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Department of Education

Greenway Park Public School Upgrade and New Public Pre School

Geotechnical Interpretive Report

April 2025

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Greenway Park Public School Upgrade
Geotechnical Interpretive Report

Department of Education

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WSP acknowledges that every project we work on takes place on First Peoples lands.
We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

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Abbreviations & glossary

AS	Australian Standard
BH	Borehole
B sample	Large, bulk disturbed sample taken from auger arisings which weighs 10 to 25kg. A sample where the soil structure, water content and/or constituents have been changed during sampling)
CAT	Cable Avoidance Tool
CBR	California Bearing Ratio
BYDA	Before You Dig Australia
D Sample	Small, disturbed sample taken from auger arisings which weighs 1 to 5 kg
DSI	Detailed Site Investigation
GPP	Ground Penetration Permit
HESP	Health, Environment & Safety Plan
kPa	Kilopascals
LL	Liquid Limit: the moisture content at which the soil passes from the plastic to the liquid state
LS	Linear Shrinkage
MPa	Megapascals
mAHD	Metres (above) Australian Height Datum
mBGL	Metres Below Ground Level
NSW	New South Wales
NZS	New Zealand Standard
PI	Plasticity Index: numerical difference between the liquid limit and the plastic limit of a soil
PL	Plastic Limit: moisture content at which the soil becomes too dry to be in a plastic condition
PP	Pocket Penetrometer
PSD	Particle Size Distribution
RL	Reduced Level
SINSW	Schools Infrastructure NSW
SPT	Standard Penetration Test
SPT N value	The number of blows to drive the split barrel sampler (split spoon sampler) to final 300mm out of the 450mm test depth
SPT Sample	A disturbed sample collected from the split spoon sampler after an SPT test has been performed

SWMS	Safe Work Method Statement
TC-bit	Tungsten Carbide drilling head
UCS	Uniaxial Compressive Strength
USCS	Unified Soil Classification System
V-bit	V-shaped drilling head

1 Project background

1.1 Introduction

This Geotechnical Interpretive Report (GIR) has been prepared to accompany a Review of Environmental Factors (REF) prepared for the Department of Education (DoE) relating to Greenway Park Public School and new public preschool (the development) under Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act) and State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP TI).

This document has been prepared in accordance with the Guidelines for Division 5.1 assessments – *Consideration of environmental factors for health services facilities and schools, Addendum October 2024* (the Guidelines) by the Department of Planning, Housing and Infrastructure.

This report examines and takes into account the relevant environmental factors in the Guidelines and Section 170, Section 171 and Section 171A of the Environmental Planning and Assessment Regulations 2021 (EP&A Regulation).

This report (Rev 3) has been updated from previous revision to address Department of Education comments.

Table 1.1 Environmental factors

Environmental Factor	Potential Environmental Impact	Management
A) The environmental impact on the community	Contamination impact during or post construction.	Managed under the site construction environmental management plan (CEMP)
J) Risk to the safety of the environment	Whether the development will have adverse environmental impacts (contamination leak)	Managed under the site construction CEMP
L) Pollution of the environment	Soil contamination during or post construction, impact of contamination spill.	Managed under the site construction CEMP
R) Other relevant environmental factors	Impacts of land contamination, any soil and groundwater contamination on the proposed development.	Managed under the Department of Education Asbestos Management Plan for NSW Government Schools

1.2 Review documents

The following plans/ reports have been reviewed to inform the assessment contained within this report:

Table 1.2 Relevant review documents

Document number	Document name
1	WSP Australia Pty Ltd, “Schools Infrastructure NSW: Greenway Park Public School Upgrade - Geotechnical Desktop Study (Ref. PS206292-SYD-GEO-REP-001),” WSP, August 2023
2	NSW Government, Department of Mineral Resources, “Penrith 1:100,000 - Geological Series Sheet 9030,” Geological Survey of N.S.W., 1991.
3	“Greenway Park Public School Upgrade Study: 23115 - Election Commitment Feasibility Study,” Schools Infrastructure NSW, 2023.

1.3 Proposed activity description

The proposed activity for the Greenway Park Public School upgrade includes:

1.3.1 Demolition/Earthworks

- Demolish part of boundary fence on Chapman Street for new vehicular crossover;
- Demolish parts of boundary fence on Chapman Street for new gates;
- Demolish shade structure and associated concrete slab and footpath;
- Demolish footpaths;
- Removal of trees;
- Trenching for underground services; and
- Earthworks associated with new buildings and landscaping.

1.3.2 Construction

- Construction and operation of single storey classroom building with associated covered walkways;
- Construction and operation of a new preschool building, including covered walkways, new carpark (12 spaces and one (1) accessible space) and vehicular crossover to Chapman Street;
- Installation of artwork on Block H and Block J façades, as well as a preschool retaining wall;
- Laying of services within trenches;
- New pedestrian entry points;
- Fencing and gates;
- Underground OSD tanks;
- Rainwater tanks;
- Shed for preschool;
- Outdoor play equipment for the preschool;
- New fire hydrant booster & associated building services connections;
- Retaining walls associated with the preschool;
- Signage;
- Landscaping; and
- Associated earthworks

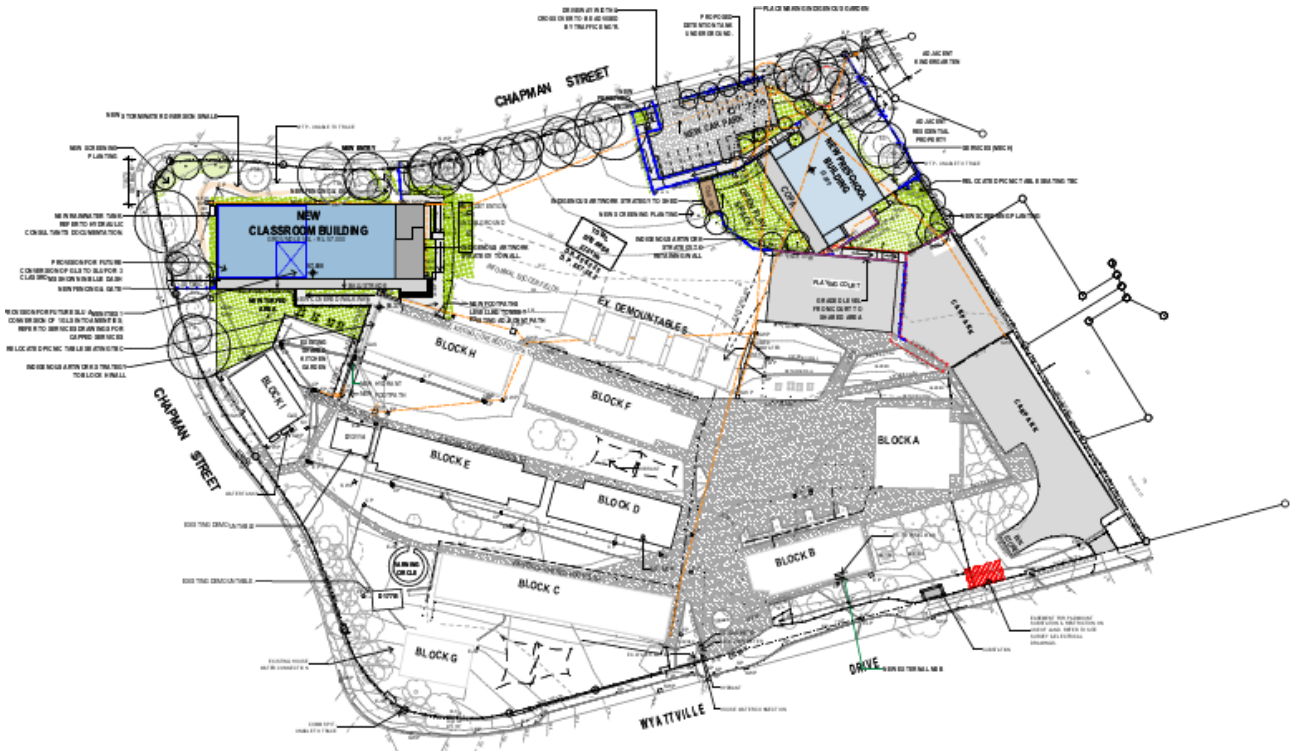


Figure 1.1 Proposed Site Plan, 7068GR01, dated 14/03/2025, Rev14

1.4 Works under separate planning pathway

To enable the proposed works to proceed, the existing seven (7) portable classrooms, associated walkways, a shade structure and associated concrete slab will be removed from site and five (5) new portable classrooms and associated walkways will be installed adjacent to Block F under a separate planning pathway. A tree removal permit for the removal of three (3) trees will also be sought separately. These works do not form part of this REF development application and have not been assessed in this report.

1.5 Activity Site

The activity site is located on Wyattville Drive, West Hoxton and is legally described as:

- Lot 11 DP 858025; and
- Lot 20 DP 867282

Greenway Park Public School is located on the south-eastern side of Chapman Street and the north-eastern side of Wyattville Drive. The surrounding context of the site is predominantly low density residential as well as a childcare centre to the north.

Figure 1.2 is an aerial photograph of the site.

Figure 1.2 Aerial photograph

2 Scope of works

The geotechnical site investigation was conducted in two stages:

Stage 1 was completed on Tuesday 26 September 2023 and comprised:

- A total of seven (7) boreholes drilled using a V-bit to termination criteria (auger refusal or SPT refusal) and then advanced to top of rock using a TC-bit, to a maximum depth of 4.19 mBGL.
- Standard Penetration Tests (SPT) were undertaken at 1 to 1.5 m intervals in appropriate soil strata, to assess relative strength.
- A total of three (3) boreholes drilled using a V-bit to 3 mBGL to a maximum depth of 1.5 mBGL for contamination assessment.

Stage 2 was completed on Wednesday 15 January 2025 and comprised:

- A total of four (4) boreholes drilled using a hand auger to 1.5mBGL (to avoid clashing with underground service) and then advanced with TC-bit to a maximum depth of 6.0mBGL.
- Standard Penetration Tests (SPT) undertaken at 1.5 m intervals starting from 1.5mBGL in appropriate soil strata, to assess relative strength.
- A total of six (6) boreholes drilled using a hand auger to 2mBGL or natural soil for contamination assessment.

For both stages:

- Experienced geotechnical engineers from WSP supervised the field investigation and logged each geotechnical borehole in accordance with AS 1726–2017 *Geotechnical Site Investigations* [1].
- Boreholes were backfilled with spoil recovered from the hole, or imported gravel where applicable, to achieve the same level as existing ground prior to intrusive works.

2.1 Purpose of this report

This geotechnical report has been prepared to collate and interpret relevant geotechnical findings, issues, potential risks, and other important information to enable recommendations to be made for the proposed school upgrade at the site.

A geotechnical desktop study (issued on 29 August 2023 [2]) was undertaken by WSP prior to the site investigation. This current report incorporates information from the desk study, as well as information derived from the geotechnical investigation and provides recommendations for geotechnical design parameters and structure foundations.

A contamination investigation was carried out concurrently with the geotechnical investigation and a DSI report will be issued separately (PS206292-CLM-REP-Greenway Park) by our environmental team.

3 Geotechnical investigation

3.1 Sitework overview

A summary of the completed geotechnical investigation locations is presented in Table 3.1. Investigation locations are further summarised on the site plan provided in Appendix A. Engineering logs, including SPT and pocket penetrometer results are presented in Appendix B.

Table 3.1 Summary of geotechnical investigation

Borehole ID	Easting[1]	Northing[1]	Reduced Levels (mAHD)[1]	Termination Depth (mBGL)	Remarks
BH01 (CLM)	300066	6242615	55.9	0.85	Refusal, although termination criterion reached
BH02 (CLM)	300050	6242616	55.8	1.50	Termination criterion reached
BH03 (CLM)	300043	6242608	55.4	1.50	Termination criterion reached
BH04	300034	6242584	57.1	4.19	Termination criterion reached
BH05	300033	6242610	56.1	2.86	Termination criterion reached
BH06	300055	6242610	55.9	2.90	Termination criterion reached
BH07	300068	6242623	55.1	3.87	Termination criterion reached
BH08	300081	6242614	55.8	3.84	Termination criterion reached
BH09	300104	6242615	55.9	3.73	Termination criterion reached
BH10	300128	6242621	56.0	3.95	Termination criterion reached
GPPS-BH01[2]	300146	6242695	55.0	6.00	Termination criterion reached
GPPS-BH02[2]	300153	6242687	55.0	5.80	Termination criterion reached
GPPS-BH03[2]	300163	6242674	55.0	6.00	Termination criterion reached
GPPS-BH04[2]	300134	6242682	55.0	4.50	Termination criterion reached
HA-BH01 (CLM)	See CLM report	See CLM report	See CLM report	1.10	-
HA-BH02 (CLM)	See CLM report	See CLM report	See CLM report	1.30	-
HA-BH03 (CLM)	See CLM report	See CLM report	See CLM report	1.30	-
HA-BH04 (CLM)	See CLM report	See CLM report	See CLM report	0.68	-
HA-BH05 (CLM)	See CLM report	See CLM report	See CLM report	0.95	-

Borehole ID	Easting[1]	Northing[1]	Reduced Levels (mAHD)[1]	Termination Depth (mBGL)	Remarks
HA-BH06 (CLM)	See CLM report	See CLM report	See CLM report	1.20	-

(1) Approximate co-ordinates and RLs obtained from GIS plan (correct to within +/- 5m)

(2) GPS-BH01 to BH04 co-ordinates are obtained from hand held GPS (correct to within +/- 5m)

3.2 Investigation methodology

3.2.1 Preliminaries

The geotechnical investigation was undertaken in accordance with the approved Health Environment and Safety Plan (HESP) and WSP Ground Penetration Permits. Relevant Safe Work Method Statements (SWMS) were adhered to during the site works.

3.2.2 Service location

Prior to attending site, a Before-You-Dig Australia (BYDA) service search was completed at all borehole and hand auger locations and service plans for potential services collated. To determine the presence of underground services, cable avoidance tool (CAT) scanning was undertaken by an accredited service locator (Geotrace Pty. Limited).

The proposed borehole and hand auger investigation locations were identified to be clear of underground utilities and the GPP signed off accordingly prior to the breaking ground.

3.2.3 Fieldwork

All field work was managed by an experienced WSP geotechnical engineer who was responsible for supervising drilling activities, soil, and rock logging, collecting samples, directing in-situ testing, and preparing engineering logs.

For Stage 1, all augered boreholes were drilled using a track mounted Comacchio Geo305 drilling rig. All drilling equipment was owned and operated by a qualified drilling crew from Matrix Drilling Pty. Limited. For Stage 2 a similar track mounted rig, Comacchio Geo300 drilling rig was used which was operated and owned by Stratacore Drilling. Test locations were positioned using a hand-held GPS.

4 Geotechnical assessment

4.1 Subsurface conditions and ground model

Based on the results of the geotechnical investigation, the geology identified across the site is consistent with the regional geology indicated by the 1:100,000 Penrith Geological Map [3]. The ground profile across the site extent can be generally summarised as follows:

- Topsoil, typically comprising fine to coarse grained clayey sand, overlying
- Fill, typically fine to coarse grained clayey sand & sandy gravel, overlying
- Alluvial soil, typically sandy silty clay, and sandy clayey silt, overlying
- Residual soil, typically comprising medium plasticity clayey silt with sand, overlying
- Extremely Weathered Shale (inferred) sandy silt with shale fragments, overlying
- Weathered rock (Bringelly Shale) highly weathered, very low to low strength.

For geotechnical characterisation of the ground conditions and to inform engineering design, the soil and rock types encountered across the site have been generalised into the Geotechnical Units presented in

. Geological cross sections have been cut across select boreholes and are provided as reference in Appendix C.

Table 4.1 Geotechnical model

Geotechnical Unit	Generalised Description	Depth to Top of Unit (mBGL)	Typical thickness of unit (m)
1. Topsoil (Encountered in all boreholes)	Gravelly Sandy SILT: low liquid limit silt fine to medium grained sand; fine to medium grained gravel	0.00	0.35
2a. Fill (Encountered in BH02-BH05, BH10 and GPPS-BH01 to BH04)	Silty Sandy CLAY: low to medium plasticity clay fine to coarse grained sand low liquid limit silt	0.20	0.4 - 1.45
2b. Fill (Encountered in BH06-BH09 only)	Clayey Sandy SILT: low liquid limit fine to coarse grained sand low plasticity clay	0.20	0.42
2c. Fill (Encountered in BH04-BH07 only)	Gravelly Silty SAND: fine to coarse grained sand low liquid limit silt fine and medium grained gravel	0.35	1.28

Geotechnical Unit	Generalised Description	Depth to Top of Unit (mBGL)	Typical thickness of unit (m)
3a. Alluvial Soil (Encountered in all boreholes)	Sandy Silty CLAY: medium to high plasticity low liquid limit silt fine and medium grained sand	0.60 – 1.00	0.5 - 1.00
3b. Alluvial Soil (Encountered in all boreholes)	Gravelly Clayey SILT: low liquid limit silt low plasticity clay fine to medium grained gravel.	1.50	0.50
4. Residual Soil (Encountered in BH01, BH03-BH08 and GPPS-BH01 to BH04)	Sandy Silty CLAY: low liquid limit silt medium to high plasticity clay fine grained sand	1.10 - 2.05	1.05 – 1.90
5. Weathered Rock (Encountered in BH04-BH10 and GPPS-BH01 to BH04)	SILTSTONE: sandstone laminations extremely to highly weathered very low strength	2.61 – 3.00	1.58
6. Rock (Encountered in BH07-BH10 only)	SILTSTONE: siltstone laminations highly weathered very low to low strength	3.50	0.45

It is noted that during the second geotechnical investigation for GPPS-BH01 to BH05, the thickness of fill materials was observed to range between 0.4 to 0.7 meters, which is thinner than that observed in the western part of the site (where the first geotechnical investigation was conducted). Similar to the first geotechnical investigation, extremely or highly weathered rock was typically encountered at approximately 3.0 mBGL, overlain by residual soil with a thickness of 1.5 to 1.9 meters.

4.2 Field test results

4.2.1 Standard penetration test

The SPT procedure is described in AS 1289.6.3.1–2004 [4] and summarised in the WSP explanatory notes provided in Appendix B. SPTs were undertaken at 1 to 1.5 m intervals until refusal. The SPTs were done across all lithologies encountered across site. The SPTs generally all refused in the weathered Rock. The SPT N values across site ranged between 12 – 63. A summary can be viewed below:

- SPTs that occurred within the fill material had an SPT N-value that ranged from 12 – 24.
- SPTs that occurred within the alluvial soil had an SPT N-value that ranged from 16 – 26.
- SPTs that occurred within the residual soil had an SPT N-value that ranged from 19 – 45.

— SPTs within extremely weathered rock refused with hammer bouncing.

The SPT results can be viewed on the borehole logs within Appendix B.

4.2.2 *Pocket penetrometer*

Pocket Penetrometer tests were undertaken on select soil samples. The results are presented in Table 4.2.

Table 4.2 Pocket penetrometer test results

Borehole ID	Depth Range (mBGL)	Material type	Number of Tests	Unconfined Compressive Strength Range (kPa)[1]	Undrained Shear Strength (kPa)	Strength Classification[1]
BH04	0.60-1.60	Alluvial Soil	2	>580	>290	H
	2.60	Residual Soil	1	>600	>300	H
	4.10	Weathered Rock	1	>600	>300	H
BH05	0.60-0.70	Fill	2	210-240	– [2]	– [2]
	1.60-1.70	Alluvial Soil	2	310-330	150-165	St - VSt
	2.60-2.70	Residual Soil	2	>600	>300	H
BH06	0.60-1.70	Alluvial Soil	4	>540	>270	H
	2.60	Residual Soil	1	>600	>300	H
BH07	0.62-1.57	Alluvial Soil	3	540-600	270-300	H
	1.57-2.00	Alluvial Soil	3	>600	>300	H
	2.60-3.05	Residual Soil	2	>600	>300	H
BH08	0.60-0.90	Alluvial soil	2	150-190	75-95	St
	0.90-2.00	Alluvial soil	3	420-510	210-255	H
	2.50-3.00	Residual Soil	3	>600	>300	H
	3.56-3.84	Rock	2	>600	>300	H
BH09	0.35-1.63	Fill	2	130-200	– [2]	– [2]
	1.63-2.00	Alluvial Soil	3	320-350	160-175	St - VSt
	2.60-2.72	Residual Soil	2	570-600	285-300	H
	2.72-3.73	Weathered Rock/Rock	3	>600	>300	H
BH10	0.30-1.65	Fill	3	130-180	– [2]	– [2]
	1.65-2.00	Alluvial Soil	3	360-370	180-185	St - VSt
	2.60-3.00	Residual Soil	3	430-580	215-290	H
	3.50-3.95	Rock	2	>600	>300	H
GPPS-BH01	1.60 – 1.80	Residual Soil	2	>600	>300	H

Borehole ID	Depth Range (mBGL)	Material type	Number of Tests	Unconfined Compressive Strength Range (kPa)[1]	Undrained Shear Strength (kPa)	Strength Classification[1]
	3.10 – 3.30	Weathered Rock	2	>600	>300	H
GPPS-BH02	1.60 – 1.80	Residual Soil	2	>600	>300	H
	3.10 – 3.30	Weathered Rock	2	>600	>300	H
GPPS-BH03	1.60 – 1.80	Residual Soil	2	>600	>300	H
	3.05 – 3.30	Weathered Rock	2	>600	>300	H
GPPS-BH04	1.60 – 1.80	Residual Soil	2	>600	>300	H
	3.00 – 3.30	Weathered Rock	2	>600	>300	H

(1) Refer to borehole logs within Appendix B to view all test results. Strength Classification a result of SPT and PP data.
[2] Strength Classification not assigned to uncontrolled fill material

4.3 Groundwater

Natural groundwater was not encountered in any boreholes during the fieldwork. It should be noted, however, that groundwater levels are subject to seasonal and climatic variations. Periods of heavy rainfall may result in a perched water table, specifically where a comparably impermeable layer underlies a more permeable layer.

An increase in soil moisture content was observed within borehole BH03 (CLM) at approximately 0.8 mBGL. It was later inferred that this was not a natural groundwater inflow but possibly seepage from a nearby water service.

4.4 Laboratory testing

Selected disturbed soil samples and rock sample were collected from the auger arisings and sent to Macquarie Geotechnical Laboratories Pty. Limited (MacGeo Labs), a NATA-accredited soil laboratory. Scheduled lab tests are listed in Table 4.3. Following test completion, laboratory test results and certificates will be provided in Section 4.4.1 and 4.4.2 and in Appendix A, respectively.

Table 4.3 Geotechnical lab test schedule

Laboratory Test	Borehole ID	Sample Type	Sample Depth (mBGL)	Date Sampled
Atterberg Limits & Linear Shrinkage (LL, PL, PI and LS) (AS 1289.3.1.1, 3.2.1, 3.3.1, 3.4.1)	BH04	SPT	1.50 – 1.95	26/09/2023
	BH04	SPT	2.50 – 2.95	26/09/2023
	BH05	DS	2.10 – 2.50	26/09/2023
	BH06	DS	2.00 – 2.50	26/09/2023
	BH07	SPT	1.50 – 1.95	26/09/2023
	BH08	SPT	2.50 – 2.95	26/09/2023

Laboratory Test	Borehole ID	Sample Type	Sample Depth (mBGL)	Date Sampled
	BH09	SPT	1.50 – 1.95	26/09/2023
	GPPS-BH01	DS	1.5-1.95	15/01/2025
	GPPS-BH03	DS	1.5-1.95	15/01/2025
	GPPS-BH04	DS	1.5-1.95	15/01/2025
Particle Size Distribution (AS 1289.3.6.1)	BH06	SPT	0.50 – 0.95	26/09/2023
	BH07	SPT	2.50 – 2.95	26/09/2023
	BH08	SPT	1.50 – 1.95	26/09/2023
	BH10	SPT	2.50 – 2.95	26/09/2023
Soil Aggressivity Test (pH, Chloride, Sulphate, Resistivity)	BH04	SPT	1.50 – 1.95	26/09/2023
	BH04	SPT	2.50 – 2.95	26/09/2023
	BH05	DS	2.10 – 2.50	26/09/2023
	BH06	SPT	0.50 – 0.95	26/09/2023
	BH06	DS	2.00 – 2.50	26/09/2023
	BH07	SPT	2.50 – 2.95	26/09/2023
	BH08	SPT	1.50 – 1.95	26/09/2023
	BH09	SPT	1.50 – 1.95	26/09/2023
	BH10	SPT	2.50 – 2.95	26/09/2023
	GPPS-BH01	DS	1.5-1.95	15/01/2025
	GPPS-BH03	DS	1.5-1.95	15/01/2025
	GPPS-BH04	DS	1.5-1.95	15/01/2025

LL = Liquid Limit, PL = Plastic Limit, PI = Plasticity Index, LS = Linear Shrinkage

4.4.1 Geotechnical test results

Following receipt from the lab, geotechnical laboratory test results will be provided in Table 4.4 and Table 4.5.

