0%		0.0%		2.2%

SHRINK SWELL GRAPH



SHRINK SWELL INDEX
1.20 %/pF

Notes: Sampled and supplied by client. Sample tested as received.
- Suction Value used in calculation = 1.8pF
- Volume Change Coefficient (α) was assumed = 2
- Visually estimated inclusions by volume = 0-5%
- Shrinkage Cracking = Moderate
- Soil Crumbling = none
- Date of receipt of sample: 29/09/2022.

NATA Accredited Laboratory Number:1327

Authorised Signature / Date (D. Treweek) 7/10/22

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Macquarie Park, NSW 2113
PO Box 976
North Ryde, Bc 1670
Telephone: 02 9888 5000
Facsimile: 02 9888 5001

SOIL TEST SERVICES

ABN 43 002 145 173

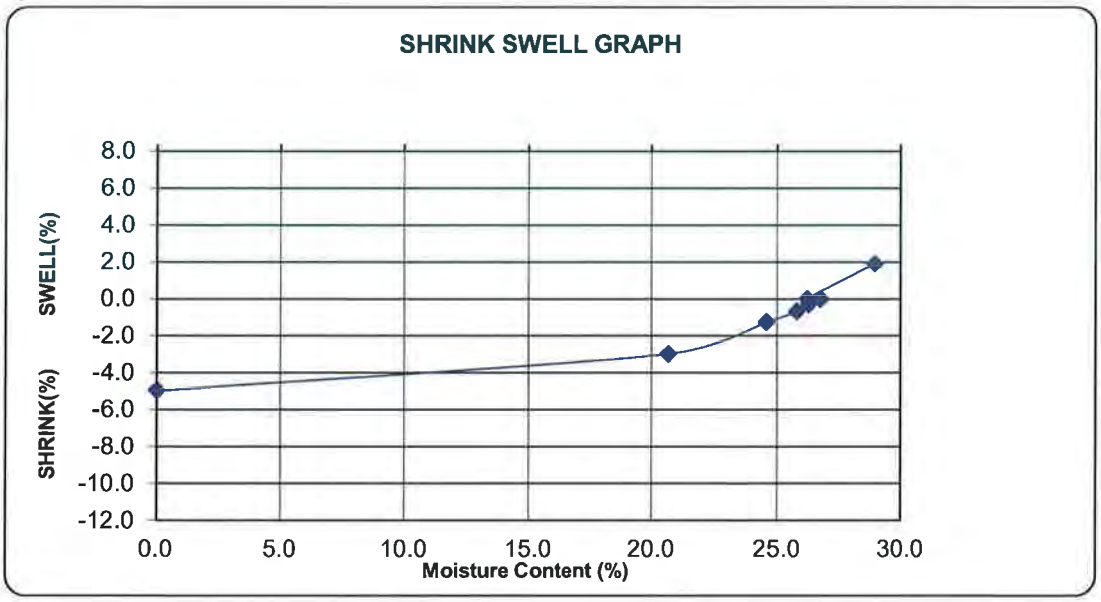
SHRINK - SWELL TEST REPORT
TEST METHOD: AS1289 7.1.1

Client: Pells Sullivan Meynink
PSM Job No.: PSM4693

Report No.: L4829 - 1
Report Date: 7/10/2022
Page 3 of 4

Should be BH_04

Testpit No.: ~~04~~		Depth: 0.3m			
MOISTURE CONTENT (SWELL)		ESTIMATED UNCONFINED COMPRESSIVE STRENGTH			
BEFORE TEST	AFTER TEST	BEFORE TEST		AFTER TEST	
26.2%	29.0%	>600	kPa	250	kPa
LOAD	SETTLEMENT UNDER LOAD BEFORE SATURATION			SWELL ON SATURATION	SHRINKAGE
25	-0.1%			1.9%	4.8%



SHRINK SWELL INDEX
3.21 %/pF

Notes: Sampled and supplied by client. Sample tested as received.
- Suction Value used in calculation = 1.8pF
- Volume Change Coefficient (α) was assumed = 2
- Visually estimated inclusions by volume = 0-5%
- Shrinkage Cracking = Moderate
- Soil Crumbling = none
- Date of receipt of sample: 29/09/2022.

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(D. Treweek)
7/10/22

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PO Box 976
North Ryde, Bc 1670
Telephone: 02 9888 5000
Facsimile: 02 9888 5001

SOIL TEST SERVICES

ABN 43 002 145 173

SHRINK - SWELL TEST REPORT
TEST METHOD: AS1289 7.1.1

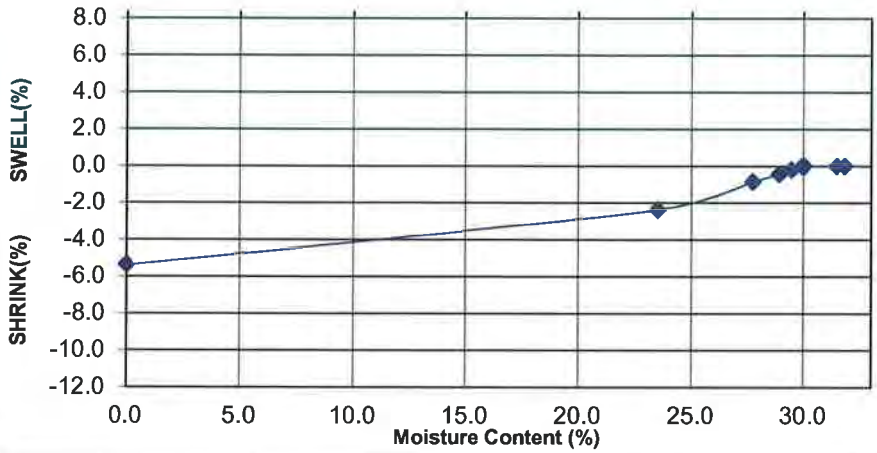
Client: Pells Sullivan Meynink
PSM Job No.: PSM4693

Report No.: L4829 - 1
Report Date: 7/10/2022
Page 4 of 4

Should be TP_13

~~Testpit No.: 13~~		Depth: 0.50 - 0.64m			
MOISTURE CONTENT (SWELL)		ESTIMATED UNCONFINED COMPRESSIVE STRENGTH			
BEFORE TEST	AFTER TEST	BEFORE	TEST	AFTER	TEST
31.5%	31.8%	160	kPa	150,180	kPa
LOAD	SETTLEMENT UNDER LOAD BEFORE SATURATION			SWELL ON SATURATION	SHRINKAGE
25	-0.1%			0.0%	5.2%

SHRINK SWELL GRAPH



SHRINK SWELL INDEX
2.91 %/pF

Notes: Sampled and supplied by client. Sample tested as received.
- Suction Value used in calculation = 1.8pF
- Volume Change Coefficient (α) was assumed = 2
- Visually estimated inclusions by volume = 0-5%
- Shrinkage Cracking = Moderate
- Soil Crumbling = none
- Date of receipt of sample: 29/09/2022.

NATA Accredited Laboratory Number:1327

Authorised Signature / Date
(D. Treweek)
7/10/22

Appendix F
Atterberg Limit Test and Moisture Content Test Results

115 Wicks Road
Macquarie Park, NSW 2113
PO Box 976
North Ryde, Bc 1670
Telephone: 02 9888 5000
Facsimile: 02 9888 5001

SOIL TEST SERVICES

ABN 43 002 145 173

MOISTURE CONTENT, ATTERBERG LIMITS AND LINEAR SHRINKAGE TEST REPORT

Client: Pells Sullivan Meynink
PSM Job No.: PSM4693

Report No.: L4829 - 3
Report Date: 12/10/2022

AS 1289	TEST METHOD	2.1.1	3.1.2	3.2.1	3.3.1	3.4.1
TESTPIT NUMBER	DEPTH m	MOISTURE CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	PLASTICITY INDEX %	LINEAR SHRINKAGE %
01	0.9	22.7	39	14	25	9.5
02	0.5	22.7	52	15	37	14.0*
06	0.5	23.3	60	21	39	14.0*
08	0.5	22.6	67	20	47	16.5*

Notes:

- The test sample for liquid and plastic limit was air-dried & dry-sieved
- The linear shrinkage mould was 125mm
- Refer to appropriate notes for soil descriptions
- Date of receipt of sample: 29/09/2022.
- Sampled and supplied by client. Samples tested as received.
- * Denotes Linear Shrinkage curled.

NATA

NATA Accredited Laboratory Number:1327

12/10/2022
Authorised Signature / Date
(D. Treweek)

Appendix G
Aggressivity and Salinity Test Results

CERTIFICATE OF ANALYSIS

Work Order	: **ES2234646**	Page	: 1 of 3
Client	: **PELLS SULLIVAN MEYNINK T/A PSM Admin PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: WILLIAM WEI	Contact	: Customer Services ES
Address	: G3, 56 DELHI ROAD NORTH RYDE NSW, AUSTRALIA 2113	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: PSM4693	Date Samples Received	: 28-Sep-2022 14:10
Order number	: ----	Date Analysis Commenced	: 30-Sep-2022
C-O-C number	: ----	Issue Date	: 14-Oct-2022 18:39
Sampler	: HENRY ZHANG		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 5		
No. of samples analysed	: 4		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Dian Dao	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EA032 (Saturated Paste EC): NATA accreditation does not cover the performance of this service.
- ALS is not NATA accredited for the analysis of Exchangeable Cations on Alkaline Soils when performed under ALS Method ED006.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).
- ALS is not NATA accredited for the calculation of saturated resistivity in a soil.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH04 0.25m	TP06 - 0.5m	BH01 - 3m	TP8 - 0.5m	----
			Sampling date / time	26-Sep-2022 00:00	27-Sep-2022 00:00	26-Sep-2022 00:00	27-Sep-2022 00:00	----
Compound	CAS Number	LOR	Unit	ES2234646-001	ES2234646-002	ES2234646-003	ES2234646-005	--------
				Result	Result	Result	Result	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	6.0	5.2	8.8	5.4	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	142	42	280	67	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	18.1	20.8	17.0	17.4	----
EA084: Saturated Resistivity								
Resistivity at 25°C	----	10	ohm cm	2170	5020	880	3730	----
ED006: Exchangeable Cations on Alkaline Soils								
Exchangeable Calcium	----	0.2	meq/100g	----	----	0.4	----	----
Exchangeable Magnesium	----	0.2	meq/100g	----	----	6.9	----	----
Exchangeable Potassium	----	0.2	meq/100g	----	----	<0.2	----	----
Exchangeable Sodium	----	0.2	meq/100g	----	----	3.6	----	----
Cation Exchange Capacity	----	0.2	meq/100g	----	----	11.1	----	----
Exchangeable Sodium Percent	----	0.2	%	----	----	32.6	----	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	2.1	0.7	----	0.4	----
Exchangeable Magnesium	----	0.1	meq/100g	6.2	3.7	----	6.4	----
Exchangeable Potassium	----	0.1	meq/100g	0.4	0.4	----	0.3	----
Exchangeable Sodium	----	0.1	meq/100g	1.4	0.5	----	1.2	----
Cation Exchange Capacity	----	0.1	meq/100g	10.1	7.3	----	9.0	----
Exchangeable Sodium Percent	----	0.1	%	14.0	9.9	----	14.4	----
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	70	50	100	80	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	220	30	250	30	----

Appendix H
Engineered Borehole Logs: BH05 to BH09

Borehole ID

BH05

Engineering Log - Non Cored Borehole

Project No.: PSM4693

Client:	The Department of Education	Commenced:	04/10/2024
Project Name:	Schofields - Tallawong High School	Completed:	04/10/2024
Hole Location:	See Figure 1	Logged By:	AL/HZ
Hole Position:	304435.0 m E 6270974.7 m N MGA2020 Zone 56	Checked By:	DP

Drill Model and Mounting:	6-tonne track mounted drill rig	Inclination:	-90°	RL Surface:	44.60 m		
Hole Diameter:	110 mm	Bearing:		Datum:	AHD	Operator:	JK Drilling

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/T		N				43.6	0		CL-CI	TOPSOIL: Silty CLAY trace sand and gravel; low to medium plasticity, dark brown; sand fine to medium grained; gravel fine to medium grained, sub-angular, up to 10 mm; organic odour and rootlets observed.	M (>PL)	F		0.00: Grassed surface. Inferred TOPSOIL.
							1			FILL: COBBLES comprising of BRICK fragments/VOID, brick structure observed, void existed within the brick structure.	M			0.10: Inferred FILL, bricks observed.
									CI	FILL: Sandy Gravelly CLAY; medium plasticity, brown; sand fine to medium grained; gravel fine to coarse grained, sub-angular, up to 20 mm; some brick fragments observed.	M (<PL)			
						42.6	2			Continued on cored borehole sheet				1.99: Inferred BEDROCK at 2.0 m.
						41.6	3							
						40.6	4							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4693

Client:	The Department of Education	Commenced:	04/10/2024
Project Name:	Schofields - Tallawong High School	Completed:	04/10/2024
Hole Location:	See Figure 1	Logged By:	AL/HZ
Hole Position:	304435.0 m E 6270974.7 m N MGA2020 Zone 56	Checked By:	DP

