

Waipapa Taumata Rau, Student Centre and Library

Geotechnical Interpretative Report

Prepared for: University of Auckland

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Client Summary

The University of Auckland are proposing to construct a new multi-storey building (Student Centre & Library) comprising eight levels, including two basement levels (Basement and Lower Ground) and six above-ground levels (Ground and Levels 1 to 5), with rooftop plant in addition, on the corner of Princes Street and Alfred Street, Auckland Central. Tonkin & Taylor Ltd (T+T) has been engaged to conduct geotechnical investigations for the proposed development, to assess the underlying geology and geotechnical characteristics of the site. The table below summarises the key geotechnical considerations for the proposed development[1].

Key Consideration	Background	Key Outcome
Ground conditions / geology	The site is generally underlain by Auckland Volcanic Field (AVF) ash over East Coast Bays Formation (ECBF) sandstone/siltstone at depth. The volcanic ash soil is typically about 2.5–5 m thick. The underlying ECBF soil extends approximately 5-6 m before transitioning into ECBF rock. Competent ECBF rock (N>50) is typically found at 30 – 35 m RL.	The subsurface profile is variable, particularly the depth and quality of the ECBF rock. This variability will influence foundation founding levels, pile socket lengths and excavation conditions. Construction-phase verification of the exposed ground conditions against the adopted ground model will be important.
Groundwater regime	Investigations indicate a shallow perched/percolating groundwater regime, with groundwater levels influenced by rainfall recharge. Historical monitoring associated with the adjacent Hiwa development also indicates groundwater pressures below a fully hydrostatic profile and seasonal recharge effects.	Groundwater drawdown associated with the basement excavation may result in settlement. Temporary groundwater inflows are expected to be manageable using an appropriately designed dewatering system. The pre-drawdown groundwater regime should be adopted for preliminary assessment of construction inflows and groundwater pressures. Further detailed assessment is provided in the Groundwater and Settlement Effects Report.
Basement drainage & consenting	Perched groundwater will need to be accommodated by the proposed basement. Potential solutions include a drained basement, a fully tanked basement, or a combination of tanked walls and a drained floor slab.	A fully drained basement is considered feasible from a groundwater management and effects perspective, subject to detailed design and operational requirements. If a tanked basement is adopted, it will need to resist hydrostatic uplift pressures. A site-specific groundwater assessment is included in a separate Groundwater and Settlement Effects Report.
Neighbouring buildings & infrastructure	The proposed basement is located immediately north of the Hiwa pool hall retaining wall, which comprises bored pile foundations and propping by permanent ground anchors with total lengths up to approximately 21 m. Nearby buildings include the AUSA Building (B322) and Kate Edger Building (B315). Public wastewater and stormwater services are also located within and adjacent to the site.	Interaction with the existing Hiwa ground anchors is an important constraint on the basement and foundation layout. Detailed review of the anchor as-built information and coordination of the proposed foundations will be required at detailed design; controlled anchor decommissioning may be necessary where significant clashes occur. Effects on B322 and B315 are expected to be manageable subject to appropriate design and effects assessment. Existing shallow wastewater services within the site may require protection, diversion or relocation.
Site seismic classification	The site is underlain by stiff soils above rock at about 13 m depth.	The site conditions are assessed as Site Subsoil Class C in accordance with NZS 1170.5:2004.

[1] This summary presents an overview of the key outcomes and geotechnical risks at the site. It should be read in conjunction with the relevant detail included in the main body of the report.

Liquefaction Risk	The materials underlying the site comprise predominantly fine grained AVF volcanic ash and silts and clays of residual ECBF.	Neither the volcanic ash nor ECBF materials are considered susceptible to liquefaction. Overall liquefaction potential at the site is considered negligible.
Foundations	Pile foundations and basement raft options are considered feasible, while individual shallow pad foundations are unlikely to be suitable for the main building because of the building height and variable ground conditions.	Bored cast in-situ reinforced concrete piles founded within competent ECBF rock are the preferred foundation solution. Final pile sizes and socket lengths will be determined based upon structural demands.
Ground retention & excavation support	Temporary excavation support will be required for the proposed two-level basement excavation. Potential systems include bored soldier piles with shotcrete infill with anchors or internal props.	Retention design should account for groundwater, neighbouring structures and services, construction staging and tolerable wall deformation. Long-term lateral support is expected to be provided by the completed building structure. Wall performance should be monitored during excavation, and localised shotcrete or face support should be allowed for where required.
Earthworks / constructability	The proposed two-level basement is anticipated to require significant excavation. Volcanic ash should generally be excavatable using conventional earthmoving plant and ECBF rock using a rock bucket. Volcanic soils are sensitive to remoulding and can soften significantly when disturbed under wet conditions.	Excavation of volcanic soils should preferably be undertaken during dry conditions and exposed subgrades protected from wetting and construction traffic. Unsuitable or disturbed material should be undercut and replaced with engineered hardfill. Allowance should also be made for construction noise and vibration associated with excavation and piling, particularly given the surrounding occupied University buildings.
Plan Change 120 (PC 120)	Auckland Council's PC120 landslide hazard mapping and assessment methodology, as set out in Appendix 24 of the Auckland Unitary Plan, has been reviewed for the site. Under the "Stage 1 – Desktop Study" assessment, Auckland Council's GeoMaps information identifies the susceptibility to shallow and large-scale landslides at the site as Very Low to Low.	PC120 Stage 1 desktop assessment concludes the site as having a Low (Acceptable) landslide hazard risk, for which the PC120 methodology does not require further assessment.

1 Introduction

1.1 General

Tonkin & Taylor Ltd (T+T) have been engaged by Waipapa Taumata Rau, The University of Auckland (UoA) to provide geotechnical consulting services to support the preliminary design phase and substantive application under the FTAA for the proposed UoA Student Centre and Library development on the corner of Princes Street and Alfred Street, Auckland Central.

Geotechnical investigations were undertaken between 12 August 2026 and 10 September 2026 to inform this report.

1.2 Scope of work

The following summarises the scope and objectives of this geotechnical interpretative report:

- On-site geotechnical investigations comprising several machine drilled boreholes, groundwater monitoring and permeability testing.
- Laboratory testing comprising Atterberg Limit tests, consolidated undrained triaxial tests, 1-D consolidation and unconfined compression tests.
- Review of existing geotechnical information and development of a site soil and groundwater model.
- Assessment of geotechnical parameters, identification of site subsoil class and seismic design criteria.
- Preliminary design advice for foundation options.

2 Site description and proposed development

2.1 Site description

The wider property is legally described as Lot 1 DP 151178, Lot 2 DP 151178, SO 44422 and SO 46532 (30–38 Princes Street), comprising approximately 26,200 m² of land. The proposed development (the Site) is located on the northern corner of the wider property, at the intersection of Princes Street and Alfred Street (refer to Figure 2.1).

The Site has a terraced topography comprising a lower northern platform and a higher southern platform. Access to the lower platform is provided by a ramp from Princes Street to the north, while the two platforms are separated by an approximately 2.5 m high internally braced masonry retaining wall.

The lower northern platform was formed following demolition of the previous Maidment Theatre building. Ground levels across much of this platform are relatively flat at approximately RL 42.75 m, with the northern portion rising via the access ramp to the Princes Street level at approximately RL 45.0 m. The southern platform is generally flat at approximately RL 45.25 m.

The Site is currently occupied by the Student Union Building Complex, comprising the Student Quad Unit and Buildings B311 and B312, located in the southern portion of the Site. The northern portion of the Site is currently vacant and is being used as a temporary car park and construction staging area. The current site conditions are shown in Figure 2.2.



Figure 2.1: Site plan.



Figure 2.2: Current site conditions of the northern (left) and southern (right) sections.

2.2 Proposed development

Proposed development plans prepared by Warren and Mahoney Architects New Zealand Ltd have been provided with the substantive application.

The proposed development involves the demolition of the existing Student Union Building Complex (Student Quad unit and Buildings B311 and B312) and construction of a new Student Centre and Library within the northern portion of the wider property at 30–38 Princes Street, Auckland Central. The proposed building comprises eight levels, including two basement levels (Basement and Lower Ground), and six above-ground levels (Ground and Levels 1 to 5), with rooftop plant in addition. The development will accommodate new library facilities, study spaces, social and event spaces, a visitor hub, and associated supporting facilities. The proposed development layout is shown in Figure 2.3 to Figure 2.5 below.

Based on the 100% Fast Track Application Plans provided by W&M, the lower basement floor level extends up to 9.5 m below existing ground level of Princes Street, and 6.5 to 9.5 m below current level on Alfred Street. The proposed basement will be located immediately north of the existing Hiwa Recreation Centre (Hiwa) pool hall retaining wall system, with a minimum separation of less than 1 m based on the current concept layout. The locations of the proposed basement and Hiwa basement are shown in Figure 2.4.



Figure 2.3: Development plan with markup of approximate site area (Base plan source: WAM).

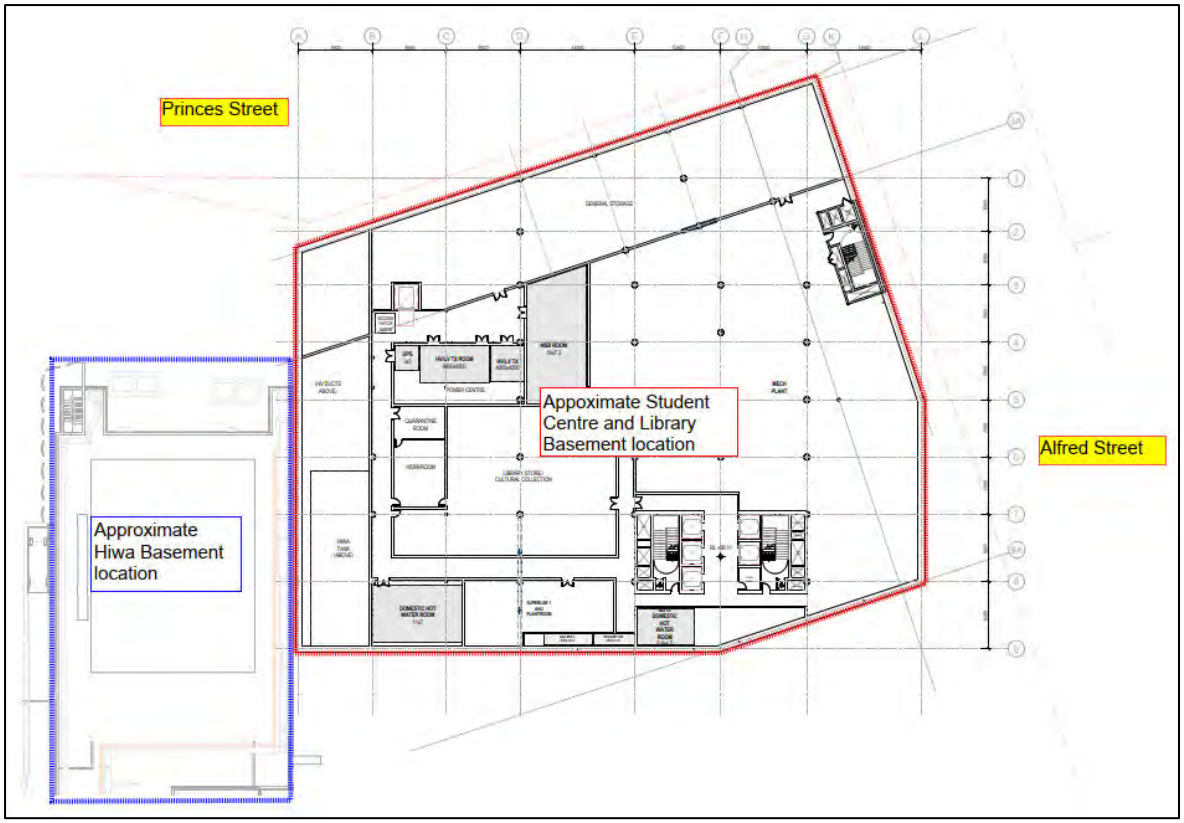

Figure 2.4: Design plans with markup of basement locations (Base plan source: WAM).

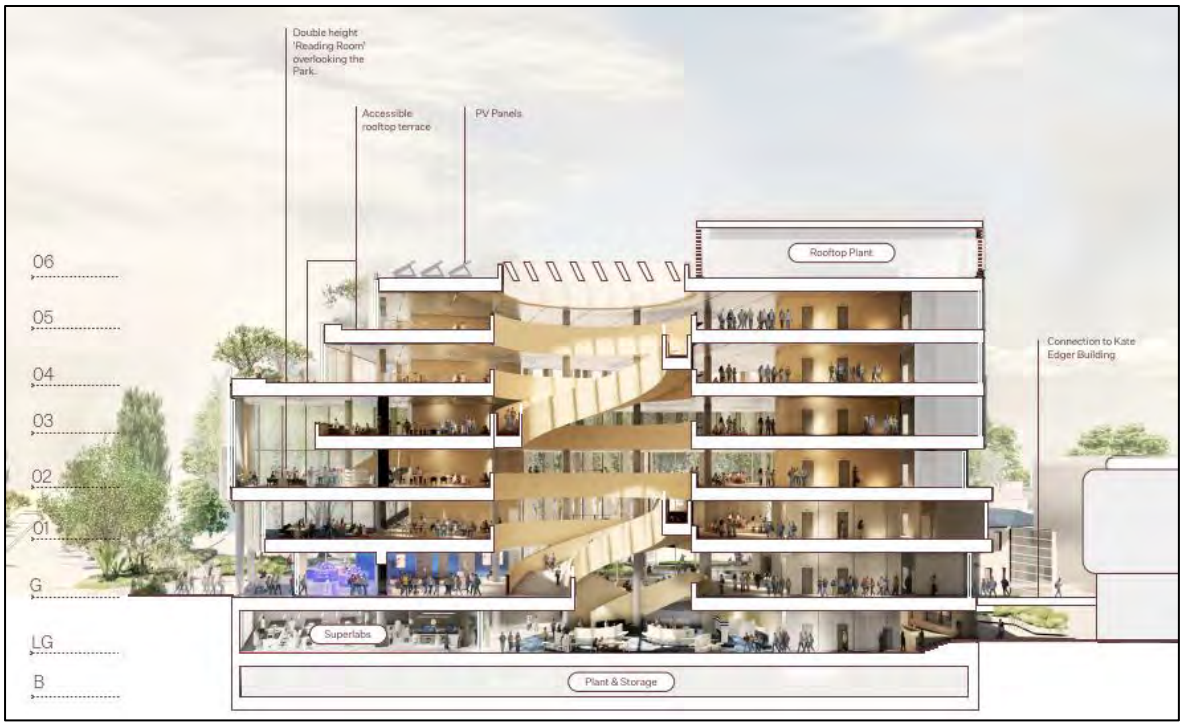

Figure 2.5: New UoA Student Centre and Library elevation (source: WAM).

3 Geotechnical site investigation

3.1 Published geology and geological context

The published geology for the area, Geology of the Auckland Urban Area[2] indicates that the Site is underlain by volcanic soils and rock of the Auckland Volcanic Field (AVF). This typically comprises Lithic tuff, comprising comminuted pre-volcanic materials with basaltic fragments, and unconsolidated ash and lapilli deposits of well-sorted basalt and basanite fragments.

As shown in Figure 3.1, the area towards the south of the Site is underlain by East Coast Bays Formation of Waitemata Group, comprising alternating sandstone and mudstone with variable volcanic content and interbedded volcaniclastic grits.

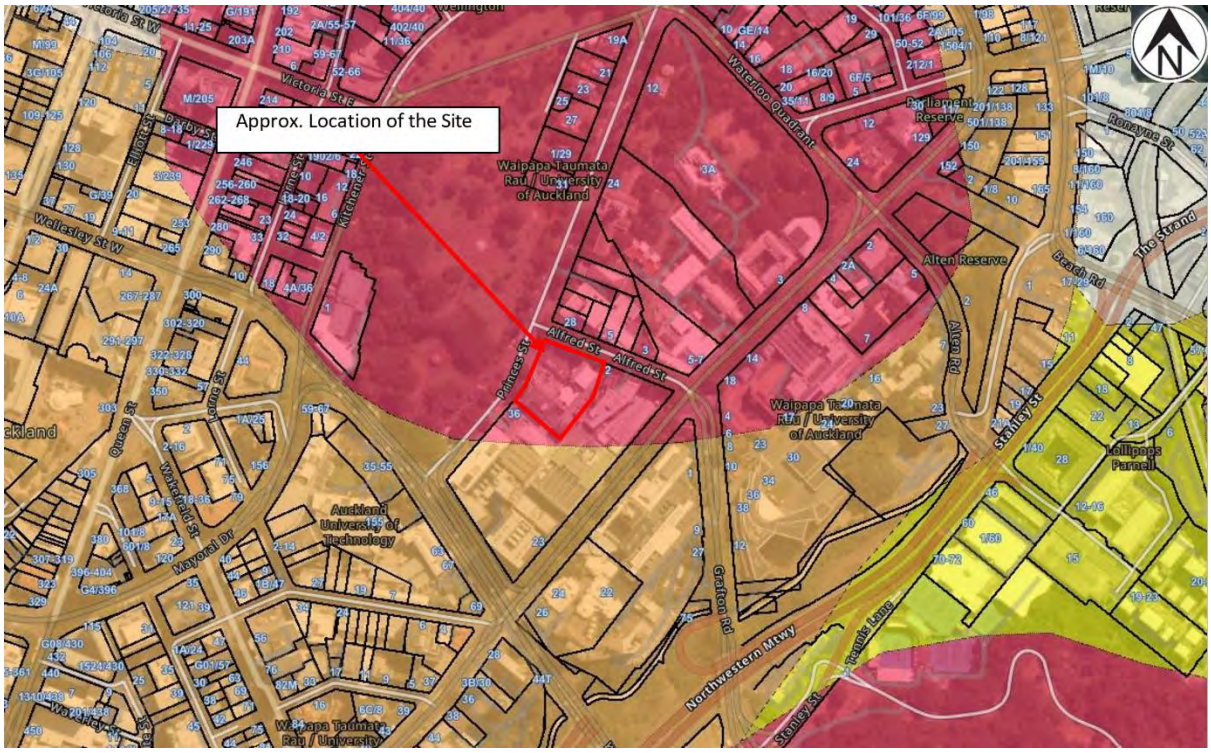

Figure 3.1: Detailed GNS Geology layers (ranging from 75k - 50k scale). Sourced from https://data.gns.cri.nz/.

3.2 Historical geotechnical investigations

A review of the T+T internal project database identified four relevant projects completed within the Site and the immediate surrounding area (refer to Figure 3.2). These investigations provide relevant subsurface information for this preliminary assessment and are summarised in Table 3.1.

Relevant investigation locations and borehole logs are included in Appendix B.

[2] Kermode, L.O. (1992). *Geology of the Auckland Urban Area*. Scale 1:50,000, Institute of Geological & Nuclear Sciences geological map 2.1 sheet + 63pp. Institute of Geological & Nuclear Sciences Ltd. Lower Hutt, N.Z.



Figure 3.2: Nearby projects.

Hiwa Recreation and Wellness Centre (Hiwa) (B310) – T+T ref 1001930

T+T undertook geotechnical investigations and provided geotechnical design recommendations for the Hiwa located immediately south of the proposed development and completed in 2024.

The Hiwa development involved demolition of the existing buildings and construction of a six-storey building with varying basement levels, including basement retaining walls and swimming pool basement walls up to approximately 9 m high. The project is particularly relevant to the current development because of its proximity to the proposed basement excavation and the presence of existing permanent ground anchors adjacent to the Site.

Student Union Complex (B311 & B312) – Seismic Strengthening – T+T ref 1007780

T+T provided geotechnical services for the foundation strengthening works to Building B312B, the demolition of the southern portion of Building B312B and the atrium between Buildings B312B and B311A as part of the Hiwa development. The works were completed in 2020. These buildings are located within the footprint of the planned Student Centre and Library development site.

Kate Edger Building (B315) & New Boiler Room – T+T ref 14218 & 1007685

T+T undertook the geotechnical investigations and provided foundation recommendations for the Kate Edger Building (B315) and subsequently completed a geotechnical investigation for the new boiler room associated with facility upgrades. The Kate Edger Building was completed in 2003, while the boiler room upgrade was completed in 2020. These works are located immediately east of the Site.

Student Centre – T+T ref 754

T+T undertook the geotechnical investigations and provided foundation recommendations for the Student Union Complex (formerly known as Student Centre). These works are within the proposed development site and can provide previous site-specific geotechnical data for the development.

Table 3.1: Summary of previous geotechnical investigation information

Reference	Summary of Information
T+T (June 2019, Ref. 1007780) Student Union Complex Upgrade (B312B)	Two Scala penetrometer tests (Scalas) to depths of 0.45 m bgl and 3.9 m bgl within the Building B312 atrium.
T+T (April 2019, Ref. 1007685) Kate Edger Building (B315) – New Boiler Room	Two hand-auger boreholes to depths of 2.5–2.7 m bgl at the proposed boiler room.
T+T (May 2001, Ref. 14281) Kate Edger Building (B315)	Seven machine-drilled boreholes to depths of 10.0–19.3 m bgl and one hand-auger borehole to 4.2 m bgl across the Kate Edger Building platform.
T+T (February 2018, Ref. 1001930.1000) Recreation and Wellness Centre	Four machine-drilled boreholes to depths of 9.0–19.5 m bgl. Groundwater monitoring installations comprising one dual standpipe piezometer, one standpipe piezometer and two multilevel piezometers. Laboratory testing included one one-dimensional consolidation test, two consolidated undrained triaxial tests with pore pressure measurement (CU tests), and four unconfined compressive strength tests.
T+T (December 1964, Ref: 754) Student Centre	Seven machined drilled boreholes to depths ranging from 28 ft (8.5 m bgl) to 42 ft (12.8 m bgl). Five consolidation tests and four undrained triaxial compression tests were carried out. The report also includes a summary of Ministry of Works' five previous boreholes on site, investigation logs missing.

3.3 Project specific geotechnical investigations

T+T undertook geotechnical investigations at the concept design stage of the UoA Student Centre and Library. The work was carried out between 12 August to 10 September 2026 and comprised:

- 6 No. machine-drilled boreholes to 25 m depth.
- Installation of 2 No. standpipe piezometer and 1 No. multi-stage piezometer; and
- 2 No. permeability tests undertaken.

The purpose of the recent project specific investigations was to improve our understanding of the subsurface conditions and allow further development of the ground model at the Site.

The locations of the investigations are shown on the site plan in Appendix A and summarised below. Site-specific investigation logs are provided in Appendix C.

3.3.1 Machine boreholes

The machine boreholes (BH01 – BH06) were carried out using a rotary coring drilling rig, supplied and operated by Perry Geotech Ltd, under the supervision of a T+T geotechnical engineer. Boreholes BH02 and BH03 were completed using a track mounted rig, while BH01, BH04, BH05 and BH05 were completed using a tractor mounted rig suitable for navigating restricted spaces. The boreholes were all advanced using HQ coring methods and terminated 25 m below existing ground level (mbgl), having proved a sufficient depth of material based on our appreciation of the proposed structures.

In situ Standard Penetration Testing (SPT) was carried out at regular (1.5 m) intervals within the boreholes. While in-barrel hand-held shear vane tests were completed where cohesive soils were encountered.

Push tube sampling was carried out within the boreholes, all at approximately, RL 39 m and RL 37 m, respectively. There were instances where push tubes were not attempted due to the geology at those depths, this has been noted in the investigation logs, in Appendix C.

Summary of borehole details are presented in Table 3.2 below.

Table 3.2: Machine borehole summary

BH ID	Location (NZTM2000)[1]		Ground Surface Elevation RL (mRL)[2]	Termination Depth (m bgl)	Install
	Easting (m)	Northing (m)			
BH01 (PZ)	1757672.09	5920112.33	45.52	25	50 mm PVC Standpipe piezometer
BH02	1757703.53	5920114.53	41.95	25	Backfill
BH03 (PZ)	1757689.38	5920140.43	45.18	25	Dual-Nested 38 mm PVC Piezometer
BH04 (PZ)	1757727.20	5920125.85	42.63	25	Multi-Stage Piezometer
BH05	1757693.92	5920072.64	45.59	25	Backfill
BH06	1757689.40	5920093.26	45.55	25	Backfill

[1] Borehole locations were obtained via hand-held GPS and have an expected positional accuracy of ± 3 m.

[2] Ground surface elevations are based on survey plans supplied by BNWalker[63], with an expected accuracy of ± 0.2 m.

3.3.2 Piezometer installation

To allow ongoing continuous monitoring of groundwater, and for permeability testing at various depths within the upper soils and the underlying ECBF rock, the piezometer information is presented in Table 3.3.

Table 3.3: Piezometer installation details

BH ID	Collar RL (mRL)	Screen Depth (m)	Response Zone (m)	Geological Unit Across Response Zone	Type
BH01 (PZ)	45.45	6.5 – 8	6 - 9	Residual ECBF Soils (Clayey Silt/Silt)	Standpipe piezometer
BH03 (Shallow)	45.11	4.5 – 6	4 - 7	Residual ECBF Soils (Silt to clayey silt)	Standpipe piezometer
BH03 (Deep)	45.11	8.5 – 10	8 - 11	HW ECBF (Sand/silt)	Standpipe piezometer
BH04 (PZ)	42.63	Varies (See Note)	-	-	Multi-stage piezometer

Note: Refer to Appendix E for multi-stage piezometer installation as-builts.

[3] Topographical As-Built Survey, Drawing Set 7119-700-01-R1, dated 27 August 2026

Details of the piezometer installation records are given on the borehole logs attached in Appendix C, piezometer as-builts are also provided in Appendix D.

3.4 Laboratory testing

Recovered soil and rock samples from the 2026 site investigations were tested at an IANZ accredited laboratory, Geotechnics Ltd. Selected testing was completed to confirm soil and rock classification as follows:

- 4 No. Atterberg limits tests, NZS4402 Test 2.2, 2.3 & 2.4 (a);
- 3 No. 1-D Consolidation (Primary Consolidation, 7 Cycles), NZS 4402 Test 7.1 (b);
- 5 No. Unconfined Compressive Strength tests, NZS 4402 Test 6.3.1 (a);
- 3 No. three-stage CIU triaxial tests, ISO 17892-9:2018 Part 9; and
- 6 No. natural water contents, NZS 4402:1986 Test 2.1 on all the samples used for the 1-D consolidation and CIU triaxial tests.

The lab test results are summarised in the following tables and are presented in Appendix E.

Table 3.4: Summary of natural moisture content and bulk density

Investigation ID	Top of sample depth (m bgl)	Inferred geological unit	Natural moisture content (%)	Bulk density (t/m^3)
BH03	6.4	Residual ECBF soils to CW ECBF	47	1.70
BH04	3.6		44	1.77
BH05	6.4		39	1.81
BH01	8.4		33	1.88
BH03	8.4		35	1.85
BH05	7.7		37	1.85

Table 3.5: Summary of Atterberg Limits tests

Investigation ID	Top of sample depth (m bgl)	Inferred geological unit	Atterberg Limits		
			Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)
BH02	3	Residual ECBF soil to CW ECBF	81	28	52
BH03	6		92	30	62
BH05	6		80	23	56
BH06	6		80	25	55

Table 3.6: Summary of 1-D Consolidation tests

Investigation ID	Top of sample depth (m bgl)	Inferred geological unit	Stress range (kPa)	Coefficient of volume compressibility, m_v (m^2/MN)
BH03	6.4	Residual ECBF soil to CW ECBF	100 to 200	0.23
BH04	3.6		50 to 100	0.06

Table 3.7: Summary of unconfined compressive strength tests

Investigation ID	Top of sample depth (m bgl)	Inferred geological unit	Unconfined compressive strength (MPa)	Young's Modulus (MPa)
BH01	24.7	ECBF Rock (N>50)	0.34	23
BH02	20.4		2.7	613
BH04	12.8		0.42	36
BH05	8.0		2.9	458
BH06	15.8		0.57	42

Table 3.8: Summary of Consolidated-Undrained (CU) triaxial test

Investigation ID	Top of sample depth (m bgl)	Inferred geological unit	Natural moisture content (%)	Bulk density (t/m^3)	Effective strength	
					Friction angle (°)	Cohesion (kPa)
BH01	8.4	Residual ECBF soil to CW ECBF	33	1.88	30	30
BH03	8.4		35	1.85	35	8
BH05	7.7		37	1.85	33	18

4 Subsurface conditions

4.1 Ground model and site stratigraphy

Based on our literature review and site investigations outlined in Sections 3.2 and 3.3, the subsurface conditions at the Site generally comprise the following geological units, in order of increasing depth:

- **Pavement/basecourse:** Existing pavement and basecourse materials are present across the developed portions of the Site.
- **Fill:** Fill is present beneath the pavement/basecourse and generally comprises reworked volcanic ash.
- **Auckland Volcanic Field (AVF) soils:** Volcanic ash deposits underlie the fill across the Site. The depth and extent of these deposits vary with the local ground elevation, with locally deeper volcanic soils identified in historical borehole records.
- **Residual / completely weathered East Coast Bays Formation (ECBF) soils:** The volcanic soils are underlain by residual ECBF soils, generally comprising silty clay to clayey silt.

- **Highly to moderately weathered ECBF:** Residual soils grade with depth into increasingly weathered ECBF materials.
- **Slightly to unweathered ECBF:** At greater depth, the ECBF typically comprises very weak, alternating sandstone and siltstone rock.

A summary of the geotechnical ground model is presented in Section 4.2 below.

An ECBF rock contour plan is presented in Appendix A, showing the depth (m RL) in which the ECBF rock is inferred to be competent (SPT N>50).

4.2 Geotechnical unit summary

A summary of the geotechnical units encountered across the Site is presented in Table 4.1 below. The inferred geological profile at the Site has been based on the historic and current investigations outlined in Section 4.1. Notes are included describing the variability.

Table 4.1: Summary of geological units encountered in recent investigations

Unit	Inferred depth to top of unit meters below ground level (mbgl)	Approx. thickness (m)
Fill/Pavement/basecourse	0.0	0-0.9
Volcanic ash	0.4 - 0.9	2.5 - 5
Residual ECBF soil to CW ECBF	3 – 6	5 - 6
HW-MW ECBF Rock (N 20 -50+)	10 – 13	4 – 6
SW-UW ECBF Rock (N>50)	16 – 17	N/A

Note: Approximately 2.5 – 5 m of volcanic ash were encountered through the Site, however nearby historical investigations on Symonds Street showed volcanic ash up to 9 m depth (1996 investigations).

4.3 Groundwater

As summarised in Section 3.3.2, multiple standpipe piezometers at varying depths have been installed at three locations across the Site to allow detailed definition of the groundwater profile. Deeper piezometer screens are positioned in the zone below the proposed excavation level and were generally screened in the ECBF rock units. The shallow piezometer screens are within the residual ECBF soil units. Automatic level loggers were installed in each standpipe piezometer following completion of drilling. Preliminary level logger data and manual readings have been undertaken intermittently since drilling completion, this information is presented in Table 4.2.

Graphed data from this groundwater monitoring has been included with T+T's Groundwater Assessment Report for the Site.

Additional groundwater conditions at the Site have been inferred from the 1996 geotechnical investigation for the Kate Edger Building, located immediately east of the Site, as well as 2017-2018 groundwater monitoring undertaken for the Hiwa, located immediately south of the Site. A summary of the available groundwater information is presented in Table 4.3 and Table 4.4, respectively.

Table 4.2: Recent groundwater level summary

Location	Monitoring dates	Response zone (m RL)	Average Groundwater level (m RL)
BH01 (PZ)	10/09/2026 – 13/10/2026	36.5 – 39.5	43.0
BH03 (PZ) - Shallow	18/08/2026 – 13/10/2026	38.2 – 41.2	41.7
BH03 (PZ) – Deep	18/08/2026 – 13/10/2026	34.2 – 37.2	40.7
BH04 (PZ) – Multi-Zone Piezometer	28/09/2026 & 07/10/2026 & 12/10/2026	40.1 – 39.2	40.9
		37.1 – 36.2	41.8
		34.1 – 33.2	37.5
		32.6 – 28.7	35.4
		28.2 – 25.7	29.8
		25.2 – 24.4	28.7
		22.1 – 21.1	26.4

Note:

1. Groundwater monitoring results are preliminary, refer to the Groundwater report for detailed groundwater assessment.
2. Groundwater levels measured in the piezometers may be a result of perched groundwater instead of regional groundwater regime, detail of such will be discussed in the groundwater assessment report.

Table 4.3: Groundwater level observation summary (1996 Kate Edger Building)

Location	Monitoring dates	Groundwater elevation (m RL)
1996 BH1	10/5/1996	36.0
1996 BH2	15/4/1996	Dry on completion
1996 BH3	10/5/1996	39.5
1996 BH4	15/4/1996	Dry on completion
1996 BH5	15/4/1996	Dry on completion
1996 BH6	10/5/1996	40.5
1996 BH7	10/5/1996	41.5
1996 BH8	10/5/1996	39.2
1996 BH9	15/4/1996	39.8

Table 4.4: Groundwater level monitoring summary (2017/1028 Hiwa Recreation Centre)

Location	Monitoring dates	Base of screen (mRL)	Base of response zone (mRL)	Measure groundwater elevation range (mRL)	Construction phase minimum elevation (mRL)
BH103A	Nov 2017 – Apr 2019	37.5	37	40.1 – 40.6	-
BH103C	Nov 2017 – Apr 2019	38.5	38	40.3 – 41.5	-
		36.5	36	36.6 – 38.0	-
		34.5	34	36.5 – 38.0	-
		32.5	32	35.9 – 36.4	-

Location	Monitoring dates	Base of screen (mRL)	Base of response zone (mRL)	Measure groundwater elevation range (mRL)	Construction phase minimum elevation (mRL)
		30.5	29.5	35.7 – 38.0	-
BH201	Nov 2017 – Feb 2020 (investigation) Mar 2021 – Sep 2022 (construction)	44.1	43.6	Dry	Dry
		41.7	41.1	Dry – 43.1	Dry
		38.7	38.1	39.9 – 41.6	Dry
		35.7	35.1	38.7 – 39.6	35.9
		32.6	32.1	35.5 – 36.2	32.9
BH203	Dec 2018 – Apr 2019	40.0	39.3	40.7 – 41.1	-
		32.5	31.8	37.8 – 38.0	-

Note: 1. Groundwater data filtered for erroneous data.

2. Assumed dry where levels recorded below 100 mm of base of screen.

The recorded groundwater pressure profile range at the borehole monitoring locations undertaken as part of the Hiwa project and located to the south of the Site are shown in Figure 4.1 below.

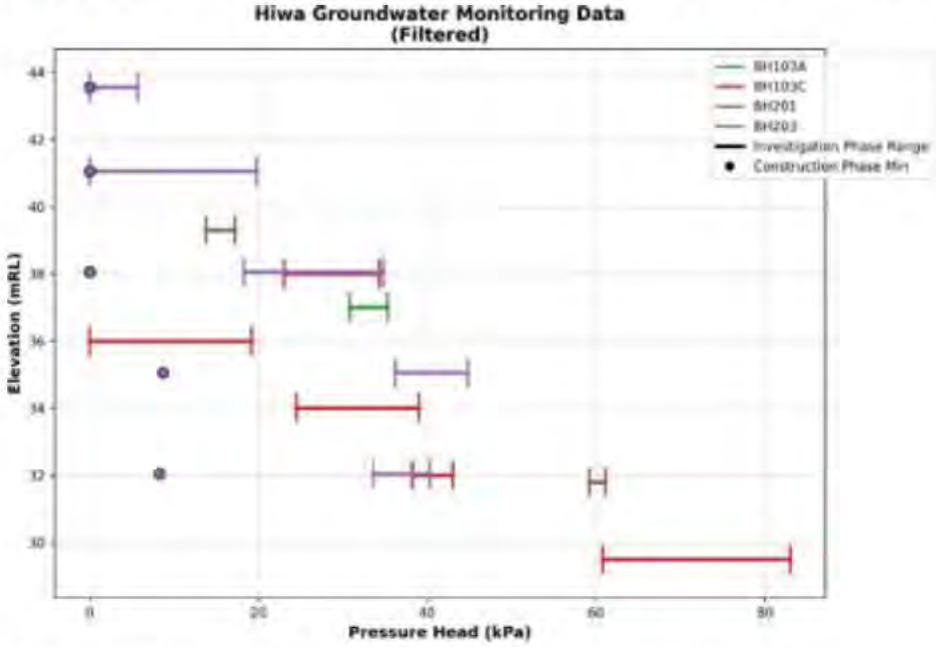

Figure 4.1: Groundwater pressure profiles recorded during Hiwa project.

4.3.1 In-situ permeability testing

Two slug tests were conducted within the standpipe piezometers, which combines a rising head test and a falling head test, on 10 September 2026 to assess the hydraulic permeability of the residual ECBF soils. Results of the permeability testing undertaken is presented in Appendix F.

The data was analysed using the Hvorslev and Bouwer & Rice methods to interpret the flow rate within two of the standpipe piezometers. Calculated hydraulic conductivities for each test are present below in Table 4.5.

Table 4.5: Summary of slug test in September 2026

Slug Test Results				
Location	BH01 (PZ)		BH03 (PZ)	
Piezometer screen depth (m)	6.5 - 8		8.5 - 10	
Screen depth geological unit	Residual ECBF (Clayey SILT/Silty CLAY)		Residual ECBF (Silty SAND to SILT, grading to highly weathered SANDSTONE)	
Test date	10 September 2026		10 September 2026	
Hydraulic conductivity (m/s) – Falling head test	Hvorslev	Bouwer & Rice	Hvorslev	Bouwer & Rice
	1.91×10^{-7}	1.45×10^{-7}	2.23×10^{-7}	1.69×10^{-7}
Hydraulic conductivity (m/s) – Rising head test	Hvorslev	Bouwer & Rice	Hvorslev	Bouwer & Rice
	1.58×10^{-7}	1.20×10^{-7}	1.53×10^{-7}	1.16×10^{-7}

The hydraulic conductivity values are within the expected range for silty sand/silt material. Table 4.6 presents the adopted hydraulic conductivity for each geological unit, based on the results of the slug test and previous historical investigations.

Table 4.6: Adopted design hydraulic conductivity

Geological Unit	Coefficient of horizontal hydraulic conductivity (m/s)
Historic Fill	$1.5x10^{-7}$
AVF	$1.5x10^{-7}$
Residual ECBF soils	$1.5x10^{-7}$
HW to MW ECBF	$2.0x10^{-7}$
SW to UW ECBF Rock	$3.0x10^{-7}$

5 Geotechnical considerations

Based on the developed subsurface model and our understanding of the proposed building concept, the key geotechnical considerations for the proposed development include:

- Consideration for effects on neighbouring structures and infrastructure.
- Groundwater regime, including potential drawdown effects.
- Earthworks construction.
- Ground retention deformations.
- Foundation recommendations.
- Seismic considerations.

Recommendations and opinions in this report are based on data from discrete boreholes at point locations. The nature and continuity of the subsoil away from the test locations is inferred so it must be appreciated that actual conditions may vary from the assumed model.

Appropriate validation during the construction phase comparing exposed ground conditions with modelling assumptions will be important.

The sections below summarise our findings and assessments for the Site.

5.1 Consideration for neighbouring buildings and infrastructure

5.1.1 General

The potential effects of the proposed development on the surrounding buildings and services have been assessed, given their close proximity. The assessment findings are summarised below. Detailed retention displacement and groundwater drawdown induced settlements are presented in the Groundwater and Settlement Effects Report (T+T ref: 1103046-RPT-GEO-106).

5.1.2 Building B3120, Hiwa Recreation and Wellness Centre (Hiwa)

The multi-storey portion (Zone 1 and 2 in Figure 5.2) of the Hiwa building fronting Symonds St is supported on pile foundations with a variable basement FFL between RL 34.9 and 38.1 m. The pool hall portion (Zone 3 in Figure 5.1) to the rear of the building has a FFL of about RL 34.9 m and is supported on shallow foundations bearing on ECBF rock. The westernmost portion of the building beyond the pool hall is founded at a higher level than the pool hall on a combination of piles and footings with FFLs between 38.1 and 41.3 m.

The existing northern (Gridline H) basement wall of the Hiwa pool hall, adjacent to the existing Building B312 and the proposed basement, is retained by 900 mm diameter bored piles at 1.8 m centres with 'permanent' ground anchors at 1.8 m centres. The design level of the anchor headworks on the internal side of the pool hall piles was RL 41.45m and they are inclined at 45° below the horizontal. A brief review of as-built information indicates the anchor lengths are up to 21 m. The anchors were designed for redundancy with allowance of every 3rd anchor to be cut for future building piles at the current development site.

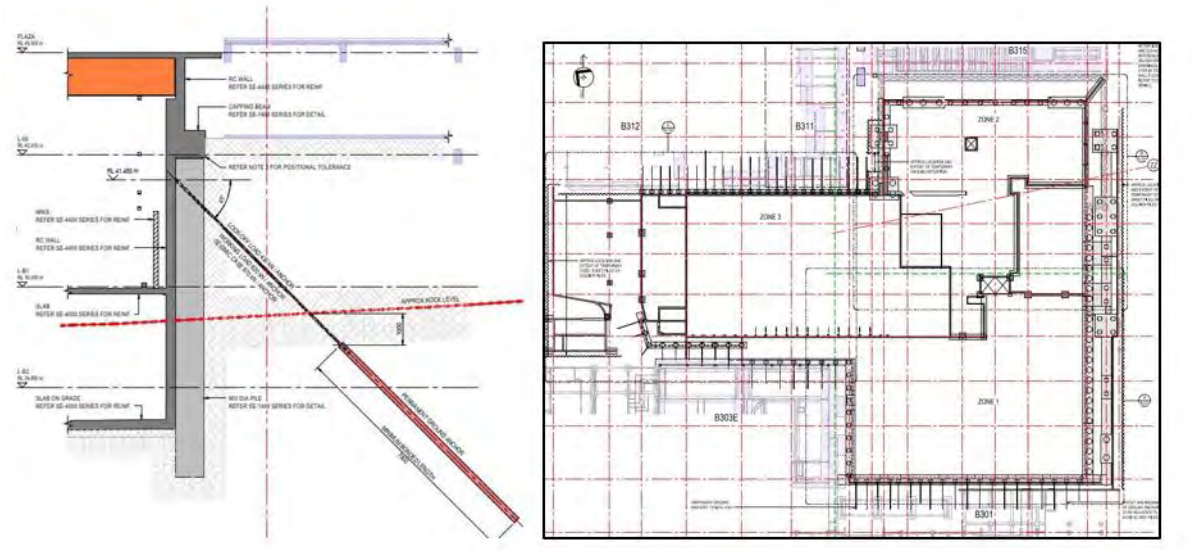

Figure 5.1: Typical section Hiwa Grid H Anchors and Hiwa Anchor Plan (Beca, DWG 5925207-310-SE-1231).

The architectural plan indicates the basement level at approximately 36 mRL and in the order of 1 m of separation between the two basements (refer Figure 2.4). As such, decommissioning of the anchors where the two basements overlap will be required. A detailed staged decommissioning plan is required to ensure the loads on the pool hall wall remain balanced and within design allowance, while excavation is ongoing for the new proposed basement.

The headworks of the pool hall anchors are fully encapsulated and behind an internal wall. Destressing would need to occur within the ground outside of the building. A staged thermal destressing methodology would be required, instead of directly shearing (cutting) the tensioned

anchor strands. The works should be undertaken by experienced personnel under tightly controlled conditions. Real time monitoring of the Hiwa wall deflection would be critical - to be implemented during the destressing process. Consideration may be required for protective shielding within the pool hall should an anchor snap prematurely.

5.1.3 Building 322, Auckland University Students Association

The Auckland University Students' Association (AUSA) Building (B322) is a two-storey building located immediately east of the proposed development. The building has a slightly elevated entrance, does not contain a basement and is identified as a Historic Heritage Place under the Auckland Unitary Plan.

At the time of preparing this report, no foundation information for Building B322 was available. However, based on the age, scale and form of construction, the building is considered likely to be supported on shallow foundations. The anticipated founding depth is approximately 0.5–1.0 m below the existing ground surface (approximately RL 41.5–42.0 m).

The proposed basement is located immediately north of Building B322, with an estimated minimum horizontal separation of approximately 8 m. The proposed basement formation level is anticipated to be approximately RL 36 m, approximately 5.5 - 6 m below the inferred founding level of Building B322.

Subject to appropriate engineering design and effects assessment, the interaction between the proposed basement excavation and Building B322 is considered to represent a low geotechnical risk.

5.1.4 Building 315, Kate Edger Information Commons

The Kate Edger Information Commons (Building B315) is a four-storey building with a single basement level located immediately east of the proposed Student Centre and Library development.

According to the historic structural drawings (by Structure Design Ltd, refer to Figure 5.2) of the B315 development, the building is founded on a reinforced concrete raft foundation at basement level. The basement finished floor level is approximately RL 38.25 m, with the raft foundation extending approximately 300 mm below this level and is expected to be in the order of 2 m above the anticipated basement founding level of the proposed Student Centre and Library (approximately RL36 m). The proposed Student Centre and Library basement is separated from Building B315 by approximately 10 m.

Historical project information also indicates that soil nails were installed to the northwestern side of Building B315 as part of the basement retaining system (refer to Figure 5.3 and Figure 5.4). As-built information for these nails was not available at the time of this assessment. Hand-marked sketches (by T+T) contained within the historical project files indicate anchor lengths of approximately 3 m installed at an inclination of approximately 10° below horizontal. It is likely that these were temporary works to support the excavation batter which has been backfilled making the nails redundant. Based on the available information and the approximate 10 m separation between the proposed excavation and Building B315, it is considered unlikely that the proposed basement excavation will intersect the nails which likely remain in the ground.

The existing B315 basement incorporates subsoil drainage, indicating that groundwater levels in the vicinity of the building have likely been modified since construction. Consequently, the proposed basement excavation is not expected to result in significant additional groundwater drawdown affecting Building B315. This assumption should be confirmed as part of the project-specific groundwater assessment.

Overall, based on the currently available information, the proposed development is considered unlikely to have significant adverse effects on the foundations or retaining system of Building B315.

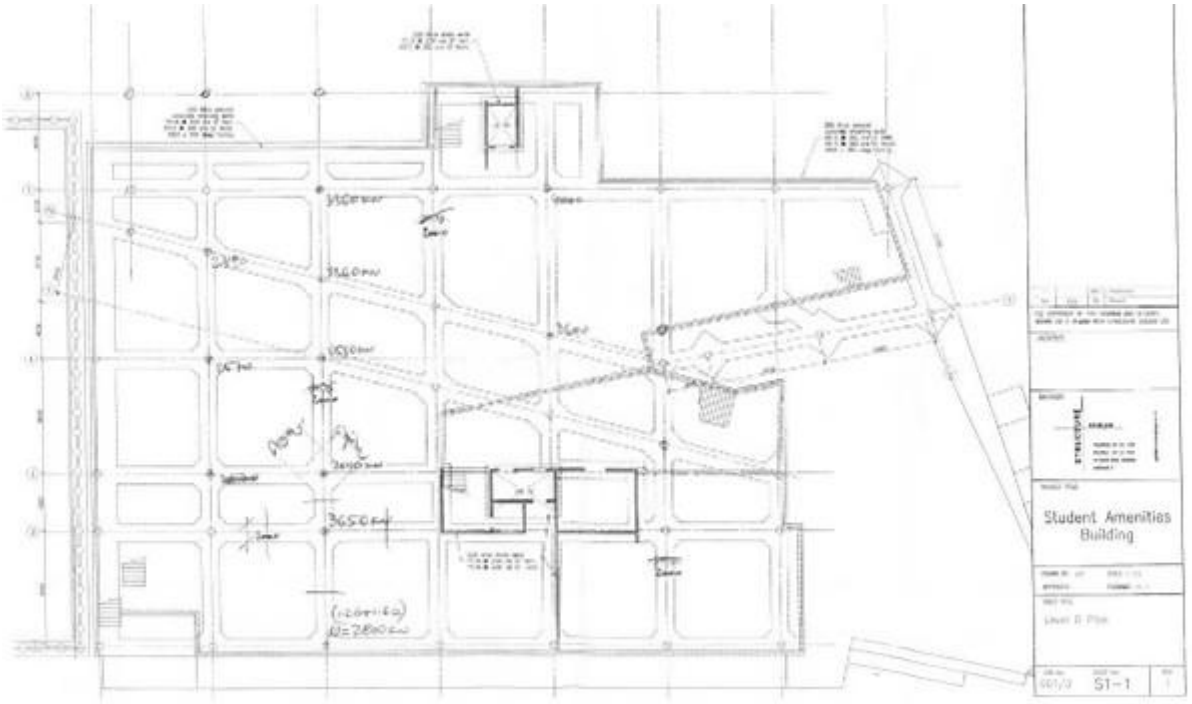

Figure 5.2: B315 foundation plan. (Undated, Design Drawing: Level 0 Plan, Structural Design).

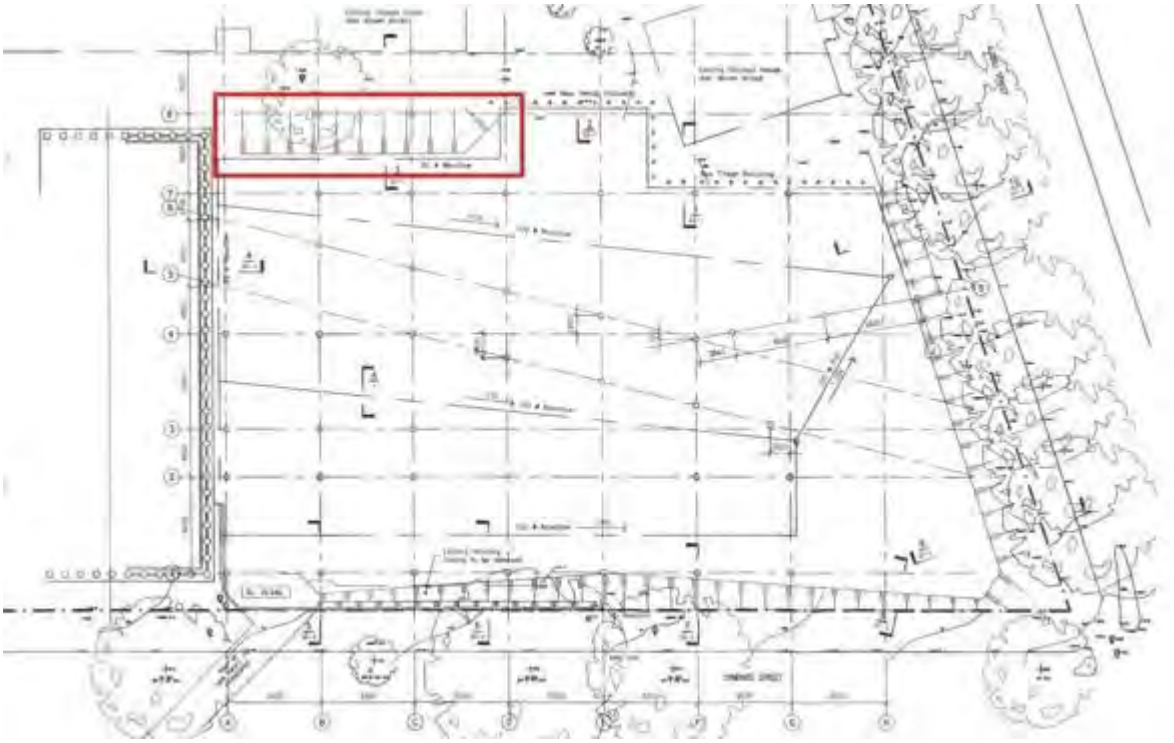

Figure 5.3: Location of anchors in B315. (Undated, Design Drawing: Excavation Plan, Structural Design).

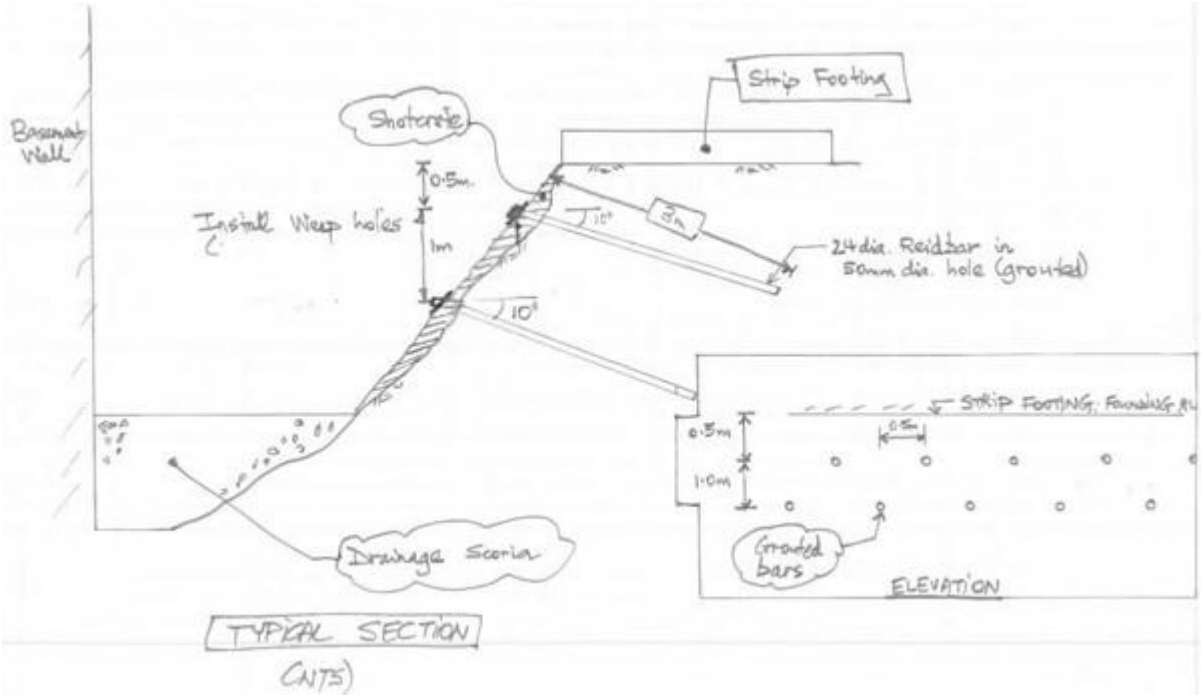

Figure 5.4: Hand sketch of soil nails at B315 (2002, Fax from T+T to Structure Design).

5.1.5 Sensitive services

A review of the Auckland Council GIS database has been undertaken to identify public buried services which may be affected by the excavation of the proposed basement (refer Figure 5.5).

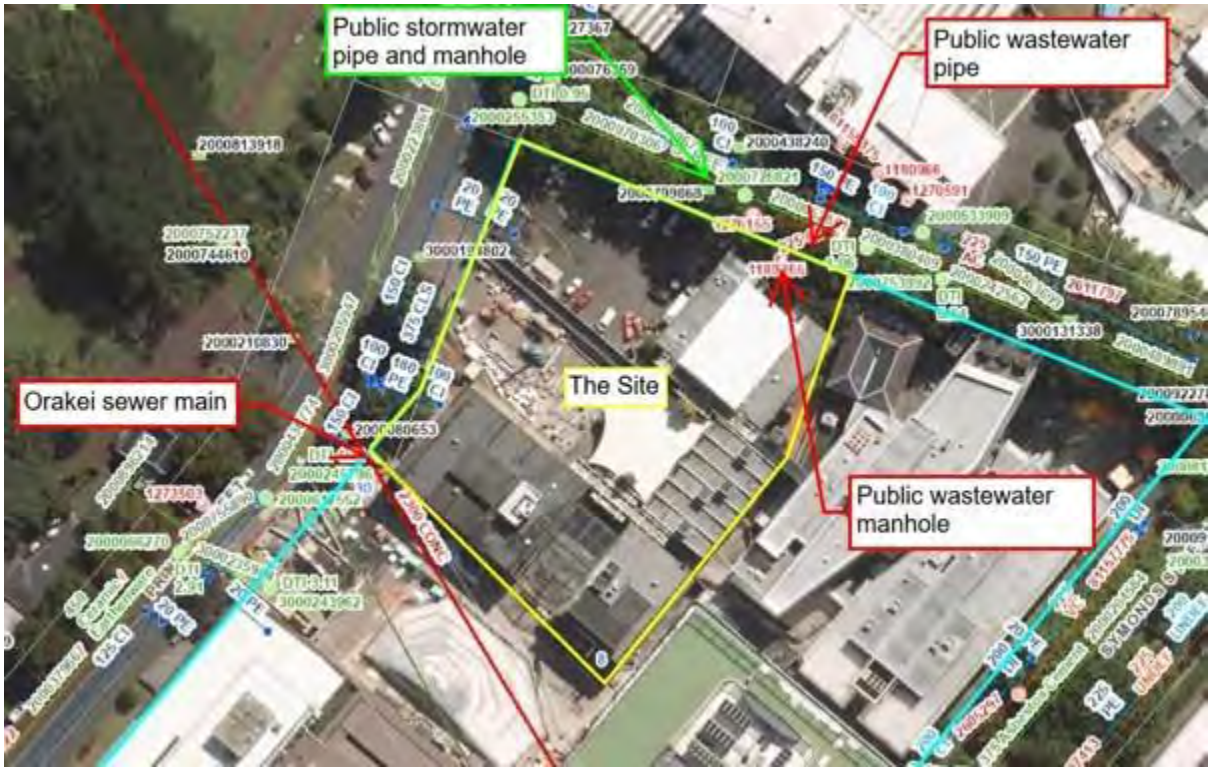

Figure 5.5: Auckland Council GIS: Public underground services near the Site.

Nearby public services, listed in Table 5.1, which could be adversely affected by the proposed development, have been identified.

Table 5.1: Nearby public services

Nearby Public Services (within 15 m)	Location	Description	Min. Setback distance from excavation (m)
Orakei Main Sewer (Transmission Line)	Intersect with site south-western boundary, across Princes Street	2300 mm dia. Concrete	2.0
Water Supply	Along site western boundary on Princess Street	375 mm dia. Concrete Lined Steel	6.0
Water Supply	Along site western boundary on Princes Street	150 mm dia. Cast Iron	12.0
Water Supply	Along site northern boundary on Alfred Street	100 mm dia. Cast Iron	12.0
Stormwater	Along site northern boundary on Alfred Street	225 mm dia. Concrete	11.0
Wastewater	Along site northern boundary on Alfred Street	225 mm dia. Asbestos Cement	7.5

The Orakei Main Sewer (OMS) is a 2.3 m diameter wastewater transmission line. The Auckland Council GIS database indicates that the invert level is between RL 2.2-2.6 m.

Watercare requires approval for works undertaken within 10 m (horizontally or vertically) of its strategic assets.

Although the proposed basement excavation is located within the 10 m horizontal protection corridor, the proposed retaining walls and foundation piles (up to 1200 mm diameter) within 10 m horizontally of the OMS are not expected to extend below RL 27 m (i.e. not less than 24 m (at least 20 x pile diameter) above the crown of the OMS. Thus, we consider the additional stress induced by the piles to be negligible and no adverse effects on the OMS are expected.

The potential effects on the other identified services surrounding the Site are specifically addressed in the Groundwater and Settlement Effects Report (T+T ref: 1103046-RPT-GEO-106).

Subject to appropriate engineering design and effects assessment, the interaction between the proposed basement excavation public services outside of the site boundary are expected to be low risk.

5.2 Groundwater

5.2.1 General

Ground investigations and groundwater monitoring undertaken adjacent to the Site indicates the presence of a shallow perched/percolating groundwater regime. The maximum pressure profile recorded prior to construction at BH201, located at Princes Street at the southwest corner of the Site was about 60% of the theoretical hydrostatic profile. During the construction of the drained Hiwa basement the minimum recorded pressures (indicated in Figure 4.1) were reduced but temporary recharge occurred due to rainfall events was also apparent.

Recent site specific groundwater monitoring confirms the presence of perched groundwater within the AVF/ECBF soil profiles. The phreatic surface is typically between 2 and 5 m depth. The range of recorded pressure head within the soil profile ranges between 15 and 50 kPa (typically 40 kPa) and is 'capped' within this range.

5.2.2 Drawdown settlement potential

For the purposes of long term groundwater drawdown consolidation effects, the southern portion of the Site has experienced drawdown related to the drained Hiwa basement and additional groundwater drawdown by the proposed Student Centre and Library basement is likely to be negligible. The extent of the drawdown by the Hiwa basement will reduce to the north and some drawdown below historical levels is likely to occur.

Away from the Hiwa basement, the perched levels are expected to be relatively seasonal. As such, soil horizons with perched groundwater will have likely experienced historical seasonal wetting and drying conditions, which will limit potential groundwater drawdown settlement due to the proposed basement excavation. Estimation of groundwater drawdown induced settlement based on a lower bound phreatic surface and up to 40 kPa pressure cap as described above are likely to conservative.

The groundwater drawdown induced settlement potential due to the proposed basement excavation will be assessed further in the separate T+T groundwater and settlement report[4] ···. Consideration has been given to the settlement effects for adjacent buildings, as well as sensitive services within the adjacent roads.

Compressibility parameters for design are summarised in Table 5.2. These have been based on the one-dimensional consolidation testing results and observations of performance during the Hiwa construction

Table 5.2: Recommended preliminary geological design parameters for drawdown settlement

Design parameter		Geological Unit			
		Auckland Volcanic Field	Residual ECBF Soils	CW-MW ECBF Rock	SW-UW ECBF Rock
Coefficient of Volume Compressibility Mv	m^2/MN	0.15	0.15 - 0.2	0.05	0.005
Coefficient of Consolidation Cv	m^2/yr	1-2	1-3	NA	NA

5.2.3 Temporary groundwater inflow

For the purposes of assessing expected temporary groundwater inflows into the proposed basement area during construction and for design groundwater pressures acting on the basement walls we recommend adopting the pre-drawdown groundwater regime. Load factors in accordance with NZS1170 are appropriate and should be applied due to the observed rainfall recharge potential.

Temporary groundwater inflows during construction are expected to be manageable through an appropriately designed dewatering system. Expected inflows will be assessed in the groundwater report.

[4] T+T (28 October 2026). Geotechnical Groundwater and Settlement Effects Report, T+T Ref 1103046-RPT-GEO-106.

5.2.4 Basement drainage

Perched groundwater will need to be considered in the design of the proposed basement. Design options to accommodate external groundwater pressures include either incorporating drainage of the basement retaining walls and basement slab or, alternatively, adopting a fully tanked design and allowing for full groundwater pressure.

From a groundwater management and effects perspective, a fully drained basement incorporating drainage to both the retaining walls and basement slab is likely to be a feasible solution, subject to detailed design and operational requirements.

Should a fully tanked basement be adopted, it should be designed to resist hydrostatic uplift pressures in accordance with NZS 1170.0 and the project structural design criteria. A combined solution comprising tanked basement walls with a drained basement floor slab may also be considered where groundwater drawdown analyses indicate that reducing long-term drawdown would minimise potential effects on neighbouring structures.

5.3 Earthworks considerations

Based on the current concept design prepared by W&M, the proposed development is anticipated to require bulk excavation for two basement levels to an estimated depth of approximately 7.5 to 10.5 m below existing ground level (including allowance for basement slab thickness and sub-slab layers), and a basement foundation level of approximately RL 36 m.

Placement of engineered fill is expected to be limited to imported hardfill materials for either the foundation subbase or to replace undercut or disturbed subgrade materials.

Any areas of unsuitable material encountered at subgrade level should be removed and replaced with engineered fill. Confirmation of potential contaminants within the existing fill will be important to enable disposal to appropriate landfills or other approved sites.

We expect that natural materials encountered will be excavatable with conventional excavation plant for a project of this scale (e.g. 15 to 20 tonne excavators). ECBF rock materials are typically excavatable with a rock bucket.

Subgrade surfaces should be protected from moisture infiltration and plant trafficking to prevent remoulding and degradation of the sensitive volcanic ash. It is recommended that final excavation trimming should be carried out immediately prior to foundation construction to minimize disturbance. The trimmed subgrade beneath floor slab areas should be sealed with a smooth drum-roller, with a cross fall to prevent water ponding.

The excavation in the volcanic soil material should be undertaken during summer and/or dry periods. In an undisturbed state these units are likely to be stiff in strength, but are sensitive to remoulding and can become very soft when disturbed and in wet conditions. This may increase cleanfill disposal rates. If these locally sourced materials are to be reused as fill elsewhere, the excavation, transport and spreading should be carried out in such a way that disturbance and remoulding of the soil is kept to a minimum. Subgrade layers in these sensitive materials may need to be protected with a layer of hardfill for construction traffic.

5.3.1 Compaction control

All new engineered fill should be placed to meet or exceed the preliminary compaction control criteria provided below. A detailed earthworks specification will need to be prepared as part of a wider set of contract documentation for the project.

5.3.1.1 Provisional engineered fill specification

It is assumed that engineered hardfill material will be well graded crushed rock aggregate (ATAP40 or similar) from a source approved by the design engineer. It is expected that hardfill compaction requirements will be included in the construction specification. A provisional specification is provided below.

Granular hardfill shall be placed in uniform layers not greater than 200 mm loose thickness. Compaction on each layer of fill materials so placed shall be sufficient to obtain the following standards:

- Set per material source and per 1000 m^3 imported thereafter: Maximum dry density and OMC, heavy compaction, NZS 4402:1986, Test 4.1.2.
- Set per 200 m^3 or 500 mm lift: In situ dry density NZS 4407:1991, Test 4.2.1 (Nuclear Densometer Direct Mode) not be less than 95 % of the maximum dry density as determined by Test 4.1.3, NZS 4402.
- Set per lift and per 100 m^2: Clegg Impact Value ASTM D5874-95, not less than 20.

5.3.2 Pavements

It is recommended that in situ testing be carried out at the time of construction to confirm final subgrade construction details. For pavements founded on volcanic ash, a subgrade CBR of 4% can be used for preliminary pavement design.

During construction, further testing should be undertaken to identify any soft or weak areas for undercutting and replacement with hardfill.

As noted above, the volcanic soil subgrade may be prone to damage and softening from construction traffic and should be managed accordingly.

5.4 Foundations

Pile foundations and basement raft options are considered feasible for the development. The current structural concept is for a piled foundation solution and geotechnical recommendations are provided below for these deep foundations.

Individual shallow pad foundations are unlikely to be suitable for the proposed building due to the building height/loading and the variable ground conditions at the proposed founding levels, resulting in differential settlement risks.

5.4.1 Bored pile foundations

Piled foundations designed to transfer structural loads to competent ECBF rock at depth are considered a suitable foundation solution, providing adequate bearing capacity and reducing the risk of differential load bearing ground performance. The completed investigations indicate that the depth of ECBF rock varies across the Site, and this variability should be considered when determining the required pile founding levels and rock socket lengths.

Bored cast in-situ reinforced concrete piles founded within competent ECBF rock are the preferred foundation solution. The current structural concept[5] indicates two pile sizes; 900 mm diameter with approximately 1,200 mm square pile caps, and 1,200 diameter with typically 1,500 wide pile caps. The concept design presently allows for building piles to be socketed approximately 8 m into ECBF rock and for piles supporting bracing elements to be socketed approximately 8 m to 12 m into ECBF

[5] Beca Ltd, *Student Centre and Library – Level B1 Foundation Plan*, Drawing No. 5013381-SE-K201, Rev. B, dated 4 September 2026.

rock. These socket depths are understood to be preliminary structural provisions. The required socket length will be determined based on the structural pile loads, pile diameter, rock quality and the available combination of end-bearing and shaft resistance. Longer sockets may be required beneath bracing elements where significant compression, uplift and lateral actions are anticipated.

Due to the cohesive nature of the upper soils, temporary casing is unlikely to be required for the pile construction. However, temporary casing or other bore support measures may be required locally where loose or unstable materials, groundwater inflow or bore instability is encountered during construction. The recommended design capacities for bored piles are presented in Table 5.3. The values presented are based on the UCS testing results of the ECBF rock, as outlined in Section 3.4.

The adopted design parameters should apply where the pile socket is formed within ECBF rock consistent with the rock quality and strength assumptions adopted in deriving the capacities.

Table 5.3: Recommended design capacities for bored piles embedded into ECBF rock

Bored straight shaft piles	Geotechnical ultimate capacity (kPa)	ULS design capacity, ϕ_g=0.5 (kPa)
End bearing	6,000	3,000
Skin friction	500 (compression) 350 (uplift)	250 (compression) 175 (uplift)

Note:

1. The ultimate geotechnical end-bearing and skin friction capacities assume:
2. The pile toe is embedded a minimum of 4D into the ECBF rock material (N>50).
3. The pile centre to centre spacing is greater than or equal to 3D.

5.5 Ground retention and stability

Temporary excavation support is expected to be required to facilitate the proposed two-level basement excavation. Permanent support would ultimately be provided by the completed propped basement walls.

Potential temporary retention systems include:

- Soldier pile with shotcrete infill between piles.
- Anchors or internally props/braced retaining walls (when required to limit deflections).
- Temporary battered excavations where sufficient working space is available.

In each case the exposed soil surface between the piles should be progressively scalloped as the excavation proceeds to mitigate soil falling between the piles. In addition, allowance should be made for fibre reinforced shotcrete where necessary between the piles to contain loose soils. Drainage of the wall face is critical and where shotcrete is used then a vertical strip drain should also be installed behind the shotcrete. A temporary perimeter collector drain should be provided during construction of the basement to intercept wall seepage and to protect the excavation subgrade.

Long-term lateral support (i.e. propping) would be provided by the building structure.

A settlement monitoring contingency plan will be required, to monitor the wall performance during active excavation.

5.5.1 Retaining wall parameters

We recommend the following parameters for the design of any retaining wall structure for the proposed development. The values for K_a, K_p and K_0 have been derived based on Rakine Theory and

do not allow for friction between the wall and soil. Values should be modified for any surcharge loads and backfill slope, and analyses should include the effects of wall deformation.

Table 5.4: Recommended preliminary geological design parameters for retention works

Design parameter		Geological Unit			
		Auckland Volcanic Field	Residual ECBF Soils	CW-MW ECBF Rock	SW-UW ECBF Rock
Unit Weight	kN/m³	18	18	19	20
Effective friction angle	°	28	30	35	40
Effective cohesion	kPa	5	5	10	50
At-rest horizontal pressure coefficient K_0	-	0.53	0.5	0.43	0.36
Active horizontal pressure coefficient K_a	-	0.36	0.33	0.27	0.22
Passive horizontal pressure coefficient K_p	-	2.77	3.0	3.69	4.6
Youngs Modulus, E'	MPa	20	20	50	150
Poisson's ratio	-	0.3	0.3	0.25	0.25

Notes: The above lateral earth pressure coefficients have been calculated using the Rankine formulae and do not allow for wall backslope, wall friction, sloping ground (behind and in front of the wall) nor any temporary (compaction related) or permanent (vehicles etc.) surcharges. The design earth pressure parameters may therefore require adjustment depending on the final layout and construction sequence.

5.5.2 Temporary batter slopes

5.5.2.1 Temporary batter angles

Implementation of temporary batter slopes may be considered where feasible (i.e. the site area is available) to minimise the cost of retention works. The following table provides preliminary temporary and permanent slope gradients for preliminary design of the batter slopes.

Table 5.5: Preliminary advice for maximum temporary cut slope batters

Unit	Maximum batter height (m)	Maximum temporary cut batter
Existing fill / volcanic ash / residual to highly weathered ECBF	1.5	1H:1V
	3	1.5H:1V
	5	2H:1V
	>5	Specific engineering design

Notes: * Localised face support may be required to mitigate risk of dropouts.

Where the excavation works are near the site boundary, we recommend adopting a minimum offset of 1 m. For sensitive neighbouring structures near the boundary, this offset may need to be increased, subject to verification of applied bearing pressures, slope stability checks and sensitivity to deformation.

5.5.2.2 Batter protection

All temporary batter slopes in volcanic soil deposits should be covered with polythene to protect the face from erosion or localised instability

Overall, we consider temporary stability will meet typical factor of safety criteria and widespread face support is not expected to be required unless ground conditions differ significantly from those anticipated.

Contingency should be included in estimated construction costs to install surface facing comprising short rock anchors, combined with shotcrete or mesh.

5.6 Seismic considerations

5.6.1 Seismic site subsoil class

On the basis of our preliminary assessment of the likely depth to ECBF rock, the general site conditions are consistent with site subsoil Class C in accordance with NZS1170.5:2004[6].

In general, site subsoil class C should be adopted for structural design. This has been determined from site specific investigations which confirm:

- The depths of soil do not exceed the values listed in NZS1170.5:2004, Table 3.2.

5.6.2 Ground acceleration

For geotechnical design, the seismic loading for the SLS and ULS cases, as outlined in Appendix A1 of the NZGS Module 1 guidance document, are set out in Table 5.6 below. It has been confirmed that the proposed structure for the Site will be importance level 3 (IL3) in accordance with NZS1170.5:2004.

Table 5.6: Design peak ground accelerations for geotechnical design

Design case	Design Life (years)	Annual exceedance probability	Peak ground accelerations (g)	Magnitude (Mw)
Serviceability Limit State (SLS)	50	1 in 25	0.05	5.9
Ultimate Limit State (ULS)		1 in 1,000	0.20 (0.19)	5.9 (6.5)

Note: ULS unbracketed values apply to pseudo-static design (e.g. M-O derived retaining wall seismic increment). Bracketed values apply to magnitude weighted analysis (e.g. Newmark block or liquefaction assessment).

5.6.3 Liquefaction hazard

The susceptibility of a site to soil liquefaction is a function of particle size distribution, groundwater level and soil density. The materials underlying the Site comprise volcanic ash of AVF and silts and clays of residual ECBF soils.

Liquefaction can occur when saturated loose sand and silt mixtures are exposed to cyclic shear load (usually a seismic event). Due to the relatively low seismicity exhibited in Auckland, and the nature of the volcanic ash and ECBF soils, we consider the risk of soil liquefaction to be low. Neither the volcanic ash nor the ECBF materials are considered susceptible to liquefaction.

Overall, the liquefaction potential of the Site is considered to be negligible.

[6] Standards New Zealand (2004) NZS 1170.5:2004, Structural Design Actions – Earthquake Actions

5.7 Risk assessment against PC120

5.7.1 General

This section summarises the landslide hazard information relevant to the proposed development on Princes Street in accordance with Plan Change 120 (PC120).

Auckland Council's PC120 landslide hazard mapping and assessment methodology, as set out in Appendix 24 of the Auckland Unitary Plan[7], has been reviewed for the Site. Under the "Stage 1

Desktop Study" assessment, Auckland Council's GeoMaps information identifies the susceptibility to shallow and large-scale landslides at the Site as **Very Low to Low**. In addition, no areas classified by Auckland Council as having Moderate to Very High landslide susceptibility are mapped upslope of, and within 150 m of, the Site.

On the basis of Auckland Council's published PC120 mapping and assessment criteria, the Site is therefore identified by Auckland Council as having a **Low (Acceptable)** landslide hazard risk, for which the PC120 methodology does not require further assessment.

It is assessed that the activity status for the proposed development is Permitted in accordance with AUP Table 36.4.1B.

5.7.2 Potential geohazards

The following table summarizes the potential hazards for the Site according to RMA, Auckland Council CoP and NPS-NH are outlined in the respective sections.

Table 5.7: Potential Nature Hazards deemed applicable to the Site

Reference	Identified Hazards	Discussion	Report Section
Auckland Council CoP & NPS-NH	Landslips / Site Stability	Site is generally flat with gentle slopes.	5.5
Auckland Council CoP	Seismic Hazard	Seismic site class and peak gravitation acceleration (PGA) has been derived.	5.6
	Uncontrolled Fill	Non-engineered fill encountered in hand auger boreholes and likely present based on-site cover. Will be undercut and removed during earthworks operations.	5.3
	Landslide susceptibility (Plan Change 120 Assessment)	The Site is mapped as having very low to low landslide susceptibility.	5.7

[7] https://new.aucklandcouncil.govt.nz/en/plans-policies-bylaws-reports-projects/our-plans-strategies/unitary-plan/auckland-unitary-plan-modifications/proposed-plan-changes/pc-120-housing-intensification-resilience.html

Reference	Identified Hazards	Discussion	Report Section
NPS-NH	Liquefaction	Liquefaction is considered to be negligible based on the underlying soil type.	5.6
Hazards below are not applicable to the Site or not within geotechnical scope			
Auckland Council CoP & NPS-NH	Coastal Instability, Inundation and Erosion	Site not located near a coast.	N/A
Auckland Council CoP	Problematic Soils (Compressible, collapsible, sensitive soils)	Site comprises residually weathered soils overlying interbedded sandstone and siltstone. Site soils are not considered prone to notable settlement or collapsibility risk.	N/A
	Acid Sulphate Soils	Soil conditions are not of the type associated with acid sulphate hazard.	N/A
	Stream instability and erosion	No stream located within or adjacent to subject site.	N/A
	Geothermal Issues	Site not located within a geothermal area.	N/A
	Rockfall or falling debris	No permanent exposed rockfaces proposed as part of the development.	N/A
	Soil erosion	As the area is in a built-up area no significant soil erosion is expected	N/A
	(Stormwater and wastewater disposal control)	subject to appropriate stormwater design.	
	Contamination	Site specific contamination testing has been reported in T+T reference 1103046-RPT-CON-201 and is not included within the scope of this report.	N/A
NPS-NH	Active fault	Site is located more than 2 km of known major faults.	N/A
	Flooding	Site not located within flood prone area.	N/A
	Flooding	Site not located within flood prone area.	N/A

Reference	Identified Hazards	Discussion	Report Section
	Tsunami	Site not located within Tsunami evacuation zone.	N/A

6 Applicability

This report has been prepared for the exclusive use of our client University of Auckland, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement. We understand and agree that our client will submit this report as part of an application under the Fast-track Approvals Act 2024 and that an Expert Panel as the consenting authority will use this report for the purposes of assessing that application.

Recommendations and opinions in this report are based on data from discrete investigation locations. The nature and continuity of subsoil away from these locations are inferred but it must be appreciated that actual conditions could vary from the assumed model.

Compliance with the Environment Court Practice Note 2023

I, Matthew Kent, confirm that in my capacity as technical reviewer of this report, I have read and abided by the Environment Court of New Zealand's Code of Conduct for Expert Witnesses contained in the Practice Note 2023.

I am a Principal Geotechnical Engineer at Tonkin & Taylor Ltd (T+T), where I specialise in geotechnical engineering investigation, design and construction verification for commercial and infrastructure developments. I have 20 years of industry experience and have worked at T+T since 2013. I am a chartered member of Engineering New Zealand and a chartered professional engineer (CPEng).

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

Report prepared by:

.....

Jason Li

Geotechnical Engineer

Authorised for Tonkin & Taylor Ltd by:

.....

Chris Freer

Project Director

Technical review by Matthew Kent, Principal Geotechnical Engineer

JASL

t:\auckland\projects\1103046\issueddocuments\1103046-rpt-geo-104-v2.1_geotechnical interpretative report.docx

Appendix A Figures

COPYRIGHT ON THIS DRAWING IS RESERVED DO NOT SCALE FROM THIS DRAWING - IF IN DOUBT, ASK. DRAWING MAY CONTAIN COLOUR CONTENT, T+T LOGO WILL SHOW IN COLOUR IF PRINTED CORRECTLY.

\\ttgroup.local\corporate\Auckland\Projects\1103046\WorkingMaterial\Cad\DWG\FIG\1103046.1000-F1.dwg 2026-Sept-18 9:49:17 am Plotted By: HOTI



Tonkin+Taylor

www.tonkintaylor.com

NOTES

1. COORDINATE SYSTEM: NZGD2000/ NEW ZEALAND TRAVERSE MERCATOR 2000.
2. LEVEL DATUM: NEW ZEALAND VERTICAL DATUM 2016.
3. PROPERTY BOUNDARIES SOURCED FROM LAND INFORMATION NEW ZEALAND (LINZ) LICENSED FOR REUSE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL LICENSE, https://data.linz.govt.nz/layer/50767-nz-topo50-maps/, ACCESSED 11SEPTEMBER 2026.
4. AERIAL PHOTO SOURCED FROM LAND INFORMATION NEW ZEALAND (LINZ) LICENSED FOR REUSE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL LICENSE, https://data.linz.govt.nz/layer/121752-auckland-0075m-urban-aerial-photos-2024-2025/, ACCESSED 11 SEPTEMBER 2026.

