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Dalmeny Public School Upgrade

Geotechnical Interpretive Report

March 2025

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Dalmeny Public School Upgrade
Geotechnical Interpretive Report

Department of Education

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Approved by:	Jessica Dalton	27 March 2025	J Dalton

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.

Table of contents

List of tables

List of appendices

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
CFA	Continuous Flight Auger
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	Department of Education
SPT	Standard Penetration Test

SPT N value	The number of blows to drive the split barrel sampler (split-spoon sampler) to final 300 mm out of the 450 mm 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 the Dalmeny Public School Upgrade (the activity) 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 health 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 *Environmental Planning and Assessment Regulations 2021* under Section 170, Section 171 and Section 171A of the EP&A Regulation as outlined in Table 1.1.

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: Dalmeny 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	“Dalmeny Public School Upgrade Study: 23115 - Election Commitment Feasibility Study,” Schools Infrastructure NSW, 2023.

1.3 Proposed Activity Description

The proposed activity for the Dalmeny Public School Upgrade includes the construction and occupation of a two-storey classroom building and associated covered walkways and landscaping.

Demolition

- Demolish part of existing fence on Dalmeny Drive;
- Tree removal; and
- Earthworks.

Construction

- Two-storey classroom building (Block H);
- Covered walkways (excluding between Block G and H);
- Footpath between Block G and Block H;
- Landscaping (surrounding Block H);
- Fence and gate south of Block H;
- OSD tank;
- New Main Switch Board;
- Substation; and
- Fire Hydrant.

The classroom building will consist of the following floor layout:

- **Ground Floor Level**: Comprises eight (8) general learning spaces (GLS) and two (2) learning commons spaces (LCS). Also located on the ground floor level are amenities, services, storage spaces and a lift and two stair cases to provide access to the first-floor level; and
- **First Floor Level**: The first-floor level will also comprise eight (8) GLS and two (2) LCS. Also located on the first-floor level are amenities, a mechanical plant room and other rooms for services.

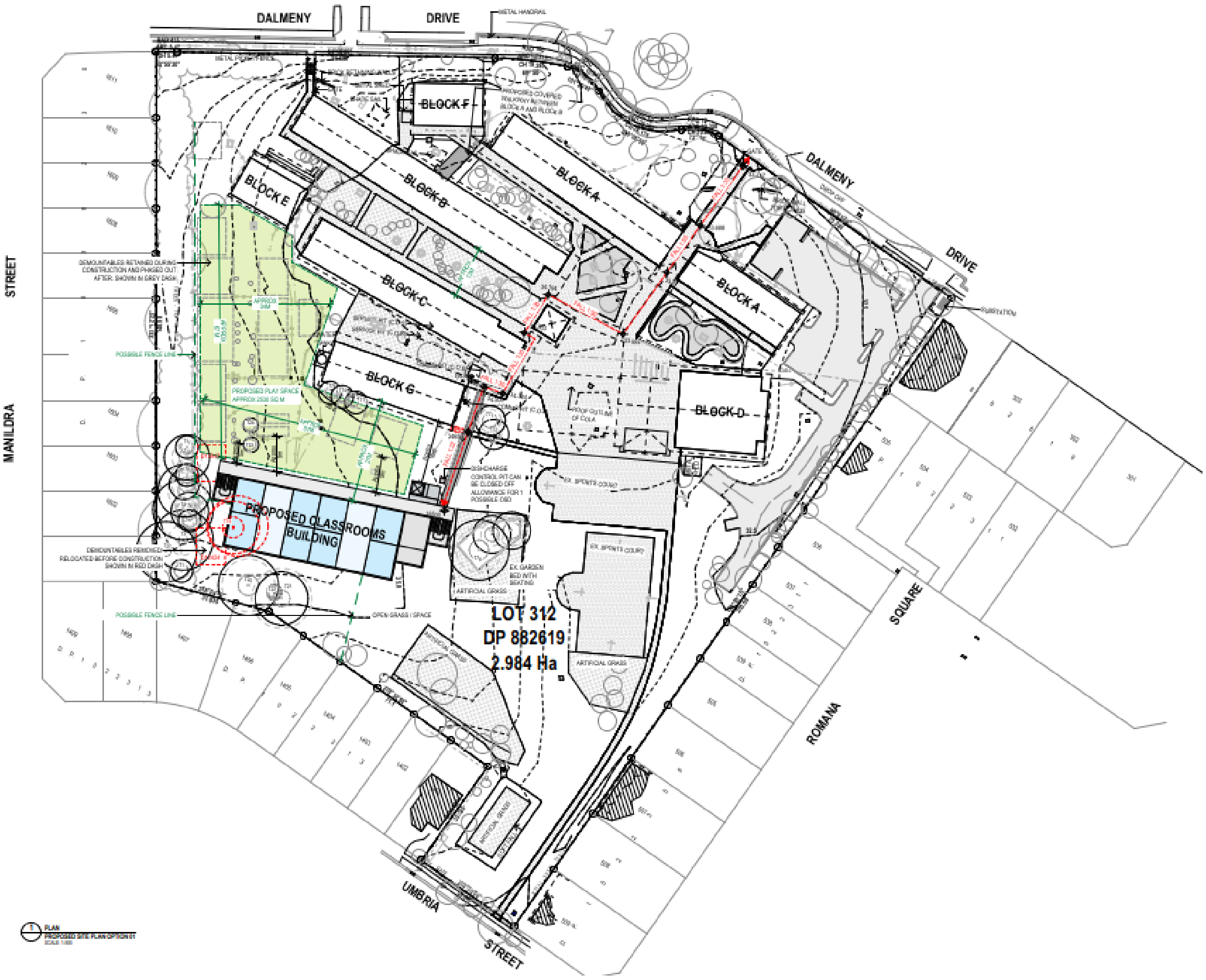

Figure 1 Proposed Site Plan Option 1, 7068DA01, dated 19/09/2024, RevA

Works to be undertaken under separate Planning Pathway (not part of this REF)

Works to be undertaken under a separate planning pathway cannot be undertaken until the Activity is completed and operational.

- Decommission and remove existing single storey portable classrooms;
- Decommission and remove existing portable amenities;
- Associated covered walkways to be demolished;
- Associated site infrastructure works;
- Shade structure over pathway between Block G and H;
- Remainder of landscaping
- Fencing and gate north-west of Block H.

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- Fencing and gate north-west of Block H.

1.5 Activity Site

The project site is located at 129 Dalmeny Drive, Prestons and is legally described as Lot 312 DP 882619.

Dalmeny Public School is located on the southern side of Dalmeny Drive and on the northern side of Umbria Street. The surrounding context of the site is predominantly low density residential.

Figure 2 is an aerial photograph of the site.

Figure 2 Aerial Photography

2 Scope of Works

The geotechnical site investigation was conducted in two stages:

Stage 1 was completed on Monday 25 September 2023 and comprised:

- A total of five (5) 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 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 for contamination assessment.

Stage 2 was completed on Tuesday 14 January 2025 and comprised:

- A total of three (3) boreholes drilled using a hand auger to 1.5mBGL (to avoid clashing with underground service) and then advanced with TC-bit to 6.0mbgl.
- Standard Penetration Tests (SPT) were undertaken at 1.5 m intervals starting from 1.5mBGL in appropriate soil strata, to assess relative strength.
- A total of four (4) boreholes drilled using a hand auger to 2mBGL 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 desktop study, as well as information derived from the intrusive geotechnical investigation and provides geotechnical design parameters and recommendation for structural foundations.

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

3 Geotechnical Investigation

3.1 Sitework overview

A summary of the completed geotechnical investigation locations is presented in Table 2.1. 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 2.1 Summary of geotechnical investigation

Borehole ID	Easting[1]	Northing[1]	Reduced Levels (mAHD)[1]	Termination Depth (mBGL)	Remarks
BH01 (CLM)	303266	6241621	36.4	3.00	Termination criterion reached
BH02 (CLM)	303282	6241636	35.5	3.00	Termination criterion reached
BH03 (CLM)	303298	6241635	34.7	3.00	Termination criterion reached
BH04	303269	6241632	35.7	3.87	Termination criterion reached
BH05	303301	6241642	35.2	3.92	Termination criterion reached
BH06	303306	6241625	35.8	3.94	Termination criterion reached
BH07	303289	6241628	35.4	3.95	Termination criterion reached
BH08	303284	6241620	35.0	3.81	Termination criterion reached
DPS-BH01	303257	6241612	36	6	Termination criterion reached
DPS-BH02	303263	6241605	37	6	Termination criterion reached
DPS-BH03	303258	6241601	38	6	Termination criterion reached
DPS-HA01	Refer CLM Report			1.50	-
DPS-HA012	Refer CLM Report			1.50	-
DPS-HA03	Refer CLM Report			1.50	-
DPS-HA04	Refer CLM Report			1.50	-
DPS-HA05	Refer CLM Report			1.50	-
DPS-HA06	Refer CLM Report			1.50	-

[1] Approximate co-ordinates and RLs obtained from GIS plan (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 (GPP). 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.

For the Stage 2 site investigation, the service locator identified the potential presence of underground sprinkler pipes and abandoned cable lines. To mitigate the risk of clashes with these services, all boreholes were initially hand augered to a depth of 1.5mbgl prior to advancing with the drill rig.

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 is 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 sandy silty clay & sandy gravelly clay, overlying
- Alluvial soil, fine to coarse grained sandy silty clay and gravelly clayey silt, overlying
- Residual soil, typically comprising medium plasticity sandy silty clay, overlying
- Weathered rock (Bringelly Shale) ranging from extremely to 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 Table 3.1. Geological cross sections have been cut across select boreholes and are provided as reference in Appendix C

Table 3.1 Summary of ground conditions and inferred geotechnical ground model

Geotechnical Unit	Generalised Description	Depth to Top of Unit (mBGL)	Typical thickness of unit (m)
1. Topsoil (Encountered in all boreholes)	Sandy Clayey SILT: low liquid limit silt low plasticity clay fine to coarse grained sand	0.00	0.20
2a. Fill (Encountered in BH01–BH03 and BH08 only)	Silty Sandy CLAY: medium plasticity clay fine to coarse grained sand low liquid limit silt	0.20	1.1 - 1.80
2b. Fill (Encountered in BH04-BH07 only)	Gravelly Sandy CLAY[1]: low to medium plasticity clay fine to coarse grained sand fine grained gravel.	0.20	1.80
3. Alluvial Soil (Encountered in all boreholes except for DPS-BH03)	Sandy Silty CLAY: medium to high plasticity clay low liquid limit silt fine to medium grained sand	1.3 - 2.00	0.3 - 0.60
4. Residual Soil (Encountered in BH01, BH03, BH04, BH06 and DPS-BH01 to BH03)	Sandy Clayey SILT: low liquid limit silt medium to high plasticity clay fine grained sand	1.4 - 2.60	0.40 – 2.4

Geotechnical Unit	Generalised Description	Depth to Top of Unit (mBGL)	Typical thickness of unit (m)
5. Weathered Rock (Encountered in BH01, BH04-BH08 and DPS-BH01 – BH03)	SILTSTONE: laminated fine grained sandstone laminations highly weathered and very low strength	3.00 – 3.80	Thickness of unit not proven within borehole locations

[1]Particularly poor fill material was encountered in borehole BH04, with possible voids noted

4.2 Field test results

4.2.1 *Standard Penetration Tests (SPTs)*

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 unit. The SPT N values across site ranged between 2 – 59. A summary is listed below:

- SPTs that occurred within the fill material (Unit 2a had an SPT N-value that ranged from 2 – 21). The particularly low SPT N-values were noted in borehole BH04 only
- SPTs that occurred within the alluvial soil units had an SPT N-value that ranged from 23-28.
- SPTs within the extremely weathered rock unit refused with the 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 3.2.

Table 3.2 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 – 1.70	Fill	4	150 - 160	–[2]	–[2]
	1.85 – 1.90	Alluvial Soil	2	390 - 410	180-205	St - Vst
	2.60 – 2.70	Residual Soil	2	370 - 390	185-195	St - Vst
	2.80 – 3.60	Weathered Rock	2	>600	>300	H
BH05	0.60 – 1.70	Fill	6	270 - 470	–[2]	–[2]
	2.50	Alluvial Soil	1	>600	>300	H
	2.6	Residual Soil	1	>600	>300	H
BH06	0.50 – 1.90	Fill	9	230 - 510	–[2]	–[2]
	2.60	Alluvial Soil	1	580	290	H
	2.70 – 2.80	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]
BH07	0.60 – 1.80	Fill	6	200 - 300	–[2]	–[2]
	2.50 – 2.70	Alluvial Soil	3	>580	>290	H
	2.90	Residual Soil	1	>600	>300	H
BH08	0.50 – 1.90	Fill	8	190 - 390	–[2]	–[2]
	2.60 – 2.70	Alluvial Soil	2	470 - 520	235-260	Vst
	2.80	Residual Soil	1	>600	>300	H
	3.60 – 3.70	Weathered Rock	2	>600	>300	H
DPS-BH01	1.50 – 1.60	Alluvial Soil				
	3.00 – 3.30	Residual Soil				
	4.50 – 4.70	Weathered Rock				
DPS-BH02	1.50 – 1.60	Alluvial Soil	2	200	100	St - Vst
	3.30 – 3.40	Residual Soil	4	250-300	125-150	Vst
	4.50 – 4.70	Weathered Rock	4	>600	>300	H
DPS-BH03	1.60 – 1.90	Residual Soil	3	500	250	H
	3.20 – 3.30	Residual Soil	2	500	250	H
	4.50 – 4.90	Weathered Rock	4	>600	>300	H

[1] Refer to borehole logs within Appendix B to view all test results. Strength Classification is inferred by correlating SPT and PP data.