Drill Model and Mounting:	6-tonne track mounted drill rig	Inclination:	-90°	RL Surface:	44.60 m		
Barrel Type and Length:	NMLC 3 m	Bearing:		Datum:	AHD	Operator:	JK Drilling

Drilling Information							Rock Substance																	Rock Mass Defects		
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL L M H VH EH 0.1 0.3 1 3 10	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
					43.6	1						
					42.6	2		Continued from non-cored borehole sheet				
NMLC	0-20% Water Return	53	Is(50) d=0.09 a=0.38 MPa					LAMINITE: dark brown/brown and dark grey, developed to well developed, thinly laminated to laminated, distinct rock fabric, some iron staining and clay seams observed; approximately 90% SHALE; dark brown and dark grey and 10% SANDSTONE; fine to medium grained, brown.				2.00: Water loss experienced during coring probably due to the void from the pre-existing brick structure. BP, 5°, CL 5 mm, PR, S BP, 3°, RF 10 mm, PR, S SM, 5°, CL 40 mm, PR, S
			Is(50) d=0.01 a=0.03 MPa		41.6	3						BP, 4°, CL VN, PR, S SM, 1°, CL 30 mm, PR, S BP, 4°, CL VN, PR, S SM, 0°, CL 30 mm, PR, S SM, 1°, CL & RF 30 mm, PR, S
		65	Is(50) a=0.31 d=0.04 MPa		40.6	4		3.30 m: Becomes well developed. 4.30 m: Becomes brown. 4.50 m: Becomes dark grey and dark brown.				SM, 2°, CL 30 mm, PR, S SM, 3°, CL 20 mm, PR, S SM, 1°, CL 20 mm, PR, S SM, 5°, CL 20 mm, PR, S SM, 1°, CL 40 mm, PR, S BP, 0°, CL VN, PR, S JT, 80°, FE SN, IR, S SM, 0°, CL & RF 40 mm, PR, S FZ, 4°, CL & RF 20 mm, PR, S

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4693

Client:	The Department of Education	Commenced:	04/10/2024
Project Name:	Schofields - Tallawong High School	Completed:	04/10/2024
Hole Location:	See Figure 1	Logged By:	AL/HZ
Hole Position:	304435.0 m E 6270974.7 m N MGA2020 Zone 56	Checked By:	DP

Drill Model and Mounting:	6-tonne track mounted drill rig	Inclination:	-90°	RL Surface:	44.60 m		
Barrel Type and Length:	NMLC 3 m	Bearing:		Datum:	AHD	Operator:	JK Drilling

Drilling Information							Rock Substance				Rock Mass Defects	
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL L M H VH EH 0.1 0.3 1 3 10	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
NMLC	0-20% Water Return	65	Is(50) d=0.37 a=0.71 MPa		38.6	6		LAMINITE: dark brown and dark grey, well developed, thinly laminated to laminated, distinct rock fabric, some iron staining along defects; approximately 90% SHALE; dark brown and dark grey and 10% SANDSTONE; fine to medium grained, brown.				SZ, CL & RF 230 mm, PR, S FZ, RF VN, PR, S SM, 1°, CL 20 mm, PR, S FZ, RF 30 mm, PR, S BP, 1°, CL, PR, S BP, 2°, FE SN, PR, S BP, 0°, FE SN, PR, S
		46	Is(50) d=0.47 a=1.74 MPa		37.6	7		5.90 m: Becomes dark grey and pale grey; approximately 80% SHALE; dark brown and dark grey and 20% SANDSTONE; fine to medium grained, pale grey.				FZ, RF 20 mm, PR, S FZ, RF 20 mm, PR, S BP, 1°, CN, PR, S BP, 3°, CN, PR, S BP, 1°, CN, PR, S BP, 0°, FE SN, PR, S BP, 0°, CN, PR, S BP, 0°, CN, PR, S BP, 2°, CN, PR, S BP, 2°, CN, PR, S BP, 2°, CN, PR, S BP, 1°, CN, PR, S BP, 0°, CN, PR, S BP, 2°, CN, PR, S BP, 1°, CN, PR, S
			Is(50) d=0.64 MPa		36.6	8						BP, 0°, CN, PR, S
					35.6	9		Hole Terminated at 8.66 m Target depth				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Notes:

Crosses drawn on the core in red indicate "drilling breaks"

The Department of Education

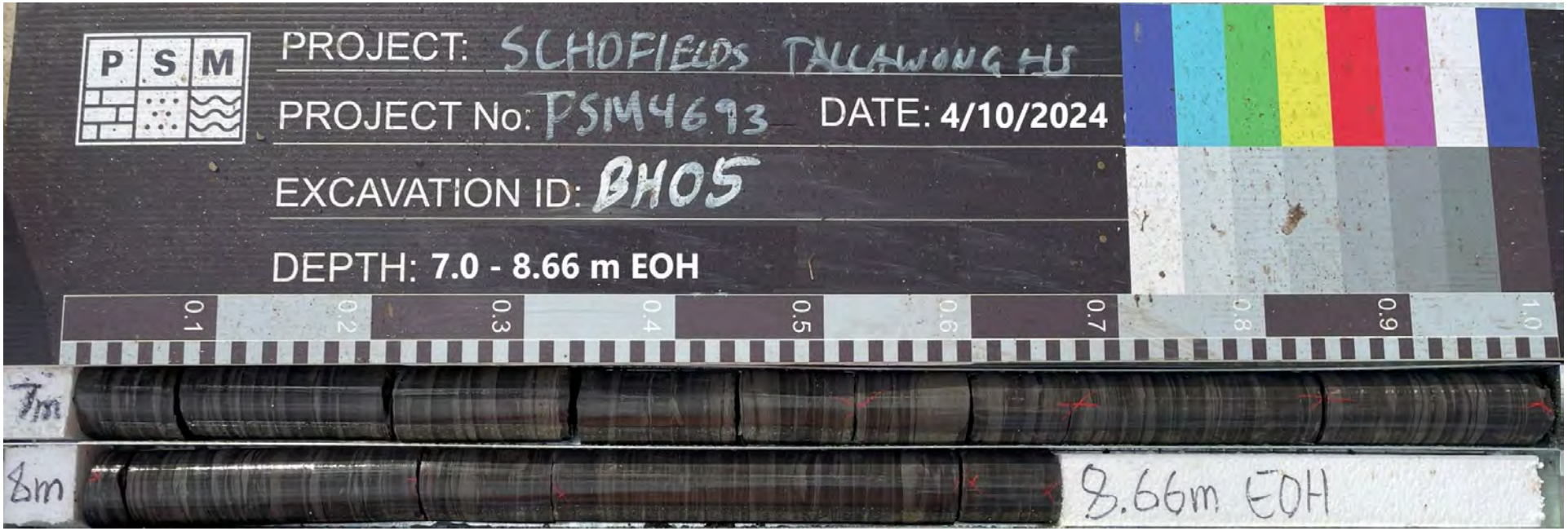
Guntawong Road Schofields

Schofields - Tallawong High School

CORE PHOTOS BH05 (2.00 to 7.00 m)

(Core Photo 1 OF 2)

PSM4693-012L	Appendix A



Notes:

Crosses drawn on the core in red indicate "drilling breaks"

The Department of Education

Guntawong Road Schofields

Schofields - Tallawong High School

CORE PHOTOS BH05 (7.00 to 8.66 m)

(Core Photo 2 OF 2)

PSM4693-012L	Appendix A

Engineering Log - Non Cored Borehole

Project No.: PSM4693

Client:	The Department of Education	Commenced:	02/10/2014
Project Name:	Schofields - Tallawong High School	Completed:	02/10/2014
Hole Location:	See Figure 1	Logged By:	AL/HZ
Hole Position:	304417.2 m E 6271014.9 m N MGA2020 Zone 56	Checked By:	DP

Drill Model and Mounting:	6-tonne track mounted drill rig	Inclination:	-90°	RL Surface:	44.80 m		
Hole Diameter:	110 mm	Bearing:		Datum:	AHD	Operator:	JK Drilling

Drilling Information								***Soil Description***				***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N				43.8	1		CL-CI	TOPSOIL: CLAY trace sand; low to medium plasticity, brown; sand fine to coarse grained; organic odour and rootlets observed.	M (<PL)	F		0.00: Grassed surface. Inferred TOPSOIL.
									CI	CLAY; medium plasticity, red brown and yellow brown.		F		0.20: Inferred NATURAL SOIL.
										1.0 m: Becomes pale brown.	M (<PL)	St		
						42.8	2			1.5 m: Becomes CLAY trace gravel: medium plasticity, brown; gravel fine to coarse grained, sub-rounded, up to 30 mm.		St to VSt		
										Continued on cored borehole sheet				2.09: V-bit Refusal, Inferred BEDROCK at 2.1 m.
						41.8	3							
						40.8	4							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4693

Client:	The Department of Education	Commenced:	02/10/2014
Project Name:	Schofields - Tallawong High School	Completed:	02/10/2014
Hole Location:	See Figure 1	Logged By:	AL/HZ
Hole Position:	304417.2 m E 6271014.9 m N MGA2020 Zone 56	Checked By:	DP

Drill Model and Mounting:	6-tonne track mounted drill rig	Inclination:	-90°	RL Surface:	44.80 m	
Barrel Type and Length:	NMLC 3 m	Bearing:		Datum:	AHD	Operator: JK Drilling

Drilling Information							Rock Substance																Rock Mass Defects		
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL 0.1 L 0.3 M 1 H 3 VH 10 EH	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
					43.8	1						
					42.8	2		Continued from non-cored borehole sheet				
NMLC	02/09/24	0						NO CORE: 130 mm thick.				
NMLC	80-100% Water Return	60	Is(50) d=0.04 MPa Is(50) d=0.12 MPa		41.8 40.8	3 4		LAMINITE: dark brown/brown and dark grey, developed to well developed, thinly laminated to laminated, distinct rock fabric, some iron staining and clay seams observed; approximately 90% SHALE; dark brown and dark grey and 10% SANDSTONE; fine to medium grained, brown. 4.15 m: Becomes dark brown with alternating light brown bands.				BP, 2°, FE SN, PR, S BP, 3°, CN, PR, S BP, 1°, FE SN, PR, S FZ, 0°, RF 20 mm, PR, S JT, 78°, CN, PR, S SM, 0°, CL & RF 50 mm, PR, S JT, 80°, CN, PR, S SM, 0°, CL 30 mm, PR, S SM, 1°, CL 20 mm, PR, S FZ, 0°, RF 40 mm, PR, S BP, 0°, CN, PR, S BP, 0°, CN, PR, S BP, 10°, CN, PR, S BP, 0°, CN, PR, S BP, 5°, CN, PR, S BP, 0°, CL VN, PR, S JT, 60°, CN, PR, S BP, 1°, CL VN, PR, S

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4693

Client:	The Department of Education	Commenced:	02/10/2014
Project Name:	Schofields - Tallawong High School	Completed:	02/10/2014
Hole Location:	See Figure 1	Logged By:	AL/HZ
Hole Position:	304417.2 m E 6271014.9 m N MGA2020 Zone 56	Checked By:	DP

Drill Model and Mounting:	6-tonne track mounted drill rig	Inclination:	-90°	RL Surface:	44.80 m		
Barrel Type and Length:	NMLC 3 m	Bearing:		Datum:	AHD	Operator:	JK Drilling

Drilling Information | **Rock Substance** | **Rock Mass Defects**

Method: NMLC
Water: 80-100% Water Return
RQD (%): 60 / 31 / 84
Samples and Field Tests: Is(50) a=0.16 MPa; Is(50) d=0.16 MPa; Is(50) a=0.24 MPa; Is(50) d=0.32 a=0.47 MPa; Is(50) d=0.16 a=0.91 MPa; Is(50) d=1.12 a=1.24 MPa
WPT (Lugeons):
RL (m): 38.8; 37.8; 36.8; 35.8
Depth (m): 6; 7; 8; 9

Material Description — ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration

LAMINITE: dark brown/brown and dark grey, developed to well developed, thinly laminated to laminated, distinct rock fabric, some iron staining and clay seams observed; approximately 90% SHALE; dark brown and dark grey and 10% SANDSTONE; fine to medium grained, brown.*(continued)*

5.68 - 5.88 m: Disturbed zone.

LAMINITE: grey and dark grey, well developed, thinly laminated to laminated, distinct rock fabric; approximately 70-90% SHALE: dark grey and 10-30% SANDSTONE: fine to medium grained, pale grey.