DESIGNED	TOLA	SEPT.26	FIGURE STATUS
DRAWN	HOTI	SEPT.26	INFORMATION ONLY
DESIGN CHECKED			PROJECT PHASE
FIGURE CHECKED			RESOURCE CONSENT

NOT FOR CONSTRUCTION

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNLESS SIGNED AS APPROVED

APPROVED DATE

CLIENT **UNIVERSITY OF AUCKLAND**

PROJECT **UOA STUDENT CENTRE AND LIBRARY**

TITLE PLAN
INFERRED ECBF ROCK (SPT 'N' 50+) CONTOUR PLAN

SCALE (A1) 1:250 FIG No. 1103046.FIG-GEO-02 REV 1

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LEGEND



Tonkin+Taylor

Exceptional thinking together www.tonkintaylor.co.nz

NOTES:

CRS: NZGD 2000 New Zealand Transverse Mercator Credits: Eagle Technology, LINZ, StatsNZ, NIWA, Natural Earth, © OpenStreetMap contributors., Auckland Council, NIWA, Earthstar Geographics, Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors



LOCATION PLAN

			APPROVED	DATE
PROJECT No.	1103046.0000			
DESIGNED	JASL	SEP.26		
DRAWN	-WEB-	SEP.26		
CHECKED				

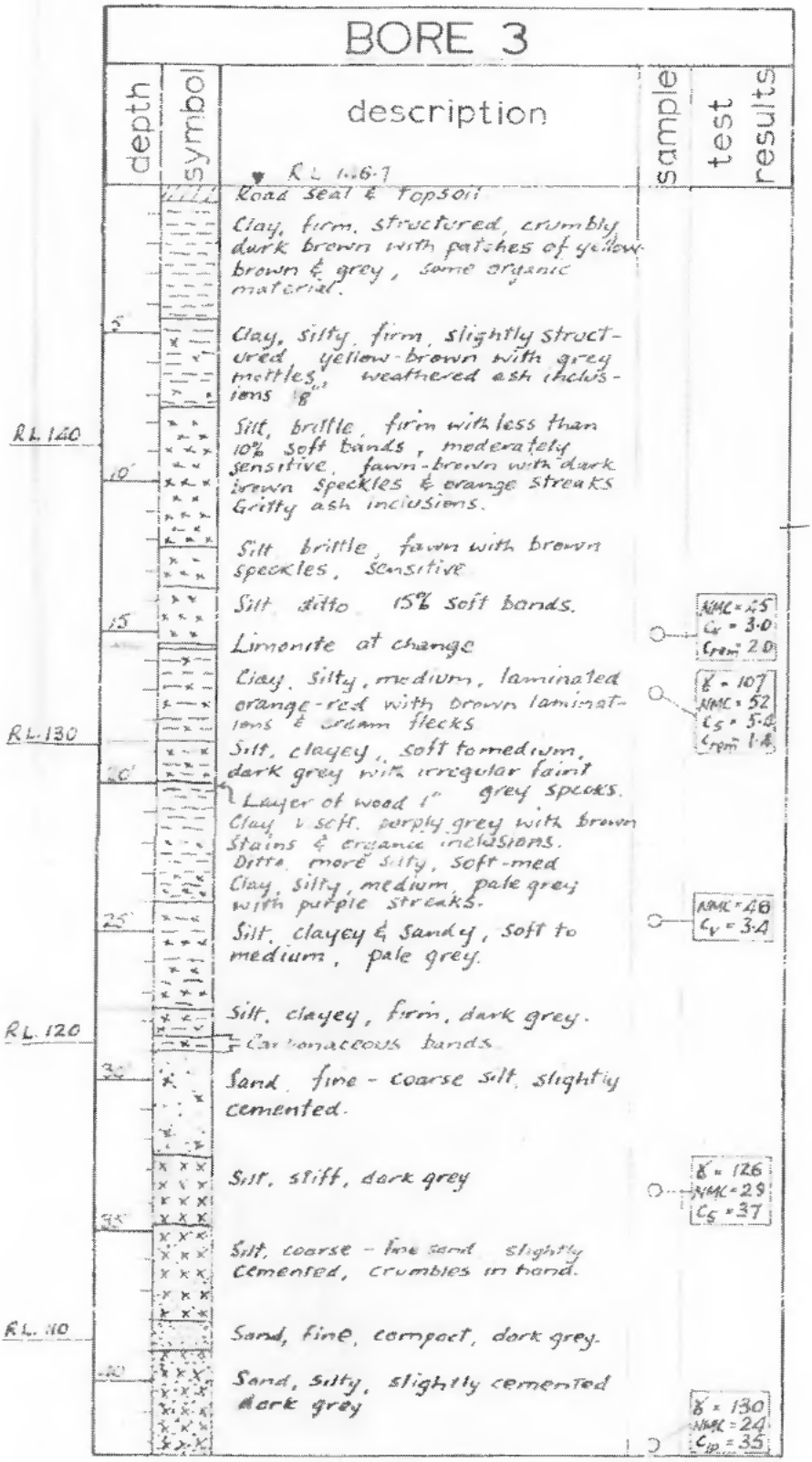
CLIENT **UNIVERSITY OF AUCKLAND**

PROJECT **UOA STUDENT CENTRE & LIBRARY**

TITLE SITE INVESTIGATION PLAN

SCALE (A3) 1:500 FIG No. FIGURE 1. REV 0

Appendix B Historical Investigation Logs


BORE 3
depth
symbol
description
sample
test results
R.L. 146.7
Road seal & Topsoil
Clay, firm, structured, crumbly dark brown with patches of yellow brown & grey, some organic material.
5'
Clay, silty, firm, slightly structured, yellow-brown with grey mottles, weathered ash inclusions 18"
R.L. 140
Silt, brittle, firm with less than 10% soft bands, moderately sensitive, fawn-brown with dark brown speckles & orange streaks Gritty ash inclusions.
10'
Silt brittle, fawn with brown speckles, sensitive
Silt ditto 15% soft bands.
15
NMC = 45
C_v = 3.0
C_{rem} 2.0
Limonite at change
Clay, silty, medium, laminated orange-red with brown laminations & cream flecks
γ = 107
NMC = 52
C_s = 5.0
C_{rem} 1.4
R.L. 130
Silt, clayey, soft to medium, dark grey with irregular faint
20'
Layer of wood 1" grey specks.
Clay v soft, purply grey with brown stains & organic inclusions.
Ditto more silty, soft-med
Clay, silty, medium, pale grey with purple streaks.
NMC = 48
C_v = 3.4
25'
Silt, clayey & sandy, soft to medium, pale grey.
Silt, clayey, firm, dark grey.
R.L. 120
Carbonaceous bands
30'
Sand, fine - coarse silt, slightly cemented.
Silt, stiff, dark grey
γ = 126
NMC = 29
C_s = 37
35'
Silt, coarse - fine sand slightly cemented, crumbles in hand.
R.L. 110
Sand, fine, compact, dark grey.
40'
Sand, silty, slightly cemented dark grey
γ = 130
NMC = 24
C_{ip} = 35

754

BORE 5

depth	symbol	description	sample	test results
		▼ R.L. 148.9		
		Clay, medium orange-brown with fawny grey mottles.		
5'		Silt firm, soft bands (15%), banded pale grey & speckled brown.		
RL140		Colour change to fawny-brown with dark brown & black specks.		
10'		Cemented band.		
		Silt, clayey, firm, laminated orange-red & light brown, banded with limonite.		
F.L.				
	L_{CSY}	Clay, silty, orange-brown with pale grey & red-brown bands		
15'		Clay, silty, medium, purply grey		
		Clay, silty medium, pale grey with faint purple mottles.		
RL130				
20'				
		Silt, clayey, soft, pale grey with purply & brown mottles		
		Silt, clayey medium, dark grey.		
25'		Ditto, firm.		
		Ditto, medium		
		Ditto firm with 20% soft bands		
		Carbonaceous band		
RL120				
30'		Fine sand / coarse silt, slightly		
		Silt, clayey, firm, dk-grey, compact		

112 had

7T4

BORE 7

depth	symbol	description ▼ RL 145.7	sample	test results
		Clay, firm, orange-brown.		
		Clay, silty, firm, orange-brown with creamy brown mottles - Gritty Lmst.		
RL 140 5'		Ditto, more gritty.		
		Silt, firm, brown with grey & dark brown bands & black specks.		
10'		Silt, firm grey-brown, brittle, speckled with black & brown specks, less than 10% soft bands.		
		Silt, cemented light brown		
		Ditto, banded with dk brown ash. — Soft band 2.		
RL 130 15'		Clay, silty, firm, banded brown & orange.		
		Clay, silty, medium-firm purple tinged grey, pale brown mottles, black organic streaks.		
20		Clay, silty, pale grey, faint purple mottles, medium-firm.		
		Silt, clayey, medium		
RL 120 25		— faint brown mottles		
		Clay & silt banded, medium, light brown & grey mottles		
		Silt, clayey, firm, dark grey. Carbonaceous band.		

TONKIN & TAYLOR LTD.

BOREHOLE LOG

BOREHOLE No: BH7
Hole Location: Refer site plan.

SHEET 1 OF 2

PROJECT: University Development | LOCATION: Symonds Street, Auckland City | JOB No: 14281

CO-ORDINATES mN / mE
R.L. 43.90 m
DATUM

DRILL TYPE: Gemco
DRILL METHOD: Rotary
DRILL FLUID: Water

HOLE STARTED: 10/04/96
HOLE FINISHED: 10/04/96
DRILLED BY: PRODRILL LTD
LOGGED BY: LPA CHECKED: JRL

GEOLOGICAL										ENGINEERING DESCRIPTION								
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS	WATER	CORE RECOVERY	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE / WEATHERING CONDITION	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	COMPRESSIVE STRENGTH (MPa) 1 5 20 50 100 250	DEFECT SPACING (mm) 50 250 1000 2000	SOIL DESCRIPTION: Soil type, minor components, plasticity or particle size, colour. ROCK DESCRIPTION: Substance: Rock type, particle size, colour, minor components. Defects: Type, inclination, thickness, roughness, filling.

FILL

			500	OB							OL	M					SILT, organic
											ML		VSt				SILT, clayey, yellow and brown
											GW						Scoria SILT and gravels
UPPER FILL			500	OB		• 91/48kPa		43	1				St				SILT, clayey, yellow and grey
			500	OB		• 84/46kPa											1
MIDDLE ASH		10/5/96	500	OB		• 67/28kPa		42	2		ML						SILT, slightly clayey, light brown, moderately sensitive, with many fine red clasts of CW volcanic gravels
			1000	OB		• 56/18kPa											2
		15/4/96				• 44/22kPa		41	3				F				3
			1500	OB		• 46/20kPa											- clayey layer
						• 53/24kPa		40	4		ML		VSt				SILT, slightly clayey, dark yellow
LOWER ASH						• 106/48kPa							F				4
			1500	OB		• 48/26kPa					MH/ CL						- grades very clayey
						• 69/42kPa		39	5				St				- becomes grey with yellow stain
			1500	OB		• 69/42kPa											5
						• 69/36kPa	6	38	6								6
			700	TUBE													
						• 70/36kPa		37	7		MH						- becoming light grey
			1800	OB		• 53/22kPa					ML						- more SILT
								36	8								- becomes SILT, slightly sandy, light grey
																	8
WEATHERED EAST COAST BAYS FORMATION						• 53/26kPa					MH						SILT, clayey, dark yellow becoming dark grey
			1500	OB		• 55/28kPa		35	9								- becomes very CLAYEY
						• 67/38kPa											9
						• 81/48kPa		34	10								

TONKIN & TAYLOR LTD.

BOREHOLE LOG

BOREHOLE No: BH7
Hole Location: Refer site plan.
SHEET 2 OF 2

PROJECT: University Development		LOCATION: Symonds Street, Auckland City	JOB No: 14281
CO-ORDINATES mN / mE		DRILL TYPE: Gemco	HOLE STARTED: 10/04/96
		DRILL METHOD: Rotary	HOLE FINISHED: 10/04/96
R.L. 43.90 m			DRILLED BY: PRODRILL LTD
DATUM		DRILL FLUID: Water	LOGGED BY: LPA CHECKED: JRL

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.

FLUID LOSS | WATER | CORE RECOVERY | METHOD | CASING | TESTS | SAMPLES | R.L. (m) | DEPTH (m) | GRAPHIC LOG | CLASSIFICATION SYMBOL | MOISTURE CONDITION / WEATHERING | STRENGTH/DENSITY CLASSIFICATION | SHEAR STRENGTH (kPa) | COMPRESSIVE STRENGTH (MPa) | DEFECT SPACING (mm)

SOIL DESCRIPTION
Soil type, minor components, plasticity or particle size, colour.

ROCK DESCRIPTION
Substance: Rock type, particle size, colour, minor components
Defects: Type, inclination, thickness, roughness, filling.

Core Recovery	Method	Tests	Samples	R.L. (m)	Depth (m)	Classification Symbol	Moisture / Weathering	Strength/Density Classification	Description
		• 70/32kPa		33	11	MH	M	St	
						ML			- sandy layer
1500	OB	• 73/26kPa	9						
								VSt	
		• 133/40kPa							
			10	32	12				- interbedded slightly clayey and sandy SILT
1500	OB	• 56/10kPa							
		• 73/30kPa							
				31	13				
		• UTP							- sand layer
1200	OB	• 88/20kPa	11						
				30	14				
		• UTP							
380	SPT	• 18							
		• 22							
		28/80 N<100		29	15				END OF BOREHOLE @ 14.58m.
				28	16				
				27	17				
				26	18				
				25	19				
				24					

TONKIN & TAYLOR LTD.

BOREHOLE LOG

BOREHOLE No: BH1
Hole Location: Refer site plan.
SHEET 1 OF 2

PROJECT: University Development | LOCATION: Symonds Street, Auckland City | JOB No: 14281

CO-ORDINATES mN / mE | DRILL TYPE: Gemco | HOLE STARTED: 15/04/96

R.L. 40.90 m | DRILL METHOD: Rotary | HOLE FINISHED: 15/04/96

DATUM | DRILL FLUID: Water | DRILLED BY: PRODRILL LTD | LOGGED BY: LPA | CHECKED: JRL

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS	WATER	CORE RECOVERY	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION: Soil type, minor components, plasticity or particle size, colour. ROCK DESCRIPTION: Substance: Rock type, particle size, colour, minor components. Defects: Type, inclination, thickness, roughness, filling
TOPSOIL											OL	M					SILT, organic
FILL			500	OB		• 80/42kPa					GW		L				GRAVELS, fine
											ML						SILT, clayey, yellow and brown
UPPER ASH			500	OB		• 73/34kPa	1	40	1		ML						SILT, clayey, yellow and light brown
			500	OB		• 120/64kPa					ML						- grades slightly clayey
MIDDLE ASH											ML						SILT, light brown, moderately sensitive with many clasts of CW volcanic gravels
			1500	OB		• 115/34kPa	2	39	2								
						• 115/36kPa		38	3								
						• 42/12kPa	3				MH		F				- clayey layer
LOWER ASH			1500	OB		• 120/46kPa		37	4		ML		VSt				SILT, slightly clayey, dark yellow
						• 128/46kPa	4										
	10/5/96					• 54/26kPa		36	5		CL		St				CLAY, slightly silty, grey
			1500	OB		• 80/43kPa	5										
						• 104/60kPa	6	35	6								
			600	TUBE													
			1000	OB		• 85/48kPa		34	7								- becomes light grey with red and yellow stain
						• 92/56kPa	7										
			1500	OB		• 74/30kPa		33	8								
						• 53/20kPa											- with slightly sandy layers
			600	TUBE			9	32	9								
WEATHERED EAST COAST BAYS FORMATION			500	OB				31	10								SILT, slightly clayey, dark yellow with grey

TONKIN & TAYLOR LTD.

BOREHOLE LOG

BOREHOLE No: BH1
Hole Location: Refer site plan.
SHEET 2 OF 2

PROJECT: University Development | LOCATION: Symonds Street, Auckland City | JOB No: 14281

CO-ORDINATES mN / mE | DRILL TYPE: Gemco | HOLE STARTED: 15/04/96

R.L. 40.90 m | DRILL METHOD: Rotary | HOLE FINISHED: 15/04/96

DATUM | DRILL FLUID: Water | DRILLED BY: PRODRILL LTD | LOGGED BY: LPA | CHECKED: JRL

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.

FLUID LOSS | WATER | CORE RECOVERY | METHOD | CASING | TESTS | SAMPLES | R.L. (m) | DEPTH (m) | GRAPHIC LOG | CLASSIFICATION SYMBOL | MOISTURE CONDITION / WEATHERING | STRENGTH/DENSITY CLASSIFICATION | SHEAR STRENGTH (kPa) | COMPRESSIVE STRENGTH (MPa) | DEFECT SPACING (mm)

SOIL DESCRIPTION
Soil type, minor components, plasticity or particle size, colour.

ROCK DESCRIPTION
Substance: Rock type, particle size, colour, minor components.
Defects: Type, inclination, thickness, roughness, filling

CORE RECOVERY	METHOD	TESTS	SAMPLES	DEPTH (m)	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	
1000	OB	• 60/24kPa	10	11	M	St	- bedded SILT, slightly clayey, sandy, dark grey
		• 44/12kPa					
1000	OB	• 64/26kPa	11	12			
		• 107/54kPa					
1500	OB	• 88/26kPa	12	13			
		• 107/46kPa					
50	SPT	• > 187kPa • N > 100		14			
1350	OB						
15	SPT	• N > 100		15			END OF BOREHOLE @ 15.15m.

BL 14281 18/06/96

TONKIN & TAYLOR LTD.

BOREHOLE LOG

BOREHOLE No: BH2
Hole Location: Refer site plan.
SHEET 1 OF 2

PROJECT: University Development | LOCATION: Symonds Street, Auckland City | JOB No: 14281

CO-ORDINATES mN / mE | DRILL TYPE: Gemco | HOLE STARTED: 15/04/96

R.L. 42.00 m | DRILL METHOD: Rotary | HOLE FINISHED: 15/04/96

DATUM | DRILL FLUID: Water | DRILLED BY: PRODRILL LTD | LOGGED BY: LPA | CHECKED: JRL

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS	WATER	CORE RECOVERY	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION / ROCK DESCRIPTION
TOPSOIL/FILL		DRY ON COMPLETION	500	OB		• UTP					OL	M	VSt				SILT, organic
																	SILT, clayey, yellow
											GW		MD				GRAVELS, fine
UPPER ASH			500	OB							ML		St				SILT, clayey, yellow with light brown
MIDDLE ASH			500	OB		• 80/42kPa		41	1		ML						SILT, light brown 1
						• 95/40kPa	2										SILT moderately sensitive with many fine red clasts of CW volcanic gravels
						• 40/14kPa		40	2				F				2
			1500	OB		• 46/12kPa											- with clayey layers
						• 44/15kPa	3	39	3								- becomes clayey 3
			1500	OB		• 42/10kPa											
						• 44/10kPa		38	4				St				
LOWER ASH							4				MH						SILT, slightly clayey, dark yellow becoming very clayey 4
						• 73/34kPa											CLAY, slightly silty, grey with yellow stain
			1500	OB		• 73/34kPa		37	5								5
						• 81/40kPa	5										- becomes grey with yellow and red stain
						• 73/26kPa		36	6								6
			1500	OB		• 80/42kPa											- becomes light grey, moderately silty
						• 53/20kPa	6	35	7				F				7
						• 46/18kPa	7										- becomes slightly sandy
			500	TUBE													
WEATHERED EAST COAST BAYS FORMATION								34	8								SILT, very slightly sandy, dark yellow becoming dark grey 8
						• 48/16kPa											- grades to SILT, sandy with slightly clayey layers
			1500	OB		• 46/16kPa	8										
						• 56/16kPa		33	9				St				9
						• 64/28kPa			10								

TONKIN & TAYLOR LTD.

BOREHOLE LOG

BOREHOLE No: BH2
Hole Location: Refer site plan.
SHEET 2 OF 2

PROJECT: University Development	LOCATION: Symonds Street, Auckland City	JOB No:	14281
CO-ORDINATES mN mE	DRILL TYPE: Gemco	HOLE STARTED:	15/04/96
	DRILL METHOD: Rotary	HOLE FINISHED:	15/04/96
R.L. 42.00 m		DRILLED BY:	PRODRILL LTD
DATUM	DRILL FLUID: Water	LOGGED BY: LPA	CHECKED: JRL

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.

FLUID LOSS | WATER | CORE RECOVERY | METHOD | CASING | TESTS | SAMPLES | R.L. (m) | DEPTH (m) | GRAPHIC LOG | CLASSIFICATION SYMBOL | MOISTURE CONDITION / WEATHERING | STRENGTH/DENSITY CLASSIFICATION | SHEAR STRENGTH (kPa) | COMPRESSIVE STRENGTH (MPa) | DEFECT SPACING (mm)

SOIL DESCRIPTION
Soil type, minor components, plasticity or particle size, colour.

ROCK DESCRIPTION
Substance: Rock type, particle size, colour, minor components.
Defects: Type, inclination, thickness, roughness, filling

CORE RECOVERY	METHOD	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	ENGINEERING DESCRIPTION
1500	OB	• 92/38kPa	9	31	11	M	St	- interbedded, slightly sandy and slightly clayey SILT, dark grey
		• 102/46kPa					VSt	
500	OB	• > 187kPa	10				H	
		• UTP						
265	SPT	• N > 50						
				30	12			END OF BOREHOLE @ 11.765m.
				29	13			
				28	14			
				27	15			
				26	16			
				25	17			
				24	18			
				23	19			

TONKIN & TAYLOR LTD.

BOREHOLE LOG

BOREHOLE No: BH3
Hole Location: Refer site plan.
SHEET 1 OF 2

PROJECT: University Development
LOCATION: Symonds Street, Auckland City
JOB No: 14281

CO-ORDINATES mN
mE
R.L 42.00 m
DATUM

DRILL TYPE: Gemco HP7
DRILL METHOD: Rotary
DRILL FLUID: Water

HOLE STARTED: 09/04/96
HOLE FINISHED: 09/04/96
DRILLED BY: PRODRILL LTD
LOGGED BY: LPA CHECKED: JRL

GEOLOGICAL

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION

ENGINEERING DESCRIPTION

FLUID LOSS | WATER | CORE RECOVERY | METHOD | CASING | TESTS | SAMPLES | R.L. (m) | DEPTH (m) | GRAPHIC LOG | CLASSIFICATION SYMBOL | MOISTURE CONDITION / WEATHERING | STRENGTH/DENSITY CLASSIFICATION | SHEAR STRENGTH (kPa) | COMPRESSIVE STRENGTH (MPa) | DEFECT SPACING (mm)

SOIL DESCRIPTION
Soil type, minor components, plasticity or particle size, colour.

ROCK DESCRIPTION
Substance: Rock type, particle size, colour, minor components.
Defects: Type, inclination, thickness, roughness, filling

TOPSOIL/FILL

SILT, organic

GRAVEL-SILT: Scoria gravels and red coarse silt

UPPER ASH

SILT, clayey, brown and yellow

- yellow with light brown

- with light grey CLAY pockets

MIDDLE ASH

SILT, slightly clayey, light brown silt moderately sensitive, with many clasts of CW red volcanic gravels

- clayey layer

LOWER ASH

SILT, slightly clayey, dark yellow, grades to very clayey

- becomes grey with occasional black organic inclusions

- becomes CLAY, slightly silty, grey with yellow

- becomes dark red with grey

- becomes grey with red and yellow stain

- slightly sandy layer

10/5/96

500 OB | 500 OB | 500 OB | 500 OB | 1000 OB | 600 TUBE | 1000 OB | 1500 OB | 500 OB | 500 TUBE | 1000 OB | 1500 OB | 500 OB

• >187kPa
• 107/54kPa
• 88/40kPa
• 72/30kPa
• 51/20kPa
• 45/15kPa
• 43/20kPa
• 133/68kPa
• 105/36kPa
• 120/44kPa
• 98/54kPa
• 78/42kPa
• 80/42kPa
• 80/40kPa
• 40/20kPa
• 52/16kPa

OL | GM | ML | ML | ML | CL | CL

D | VSt | St | VSt | St

TONKIN & TAYLOR LTD.

BOREHOLE LOG

BOREHOLE No: BH3
Hole Location: Refer site plan.
SHEET 2 OF 2

PROJECT: University Development		LOCATION: Symonds Street, Auckland City	JOB No: 14281
CO-ORDINATES mN / mE		DRILL TYPE: Gemco HP7	HOLE STARTED: 09/04/96
		DRILL METHOD: Rotary	HOLE FINISHED: 09/04/96
R.L. 42.00 m			DRILLED BY: PRODRILL LTD
DATUM		DRILL FLUID: Water	LOGGED BY: LPA CHECKED: JRL

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS	WATER	CORE RECOVERY	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	WEATHERING / MOISTURE CONDITION	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION: Soil type, minor components, plasticity or particle size, colour. ROCK DESCRIPTION: Substance: Rock type, particle size, colour, minor components. Defects: Type, inclination, thickness, roughness, filling.
WEATHERED EAST COAST BAYS FORMATION			800	OB		• 51/16kPa	14	31	11		CL ML	M	St				SILT, sandy, grey
						• 53/16kPa											
			1000	OB		• 60/24kPa	15										
						• 47/16kPa		30	12								
			1500	OB		• 55/22kPa											- thin CLAYEY layers
						• 133/60kPa	16	29	13		ML						
						• 79/30kPa											
						• 86/34kPa		28	14								
			1500	OB		• 125/50kPa					ML		VSt				SILT, slightly clayey, dark grey with slightly sandy layers
						• 133/54kPa	17										
						• UTP		27	15								
			1000	OB		• UTP	18										
			45	SPT		• UTP N>100		26	16								END OF BOREHOLE @ 16.055m.
								25	17								
								24	18								
								23	19								

TONKIN & TAYLOR LTD.

BOREHOLE LOG

BOREHOLE No: BH4
Hole Location: Refer site plan

SHEET 1 OF 2

PROJECT: University Development | LOCATION: Symonds Street, Auckland City | JOB No: 14281

CO-ORDINATES mN / mE | DRILL TYPE: Gemco HP7 | HOLE STARTED: 09/04/96

R.L. 43.40 m | DRILL METHOD: Rotary | HOLE FINISHED 09/04/96

DATUM | DRILL FLUID: Water | DRILLED BY: PRODRILL LTD | LOGGED BY: LPA | CHECKED: JRL

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION

FLUID LOSS | WATER | CORE RECOVERY | METHOD | CASING | TESTS | SAMPLES | R.L. (m) | DEPTH (m) | GRAPHIC LOG | CLASSIFICATION SYMBOL | MOISTURE CONDITION / WEATHERING | STRENGTH/DENSITY CLASSIFICATION | SHEAR STRENGTH (kPa) | COMPRESSIVE STRENGTH (MPa) | DEFECT SPACING (mm)

SOIL DESCRIPTION
Soil type, minor components, plasticity or particle size, colour.

ROCK DESCRIPTION
Substance: Rock type, particle size, colour, minor components.
Defects: Type, inclination, thickness, roughness, filling.

TOPSOIL/FILL		300	OB				43		OL	M				SILT, organic
FILL		600	OB						GW		D			BASALT gravels to 100mm
Recovered disturbed FILL?								1	ML		St/F			SILT, clayey, yellow and grey with occasional gravels
MIDDLE ASH	10/5/96	1100	OB				42		ML					SILT, slighdy clayey, moderately sensitive
					• 47/18kPa	1		2						
		1000	OB				41							- becomes light grey/brown with many fine red clasts of CW volcanic gravels
					• 53/18kPa	2		3						
		600	OB		• 84/36kPa		40							
		1500	OB					4						- clayey layer
LOWER ASH					• 100/54kPa	3	39		ML/MH		VSt			SILT, slightly clayey, dark yellow, grades very CLAYEY
								5						
		1500	OB		• 67/40kPa		38		CL					- grades to CLAY, slightly silty, grey
						4		6						
					• 73/42kPa		37							- becomes with yellow and red stain
		1500	OB		• 62/36kPa	5		7						
					• 73/40kPa		36							
								8						
		1500	OB		• 84/40kPa		35							
WEATHERED EAST COAST BAYS FORMATION						6		9	ML					SILT, slightly sandy, grey with clayey layers
			OB		• 56/26kPa		34							
								10						

TONKIN & TAYLOR LTD.

BOREHOLE LOG

BOREHOLE No: BH4
Hole Location: Refer site plan.
SHEET 2 OF 2

PROJECT: University Development | LOCATION: Symonds Street, Auckland City | JOB No: 14281

CO-ORDINATES mN / mE | DRILL TYPE: Gemco HP7 | HOLE STARTED: 09/04/96

R.L. 43.40 m | DRILL METHOD: Rotary | HOLE FINISHED: 09/04/96

DATUM | DRILL FLUID: Water | DRILLED BY: PRODRILL LTD | LOGGED BY: LPA | CHECKED: JRL

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION	FLUID LOSS	WATER	CORE RECOVERY	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION / ROCK DESCRIPTION
			1500	OB		• 134/40kPa	7	33	11		ML	M	VSt				- becomes SILT, clayey, dark grey
						• UTP	8	32					D				- becomes SILT, sandy, dark grey with thin CLAYEY layers
			1400	OB									VD				- becomes SILT, slightly clayey, dark grey with thin sandy layers
			260	SPT		• 24/150kPa • 26/110kPa N > 100	9	31	12								
								30	13								END OF BOREHOLE @ 12.66m.
								29	14								
								28	15								
								27	16								
								26	17								
								25	18								
								24	19								

TONKIN & TAYLOR LTD.

BOREHOLE LOG

BOREHOLE No: BH5
Hole Location: Refer site plan.
SHEET 1 OF 1

PROJECT: University Development
LOCATION: Symonds Street, Auckland City
JOB No: 14281

CO-ORDINATES mN
mE
R.L. 43.30 m
DATUM

DRILL TYPE: N/A
DRILL METHOD: 50mm dia. Hand Auger
DRILL FLUID: N/A

HOLE STARTED: 12/04/96
HOLE FINISHED: 15/04/96
DRILLED BY: LPA
LOGGED BY: LPA
CHECKED: JRL

GEOLOGICAL / ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION	FLUID LOSS	WATER	CORE RECOVERY	METHOD	CASING	TESTS	SAMPLES	R.L (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION: Soil type, minor components, plasticity or particle size, colour. ROCK DESCRIPTION: Substance: Rock type, particle size, colour, minor components. Defects: Type, inclination, thickness, roughness, filling.
FILL												M					PAVING STONES
UPPER ASH		DRY ON COMPLETION	800	DIACUT		• 92/48kPa		43			GW						Fine GRAVELS
											ML		St				SILT, clayey, yellow and light brown
MIDDLE ASH						• 74/40kPa			1		ML						SILT, granular, yellow and light brown, moderately sensitive, with many fine red clasts of CW volcanic gravels
						• 66/26kPa		42									
			3400	H/AUGER	N/A	• 60/22kPa			2								
						• 53/18kPa		41									- becomes clayey, fine grained, light brown
						• 80/32kPa			3								
						• 54/26kPa		40									
LOWER ASH						• 40/20kPa					MH		F				SILT, clayey, dark yellow becoming CLAY, slightly silty, grey
						• 46/22kPa			4		CL						
								39									END OF BOREHOLE @ 4.2m.
									5								
								38									
									6								
								37									
									7								
								36									
									8								
								35									
									9								
								34									

TONKIN & TAYLOR LTD.

BOREHOLE LOG

BOREHOLE No: BH8
Hole Location: Refer site plan.
SHEET 1 OF 2

PROJECT: University Development		LOCATION: Symonds Street, Auckland City	JOB No: 14281
CO-ORDINATES mN / mE		DRILL TYPE: Gemco	HOLE STARTED: 10/04/96
		DRILL METHOD: Rotary	HOLE FINISHED: 10/04/96
R.L. 45.00 m			DRILLED BY: PRODRILL LTD
DATUM		DRILL FLUID: Water	LOGGED BY: LPA CHECKED: JRL

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION	FLUID LOSS	WATER	CORE RECOVERY	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE / WEATHERING CONDITION	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION: Soil type, minor components, plasticity or particle size, colour. ROCK DESCRIPTION: Substance: Rock type, particle size, colour, minor components. Defects: Type, inclination, thickness, roughness, filling.
TOPSOIL											OL	M					SILT, organic
FILL			500	OB							ML		VSt				SILT, slightly clayey, yellow and brown with basalt gravels - 40mm
HARD FILL			500	WASH							GW		VD				GRAVEL, basalts to 100mm
FILL			500	OB				44	1		ML		VSt				SILT, gravelly, red, scoriaceous
TOPSOIL											OL						SILT, organic, grey/brown
UPPER ASH			500	OB		• > 187kPa	1				ML						SILT, clayey, yellow and light grey
						• 100/52kPa		43	2								2
MIDDLE ASH			1000	OB		• 90/42kPa					ML		St				SILT, slightly clayey, yellow and light brown, moderately sensitive, with many fine red clasts of CW volcanic gravels
						• 83/32kPa	2	42	3								3
			1500	OB													- becoming CLAYEY, fine gravel
LOWER ASH						• 90/38kPa		41	4		ML						SILT, slightly clayey, dark yellow
							3										4
						• 64/39kPa					MH CL						- grades very CLAYEY to CLAY, slightly silty, grey with dark yellow stain
								40	5								5
		10/5/96	1500	OB		• 80/33kPa	4										
						• 113/46kPa		39	6			W					6
			1500	OB			5										
								38	7								7
						• 73/36kPa											
			600	DI TUBE			6										
WEATHERED EAST COAST BAYS FORMATION			100					37	8		ML						SILT, slightly sandy, grey with clayey layers 8
																	- lost core, assumed very sandy
								36	9								9
			1000	OB		• 54/20kPa					ML						
									10								

TONKIN & TAYLOR LTD.

BOREHOLE LOG

BOREHOLE No: BH8
Hole Location: Refer site plan.
SHEET 2 OF 2

PROJECT: University Development | LOCATION: Symonds Street, Auckland City | JOB No: 14281

CO-ORDINATES mN / mE | DRILL TYPE: Gemco | HOLE STARTED: 10/04/96

R.L. 45.00 m | DRILL METHOD: Rotary | HOLE FINISHED: 10/04/96

DATUM | DRILL FLUID: Water | DRILLED BY: PRODRILL LTD | LOGGED BY: LPA | CHECKED: JRL

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION	FLUID LOSS	WATER	CORE RECOVERY	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH kPa	COMPRESSIVE STRENGTH MPa	DEFECT SPACING (mm)	SOIL DESCRIPTION: Soil type, minor components, plasticity or particle size, colour. ROCK DESCRIPTION: Substance: Rock type, particle size, colour, minor components. Defects: Type, inclination, thickness, roughness, filling.	
						• 95/42kPa	7				ML	M	St					
			1500	OB		• 38/14kPa		34	11								very sandy layer	11
							8											
			1500	OB		• 103/52kPa		33	12									12
						• 91/42kPa	9	32	13								SILT, clayey with sandy layers	13
						• 62/34kPa												
						• 107/40kPa												
			1500	OB		• 120/42kPa	10	31	14				VSt					14
						• 133/64kPa	11											
								30	15								- interbedded slightly clayey and sandy SILT	15
			1500	OB		• 115/48kPa	12											
						• 120/46kPa		29	16									16
						• 132/46kPa	13											
						• 109/38kPa												
			1500	OB		• 109/46kPa	14	28	17									17
						• >187kPa	15	27	18									18
						• UTP							H				SILT, slightly clayey, dark grey with weakly cemented layers	
			1200	OB		• >187kPa	16											
								26	19									19
			115	PT		• UTP												
						N > [illegible]											END OF BOREHOLE @ 19.315m.	

TONKIN & TAYLOR LTD.

BOREHOLE LOG

BOREHOLE No: BH9
Hole Location: Refer site plan.
SHEET 1 OF 2

PROJECT: University Development		LOCATION: Symonds Street, Auckland City	JOB No: 14281
CO-ORDINATES mN / mE		DRILL TYPE: Gemco	HOLE STARTED: 12/04/96
		DRILL METHOD: Rotary	HOLE FINISHED: 12/04/96
R.L. 45.80 m			DRILLED BY: PRODRILL LTD
DATUM		DRILL FLUID: Water	LOGGED BY: LPA CHECKED: JRL

GEOLOGICAL / ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SOIL DESCRIPTION / ROCK DESCRIPTION
ACCESS PATH							M		CONCRETE, 0.085mm
HARD FILL						GW		MD	GRAVELS, fine
FILL	• >187kPa	1	45	1		ML		VSt	SILT, slighty clayey, brown and yellow with occasional brick pieces
	• >187kPa								
UPPER ASH	• 84/52kPa	2	44	2		ML		St	SILT, clayey, yellow and light brown
MIDDLE ASH	• 60/24kPa		43	3		ML			SILT, light brown, moderately sensitive, with many fine red clasts of CW volcanic gravels
	• 44/18kPa								
	• 46/20kPa	3	42	4					- clayey layer
	• 52/24kPa								
LOWER ASH	• 40/18kPa		41	5		MH			SILT, clayey, dark yellow
	• 60/30kPa	4				CL			- grades to CLAY, slightly silty, grey
	• 80/42kPa		40	6					- becomes light grey
	• 69/36kPa								
	• 77/44kPa	5	39	7					
	• 80/42kPa		38	8					
WEATHERED EAST COAST BAYS FORMATION	• 51/26kPa	6	37	9		MH			SILT, very clayey, dark grey
	•		36	10					- with sandy layers

	FLUID LOSS	WATER	CORE RECOVERY	METHOD	CASING
ACCESS PATH / HARD FILL			500	DIA CUT	
			500	OB	
FILL / UPPER ASH			500	OB	
			1500	OB	
MIDDLE ASH			1500	OB	
		15/4/96	1500	OB	
LOWER ASH			1500	OB	
			1500	OB	
WEATHERED EAST COAST BAYS FORMATION			1500	OB	

SOIL DESCRIPTION
Soil type, minor components, plasticity or particle size, colour.

ROCK DESCRIPTION
Substance: Rock type, particle size, colour, minor components.
Defects: Type, inclination, thickness, roughness, filling.

TONKIN & TAYLOR LTD.

BOREHOLE LOG

BOREHOLE No: BH9
Hole Location: Refer site plan.
SHEET 2 OF 2

PROJECT: University Development | LOCATION: Symonds Street, Auckland City | JOB No: 14281

CO-ORDINATES mN / mE | DRILL TYPE: Gemco | HOLE STARTED: 12/04/96

R.L. 45.80 m | DRILL METHOD: Rotary | HOLE FINISHED: 12/04/96

DATUM | DRILL FLUID: Water | DRILLED BY: PRODRILL LTD | LOGGED BY: LPA | CHECKED: JRL

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION

FLUID LOSS | WATER | CORE RECOVERY | METHOD | CASING | TESTS | SAMPLES | R.L. (m) | DEPTH (m) | GRAPHIC LOG | CLASSIFICATION SYMBOL | MOISTURE CONDITION / WEATHERING | STRENGTH/DENSITY CLASSIFICATION | SHEAR STRENGTH (kPa) | COMPRESSIVE STRENGTH (MPa) | DEFECT SPACING (mm)

SOIL DESCRIPTION
Soil type, minor components, plasticity or particle size, colour.

ROCK DESCRIPTION
Substance: Rock type, particle size, colour, minor components.
Defects: Type, inclination, thickness, roughness, filling.

TESTS	SAMPLES	R.L. (m)	DEPTH (m)	CLASSIFICATION SYMBOL	MOISTURE CONDITION	STRENGTH/DENSITY CLASSIFICATION
60/28kPa	7			ML	M	St
• 46/28kPa						F
	8	35	11			VSt
• 113/60kPa						
• 174/76kPa	9					
• > 187kPa		34	12			
	10					
• 168/76kPa						
		33	13			
		32	14			
		31	15			
		30	16			
		29	17			
		28	18			
		27	19			
		26				

CORE RECOVERY: 1500
METHOD: OB

END OF BOREHOLE @ 12.5m.

NOTES :

1. All dimensions are in millimetres unless noted otherwise.
2. Base drawing sourced from Auckland University.

LEGEND:

- BH 1 — Ministry of Works Machine drilled borehole (1962, 1963)
- BH 1 — Tonkin & Taylor Ltd Machine drilled borehole (2009)
- BH 1 — Tonkin & Taylor Ltd Percussion drilled environmental borehole (2009)
- ? 39 — Inferred rock head contours (SPT N>50)

1	Revised Issue		
0	First Issue	SVB	Jun. 11
REVISION DESCRIPTION		BY	DATE
DESIGNED :		STT	Jul. 11
DRAWN :		JATG	Jul. 11
DESIGN CHECKED :			
DRAFTING CHECKED :			

REFERENCE :

CADFILE : \\25668.300-F2.dwg

APPROVED :

NOT FOR CONSTRUCTION

This drawing is not to be used for construction purposes unless signed as approved

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Tonkin & Taylor
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DRAWING STATUS: PRELIMINARY DRAFT

THE UNIVERSITY OF AUCKLAND

GEOTECHNICAL & ENVIRONMENTAL INVESTIGATION

SECTOR 300
SCHOOL OF SCIENCE

BOREHOLE LOCATION PLAN

SCALES (AT A3 SIZE) 1: 750

DWG. No. Figure 2 | REV. 1

SCALE 1: 750

0 10 20 30 40 50 (m)

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BH_TT125699

TONKIN & TAYLOR LTD

BOREHOLE LOG

BOREHOLE No: BH1
Hole Location: Refer to site plan

SHEET 1 OF 1

PROJECT: Auckland University | LOCATION: Sector 300 Carpark 36 | JOB No: 25668.300

CO-ORDINATES 803052.45 mN, 400385.64 mE | DRILL TYPE: Dando Terrier Rig | HOLE STARTED: 2/2/09

DRILL METHOD: Percussion | HOLE FINISHED: 2/2/09

R.L. 42.59 m | DRILLED BY: Geotechnics (JRSS)

DATUM | DRILL FLUID: N/A | LOGGED BY: AJDC CHECKED: SVB

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION.	FLUID LOSS	WATER	CORE RECOVERY	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	WEATHERING / MOISTURE CONDITION	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION / ROCK DESCRIPTION
MADE GROUND								42.5			GS	Mst					ASPHALT. GRAVEL (basalt), sandy with minor silt, fine to coarse, sub angular, brownish grey.
									0.5		CH		F/St				CLAY, gravelly (fine to coarse basalt) with some silt, grey, firm to stiff, moist, slightly to moderately plastic. 0.5
								42.0			GS						GRAVEL (basalt), sandy with minor silt, fine to coarse, sub angular, grey.
WAITEMATA SERIES EAST COAST BAYS FORMATION RESIDUAL SOILS		DRY ON COMPLETION				81/55 kPa		41.5	1.0		CH		F/St				CLAY, silty with some rootlets, light grey with some yellowish brown mottles, firm to stiff, moist, moderately plastic. 1.0
									1.5								1.5
						87/61 kPa		41.0	2.0								2.0
								40.5					F				CLAY, with some silt, yellowish brown with grey mottles, firm, moist, moderately to highly plastic.
									2.5								2.5
								40.0					F/St				CLAY, with some silt, grey with yellowish brown mottles and some small dark purple inclusions, firm to stiff, moist, moderately plastic.
						69/44 kPa			3.0								3.0
								39.5									END OF BOREHOLE AT 3.0m
									4								

USAGE RIGHTS: FOR GENERAL: Data can be used within Tonkin & Taylor. Client/Landowner approval is requ

Log Scale 1:17.5

BORELOG 25668.300.GPJ 28/5/09

BH_TT125699

USAGE RIGHTS: T+T GENERAL: Data can be used within Tonkin & Taylor. Client/data owner approval is required to publish this data.

Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.: BH102

SHEET: 1 OF 2

PROJECT: University of Auckland - Rec Centre
JOB No.: 1001930.1000
LOCATION: 17 Symonds Street, Auckland

CO-ORDINATES: (NZTM2000) 5920009.58 mN 1757752.06 mE
DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 42.50m
R.L. COLLAR:
DATUM: ELLIPSOID
SURVEY: Handheld GPS

DRILLED BY: Lance Vuglar
LOGGED BY: SJTI
CHECKED: KJH
START DATE: 30/10/2017
FINISH DATE: 30/10/2017
CONTRACTOR: DCN Drilling Ltd

GEOLOGICAL UNIT	DESCRIPTION OF CORE (SOIL: Classification, colour, consistency / density, moisture, plasticity; ROCK: Weathering, colour, fabric, name, strength, cementation)	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)
Fill	0.0-0.05m: TARSEAL.					
	0.05-0.4m: Fine to coarse angular GRAVEL, with some silt. Tightly packed. [HARDFILL]					
	Gravelly CLAY, with some silt, minor organics; orange brown. Soft, moist; gravel, fine to coarse; organics, decomposed wood, rootlets? [FILL]	HVAC	0	● 28/16 kPa	42	
	CLAY, with trace gravel; orange brown with cream mottles. Stiff, moist; gravel, fine.					1
	CLAY, with minor gravel; light brown with some black mottles. Stiff, moist, high plasticity; gravel, fine to medium.	SPT	100	94/35 kPa 1/1 2/1 1/2 N=6	41	
	1.95-2.08m: CORE LOSS.					2
	Silty CLAY, with minor gravel; light brown with black mottles. Soft, moist, high plasticity; gravel, fine to medium.	OB	87		40	
	2.83: Grades to silty CLAY; light brown with grey mottles. Stiff, dry, high plasticity.					3
Auckland Volcanic Field	3-3.4m: CORE LOSS.	SPT	11	192/69 kPa 1/2 2/2 3/3 N=10		
	Grades to silty CLAY; light grey with light brown mottles. Firm, moist, high plasticity.	OB	73		39	
						4
	4.5-4.95m: CORE LOSS.	SPT	0	57/22 kPa 1/1 2/1 2/3 N=8	38	
	4.95-5.15m: CORE LOSS.					5
	CLAY, with some silt; light grey with orange and red mottles.Very stiff, dry, high plasticity.	OB	80		37	
	5.85m: Grades to orangish brown with grey mottles.	SPT	100	105/16 kPa 1/1 2/1 2/2 N=7		6
	CLAY, with minor silt; grey. Stiff, dry, high plasticity.				36	
	6.45-6.78m: CORE LOSS.					
	CLAY, with minor silt; grey. Firm, moist, high plasticity.	OB	68			7
		PT	100	● 41/16 kPa	35	
	8-8.32m: CORE LOSS.	SPT	28	1/1 2/1 2/2 N=7		8
	CLAY, with minor silt; grey. Firm, moist, high plasticity.				34	
	Sandy CLAY, with some silt; grey. Firm, moist, medium plasticity; sand, fine.	OB	100			
	CLAY, with minor silt; grey. Stiff, moist, high plasticity.	SPT	100	94/39 kPa 1/2 1/2 2/2 N=7		9
Residual East Coast Bays Formation Soils	Completely weathered, grey interbedded SILTSTONE and fine grained SANDSTONE. Extremely weak.				33	
	9.45-9.6m: CORE LOSS.	OB	86			

ROCK DEFECTS								
Graphic Log	Defect Log	Fracture Spacing (mm)	RQD (%)	Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
				1.00m: Enviro sample					
				1.50m: Enviro sample					
				3.00m: Enviro sample					
				4.00m: Port #1					
				4.50m: Enviro sample					Box 1, 0.0-5.5m
				6.00m: Port #2					
				9.50m: Port #3 *9.60m:* 7mm band of carbonaceous material					Box 2, 5.5-9.5m

COMMENTS: Shear vane readings taken with SV376 and corrected by a factor of 1.572.

Hole Depth 19.61m

Scale 1:50

Rev.: E

General Log - 3/07/2019 4:23:52 p.m. - Produced with Core-GS by GeRoc

BH_TT116870

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BOREHOLE LOG

BOREHOLE No.: BH102

SHEET: 2 OF 2

PROJECT: University of Auckland - Rec Centre
JOB No.: 1001930.1000
LOCATION: 17 Symonds Street, Auckland

CO-ORDINATES: (NZTM2000) 5920009.58 mN 1757752.06 mE
DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 42.50m
R.L. COLLAR:
DATUM: ELLIPSOID
SURVEY: Handheld GPS

DRILLED BY: Lance Vuglar
LOGGED BY: SJTI
CHECKED: KJH
START DATE: 30/10/2017
FINISH DATE: 30/10/2017
CONTRACTOR: DCN Drilling Ltd

GEOLOGICAL UNIT	DESCRIPTION OF CORE (SOIL: Classification, colour, consistency / density, moisture, plasticity; ROCK: Weathering, colour, fabric, name, strength, cementation)	Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS: Defect Log	Fracture Spacing (mm)	RQD (%)	Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
Weathered East Coast Bays Formation	Completely weathered, grey interbedded SILTSTONE and fine grained SANDSTONE. Extremely weak.			OB	86													
				SPT	100	63/19 kPa 1/1 1/1 2/2 N=6	32											
	10.95-11.12m: CORE LOSS.							11										
	Completely weathered, grey, fine grained SANDSTONE. Extremely weak.			OB	83		31											
	Completely weathered, grey SILTSTONE. Extremely weak.																	
	Completely weathered, grey interbedded SILTSTONE and fine grained SANDSTONE.			SPT	100	138/41 kPa 2/3 4/5 6/7 N=22		12										Box 3, 9.5-12.2m
	12.45-12.82m: CORE LOSS.						30						*12.50m:* Port #4					
	Highly weathered, grey interbedded SILTSTONE and fine grained SANDSTONE. Extremely weak.			HQTT	64			13										
				SPT	100	5/4 4/6 9/11 N=30	29											
	13.95-14.4m: CORE LOSS.							14										
East Coast Bays Formation	Highly weathered, grey, fine grained SANDSTONE. Extremely weak.			HQTT	57		28											
	15-15.85m: CORE LOSS.			SPT	0	6/11 27/23 for 60mm N>=50 Solid		15										
	Highly weathered, grey interbedded fine grained SANDSTONE and SILTSTONE. Extremely weak.			HQTT	53		27						*15.50m:* Port #5					
	16.5-16.8m: CORE LOSS.				0	23/27 for 65mm N>=50 Solid		16										
	Highly weathered, grey interbedded SILTSTONE and fine grained SANDSTONE. Extremely weak.			HQTT	78		26											
				HQTT	100			17										
	18.0-18.09m: CORE LOSS.				0	32/18 for 15mm N>=50 Solid	25						*17.85 - 18.00m:* wood, fibrous; trace of pyrite *18.00m:* Port #6					
	Highly weathered, grey interbedded SILTSTONE and fine grained SANDSTONE. Extremely weak.			HQTT	92			18										
				HQTT	100		24						19.25m: J, sub-horizontal, UN, R, VW, HW, N, CN 19.45m: B, sub-horizontal, UN, R, VW, HW, N, CN					Box 4, 12.2-19.5m
					0	21/29 for 35mm N>=50 Solid	23	19										
	19.61m: END OF BOREHOLE																	

COMMENTS: Shear vane readings taken with SV376 and corrected by a factor of 1.572.

Hole Depth 19.61m

Scale 1:50

Rev.: E

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CORE PHOTOS

BOREHOLE No.: **BH102**

PROJECT: University of Auckland - Rec Centre		LOCATION: 17 Symonds Street, Auckland		JOB No.: 1001930.1000	
CO-ORDINATES: (NZTM2000)	5920009.58 mN 1757752.06 mE	DRILL TYPE:		HOLE STARTED: 30/10/2017	
		DRILL METHOD: RC		HOLE FINISHED: 30/10/2017	
R.L.:	42.50m			DRILLED BY: DCN Drilling Ltd	
DATUM:	ELLIPSOID	DRILL FLUID:		LOGGED BY: SJTI	CHECKED: KJH



0.00-5.45m



5.45-9.45m

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CORE PHOTOS

BOREHOLE No.: **BH102**

PROJECT: University of Auckland - Rec Centre	LOCATION: 17 Symonds Street, Auckland	JOB No.: 1001930.1000
CO-ORDINATES: 5920009.58 mN (NZTM2000) 1757752.06 mE	DRILL TYPE:	HOLE STARTED: 30/10/2017
R.L.: 42.50m	DRILL METHOD: RC	HOLE FINISHED: 30/10/2017
DATUM: ELLIPSOID	DRILL FLUID:	DRILLED BY: DCN Drilling Ltd
		LOGGED BY: SJTI CHECKED: KJH



9.45-12.45m



12.45-17.53m

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CORE PHOTOS

BOREHOLE No.: **BH102**

PROJECT: University of Auckland - Rec Centre	LOCATION: 17 Symonds Street, Auckland	JOB No.: 1001930.1000
CO-ORDINATES: 5920009.58 mN (NZTM2000) 1757752.06 mE	DRILL TYPE:	HOLE STARTED: 30/10/2017
R.L.: 42.50m	DRILL METHOD: RC	HOLE FINISHED: 30/10/2017
DATUM: ELLIPSOID	DRILL FLUID:	DRILLED BY: DCN Drilling Ltd
		LOGGED BY: SJTI CHECKED: KJH



17.53-19.50m

General Log - 3/07/2019 4:23:53 p.m. - Produced with Core-GS by GeRoc

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BOREHOLE LOG

BOREHOLE No.: BH103A

SHEET: 1 OF 1

PROJECT: University of Auckland - Rec Centre
JOB No.: 1001930.1000
LOCATION: 17 Symonds Street, Auckland

CO-ORDINATES: 174.768681228161, -36.8523679696465 (WGS84)
DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND:
R.L. COLLAR:
DATUM:
SURVEY: Map or aerial photograph

DRILLED BY: Lance Vuglar
LOGGED BY: SJTI
CHECKED: KJH
START DATE: 25/10/2017
FINISH DATE: 28/10/2017
CONTRACTOR: DCN Drilling Ltd

GEOLOGICAL UNIT	DESCRIPTION OF CORE (SOIL: Classification, colour, consistency / density, moisture, plasticity; ROCK: Weathering, colour, fabric, name, strength, cementation)	Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS: Defect Log	Fracture Spacing (mm)	RQD (%)	Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
Fill	0.00 - 0.05m: TARSEAL																	
Fill	Gravelly SAND, with minor cobbles; dark brown. Tightly packed, dry; cobbles up to 8cm, angular, greywacke. [HARDFILL]												*0.15m:* Enviro sample					
Fill	CLAY, with trace gravel; light grey with brown mottles. Firm, moist, high plasticity; gravel, fine. [FILL]			HA	0	13/6 kPa; 63/38 kPa	42						*0.50m:* Enviro sample					
Fill	CLAY; light grey. Stiff, moist, high plasticity.					134/53 kPa		1					*1.00m:* Enviro sample					
Fill	CLAY, with minor gravel; light grey with orange mottles. Firm, dry, high plasticity; gravel, fine to medium. 2.0m: grades to moist.			HA	40	116/53 kPa	41						*1.50m:* Enviro sample					
Residual East Coast Bays Formation	Clayey SILT; light grey. Firm, moist, medium plasticity.			PT	100			2										
Residual East Coast Bays Formation	CLAY; brownish grey with orange mottles. Firm, moist, high plasticity.			PT	50		40											
Residual East Coast Bays Formation	CLAY, with minor silt; dark grey. Firm, moist, high plasticity.			SPT	100	1/1 2/1 2/0 N=5		3					*3.00m:* Enviro sample					
Weathered East Coast Bays Formation	Completely weathered, dark grey SILTSTONE. Extremely weak. Remoulds to silty CLAY; dark grey. Firm, moist, high plasticity.			HQTT	100		39										Box 1, 0.0-4.1m	
Weathered East Coast Bays Formation	Completely weathered, dark grey SILTSTONE. Extremely weak.			PT	70			4										
Weathered East Coast Bays Formation	Completely weathered, dark grey SANDSTONE. Extremely weak. Remoulds to silty, fine SAND, with some clay. Loose, moist.			HQTT	100		38											
Weathered East Coast Bays Formation	Completely weathered, dark grey SILTSTONE. Extremely weak.							5										
Weathered East Coast Bays Formation	Highly weathered, dark grey SILTSTONE. Extremely weak.						37											
Weathered East Coast Bays Formation	Highly weathered, dark grey SANDSTONE. Extremely weak.			HQTT	100			6					*6.00 - 6.20m:* 20cm zone of carbonaceous laminations in ECBF				Box 2, 4.1-6.8m	
Weathered East Coast Bays Formation	Moderately weathered, dark grey SILTSTONE. Extremely weak.						36											
Weathered East Coast Bays Formation								7					6.92m: J, sub-horizontal, PL, R, VW, MN, N, CV					
Weathered East Coast Bays Formation							35						7.42m: J, sub-horizontal, PL, SM, VW, MN, N, CV					
Weathered East Coast Bays Formation								8					7.98m: J, sub-horizontal, ST, R, VW, MN, MN, CV 8.16m: J, sub-horizontal, PL, SM, VW, MW, VN, CL 8.62m: J, sub-horizontal, ST, SM, VW, MW, N, CV					
Weathered East Coast Bays Formation				HQTT	100		34											
ECBF	Moderately weathered, dark grey SANDSTONE. Very weak.												8.82m: J, sub-horizontal, PL, SM, VW, MW, VN, CV					
ECBF	Moderately weathered, dark grey SILTSTONE. Very weak. 8.8m: ~10cm zone of interbedded carbonaceous laminations of organic and fine sandy siltstone.			SPT	0	5/7 11/15 21/3 for 50mm N>=50 Solid		9					8.95m: J, sub-horizontal, PL, SM, VW, MW, VN, CV				Box 3, 6.8-9.1m	
	9.43m: END OF BOREHOLE						33											

COMMENTS: 1. Shear vane readings taken with SV376 and corrected by a factor of 1.572. 2. Piezometer 32mm diameter.

Hole Depth 9.43m

Scale 1:50

Rev.: D

General Log - 10/09/2019 1:56:01 PM - Produced with Core-GS by GeRoc

BH_TT116871

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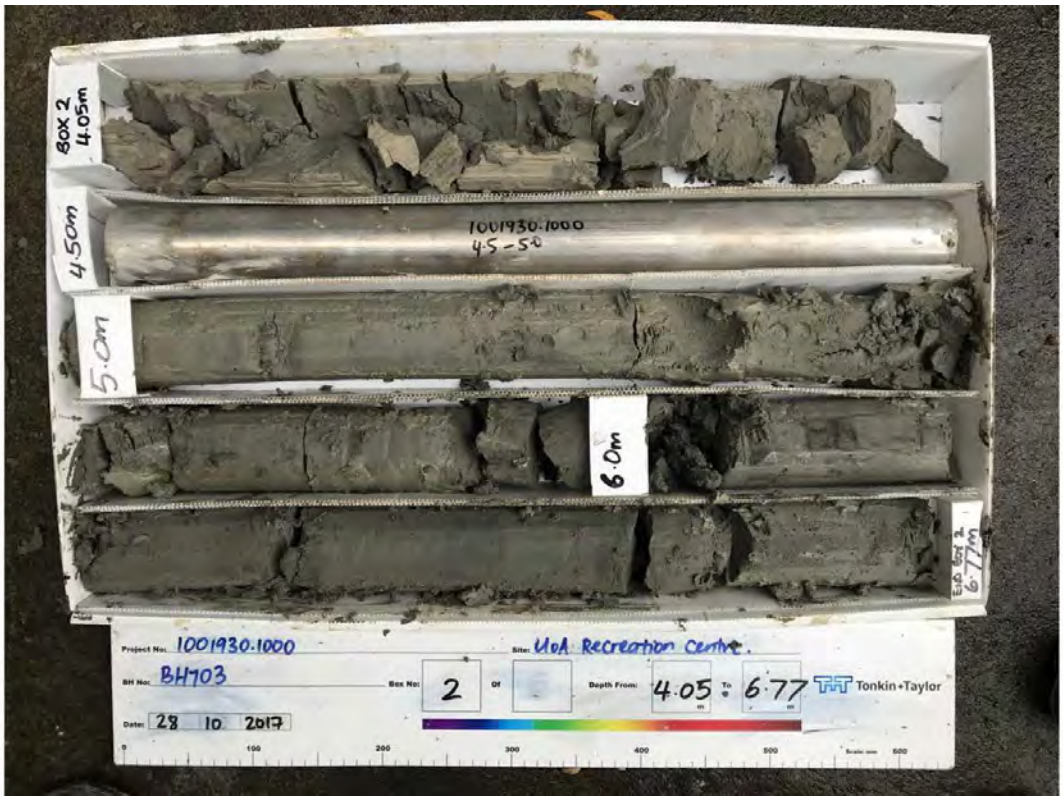
CORE PHOTOS

BOREHOLE No.: **BH103A**

PROJECT: University of Auckland - Rec Centre	LOCATION: 17 Symonds Street, Auckland	JOB No.: 1001930.1000
CO-ORDINATES: 174.768681228161 (WGS84) -36.8523679696465 R.L.: DATUM:	DRILL TYPE: DRILL METHOD: RC	HOLE STARTED: 25/10/2017 HOLE FINISHED: 28/10/2017 DRILLED BY: DCN Drilling Ltd LOGGED BY: SJTI CHECKED: KJH



0.00-4.05m



4.05-6.77m

General Log - 10/09/2019 1:56:01 PM - Produced with Core-GS by GeRoc

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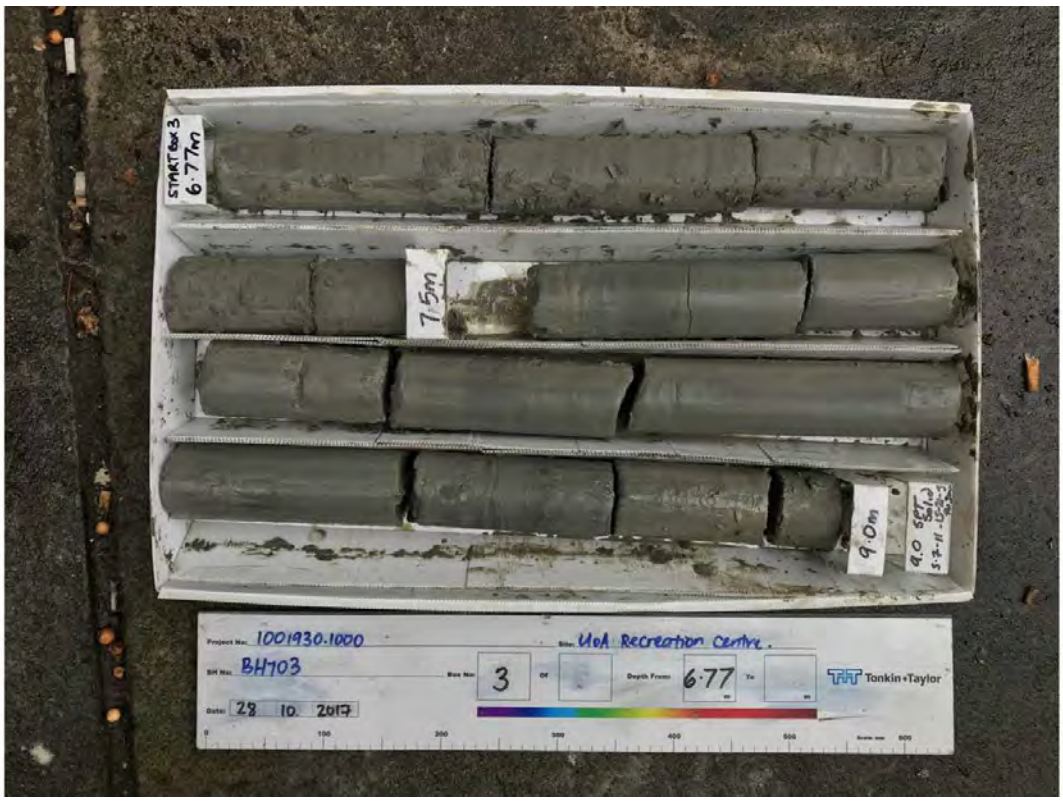
Tonkin+Taylor

CORE PHOTOS

BOREHOLE No.: **BH103A**

PROJECT: University of Auckland - Rec Centre	LOCATION: 17 Symonds Street, Auckland	JOB No.: 1001930.1000
CO-ORDINATES: 174.768681228161 (WGS84) -36.8523679696465 R.L.: DATUM:	DRILL TYPE: DRILL METHOD: RC	HOLE STARTED: 25/10/2017 HOLE FINISHED: 28/10/2017 DRILLED BY: DCN Drilling Ltd LOGGED BY: SJTI CHECKED: KJH



6.77-9.00m

General Log - 10/09/2019 1:56:01 PM - Produced with Core-GS by GeRoc

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BOREHOLE LOG

BOREHOLE No.: BH103C

SHEET: 1 OF 2

PROJECT: University of Auckland - Rec Centre
JOB No.: 1001930.1000
LOCATION: 17 Symonds Street, Auckland

CO-ORDINATES: (NZTM2000) 5920059.26 mN 1757662.26 mE
DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 42.50m
R.L. COLLAR:
DATUM: ELLIPSOID
SURVEY: Handheld GPS

DRILLED BY: Lance Vuglar
LOGGED BY: SJTI
CHECKED: KJH
START DATE: 24/10/2017
FINISH DATE: 25/10/2017
CONTRACTOR: DCN Drilling Ltd

GEOLOGICAL UNIT	DESCRIPTION OF CORE (SOIL: Classification, colour, consistency / density, moisture, plasticity; ROCK: Weathering, colour, fabric, name, strength, cementation)	Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS: Defect Log	ROCK DEFECTS: Fracture Spacing (mm)	ROCK DEFECTS: RQD (%)	Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
Fill	0.0 - 0.05m: ASPHALT Sandy, fine to coarse angular gravel; dark grey. Tightly packed, wet. [HARDFILL]																	
Residual East Coast Bays Formation	CLAY with trace of gravel; light grey with black mottles. Firm, moist, high plasticity; gravel, fine grained.			HVAC	0		42						*0.50m:* Enviro sample					
	CLAY: light grey. Firm, wet, high plasticity.							1					*1.00m:* Enviro sample					
	1.5-1.83m: CORE LOSS			SPT	26	1/1 1/1 2/2 N=6	41						*1.50m:* Enviro sample					
	CLAY with some silt; light grey. Firm, moist, high plasticity.			TT	0			2										
	1.95-2.1m: CORE LOSS																	
Weathered East Coast Bays Formation	CLAY with some silt; grey with orange-brown mottles. Firm, moist, high plasticity.			PT	100		40											
	Completely weathered, grey interbedded SILTSTONE and fine grained SANDSTONE. Extremely weak. Remoulds to clayey SILT; grey. Very soft, moist, high plasticity.			PT	100			3										
	Completely weathered, grey interbedded SILTSTONE and fine grained SANDSTONE. Extremely weak. Remoulds to clayey SILT and silty, fine SAND.			SPT	100	1/2 1/2 2/2 N=7	39						*3.10m:* Enviro sample					
	Highly weathered, grey interbedded SILTSTONE and fine grained SANDSTONE. Extremely weak.			TT	100			4					*4.00m:* Port #1					
				SPT	100	2/2 4/5 7/10 N=26	38						*4.50m:* Enviro sample					
	4.9m: Grades to very weak. 5.15m: Black streaks of organic material. 5.3m: 5mm bed of thinly laminated black silt (organic material?) and fine grained sandstone.			TT	100		37	5					*5.20 - 5.30m:* zone of laminated carbonaceous material and ECBF *5.40m:* zone of carbonaceous laminations spaced ~10mm					
	Moderately weathered, grey interbedded SILTSTONE and fine grained SANDSTONE. Very weak.			SPT	0	3/5 13/20 17 for 60mm N>=50 Solid		6					*6.00m:* Port #2					Box 1, 0.0-6.5m
East Coast Bays Formation	Moderately weathered, grey SILTSTONE. Extremely weak.			TT	108		36											
				SPT	0	5/10 31/19 for 35mm N>=50 Solid	35	7										
	8.00m: 5cm zone of carbonaceous laminations in ECBF Moderately weathered, grey interbedded SILTSTONE and fine grained SANDSTONE. Extremely weak.			TT	100			8					*8.00m:* Port #3 *8.03m:* 5mm layer of thinly laminated very fine grained, black sandstone.					
	Moderately weathered, grey SILTSTONE. Extremely weak.						34											
				SPT	0	5/11 31/19 for 55mm N>=50 Solid		9										
	Moderately weathered, grey, fine grained SANDSTONE. Extremely weak.			TT	104		33											Box 2, 6.5-10.2m

COMMENTS: Shear vane readings taken with SV376 and corrected by a factor of 1.572.CMT multilevel piezometers installed by Geotechnics Ltd technician.

Hole Depth 13.82m

Scale 1:50

Rev.: E

General Log - 3/07/2019 4:25:50 p.m. - Produced with Core-GS by GeRoc

BH_TT116872

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BOREHOLE LOG

BOREHOLE No.: BH103C

SHEET: 2 OF 2

PROJECT: University of Auckland - Rec Centre

JOB No.: 1001930.1000

LOCATION: 17 Symonds Street, Auckland

CO-ORDINATES: (NZTM2000) 5920059.26 mN 1757662.26 mE

DIRECTION:

ANGLE FROM HORIZ.: -90°

R.L. GROUND: 42.50m

R.L. COLLAR:

DATUM: ELLIPSOID

SURVEY: Handheld GPS

DRILLED BY: Lance Vuglar

LOGGED BY: SJTI

CHECKED: KJH

START DATE: 24/10/2017

FINISH DATE: 25/10/2017

CONTRACTOR: DCN Drilling Ltd

GEOLOGICAL UNIT	DESCRIPTION OF CORE SOIL: Classification, colour, consistency / density, moisture, plasticity ROCK: Weathering, colour, fabric, name, strength, cementation	Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS: Defect Log	Fracture Spacing (mm)	RQD (%)	Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
East Coast Bays Formation	10.0m: [CONT] Moderately weathered, grey, fine grained SANDSTONE. Extremely weak.	UW SW MW HW CW	EW MW SW HW CW	TT	100		32						*10.00m:* Port #4					
	Moderately weathered, grey interbedded SILTSTONE and fine grained SANDSTONE. Extremely weak.			SPT	100	10/14 45/5 for 5mm **N>=50** Solid		11					10.40m: J, sub-horizontal, UN, R, EW, MW					
	Moderately weathered, grey, fine grained SANDSTONE. Extremely weak. 11.04m: 5cm zone of dark grey to black carbonaceous material in host rock (moderately weathered, grey, very fine grained sandstone). 11.55m: Very thin sub-horizontal bed of carbonaceous material, peat. 11.95m: 5cm zone of black, very thin carbonaceous lamination in host rock (moderately weathered, grey, very fine grained sandstone). 12.28m: 5cm zone of black, very thin laminations in host material (moderately weathered, grey, very fine grained sandstone).			TT	100		31						11.55m: B, 15° dip, ST, SM, EW, MW, T, CN, N, Fe stain					
				SPT	100	16/34 for 55mm **N>=50** Solid		12					12.13m: J, sub-horizontal, PL, R, SW, MW, N, CN					
				TT	100		30						*12.50m:* Port #5					
	Moderately weathered, grey SILTSTONE. Extremely weak.							13										
	Moderately weathered, grey, fine grained SANDSTONE. Extremely weak.			SPT	100	12/38 for 50mm **N>=50** Solid	29						13.42m: J, sub-horizontal, PL, SL, EW, MW, VN, CN					Box 3, 10.2-13.6m
	13.62m: END OF BOREHOLE							14										
							28											
								15										
							27											
								16										
							26											
								17										
							25											
								18										
							24											
								19										
							23											

COMMENTS: Shear vane readings taken with SV376 and corrected by a factor of 1.572.CMT multilevel piezometers installed by Geotechnics Ltd technician.

Hole Depth 13.62m

Scale 1:50

Rev.: E

General Log - 3/07/2019 4:25:51 p.m. - Produced with Core-GS by GeRoc

BH_TT116872

BOREHOLE LOG

Tonkin+Taylor

BOREHOLE No.: BH101

SHEET: 1 OF 2

PROJECT: University of Auckland - Rec Centre
JOB No.: 1001930.1000
LOCATION: 17 Symonds Street, Auckland

CO-ORDINATES: 6481669.60 N, 2668155.53 E (EDENTM1949)
DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 43.50m
R.L. COLLAR:
DATUM: GEODETIC
SURVEY:

DRILLED BY: Lance Vulgar
LOGGED BY: SJTI
CHECKED: KJH
START DATE: 30/10/2017
FINISH DATE: 02/11/2017
CONTRACTOR: DCN Drilling Ltd

GEOLOGICAL UNIT	DESCRIPTION OF CORE (SOIL: Classification, colour, consistency / density, moisture, plasticity; ROCK: Weathering, colour, fabric, name, strength, cementation)	Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS: Defect Log	ROCK DEFECTS: Fracture Spacing (mm)	ROCK DEFECTS: RQD (%)	Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
TSoil	Clayey SILT, with minor gravel; dark brown. Moist, moderate plasticity; gravel, fine to medium.			HVAC	0	28/16 kPa			TS				*0.50m:* Enviro sample					
Auckland Volcanic Field	CLAY, with trace gravel; orange brown with cream mottles. Firm, moist, high plasticity; gravel, fine.					88/28 kPa		1					*1.00m:* Enviro sample					
	Silty CLAY, with trace gravel; orange brown with cream mottles. Firm, moist, moderate plasticity; gravel, fine to medium. Trace organics, decomposed wood/rootlets.			SPT	100	1/0 1/1 1/1 N=4							*1.50m:* Enviro sample					
	1.95-2.5m: CORE LOSS.							2										
	Silty CLAY; orangish brown. Stiff, dry, high plasticity.			OB	47													
	Silty CLAY; grey. Firm, moist, high plasticity.			PT	100	121/47 kPa		3					*3.00m:* Enviro sample					
	3.5-3.68m: CORE LOSS.																	
Residual East Coast Bays Formation	Silty CLAY; grey. Firm, moist, high plasticity.			OB	82			4										
	Silty CLAY; grey. Firm, moist, high plasticity.			SPT	100	75/41 kPa 1/1 1/1 1/1 N=4							*4.50m:* Enviro sample					
	4.95-5.23m: CORE LOSS.							5										
	CLAY, with some silt; dark grey. Soft, moist, high plasticity.			OB	73													Box 1, 0.0-5.8m
				SPT	100	50/25 kPa 1/1 1/2 1/2 N=6		6										
	6.45-6.54m: CORE LOSS.																	
	CLAY, with some silt; dark grey. Soft, moist, high plasticity. Thin (<5cm) lenses of fine sandy CLAY at approx. 6.7m and 6.9m.			OB	91			7										
				SPT	100	66/17 kPa 1/1 1/2 2/2 N=7												
	7.95-8.05m: CORE LOSS.							8										
East Coast Bays Formation	Silty CLAY; dark grey. Firm, moist, high plasticity. Occasional lenses (<5cm) of fine sandy CLAY with some silt. (Completely weathered ECBF)			OB	90													Box 2, 5.8-8.8m
				PT	100	2 @ 9.0m		9										
	9.5-9.63m: CORE LOSS.												*9.40m:* carbonaceous material					
	Highly weathered, grey interbedded SILTSTONE and fine grained SANDSTONE. Extremely weak.			OB	83													

COMMENTS: 1. Shear vane readings taken with SV376 and corrected by a factor of 1.572. 2. Nested piezos both 25 mm.

Hole Depth 15.07m

Scale 1:50

Rev.: A

General Log - 24/01/2018 1:01:49 p.m. - Produced with Core-GS by GeRoc

BOREHOLE LOG

Tonkin+Taylor

BOREHOLE No.: BH101

SHEET: 2 OF 2

PROJECT: University of Auckland - Rec Centre
JOB No.: 1001930.1000
LOCATION: 17 Symonds Street, Auckland

CO-ORDINATES: 6481669.60 N, 2668155.53 E (EDENTM1949)
DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 43.50m
R.L. COLLAR:
DATUM: GEODETIC
SURVEY:

DRILLED BY: Lance Vulgar
LOGGED BY: SJTI
CHECKED: KJH
START DATE: 30/10/2017
FINISH DATE: 02/11/2017
CONTRACTOR: DCN Drilling Ltd

GEOLOGICAL UNIT	DESCRIPTION OF CORE (SOIL: Classification, colour, consistency / density, moisture, plasticity; ROCK: Weathering, colour, fabric, name, strength, cementation)	Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m) / Depth (m)	Graphic Log	ROCK DEFECTS: Defect Log	Fracture Spacing (mm)	RQD (%)	Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
East Coast Bays Formation	Highly weathered, grey interbedded SILTSTONE and fine grained SANDSTONE. Extremely weak.	UW SW MW HW CW	ES VS S MS W VW EW	OB	83		11										
				SPT	100	5/6 6/6 6/8 **N=26**											
				OB	100												
	11.3-11.6m: CORE LOSS.																
	Highly weathered, grey interbedded SILTSTONE and fine grained SANDSTONE. Extremely weak.			TT	57												
	12.05-12.85m: CORE LOSS.			SPT	0	19/21 27/23 for 50mm **N>=50** Solid	12										
	Highly weathered, grey, interbedded SILTSTONE and fine grained SANDSTONE. Extremely weak.			TT	53		13										
				SPT	0	22/28 for 50mm **N>=50** Solid											
				TT	97		14					*13.80m:* 5mm band of carbonaceous material *14.30m:* sub-horizontal bedding.					
				TT	100												
	15.07m: END OF BOREHOLE				0	50 for 75mm **N>=50** Solid	15										Box 3. 8.8-15.1m
							16										
							17										
							18										
							19										

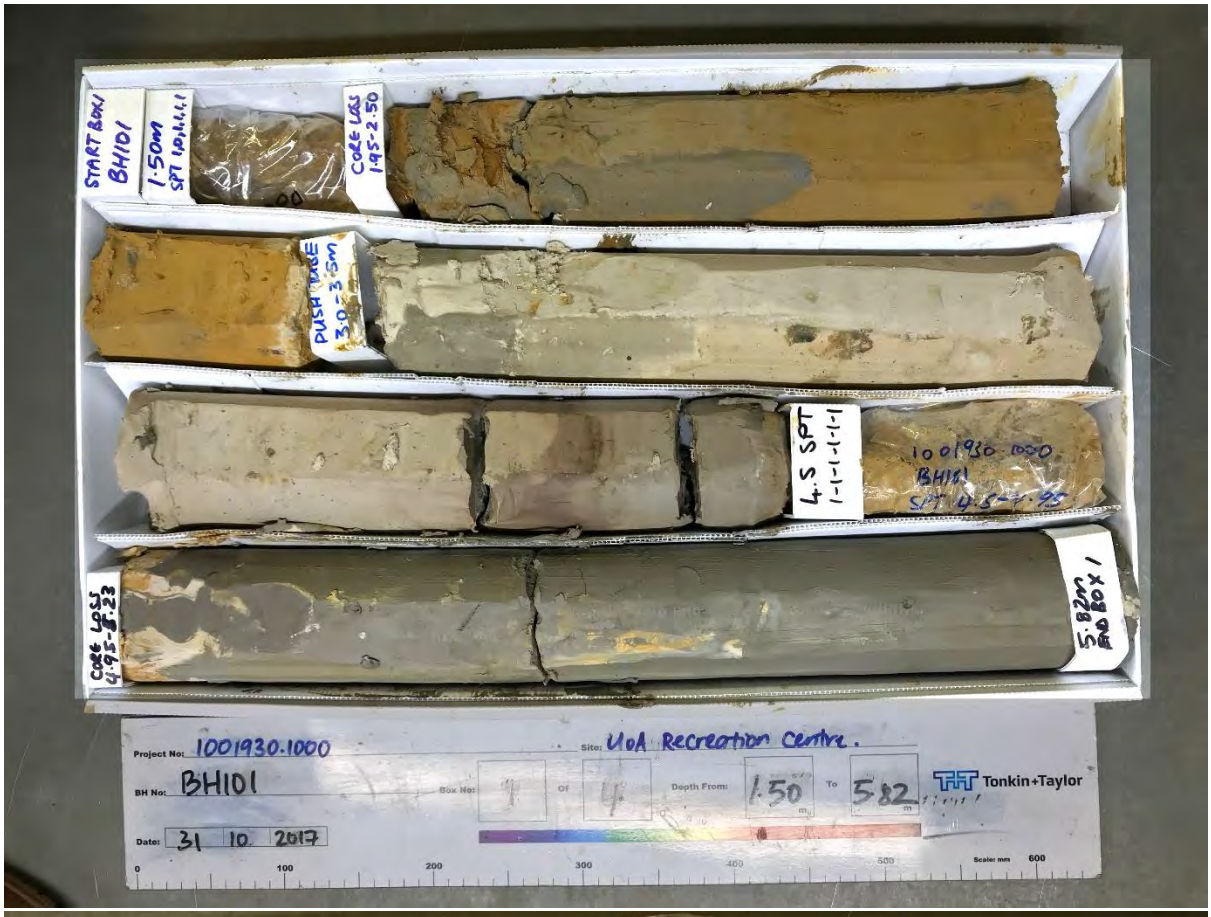
COMMENTS: 1. Shear vane readings taken with SV376 and corrected by a factor of 1.572. 2. Nested piezos both 25 mm.