Table 4.4 Atterberg Limit test results

Borehole ID	Sample Depth (mBGL)	Material	USCS[1] Symbol	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)
BH04	1.50-1.95	Silty CLAY	CI-CH	49	17	32	11.0
BH04	2.50-2.95	Silty CLAY	CI-CH	49	18	31	14.5
BH05	2.10-2.50	Silty CLAY	CI	40	18	22	8.0
BH06	2.00-2.50	Silty Sandy CLAY	CH	52	13	39	9.0
BH07	1.50-1.95	Silty CLAY	CH	65	16	49	12.5

Borehole ID	Sample Depth (mBGL)	Material	USCS[1] Symbol	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)
BH08	2.50-2.95	Silty CLAY	CH	55	15	40	12.0
BH09	1.50-1.95	Silty CLAY	CH	56	17	39	12.5
GPPS-BH01	1.5-1.95	Silty CLAY	CH	51	14	37	13.5
GPPS-BH03	1.5-1.95	Silty CLAY	CH	56	17	39	13.5
GPPS-BH04	1.5-1.95	Silty CLAY	CH	54	16	38	12.5

(1) USCS = Unified Soil Classification System

Table 4.5 Particle Size Distribution (PSD) test results

Borehole ID	Sample Depth (mBGL)	Material	Gravel (%)	Sand (%)	Clay (%)
BH06	0.50-0.95	Silty CLAY	18	17	65
BH07	2.50-2.95	Silty CLAY	12	14	74
BH08	1.50-1.95	Silty CLAY	17	29	54
BH10	2.50-2.95	Silty CLAY	1	1	98

(1) USCS = Unified Soil Classification System

4.4.2 *Chemical test results*

Following receipt from the lab, soil chemical laboratory test results will be provided in Table 4.6.

Table 4.6 Chemical laboratory test results

Borehole ID	Sample Depth (mBGL)	pH	Sulphate (SO_4^{2-}) (mg/kg)	Chloride (mg/kg)	Electrical Conductivity (µS/cm)
BH04	1.50-1.95	5.0	370	300	540
BH04	2.50-2.95	5.1	210	480	530
BH05	2.10-2.50	5.4	160	46	200
BH06	0.50-0.95	5.2	180	10	150
BH06	2.00-2.50	5.1	180	440	440
BH07	2.50-2.95	5.2	430	1000	950
BH08	1.50-1.95	4.8	150	350	390
BH09	1.50-1.95	4.8	320	430	540
BH10	2.50-2.95	5.0	370	500	570
GPPS-BH01	1.5-1.95	5.0	480	570	610
GPPS-BH03	1.5-1.95	4.8	740	770	820
GPPS-BH04	1.5-1.95	5.2	500	360	500

4.5 Preliminary geotechnical design parameters

Preliminary geotechnical design parameters have been developed for the adopted Geotechnical Units across the site extent. These properties are representative values typical of the geotechnical conditions encountered at the site. The design parameters have been developed based on interpretation of all geotechnical investigation results, consideration of published correlations and engineering judgement.

During the construction phases, all materials encountered should be inspected, compared, and verified with the parameters adopted during the design process by an experienced geotechnical engineer or engineering geologist.

The soil design parameters presented in Table 4.7 are intended for use with Ultimate Limit State (ULS) and Serviceability Limit State (SLS) design approaches, using appropriate design standards with associated strength reduction and load factors applied accordingly.

Table 4.7 Summary of geotechnical design parameters for adopted geotechnical units

Geotechnical Unit	Consistency /Strength	Bulk Unit Weight, γ (kN/m^3) [1]	Undrained Shear Strength, C_u (kPa) [2]	Effective Cohesion, C' (kPa) [2]	Effective Friction Angle, Ø' (°) [2]	Drained Poisson Ratio, v' [2]	Elastic Modulus, E' (MPa) [2]
1 (Topsoil) [3]	-	15	-	-	-	-	-
2a (Fill – Silty Sandy CLAY)	-	16	-	-	-	-	-
2b (Fill – Clayey Sandy SILT)	-	16	-	-	-	-	-
2c (Fill – Gravelly Silty SAND)	-	16	-	-	-	-	-
3a (Alluvial Soil-Sandy Silty CLAY)	Stiff to Very Stiff	19	100	4	28	0.3	20
3b (Alluvial Soil-Gravelly Clayey SILT)	Stiff to Very Stiff	19	100	4	28	0.3	20
4 (Residual Soil)	Hard	20	200	8	30	0.3	20
5 (Weathered Rock – HW Siltstone)	Very Low	23	-	50	32	0.25	40
6 (Rock – MW Siltstone)	Low	24	-	100	32	0.25	200

(1) Bulk unit weight inferred from Table D1, Appendix D of AS 4678: 2002 *Earth retaining structures* [5].

(2) Values based on published literature and engineering judgement with similar materials.

(3) Topsoil and fill material are inherently unsuitable and would typically be removed and replaced as per Section 5.1.1 of this report.

4.6 Site classification

Site classification in accordance with AS 2870-2011 *Residential slabs and footings* [6] is based on the expected ground surface movements as a result of soil volumetric changes due to moisture content variations. Sites where ground movement is predominantly due to soil reactivity under normal conditions are classified from lowest to highest reactivity (Classes A, S, M, H1, H2 and E). Although not fully applicable to the design of commercial development, an assessment in accordance with AS 2870-2011 [6] provides an indicative framework for foundation design.

Based on the variability of the subsurface profiles encountered, specifically the differing depth of uncontrolled fill, a site classification of 'Class P' (problem site) is applicable to the site. Ground surface movements are expected to be in the range of 20 mm to 40 mm (or more based on the uncertain nature of the uncontrolled fill) for this site.

The weathered siltstone (Bringelly Shale) underlying the site exhibits a high swelling potential when exposed to changes in volumetric moisture content. Although no groundwater was encountered during the geotechnical investigation, moisture content fluctuations in soil and weathered rock can also be exacerbated through the root systems of mature trees. Some trees are located along the north-western boundary, however, based on their level of maturity, and proximity to the proposed new buildings, they would likely have negligible effect on estimated surface settlement.

4.7 Durability assessment

Following receipt of the chemical test results, a durability classification assessment was undertaken in accordance with AS 2159-2009 *Piling – Design and installation* [7] to assess potential chemical impacts on embedded concrete and steel structures.

Based on a correlation of the chemical results presented in Table 4.6 of this report and criteria noted in Table 6.4.2(C) and Table 6.5.2(C) of AS 2159-2009 [7], a durability classification of **non-aggressive** may be applied for steel exposure and **mild** for concrete exposure.

An exposure classification was also assessed in accordance with Table 4.8.1 of AS 3600-2018 *Concrete structures* [8]. Soil chemical results show that a concrete exposure classification **A1** is appropriate for this site.

4.8 Earthquake site classification

AS/NZS 1170.4-2007 *Earthquake actions in Australia* [9] requires designers to consider the effects of earthquakes. The design is influenced by a hazard factor (based on the probability of an earthquake occurring) and the classification of the site (based on the subsoil strength and thickness).

The hazard factor (Z) for this site should be taken as 0.09 as per Table 3.2 and Figure 3.2(A) of AS/ANZ 1170.4 [9]. The hazard factor quoted in the standard is based on a 1 in 500-year probability of exceedance.

The site sub-soil classification recommended for this site is Class Ce (shallow soil) as per Section 4 of the AS/NZS 1170.4 [9]. Although rock is generally present within a depth of 3 mBGL, the rock has a compressive strength less than 1 MPa and therefore does not qualify for Class Be (rock).

5 Discussion and recommendations

5.1 Earthworks and constructability

All excavation work should be carried out in accordance with the SafeWork NSW publications, Excavation Work Code of Practice, January 2020 [10] and Construction Work Code of Practice, August 2019 [11]. If the publications have been revised before construction commences, the most recently published version should be used.

5.1.1 Site preparation

Geotechnical Units 1, 2a, 2b and 2c (topsoil and fill) are inherently unsuitable materials due to their variable nature and should therefore be removed off site and/or stripped and stockpiled for reuse as landscaping (non-engineered) material, as appropriate. Additional unsuitable material, potentially not identified during the geotechnical investigation, may include man-made waste, perishable materials, other organics, and any materials with a California Bearing Ratio (CBR) value less than 1% (CBR<1). Such materials should be excavated, further stockpiled and/or disposed off-site in general accordance with NSW Environmental Protection Authority (EPA) Waste Classification Guidelines [12].

As part of construction, the site should be suitably cleared and grubbed, with temporary drainage provided to manage surface run-off and potential inflow. Where exposed, temporary protection should be provided for exposed soil slopes to prevent erosion and loss of topsoil.

During construction, inspection by a suitable qualified geotechnical engineer or engineering geologist should be sought to verify the geotechnical conditions across the site, to identify any localised zones of poor or unsuitable material.

5.1.2 Excavatability of site material

Excavation of topsoil (Geotechnical Unit 1), fill (Geotechnical Unit 2a, 2b and 2c), alluvial soil (Geotechnical Unit 3a and 3b), residual soil (Geotechnical Unit 4) and extremely weathered rock (Geotechnical Unit 5 and Unit 6) will be readily achieved using conventional earthmoving plant such as dozers, excavators with straight-blade or toothed buckets.

Geotechnical Unit 5 is expected to range from moderate to hard ripping using a 30-tonne excavator, however excavation to this depth is not anticipated based on the proposed activity. The use of large, tracked excavators with hydraulic rock breakers may be required for smaller excavations in these units if required.

It is recommended that the engaged contractors examine the engineering logs to make their own assessment of the required excavation plant and production rates prior to breaking ground.

Off-site disposal of waste spoil will typically require classification in accordance with the NSW EPA Classification Guidelines [12].

5.1.3 Suitability of cut material to be used as fill

Material derived from excavation will consist of a mixture of sandy clay/silt fill material, alluvial and residual clay soils, with the potential for excavation of weathered siltstone. Alluvial soil, residual soil and poor-quality rock (Geotechnical Units 3a, 3b, 4 and 5) should not be used beneath structures or pavements/ hardstand as it would likely show characteristics of high shrink/swell potential from changes in moisture content and is prone to 'creep' settlement over time which is greater as the depth of fill increases. This creep settlement is in addition to any immediate elastic settlement or consolidation settlement under imposed structural loads. Creep settlement can occur under the self-weight of the soil and continue for many years after placement.

These characteristics can be improved by treatments such as adding hydrated lime (typically 2%-5% by volume) or mixing with crushed sandstone (which may be readily available as spoil from other projects around Sydney). Testing would be required to determine the optimum mix proportions.

Alternatively, the poor-quality clay soils and very weak rock from near the surface could be stockpiled separately for use in landscape areas or removed from site.

The better-quality excavated rock (Geotechnical Unit 6) could be crushed and reused as general fill. This material could potentially be placed under building footprints provided imported sandstone or similar material is placed above to provide protection from decomposition. The depth of imported sandstone would have to be assessed depending on the nature of the building, required bearing capacity and tolerance to settlement.

Engineered fill used as replacement material or to support shallow building footings should be placed, compacted, and testing under Level 1 supervision in general accordance with AS 3798-2007 *Guidelines on earthworks for commercial and residential developments* [13].

5.1.4 Batters and benching

Based on the proposed site upgrade, excavation is expected to be required for foundations of the proposed building. These excavations may encounter Geotechnical Units 1 to 5. Due to its inherent unsuitability and heterogeneous nature, topsoil (Geotechnical Unit 1) and fill (Geotechnical Unit 2a, 2b and 2c) materials should not be incorporated into batter slopes and should be treated in accordance with the recommendations in Section 5.1.1 of this report.

Alluvial Soils (Geotechnical Unit 3a and 3b) and residual soils (Geotechnical Unit 4) are expected to remain stable at long-term batters of up to 1V:2H for heights up to 3 m. Geotechnical Unit 5 is expected to be stable at an unsupported batter of up to 1V:1.5H and for slope heights up to 3 m. Surface protection would be required for slopes as Bringelly Shale, including the residual soil, is particularly susceptible to deterioration and erosion. Short-term protection during construction would include polythene sheeting. Preliminary design recommendations for unsupported (short-term) or permanent (long-term) cut slopes are presented in Table 5.1. Cut slopes would require appropriate stability analysis and designed to achieve a factor of safety of at least 1.3 and 1.5 for short- and long-term stability respectively.

If groundwater inflows are encountered during construction, a sump should be formed at the base of the excavation and the water pumped out. Adequate drainage measures should be incorporated into long term design solutions.

Table 5.1 Temporary and permanent batter slopes

Geotechnical Unit	Consistency / Strength	Cut Slope Batters	
		Permanent	Temporary
Unit 1 & 2 (Topsoil and Fill)[1]	-	-	-
Unit 3 (Alluvial soil)	Stiff to Very Stiff	1V: 2H	1V: 1.5H
Unit 4 (Residual soil)	Hard	1V: 2H	1V: 1.5H
Unti 5 (Extremely Weathered Rock)	Very Low	1V: 2H	1V: 1.5H
Unit 6 (Rock)	Low	1V: 1.5H	1V: 0.75H

(1) Refer to text above for recommendations regarding batters and benching in these geotechnical units

A minimum 0.5m wide bench should be incorporated at a maximum every 1.5 m of excavation.

If the site boundaries/constraints prevent application of the above recommended safe batter slopes, consideration should be given to:

- Use of a 1:1 batter slope incorporating a minimum 0.5 m wide bench at a depth of 1 m and every 1.5 m of excavation thereafter.
- Retaining structures, if required, would typically include concrete solider piles or post and panel walls with timber/steel/concrete walers, sheet piles or trench boxes to support temporary excavations.

All excavations (deeper than 1.5 m) should be observed by a geotechnical engineer or engineering geologist, who shall assess safe batter angles appropriate for the conditions encountered. Where access is required for a worker, the need (or otherwise) for support of the temporary excavation should be assessed on-site by a geotechnical engineer or engineering geologist.

If a period of heavy rainfall occurs during construction, the stability of the excavation should also be reassessed prior to recommencement of work. If the exposed soils have softened significantly due to an increase in moisture content, then temporary shoring or other approaches may be required to support excavations.

5.2 Footings and pavement design

5.2.1 Foundations

Foundation options will depend on the structural loading and the ability of the structure to accommodate movement. For example, steel framed shed type buildings can typically accommodate greater movement compared with a concrete framed or brick walled structures.

Foundation options to be considered include:

- Pad footings – founded on the stiff to hard alluvial and residual soils, where bearing pressures to 150 kPa can be supported with settlements of around 1% of the footing width.
- Pad footings on engineered fill – allowable bearing pressures would be dependent on the depth and type of fill and advice sought at a later design stage.
- Piled foundations – extending into the weathered siltstone bedrock where bearing pressures over 1 MPa are permissible and settlements of 1% of the pile diameter can be accommodated. However, bearing pressures over 1 MPa are not expected for the proposed activity.
- Combination of individual footings, beam, and slab on ground – this option would consist of using pad footings as discussed above with beam or strip footings between and a floating concrete slab. The slab would need to be constructed above a capping layer of granular imported material to provide an even bearing surface.

Provided bearing capacity satisfies the proposed structural loading, footings may be founded in the stiff to very stiff (or better) alluvial and residual soil, and extremely weathered rock layers (Geotechnical Units 3, 4, 5, and 6).

The estimated allowable bearing capacities outlined above are dependent on the foundation subgrade being inspected by a suitably qualified geotechnical engineer or engineering geologist to verify that ground conditions are consistent with design assumptions, founding surfaces are clean from spoil and other soft / loose materials, and free from water to allow concrete placement. Proof rolling of the foundation subgrade (soils only) should be conducted and if visible deformation is observed or unsuitable material is encountered at foundation level, the affected material / area should be over-excavated and replaced with suitable material.

Engineered fill used as replacement material or to support high level building footings should be placed, compacted, and tested under level 1 supervision in general accordance with AS 3798–2007 *Guidelines for earthworks for commercial and residential developments* [13].

5.2.2 Pavement

A preliminary design CBR value of 3% can be assumed for Unit 3a & Unit 3b – Alluvial Soil. It may be possible to re-use the fill material beneath pavements or slabs to avoid removal and disposal from site. A CBR of 3% can be assumed for this material.

It is recommended that the subgrade is inspected by a geotechnical engineer or engineering geologist and proof rolled to identify any soft spots prior to the placement of pavement layers. There may be a requirement to excavate soft material or uncontrolled fill and replace with imported granular engineered fill at some locations.

Particular attention should be given to site drainage to avoid accumulation or ponding of water as this will compromise the bearing capacity of the pavement if it penetrates cracks, leading to further damage.

6 Evaluation of environmental impacts

This report provides an assessment of the potential environmental impacts associated with the Greenway Park Public School Upgrade project. Each discipline has been evaluated the impact of the activity and determined whether the identified effects can be adequately mitigated or minimized through appropriate measures to ensure that no significant adverse environmental impact occurs.

Table 6.1 Environmental factors for Greenway Park Public School Upgrade

Environmental Factors	Relevance to Public School Upgrade	Supporting Information
Environmental Impact on the community	Construction activities may cause noise, vibration, traffic disruption, dust and stormwater runoff. Post-construction impacts may include operational noise and increased traffic.	Findings from geotechnical assessment, site inspections and observations and soil contamination assessments.
Transformation of the location	The upgrade will alter the existing site layout and landscape which will impact the streetscape, landscape and existing visual characteristics.	Review of available reports and historical aerial imagery.
Impact on ecosystems	Potential disturbance to soil, groundwater, flora and fauna. Urban heat island effects due to vegetation removal.	Results from geology, hydrogeology and acid sulphate soil assessments as well as ecological assessments.
Reduction in aesthetic, recreational or scientific value	Temporary construction impacts on local aesthetics, overshadowing, noise and light pollution.	Evaluation from topography, landscape planning and visual impact assessments.
Effects on places of cultural heritage significance	Potential impacts on areas of cultural heritage and significance	Refer to cultural heritage reports, have on-site presence from a cultural and heritage consultant.
Impact on habitat of protected species	Potential loss or fragmentation of habitat or disturbance to protected fauna or flora.	Ecological evaluation through desktop studies and on-site investigations
Endangering species	Potential impact on species and communities through spread of contamination or pollutants within the construction phase.	Ecological screening levels and health investigation levels from laboratory analysis of soil, water and gas samples taken throughout each phase of construction.
Long-term environmental effects	Changes in flood risk, stormwater management and urban heat island effects.	Flood desktop studies and modelling, integrated water and flood management planning and site reviews.
Reduction in beneficial use of the environment	Possible loss of open space, increased land use constraints and reduction in environmental quality.	Analysis from preliminary conceptual site model and planning information with frequent reviews.

Environmental Factors	Relevance to Public School Upgrade	Supporting Information
Pollution of the environment	Risk of soil and water contamination, air pollution and hazardous material exposure.	Soil contamination assessment, groundwater analysis and site investigation.
Waste disposal issues	Generation of construction waste, operational waste and hazardous waste leading to disposal constraints.	Carrying out a waste disposal impact study, assess soil quality and contamination levels and monitor environmental impacts.
Increased demand in resources	Higher demand for construction materials, energy and water	Consider repurposing of material though analysis of soil contaminants and geotechnical parameters. Consider resource constraints in detailed design plans.
Cumulative environmental impacts	Interaction with other development projects, increasing environmental pressures.	Departmental project team need to communicate with regards to costs, resources and management plans.
Climate change considerations	Increased resilience required due to project climate conditions.	Climate adaptation strategy, carbon footprint assessment and regional strategic planning compliances to be carried out.
Other relevant environmental factors	Address potential social, economic and accessibility factors	Check currently existing information, site investigations and monitoring of additional factors.

7 Mitigation measures

It is important to note that there are no geotechnical risks identified that would constrain future development of the proposed site, although design measures and ground treatments necessary to accommodate the site conditions may have a cost implication. The following may be concluded:

- Consideration should be given to placing alluvial and residual soil and poor-quality siltstone beneath landscape areas only or improving its engineering properties by treating using lime or mixing with crushed sandstone. Alternatively, it should be removed from site. Better quality siltstone could be used beneath structures at depth but would require engineered fill to be placed above.
- Based on the thickness of uncontrolled fill across the site, piled footings may be required in some areas. Engineered fill is expected to be required beneath slabs and areas of hardstand. The thickness of engineered fill would be developed once structural loads have been confirmed.

Some mitigation measures are provided in the table below.

Table 7.1 Geotechnical related mitigation measures

Mitigation Number/Name	Aspect/Section	Mitigation Measure	Reason for Mitigation Measure
Poor quality ground	Construction	Consider hierarchy of controls: Remove from site, keep on site within landscaping areas; treat with hydrated lime to improve engineering properties and use within the works, replace with imported suitable material	To avoid cost of removal from site; to achieve the required engineering properties to allow use within the works
Uncontrolled Fill	Design	Structures to be supported on piled footings where required. Slab or hardstand areas to found on engineered fill	To reduce or remove the risk of settlement and cracking
Engineered Fill placement	Construction	Engineered fill used as a replacement material or to support high level footings should be placed, compacted and tested under Level 1 supervision in general accordance with AS 3798	To reduce the risk of cracking or settlement
Surplus soil material	Design stage	Consider reducing cut volume by supporting the building on piers or create a split level	Avoid or reduce volume of soil for disposal off site.
Expansive soils	Design and construction	Treat soil and extremely weak rock with hydrated lime to improve engineering properties and to reduce or remove shrink/swell movement from drying and wetting.	To reduce or remove the risk of cracking of hardstand areas, pavements and structures.
Exposed soil slopes	Construction	Temporary protection and drainage should be provided.	To prevent erosion and loss of topsoil.

Mitigation Number/Name	Aspect/Section	Mitigation Measure	Reason for Mitigation Measure
Excavations deeper than 1.5m	Construction	All excavations deeper than 1.5m should be observed by a geotechnical engineer or engineering geologist, who shall assess safe batter angles appropriate for the conditions encountered. Where access is required for a worker, the need for support of the temporary excavation should be assessed on-site by a geotechnical engineer or engineering geologist.	Reduce risk of instability
Open excavations, heavy rainfall	Construction	If a period of heavy rainfall occurs during construction, the stability of the excavation should be reassessed prior to recommencement of work. If the exposed soils have softened significantly, then temporary shoring or other approaches may be required to support excavations.	Reduce risk of instability
Groundwater inflows	Design and construction	If groundwater inflows are encountered during construction, a sump should be formed at the base of the excavation and water pumped out. Adequate drainage measures should be incorporated into long term design solutions.	Reduce risk of instability or deformation
Pavement subgrade	Construction	Subgrade to be inspected by a geotechnical engineer or engineering geologist and proof rolled to identify any soft spots prior to the placement of pavement layers. There may be a requirement to excavate soft material or uncontrolled fill and replace with imported granular engineered fill at some locations.	To reduce the risk of poor pavement performance
Salinity	Construction	Prior to ground disturbance, a visual inspection would be undertaken to identify areas that potentially contain saline soils. Areas where evidence of salting is observed or recorded will be subject to further testing as required. If salinity is confirmed, excavated soils will be managed in accordance with Book 4 Dryland Salinity: Productive use of Saline Land and Water (NSW DECC 2008) to prevent impacts from salinity.	To reduce the risk of salt mobilisation

8 References

[1] Standards Australia, “AS 1726-2017 Geotechnical site investigations,” SAI Global Limited, Sydney, 2017.

[2] WSP Australia Pty Ltd, “Schools Infrastructure NSW: Greenway Park Public School Upgrade - Geotechnical Desktop Study (Ref. PS206292-SYD-GEO-REP-001),” WSP, August 2023.

[3] NSW Government, Department of Mineral Resources, “Penrith 1:100,000 - Geological Series Sheet 9030,” Geological Survey of N.S.W., 1991. [Online]. [Accessed 15 November 2023].

[4] Standards Australia, “AS 1289.6.3.1-2004 Methods of testing soils for engineering purposes,” SAI Global Limited, Sydney, 2004.

[5] Standards Australia, “AS 4678-2002 Earth-retaining Structures,” SAI Global Limited, Sydney, 2002.

[6] Standards Australia, “AS 2870-2011 Residential slabs and footings,” SAI Global Limited, Sydney, 2011.