Weathering: XW | HW | MW | SW | FR

Strength Is(50) ● - Axial ○ - Diametral: VL (0.1) | L (0.3) | M (1) | H (3) | VH (10) | EH

Defect Spacing (mm): <20 | 60 | 200 | 600 | 1000

Defect Descriptions / Comments — Description, alpha/beta, infilling or coating, shape, roughness, thickness, other

- BP, 8°, CN, PR, S
- BP, 5°, CN, PR, S
- BP, 3°, CN, PR, S
- BP, 1°, CN, PR, S
- SZ, RF & CL 70 mm, PR, S
- SM, 1°, CL 30 mm, PR, S
- BP, 2°, CN, PR, S
- BP, 2°, CN, PR, S
- BP, 0°, CN, PR, S
- FZ, RF 90 mm, PR, S
- BP, 1°, FE SN, PR, S
- BP, 3°, CN, PR, S
- BP, 0°, RF 10 mm, PR, S
- BP, 2°, CN, PR, S
- BP, 2°, CN, PR, S
- BP, 1°, CN, PR, S
- BP, 2°, CN, PR, S
- BP, 3°, CN, PR, S
- SM, 0°, RF 20 mm, PR, S
- SM, 1°, RF 20 mm, PR, S
- BP, 0°, CN, PR, S
- BP, 1°, CN, PR, S
- BP, 0°, CN, PR, S
- BP, 2°, CN, PR, S
- BP, 0°, CN, PR, S
- BP, 0°, CN, PR, S
- BP, 1°, CN, PR, S
- BP, 2°, RF 20 mm, PR, S
- BP, 1°, CN, PR, S
- BP, 0°, CN, PR, S
- BP, 1°, CN, PR, S
- BP, 0°, CN, PR, S
- JT, 32°, CN, PR, S
- BP, 0°, CN, PR, S
- BP, 2°, CN, PR, S

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
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DB - Drilling Break

Infilling/Coating
CN - Clean
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VN - Veneer
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RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4693

Client:	The Department of Education	Commenced:	02/10/2014
Project Name:	Schofields - Tallawong High School	Completed:	02/10/2014
Hole Location:	See Figure 1	Logged By:	AL/HZ
Hole Position:	304417.2 m E 6271014.9 m N MGA2020 Zone 56	Checked By:	DP

Drill Model and Mounting:	6-tonne track mounted drill rig	Inclination:	-90°	RL Surface:	44.80 m		
Barrel Type and Length:	NMLC 3 m	Bearing:		Datum:	AHD	Operator:	JK Drilling

Drilling Information							***Rock Substance***						***Rock Mass Defects***	
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL 0.1 L 0.3 M 1 H 3 VH 10 EH	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
NMLC		84	Is(50) d=0.72 a=0.87 MPa					LAMINITE: grey and dark grey, well developed, thinly laminated to laminated, distinct rock fabric; approximately 70-90% SHALE: dark grey and 10-30% SANDSTONE: fine to medium grained, pale grey.*(continued)*				BP, 2°, CN, PR, S BP, 3°, CN, PR, S BP, 3°, CN, PR, S
					33.8	11		Hole Terminated at 10.60 m Target depth				
					32.8	12						
					31.8	13						
					30.8	14						

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

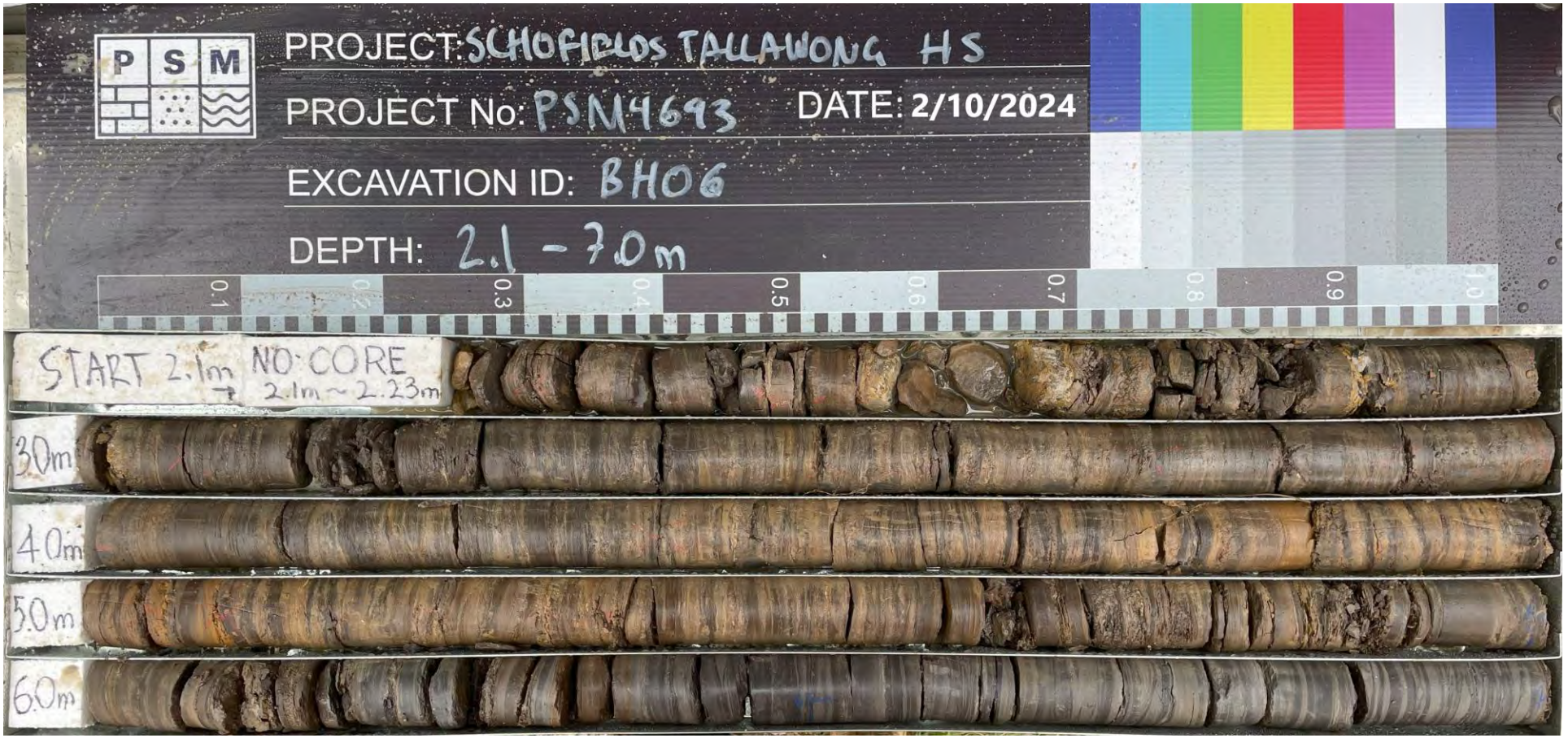
Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

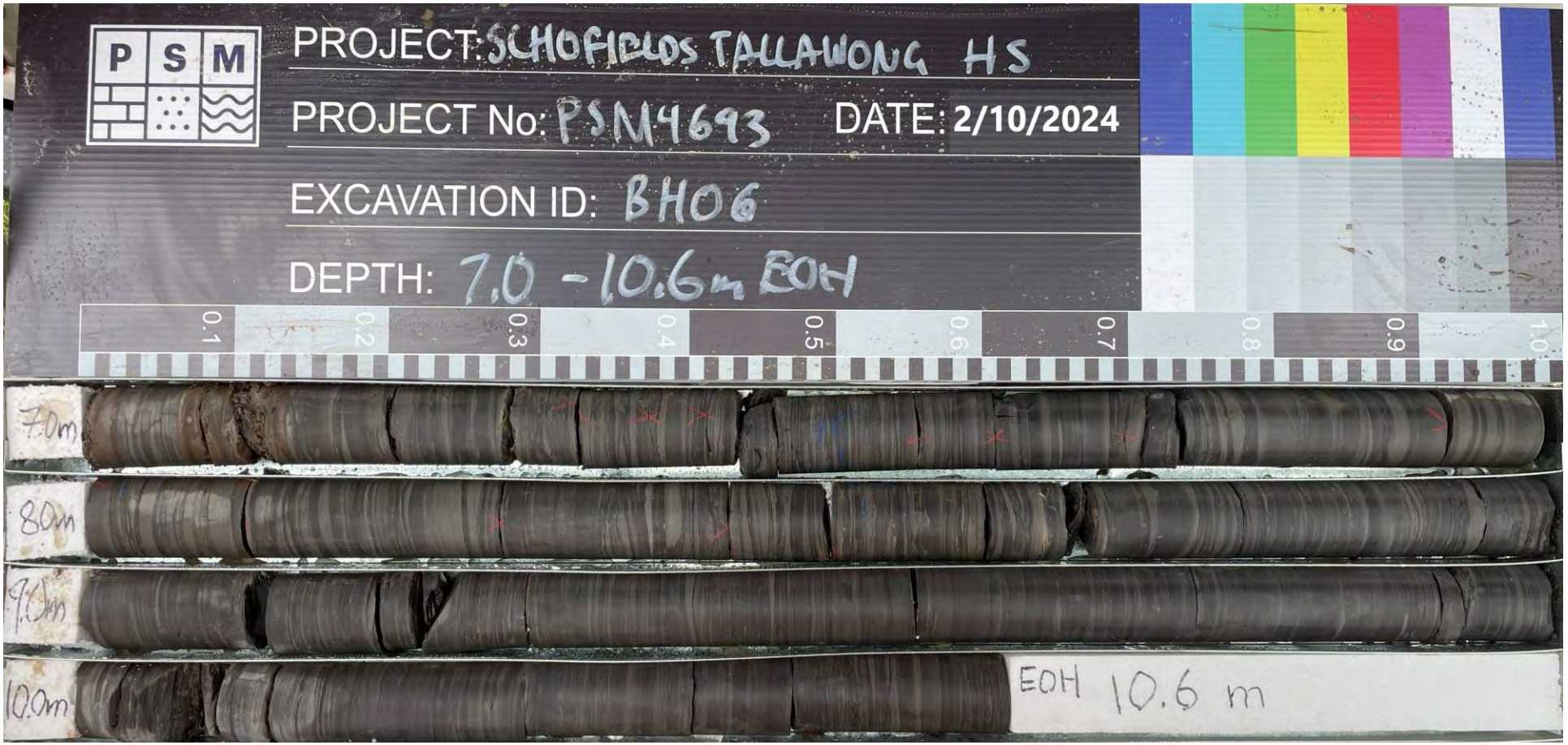


Notes:

Crosses drawn on the core in red indicate "drilling breaks"

The Department of Education
Guntawong Road Schofields
Schofields - Tallawong High School
CORE PHOTOS BH06 (2.10 to 7.00 m)
(Core Photo 1 OF 2)

PSM4693-012L	Appendix A



Notes:

Crosses drawn on the core in red indicate "drilling breaks"

The Department of Education
Guntawong Road Schofields
Schofields - Tallawong High School
CORE PHOTOS BH06 (7.00 to 10.60 m)
(Core Photo 2 OF 2)

PSM4693-012L	Appendix A

Borehole ID

BH07

Engineering Log - Non Cored Borehole

Project No.: PSM4693

Client:	The Department of Education	Commenced:	03/10/2014
Project Name:	Schofields - Tallawong High School	Completed:	03/10/2014
Hole Location:	See Figure 1	Logged By:	AL/HZ
Hole Position:	304312.3 m E 6270980.4 m N MGA2020 Zone 56	Checked By:	DP

Drill Model and Mounting:	6-tonne track mounted drill rig	Inclination:	-90°	RL Surface:	39.70 m		
Hole Diameter:	110 mm	Bearing:		Datum:	AHD	Operator:	JK Drilling

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N				38.7	1		CL	TOPSOIL: Silty CLAY; low plasticity, dark brown, organic odour and rootlets observed.	M (>PL)	S		0.00: Grassed surface. Inferred TOPSOIL.
									CI	CLAY trace sand and gravel: medium plasticity, brown and pale grey; sand fine to coarse grained; gravel fine to coarse grained, sub-angular, up to 30 mm.		F		0.20: Inferred NATURAL SOIL.
										0.7 m: Becomes red brown.	M (<PL)	St		
						37.7	2			1.5 m: Becomes Gravelly CLAY trace sand; brown; gravel fine to coarse grained, sub-rounded, up to 20 mm; shale fragments.	D	VSt		2.10: V-bit Refusal, Inferred BEDROCK at 2.1 m.
						36.7	3			Continued on cored borehole sheet				
						35.7	4							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4693

Client:	The Department of Education	Commenced:	03/10/2014
Project Name:	Schofields - Tallawong High School	Completed:	03/10/2014
Hole Location:	See Figure 1	Logged By:	AL/HZ
Hole Position:	304312.3 m E 6270980.4 m N MGA2020 Zone 56	Checked By:	DP

Drill Model and Mounting:	6-tonne track mounted drill rig	Inclination:	-90°	RL Surface:	39.70 m		
Barrel Type and Length:	NMLC 3 m	Bearing:		Datum:	AHD	Operator:	JK Drilling

Drilling Information							Rock Substance															Rock Mass Defects		
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL 0.1 L 0.3 M 1 H 3 VH 10 EH	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
					38.7	1						
					37.7	2		Continued from non-cored borehole sheet				
NMLC	80-100% Water Return	19	Is(50) a=0.13 MPa Is(50) d=0.18 MPa Is(50) a=0.15 MPa Is(50) d=0.02 MPa		36.7 35.7	3 4		LAMINITE: dark brown/brown and some dark grey, poorly dev. rock fabric to developed, thinly laminated, distinct rock fabric, clay seams throughout rock mass; approx. 90% SHALE; dark grey and dark brown and 10% SANDSTONE; fine to medium grained, brown.				SM, 0°, CL 5 mm, PR, S BP, 1°, CL 1 mm, PR, S BP, 2°, CL 1 mm, PR, S SM, 0°, CL 150 mm, PR, S BP, 5°, CL 1 mm, PR, S BP, 2°, CL 1 mm, PR, S BP, 1°, CL 1 mm, PR, S BP, 2°, CL 1 mm, PR, S JT, 70°, FE VN, PR, S BP, 1°, CL SN, PR, S BP, 5°, CL VN, PR, S BP, 3°, CL VN, PR, S

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4693

Client:	The Department of Education	Commenced:	03/10/2014
Project Name:	Schofields - Tallawong High School	Completed:	03/10/2014
Hole Location:	See Figure 1	Logged By:	AL/HZ
Hole Position:	304312.3 m E 6270980.4 m N MGA2020 Zone 56	Checked By:	DP

Drill Model and Mounting: 6-tonne track mounted drill rig | Inclination: -90° | RL Surface: 39.70 m
Barrel Type and Length: NMLC 3 m | Bearing: | Datum: AHD | Operator: JK Drilling

Drilling Information

Method: NMLC
Water: 80-100% Water Return
RQD (%): 89, 92
Samples and Field Tests: Is(50) d=0.22 a=0.2 MPa; Is(50) d=0.18 MPa; Is(50) d=0.18 MPa; Is(50) d=0.6 MPa; Is(50) d=0.8 MPa; Is(50) d=0.48 a=1.3 MPa; Is(50) d=1 MPa
WPT (Lugeons):
RL (m): 33.7, 32.7, 31.7, 30.7
Depth (m): 6, 7, 8, 9

Rock Substance

Graphic Log

Material Description
ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration

LAMINITE: dark grey/dark brown and pale grey/brown, well developed, thinly laminated, distinct rock fabric; approximately 70-80% SHALE; dark grey and dark brown and 20-30% SANDSTONE; fine to medium grained, pale grey and brown.