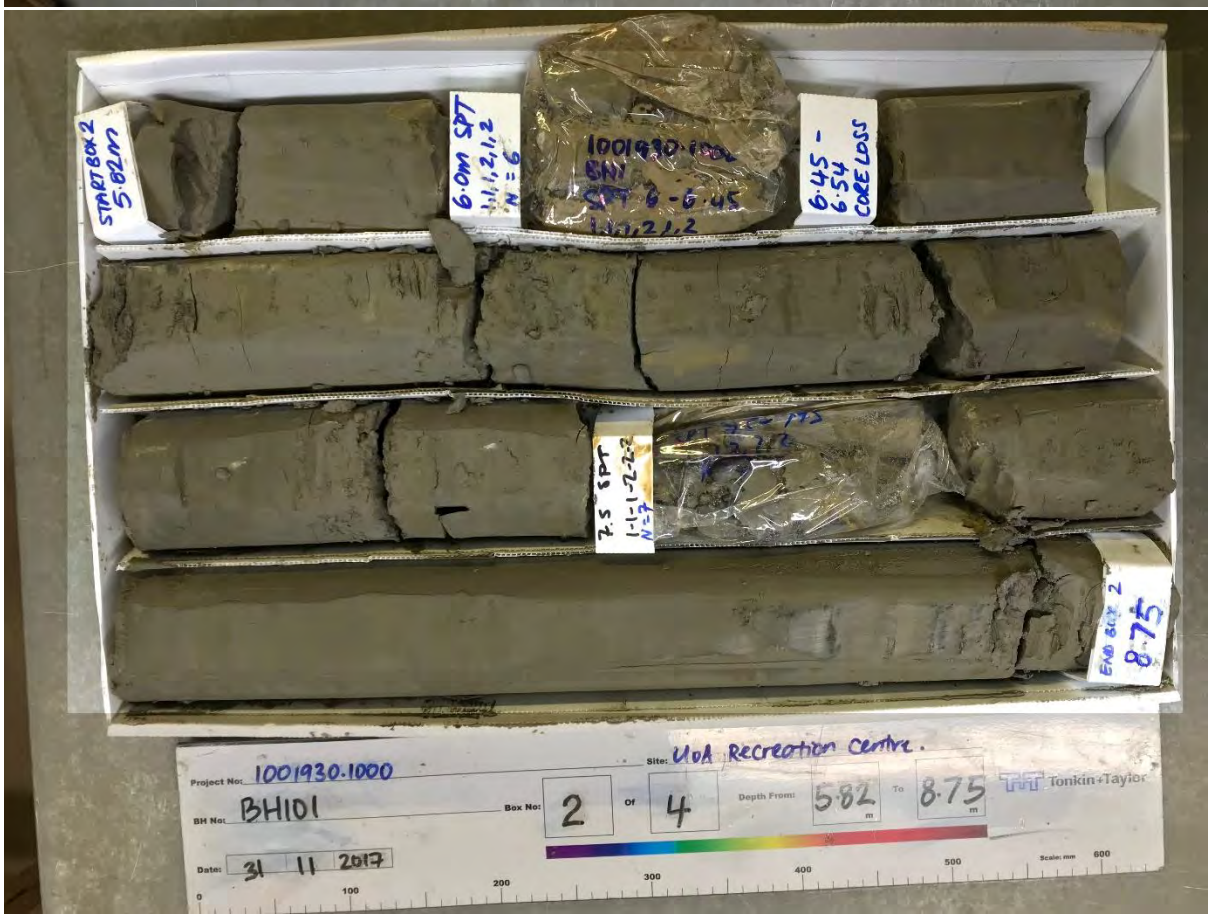
Hole Depth 15.07m

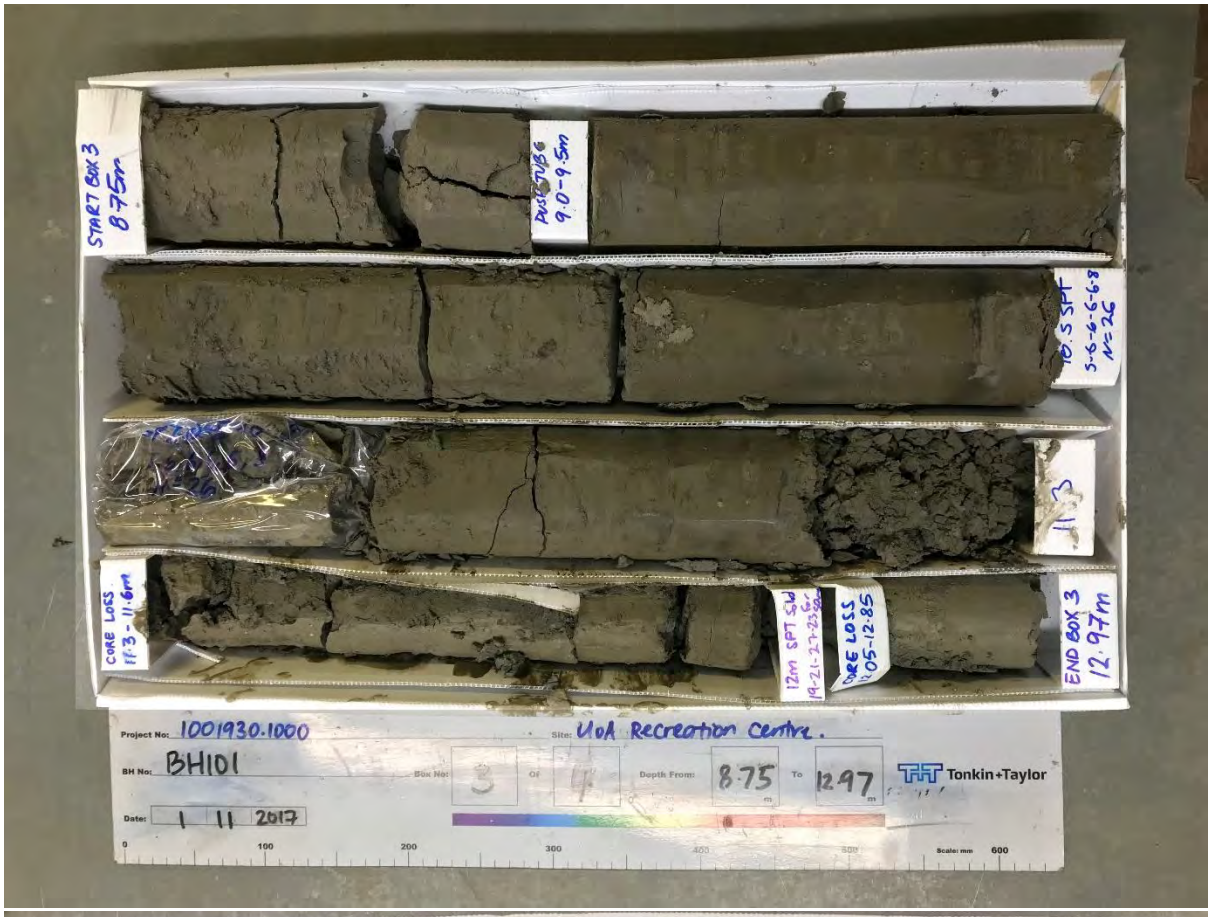
Scale 1:50

Rev.: A

General Log - 24/01/2018 1:01:49 p.m. - Produced with Core-GS by GeRoc


START BOX 1
BH101
1.50m
SPT 1,0,1,1,1
CORE LOSS
1.95-2.50
PUSH TUBE
3.0-3.5m
4.5 SPT
1-1-1-1-1-1
1001930.1000
BH101
CORE LOSS
4.95-5.23
5.82m
END BOX 1
Project No: 1001930.1000
BH No: BH101
Site: UoA Recreation Centre.
Box No: 1
Of 4
Depth From: 1.50 m
To 5.82 m
Tonkin+Taylor
Date: 31 10 2017
0
100
200
300
400
500
Scale: mm
600


START BOX 2
5.82m
6.0m SPT
1,1,2,1,2
N=6
1001930.1000
BH1
SPT 6-6.45
1,1,2,1,2
6.45 -
6.54
CORE LOSS
7.5 SPT
1-1-1-2-2-2
N=7
END BOX 2
8.75
Project No: 1001930.1000
BH No: BH101
Site: UoA Recreation Centre.
Box No: 2
Of 4
Depth From: 5.82 m
To 8.75 m
Tonkin+Taylor
Date: 31 11 2017
0
100
200
300
400
500
Scale: mm
600


START BOX 3
8.75m
PUSH TUBE
9.0-9.5m
10.5 SPT
5-6-6-6-8
N=26
11.3
CORE LOSS
11.3-11.6m
12m SPT S&W
19-21-23-23
CORE LOSS
11.05-12.85
END BOX 3
12.97m
Project No: 1001930.1000
Site: UoA Recreation Centre.
BH No: BH101
Box No: 3
Of 4
Depth From: 8.75 m
To 12.97 m
Tonkin+Taylor
Date: 1 11 2017
0
100
200
300
400
500
Scale: mm
600


START BOX 4
12.97m
13.5 SPT
SOLID
22-28
50/75mm
14.3
15.0m SPT
50 for 75mm
End of Hole
15.075m
Project No: 1001930.1000
Site: UoA Recreation Centre.
BH No: BH101
Box No: 4
Of 4
Depth From: 12.97 m
To 15.075 m
Tonkin+Taylor
E04
Date: 1 11 2017
0
100
200
300
400
500
Scale: mm
600

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Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.: BH204

SHEET: 1 OF 3

PROJECT: UoA RWC Development
JOB No.: 1001930.2000
LOCATION: UoA - western corner of B315.

CO-ORDINATES: 5920025.68 mN, 1757694.77 mE (NZTM2000)
DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 42.50m
R.L. COLLAR: 50.41m
DATUM: NZVD2016
SURVEY: Handheld GPS

DRILLED BY: Craig/Hone
LOGGED BY: CMCD
CHECKED: JASM
START DATE: 26/11/2018
FINISH DATE: 26/11/2018
CONTRACTOR: McMillan Drilling

GEOLOGICAL UNIT	DESCRIPTION OF CORE (SOIL: Classification, colour, consistency / density, moisture, plasticity; ROCK: Weathering, colour, fabric, name, strength, cementation)	Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS: Defect Log	Fracture Spacing (mm)	RQD (%)	Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
Fill	CONCRETE.																	
	Fine to coarse GRAVEL, with some silt and sand; grey grey. Tightly packed, moist, well graded; gravel, sub-angular to angular, greywacke, with trace scoria. [HARDFILL]												*0.35m:* Enviro sample					
	Silty CLAY, with some sand; orange brown mottled light grey. Firm, moist, medium plasticity; sand, fine. [FILL]			HVAC	0		42	0.5										
	1.00m: light grey mottled orange brown.							1.0					*1.00m:* Enviro sample					
Residual East Coast Bays Formation	Sandy SILT, with some clay; light grey. Firm, moist, medium plasticity; sand, fine. [Res ECBF] *1.50m:* with minor clay and trace fine gravel. Soft.			SPT	100	0/0 0/0 0/1 N=1	41	1.5					*1.50m:* Enviro sample					
	2.00 - 2.20m: Silty CLAY; grey. Firm, moist to wet, medium to high plasticity.							2.0										
	Clayey SILT with some fine to medium sand; grey. Soft, wet, low plasticity.			HQTT	100		40	2.5										
	Silty CLAY; grey. Firm to stiff, moist to wet, medium plasticity.			PT	100	BH204_3 0-3.5 @ 3.00m		3.0										
	3.50 - 4.00m: Becoming stiff.						39	3.5										
	3.90 - 4.00m: trace organics and wood fragments. Becoming very stiff.			HQTT	100			4.0										
Weathered East Coast Bays Formation	Highly weathered, dark grey SILTSTONE. Extremely weak. Remoulds to: clayey SILT; grey. Very stiff, moist, medium plasticity																	
	4.30 - 4.70m: SAND; grey. Medium dense, moist; sand, fine. (Highly weathered, grey, fine SANDSTONE; extremely weak).			SPT	100	3/6 4/5 7/7 N=23	38	4.5									Box 1, 0.0-5.0m	

COMMENTS: Peak and remoulded shear strengths measured using shear vane 569. Values on this log have been corrected by a factor of 1.438.

Hole Depth 10.63m

Scale 1:25

Rev.: A

General Log - 2/12/2024 11:19:01 AM - Produced with Core-GS by GeRoc

BH_TT282665

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BOREHOLE LOG

BOREHOLE No.: BH204

SHEET: 2 OF 3

PROJECT: UoA RWC Development
JOB No.: 1001930.2000
LOCATION: UoA - western corner of B315.

CO-ORDINATES: 5920025.68 mN, 1757694.77 mE (NZTM2000)
DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 42.50m
R.L. COLLAR: 50.41m
DATUM: NZVD2016
SURVEY: Handheld GPS

DRILLED BY: Craig/Hone
LOGGED BY: CMCD
CHECKED: JASM
START DATE: 26/11/2018
FINISH DATE: 26/11/2018
CONTRACTOR: McMillan Drilling

GEOLOGICAL UNIT	DESCRIPTION OF CORE (SOIL: Classification, colour, consistency / density, moisture, plasticity; ROCK: Weathering, colour, fabric, name, strength, cementation)	Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS: Defect Log	Fracture Spacing (mm)	RQD (%)	Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
Weathered East Coast Bays Formation	[CONT] Highly weathered, dark grey SILTSTONE. Extremely weak. Remoulds to: clayey SILT; grey. Very stiff, moist, medium plasticity			HQTT	100		37	5.5										
	5.75 - 5.95m: Fine SAND; grey. Medium dense, moist; (Highly weathered, grey, fine SANDSTONE; extremely weak).			SPT	100	4/6 7/12 13/14 N=46		6.0										
	Highly to moderately weathered, grey, laminated SILTSTONE. Very weak.						36	6.5										
	6.63 - 7.00m: Moderately weathered, fine SANDSTONE; very weak.			HQTT	100			7.0					6.63 - 6.95m: BZ 6.80m: J, Un, Ro, CN					
East Coast Bays Formation	Slightly weathered, grey, SILTSTONE. Very weak.			SPT	100	5/8 12/16 16/8 for 30mm N>=50	35	7.5										
	8.20 - 8.25m: Unweathered, grey, fine SANDSTONE; very weak.			HQTT	91			8.0										
	8.91-9.00m: CORE LOSS.						34	8.5										Box 2, 5.0-6.6m
	[CONT] Slightly weathered, grey, SILTSTONE. Very weak.			SPT	0	4/13 50 for 65mm N>=50 Solid		9.0										
							33	9.5					9.75 - 9.90m: BZ					

COMMENTS: Peak and remoulded shear strengths measured using shear vane 569. Values on this log have been corrected by a factor of 1.438.

Hole Depth 10.63m

Scale 1:25

Rev.: A

General Log - 2/12/2024 11:19:02 AM - Produced with Core-GS by GeRoc

BH_TT282665

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Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.: BH204

SHEET: 3 OF 3

PROJECT: UoA RWC Development
JOB No.: 1001930.2000
LOCATION: UoA - western corner of B315.

CO-ORDINATES: 5920025.68 mN, 1757694.77 mE (NZTM2000)
DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 42.50m
R.L. COLLAR: 50.41m
DATUM: NZVD2016
SURVEY: Handheld GPS

DRILLED BY: Craig/Hone
LOGGED BY: CMCD
CHECKED: JASM
START DATE: 26/11/2018
FINISH DATE: 26/11/2018
CONTRACTOR: McMillan Drilling

GEOLOGICAL UNIT	DESCRIPTION OF CORE (SOIL: Classification, colour, consistency / density, moisture, plasticity; ROCK: Weathering, colour, fabric, name, strength, cementation)	Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS: Defect Log	Fracture Spacing (mm)	RQD (%)	Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
East Coast Bays Formation	[CONT] Slightly weathered, grey, SILTSTONE. Very weak.			HQTT	93		32	10.5										Box 3, 8.6-10.6m
				SPT	0	14/36 for 60mm N>=50 Solid												
	10.63m: END OF BOREHOLE						31	11.5										
							30	12.5										
							29	13.5										
							28	14.5										

COMMENTS: Peak and remoulded shear strengths measured using shear vane 569. Values on this log have been corrected by a factor of 1.438.

Hole Depth 10.63m

Scale 1:25

Rev.: A

General Log - 2/12/2024 11:19:02 AM - Produced with Core-GS by GeRoc v3.3

BH_TT262665

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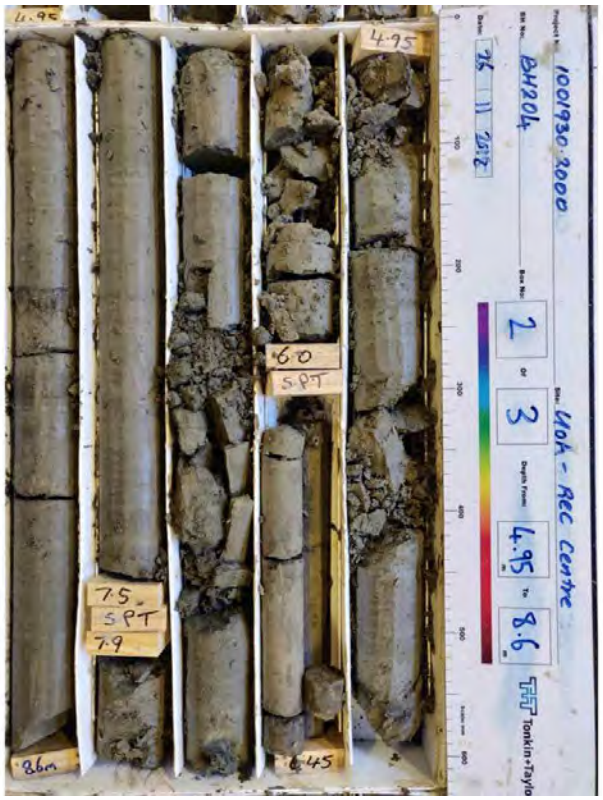
CORE PHOTOS

BOREHOLE No.: **BH204**

PROJECT: UoA RWC Development	LOCATION: UoA - western corner of B315.	JOB No.: 1001930.2000
CO-ORDINATES: (NZTM2000) 5920025.68 mN 1757694.77 mE R.L.: 42.50m DATUM: NZVD2016	DRILL TYPE: DRILL METHOD: RC	HOLE STARTED: 26/11/2018 HOLE FINISHED: 26/11/2018 DRILLED BY: McMillan Drilling LOGGED BY: CMCD CHECKED: JASM



0.00-4.95m



4.95-8.60m

General Log - 2/12/2024 11:19:02 AM - Produced with Core-GS by GeRoc

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CORE PHOTOS

BOREHOLE No.: **BH204**

PROJECT: UoA RWC Development	LOCATION: UoA - western corner of B315.	JOB No.: 1001930.2000
CO-ORDINATES: (NZTM2000) 5920025.68 mN 1757694.77 mE R.L.: 42.50m DATUM: NZVD2016	DRILL TYPE: DRILL METHOD: RC	HOLE STARTED: 26/11/2018 HOLE FINISHED: 26/11/2018 DRILLED BY: McMillan Drilling LOGGED BY: CMCD CHECKED: JASM



8.60-10.50m

General Log - 2/12/2024 11:19:02 AM - Produced with Core-GS by GeRoc

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BOREHOLE LOG

BOREHOLE No.: BH201

SHEET: 1 OF 4

PROJECT: UoA RWC Development
JOB No.: 1001930.2000
LOCATION: UoA - western corner of B315.

CO-ORDINATES: 5920079.26 mN, 1757649.77 mE (NZTM2000)
DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 45.55m
R.L. COLLAR: 45.55m
DATUM: NZVD2016
SURVEY: Handheld GPS

DRILLED BY: Vin/Hone
LOGGED BY: SJTI
CHECKED: JASM
START DATE: 28/11/2018
FINISH DATE: 28/11/2018
CONTRACTOR: McMillan Drilling

GEOLOGICAL UNIT	DESCRIPTION OF CORE (SOIL: Classification, colour, consistency / density, moisture, plasticity; ROCK: Weathering, colour, fabric, name, strength, cementation)	Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS: Defect Log	Fracture Spacing (mm)	RQD (%)	Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
Fill	ASPHALT.																	
	Sandy, silty, fine to coarse GRAVEL; dark grey. Tightly packed, moist, well graded; gravel, sub-rounded to angular, greywacke. Trace scoria. [HARDFILL]							0.5										
	Silty CLAY, with trace sand; orange brown mottled light grey. Stiff, moist, medium plasticity. [FILL]			HVAC	0	● 93/6 kPa	45						*0.50m:* Enviro sample *0.80m:* tree root.					
	1.0m: grading sandy SILT, with minor to some clay and trace gravel; light brown mottled dark brown. Stiff, moist, medium plasticity; sand, fine; gravel, fine to medium.							1.0					*1.00m:* Enviro sample					
				SPT	100	0/0 1/0 1/1 N=3	44	1.5					*1.50m:* Enviro sample					
	1.95-2.35m: CORE LOSS.							2.0										
	Sandy SILT, with minor to some clay, and trace gravel; light brown mottled dark brown. Stiff, moist, medium plasticity; sand, fine; gravel, fine to medium.			HQTT	61		43	2.5										
						● 85/14 kPa							*2.85 - 3.00m:* Enviro sample					
	3.0-3.1m: CORE LOSS.			SPT	77	1/0 0/1 1/2 N=4		3.0										
	[CONT] Sandy SILT, with minor to some clay, and trace gravel; light brown mottled dark brown. Stiff, moist, medium plasticity; sand, fine; gravel, fine to medium.																	
	Silty CLAY, with trace sand; light grey. Stiff, moist, high plasticity; sand, fine.						42	3.5										
	3.45-3.8m: CORE LOSS.																	
	Clayey SILT, with trace sand and organics; brownish grey mottled orange brown. Stiff, moist, medium plasticity; sand, fine; organics, amorphous. *4.15m:* light grey.			HQTT	66			4.0					*3.80 - 3.90m:* Enviro sample					
						● 75/43 kPa												
	4.5-5.0m: Push tube.			PT	100	Push tube @ 4.50m	41	4.5										

COMMENTS: Peak and remoulded shear strengths measured using shear vane 569. Values on this log have been corrected by a factor of 1.438.

Hole Depth 15.13m

Scale 1:25

Rev.: A

General Log - 2/12/2024 11:17:09 AM - Produced with Core-GS by GeRoc

BH_TT282662

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BOREHOLE LOG

BOREHOLE No.: BH201

SHEET: 2 OF 4

PROJECT: UoA RWC Development
JOB No.: 1001930.2000
LOCATION: UoA - western corner of B315.

CO-ORDINATES: 5920079.26 mN, 1757649.77 mE (NZTM2000)
DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 45.55m
R.L. COLLAR: 45.55m
DATUM: NZVD2016
SURVEY: Handheld GPS

DRILLED BY: Vin/Hone
LOGGED BY: SJTI
CHECKED: JASM
START DATE: 28/11/2018
FINISH DATE: 28/11/2018
CONTRACTOR: McMillan Drilling

GEOLOGICAL UNIT	DESCRIPTION OF CORE (SOIL: Classification, colour, consistency / density, moisture, plasticity; ROCK: Weathering, colour, fabric, name, strength, cementation)	Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS: Defect Log	Fracture Spacing (mm)	RQD (%)	Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
Residual East Coast Bays Formation	Clayey SILT, with some sand; light grey. Stiff, moist, medium plasticity; sand, fine. [Res ECBF]			HQTT	100		40	5.5										
	5.5-5.95m: grading sandy SILT, with some clay; light grey. Stiff, moist, medium plasticity; sand, fine.					● 53/27 kPa												
	Silty CLAY, with trace sand; light grey mottled orange brown. Very stiff, moist, high plasticity; sand, fine.			SPT	100	0/0 0/1 1/2 N=4		6.0										
	6.2-6.95m: grading CLAY with some silt; grey with trace orange brown mottling. Very stiff, moist, high plasticity.						39	6.5										
Weathered East Coast Bays Formation	6.95-7.95m: grading highly weathered, grey MUDSTONE. Extremely weak. Remoulds to CLAY, with some silt; grey. Very stiff, moist, high plasticity. *7.00m:* laminations.			HQTT	100	● 76/24 kPa		7.0										
				SPT	100	1/2 3/4 3/5 N=15	38	7.5										
	7.95-8.2m: CORE LOSS.							8.0										
	Moderately weathered, dark grey MUDSTONE. Extremely weak. Remoulds to clayey SILT, with minor sand; dark grey. Hard, moist, medium plasticity; sand, fine.			HQTT	100		37	8.5										
	Moderately weathered, grey, fine grained SANDSTONE. Extremely weak, very weakly cemented. Remoulds to silty fine SAND, with trace clay; dark grey. Medium dense, moist.																	
	Moderately weathered, dark grey MUDSTONE. Extremely weak. Remoulds to silty CLAY, with minor sand; dark grey. Hard, moist, medium plasticity; sand, fine. *9.20 - 9.35m:* carbonaceous laminations to very thin beds.			SPT	100	4/5 6/6 8/7 N=27		9.0										
	9.45-10.0m: CORE LOSS.			HQTT	48		36	9.5										

Box 1, 0.0-5.7m
Box 2, 5.7-9.5m

COMMENTS: Peak and remoulded shear strengths measured using shear vane 569. Values on this log have been corrected by a factor of 1.438.

Hole Depth 15.13m

Scale 1:25

Rev.: A

General Log - 2/12/2024 11:17:09 AM - Produced with Core-GS by GeRoc

BH_TT282662

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Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.: BH201

SHEET: 3 OF 4

PROJECT: UoA RWC Development
JOB No.: 1001930.2000
LOCATION: UoA - western corner of B315.

CO-ORDINATES: 5920079.26 mN, 1757649.77 mE (NZTM2000)
DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 45.55m
R.L. COLLAR: 45.55m
DATUM: NZVD2016
SURVEY: Handheld GPS

DRILLED BY: Vin/Hone
LOGGED BY: SJTI
CHECKED: JASM
START DATE: 28/11/2018
FINISH DATE: 28/11/2018
CONTRACTOR: McMillan Drilling

GEOLOGICAL UNIT	DESCRIPTION OF CORE (SOIL: Classification, colour, consistency / density, moisture, plasticity; ROCK: Weathering, colour, fabric, name, strength, cementation)	Rock Weathering	Rock Strength	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS: Defect Log	Fracture Spacing (mm)	RQD (%)	Description & Additional Observations	Fluid Loss (%)	Water Level	Casing	Installation	Core Box No
Weathered East Coast Bays Formation	Moderately weathered, dark grey MUDSTONE. Extremely weak. Remoulds to CLAY with some silt; dark grey. Hard, moist, medium plasticity. *10.25m:* carbonaceous laminations and very thin beds.			HQTT	48													
	Moderately weathered, grey, fine grained SANDSTONE. Extremely weak, very weakly cemented. Remoulds to silty, fie SAND, with trace clay; dark grey. Dense, moist.			SPT	100	3/5 6/8 18/9 N=41	35	10.5										
	Moderately weathered, grey MUDSTONE. Extremely weak. Remoulds to CLAY, with some silt; dark grey. Very stiff, moist, high plasticity. *11.00m:* carbonaceous laminations. *11.10 - 11.20m:* Moderately thin bed of moderately weathered, grey, fine grained SANDSTONE. Extremely weak, very weakly cemented.							11.0										
East Coast Bays Formation	Slightly weathered, grey MUDSTONE. Extremely weak. Remoulds to CLAY, with some silt and trace to minor sand; dark grey. Very stiff, moist, high plasticity; sand, fine. *11.85 - 12.90m:* carbonaceous laminations to very thin beds.			HQTT	100		34	11.5										
	12.0-12.44m: CORE LOSS - solid cone SPT.			SPT	0	5/11 15/13 12/10 for 65mm N>=50 Solid		12.0										
	Slightly weathered, grey MUDSTONE. Extremely weak. Remoulds to CLAY, with some silt and trace to minor sand; dark grey. Very stiff, moist, high plasticity; sand, fine.			HQTT	100		33	12.5										
	Slightly weathered, grey, silty, fine grained SANDSTONE. Very weak, very weakly cemented.							13.0										Box 3, 9.5-13.2m
	13.7-13.775m: NO CORE - solid cone SPT.			SPT	0	13/37 for 75mm N>=50 Solid	32	13.5					*13.40m:* Driller's note: Core snapped off at 13.4m. Unable to fish core out. Drilled over to 13.7m . Core retrieved. Accounts for longer run.					
	[CONT] Slightly weathered, grey, silty, fine grained SANDSTONE. Very weak, very weakly cemented.							14.0										
	Slightly weathered, grey MUDSTONE. Very weak. *14.90 - 14.95m:* Moderately thin bed of slightly weathered, grey, fine grained SANDSTONE. Weak, weakly to moderately cemented.			HQTT	100		31	14.5										

COMMENTS: Peak and remoulded shear strengths measured using shear vane 569. Values on this log have been corrected by a factor of 1.438.

Hole Depth 15.13m

Scale 1:25

Rev.: A

General Log - 2/12/2024 11:17:09 AM - Produced with Core-GS by GeRoc

BH_TT282662

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Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.: BH201

SHEET: 4 OF 4

PROJECT: UoA RWC Development
JOB No.: 1001930.2000
LOCATION: UoA - western corner of B315.

CO-ORDINATES: 5920079.26 mN, 1757649.77 mE (NZTM2000)
DIRECTION:
ANGLE FROM HORIZ.: -90°

R.L. GROUND: 45.55m
R.L. COLLAR: 45.55m
DATUM: NZVD2016
SURVEY: Handheld GPS

DRILLED BY: Vin/Hone
LOGGED BY: SJTI
CHECKED: JASM
START DATE: 28/11/2018
FINISH DATE: 28/11/2018
CONTRACTOR: McMillan Drilling

GEOLOGICAL UNIT	DESCRIPTION OF CORE SOIL: Classification, colour, consistency / density, moisture, plasticity ROCK: Weathering, colour, fabric, name, strength, cementation	Rock Weathering (XW SW MW HW DW)	Rock Strength (ES VS S MS HS VH EH)	Sampling Method	Core Recovery (%)	Testing	RL (m)	Depth (m)	Graphic Log	ROCK DEFECTS: Defect Log	Fracture Spacing (mm) (2000 600 200 60 20)	RQD (%)	Description & Additional Observations	Fluid Loss (%) (25 50 75)	Water Level	Casing	Installation	Core Box No
East Coast Bays Formation	15.0-15.13m: CORE LOSS.			SPT	0	13/35 for 55mm **N>=50** Solid	30	15.5										Box 4, 13.2-15.1m
	15.13m: END OF BOREHOLE						29	16.0										
								16.5										
							28	17.0										
								17.5										
							27	18.0										
								18.5										
							26	19.0										
								19.5										

COMMENTS: Peak and remoulded shear strengths measured using shear vane 569. Values on this log have been corrected by a factor of 1.438.

Hole Depth 15.13m

Scale 1:25

Rev.: A

General Log - 2/12/2024 11:17:09 AM - Produced with Core-GS by GeRoc v3.3

BH_TT262662

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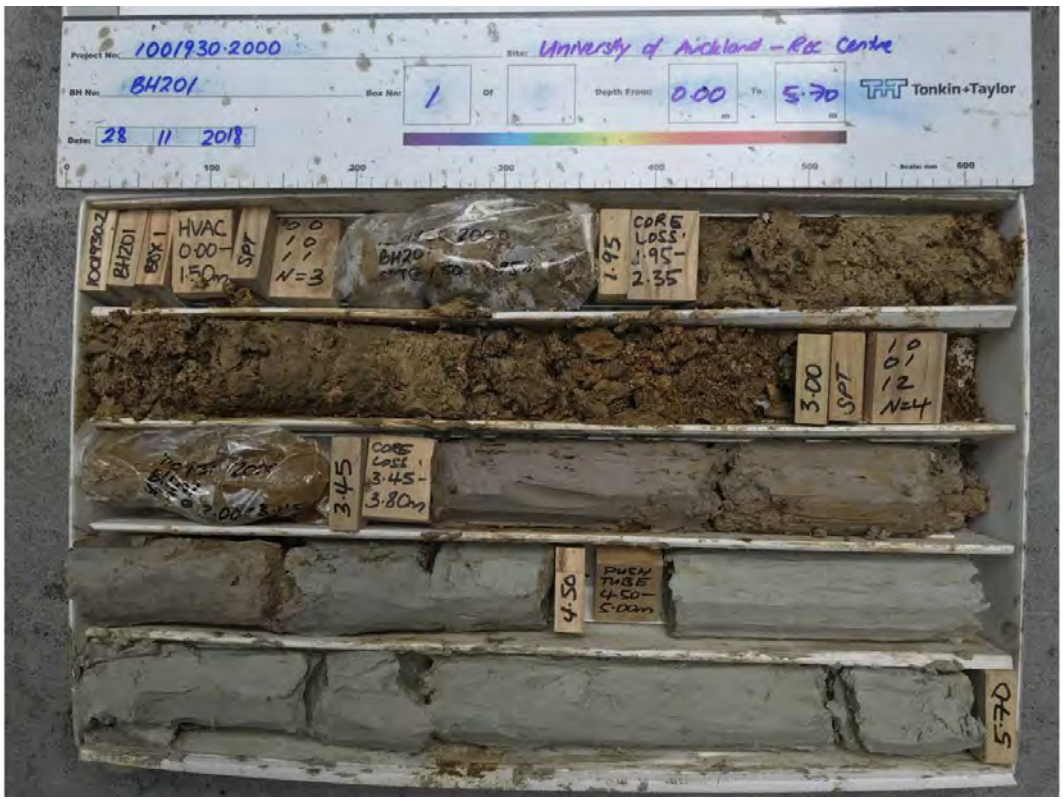
Tonkin+Taylor

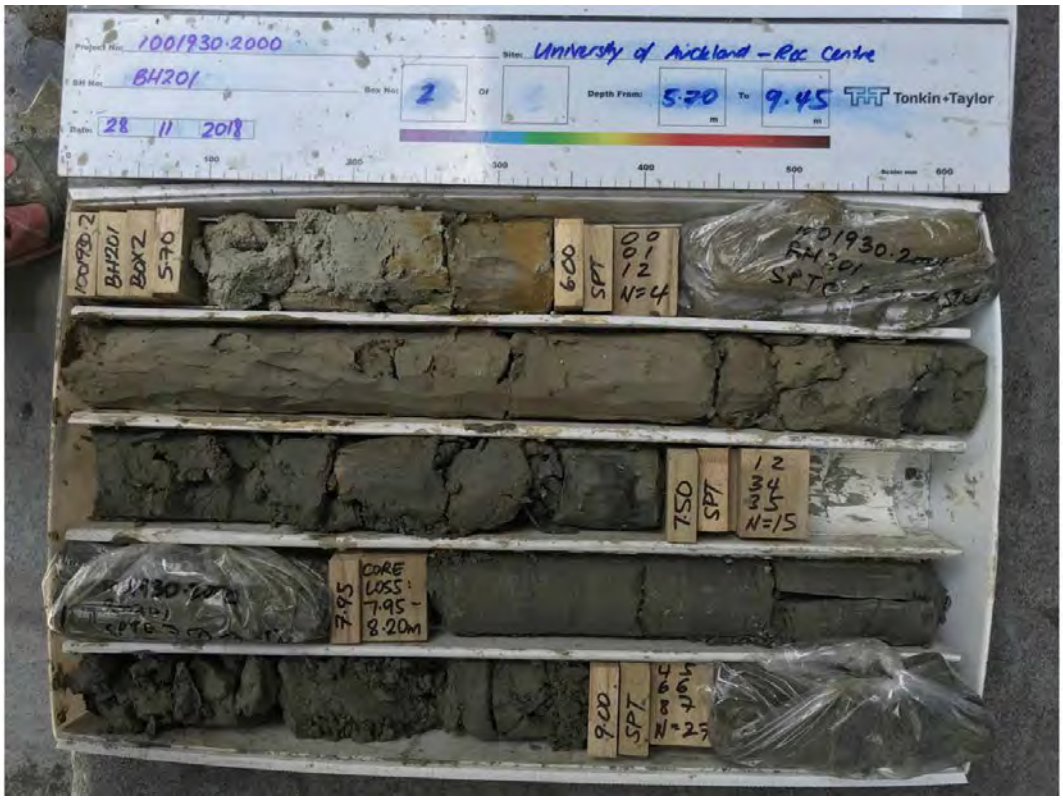
CORE PHOTOS

BOREHOLE No.: **BH201**

PROJECT: UoA RWC Development	LOCATION: UoA - western corner of B315.	JOB No.: 1001930.2000
CO-ORDINATES: 5920079.26 mN (NZTM2000) 1757649.77 mE R.L.: 45.55m DATUM: NZVD2016	DRILL TYPE: DRILL METHOD: RC	HOLE STARTED: 28/11/2018 HOLE FINISHED: 28/11/2018 DRILLED BY: McMillan Drilling LOGGED BY: SJTI CHECKED: JASM



0.00-5.70m



5.70-9.45m

General Log - 2/12/2024 11:17:09 AM - Produced with Core-GS by GeRoc

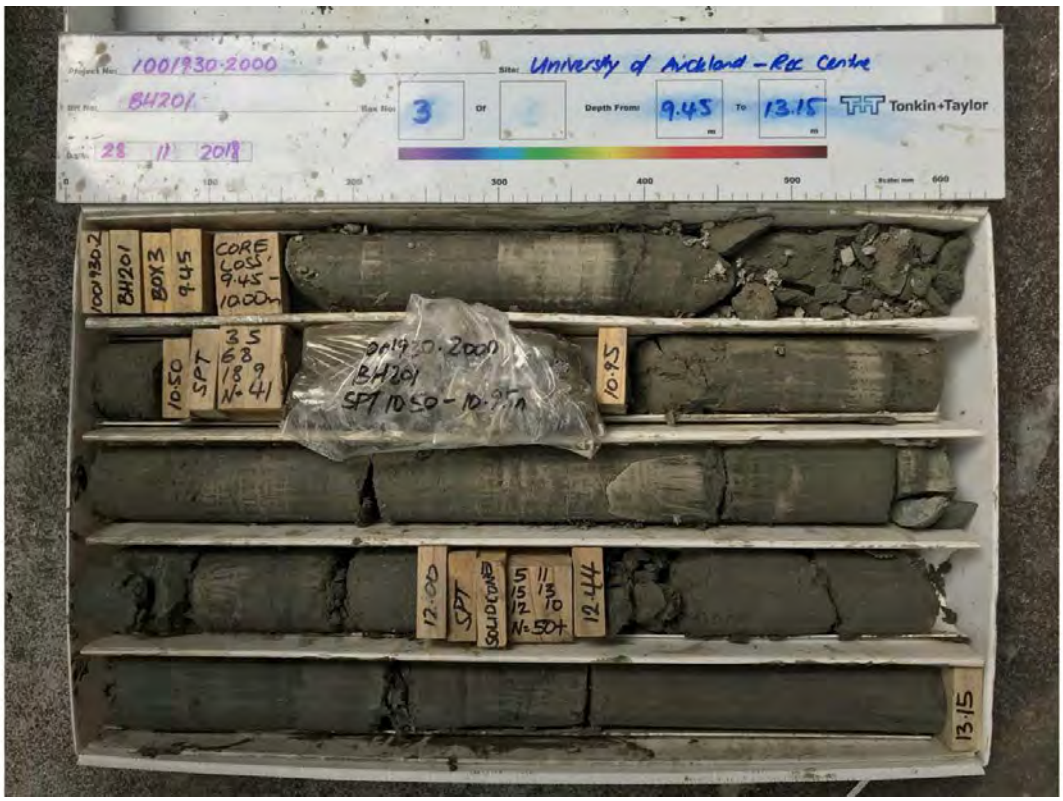
USAGE RIGHTS: T+T GENERAL: Data can be used within Tonkin & Taylor. Client/data owner approval is required to publish this data.

Tonkin+Taylor

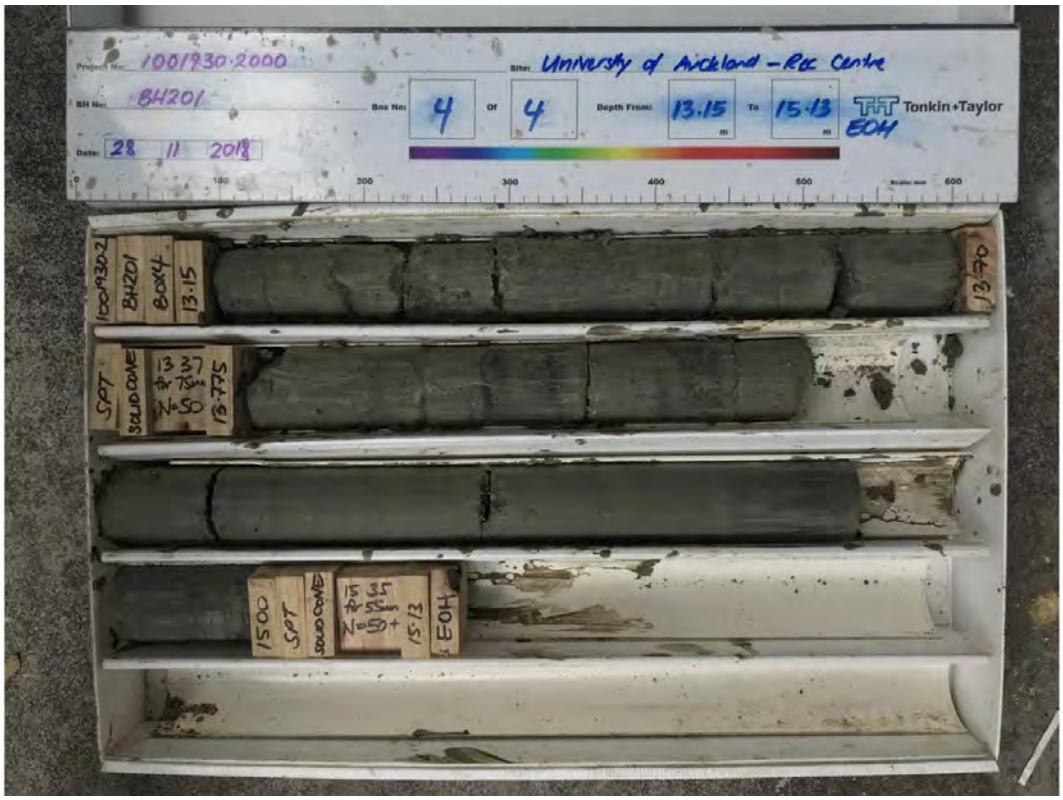
CORE PHOTOS

BOREHOLE No.: **BH201**

PROJECT: UoA RWC Development		LOCATION: UoA - western corner of B315.	JOB No.: 1001930.2000
CO-ORDINATES: (NZTM2000)	5920079.26 mN 1757649.77 mE	DRILL TYPE: DRILL METHOD: RC	HOLE STARTED: 28/11/2018 HOLE FINISHED: 28/11/2018 DRILLED BY: McMillan Drilling
R.L.:	45.55m		LOGGED BY: SJTI CHECKED: JASM
DATUM:	NZVD2016		



9.45-13.15m

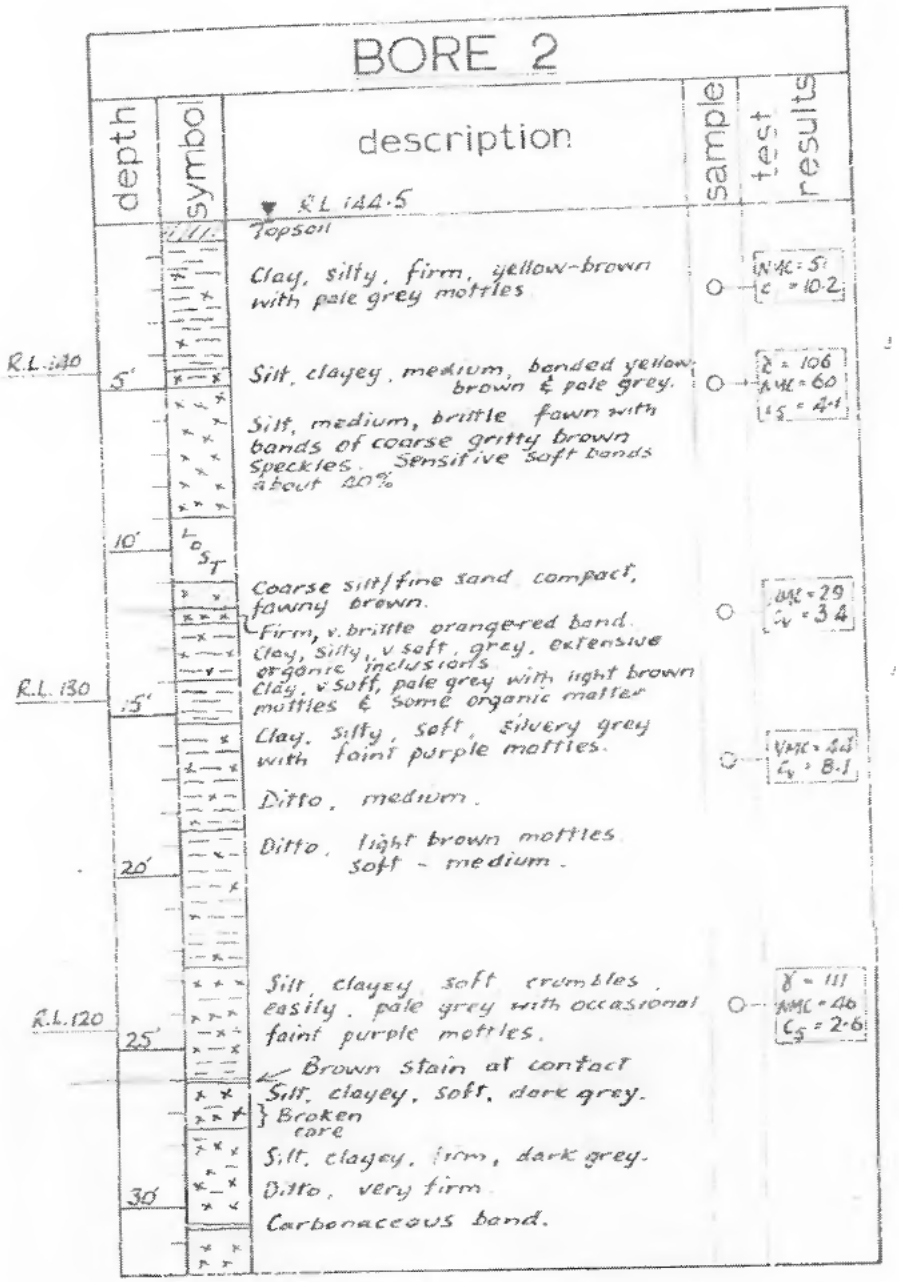


13.15-15.13m

General Log - 2/12/2024 11:17:09 AM - Produced with Core-GS by GeRoc

BORE 1, 1a

depth	symbol	description	sample	test results
		R.L. 129.6		
		Tar seal.		
		Clay, silty, medium, orange-brown with grey mottles brown stained.		
		Ditto, no brown stain, gritty black & brown inclusions to 1/16" dia		γ = 104 NMC = 53 c_s = 2
5'				
		Silt, medium, brittle, fawn with bands of coarse gritty orange & brown speckling. About 30% soft bands		c_v = 2.1
				γ = 104 NMC = 54 c_s = 1
R.L. 140	L C S T	Sample described as silt, clayey v. soft, orange-brown changing to grey.		
10		— Limonite band. distinct mottles		γ = 105 NMC = 51 LL = 81 PL = 40 c_u = 5 c_v = 5.7 consol.
		Clay, silty, soft-med, bright orange &		
		Ditto, laminated orange-brown & dark brown with creamy inclusions		
		Clay, firm, silvery-grey with faint purple mottles. (Vertical organic streaks to 14')		γ = 105 NMC = 46 c_s = 7.5 c_{cons} = 2.1
15'				
		Clay, soft, silver-grey.		NMC = 35 c_v = 13.3
		Silt, clayey, soft, pale silver-grey with faint purple mottles		
R.L. 130				
20		— faint brown mottles.		
		Clay, silty, soft-med. pale grey faint purple mottles & brown stains.		
		— browner above contact		
		Clay, silty, medium, dark grey. Carbonaceous bands.		
		Silt, clayey, v. firm, dark grey.		
25'				
		Sand, crumbly (core split) dk. grey		
		Silt, v. firm, slightly structured, dk. grey		γ = 128 NMC = 28 c_{10} = 22
R.L. 120				
30'		Sand, fine, moderately cemented, dk. grey.		


BORE 2
depth
symbol
description
sample
test results
▼ RL 144·5
Topsoil
Clay, silty, firm, yellow-brown with pale grey mottles
WMC = 5%
c = 10·2
R.L. 140
5'
Silt, clayey, medium, banded yellow-brown & pale grey.
γ = 106
WMC = 60
LS = 4·1
Silt, medium, brittle fawny brown with bands of coarse gritty brown Speckles. Sensitive soft bands about 20%
10'
L.O.S.T.
Coarse silt/fine sand compact, fawny brown.
WMC = 29
Cv = 3·4
Firm, v. brittle orangered band.
Clay, silty, v soft, grey, extensive organic inclusions.
R.L. 130
15'
Clay, v soft, pale grey with light brown mottles & some organic matter
Clay, silty, soft, silvery grey with faint purple mottles.
WMC = 44
Cv = 8·1
Ditto, medium.
Ditto, light brown mottles soft - medium.
20'
Silt clayey soft crumbles easily, pale grey with occasional faint purple mottles.
γ = 111
WMC = 46
Cv = 2·6
R.L. 120
25'
Brown Stain at contact
Silt, clayey, soft, dark grey.
Broken core
Silt, clayey, firm, dark grey.
Ditto, very firm
30'
Carbonaceous band.

Appendix C Project Specific Investigation Logs

Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.: **BH01 (PZ)**

Hole Location: On artificial turf, next to Princes Street.

SHEET: 1 OF 3

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920112.33 mN 1757672.09 mE	DRILL TYPE: JD1	HOLE STARTED: 04/09/2026
		METHOD: Rotary cored	HOLE FINISHED: 07/09/2026
R.L.:	45.52m		DRILLED BY: JASL
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI

GEOLOGICAL | METHOD OBSERVATIONS | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT / ADDITIONAL OBSERVATIONS	DESCRIPTION
Fill	*0.00m* Fine to medium GRAVEL; grey Tightly packed, moist, fill, gap40 hardfill. Gravel, sub-angular to angular.
	0.10m: SILT, some gravel, minor sand; dark grey mottled orange . Soft, wet, non-plastic; gravel, fine, sub-rounded to sub-angular; sand, fine to coarse.
	0.50m: SILT, some clay, trace sand; orange mottled white. Firm to stiff, moist, low to medium plasticity; sand, fine.
Auckland Volcanic Field	*1.00m:* Sandy gravelly SILT, minor clay; light brown spotted brown. Soft, wet, low plasticity; sand, fine to coarse; gravel, fine, rounded to sub-rounded.
	3.10m: SILT, some clay, minor sand; orange streaked white. Very soft to soft, moist to wet, low plasticity; sand, fine.
	3.75m: CORE LOSS - Suspect material left in bottom of hole, washed out on subsequent run.
East Coast Bays Formation	*4.50m:* Clayey SILT, minor sand; light grey streaked orange. Soft, moist, medium plasticity; sand, fine.
	6.00m: NOT LOGGED - Push tube, top and bottom of push tube consistent - clayey.
	6.50m Clayey SILT, trace sand; light grey Soft to firm, moist, medium plasticity; sand, fine.
	7.40m: SILT, minor clay, trace sand; grey. Firm, moist, low plasticity, residual soil; sand, fine. *7.60 - 7.95m:* Locally sandy.
	7.95m: NOT LOGGED - Push tube, top and bottom of push tube consistent - clayey.
	8.50m: Highly weathered, light orangish grey, SANDSTONE. Extremely weak, moderately cemented, fine to coarse grained. Interbedded with: SILTSTONE. Soil description, silty fine to coarse sand, medium dense, moist to wet.
	9.75 - 9.85m: Locally; light grey mottled brown.

RL (m)	DEPTH (m)	CORE RECOVERY (%)	METHOD	TESTS	WEATHERING CLASSIFICATION	MOISTURE CLASSIFICATION	CONSISTENCY / DENSITY CLASSIFICATION
45	0	100	HANDEX			M	TP
						W	S
	1					M	F-St
		100	HQTT			W	S
44		100	SPT	0/0// 0/0/1/1 N=2			
	2			15/5 kPa in barrel			
		100	HQTT				
43							
	3	100	SPT	0/1// 0/1/0/1 N=2		M-W	VS-S
42		33	HQTT	23/8 kPa in barrel			
	4						
41		100	SPT	0/0// 1/1/1/2 N=5		M	S
	5			15/5 kPa in barrel			
40		100	HQTT				
	6	100	PT	PT @ 6.00m 68/15 kPa in barrel	N/L N		
39		00	HQTT			M	S-F
	7						
38		44	SPT	0/1// 1/2/1/2 N=6	RS		F
	8			PT @ 7.95m 105/38 kPa in barrel	N/L N		
37		100	PT				
		100	HQTT		HW		EW
	9	100	SPT	2/4// 4/6/6/7 N=23			
36				UTP in barrel			
		100	HQTT				

07/ 09/2026

COMMENTS: Groundwater measured at 8.5 m below ground level on 07/09/2026, prior to drilling, hole left open overnight.

Hole Depth 25.5m

Scale 1:50

Rev.: A

TTNZ_20240924 - BoreLog (Piezo) - 12/10/2026 3:26:34 pm - Produced with Core-GS by GeRoc

BOREHOLE LOG

BOREHOLE No.: **BH01 (PZ)**

Hole Location: On artificial turf, next to Princes Street.

SHEET: 2 OF 3

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920112.33 mN 1757672.09 mE	DRILL TYPE: JD1	HOLE STARTED: 04/09/2026 HOLE FINISHED: 07/09/2026
R.L.:	45.52m	METHOD: Rotary cored	DRILLED BY: JASL
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI

GEOLOGICAL	METHOD OBSERVATIONS	ENGINEERING DESCRIPTION

GEOLOGICAL UNIT / ADDITIONAL OBSERVATIONS	INSTALLATION	FLUID LOSS (%)	WATER	CASING	CORE RECOVERY (%)	METHOD	TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	WEATHERING CLASSIFICATION	MOISTURE CLASSIFICATION	CONSISTENCY / DENSITY CLASSIFICATION	ESTIMATED SOIL SHEAR STRENGTH (Su, kPa)	ESTIMATED ROCK COMPRESSIVE STRENGTH (qu, MPa)	DEFECT SPACING (mm)	DESCRIPTION
East Coast Bays Formation		25 50 75			100 100 100 100 0 100 0 85 0 100 0 100	HQTT SPT HQTT SPT HQTT SPTC HQTT SPTC HQTT SPTC HQTT SPTC HQTT	4/4// 3/4/7/8 **N=22** 6/11// 13/14/18/5 for 11mm **N>=50** 15/28// 25 for 30mm **N>=50** Solid Cone 6/8// 30 for 54mm **N>=50** Solid Cone Bouncing 7/35// for 56mm **N>=50** Solid Cone Bouncing 10/38// 15 for 27mm **N>=50** Solid Cone Bouncing 7/41// 50 for 62mm **N>=50** Solid Cone	35 34 33 32 31 30 29 28 27 26	11 12 13 14 15 16 17 18 19		HW MW SW		EW VW				*10.00m* Highly weathered, orange grey, SANDSTONE. Extremely weak, moderately cemented, fine to coarse grained. Interbedded with: SILTSTONE. Soil description, silty fine to coarse sand, medium dense grading to very dense, moist to wet. *12.20 - 12.90m:* Grading to grey. *12.90m:* Moderately weathered, grey, SILTSTONE. Very weak, moderately cemented, fine to coarse grained. *13.80 - 14.30m:* Poorly cemented. *15.00 - 15.40m:* Mottled dark brown. *15.40m:* Slightly weathered, grey, SANDSTONE. Very weak, moderately cemented, fine to coarse grained. Interbedded with: Slightly weathered, grey, SILTSTONE. *17.00m:* Slightly weathered, grey, SANDSTONE. Very weak, moderately cemented, fine to coarse grained. Interbedded with: SILTSTONE.

COMMENTS: Groundwater measured at 8.5 m below ground level on 07/09/2026, prior to drilling, hole left open overnight.

Hole Depth 25.5m

Scale 1:50

Rev.: A

TTNZ_20240924 - BoreLog (Plezo) - 12/10/2026 3:26:34 pm - Produced with Core-GS by GeRoc

BOREHOLE LOG

BOREHOLE No.: **BH01 (PZ)**

Hole Location: On artificial turf, next to Princes Street.

PROJECT: UoA Library and Student Hub	LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: 5920112.33 mN (NZTM2000) 1757672.09 mE	DRILL TYPE: JD1	HOLE STARTED: 04/09/2026
	METHOD: Rotary cored	HOLE FINISHED: 07/09/2026
R.L.: 45.52m		DRILLED BY: JASL
DATUM: NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI

GEOLOGICAL	METHOD OBSERVATIONS								ENGINEERING DESCRIPTION							
GEOLOGICAL UNIT/ ADDITIONAL OBSERVATIONS	INSTALLATION	FLUID LOSS (%) 25 50 75	WATER	CASING	CORE RECOVERY (%)	METHOD	TESTS	RL (m) / DEPTH (m)	GRAPHIC LOG	WEATHERING CLASSIFICATION	MOISTURE CLASSIFICATION	CONSISTENCY / DENSITY CLASSIFICATION	ESTIMATED SOIL SHEAR STRENGTH (Su, kPa) VS 12 25 50 F St 100 200 HS	ESTIMATED ROCK COMPRESSIVE STRENGTH (qu, MPa) EW 1 VW 5 W 20 MS 50 S 100 VS+	DEFECT SPACING (mm) 20 60 200 600 2000	DESCRIPTION
East Coast Bays Formation					100	HQTT	12/38// for 73mm **N>=50** Solid Cone	25 21 24 22 23 23 22 24 21 25 20		SW		VW				[CONT] *17 00m* Slightly weathered, grey, SANDSTONE. Very weak, moderately cemented, fine to coarse grained. Interbedded with: SILTSTONE.
					0	WTC										
					100	HQTT										
					100	HQTT										
					100	HQTT										
								26 19 27 18 28 17 29 16								25.5m: Target depth

COMMENTS: Groundwater measured at 8.5 m below ground level on 07/09/2026, prior to drilling, hole left open overnight.

Hole Depth 25.5m

Scale 1:50

Rev.: A

TTNZ_20240924 - BoreLog (Plezo) - 12/10/2026 3:26:34 pm - Produced with Core-GS by GeRoc

CORE PHOTOS

BOREHOLE No.: **BH01 (PZ)**

Hole Location: On artificial turf, next to Princes Street.

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920112.33 mN 1757672.09 mE	DRILL TYPE: JD1	HOLE STARTED: 04/09/2026
		METHOD: Rotary cored	HOLE FINISHED: 07/09/2026
R.L.:	45.52m		DRILLED BY: JASL
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI



0.00-3.45m



3.45-8.90m

TTNZ_20240924 - BoreLog (Piezo) - 12/10/2026 3:26:34 pm - Produced with Core-GS by GeRoc

CORE PHOTOS

BOREHOLE No.: **BH01 (PZ)**

Hole Location: On artificial turf, next to Princes Street.

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920112.33 mN 1757672.09 mE	DRILL TYPE: JD1	HOLE STARTED: 04/09/2026
		METHOD: Rotary cored	HOLE FINISHED: 07/09/2026
R.L.:	45.52m		DRILLED BY: JASL
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI



8.90-12.39m



12.39-15.35m

TTNZ_20240924 - BoreLog (Piezo) - 12/10/2026 3:26:34 pm - Produced with Core-GS by GeRoc

CORE PHOTOS

BOREHOLE No.: **BH01 (PZ)**

Hole Location: On artificial turf, next to Princes Street.

PROJECT: UoA Library and Student Hub	LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: 5920112.33 mN (NZTM2000) 1757672.09 mE	DRILL TYPE: JD1	HOLE STARTED: 04/09/2026
R.L.: 45.52m	METHOD: Rotary cored	HOLE FINISHED: 07/09/2026
DATUM: NZVD2016	DRILL FLUID: WATER POLY	DRILLED BY: JASL
		LOGGED BY: JASL CHECKED: JOWI



15.35-18.50m



18.50-21.75m

TTNZ_20240924 - BoreLog (Plezo) - 12/10/2026 3:26:34 pm - Produced with Core-GS by GeRoc

CORE PHOTOS

BOREHOLE No.: **BH01 (PZ)**

Hole Location: On artificial turf, next to Princes Street.

PROJECT: UoA Library and Student Hub	LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000) 5920112.33 mN 1757672.09 mE	DRILL TYPE: JD1	HOLE STARTED: 04/09/2026
R.L.: 45.52m	METHOD: Rotary cored	HOLE FINISHED: 07/09/2026
DATUM: NZVD2016	DRILL FLUID: WATER POLY	DRILLED BY: JASL
		LOGGED BY: JASL CHECKED: JOWI



21.75-24.60m



24.60-25.50m

TTNZ_20240924 - BoreLog (Piezo) - 12/10/2026 3:26:34 pm - Produced with Core-GS by GeRoc

Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.: **BH02**

Hole Location: Northern corner of closed site close to entrance.

SHEET: 1 OF 3

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920114.53 mN 1757703.53 mE	DRILL TYPE: MRK2	HOLE STARTED: 12/08/2026
		METHOD: Rotary cored	HOLE FINISHED: 13/08/2026
R.L.:	41.95m		DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI

GEOLOGICAL | METHOD OBSERVATIONS | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT / ADDITIONAL OBSERVATIONS	DESCRIPTION
Fill	*0.00m* GRAVEL; grey Tightly packed, moist Gravel, sub-angular to angular; fill, concrete fragments.
	0.30m: Sandy SILT, minor clay; light orange mottled brown. Soft, moist, low plasticity; sand, fine to coarse; fill, ash.
	0.80m: SILT, some clay and some sand; light orange mottled orange spotted dark grey . Soft, moist, low plasticity; sand, fine to coarse; fill, ash.
Auckland Volcanic Field	*1.30m:* SILT, minor sand; light orange mottled orange . Soft, moist, non-plastic to low plasticity; sand, fine to coarse; fill, ash.
	1.50m: NO RECOVERY - Suspect slipped out of SPT spoon.
	1.95m: SILT, trace clay and trace sand; dark grey . Soft, wet, non-plastic; sand, fine.
	2.40m: Fine to medium GRAVEL, some silt; grey with reddish orange. Tightly packed, wet, non-plastic. Gravel, sub-angular to angular.
	2.55m: SILT, some clay, trace sand; grey mottled orange spotted black. Firm, wet, low to medium plasticity; sand, fine.
	2.90m: Silty fine GRAVEL, some sand; light orange. Loose, wet, non-plastic. Gravel, rounded to sub-rounded; sand, fine to coarse.
	3.20m: Silty CLAY; light grey . Firm, moist, medium plasticity.
East Coast Bays Formation	*4.40m:* Silty fine SAND, minor clay; grey. Loose, moist, low plasticity.
	5.10m: Completely weathered, grey, SANDSTONE. Extremely weak, medium to coarse grained.
	5.50m: Highly weathered, grey, SILTSTONE. Extremely weak, moderately cemented. Interbedded with: SANDSTONE, fine to medium grained.
	7.20 - 7.80m: Very weak to weak.
	10.00 - 10.20m: Completely weathered. Very weak to weak.

RL (m)	DEPTH (m)	CORE RECOVERY (%)	METHOD	TESTS	WEATHERING CLASSIFICATION	MOISTURE CLASSIFICATION	CONSISTENCY / DENSITY CLASSIFICATION
		0	CCORE			M	TP
		0	HANDEX				S
41	1	100	HQTT				
		0	SPT	1/0// 0/1/0/1 N=2			
40	2	100	HQTT	UTP in barrel		W	S
							TP
							F
39	3	100	SPT	0/1// 2/1/1/2 N=6			L
						M	F
38	4	00	HQTT	83/18 kPa in barrel			
		100	SPT	1/1// 1/1/1/2 N=5			L
37	5	100	HQTT	48/3 kPa in barrel	CW		EW
					HW		
36	6	0	SPT	2/4// 5/7/7/11 N=30			
		100	HQTT	UTP in barrel			
35	7						
		00	SPT	4/10// 35/15 for 44mm N>=50			
34	8	100	HQTT				
		100	SPT	6/8// 8/12/16/13 N=49			
33	9	100	HQTT				

WATER: 13/08/2026

COMMENTS: Groundwater level measured at 3.4 m below ground level in the morning of 13/08/2026 prior to drilling. Hole left open overnight.

Hole Depth 25.63m

Scale 1:50

Rev.: A

TTNZ_20240924 - BoreLog (Piezo) - 12/10/2026 3:26:36 pm - Produced with Core-GS by GeRoc

BOREHOLE LOG

BOREHOLE No.: **BH02**

Hole Location: Northern corner of closed site close to entrance.

SHEET: 2 OF 3

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920114.53 mN 1757703.53 mE	DRILL TYPE: MRK2	HOLE STARTED: 12/08/2026
		METHOD: Rotary cored	HOLE FINISHED: 13/08/2026
R.L.:	41.95m		DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI

GEOLOGICAL	METHOD OBSERVATIONS									ENGINEERING DESCRIPTION							
GEOLOGICAL UNIT/ ADDITIONAL OBSERVATIONS	INSTALLATION	FLUID LOSS (%) 25 50 75	WATER	CASING	CORE RECOVERY (%)	METHOD	TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	WEATHERING CLASSIFICATION	MOISTURE CLASSIFICATION	CONSISTENCY / DENSITY CLASSIFICATION	ESTIMATED SOIL SHEAR STRENGTH (Su, kPa) VS 12 25 50 F 24 100 VS 200	ESTIMATED ROCK COMPRESSIVE STRENGTH (qu, MPa) EW 1 W 5 20 MS 50 S 100 VS+	DEFECT SPACING (mm) 20 60 200 600 2000	DESCRIPTION
East Coast Bays Formation					100	HQTT		31	11		CW		VW-W				[CONT] *5 50m* Highly weathered, grey, SILTSTONE Extremely weak, moderately cemented. Interbedded with: SANDSTONE, fine to medium grained.
					99	SPT	8/14// 11/21/18 for 17mm **N>=50**				HW		EW				
					100	HQTT					MW-HW						*11.10m:* Moderately to highly weathered, grey, SANDSTONE. Extremely weak, medium to coarse grained.
					100	SPT	9/19// 43/7 for 64mm **N>=50**	30	12								
					100	HQTT					MW		VW				*12.75m:* Moderately weathered, grey, SANDSTONE. Very weak, medium to coarse grained. *13.10 - 13.40m:* Fine to medium SAND. Very dense, wet.
					0	SPT	13/37// for 38mm **N>=50**	29	13								
					100	HQTT		28	14		SW						*14.65m:* Slightly weathered, grey, SANDSTONE. Very weak, fine to medium grained. Interbedded with: SILTSTONE.
					97	SPT	18/32// for 41mm **N>=50**	27	15								
					100	HQTT											
					0	SPT	26/24// for 27mm **N>=50** Solid Cone	26	16								
					100	HQTT		25	17		UW						*16.80m:* Unweathered, grey, SANDSTONE. Very weak, fine grained.
					0	SPT C	6/8// 42/8 for 4mm **N>=50** Solid Cone	24	18								
					71	HQTT		23	19								
					100	HQTT	16/34// for 25mm **N>=50** Solid Cone						W				*19.50m:* Unweathered, grey, SILTSTONE. Weak. Interbedded with: SANDSTONE, fine grained.

COMMENTS: Groundwater level measured at 3.4 m below ground level in the morning of 13/08/2026 prior to drilling. Hole left open overnight.

Hole Depth 25.63m

Scale 1:50

Rev.: A

TTNZ_20240924 - BoreLog (Plezo) - 12/10/2026 3:26:36 pm - Produced with Core-GS by GeRoc

BOREHOLE LOG

BOREHOLE No.: **BH02**

Hole Location: Northern corner of closed site close to entrance.

SHEET: 3 OF 3

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920114.53 mN 1757703.53 mE	DRILL TYPE: MRK2	HOLE STARTED: 12/08/2026
		METHOD: Rotary cored	HOLE FINISHED: 13/08/2026
R.L.:	41.95m		DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI

GEOLOGICAL	METHOD OBSERVATIONS								ENGINEERING DESCRIPTION								
GEOLOGICAL UNIT/ ADDITIONAL OBSERVATIONS	INSTALLATION	FLUID LOSS (%) 25 50 75	WATER	CASING	CORE RECOVERY (%)	METHOD	TESTS	RL (m) / DEPTH (m)	GRAPHIC LOG	WEATHERING CLASSIFICATION	MOISTURE CLASSIFICATION	CONSISTENCY / DENSITY CLASSIFICATION	ESTIMATED SOIL SHEAR STRENGTH (Su, kPa) VS 12 25 50 F 24 100 VSt 48 200	ESTIMATED ROCK COMPRESSIVE STRENGTH (qu, MPa) EW 1 VW 5 W 20 MS 50 S 100 VS+	DEFECT SPACING (mm) 20 60 200 600 2000	DESCRIPTION
East Coast Bays Formation					100	HQTT	14/36// for 51mm **N>=50** Solid Cone	21 / 21		UW		W				[CONT] *19 50m* Unweathered, grey, SILTSTONE Weak. Interbedded with: SANDSTONE, fine grained.
					82	HQTT	23/27// for 33mm **N>=50** Solid Cone	20 / 22								
					76	HQTT		19 / 23				MS				*23.00m:* Unweathered, grey, SANDSTONE. Moderately strong, fine to coarse grained.
					0	HQTT	15/35// for 31mm **N>=50** Solid Cone	18 / 24				VW-W				*23.65m:* Unweathered, grey, SILTSTONE. Very weak to weak. Interbedded with: SANDSTONE, fine to medium grained.
					100	HQTT		17 / 25								
					0		11/39// for 49mm **N>=50** Solid Cone	16 / 26								25.63m: Target depth
								15 / 27								
								14 / 28								
								13 / 29								
								12								

COMMENTS: Groundwater level measured at 3.4 m below ground level in the morning of 13/08/2026 prior to drilling. Hole left open overnight.

Hole Depth 25.63m

Scale 1:50

Rev.: A

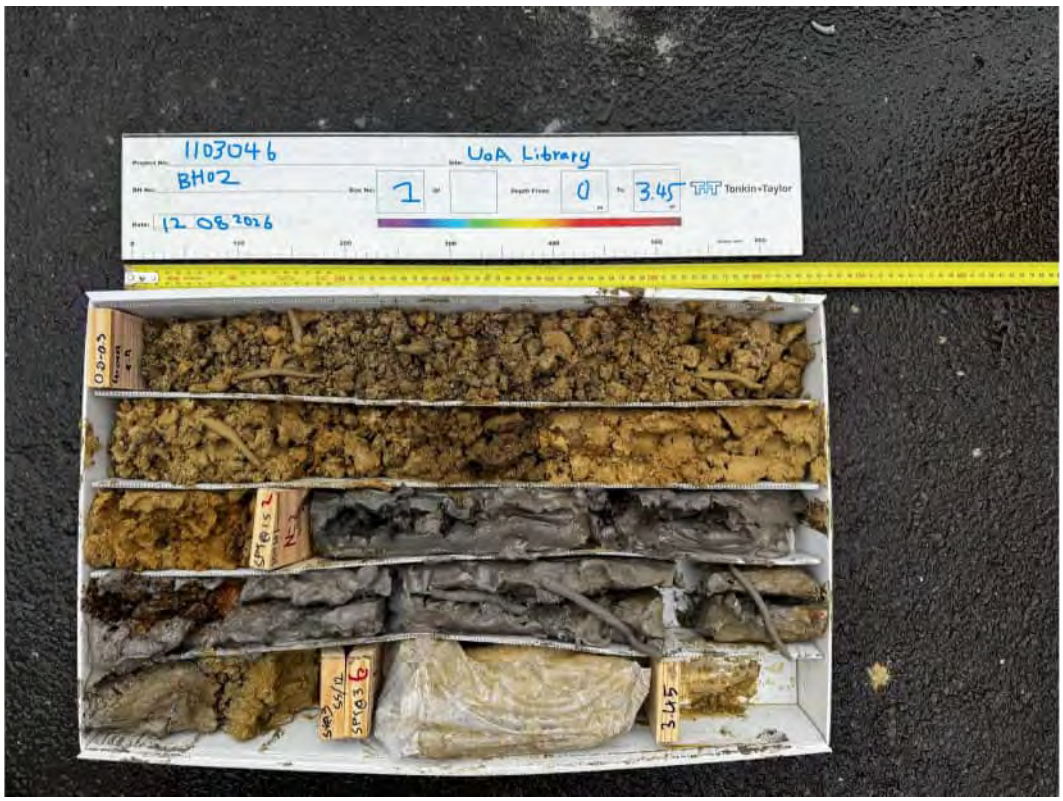
TTNZ_20240924 - BoreLog (Plezo) - 12/10/2026 3:26:36 pm - Produced with Core-GS by GeRoc

CORE PHOTOS

BOREHOLE No.: **BH02**

Hole Location: Northern corner of closed site close to entrance.

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920114.53 mN 1757703.53 mE	DRILL TYPE: MRK2	HOLE STARTED: 12/08/2026
		METHOD: Rotary cored	HOLE FINISHED: 13/08/2026
R.L.:	41.95m		DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI



0.00-3.45m



3.45-7.00m

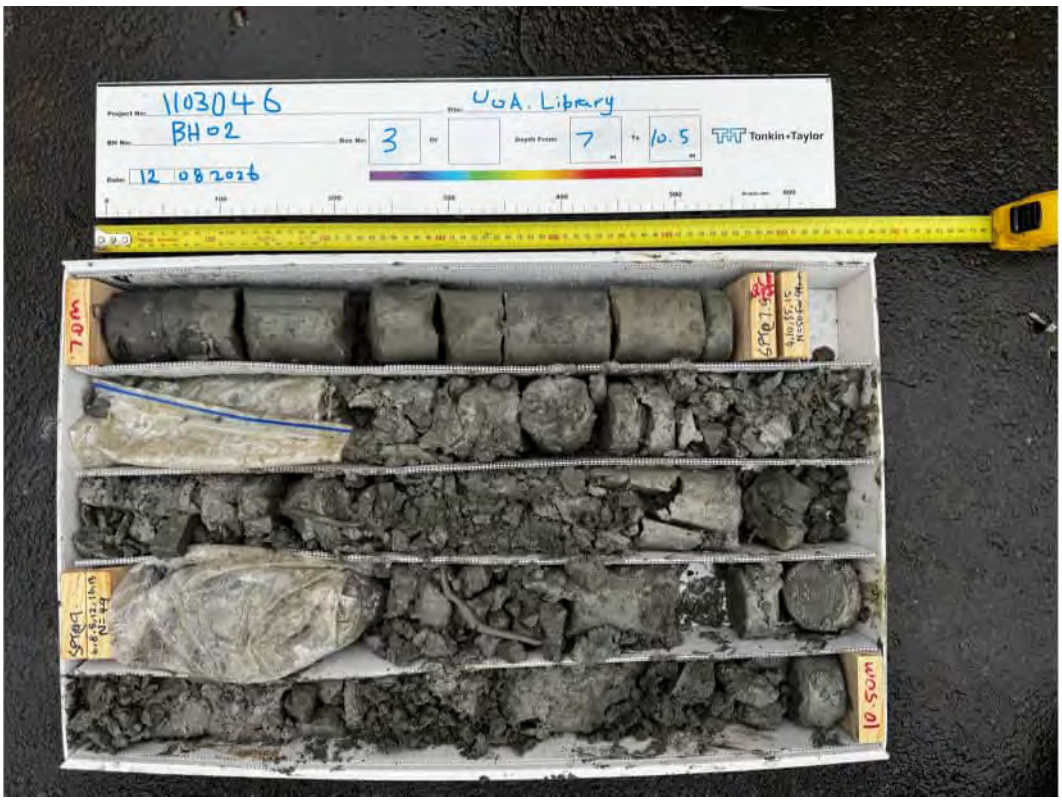
TTNZ_20240924 - BoreLog (Piezo) - 12/10/2026 3:26:36 pm - Produced with Core-GS by GeRoc

CORE PHOTOS

BOREHOLE No.: **BH02**

Hole Location: Northern corner of closed site close to entrance.

PROJECT: UoA Library and Student Hub	LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: 5920114.53 mN (NZTM2000) 1757703.53 mE	DRILL TYPE: MRK2	HOLE STARTED: 12/08/2026
R.L.: 41.95m	METHOD: Rotary cored	HOLE FINISHED: 13/08/2026
DATUM: NZVD2016	DRILL FLUID: WATER POLY	DRILLED BY: Perry Drilling
		LOGGED BY: JASL CHECKED: JOWI



7.00-10.50m



10.50-14.50m

TTNZ_20240924 - BoreLog (Plezo) - 12/10/2026 3:26:36 pm - Produced with Core-GS by GeRoc

CORE PHOTOS

BOREHOLE No.: **BH02**

Hole Location: Northern corner of closed site close to entrance.

PROJECT: UoA Library and Student Hub	LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: 5920114.53 mN (NZTM2000) 1757703.53 mE	DRILL TYPE: MRK2	HOLE STARTED: 12/08/2026
R.L.: 41.95m	METHOD: Rotary cored	HOLE FINISHED: 13/08/2026
DATUM: NZVD2016	DRILL FLUID: WATER POLY	DRILLED BY: Perry Drilling
		LOGGED BY: JASL CHECKED: JOWI



14.50-18.40m



18.40-23.00m

TTNZ_20240924 - BoreLog (Plezo) - 12/10/2026 3:26:36 pm - Produced with Core-GS by GeRoc

CORE PHOTOS

BOREHOLE No.: **BH02**

Hole Location: Northern corner of closed site close to entrance.

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920114.53 mN 1757703.53 mE	DRILL TYPE: MRK2	HOLE STARTED: 12/08/2026
		METHOD: Rotary cored	HOLE FINISHED: 13/08/2026
R.L.:	41.95m		DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI



23.00-25.63m

TTNZ_20240924 - BoreLog (Plezo) - 12/10/2026 3:26:36 pm - Produced with Core-GS by GeRoc

Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.: **BH03 (PZ)**

Hole Location: Southern corner of closed site.

SHEET: 1 OF 3

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920140.43 mN 1757689.38 mE	DRILL TYPE: MRK2	HOLE STARTED: 13/08/2026
		METHOD: Rotary cored	HOLE FINISHED: 17/08/2026
R.L.:	45.18m		DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI

GEOLOGICAL | METHOD OBSERVATIONS | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT / ADDITIONAL OBSERVATIONS	DESCRIPTION
Fill	*0.00m* Fine to medium GRAVEL; grey Tightly packed, wet. Gravel, sub-angular to angular; fill, concrete fragments.
	0.10m: CORE LOSS - Suspect loose granular material dropped out of barrel.
	0.45m: Fine GRAVEL; dark grey . Tightly packed, wet. Gravel, sub-rounded to sub-angular; fill, asphalt fragments.
Auckland Volcanic Field	*0.90m:* SILT, some clay; orange streaked white mottled dark red. Firm, moist, low plasticity; fill, ash.
	1.40m: Clayey SILT, minor sand; orange streaked white mottled red. Soft, moist, medium plasticity; sand, fine to medium; fill, ash.
	2.20m: Sandy SILT, some clay; light brown mottled orange streaked light orange. Soft, moist, low to medium plasticity; sand, fine to coarse; fill, ash.
	3.20m: Gravelly medium to coarse SAND, minor silt; light orange spotted brown. Loose, wet, non-plastic to low plasticity; gravel, fine; fill, ash.
	4.40m: Silty fine to medium SAND, some clay, trace gravel; light orange mottled orange. Soft to firm, wet, low to medium plasticity; gravel, fine; fill, ash.
	4.65m: SILT, some sand, minor clay, trace gravel; light orange speckleddark brown . Soft to firm, wet, non-plastic to low plasticity; sand, fine; gravel, fine; fill, ash.
	5.40m: Clayey SILT, some sand, trace gravel; light orange grading to reddish orange spotted dark brown . Firm, moist, medium plasticity; sand, fine to medium; gravel, fine; fill, ash.
East Coast Bays Formation	*6.00m:* Silty CLAY; grey. Firm, moist, high plasticity. *5.90 - 6.00m:* Locally, some wood fragments; spotted black.
	7.95m: NOT LOGGED - Push tube, base of push tube sandy.
	8.50m: Silty fine to medium SAND, trace clay; darkish grey. Tightly packed, moist, non-plastic to low plasticity.
	8.90m: SILT, some sand; grey. Very stiff to hard, moist, non-plastic; sand, fine to medium.
	9.75m: Highly weathered, grey, SANDSTONE.

DEPTH (m)	RL (m)	CORE RECOVERY (%)	METHOD	TESTS	WATER
0	45	22	HQTT		
		89	HQTT		
1	44	100	HQTT		
		100	SPT	1/1// 1/1/2/2 N=6	
2	43			157/48 kPa in barrel	
		100	HQTT		
3	42	100	SPT	1/0// 1/1/1/1 N=4	
				135/18 kPa in barrel	
4	41	00	HQTT		
		100	SPT	1/0// 1/1/1/1 N=4	
5	40			36/9 kPa in barrel	
		100	HQTT		
6	39	100	PT	PT @ 6.00m 144/21 kPa in barrel	
		100	SPT	1/1// 1/1/1/2 N=5	
7	38	100	HQTT		
		100	SPT	1/0// 1/1/1/1 N=4	
8	37	100	PT	PT @ 7.95m 54/21 kPa in barrel	
		100	HQTT		
9	36	100	SPT	1/2// 2/2/3/4 N=11	
		100	HQTT	119/15 kPa in barrel	

COMMENTS: Groundwater level measured at 2.1 m below ground level on 14/08/2026, prior to drilling, hole left open overnight.

Hole Depth 25.0m

Scale 1:50

Rev.: A

TTNZ_20240924 - BoreLog (Piezo) - 12/10/2026 3:26:36 pm - Produced with Core-GS by GeRoc

Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.: **BH03 (PZ)**

Hole Location: Southern corner of closed site.

SHEET: 2 OF 3

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920140.43 mN 1757689.38 mE	DRILL TYPE: MRK2	HOLE STARTED: 13/08/2026
		METHOD: Rotary cored	HOLE FINISHED: 17/08/2026
R.L.:	45.18m		DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI

GEOLOGICAL	METHOD OBSERVATIONS								ENGINEERING DESCRIPTION								
GEOLOGICAL UNIT/ ADDITIONAL OBSERVATIONS	INSTALLATION	FLUID LOSS (%)	WATER	CASING	CORE RECOVERY (%)	METHOD	TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	WEATHERING CLASSIFICATION	MOISTURE CLASSIFICATION	CONSISTENCY / DENSITY CLASSIFICATION	ESTIMATED SOIL SHEAR STRENGTH (Su, kPa)	ESTIMATED ROCK COMPRESSIVE STRENGTH (qu, MPa)	DEFECT SPACING (mm)	DESCRIPTION
East Coast Bays Formation					100	HQTT		35			HW		EW				Extremely weak, well cemented, fine to medium grained. Interbedded with: SILTSTONE.
					0	SPTC	8/19// 36/14 for 30mm N>50 Solid Cone										
					93	HQTT	UTP in barrel	34	11								
					0	PC	12/38// for 68mm N>50 Solid Cone	33	12		MW		VW				*11.50m:* Moderately weathered, grey, SANDSTONE. Very weak, moderately cemented, fine to coarse grained. Interbedded with: SILTSTONE.
					70	HQTT			13								
					0	PC	10/40// for 67mm N>50 Solid Cone	32									
					89	HQTT			14		SW						*13.80m:* Slightly weathered, grey, SANDSTONE. Very weak, well cemented, fine grained. Interbedded with: SILTSTONE.
					0	UPC	13/37// for 52mm N>50 Solid Cone	31	15								
					44	HQTT		30									
					0		28/22// for 11mm N>50 Solid Cone	29	16								*16 50m* Slightly weathered, grey, SANDSTONE Very weak, moderately cemented to well cemented, fine to medium grained.
					89	HQTT		28	17								
					0	PC	22/28// for 39mm N>50 Solid Cone	27	18								
					91	HQTT			19								
					0	PC	17/33// for 34mm N>50 Solid Cone	26									
					86	HQTT											

COMMENTS: Groundwater level measured at 2.1 m below ground level on 14/08/2026, prior to drilling, hole left open overnight.

Hole Depth 25.0m

Scale 1:50

Rev.: A

TTNZ_20240924 - BoreLog (Piezo) - 12/10/2026 3:26:38 pm - Produced with Core-GS by GeRoc

BOREHOLE LOG

BOREHOLE No.: **BH03 (PZ)**

Hole Location: Southern corner of closed site.