[2] Strength Classification not assigned to uncontrolled fill material

4.3 Groundwater

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.

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 laboratory tests are listed in Table 3.3. Following test completion, laboratory test results and certificates will be provided in Section 3.4.1 and 3.4.2 and in Appendix C, respectively.

Table 3.3 Geotechnical laboratory testing 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	DS	2.00 – 2.50	25/09/2023
	BH05	SPT	2.50 – 2.95	25/09/2023
	BH08	SPT	2.50 – 2.95	25/09/2023
	DPS-BH01	DS	3.00 – 3.45	14/01/2025
	DPS-BH02	DS	1.50 – 1.95	14/01/2025
	DPS-BH03	DS	1.50 – 1.95	14/01/2025
Particle Size Distribution (AS 1289.3.6.1)	BH06	DS	2.00 – 2.50	25/09/2023
Soil Aggressivity Test (pH, Chloride, Sulphate, Resistivity)	BH04	DS	2.00 – 2.50	25/09/2023
	BH05	SPT	2.50 – 2.95	25/09/2023
	BH06	DS	2.00 – 2.50	25/09/2023
	BH08	SPT	2.50 – 2.95	25/09/2023
	DPS-BH01	DS	3.00 – 3.45	11/02/2025
	DPS-BH02	DS	1.50 – 1.95	11/02/2025
	DPS-BH03	DS	1.50 – 1.95	11/02/2025

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 3.4 and Table 3.5.

Table 3.4 Atterberg Limits Test Results

Borehole ID	**Sample Depth (mBGL)**	**Material**	**USCS[1] Symbol**	**Liquid Limit (%)**	**Plastic Limit (%)**	**Plasticity Index (%)**	**Linear Shrinkage (%)**
BH04	2.00-2.50	Silty CLAY	CH	66	16	50	12.0
BH05	2.50-2.95	Silty CLAY	CL-CI	34	16	18	9.0
BH08	2.50-2.95	Silty CLAY	CI	43	16	27	11.5
DPS-BH01	3.00 – 3.45	Silty CLAY	CH	55	16	39	12.5
DPS-BH02	1.50 – 1.95	Silty CLAY	CH	64	18	46	15.5
DPS-BH03	1.50 – 1.95	Silty CLAY	CH	66	17	49	14.5

[1] USCS = Unified Soil Classification System

Table 3.5 Particle Size Distribution test results

Borehole ID	**Sample Depth (mBGL)**	**Material**	**Gravel (%)**	**Sand (%)**	**Clay (%)**
BH06	2.00-2.50	Silty CLAY	4	12	84

4.4.2 Chemical test results

Following receipt from the lab, soil chemical laboratory test results will be provided in Table 3.6.

Table 3.6 Chemical laboratory test results

Borehole ID	**Sample Depth (mBGL)**	**pH**	**Sulphate (SO_4^{2-}) (mg/kg)**	**Chloride (mg/kg)**	**Electrical Conductivity (µS/cm)**
BH04	2.00-2.50	5.2	360	410	520
BH05	2.50-2.95	6.5	59	220	250
BH06	2.00-2.50	5.2	240	360	430
BH08	2.50-2.95	5.3	130	250	290
DPS-BH01	3.00 – 3.45	5.5	290	650	530
DPS-BH02	1.50 – 1.95	5.1	270	540	500
DPS-BH03	1.50 – 1.95	4.9	310	900	740

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 3.7 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 3.7 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 – Clayey Sand)	-	16	-	-	-	-	-
2b (Fill – Sandy Clay)	-	16	-	-	-	-	-
3 (Alluvial Soil – Sandy silty clay)	Stiff to Very Stiff	19	150	4	28	0.3	20
4 (Residual Soil)	Hard	20	200	8	30	0.3	50
5 (Weathered Rock)	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 is inherently unsuitable and would typically be removed and replaced as per Section 4.1.1 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 subsurface profile encountered, in particular the depth of uncontrolled fill, and with reference to Table 2.1 of AS 2870–2011 [6], a site classification of 'Class P' (problem site) is applicable. Ground surface movements from moisture change are expected to be in the range of 20 mm to 40 mm for the 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. No significant trees are located near the proposed new buildings; thus, soil moisture fluctuations are not likely to be affected by this.

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 mild to **non-aggressive** may be applied for steel structures and **mild** for concrete structures.

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 **A2** 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 quotes 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 and 2b (topsoil and uncontrolled 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 inflows. 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 and 2b), alluvial soil (Geotechnical Unit 3), residual soil (Geotechnical Unit 4) and extremely weathered rock (Geotechnical Unit 5) 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 development. 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 3, 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 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, it is expected that excavations will be associated with the demolition of existing buildings as well as excavations 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 and 2b) materials should not be incorporated into batter slopes and should be treated in accordance with the recommendations in Section 4.1.1 of this report.

Alluvial Soils (Geotechnical Unit 3) 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 these slopes as Bringelly Shale, including the overlying 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 4.1. 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 4.1 Temporary and permanent batter slopes

Geotechnical Unit	**Consistency / Strength**	**Cut Slope Batters**	
		Permanent	**Temporary**
Units 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
Unit 5 (Extremely Weathered Rock)	Very Low	1V: 2H	1V: 1.5H

[1] Refer to text above for recommendations regarding batters and benching in these geotechnical units

A minimum 0.5 m 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.

Given that Unit 2 uncontrolled fill was encountered to depths in the order of 2 m across the site, piled footings are likely required. Suitable piling options at this site could include bored piles, continuous flight auger (CFA) piles and screw piles.

5.2.1.1 Screw piles

For screw piles, the advice of specialist contractors experienced in the design and installation of such piles should be sought. The load capacity of the screw piles will depend on the number, strength and diameter of the helix, the ability of the installing rig to screw the helix through the subsurface materials and the geotechnical capacity of the founding materials. We recommend that designers of screw piles be provided with this report as a guide to the likely subsurface conditions at the site and pile design be undertaken using a limit state approach in accordance with AS 2159 (2009). WSP can review the proposed screw pile design, if required.

For preliminary design and costing purposes, we consider a screw pile with a single 300 mm diameter helix founded at a depth of at least 1 m (up to 3 m below the ground surface) into the natural Unit 3 or 4 materials could be designed for a working load of up to 20 kN per pile. However, this also depends on the structural capacity of the pile and would need to be confirmed by a specialist piling contractor. Under the working load provided we estimate the top of pile settlement would be approximately 10 mm.

The assessment of the geotechnical capacity of screw piles is typically undertaken based on correlations between torque and bearing capacity. Torque is generally measured by a pressure gauge. It is recommended that torque is correlated against site specific static load tests with piles installed using the equipment and pressure gauge that will be used for the working piles.

As noted above, the structural capacity rather than geotechnical capacity may govern the design loads for piles in some cases. We recommend that the structural capacity of the proposed piles be confirmed by a specialist piling contractor and their structural engineer.

5.2.1.2 Bored and CFA pile design

If CFA piling or bored piling (with casing) techniques are considered at this site, preliminary sizing of piles can be undertaken using the ultimate unit resistances summarised in Table 4.2. These values are unfactored ultimate values.

Table 4.2 Recommended maximum ultimate resistance for bored piles

Founding material	**Consistency / Strength**	**Ultimate resistance (kPa)**	
		Shaft	**Base**
Units 3 or 4 (Alluvial or Residual Soil)	Stiff to Hard	50	450
Unit 5 (Extremely Weathered Rock)	Very low	150	3000

A geotechnical strength reduction factor, ϕ_g, will need to be applied to these values as per AS 2159 (2009). Assuming that no pile testing is undertaken, we recommend that a ϕ_g of 0.45 is adopted.

Bored and CFA piles should be constructed in the full-time presence of a suitably qualified geotechnical engineer to confirm the subsurface conditions are consistent with those assumed in design.

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 Pavements

Based on the preferred option drawing provided in the feasibility study report *Dalmeny Public School Upgrade Study 23115 – Election Commitment Feasibility Study*, Option 1, dated 14 August 2023 [14], the proposed development does not include any new roads or car park areas. However, if pavements are included at a later stage, or for temporary construction works, a preliminary design CBR value of 2.5% can be assumed for alluvial soil Unit 3.

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 Dalmeny 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 5.1 Environmental factors for Dalmeny 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.
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 are likely to be required. 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 6.1 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. Slab or hardstand areas to found on engineered fill	To reduce or remove the risk of settlement and cracking
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 residual 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
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: Dalmeny 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] “Dalmeny 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

SINSW

Geotechnical Investigation Location Plan– Dalmeny Public School

N ↑

Image Source – Nearmap

Legend

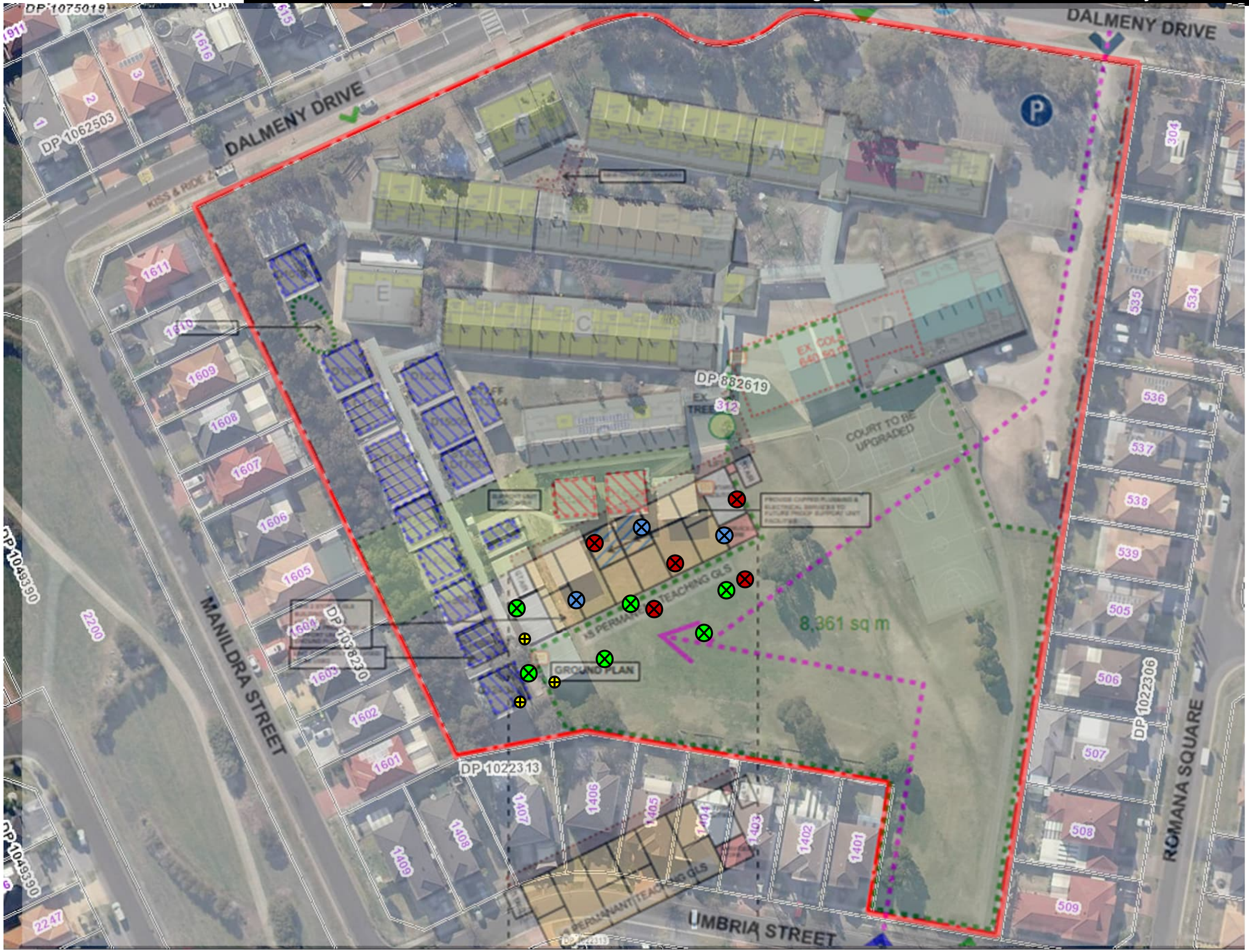
▭ Site boundary
⊗ Geotechnical Assessment Location
⊗ Environmental Assessment Location
⊗ 2nd Environmental Assessment Location
⊗ 2nd Geotechnical Assessment Location
- - Geological Cross Section

30m

Figure 1
Borehole location plan

Geotechnical Investigation Location Plan– Dalmeny Public School

N ↑



Legend

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

30m

Image Source – Nearmap

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	—◀	Outflow
◁	Partial water loss	▷	Inflow
▽	Water level at date shown		

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)

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

ROCK QUALITY DESIGNATION (Rock logs only)

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

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 $I_{s(50)}$ (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).

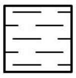
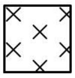
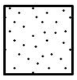
🟪	Clay dominated soils	Soils
🟩	Silt dominated soils, topsoil, undifferentiated fine grained soil	
🟧	Sand dominated soils	
🟫	Gravel or cobble dominated soils	
🟦	Peat soils	
🟫	Lithic sedimentary breccia and conglomerate	Sedimentary rocks
🟨	Sandstone, arenite	
🟧	Arkose	
🟩	Pelitic rocks, shale, mudstone	
🟫	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

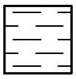
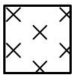
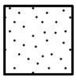
Typical symbols for soils and rocks are as follows. Combinations of these symbols may be used to indicate mixed materials such as clayey sand.