6.40 m: Becomes dark grey and pale grey with occasional sections of dark brown/brown, well developed, thinly laminated to laminated.

8.85 m: Becomes pale grey and dark grey, thinly laminated to laminated; approximately 70% SHALE; dark grey and 30% SANDSTONE; fine to medium grained, pale grey.

Weathering: XW HW MW SW FR

Strength Is(50) ● - Axial ○ - Diametral: VL 0.1 L 0.3 M 1 H 3 VH 10 EH

Rock Mass Defects

Defect Spacing (mm): <20 60 200 600 1000

Defect Descriptions / Comments
Description, alpha/beta, infilling or coating, shape, roughness, thickness, other

- BP, 0°, CL VN, PR, S
- BP, 1°, CL VN, PR, S
- FZ, 0°, RF 40 mm, PR, S
- FZ, 0°, RF 10 mm, PR, S
- BP, 1°, CL VN, PR, S
- BP, 3°, FE SN, PR, S
- BP, 2°, CL VN, PR, S
- BP, 5°, CL VN, PR, S
- BP, 3°, CN, PR, S
- BP, 2°, CN, PR, S
- BP, 2°, CN, PR, S
- BP, 4°, FE SN, PR, S
- BP, 0°, CL VN, PR, S
- BP, 2°, CL VN, PR, S
- BP, 2°, FE SN, PR, S
- BP, 1°, CN, PR, S
- BP, 4°, CL VN, PR, S
- BP, 0°, CN, PR, S
- JT, 68°, FE SN, PR, S
- BP, 0°, FE SN, PR, S
- JT, 45°, FE SN, PR, S
- BP, 0°, FE SN, PR, S
- CZ, 0°, RF & CL 50 mm, PR, S
- BP, 0°, CN, PR, S
- BP, 1°, CN, PR, S
- BP, 2°, CN, PR, S

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4693

Client:	The Department of Education	Commenced:	03/10/2014
Project Name:	Schofields - Tallawong High School	Completed:	03/10/2014
Hole Location:	See Figure 1	Logged By:	AL/HZ
Hole Position:	304312.3 m E 6270980.4 m N MGA2020 Zone 56	Checked By:	DP

Drill Model and Mounting:	6-tonne track mounted drill rig	Inclination:	-90°	RL Surface:	39.70 m		
Barrel Type and Length:	NMLC 3 m	Bearing:		Datum:	AHD	Operator:	JK Drilling

Drilling Information							Rock Substance														Rock Mass Defects		
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL 0.1 L 0.3 M 1 H 3 VH 10 EH	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
NMLC		92						LAMINITE: dark grey and pale grey, well developed, thinly laminated to laminated, distinct rock fabric; approximately 70-80% SHALE; dark grey and 20-30% SANDSTONE; fine to medium grained, pale grey.				BP, 0°, CN, PR, S
					28.7	11		Hole Terminated at 10.62 m Target depth				
					27.7	12						
					26.7	13						
					25.7	14						

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Notes:

Crosses drawn on the core in red indicate "drilling breaks"

The Department of Education

Guntawong Road Schofields

Schofields - Tallawong High School

CORE PHOTOS BH07 (2.15 to 7.00 m)

(Core Photo 1 OF 2)

PSM4693-012L	**Appendix A**

Notes:

Crosses drawn on the core in red indicate "drilling breaks"

The Department of Education

Guntawong Road Schofields

Schofields - Tallawong High School

CORE PHOTOS BH07 (7.00 to 10.62 m)

(Core Photo 2 OF 2)

PSM4693-012L	Appendix A

Borehole ID

BH08

Engineering Log - Non Cored Borehole

Project No.: PSM4693

Client:	The Department of Education	Commenced:	03/10/2014
Project Name:	Schofields - Tallawong High School	Completed:	03/10/2014
Hole Location:	See Figure 1	Logged By:	AL/HZ
Hole Position:	304372.6 m E 6270897.2 m N MGA2020 Zone 56	Checked By:	DP

Drill Model and Mounting:	6-tonne track mounted drill rig	Inclination:	-90°	RL Surface:	38.60 m		
Hole Diameter:	110 mm	Bearing:		Datum:	AHD	Operator:	JK Drilling

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	03/09/24			37.6	1		CL-CI	TOPSOIL: CLAY; low to medium plasticity, dark brown, organic odour and rootlets observed.		F		0.00: Grassed surface. Inferred TOPSOIL.
									CI	CLAY; medium plasticity, red brown.		F		0.20: Inferred NATURAL SOIL.
						36.6	2				M (>PL)			
										2.5 m: Becomes CLAY trace gravel: red brown; gravel fine to medium grained, sub-angular, up to 10 mm.		St		
						35.6	3			2.9 m: Becomes red brown and grey				
										3.4 m: Becomes red brown and yellow brown	M (<PL)			
						34.6	4			4.3 m: Becomes yellow brown		VSt		

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM4693

Client:	The Department of Education	Commenced:	03/10/2014
Project Name:	Schofields - Tallawong High School	Completed:	03/10/2014
Hole Location:	See Figure 1	Logged By:	AL/HZ
Hole Position:	304372.6 m E 6270897.2 m N MGA2020 Zone 56	Checked By:	DP

Drill Model and Mounting:	6-tonne track mounted drill rig	Inclination:	-90°	RL Surface:	38.60 m		
Hole Diameter:	110 mm	Bearing:		Datum:	AHD	Operator:	JK Drilling

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N				32.6	6		CI	CLAY trace gravel: medium plasticity, yellow brown and red brown; gravel fine to coarse grained, sub-angular, up to 20 mm. 5.3 m: Becomes yellow brown and grey.	M (<PL)	VSt		
										6.0 m: Becomes CLAY with sand and gravel: brown; sand fine to coarse grained; gravel fine to coarse grained, sub-angular, up to 40 mm; shale fragments.				
						31.6	7			6.8 m: Becomes Gravelly CLAY with sand; brown.	D			7.15: V-bit Refusal, Inferred BEDROCK at 7.2 m.
										Continued on cored borehole sheet				
						30.6	8							
						29.6	9							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4693

Client:	The Department of Education	Commenced:	03/10/2014
Project Name:	Schofields - Tallawong High School	Completed:	03/10/2014
Hole Location:	See Figure 1	Logged By:	AL/HZ
Hole Position:	304372.6 m E 6270897.2 m N MGA2020 Zone 56	Checked By:	DP

Drill Model and Mounting: 6-tonne track mounted drill rig | Inclination: -90° | RL Surface: 38.60 m

Barrel Type and Length: NMLC 3 m | Bearing: | Datum: AHD | Operator: JK Drilling

Drilling Information

Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)
NMLC	80-100% Water Return	5	Is(50) a=0.36 MPa		32.6	6
					31.6	7
					30.6	8
		83	Is(50) a=0.91 MPa Is(50) d=0.96 MPa Is(50) a=1.58 MPa		29.6	9

Rock Substance

Graphic Log | Material Description — ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration | Weathering (XW, HW, MW, SW, FR) | Strength Is(50) ● - Axial ○ - Diametral (VL 0.1, L 0.3, M 1, H 3, VH 10, EH)

Continued from non-cored borehole sheet

NO CORE: 100 mm thick.

LAMINITE: grey and yellow brown/brown, poorly developed rock mass to developed, thinly laminated, distinct rock fabric, some clay seams; approximately 90% SHALE: grey and 10% SANDSTONE; fine grained, brown.

7.60 m: Becomes dark brown and brown with some sections of dark grey and pale grey, well developed, thinly lamainted, distinct rock fabric; approximately 80% SHALE: dark brown/dark grey and 20% SANDSTONE; fine to medium grained, brown/pale grey.

8.00 - 8.52 m: Disturbed zone consisting of several clay seams and fractured zones.

8.52 m: Becomes dark grey/pale grey and some brown, well developed, thinly laminated, distinct rock fabric; approximately 80-90% SHALE: dark grey and brown and 10-20% SANDSTONE; fine to medium grained, pale grey.

9.5 m: Becomes dark grey and pale grey.

Rock Mass Defects

Defect Spacing (mm) (<20, 60, 200, 600, 1000)

Defect Descriptions / Comments — Description, alpha/beta, infilling or coating, shape, roughness, thickness, other

7.20: Possibly some caved in material and several drilling/mechanical fractures between 7.2 to 7.95 m.

FZ, RF 300 mm, PR, S

FZ, RF & CL 200 mm, PR, S

BP, 0°, CN, PR, S

BP, 0°, CL VN, PR, S

FZ, RF 50 mm, PR, S

SM, 2°, CL 15 mm, PR, S

SM, 1°, CL 5 mm, PR, S

SM, 3°, CL 5 mm, PR, S

SM, 4°, CL 10 mm, PR, S

SM, 2°, CL 10 mm, PR, S

FZ, 2°, RF 40 mm, PR, S

SM, 1°, RF 10 mm, PR, S

JT, 78°, CN, UN, RF

FZ, RF 20 mm, PR, RF

SM, 1°, RF 20 mm, PR, S

BP, 2°, CN, PR, S

BP, 1°, CN, PR, S

BP, 2°, CN, PR, S

BP, 0°, CN, PR, S

BP, 1°, CN, PR, S

Method

AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube

WPT - Water pressure test

Water

Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss

Core recovered (hatching indicates material)
No core recovery

Weathering

XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength

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

Defect Type

FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating

CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness

SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape

PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4693

Client:	The Department of Education	Commenced:	03/10/2014
Project Name:	Schofields - Tallawong High School	Completed:	03/10/2014
Hole Location:	See Figure 1	Logged By:	AL/HZ
Hole Position:	304372.6 m E 6270897.2 m N MGA2020 Zone 56	Checked By:	DP

Drill Model and Mounting:	6-tonne track mounted drill rig	Inclination:	-90°	RL Surface:	38.60 m		
Barrel Type and Length:	NMLC 3 m	Bearing:		Datum:	AHD	Operator:	JK Drilling

Drilling Information							***Rock Substance***															***Rock Mass Defects***	
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL L M H VH EH 0.1 0.3 1 3 10	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
NMLC	80-100% Water Return	83	Is(50) d=0.72 MPa Is(50) a=0.86 MPa		27.6	11		LAMINITE: dark grey and pale grey, well developed, thinly laminated, distinct rock fabric; approximately 80-90% SHALE: dark grey and brown and 10-20% SANDSTONE; fine to medium grained, pale grey.				BP, 2°, CN, PR, S BP, 1°, CN, PR, S BP, 2°, CN, PR, S JT, 85°, healed, UN, S BP, 3°, CN, PR, S BP, 2°, CN, PR, S BP, 2°, CN, PR, S
					26.6	12		Hole Terminated at 11.10 m Target depth				
					25.6	13						
					24.6	14						

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Notes:

Crosses drawn on the core in red indicate "drilling breaks"

The Department of Education

Guntawong Road Schofields

Schofields - Tallawong High School

CORE PHOTOS BH08 (7.2 to 11.1 m)

(Core Photo 1 OF 1)

PSM4693-012L	**Appendix A**

Engineering Log - Non Cored Borehole

Project No.: PSM4693

Client:	The Department of Education	Commenced:	04/10/2024
Project Name:	Schofields - Tallawong High School	Completed:	04/10/2024
Hole Location:	See Figure 1	Logged By:	AL/HZ
Hole Position:	304466.5 m E 6270898.1 m N MGA2020 Zone 56	Checked By:	DP