SHEET: 3 OF 3

PROJECT: UoA Library and Student Hub	LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: 5920140.43 mN (NZTM2000) 1757689.38 mE	DRILL TYPE: MRK2	HOLE STARTED: 13/08/2026
	METHOD: Rotary cored	HOLE FINISHED: 17/08/2026
R.L.: 45.18m		DRILLED BY: Perry Drilling
DATUM: NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI

GEOLOGICAL	METHOD OBSERVATIONS								ENGINEERING DESCRIPTION								
GEOLOGICAL UNIT/ ADDITIONAL OBSERVATIONS	INSTALLATION	FLUID LOSS (%) 25 50 75	WATER	CASING	CORE RECOVERY (%)	METHOD	TESTS	RL (m) / DEPTH (m)	GRAPHIC LOG	WEATHERING CLASSIFICATION	MOISTURE CLASSIFICATION	CONSISTENCY / DENSITY CLASSIFICATION	ESTIMATED SOIL SHEAR STRENGTH (Su, kPa) VS 12 25 50 F St 100 VSt 200 H	ESTIMATED ROCK COMPRESSIVE STRENGTH (qu, MPa) EW 1 VW 5 W 20 MS 50 S 100 VS+	DEFECT SPACING (mm) 20 60 200 600 2000	DESCRIPTION
East Coast Bays Formation					86 0 86 0	HQTT - HQTT -	18/32// for 27mm **N>=50** Solid Cone 25/25// for 7 mm **N>=50** Solid Cone	25 21 24 22 23 22 24 21 25 20 26 19 27 18 28 17 29 16		SW		VW				[CONT] *16 50m* Slightly weathered, grey, SANDSTONE. Very weak, moderately cemented to well cemented, fine to medium grained. 25.6m: Target depth

COMMENTS: Groundwater level measured at 2.1 m below ground level on 14/08/2026, prior to drilling, hole left open overnight.

Hole Depth 25.6m

Scale 1:50

Rev.: A

TTNZ_20240924 - BoreLog (Plezo) - 12/10/2026 3:26:38 pm - Produced with Core-GS by GeRoc

CORE PHOTOS

BOREHOLE No.: **BH03 (PZ)**

Hole Location: Southern corner of closed site.

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920140.43 mN 1757689.38 mE	DRILL TYPE: MRK2 METHOD: Rotary cored	HOLE STARTED: 13/08/2026 HOLE FINISHED: 17/08/2026 DRILLED BY: Perry Drilling
R.L.:	45.18m		
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI



0.00-4.10m



4.10-9.00m

TTNZ_20240924 - BoreLog (Piezo) - 12/10/2026 3:26:38 pm - Produced with Core-GS by GeRoc

CORE PHOTOS

BOREHOLE No.: **BH03 (PZ)**

Hole Location: Southern corner of closed site.

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920140.43 mN 1757689.38 mE	DRILL TYPE: MRK2 METHOD: Rotary cored	HOLE STARTED: 13/08/2026 HOLE FINISHED: 17/08/2026
R.L.:	45.18m		DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI



9.00-12.50m



12.50-17.00m

TTNZ_20240924 - BoreLog (Piezo) - 12/10/2026 3:26:38 pm - Produced with Core-GS by GeRoc

CORE PHOTOS

BOREHOLE No.: **BH03 (PZ)**

Hole Location: Southern corner of closed site.

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920140.43 mN 1757689.38 mE	DRILL TYPE: MRK2	HOLE STARTED: 13/08/2026
		METHOD: Rotary cored	HOLE FINISHED: 17/08/2026
R.L.:	45.18m		DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI



17.00-21.10m



21.10-24.80m

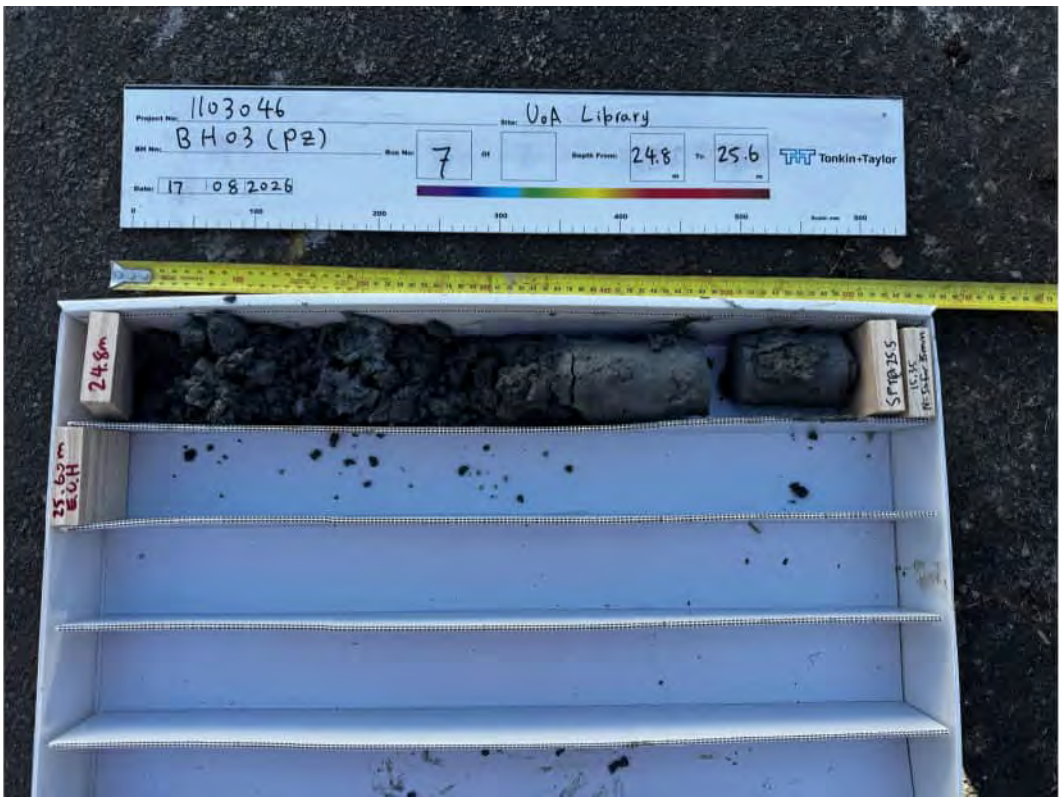
TTNZ_20240924 - BoreLog (Piezo) - 12/10/2026 3:26:38 pm - Produced with Core-GS by GeRoc

CORE PHOTOS

BOREHOLE No.: **BH03 (PZ)**

Hole Location: Southern corner of closed site.

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920140.43 mN 1757689.38 mE	DRILL TYPE: MRK2	HOLE STARTED: 13/08/2026
		METHOD: Rotary cored	HOLE FINISHED: 17/08/2026
R.L.:	45.18m		DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI



24.80-25.60m

TTNZ_20240924 - BoreLog (Piezo) - 12/10/2026 3:26:38 pm - Produced with Core-GS by GeRoc

Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.: **BH04 (PZ)**

Hole Location: Next to Alfred Street.

SHEET: 1 OF 3

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920125.85 mN 1757727.20 mE	DRILL TYPE: JD1	HOLE STARTED: 08/09/2026
		METHOD: Rotary cored	HOLE FINISHED: 10/09/2026
R.L.:	42.63m		DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI

GEOLOGICAL | METHOD OBSERVATIONS | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT / ADDITIONAL OBSERVATIONS	DESCRIPTION
Fill	*0.00m* Medium to coarse GRAVEL; dark grey Tightly packed, moist. Gravel, sub-angular to angular, Hardfill .
	0.20m: SILT, some sand, minor clay; light orange spotted dark brown mottled black. Soft to firm, moist, non-plastic to low plasticity; sand, fine to coarse.
Auckland Volcanic Field	*0.75m:* SILT, some sand and some gravel; orange mottled brown. Soft, wet, low plasticity; sand, fine to coarse; gravel, fine, sub-rounded to sub-angular.
	1.50m: Sandy gravelly SILT; light orange spotted . Soft, wet, low plasticity; sand, fine to medium; gravel, fine to medium, sub-rounded to sub-angular.
	3.20m: Clayey SILT, minor sand, trace gravel; orange mottled light orange. Soft, moist, medium plasticity; sand, fine; gravel, fine, rounded to sub-rounded.
	3.70m: Silty CLAY; grey. Soft to firm, moist, medium to high plasticity.
	4.40 - 4.95m: Light grey mottled light orange.
	4.95m: NOT LOGGED - Push tube, top and bottom of push tube consistent - clayey.
East Coast Bays Formation	*5.50m:* Silty CLAY, minor sand; light grey. Soft, moist, medium to high plasticity; sand, fine.
	6.40m: SILT, minor clay and minor sand; light grey mottled light orange. Firm, moist, low plasticity; sand, fine.
	6.70 - 7.00m: Grading to; grey.
	7.00m: NOT LOGGED - Push tube, base of push tube sandy.
	7.30m: Fine to medium SAND, some silt; grey. Medium dense, moist, non-plastic to low plasticity, completely weathered.
	8.10m: Highly weathered, grey, SILTSTONE. Extremely weak, moderately cemented. Interbedded with: SANDSTONE, fine to medium grained.

TESTS: 0/1// 0/1/0/1 N=2 — 8/8 kPa In barrel; 0/1// 1/2/1/1 N=5 — 15/5 kPa In barrel; 0/1// 1/0/1/1 N=3 — PT @ 4.95m 48/14 kPa In barrel; 1/2// 4/5/5/8 N=22 — 53/18 kPa In barrel; PT @ 7.00m 123/27 kPa In barrel; 3/2// 3/3/4/4 N=14; 7/9// 10/6/8/10 N=34 — UTP In barrel

WATER: 09/ 09/2026

COMMENTS: Groundwater level measured at 2.3 m below ground level on 09/ 09/2026 in the morning prior to drilling. Hole left open overnight. Unknown fill between 11.1 to 13.9 m below ground level, due to blockage of backfill during piezometer installation.

Hole Depth 25m

Scale 1:50

Rev.: A

TTNZ_20240924 - BoreLog (Piezo) - 12/10/2026 3:26:39 pm - Produced with Core-GS by GeRoc

Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.: **BH04 (PZ)**

Hole Location: Next to Alfred Street.

SHEET: 2 OF 3

PROJECT: UoA Library and Student Hub	LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000) 5920125.85 mN 1757727.20 mE	DRILL TYPE: JD1	HOLE STARTED: 08/09/2026
	METHOD: Rotary cored	HOLE FINISHED: 10/09/2026
R.L.: 42.63m		DRILLED BY: Perry Drilling
DATUM: NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI

GEOLOGICAL | METHOD OBSERVATIONS | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT/ ADDITIONAL OBSERVATIONS

INSTALLATION | FLUID LOSS (%) | WATER | CASING | CORE RECOVERY (%) | METHOD | TESTS | RL (m) | DEPTH (m) | GRAPHIC LOG | WEATHERING CLASSIFICATION | MOISTURE CLASSIFICATION | CONSISTENCY / DENSITY CLASSIFICATION | ESTIMATED SOIL SHEAR STRENGTH (Su, kPa) | ESTIMATED ROCK COMPRESSIVE STRENGTH (qu, MPa) | DEFECT SPACING (mm) | DESCRIPTION

East Coast Bays Formation

Depth (m)	RL (m)	Core Recovery (%)	Method	Tests	Weathering	Consistency / Density
11	32	100	HQTT		HW	EW
		100	SPT	2/6// 8/7/8/11 N=34		EW-VW
12	31	100	HQTT			
		100	SPT	6/9// 8/9/19/14 for 45mm N>=50		
13	30	100	HQTT		MW	
		100	SPT	6/12// 17/25/8 for 10mm N>=50	SW	VW
14	29	100	HQTT			
15	28	0	SPTC	6/17// 26/24 for 50mm N>=50 Solid Cone		
16	27	100	HQTT			
17	26	0	SPTC	12/38// for 70mm N>=50 Solid Cone		
18	25	100	HQTT			
19	24	0	SPTC	13/37// for 75mm N>=50 Solid Cone		
23	23	100	HQTT			
		0	SPTC	13/37// for 50mm N>=50 Solid Cone		
		101	HQTT			

[CONT] *8 10m* Highly weathered, grey, SILTSTONE Extremely weak, moderately cemented. Interbedded with: SANDSTONE, fine to medium grained.

10.20m: Highly weathered, grey, SANDSTONE. Extremely weak to very weak, moderately cemented, fine to medium grained. Interbedded with: SILTSTONE.

12.50 - 13.20m: Moderately weathered.

13.20m: Slightly weathered, grey, SANDSTONE. Very weak, well cemented, fine to medium grained. Interbedded with: SILTSTONE.

15.50m: Slightly weathered, grey, SANDSTONE. Very weak, well cemented, fine to medium grained. Interbedded with: SILTSTONE.

COMMENTS: Groundwater level measured at 2.3 m below ground level on 09/09/2026 in the morning prior to drilling. Hole left open overnight. Unknown fill between 11.1 to 13.9 m below ground level, due to blockage of backfill during piezometer installation.

Hole Depth 25m

Scale 1:50

Rev.: A

TTNZ_20240924 - BoreLog (Piezo) - 12/10/2026 3:26:39 pm - Produced with Core-GS by GeRoc

Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.: **BH04 (PZ)**

Hole Location: Next to Alfred Street.

SHEET: 3 OF 3

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920125.85 mN 1757727.20 mE	DRILL TYPE: JD1	HOLE STARTED: 08/09/2026
		METHOD: Rotary cored	HOLE FINISHED: 10/09/2026
R.L.:	42.63m		DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI

GEOLOGICAL	METHOD OBSERVATIONS								ENGINEERING DESCRIPTION							
GEOLOGICAL UNIT/ ADDITIONAL OBSERVATIONS	INSTALLATION	FLUID LOSS (%)	WATER	CASING	CORE RECOVERY (%)	METHOD	TESTS	RL (m) / DEPTH (m)	GRAPHIC LOG	WEATHERING CLASSIFICATION	MOISTURE CLASSIFICATION	CONSISTENCY / DENSITY CLASSIFICATION	ESTIMATED SOIL SHEAR STRENGTH (Su, kPa)	ESTIMATED ROCK COMPRESSIVE STRENGTH (σu, MPa)	DEFECT SPACING (mm)	DESCRIPTION
East Coast Bays Formation					101	HQTT		22 / 21		SW		VW				[CONT] *15 50m* Slightly weathered, grey, SANDSTONE. Very weak, well cemented, fine to medium grained. Interbedded with: SILTSTONE.
					0	HQTT	12/38// for 30mm N>=50 Solid Cone	21 / 22								
					101	HQTT		20 / 23								
					100	HQTT		19 / 24								
					100	HQTT		18 / 25								
								17 / 26								25m: Target depth
								16 / 27								
								15 / 28								
								14 / 29								
								13								

COMMENTS: Groundwater level measured at 2.3 m below ground level on 09/09/2026 in the morning prior to drilling. Hole left open overnight. Unknown fill between 11.1 to 13.9 m below ground level, due to blockage of backfill during piezometer installation.

Hole Depth 25m

Scale 1:50

Rev.: A

TTNZ_20240924 - BoreLog (Piezo) - 12/10/2026 3:26:39 pm - Produced with Core-GS by GeRoc

CORE PHOTOS

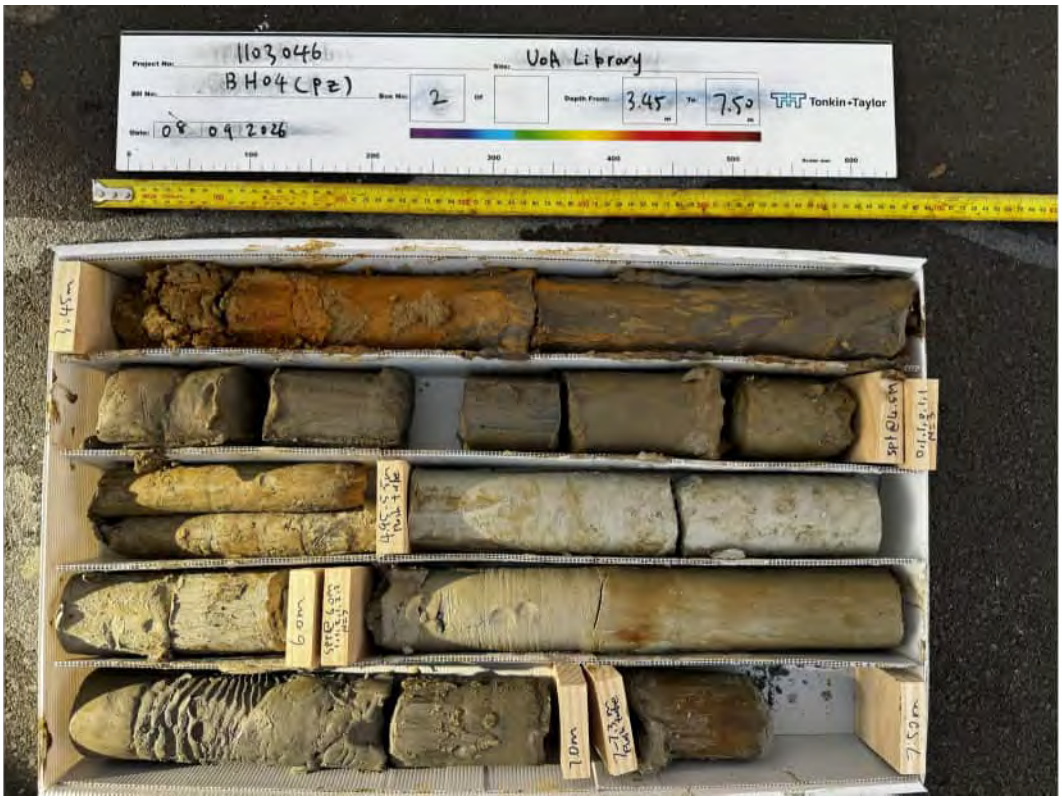
BOREHOLE No.: **BH04 (PZ)**

Hole Location: Next to Alfred Street.

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920125.85 mN 1757727.20 mE	DRILL TYPE: JD1	HOLE STARTED: 08/09/2026
		METHOD: Rotary cored	HOLE FINISHED: 10/09/2026
R.L.:	42.63m		DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI



0.00-3.45m



3.45-7.50m

TTNZ_20240924 - BoreLog (Piezo) - 12/10/2026 3:26:39 pm - Produced with Core-GS by GeRoc

CORE PHOTOS

BOREHOLE No.: **BH04 (PZ)**

Hole Location: Next to Alfred Street.

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920125.85 mN 1757727.20 mE	DRILL TYPE: JD1	HOLE STARTED: 08/09/2026
		METHOD: Rotary cored	HOLE FINISHED: 10/09/2026
R.L.:	42.63m		DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI



7.50-10.50m



10.50-13.81m

TTNZ_20240924 - BoreLog (Plezo) - 12/10/2026 3:26:39 pm - Produced with Core-GS by GeRoc

CORE PHOTOS

BOREHOLE No.: **BH04 (PZ)**

Hole Location: Next to Alfred Street.

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920125.85 mN 1757727.20 mE	DRILL TYPE: JD1	HOLE STARTED: 08/09/2026
		METHOD: Rotary cored	HOLE FINISHED: 10/09/2026
R.L.:	42.63m		DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI



13.81-16.90m



16.90-20.00m

TTNZ_20240924 - BoreLog (Plezo) - 12/10/2026 3:26:39 pm - Produced with Core-GS by GeRoc

CORE PHOTOS

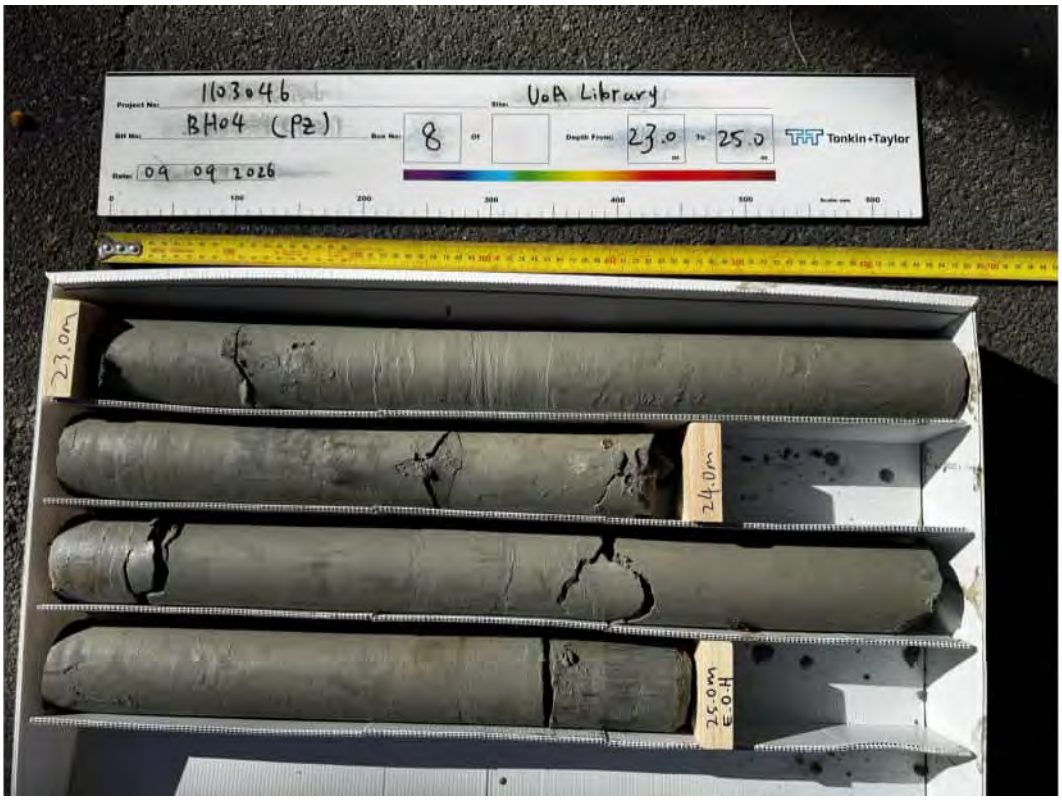
BOREHOLE No.: **BH04 (PZ)**

Hole Location: Next to Alfred Street.

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920125.85 mN 1757727.20 mE	DRILL TYPE: JD1	HOLE STARTED: 08/09/2026
		METHOD: Rotary cored	HOLE FINISHED: 10/09/2026
R.L.:	42.63m		DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI



20.00-23.00m



23.00-25.00m

TTNZ_20240924 - BoreLog (Piezo) - 12/10/2026 3:26:39 pm - Produced with Core-GS by GeRoc

Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.: **BH05**

Hole Location: In the food court hall.

SHEET: 1 OF 3

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920072.64 mN 1757693.92 mE	DRILL TYPE: JD1	HOLE STARTED: 31/08/2026
		METHOD: Rotary cored	HOLE FINISHED: 01/09/2026
R.L.:	45.59m		DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI

GEOLOGICAL	METHOD OBSERVATIONS										ENGINEERING DESCRIPTION								
GEOLOGICAL UNIT/ ADDITIONAL OBSERVATIONS	INSTALLATION	FLUID LOSS (%) 25 50 75	WATER	CASING	CORE RECOVERY (%)	METHOD	TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	WEATHERING CLASSIFICATION	MOISTURE CLASSIFICATION	CONSISTENCY / DENSITY CLASSIFICATION	ESTIMATED SOIL SHEAR STRENGTH (Su, kPa) VS 12 S 25 F 50 St 100 VSt 200 H	ESTIMATED ROCK COMPRESSIVE STRENGTH (σu, MPa) VW 1 W 5 M 20 MS 50 S 100 VS+	DEFECT SPACING (mm) 20 60 200 600 2000	DESCRIPTION
Fill					100	HQTT		45				M	F				*0.00m* Concrete, some scoria fallen in from sidewalls
Auckland Volcanic Field			01/09/2026		0	SPT	1,0// 0/1/0/1 N=2	44	1				S				*0.60m:* SILT, minor sand and minor gravel, trace clay; light orange . Firm, moist, low plasticity; sand, fine to medium; gravel, fine, rounded to sub-rounded.
					100	HQTT	45/23 kPa In barrel	43	2								*1.20m:* Silty gravelly fine to coarse SAND; light brown mottled dark grey. Soft, moist, non-plastic to low plasticity; gravel, fine, sub-rounded to sub-angular.
					89	SPT	1,0// 1,2/2/1 N=6	42	3			M-W	F				*3.10m:* SILT, some sand and some gravel; reddish orange spotted dark grey. Firm, moist to wet, non-plastic to low plasticity; sand, fine; gravel, fine, rounded to sub-rounded.
					48	HQTT	38/23 kPa In barrel	41	4								
					0	SPT	0/1// 0/1/2/1 N=4	40	5			M	S-F				*4.95m:* CLAY, minor silt; light grey. Soft to firm, moist, high plasticity.
					100	HQTT	60/23 kPa In barrel	39	6								
					100	PT	PT @ 6.00m			N/L N							*6.00m:* NOT LOGGED - Push tube, push tube top and bottom consistent - clayey.
East Coast Bays Formation					00	HQTT	105/38 kPa In barrel	38	7			M	F				*6.50m:* Silty CLAY; grey. Firm, moist, high plasticity.
					100	PT	PT @ 7.50m 151/53 kPa In barrel	37	8	N/L N							*7.50m:* NOT LOGGED - Push tube, top and bottom of push tube consistent. Clayey.
					100	SPT	1,2// 2,2/2/3 N=9	36	9		CW	M	St				*8.00m:* SILT, some clay and some sand; grey. Stiff, moist, medium plasticity, completely weathered; sand, fine
					100	HQTT											
					100	SPT	1,2// 2,3/3/3 N=11										
					100	HQTT	UTP In barrel										*9.60 - 9.80m:* Locally silty fine to medium SAND; grey. Tightly packed, moist, non-plastic to low plasticity.

COMMENTS: Groundwater level measured at 1.3 m below ground level on 01/09/2026 in the morning prior to drilling. Hole left open overnight.

Hole Depth 25m

Scale 1:50

Rev.: A

TTNZ_20240924 - BoreLog (Piezo) - 12/10/2026 3:26:41 pm - Produced with Core-GS by GeRoc

BOREHOLE LOG

BOREHOLE No.: **BH05**

Hole Location: In the food court hall.

SHEET: 2 OF 3

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920072.64 mN 1757693.92 mE	DRILL TYPE: JD1	HOLE STARTED: 31/08/2026 HOLE FINISHED: 01/09/2026
R.L.:	45.59m	METHOD: Rotary cored	DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI

GEOLOGICAL	METHOD OBSERVATIONS								ENGINEERING DESCRIPTION							
GEOLOGICAL UNIT/ ADDITIONAL OBSERVATIONS	INSTALLATION	FLUID LOSS (%) 25 50 75	WATER	CASING	CORE RECOVERY (%)	METHOD	TESTS	RL (m) / DEPTH (m)	GRAPHIC LOG	WEATHERING CLASSIFICATION	MOISTURE CLASSIFICATION	CONSISTENCY / DENSITY CLASSIFICATION	ESTIMATED SOIL SHEAR STRENGTH (Su, kPa) VS 12 25 50 F St 100 VSt 200 Hd	ESTIMATED ROCK COMPRESSIVE STRENGTH (qu, MPa) EW 1 VW 5 W 20 MS 50 S 100 VS+	DEFECT SPACING (mm) 20 60 200 600 2000	DESCRIPTION
East Coast Bays Formation					100	HQTT		35		CW	M	St				[CONT] *8.00m* SILT, some clay and some sand; grey Stiff, moist, medium plasticity, completely weathered; sand, fine.
					100	SPT	2/4// 4/5/5/6 **N=20**	11		HW		EW				*10.30m:* Highly weathered, grey, SILTSTONE. Extremely weak, moderately cemented. Soil description: SILT, minor sand, non-plastic to low plasticity; sand, fine.
					100	HQTT		34								
					100	SPT	3/5// 5/5/5/7 **N=22**	12								
					100	HQTT		33								
					100	SPT	8/15// 20/30 for 75mm **N>=50**	13								*13.25m:* Highly weathered, grey, SANDSTONE. Extremely weak, moderately cemented, fine to medium grained. Soil description: silty fine to medium SAND. Very dense, non-plastic.
					100	HQTT		32		MW						*13.80m:* Moderately weathered, grey, SILTSTONE. Extremely weak, moderately cemented. Soil description: SILT, some sand. Moist, non-plastic to low plasticity; sand, fine.
					100	SPT	8/8// 7/15/5 for 10mm **N>=50** Bouncing	14								
					100	HQTT		31								
					96	SPT	12/14// 19/6 for 10mm **N>=50** Bouncing	15								
					100	HQTT		30								
					101	HQTT		29		SW		VW				*16.73m:* Slightly weathered, grey, SANDSTONE. Very weak, moderately cemented, fine and coarse grained. Indistinctly interbedded with SILTSTONE
					0		12/38// for 40mm **N>=50** Solid Cone	16								
					100	HQTT		28								
								17								
								27		UW						*18.50m:* Unweathered, grey, SANDSTONE. Very weak, moderately cemented, fine to coarse grained. Interbedded with: SILTSTONE.
								18								
								26								
					100	HQTT	29 for 52mm **N>=50** Solid Cone Bouncing	19								*20.00 - 20.20m:* Unweathered, SILTSTONE. Extremely weak, poorly cemented. Soil description: clayey SILT. Stiff, medium plasticity.

COMMENTS: Groundwater level measured at 1.3 m below ground level on 01/09/2026 in the morning prior to drilling. Hole left open overnight.

Hole Depth 25m

Scale 1:50

Rev.: A

TTNZ_20240924 - BoreLog (Plezo) - 12/10/2026 3:26:41 pm - Produced with Core-GS by GeRoc

BOREHOLE LOG

BOREHOLE No.: **BH05**

Hole Location: In the food court hall.

SHEET: 3 OF 3

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920072.64 mN 1757693.92 mE	DRILL TYPE: JD1	HOLE STARTED: 31/08/2026 HOLE FINISHED: 01/09/2026
R.L.:	45.59m	METHOD: Rotary cored	DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI

GEOLOGICAL	METHOD OBSERVATIONS							ENGINEERING DESCRIPTION							
GEOLOGICAL UNIT/ ADDITIONAL OBSERVATIONS	INSTALLATION	FLUID LOSS (%) 25 50 75	WATER	CASING	CORE RECOVERY (%)	METHOD	TESTS	RL (m) / DEPTH (m)	GRAPHIC LOG	WEATHERING CLASSIFICATION	MOISTURE CLASSIFICATION	CONSISTENCY / DENSITY CLASSIFICATION	ESTIMATED SOIL SHEAR STRENGTH (Su, kPa) VS F St VSt H	ESTIMATED ROCK COMPRESSIVE STRENGTH (qu, MPa) EW VW W MS S VS+	DEFECT SPACING (mm) 20 60 200 600 2000	DESCRIPTION
East Coast Bays Formation					100	HQTT		25 / 20		UW		VW				[CONT] *18 50m* Unweathered, grey, SANDSTONE Very weak, moderately cemented, fine to coarse grained. Interbedded with: SILTSTONE. *20.70 - 21.10m:* Poorly cemented.
					100	HQTT		21 / 24								
					100	HQTT		23 / 22								
					100	HQTT		21 / 24								
								25 / 20								25m: Target depth
								26 / 19								
								27 / 18								
								28 / 17								
								29 / 16								

COMMENTS: Groundwater level measured at 1.3 m below ground level on 01/09/2026 in the morning prior to drilling. Hole left open overnight.

Hole Depth 25m

Scale 1:50

Rev.: A

TTNZ_20240924 - BoreLog (Plezo) - 12/10/2026 3:26:41 pm - Produced with Core-GS by GeRoc

CORE PHOTOS

BOREHOLE No.: **BH05**

Hole Location: In the food court hall.

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920072.64 mN 1757693.92 mE	DRILL TYPE: JD1	HOLE STARTED: 31/08/2026
		METHOD: Rotary cored	HOLE FINISHED: 01/09/2026
R.L.:	45.59m		DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI



0.00-4.95m



4.95-9.45m

TTNZ_20240924 - BoreLog (Piezo) - 12/10/2026 3:26:41 pm - Produced with Core-GS by GeRoc

CORE PHOTOS

BOREHOLE No.: **BH05**

Hole Location: In the food court hall.

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920072.64 mN 1757693.92 mE	DRILL TYPE: JD1	HOLE STARTED: 31/08/2026
		METHOD: Rotary cored	HOLE FINISHED: 01/09/2026
R.L.:	45.59m		DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI



9.45-12.65m



12.65-15.55m

TTNZ_20240924 - BoreLog (Plezo) - 12/10/2026 3:26:41 pm - Produced with Core-GS by GeRoc

CORE PHOTOS

BOREHOLE No.: **BH05**

Hole Location: In the food court hall.

PROJECT: UoA Library and Student Hub	LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: 5920072.64 mN (NZTM2000) 1757693.92 mE	DRILL TYPE: JD1	HOLE STARTED: 31/08/2026
R.L.: 45.59m	METHOD: Rotary cored	HOLE FINISHED: 01/09/2026
DATUM: NZVD2016	DRILL FLUID: WATER POLY	DRILLED BY: Perry Drilling
		LOGGED BY: JASL CHECKED: JOWI



15.55-18.30m



18.30-21.20m

TTNZ_20240924 - BoreLog (Plezo) - 12/10/2026 3:26:41 pm - Produced with Core-GS by GeRoc

CORE PHOTOS

BOREHOLE No.: **BH05**

Hole Location: In the food court hall.

PROJECT: UoA Library and Student Hub	LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: 5920072.64 mN (NZTM2000) 1757693.92 mE	DRILL TYPE: JD1	HOLE STARTED: 31/08/2026
R.L.: 45.59m	METHOD: Rotary cored	HOLE FINISHED: 01/09/2026
DATUM: NZVD2016	DRILL FLUID: WATER POLY	DRILLED BY: Perry Drilling
		LOGGED BY: JASL CHECKED: JOWI



21.20-24.00m



24.00-25.00m

TTNZ_20240924 - BoreLog (Plezo) - 12/10/2026 3:26:41 pm - Produced with Core-GS by GeRoc

Tonkin+Taylor

BOREHOLE LOG

BOREHOLE No.: **BH06**

Hole Location: On artificial turf, adjacent to the quad.

SHEET: 1 OF 3

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920093.26 mN 1757689.40 mE	DRILL TYPE: JD1	HOLE STARTED: 01/09/2026
		METHOD: Rotary cored	HOLE FINISHED: 03/09/2026
R.L.:	45.55m		DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI

GEOLOGICAL	METHOD OBSERVATIONS									ENGINEERING DESCRIPTION								
GEOLOGICAL UNIT/ ADDITIONAL OBSERVATIONS	INSTALLATION	FLUID LOSS (%)	WATER	CASING	CORE RECOVERY (%)	METHOD	TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	WEATHERING CLASSIFICATION	MOISTURE CLASSIFICATION	CONSISTENCY / DENSITY CLASSIFICATION	ESTIMATED SOIL SHEAR STRENGTH (Su, kPa)	ESTIMATED ROCK COMPRESSIVE STRENGTH (σc, MPa)	DEFECT SPACING (mm)	DESCRIPTION
Fill					100	HANDEX		45				M	S				*0.00m* PEAT (FIBROUS), minor gravel; dark brown Soft, moist; gravel, fine, brick fragments.
Auckland Volcanic Field					100	HQTT			1								*0.50m:* Clayey SILT, trace sand; light orange streaked light grey. Soft, moist, medium plasticity; sand, fine.
					0	SPT	0/1// 0,0/0/0 N=0	44				W					*1.40m:* Gravelly SILT, some sand; light oranged spotted dark grey. Soft, wet, non-plastic to low plasticity; gravel, fine, sub-rounded to sub-angular; sand, fine to medium.
							15/5 kPa in barrel		2								
					100	HQTT		43									
					100	SPT	0,0// 0/1/2/2 N=5		3			M	S-F				*3.20m:* SILT, some sand, minor clay, trace gravel; light orange spotted grey. Soft to firm, moist, low plasticity, dilatant; sand, fine; gravel, fine.
							23/8 kPa in barrel	42									*3.45m:* CORE LOSS - Suspect soft cohesive material dropped out of barrel.
			03/09/2026		19	HQTT			4								
					67	SPT	0/1// 0/1/1/1 N=3	41				W	VS				*4.30m:* SILT, minor clay; grey. Very soft, wet, low plasticity.
							30/8 kPa in barrel		5			M	F				*4.70m:* Clayey SILT; light grey mottled light orange. Firm, moist, medium to high plasticity.
					100	HQTT		40									
					100	PT	PT @ 6.00m		6								*6.00m:* NOT LOGGED - Push tube, top and bottom of push tube consistent - clayey.
East Coast Bays Formation							60/23 kPa in barrel	39				M	F				*6 50m* Silty CLAY; light grey Firm, moist, high plasticity.
					00	HQTT			7								
					100	SPT	0/1// 1/2/2/2 N=7	38					F-St				*7.40m:* SILT, some clay, trace sand; grey. Firm to stiff, moist, medium plasticity; sand, fine.
					100	PT	PT @ 7.95m 60/23 kPa in barrel		8								*8.00m:* NOT LOGGED - Push tube, top and bottom of push tube consistent - clayey.
					100	HQTT		37			CW		EW				*8.50m:* Completely weathered, grey, SANDSTONE. Extremely weak, moderately cemented, fine to medium grained. Soil description: fine to medium SAND, some silt, minor clay. Medium dense, moist, low plasticity.
					100	HQTT	UTP in barrel		9								
								36									

COMMENTS: Groundwater level measured at 4.1 m below ground level on 03/09/2026 in the morning prior to drilling. Hole left open overnight.

Hole Depth 25m

Scale 1:50

Rev.: A

TTNZ_20240924 - BoreLog (Piezo) - 12/10/2026 3:26:43 pm - Produced with Core-GS by GeRoc

BOREHOLE LOG

BOREHOLE No.: **BH06**

Hole Location: On artificial turf, adjacent to the quad.

SHEET: 2 OF 3

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920093.26 mN 1757689.40 mE	DRILL TYPE: JD1	HOLE STARTED: 01/09/2026
		METHOD: Rotary cored	HOLE FINISHED: 03/09/2026
R.L.:	45.55m		DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI

GEOLOGICAL | METHOD OBSERVATIONS | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT / ADDITIONAL OBSERVATIONS	INSTALLATION	FLUID LOSS (%)	WATER	CASING	CORE RECOVERY (%)	METHOD	TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	WEATHERING CLASSIFICATION	MOISTURE CLASSIFICATION	CONSISTENCY / DENSITY CLASSIFICATION	ESTIMATED SOIL SHEAR STRENGTH (Su, kPa)	ESTIMATED ROCK COMPRESSIVE STRENGTH (qu, MPa)	DEFECT SPACING (mm)	DESCRIPTION
East Coast Bays Formation					100	HQTT		35	11		HW		EW-VW				*10.00m* Highly weathered, grey, SILTSTONE Extremely weak to very weak, moderately cemented to well cemented. Interbedded with: SANDSTONE, fine to medium grained.
					100	SPT	3/4// 5/7/8/9 **N=29**										
					100	HQTT		34	12				VW				*11.80m:* Highly weathered, grey, SILTSTONE. Very weak, moderately cemented. Grading to: Moderately weathered, SANDSTONE Very weak, fine to medium grained.
					100	SPT	3/6// 8/8/10/13 **N=39**										
					100	HQTT		33	13								
					93	SPT	8/23// 31/19 for 75mm **N>=50**	32									*13.95 - 14.90m:* Poorly cemented.
					67	HQTT			14		MW						*13.95m:* Moderately weathered, grey, SANDSTONE. Very weak, moderately cemented, fine to medium grained. Interbedded with: SILTSTONE.
					0	SPTC	4/9// 21/29 for 46mm **N>=50** Solid Cone	31	15								*15.15 - 15.25m:* Grey mottled brown.
					101	HQTT		30	16								
					0	SPTC	16/27// 37/13 for 15mm **N>=50** Solid Cone	29	17								
					100	HQTT		28			SW						*17.10m:* Slightly weathered, grey, SILTSTONE. Very weak, moderately cemented. Interbedded with: Unweathered, SANDSTONE. Very weak, fine to medium grained.
					0	SPTC	10/40// for 55mm **N>=50** Solid Cone	27	18								
					100	HQTT			19								
19.50-19.56m: SPT terminated due to hammer bouncing.					0		30 for 60mm **N>=50** Solid Cone Bouncing	26									*19.65 - 19.80m:* Light grey. Weak, well cemented.
					69	HQTT											

COMMENTS: Groundwater level measured at 4.1 m below ground level on 03/09/2026 in the morning prior to drilling. Hole left open overnight.

Hole Depth 25m

Scale 1:50

Rev.: A

TTNZ_20240924 - BoreLog (Plezo) - 12/10/2026 3:26:43 pm - Produced with Core-GS by GeRoc

BOREHOLE LOG

BOREHOLE No.: **BH06**

Hole Location: On artificial turf, adjacent to the quad.

PROJECT: UoA Library and Student Hub	LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: 5920093.26 mN (NZTM2000) 1757689.40 mE	DRILL TYPE: JD1	HOLE STARTED: 01/09/2026
	METHOD: Rotary cored	HOLE FINISHED: 03/09/2026
R.L.: 45.55m		DRILLED BY: Perry Drilling
DATUM: NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI

GEOLOGICAL	METHOD OBSERVATIONS								ENGINEERING DESCRIPTION								
GEOLOGICAL UNIT/ ADDITIONAL OBSERVATIONS	INSTALLATION	FLUID LOSS (%) 25 50 75	WATER	CASING	CORE RECOVERY (%)	METHOD	TESTS	RL (m) / DEPTH (m)	GRAPHIC LOG	WEATHERING CLASSIFICATION	MOISTURE CLASSIFICATION	CONSISTENCY / DENSITY CLASSIFICATION	ESTIMATED SOIL SHEAR STRENGTH (Su, kPa) VS 12 25 50 F St 100 VSt 200 H	ESTIMATED ROCK COMPRESSIVE STRENGTH (qu, MPa) EW 1 VW 5 W 20 MS 50 S 100 VS+	DEFECT SPACING (mm) 20 60 200 600 2000	DESCRIPTION
East Coast Bays Formation					69	HQTT		25		SW		VW				[CONT] *17.10m* Slightly weathered, grey, SILTSTONE. Very weak, moderately cemented. Interbedded with: Unweathered, SANDSTONE. Very weak, fine to medium grained.
					0		16/34// for 40mm **N>=50** Solid Cone	24								
					100	HQTT		23								*21.50 - 21.60m:* Weak, well cemented.
					100	HQTT		22								*22.10 - 22.25m:* Weak, well cemented.
					100	HQTT		21								*23.75 - 24.30m:* Light grey. Weak, well cemented.
								20								*24.70 - 24.90m:* Light grey. Weak, well cemented.
								19								25m: Target depth
								18								
								17								
								16								

COMMENTS: Groundwater level measured at 4.1 m below ground level on 03/09/2026 in the morning prior to drilling. Hole left open overnight.

Hole Depth 25m

Scale 1:50

Rev.: A

TTNZ_20240924 - BoreLog (Plezo) - 12/10/2026 3:26:43 pm - Produced with Core-GS by GeRoc

CORE PHOTOS

BOREHOLE No.: **BH06**

Hole Location: On artificial turf, adjacent to the quad.

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920093.26 mN 1757689.40 mE	DRILL TYPE: JD1	HOLE STARTED: 01/09/2026
		METHOD: Rotary cored	HOLE FINISHED: 03/09/2026
R.L.:	45.55m		DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI



0.00-4.50m



4.50-8.50m

TTNZ_20240924 - BoreLog (Plezo) - 12/10/2026 3:26:43 pm - Produced with Core-GS by GeRoc

CORE PHOTOS

BOREHOLE No.: **BH06**

Hole Location: On artificial turf, adjacent to the quad.

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920093.26 mN 1757689.40 mE	DRILL TYPE: JD1 METHOD: Rotary cored	HOLE STARTED: 01/09/2026 HOLE FINISHED: 03/09/2026 DRILLED BY: Perry Drilling
R.L.:	45.55m		
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI



8.50-11.65m



11.65-15.10m

TTNZ_20240924 - BoreLog (Plezo) - 12/10/2026 3:26:43 pm - Produced with Core-GS by GeRoc

CORE PHOTOS

BOREHOLE No.: **BH06**

Hole Location: On artificial turf, adjacent to the quad.

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920093.26 mN 1757689.40 mE	DRILL TYPE: JD1	HOLE STARTED: 01/09/2026
		METHOD: Rotary cored	HOLE FINISHED: 03/09/2026
R.L.:	45.55m		DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI



15.10-18.60m



18.60-22.10m

TTNZ_20240924 - BoreLog (Plezo) - 12/10/2026 3:26:43 pm - Produced with Core-GS by GeRoc

CORE PHOTOS

BOREHOLE No.: **BH06**

Hole Location: On artificial turf, adjacent to the quad.

PROJECT: UoA Library and Student Hub		LOCATION: University of Auckland	JOB No.: 1103046.0000
CO-ORDINATES: (NZTM2000)	5920093.26 mN 1757689.40 mE	DRILL TYPE: JD1	HOLE STARTED: 01/09/2026
		METHOD: Rotary cored	HOLE FINISHED: 03/09/2026
R.L.:	45.55m		DRILLED BY: Perry Drilling
DATUM:	NZVD2016	DRILL FLUID: WATER POLY	LOGGED BY: JASL CHECKED: JOWI



22.10-25.00m

TTNZ_20240924 - BoreLog (Plezo) - 12/10/2026 3:26:43 pm - Produced with Core-GS by GeRoc

Appendix D Piezometer As-Built Details

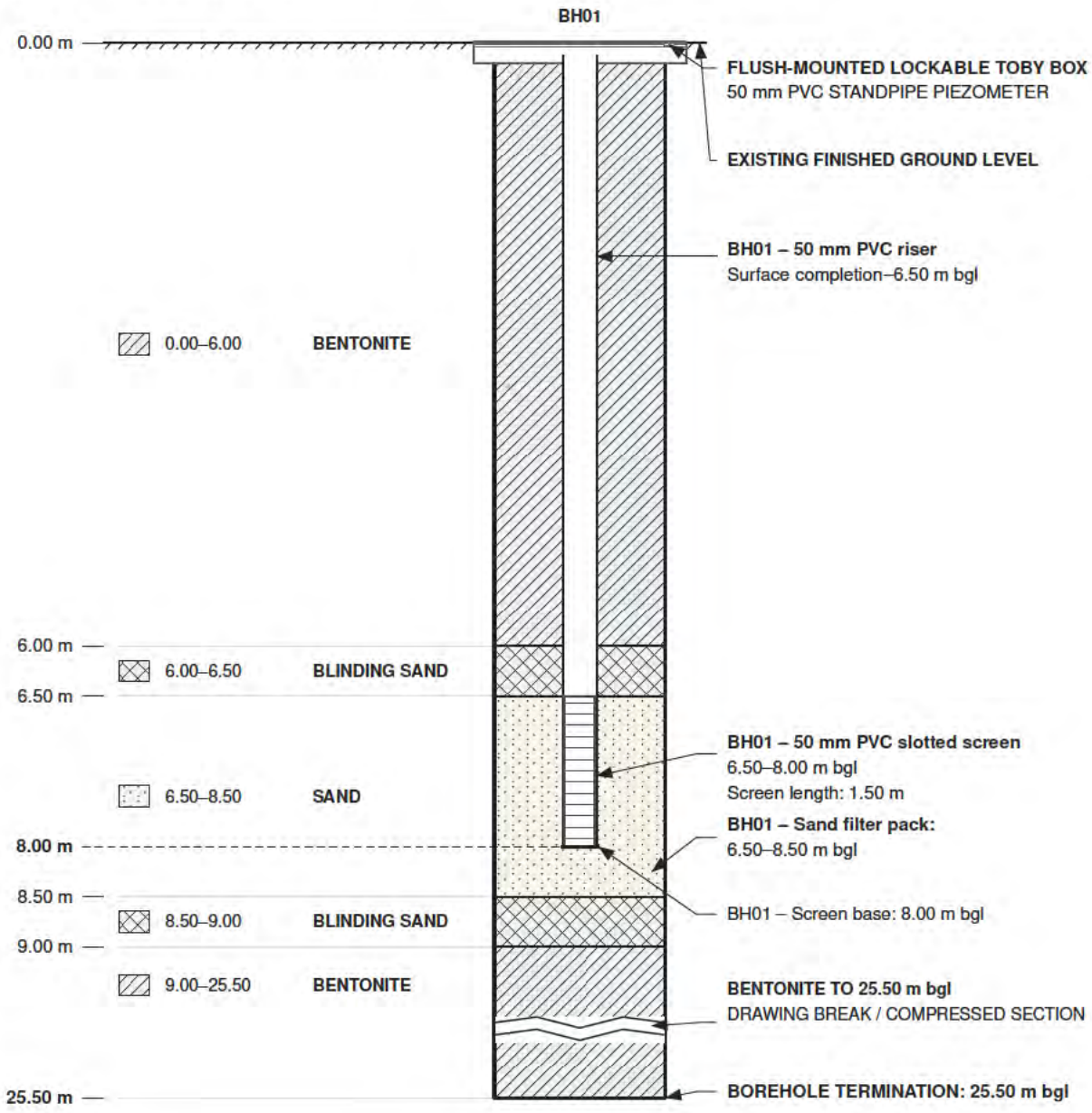
PIEZOMETER RECORD – SINGLE STANDPIPE PIEZOMETER

GEOTECHNICAL MONITORING INSTALLATION | AS-BUILT SCHEMATIC

Piezo No.	Job No.	Prepared by
BH01	1103046.0000	JASL

Job Name UoA Student Centre & Library	**Location** 30–38 Princes Street, Auckland Central
Northing 5920112.33 mN	**Easting** 1757672.09 mE
Drilling Commencement Date 07/09/2026	**Installation Completion Date** 07/09/2026
Installation Type Single standpipe piezometer	**Pipe Diameter** 50 mm PVC
Surface Completion Flush-mounted lockable toby box	**Maximum Borehole Depth** 25.50 m bgl

DEPTH (m bgl) | **CONSTRUCTION MATERIALS** Interval (m bgl) / backfill | **ONE BOREHOLE** | **INSTALLATION DETAILS**



LEGEND

- Bentonite – diagonal hatch
- Blinding sand – cross-hatch
- Sand filter pack – grain stipple
- PVC riser – solid outline
- Slotted screen – horizontal slots
- Ground surface – ground symbol
- Material boundary – solid line
- Screen termination – dashed line

ESSENTIAL NOTES

NOT TO SCALE.
All depths: metres below ground level.
Lower bentonite section compressed.
Borehole width and pipe geometry schematic.
Toby box and pipe terminations schematic; unspecified dimensions are not inferred.
No sump or blank tailpipe is inferred.

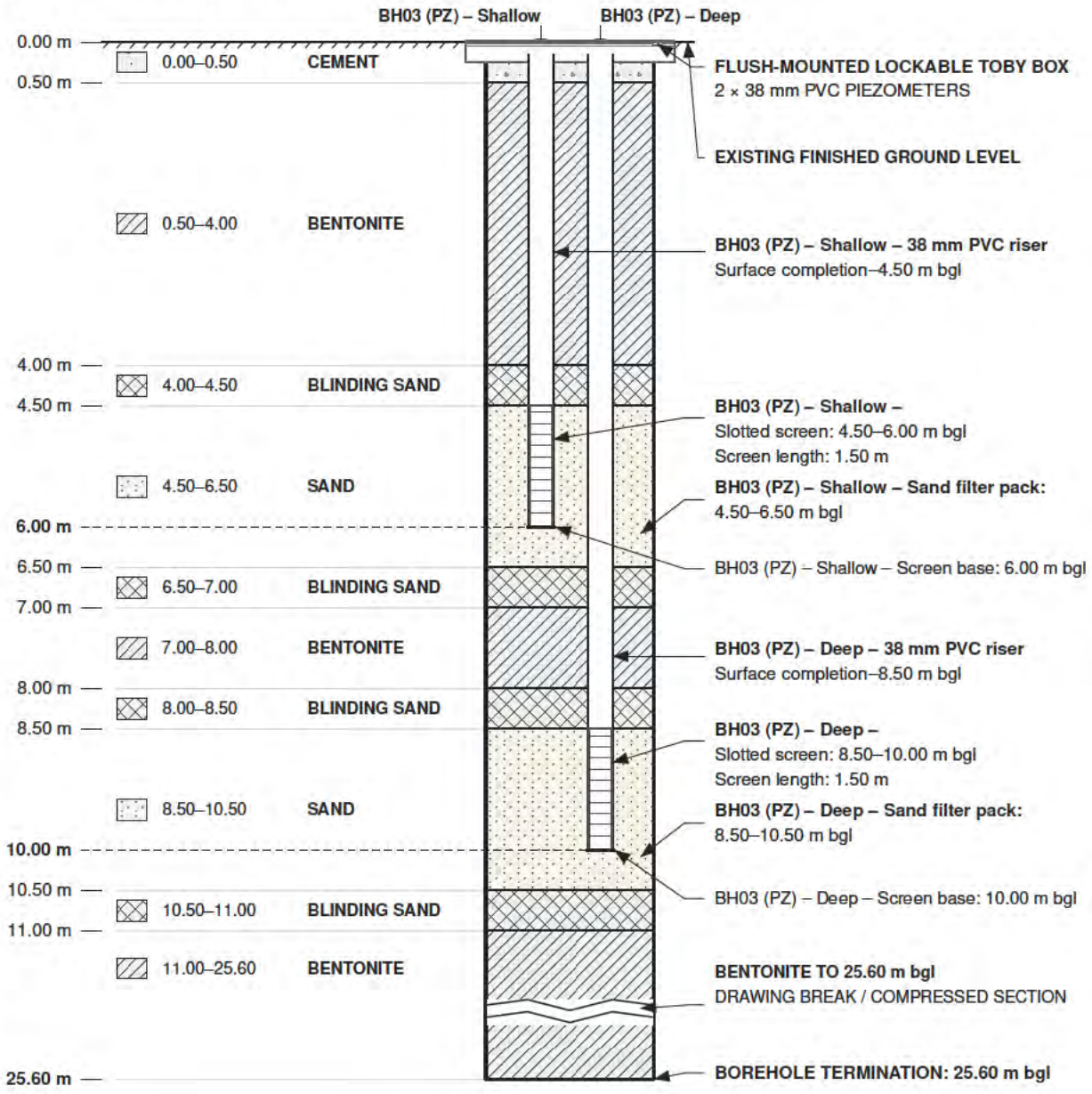
PIEZOMETER RECORD – DUAL NESTED PIEZOMETER

GEOTECHNICAL MONITORING INSTALLATION | AS-BUILT SCHEMATIC

Piezo No.	Job No.	Prepared by
BH03 (pz)	**1103046.0000**	JASL

Job Name UoA Student Centre & Library	**Location** 30–38 Princes Street, Auckland Central
Northing 5920140.43 mN	**Easting** 1757689.38 mE
Drilling Commencement Date 17/08/2026	**Installation Completion Date** 17/08/2026
Installation Type Dual nested standpipe piezometer	**Pipe Diameter** 2 × 38 mm PVC
Surface Completion Flush-mounted lockable toby box	**Maximum Borehole Depth** 25.60 m bgl

DEPTH (m bgl) | **CONSTRUCTION MATERIALS** Interval (m bgl) / backfill | **ONE BOREHOLE** | **INSTALLATION DETAILS**



LEGEND

- Cement – stipple
- Bentonite – diagonal hatch
- Blinding sand – cross-hatch
- Sand filter pack – grain stipple
- PVC riser – solid outline
- Slotted screen – horizontal slots
- Ground surface – ground symbol
- Material boundary – solid line
- Screen termination – dashed line

ESSENTIAL NOTES

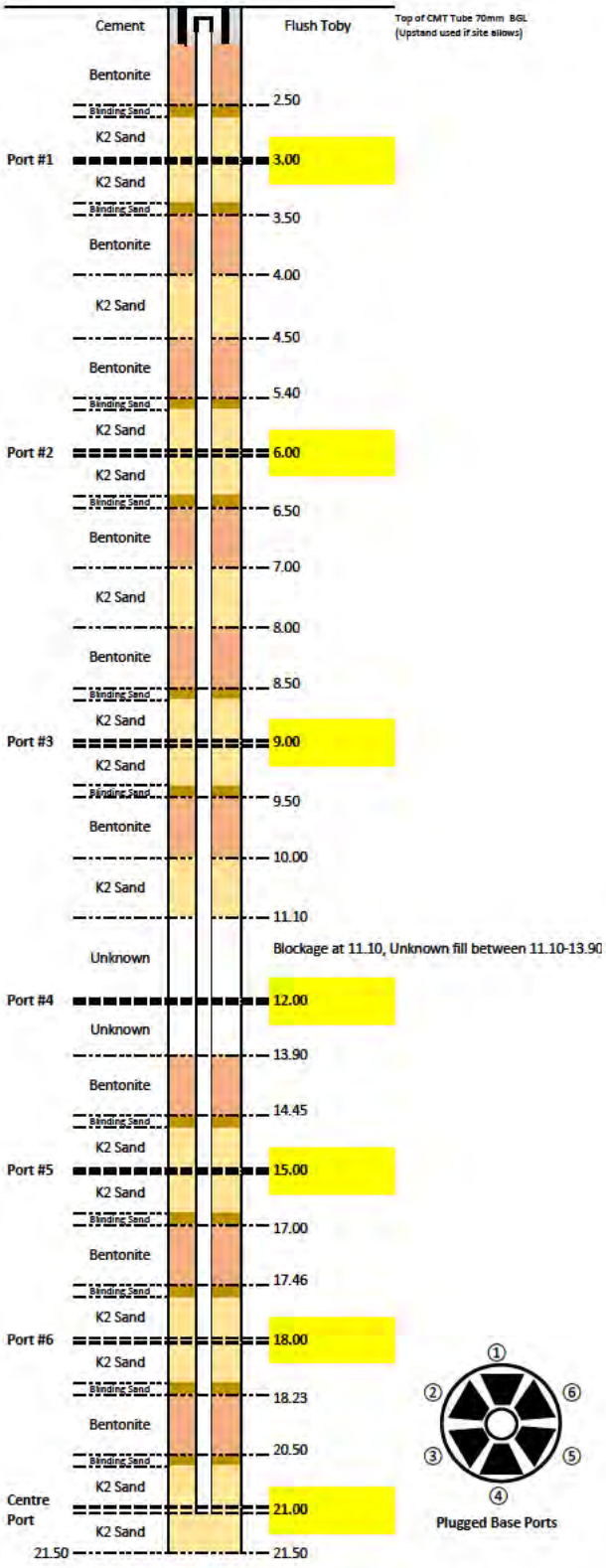
NOT TO SCALE.
All depths: metres below ground level.
Lower bentonite section compressed.
Borehole width and pipe spacing schematic.
Toby box and pipe terminations schematic; unspecified dimensions are not inferred.
No sump or blank tailpipe is inferred.

Multi Level Piezometer Installation Field Sheet

Geotechnics Ltd.

Site:	UoA - Alfred Street	Technician:	Santosh
Client :	Tonkin + Taylor	Installed Date:	10/09/26
Client Job Name:	UoA Student Centre & Library	Client Job No.:	1103046
Our Job Name:	CRRO AK UoA Student Centre Pz	Our Job No.:	1103841

BH No.:	BH04 (PZ)



Borehole Diameter	100mm	Total borehole depth (mBGL)	21.5
Bentonite x 22.7kg 3/8" Kiwi Plug Chip		Arrive on site	08:00
2mm Sand x 20kg		Leave Site	18:00

Appendix E Laboratory Testings Results

22 September 2026
Our Ref: 1103850.0000.01.0/Rep1
Customer Ref: 1103046

Tonkin & Taylor Limited
PO BOX 5271
AUCKLAND 1141

Attention: Tommy Lam

Dear Tommy

UoA Student Centre & Library

Laboratory Test Report

Customer's Instructions

Detailed testing instructions were provided by the customer.

Sampling Procedure

Samples have been tested as received.

Sample Location Plan

Not applicable.

Samples

We received seven push tube samples and five rock core samples labelled with the location ID and sample depth.

Date(s) of Sample Receipt

21 August 2026, 7 September 2026 and 16 September 2026

Test Method(s)

ISO 17892:2018 Part 9 - Consolidated triaxial compression tests on water saturated soils (CIU)

ASTM D2216-19 - Determination of the Water Content

ASTM D7012-14e1 Method C and D - Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures

NZS 4402: 1986 Test 2.1 - Water Content

NZS 4402: 1986 Test 7.1 - Determination of the One-dimensional Consolidation Properties

Material Description

Descriptions are provided in the attached presentation pages.

Test Results

Test results are attached.

Test Remarks

Test remarks are detailed on the presentation page.

General Remarks

Samples not destroyed during testing, will be retained for one month from the date of this report before being discarded.

Descriptions are enclosed for your information but are not covered under the IANZ endorsement of this report.

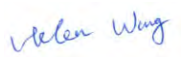
This report has been prepared for the benefit of Tonkin & Taylor Limited, with respect to the particular brief given to us and it cannot be relied upon in other contexts or for any other purpose without our prior review and agreement.

Please reproduce this report in full when transmitting to others or including in internal reports.

If we can be of any further assistance, feel free to get in touch. Contact details are provided at the bottom of the letterhead page.

GEOTECHNICS LTD

Report approved by:



.....
Helen Wang
Triaxial Laboratory Manager
Key Technical Person

Authorised for Geotechnics by:



.....
Steven Anderson
Project Director

ACCREDITED IANZ TESTING LABORATORY

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

22-Sept-26
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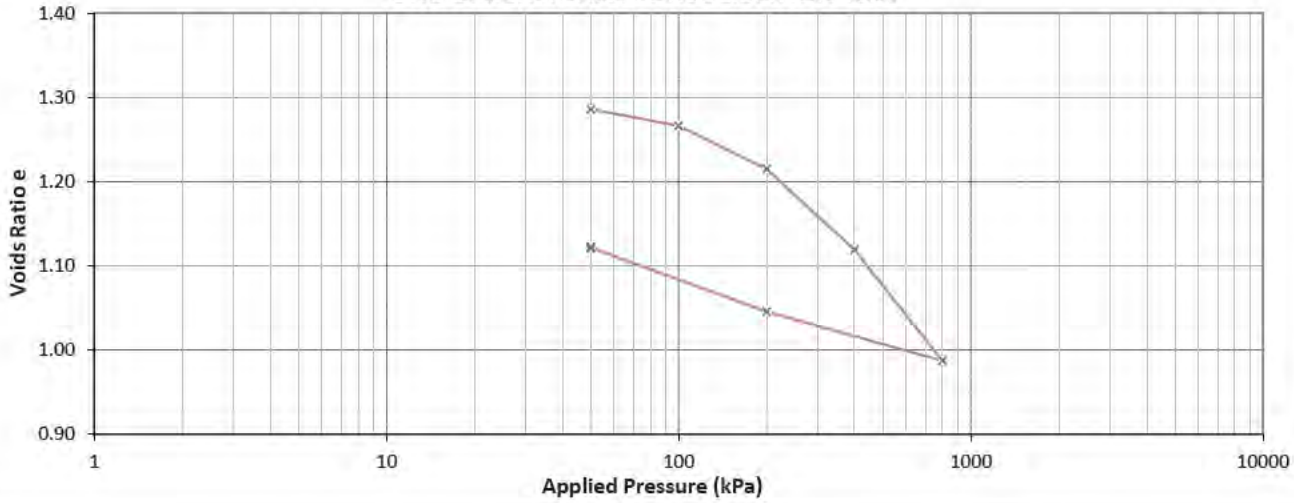
GEOTECHNICS
1 Hill Street
Onehunga
Auckland
New Zealand
p. +64 9 356 3510

Geotechnics Project ID: 1103850.0000.01.0
Customer Project ID: 1103046
Testing Schedule Reference: --

Site/Location: UoA Student Centre & Library Location ID: BH03
Sample Ref.: -- Geotechnics ID: -- Depth: 6.40 - 6.42 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST



Sample Parameters

Initial Sample Height:	19.95	mm	Initial Water Content:	47.2	%
Initial Sample Diameter:	50.00	mm	Initial Saturation Degree:	97	%
Initial Bulk Density:	1.70	t/m³	Solid Density (assumed):	2.65	t/m³
Initial Dry Density:	1.16	t/m³	Temperature During Testing:	19.5 to 20.5	°C

One-Dimensional Consolidation Results

Test Status	Applied Pressure (kPa)	Void Ratio e	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m^2/yr)		Coefficient of Volume Compressibility Mv (m^2/MN)
				Logarithm Time	Square-root Time	
As received	0	1.292				
Loading & Unloading	50	1.286	0 to 50	NA	196	0.049
	100	1.266	50 to 100	NA	2.4	0.17
	200	1.215	100 to 200	NA	1.2	0.23
	400	1.119	200 to 400	NA	0.89	0.22
	800	0.988	400 to 800	NA	0.67	0.16
	200	1.046	800 to 200	NA	NA	NA
	50	1.122	200 to 50	NA	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: Silty CLAY, with a trace of rootlets; brownish grey, mottled dark grey. Stiff, moist.

Test Remarks: Test results have been corrected for equipment deformation. The coefficient of consolidation Cv for each load stage has been derived by using a square-root time method. The calculations of void ratio are affected by the solid density value, which was assumed to be 2.65 t/m³ for the test. The Void Ratio e and the Coefficient of Volume Compressibility Mv derived for the first load stage may not be representative as the initial contact between the specimen and testing device may not be perfect, though a 3 kPa seating pressure was applied to the specimen before test commenced.

Tested by: PIHE Date: 2/09/2026 Approved by KTP: Date: 4/09/2026

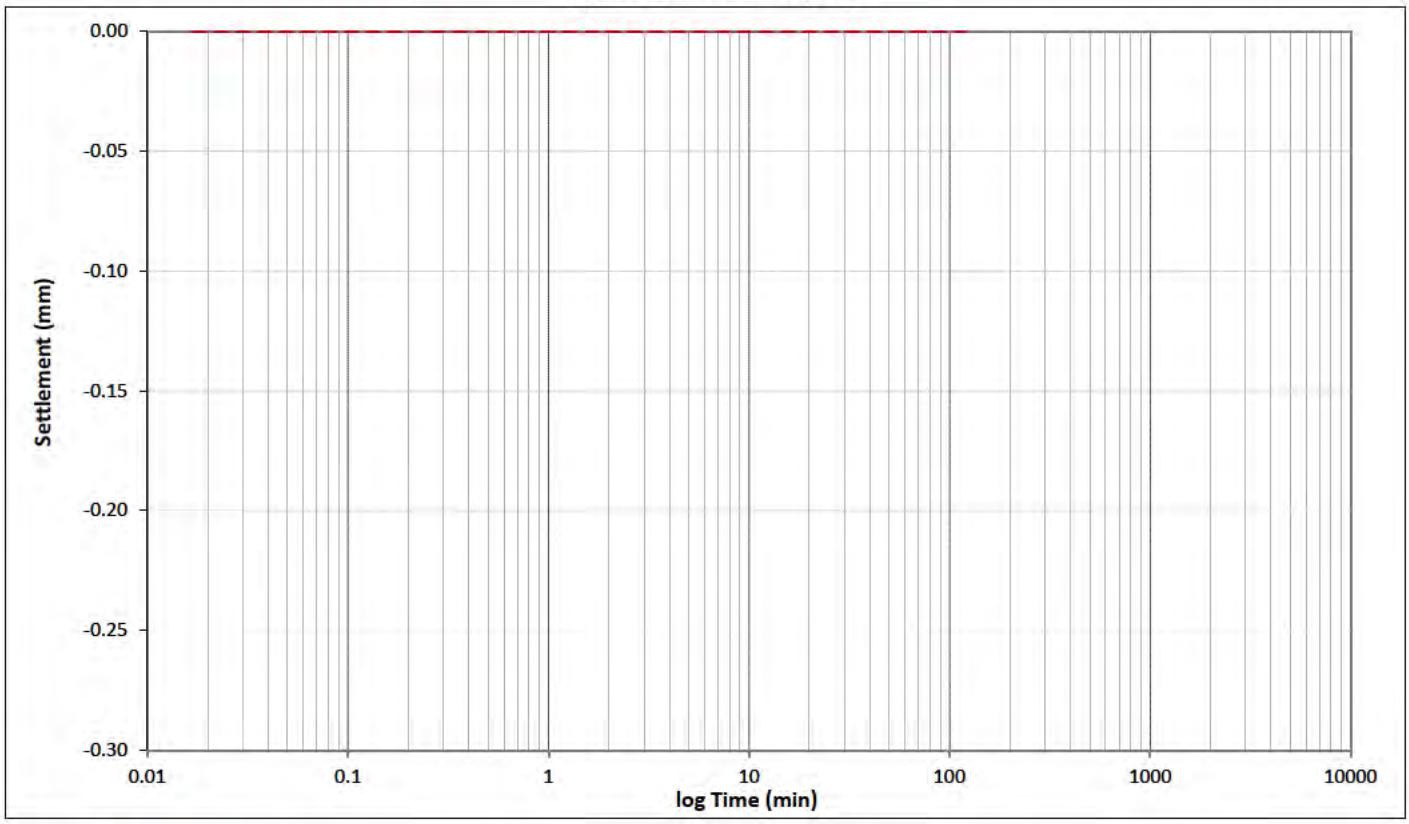
GEOTECHNICS
1 Hill Street
Onehunga
Auckland
New Zealand
p. +64 9 356 3510

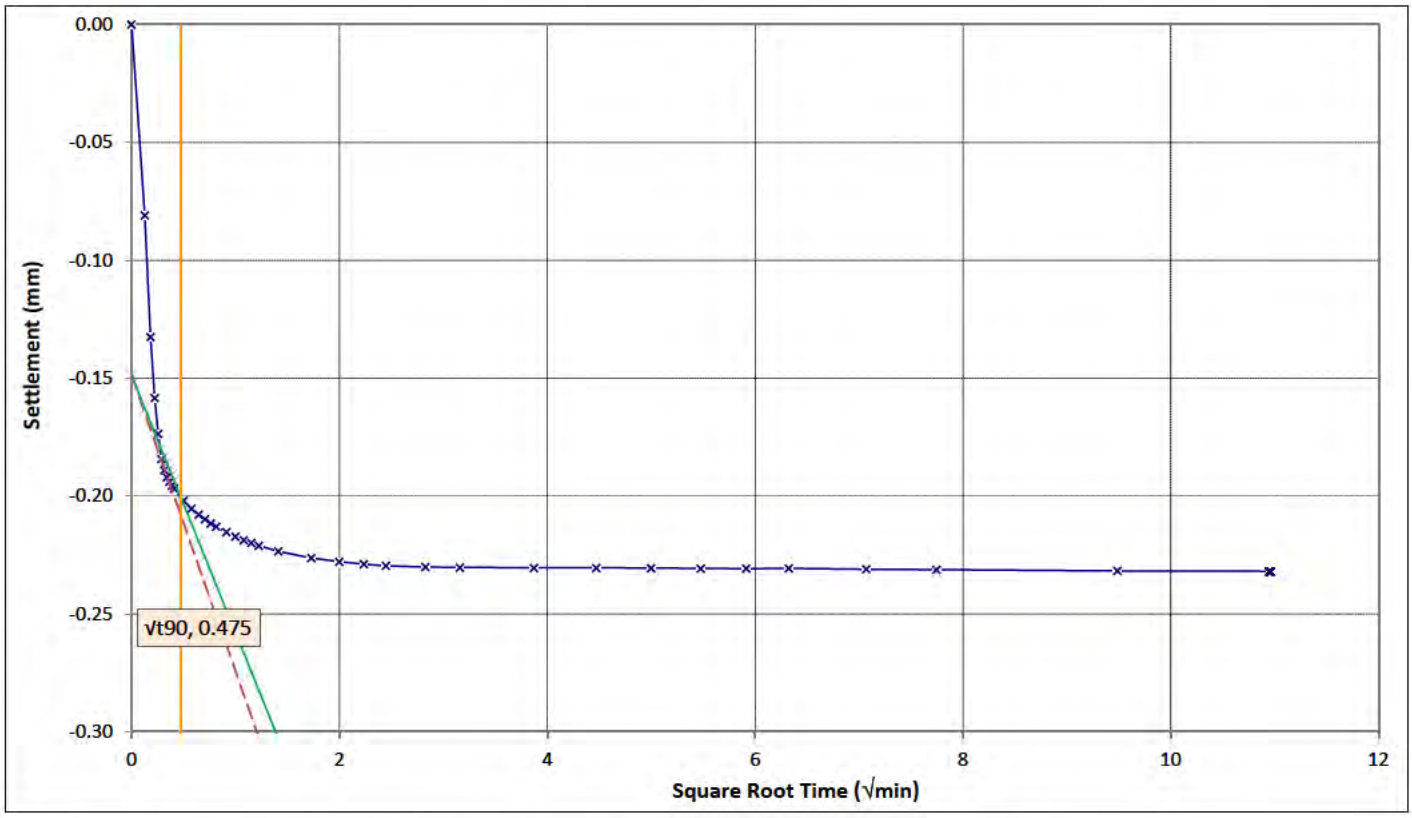
Geotechnics Project ID: 1103850.0000.01.0
Customer Project ID: 1103046
Test Schedule Reference: --

Site/Location: UoA Student Centre & Library Location ID: BH03
Sample Ref.: -- Geotechnics ID: -- Depth: 6.40 - 6.42 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST

Applied Pressure = 50 (kPa)





Tested by: PIHE Date: 2/09/2026 Approved by KTP: YHW Date: 4/09/2026

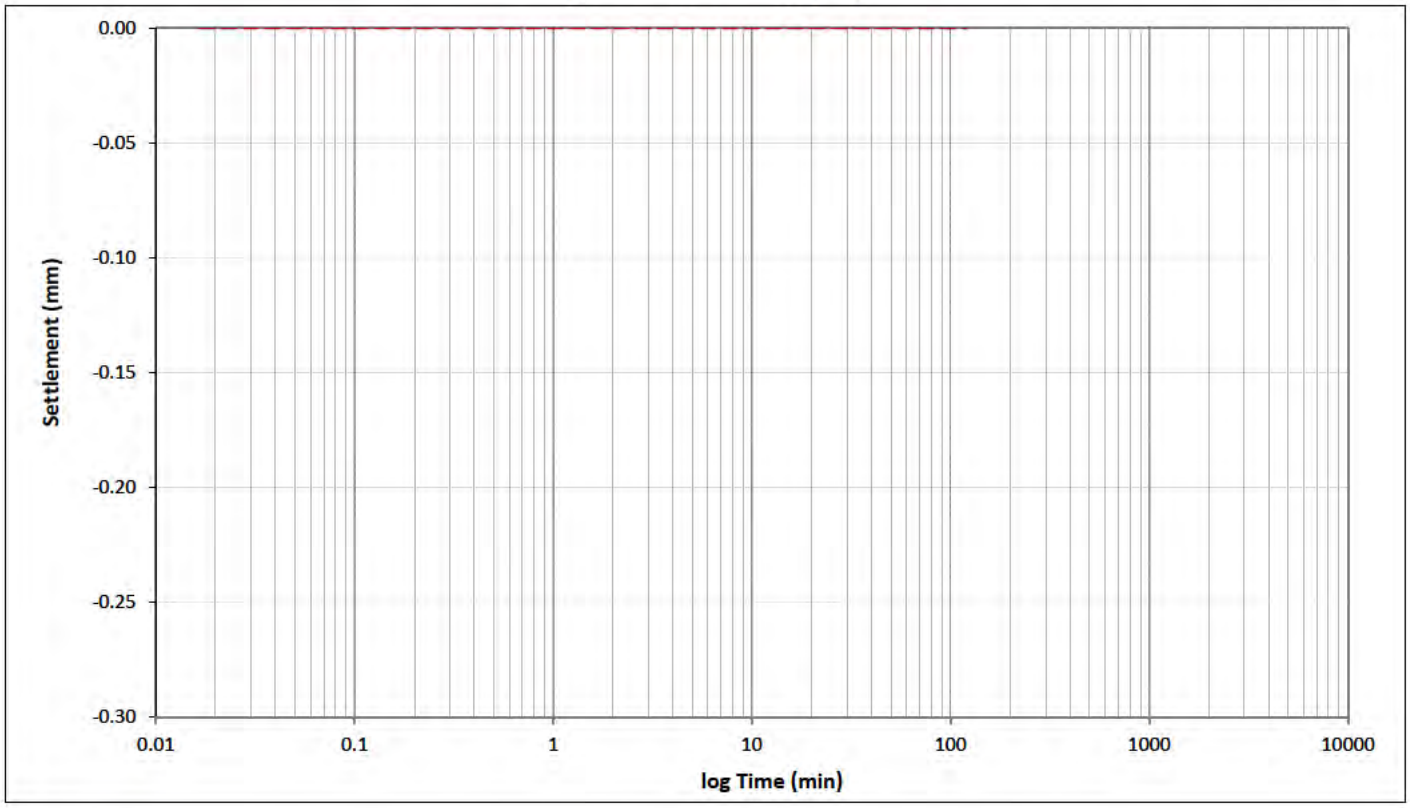
GEOTECHNICS
1 Hill Street
Onehunga
Auckland
New Zealand
p. +64 9 356 3510

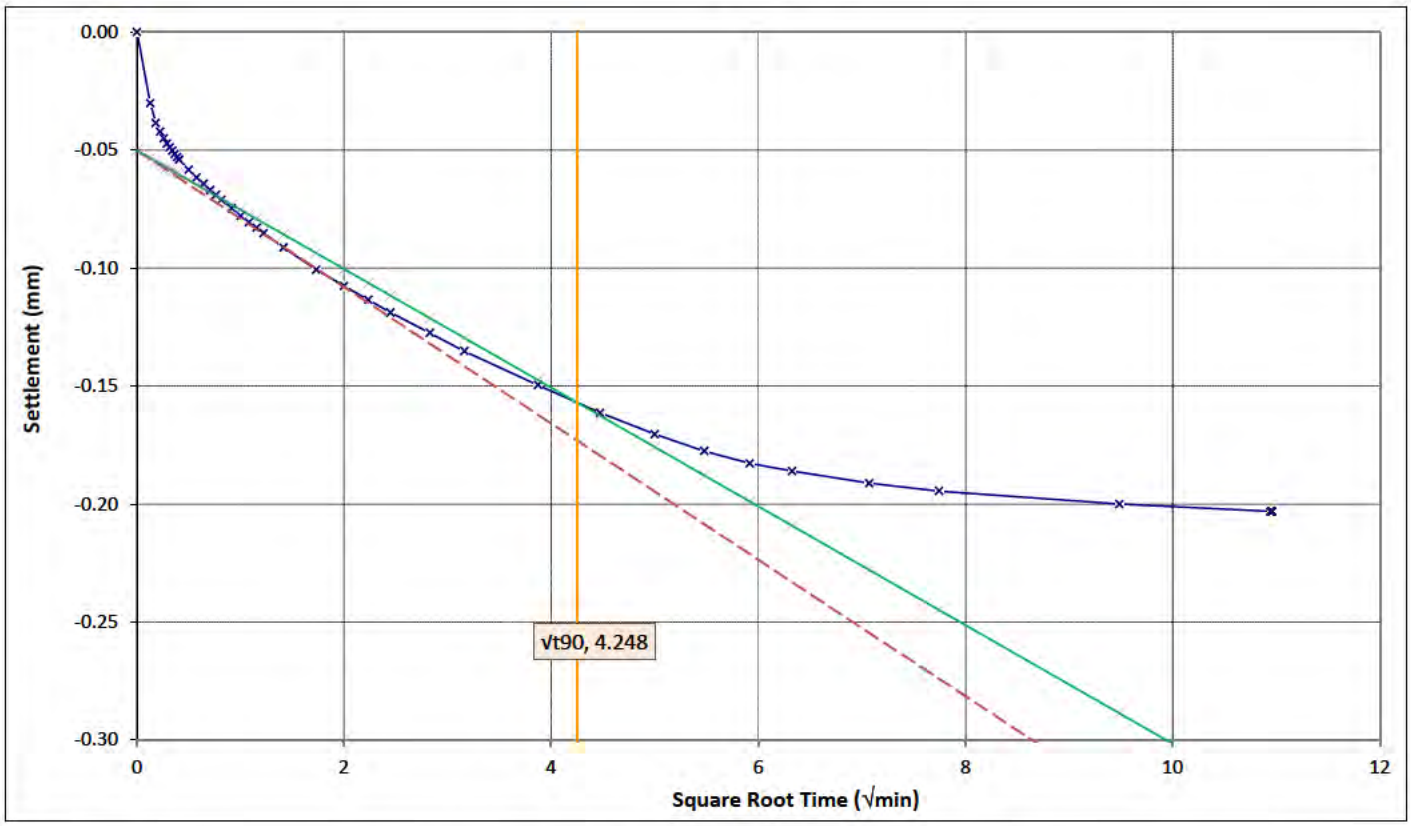
Geotechnics Project ID: 1103850.0000.01.0
Customer Project ID: 1103046
Test Schedule Reference: --

Site/Location: UoA Student Centre & Library Location ID: BH03
Sample Ref.: -- Geotechnics ID: -- Depth: 6.40 - 6.42 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST

Applied Pressure = 100 (kPa)