SOIL SYMBOLS

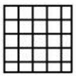
Main components

	CLAY
	SILT
	SAND
	GRAVEL
	BOULDERS / COBBLES
	TOPSOIL
	PEAT

Minor components

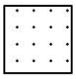
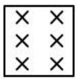
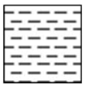
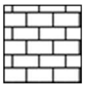
	CLAYEY
	SILTY
	SANDY
	GRAVELLY

OTHER MATERIAL SYMBOLS

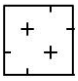
	FILL
	BITUMEN
	CONCRETE

ROCK SYMBOLS

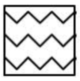
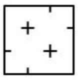
Sedimentary Rocks

	SANDSTONE
	SILTSTONE
	CLAYSTONE, MUDSTONE
	SHALE
	COAL
	LIMESTONE
	CONGLOMERATE

Igneous rocks

	GRANITE
	BASALT
	UNDIFFERENTIATED IGNEOUS

Metamorphic rocks

	SLATE, PHYLLITE, SCHIST
	GNEISS
	QUARTZITE

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH01 (CLM)

FILE / JOB NO : PS206292
SHEET : 1 OF 1

CLIENT : SINSW
PROJECT : SINSW UPS T23-24
LOCATION : Dalmeny Public School

POSITION : E: 303266.0, N: 6241621.0 (MGA2020-56)
SURFACE ELEVATION : 36.40 (AHD)
ANGLE FROM HORIZONTAL : 90°

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

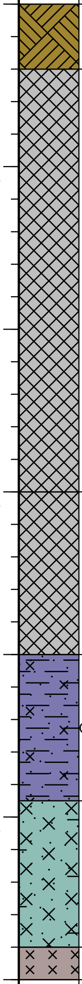
DATE STARTED : 25/9/2023
DATE COMPLETED : 25/9/2023
DATE LOGGED : 25/9/2023
LOGGED BY : TFW
CHECKED BY : JD

DRILLING

DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)
AD/V		E	Not Encountered		0.0 – 2.0
		F			2.0 – 2.9
		H			2.9 – 3.0

DEPTH (m)	RL (m AHD)
0.0	36.4
0.5	35.9
1.0	35.4
1.5	34.9
2.0	34.4
2.5	33.9
3.0	33.4
3.5	32.9
4.0	32.4
4.5	31.9
5.0	31.4

MATERIAL



Depth	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
0.0		TOPSOIL Sandy Clayey SILT: grey brown, low liquid limit, clay is medium plasticity; sand is fine to coarse grained; with fine and medium grained, subangular and sub-rounded ironstone, sandstone, shale, trace brick gravel.			TOPSOIL
0.20m		FILL Silty Sandy CLAY: medium plasticity, grey brown and red brown, sand is fine to coarse grained; silt is low liquid limit; with fine and medium grained, subangular and sub-rounded ironstone, sandstone, shale, trace brick gravel; rootlets.	w<PL		FILL
1.50m		FILL Silty Sandy CLAY: medium plasticity, pale grey, brown and red brown, sand is fine to coarse grained; silt is low liquid limit; with fine and medium grained, subangular and sub-rounded ironstone, sandstone, shale, trace brick gravel; rootlets.			
2.00m	CI-CH	Sandy Silty CLAY: medium to high plasticity, red brown, silt is low liquid limit; sand is fine and medium grained; with fine grained, sub-rounded shale gravel.			ALLUVIAL SOIL
2.45m	ML	Sandy Clayey SILT: pale grey and red brown, low liquid limit, clay is medium to high plasticity; sand is fine grained; trace fine grained, sub-rounded and rounded shale gravel; rootlets.	w<PL - w≈PL	St - VSt	RESIDUAL SOIL
2.90m		SILTSTONE: pale grey and grey brown, laminated, distinct bedding, 0-5' bedding, with 0-5° beds of brown fine grained sandstone, highly weathered, extremely weak.		H	WEATHERED ROCK
3.00m		Hole Terminated at 3.00 m Target depth Sufficient Natural Material Encountered			

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
PROJECT : SINSW UPS T23-24
LOCATION : Dalmeny Public School

POSITION : E: 303282.0, N: 6241636.0 (MGA2020-56)
SURFACE ELEVATION : 35.50 (AHD)
ANGLE FROM HORIZONTAL : 90°
RIG TYPE : Commachio 305
MOUNTING : Track
CONTRACTOR : Matrix
DRILLER : JY
DATE STARTED : 25/9/2023
DATE COMPLETED : 25/9/2023
DATE LOGGED : 25/9/2023
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
AD/V (0.0–3.0)		E	Not Encountered		0.0 35.5	▨		TOPSOIL Sandy Clayey SILT: grey brown, low liquid limit, clay is medium plasticity; sand is fine to coarse grained; with fine and medium grained, subangular and sub-rounded ironstone, sandstone, shale, trace brick gravel.			TOPSOIL
					0.20m	▨		FILL Silty Sandy CLAY: medium plasticity, grey brown and red brown, sand is fine to coarse grained; silt is low liquid limit; with fine and medium grained, subangular and sub-rounded ironstone, sandstone, shale, trace brick gravel; rootlets and wood fragments.	w<PL		FILL
					0.5 35.0						
					1.0 34.5						
					1.50m 1.5 34.0	▨		FILL Silty Sandy CLAY: medium to high plasticity, dark grey and grey brown, sand is fine to coarse grained; silt is low liquid limit; with fine and medium grained, subangular and sub-rounded ironstone, sandstone, shale, trace brick gravel; rootlets.			
					2.0 33.5						
		F			2.10m	▨	CI-CH	Sandy Silty CLAY: medium to high plasticity, red brown, silt is low liquid limit; sand is fine and medium grained; with fine grained, sub-rounded shale gravel.	w<PL - w≈PL	F - St	ALLUVIAL SOIL
					2.5 33.0						
					3.00m 3.0 32.5			Hole Terminated at 3.00 m Target depth Sufficient Natural Material Encountered			
					3.5 32.0						
					4.0 31.5						
					4.5 31.0						
					5.0 30.5						

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

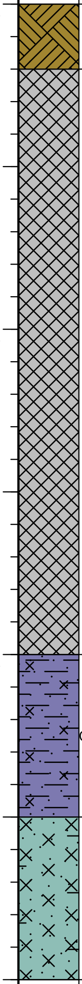
NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH03 (CLM)

FILE / JOB NO : PS206292
SHEET : 1 OF 1

CLIENT : SINSW
LOCATION : Dalmeny Public School
PROJECT : SINSW UPS T23-24

POSITION : E: 303298.0, N: 6241635.0 (MGA2020-56)
SURFACE ELEVATION : 34.70 (AHD)
ANGLE FROM HORIZONTAL : 90°
RIG TYPE : Commachio 305
MOUNTING : Track
CONTRACTOR : Matrix
DRILLER : JY
DATE STARTED : 25/9/2023
DATE COMPLETED : 25/9/2023
DATE LOGGED : 25/9/2023
LOGGED BY : TFW
CHECKED BY : JD



DRILLING: PROGRESS: DRILLING & CASING	DRILLING: PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/V		E	Not Encountered		0.0 34.7		TOPSOIL Sandy Clayey SILT: grey brown, low liquid limit, clay is medium plasticity; sand is fine to coarse grained; with fine and medium grained, subangular and sub-rounded ironstone, sandstone, shale, trace brick gravel.			TOPSOIL
					0.20m		FILL Silty Sandy CLAY: medium plasticity, grey brown and red brown, sand is fine to coarse grained; silt is low liquid limit; with fine and medium grained, subangular and sub-rounded ironstone, sandstone, shale, trace brick gravel; rootlets.	w<PL		FILL
		F			2.00m	CI-CH	Sandy Silty CLAY: medium to high plasticity, red brown, silt is low liquid limit; sand is fine and medium grained; with fine grained, sub-rounded shale gravel.	w<PL - w≈PL	St	ALLUVIAL SOIL
					2.50m	ML	Sandy Clayey SILT: yellow brown and grey brown, low liquid limit, clay is medium to high plasticity; sand is fine grained; trace fine grained, sub-rounded and rounded shale gravel; rootlets.			RESIDUAL SOIL
					3.00m		Hole Terminated at 3.00 m Target depth Sufficient Natural Material Encountered			

DEPTH (m)	RL (m AHD)
0.0	34.7
0.5	34.2
1.0	33.7
1.5	33.2
2.0	32.7
2.5	32.2
3.0	31.7
3.5	31.2
4.0	30.7
4.5	30.2
5.0	29.7

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
PROJECT : SINSW UPS T23-24
LOCATION : Dalmeny Public School

POSITION : E: 303269.0, N: 6241632.0 (MGA2020-56)
SURFACE ELEVATION : 35.70 (AHD)
ANGLE FROM HORIZONTAL : 90°
RIG TYPE : Commachio 305
MOUNTING : Track
CONTRACTOR : Matrix
DRILLER : JY
DATE STARTED : 25/9/2023
DATE COMPLETED : 25/9/2023
DATE LOGGED : 25/9/2023
LOGGED BY : TFW
CHECKED BY : JD

DRILLING

DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS
AD/V (0.00–2.50m)	N/A	E (0.00–1.80m)	Not Encountered	0.50m–0.95m SPT 1,1,1 N=2
				1.00m D
				1.50m–1.95m SPT 2,3,5 N=8
		F (1.80–2.50m)		2.00m D
AD/T (2.50–3.87m)		F-H (2.50–2.76m)		2.50m–2.95m SPT 10,10,13 N=23
		H (2.76–3.87m)		3.50m–3.87m SPT 12,21,12/70mm HB N=R

DEPTH (m)	RL (m AHD)
0.0	35.7
0.5	35.2
1.0	34.7
1.5	34.2
2.0	33.7
2.5	33.2
3.0	32.7
3.5	32.2
4.0	31.7
4.5	31.2
5.0	30.7

MATERIAL

Depth (m)	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
0.00–0.20m		TOPSOIL Sandy Clayey SILT: brown, low liquid limit, clay is low plasticity; sand is fine and coarse grained; with fine grained, angular to sub-rounded sandstone, brick, shale gravel.	w<PL		TOPSOIL
0.20–1.80m		FILL Gravelly Sandy CLAY: medium plasticity, grey brown, sand is fine and coarse grained; gravel is fine grained, subangular and sub-rounded brick, sandstone and shale. 0.50-0.96m possible voids due to SPT dropping 280mm, 130mm and 150mm each blow with minimal recovery 1.30m plastic sheeting fragments			FILL 0.60: PP =150 kPa 0.70: PP =150 kPa 1.60: PP =160 kPa 1.70: PP =150 kPa
1.80–2.00m	CI-CH	Sandy Silty CLAY: medium to high plasticity, red brown, grey and orange brown, silt is low liquid limit; sand is fine and medium grained; with fine and medium grained, subangular and sub-rounded ironstone and shale gravel.	w<PL - w≈PL	St - VSt	ALLUVIAL SOIL 1.85: PP =390 kPa 1.90: PP =410 kPa
2.00–2.55m	CH	Sandy Silty CLAY: medium to high plasticity, red brown, grey and orange brown, silt is low liquid limit; sand is fine and medium grained; with fine and medium grained, subangular and sub-rounded ironstone and shale gravel.			
2.55–2.76m	ML	Clayey SILT: grey, low liquid limit, clay is low plasticity; with coarse grained sand; trace fine grained, sub-rounded shale gravel.		VSt - H	RESIDUAL SOIL 2.60: PP =370 kPa 2.70: PP =390 kPa
2.76–3.87m		SILTSTONE: pale grey and grey brown, laminated, distinct bedding, 0-5° bedding, with 0-5° beds of brown fine grained sandstone, highly weathered, extremely weak.			WEATHERED ROCK 2.80: PP >600 kPa 3.60: PP >600 kPa

Hole Terminated at 3.87 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 : BH05
FILE / JOB NO : PS206292
SHEET : 1 OF 1

CLIENT : SINSW
PROJECT : SINSW UPS T23-24
LOCATION : Dalmeny Public School

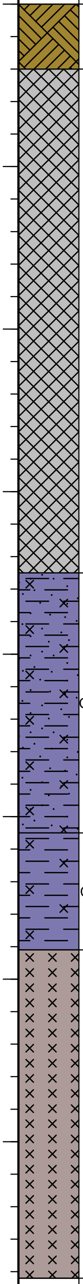
POSITION : E: 303301.0, N: 6241642.0 (MGA2020-56)
SURFACE ELEVATION : 35.20 (AHD)
ANGLE FROM HORIZONTAL : 90°
RIG TYPE : Commachio 305
MOUNTING : Track
CONTRACTOR : Matrix
DRILLER : JY
DATE STARTED : 25/9/2023
DATE COMPLETED : 25/9/2023
DATE LOGGED : 25/9/2023
LOGGED BY : TFW
CHECKED BY : JD