Drill Model and Mounting:	6-tonne track mounted drill rig	Inclination:	-90°	RL Surface:	41.90 m		
Hole Diameter:	110 mm	Bearing:		Datum:	AHD	Operator:	JK Drilling

Drilling Information							Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/V		N	04/09/24			40.9	1		CL	TOPSOIL: CLAY trace sand and gravel; low plasticity, dark brown; sand fine to coarse grained; gravel fine to medium grained, sub-rounded, up to 10 mm, organic odour and rootlets.	M (>PL)	F		0.00: Grassed surface. Inferred TOPSOIL.
									CI					0.20: Inferred FILL.
									CI	FILL: CLAY trace gravel; medium plasticity, red brown, gravel fine grained, sub-rounded up to 5 mm; inferred reworked natural.		F		0.50: Inferred NATURAL SOIL.
										CLAY: medium plasticity, red brown.	M (<PL)	St		
										1.4 m: Becomes CLAY with gravel; brown and red brown; gravel fine to medium grained, sub-angular, up to 30 mm; shale fragments.				1.50: V-bit Refusal, Inferred BEDROCK at 1.62 m.
						39.9	2			Continued on cored borehole sheet				
						38.9	3							
						37.9	4							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger Screwing

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4693

Client:	The Department of Education	Commenced:	04/10/2024
Project Name:	Schofields - Tallawong High School	Completed:	04/10/2024
Hole Location:	See Figure 1	Logged By:	AL/HZ
Hole Position:	304466.5 m E 6270898.1 m N MGA2020 Zone 56	Checked By:	DP

Drill Model and Mounting:	6-tonne track mounted drill rig	Inclination:	-90°	RL Surface:	41.90 m		
Barrel Type and Length:	NMLC 3 m	Bearing:		Datum:	AHD	Operator:	JK Drilling

Drilling Information							Rock Substance					Rock Mass Defects	
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL 0.1 L 0.3 M 1 H 3 VH 10 EH	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
					40.9	1		Continued from non-cored borehole sheet				
NMLC	80-100% Water Return	0			39.9	2		NO CORE: 1060 mm thick.				
					38.9	3		LAMINITE: dark brown/brown and pale grey, poorly defined rock fabric, some clay seams; approximately 90% SHALE: dark brown and 10% SANDSTONE; fine grained, brown.				~~2.68: Possibly some caved in~~ material and several drilling/mechanical fractures between 2.68 to 3.0 m.
			Is(50) d=0.01 a=0.03 MPa					3.55 m: Becomes dark grey and brown, well developed, thinly laminated, distinct rock fabric; approximately 90% SHALE: dark grey and brown and 10% SANDSTONE; fine grained, brown.				BP, 1°, CL 1 mm, PR, S SM, 2°, CL 250 mm, PR, S
					37.9	4						BP, 1°, CL 1 mm, PR, S BP, 2°, CL 1 mm, PR, S BP, 3°, CL 1 mm, PR, S SM, 2°, CL 20 mm, PR, S
		72	Is(50) d=0.02 a=0.14 MPa									BP, 3°, CL 1 mm, PR, RF

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube

WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4693

Client:	The Department of Education	Commenced:	04/10/2024
Project Name:	Schofields - Tallawong High School	Completed:	04/10/2024
Hole Location:	See Figure 1	Logged By:	AL/HZ
Hole Position:	304466.5 m E 6270898.1 m N MGA2020 Zone 56	Checked By:	DP

Drill Model and Mounting: 6-tonne track mounted drill rig | Inclination: -90° | RL Surface: 41.90 m
Barrel Type and Length: NMLC 3 m | Bearing: | Datum: AHD | Operator: JK Drilling

Drilling Information							Rock Substance				Rock Mass Defects	
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL L M H VH EH 0.1 0.3 1 3 10	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
NMLC	80-100% Water Return	72	Is(50) d=0.08 MPa Is(50) d=0.02 a=0.2 MPa		35.9	6		LAMINITE: dark grey and brown, well developed, thinly laminated, distinct rock fabric; approximately 80-90% SHALE: dark grey and 10-20% SANDSTONE; fine to medium grained, brown.				BP, 2°, CL 1 mm, PR, S BP, 0°, CL 1 mm, PR, S BP, 1°, RF 10 mm, PR, S SM, 2°, RF 20 mm, PR, S SM, 0°, CL VN, PR, S BP, 3°, RF 10 mm, PR, S
			Is(50) d=0 a=0.1 MPa					6.40 m: Becomes dark grey pale and pale grey.				BP, 3°, CL VN, PR, S BP, 1°, CL VN, PR, S SM, 8°, RF 10 mm, PR, S SM, 0°, CL 50 mm, PR, S
					34.9	7						SM, 3°, RF 20 mm, PR, S SM, 2°, CL 20 mm, PR, S BP, 2°, CL VN, PR, S BP, 4°, CL VN, PR, S
		83	Is(50) d=0 a=0.33 MPa									BP, 2°, RF 10 mm, PR, S
					33.9	8						FZ, 2°, RF 20 mm, PR, S SZ, 3°, CL 20 mm, PR, S BP, 2°, CN, PR, S BP, 0°, CN, PR, S BP, 3°, CN, PR, S
			Is(50) d=0 a=0.17 MPa									BP, 4°, CN, PR, S SM, 0°, RF 20 mm, PR, S SM, 0°, CL 30 mm, PR, S
					32.9	9						BP, 0°, RF 10 mm, PR, S BP, 0°, CL VN, PR, S BP, 0°, CN, PR, S FZ, 3°, RF 30 mm, PR, S BP, 0°, CN, PR, S
		76	Is(50) d=0.4 a=0.6 MPa					9.50 m - 9.70 m: Disturbed zone.				BP, 2°, CN, PR, S BP, 5°, CN, PR, S BP, 1°, CN, PR, S BP, 2°, CN, PR, S FZ, 0°, RF 50 mm, PR, S

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4693

Client:	The Department of Education	Commenced:	04/10/2024
Project Name:	Schofields - Tallawong High School	Completed:	04/10/2024
Hole Location:	See Figure 1	Logged By:	AL/HZ
Hole Position:	304466.5 m E 6270898.1 m N MGA2020 Zone 56	Checked By:	DP

Drill Model and Mounting:	6-tonne track mounted drill rig	Inclination:	-90°	RL Surface:	41.90 m		
Barrel Type and Length:	NMLC 3 m	Bearing:		Datum:	AHD	Operator:	JK Drilling

Drilling Information							***Rock Substance***								***Rock Mass Defects***	
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL 0.1 L 0.3 M 1 H 3 VH 10 EH	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
NMLC		76	Is(50) d=0.8 a=0.72 MPa					LAMINITE: dark grey/pale grey and some brown, well developed, thinly laminated, distinct rock fabric; approximately 80-90% SHALE: dark grey and brown and 10-20% SANDSTONE; fine to medium grained, pale grey.				BP, 0°, RF 20 mm, PR, S BP, 1°, CN, PR, S BP, 3°, CN, PR, S JT, 87°, CN, PR, S BP, 0°, CN, PR, S
					30.9	11		Hole Terminated at 10.50 m Target depth				
					29.9	12						
					28.9	13						
					27.9	14						

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

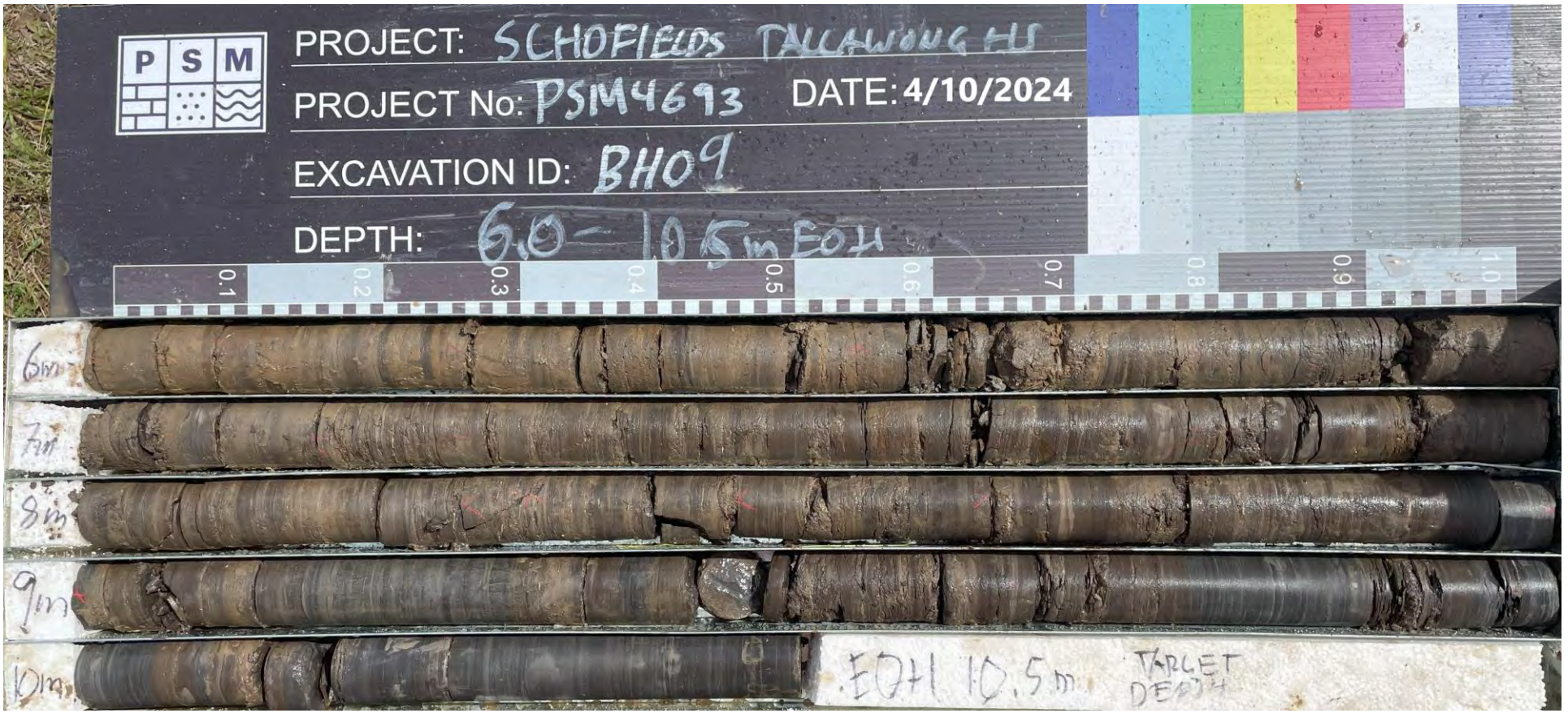
Logged in accordance with AS 1726:2017 Geotechnical site investigations

Notes:

Crosses drawn on the core in red indicate "drilling breaks"

The Department of Education
Guntawong Road Schofields
Schofields - Tallawong High School
CORE PHOTOS BH09 (1.62 to 6.00 m)
(Core Photo 1 OF 2)

PSM4693-012L	Appendix A



Notes:

Crosses drawn on the core in red indicate "drilling breaks"

The Department of Education
Guntawong Road Schofields
Schofields - Tallawong High School
CORE PHOTOS BH09 (6.00 to 10.50 m)
(Core Photo 2 OF 2)

PSM4693-012L	Appendix A

Appendix I
Piezometer Construction Records

Pells Sullivan Meynink
Engineering Consultants
Rock - Soil - Water

JOB no.: PSM4693

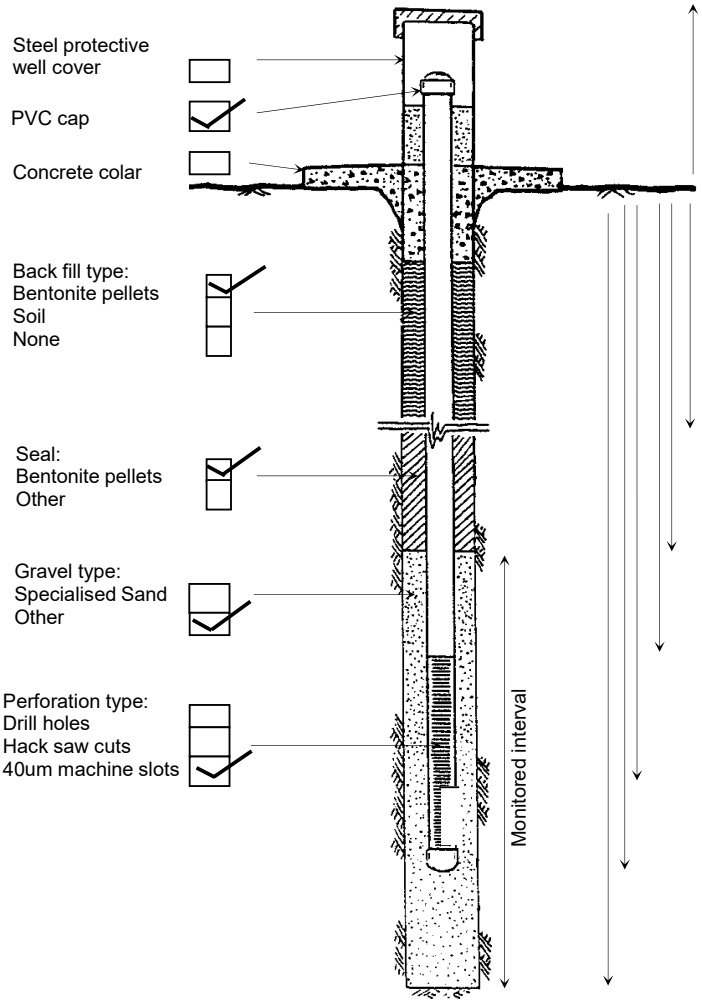
PROJECT: Schofields - Tallawong High School

PIEZOMETER CONSTRUCTION RECORD

HOLE NUMBER: BH06
PIEZOMETER: PZ01
COLLAR EASTING: 304417.2
COLLAR NORTHIN(6271014.9
COLLAR RL(m): 44.8
DATUM: mAHD

DRILLING CONTRACTOR: JK Drilling
RIG: JK308
DEPTH OF HOLE (m): 10.60
BOREHOLE INCLINATION -90
PIEZO INSTALLATION DATE: 2 October 2024
SUPERVISED BY: HZ/AL

Tick boxes | *Complete dimensions if appropriate*



Height of stickup (m)	0.75
Diameter of PVC (mm)	50
Depth to top of seal (m)	0
Depth to top of gravel pack (m)	-
Depth to top of screen (m)	4.6
Depth to base of screen (m)	10.6
Depth to base of piezo (m)	10.6
Depth to base of gravel (m)	-

COMMENTS:
Groundwater level measured on 3 October 2024 - 3.5 metres below ground level (RL 41.3 m AHD)
Blockage (coring casing unscrewed) encountered at 1.2 m, hence backfilling beyond the blockage could not occur.