Tested by: PIHE Date: 2/09/2026 Approved by KTP: YHW Date: 4/09/2026

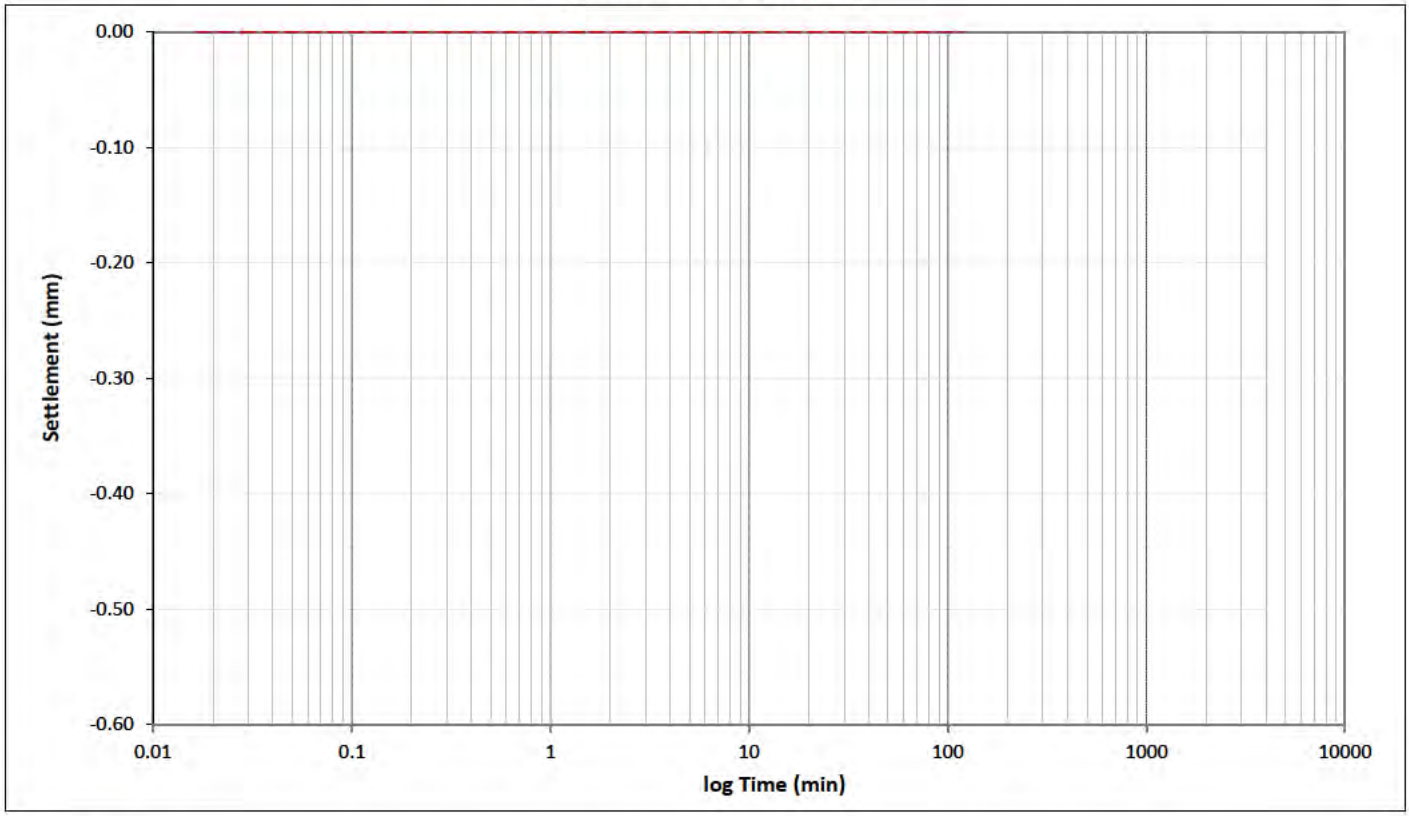
GEOTECHNICS
1 Hill Street
Onehunga
Auckland
New Zealand
p. +64 9 356 3510

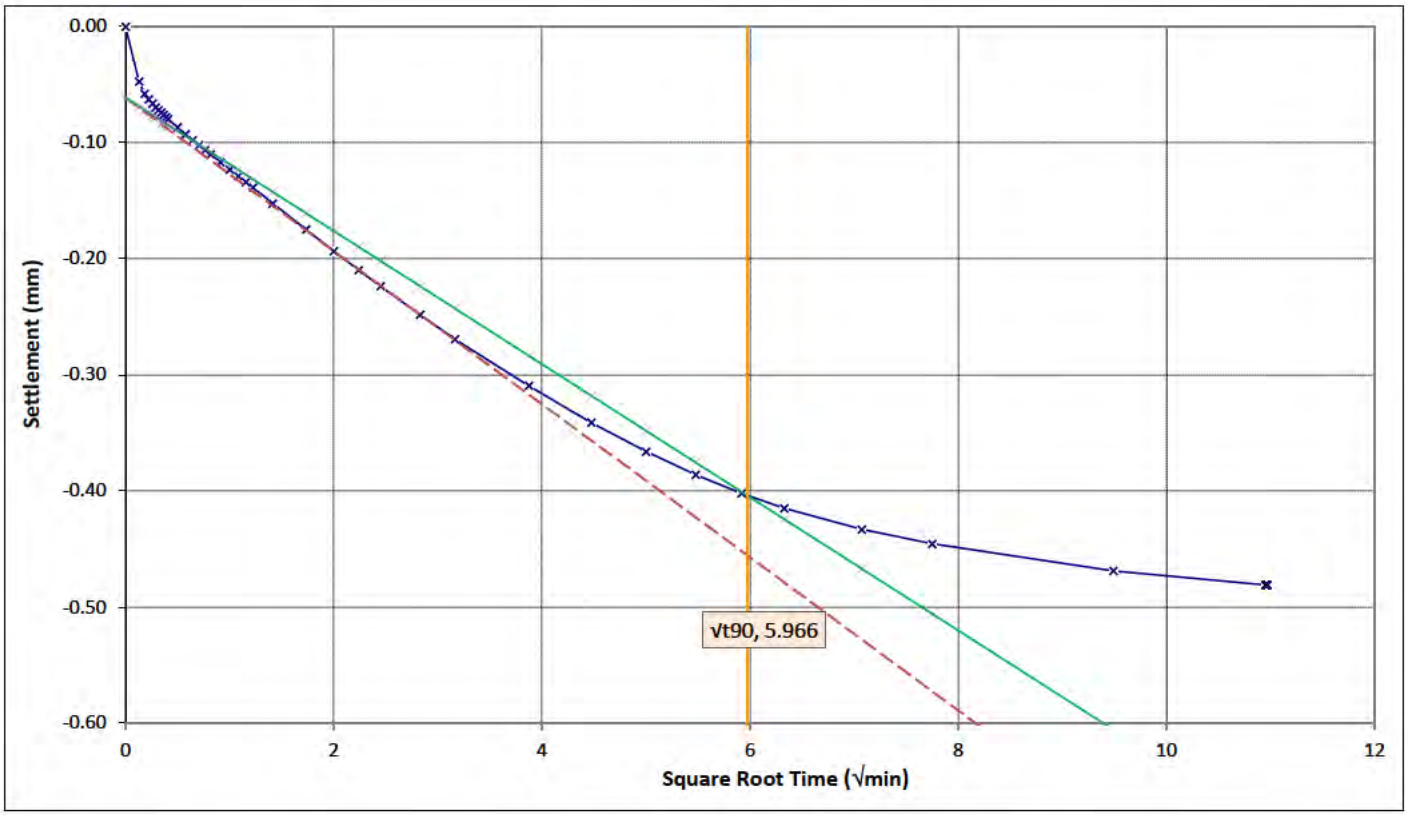
Geotechnics Project ID: 1103850.0000.01.0
Customer Project ID: 1103046
Test Schedule Reference: --

Site/Location: UoA Student Centre & Library Location ID: BH03
Sample Ref.: -- Geotechnics ID: -- Depth: 6.40 - 6.42 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST

Applied Pressure = 200 (kPa)





Tested by: PIHE Date: 2/09/2026 Approved by KTP: YHW Date: 4/09/2026

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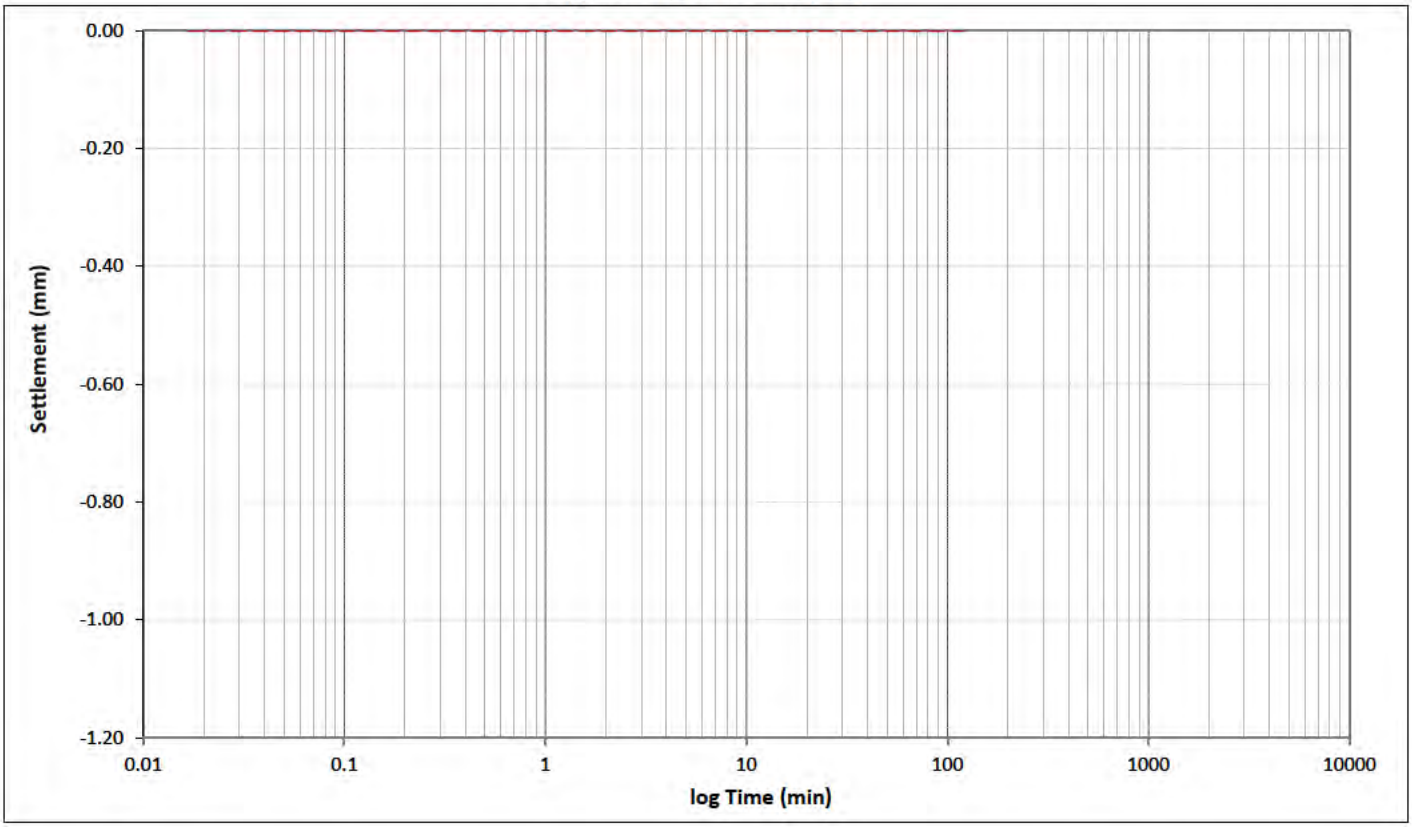
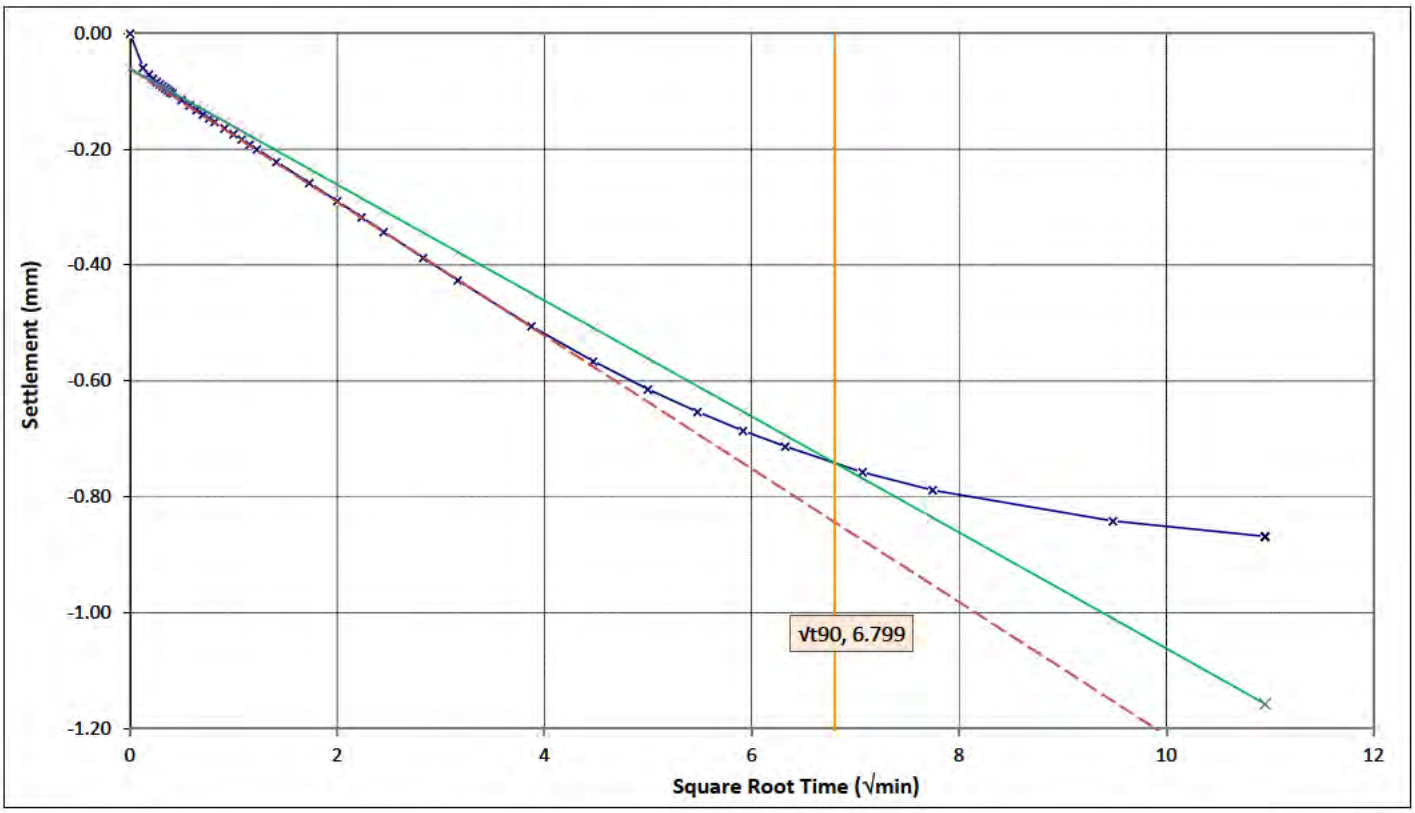
Geotechnics Project ID: 1103850.0000.01.0
Customer Project ID: 1103046
Test Schedule Reference: --

Site/Location: UoA Student Centre & Library Location ID: BH03
Sample Ref.: -- Geotechnics ID: -- Depth: 6.40 - 6.42 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST

Applied Pressure = 400 (kPa)





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Geotechnics Project ID: 1103850.0000.01.0
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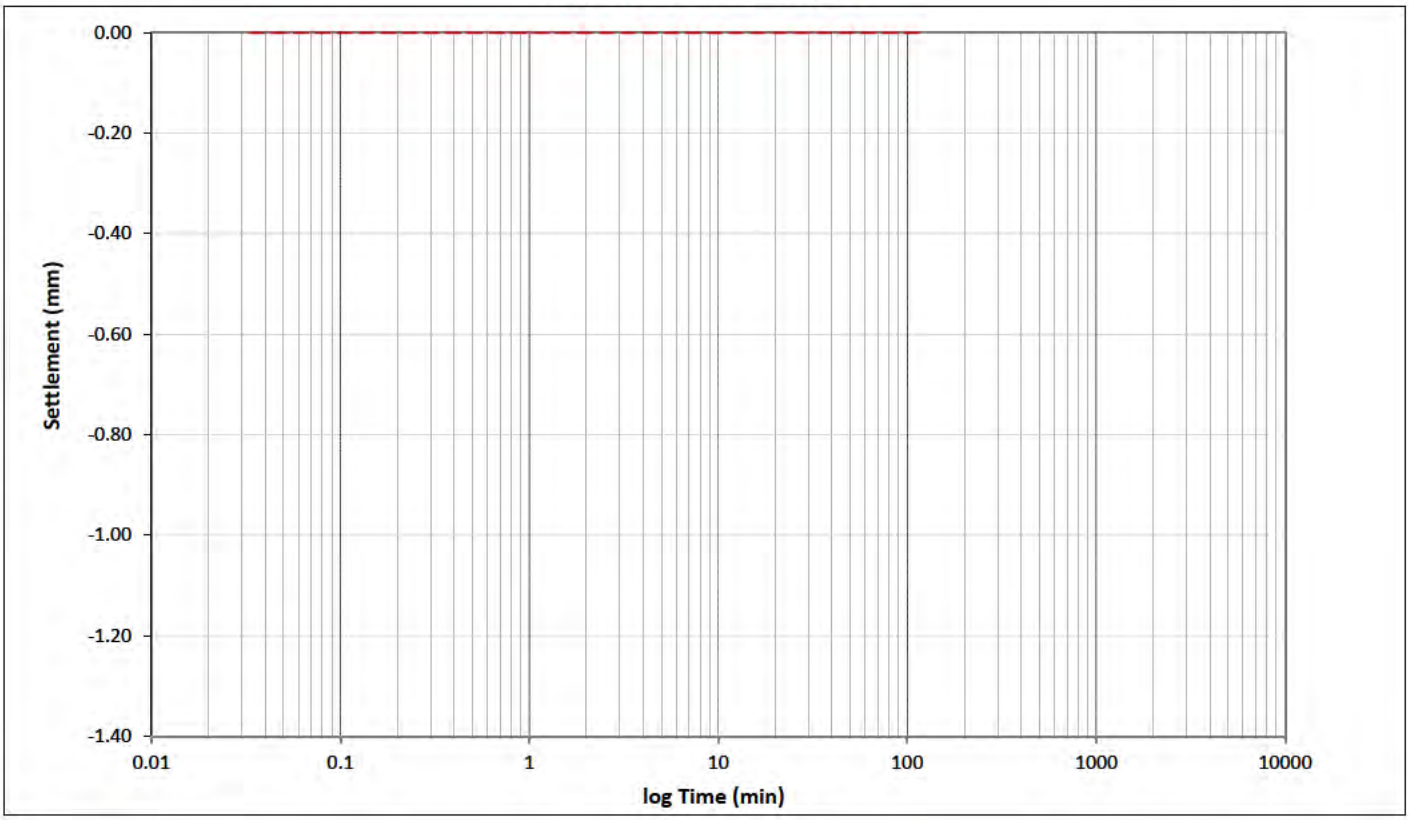
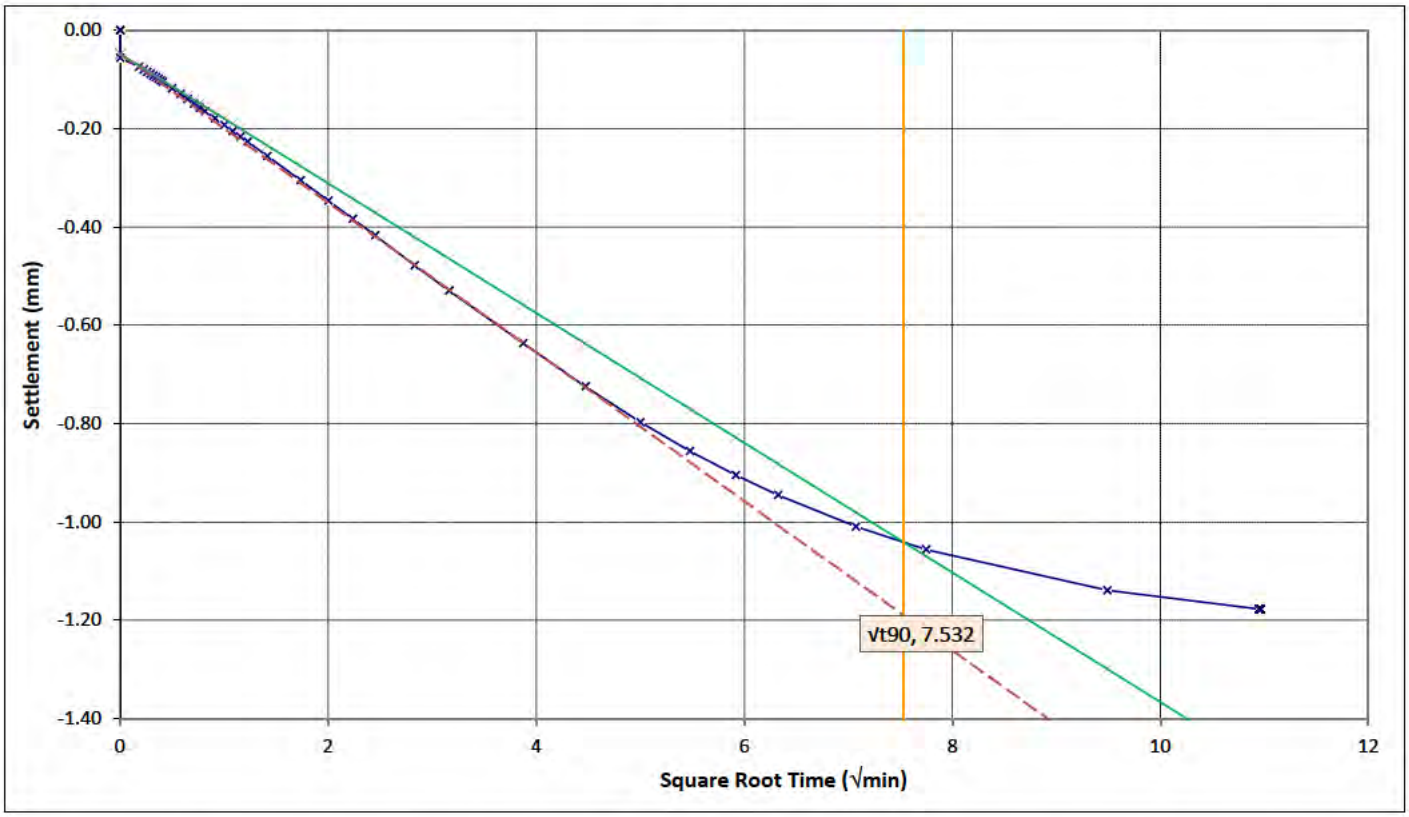
Test Schedule Reference: --

Site/Location: UoA Student Centre & Library Location ID: BH03
Sample Ref.: -- Geotechnics ID: -- Depth: 6.40 - 6.42 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST

Applied Pressure = 800 (kPa)





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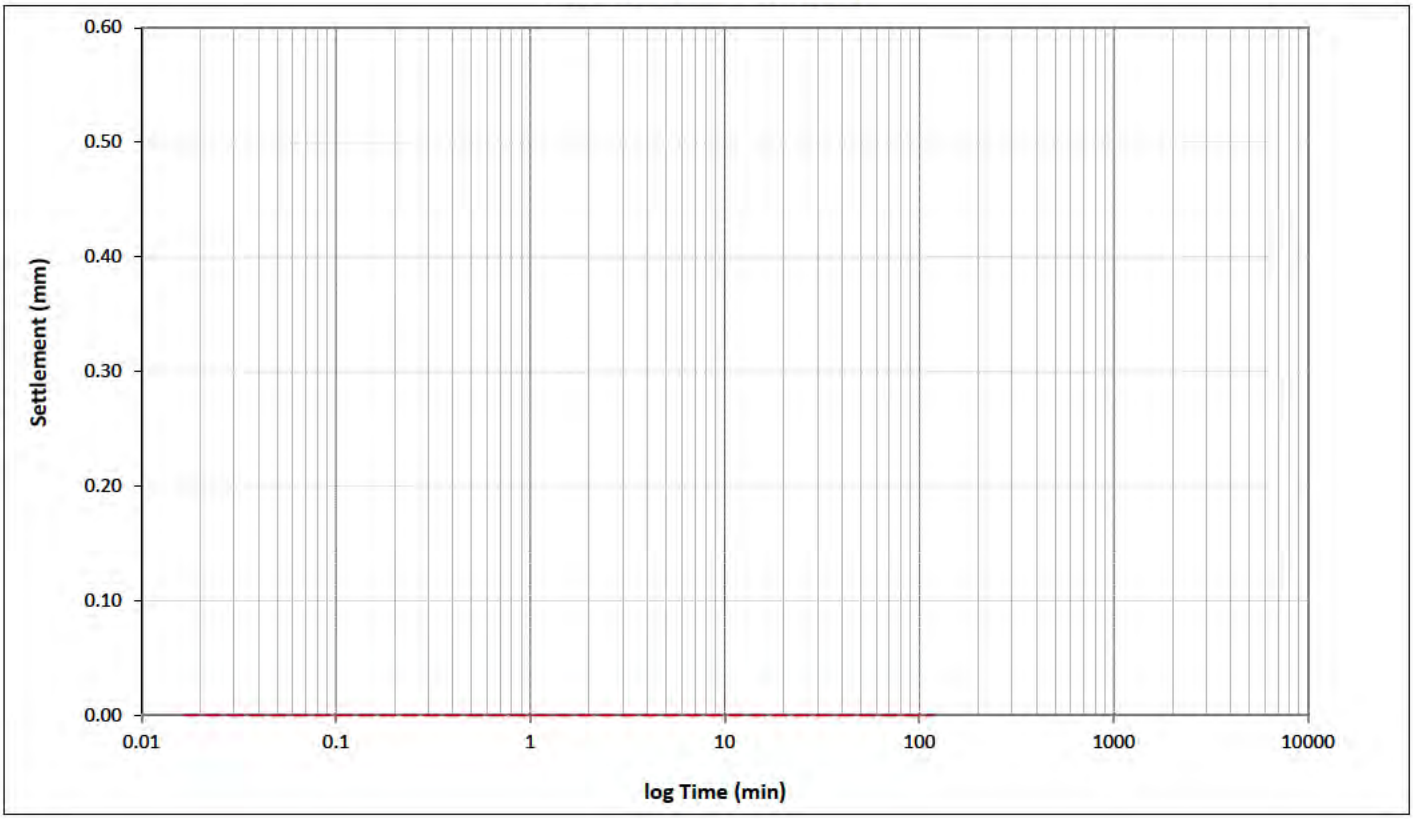
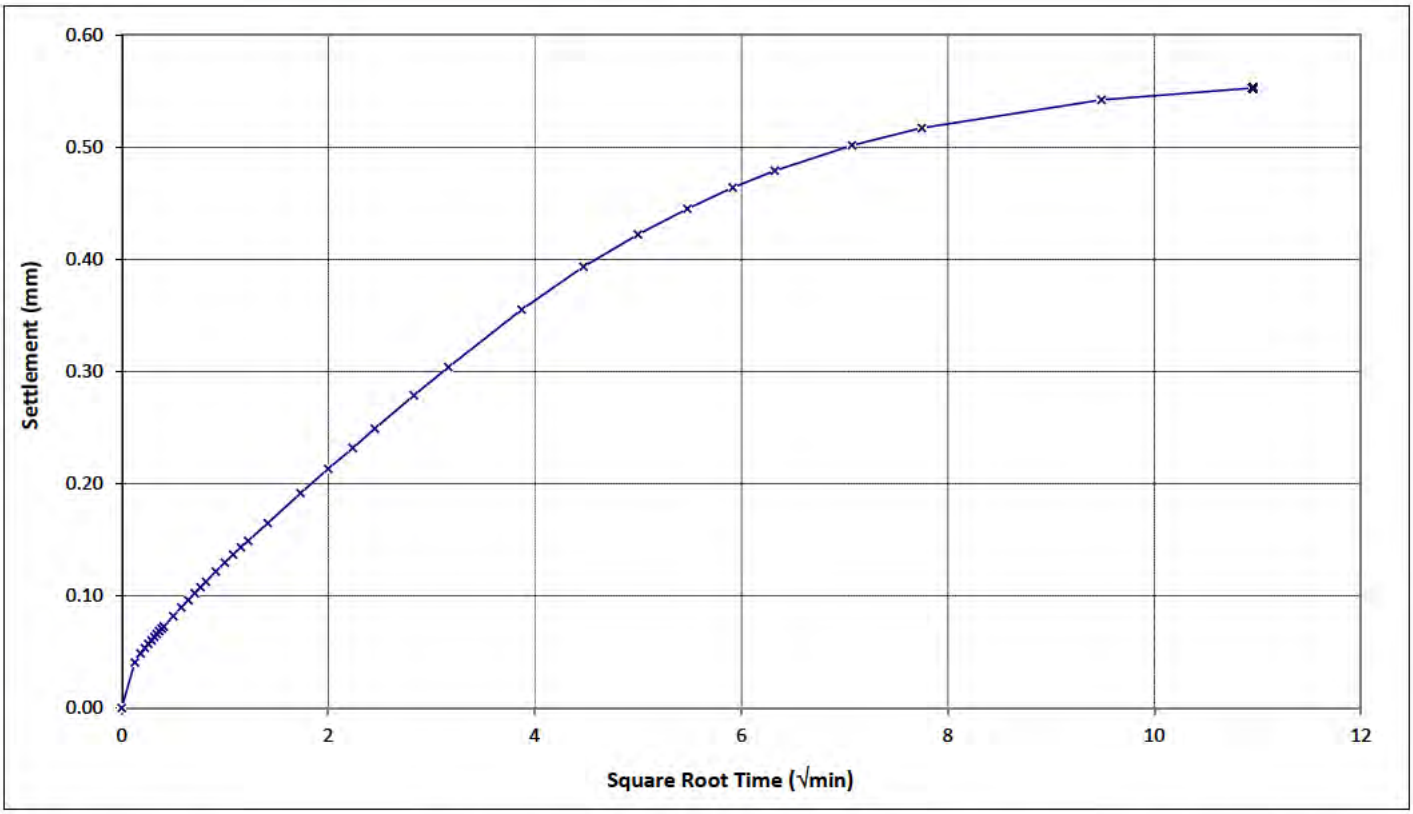
Geotechnics Project ID: 1103850.0000.01.0
Customer Project ID: 1103046
Test Schedule Reference: --

Site/Location: UoA Student Centre & Library Location ID: BH03
Sample Ref.: -- Geotechnics ID: -- Depth: 6.40 - 6.42 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST

Applied Pressure = 200 (kPa)





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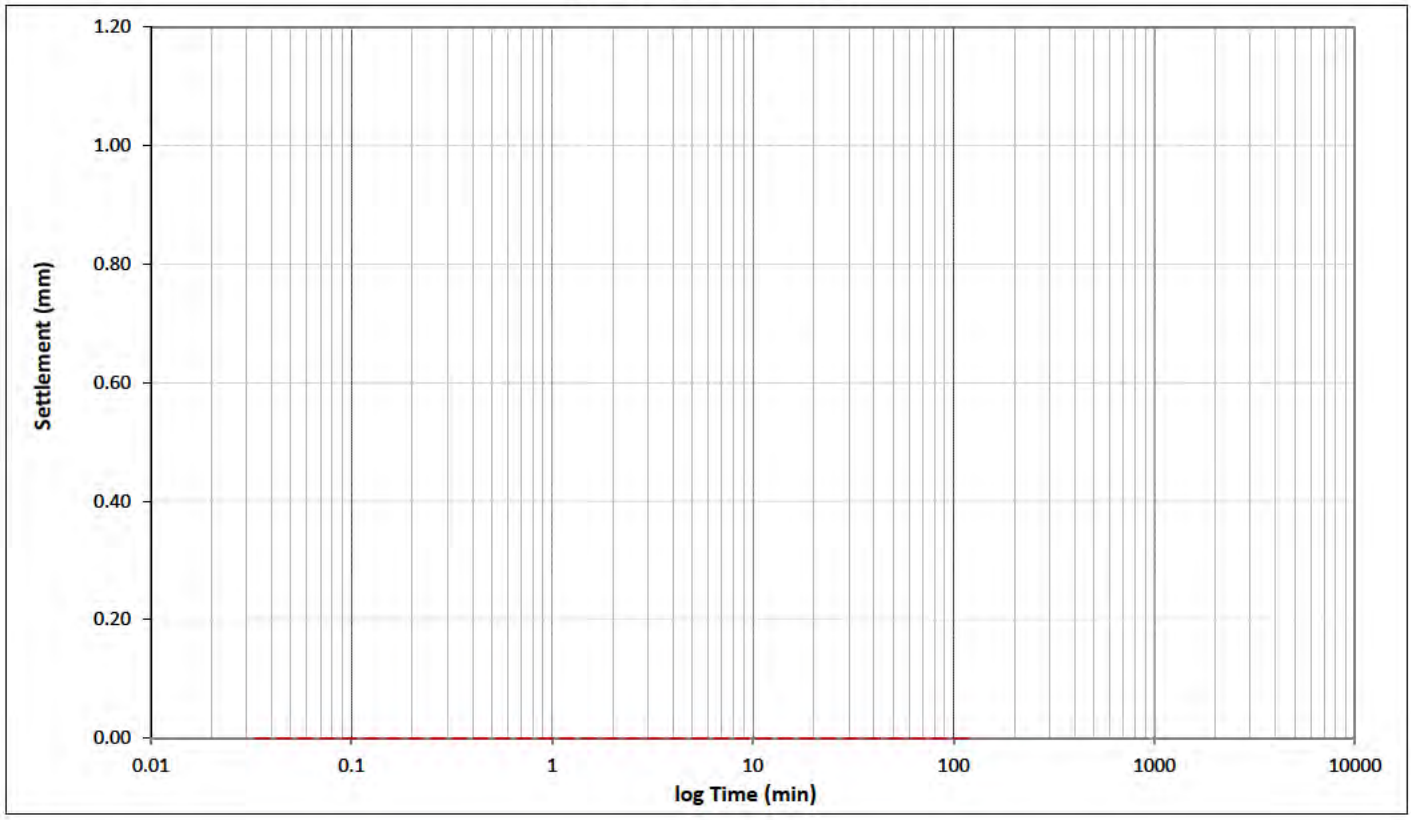
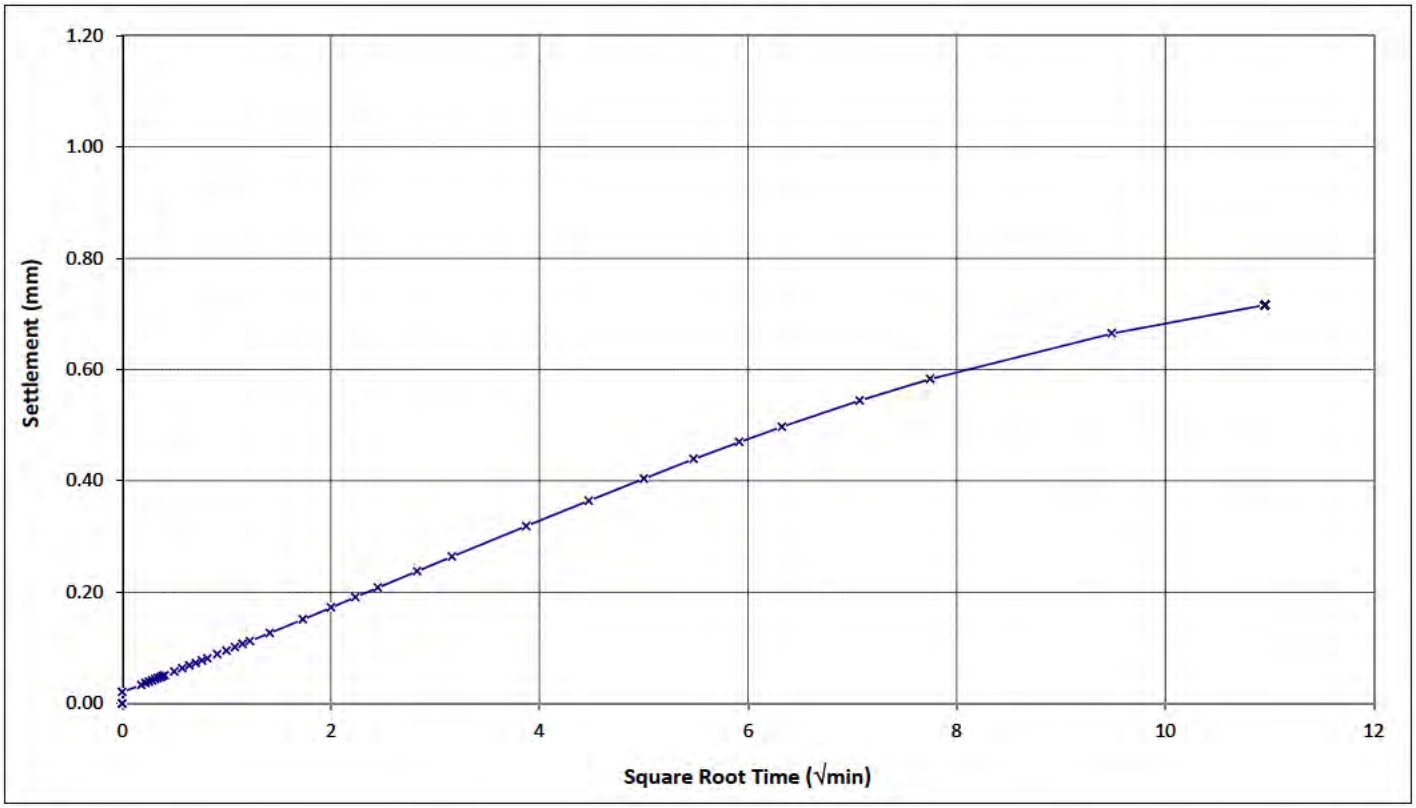
Geotechnics Project ID: 1103850.0000.01.0
Customer Project ID: 1103046
Test Schedule Reference: --

Site/Location: UoA Student Centre & Library Location ID: BH03
Sample Ref.: -- Geotechnics ID: -- Depth: 6.40 - 6.42 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST

Applied Pressure = 50 (kPa)





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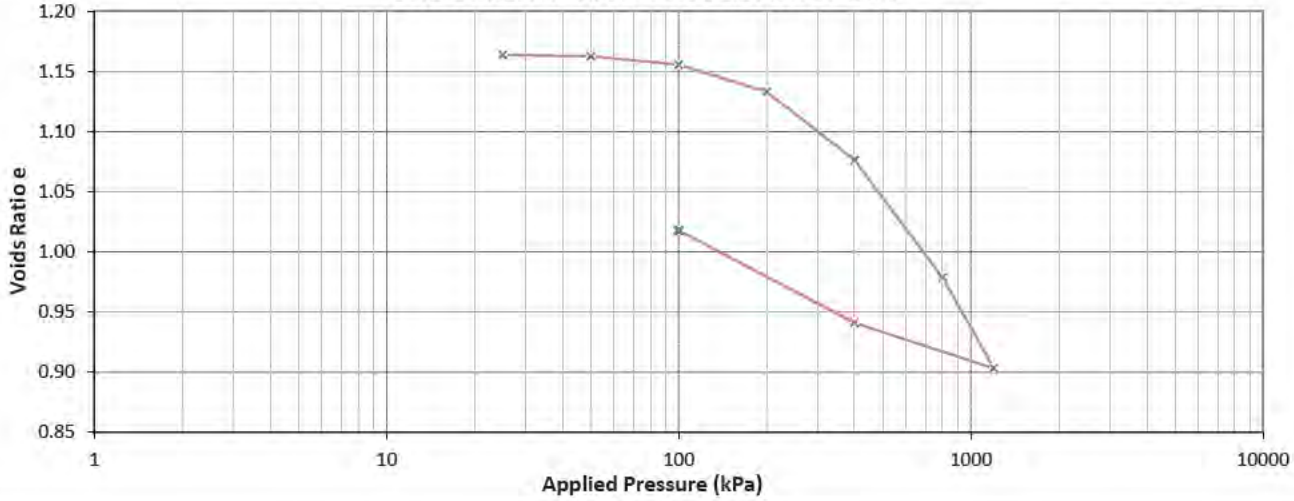
Geotechnics Project ID: 1103850.0000.01.0
Customer Project ID: 1103046
Testing Schedule Reference: --

Site/Location: UoA Student Centre & Library Location ID: BH04
Sample Ref.: -- Geotechnics ID: -- Depth: 3.57 -5.39 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST



Sample Parameters

Initial Sample Height:	19.97	mm	Initial Water Content:	43.6	%
Initial Sample Diameter:	50.00	mm	Initial Saturation Degree:	100	%
Initial Bulk Density:	1.77	t/m³	Solid Density (assumed):	2.68	t/m³
Initial Dry Density:	1.23	t/m³	Temperature During Testing:	19.5 to 21.0	°C

One-Dimensional Consolidation Results

Test Status	Applied Pressure (kPa)	Void Ratio e	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m^2/yr)		Coefficient of Volume Compressibility Mv (m^2/MN)
				Logarithm Time	Square-root Time	
As received	0	1.170				
Loading & Unloading	25	1.164	0 to 25	NA	NA	0.12
	50	1.163	25 to 50	NA	NA	0.022
	100	1.156	50 to 100	NA	131	0.063
	200	1.133	100 to 200	NA	3.2	0.11
	400	1.076	200 to 400	NA	1.7	0.13
	800	0.979	400 to 800	NA	1.2	0.12
	1200	0.903	800 to 1200	NA	0.87	0.096
	400	0.941	1200 to 400	NA	NA	NA
	100	1.018	400 to 100	NA	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: Silty CLAY with traces of sand and rootlets; light grey, mottled brown and dark grey. Stiff, moist.

Test Remarks: Test results have been corrected for equipment deformation. The coefficient of consolidation Cv for each load stage has been derived by using a square-root time method. The calculations of void ratio are affected by the solid density value, which was assumed to be 2.68 t/m³ for the test. The Void Ratio e and the Coefficient of Volume Compressibility Mv derived for the first load stage may not be representative as the initial contact between the specimen and testing device may not be perfect, though a 3 kPa seating pressure was applied to the specimen before test commenced. The sample swelled under the normal stresses 25 and 50 kPa, it may affect the values of the Void Ratio e and the Coefficient of Volume Compressibility Mv derived from those stages.

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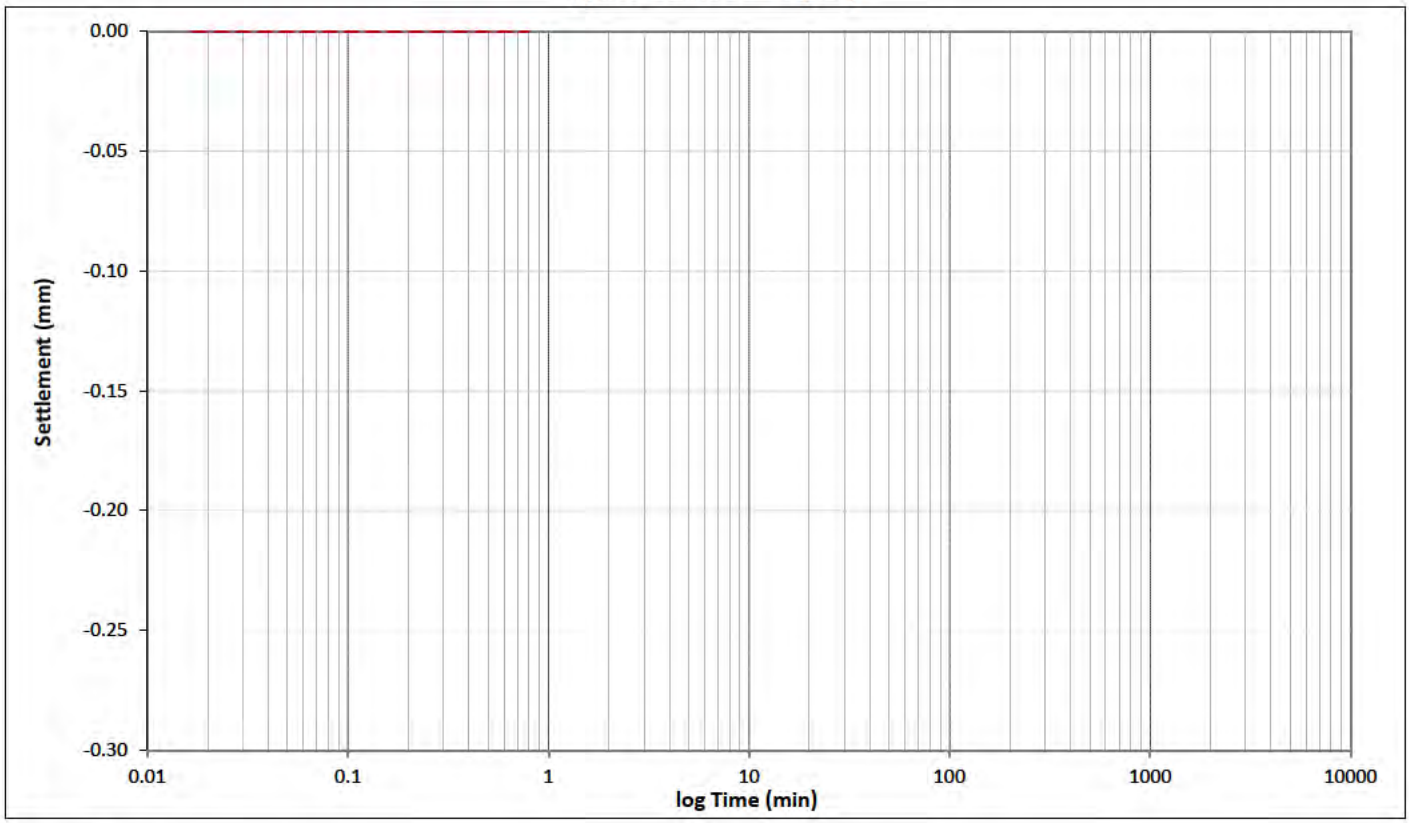
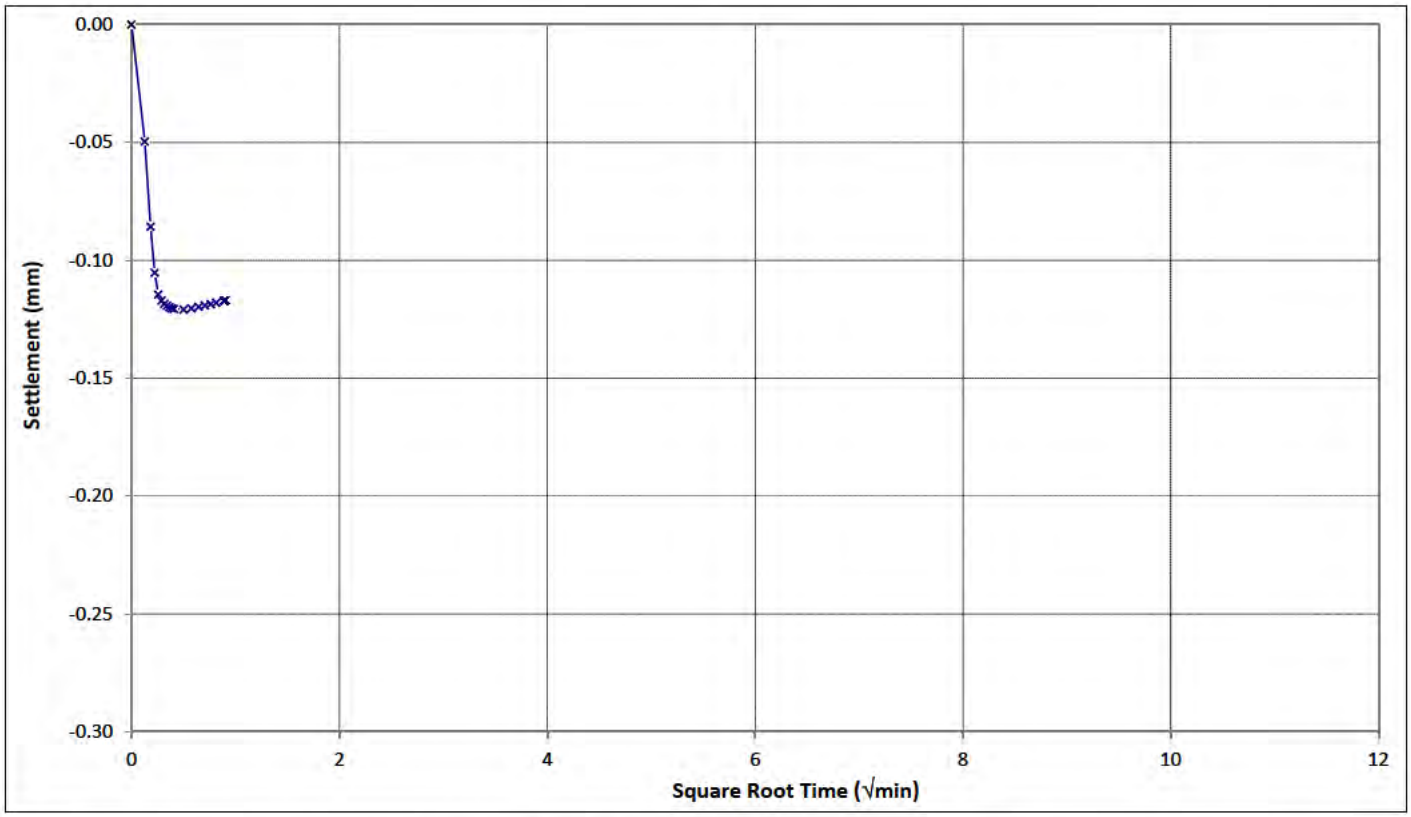
Geotechnics Project ID: 1103850.0000.01.0
Customer Project ID: 1103046
Test Schedule Reference: --

Site/Location: UoA Student Centre & Library Location ID: BH04
Sample Ref.: -- Geotechnics ID: -- Depth: 3.57 -5.39 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST

Applied Pressure = 25 (kPa)





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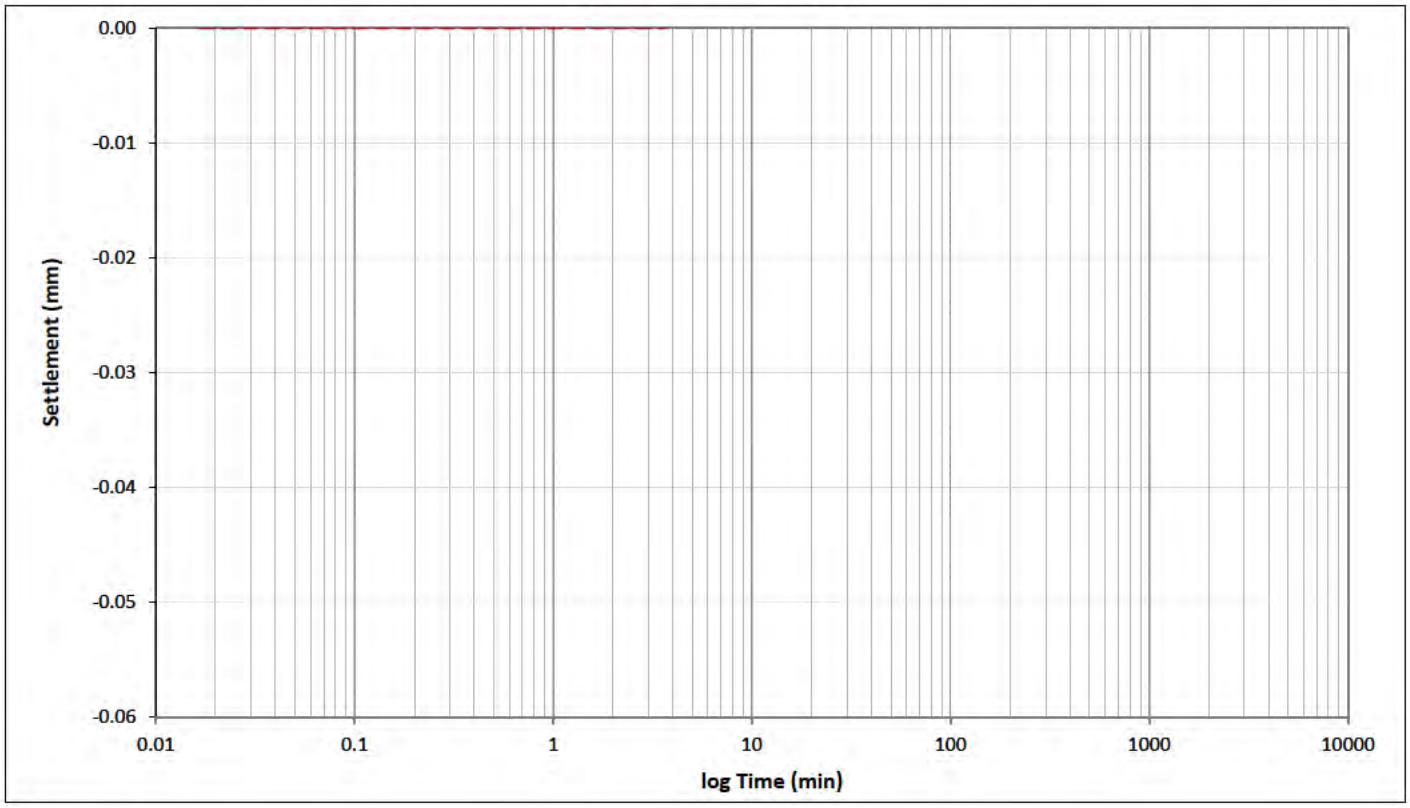
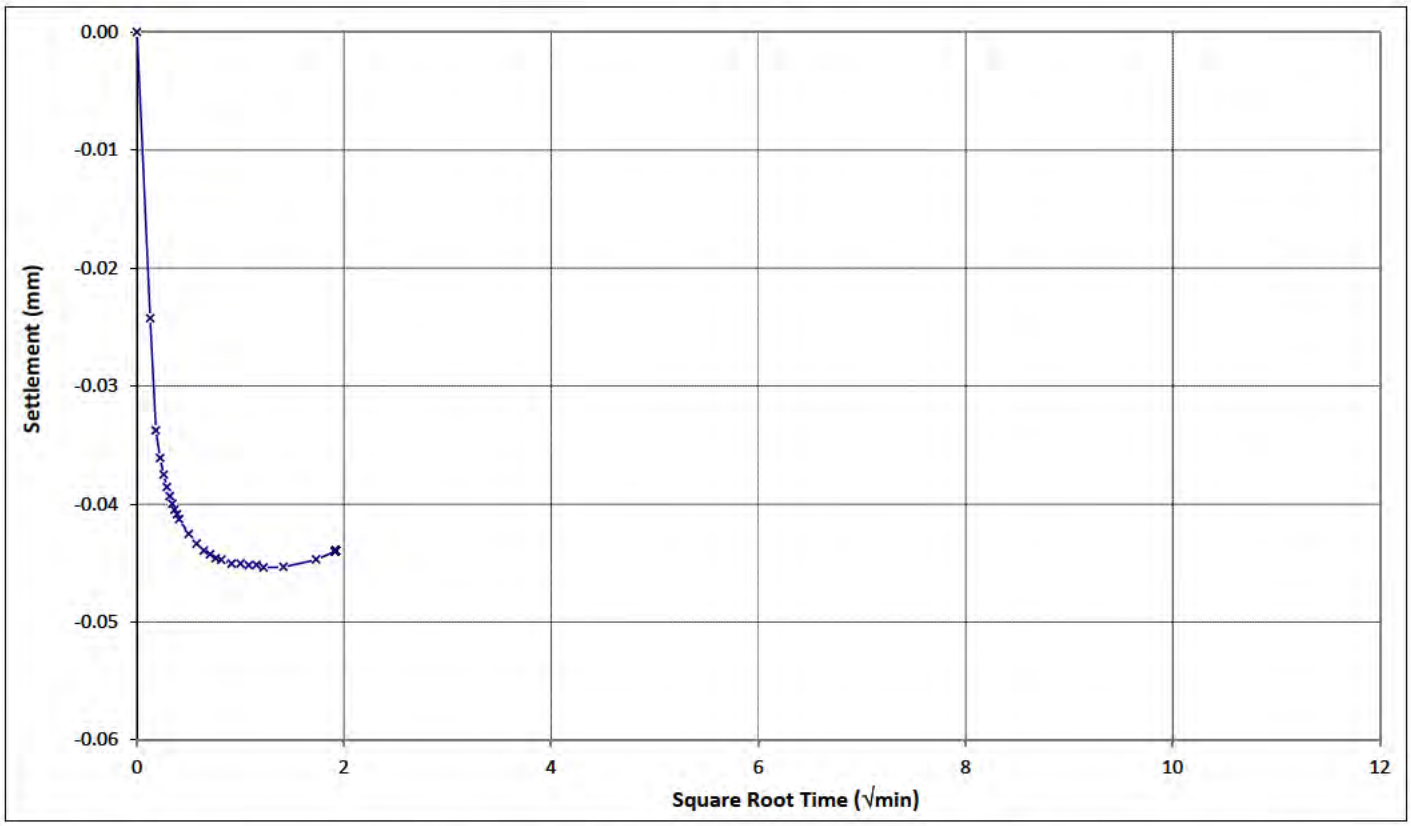
Site/Location: UoA Student Centre & Library Location ID: BH04
Sample Ref.: -- Geotechnics ID: -- Depth: 3.57 -5.39 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST

Applied Pressure = 50 (kPa)





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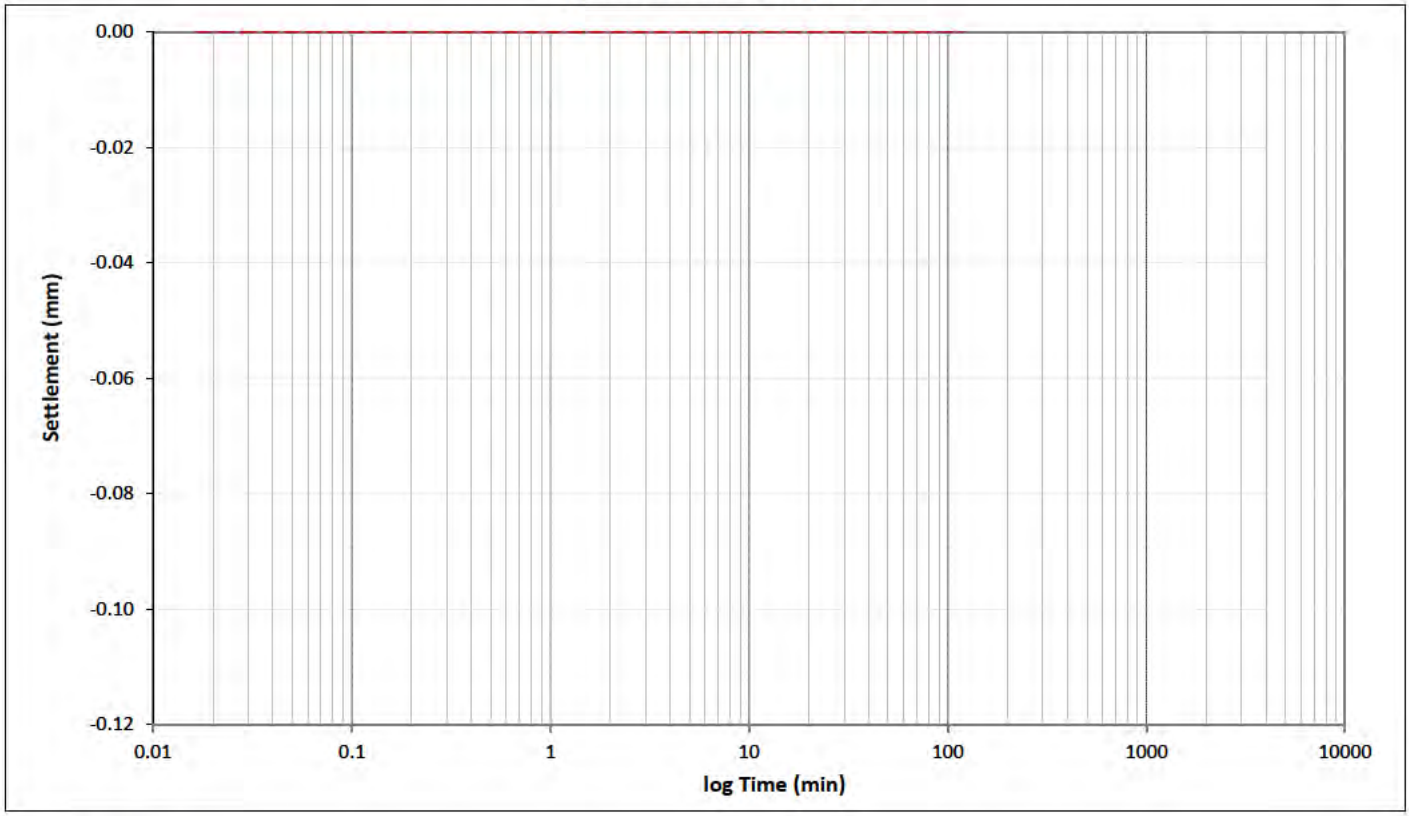
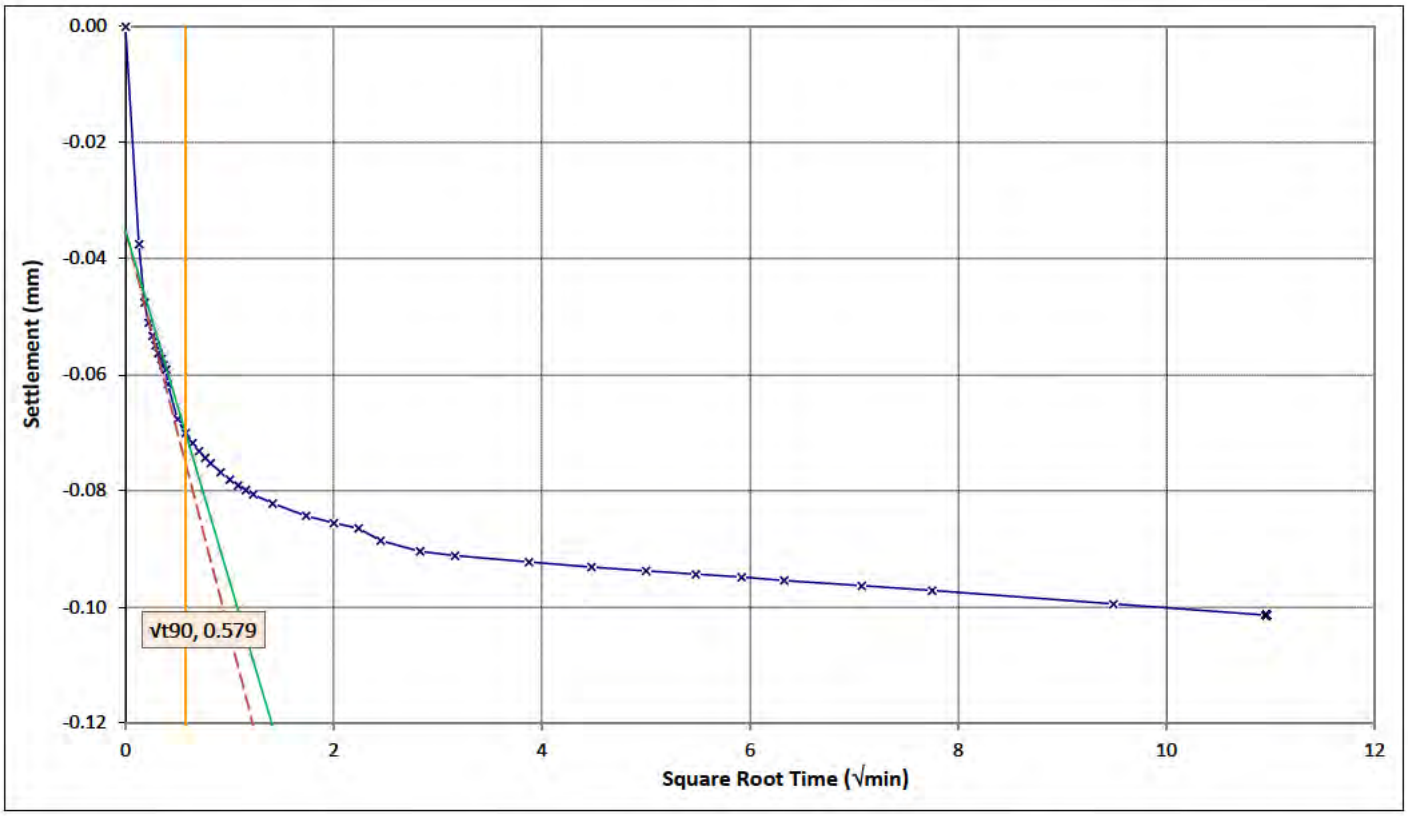
Test Schedule Reference: --

Site/Location: UoA Student Centre & Library Location ID: BH04
Sample Ref.: -- Geotechnics ID: -- Depth: 3.57 -5.39 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST

Applied Pressure = 100 (kPa)





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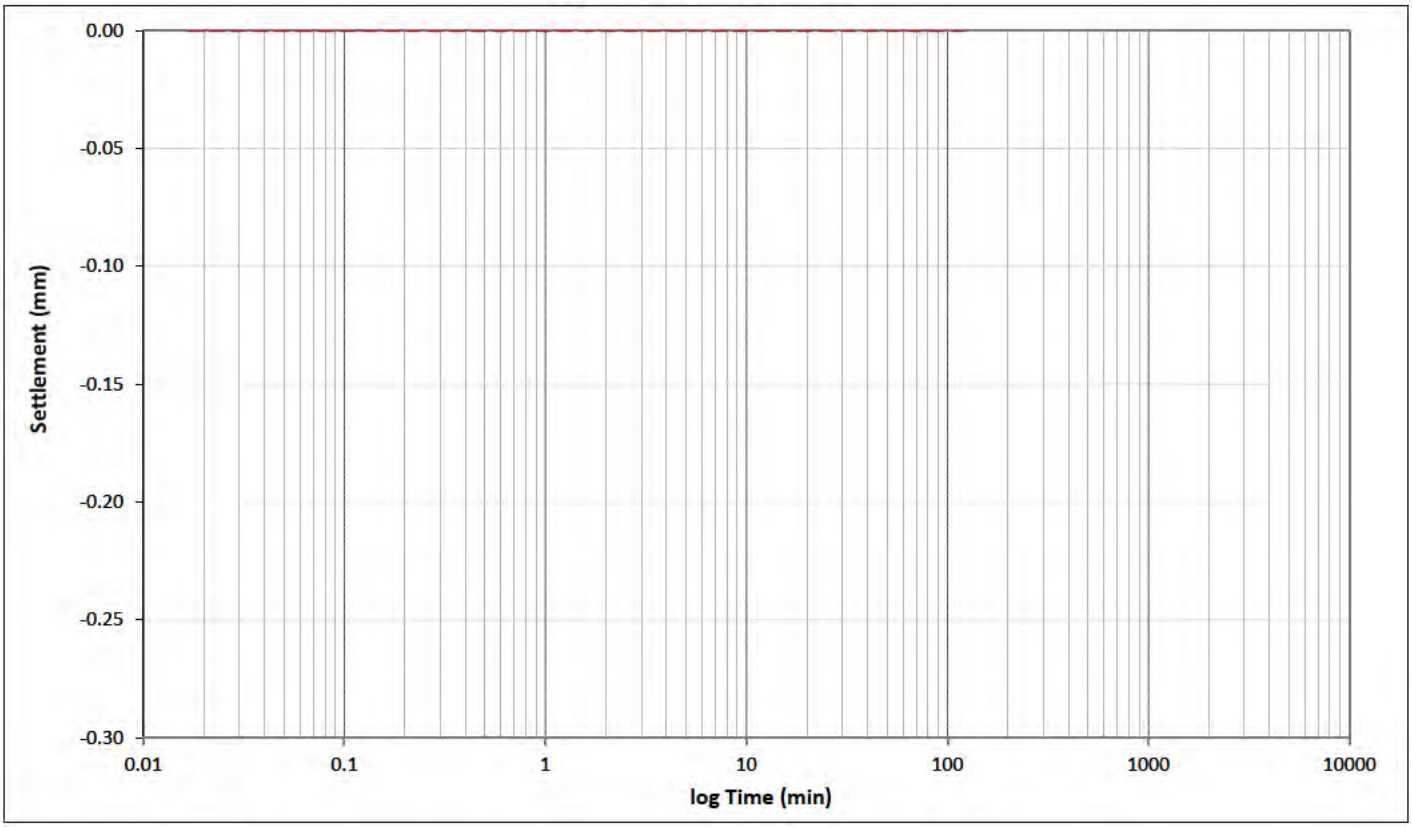
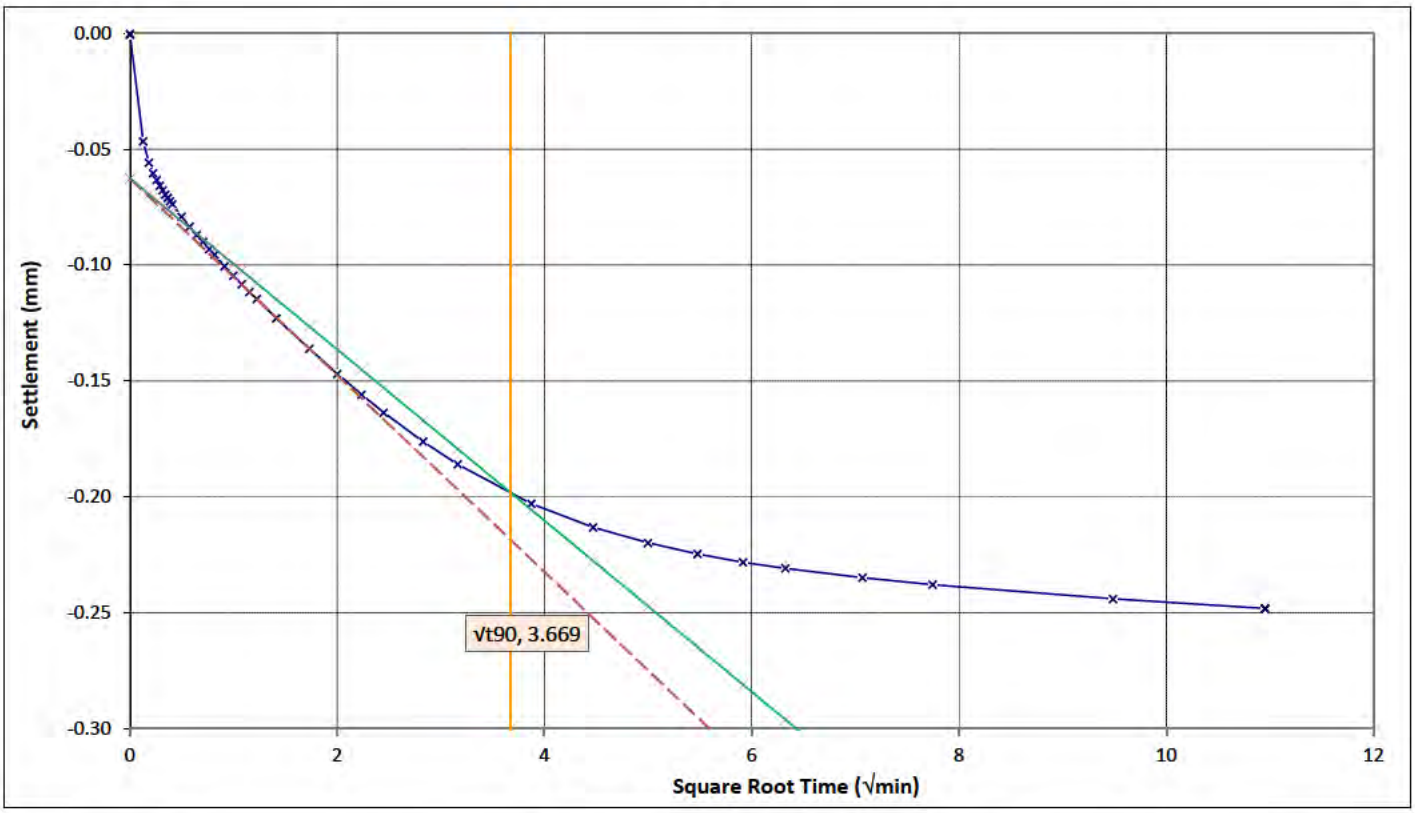
Test Schedule Reference: --

Site/Location: UoA Student Centre & Library Location ID: BH04
Sample Ref.: -- Geotechnics ID: -- Depth: 3.57 -5.39 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST

Applied Pressure = 200 (kPa)





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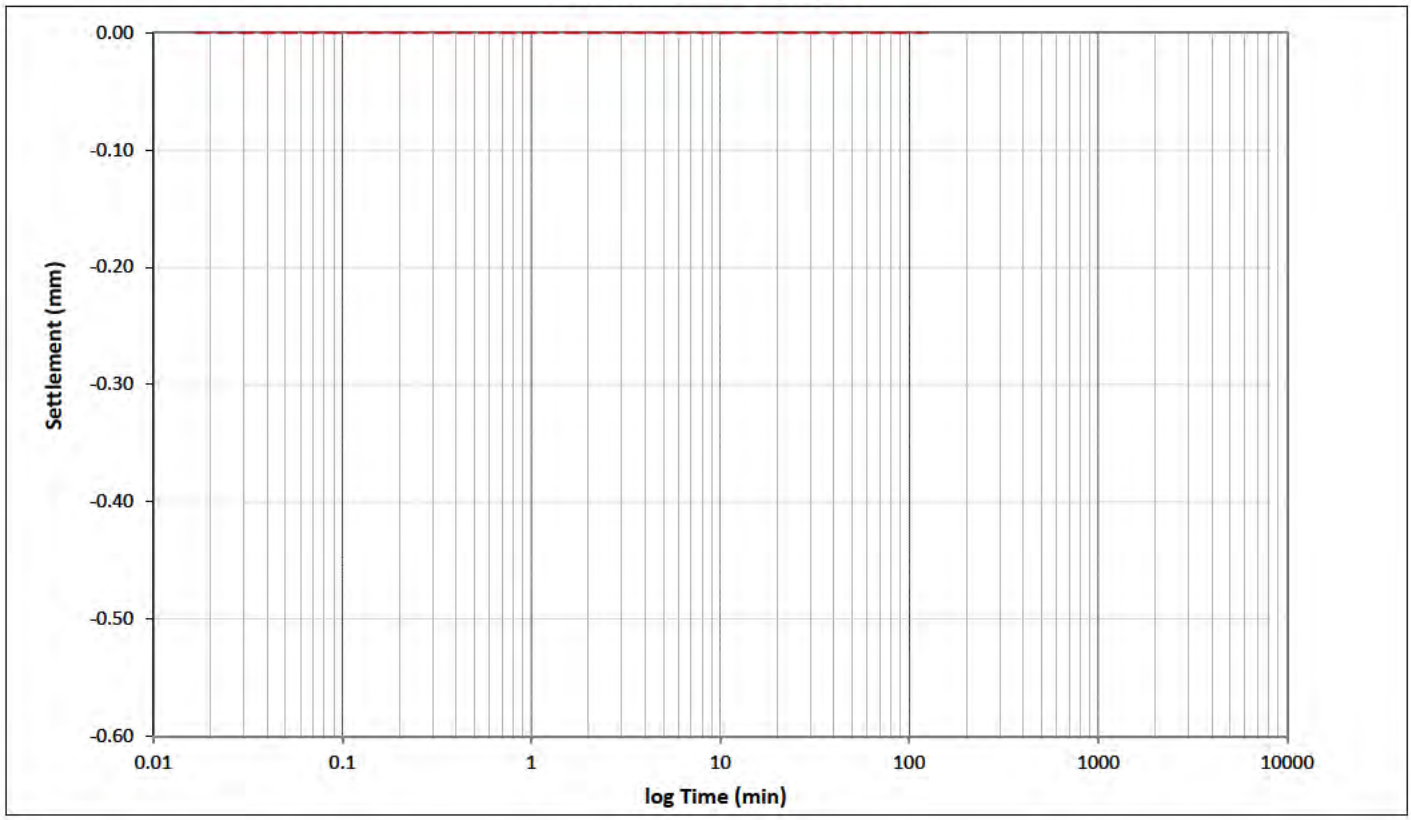
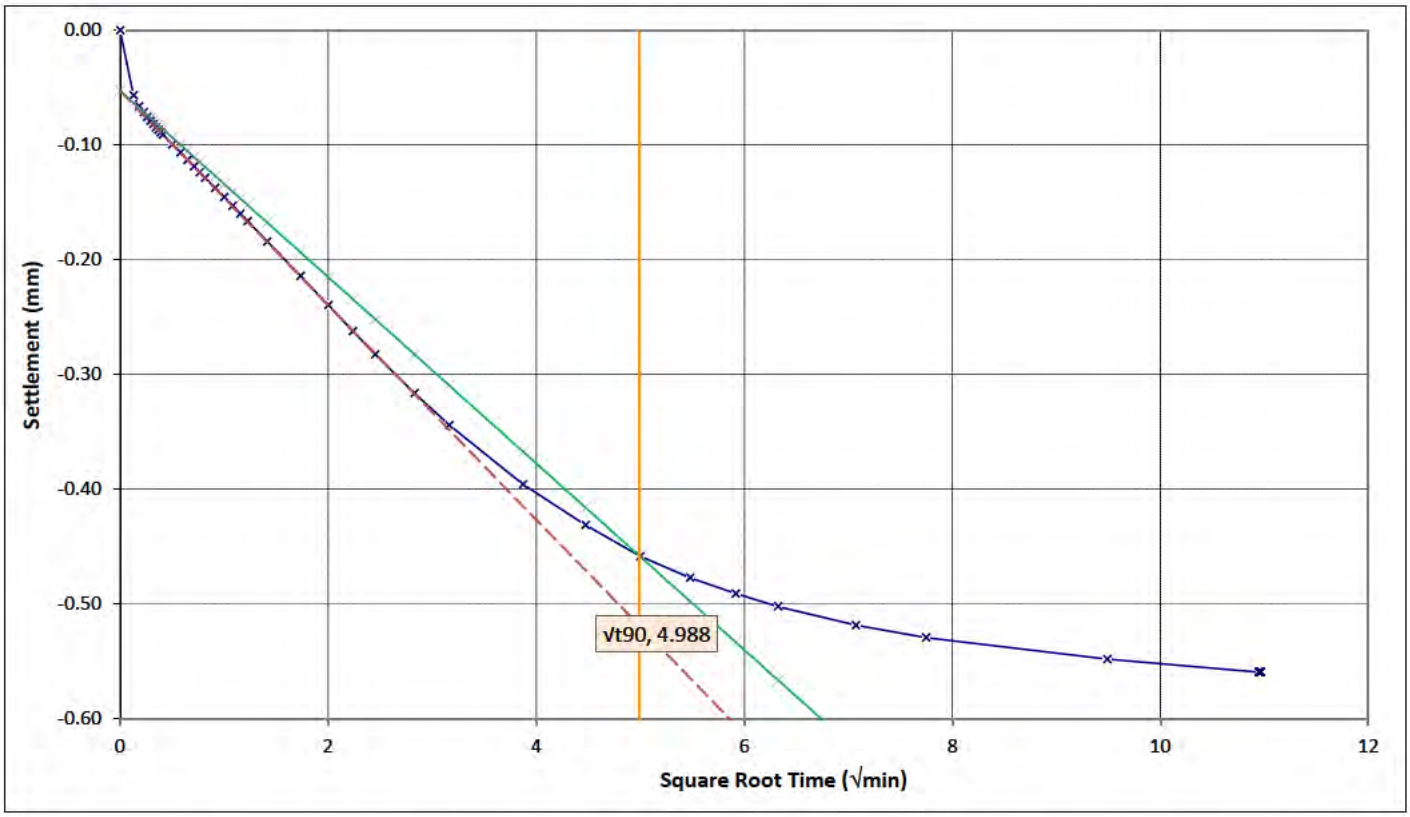
Customer Project ID: 1103046
Test Schedule Reference: --

Site/Location: UoA Student Centre & Library Location ID: BH04
Sample Ref.: -- Geotechnics ID: -- Depth: 3.57 -5.39 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST

Applied Pressure = 400 (kPa)