DRILLING / MATERIAL

PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/V	N/A	E	Not Encountered		0.00–0.20m		TOPSOIL Sandy Clayey SILT: brown, low liquid limit, clay is low plasticity; sand is fine and coarse grained; with fine grained, angular to sub-rounded sandstone, brick, shale gravel; with rootlets.			TOPSOIL
				0.50m SPT 6,9,9 N=18 0.95m 1.50m SPT 5,9,10 N=19	0.20m–1.75m		FILL Gravelly Sandy CLAY: medium plasticity, grey brown, sand is fine and coarse grained; gravel is fine grained, subangular and sub-rounded brick, sandstone and shale.	w<PL		FILL 0.60: PP =270 kPa 0.70: PP =290 kPa 0.75: PP =280 kPa 1.50: PP =470 kPa 1.60: PP =460 kPa 1.70: PP =470 kPa
		F		1.95m 2.00m D 2.50m SPT 13,27,28/110mm HB N=R	1.75m–2.55m	CI-CH	Sandy Silty CLAY: medium to high plasticity, orange brown and grey, silt is low liquid limit; sand is fine and medium grained.	w<PL - w≈PL	St - VSt	ALLUVIAL SOIL 2.50: PP >600 kPa
AD/T		F-H		2.91m	2.55m–2.91m	CL-CI	Silty CLAY: low to medium plasticity, grey, with coarse grained sand; trace fine grained, sub-rounded shale gravel.		H	RESIDUAL SOIL 2.60: PP >600 kPa
		H		3.50m D 3.90m SPT 4/20mm HB N=R 3.92m	2.91m–3.92m		SILTSTONE: pale grey and grey brown, laminated, distinct bedding, 0-5° bedding, with 0-5° beds of brown fine grained sandstone, highly weathered, extremely weak.			WEATHERED ROCK
					3.92m		Hole Terminated at 3.92 m Target depth Terminated upon TC-bit auger and SPT refusal			

DEPTH (m) / RL (m AHD): 0.0 / 35.2; 0.5 / 34.7; 1.0 / 34.2; 1.5 / 33.7; 2.0 / 33.2; 2.5 / 32.7; 3.0 / 32.2; 3.5 / 31.7; 4.0 / 31.2; 4.5 / 30.7; 5.0 / 30.2

GRAPHIC LOG



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
LOCATION : Dalmeny Public School
PROJECT : SINSW UPS T23-24

POSITION : E: 303306.0, N: 6241625.0 (MGA2020-56)
SURFACE ELEVATION : 35.80 (AHD)
ANGLE FROM HORIZONTAL : 90°

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

DATE STARTED : 25/9/2023
DATE COMPLETED : 25/9/2023
DATE LOGGED : 25/9/2023
LOGGED BY : TFW
CHECKED BY : JD

DRILLING

DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	DEPTH (m)
AD/V	N/A	E	Not Encountered	0.0 – 2.0
AD/V		F		2.0 – 2.5
AD/T		F-H		2.5 – 3.0
AD/T		H		3.0 – 3.94

SAMPLES & FIELD TESTS
0.50m SPT 6,8,8 N=16 0.95m
1.00m D
1.50m SPT 8,10,11 N=21 1.95m
2.00m D
2.50m SPT 13,31,28 HB N=59 2.95m
3.50m D
3.90m SPT 4/40mm HB N=R 3.94m

DEPTH (m)	RL (m AHD)
0.0	35.8
0.5	35.3
1.0	34.8
1.5	34.3
2.0	33.8
2.5	33.3
3.0	32.8
3.5	32.3
4.0	31.8
4.5	31.3
5.0	30.8

MATERIAL

Depth	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
0.00 – 0.20m		TOPSOIL Sandy Clayey SILT: brown, low liquid limit, clay is low plasticity; sand is fine and coarse grained; with fine grained, angular to sub-rounded sandstone, brick, shale gravel; with rootlets.			TOPSOIL
0.20 – 2.00m		FILL Gravelly Sandy CLAY: medium plasticity, grey brown, sand is fine and coarse grained; gravel is fine grained, subangular and sub-rounded brick, sandstone and shale.	w<PL		FILL 0.50: PP =230 kPa 0.60: PP =240 kPa 0.70: PP =240 kPa 0.80: PP =270 kPa 1.50: PP =470 kPa 1.60: PP =480 kPa 1.70: PP =490 kPa 1.80: PP =490 kPa 1.90: PP =510 kPa
2.00 – 2.65m	CI-CH	Sandy Silty CLAY: medium to high plasticity, orange brown, silt is low liquid limit; sand is fine and medium grained.	w<PL - w≈PL	St - VSt	ALLUVIAL SOIL 2.60: PP =580 kPa
2.65 – 3.00m	ML	Clayey SILT: grey brown, low liquid limit, clay is low plasticity; with coarse grained sand; trace fine grained, sub-rounded shale gravel.	w<PL	H	RESIDUAL SOIL 2.70: PP >600 kPa 2.80: PP >600 kPa
3.00 – 3.94m		SILTSTONE: pale grey and grey brown, laminated, distinct bedding, 0-5° bedding, with 0-5° beds of brown fine grained sandstone, highly weathered, extremely weak.			WEATHERED ROCK

Hole Terminated at 3.94 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 : BH07

FILE / JOB NO : PS206292
SHEET : 1 OF 1

CLIENT : SINSW
PROJECT : SINSW UPS T23-24
LOCATION : Dalmeny Public School

POSITION : E: 303289.0, N: 6241628.0 (MGA2020-56)
SURFACE ELEVATION : 35.40 (AHD)
ANGLE FROM HORIZONTAL : 90°
RIG TYPE : Commachio 305
MOUNTING : Track
CONTRACTOR : Matrix
DRILLER : JY
DATE STARTED : 25/9/2023
DATE COMPLETED : 25/9/2023
DATE LOGGED : 25/9/2023
LOGGED BY : TFW
CHECKED BY : JD

DRILLING PROGRESS DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	RL (m AHD)	MATERIAL 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
AD/V	N/A	E	Not Encountered		0.0	35.4	▩		TOPSOIL Sandy Clayey SILT: brown, low liquid limit, clay is low plasticity; sand is fine and coarse grained; with fine and medium grained, angular to sub-rounded sandstone, brick, shale gravel.			TOPSOIL
				0.50m SPT 5,5,5 N=10 0.95m	0.20m		▨		FILL Gravelly Sandy CLAY: low to medium plasticity, grey brown, sand is fine and coarse grained; gravel is fine grained, subangular and sub-rounded brick, sandstone, ironstone and shale.	w<PL		FILL 0.60: PP =200 kPa 0.70: PP =210 kPa 0.80: PP =210 kPa
				1.50m SPT 6,8,10 N=18 1.95m	1.40m		▨		FILL Sandy Clayey SILT: dark brown, low liquid limit, clay is low to medium plasticity; sand is fine to coarse grained; trace fine grained, angular to sub-rounded sandstone, shale, brick and ironstone gravel; roots and rootlets.			1.60: PP =270 kPa 1.70: PP =290 kPa 1.80: PP =300 kPa
		F		2.00m D	2.00m	33.4	▤	CI-CH	Sandy Silty CLAY: medium to high plasticity, red brown, orange brown and grey, silt is low liquid limit; sand is fine and medium grained.	w<PL - w≈PL	St - VSt	ALLUVIAL SOIL
AD/T		F-H		2.50m SPT 10,20 HB N=R 2.90m	2.50	32.9			2.56-2.76m grey clayey silt trace rootlets			2.50: PP =580 kPa 2.60: PP >600 kPa 2.70: PP >600 kPa
					2.76m		▤	CL-CI	Silty CLAY: low to medium plasticity, grey brown mottled pale red brown, silt is low liquid limit; with coarse grained sand; trace fine grained, sub-rounded shale gravel.	w<PL	H	RESIDUAL SOIL 2.90: PP >600 kPa
		H		3.50m D 3.90m SPT 4/50mm HB N=R 3.95m	3.05m		▦		SILTSTONE: pale grey and grey brown, laminated, distinct bedding, 0-5° bedding, with 0-5° beds of brown fine grained sandstone, highly weathered, extremely weak.			WEATHERED ROCK
					3.95m				Hole Terminated at 3.95 m Target depth Terminated upon TC-bit auger and SPT refusal			

DEPTH (m)	RL (m AHD)
0.0	35.4
0.5	34.9
1.0	34.4
1.5	33.9
2.0	33.4
2.5	32.9
3.0	32.4
3.5	31.9
4.0	31.4
4.5	30.9
5.0	30.4

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
PROJECT : SINSW UPS T23-24
LOCATION : Dalmeny Public School

POSITION : E: 303284.0, N: 6241620.0 (MGA2020-56)
SURFACE ELEVATION : 35.00 (AHD)
ANGLE FROM HORIZONTAL : 90°
RIG TYPE : Commachio 305
MOUNTING : Track
CONTRACTOR : Matrix
DRILLER : JY
DATE STARTED : 25/9/2023
DATE COMPLETED : 25/9/2023
DATE LOGGED : 25/9/2023
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
AD/V	N/A	E	Not Encountered		0.0 35.0	▨		TOPSOIL Sandy Clayey SILT: brown, low liquid limit, clay is low plasticity; sand is fine and coarse grained; with fine and medium grained, angular to sub-rounded sandstone, brick, shale gravel.			TOPSOIL
				0.50m SPT 2,4,6 N=10 0.95m 1.50m SPT 4,4,6 N=10 1.95m	0.20m 0.5 34.5 1.0 34.0 1.5 33.5	▩		FILL Sandy Silty CLAY: medium plasticity, grey brown, orange brown, silt is low liquid limit; sand is fine to coarse grained; with fine grained, angular to sub-rounded sandstone, brick, shale gravel; with angular and subangular wood fragments, up to 15 mm and rootlets.	w<PL		FILL 0.60: PP =190 kPa 0.70: PP =200 kPa 0.80: PP =230 kPa 0.90: PP =220 kPa 1.60: PP =210 kPa 1.70: PP =420 kPa 1.80: PP =270 kPa 1.90: PP =390 kPa
		F		2.00m D	2.00m 2.0 33.0	▤	CI - CH	Sandy Silty CLAY: medium to high plasticity, red brown, orange brown and grey, silt is low liquid limit; sand is fine and medium grained.	w<PL - w≈PL	VSt	ALLUVIAL SOIL
AD/T		F-H		2.50m SPT 12,12,12 N=24 2.95m	2.5 32.5 2.55m	▤	CI	Silty CLAY: medium plasticity, red brown and grey, with fine and medium grained sand.	w<PL	H	RESIDUAL SOIL 2.60: PP =470 kPa 2.70: PP =520 kPa 2.80: PP >600 kPa
		H		3.00m D 3.50m SPT 10,27,30/10mm HB N=R 3.81m	3.00m 3.0 32.0 3.5 31.5	☒		SILTSTONE: pale grey and grey brown, laminated, distinct bedding, 0-5° bedding, with 0-5° beds of brown fine grained sandstone, highly weathered, extremely weak.			WEATHERED ROCK 3.60: PP >600 kPa 3.70: PP >600 kPa
					3.81m 4.0 31.0 4.5 30.5 5.0 30.0			Hole Terminated at 3.81 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 : DPS-BH01

FILE / JOB NO : PS206292

SHEET : 1 OF 1

CLIENT : SINSW

LOCATION : Dalmeny Public School

PROJECT : SINSW UPS T23-24

POSITION : E: 303257.0, N: 6241612.0 (MGA2020-56)

SURFACE ELEVATION : 36.40 (AHD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Commachio 300

MOUNTING : Track

CONTRACTOR : Stratacore

DRILLER : RM

DATE STARTED : 14/1/2025

DATE COMPLETED : 14/1/2025

DATE LOGGED : 14/1/2025

LOGGED BY : TD

CHECKED BY : JD

DRILLING: PROGRESS – DRILLING & CASING	DRILLING: PROGRESS – WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) / RL (m AHD)	GROUP SYMBOL	MATERIAL DESCRIPTION: Soil Type, Colour, Plasticity or Particle Characteristic, Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
HA (0.0–1.5 m)		E	Not Encountered	ES 0.10m	0.0 / 36.0 – 0.20m		TOPSOIL Clayey SAND: fine to medium grained, brown to dark brown, clay is low plasticity clay.	D		TOPSOIL DPS_BH-1_0.1: PID = 3.2
		F		0.30m D ES 0.50m	0.20m – 1.30m (1.0 / 35.0)		FILL Sandy Silty CLAY: low to medium plasticity, brown, sand is fine grained; trace fine to coarse grained, subangular gravel. 0.55m: colour becoming grey mottled red brown	w<PL		FILL Plastic mesh observed at 0.3 m DPS_BH01_0.5: PID = 4.9 DPS_BH-1_1.0: PID = 2.3
AD/T (1.5–6.0 m)		H		SPT 5,9,8 N=17 1.95m	1.30m – 1.65m	CI-CH	Sandy Silty CLAY: medium to high plasticity, dark brown and red brown, sand is fine to medium grained.	w<PL	VSt	ALLUVIAL SOIL DPS_BH-1_1.5: PID = 3.2
					1.65m – 3.00m (2.0 / 34.0)	CI-CH	Silty CLAY: medium to high plasticity, grey mottled red brown, trace fine to medium grained, subangular to subrounded gravel.	w<PL	VSt	RESIDUAL SOIL
		VH		SPT 4,9,12 N=21 3.45m SPT 4,10/20mm HB N=R 4.67m	3.00m – 6.00m (3.0 / 33.0; 4.0 / 32.0; 5.0 / 31.0)		SILTSTONE, pale grey to dark grey mottled orange, 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
					6.0 / 30.0		Hole Terminated at 6.00 m Target depth			
					7.0 / 29.0					
					8.0 / 28.0					

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

WSP-AU 5.07.2 LIB_UPDATED.7.12.23.GLB Log IS AU BOREHOLE 2A PS206292 2ND MOB.GPJ <<DrawingFile>> 2/2/2025 21:39 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: WSP 5.07.2 2023-10-30 Prj: WSP 5.05.2 2023-08-23