[7] Standards Australia, “AS 2159-2009 Piling - Design and installation,” SAI Global Limited, Sydney, 2009.

[8] Standards Australia, “AS 3600-2018 Concrete structures,” SAI Global Limited, Sydney, 2018.

[9] Standards Australia, “AS 1170.4-2007 Structural Design Actions - Part 4 Earthquake actions in Australia,” SAI Global Limited, Sydney, 2018.

[10] SafeWork NSW, “Code of Practice: Excavation Work,” NSW Government, January 2020.

[11] SafeWork NSW, “Code of Practice: Construction Work,” NSW Government, August 2019.

[12] State of NSW, Environment Protection Authority, “Waste Classificaion Guidelines, Part 1: Classifying Waste,” NSW Environmental Protection Authority (EPA), Sydney, November 2014.

[13] Standards Australia, “AS 3798-2007 Guidelines on earthworks for commercial and residential developments,” SAI Global Limited, Sydney, 2007.

[14] “Greenway Park Public School Upgrade Study: 23115 - Election Commitment Feasibility Study,” Schools Infrastructure NSW, 2023.

9 Limitations

Scope of services

This geotechnical site assessment report (the report) has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the client and WSP (scope of services). In some circumstances, the scope of services may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

Reliance on data

In preparing the report, WSP has relied upon data, surveys, analyses, designs, plans and other information provided by the client and other individuals and organisations, most of which are referred to in the report (the data). Except as otherwise stated in the report, WSP has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report (conclusions) are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. WSP will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP.

Geotechnical investigation

Geotechnical engineering is based extensively on judgment and opinion. It is far less exact than other engineering disciplines. Geotechnical engineering reports are prepared to meet the specific needs of individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor or even some other consulting civil engineer. This report was prepared expressly for the client and expressly for purposes indicated by the client or his/her representative. Use by any other persons for any purpose, or by the client for a different purpose, might result in problems. The client should not use this report for other than its intended purpose without seeking additional geotechnical advice.

This geotechnical report is based on project-specific factors

This geotechnical engineering report is based on a subsurface investigation, which was designed for project-specification factors, including the nature of any development, its size and configuration, the location of any development on the site and its orientation, and the location of access roads and parking areas. Unless further geotechnical advice is obtained, this geotechnical engineering report cannot be used:

- When the nature of any proposed development is changed.
- When the size, configuration location or orientation of any proposed development is modified.

This geotechnical engineering report cannot be applied to an adjacent site.

The limitations of site investigation

When assessing a site from a limited number of boreholes or test pits there is the possibility that variations may occur between test locations. Site exploration identifies specific subsurface conditions only at those points from which samples have been taken. The risk that variations will not be detected can be reduced by increasing the frequency of test locations; however, this often does not result in any overall cost savings for the project. The investigation program undertaken is a professional estimate of the scope of investigation required to provide a general profile of the subsurface conditions. The data derived from the site investigation program and subsequent laboratory testing are extrapolated across the site to form an inferred geological model and an engineering opinion is rendered about overall subsurface conditions and their likely behaviour with regards to the proposed development. Despite investigation the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies.

The borehole logs are the subjective interpretation of subsurface conditions at a particular location, made by trained personnel. The interpretation may be limited by the method of investigation and cannot always be definitive. For example, inspection of an excavation or test pit allows a greater area of the subsurface profile to be inspected than borehole investigation, however, such methods are limited by depth and site disturbance restrictions. In borehole investigation, the actual interface between materials may be more gradual or abrupt than a report indicates.

Subsurface conditions are time dependent

Subsurface conditions may be modified by changing natural forces or man-made influences. A geotechnical engineering report is based on conditions which existed at the time of subsurface exploration.

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

Avoid misinterpretation

A geotechnical engineer should be retained to work with other appropriate design professionals explaining relevant geotechnical findings and in reviewing the adequacy of their plans and specifications relative to geotechnical issues.

Bore/profile logs should not be separated from the engineering report

Final bore/profile logs are developed by geotechnical engineers based upon their interpretation of field logs and laboratory evaluation of field samples. Customarily, only the final bore/profile logs are included in geotechnical engineering reports. These logs should not under any circumstances be redrawn for inclusion in architectural or other design drawings. To minimise the likelihood of bore/profile log misinterpretation, contractors should be given access to the complete geotechnical engineering report prepared or authorised for their use. Providing the best available information to contractors helps prevent costly construction problems. For further information on this matter reference should be made to 'Guidelines for the Provision of Geotechnical Information in Construction Contracts' published by the Institution of Engineers Australia, National Headquarters, Canberra 1987.

Geotechnical involvement during construction

During construction, excavation is frequently undertaken which exposes the actual subsurface conditions. For this reason, geotechnical consultancy should be retained through the construction stage to identify variations if they are exposed, and to conduct additional tests, which may be required and to deal quickly with geotechnical problems if they arise.

Report for benefit of client

The report has been prepared for the benefit of the client and no other party. WSP assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of WSP or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

Other limitations

WSP will not be liable to update or revise the report to consider any events or emergent circumstances or facts occurring or becoming apparent after the date of the report.

Appendix A

Borehole investigation plan

Geotechnical Investigation Location Plan - Greenway Park Public School

Legend

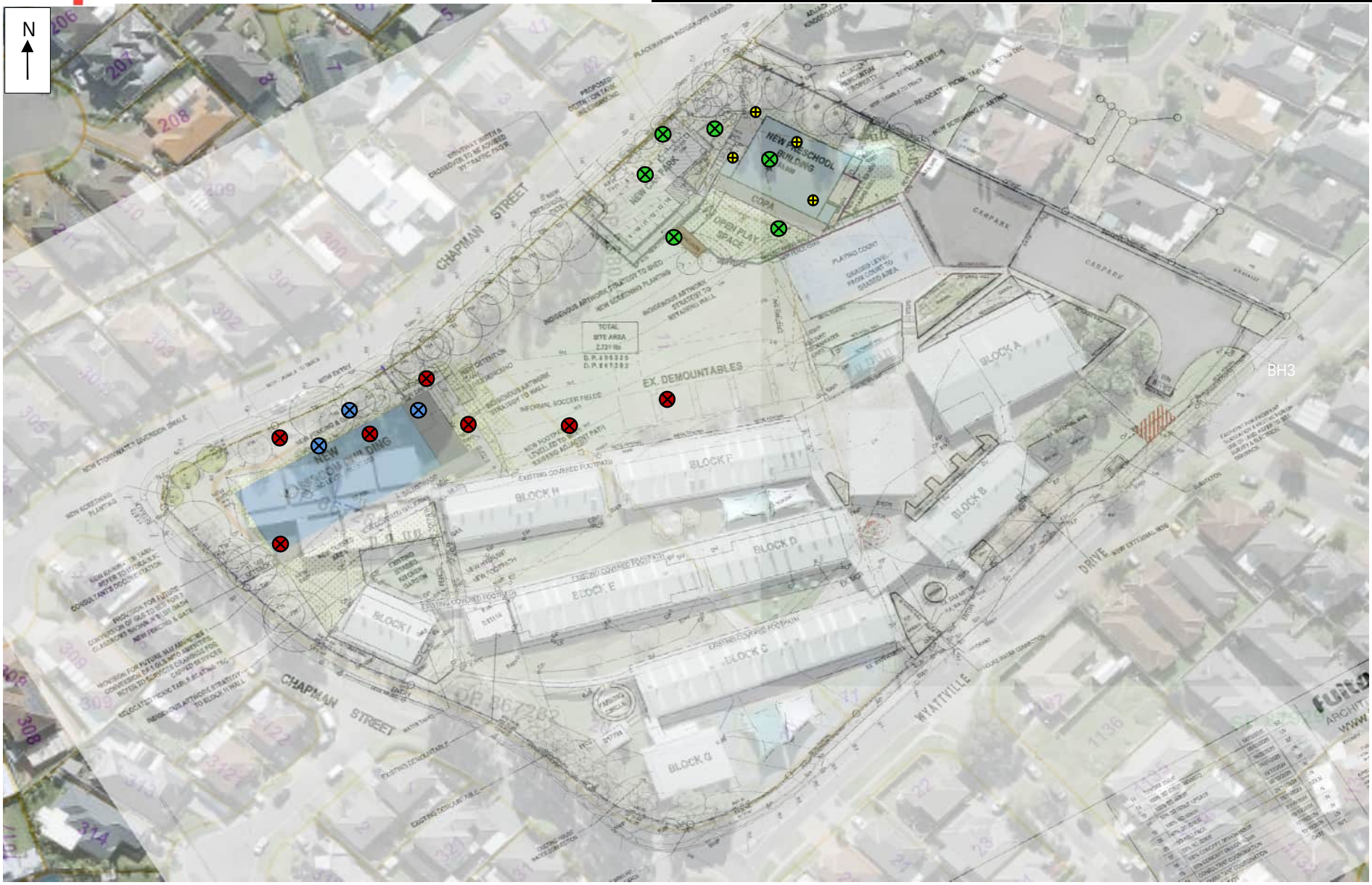
- Site boundary
- Environmental Assessment Location
- 2nd Environmental Assessment Location
- Geotechnical Assessment Location
- 2nd Geotechnical Assessment Location

30m

Image Source – SIX Maps 2023

Figure 1
Borehole location plan

Geotechnical Investigation Location Plan - Greenway Park Public School



Legend

- Site boundary
- Environmental Assessment Location
- 2nd Environmental Assessment Location
- Geotechnical Assessment Location
- 2nd Geotechnical Assessment Location

30m

Image Source – SIX Maps 2025

Figure 2
Borehole location plan

Appendix B

Borehole logs and explanatory notes

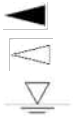
Explanatory Notes – Engineering Logs

Engineering logs have been prepared in general accordance with AS1726:2017 “Geotechnical Site Investigations”, AGS 4.1AU data format and as defined below.

DRILLING/EXCAVATION METHODS

Symbol	Term
AD/T	Auger drilling with TC-bit
AD/V	Auger drilling with V-bit
AS	Auger screwing
AT	Air track / rotary air blast
DP	Direct push
DT	Diatube
E	Excavator
HA	Hand auger
HAND	Hand excavation
HSA	Hollow stem auger
NMLC/HMLC	Diamond core – triple tube
NQ3/HQ3/PQ3	Diamond core – wireline
RC	Reverse circulation
RR	Rock roller
S	Sonic drill
VB	Vibrocoring
VE	Vacuum extraction
WB	Washbore with blade or drag bit

WATER



Complete water loss

Partial water loss

Water level at date shown

Outflow

Inflow

NOT OBSERVED – not possible to assess groundwater conditions e.g. due to drilling water, surface seepage or cave-in
NOT ENCOUNTERED – the hole was dry soon after excavation, however, groundwater could be present in less permeable strata. Inflow may have been observed had the hole been left open for a longer period

FIELD TEST (Soil borehole and test pit logs)

DCP Dynamic Cone Penetrometer
HB Hammer bounce
HW/RW SPT penetration under rod/hammer weight only
OT Other test (e.g., plate load test)
PID Photoionisation detector
PKT Permeability test (various methods)
PRM Pressuremeter test
PP Pocket penetrometer
PSP Perth sand penetrometer
SPT Standard penetration test, with ‘N’ value
VST Shear vane test

SAMPLE

B Bulk disturbed sample
C Core sample
CBR CBR mould sample
D Small disturbed sample
ES Soil sample for environmental testing
EW Water sample for environmental testing
G Gas sample
P Piston sample
U63 Push tube sample (with diameter in mm)
W Water sample

TOTAL CORE RECOVERY (Rock logs only)

$$TCR\ (\%) = \frac{\text{Length of core recovered}}{\text{Length of core run}} \times 100$$

ROCK QUALITY DESIGNATION (Rock logs only)

$$RQD\ (\%) = \frac{\sum \text{Length of sound core pieces} > 100\text{mm}}{\text{Length of core run}} \times 100$$

GROUP SYMBOL (Soil borehole and test pit logs)

Soils are classified to reflect their primary and significant secondary component/characteristic using the classification symbols described in AS1726-2017, summarised as follows.

Symbol	Major division	Typical names
GW, GP	GRAVEL	Gravel & gravel-sand mixtures, little/no fines
GM		Gravel-silt & gravel-sand-silt mixtures
GC		Gravel-clay & gravel-sand-clay mixtures
SW, SP	SAND	Sand & gravel-sand mixtures, little/no fines
SM		Sand-silt mixtures
SC		Sand-clay mixtures
ML	SILT & CLAY (low & medium plasticity)	Inorganic silt/clayey fine sand or silt
CL, CI		Inorganic clay, gravelly clay, sandy clay
OL		Organic silt
MH	SILT & CLAY (high plasticity)	Inorganic silt
CH		Inorganic clay, high plasticity
OH		Organic clay, med-high plasticity, organic silt
Pt	Highly organic soil	Peat, highly organic soil

FIELD DESCRIPTION

Soil and rock materials described in general accordance with AS1726-2017. The description of percentage of cobbles and boulders in a soil may be limited by sample size.

MOISTURE CONDITION

Coarse grained soils and rocks
Dry (D), Moist (M) or Wet (W).
Estimated based on appearance and feel.

Cohesive soils (estimated based on judgement)

Symbol	Term
MC<PL	Moist, dry of plastic limit
MC≈PL	Moist, near plastic limit
MC>PL	Moist, wet of plastic limit
MC≈LL	Wet, near liquid limit
MC>LL	Wet, wet of liquid limit

COHESIVE SOILS – CONSISTENCY

The consistency of a cohesive soil is assessed by tactile means or field measurement of undrained shear strength.
A Hand Penetrometer may be used in the field or the laboratory to provide approximate assessment of unconfined compressive strength of cohesive soils (kPa) as follows:

Strength	Symbol	Indicative undrained shear strength (kPa)	Hand Penetrometer Reading (kPa)
Very Soft	VS	≤ 12	< 25
Soft	S	>12 and ≤ 25	25 to 50
Firm	F	> 25 and ≤ 50	50 to 100
Stiff	St	>50 and ≤ 100	100 to 200
Very Stiff	VSt	> 100 and ≤ 200	200 to 400
Hard	H	>200	> 400
Friable	Fr	-	-

COHESIONLESS SOILS – RELATIVE DENSITY

Relative density terms are used to describe silty and sandy material, and these are usually based on resistance to drilling penetration or the Standard Penetration Test (SPT) ‘N’ values.

The Standard Penetration Test (SPT) is carried out in accordance with AS 1289, 6.3.1. For completed tests the number of blows required to drive the split spoon sampler 300 mm is recorded as the N value. For incomplete tests the number of blows and the penetration beyond the seating

depth of 150 mm are recorded. If the 150 mm seating penetration is not achieved the number of blows to achieve the measured penetration is recorded. SPT correlations may be subject to corrections for overburden pressure and equipment type.

Term	Symbol	Density Index	N Value (blows /0.3 m)	DCP (blows/100 mm)
Very Loose	VL	0 to 15	0 to 4	0 to 1
Loose	L	15 to 35	4 to 10	1 to 2
Medium Dense	MD	35 to 65	10 to 30	2 to 3
Dense	D	65 to 85	30 to 50	4 to 8
Very Dense	VD	>85	>50	>8

SOIL STRUCTURE

Soil structure is described to AS 1726-2017 if visible and present.

SOIL / ROCK ORIGIN

The geological origin of the soil or rock is presented as an interpretation of the geological and geomorphological setting. Origin cannot be deduced on the basis of material appearance and properties alone and is therefore limited by the availability of supporting geological information

ROCK MATERIAL WEATHERING

Rock weathering is described mainly using the following abbreviations and definitions used in AS1726.

Term	Symbol	Definition
Residual soil	RS	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible.
Extremely weathered	XW	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.
Highly weathered	HW	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognizable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Moderately weathered	MW	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable, but shows little or no change of strength from fresh rock.
Slightly weathered	SW	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.
Fresh	FR	Rock shows no sign of decomposition of individual minerals or colour changes.

If differentiation between highly and moderately weathered rock is not practicable, then Distinctly Weathered (DW) is used as defined in AS1726:2017.

INFERRED ROCK STRENGTH

Rock strength is inferred based on field assessment, Point Load Index (AS4133.4.1) or Uniaxial Compressive Strength (AS 4133.4.2.1) as follows:

Term	Symbol	UCS (MPa)	Point Load Index $Is_{(50)}$ (MPa)*
Very Low	VL	0.6 to 2	0.03 to 0.1
Low	L	2 to 6	0.1 to 0.3
Medium	M	6 to 20	0.3 to 1
High	H	20 to 60	1 to 3
Very High	VH	60 to 200	3 to 10
Extremely High	EH	>200	>10

*example based on UCS = 20 x $I_{s(50)}$, actual correlation factor varies across rock types and weathering grades

●○ Axial\Diametral Point Load Index test

■ Uniaxial Compressive Strength test

DEFECT SPACING/BEDDING SPACING (Rock)

Measured at right angles to defects of same set or bedding.

Term	Defect Spacing	Bedding
Extremely closely spaced	<6 mm 6 to 20 mm	Thinly Laminated Laminated
Very closely spaced	20 to 60 mm	Very Thin
Closely spaced	0.06 to 0.2 m	Thin
Moderately widely spaced	0.2 to 0.6 m	Medium
Widely spaced	0.6 to 2 m	Thick
Very widely spaced	>2 m	Very Thick

DEFECT TYPE (Rock)

Symbol	Term	Symbol	Term
CS	crushed seam	J	joint
DB	drilling break	MB	mechanical break
DL	drill lift	P	parting
EW	extremely weathered seam	S	sheared surface
HB	handling break	SS	shear seam
IS	infilled seam	SZ	shear zone

DEFECT ORIENTATION (Rock)

Dip measured relative to the horizontal plane in vertical boreholes and relative to core axis in inclined boreholes.

DEFECT ROUGHNESS AND SHAPE (Rock)

Roughness	Description	Roughness	Description
SM	Smooth	PO	Polished
RF	Rough	SL	Slickensided
VR	Very Rough		

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

DEFECT APERTURE OBSERVATION (Rock)

Symbol	Term
CN	Clean
CT	Coating (<=1 mm)
SN	Stained
VN	Veneer

Aperture infill is denoted through presence of a value in the aperture thickness measurement and an infill material code or name in the infill material cell.

DEFECT INFILLING (Rock)

Where defects are infilled, the infilling material is either coded with a soil\mineral name (e.g. CLAY), a group symbol code (e.g. SC), or one of the material codes in the table below.

Term	Description	Term	Description
Ca	Calcite	Mn	Manganese
Ch	Chlorite	Py	Pyrite
Co	Coal/carbonaceous	Gp	Gypsum
CR	Crushed rock	Qz	Quartz
Fe	Limonite/ironstone	Ud	Unidentified
Fs	Feldspar		

OTHER OBSERVATIONS

Ranking of visually observable contamination and odour (applies on specific soil contamination projects only)

Symbol	Term
R = 0	No visible evidence of contamination
R = 1	Slight evidence of contamination
R = 2	Visible evidence of contamination
R = 3	Significant visible evidence of contamination
R = A	No non-natural odours identified
R = B	Slight non-natural odours identified
R = C	Moderate non-natural odours identified
R = D	Strong non-natural odours identified

Graphic Log Colour Scheme – Soils and Rocks

The soil and rock colour schemes presented on the logs and fences have been derived from those below.
The rock colour scheme is taken from Geoscience Australia's predecessor, the Bureau of Mineral Resources (BMR).

	Clay dominated soils	Soils
	Silt dominated soils, topsoil, undifferentiated fine grained soil	
	Sand dominated soils	
	Gravel or cobble dominated soils	
	Peat soils	
	Lithic sedimentary breccia and conglomerate	Sedimentary rocks
	Sandstone, arenite	
	Arkose	
	Pelitic rocks, shale, mudstone	
	Greywacke, siltstone, siltstone-sandstone mixtures	
	Coal, lignite, undifferentiated carbonaceous rock	
	Limestone, chert, undifferentiated calcareous soils, and rocks	
	Undifferentiated metamorphic rocks of any grade	Metamorphic rocks
	Schist, gneiss, and other high grade metamorphic rocks	
	Greenschist, phyllite, hornfels and lower grade metamorphic rocks	
	Undifferentiated igneous rock, tuff, volcanics	Igneous rocks
	Extrusive acid igneous rock, rhyolite	
	Extrusive basic igneous rock, basalt, spilite	
	Extrusive intermediate igneous rock, dacite	
	Extrusive ultrabasic igneous	
	Intrusive acid igneous rock, all granitoid rock	
	Intrusive basic igneous rock, gabbro, dolerite	
	Intrusive intermediate igneous rock, andesite, diorite	
	Intrusive ultrabasic igneous rock, peridotite	
	Fill, concrete, pavement	Secondary rock, man-made and other materials
	Water	
	Undifferentiated evaporite unit	
	Calcrete	
	Ironstone, ferricrete, ferruginous rock	

Graphic Symbols – Soils and Rocks

Typical symbols for soils and rocks are as follows. Combinations of these symbols may be used to indicate mixed materials such as clayey sand.

SOIL SYMBOLS

Main components

 CLAY

 SILT

 SAND

 GRAVEL

 BOULDERS / COBBLES

 TOPSOIL

 PEAT

Minor components

 CLAYEY

 SILTY

 SANDY

 GRAVELLY

OTHER MATERIAL SYMBOLS

 FILL

 BITUMEN

 CONCRETE

ROCK SYMBOLS

Sedimentary Rocks

 SANDSTONE

 SILTSTONE

 CLAYSTONE, MUDSTONE

 SHALE

 COAL

 LIMESTONE

 CONGLOMERATE

Igneous rocks

 GRANITE

 BASALT

 UNDIFFERENTIATED IGNEOUS

Metamorphic rocks

 SLATE, PHYLLITE, SCHIST

 GNEISS

 QUARTZITE

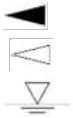
Explanatory Notes – Engineering Logs

Engineering logs have been prepared in general accordance with AS1726:2017 “Geotechnical Site Investigations”, AGS 4.1AU data format and as defined below.

DRILLING/EXCAVATION METHODS

Symbol	Term
AD/T	Auger drilling with TC-bit
AD/V	Auger drilling with V-bit
AS	Auger screwing
AT	Air track / rotary air blast
DP	Direct push
DT	Diatube
E	Excavator
HA	Hand auger
HAND	Hand excavation
HSA	Hollow stem auger
NMLC/HMLC	Diamond core – triple tube
NQ3/HQ3/PQ3	Diamond core – wireline
RC	Reverse circulation
RR	Rock roller
S	Sonic drill
VB	Vibrocoring
VE	Vacuum extraction
WB	Washbore with blade or drag bit

WATER



Complete water loss

Partial water loss

Water level at date shown

Outflow

Inflow

NOT OBSERVED – not possible to assess groundwater conditions e.g. due to drilling water, surface seepage or cave-in
NOT ENCOUNTERED – the hole was dry soon after excavation, however, groundwater could be present in less permeable strata. Inflow may have been observed had the hole been left open for a longer period

FIELD TEST (Soil borehole and test pit logs)

DCP Dynamic Cone Penetrometer
HB Hammer bounce
HW/RW SPT penetration under rod/hammer weight only
OT Other test (e.g., plate load test)
PID Photoionisation detector
PKT Permeability test (various methods)
PRM Pressuremeter test
PP Pocket penetrometer
PSP Perth sand penetrometer
SPT Standard penetration test, with ‘N’ value
VST Shear vane test

SAMPLE

B Bulk disturbed sample
C Core sample
CBR CBR mould sample
D Small disturbed sample
ES Soil sample for environmental testing
EW Water sample for environmental testing
G Gas sample
P Piston sample
U63 Push tube sample (with diameter in mm)
W Water sample

TOTAL CORE RECOVERY (Rock logs only)

$$TCR\ (\%) = \frac{\text{Length of core recovered}}{\text{Length of core run}} \times 100$$

ROCK QUALITY DESIGNATION (Rock logs only)

$$RQD\ (\%) = \frac{\sum \text{Length of sound core pieces} > 100\text{mm}}{\text{Length of core run}} \times 100$$

GROUP SYMBOL (Soil borehole and test pit logs)

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SW, SP	SAND	Sand & gravel-sand mixtures, little/no fines
SM		Sand-silt mixtures
SC		Sand-clay mixtures
ML	SILT & CLAY (low & medium plasticity)	Inorganic silt/clayey fine sand or silt
CL, CI		Inorganic clay, gravelly clay, sandy clay
OL		Organic silt
MH	SILT & CLAY (high plasticity)	Inorganic silt
CH		Inorganic clay, high plasticity
OH		Organic clay, med-high plasticity, organic silt
Pt	Highly organic soil	Peat, highly organic soil

FIELD DESCRIPTION

Soil and rock materials described in general accordance with AS1726-2017. The description of percentage of cobbles and boulders in a soil may be limited by sample size.