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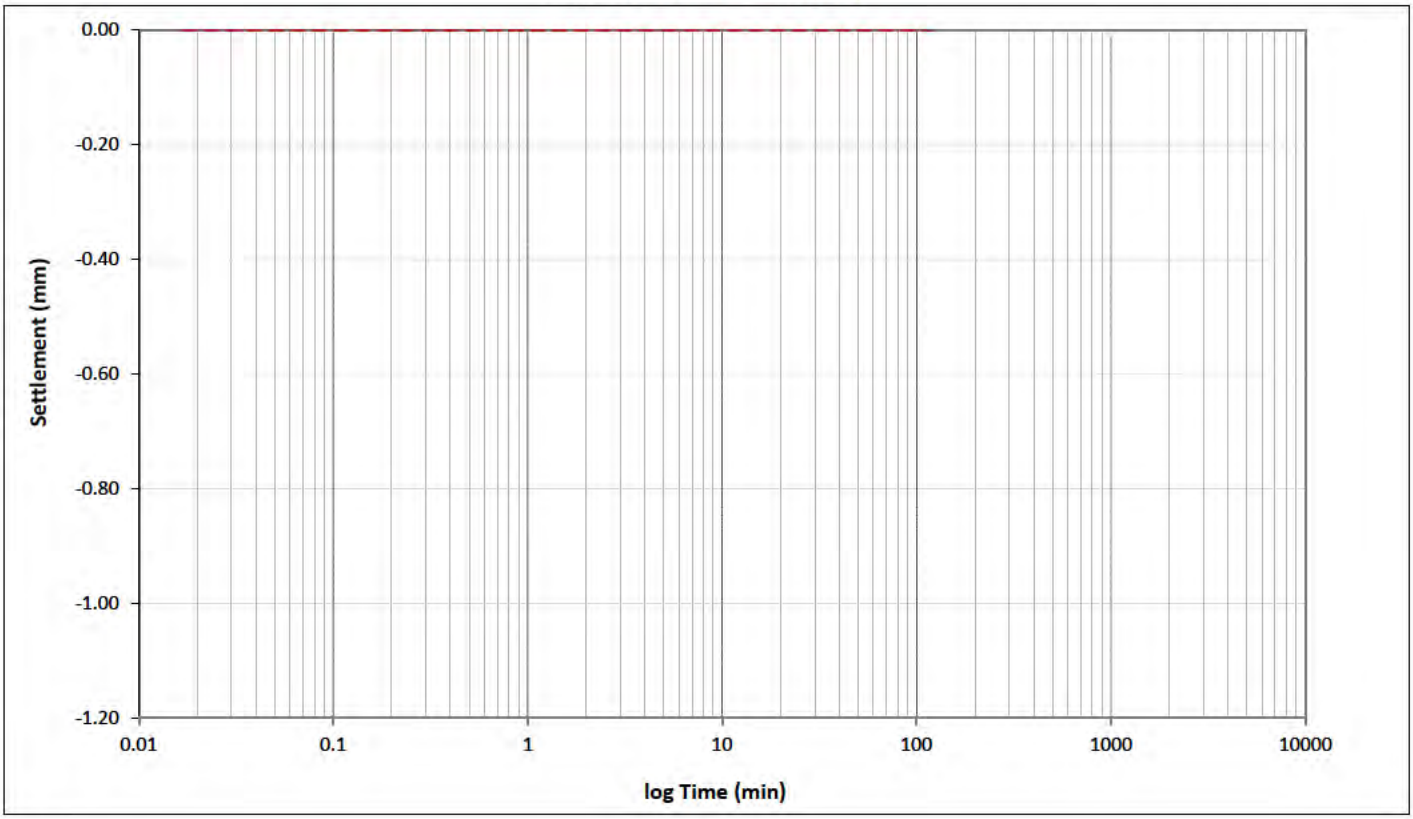
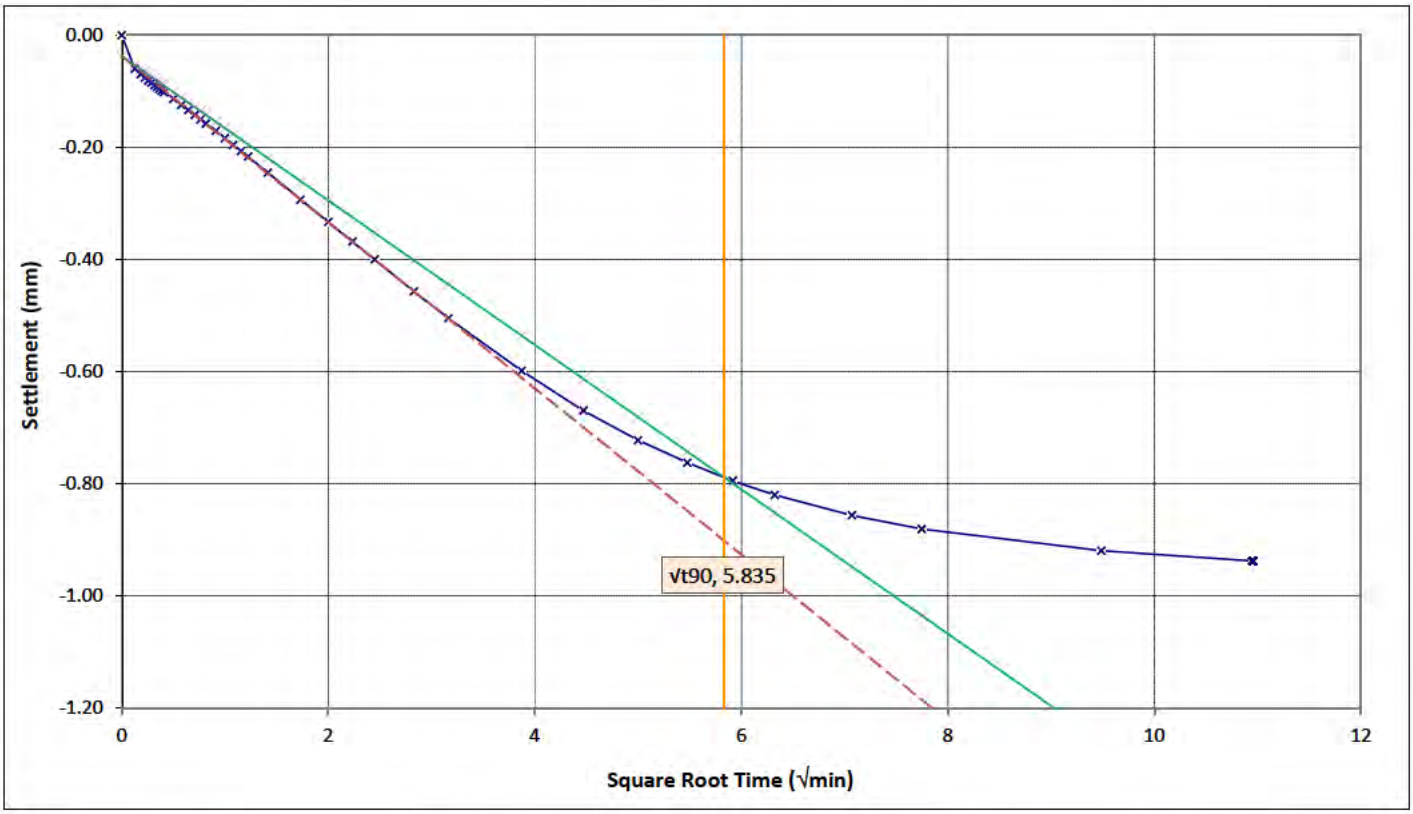
Test Schedule Reference: --

Site/Location: UoA Student Centre & Library Location ID: BH04
Sample Ref.: -- Geotechnics ID: -- Depth: 3.57 -5.39 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST

Applied Pressure = 800 (kPa)





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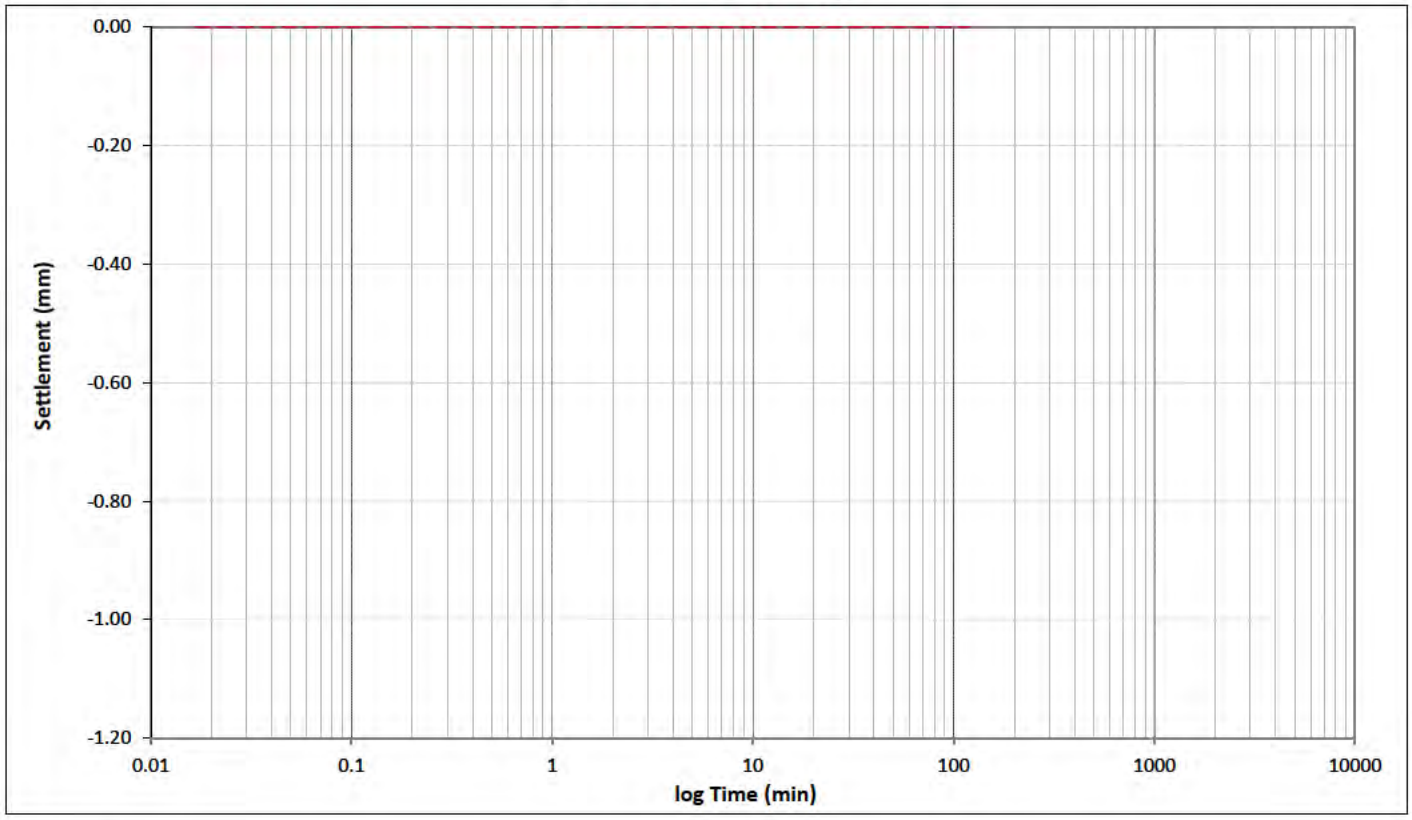
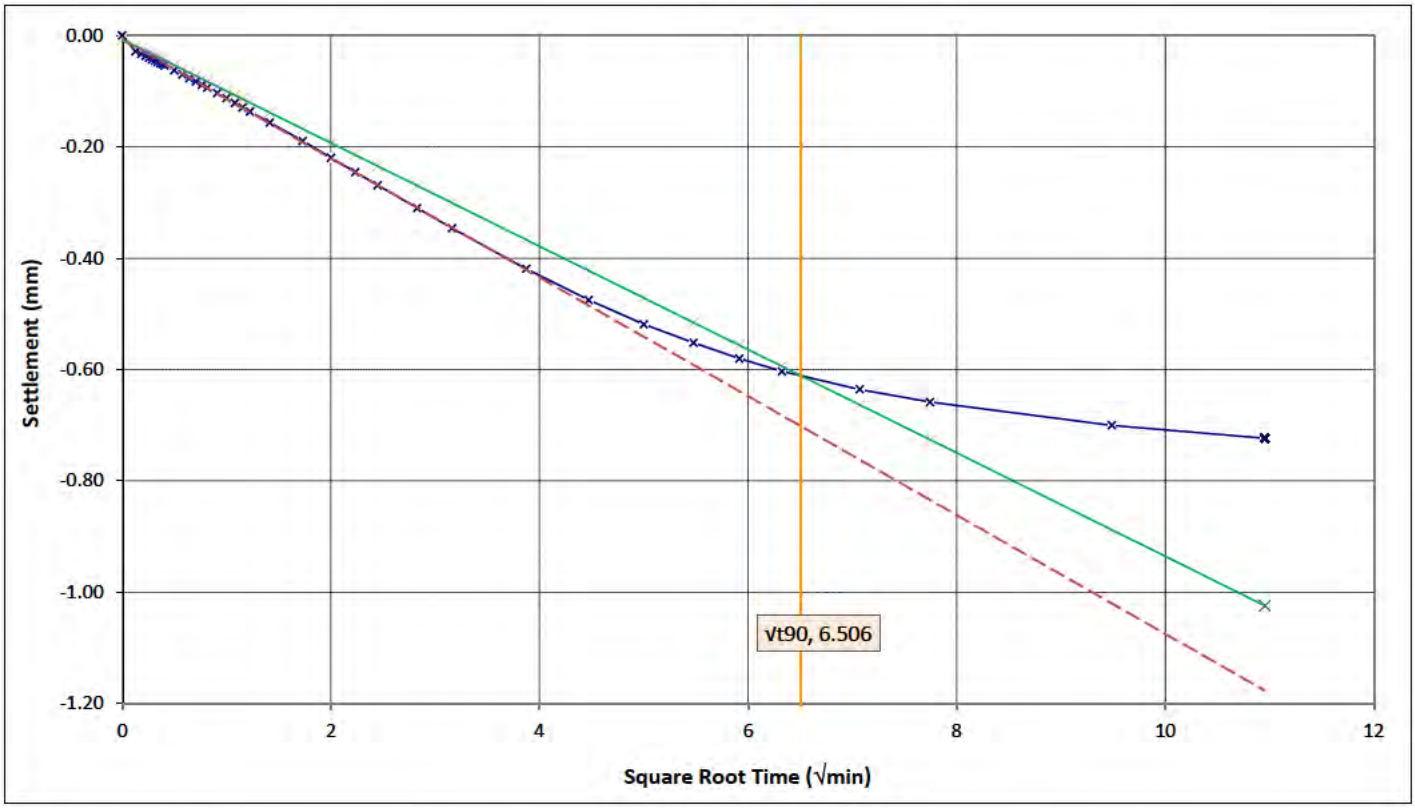
Site/Location: UoA Student Centre & Library Location ID: BH04
Sample Ref.: -- Geotechnics ID: -- Depth: 3.57 -5.39 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST

Applied Pressure = 1200 (kPa)





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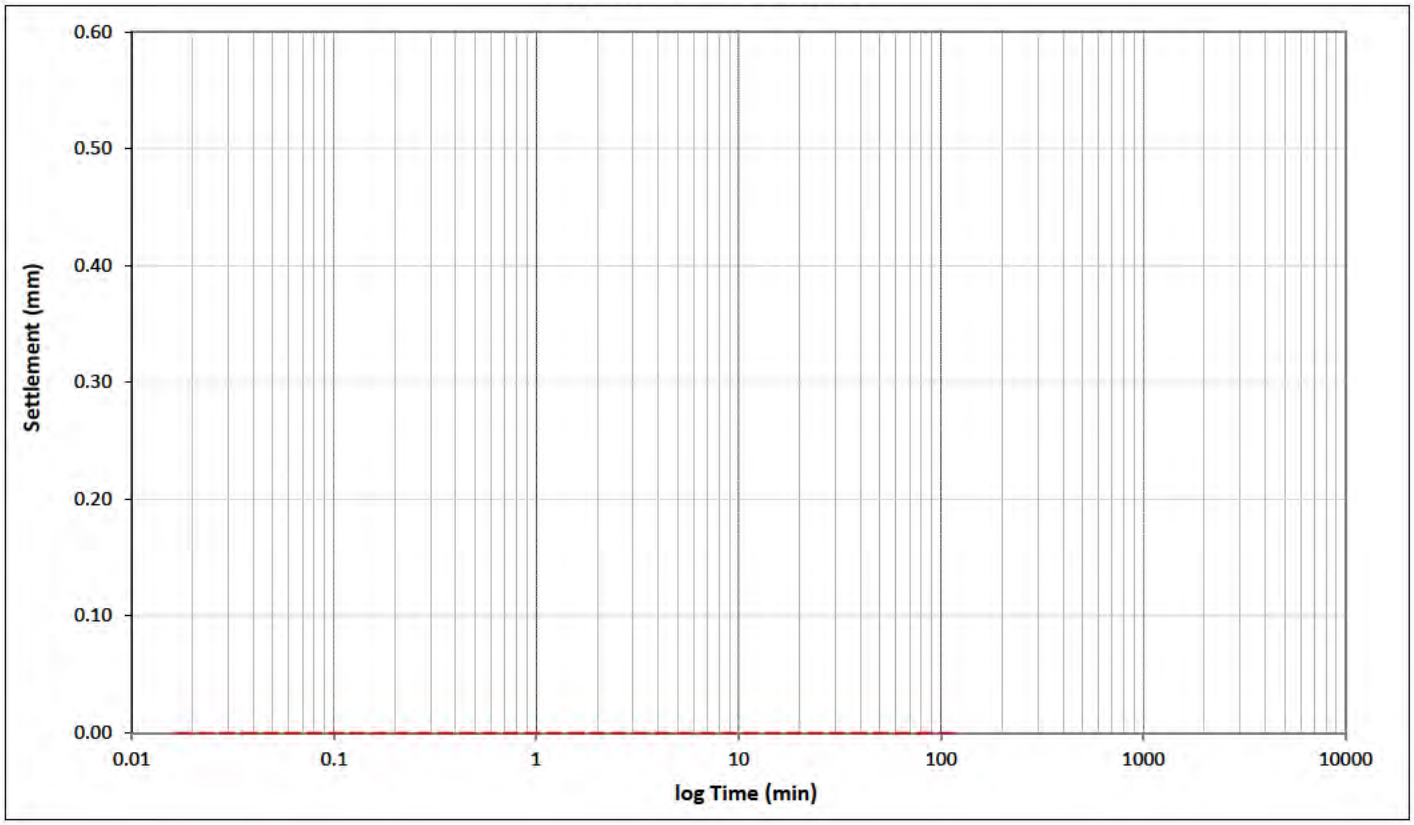
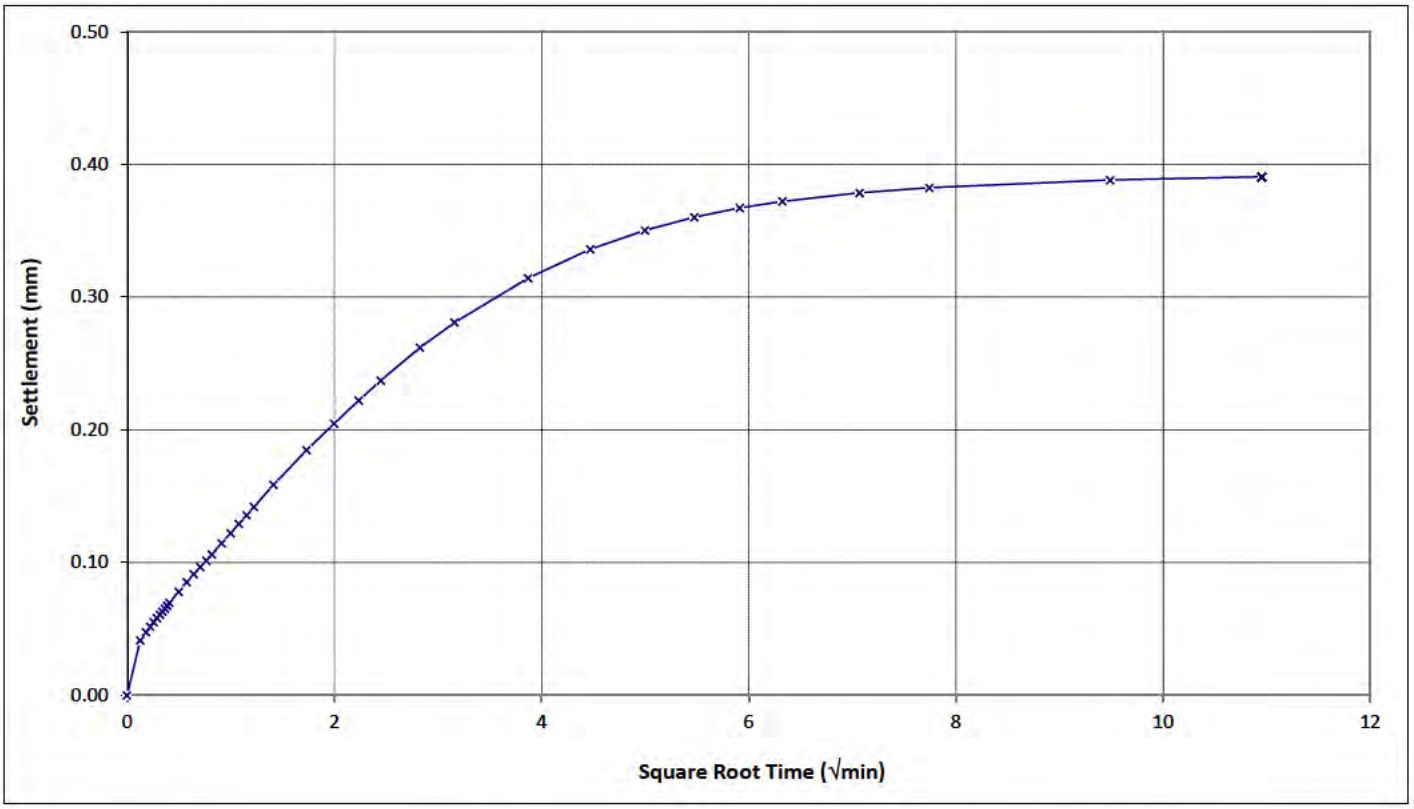
Test Schedule Reference: --

Site/Location: UoA Student Centre & Library Location ID: BH04
Sample Ref.: -- Geotechnics ID: -- Depth: 3.57 -5.39 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST

Applied Pressure = 400 (kPa)





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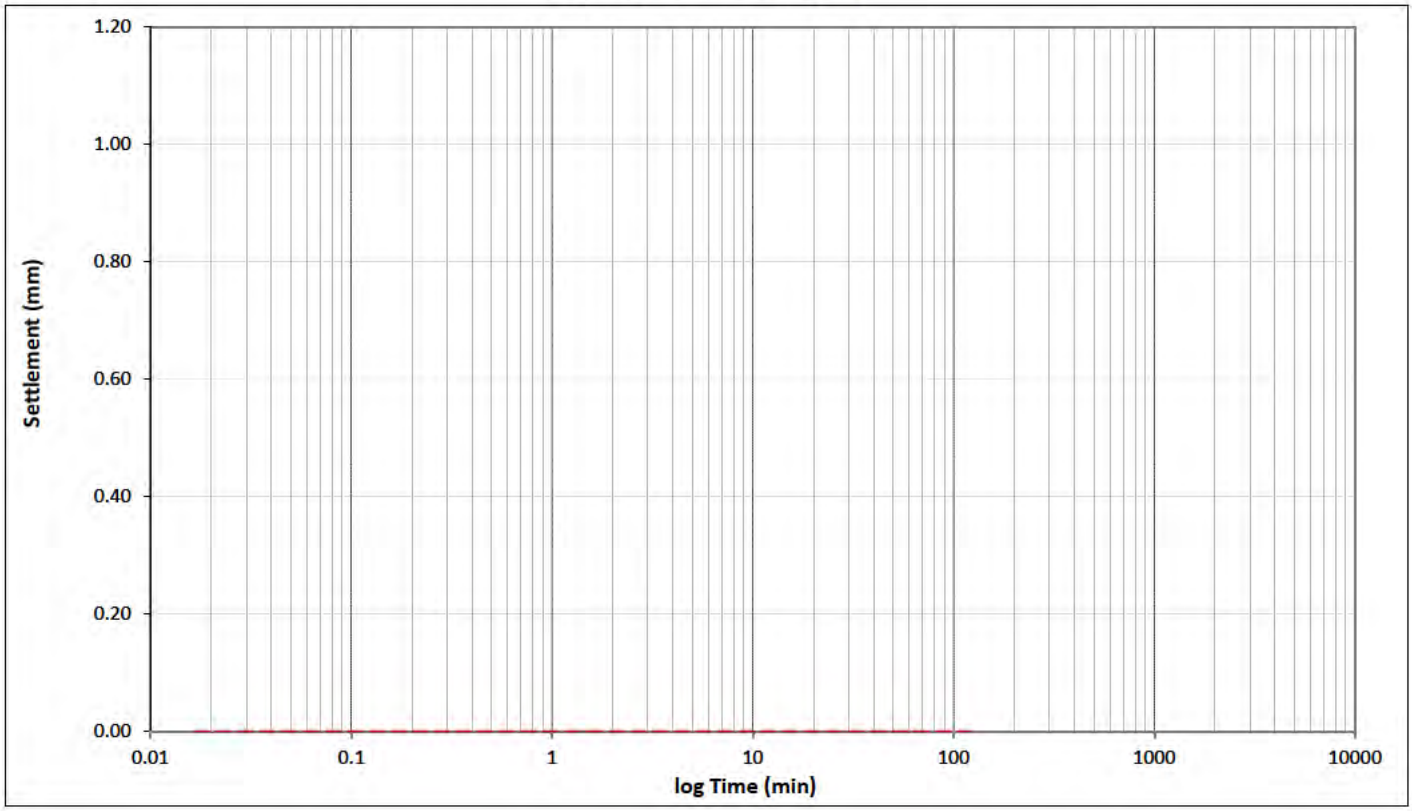
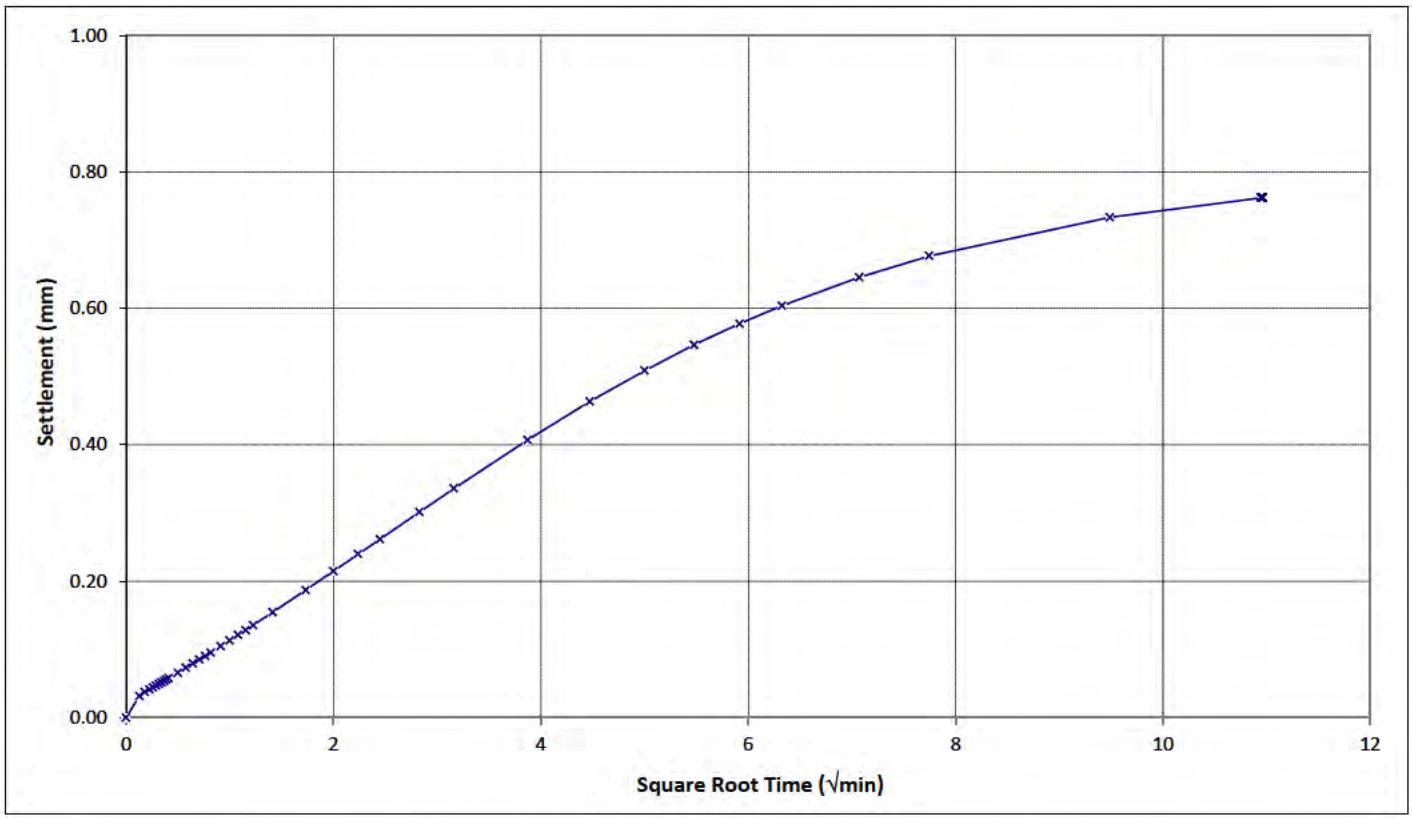
Site/Location: UoA Student Centre & Library Location ID: BH04
Sample Ref.: -- Geotechnics ID: -- Depth: 3.57 -5.39 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST

Applied Pressure = 100 (kPa)





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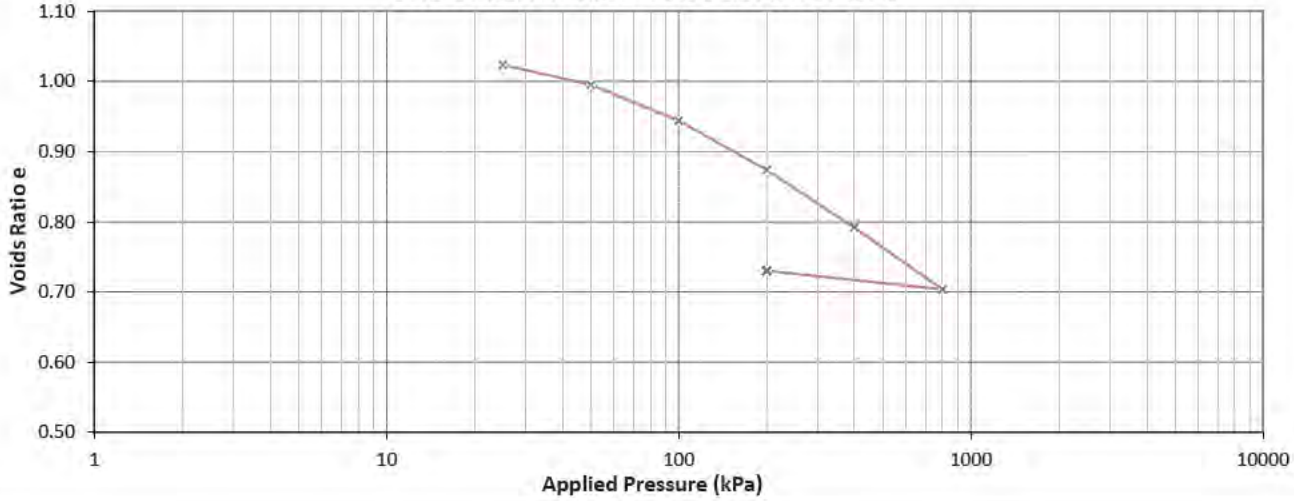
Geotechnics Project ID: 1103850.0000.01.0
Customer Project ID: 1103046
Testing Schedule Reference: --

Site/Location: UoA Student Centre & Library Location ID: BH05
Sample Ref.: -- Geotechnics ID: -- Depth: 6.40 - 6.42 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST



Sample Parameters

Initial Sample Height:	19.95	mm	Initial Water Content:	38.7	%
Initial Sample Diameter:	50.00	mm	Initial Saturation Degree:	99	%
Initial Bulk Density:	1.81	t/m³	Solid Density (assumed):	2.65	t/m³
Initial Dry Density:	1.30	t/m³	Temperature During Testing:	19.0 to 20.0	°C

One-Dimensional Consolidation Results

Test Status	Applied Pressure (kPa)	Void Ratio e	Pressure Increment (kPa)	Coefficient of Consolidation Cv (m²/yr)		Coefficient of Volume Compressibility Mv (m²/MN)
				Logarithm Time	Square-root Time	
As received	0	1.035				
Loading & Unloading	25	1.024	0 to 25	NA	41	0.21
	50	0.995	25 to 50	NA	1.8	0.56
	100	0.944	50 to 100	NA	1.5	0.51
	200	0.874	100 to 200	NA	1.3	0.36
	400	0.792	200 to 400	NA	1.5	0.22
	800	0.704	400 to 800	NA	1.6	0.12
	200	0.730	800 to 200	NA	NA	NA

Sample History: Undisturbed core trimmed at natural water content.

Soil Description: Clayey SILT; light grey, mottled yellowish brown. Firm, moist.

Test Remarks: Test results have been corrected for equipment deformation. The coefficient of consolidation Cv for each load stage has been derived by using a square-root time method. The calculations of void ratio are affected by the solid density value, which was assumed to be 2.65 t/m³ for the test. The Void Ratio e and the Coefficient of Volume Compressibility Mv derived for the first load stage may not be representative as the initial contact between the specimen and testing device may not be perfect, though a 2 kPa seating pressure was applied to the specimen before test commenced.

Tested by: PIHE Date: 10/09/2026 Approved by KTP: Date: 16/09/2026

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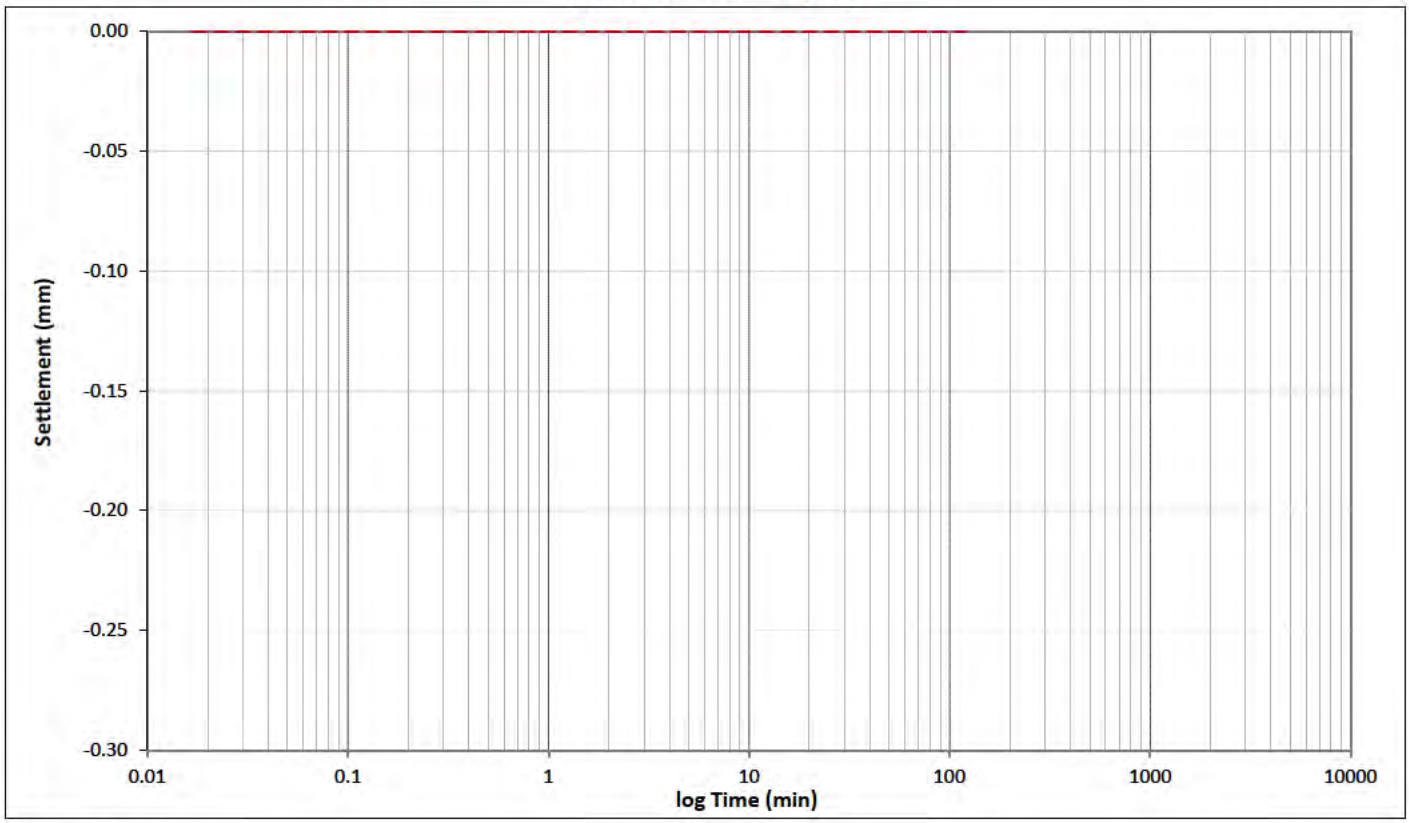
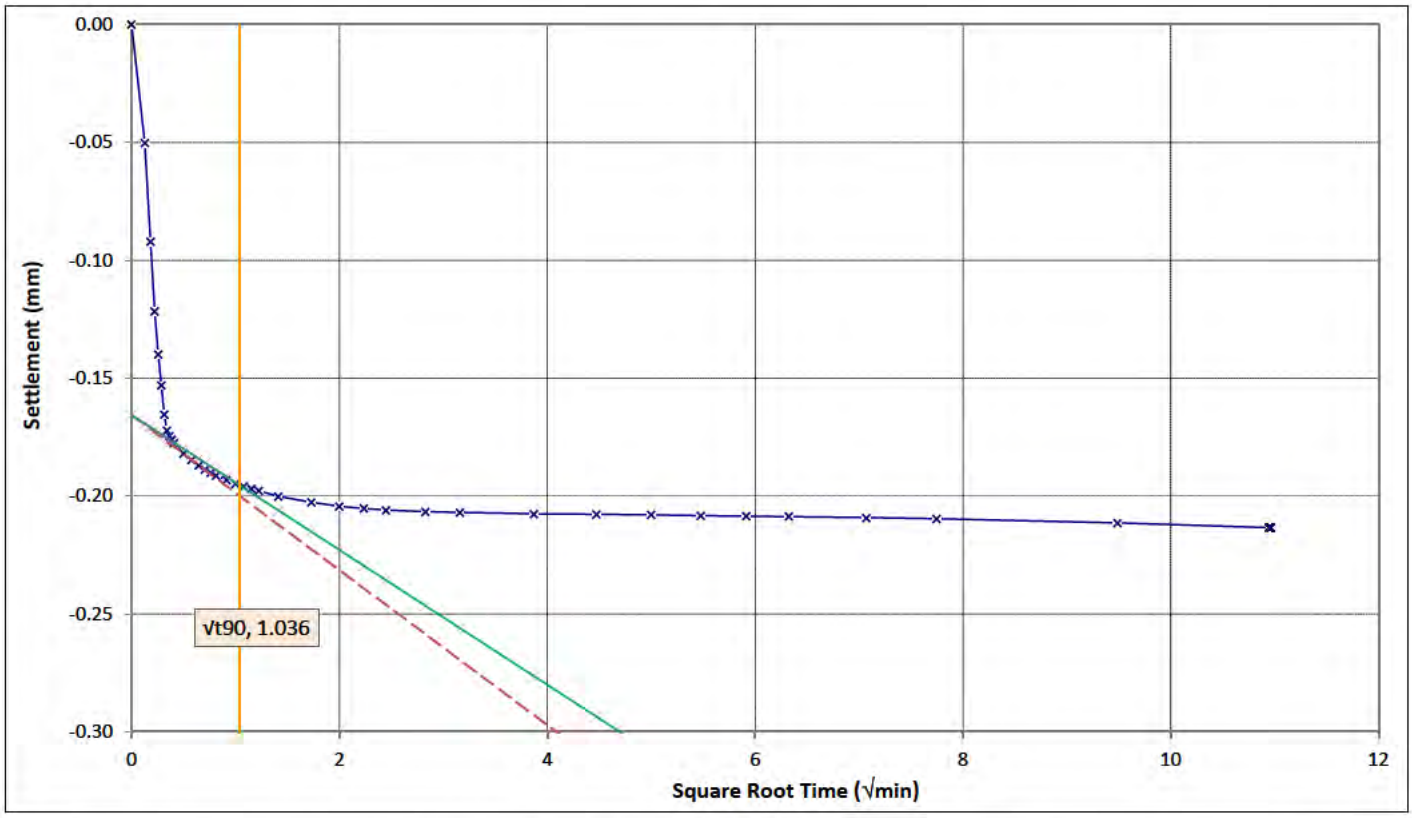
Geotechnics Project ID: 1103850.0000.01.0
Customer Project ID: 1103046
Test Schedule Reference: --

Site/Location: UoA Student Centre & Library Location ID: BH05
Sample Ref.: -- Geotechnics ID: -- Depth: 6.40 - 6.42 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST

Applied Pressure = 25 (kPa)





Tested by: PIHE Date: 10/09/2026 Approved by KTP: YHW Date: 16/09/2026

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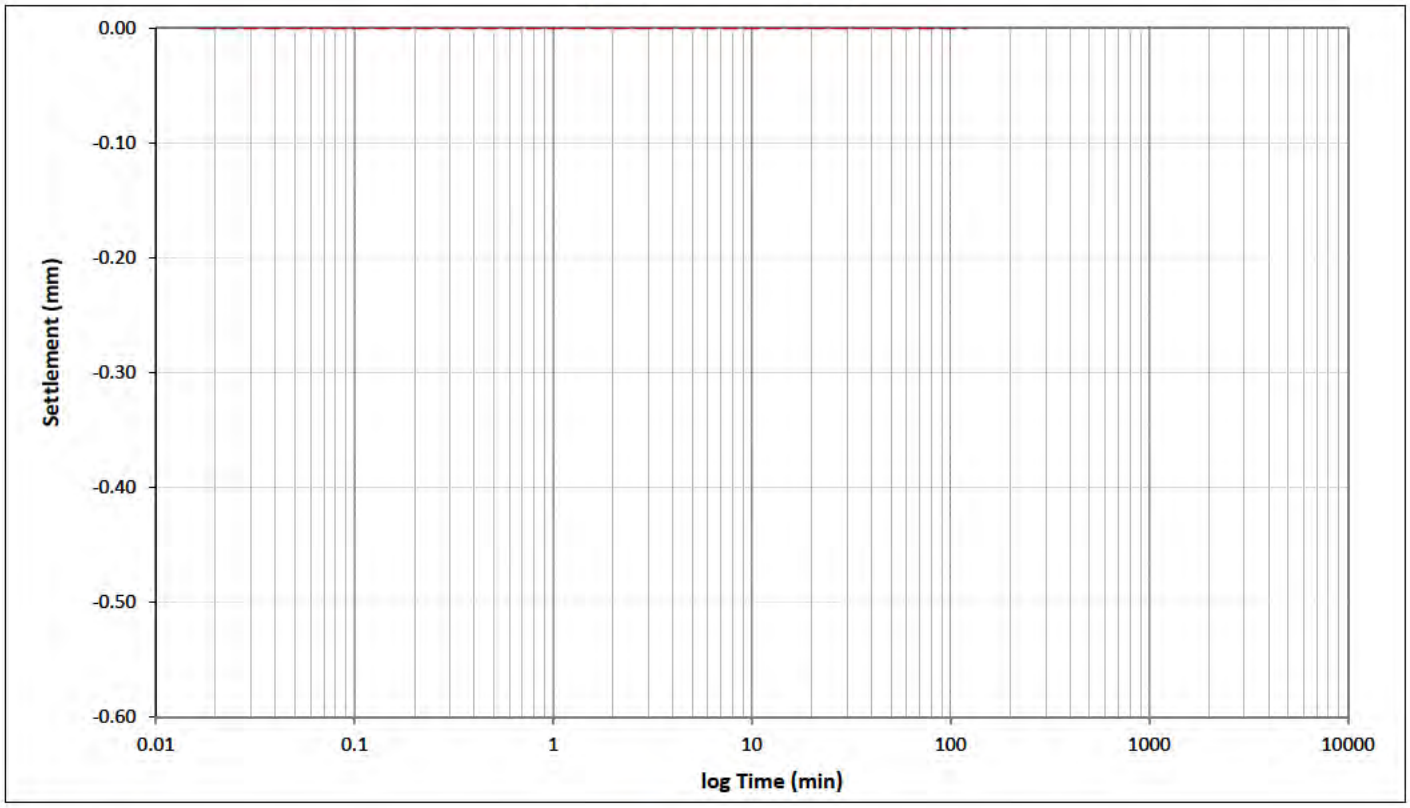
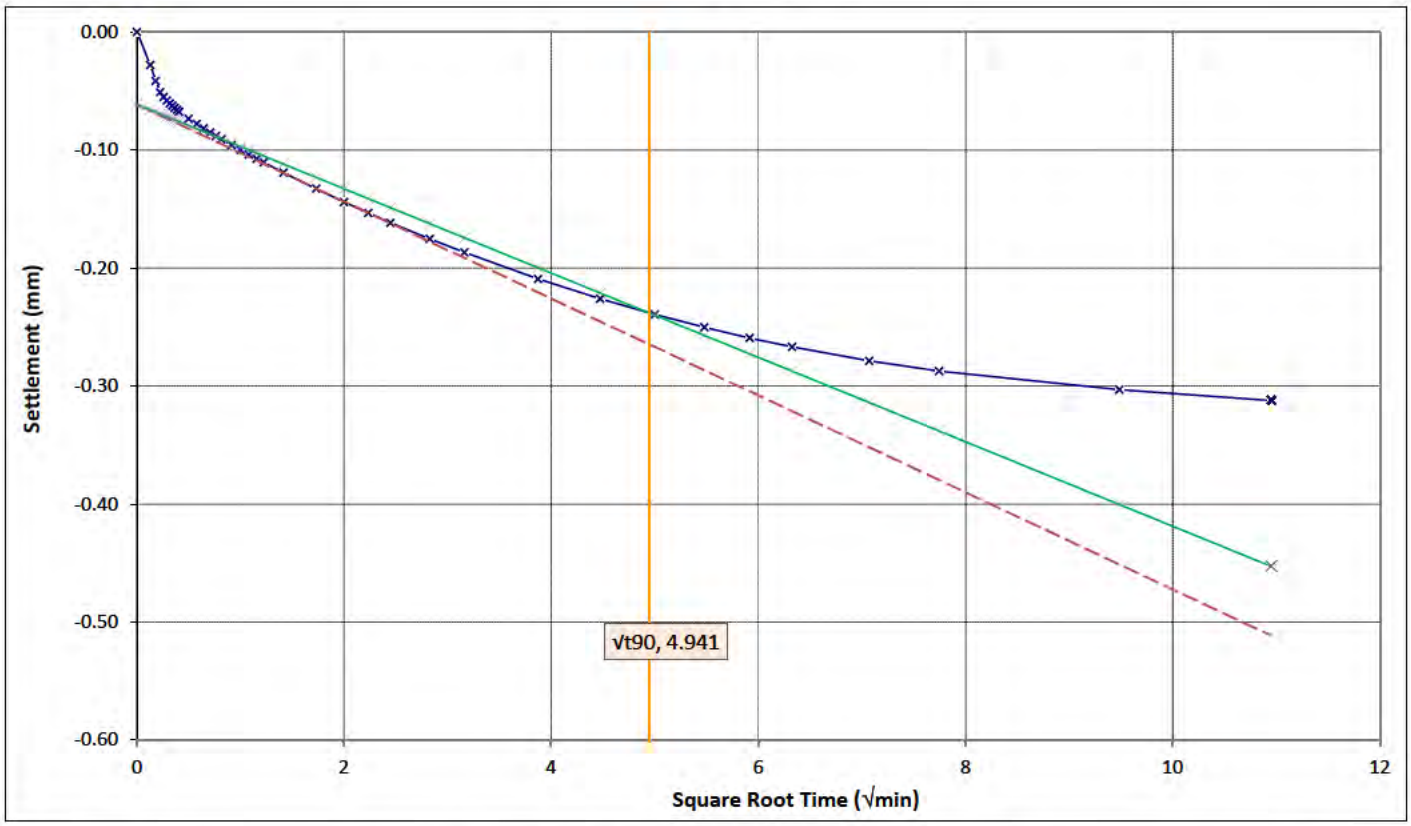
Geotechnics Project ID: 1103850.0000.01.0
Customer Project ID: 1103046
Test Schedule Reference: --

Site/Location: UoA Student Centre & Library Location ID: BH05
Sample Ref.: -- Geotechnics ID: -- Depth: 6.40 - 6.42 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST

Applied Pressure = 50 (kPa)





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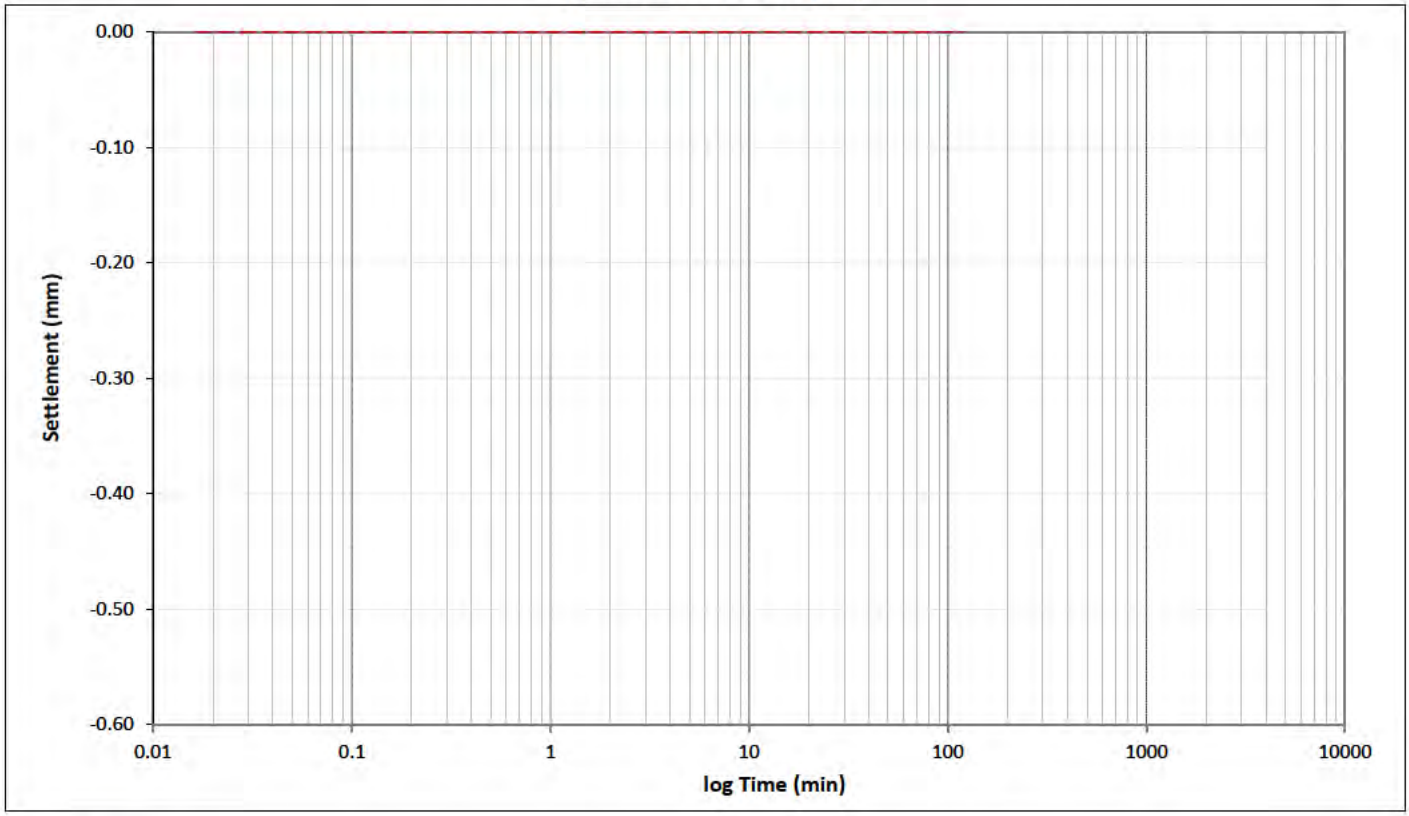
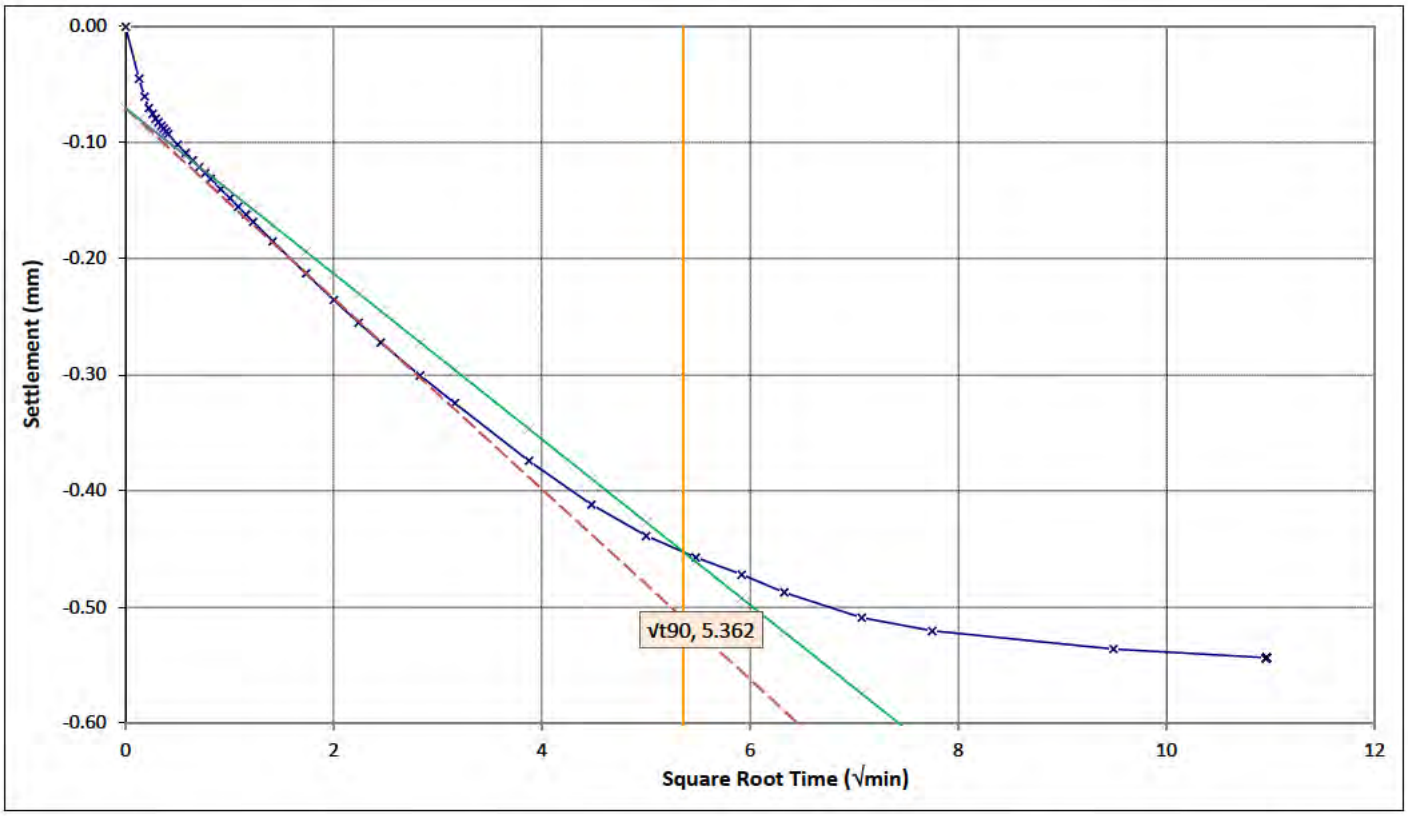
Customer Project ID: 1103046
Test Schedule Reference: --

Site/Location: UoA Student Centre & Library Location ID: BH05
Sample Ref.: -- Geotechnics ID: -- Depth: 6.40 - 6.42 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST

Applied Pressure = 100 (kPa)





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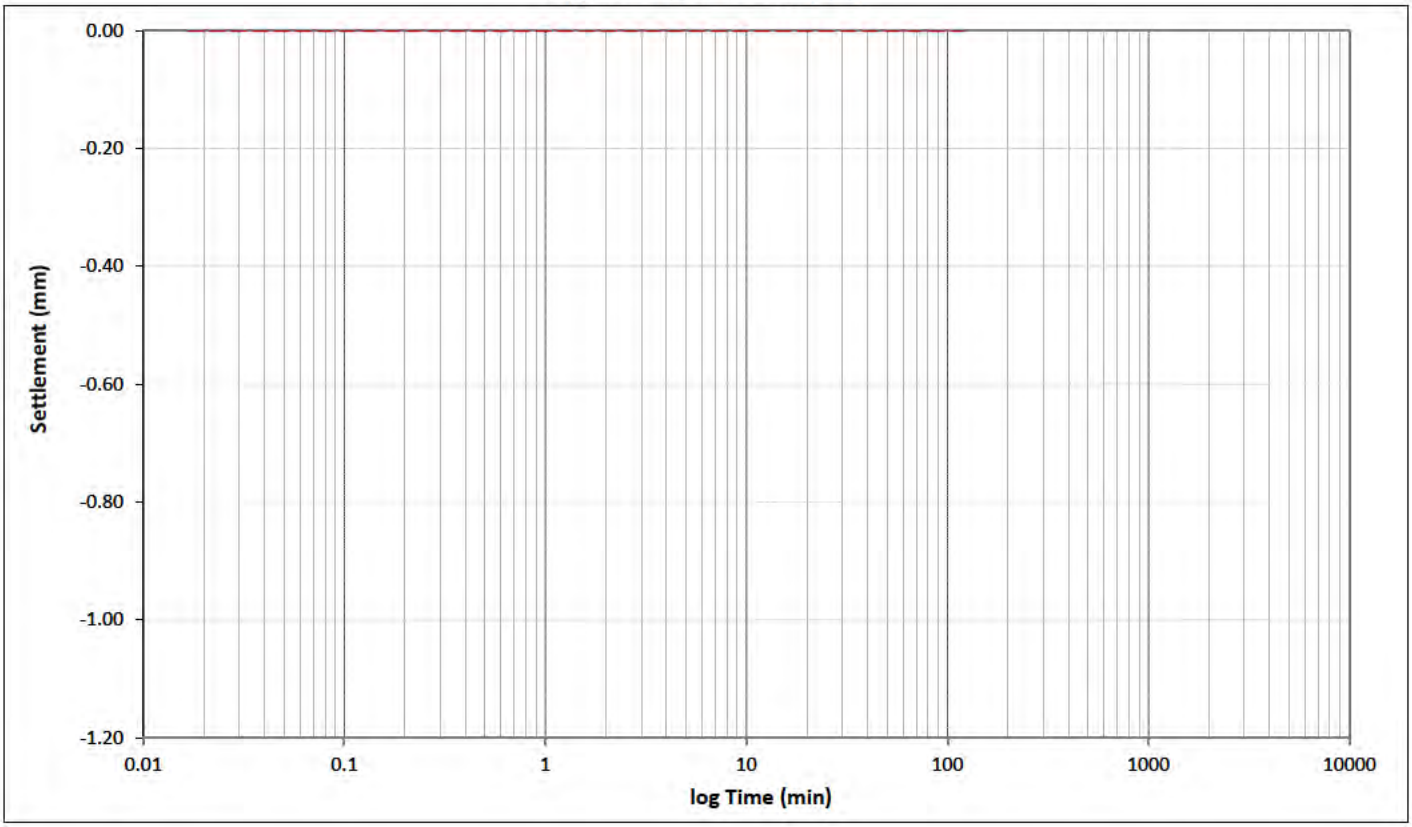
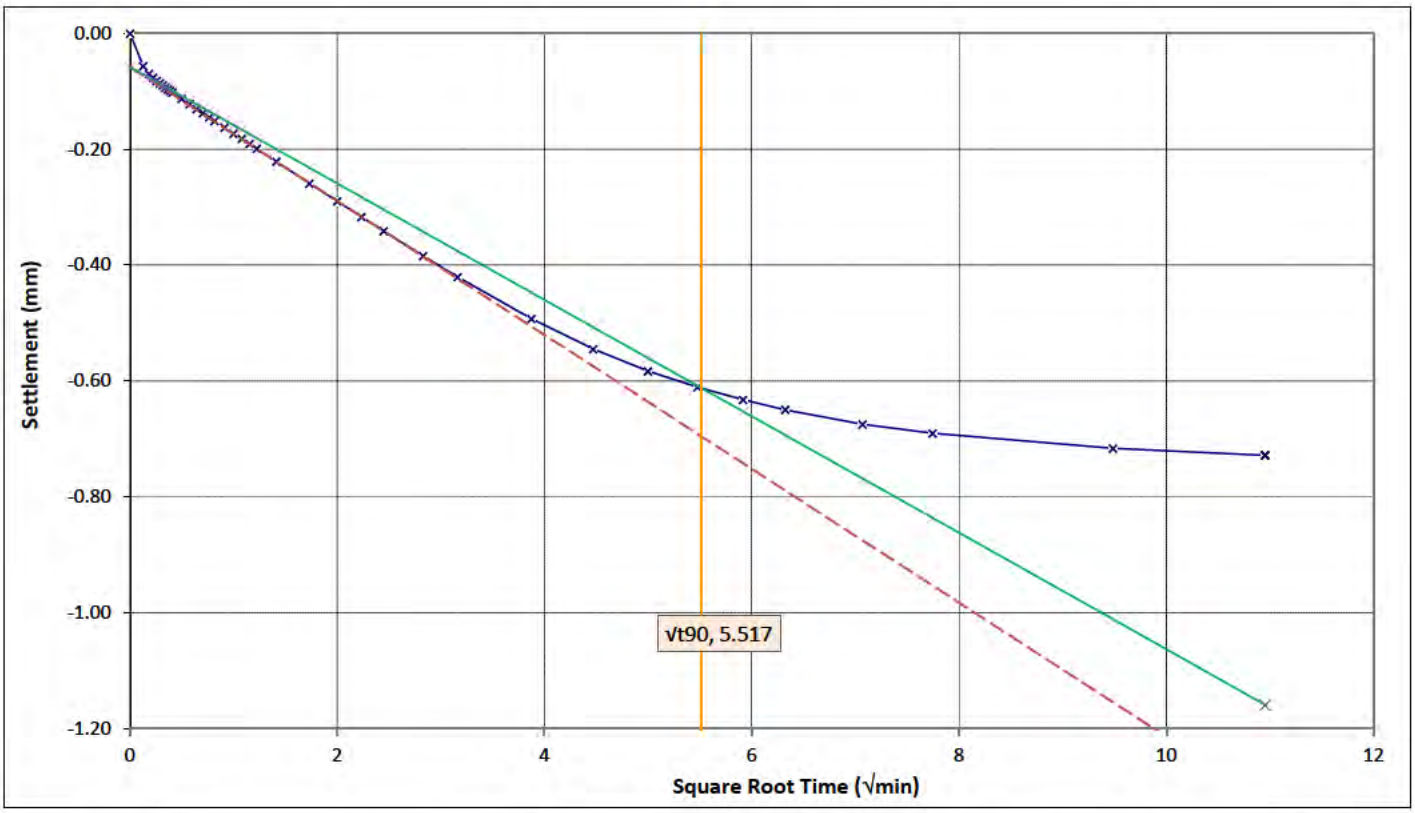
Customer Project ID: 1103046
Test Schedule Reference: --

Site/Location: UoA Student Centre & Library Location ID: BH05
Sample Ref.: -- Geotechnics ID: -- Depth: 6.40 - 6.42 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST

Applied Pressure = 200 (kPa)





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Geotechnics Project ID: 1103850.0000.01.0
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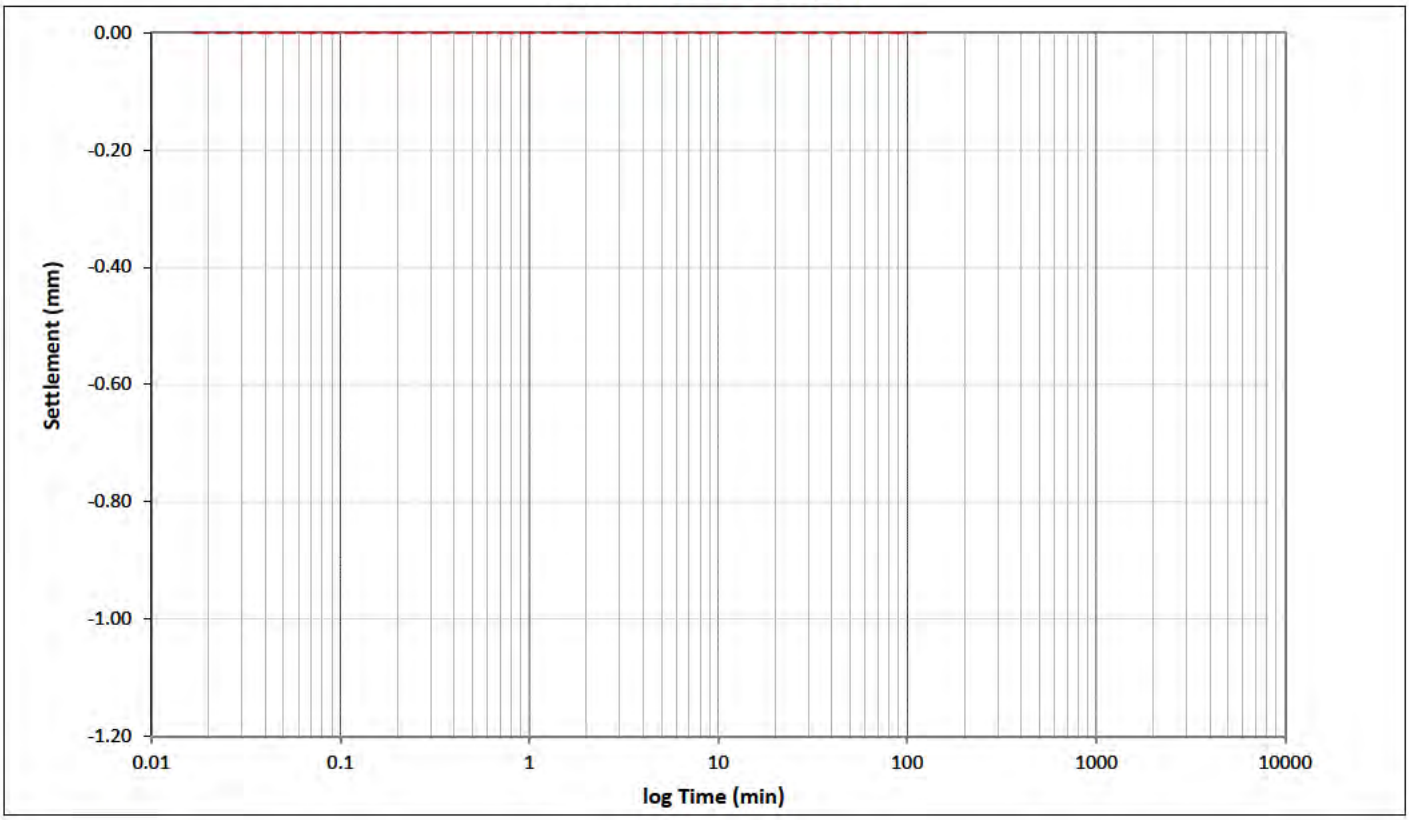
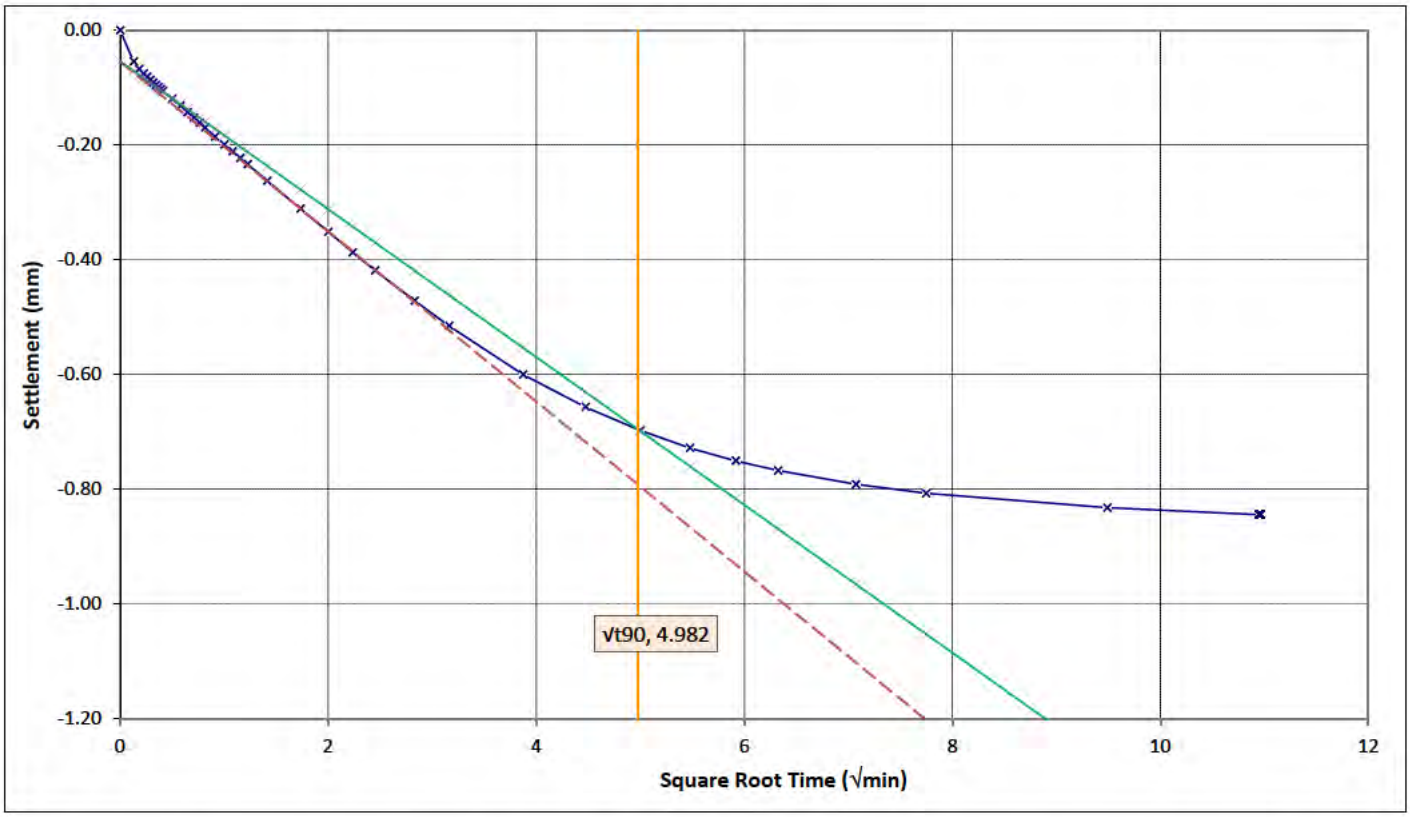
Site/Location: UoA Student Centre & Library Location ID: BH05
Sample Ref.: -- Geotechnics ID: -- Depth: 6.40 - 6.42 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST

Applied Pressure = 400 (kPa)





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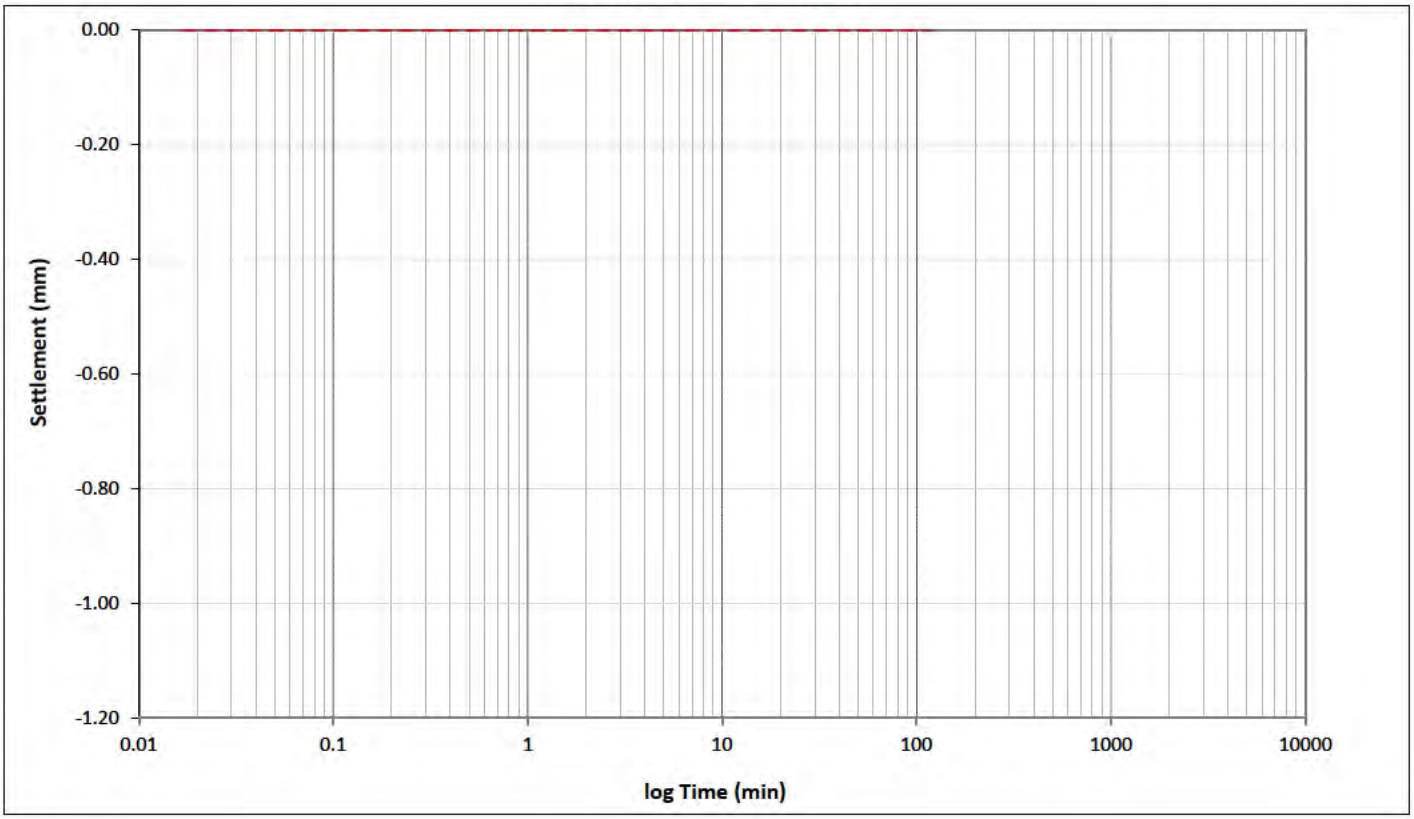
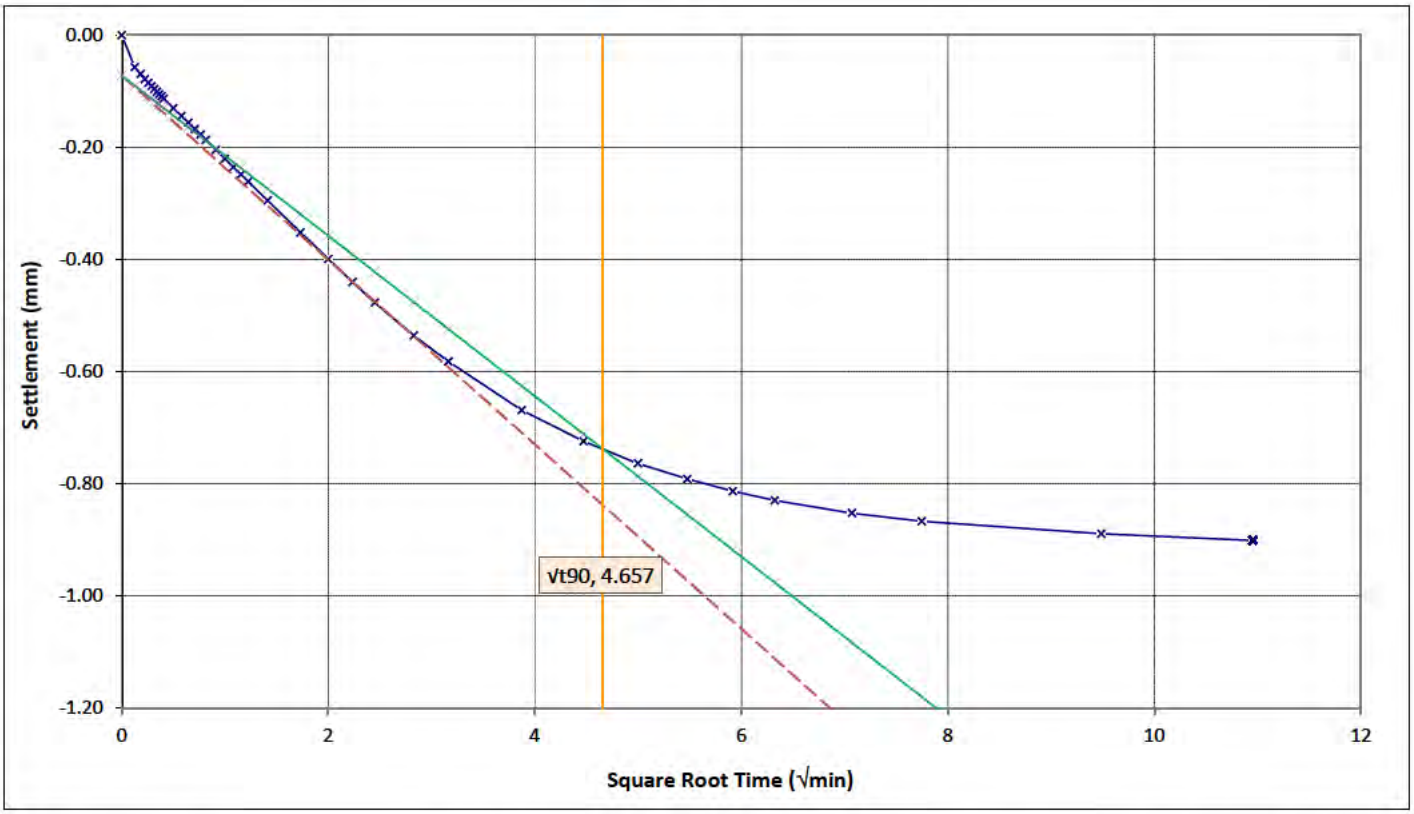
Site/Location: UoA Student Centre & Library Location ID: BH05
Sample Ref.: -- Geotechnics ID: -- Depth: 6.40 - 6.42 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST

Applied Pressure = 800 (kPa)





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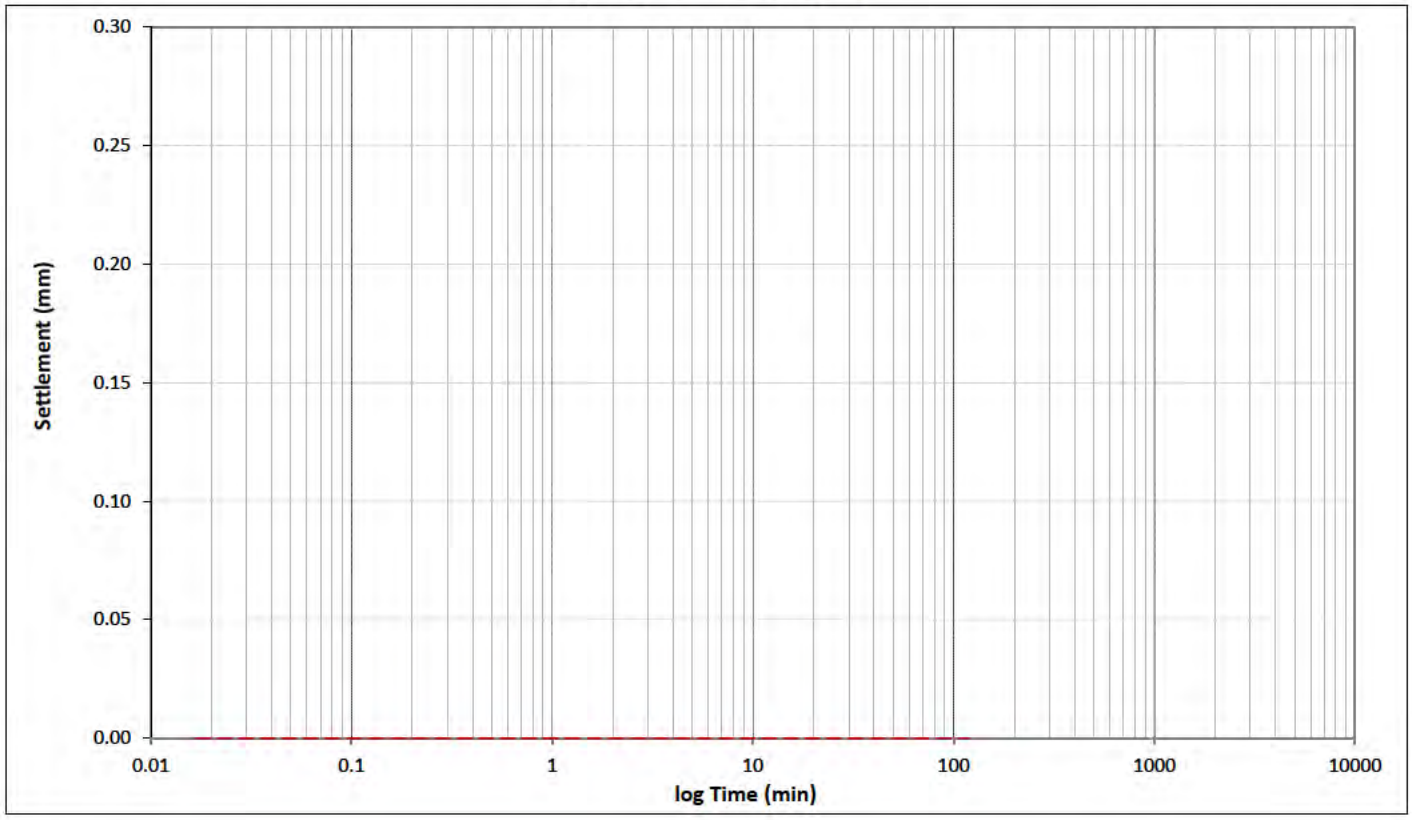
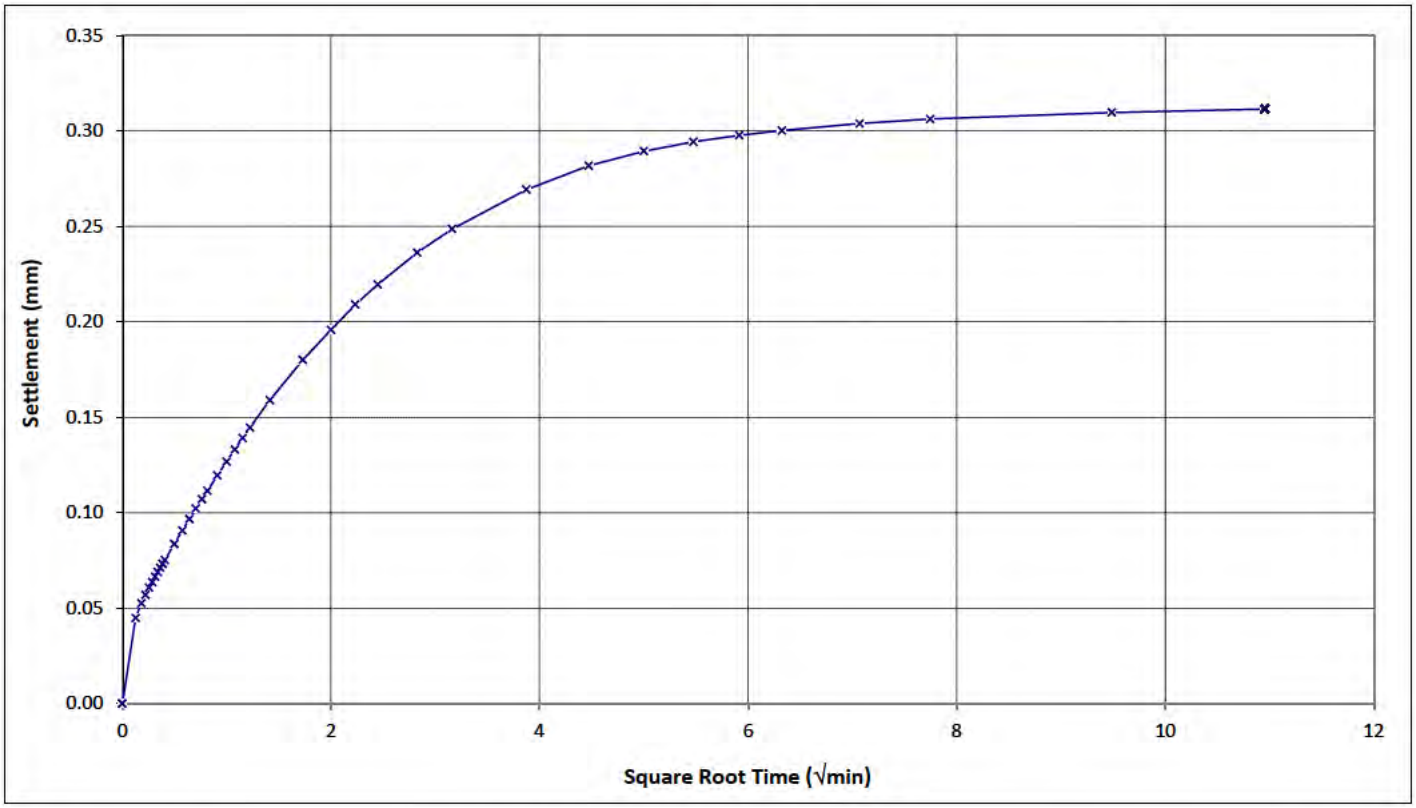
Site/Location: UoA Student Centre & Library Location ID: BH05
Sample Ref.: -- Geotechnics ID: -- Depth: 6.40 - 6.42 (m)
Test method used: NZS 4402:1986 Test 7.1 Determination of the One-dimensional Consolidation Properties
NZS 4402:1986 Test 2.1 Determination of Water Content

ONE-DIMENSIONAL CONSOLIDATION TEST

Applied Pressure = 200 (kPa)





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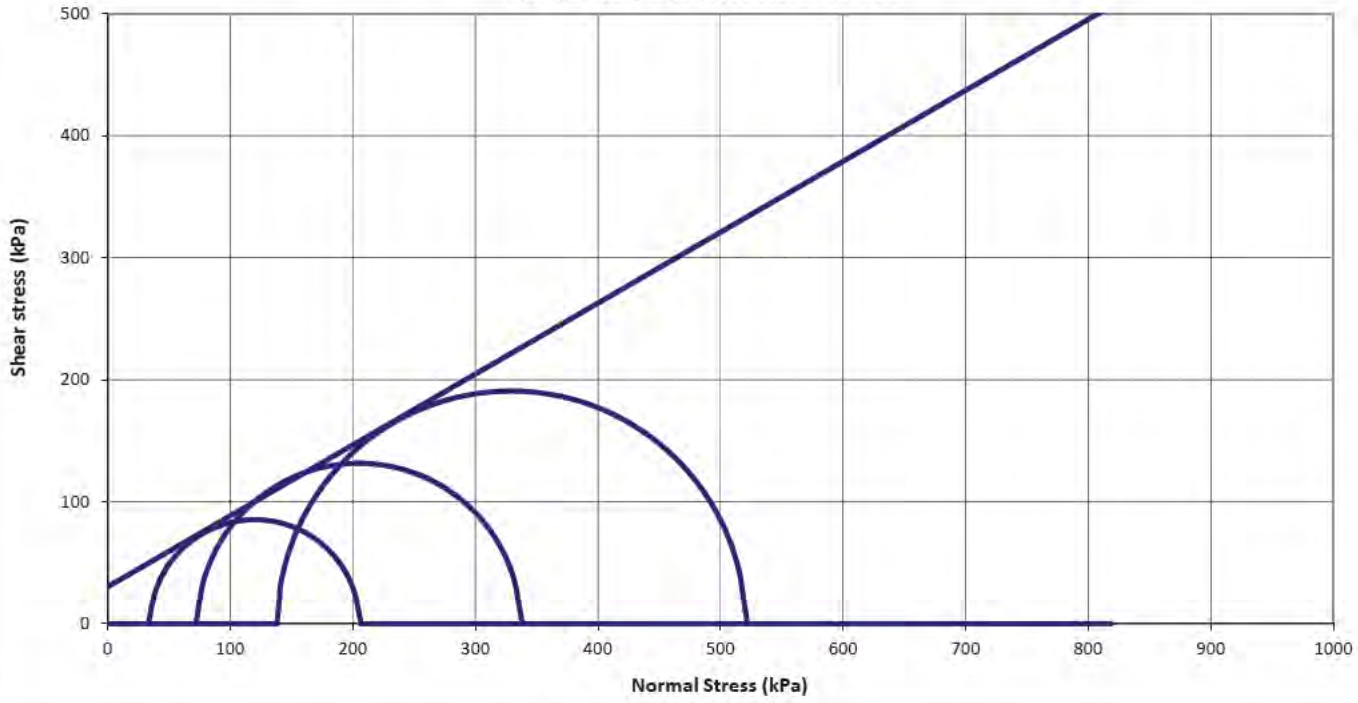
Test Schedule Reference: --

Site: UoA Student Centre & Library Location ID: BH01
Sample Ref.: -- Geotechnics ID: -- Depth: 8.36 - 8.48 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST (MULTI-STAGE)

MOHR CIRCLES OF EFFECTIVE STRESSES



General Sample Parameters

Initial Sample Height:	124.92	mm	Initial Water Content:	33.4	%
Initial Sample Diameter:	60.69	mm	Initial Bulk Density:	1.88	t/m³
Initial B Value:	--	%	Initial Dry Density:	1.41	t/m³
B Value before Consolidation:	92	%	Final Water Content:	33.4	%

Test Results

	At the End of Consolidation Stage						Failure Values						Failure Mode & Photo
	Effective Stress		Back	Volumetric					Effective Stress		Corrections (kPa)		Planar / Plastic
	Horizontal σ_h'(kPa)	Vertical σ_v'(kPa)	Pressure (kPa)	Strain (%)	Rate (%/hr)		Deviator Stress $(\sigma_v' - \sigma_h')$ (kPa)	Vertical Strain ε (%)	Vertical σ_v' (kPa)	Horizontal σ_h'(kPa)	Membrane $(\Delta\sigma_v)_m$	Filter P $(\Delta\sigma_v)_{fp}$	
Stage 1	60	61	300	0.99	0.00		170.54	2.64	205.34	34.80	1.06	3.77	
Stage 2	125	126	300	1.10	0.00		263.03	2.40	336.63	73.60	0.96	3.76	
Stage 3	250	251	300	1.48	0.00		381.45	3.37	520.05	138.60	1.35	3.77	



Effective Strength

Angle of Frictional Resistance: $\phi' =$ 30 °
Cohesion: $c' =$ 30 kPa
Linear Regression Coefficient: $r =$ 0.999

Sample History: Undisturbed core trimmed at natural water content.