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : DPS-BH02

FILE / JOB NO : PS206292
SHEET : 1 OF 1

CLIENT : SINSW
PROJECT : SINSW UPS T23-24
LOCATION : Dalmeny Public School

POSITION : E: 303263.0, N: 6241605.0 (MGA2020-56)
SURFACE ELEVATION : 36.60 (AHD)
ANGLE FROM HORIZONTAL : 90°
RIG TYPE : Commachio 300
MOUNTING : Track
CONTRACTOR : Stratacore
DRILLER : RM
DATE STARTED : 14/1/2025
DATE COMPLETED : 14/1/2025
DATE LOGGED : 14/1/2025
LOGGED BY : KC
CHECKED BY : JD

DRILLING & CASING	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 36.0	▨		TOPSOIL Clayey SAND: fine to medium grained, brown to dark brown, clay is low plasticity clay.	D		TOPSOIL DPS-BH02_0.1
		F		0.30m ES 0.50m	0.20m	▨		FILL Sandy Silty CLAY: low to medium plasticity, brown, sand is fine grained; trace fine to coarse grained, subangular gravel.			FILL DPS-BH02_0.5
					0.50m 1.0 35.0			becoming grey mottled red brown	w<PL		DPS-BH02_1.0
		H			1.30m	▨	CI	Sandy Silty CLAY: medium plasticity, brown, sand is fine to medium grained; trace fine grained, subangular to subrounded gravel.	w<PL	St	ALLUVIAL SOIL
AD/T				SPT 4,7,8 N=15 1.95m	1.40m 2.0 34.0	▨	CI-CH	Sandy Silty CLAY: medium to high plasticity, pale grey mottled red brown, sand is fine to medium grained; trace fine to medium grained, subangular siltstone gravel.	w<PL	VSt	RESIDUAL SOIL DPS-BH02_1.5 DPS-BH02_2.0: PID
		VH		SPT 4,7,15 N=22 3.45m	2.80m 3.0 33.0		CI-CH	Increasing gravel content, colour becoming grey to dark grey			
				SPT 10/145mm HB N=R 4.65m	3.30m 4.0 32.0 5.0 31.0	☒		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. with siltstone fragments, fine to medium grained, sub-angular to angular			INFERRED WEATHERED ROCK
					6.00m 6.0 30.0 7.0 29.0 8.0 28.0			Hole Terminated at 6.00 m Target depth			

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

WSP-AU 5.07.2 LIB_UPDATED.7.12.23.GLB Log IS AU BOREHOLE 2A PS206292 2ND MOB.GPJ <<DrawingFile>> 2/2/2025 21:39 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: WSP 5.07.2 2023-10-30 Prj: WSP 5.05.2 2023-08-23

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : DPS-BH03
FILE / JOB NO : PS206292
SHEET : 1 OF 1

CLIENT : SINSW
LOCATION : Dalmeny Public School
PROJECT : SINSW UPS T23-24

POSITION : E: 303258.0, N: 6241601.0 (MGA2020-56)
SURFACE ELEVATION : 37.00 (AHD)
ANGLE FROM HORIZONTAL : 90°
RIG TYPE : Commachio 300
MOUNTING : Track
CONTRACTOR : Stratacore
DRILLER : RM
DATE STARTED : 14/1/2025
DATE COMPLETED : 14/1/2025
DATE LOGGED : 14/1/2025
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	0.0 36.0			TOPSOIL Clayey SAND: fine to medium grained, brown to dark brown, clay is clay is low plasticity; with rootlets.	D		TOPSOIL DPS_BH03_0.1: PID = 2.2
		F		0.50m ES	0.20m			FILL Silty CLAY: pale grey mottled red, with fine grained sand; trace fine grained, subangular gravel.	w<PL		FILL DPS_BH03_0.5: PID = 3.4
					0.80m 1.0 35.0			Increasing sand content, becoming Sandy Silty CLAY	D		DPS_BH03_1.0: PID = 4.2
AD/T		H		SPT 4,6,6 N=12 1.95m	1.40m 2.0 34.0		CI-CH	Silty CLAY: medium to high plasticity, pale grey mottled red brown, trace fine grained, subangular to subrounded gravel.	w<PL	St	RESIDUAL SOIL DPS_BH03_1.5: PID = 4.3 1.60: PP =500 kPa DPS_BH03_2.0: PID = 6.2
		VH		SPT 3,8,14 N=22 3.45m	2.70m 3.0 33.0		CI-CH	trace subangular ironstone gravel		VSt	3.10: PP =500 kPa
				SPT 10/10mm HB N=R 4.51m	3.80m 4.0 32.0 5.0 31.0			SILTSTONE, pale grey to dark grey mottled orange, 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
					6.00m 6.0 30.0 7.0 29.0 8.0 28.0			Hole Terminated at 6.00 m Target depth			

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

HAND AUGER: DPS_HA01

Sheet 1 of 1

Project: Dalmeny Public School Upgrade
Location: Dalmeny Public School, 1612 Dalmeny Dr, Prestons NSW 2170
Client: School Infrastructure NSW
Contractor:
Drill Rig:
Job No.: PS206292
Inclination: -90°

Date Started: 14/1/2025
Date Completed: 14/1/2025
Logged: GBP/MW

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		ES 0.10 m GPS_HA01_0.1 PID 4.7 ppm		▨		TOPSOIL Clayey SAND: fine to medium grained, brown to dark brown, clay is low to medium plasticity.	w<PL		TOPSOIL rootlets observed
			0.2	0.20	ES 0.50 m GPS_HA01_0.5 PID 2.0 ppm		▩		FILL Silty CLAY: low to medium plasticity, pale grey mottled red, trace fine grained sand; trace fine grained, subangular gravel.	w<PL		FILL
			0.8	0.80	ES 1.00 m GPS_HA01_1.0 PID 1.00 m 3.7 ppm		▩		FILL Silty CLAY: as above increasing sand content, becoming sandy silty CLAY	w<PL		
			1.4	1.40	PID 3.4 ppm		▤		Silty CLAY: medium to high plasticity, pale grey mottled red, trace fine grained, subangualr to subrounded gravel; trace gravel.	w<PL	VSt	ALLUVIAL SOIL
				1.50					Hole Terminated at 1.50 m			
			1.6									

Comments

Checked
Date

HAND AUGER: DPS_HA02

Sheet 1 of 1

Project: Dalmeny Public School Upgrade
Location: Dalmeny Public School, 1612 Dalmeny Dr, Prestons NSW 2170
Client: School Infrastructure NSW
Contractor:
Drill Rig:
Job No.: PS206292
Inclination: -90°

Date Started: 14/1/2025
Date Completed: 14/1/2025
Logged: GBP/MW

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		ES 0.10 m DPS_HA02_0.1 PID 4.3 ppm		▨		TOPSOIL Clayey SAND: fine to coarse grained, brown, clay is low to medium plasticity.	D		TOPSOIL rootlets observed
			0.2	0.20	ES 0.50 m DPS_HA02_0.5 PID 1.4 ppm		▩		FILL Silty CLAY: low to medium plasticity, pale grey mottled red, trace fine grained sand; trace fine grained, subangular gravel.	w<PL		FILL
			0.8	0.80	ES 1.00 m DPS_HA02_1.0 PID 1.4 ppm		▩		FILL Silty CLAY: as above increasing sand content, becoming Sandy Silty CLAY	w<PL		
			1.4	1.40	ES 1.50 m DPS_HA02_1.5 PID 3.7 ppm		▤		Silty CLAY: medium to high plasticity, pale grey mottled red, trace fine grained, subangualr to subrounded gravel.	w<PL	St	RESIDUAL SOIL
			1.50	1.50					Hole Terminated at 1.50 m			
			1.6									

Comments

Checked
Date

WSP-AU 5.07.3 LIB.GLB Log IS AU BOREHOLE 3 DRAFT_DALMENY_2NDMOB_HALOGS.GPJ <<DrawingFile>> 7/2/2025 11:48 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: WSP 5.07.3 2023-12-04 Prj: WSP 5.07.3 2023-12-04

HAND AUGER: DPS_HA03

Sheet 1 of 1

Project: Dalmeny Public School Upgrade
Location: Dalmeny Public School, 1612 Dalmeny Dr, Prestons NSW 2170
Client: School Infrastructure NSW
Contractor:
Drill Rig:
Job No.: PS206292
Inclination: -90°

Date Started: 14/1/2025
Date Completed: 14/1/2025
Logged: GBP/MW

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
BH			0.0	0.10	ES 0.1 m DPS_HA03_0.1 QC101/101A PID 3.2 ppm		▨		TOPSOIL Clayey SAND: fine to coarse grained, brown, clay is low to medium plasticity; with rootlets.	D		TOPSOIL rootlets observed
			0.2 0.4 0.6 0.8 1.0 1.2	1.40	ES 0.50 m DPS_HA03_0.5 PID 3.5 ppm ES 1.00 m DPS_HA03_1.0 PID 3.9 ppm		▩		FILL Silty GRAVEL: fine to medium, brown-grey.	w<PL		FILL
			1.4	1.50	ES 1.50 m DPS_HA03_1.5 PID 2.9 ppm		▤		Silty CLAY: medium plasticity, grey mottled red, trace fine grained sand, subangualr to subrounded gravel.	w<PL	St	RESIDUAL SOIL
			1.6						Hole Terminated at 1.50 m			

Comments

Checked
Date

HAND AUGER: DPS_HA04

Sheet 1 of 1

Project: Dalmeny Public School Upgrade
Location: Dalmeny Public School, 1612 Dalmeny Dr, Prestons NSW 2170
Client: School Infrastructure NSW
Contractor:
Drill Rig:
Job No.: PS206292
Inclination: -90°

Date Started: 14/1/2025
Date Completed: 14/1/2025
Logged: GBP/MW

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	0.10	ES 0.10 ppm DPS_HA04_0.1 PID 3.9 ppm				TOPSOIL Clayey SAND: fine to coarse grained, brown, clay is low to medium plasticity.	D		TOPSOIL rootlets observed
			0.2 0.4 0.6	0.80	ES DPS_HA04_0.5 PID 5.3 ppm				FILL Silty Sandy CLAY: low to medium plasticity, red brown, sand is fine to medium grained; trace fine to medium grained, subangular to subrounded gravel gravel.	w<PL		FILL
			0.8 1.0 1.2	1.40	ES 1.00 m DPS_HA04_1.0 PID 5.5 ppm				FILL Silty GRAVEL: fine to medium, brown grey.	w<PL		
			1.4	1.50	ES 1.50 m DPS_HA04_1.5 PID 2.6 ppm				Silty CLAY: medium plasticity, grey mottled red, trace fine grained sand.	w<PL	St	RESIDUAL SOIL
			1.6						Hole Terminated at 1.50 m			

Comments

Checked
Date

HAND AUGER: DPS_HA05

Sheet 1 of 1

Project: Dalmeny Public School Upgrade
Location: Dalmeny Public School, 1612 Dalmeny Dr, Prestons NSW 2170
Client: School Infrastructure NSW
Contractor:
Drill Rig:
Job No.: PS206292
Inclination: -90°

Date Started: 14/1/2025
Date Completed: 14/1/2025
Logged: GBP/MW

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	*0.10*	ES 0.10 m DPS_HA05_0.1 PID 4.7 ppm		▨		TOPSOIL Clayey SAND: fine to coarse grained, brown, clay is low to medium plasticity.	D		TOPSOIL rootlets observed
			0.2 0.4 0.6 0.8 1.0 1.2 1.4	*1.50*	ES 0.10 m DPS_HA05_0.5 PID 0.2 ppm ES 1.0 m DPS_HA05_1.0 PID 0.3 ppm ES 1.50 m DPS_HA05_1.5 PID 0.5 ppm		▩		FILL Silty CLAY: medium plasticity, grey mottled red.	w<PL		FILL
			1.6						Hole Terminated at 1.50 m			

Comments

Checked
Date

HAND AUGER: DPS_HA06

Sheet 1 of 1

Project: Dalmeny Public School Upgrade
Location: Dalmeny Public School, 1612 Dalmeny Dr, Prestons NSW 2170
Client: School Infrastructure NSW
Contractor:
Drill Rig:
Job No.: PS206292
Inclination: -90°
Date Started: 14/1/2025
Date Completed: 14/1/2025
Logged: GBP/MW