Pells Sullivan Meynink
Engineering Consultants
Rock - Soil - Water

JOB no.: PSM4693

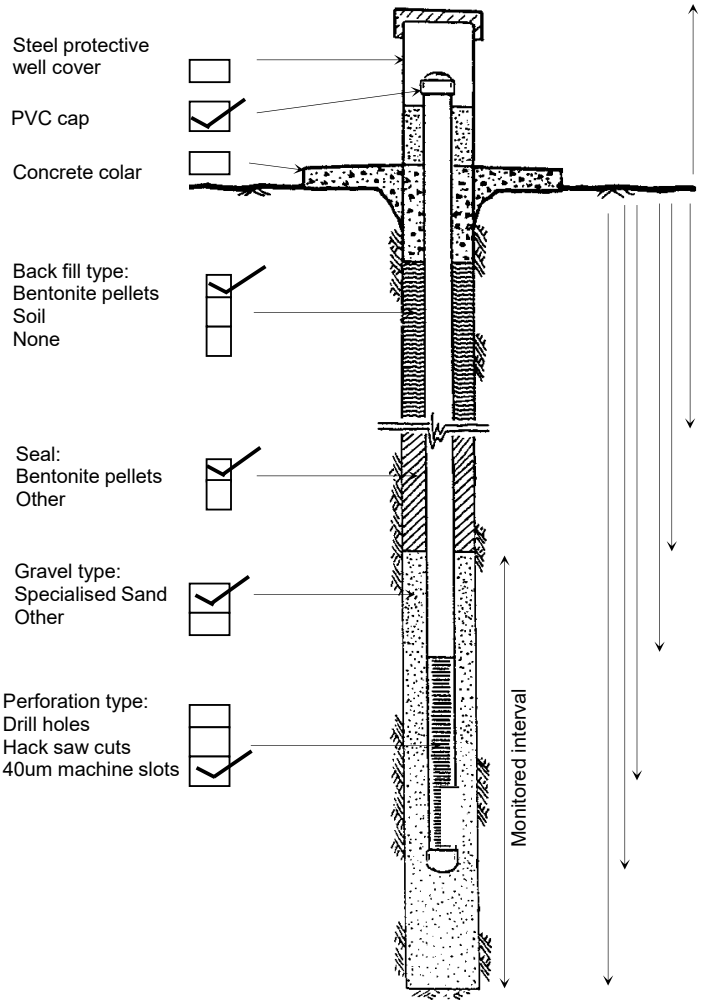
PROJECT: Schofields - Tallawong High School

PIEZOMETER CONSTRUCTION RECORD

HOLE NUMBER: BH08
PIEZOMETER: PZ02
COLLAR EASTING: 304372.6
COLLAR NORTHIN(6270897.1
COLLAR RL(m): 38.6
DATUM: mAHD

DRILLING CONTRACTOR: JK Drilling
RIG: JK309
DEPTH OF HOLE (m): 11.02
BOREHOLE INCLINATION -90
PIEZO INSTALLATION DATE: 3 October 2024
SUPERVISED BY: HZ/AL

Tick boxes | *Complete dimensions if appropriate*



Height of stickup (m)	0.6
Diameter of PVC (mm)	50
Depth to top of seal (m)	0
Depth to top of gravel pack (m)	5.9
Depth to top of screen (m)	8.1
Depth to base of screen (m)	11.1
Depth to base of piezo (m)	11.1
Depth to base of gravel (m)	11.1

COMMENTS:
Groundwater level measured on 4 October 2024 - 1.0 metres below ground level (RL 37.6 m AHD)

Pells Sullivan Meynink
Engineering Consultants
Rock - Soil - Water

JOB no.: PSM4693

PROJECT: Schofields - Tallawong High School

PIEZOMETER CONSTRUCTION RECORD

HOLE NUMBER: BH09
PIEZOMETER: PZ03
COLLAR EASTING: 304466.5
COLLAR NORTHIN(6270898.1
COLLAR RL(m): 41.9
DATUM: mAHD

DRILLING CONTRACTOR: JK Drilling
RIG: JK308
DEPTH OF HOLE (m): 10.50
BOREHOLE INCLINATION: -90
PIEZO INSTALLATION DATE: 4 October 2024
SUPERVISED BY: HZ/AL

Tick boxes

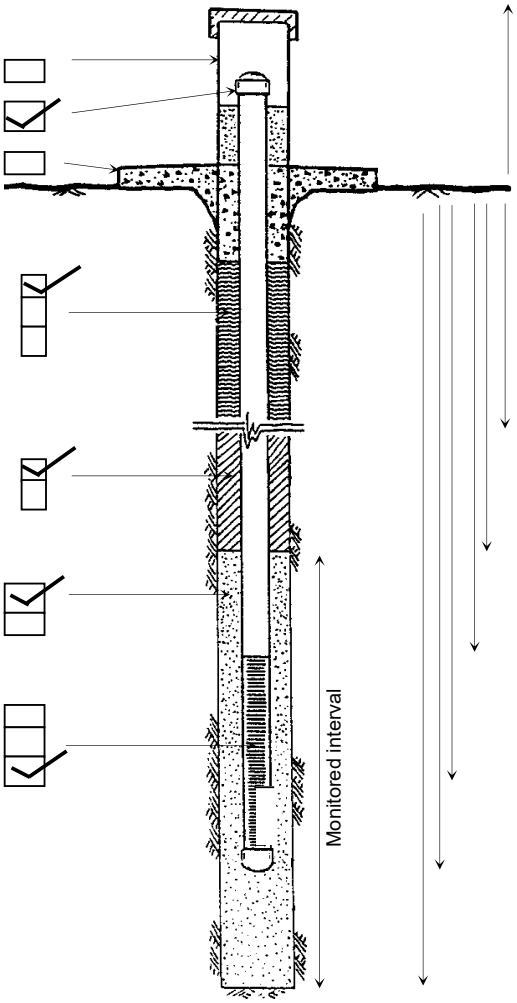
Steel protective well cover ☐
PVC cap ☑
Concrete colar ☐

Back fill type:
Bentonite pellets ☑
Soil ☐
None ☐

Seal:
Bentonite pellets ☑
Other ☐

Gravel type:
Specialised Sand ☑
Other ☐

Perforation type:
Drill holes ☐
Hack saw cuts ☐
40um machine slots ☑



Complete dimensions if appropriate

Height of stickup (m)	0.71
Diameter of PVC (mm)	50
Depth to top of seal (m)	0
Depth to top of gravel pack (m)	0.6
Depth to top of screen (m)	1
Depth to base of screen (m)	10.5
Depth to base of piezo (m)	10.5
Depth to base of gravel (m)	10.5

COMMENTS:
Groundwater level measured on 4 October 2024 - 1.2 metres below ground level (RL 40.7 m AHD)

Appendix J
Point Load Test Results

Pells Sullivan Meynink

POINT LOAD STRENGTH INDEX TEST RESULTS

Job No. *PSM4693-012L* **Sheet** 1 of 2

Project *Schofields - Tallawong High School, Guntawong Road*

Test Method	*AS 4133.4.1-2007 Methods of testing rocks for engineering purposes - Determination of point load strength index*	Sampling Technique	*NLMC*	Sampling Date	*2/10/2024*
		Storage History	*North Ryde office storage*	Testing Date	*2/10/2024*
Test Machine	*GSA 6510-0704*	Moisture Condition	*Natural*	Tested By	*HZ*
Calibration Date	*14/1/2021*	Loading Rate	*< 30 seconds*		

Rock Type	Location	Depth	Diametral Tests					Axial Tests						AS 1726:2017 Strength Class
			D	L	P	$I_{s(50)}$	Failure Mode	W	D	P	I_s	$I_{s(50)}$	Failure Mode	
		(m)	(mm)	(mm)	(kN)	(MPa)		(mm)	(mm)	(kN)	(MPa)	(MPa)		
LAMINITE	***BH05***	***2.44***	*50*	*60*	*0.2*	***0.1***	*Parallel to bedding*	*50*	*25*	*0.7*	*0.4*	***0.4***	*Through substance*	***VL / M***
LAMINITE	***BH05***	***3.00***	*50*	*50*	*0.0*	***0.0***	*Parallel to bedding*	*50*	*50*	*0.1*	*0.0*	***0.0***	*Bad break*	***#N/A***
LAMINITE	***BH05***	***4.00***	*50*	*40*	*0.1*	***0.0***	*Parallel to bedding*	*50*	*40*	*0.8*	*0.3*	***0.3***	*Through substance*	***VL / M***
LAMINITE	***BH05***	***5.40***	*50*	*60*	*0.9*	***0.4***	*Parallel to bedding*	*50*	*40*	*1.8*	*0.7*	***0.7***	*Through substance*	***M***
LAMINITE	***BH05***	***6.30***	*50*	*75*	*1.2*	***0.5***	*Parallel to bedding*	*50*	*40*	*4.4*	*1.7*	***1.7***	*Through substance*	***M / H***
LAMINITE	***BH06***	***4.18***	*50*	*70*	*0.1*	***0.0***	*Parallel to bedding*							***VL***
LAMINITE	***BH06***	***4.60***	*50*	*80*	*0.3*	***0.1***	*Parallel to bedding*							***L***
LAMINITE	***BH06***	***5.54***						*50*	*40*	*0.4*	*0.2*	***0.2***	*Through substance*	***L***
LAMINITE	***BH06***	***6.16***	*50*	*50*	*0.4*	***0.2***	*Parallel to bedding*							***L***
LAMINITE	***BH06***	***6.67***						*50*	*40*	*0.6*	*0.2*	***0.2***	*Through substance*	***L***
LAMINITE	***BH06***	***7.90***	*50*	*70*	*0.8*	***0.3***	*Parallel to bedding*	*50*	*40*	*1.2*	*0.5*	***0.5***	*Through substance*	***M***
LAMINITE	***BH06***	***8.13***	*50*	*100*	*0.4*	***0.2***	*Parallel to bedding*	*50*	*40*	*2.3*	*0.9*	***0.9***	*Through substance*	***L / M***
LAMINITE	***BH06***	***9.54***	*50*	*100*	*2.8*	***1.1***	*Parallel to bedding*	*50*	*45*	*3.5*	*1.2*	***1.2***	*Through substance*	***H***
LAMINITE	***BH06***	***10.36***	*50*	*100*	*1.8*	***0.7***	*Parallel to bedding*	*50*	*40*	*2.2*	*0.9*	***0.9***	*Through substance*	***M***
LAMINITE	***BH07***	***3.28***						*50*	*50*	*0.4*	*0.1*	***0.1***	*Through substance*	***L***
LAMINITE	***BH07***	***3.82***	*50*	*70*	*0.5*	***0.2***	*Parallel to bedding*							***L***
LAMINITE	***BH07***	***4.27***	*50*	*70*	*0.1*	***0.0***	*Parallel to bedding*	*50*	*30*	*0.3*	*0.2*	***0.1***	*Through substance*	***#N/A***
LAMINITE	***BH07***	***5.38***	*50*	*80*	*0.6*	***0.2***	*Parallel to bedding*	*50*	*40*	*0.5*	*0.2*	***0.2***	*Through substance*	***L***
LAMINITE	***BH07***	***6.46***	*50*	*70*	*0.5*	***0.2***	*Parallel to bedding*							***L***
LAMINITE	***BH07***	***6.86***	*50*	*80*	*1.5*	***0.6***	*Parallel to bedding*							***M***
LAMINITE	***BH07***	***7.73***	*50*	*180*	*2.0*	***0.8***	*Parallel to bedding*							***M***
LAMINITE	***BH07***	***8.65***	*50*	*100*	*1.2*	***0.5***	*Parallel to bedding*	*50*	*45*	*3.3*	*1.2*	***1.2***	*Through substance*	***M / H***
LAMINITE	***BH07***	***9.52***	*50*	*190*	*2.5*	***1.0***	*Parallel to bedding*							***H***
LAMINITE	***BH08***	***8.40***						*50*	*50*	*1.1*	*0.3*	***0.4***	*Through substance*	***M***
LAMINITE	***BH08***	***8.96***						*50*	*40*	*2.3*	*0.9*	***0.9***	*Through substance*	***M***
LAMINITE	***BH08***	***9.47***	*50*	*100*	*2.4*	***1.0***	*Parallel to bedding*	*50*	*40*	*4.0*	*1.6*	***1.6***	*Through substance*	***M / H***