Soil description: SILT with some clay and a trace of sand; grey. Stiff, moist.

Test Speed: 0.020 (mm/min)

Test Remarks: The sample was saturated by increments of cell pressure and back pressure.
It was drained from radial boundary and both ends in the consolidation stages.
Failure for each stage was determined by the maximum effective stress ratio. Strength parameters have been derived by using a linear regression fitting method.

Tested by: PIHE Date: 17/09/2026 Approved by KTP: Date: 22/09/2026

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Geotechnics Project ID: 1103850.0000.01.0
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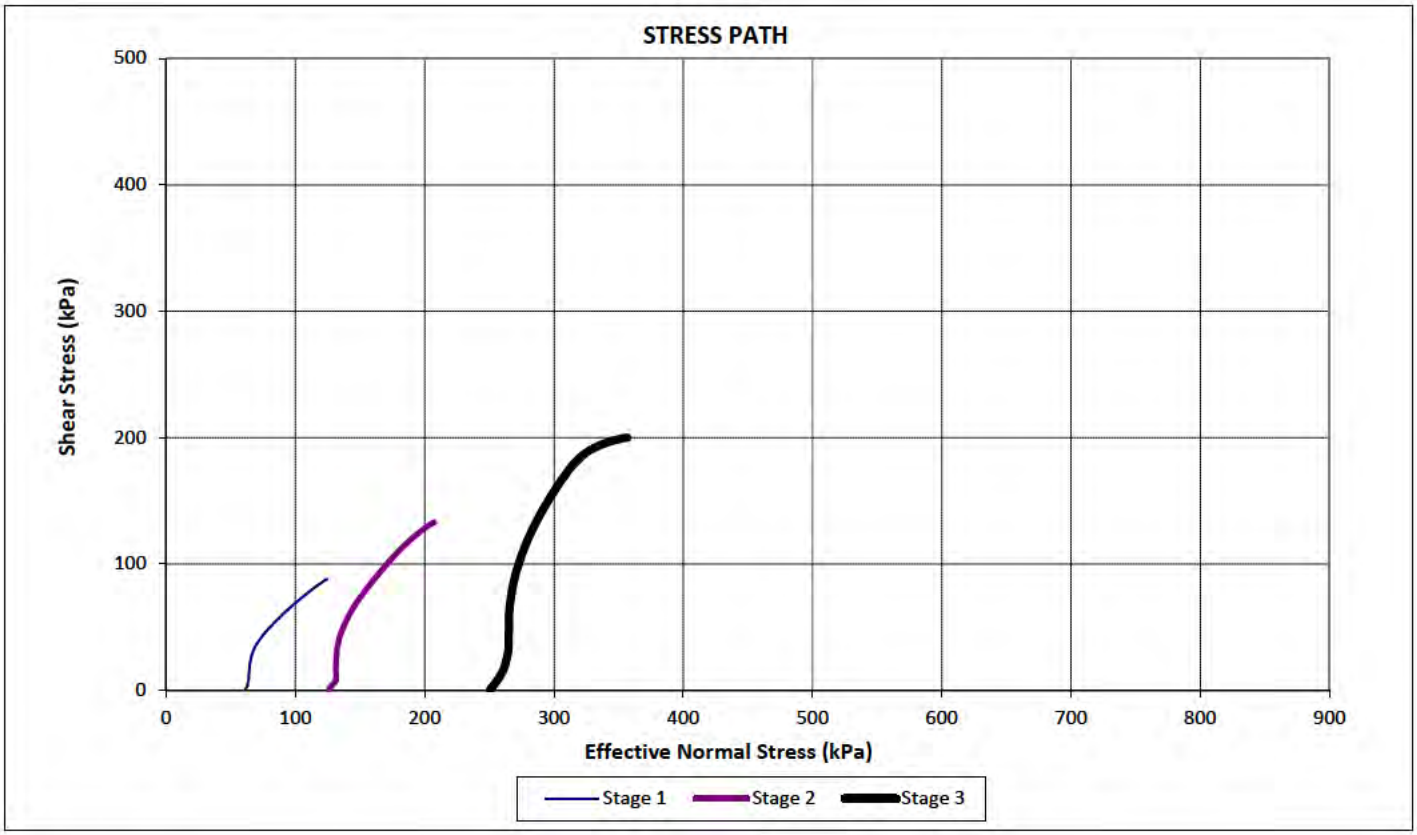
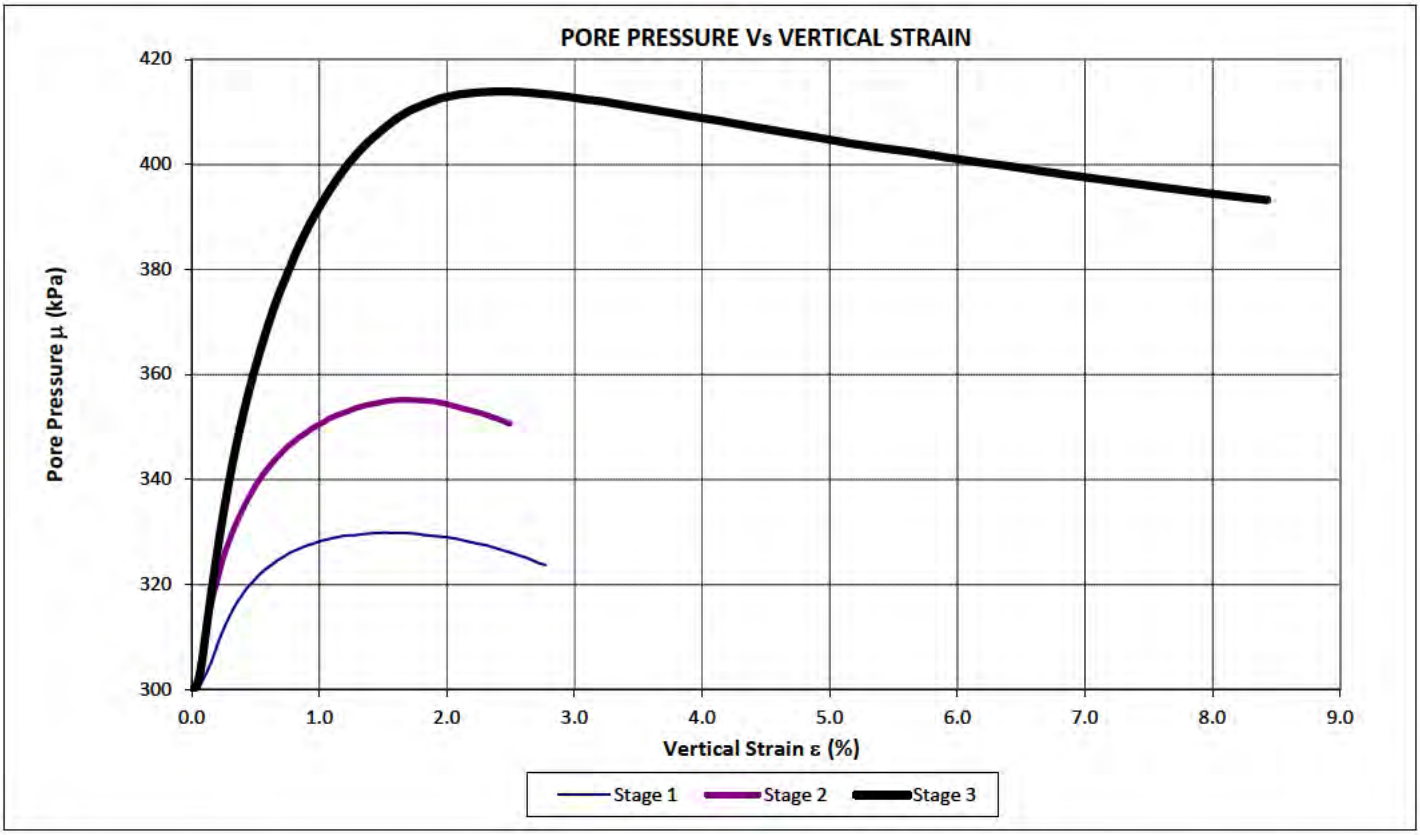
Test Schedule Reference: --

Site: UoA Student Centre & Library Location ID: BH01
Sample Ref.: -- Geotechnics ID: -- Depth: 8.36 - 8.48 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

GRAPHS





Tested by: PIHE Date: 17/09/2026 Approved by KTP: YHW Date: 22/09/2026

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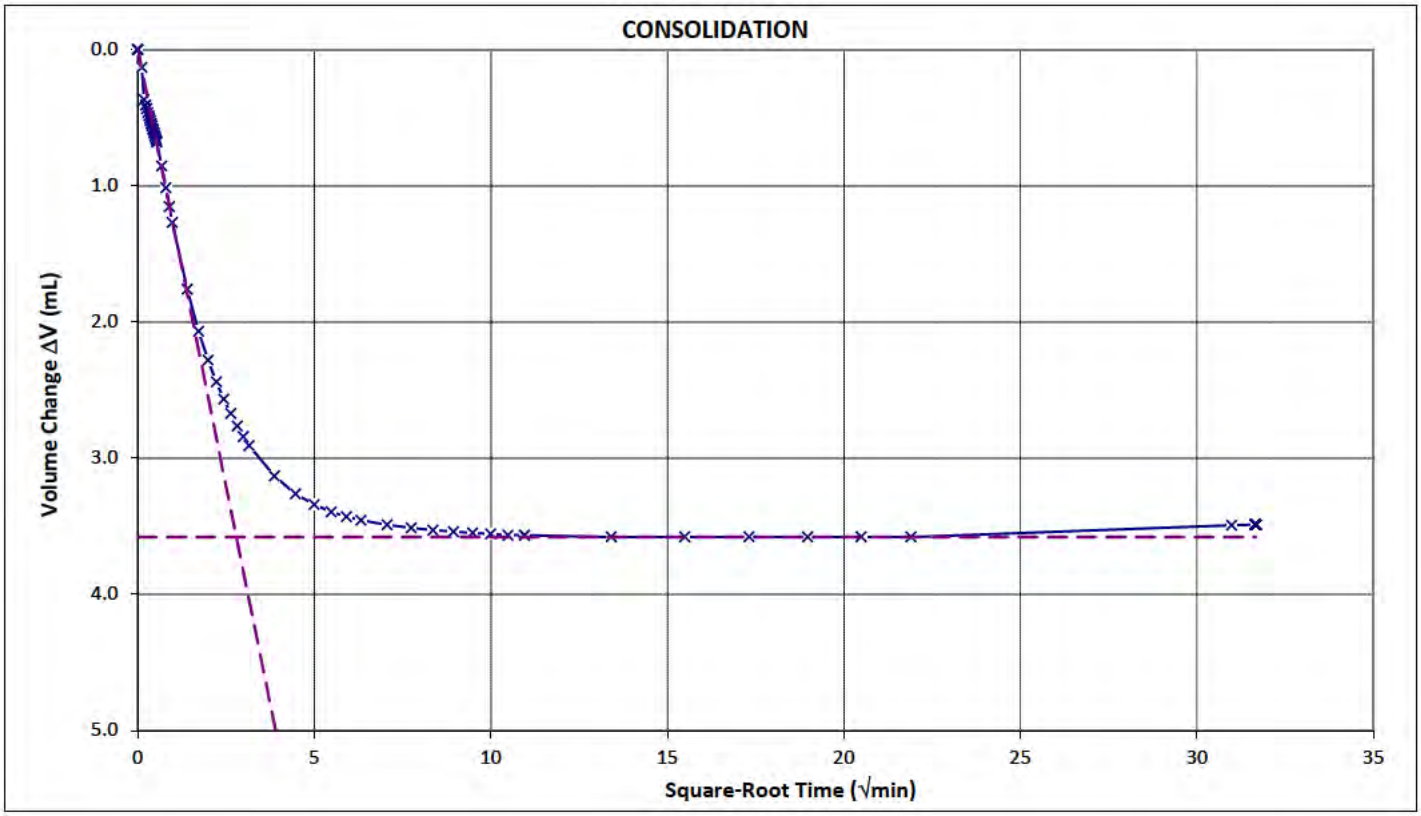
Geotechnics Project ID: 1103850.0000.01.0
Customer Project ID: 1103046
Test Schedule Reference: --

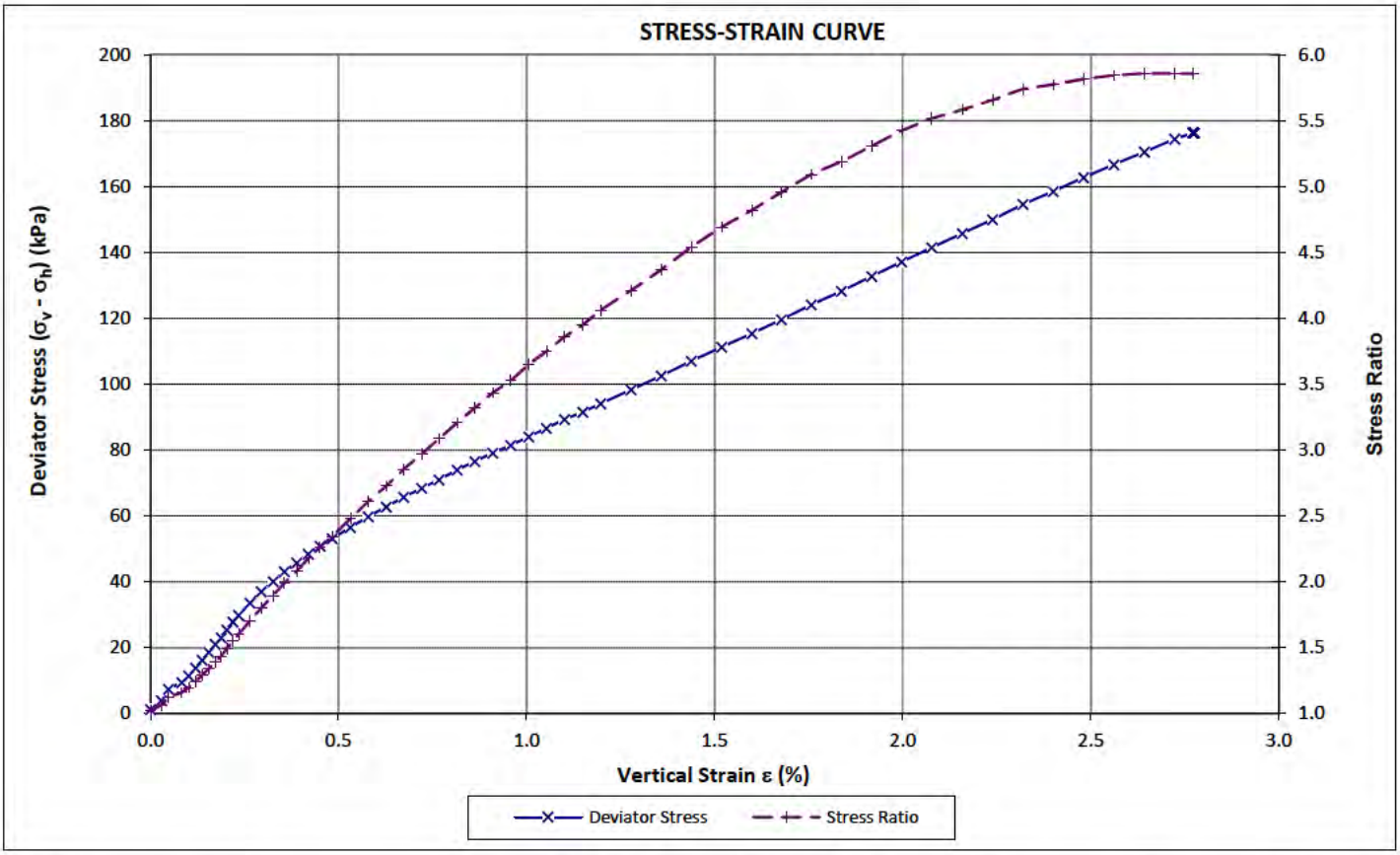
Site: UoA Student Centre & Library Location ID: BH01
Sample Ref.: -- Geotechnics ID: -- Depth: 8.36 - 8.48 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 1 GRAPHS

CONSOLIDATION



STRESS-STRAIN CURVE



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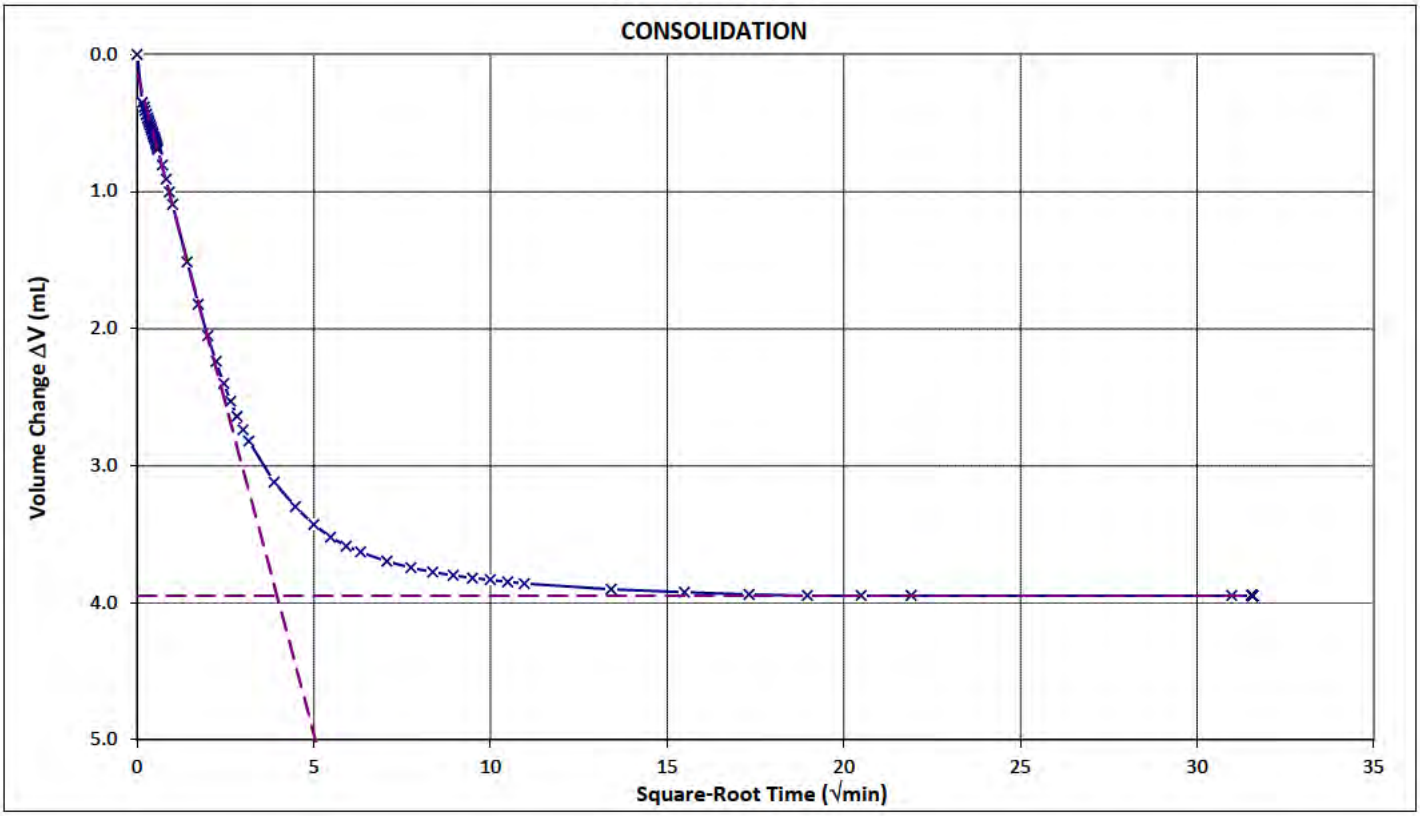
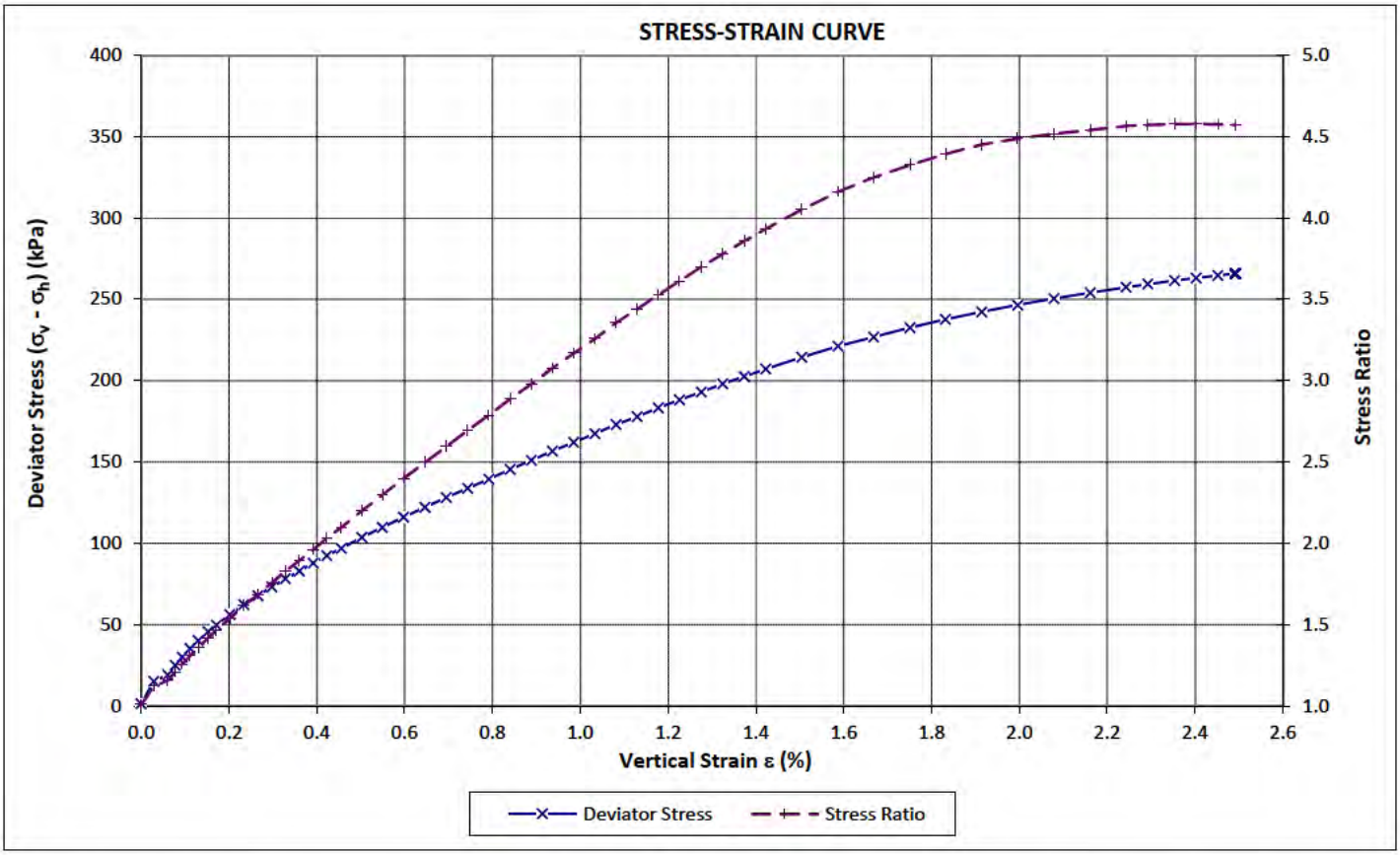
Site: UoA Student Centre & Library Location ID: BH01
Sample Ref.: -- Geotechnics ID: -- Depth: 8.36 - 8.48 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 2 GRAPHS





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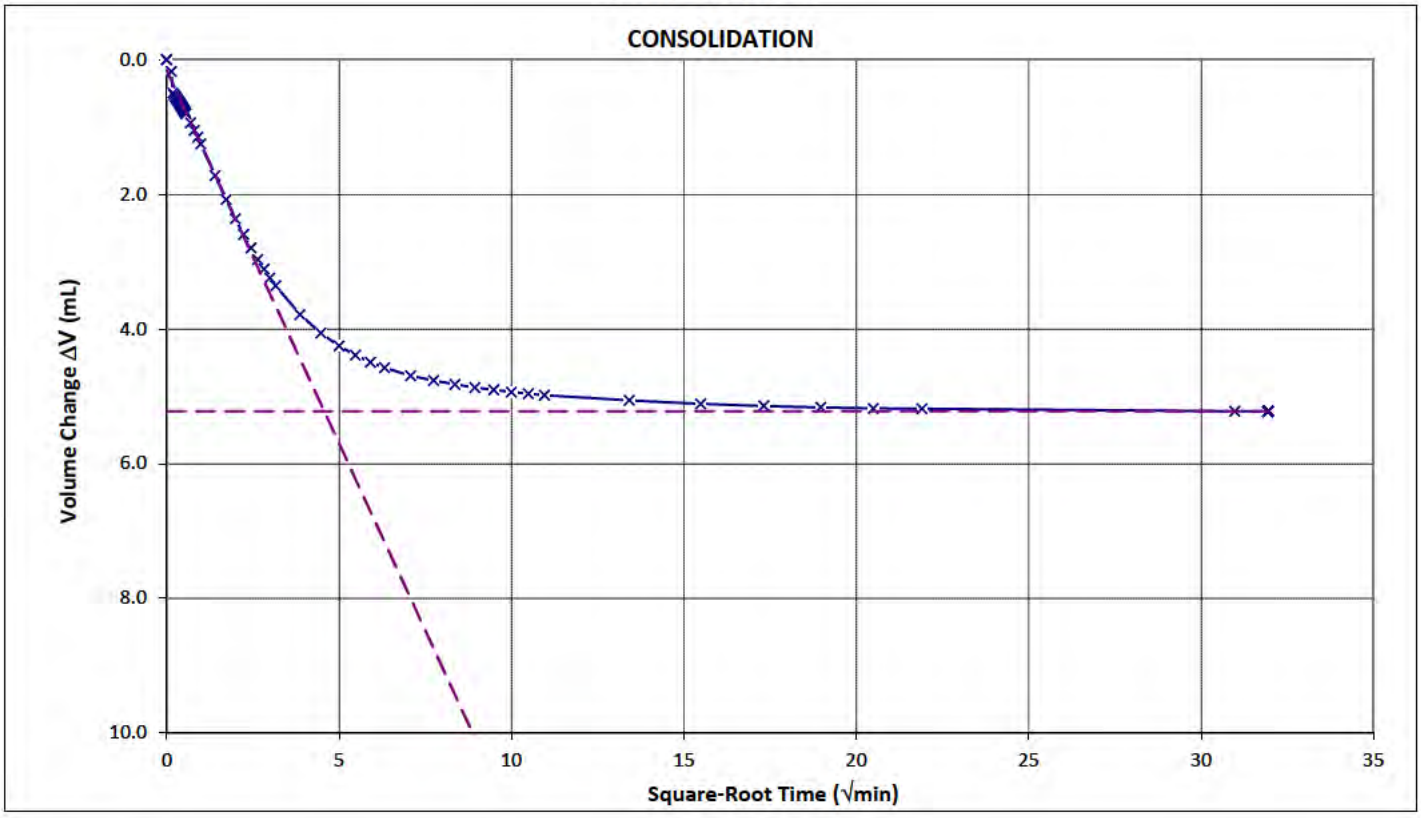
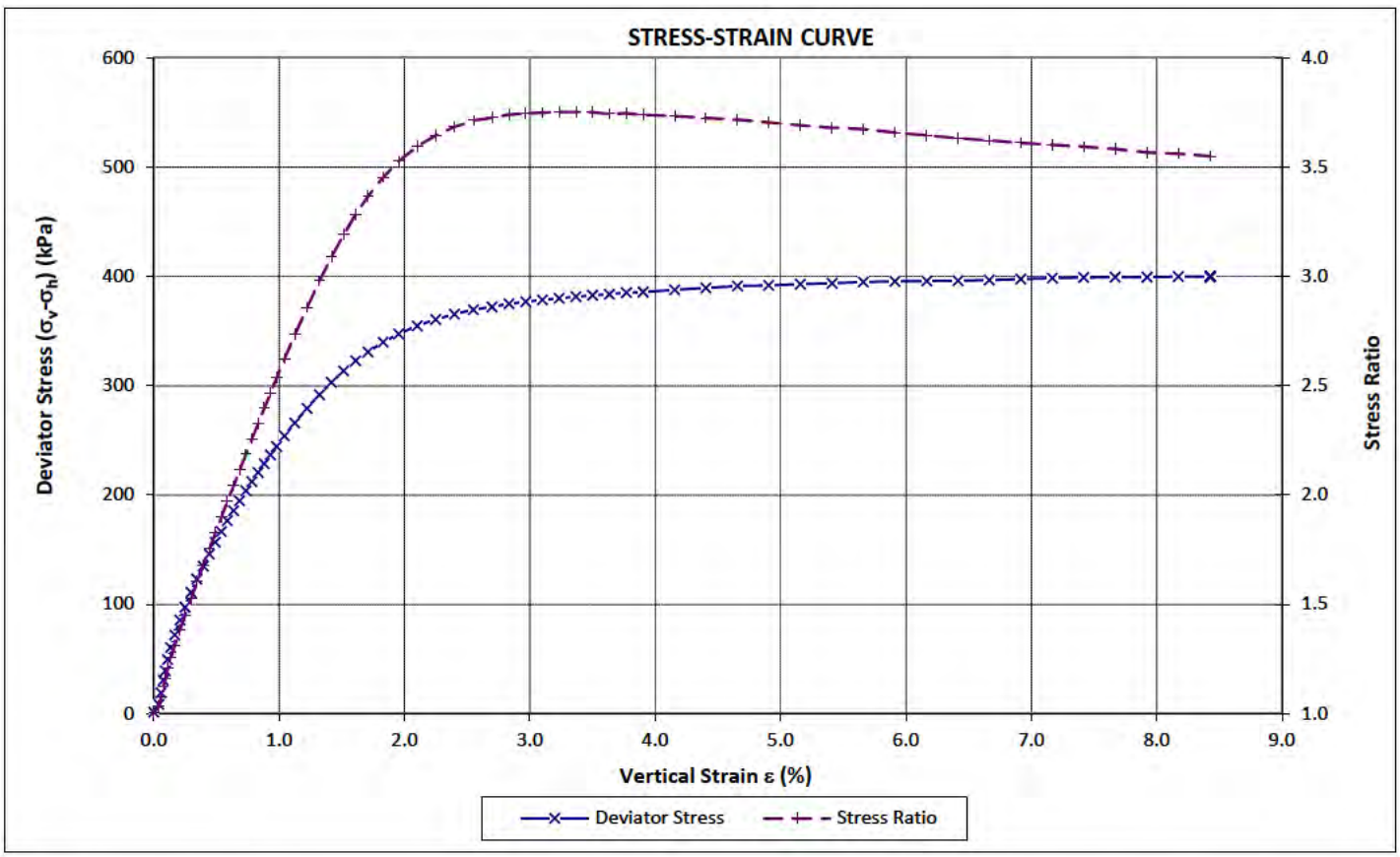
Site: UoA Student Centre & Library Location ID: BH01
Sample Ref.: -- Geotechnics ID: -- Depth: 8.36 - 8.48 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 3 GRAPHS





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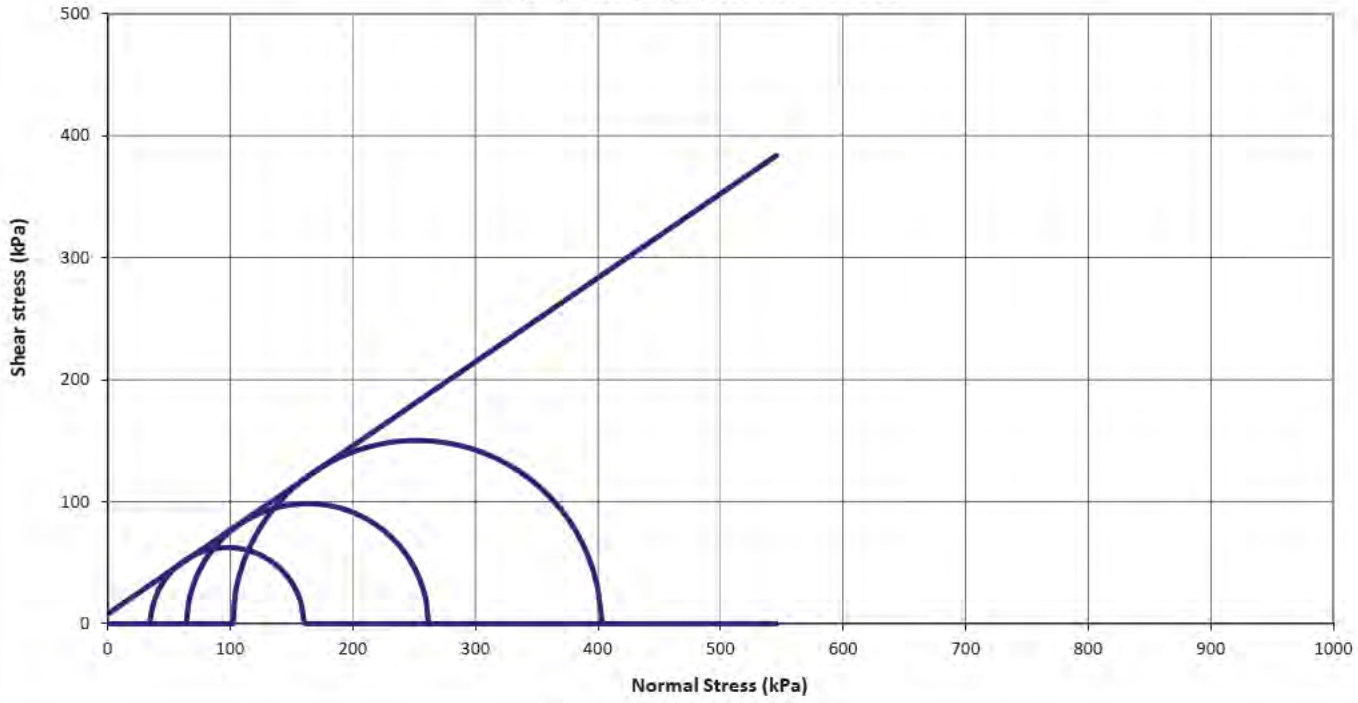
Geotechnics Project ID: 1103850.0000.01.0
Customer Project ID: 1103046
Test Schedule Reference: --

Site: UoA Student Centre & Library Location ID: BH03
Sample Ref.: -- Geotechnics ID: -- Depth: 8.35 - 8.48 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST (MULTI-STAGE)

MOHR CIRCLES OF EFFECTIVE STRESSES



General Sample Parameters

Initial Sample Height:	123.71	mm	Initial Water Content:	35.3	%
Initial Sample Diameter:	60.83	mm	Initial Bulk Density:	1.85	t/m³
Initial B Value:	58	%	Initial Dry Density:	1.37	t/m³
B Value before Consolidation:	98	%	Final Water Content:	33.6	%

Test Results

	At the End of Consolidation Stage					Failure Values						Failure Mode & Photo
	Effective Stress		Back	Volumetric		Deviator Stress	Vertical	Effective Stress		Corrections (kPa)		
	Horizontal σ_h'(kPa)	Vertical σ_v'(kPa)	Pressure (kPa)	Strain (%)	Rate (%/hr)	$(\sigma_v' - \sigma_h')$ (kPa)	Strain ε (%)	Vertical σ_v' (kPa)	Horizontal σ_h'(kPa)	Membrane $(\Delta\sigma_v)_m$	Filter P $(\Delta\sigma_v)_{fp}$	Plastic
Stage 1	60	61	400	1.59	0.00	124.89	1.89	160.09	35.20	0.73	3.56	
Stage 2	125	126	400	1.27	0.00	196.89	4.05	261.59	64.70	1.56	3.77	
Stage 3	250	251	400	2.44	0.00	300.40	6.22	402.60	102.20	2.40	3.75	

Effective Strength

Angle of Frictional Resistance: $\phi' =$ 35 °
Cohesion: $c' =$ 8 kPa
Linear Regression Coefficient: $r =$ 1.000

Sample History: Undisturbed core trimmed at natural water content.

Soil description: Sandy SILT with trace of clay, firm, light grey.

Test Speed: 0.023 (mm/min)

Test Remarks: The sample was saturated by increments of cell pressure and back pressure.
It was drained from radial boundary and both ends in the consolidation stages.
Failure for each stage was determined by the maximum effective stress ratio. Strength parameters have been derived by using a linear regression fitting method.

Tested by: PAVI/ PIHE Date: 3/09/2026 Approved by KTP: Date: 21/09/2026

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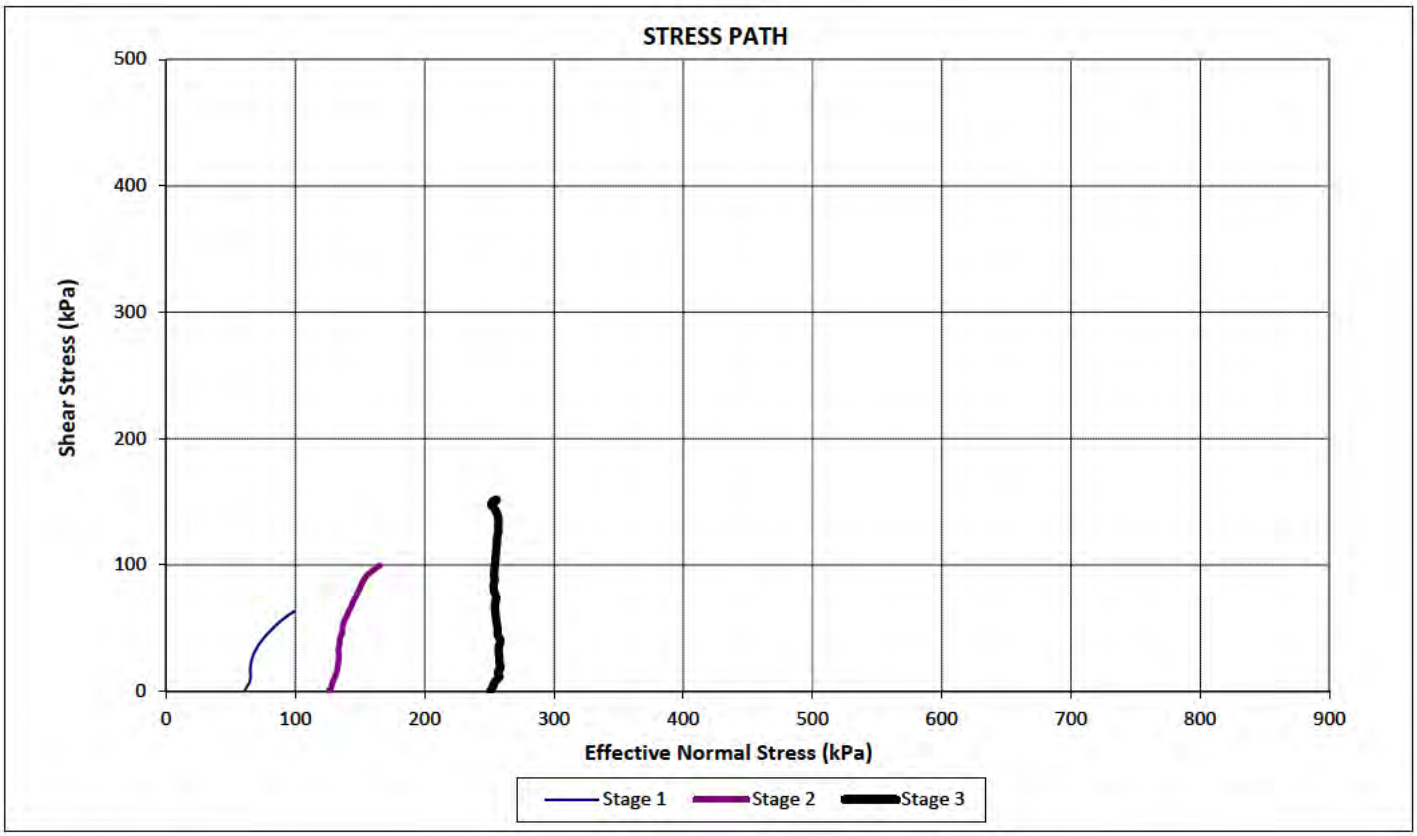
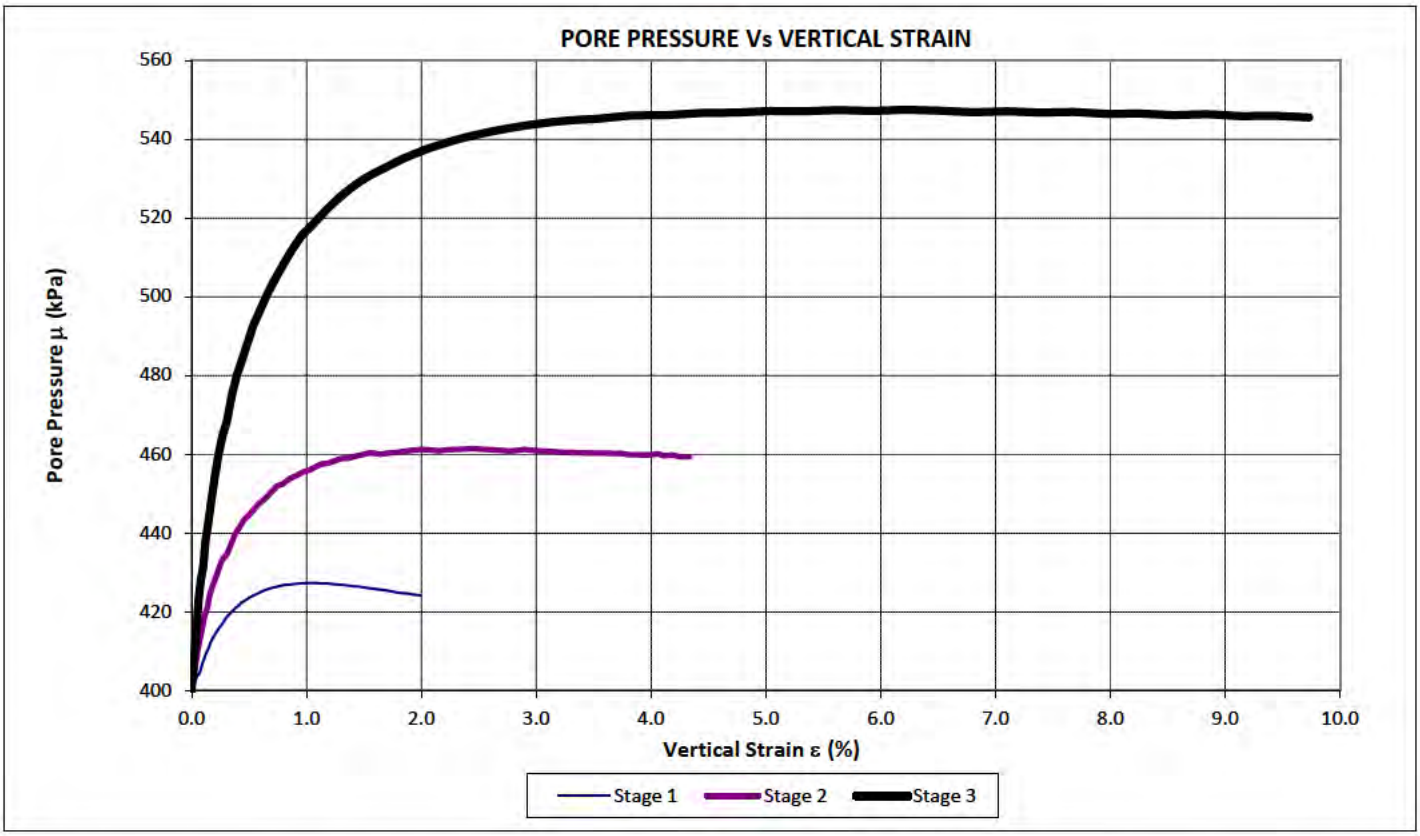
Site: UoA Student Centre & Library Location ID: BH03
Sample Ref.: -- Geotechnics ID: -- Depth: 8.35 - 8.48 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

GRAPHS





Tested by: PAVI/ PIHE Date: 3/09/2026 Approved by KTP: YHW Date: 21/09/2026

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Site: UoA Student Centre & Library Location ID: BH03
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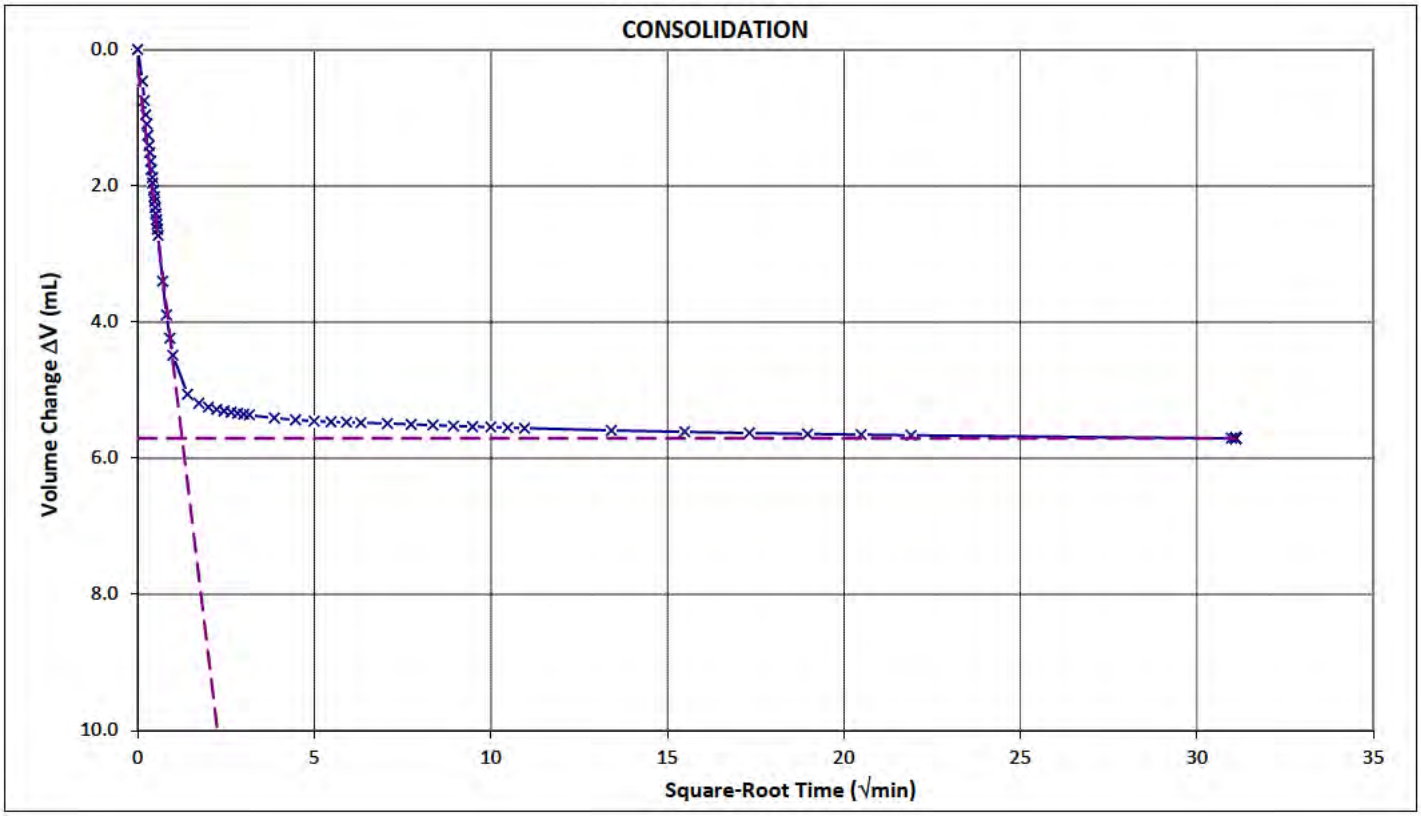
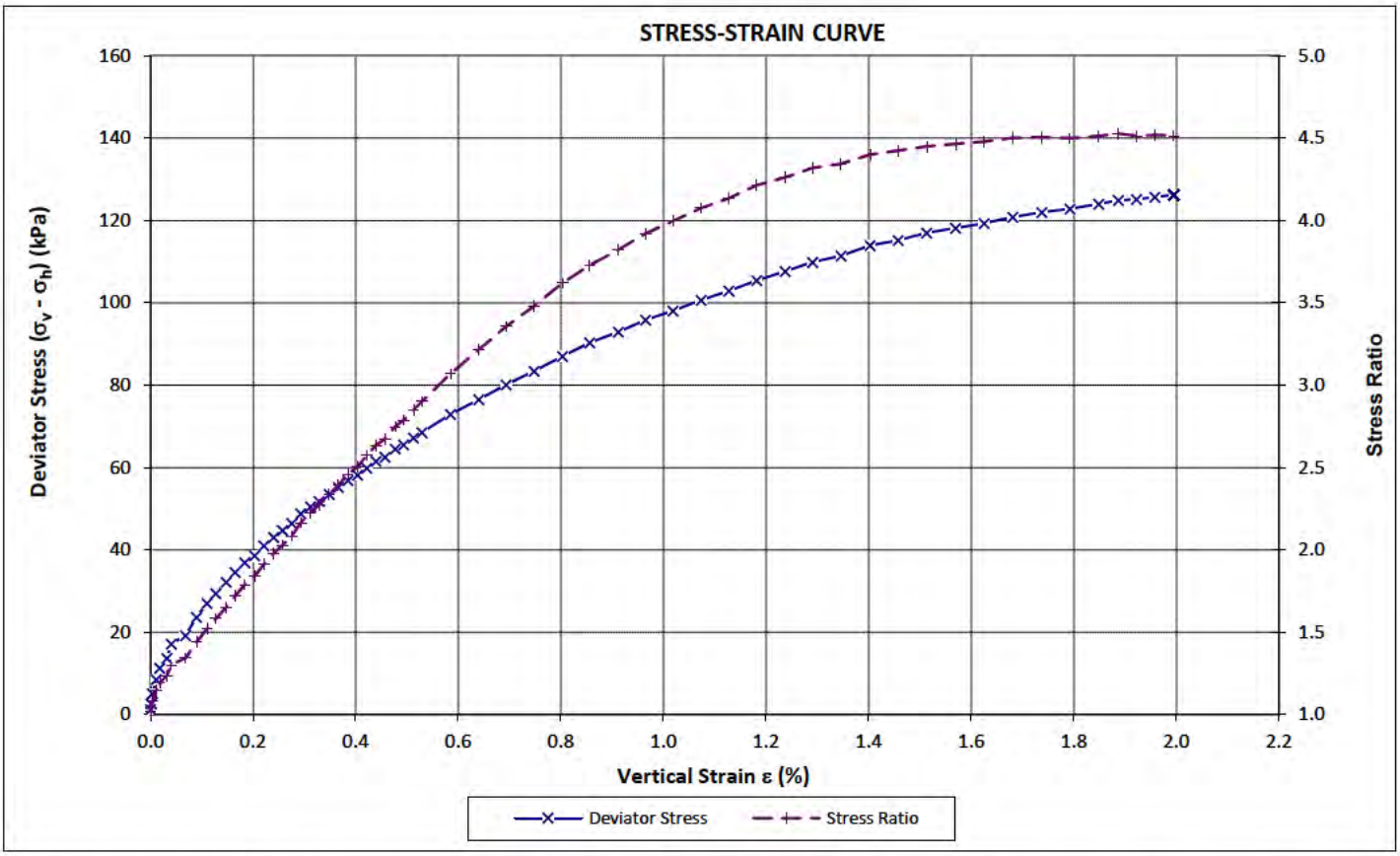
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 1 GRAPHS

CONSOLIDATION



STRESS-STRAIN CURVE



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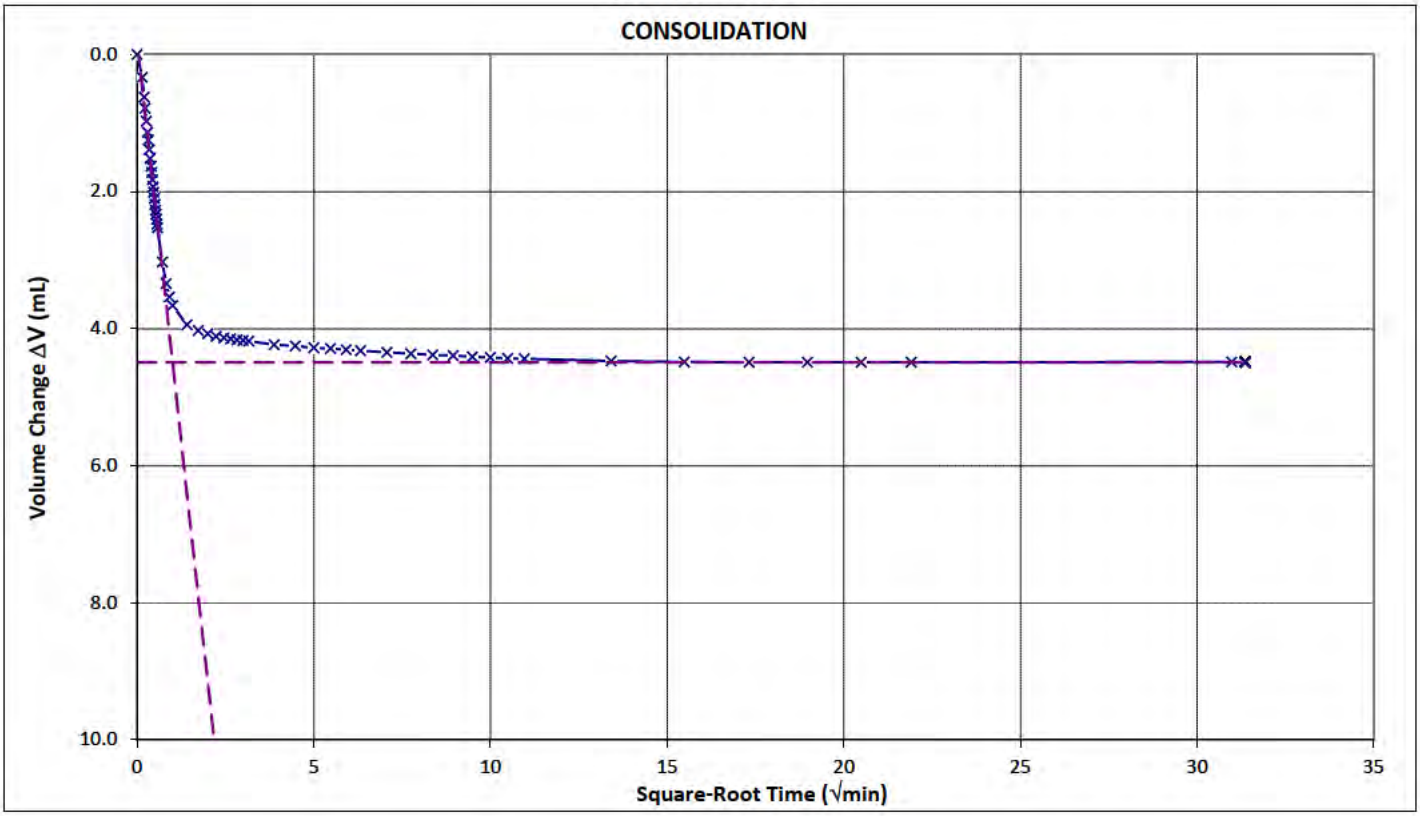
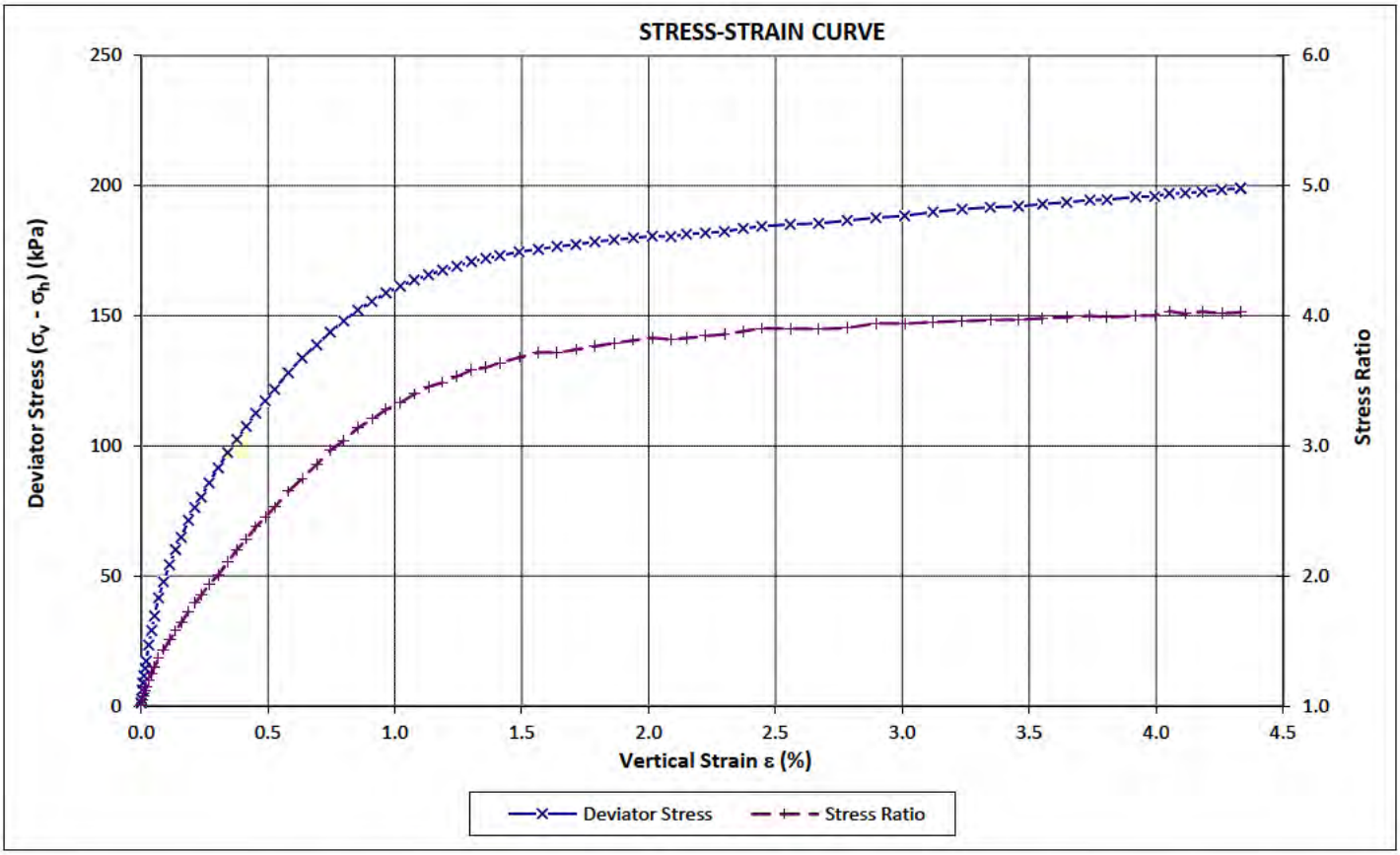
Test Schedule Reference: --

Site: UoA Student Centre & Library Location ID: BH03
Sample Ref.: -- Geotechnics ID: -- Depth: 8.35 - 8.48 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 2 GRAPHS





Tested by: PAVI/ PIHE Date: 3/09/2026 Approved by KTP: YHW Date: 21/09/2026

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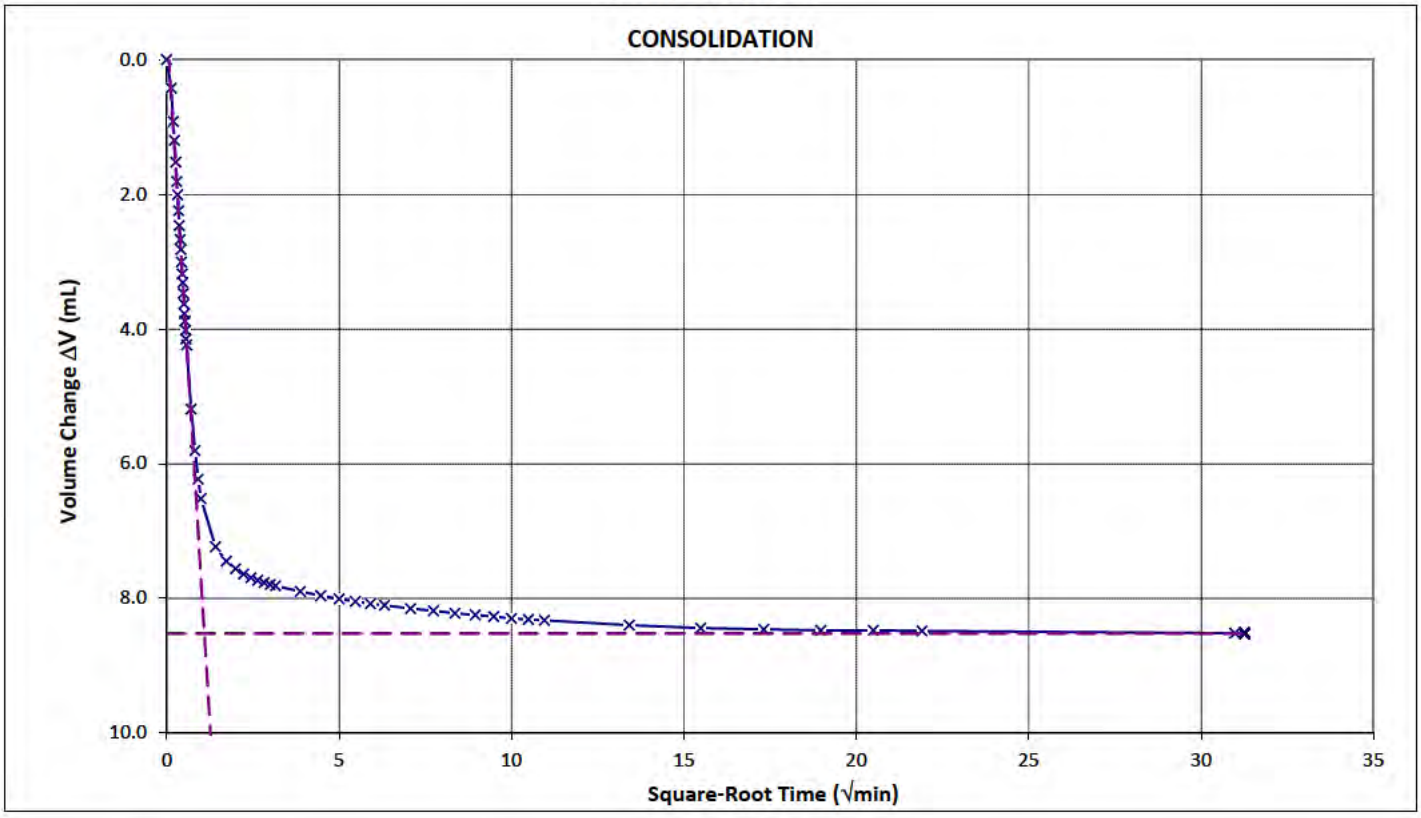
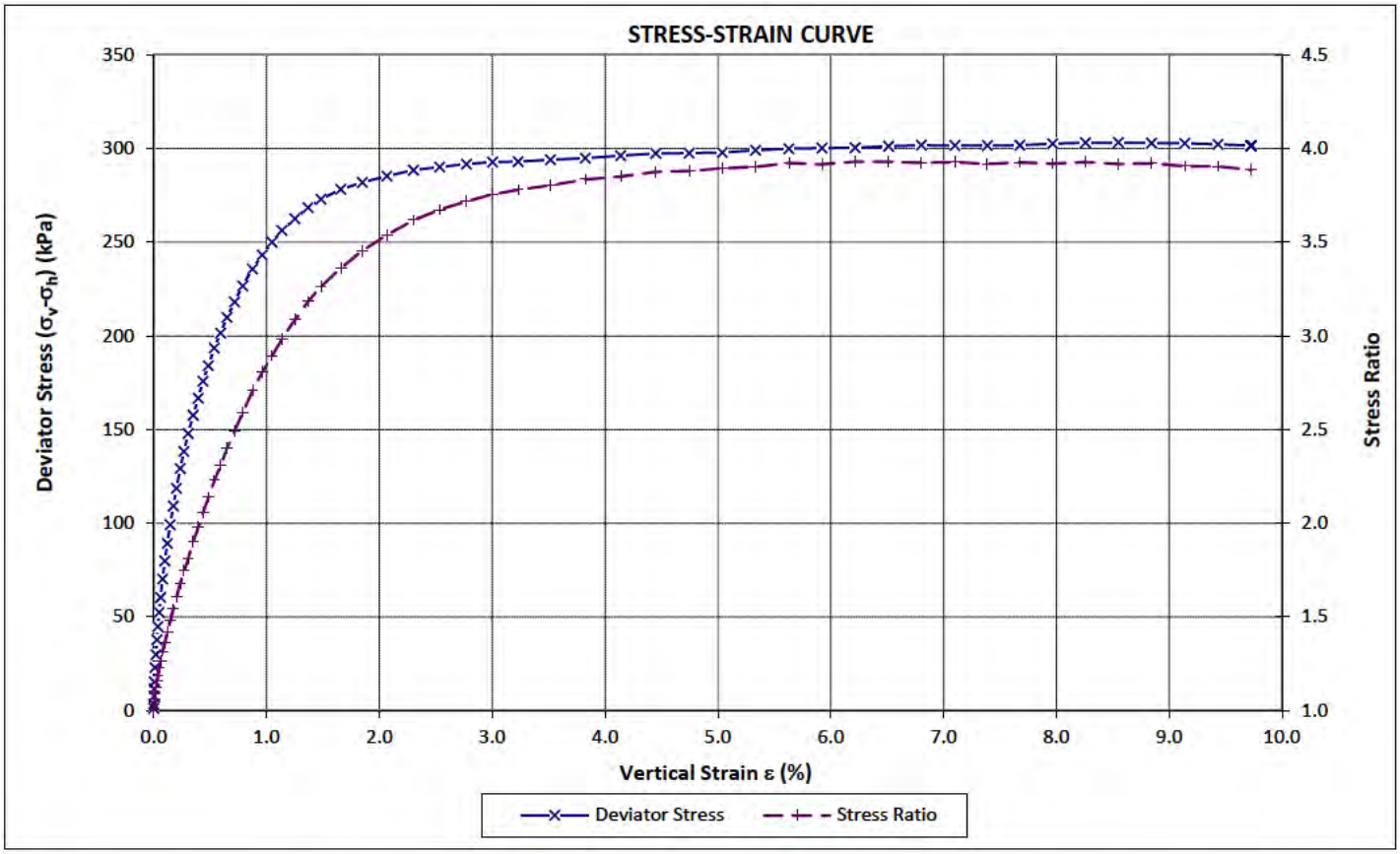
Site: UoA Student Centre & Library Location ID: BH03
Sample Ref.: -- Geotechnics ID: -- Depth: 8.35 - 8.48 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 3 GRAPHS





Tested by: PAVI/ PIHE Date: 3/09/2026 Approved by KTP: YHW Date: 21/09/2026

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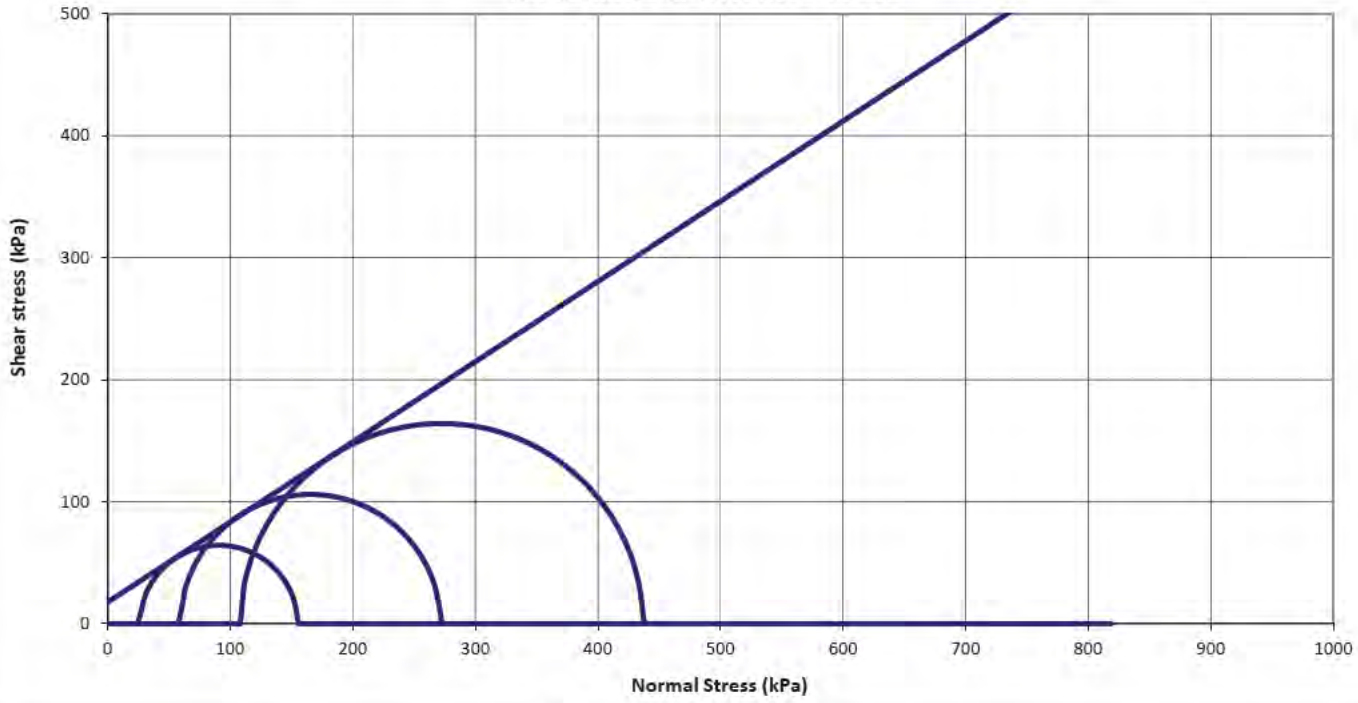
Geotechnics Project ID: 1103850.0000.01.0
Customer Project ID: 1103046
Test Schedule Reference: --

Site: UoA Student Centre & Library Location ID: BH05
Sample Ref.: -- Geotechnics ID: -- Depth: 7.67 - 7.80 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST (MULTI-STAGE)

MOHR CIRCLES OF EFFECTIVE STRESSES



General Sample Parameters

Initial Sample Height:	125.13	mm	Initial Water Content:	36.6	%
Initial Sample Diameter:	60.88	mm	Initial Bulk Density:	1.85	t/m³
Initial B Value:	10	%	Initial Dry Density:	1.35	t/m³
B Value before Consolidation:	94	%	Final Water Content:	35.7	%

Test Results

	At the End of Consolidation Stage					Failure Values						Failure Mode & Photo
	Effective Stress		Back	Volumetric		Deviator Stress	Vertical	Effective Stress		Corrections (kPa)		
	Horizontal σ_h'(kPa)	Vertical σ_v'(kPa)	Pressure (kPa)	Strain (%)	Rate (%/hr)	$(\sigma_v' - \sigma_h')$ (kPa)	Strain ε (%)	Vertical σ_v' (kPa)	Horizontal σ_h'(kPa)	Membrane $(\Delta\sigma_v)_m$	Filter P $(\Delta\sigma_v)_{fp}$	
Stage 1	60	61	300	1.37	0.01	128.54	2.92	154.94	26.40	1.13	3.76	Plastic
Stage 2	125	126	300	1.73	0.00	211.96	3.13	271.46	59.50	1.21	3.76	
Stage 3	250	251	300	2.65	0.00	328.25	4.72	436.65	108.40	1.82	3.77	



Effective Strength

Angle of Frictional Resistance: $\phi' =$ 33 °
Cohesion: $c' =$ 18 kPa
Linear Regression Coefficient: $r =$ 1.000

Sample History: Undisturbed core trimmed at natural water content.

Soil description: SILT with some clay and a trace of sand: brownish grey. Stiff, moist.

Test Speed: 0.028 (mm/min)

Test Remarks: The sample was saturated by increments of cell pressure and back pressure.
It was drained from radial boundary and both ends in the consolidation stages.
Failure for each stage was determined by the maximum effective stress ratio. Strength parameters have been derived by using a linear regression fitting method.