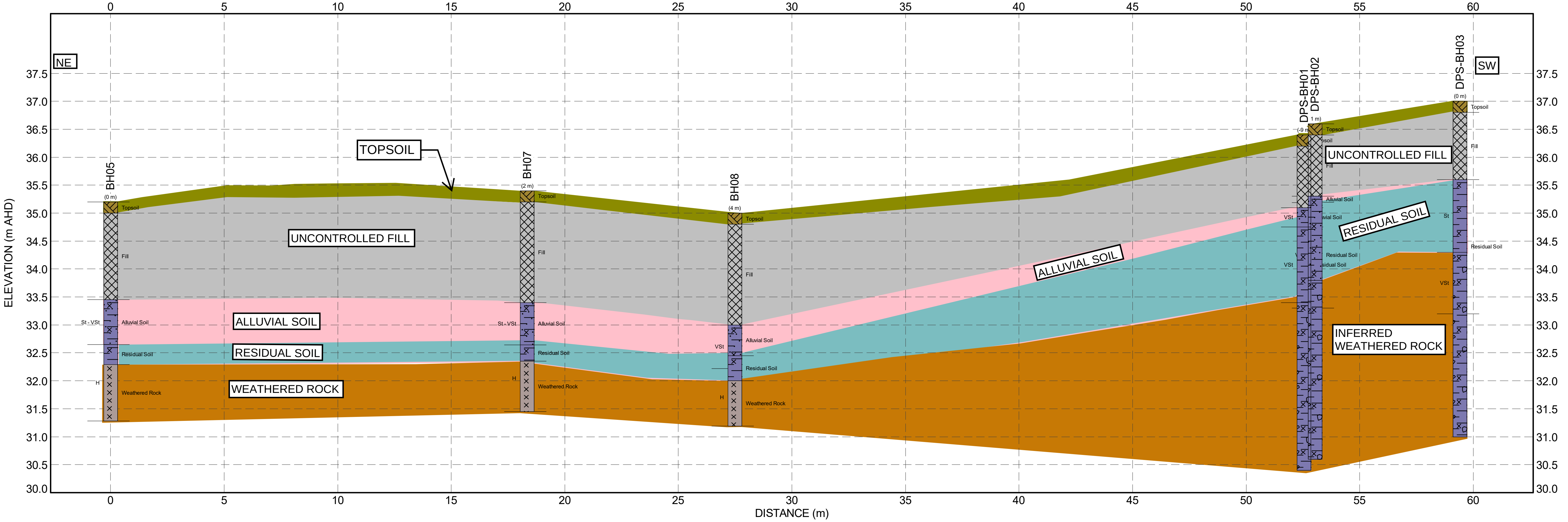
Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA			0.0	*0.10*	ES 0.10 m DPS_HA06_0.1 PID 0.5 ppm		▨		TOPSOIL Clayey SAND: fine to coarse grained, brown, clay is low to medium plasticity.	D		TOPSOIL rootlets observed
			0.2 0.4 0.6	*0.80*	ES 0.50 m DPS_HA06_0.5 PID 0.6 ppm		▨		FILL Silty Sandy CLAY: low to medium plasticity, red brown, sand is fine to medium grained; trace fine to medium grained, subangular to subrounded gravel.	w<PL		FILL
			0.8 1.0 1.2	*1.40*	ES 1.00 m DPS_HA06_1.0 PID 0.4 ppm		▨		FILL Silty GRAVEL: fine to medium, brown grey.	w<PL		
			1.4	*1.50*	ES 1.50 m DPS_HA06_1.5 PID 0.3 ppm		▨		Silty CLAY: medium plasticity, grey mottled red, trace fine grained sand.	w<PL	St	RESIDUAL SOIL
			1.6						Hole Terminated at 1.50 m			

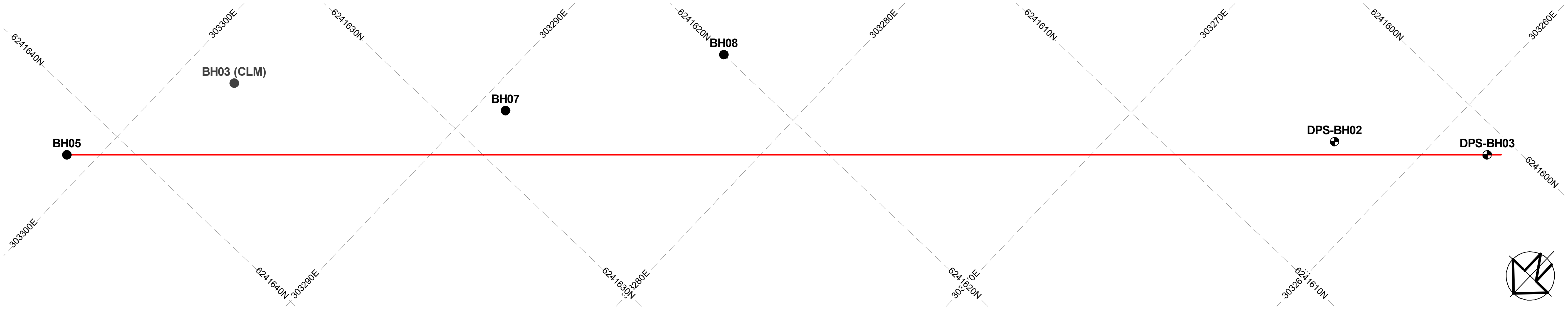
Comments

Checked
Date

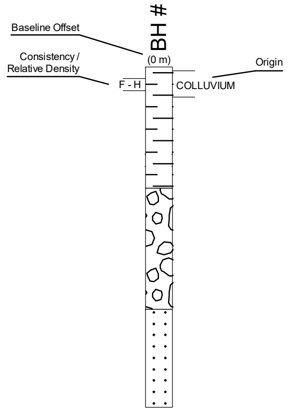
Appendix C

Geological cross section





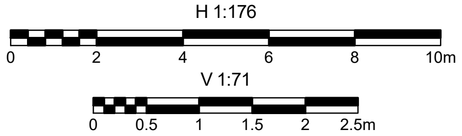
POST LEGEND



MATERIAL GRAPHIC

▨ TOPSOIL
▨ FILL
▨ Silty CLAY
▨ Silty sandy CLAY
▨ Silty gravelly CLAY
▨ SILTSTONE

MAP KEY
◐ Borehole
● Solid Stem Auger



Coord.System: MGA2020-56 Height Datum: AHD

TITLE	DRAWN	DATE
SINSW Dalmeny Public School SINSW UPS T23-24 Inferred Subsurface Section		4/2/2025
	CHECKED	DATE 4/2/2025
	SCALE H 1:176 V 1:71	A3
	PROJECT No PS206292	FIGURE No

Appendix D

Laboratory test certificates

SOIL CLASSIFICATION REPORT

Client	WSP Australia Pty Ltd	**Source**	BH04 2.00-2.50m
Address	Level 27, 680 George St, Sydney NSW 2000	**Sample Description**	Silty CLAY
Project	Dalmeny Public School (PS206292)	**Report No.**	S89770-PI
Job No.	S23428-1	**Lab No.**	S89770

Test Procedure

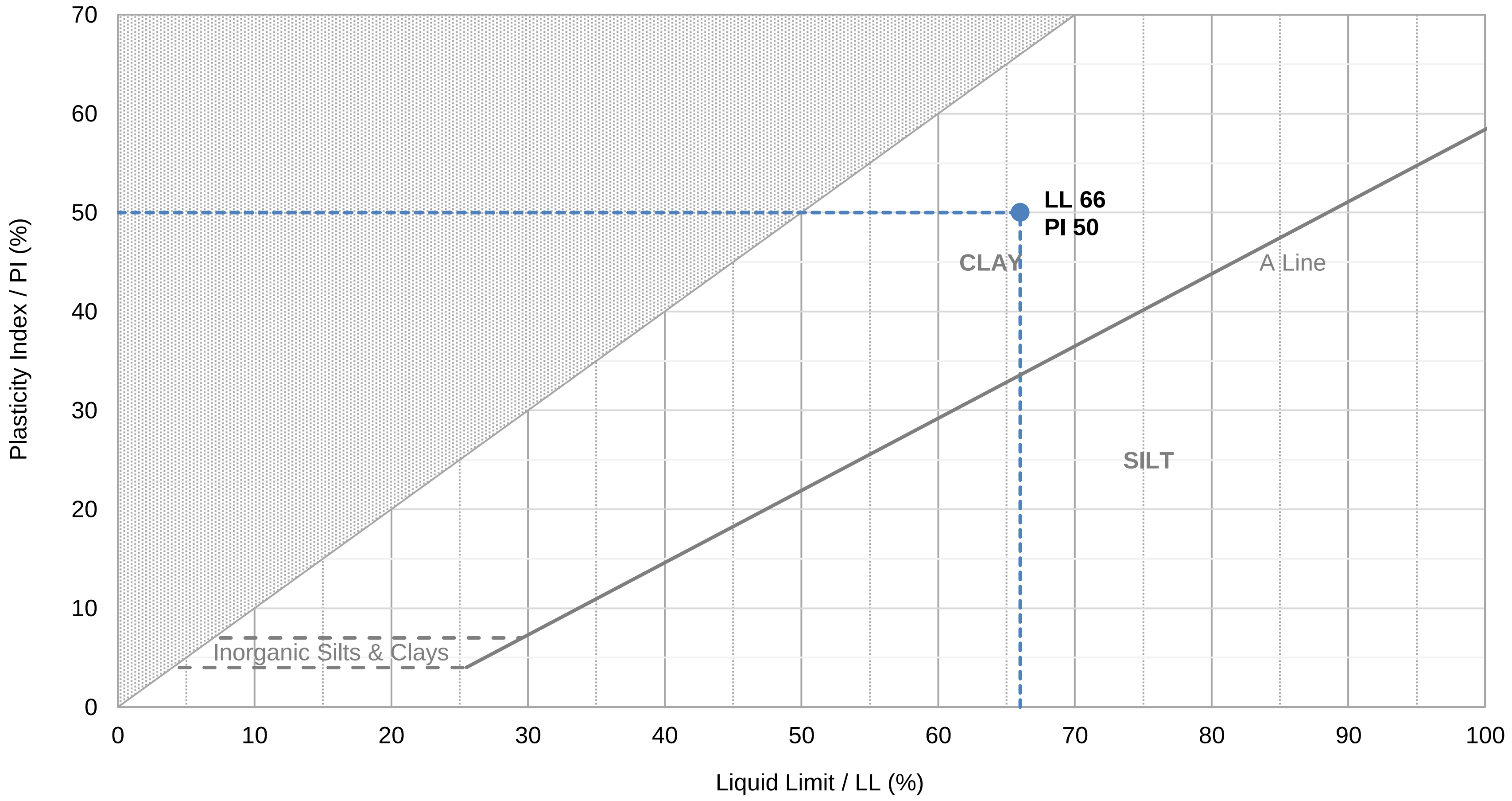
☑	AS1289 3.1.1	Liquid Limit - Four point Casagrande method
☐	AS1289 3.1.2	Liquid Limit - One point Casagrande method
☑	AS1289 3.2.1	Plastic Limit - Standard method
☑	AS1289 3.3.1	Calculation of the Plasticity Index
☑	AS1289 3.4.1	Linear Shrinkage - Standard method

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 25/09/2023

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 (%)	**66**
Plastic Limit (%)	**16**
Plasticity Index / PI (%)	**50**
Linear Shrinkage (%)	**12.0**
Condition upon Drying	**Curling Occured**

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:

Chris Lloyd

13/10/2023

Date:

Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

SOIL CLASSIFICATION REPORT

Client	WSP Australia Pty Ltd	**Source**	BH05 2.50-2.95m
Address	Level 27, 680 George St, Sydney NSW 2000	**Sample Description**	Silty CLAY
Project	Dalmeny Public School (PS206292)	**Report No.**	S89768-PI
Job No.	S23428-1	**Lab No.**	S89768

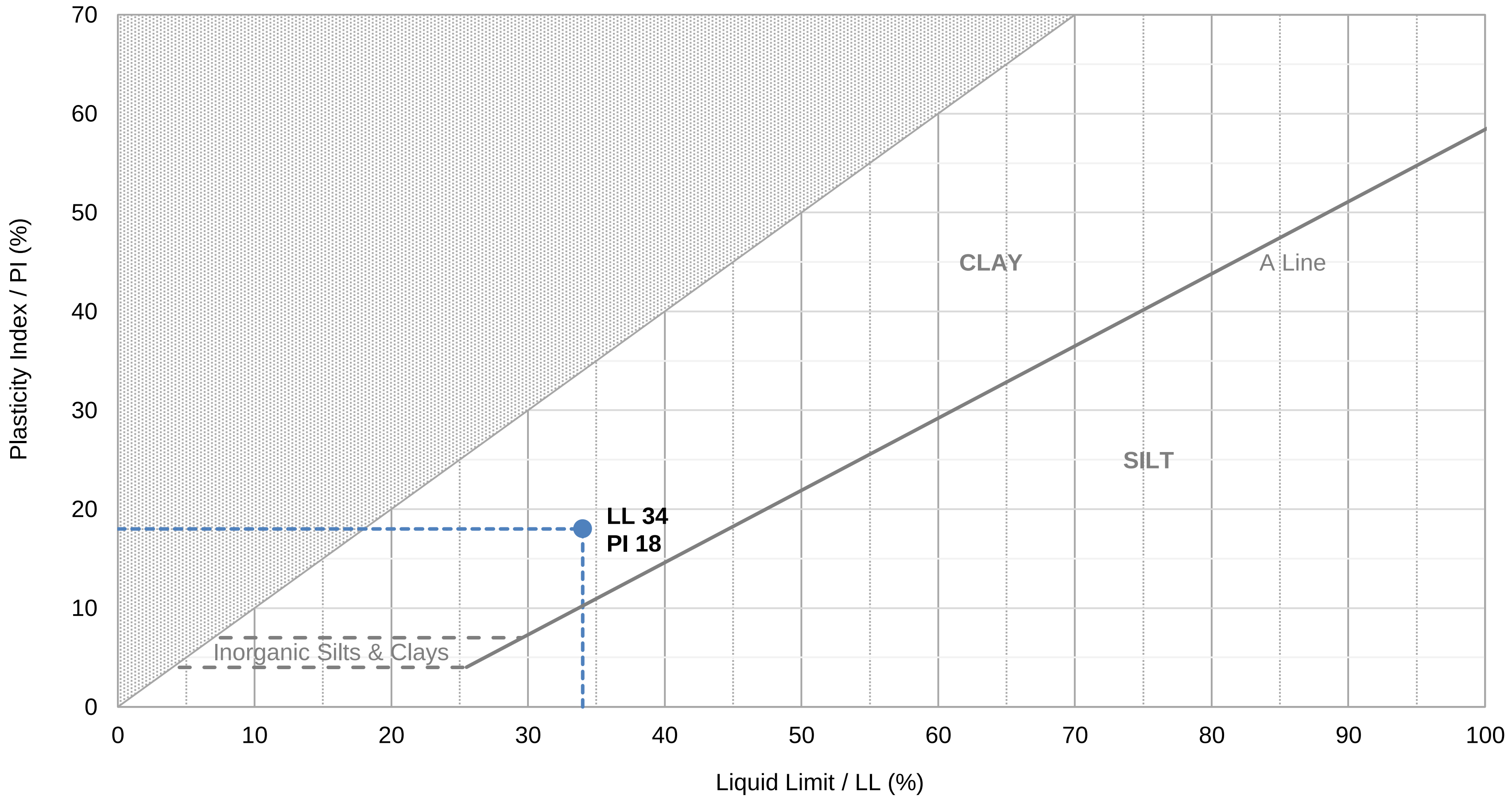
Test Procedure

☑	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**	25/09/2023
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 (%)	**34**
Plastic Limit (%)	**16**
Plasticity Index / PI (%)	**18**
Linear Shrinkage (%)	**9.0**
Condition upon Drying	**Linear**