By: ***AL/HZ*** **Checked:** ***DP*** **Date:** ***14/10/2024***

Pells Sullivan Meynink

POINT LOAD STRENGTH INDEX TEST RESULTS

Job No. ***PSM4693-012L*** **Sheet 2 of 2**

Project ***Schofields - Tallawong High School, Guntawong Road***

Test Method	*AS 4133.4.1-2007 Methods of testing rocks for engineering purposes - Determination of point load strength index*	Sampling Technique	*NLMC*	Sampling Date	*2/10/2024*
		Storage History	*North Ryde office storage*	Testing Date	*2/10/2024*
Test Machine	*GSA 6510-0704*	Moisture Condition	*Natural*	Tested By	*HZ*
Calibration Date	*14/1/2021*	Loading Rate	*< 30 seconds*		

Rock Type	Location	Depth	Diametral Tests					Axial Tests						AS 1726:2017 Strength Class
			D	L	P	$I_{s(50)}$	Failure Mode	W	D	P	I_s	$I_{s(50)}$	Failure Mode	
		(m)	(mm)	(mm)	(kN)	(MPa)		(mm)	(mm)	(kN)	(MPa)	(MPa)		
LAMINITE	***BH08***	***10.69***	*50*	*130*	*1.8*	***0.7***	*Parallel to bedding*							***M***
LAMINITE	***BH08***	***11.05***						*50*	*50*	*2.6*	*0.8*	***0.9***	*Through substance*	***M***
LAMINITE	***BH09***	***3.61***	*50*	*60*	*0.0*	***0.0***	*Parallel to bedding*	*50*	*25*	*0.1*	*0.0*	***0.0***	*Bad break*	***#N/A***
LAMINITE	***BH09***	***4.39***	*50*	*120*	*0.1*	***0.0***	*Parallel to bedding*	*50*	*50*	*0.4*	*0.1*	***0.1***	*Bad break*	***#N/A***
LAMINITE	***BH09***	***5.48***	*50*	*70*	*0.0*	***0.0***	*Parallel to bedding*	*50*	*40*	*0.5*	*0.2*	***0.2***	*Bad break*	***#N/A***
LAMINITE	***BH09***	***5.21***	*50*	*80*	*0.2*	***0.1***	*Parallel to bedding*							***VL***
LAMINITE	***BH09***	***6.10***	*50*	*60*	*0.0*	***0.0***	*Parallel to bedding*	*50*	*50*	*0.3*	*0.1*	***0.1***	*Bad break*	***#N/A***
LAMINITE	***BH09***	***7.28***	*50*	*60*	*0.0*	***0.0***	*Parallel to bedding*	*50*	*50*	*1.0*	*0.3*	***0.3***	*Through substance*	***#N/A***
LAMINITE	***BH09***	***8.11***	*50*	*100*	*0.0*	***0.0***	*Parallel to bedding*	*50*	*50*	*0.5*	*0.2*	***0.2***	*Bad break*	***#N/A***
LAMINITE	***BH09***	***9.28***	*50*	*75*	*1.0*	***0.4***	*Parallel to bedding*	*50*	*50*	*1.8*	*0.6*	***0.6***	*Through substance*	***M***
LAMINITE	***BH09***	***10.20***	*50*	*75*	*2.0*	***0.8***	*Parallel to bedding*	*50*	*45*	*2.0*	*0.7*	***0.7***	*Through substance*	***M***

By: ***AL/HZ*** **Checked:** ***DP*** **Date:** ***14/10/2024***

Appendix K
Bulk Earthworks Specification (ref.PSM4693-013S REV1 DRAFT)

New High School for Schofields and Tallawong

Bulk Earthwork Specification. Filling, Cutting and Testing.

PSM4693-013S REV1 DRAFT 21 November 2024

Table of Contents

List of Figures

List of Appendices

1. Scope

This specification details the requirements for the bulk earthworks to be undertaken at the proposed Schofields - Tallawong High School ('The Site') for The Department of Education (DoE). The area where this specification is applicable is shown in Figure 1. This includes areas where material is filled or cut to bulk earthworks level (BEL) within the site.

Fill placed in accordance with this specification is denoted as Engineered Fill.

This specification does not address any environmental, contamination, demolition or erosion issues or additional regulatory/approval requirements (e.g. Council Consent Conditions) associated with the earthworks.

2. Site preparation works

The following tasks shall be undertaken as part of the Site Preparation Works:

1. To prepare the site for the earthworks:
    a. Removal of stockpiles and mounds.
    b. Clearing of the area including removal and disposal of all trees, stumps, roots, bush, other organic material, all vegetation both living and dead, all minor man-made structures (e.g. fences) and all rubbish.
    c. Grubbing operations shall be carried out to a minimum depth of 0.5m below the surface, where grubbing is required.
    d. Stripping of topsoil and stockpiling for potential blending with Engineered Fill (refer Section 3.3.2).
    e. Demolition of structures as directed by the Principal. Extent of demolition works are not addressed by this Specification.
    f. Decommissioning the services from the pre-existing infrastructure. This is to include backfilling any voids such that they do not collapse or undergo excessive settlement under the weight of the filling and building loads. Backfilling is to be undertaken with one of the following materials:
        i. Cement stabilised sand (min. 3% cement) placed in accordance with the supplier requirements or
        ii. Mass concrete or grout as approved by PSM.
        iii. Engineered fill placed in accordance with Clauses 3.5 and 3.6 of the Specification.

    Where any excavation is required to complete the above tasks, the surface exposed at completion of the excavation shall be treated in accordance with the Subgrade Preparation requirements in Clause 3.1.

3. Filling Works

3.1 Subgrade Preparation

The condition of the subgrade should be assessed immediately prior to the commencement of filling.

All Engineered Fill is to be placed on one of the following materials:

1. Bedrock.
2. Natural insitu material of at least stiff consistency.
3. Engineered compacted fill placed in accordance with this or other approved specifications for which the Geotechnical Inspection and Testing Authority (GITA) has a Level 1 certificate certifying compliance with that approved specification AND of at least stiff consistency.
4. Existing fill / pavements / slabs and other materials as approved by PSM.

Proof rolling shall only be undertaken under the direction of PSM. PSM may also direct a bridging layer of Engineered Fill be placed and compacted to a Dry or Hilf Density Ratio (Standard Compaction) of between 98% and 102%. Any such layer shall be a Lot under Clause 5.3.

The GITA should satisfy itself that the subgrade has not been desiccated, affected by rain or disturbed. If the GITA cannot so satisfy itself, then the subgrade should be moisture conditioned and compacted to be in accordance with

Clauses 3.5 and 3.6 of this specification. Engineered Fill shall be placed only on subgrade approved by the GITA as being in accordance with this specification.

3.2 Base Geometry

The slope of any buried batter shall be less (flatter) than 1H:1V unless otherwise directed by PSM.

The contractor shall remove or flatten any geometrical obstructions (e.g. protrusions or holes) such that subsequent Engineered Fill can be placed to achieve the requirements of this specification.

Engineered Fill shall be placed only on areas where the base geometry has been approved by the GITA.

3.3 Material

3.3.1 Imported Fill

Imported Engineered Fill is to conform to one of the following definitions:

1. "Virgin excavated natural material" (VENM) as defined by the Protection of the Environment Operations Act 1997 No 156, Schedule 1, on Page 209:

   "Virgin excavated natural material (eg clay, gravel, sand, soil and rock) that is not mixed with any other waste and that:

   i. has been excavated from areas that are not contaminated, as a result of industrial, commercial, mining or agricultural activities, with manufactured chemicals and that does not contain sulphide ores or soils, or
   ii. consists of excavated natural materials that meet such criteria as may be approved by the EPA".
2. "Excavated natural material" (ENM) as defined under Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014:

   "Excavated natural material is naturally occurring rock and soil (including but not limited to materials such as sandstone, shale, clay and soil) that has:

   i. been excavated from the ground, and
   ii. contains at least 98% (by weight) natural material, and
   iii. does not meet the definition of Virgin Excavated Natural Material in the Act.
   iv. Excavated Natural Material does not include material that has been located in a hotspot; that has been processed; or that contains asbestos, Acid Sulphate Soils (ASS), Potential Acid Sulphate soils (PASS) or sulfidic ores."

3.3.2 Site Won Material

Site Won material shall comprise material won from excavations on site including natural and existing fill, including crushed concrete pavement on site. They need to satisfy Clause 3.3.3.

3.3.3 All Fill

The Engineered Fill shall be approved by the GITA as suitable for use in a structural fill.

Engineered Fill shall not comprise unsuitable material that includes:

- organic soils, such as many topsoils, severely root-affected subsoils and peat;
- silts, or materials that have the deleterious engineering properties of silt;
- other materials with properties that are unsuitable for the forming of structural fill; unless it is approved by PSM,

The GITA shall assess that the proportion of deleterious material in each Lot is not greater than 1% by weight. Deleterious material is defined by Table 3015.6 of the RMS QA Specification 3051 (Edition 7 June 2020) as:

"Rubber, Plastic, Bitumen, Paper, Cloth, Paint, Wood and Other Vegetable Matter"

If the GITA is not able to visually assess the above criterion, the GITA shall arrange appropriate testing.

All Engineered Fill particles shall be able to be incorporated within a single layer. Further, less than 30% of particles shall be retained on the 37.5 mm sieve.

Engineered Fill shall be able to be tested in accordance with the Standard Compaction method (AS1289.5.4.1) or Hilf test method (AS1289.5.7.1). These methods require less than 20% retained on the 37.5 mm sieve. Where between 20% and 30% of particles are retained on the 37.5 mm sieve the above test methods shall still be adopted and test reports annotated appropriately.

These requirements should be met by the material after placement and compaction.

Only material approved by the GITA shall be placed as Engineered Fill.

3.4 Fill Zonation and Placement

HOLD POINT

Process Held	Placing of Fill
Submission detail	The Contractor / GITA submit to PSM a Weekly Certificate as defined in Clause 7.2.1of this specification for the earthworks completed to the previous Saturday no later than 5 pm of the subsequent Wednesday.
Release of Hold Point	PSM to confirm receipt of Weekly Certificate and recommend release of Hold Point if initial assessment of the Weekly Certificate indicates it complies with requirements of this specification. The contract superintendent should then release the Hold Point if it considers appropriate.

Engineered Fill shall be placed in accordance with the following requirements:

1. In near horizontal, laterally extensive layers of uniform material and thickness, deposited systematically across the work area as determined by the GITA.
2. The compacted thickness of each layer shall be equal to or less than 300 mm.

Engineered Fill shall only be placed on subgrade in accordance with this specification and approved by the GITA.

3.5 Compaction

Engineered Fill shall be placed and compacted to a Dry or Hilf Density Ratios (Standard Compaction) of between 98% and 102%.

The insitu density shall be measured over the full depth of each layer placed.

3.6 Moisture Control

The placement moisture variation or Hilf moisture variation shall be controlled to be between 2% dry of optimum and 2% wet of optimum.

Placement moisture content of the Engineered Fill shall be measured.

4. Cutting

4.1 Subgrade Condition

The subgrade is to comprise one of the following materials:

1. Bedrock.
2. Natural insitu material of at least stiff consistency.
3. Existing fill and other materials as approved by PSM.

Proof rolling shall only be undertaken under the direction of PSM.

The GITA should satisfy itself that the subgrade has not been desiccated, affected by rain or disturbed. If the GITA cannot so satisfy itself, then the subgrade should be excavated and filled to the BEL in accordance with this specification.

5. Survey

5.1 Filling Areas

The survey requirements are as follows:

1. Any approved subgrade shall be surveyed prior to first filling such that subgrade levels are established to within ± 0.1 m. The area subject to approval shall be assessed and shown on a plan drawing to an accuracy of at least +/- 5 m in plan.
2. The Lot boundaries shall be assessed and shown on a plan drawing to an accuracy of at least +/- 5 m in plan.
3. The location of the field density tests shall be assessed and shown on the Lot boundary plan drawing to an accuracy of at least +/-5 m in plan.
5. The elevation of the field density tests shall be surveyed to an accuracy of +/-0.05 m.