MOISTURE CONDITION

Coarse grained soils and rocks
Dry (D), Moist (M) or Wet (W).
Estimated based on appearance and feel.

Cohesive soils (estimated based on judgement)

Symbol	Term
MC<PL	Moist, dry of plastic limit
MC≈PL	Moist, near plastic limit
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COHESIVE SOILS – CONSISTENCY

The consistency of a cohesive soil is assessed by tactile means or field measurement of undrained shear strength.
A Hand Penetrometer may be used in the field or the laboratory to provide approximate assessment of unconfined compressive strength of cohesive soils (kPa) as follows:

Strength	Symbol	Indicative undrained shear strength (kPa)	Hand Penetrometer Reading (kPa)
Very Soft	VS	≤ 12	< 25
Soft	S	>12 and ≤ 25	25 to 50
Firm	F	> 25 and ≤ 50	50 to 100
Stiff	St	>50 and ≤ 100	100 to 200
Very Stiff	VSt	> 100 and ≤ 200	200 to 400
Hard	H	>200	> 400
Friable	Fr	-	-

COHESIONLESS SOILS – RELATIVE DENSITY

Relative density terms are used to describe silty and sandy material, and these are usually based on resistance to drilling penetration or the Standard Penetration Test (SPT) ‘N’ values.

The Standard Penetration Test (SPT) is carried out in accordance with AS 1289, 6.3.1. For completed tests the number of blows required to drive the split spoon sampler 300 mm is recorded as the N value. For incomplete tests the number of blows and the penetration beyond the seating

depth of 150 mm are recorded. If the 150 mm seating penetration is not achieved the number of blows to achieve the measured penetration is recorded. SPT correlations may be subject to corrections for overburden pressure and equipment type.

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Medium Dense	MD	35 to 65	10 to 30	2 to 3
Dense	D	65 to 85	30 to 50	4 to 8
Very Dense	VD	>85	>50	>8

SOIL STRUCTURE

Soil structure is described to AS 1726-2017 if visible and present.

SOIL / ROCK ORIGIN

The geological origin of the soil or rock is presented as an interpretation of the geological and geomorphological setting. Origin cannot be deduced on the basis of material appearance and properties alone and is therefore limited by the availability of supporting geological information

ROCK MATERIAL WEATHERING

Rock weathering is described mainly using the following abbreviations and definitions used in AS1726.

Term	Symbol	Definition
Residual soil	RS	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible.
Extremely weathered	XW	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.
Highly weathered	HW	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognizable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Moderately weathered	MW	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable, but shows little or no change of strength from fresh rock.
Slightly weathered	SW	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.
Fresh	FR	Rock shows no sign of decomposition of individual minerals or colour changes.

If differentiation between highly and moderately weathered rock is not practicable, then Distinctly Weathered (DW) is used as defined in AS1726:2017.

INFERRED ROCK STRENGTH

Rock strength is inferred based on field assessment, Point Load Index (AS4133.4.1) or Uniaxial Compressive Strength (AS 4133.4.2.1) as follows:

Term	Symbol	UCS (MPa)	Point Load Index $Is_{(50)}$ (MPa)*
Very Low	VL	0.6 to 2	0.03 to 0.1
Low	L	2 to 6	0.1 to 0.3
Medium	M	6 to 20	0.3 to 1
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Extremely High	EH	>200	>10

*example based on UCS = 20 x $I_{s(50)}$, actual correlation factor varies across rock types and weathering grades

●○ Axial\Diametral Point Load Index test

■ Uniaxial Compressive Strength test

DEFECT SPACING/BEDDING SPACING (Rock)

Measured at right angles to defects of same set or bedding.

Term	Defect Spacing	Bedding
Extremely closely spaced	<6 mm 6 to 20 mm	Thinly Laminated Laminated
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Closely spaced	0.06 to 0.2 m	Thin
Moderately widely spaced	0.2 to 0.6 m	Medium
Widely spaced	0.6 to 2 m	Thick
Very widely spaced	>2 m	Very Thick

DEFECT TYPE (Rock)

Symbol	Term	Symbol	Term
CS	crushed seam	J	joint
DB	drilling break	MB	mechanical break
DL	drill lift	P	parting
EW	extremely weathered seam	S	sheared surface
HB	handling break	SS	shear seam
IS	infilled seam	SZ	shear zone

DEFECT ORIENTATION (Rock)

Dip measured relative to the horizontal plane in vertical boreholes and relative to core axis in inclined boreholes.

DEFECT ROUGHNESS AND SHAPE (Rock)

Roughness	Description	Roughness	Description
SM	Smooth	PO	Polished
RF	Rough	SL	Slickensided
VR	Very Rough		

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

DEFECT APERTURE OBSERVATION (Rock)

Symbol	Term
CN	Clean
CT	Coating (<=1 mm)
SN	Stained
VN	Veneer

Aperture infill is denoted through presence of a value in the aperture thickness measurement and an infill material code or name in the infill material cell.

DEFECT INFILLING (Rock)

Where defects are infilled, the infilling material is either coded with a soil\mineral name (e.g. CLAY), a group symbol code (e.g. SC), or one of the material codes in the table below.

Term	Description	Term	Description
Ca	Calcite	Mn	Manganese
Ch	Chlorite	Py	Pyrite
Co	Coal/carbonaceous	Gp	Gypsum
CR	Crushed rock	Qz	Quartz
Fe	Limonite/ironstone	Ud	Unidentified
Fs	Feldspar		

OTHER OBSERVATIONS

Ranking of visually observable contamination and odour (applies on specific soil contamination projects only)

Symbol	Term
R = 0	No visible evidence of contamination
R = 1	Slight evidence of contamination
R = 2	Visible evidence of contamination
R = 3	Significant visible evidence of contamination
R = A	No non-natural odours identified
R = B	Slight non-natural odours identified
R = C	Moderate non-natural odours identified
R = D	Strong non-natural odours identified

Graphic Log Colour Scheme – Soils and Rocks

The soil and rock colour schemes presented on the logs and fences have been derived from those below.
The rock colour scheme is taken from Geoscience Australia's predecessor, the Bureau of Mineral Resources (BMR).

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	Silt dominated soils, topsoil, undifferentiated fine grained soil	
	Sand dominated soils	
	Gravel or cobble dominated soils	
	Peat soils	
	Lithic sedimentary breccia and conglomerate	Sedimentary rocks
	Sandstone, arenite	
	Arkose	
	Pelitic rocks, shale, mudstone	
	Greywacke, siltstone, siltstone-sandstone mixtures	
	Coal, lignite, undifferentiated carbonaceous rock	
	Limestone, chert, undifferentiated calcareous soils, and rocks	
	Undifferentiated metamorphic rocks of any grade	Metamorphic rocks
	Schist, gneiss, and other high grade metamorphic rocks	
	Greenschist, phyllite, hornfels and lower grade metamorphic rocks	
	Undifferentiated igneous rock, tuff, volcanics	Igneous rocks
	Extrusive acid igneous rock, rhyolite	
	Extrusive basic igneous rock, basalt, spilite	
	Extrusive intermediate igneous rock, dacite	
	Extrusive ultrabasic igneous	
	Intrusive acid igneous rock, all granitoid rock	
	Intrusive basic igneous rock, gabbro, dolerite	
	Intrusive intermediate igneous rock, andesite, diorite	
	Intrusive ultrabasic igneous rock, peridotite	
	Fill, concrete, pavement	Secondary rock, man-made and other materials
	Water	
	Undifferentiated evaporite unit	
	Calcrete	
	Ironstone, ferricrete, ferruginous rock	

Graphic Symbols – Soils and Rocks

Typical symbols for soils and rocks are as follows. Combinations of these symbols may be used to indicate mixed materials such as clayey sand.

SOIL SYMBOLS

Main components

 CLAY

 SILT

 SAND

 GRAVEL

 BOULDERS / COBBLES

 TOPSOIL

 PEAT

Minor components

 CLAYEY

 SILTY

 SANDY

 GRAVELLY

OTHER MATERIAL SYMBOLS

 FILL

 BITUMEN

 CONCRETE

ROCK SYMBOLS

Sedimentary Rocks

 SANDSTONE

 SILTSTONE

 CLAYSTONE, MUDSTONE

 SHALE

 COAL

 LIMESTONE

 CONGLOMERATE

Igneous rocks

 GRANITE

 BASALT

 UNDIFFERENTIATED IGNEOUS

Metamorphic rocks

 SLATE, PHYLLITE, SCHIST

 GNEISS

 QUARTZITE

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH01 (CLM)

FILE / JOB NO : PS206292
SHEET : 1 OF 1

CLIENT : SINSW
LOCATION : Greenway Park Public School
PROJECT : SINSW UPS T23-24

POSITION : E: 300066.0, N: 6242615.0 (MGA2020-56) SURFACE ELEVATION : 55.90 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Commachio 305 MOUNTING : Track CONTRACTOR : Matrix DRILLER : JY

DATE STARTED : 26/9/2023 DATE COMPLETED : 26/9/2023 DATE LOGGED : 26/9/2023 LOGGED BY : TFW CHECKED BY : JD

DRILLING					MATERIAL						
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
HA	N/A	F	Not Encountered		0.0 55.9			TOPSOIL Gravelly Sandy SILT: brown, grey brown, low liquid limit, sand is fine and medium grained; gravel is fine and medium, subangular and sub-rounded sandstone, shale and laminite; with clay; trace rootlets.	w<PL		TOPSOIL
					0.30m			FILL Sandy Silty CLAY: low to medium plasticity, grey and dark brown grey, silt is low liquid limit; sand is fine to coarse grained; with fine and medium grained, subangular and sub-rounded sandstone, shale and laminite gravel.			FILL
					0.50m 0.5 55.4		CI-CH	Sandy Silty CLAY: medium to high plasticity, orange brown and brown, silt is low liquid limit; sand is fine to coarse grained; with fine to coarse grained, angular to sub-rounded shale and ironstone gravel.	w<PL - w≈PL	St	ALLUVIAL SOIL
					0.85m			Hole Terminated at 0.85 m Refusal Contamination sampling location. Borehole hand augered and terminated upon refusal			0.85: refusal on gravel layer
					1.0 54.9						
					1.5 54.4						
					2.0 53.9						
					2.5 53.4						
					3.0 52.9						
					3.5 52.4						
					4.0 51.9						
					4.5 51.4						
					5.0 50.9						

See Explanatory Notes for details of abbreviations & basis of descriptions.

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH02 (CLM)

FILE / JOB NO : PS206292
SHEET : 1 OF 1

CLIENT : SINSW
LOCATION : Greenway Park Public School
PROJECT : SINSW UPS T23-24

POSITION : E: 300050.0, N: 6242616.0 (MGA2020-56) SURFACE ELEVATION : 55.80 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Commachio 305 MOUNTING : Track CONTRACTOR : Matrix DRILLER : JY

DATE STARTED : 26/9/2023 DATE COMPLETED : 26/9/2023 DATE LOGGED : 26/9/2023 LOGGED BY : TFW CHECKED BY : JD

DRILLING					MATERIAL						
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
	N/A				0.0 55.8			TOPSOIL Gravelly Sandy SILT: brown, grey brown, low liquid limit, sand is fine and medium grained; gravel is fine and medium, subangular and sub-rounded sandstone, shale and laminite; with clay; trace rootlets.			TOPSOIL
					0.20m			FILL Sandy Silty CLAY: low to medium plasticity, grey and dark brown grey, silt is low liquid limit; sand is fine to coarse grained.	w<PL		FILL
					0.45m						
HA		F	Not Encountered		0.5 55.3		CI-CH	Sandy Silty CLAY: medium to high plasticity, orange brown and brown, silt is low liquid limit; sand is fine to coarse grained.	w<PL - w≈PL	St	ALLUVIAL SOIL
					1.0 54.8						
					1.30m						
							ML	Sandy Clayey SILT: brown, pale brown becoming dark brown, low liquid limit, clay is medium to high plasticity; sand is fine and medium grained.			
					1.50m						
					1.5 54.3			Hole Terminated at 1.50 m Target depth Contamination sampling location. Borehole hand augered and terminated upon refusal			
					2.0 53.8						
					2.5 53.3						
					3.0 52.8						
					3.5 52.3						
					4.0 51.8						
					4.5 51.3						
					5.0 50.8						

See Explanatory Notes for details of abbreviations & basis of descriptions.

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH03 (CLM)

FILE / JOB NO : PS206292
SHEET : 1 OF 1

CLIENT : SINSW
LOCATION : Greenway Park Public School
PROJECT : SINSW UPS T23-24

POSITION : E: 300043.0, N: 6242608.0 (MGA2020-56) SURFACE ELEVATION : 55.40 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Commachio 305 MOUNTING : Track CONTRACTOR : Matrix DRILLER : JY

DATE STARTED : 26/9/2023 DATE COMPLETED : 26/9/2023 DATE LOGGED : 26/9/2023 LOGGED BY : TFW CHECKED BY : JD

DRILLING					MATERIAL						
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
HA	N/A	F	Not Encountered		0.0 55.4			TOPSOIL Gravelly Sandy SILT: brown, grey brown, low liquid limit, sand is fine and medium grained; gravel is fine and medium grained, subangular and sub-rounded sandstone, shale and laminite; with clay; trace rootlets.			TOPSOIL
					0.30m						
					0.5 54.9			FILL Sandy Silty CLAY: medium plasticity, grey brown, grey and red brown, silt is low liquid limit; sand is fine to coarse grained; with fine and medium grained, subangular to sub-rounded brick, sandstone, shale, laminite and ironstone gravel; rootlets.	w<PL		FILL
					0.80m						
					1.0 54.4		CI	Sandy Silty CLAY: medium plasticity, grey brown, grey, silt is low liquid limit; sand is fine and medium grained; with rootlets.	w>PL w<PL - w≈PL	St - VSt	ALLUVIAL SOIL
					1.30m						
							ML	Sandy Clayey SILT: red brown and grey, low liquid limit, clay is medium to high plasticity; sand is fine to coarse grained.	w<PL		
					1.50m						
					1.5 53.9			Hole Terminated at 1.50 m Target depth Contamination sampling location. Borehole hand augered and terminated upon refusal			
					2.0 53.4						
					2.5 52.9						
					3.0 52.4						
					3.5 51.9						
					4.0 51.4						
					4.5 50.9						
					5.0 50.4						

See Explanatory Notes for details of abbreviations & basis of descriptions.

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH04

FILE / JOB NO : PS206292
SHEET : 1 OF 1

CLIENT : SINSW
LOCATION : Greenway Park Public School
PROJECT : SINSW UPS T23-24

POSITION : E: 300034.0, N: 6242584.0 (MGA2020-56) SURFACE ELEVATION : 57.10 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Commachio 305 MOUNTING : Track CONTRACTOR : Matrix DRILLER : JY

DATE STARTED : 26/9/2023 DATE COMPLETED : 26/9/2023 DATE LOGGED : 26/9/2023 LOGGED BY : TFW CHECKED BY : JD

DRILLING						MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
	N/A	E			0.0 57.1			TOPSOIL Gravelly Sandy SILT: brown, grey brown, low liquid limit, sand is fine and medium grained; gravel is fine and medium grained, subangular and sub-rounded sandstone, shale and laminite; with clay.	w<PL		TOPSOIL
				0.50m SPT 6,9,10 N=19	0.5 56.6			0.35m FILL Sandy Silty CLAY: low to medium plasticity, brown and red brown, silt is low liquid limit; sand is fine and medium grained; with fine grained, subangular and sub-rounded shale and ironstone gravel. 0.57m			FILL
AD/V		F		0.95m	1.0 56.1		ML	Clayey Sandy SILT: grey, red brown and orange brown, low liquid limit, sand is fine grained; clay is medium plasticity; with fine grained, sub-rounded shale and ironstone gravel; trace rootlets.		St - VSt	ALLUVIAL SOIL 0.60: PP =580 kPa
				1.50m SPT 10,11,15 N=26	1.5 55.6			1.50m Gravelly Silty CLAY: medium to high plasticity, grey and orange brown, gravel is fine and medium grained, subangular and sub-rounded shale, sandstone and ironstone; trace rootlets; subhorizontal fissuring; Iron staining. 1.56-1.65m pale red brown sandy silt with coarse pale grey siltstone specks	w<PL - w≈PL		1.60: PP >600 kPa
			Not Encountered	1.95m			CI-CH				
				2.30m D	2.0 55.1			2.30m Sandy CLAY: medium to high plasticity, pale red brown and pale grey, sand is fine and medium grained.		VSt	
		F-H		**2.50m** SPT 17,21,27 N=48	2.5 54.6		CI-CH	2.55m Silty CLAY: medium to high plasticity, pale grey and red brown, with fine and medium grained sand; subhorizontal fissuring; Iron staining.		VSt - H	RESIDUAL SOIL 2.60: PP >600 kPa
AD/T				2.95m 3.00m D				2.90m SILTSTONE: grey and brown mottled orange brown, laminated, 0-5° bedding, with 0-5°, fine and medium grained, red brown and orange brown sandstone laminations, highly weathered, very low strength, Iron staining.			WEATHERED ROCK
				3.50m	3.0 54.1						
		H		4.00m SPT 10,8/40mm HB N=R 4.19m	3.5 53.6						
					4.0 53.1			4.19m Hole Terminated at 4.19 m Target depth Terminated upon TC-bit auger and SPT refusal.			4.10: PP >600 kPa
					4.5 52.6						
					5.0 52.1						

See Explanatory Notes for details of abbreviations & basis of descriptions.

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH05

FILE / JOB NO : PS206292
SHEET : 1 OF 1

CLIENT : SINSW
LOCATION : Greenway Park Public School
PROJECT : SINSW UPS T23-24

POSITION : E: 300033.0, N: 6242610.0 (MGA2020-56) SURFACE ELEVATION : 56.10 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Commachio 305 MOUNTING : Track CONTRACTOR : Matrix DRILLER : JY

DATE STARTED : 26/9/2023 DATE COMPLETED : 26/9/2023 DATE LOGGED : 26/9/2023 LOGGED BY : TFW CHECKED BY : JD

DRILLING						MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
	N/A			D	0.0 56.1			TOPSOIL Gravelly Sandy SILT: brown, grey brown, low liquid limit, sand is fine and medium grained; gravel is fine and medium grained, subangular and sub-rounded sandstone, shale and laminite; with clay; trace plastic fragments.			TOPSOIL
		E						0.30m	w<PL		
				0.50m SPT 5,7,7 N=14	0.5 55.6			FILL Sandy Silty CLAY: low to medium plasticity, brown, silt is low liquid limit; sand is fine and medium grained; with fine grained, subangular and sub-rounded shale and ironstone gravel; with rootlets.			FILL
								0.52m FILL Clayey Sandy SILT: brown, brown grey and orange brown, low liquid limit, sand is fine to coarse grained; clay is low plasticity; with fine and medium grained, subangular and sub-rounded sandstone, ironstone, shale, trace brick and charcoal gravel; with rootlets; Iron staining.			0.60: PP =240 kPa 0.70: PP =210 kPa
				0.95m 1.00m D	1.0 55.1						
		F	Not Encountered	1.50m SPT 5,7,9 N=16	1.5 54.6			1.54m Sandy Clayey SILT: pale grey mottled grey and red brown, low liquid limit, clay is medium plasticity; sand is fine to coarse grained; with fine and medium grained, subangular and sub-rounded sandstone, ironstone, trace charcoal gravel; with rootlets; subhorizontal fissuring; Iron staining.	w<PL - w≈PL	St - VSt	ALLUVIAL SOIL 1.60: PP =330 kPa 1.70: PP =330 kPa
				1.95m			ML				
AD/V				2.10m	2.0 54.1			2.10m			
				D				Silty CLAY: medium plasticity, brown grey, trace fine grained, sub-rounded ironstone, sandstone and siltstone gravel; subhorizontal fissuring; Iron staining.			RESIDUAL SOIL
AD/T		F-H		2.50m SPT 15,16,20/60mm HB N=R	2.5 53.6		CI				2.60: PP >600 kPa
				2.86m				2.73m SILTSTONE: grey and brown mottled orange brown, laminated, 0-5° bedding, with 0-5°, fine and medium grained, red brown and orange brown sandstone laminations, highly weathered, very low strength, Iron staining.			2.70: PP >600 kPa WEATHERED ROCK
					2.86m			Hole Terminated at 2.86 m Target depth Terminated upon TC-bit auger and SPT refusal.			
					3.0 53.1						
					3.5 52.6						
					4.0 52.1						
					4.5 51.6						
					5.0 51.1						

See Explanatory Notes for details of abbreviations & basis of descriptions.

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH06

FILE / JOB NO : PS206292
SHEET : 1 OF 1

CLIENT : SINSW
PROJECT : SINSW UPS T23-24
LOCATION : Greenway Park Public School

POSITION : E: 300055.0, N: 6242610.0 (MGA2020-56) SURFACE ELEVATION : 55.90 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Commachio 305 MOUNTING : Track CONTRACTOR : Matrix DRILLER : JY

DATE STARTED : 26/9/2023 DATE COMPLETED : 26/9/2023 DATE LOGGED : 26/9/2023 LOGGED BY : TFW CHECKED BY : JD

DRILLING						MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
	N/A				0.0 55.9			TOPSOIL Gravelly Sandy SILT: grey brown, low liquid limit, sand is fine and medium grained; gravel is fine and medium grained, subangular and sub-rounded sandstone, shale and laminite; with clay; trace plastic fragments, rootlets.			TOPSOIL
		E			0.20m			FILL Clayey Sandy SILT: pale brown grey, pale red brown, low liquid limit, sand is fine grained; clay is low to medium plasticity; with fine grained, sub-rounded laminite, shale and ironstone gravel; with rootlets.	w<PL		FILL
				0.50m SPT 10,11,14 N=25	0.45m 0.5 55.4			Silty CLAY: low to medium plasticity, red brown, silt is low liquid limit; with fine to coarse grained sand; with fine to medium grained, subangular to rounded sandstone and siltstone gravel; trace rootlets, trace charcoal.			ALLUVIAL SOIL 0.60: PP =540 kPa 0.70: PP =540 kPa
AD/V		F	Not Encountered	0.95m	1.0 54.9		CL-CI				
				1.50m SPT 5,9,10 N=19	1.5 54.4			1.50-1.55m fine and medium grained, pale brown sandstone cobble	w<PL - w≈PL	St - VSt	
				1.95m 2.00m SPTLS	1.60m 2.0 53.9		CH	Sandy Silty CLAY: high plasticity, pale grey and pale red brown, silt is low liquid limit; sand is fine and medium grained; trace fine grained, sub-rounded laminite, shale and ironstone gravel; subhorizontal fissuring.			RESIDUAL SOIL 1.60: PP >600 kPa 1.70: PP >600 kPa
AD/T		F-H		**2.50m** SPT 16,23,30/100mm HB N=R	2.5 53.4						
				2.90m	2.61m			SILTSTONE: grey and brown mottled orange brown, laminated, 0-5° bedding, with 0-5°, fine and medium grained, red brown and orange brown sandstone laminations, highly weathered, very low strength, Iron staining.			2.60: PP >600 kPa WEATHERED ROCK
					2.90m 3.0 52.9			Hole Terminated at 2.90 m Target depth Terminated upon TC-bit auger and SPT refusal.			
					3.5 52.4						
					4.0 51.9						
					4.5 51.4						
					5.0 50.9						

See Explanatory Notes for details of abbreviations & basis of descriptions.