Notes

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Authorised Signatory:

Chris Lloyd

13/10/2023

Date:

MACQUARIE GEOTECH

Macquarie Geotechnical
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	Dalmeny Public School (PS206292)	**Report No.**	S89769-PI
Job No.	S23428-1	**Lab No.**	S89769

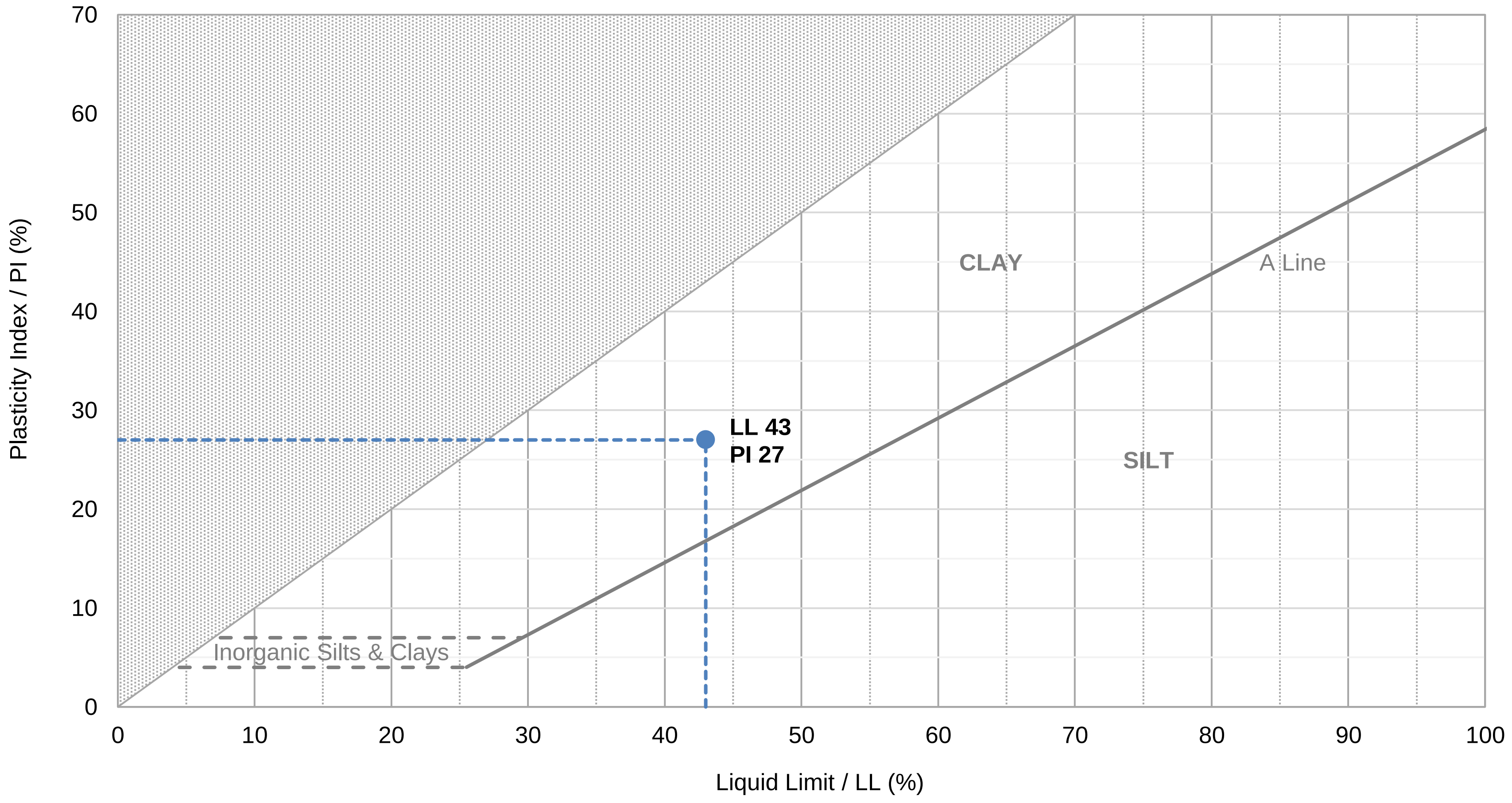
Test Procedure

☑	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**	25/09/2023
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 (%)	**43**
Plastic Limit (%)	**16**
Plasticity Index / PI (%)	**27**
Linear Shrinkage (%)	**11.5**
Condition upon Drying	**Linear**

Notes

NATA

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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

13/10/2023

Date:

MACQUARIE GEOTECH

Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

SOIL CLASSIFICATION REPORT

Client	WSP Australia Pty Ltd	**Source**	PS206292-117 DPS-BH01_3.0-3.45
Address	Level 27, 680 George St, Sydney NSW 2000	**Sample Description**	Silty CLAY
Project	PS206292 - Dalmeny Public School & Greenway Public School	**Report No.**	S103240-PI
Job No.	S25046-1	**Lab No.**	S103240

Test Procedure

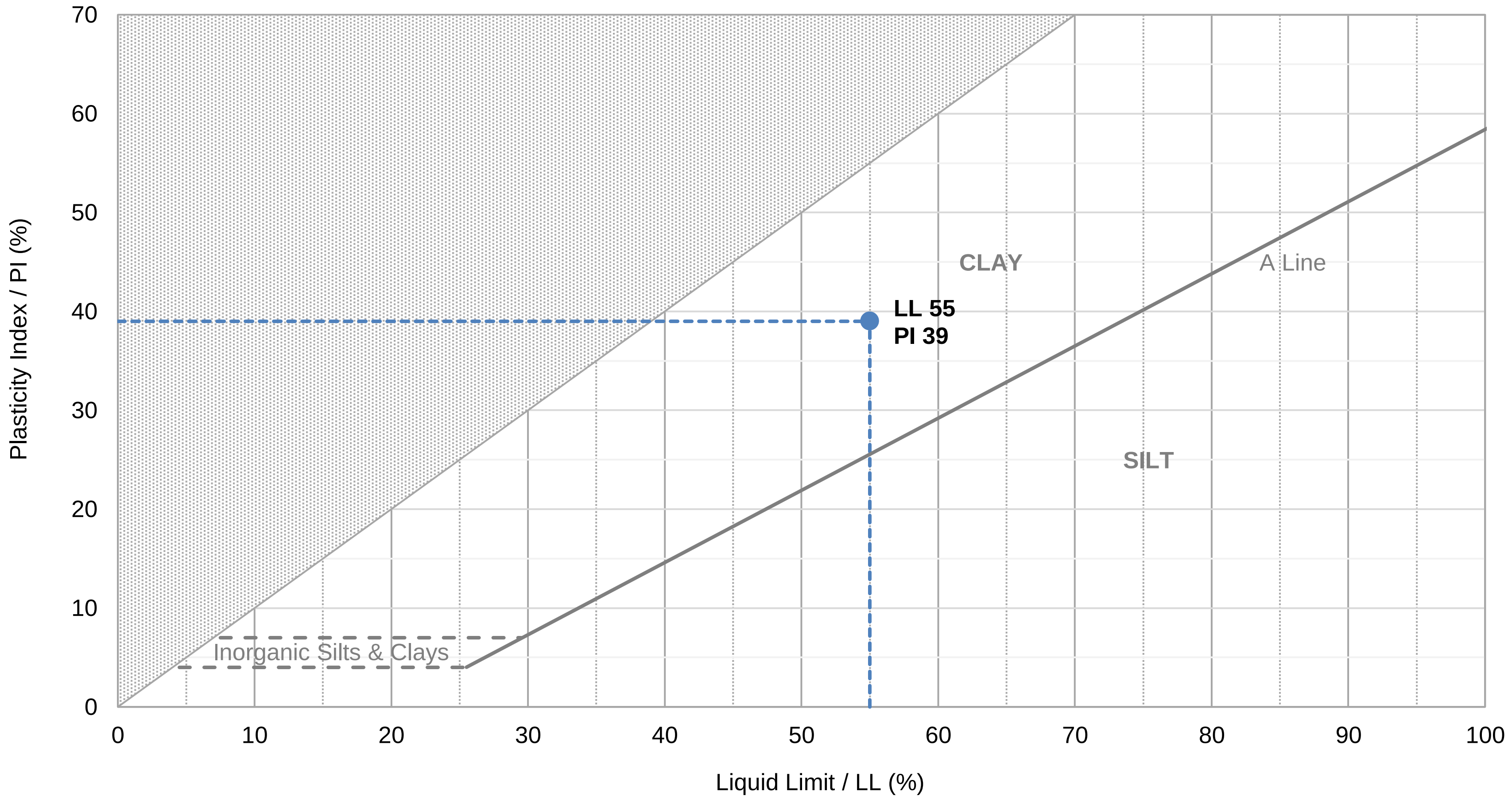
☑ AS1289 3.1.1 Liquid Limit - Four point Casagrande method
☐ AS1289 3.1.2 Liquid Limit - One point Casagrande method
☑ AS1289 3.2.1 Plastic Limit - Standard method
☑ AS1289 3.3.1 Calculation of the Plasticity Index
☑ AS1289 3.4.1 Linear Shrinkage - Standard method

Sampling Sampled by Client - results apply to the sample as received **Date Sampled** 14/01/2025

Preparation Prepared in accordance with the test method **Date Tested** 17/02/2025

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	**Air Dried**

Results

Liquid Limit / LL (%)	**55**
Plastic Limit (%)	**16**
Plasticity Index / PI (%)	**39**
Linear Shrinkage (%)	**12.5**
Condition upon Drying	**Linear**

Notes

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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

19/02/2025

Date:

Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

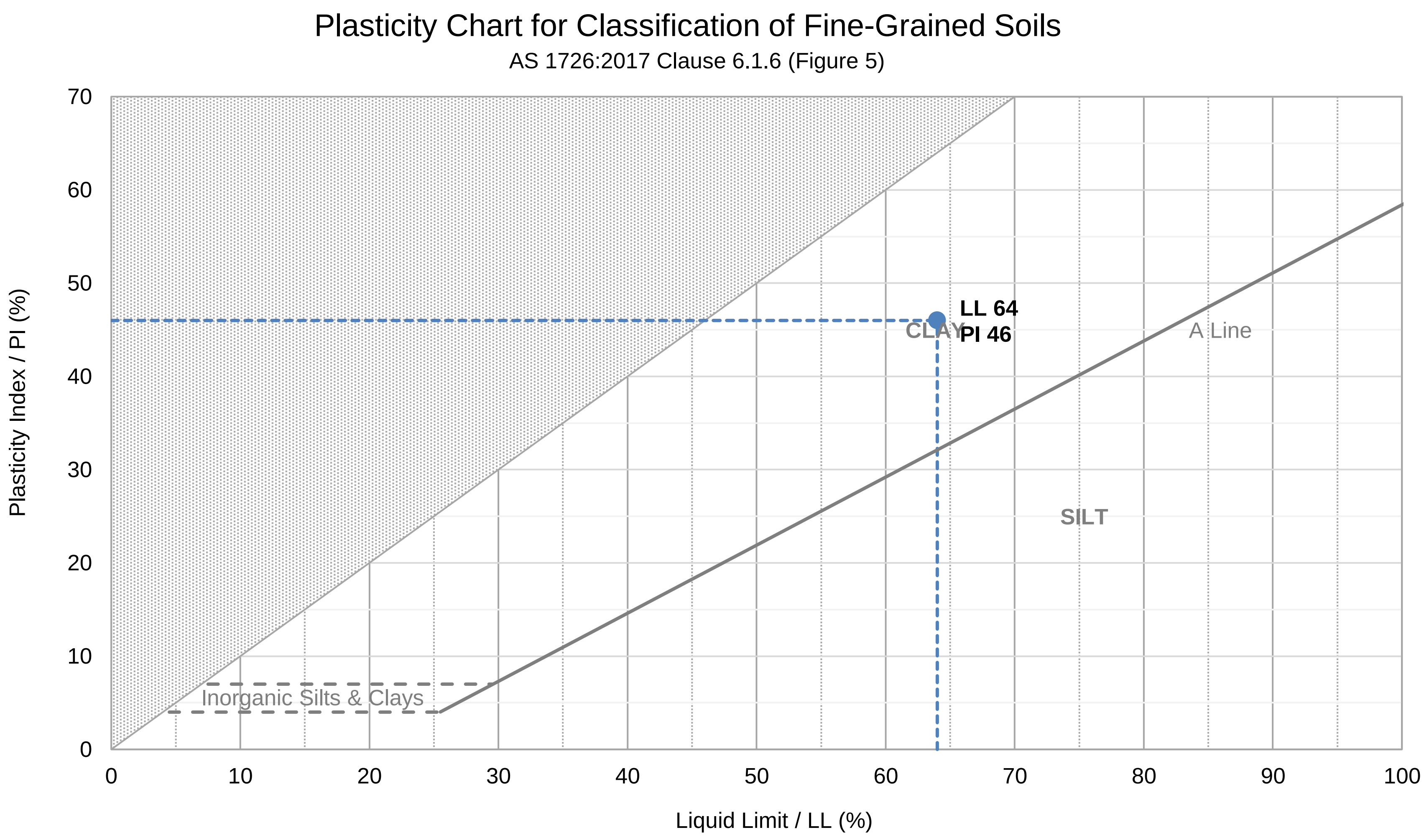
SOIL CLASSIFICATION REPORT

Client	WSP Australia Pty Ltd	**Source**	PS206292-117 DPS-BH02_1.5-1.95
Address	Level 27, 680 George St, Sydney NSW 2000	**Sample Description**	Silty CLAY
Project	PS206292 - Dalmeny Public School & Greenway Public School	**Report No.**	S103241-PI
Job No.	S25046-1	**Lab No.**	S103241

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**	14/01/2025
Preparation	Prepared in accordance with the test method	**Date Tested**	17/02/2025



Preparation

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

Results

Liquid Limit / LL (%)	**64**
Plastic Limit (%)	**18**
Plasticity Index / PI (%)	**46**
Linear Shrinkage (%)	**15.5**
Condition upon Drying	**Linear**

Notes

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NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

19/02/2025

Date:

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Results relate only to the samples tested.

Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

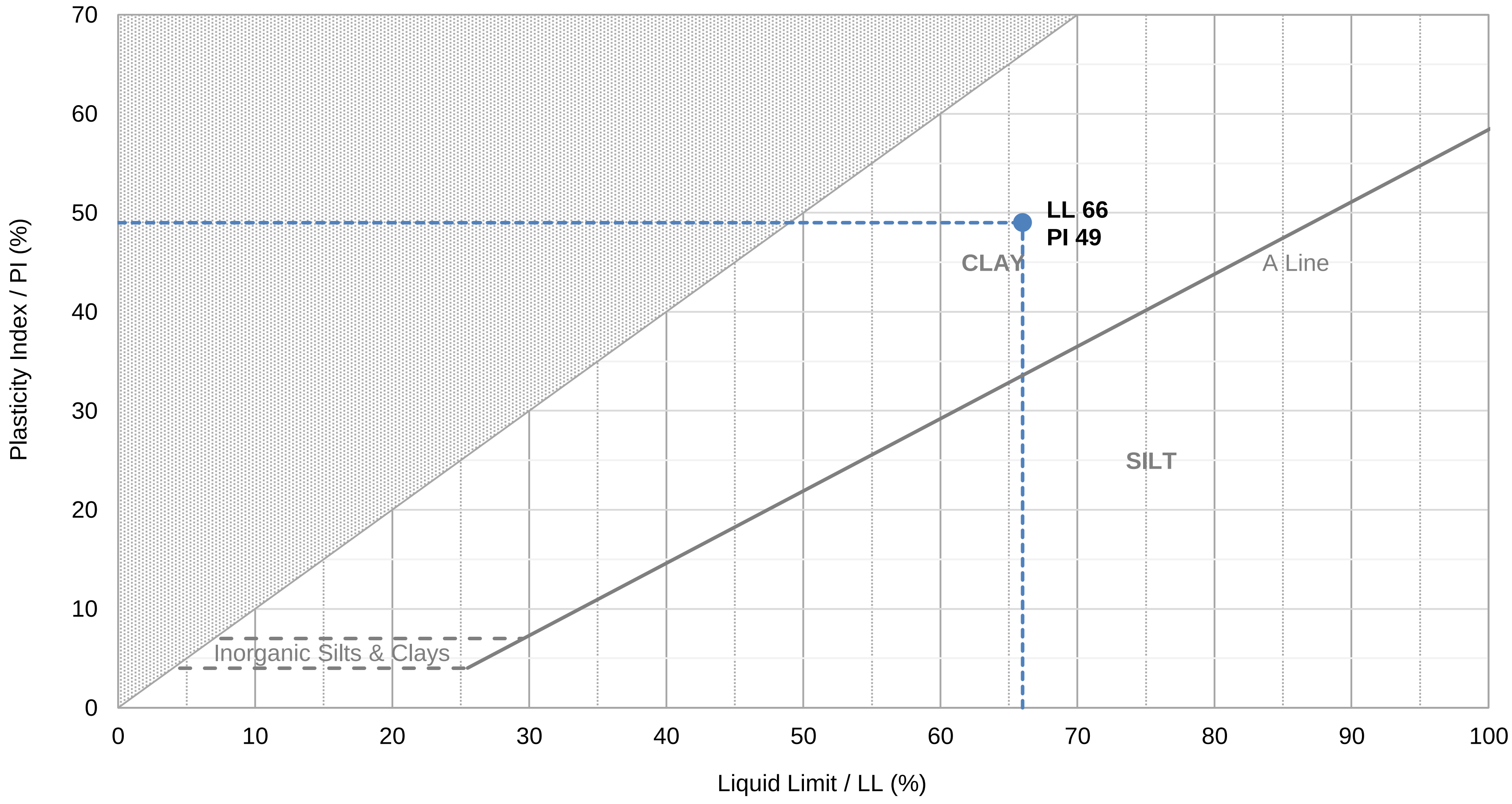
SOIL CLASSIFICATION REPORT

Client	WSP Australia Pty Ltd	**Source**	PS206292-117 DPS-BH03_1.5-1.95
Address	Level 27, 680 George St, Sydney NSW 2000	**Sample Description**	Silty CLAY
Project	PS206292 - Dalmeny Public School & Greenway Public School	**Report No.**	S103242-PI
Job No.	S25046-1	**Lab No.**	S103242

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**	14/01/2025
Preparation	Prepared in accordance with the test method	**Date Tested**	17/02/2025



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	**Air Dried**

Results

Liquid Limit / LL (%)	**66**
Plastic Limit (%)	**17**
Plasticity Index / PI (%)	**49**
Linear Shrinkage (%)	**14.5**
Condition upon Drying	**Linear**

Notes

Accredited for compliance with ISO/IEC 17025 - Testing.

NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

19/02/2025

Date:

Macquarie Geotechnical
14 Carter St
Lidcombe NSW 2141

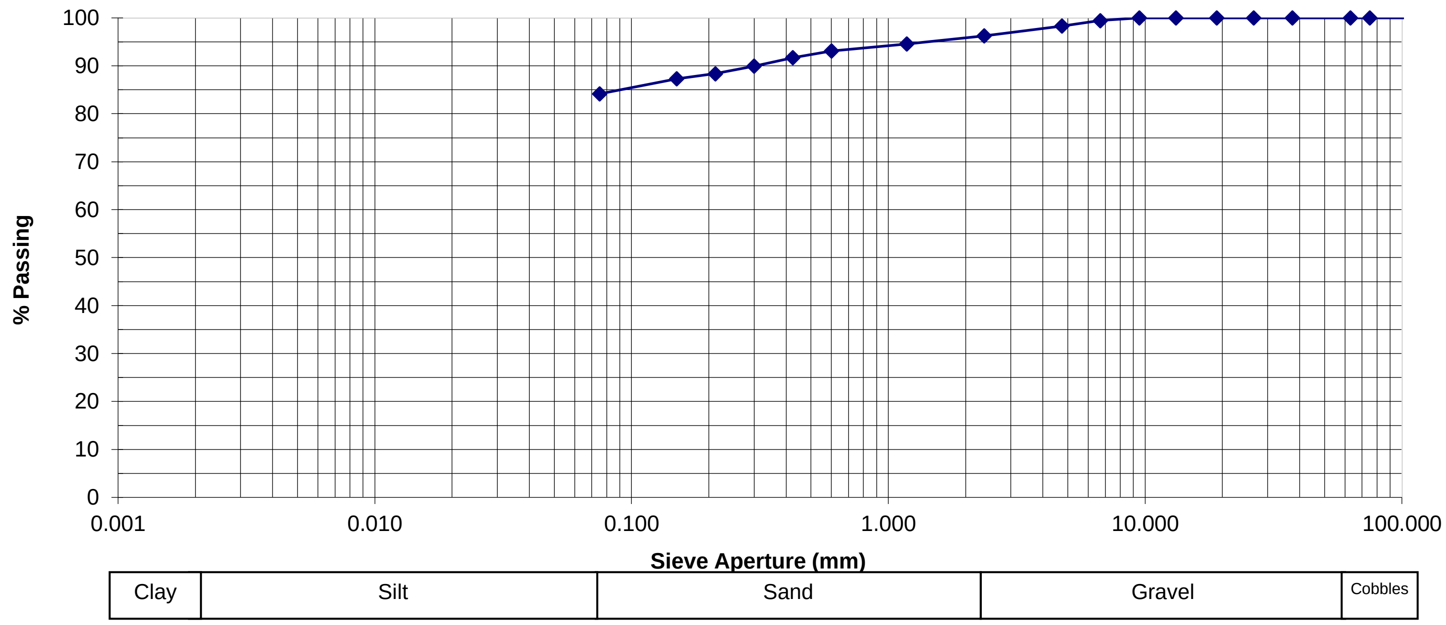
Particle Size Distribution Report

Client	WSP Australia Pty Ltd	**Source**	BH06 2.00-2.50m
Address	Level 27, 680 George St, Sydney NSW 2000	**Sample Description**	Silty CLAY, trace of Sand and Gravel
Project	Dalmeny Public School (PS206292)	**Report No**	S89767-PSD
Job No	S23428-1	**Lab No**	S89767

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** 25/09/2023

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	98	
75	100		2.36	96	
63	100		1.18	95	
37.5	100		0.600	93	
26.5	100		0.425	92	
19	100		0.300	90	
13.2	100		0.212	88	
9.5	100		0.150	87	
6.7	99		0.075	84	

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

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200   fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 334793

Client Details

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

Sample Details

Your Reference	**S23428-1 Dalmeny Public School (PS206292)**
Number of Samples	4 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.

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

Report Details

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

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Results Approved By
Diego Bigolin, Inorganics Supervisor

Authorised By
Nancy Zhang, Laboratory Manager

Misc Inorg - Soil					
Our Reference		334793-1	334793-2	334793-3	334793-4
Your Reference	UNITS	S89767	S89768	S89769	S89770
Date Sampled		25/09/2023	25/09/2023	25/09/2023	25/09/2023
Sample ID		BH06	BH05	BH08	BH04
Depth		2.0-2.50	2.50-2.95	2.50-2.95	2.0-2.50
Type of sample		Soil	Soil	Soil	Soil
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	6.5	5.3	5.2
Electrical Conductivity 1:5 soil:water	µS/cm	430	250	290	520
Chloride, Cl 1:5 soil:water	mg/kg	360	220	250	410
Sulphate, SO4 1:5 soil:water	mg/kg	240	59	130	360

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	-			10/10/2023	[NT]	[NT]	[NT]	[NT]	10/10/2023	[NT]
Date analysed	-			10/10/2023	[NT]	[NT]	[NT]	[NT]	10/10/2023	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	98	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	[NT]	[NT]	[NT]	[NT]	101	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	94	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	88	[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.

Report Comments

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

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www.envirolab.com.au

CERTIFICATE OF ANALYSIS 372396

Client Details

Client	Macquarie Geotech (Sydney)
Attention	D Grover
Address	3 Watt Dr, Bathurst, NSW, 2795

Sample Details

Your Reference	**S25046-1, PS206292 - Dalmeny PS & Greenway PS**
Number of Samples	6 Soil
Date samples received	07/02/2025
Date completed instructions received	07/02/2025

Analysis Details

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

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

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

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

Report Details

Date results requested by	14/02/2025
Date of Issue	13/02/2025

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

Results Approved By
Priya Samarawickrama, Senior Chemist

Authorised By
Nancy Zhang, Laboratory Manager

Misc Inorg - Soil						
Our Reference		372396-1	372396-2	372396-3	372396-4	372396-5
Your Reference	UNITS	S103240	S103241	S103242	S103243	S103244
Sample ID		PS206292-117 DPS-BH01_3.0-3.45	PS206292-117 DPS-BH02_1.5-1.95	PS206292-117 DPS-BH03_1.5-1.95	PS206292-115 GPPS-BH01_1.5-1.95	PS206292-115 GPPS-BH03_1.5-1.95
Date Sampled		14/01/2025	14/01/2025	14/01/2025	15/01/2025	15/01/2025
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	11/02/2025	11/02/2025	11/02/2025	11/02/2025	11/02/2025
Date analysed	-	11/02/2025	11/02/2025	11/02/2025	11/02/2025	11/02/2025
pH 1:5 soil:water	pH Units	5.5	5.1	4.9	5.0	4.8
Chloride, Cl 1:5 soil:water	mg/kg	650	540	900	570	770
Sulphate, SO4 1:5 soil:water	mg/kg	290	270	310	480	740
Electrical Conductivity 1:5 soil:water	µS/cm	530	500	740	610	820

Misc Inorg - Soil		
Our Reference		372396-6
Your Reference	UNITS	S103245
Sample ID		PS206292-115 GPPS-BH04_1.5-1.95
Date Sampled		15/01/2025
Type of sample		Soil
Date prepared	-	11/02/2025
Date analysed	-	11/02/2025
pH 1:5 soil:water	pH Units	5.2
Chloride, Cl 1:5 soil:water	mg/kg	360
Sulphate, SO4 1:5 soil:water	mg/kg	500
Electrical Conductivity 1:5 soil:water	µS/cm	500

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode. 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.
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]
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Date analysed	-			11/02/2025	1	11/02/2025	11/02/2025		11/02/2025	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	1	5.5	5.4	2	102	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	1	650	670	3	117	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	1	290	290	0	119	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	1	530	630	17	103	[NT]

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

Report Comments

MISC_INORG_DRY: pH/EC
Samples were out of the recommended holding time for this analysis.