The plan drawing shall show at the boundaries of the site and other identifiable site features, so as to allow the location of the lots and the test to be recoverable.

5.2 Cutting Areas

Any approved subgrade for cut areas shall be surveyed such that subgrade levels are established to within ± 0.1 m.

6. Inspection and Testing

6.1 Role of the GITA

A NATA accredited Geotechnical Inspection and Testing Authority (GITA) shall be contracted to document and certify that the works undertaken by the contractor has been completed in accordance with the relevant design and specifications.

6.2 Level 1 Control

The GITA shall adopt Level 1 responsibility as described in Section 8.2 of AS 3798-2007 "Guidelines on earthworks for commercial and residential developments":

> *"The primary objective of Level 1 Inspection and Testing is for the geotechnical inspection and testing authority (GITA) to be able to express an opinion on the compliance of the work. The GITA is responsible for ensuring that the inspection and testing are sufficient for this purpose.*
>
> *The geotechnical inspection and testing authority needs to have competent personnel on site at all times while earthwork operations are undertaken. Such operations include:*
>
> - *Completion of removal of top soil*
> - *Placing of imported or cut material*
> - *Compaction and adding/removal of moisture*
> - *Trenching and backfilling*
> - *Test rolling*
> - *Testing.*
>
> *The superintendent should agree a suitable inspection and testing plan prior to commencement of the works.*
>
> *On completion of the earthworks, the GITA will usually be required to provide a report setting out the inspections, sampling and testing it has carried out, and the locations and results thereof. Unless very unusual conditions apply, the GITA should also be able to express an opinion that the works (as far as it has been able to determine) comply with the requirements of the specification and drawings."*

For this particular contract, Level 1 responsibility includes:

1. Lot testing as per Clause 6.3 of this specification.
2. A frequency of compaction testing not less than that specified in Clause 6.4 of this specification.
3. The GITA documenting and reporting its activity in the terms required by Clause 7 of this specification.
4. The GITA undertaking adequate inspections and testing to comply with the above requirements and to be able to certify the fill in the terms required by Clause 7 of this specification.

6.3 Lot Testing

This specification requires lot testing to be undertaken.

A Lot is defined as a single layer of Engineered Fill consisting of uniform material which has undergone similar treatment (both moisture conditioning and compaction) and that represents no more than one day's work.

Lot testing comprises the following:

1. A Lot shall be identified by the Contractor or the GITA with a Lot Number and presented for testing.
2. A Lot shall be deemed to be in accordance with the specification if all the tests undertaken within the Lot are in accordance with the specification, i.e. "a none to fail basis".
3. If any one test undertaken within a Lot fails, the whole of the Lot shall be reworked and retested.

Any portion of the placed Engineered Fill must be part of a single lot and all Lots will require approval by the GITA.

6.4 Testing Frequency (Compaction Testing)

The frequency of compaction testing for each lot shall be the greater of:

a. 1 test per 500 m^3 of material placed
b. 3 tests per lot.

A laboratory moisture content test shall be undertaken for each field density test.

6.5 Proof Rolling and Plate Load Testing

Proof rolling, together with minor boxing out and refilling, of the upper surface of the bulk earthworks will be undertaken as directed by PSM. The plant to be adopted depends upon the design loads adopted by the structural engineers for each section of the site.

Plate load testing shall be undertaken at the direction of PSM at final bulk earthworks level (BEL) prior to placement of roadbase or capping material. Expected test frequency is approximately a day of testing for each building pad.

The contractor is to make a suitable reaction (eg 20 tonne excavator) available for the tests.

6.6 Inspection, Testing and Survey

The GITA shall at least undertake the following tasks:

Cut areas

1. Identify the subgrade as one of the subgrade types listed in Clause 4.1 of this specification and assess that the subgrade condition of cut areas is in accordance with the subgrade condition requirements of Clause 4.1 of this specification.
2. Should Engineered Fill be required to fill overcut areas, assess that filling has been placed in accordance with this specification.

Fill areas

3. Identify the subgrade as one of the subgrade types listed in Clause 3.1 of this specification and assess that the subgrade condition of any area prior to placement of fill material is in accordance with the subgrade preparation requirements of Clause 3.1 of this specification. Should the subgrade material comprise "Other materials as approved by PSM, eg. existing fill intended to be left in place.", PSM should be requested to inspect and provide approval prior to filling.

The GITA needs to include / refer to PSM approval in its weekly report for subgrade comprising existing fill and other materials as approved by PSM

4. Assess that the base geometry of any area prior to placement of fill material is in accordance with the base geometry requirements of Clause 3.2 of this specification.
5. Assess that the material placed is in accordance with the fill material requirements of Clause 3.3 of this specification.
6. Assess that the Engineered Fill has been placed in accordance with the requirements for fill zonation and placement of Clause 3.4 of this specification.
7. Assess that each Lot as presented for approval by the contractor is in accordance with the requirements for Lot definition of Clause 6.3 of this specification.
8. Ensure that the survey requirements in Clause 4 of this specification have been completed.
9. Estimate the approximate volume of Engineered Fill placed in each Lot presented for approval.
10. Conduct Lot testing in accordance with the construction control testing requirements of Clauses 6.3 and 6.4 of this specification.
11. Assess that the compaction of each Lot is in accordance with the requirements of Clause 3.5 of this specification. The GITA shall select a depth of insitu density tests that allows the density of the full layer to be assessed.
12. Assess that the moisture variation of each Lot is in accordance with the requirements for moisture control in Clause 3.6 of this specification.
13. Conduct material property testing in accordance with the material testing requirements in this specification.

7. Reporting and Certification

7.1 Reporting

The GITA shall produce at least the following reports:

1. *Subgrade Approval Reports* (a sample is attached). Such a report shall:
   a. Document assessments undertaken for tasks 1 and task 3 of Clause 6.6 including reporting the subgrade type.
   b. Document the subgrade survey that has been undertaken.
   c. Approve or reject the subgrade condition and base geometry for filling, based on tasks 3 and 4 of Clause 6.6.
   d. Approve or reject the subgrade condition for cut areas based on task 1.

2. *Lot Approval Reports* (a sample is attached). Such a report shall:
   a. Document assessments, testing and survey undertaken for tasks 3 to 13 of Clause 6.6.
   b. Report the results of testing undertaken for task 10 of Clause 6.6.
   c. Approve or reject lots based on tasks 11 and 12 of Clause 6.6.

3. *Material Testing Reports.* Such a report shall:
   a. Report the results of material property testing undertaken for task 13 of Clause 6.6.

4. *Daily Reports* (a sample is attached). Such a report shall be completed daily and shall:
   a. Document time spent on site by the GITA personnel.
   b. List subgrade assessments and approvals undertaken each day with reference to relevant Subgrade Approval Report(s).
   c. List Lots presented, accepted and approved or rejected each day, with reference to relevant Lot Approval Report(s).

d. List survey undertaken each day as for task 8 of Clause 6.6 and not already documented in the Subgrade or Lot Approval Reports.

e. Document other relevant activities undertaken on site that day (site instructions, breakdowns, compaction equipment used, etc.).

7.2 Certification

7.2.1 Weekly Certificates

The GITA shall produce a Weekly Certificate for any week in which earthworks are undertaken in accordance with this specification. The Weekly Certificate will cover all works from the previous Weekly Certificate until the end of work on a Saturday.

The Weekly Certificate shall transmit the following:

- Copy or reference to the complete specification document(s)
- Subgrade Approval Reports
- Lot Approval Reports
- Material property testing reports
- Daily Reports
- Survey of subgrade geometry prior to filling or in cut areas
- Plan survey drawing showing lot boundaries and location of density tests
- Survey documenting filling undertaken to date and showing location of testing
- Provide an Excel spreadsheet presenting the results of the week's acceptance testing completed by the GITA.

And certify that:

"All the earthworks undertaken and the subgrade condition in the cut areas [in the stated period] are documented in the above reports and have been undertaken in accordance with the Specification (Ref. PSM4693-013S RevX dated XXX)."

7.2.2 Interim or Final Filling Certificate

At the completion of the bulk earthworks, or as requested by the Client, the GITA shall provide an Interim or Final Filling Certificate which shall:

1. Transmit a reference list of the Weekly Certificates.
2. Provide an Excel spreadsheet presenting the results of all the acceptance testing completed by the GITA.
3. Certify that *"All the earthworks undertaken and the subgrade condition in the cut areas [in the stated period] are documented in the above reports and have been undertaken in accordance with the Specification (Ref. Ref. PSM4693-013S RevX dated XXX)."*

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304500

6271000

6271000

304500

Legend

- Approximate Site Extents - Schofields - Tallawong High School
- Approximate Stage 1 Development Plan

Note:
Aerial imagery from Nearmap of site conditions on 28 October 2024.

Scale 1:2,000

N

0 20 40 60 80 100 m

Map Projection:
Horizontal Datum:
Grid: EPSG:7856

P S M	Created By: PSM	Revision: A	
	Date: 29 Nov 2024	Paper Size: A3	

The Department of Education
Geotechnical Investigation
Schofields Tallawong High School
Guntawong Road

LOCALITY PLAN

PSM4693-013S | Figure 1

\\psmblobarchive.file.core.windows.net\archive\4000\PSM4693\Eng\QGIS\02_Workspace\01_Masterfile\PSM4693-Site 1 Masterfile.qgz Layout: PSM4693-013S - Figure 1

Appendix A
Subgrade Approval Report

GEOTECHNICAL INSPECTION AND TESTING AUTHORITY

NATA accreditation number

SUBGRADE APPROVAL REPORT

Client:	Contractor:
Job number:	Report number:
Project:	Technician:

Subgrade areas assessed:

Area ID	Date	Approximate extent	Subgrade description	Geometry summary	Specification reference	Compliance (Pass/Fail)	Survey reference	Approved (Yes/No)

COMMENTS:

Signed: Date:

Appendix B
Lot Approval Report

GEOTECHNICAL INSPECTION AND TESTING AUTHORITY

NATA accreditation number

LOT APPROVAL REPORT

Client:	Report number:
Job number:	Report date:
Project:	Technician:
Contractor:	Test methods:

LOT ID:			**Sheet**	**of**
Retest (Yes/No)			Original test report number:	
Specification reference				
Location:				
Lot boundary survey reference/location:				
Materials description:	*(MATERIAL TYPE, colour, minor components, maximum particle size)*			
Material identification:	*(Identify the material as defined in Clause 2.3.1, Clause 2.3.2 or Clause 2.3.3 of the Specification)*			
Deleterious material assessment:	*(Report proportion of deleterious material)*			
Layer thickness:				
Accepted as Lot: (Yes/No)			Date:	
Approximate volume (m3)			Number of tests required:	

Test ID No.				
Test soil description				
Date tested:				
Grid reference				
Surveyed test locations (RL,E,N)				
Test depth (mm)				
Max size (mm)				
% Oversize material (wet)				
Field wet density (t/m^3)				
Field moisture content (%)				
PWCD (t/m^3)				
Compactive effort				
Moisture variation (%)				
HILF density ratio (%)				
TEST (Pass/Fail)				

LOT APPROVAL	(Pass/Fail)	Signed:	Date:

Appendix C
Daily Report

GEOTECHNICAL INSPECTION AND TESTING AUTHORITY

NATA accreditation number

DAILY REPORT

Client:	Report number:
Job number:	Report date:
Project:	
Location:	Level of testing: Level 1
Contractor	Technician:
Time on site:	
Time off site:	

1. Subgrade Approval

Areas ID	Subgrade Approval Report No:	Comments

2. Lot Approval

Lot ID	Lot Approval Report No:	Comments

3. Survey

Type of survey	Survey undertaken by:	Reference

4. Instructions received on site

5. Instructions given on site

COMMENTS:

Signed:	Date:

Appendix D
Certification Letter (Sample Only)

Our Ref:

Date:

Addressed to: Earthwork Contractor

Attention: Earthwork Contractor Representative

Dear

RE: SAMPLE INTERIM (OR FINAL) FILLING CERTIFICATE
SCHOFIELDS - TALLAWONG HIGH SCHOOL, BULK EARTHWORKS
CERTIFICATION OF EARTHWORKS
BETWEEN [DATE OF COMMENCEMENT] AND [DATE OF COMPLETION]

In the period between [date start] and [date finish] the contractor has undertaken earthworks in areas XXX and XXX.

During the above period:

- The GITA has prepared the following Subgrade Approval Reports:

1. Subgrade Approval Report No 1
2. ……

- The GITA has prepared the following Lot Approval Reports:

1. Lot Approval Report No 1
2. ……

- The GITA has prepared the following Daily Reports:

1. Daily Report No 1……
2. ……

- The following subgrade survey was undertaken:

1. Subgrade Survey reference……
2. ……

- The following weekly survey was undertaken:

1. Weekly survey of week ending …….reference……..
2. ……

Copies of all the above documents are attached.

The GITA certifies that all the earthworks undertaken in the above stated period are documented in the above reports and have been undertaken in accordance with the Specifications (ref. PSM3821-006S, dated XXX) a copy of which is attached, with the exception of:

1. List outstanding issues (not approved subgrade, lots, unsuitable material, failed tests etc.)
2. ……..

Signed

GITA