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH07

FILE / JOB NO : PS206292
SHEET : 1 OF 1

CLIENT : SINSW
LOCATION : Greenway Park Public School
PROJECT : SINSW UPS T23-24

POSITION : E: 300068.0, N: 6242623.0 (MGA2020-56) SURFACE ELEVATION : 55.10 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Commachio 305 MOUNTING : Track CONTRACTOR : Matrix DRILLER : JY

DATE STARTED : 26/9/2023 DATE COMPLETED : 26/9/2023 DATE LOGGED : 26/9/2023 LOGGED BY : TFW CHECKED BY : JD

DRILLING						MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
	N/A				0.0 55.1			TOPSOIL Gravelly Sandy SILT: grey brown, low liquid limit, sand is fine and medium grained; gravel is fine and medium grained, subangular and sub-rounded sandstone, shale and laminite; with clay; with rootlets.			TOPSOIL
		E						0.30m FILL Clayey Sandy SILT: pale brown grey, pale red brown, low liquid limit, sand is fine grained; clay is low to medium plasticity; with fine grained, sub-rounded laminite, shale and ironstone gravel; trace rootlets.	w<PL		FILL
				0.50m SPT 6,12,11 N=23	0.5 54.6			0.62m Gravelly Sandy CLAY: low to medium plasticity, pale red brown and dark grey, sand is fine to coarse grained; gravel is fine to coarse grained, subangular and sub-rounded shale, ironstone and sandstone; with low liquid limit sand; trace rootlets; Iron staining.			ALLUVIAL SOIL 0.70: PP =540 kPa 0.80: PP =560 kPa 0.90: PP >600 kPa
				0.95m	1.0 54.1		CL				
AD/V				1.50m SPT 5,8,13 N=21	1.5 53.6			1.57m Silty CLAY: high plasticity, pale grey mottled red brown, with fine to coarse grained, subangular to sub-rounded shale, ironstone and sandstone gravel; trace fine to coarse grained sand; trace rootlets and decaying vegetation, subhorizontal fissuring; Iron staining.	w<PL - w≈PL	St - VSt	RESIDUAL SOIL 1.60: PP >600 kPa 1.70: PP >600 kPa 1.80: PP >600 kPa
		F	Not Encountered	1.95m			CH				
				2.50m SPT 10,11,12 N=23	2.0 53.1			2.00m Sandy Silty CLAY: medium to high plasticity, pale grey and pale red brown, silt is low liquid limit; sand is fine and medium grained; trace fine grained, sub-rounded laminite, shale and ironstone gravel.			
				2.95m	2.5 52.6		CI-CH	2.60m Silty CLAY: medium to high plasticity, pale grey and red brown mottled orange brown, with fine and medium grained sand; with fine to coarse grained, angular to sub-rounded weathered gravel.			2.70: PP >600 kPa
AD/T				3.00m D			CI-CH				2.80: PP >600 kPa
		F-H			3.0 52.1			3.05m weathered shale cobble (rip-up clast) SILTSTONE: grey and brown mottled orange brown, laminated, 0-5° bedding, with 0-5°, fine and medium grained, red brown and orange brown sandstone laminations, highly weathered, very low strength, Iron staining.			WEATHERED ROCK
				3.50m SPT 10,20,8/70mm HB N=R	3.5 51.6			3.60m SILTSTONE: grey and dark grey, laminated, distinct bedding, 0-5° bedding, with 0-5°, carbonaceous siltstone laminations, moderately weathered, low strength.			ROCK
		H		3.87m				3.87m 3.86-3.87m pale yellow brown, fine grained sandstone Hole Terminated at 3.87 m Target depth Terminated upon TC-bit auger and SPT refusal.			
					4.0 51.1						
					4.5 50.6						
					5.0 50.1						

See Explanatory Notes for details of abbreviations & basis of descriptions.

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH08

FILE / JOB NO : PS206292
SHEET : 1 OF 1

CLIENT : SINSW
LOCATION : Greenway Park Public School
PROJECT : SINSW UPS T23-24

POSITION : E: 300081.0, N: 6242614.0 (MGA2020-56) SURFACE ELEVATION : 55.80 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Commachio 305 MOUNTING : Track CONTRACTOR : Matrix DRILLER : JY

DATE STARTED : 26/9/2023 DATE COMPLETED : 26/9/2023 DATE LOGGED : 26/9/2023 LOGGED BY : TFW CHECKED BY : JD

DRILLING						MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
	N/A				0.0 55.8			TOPSOIL Gravelly Sandy SILT: grey brown, low liquid limit, sand is fine and medium grained; gravel is fine and medium grained, subangular and sub-rounded sandstone, shale and laminite; with clay; with rootlets.			TOPSOIL
		E						0.30m FILL Clayey Sandy SILT: pale brown grey, pale red brown, low liquid limit, sand is fine grained; clay is low to medium plasticity; with fine grained, sub-rounded laminite, shale and ironstone gravel; trace rootlets.	w<PL		FILL
				0.50m SPT 6,11,14 N=25	0.5 55.3			0.60m Gravelly Sandy CLAY: low to medium plasticity, pale red brown and dark grey, sand is fine to coarse grained; gravel is fine to coarse grained, angular to sub-rounded weathered sandstone, ironstone and shale; with low liquid limit sand; trace rootlets; Iron staining. 0.70-0.75m clayey subangular, fine sandstone and ironstone gravel		VSt	ALLUVIAL SOIL 0.60: PP =150 kPa 0.70: PP =190 kPa
				0.95m			CL-CI	0.90m Sandy Clayey SILT: red brown and pale grey mottled orange brown, low liquid limit, clay is medium to high plasticity; sand is fine to coarse grained; with fine to coarse grained, subangular and sub-rounded sandstone, shale and ironstone gravel; subhorizontal fissuring; Iron staining.			
AD/V				1.50m SPT 6,8,11 N=19	1.0 54.8 1.5 54.3		ML	1.50-1.65m pale red brown fine to coarse silty sand	w<PL - w≈PL	St - VSt	1.60: PP =420 kPa 1.70: PP =500 kPa 1.80: PP =510 kPa
		F	Not Encountered	1.95m				2.00m Sandy Silty CLAY: medium plasticity, pale red brown and pale grey, silt is low liquid limit; sand is fine and medium grained; trace fine to coarse grained, subangular and sub-rounded sandstone, shale and ironstone gravel; Iron staining.			
				2.50m SPT 10,12,14 N=26	2.0 53.8 2.5 53.3		CI	2.45m Silty CLAY: high plasticity, pale grey, orange brown and red brown, with fine and medium grained sand; with fine to coarse grained, angular to sub-rounded weathered sandstone, ironstone and shale gravel; subhorizontal fissuring; Iron staining.			RESIDUAL SOIL 2.60: PP >600 kPa 2.70: PP >600 kPa 2.80: PP >600 kPa
				2.95m			CH			VSt - H	
AD/T		F-H		3.50m SPT 20,28,8/40mm HB N=R	3.0 52.8 3.5 52.3			3.10m SILTSTONE: grey and brown mottled orange brown, laminated, 0-5° bedding, with 0-5°, fine and medium grained, red brown and orange brown sandstone laminations, highly weathered, very low strength, Iron staining.			WEATHERED ROCK
		H		3.84m				3.56m SILTSTONE: grey and dark grey, laminated, distinct bedding, 0-5° bedding, with 0-5°, carbonaceous siltstone laminations, moderately weathered, low strength. 3.84m			ROCK 3.60: PP >600 kPa 3.70: PP >600 kPa
					4.0 51.8 4.5 51.3 5.0 50.8			Hole Terminated at 3.84 m Target depth Terminated upon TC-bit auger and SPT refusal.			

See Explanatory Notes for details of abbreviations & basis of descriptions.

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH09

FILE / JOB NO : PS206292
SHEET : 1 OF 1

CLIENT : SINSW
PROJECT : SINSW UPS T23-24
LOCATION : Greenway Park Public School

POSITION : E: 300104.0, N: 6242615.0 (MGA2020-56) SURFACE ELEVATION : 55.90 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Commachio 305 MOUNTING : Track CONTRACTOR : Matrix DRILLER : JY

DATE STARTED : 26/9/2023 DATE COMPLETED : 26/9/2023 DATE LOGGED : 26/9/2023 LOGGED BY : TFW CHECKED BY : JD

DRILLING						MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
	N/A				0.0 55.9			TOPSOIL Gravelly Sandy SILT: grey brown, low liquid limit, sand is fine and medium grained; gravel is fine to coarse grained, angular to sub-rounded weathered sandstone, ironstone and shale fine and medium, subangular and sub-rounded sandstone, shale and laminite; with clay; with rootlets.			TOPSOIL
					0.25m			FILL Clayey Sandy SILT: pale brown grey, pale red brown, low liquid limit, sand is fine grained; clay is low to medium plasticity; with fine grained, subrounded laminite, shale and ironstone gravel; trace rootlets.			FILL
				0.50m SPT 9,13,11 N=24	0.5 55.4			FILL Gravelly Silty SAND: fine to coarse grained, poorly graded, brown and grey brown, silt is low liquid limit; gravel is fine and medium grained, subangular and sub-rounded sandstone, shale and laminite.			0.60: PP =130 kPa 0.70: PP =200 kPa
AD/V		E		0.95m	1.0 54.9				w<PL		
				1.50m SPT 7,9,10 N=19	1.5 54.4			1.50m Silty CLAY: high plasticity, pale grey, red brown and orange brown, with fine and medium grained sand; trace fine grained, sub-rounded ironstone,sandstone and shale gravel; trace rootlets, subhorizontal fissuring; Iron staining.			ALLUVIAL SOIL 1.60: PP =330 kPa 1.70: PP =350 kPa 1.80: PP =320 kPa
		F	Not Encountered	1.95m	2.0 53.9		CH	2.00m Sandy Silty CLAY: medium to high plasticity, pale grey and pale red brown, silt is low liquid limit; sand is fine and medium grained.	w<PL w≈PL	F - VSt	
				2.50m SPT 10,21,24 N=45	2.5 53.4		CI	2.60m Gravelly Clayey SILT: pale grey, red brown and orange brown, low liquid limit, clay is medium plasticity; gravel is fine and medium grained, subangular and sub-rounded weathered sandstone and shale; with sand; trace rootlets; subhorizontal fissuring; Iron staining.			RESIDUAL SOIL 2.60: PP =570 kPa 2.70: PP >600 kPa
AD/T		F-H		2.95m	3.0 52.9		ML	2.72m SILTSTONE: grey and brown mottled orange brown, laminated, 0-5° bedding, with 0-5°, fine and medium grained, red brown and orange brown sandstone laminations, highly weathered, very low strength, Iron staining. 3.20-3.23m pale yellow brown, fine grained sandstone			WEATHERED ROCK 2.80: PP >600 kPa
				3.50m SPT 24,8/80mm HB N=R	3.5 52.4			3.55m SILTSTONE: grey and dark grey, laminated, distinct bedding, 0-5° bedding, with 0-5°, carbonaceous siltstone laminations, moderately weathered, low strength.			ROCK 3.60: PP >600 kPa
		H		3.73m				3.73m Hole Terminated at 3.73 m Target depth Terminated upon TC-bit auger and SPT refusal.			3.70: PP >600 kPa
					4.0 51.9						
					4.5 51.4						
					5.0 50.9						

See Explanatory Notes for details of abbreviations & basis of descriptions.

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH10

FILE / JOB NO : PS206292
SHEET : 1 OF 1

CLIENT : SINSW
LOCATION : Greenway Park Public School
PROJECT : SINSW UPS T23-24

POSITION : E: 300128.0, N: 6242621.0 (MGA2020-56) SURFACE ELEVATION : 56.00 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Commachio 305 MOUNTING : Track CONTRACTOR : Matrix DRILLER : JY

DATE STARTED : 26/9/2023 DATE COMPLETED : 26/9/2023 DATE LOGGED : 26/9/2023 LOGGED BY : TFW CHECKED BY : JD

DRILLING						MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
	N/A				0.0 56.0			TOPSOIL Gravelly Sandy SILT: grey brown, low liquid limit, sand is fine and medium grained; gravel is fine and medium grained, subangular and sub-rounded sandstone, shale and laminite; with low plasticity clay; with rootlets; possible asbestos fragment.			TOPSOIL
					0.30m						
				0.50m SPT 5,6,6 N=12	0.5 55.5			FILL Silty Sandy CLAY: low to medium plasticity, grey brown and brown, sand is fine to coarse grained; silt is low liquid limit; with fine and medium grained, subangular and sub-rounded sandstone, shale, ironstone, concrete and brick gravel; trace rootlets. 0.50m potential asbestos fragment			FILL 0.60: PP =130 kPa 0.70: PP =170 kPa
		E		0.95m	1.0 55.0				w<PL		0.80: PP =180 kPa
				1.50m SPT 7,9,10 N=19	1.5 54.5						1.60: PP =360 kPa
					1.65m						
							CL	Sandy Silty CLAY: low plasticity, grey, red brown mottled orange brown, silt is low liquid limit; sand is fine and medium grained; with fine grained, sub-rounded ironstone and sandstone gravel; trace rootlets; subhorizontal fissuring.			ALLUVIAL SOIL 1.70: PP =360 kPa 1.80: PP =370 kPa
				1.95m							
					2.00m						
		F	Not Encountered		2.0 54.0			Sandy Silty CLAY: medium plasticity, pale grey and pale red brown, silt is low liquid limit; sand is fine and medium grained; trace fine grained, sub-rounded ironstone and sandstone gravel.	w<PL - w≈PL		
							CL-CI			F - St	
				2.50m SPT 7,9,10 N=19	2.5 53.5						
					2.60m						
							ML	Clayey SILT: pale grey mottled orange brown and red brown, low liquid limit, clay is medium to high plasticity; with fine and medium grained sand; trace rootlets and decaying vegetation; subhorizontal fissuring; Iron staining.			RESIDUAL SOIL 2.60: PP =430 kPa 2.70: PP =540 kPa 2.80: PP >580 kPa
				2.95m							
		F-H			3.0 53.0						
					3.00m			SILTSTONE: grey and brown mottled orange brown, laminated, 0-5° bedding, with 0-5°, fine and medium grained, red brown and orange brown sandstone laminations, highly weathered, very low strength, Iron staining.			WEATHERED ROCK
				3.50m							
					3.50m						
				SPT 18,26,37 HB N=63	3.5 52.5			SILTSTONE: grey and dark grey, laminated, distinct bedding, 0-5° bedding, with 0-5°, carbonaceous siltstone laminations, moderately weathered, low strength.			ROCK 3.60: PP >600 kPa
		H									3.70: PP >600 kPa
				3.95m							
					3.95m						
					4.0 52.0			Hole Terminated at 3.95 m Target depth Terminated upon TC-bit auger and SPT refusal.			
					4.5 51.5						
					5.0 51.0						

AD/V

AD/T

See Explanatory Notes for details of abbreviations & basis of descriptions.

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : GPS-BH01
FILE / JOB NO : PS206292
SHEET : 1 OF 1

CLIENT : SINSW
LOCATION : Greenway Park Public School
PROJECT : SINSW UPS T23-24

POSITION : E: 300146.0, N: 6242695.0 (MGA2020-56) SURFACE ELEVATION : 53.00 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Commachio 300 MOUNTING : Track CONTRACTOR : Stratacore DRILLER : RM

DATE STARTED : 15/1/2025 DATE COMPLETED : 15/1/2025 DATE LOGGED : 15/1/2025 LOGGED BY : TD CHECKED BY : JD

DRILLING						MATERIAL						
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
HA		E	Not Encountered	ES 0.10m	0.0 55.0			TOPSOIL Sandy CLAY: low to medium plasticity, brown to dark brown, sand is fine to medium grained; trace fine to medium grained, subangular to subrounded gravel; with rootlets.	w<PL		TOPSOIL GPS_BH01_0.1: PID = 0.6
				0.40m ES 0.50m	0.30m			FILL Sandy Silty CLAY: medium plasticity, brown, sand is fine to medium grained; trace fine to medium grained, subangular to subrounded gravel.	w<PL		FILL GPS_BH01_0.5: PID = 0.9
		F			0.50m			FILL CLAY: medium plasticity, brown mottled red brown, trace fine to medium grained sand; trace fine grained gravel.	w<PL		GPS_BH01_1.0: PID = 1.5
				0.90m ES 1.00m	1.0 54.0						
				1.40m ES	1.00m		CI	Sandy CLAY: medium plasticity, red brown, sand is fine to medium grained.	w<PL	VSt	ALLUVIAL SOIL
				SPT 4,6,14 N=20	1.50m			Silty CLAY: medium to high plasticity, grey mottled red brown, trace fine to medium grained, subangular siltstone gravel.			RESIDUAL SOIL 1.60: PP >600 kPa GPS_BH01_1.5: PID = 1.5
		H		1.95m ES 2.00m	2.0 53.0		CI-CH		w<PL	VSt	GPS_BH01_2.0: PID = 0.9
AD/T					3.00m						
				SPT 7,21/130mm N=R 3.28m	3.0 52.0			SILTSTONE, pale grey to dark grey, inferred very low strength, extremely weathered, recovered as Gravelly Silty CLAY, medium to high plasticity, gravel is fine grained, sub-angular to angular.			INFERRED WEATHERED ROCK 3.10: PP >600 kPa
		VH			4.0 51.0						
				SPT 10/115mm HB N=R 4.62m	5.0 50.0						
					6.00m						
					6.0 49.0			Hole Terminated at 6.00 m Target depth Target depth reached			
					7.0 48.0						
					8.0 47.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : GPS-BH02

FILE / JOB NO : PS206292
SHEET : 1 OF 1

CLIENT : SINSW
LOCATION : Greenway Park Public School
PROJECT : SINSW UPS T23-24

POSITION : E: 300153.0, N: 6242687.0 (MGA2020-56) SURFACE ELEVATION : 53.80 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Commachio 300 MOUNTING : Track CONTRACTOR : Stratacore DRILLER : RM

DATE STARTED : 15/1/2025 DATE COMPLETED : 15/1/2025 DATE LOGGED : 15/1/2025 LOGGED BY : KC CHECKED BY : JD

DRILLING						MATERIAL						
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
HA		E	Not Encountered	ES 0.10m	0.0 55.0			TOPSOIL Clayey SAND: fine to medium grained, brown, clay is clay is low plasticity; trace fine grained gravel gravel; with rootlets.	D		TOPSOIL GPS_BH02_0.1: PID = 2.0
					0.20m						
		F		0.40m ES 0.50m				FILL Sandy CLAY: medium to high plasticity, brown, red-brown and grey, sand is fine to medium grained; trace fine to medium grained gravel gravel.	w<PL		FILL GPS_BH02_0.5: PID = 3.3
					0.60m						
				0.90m ES 1.00m	1.0 54.0		CI-CH	Sandy Silty CLAY: medium to high plasticity, red-brown, sand is fine grained; trace fine to medium grained, subangular to subrounded gravel.	w<PL to w≈PL	St	ALLUVIAL SOIL GPS_BH02_1.0: PID = 1.8
					1.30m						
				1.40m ES SPT 4,10,11 N=21				Silty CLAY: medium to high plasticity, pale grey mottled red.			RESIDUAL SOIL GPS_BH02_1.5: PID = 3.8 1.60: PP >600 kPa 1.70: PP >600 kPa
				1.90m ES 2.00m	2.0 53.0		CI-CH	Increasing sand content	w<PL	VSt	
					2.80m			2.80m: with fine to medium grained, subangular to angular siltstone fragments			
					3.00m						
AD/T		H		SPT 7,20/130mm HB N=R 3.28m	3.0 52.0			SILTSTONE, pale grey to dark grey, inferred very low strength, extremely weathered, recovered as Gravelly Silty CLAY, medium to high plasticity, gravel is fine grained, sub-angular to angular.			INFERRED WEATHERED ROCK 3.10: PP >600 kPa 3.20: PP >600 kPa
					4.0 51.0			4.25m: becoming yellow brown with iron staining			
				SPT 15/20mm HB N=R 4.52m	5.0 50.0						
					5.60m						
					5.80m			SILTSTONE: grey and brown mottled orange brown, very fine grained, extremely to highly weathered, very low to low strength, Iron staining.			ROCK
					6.0 49.0			Hole Terminated at 5.80 m Refusal Terminated upon TC-bit auger refusal			
					7.0 48.0						
					8.0 47.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : GPS-BH03

FILE / JOB NO : PS206292
SHEET : 1 OF 1

CLIENT : SINSW
LOCATION : Greenway Park Public School
PROJECT : SINSW UPS T23-24

POSITION : E: 300163.0, N: 6242674.0 (MGA2020-56) SURFACE ELEVATION : 54.00 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Commachio 300 MOUNTING : Track CONTRACTOR : Stratacore DRILLER : RM

DATE STARTED : 15/1/2025 DATE COMPLETED : 15/1/2025 DATE LOGGED : 15/1/2025 LOGGED BY : TD CHECKED BY : JD

DRILLING						MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
HA		E	Not Encountered	ES 0.10m	0.0 55.0			TOPSOIL Sandy CLAY: low to medium plasticity, brown to dark brown, sand is fine to medium grained.	w<PL		TOPSOIL, glass observed GPS_BH03_0.1: PID = 5.9
				0.40m	0.20m			FILL Sandy CLAY: low to medium plasticity, brown, sand is fine to medium grained; with fine to coarse grained up to 30mm, subangular gravel.			FILL
		F		ES 0.50m					w<PL		GPS_BH03_0.5: PID = 2.9
					0.70m						
				0.90m				Sandy CLAY: medium plasticity, red brown and brown, sand is fine to medium grained.	w<PL	St	ALLUVIAL SOIL
				ES 1.00m	1.0 54.0		CI				GPS_BH03_1.0: PID = 1.8
					1.10m			Silty CLAY: medium to high plasticity, grey mottled red brown, trace fine to medium grained sand; trace; trace fine to medium grained, subangular siltstone gravel.			RESIDUAL SOIL
				1.40m							GPS_BH03_1.5: PID = 1.3
				ES 1.50m							
				SPT 3,7,15 N=22							1.60: PP >600 kPa 1.70: PP >600 kPa
		H		1.90m							
				1.95m ES 2.00m	2.0 53.0		CI-CH		w<PL	St to VSt	GPS_BH03_2.0: PID = 1.3
					3.00m						
				SPT 7,20/110mm N=R 3.26m	3.0 52.0			SILTSTONE, grey mottled red brown, inferred very low strength, extremely weathered, recovered as Gravelly Silty CLAY, medium to high plasticity, gravel is fine grained, sub-angular to angular.			INFERRED WEATHERED ROCK 3.05: PP >600 kPa 3.10: PP >600 kPa
AD/T		VH			4.0 51.0						
				SPT 5,9/110mm N=R 4.76m	5.0 50.0						
					6.00m			Hole Terminated at 6.00 m Target depth Target depth reached			
					6.0 49.0						
					7.0 48.0						
					8.0 47.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : GPS-BH04

FILE / JOB NO : PS206292
SHEET : 1 OF 1

CLIENT : SINSW
LOCATION : Greenway Park Public School
PROJECT : SINSW UPS T23-24

POSITION : E: 300134.0, N: 6262682.0 (MGA2020-56) SURFACE ELEVATION : 53.10 (AHD) ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Commachio 300 MOUNTING : Track CONTRACTOR : Stratacore DRILLER : RM

DATE STARTED : 15/1/2025 DATE COMPLETED : 15/1/2025 DATE LOGGED : 15/1/2025 LOGGED BY : KC CHECKED BY : JD

DRILLING						MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
HA		E	Not Encountered	ES 0.10m	0.0 55.0			TOPSOIL Clayey SAND: fine to coarse grained, brown, clay is clay is low plasticity.	D		TOPSOIL GPS_BH04_0.1: PID = 2.6
		F		0.40m ES 0.50m	0.20m			FILL Sandy Silty CLAY: low to medium plasticity, brown, sand is fine to medium grained; trace fine grained, subrounded gravel gravel.	w<PL		FILL GPS_BH04_0.5: PID = 5.8
				0.90m ES 1.00m	0.60m 1.0 54.0		CI	Silty CLAY: medium plasticity, pale grey to red brown, with fine grained sand; trace rootlets.	w<PL	St	ALLUVIAL SOIL GPS_BH04_1.0: PID = 5.1
AD/T		H		1.40m ES SPT 7,7,16 N=23	1.20m			Silty CLAY: medium to high plasticity, pale grey mottled red brown, with fine to medium grained sand; trace fine to coarse grained, subangular to subrounded siltstone and sandstone gravels with fissuring.			RESIDUAL SOIL GPS_BH04_1.5: PID = 5.0 GPS_BH04_2.0: PID = 0.7 1.60: PP >600 kPa 1.70: PP >600 kPa 1.80: PP >600 kPa
				1.90m ES 2.00m	2.0 53.0		CI-CH		w<PL	VSt	
								2.50m: with sub-rounded to sub-angular siltstone fragments			
		VH		SPT 4,9,15/110mm HB N=R 3.41m	2.70m 3.0 52.0			SILTSTONE, pale grey to dark grey mottled red brown, inferred very low strength, extremely weathered, recovered as Gravelly Silty CLAY, medium to high plasticity, gravel is fine grained, sub-angular to angular.			INFERRED WEATHERED ROCK 3.00: PP >600 kPa 3.10: PP >600 kPa
					4.0 51.0						
				SPT 10/5mm N=R 4.51m	4.50m			Hole Terminated at 4.50 m Target depth Terminated upon TC-bit auger and SPT refusal			
					5.0 50.0						
					6.0 49.0						
					7.0 48.0						
					8.0 47.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

HAND AUGER: HA01

Sheet 1 of 1

Project: Greenway Park Primary School Upgrade

Location: Greenway Park Primary School, Wyattville Dr, Carnes Hill NSW 2171

Client: School Infrastructure NSW

Job No.: PS206292

Contractor: Stratacore Drill Rig:

Inclination: -90°

Date Started: 15/01/2025

Date Completed: 15/01/2025

Logged: GBP

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA			0.0						TOPSOIL Sandy CLAY: low to medium plasticity, brown to dark brown, sand is fine to medium grained; trace fine to medium grained, subangular to angular gravel.	w<PL		TOPSOIL glass and rootlets observed
				0.20	ES 0.10 m GPS_HA01_0.1 PID 0.0 ppm				FILL Silty Sandy CLAY: medium plasticity, brown, sand is fine to medium grained; trace fine to medium grained, subangular to subrounded gravel.			FILL
			0.2									
			0.4							w<PL		
					ES 0.50 m GPS_HA01_0.5 PID 0.50 m 0.0 ppm							
				0.60					Sandy CLAY: brown mottled red brown, trace fine to medium grained sand sand; trace fine grained gravel.			ALLUVIAL SOIL
			0.6							w<PL		
			0.8									
				1.00								
			1.0		ES 1.00 m GPS_HA01_1.0 PID 0.0 ppm				Sandy CLAY: medium plasticity, red brown, sand is fine to medium grained.			RESIDUAL SOIL
				1.10					Hole Terminated at 1.10 m			
			1.2							w<PL	VSt	
			1.4									

Comments

Checked

Date

HAND AUGER: HA02

Sheet 1 of 1

Project: Greenway Park Primary School Upgrade

Location: Greenway Park Primary School, Wyattville Dr, Carnes Hill NSW 2171 — Date Started 15/01/2025:

Client: School Infrastructure NSW — Contractor: Stratacore — Drill Rig: — Date Completed: 15/01/2025

Job No.: PS206292 — Inclination: -90° — Logged: GBP

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA			0.0						TOPSOIL Silty Sandy CLAY: low to medium plasticity, brown to dark brown, sand is fine to medium grained.	w<PL		TOPSOIL organics and rootlets observed.
				0.20	ES 0.10 m GPS_HA02_0.1 PID 1.5 ppm				FILL Silty Sandy CLAY: medium plasticity, brown, sand is fine to medium grained; with fine to coarse grained up to 30mm, subangular gravel.			FILL organic material observed
			0.2									
			0.4							w<PL		
					ES 0.50 m GPS_HA02_0.5 PID 2.1 ppm							
			0.6									
				0.65					Sandy CLAY: medium plasticity, red brown and brown, sand is fine to medium grained.			
					ES 0.75 m GPS_HA02_0.75 PID 0.2 ppm							
			0.8							w<PL		
			1.0									
				1.10					Silty CLAY: medium to high plasticity, grey mottled red brown, trace fine to medium grained sand; trace grained subangular siltstone gravel.			
			1.2									
					ES 1.25 m GPS_HA02_1.25 PID 0.2 ppm							
				1.30						w<PL		
									Hole Terminated at 1.30 m			
			1.4									

Comments

Checked

Date

HAND AUGER: HA03

Sheet 1 of 1

Project: Greenway Park Primary School Upgrade

Location: Greenway Park Primary School, Wyattville Dr, Carnes Hill NSW 2171

Client: School Infrastructure NSW

Job No.: PS206292

Contractor: Stratacore Drill Rig:

Inclination: -90°

Date Started: 15/01/2025

Date Completed: 15/01/2025

Logged: GBP

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA			0.0						TOPSOIL Clayey SAND: fine to coarse grained, brown, clay is low to medium plasticity.	D		TOPSOIL rootlets, brick/paver fragments observed.
					ES 0.10 m GPS_HA03_0.1 PID 0.1 ppm							
			0.2	0.20					FILL Silty Sandy CLAY: low to medium plasticity, brown, sand is fine to medium grained; trace fine to medium grained, subangular to subrounded gravel gravel.			FILL
			0.4							w<PL		
					ES 0.50 m GPS_HA03_0.5 PID 0.0 ppm							
			0.6	0.60					Silty CLAY: medium plasticity, grey mottled red, trace fine grained sand.			ALLUVIAL SOIL Organics observed.
			0.8							w<PL	St	
			1.0		ES 1.00 m GPS_HA03_1.0 PID 0.0 ppm							
			1.2									
					ES 1.30 m GPS_HA03_1.3 PID 0.0 ppm							
				1.30					Hole Terminated at 1.30 m			
			1.4									

Comments

Checked

Date

HAND AUGER: HA04

Sheet 1 of 1

Project: Greenway Park Primary School Upgrade

Location: Greenway Park Primary School, Wyattville Dr, Carnes Hill NSW 2171

Client: School Infrastructure NSW

Job No.: PS206292

Contractor: Stratacore Drill Rig:

Inclination: -90°

Date Started: 15/01/25

Date Completed: 15/01/25

Logged: GBP

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA			0.0						TOPSOIL Clayey SAND: fine to coarse grained, brown, clay is low to medium plasticity.			TOPSOIL rootlets, charcoal fragments, gravel and brick/paver pieces observed.
				0.15	ES 0.10 m GPS_HA04_0.1 PID 0.1 ppm				FILL Silty Sandy CLAY: low to medium plasticity, brown, sand is fine to medium grained; trace fine to medium grained, subangular to subrounded gravel.			FILL suspected ACM identified.
			0.2		ES 0.20 m ACM fragment sample							
			0.4									
				0.55	ES 0.50 m GPS_HA04_0.5 PID 0.0 ppm				Silty CLAY: medium plasticity, grey mottled red, trace fine grained sand.			ALLUVIAL SOIL
			0.6	0.68					Hole Terminated at 0.68 m			
			0.8									
			1.0									
			1.2									
			1.4									

Comments

Checked

Date

HAND AUGER: HA05

Sheet 1 of 1

Project: Greenway Park Primary School Upgrade

Location: Greenway Park Primary School, Wyattville Dr, Carnes Hill NSW 2171

Client: School Infrastructure NSW

Job No.: PS206292

Contractor: Stratacore Drill Rig:

Inclination: -90°

Date Started: 15/01/2025

Date Completed: 15/01/2025

Logged: GBP

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA			0.0						TOPSOIL Clayey SAND: fine to coarse grained, brown, clay is low to medium plasticity.		TOPSOIL
					ES 0.10 m GPS_HA05_0.1 PID 0.1 ppm						
			0.2	0.20					FILL Silty Sandy CLAY: low to medium plasticity, brown, sand is fine to medium grained; trace fine to medium grained, subangular to subrounded gravel.		FILL
			0.4								
					ES 0.50 m GPS_HA05_0.5 PID 0.0 ppm						
			0.6	0.60					Silty CLAY: medium plasticity, grey mottled red, trace fine grained sand..		ALLUVIAL SOIL trace organics observed.
			0.8								
					ES 0.90 m GPS_HA05_0.9 GPS_HA05_0.9						0.90: GPS_HA05_0.9
				0.95					Hole Terminated at 0.95 m		
			1.0								
			1.2								
			1.4								

Comments

Checked

Date

HAND AUGER: HA06

Sheet 1 of 1

Project: Greenway Park Primary School Upgrade

Location: Greenway Park Primary School, Wyattville Dr, Carnes Hill NSW 2171

Client: School Infrastructure NSW

Contractor: Stratacore Drill Rig:

Job No.: PS206292

Inclination: -90°

Date Started: 15/01/2025

Date Completed: 15/01/2025

Logged: GBP

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA			0.0						TOPSOIL Clayey SAND: fine to coarse grained, brown, clay is low to medium plasticity; trace rootlets, plastic sheeting/ rootlets, charcoal fragments.	w<PL		TOPSOIL
					ES 0.10 m GPS_HA06_0.1 PID 0.10 m 0.0 ppm							
			0.2	0.20					FILL Silty Sandy CLAY: low to medium plasticity, brown, sand is fine to medium grained; trace fine to medium grained, subangular to subrounded gravel.			FILL
			0.4							w<PL		
			0.6	0.60					Silty CLAY: medium plasticity, grey mottled red, trace fine grained sand; trace rootlets.	w<PL	St to VSt	ALLUVIAL SOIL
				0.75	ES 0.75 m GPS_HA06_0.75 PID 0.75 m 0.0 ppm							
			0.8									
			1.0									
					ES 1.10 m GPS_HA06_1.1 PID 0.0 ppm							
			1.2						Hole Terminated at 1.20 m			
			1.4									

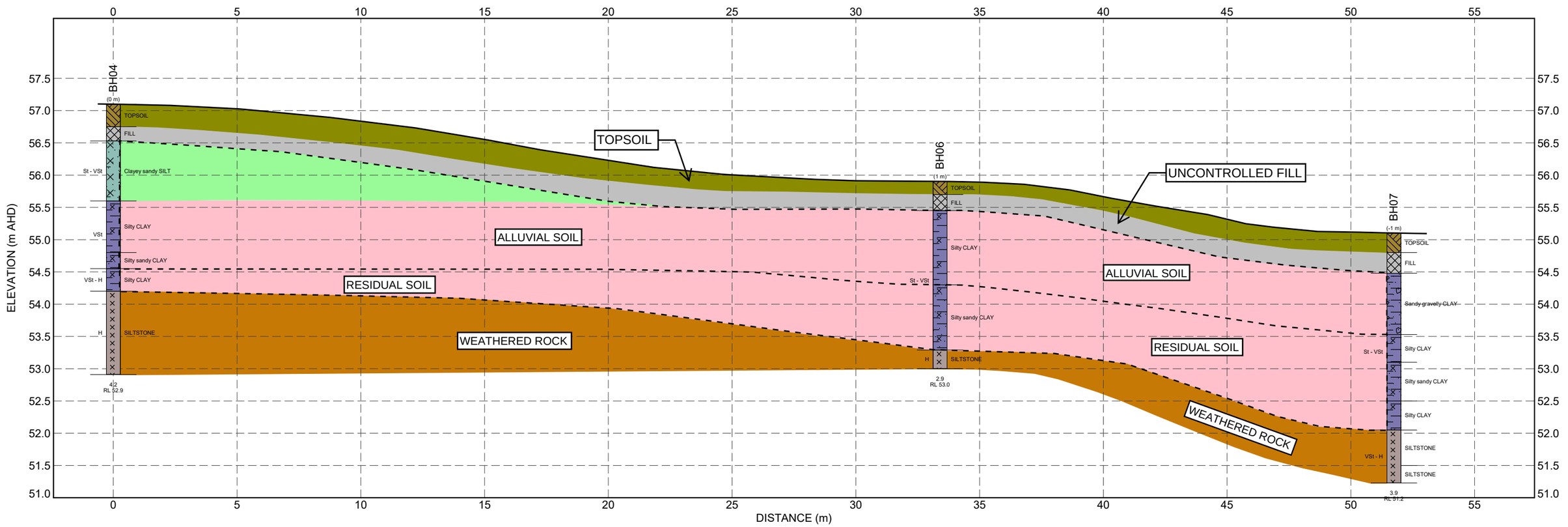
Comments

Checked

Date

Appendix C

Geological cross sections



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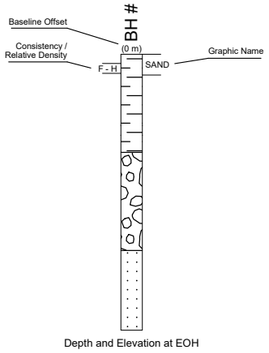


Depth and Elevation at EOH

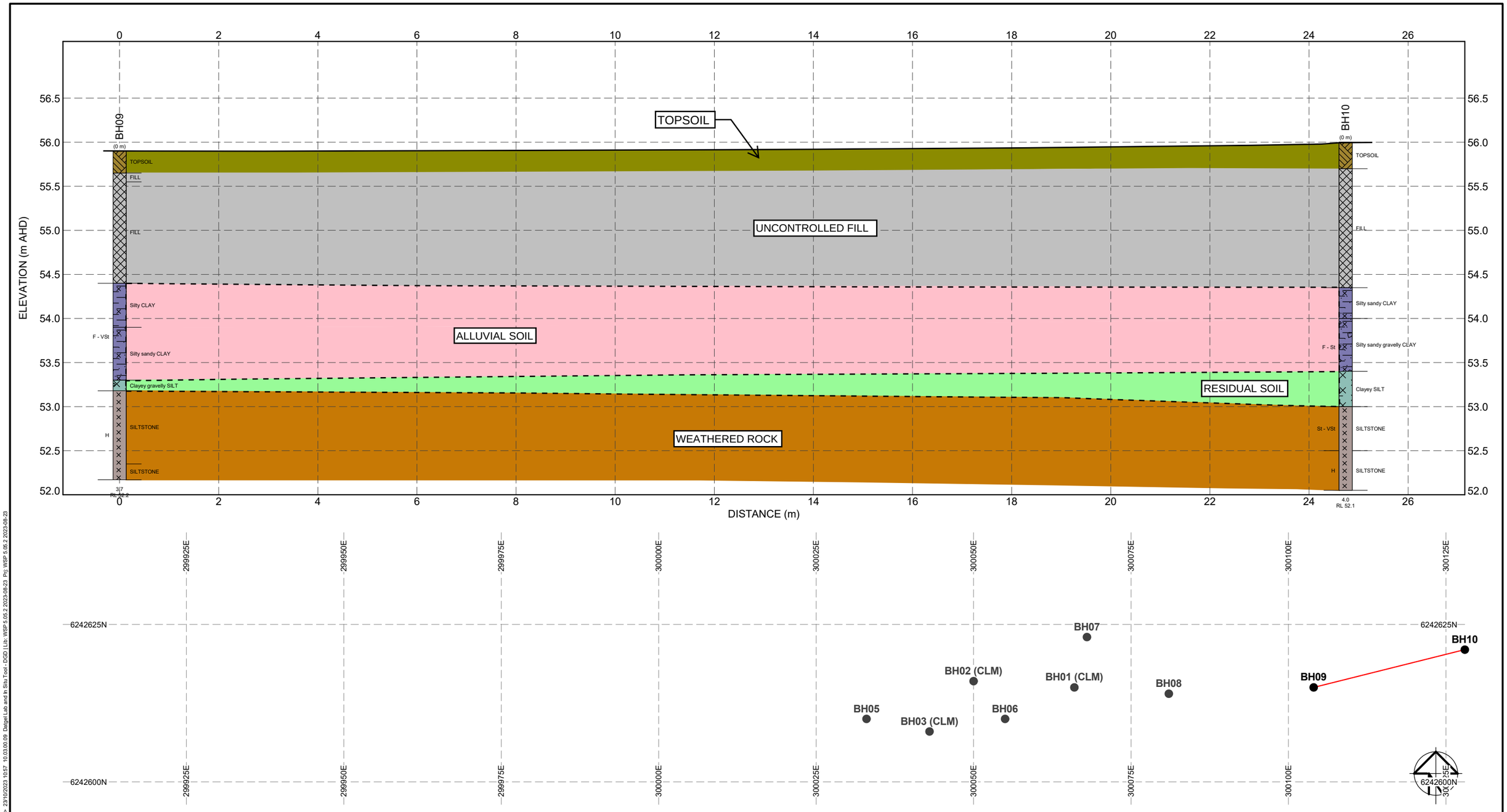
MATERIAL GRAPHIC

- TOPSOIL
- FILL
- Silty CLAY
- Silty sandy CLAY
- Sandy gravelly CLAY
- Clayey sandy SILT
- SILTSTONE

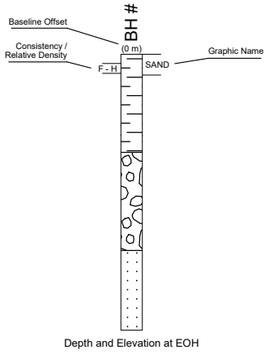
MAP KEY
● Solid Stem Auger

H 1:161
0 1 2 3 4 5m
V 1:62
0 0.5 1 1.5 2 2.5m
Coord.System: MGA2020-56 Height Datum: AHD

TITLE	SINSW Greenway Park Public School SINSW UPS T23-24 Geological Section A-A
DRAWN: CTJ	DATE: 23/10/2023
CHECKED: JD	DATE: 23/10/2023
SCALE: H 1:161 V 1:62	A3
PROJECT No: PS206292	FIGURE No: 01



POST LEGEND



MATERIAL GRAPHIC

- TOPSOIL
- FILL
- Silty CLAY
- Silty sandy CLAY
- Silty sandy gravelly CLAY
- Clayey SILT
- Clayey gravelly SILT
- SILTSTONE

MAP KEY
● Solid Stem Auger

H 1:76
0 0.5 1 1.5 2 2.5m
V 1:43
0 0.5 1 1.5 2 2.5m
Coord.System: MGA2020-56 Height Datum: AHD

TITLE: SINSW Greenway Park Public School SINSW UPS T23-24 Geological Section B-B	DRAWN: CTJ	DATE: 23/10/2023	
	CHECKED: JD	DATE: 23/10/2023	
	SCALE: H 1:76 V 1:43		A3
	PROJECT No: PS206292	FIGURE No: 02	

NORTH

SOUTH

ELEVATION (m AHD)

DISTANCE (m)

GPS-BH01

(0 m)

Topsoil

Fill

Alluvial Soil

VSt

Residual Soil

VSt

GPS-BH04

(-4 m)

Topsoil

Fill

St

Alluvial Soil

VSt

Residual Soil

BH10

(0 m)

Topsoil

Fill

Alluvial Soil

F - St

Residual Soil

St - VSt

Weathered Rock

H

Rock

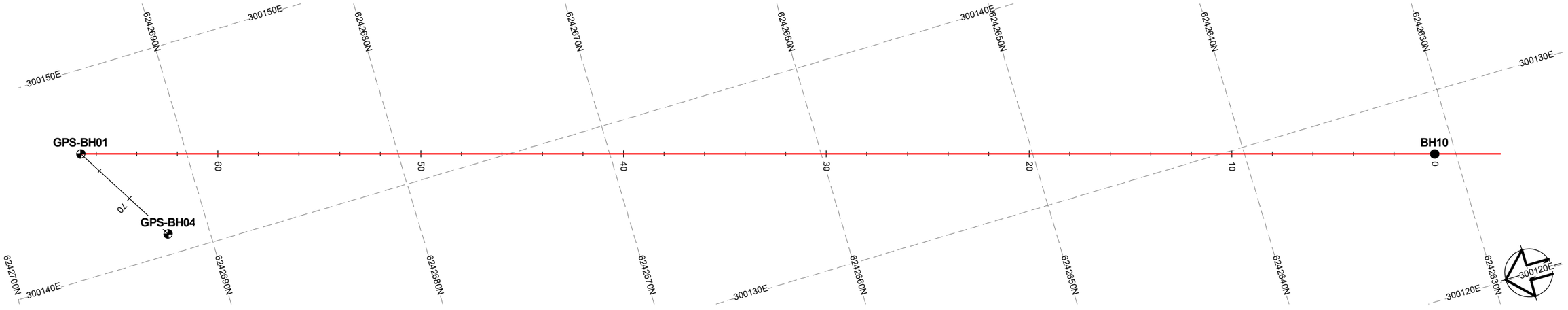
TOPSOIL

UNCONTROLLED FILL

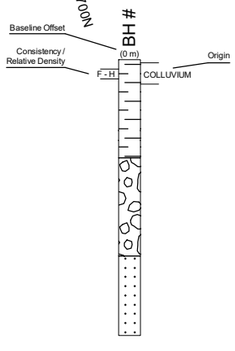
ALLUVIAL SOIL

RESIDUAL SOIL

WEATHERED ROCK



POST LEGEND



MATERIAL GRAPHIC

- TOPSOIL
- FILL
- Silty CLAY
- Silty sandy CLAY
- Silty sandy gravelly CLAY
- Silty gravelly CLAY
- Clayey SILT
- SILTSTONE

MAP KEY
- Borehole
- Solid Stem Auger

H 1:205
0 2 4 6 8 10m

V 1:95
0 1 2 3 4 5m

Coord.System: MGA2020-56 Height Datum: AHD

TITLE	SINSW Greenway Park Public School SINSW UPS T23-24 Inferred Subsurface Section
DRAWN	DATE 5/2/2025
CHECKED	DATE 5/2/2025
SCALE H 1:205 V 1:95	A3
PROJECT No PS206292	FIGURE No

Appendix D

Laboratory test certificates

SOIL CLASSIFICATION REPORT

Client	WSP Australia Pty Ltd	**Source**	BH04 1.50-1.95m
Address	Level 27, 680 George St, Sydney NSW 2000	**Sample Description**	Silty CLAY
Project	Greenway Park Public School (PS206292)	**Report No.**	S89756-PI
Job No.	S23427-1	**Lab No.**	S89756

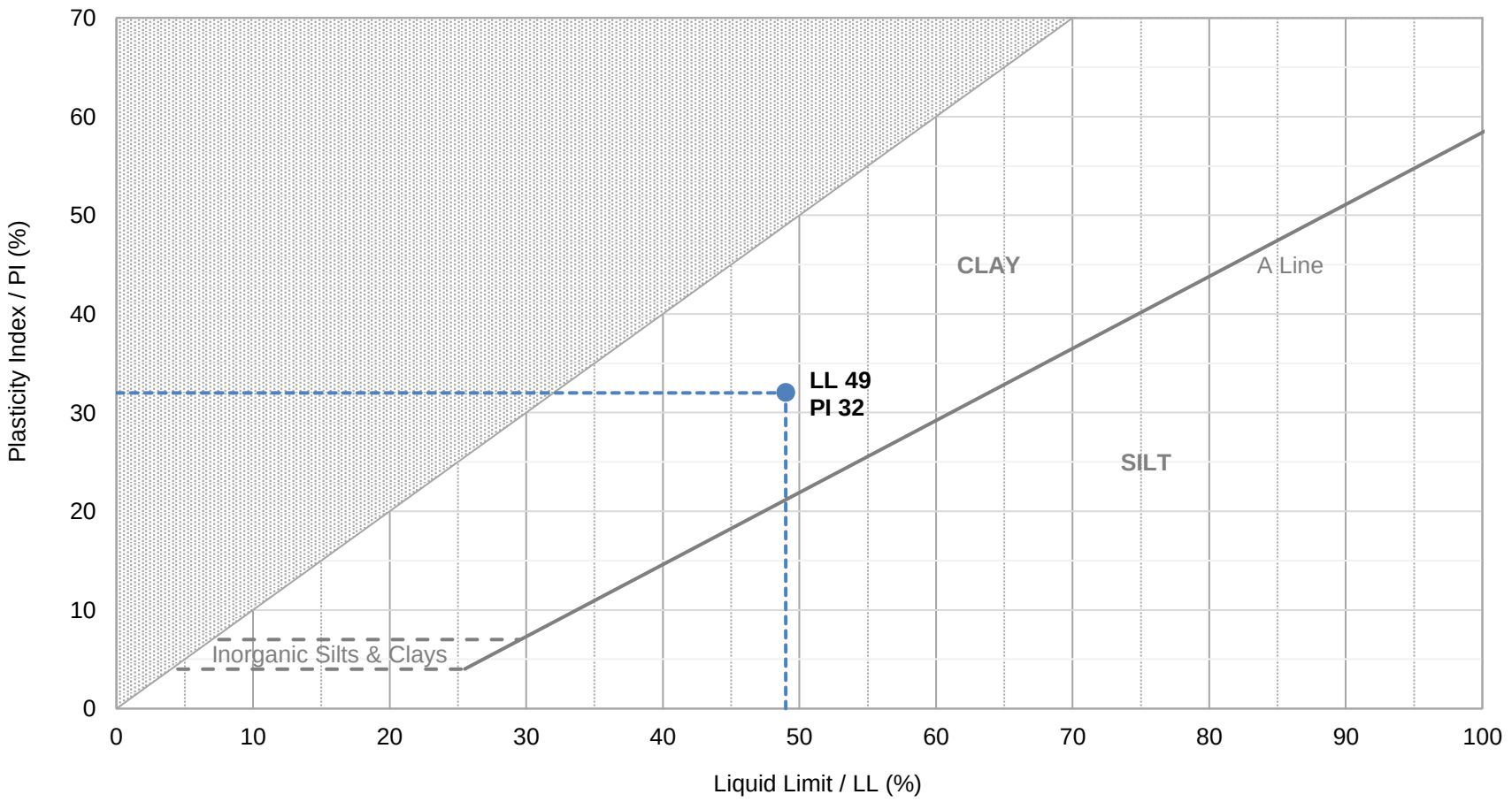
Test Procedure

☑	AS1289 3.1.1	Liquid Limit - Four point Casagrande method
☐	AS1289 3.1.2	Liquid Limit - One point Casagrande method
☑	AS1289 3.2.1	Plastic Limit - Standard method
☑	AS1289 3.3.1	Calculation of the Plasticity Index
☑	AS1289 3.4.1	Linear Shrinkage - Standard method

Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	26/09/2023
Preparation	Prepared in accordance with the test method	**Date Tested**	12/10/2023

Plasticity Chart for Classification of Fine-Grained Soils

AS 1726:2017 Clause 6.1.6 (Figure 5)



Preparation		**Results**	
Method of Preparation	**Dry Sieved**	Liquid Limit / LL (%)	**49**
History of the Sample	**Oven Dried**	Plastic Limit (%)	**17**
		Plasticity Index / PI (%)	**32**
		Linear Shrinkage (%)	**11.0**
		Condition upon Drying	**Linear**

Notes

Accredited for compliance with ISO/IEC 17025 - Testing.

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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

13/10/2023

Date:

Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

SOIL CLASSIFICATION REPORT

Client	WSP Australia Pty Ltd	**Source**	BH04 2.50-2.95m
Address	Level 27, 680 George St, Sydney NSW 2000	**Sample Description**	Silty CLAY
Project	Greenway Park Public School (PS206292)	**Report No.**	S89757-PI
Job No.	S23427-1	**Lab No.**	S89757

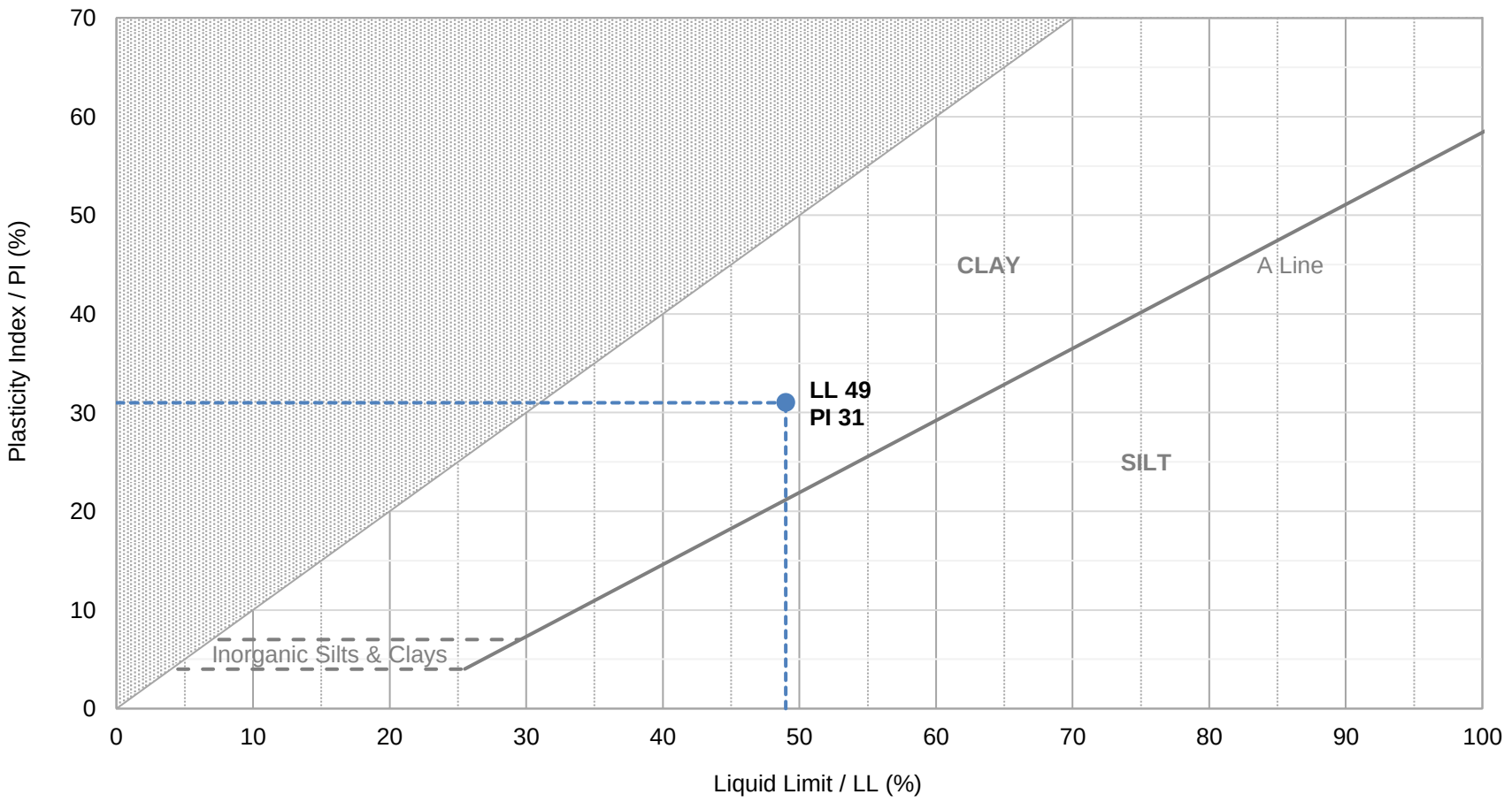
Test Procedure

☑	AS1289 3.1.1	Liquid Limit - Four point Casagrande method
☐	AS1289 3.1.2	Liquid Limit - One point Casagrande method
☑	AS1289 3.2.1	Plastic Limit - Standard method
☑	AS1289 3.3.1	Calculation of the Plasticity Index
☑	AS1289 3.4.1	Linear Shrinkage - Standard method

Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	26/09/2023
Preparation	Prepared in accordance with the test method	**Date Tested**	12/10/2023

Plasticity Chart for Classification of Fine-Grained Soils

AS 1726:2017 Clause 6.1.6 (Figure 5)



Preparation		**Results**	
Method of Preparation	**Dry Sieved**	Liquid Limit / LL (%)	**49**
History of the Sample	**Oven Dried**	Plastic Limit (%)	**18**
		Plasticity Index / PI (%)	**31**
		Linear Shrinkage (%)	**14.5**
		Condition upon Drying	**Linear**

Notes

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Authorised Signatory:

Chris Lloyd

13/10/2023

Date:

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14 Carter St
Lidcombe NSW 2141

SOIL CLASSIFICATION REPORT

Client	WSP Australia Pty Ltd	**Source**	BH05 2.10-2.50m
Address	Level 27, 680 George St, Sydney NSW 2000	**Sample Description**	Silty CLAY
Project	Greenway Park Public School (PS206292)	**Report No.**	S89758-PI
Job No.	S23427-1	**Lab No.**	S89758

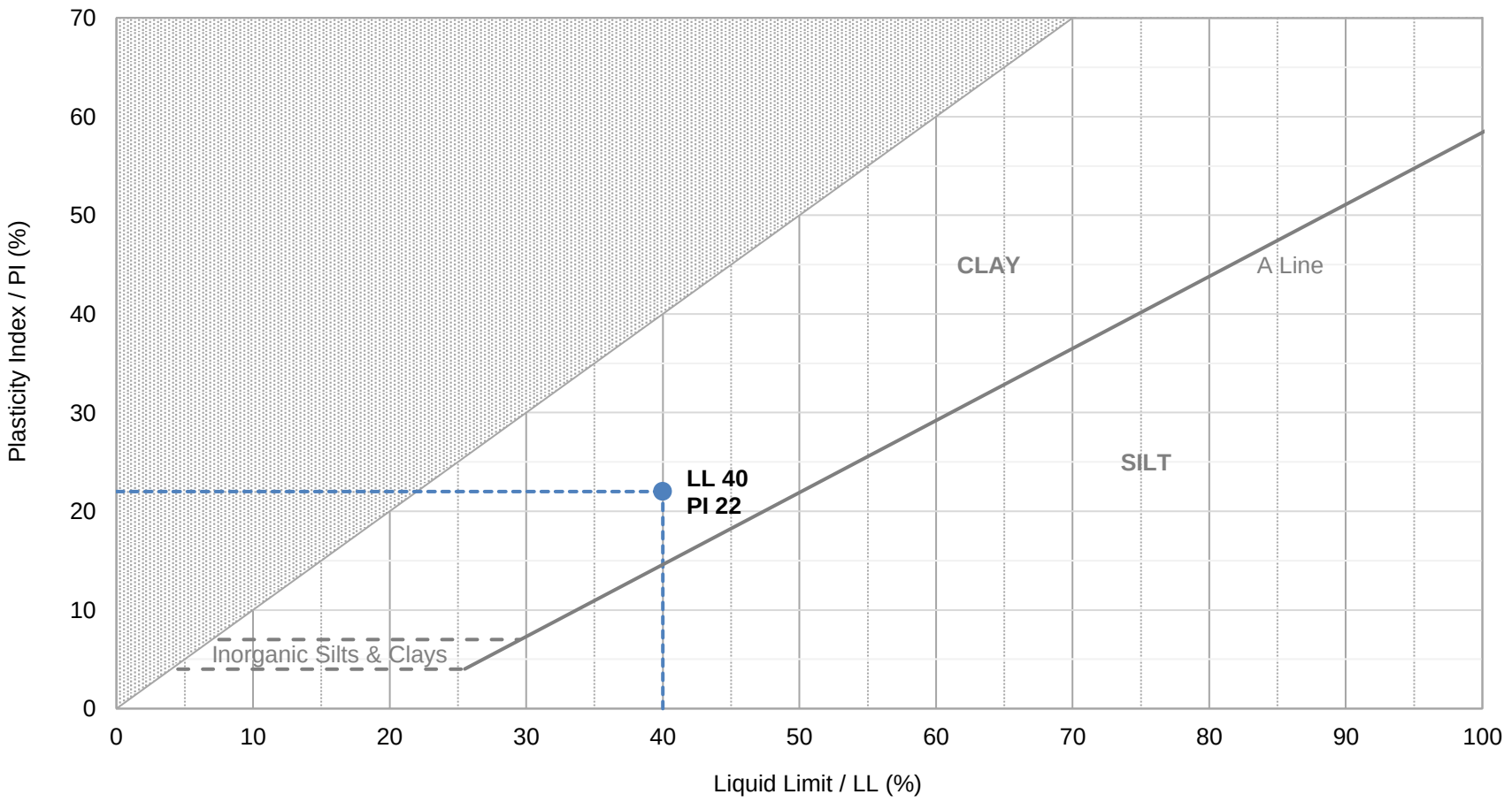
Test Procedure

☑	AS1289 3.1.1	Liquid Limit - Four point Casagrande method
☐	AS1289 3.1.2	Liquid Limit - One point Casagrande method
☑	AS1289 3.2.1	Plastic Limit - Standard method
☑	AS1289 3.3.1	Calculation of the Plasticity Index
☑	AS1289 3.4.1	Linear Shrinkage - Standard method

Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	26/09/2023
Preparation	Prepared in accordance with the test method	**Date Tested**	12/10/2023

Plasticity Chart for Classification of Fine-Grained Soils

AS 1726:2017 Clause 6.1.6 (Figure 5)



Preparation		**Results**	
Method of Preparation	**Dry Sieved**	Liquid Limit / LL (%)	**40**
History of the Sample	**Oven Dried**	Plastic Limit (%)	**18**
		Plasticity Index / PI (%)	**22**
		Linear Shrinkage (%)	**8.0**
		Condition upon Drying	**Linear**

Notes

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14 Carter St
Lidcombe NSW 2141

SOIL CLASSIFICATION REPORT

Client	WSP Australia Pty Ltd	**Source**	BH06 2.00-2.50m
Address	Level 27, 680 George St, Sydney NSW 2000	**Sample Description**	Silty Sandy CLAY
Project	Greenway Park Public School (PS206292)	**Report No.**	S89760-PI
Job No.	S23427-1	**Lab No.**	S89760

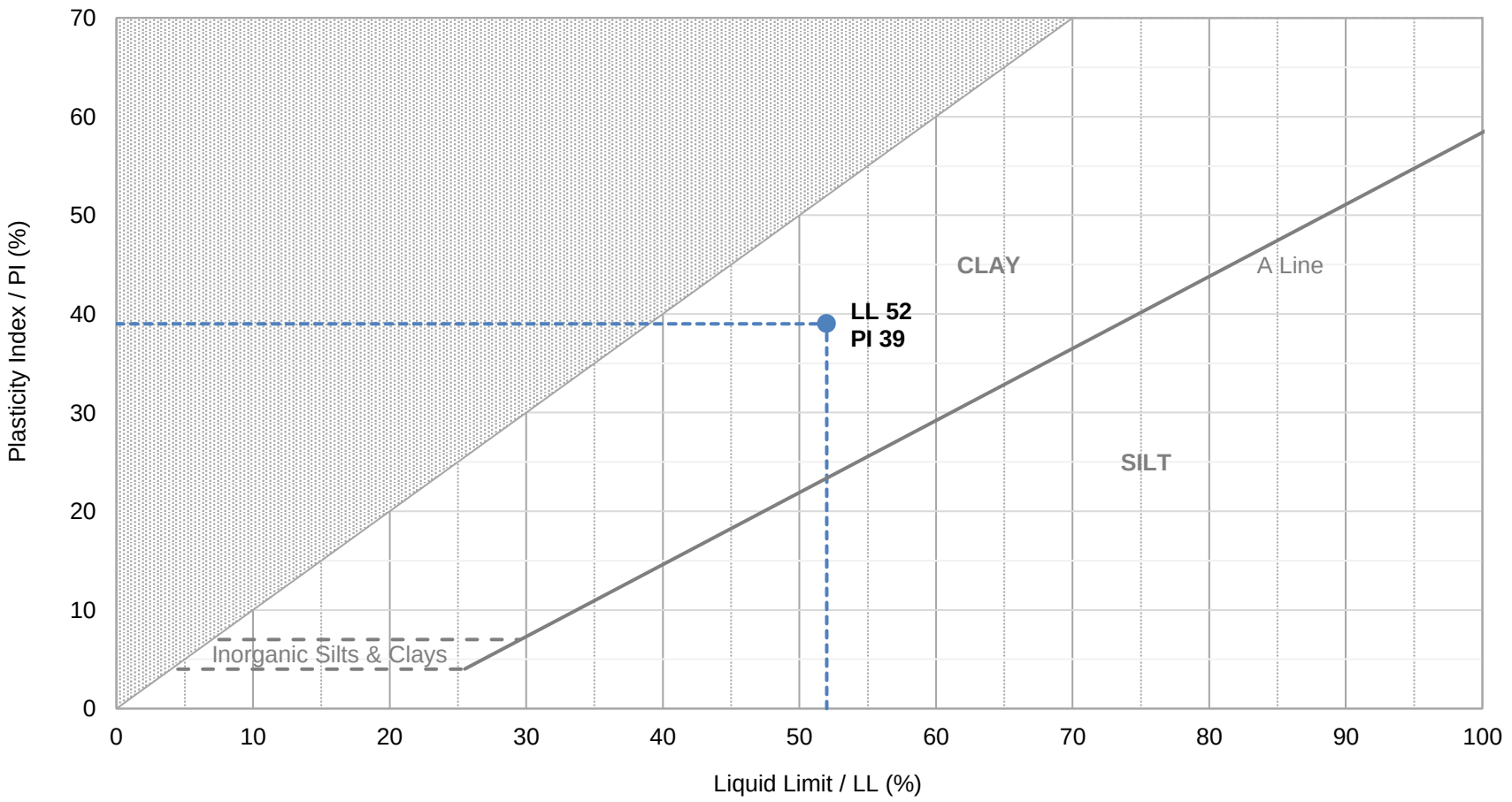
Test Procedure

☑	AS1289 3.1.1	Liquid Limit - Four point Casagrande method
☐	AS1289 3.1.2	Liquid Limit - One point Casagrande method
☑	AS1289 3.2.1	Plastic Limit - Standard method
☑	AS1289 3.3.1	Calculation of the Plasticity Index
☑	AS1289 3.4.1	Linear Shrinkage - Standard method

Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	26/09/2023
Preparation	Prepared in accordance with the test method	**Date Tested**	12/10/2023

Plasticity Chart for Classification of Fine-Grained Soils

AS 1726:2017 Clause 6.1.6 (Figure 5)



Preparation		**Results**	
Method of Preparation	**Dry Sieved**	Liquid Limit / LL (%)	**52**
History of the Sample	**Oven Dried**	Plastic Limit (%)	**13**
		Plasticity Index / PI (%)	**39**
		Linear Shrinkage (%)	**9.0**
		Condition upon Drying	**Linear**

Notes

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Authorised Signatory:

Chris Lloyd

13/10/2023

Date:

Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

SOIL CLASSIFICATION REPORT

Client	WSP Australia Pty Ltd	**Source**	BH07 1.50-1.95m
Address	Level 27, 680 George St, Sydney NSW 2000	**Sample Description**	Silty CLAY
Project	Greenway Park Public School (PS206292)	**Report No.**	S89761-PI
Job No.	S23427-1	**Lab No.**	S89761

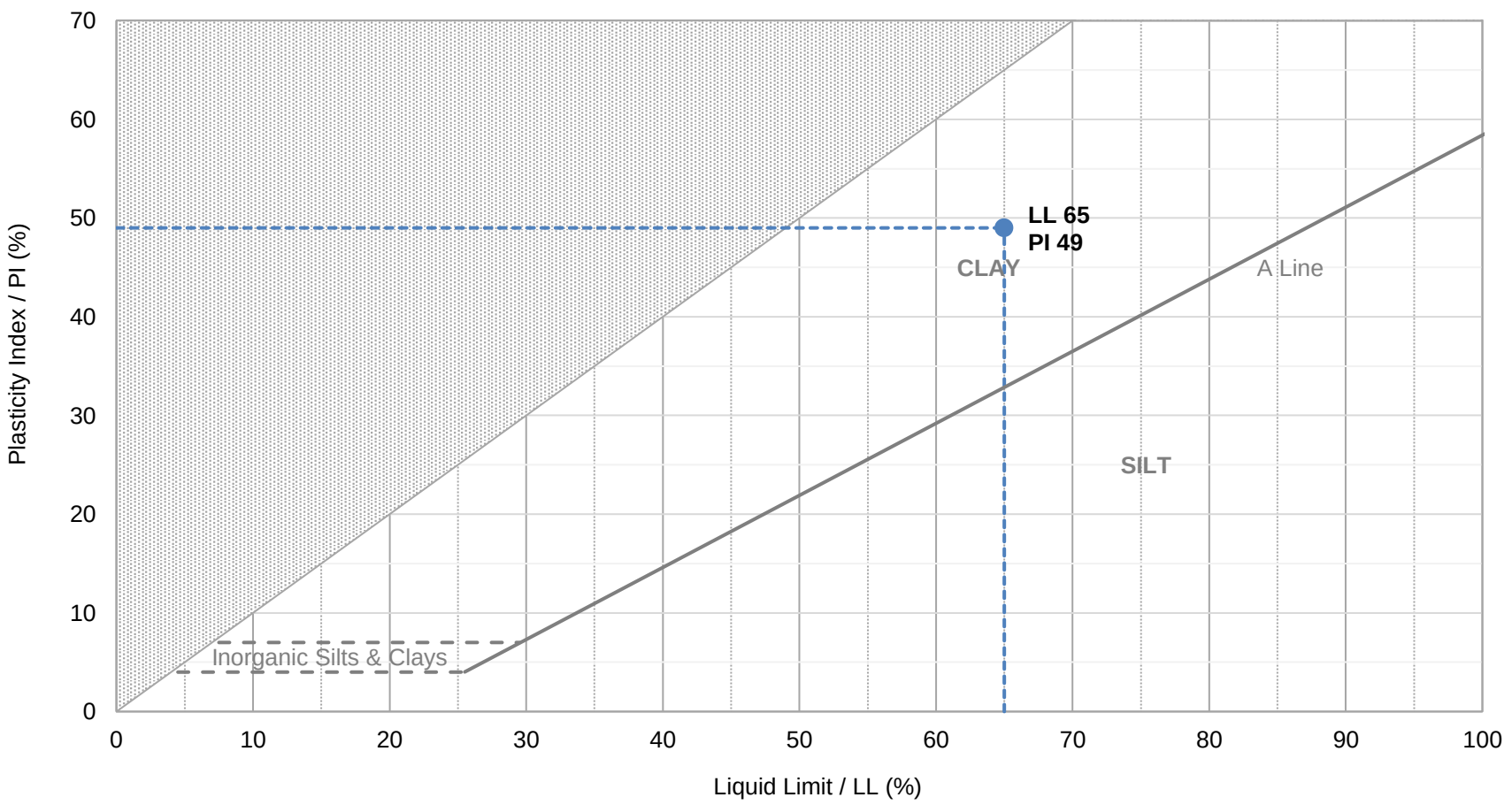
Test Procedure

☑	AS1289 3.1.1	Liquid Limit - Four point Casagrande method
☐	AS1289 3.1.2	Liquid Limit - One point Casagrande method
☑	AS1289 3.2.1	Plastic Limit - Standard method
☑	AS1289 3.3.1	Calculation of the Plasticity Index
☑	AS1289 3.4.1	Linear Shrinkage - Standard method

Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	26/09/2023
Preparation	Prepared in accordance with the test method	**Date Tested**	12/10/2023

Plasticity Chart for Classification of Fine-Grained Soils

AS 1726:2017 Clause 6.1.6 (Figure 5)



Preparation	
Method of Preparation	**Dry Sieved**
History of the Sample	**Oven Dried**

Results	
Liquid Limit / LL (%)	**65**
Plastic Limit (%)	**16**
Plasticity Index / PI (%)	**49**
Linear Shrinkage (%)	**12.5**
Condition upon Drying	**Curling Occured**

Notes

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Authorised Signatory:

Chris Lloyd

13/10/2023

Date:

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14 Carter St
Lidcombe NSW 2141

SOIL CLASSIFICATION REPORT

Client	WSP Australia Pty Ltd	**Source**	BH08 2.50-2.95m
Address	Level 27, 680 George St, Sydney NSW 2000	**Sample Description**	Silty CLAY
Project	Greenway Park Public School (PS206292)	**Report No.**	S89764-PI
Job No.	S23427-1	**Lab No.**	S89764

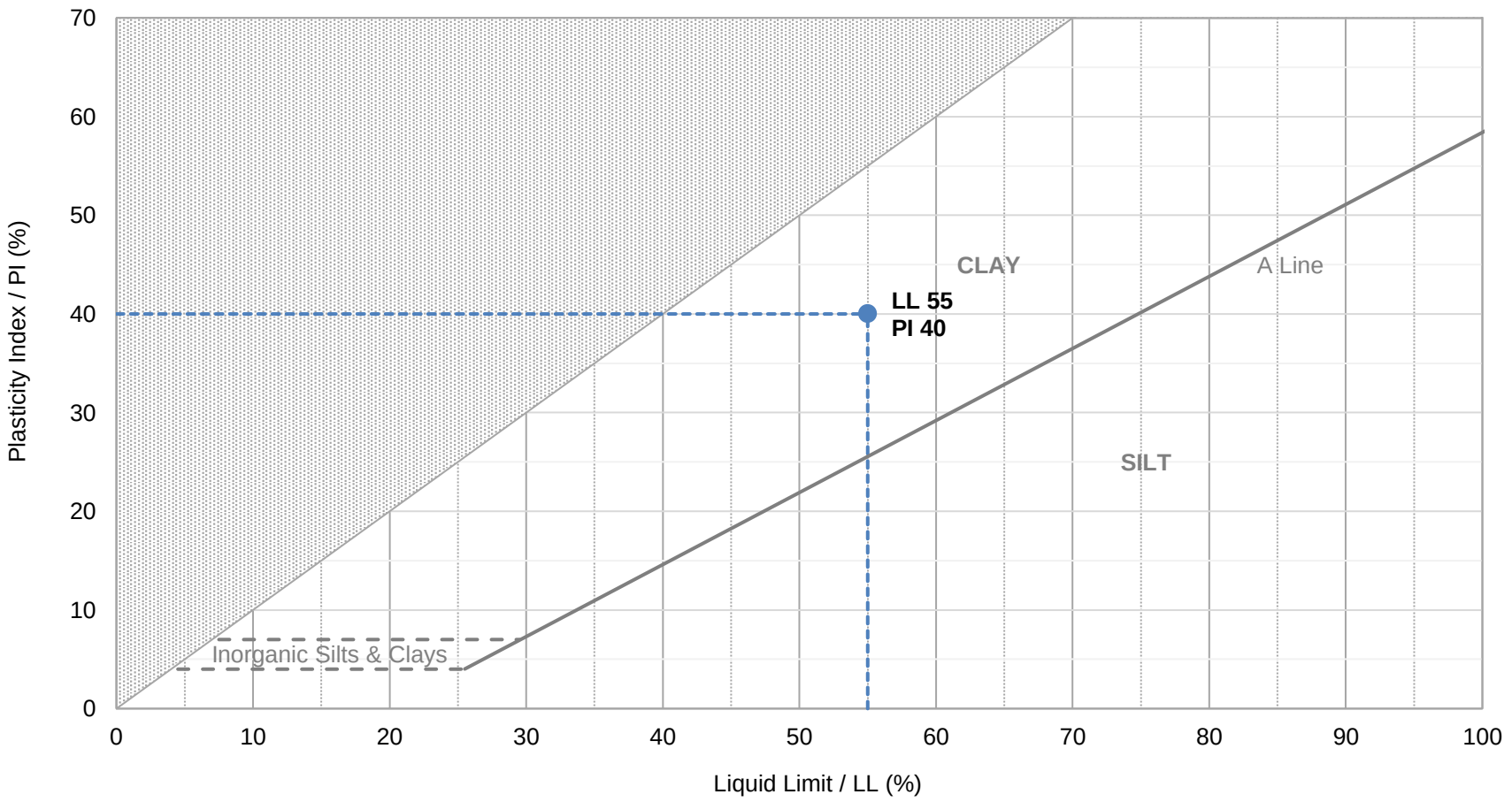
Test Procedure

☑	AS1289 3.1.1	Liquid Limit - Four point Casagrande method
☐	AS1289 3.1.2	Liquid Limit - One point Casagrande method
☑	AS1289 3.2.1	Plastic Limit - Standard method
☑	AS1289 3.3.1	Calculation of the Plasticity Index
☑	AS1289 3.4.1	Linear Shrinkage - Standard method

Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	26/09/2023
Preparation	Prepared in accordance with the test method	**Date Tested**	12/10/2023

Plasticity Chart for Classification of Fine-Grained Soils

AS 1726:2017 Clause 6.1.6 (Figure 5)



Preparation	
Method of Preparation	**Dry Sieved**
History of the Sample	**Oven Dried**

Results	
Liquid Limit / LL (%)	**55**
Plastic Limit (%)	**15**
Plasticity Index / PI (%)	**40**
Linear Shrinkage (%)	**12.0**
Condition upon Drying	**Linear**

Notes

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Authorised Signatory:

Chris Lloyd

13/10/2023

Date:

Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

SOIL CLASSIFICATION REPORT

Client	WSP Australia Pty Ltd	**Source**	BH09 1.50-1.95m
Address	Level 27, 680 George St, Sydney NSW 2000	**Sample Description**	Silty CLAY
Project	Greenway Park Public School (PS206292)	**Report No.**	S89765-PI
Job No.	S23427-1	**Lab No.**	S89765

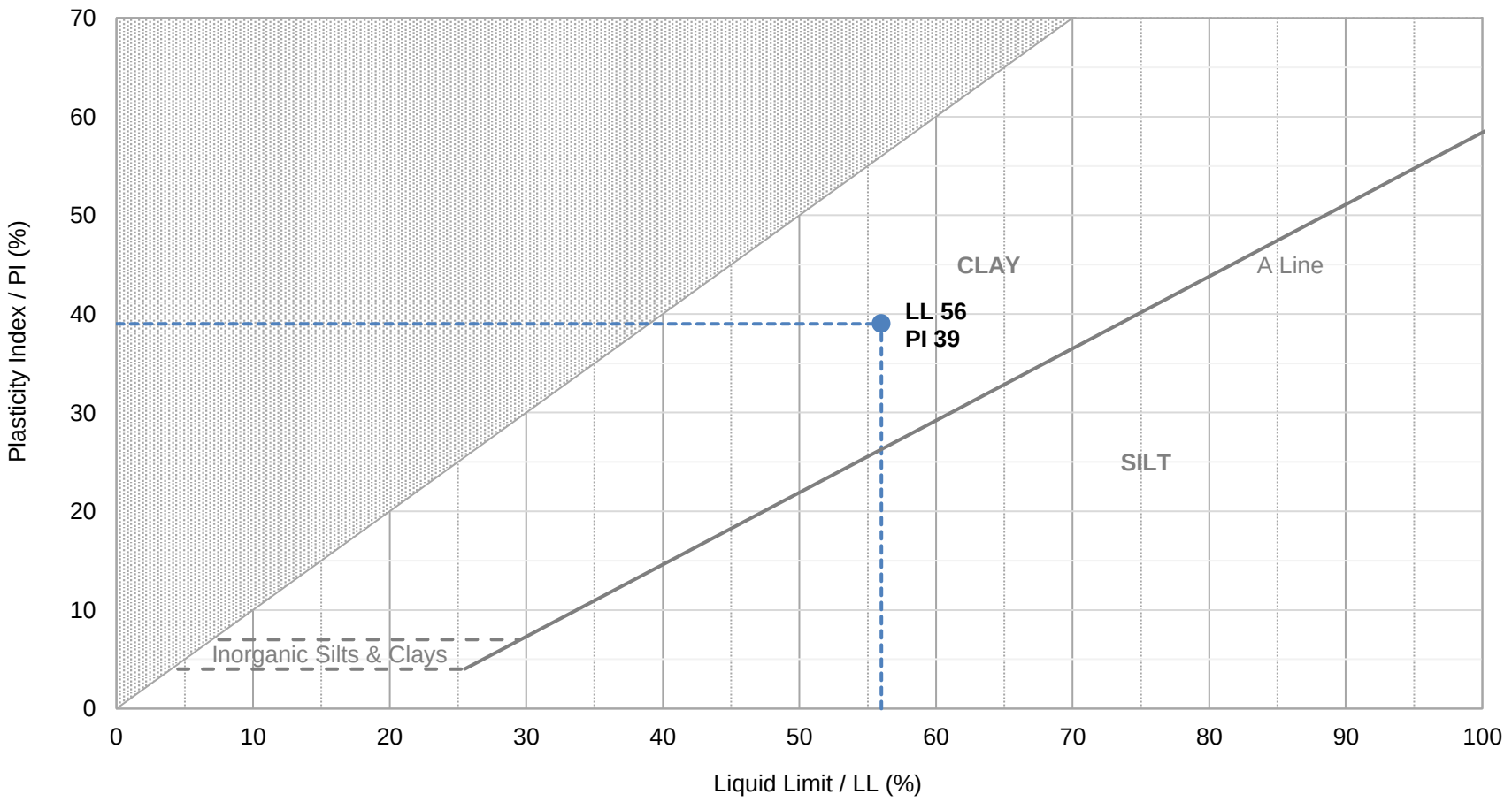
Test Procedure

☑	AS1289 3.1.1	Liquid Limit - Four point Casagrande method
☐	AS1289 3.1.2	Liquid Limit - One point Casagrande method
☑	AS1289 3.2.1	Plastic Limit - Standard method
☑	AS1289 3.3.1	Calculation of the Plasticity Index
☑	AS1289 3.4.1	Linear Shrinkage - Standard method

Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	26/09/2023
Preparation	Prepared in accordance with the test method	**Date Tested**	12/10/2023

Plasticity Chart for Classification of Fine-Grained Soils

AS 1726:2017 Clause 6.1.6 (Figure 5)



Preparation	
Method of Preparation	**Dry Sieved**
History of the Sample	**Oven Dried**

Results	
Liquid Limit / LL (%)	**56**
Plastic Limit (%)	**17**
Plasticity Index / PI (%)	**39**
Linear Shrinkage (%)	**12.5**
Condition upon Drying	**Curling Occured**

Notes

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Authorised Signatory:

Chris Lloyd

13/10/2023

Date:

Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

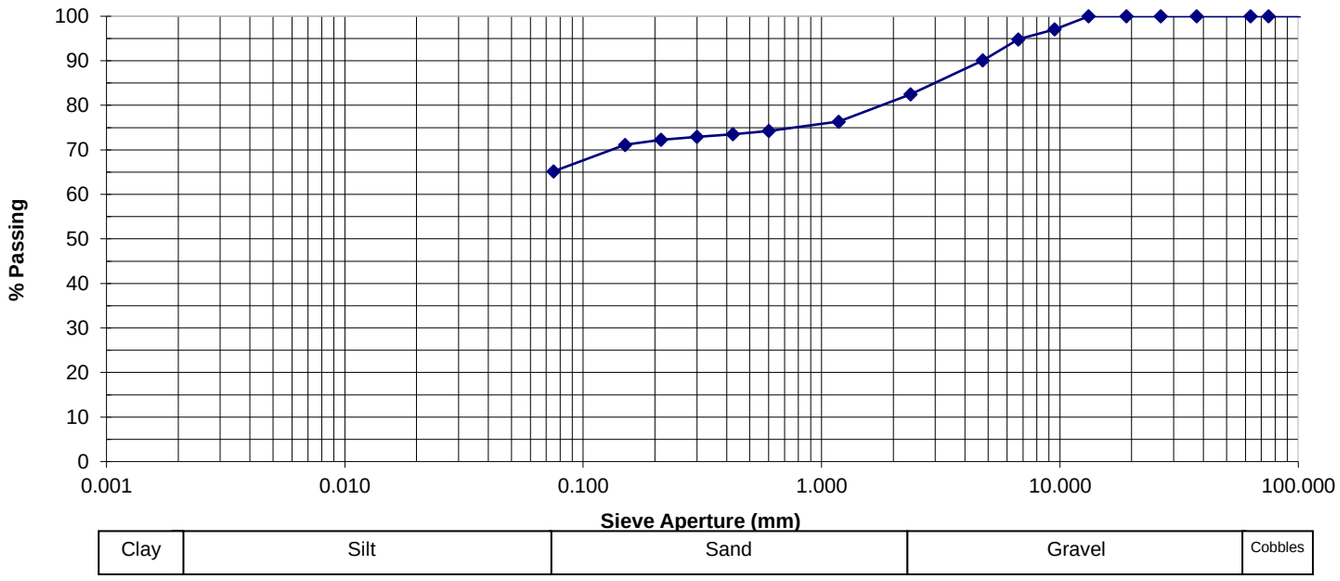
Particle Size Distribution Report

Client	WSP Australia Pty Ltd	**Source**	BH06 0.50-0.95m
Address	Level 27, 680 George St, Sydney NSW 2000	**Sample Description**	Silty CLAY with Sand and Gravel
Project	Greenway Park Public School (PS206292)	**Report No**	S89759-PSD
Job No	S23427-1	**Lab No**	S89759

Test Procedure AS 1289.3.6.1 - Particle size distribution of a soil

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 26/09/2023

Preparation Prepared in accordance with the test method **Date Tested** 11/10/2023



Sieve Aperture: (mm)	% Passing	Specification (..) Envelope	Sieve Aperture: (mm)	% Passing	Specification (..) Envelope
200	100		4.75	90	
75	100		2.36	82	
63	100		1.18	76	
37.5	100		0.600	74	
26.5	100		0.425	74	
19	100		0.300	73	
13.2	100		0.212	72	
9.5	97		0.150	71	
6.7	95		0.075	65	

Notes

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NATA Accredited Laboratory Number: 14874

Authorised Signatory: Date:

12/10/2023

Chris Lloyd

Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

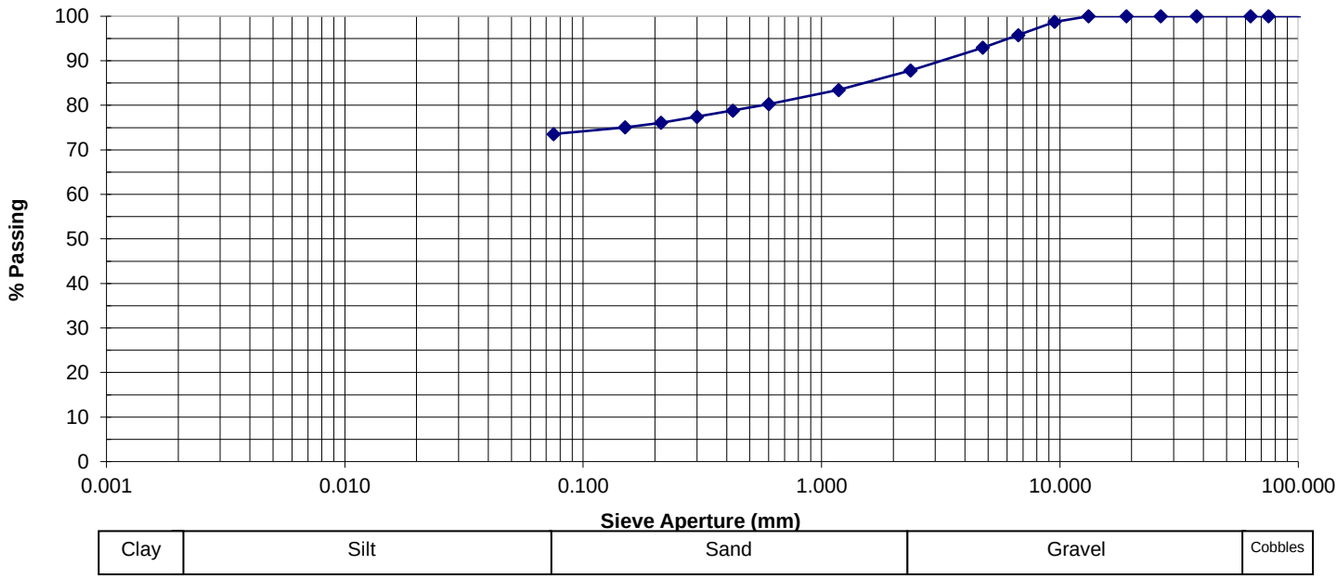
Particle Size Distribution Report

Client	WSP Australia Pty Ltd	**Source**	BH07 2.50-2.95m
Address	Level 27, 680 George St, Sydney NSW 2000	**Sample Description**	Silty CLAY, trace of Sand and Gravel
Project	Greenway Park Public School (PS206292)	**Report No**	S89762-PSD
Job No	S23427-1	**Lab No**	S89762

Test Procedure AS 1289.3.6.1 - Particle size distribution of a soil

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 26/09/2023

Preparation Prepared in accordance with the test method **Date Tested** 10/10/2023



Sieve Aperture: (mm)	% Passing	Specification (..) Envelope	Sieve Aperture: (mm)	% Passing	Specification (..) Envelope
200	100		4.75	93	
75	100		2.36	88	
63	100		1.18	83	
37.5	100		0.600	80	
26.5	100		0.425	79	
19	100		0.300	77	
13.2	100		0.212	76	
9.5	99		0.150	75	
6.7	96		0.075	74	

Notes

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The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
This document shall not be reproduced, except in full.
Results relate only to the samples tested.

NATA Accredited Laboratory Number: 14874

Authorised Signatory: Date:

10/10/2023

Chris Lloyd

Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

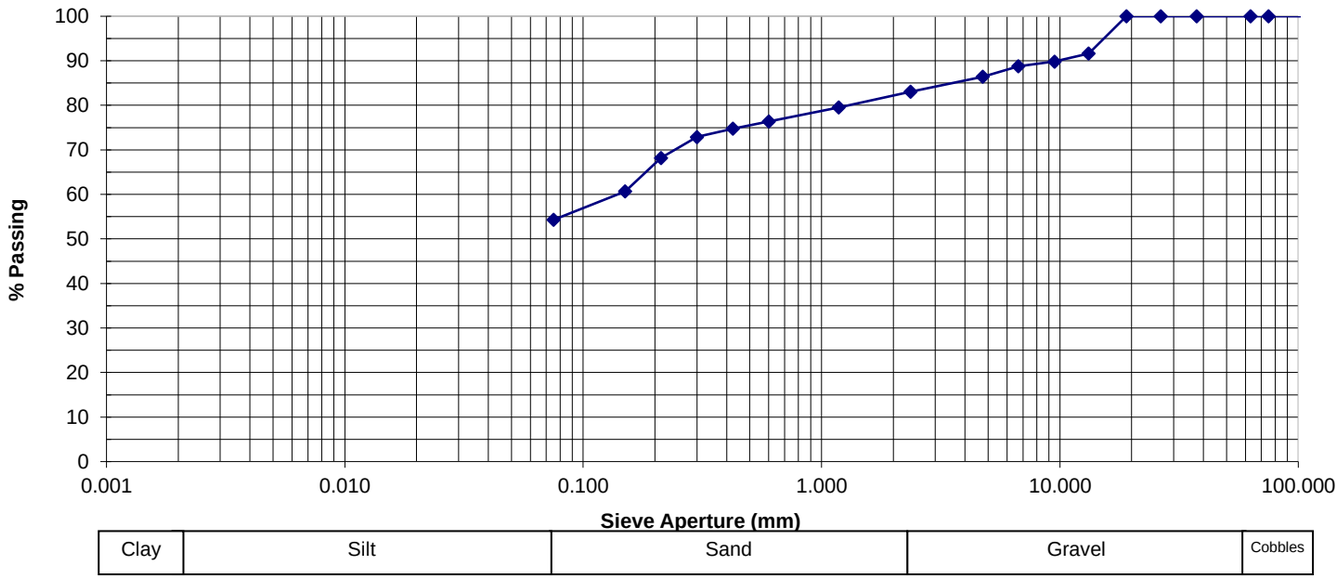
Particle Size Distribution Report

Client	WSP Australia Pty Ltd	**Source**	BH08 1.50-1.95m
Address	Level 27, 680 George St, Sydney NSW 2000	**Sample Description**	Silty CLAY with Sand and Gravel
Project	Greenway Park Public School (PS206292)	**Report No**	S89763-PSD
Job No	S23427-1	**Lab No**	S89763

Test Procedure AS 1289.3.6.1 - Particle size distribution of a soil

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 26/09/2023

Preparation Prepared in accordance with the test method **Date Tested** 12/10/2023



Sieve Aperture: (mm)	% Passing	Specification (..) Envelope	Sieve Aperture: (mm)	% Passing	Specification (..) Envelope
200	100		4.75	86	
75	100		2.36	83	
63	100		1.18	80	
37.5	100		0.600	76	
26.5	100		0.425	75	
19	100		0.300	73	
13.2	92		0.212	68	
9.5	90		0.150	61	
6.7	89		0.075	54	

Notes

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NATA Accredited Laboratory Number: 14874

Authorised Signatory: Date:

12/10/2023

Chris Lloyd

Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

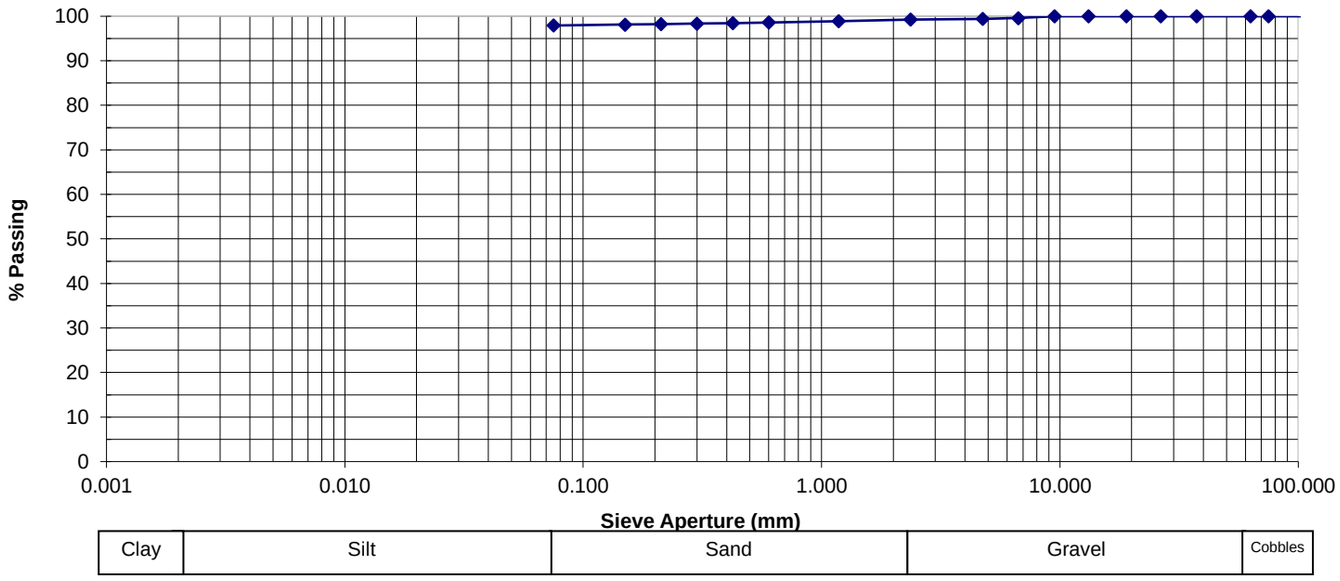
Particle Size Distribution Report

Client	WSP Australia Pty Ltd	**Source**	BH10 2.50-2.95m
Address	Level 27, 680 George St, Sydney NSW 2000	**Sample Description**	Silty CLAY, trace of Sand and Gravel
Project	Greenway Park Public School (PS206292)	**Report No**	S89766-PSD
Job No	S23427-1	**Lab No**	S89766

Test Procedure AS 1289.3.6.1 - Particle size distribution of a soil

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 26/09/2023

Preparation Prepared in accordance with the test method **Date Tested** 12/10/2023



Sieve Aperture: (mm)	% Passing	Specification (..) Envelope	Sieve Aperture: (mm)	% Passing	Specification (..) Envelope
200	100		4.75	99	
75	100		2.36	99	
63	100		1.18	99	
37.5	100		0.600	99	
26.5	100		0.425	98	
19	100		0.300	98	
13.2	100		0.212	98	
9.5	100		0.150	98	
6.7	100		0.075	98	

Notes

NATA

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Results relate only to the samples tested.

NATA Accredited Laboratory Number: 14874

Authorised Signatory: Date:

12/10/2023

Chris Lloyd

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CERTIFICATE OF ANALYSIS 334794

Client Details

Client	Macquarie Geotech
Attention	Jasper Haines
Address	3 Watt Dr, Bathurst, NSW, 2795

Sample Details

Your Reference	**S23427-1 Greenway Park Public School (PS206292)**
Number of Samples	9 Soil
Date samples received	06/10/2023
Date completed instructions received	06/10/2023

Analysis Details

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

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

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

Report Details

Date results requested by	13/10/2023
Date of Issue	13/10/2023

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

Results Approved By
Diego Bigolin, Inorganics Supervisor

Authorised By
Nancy Zhang, Laboratory Manager

Misc Inorg - Soil						
Our Reference		334794-1	334794-2	334794-3	334794-4	334794-5
Your Reference	UNITS	S89756	S89757	S89758	S89759	S89760
Sample ID		BH04	BH04	BH05	BH06	BH06
Depth		1.50-1.95	2.5-2.95	2.1-2.5	0.5-0.95	2.0-2.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date Sampled		26/09/2023	26/09/2023	26/09/2023	26/09/2023	26/09/2023
Date prepared	-	10/10/2023	10/10/2023	10/10/2023	10/10/2023	10/10/2023
Date analysed	-	10/10/2023	10/10/2023	10/10/2023	10/10/2023	10/10/2023
pH 1:5 soil:water	pH Units	5.0	5.1	5.4	5.2	5.1
Electrical Conductivity 1:5 soil:water	µS/cm	540	530	200	150	440
Chloride, Cl 1:5 soil:water	mg/kg	300	480	46	10	440
Sulphate, SO4 1:5 soil:water	mg/kg	370	210	160	180	180

Misc Inorg - Soil					
Our Reference		334794-6	334794-7	334794-8	334794-9
Your Reference	UNITS	S89762	S89763	S89765	S89766
Sample ID		BH07	BH08	BH09	BH10
Depth		2.5-2.95	1.5-1.95	1.5-1.95	2.5-2.95
Type of sample		Soil	Soil	Soil	Soil
Date Sampled		26/09/2023	26/09/2023	26/09/2023	26/09/2023
Date prepared	-	10/10/2023	10/10/2023	10/10/2023	10/10/2023
Date analysed	-	10/10/2023	10/10/2023	10/10/2023	10/10/2023
pH 1:5 soil:water	pH Units	5.2	4.8	4.8	5.0
Electrical Conductivity 1:5 soil:water	µS/cm	950	390	540	570
Chloride, Cl 1:5 soil:water	mg/kg	1,000	350	430	500
Sulphate, SO4 1:5 soil:water	mg/kg	430	150	320	370

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

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			11/10/2023	1	10/10/2023	10/10/2023		11/10/2023	[NT]
Date analysed	-			11/10/2023	1	10/10/2023	10/10/2023		11/10/2023	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	1	5.0	5.0	0	98	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	1	540	560	4	102	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	1	300	310	3	103	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	1	370	380	3	106	[NT]

Result Definitions

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

Quality Control Definitions

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

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

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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

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