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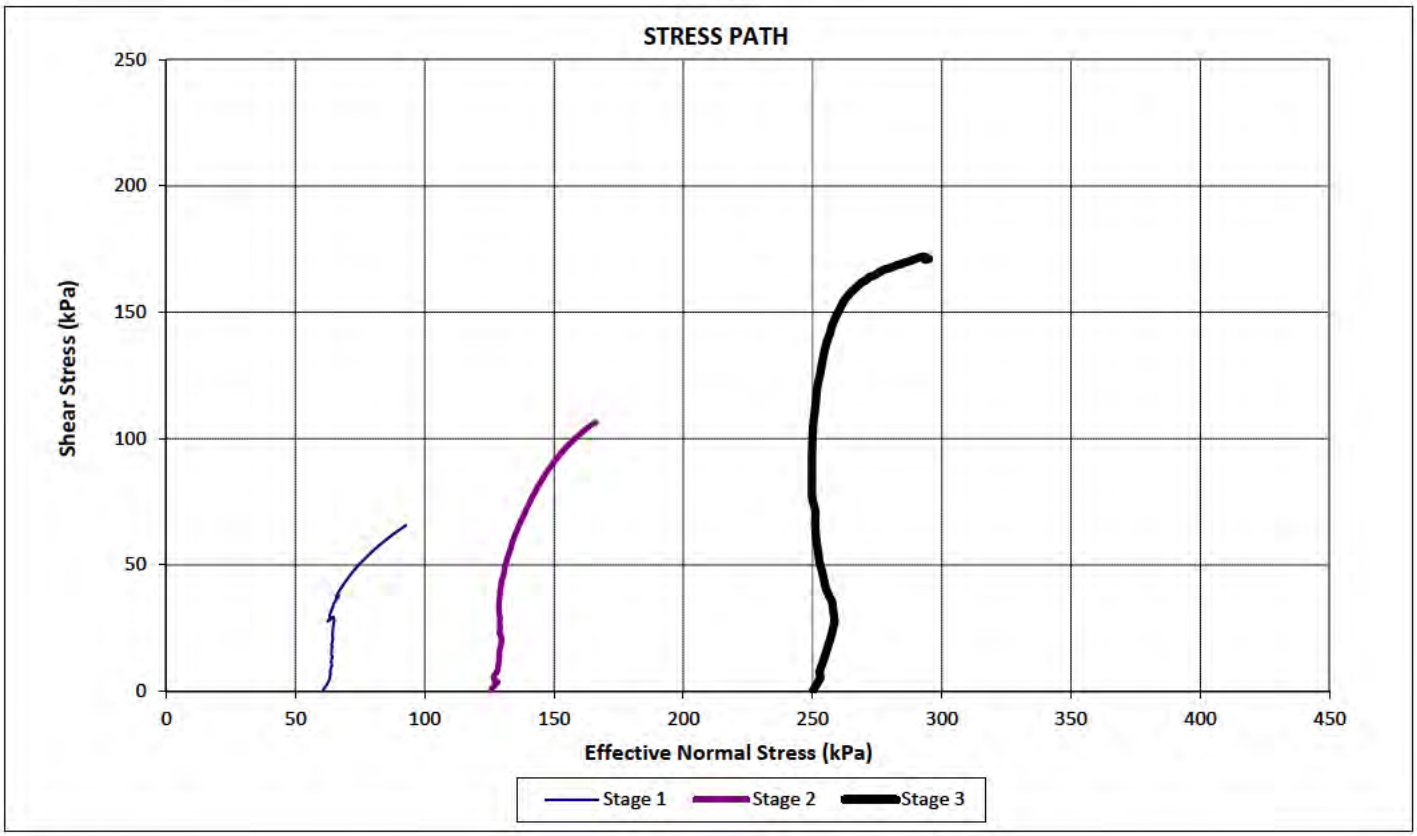
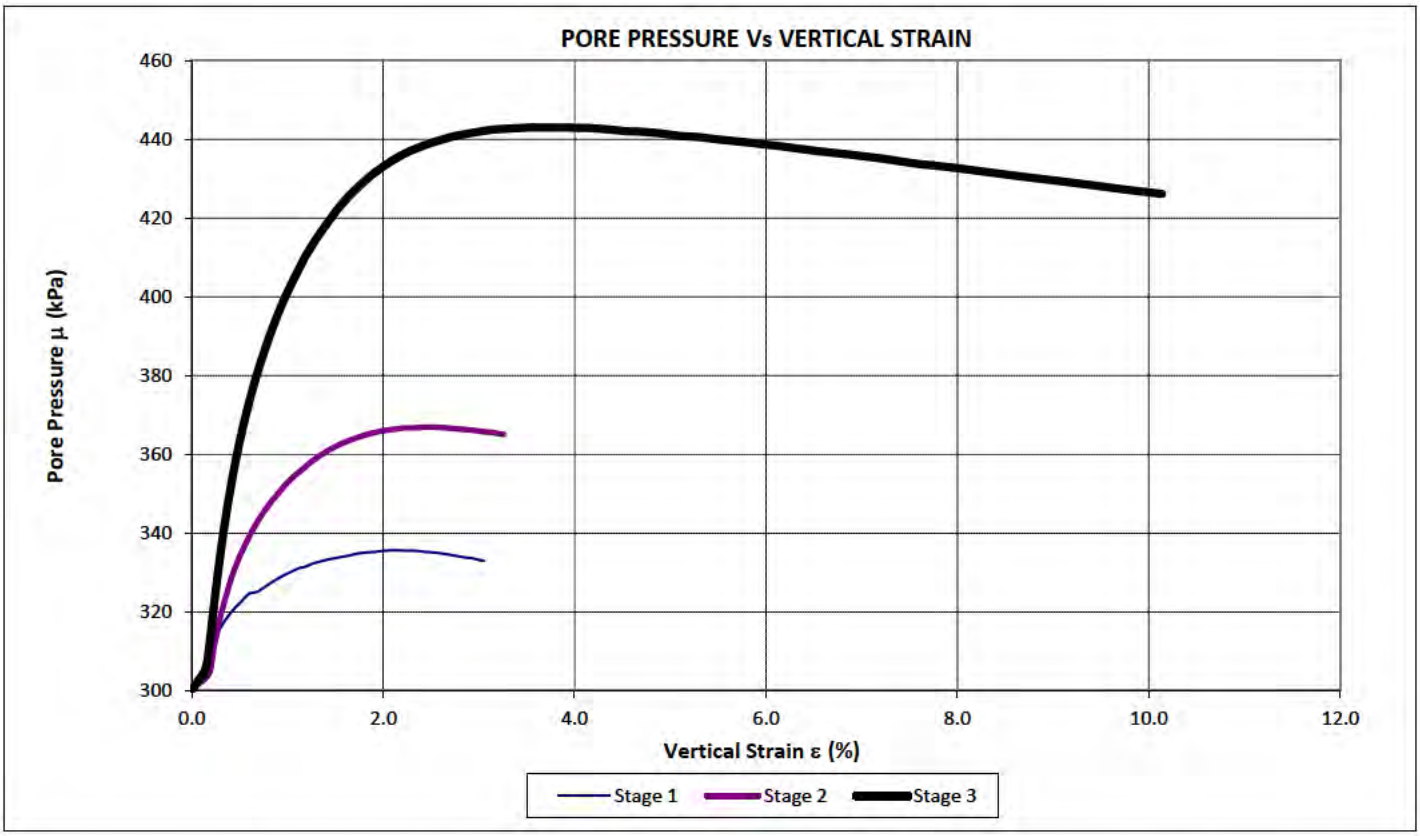
Test Schedule Reference: --

Site: UoA Student Centre & Library Location ID: BH05
Sample Ref.: -- Geotechnics ID: -- Depth: 7.67 - 7.80 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

GRAPHS





Tested by: PAVI Date: 19/09/2026 Approved by KTP: YHW Date: 22/09/2026

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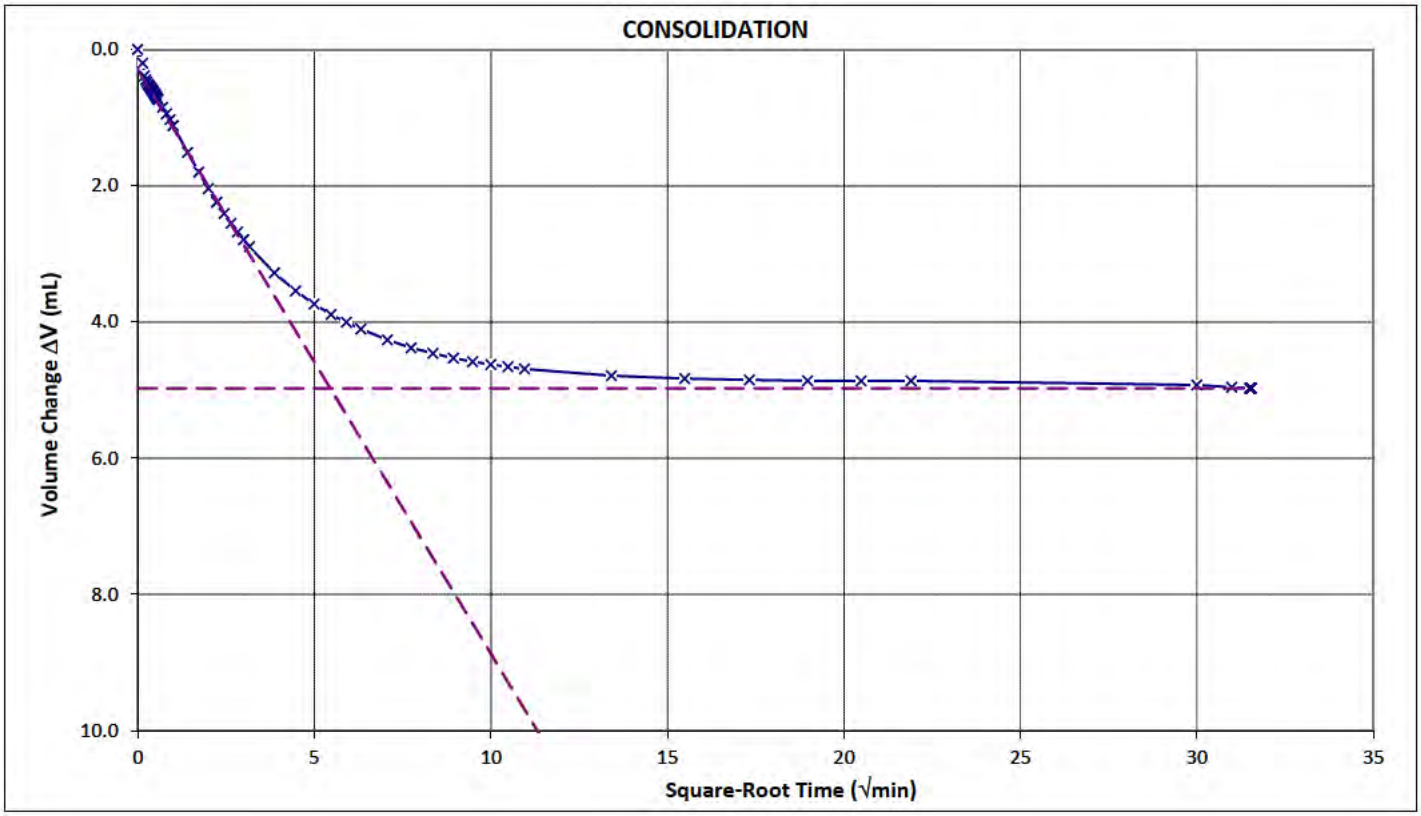
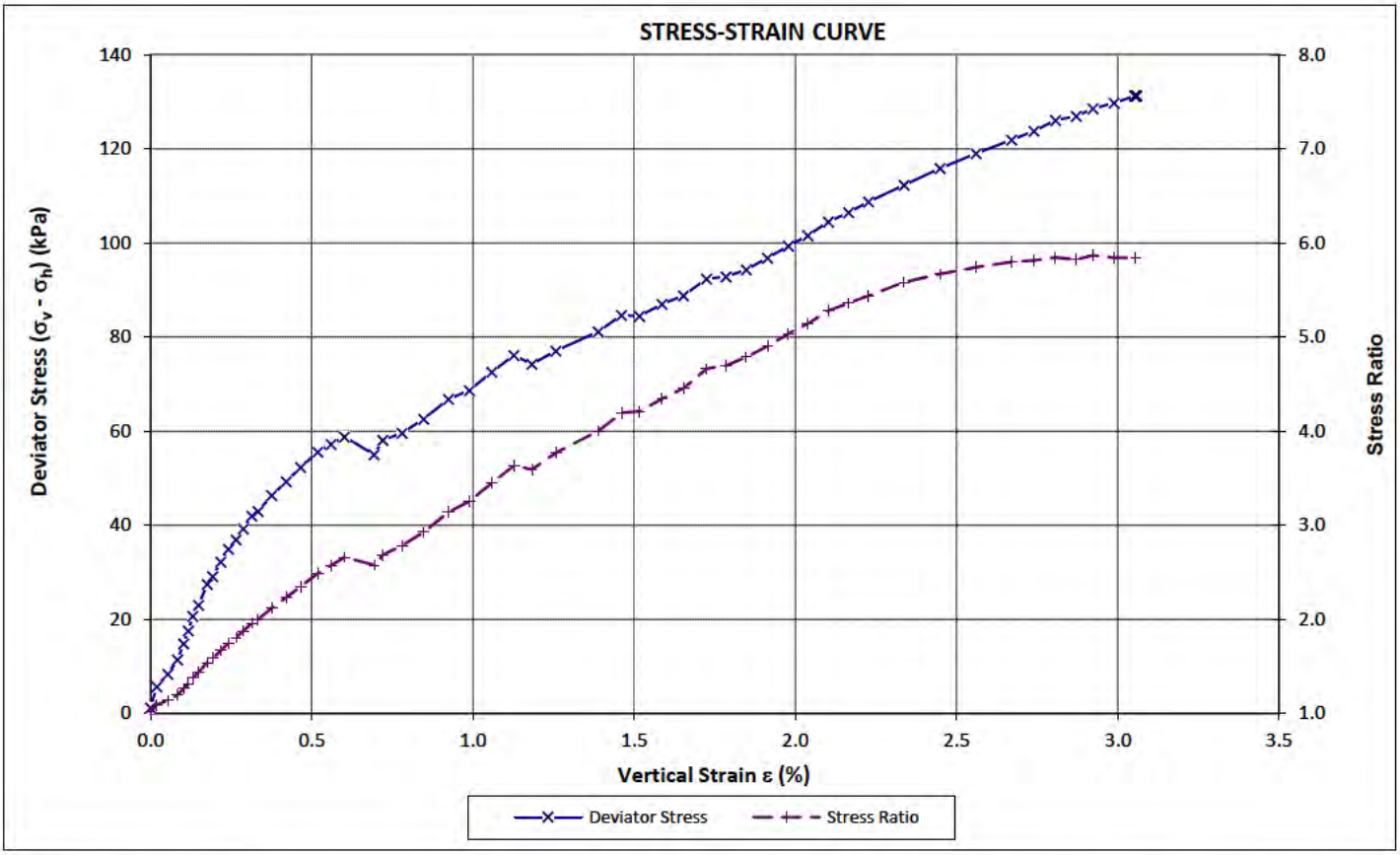
Sample Ref.: -- Geotechnics ID: -- Depth: 7.67 - 7.80 (m)
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 1 GRAPHS

CONSOLIDATION



STRESS-STRAIN CURVE



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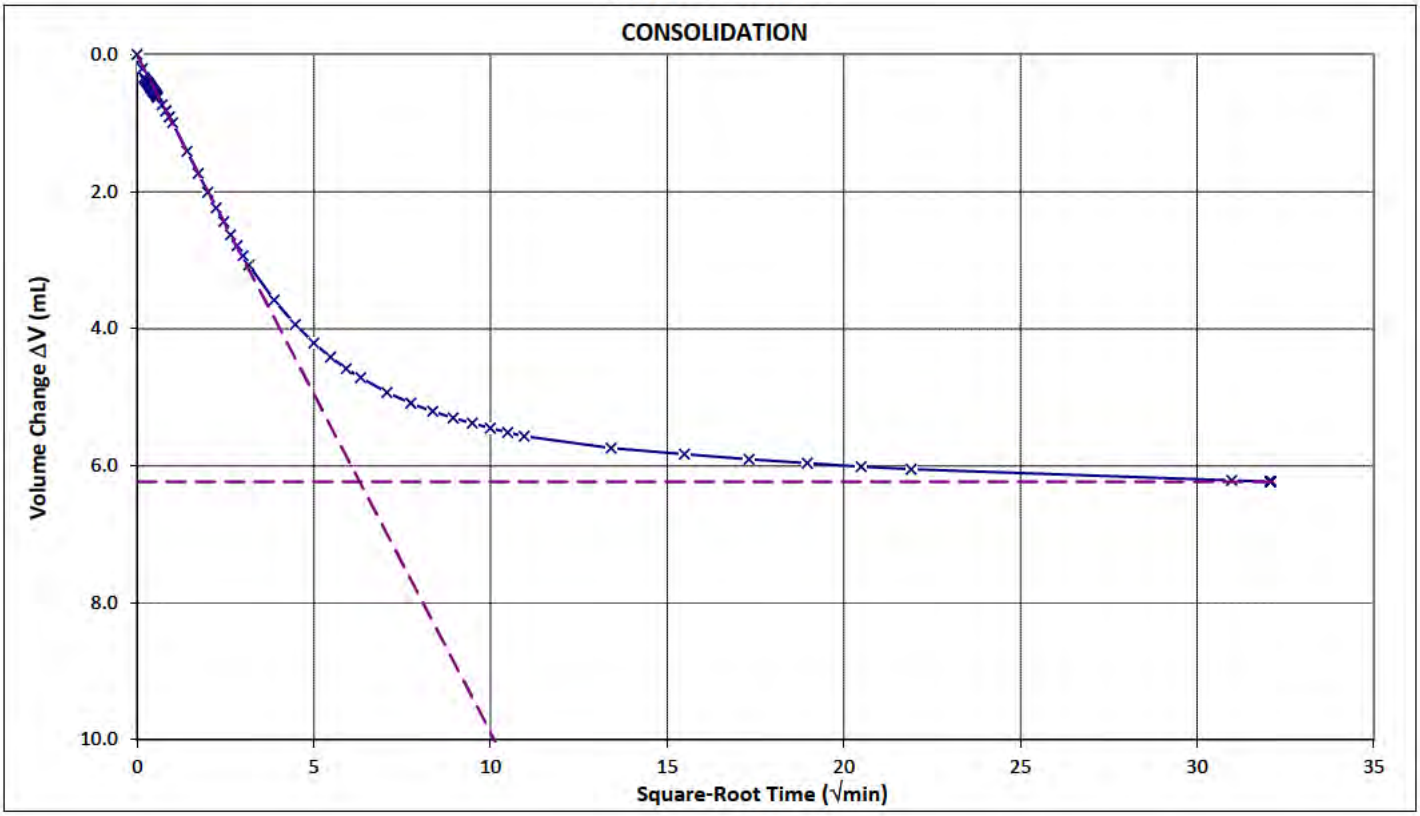
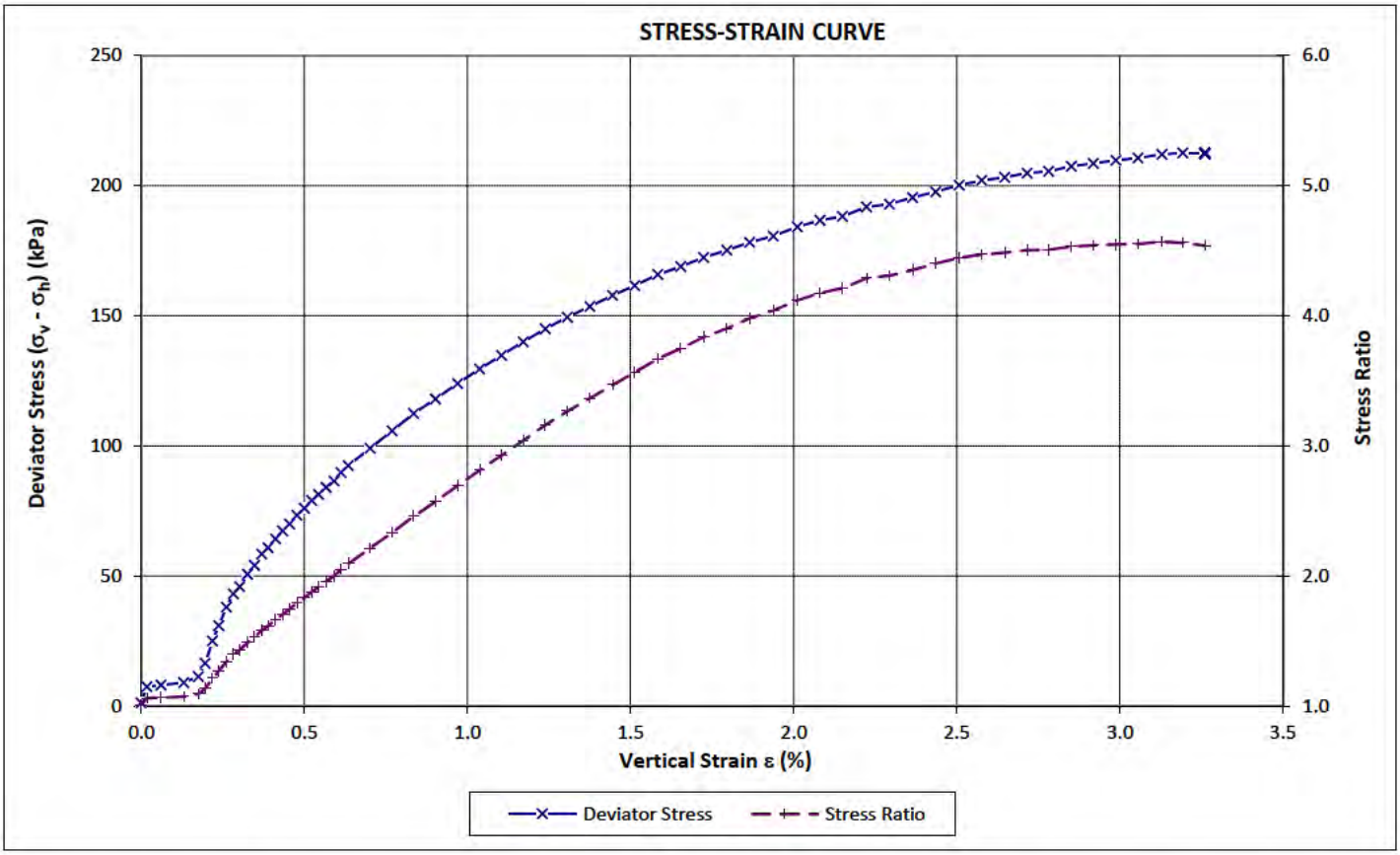
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 2 GRAPHS





Tested by: PAVI Date: 19/09/2026 Approved by KTP: YHW Date: 22/09/2026

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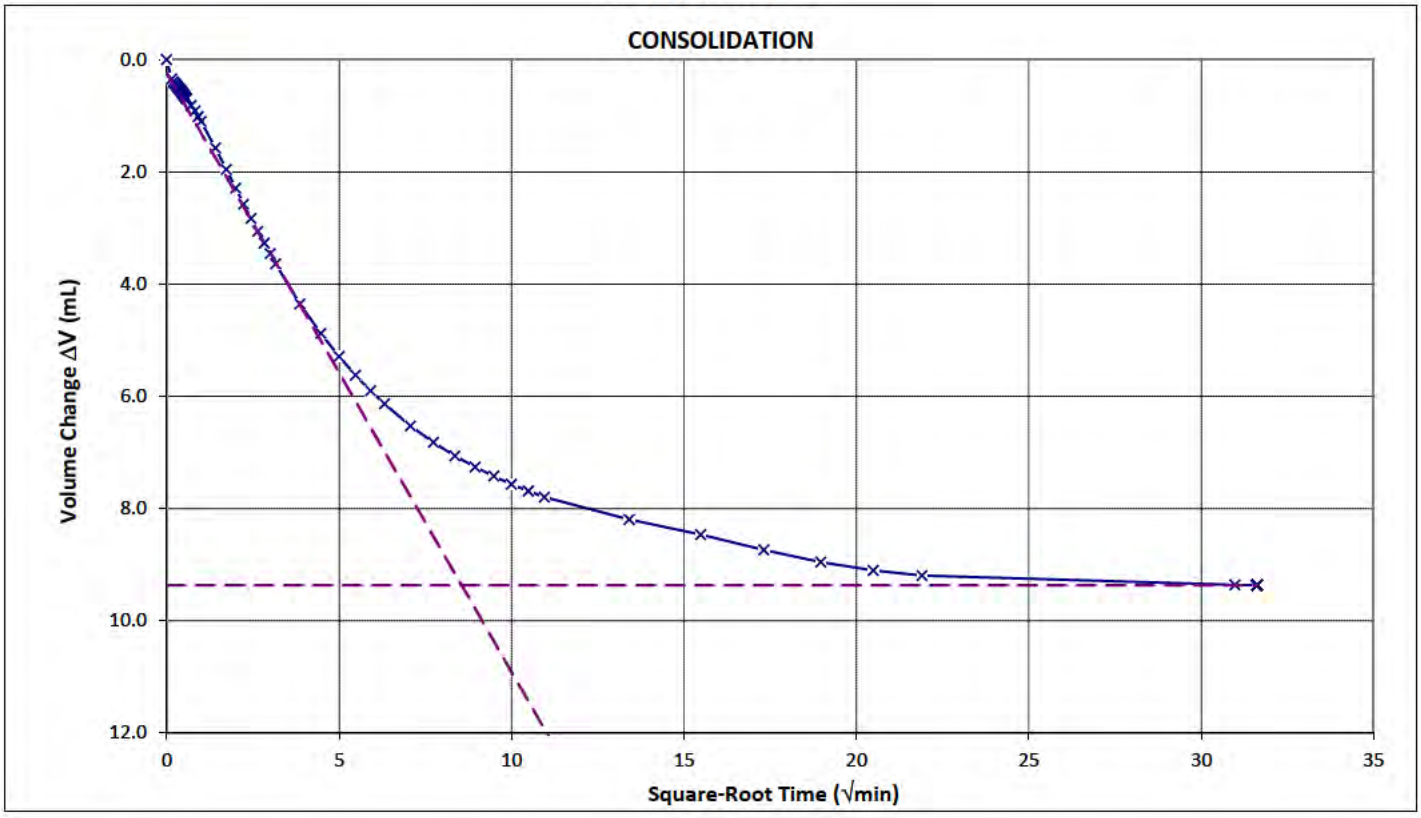
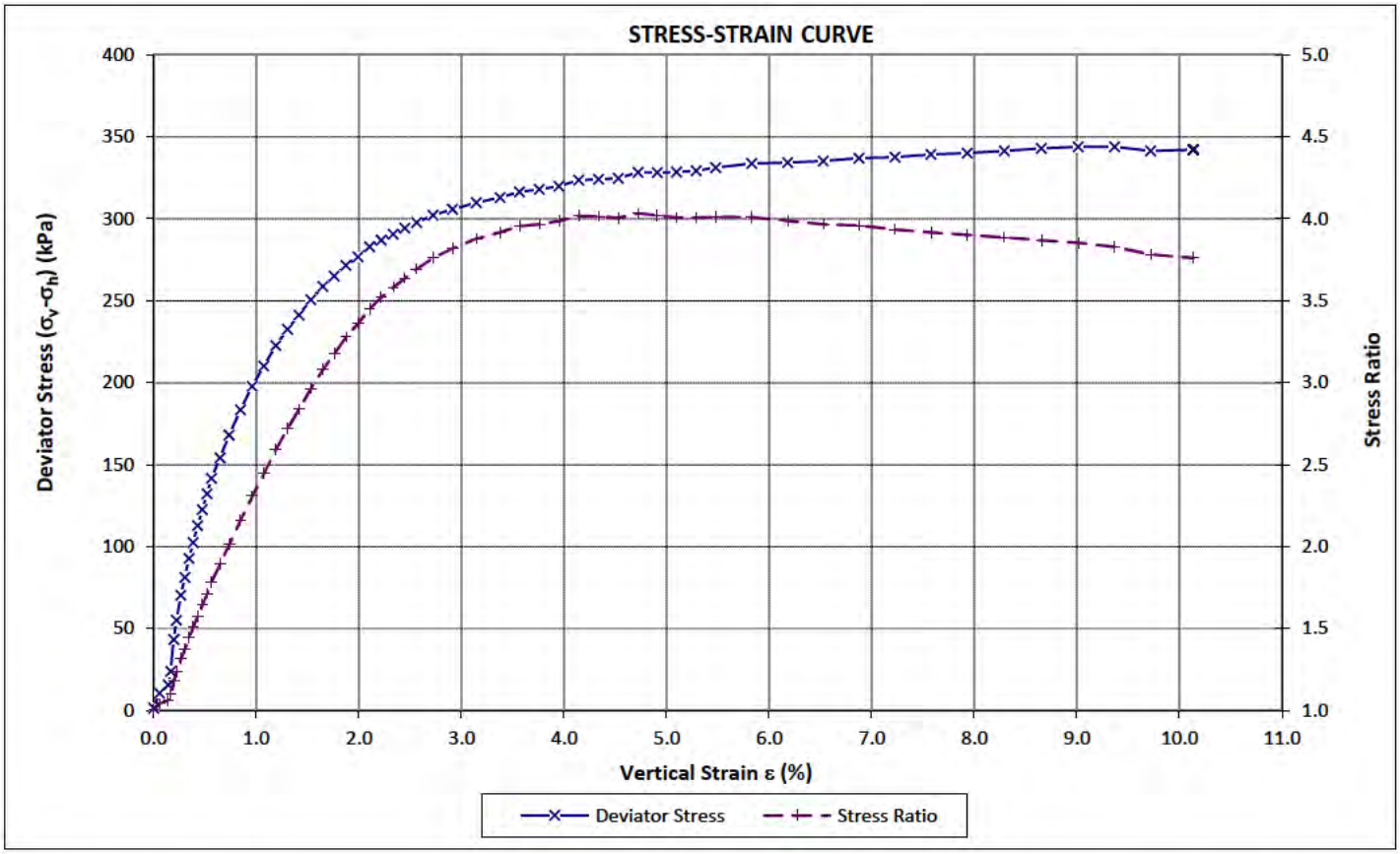
Test method used: ISO 17892-9:2018 Part 9 Isotropic consolidated-undrained triaxial compression test on water saturated soils (CIU)
NZS 4402:1986 Test 2.1 Determination of Water Content

STAGE 3 GRAPHS





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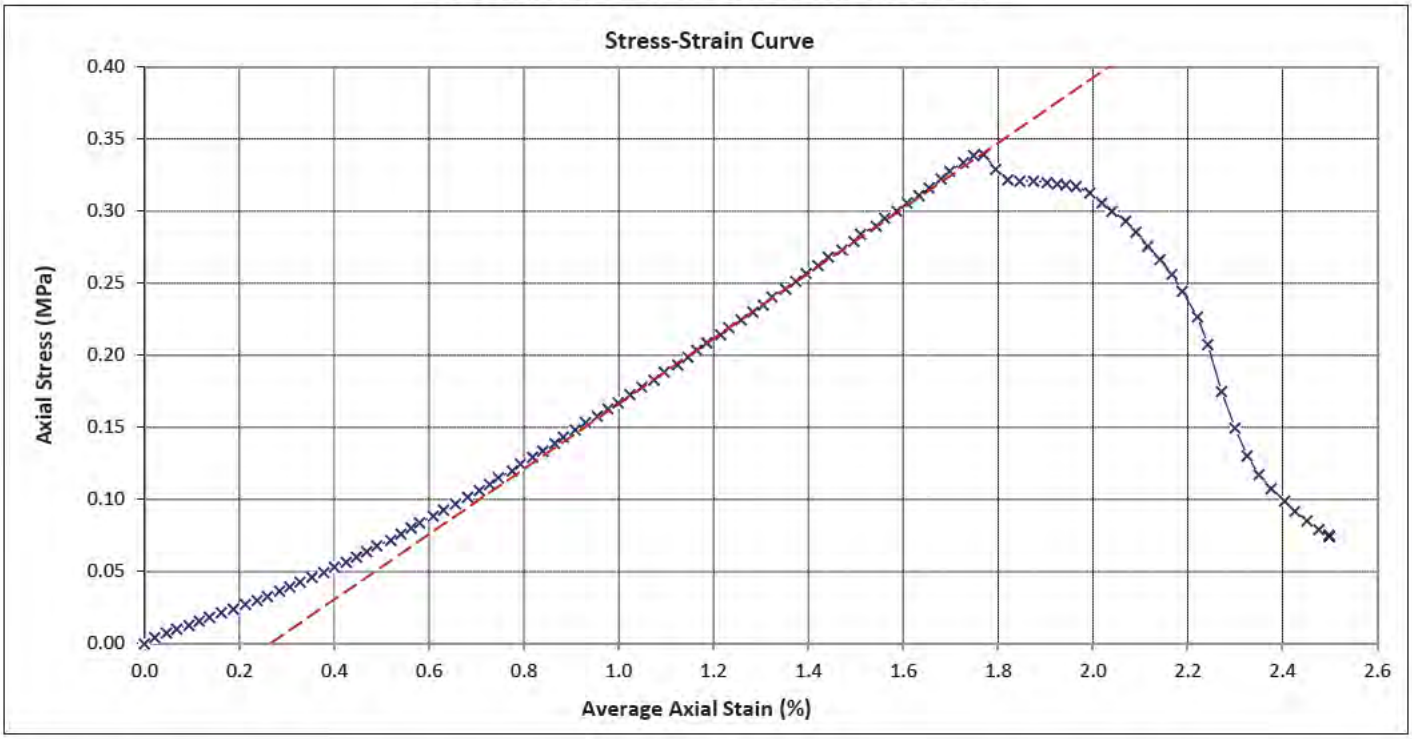
Test Schedule Reference: --

Site:	UoA Student Centre & Library		Location ID:	BH01
Sample Ref.:	--	Geotechnics ID: --	Depth:	24.71-24.85 (m)
Test method used:	ASTM D7012-23 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures (Method C and D) ASTM D2216 Determination of Water (Moisture) Content of Soil and Rock by Mass			

UNCONFINED COMPRESSION STRENGTH TEST



Initial Sample Parameters:

Sample Length (mm)	138.69	Bulk Density (t/m³)	2.06
Sample Diameter (mm)	62.21	Dry Density (t/m³)	1.69
Test Length (mm)	138.69	Water Content (%)	21.7
Test Height / Diameter Ratio	2.2		

Failure Value:

Average Global Axial Strain ε (%)	Unconfined Compressive Strength q_u (MPa)	Rate of Compression (mm/min)	Failure Mode
1.77	0.34	0.19	Shear

Young's Modulus (MPa): 23

Sample History: Core sample trimmed at natural water content.

Sample Description: Dark grey, Extremely Weak, SLITSTONE/SANDSTONE

Test Remarks: Unconfined Compressive Strength reported to the nearest 0.01 MPa.

Failure Photo



Tested by:	MOKO/PIHE	Date:	17/09/2026	Approved by KTP:		Date:	22/09/2026

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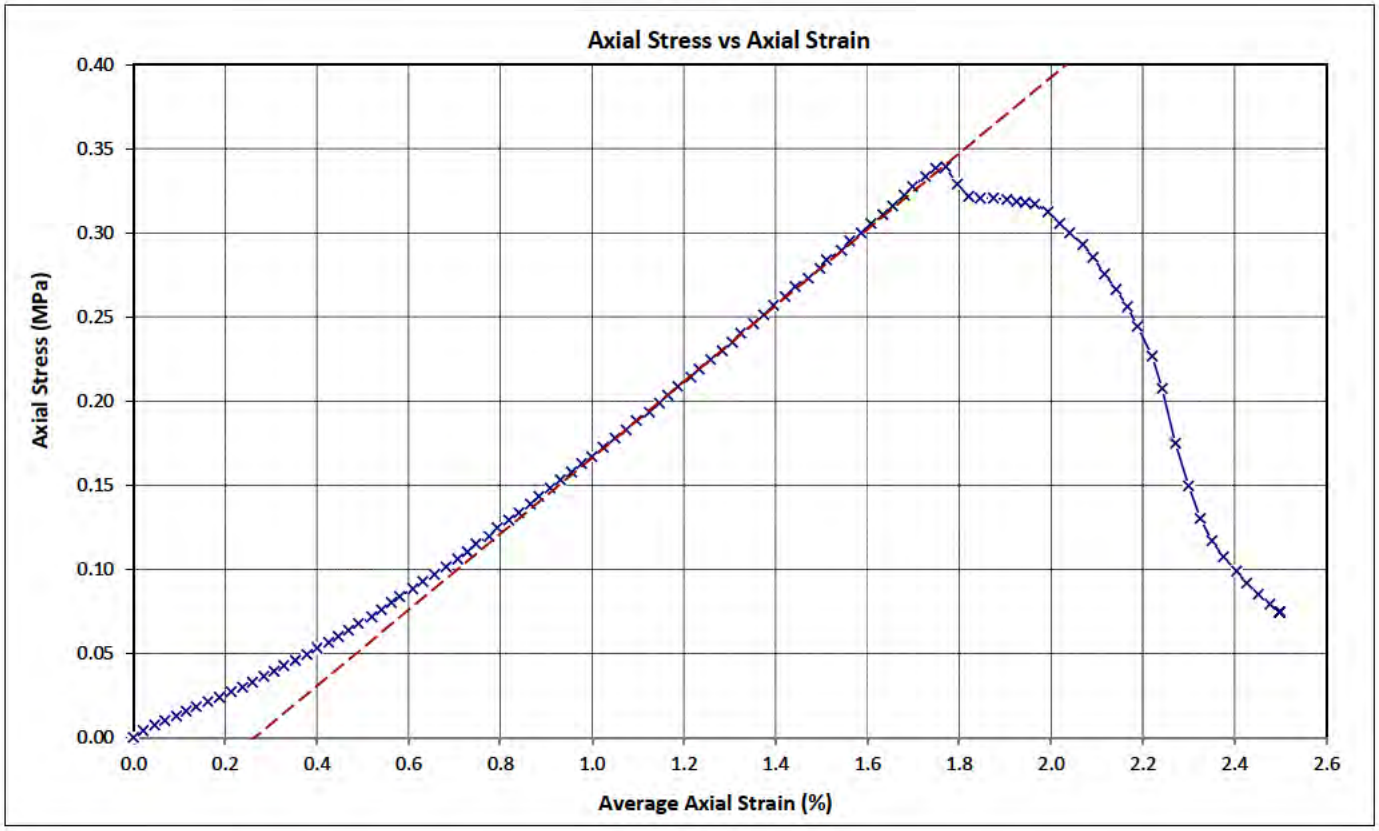
Geotechnics Project ID: 1103850.0000.01.0
Customer Project ID: 1103046
Test Schedule Reference: --

Site:	UoA Student Centre & Library	Location ID:	BH01
Sample Ref.:	-- Geotechnics ID: --	Depth (m):	24.71-24.85

Test method used: ASTM D7012-23 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures (Method C and D)
ASTM D2216 Determination of Water (Moisture) Content of Soil and Rock by Mass

GRAPHS





Tested by:	MOKO/PIHE	Date:	17/09/2026	Approved by KTP:	YHW	Date:	22/09/2026

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Geotechnics Project ID: 1103850.0000.01.0
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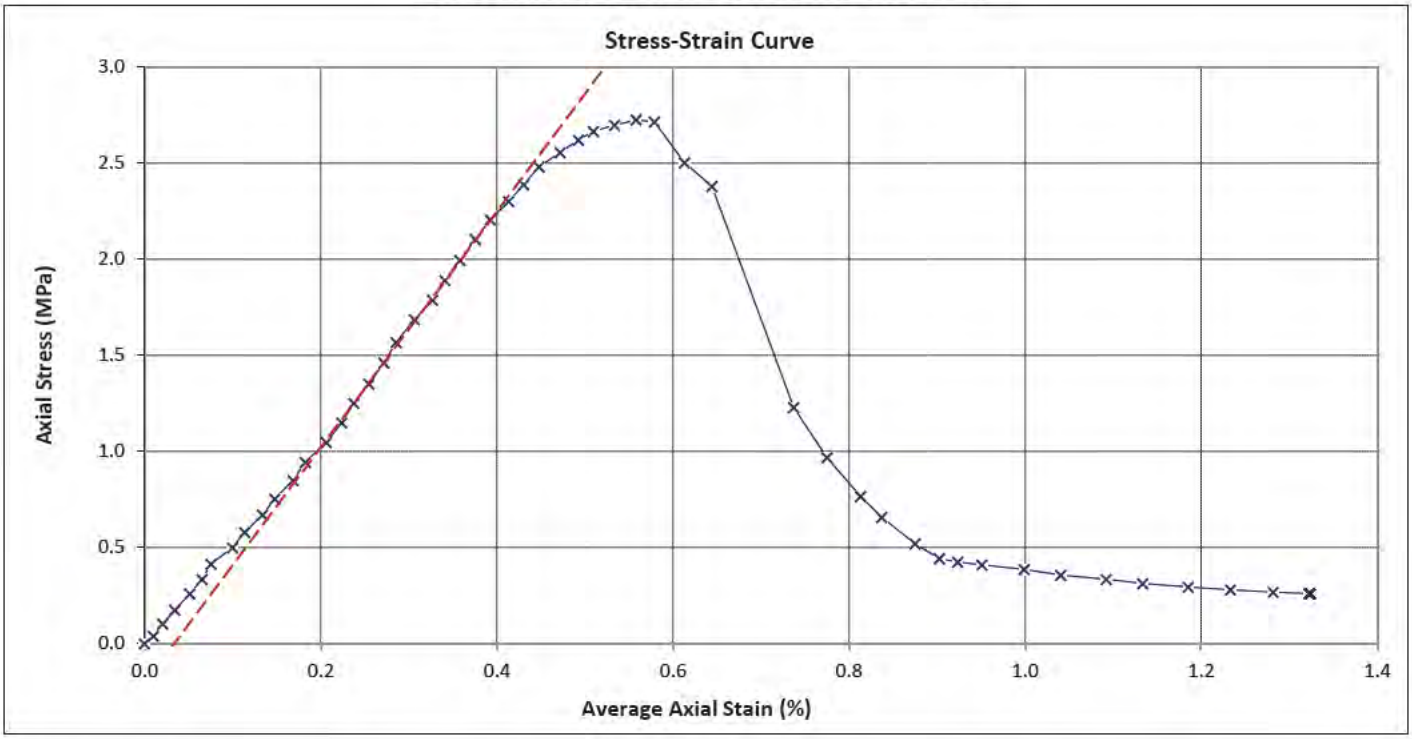
Test Schedule Reference: --

Site:	UoA Student Centre & Library		Location ID:	BH02
Sample Ref.:	--	Geotechnics ID: --	Depth:	20.42-20.56 (m)
Test method used:	ASTM D7012-23 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures (Method C and D) ASTM D2216 Determination of Water (Moisture) Content of Soil and Rock by Mass			

UNCONFINED COMPRESSION STRENGTH TEST



Initial Sample Parameters:

Sample Length (mm)	145.12	Bulk Density (t/m³)	2.11
Sample Diameter (mm)	59.36	Dry Density (t/m³)	1.81
Test Length (mm)	145.12	Water Content (%)	16.9
Test Height / Diameter Ratio	2.4		

Failure Value:

Average Global Axial Strain ε (%)	Unconfined Compressive Strength q_u (MPa)	Rate of Compression (mm/min)	Failure Mode
0.56	2.7	0.13	Shear

Young's Modulus (MPa): 613

Sample History: Core sample trimmed at natural water content.

Sample Description: Dark Grey, Very weak, SLITSTONE/SANDSTONE

Test Remarks: Unconfined Compressive Strength reported to the nearest 0.1 MPa.

Failure Photo



Tested by:	MOKO/PIHE	Date:	17/09/2026	Approved by KTP:		Date:	22/09/2026

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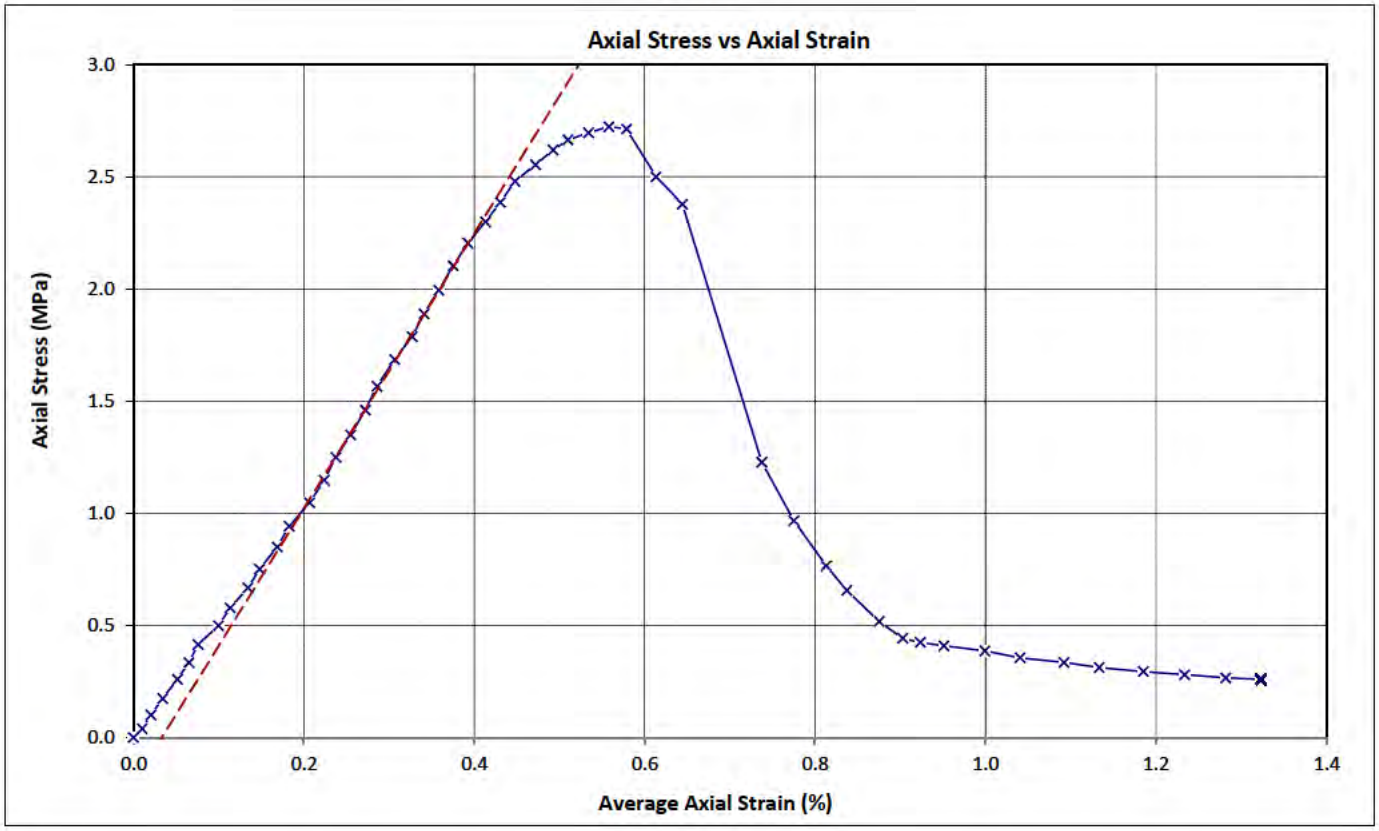
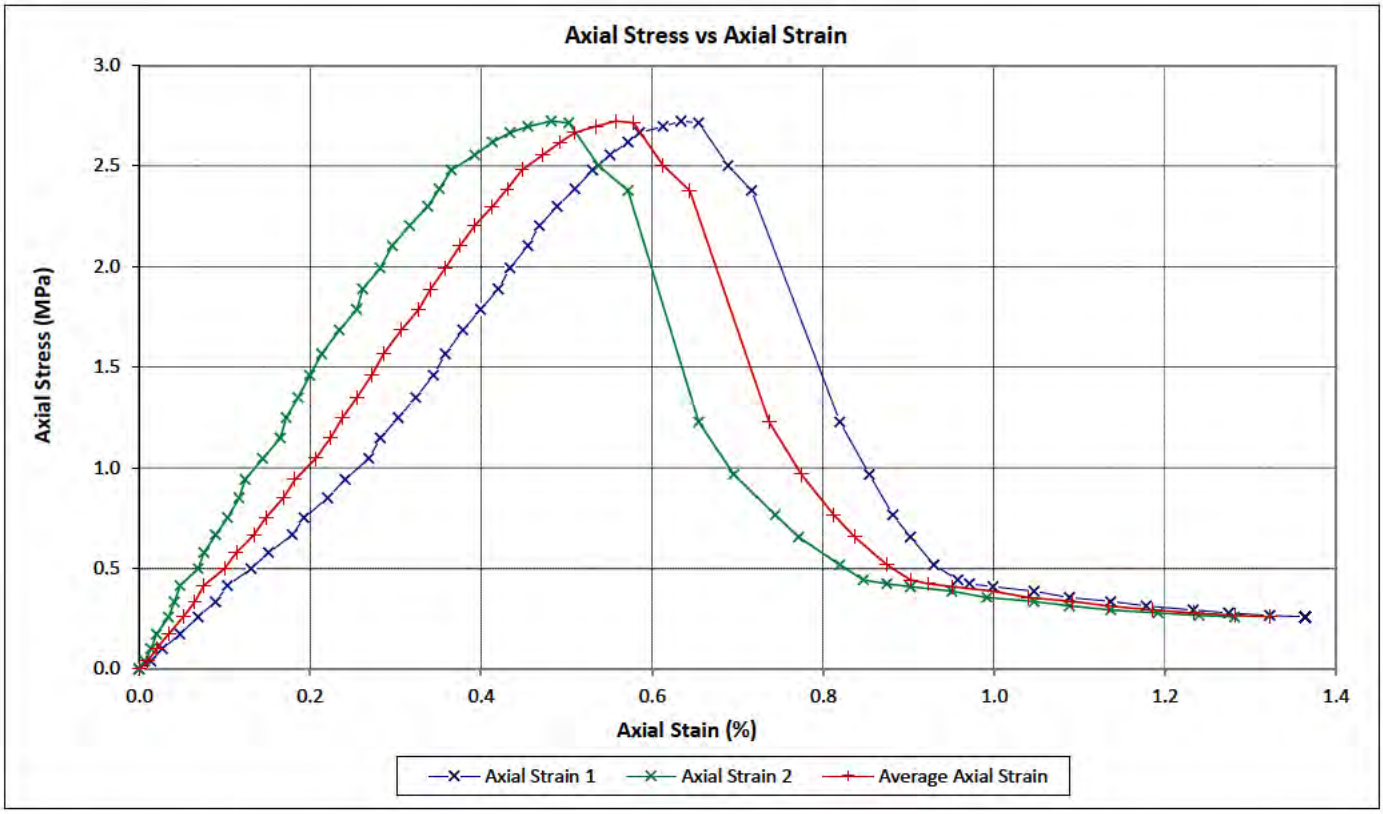
Customer Project ID: 1103046
Test Schedule Reference: --

Site:	UoA Student Centre & Library	Location ID:	BH02
Sample Ref.:	-- Geotechnics ID: --	Depth (m):	20.42-20.56

Test method used: ASTM D7012-23 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures (Method C and D)
ASTM D2216 Determination of Water (Moisture) Content of Soil and Rock by Mass

GRAPHS





Tested by: MOKO/PIHE Date: 17/09/2026 Approved by KTP: YHW Date: 22/09/2026

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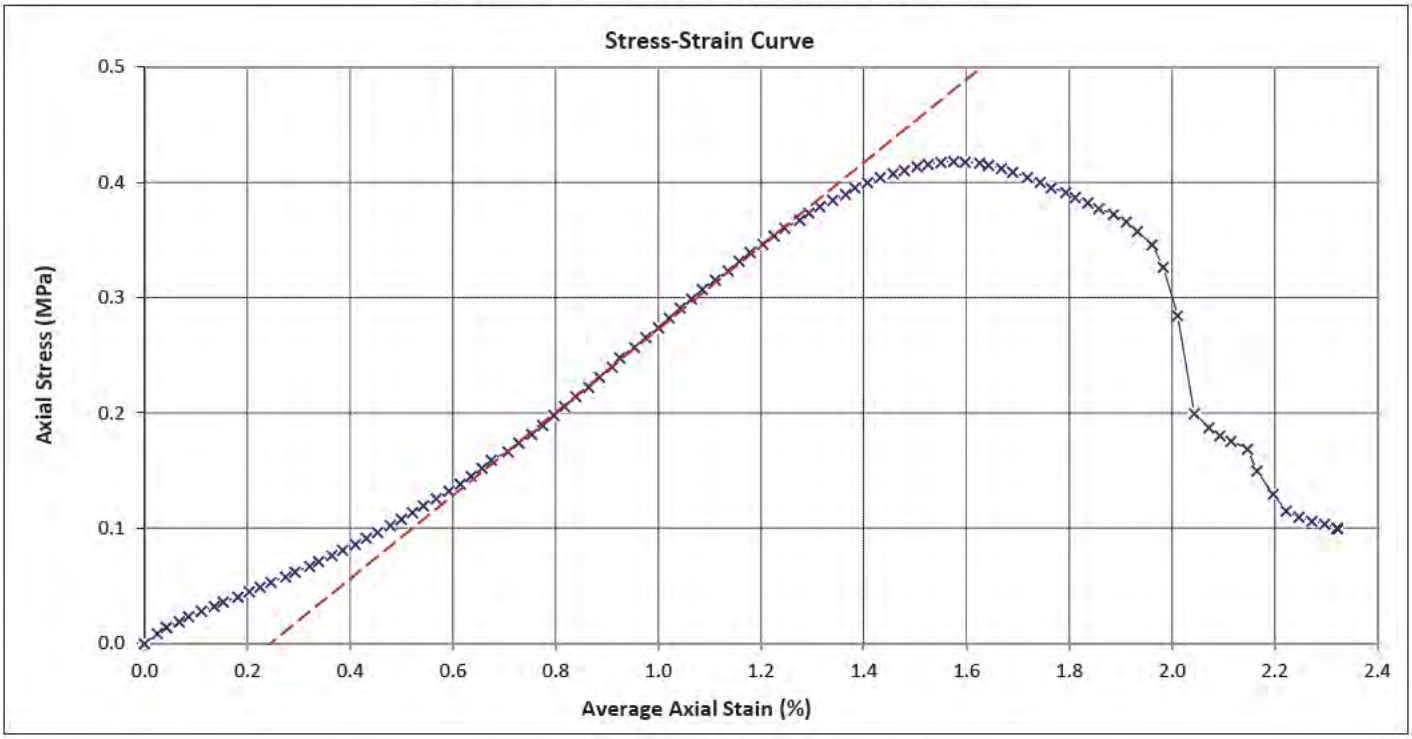
Geotechnics Project ID: 1103850.0000.01.0
Customer Project ID: 1103046
Test Schedule Reference: --

Site:	UoA Student Centre & Library		Location ID:	BH04
Sample Ref.:	--	Geotechnics ID: --	Depth:	12.82-12.96 (m)
Test method used:	ASTM D7012-23 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures (Method C and D) ASTM D2216 Determination of Water (Moisture) Content of Soil and Rock by Mass			

UNCONFINED COMPRESSION STRENGTH TEST



Initial Sample Parameters:

Sample Length (mm)	139.94	Bulk Density (t/m³)	2.06
Sample Diameter (mm)	62.41	Dry Density (t/m³)	1.72
Test Length (mm)	139.94	Water Content (%)	20.1
Test Height / Diameter Ratio	2.2		

Failure Value:

Average Global Axial Strain ε (%)	Unconfined Compressive Strength q_u (MPa)	Rate of Compression (mm/min)	Failure Mode
1.58	0.42	0.19	Shear

Young's Modulus (MPa): 36

Sample History: Core sample trimmed at natural water content.

Sample Description: Dark grey, Extremely Weak, SLITSTONE/SANDSTONE

Test Remarks: Unconfined Compressive Strength reported to the nearest 0.01 MPa.

Failure Photo



Tested by:	MOKO/PIHE	Date:	17/09/2026	Approved by KTP:		Date:	22/09/2026

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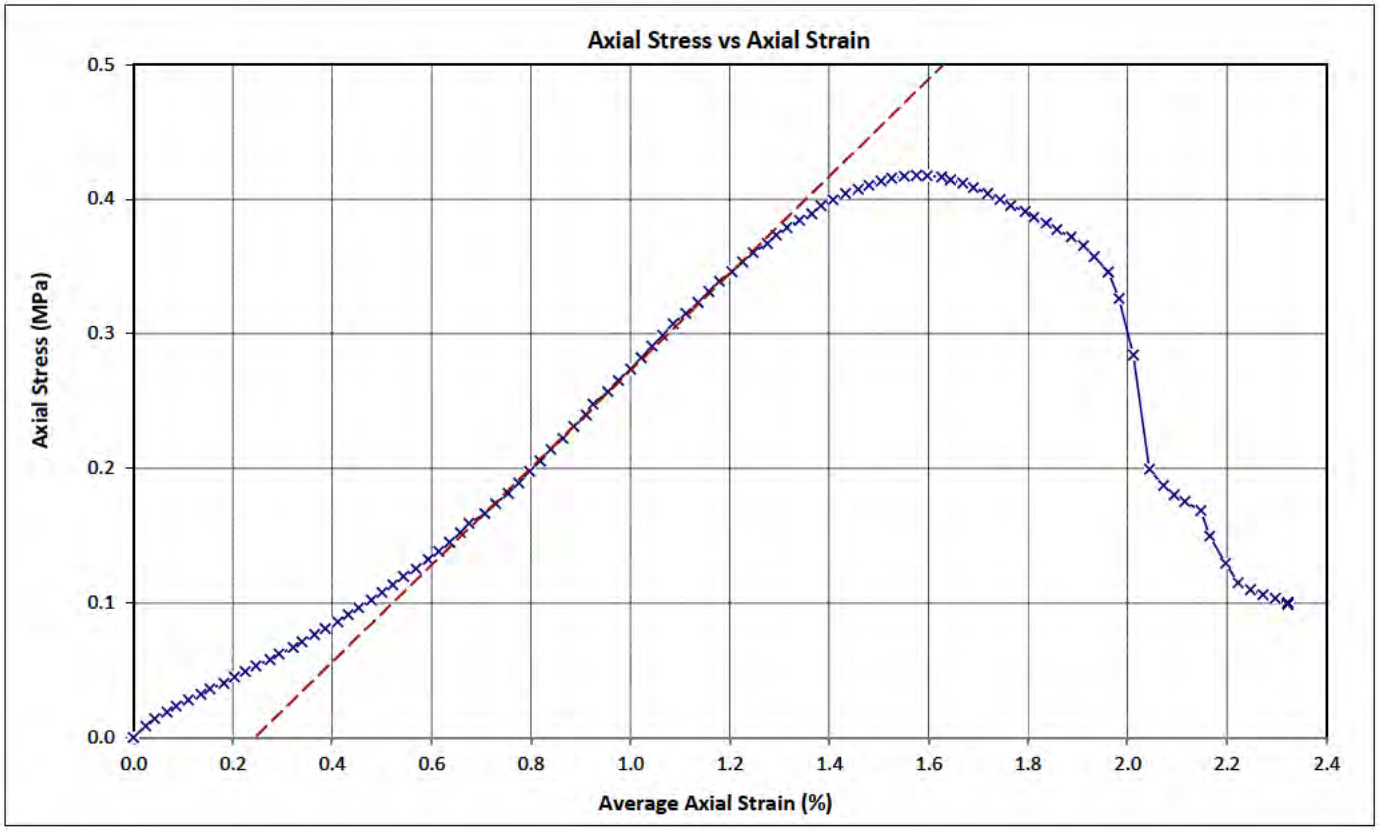
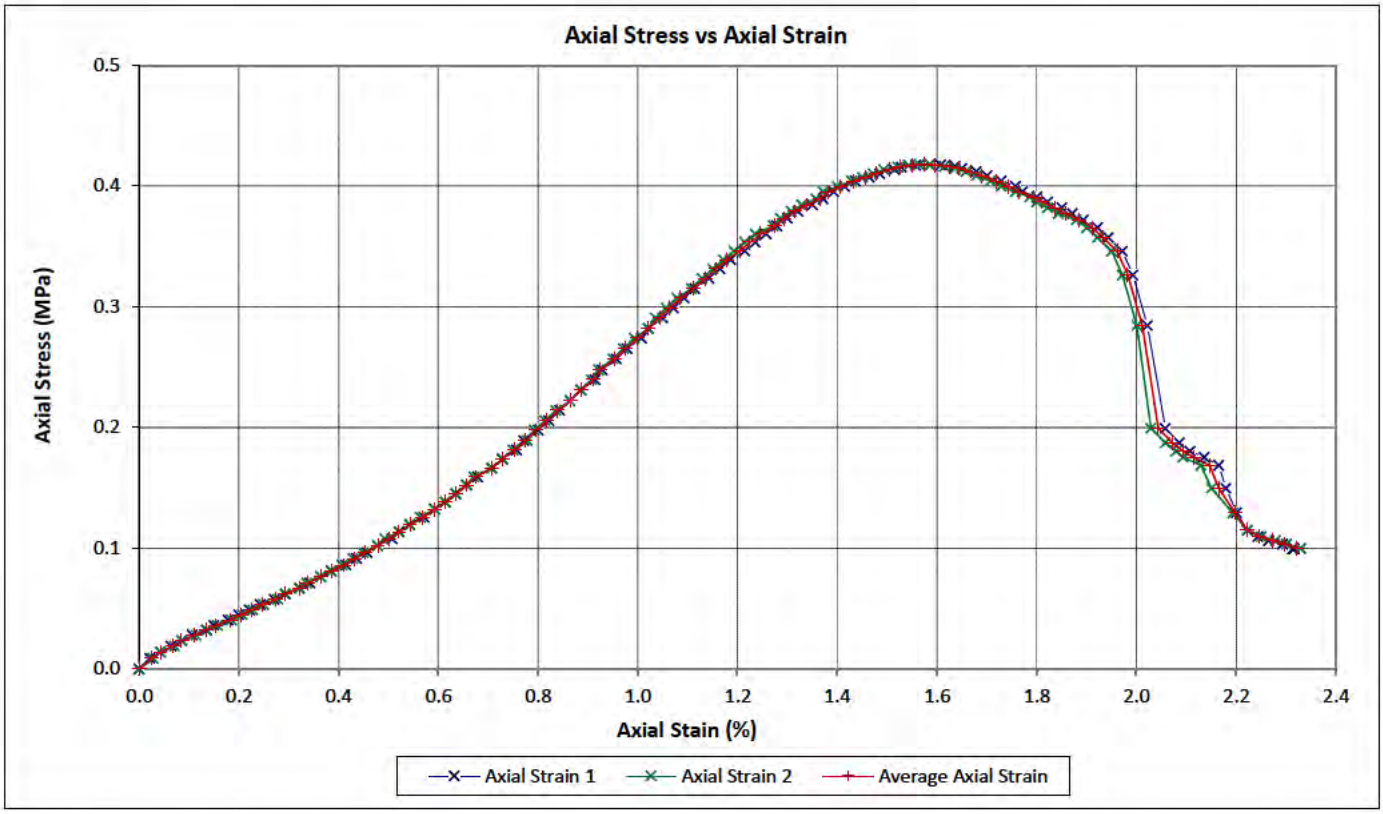
Customer Project ID: 1103046
Test Schedule Reference: --

Site:	UoA Student Centre & Library	Location ID:	BH04
Sample Ref.:	-- Geotechnics ID: --	Depth (m):	12.82-12.96

Test method used: ASTM D7012-23 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures (Method C and D)
ASTM D2216 Determination of Water (Moisture) Content of Soil and Rock by Mass

GRAPHS





Tested by:	MOKO/PIHE	Date:	17/09/2026	Approved by KTP:	YHW	Date:	22/09/2026

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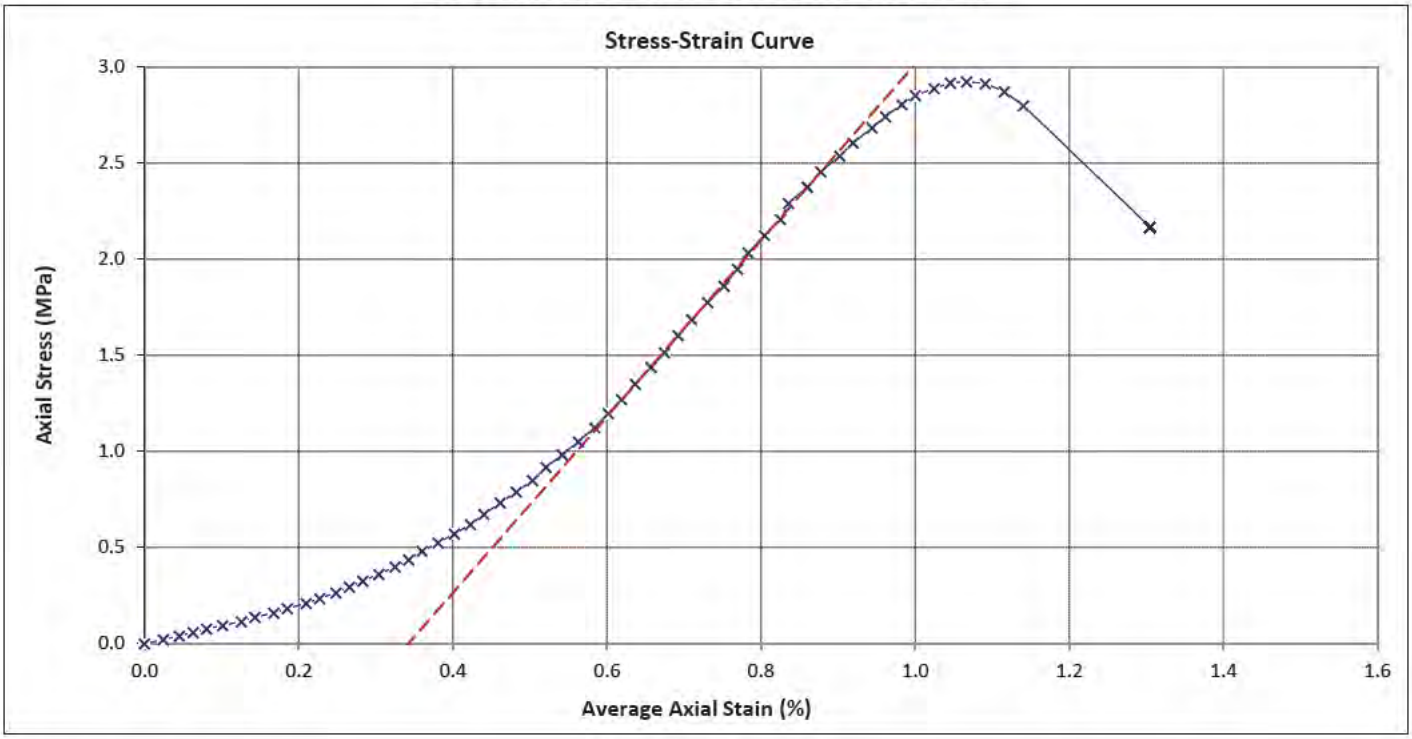
Geotechnics Project ID: 1103850.0000.01.0
Customer Project ID: 1103046
Test Schedule Reference: --

Site:	UoA Student Centre & Library		Location ID:	BH05
Sample Ref.:	--	Geotechnics ID: --	Depth:	8.02-8.16 (m)
Test method used:	ASTM D7012-23 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures (Method C and D) ASTM D2216 Determination of Water (Moisture) Content of Soil and Rock by Mass			

UNCONFINED COMPRESSION STRENGTH TEST



Initial Sample Parameters:

Sample Length (mm)	142.93	Bulk Density (t/m³)	2.13
Sample Diameter (mm)	60.83	Dry Density (t/m³)	1.81
Test Length (mm)	142.93	Water Content (%)	17.7
Test Height / Diameter Ratio	2.3		

Failure Value:

Average Global Axial Strain ε (%)	Unconfined Compressive Strength q_u (MPa)	Rate of Compression (mm/min)	Failure Mode
1.07	2.9	0.17	Shear

Young's Modulus (MPa): 458

Sample History: Core sample trimmed at natural water content.

Sample Description: Dark Grey, Very Weak, SLITSTONE/SANDSTONE

Test Remarks: Unconfined Compressive Strength reported to the nearest 0.1 MPa.

Failure Photo



Tested by:	MOKO/PIHE	Date:	17/09/2026	Approved by KTP:		Date:	22/09/2026

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Geotechnics Project ID: 1103850.0000.01.0
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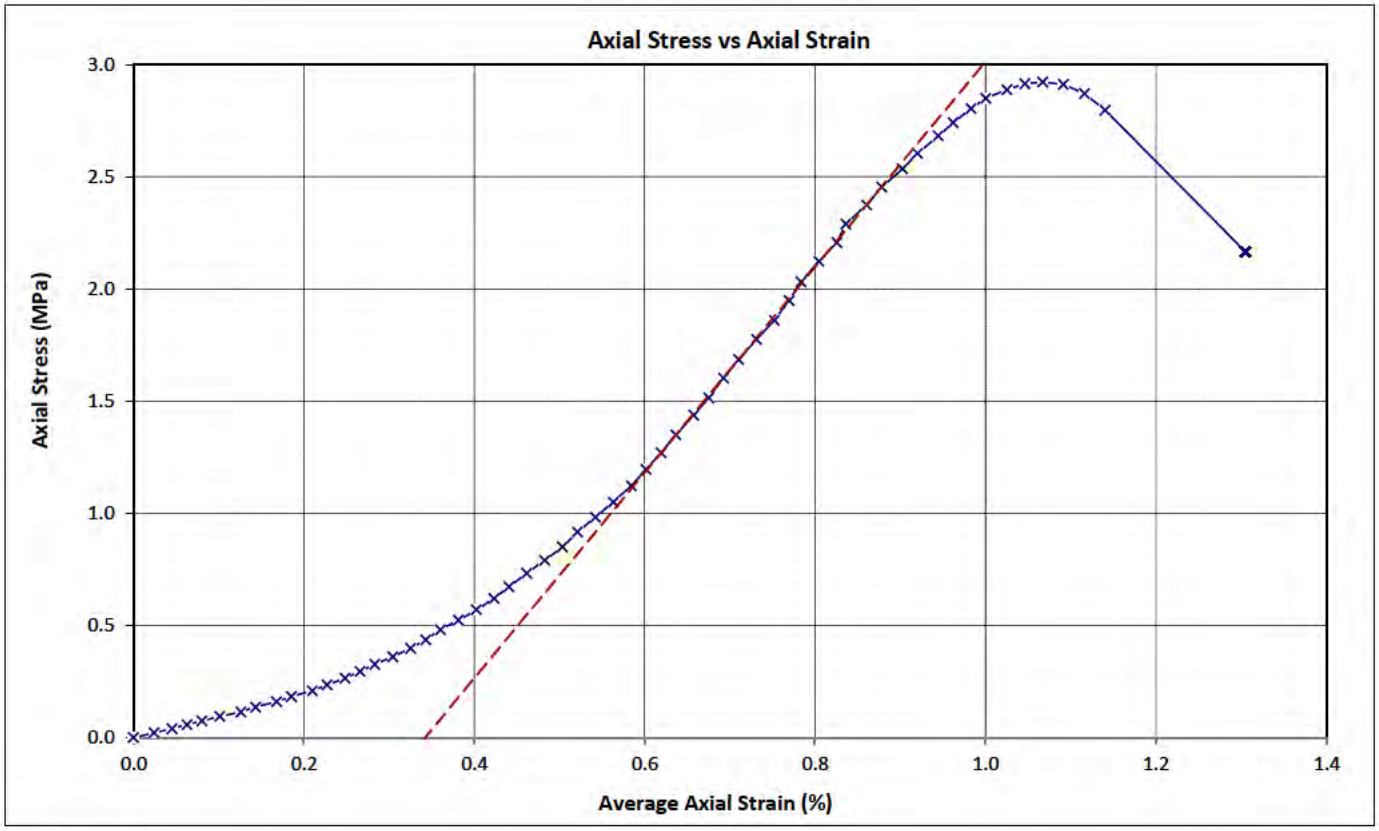
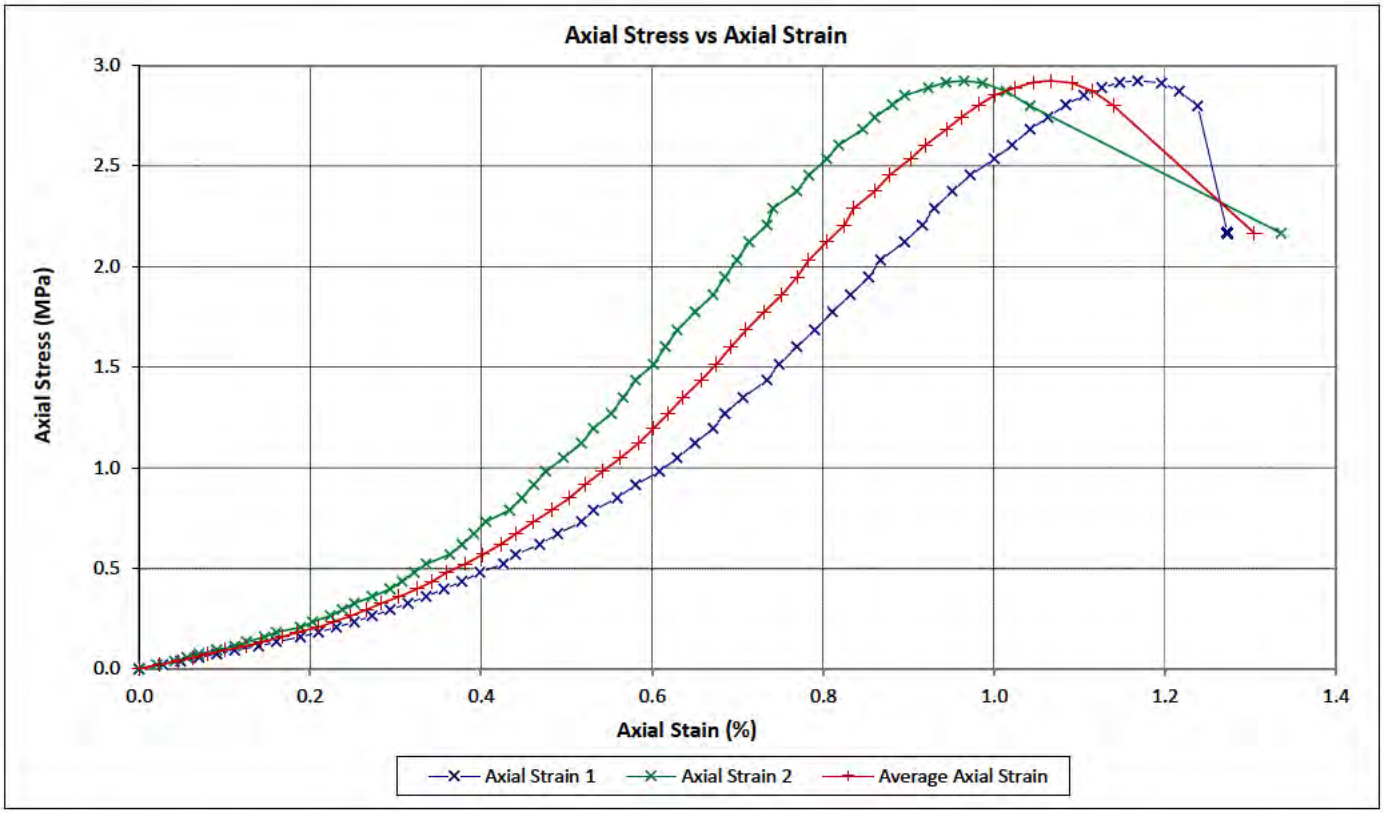
Test Schedule Reference: --

Site: UoA Student Centre & Library — Location ID: BH05
Sample Ref.: -- — Geotechnics ID: -- — Depth (m): 8.02-8.16
Test method used: ASTM D7012-23 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures (Method C and D)
ASTM D2216 Determination of Water (Moisture) Content of Soil and Rock by Mass

GRAPHS





Tested by: MOKO/PIHE Date: 17/09/2026 Approved by KTP: YHW Date: 22/09/2026

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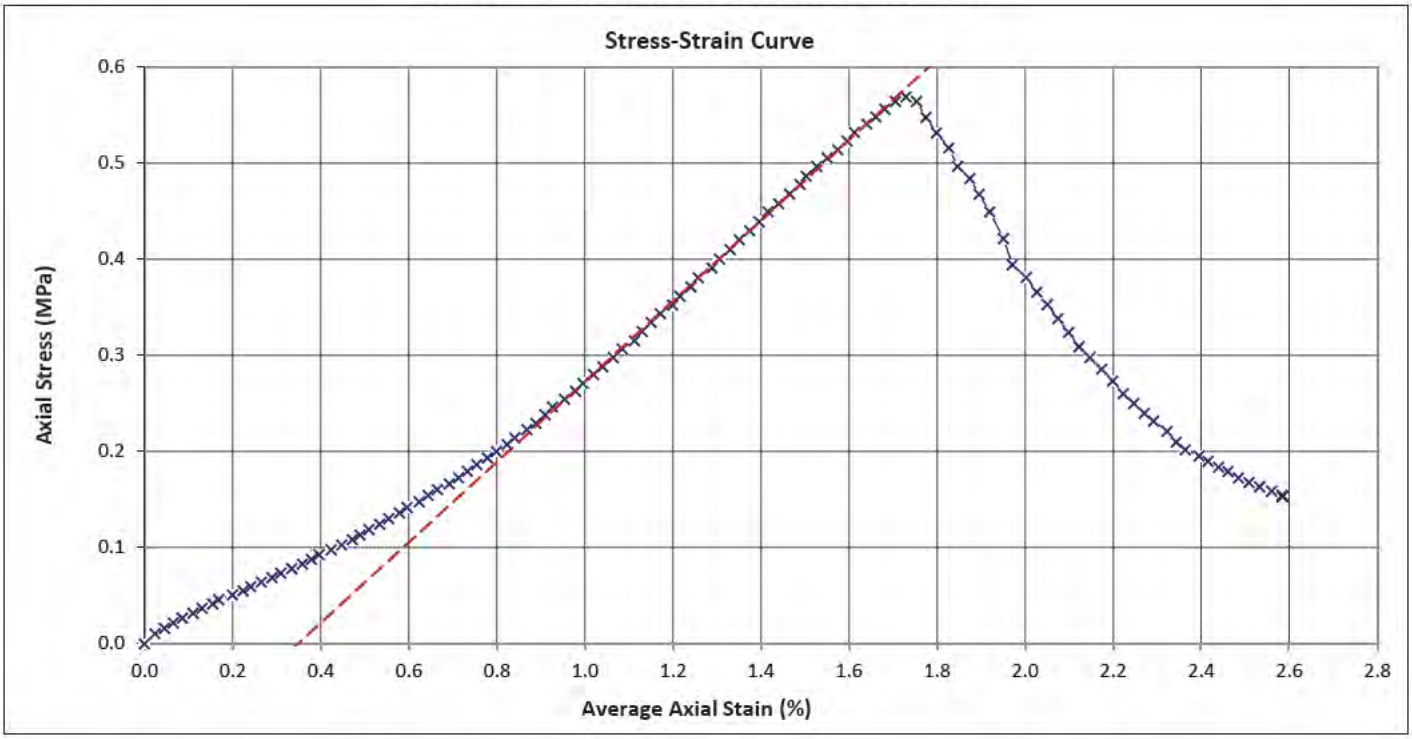
Test Schedule Reference: --

Site:	UoA Student Centre & Library		Location ID:	BH06
Sample Ref.:	--	Geotechnics ID: --	Depth:	15.83-15.98 (m)
Test method used:	ASTM D7012-23 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures (Method C and D) ASTM D2216 Determination of Water (Moisture) Content of Soil and Rock by Mass			

UNCONFINED COMPRESSION STRENGTH TEST



Initial Sample Parameters:

Sample Length (mm)	145.09	Bulk Density (t/m³)	2.04
Sample Diameter (mm)	62.19	Dry Density (t/m³)	1.66
Test Length (mm)	145.09	Water Content (%)	23.0
Test Height / Diameter Ratio	2.3		

Failure Value:

Average Global Axial Strain ε (%)	Unconfined Compressive Strength q_u (MPa)	Rate of Compression (mm/min)	Failure Mode
1.73	0.57	0.19	Shear

Young's Modulus (MPa): 42

Sample History: Core sample trimmed at natural water content.

Sample Description: Dark grey, Extremely Weak, SLITSTONE/SANDSTONE

Test Remarks: Unconfined Compressive Strength reported to the nearest 0.01 MPa.

Failure Photo



Tested by: MOKO/PIHE Date: 17/09/2026 Approved by KTP: Date: 22/09/2026

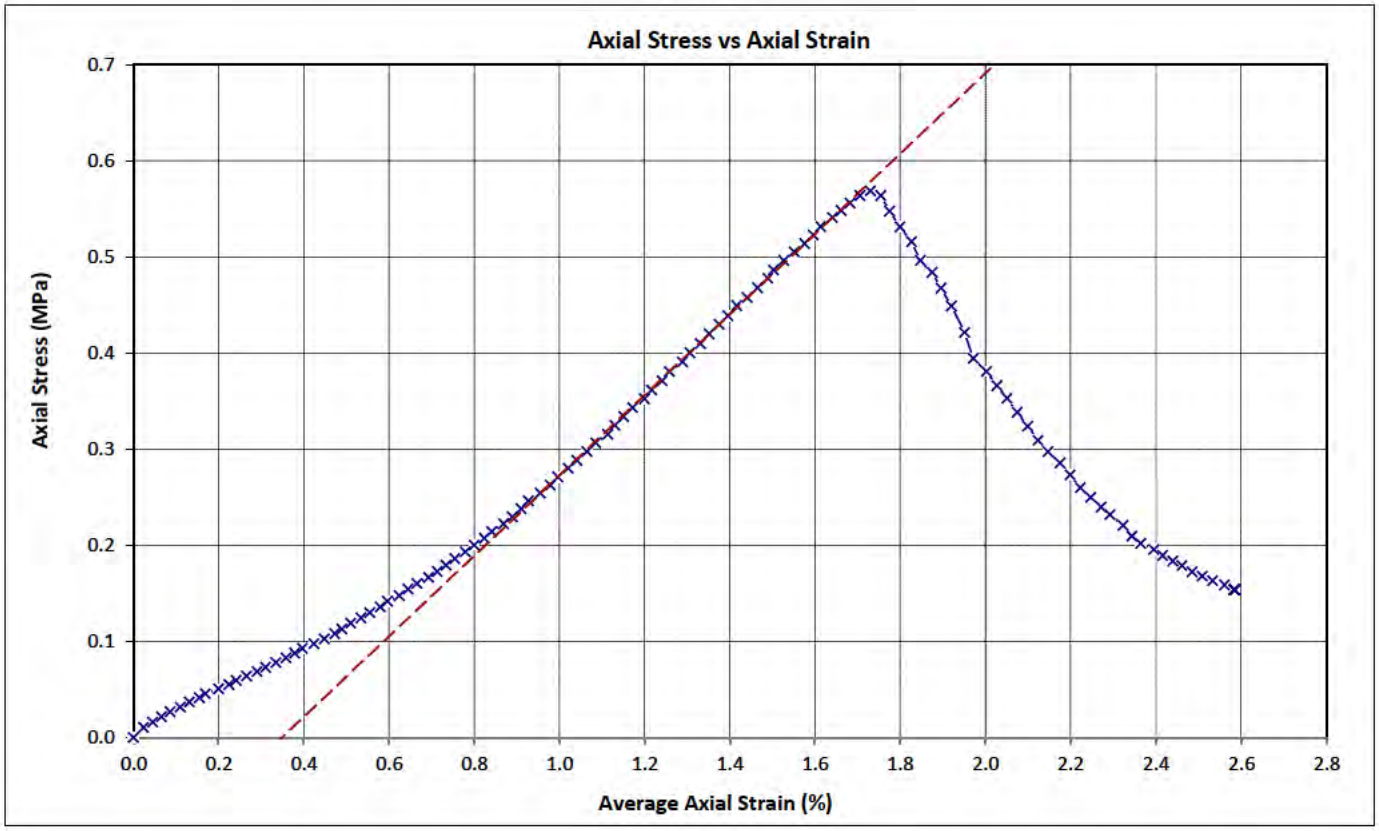
GEOTECHNICS
1 Hill Street
Onehunga
Auckland
New Zealand
p. +64 9 356 3510

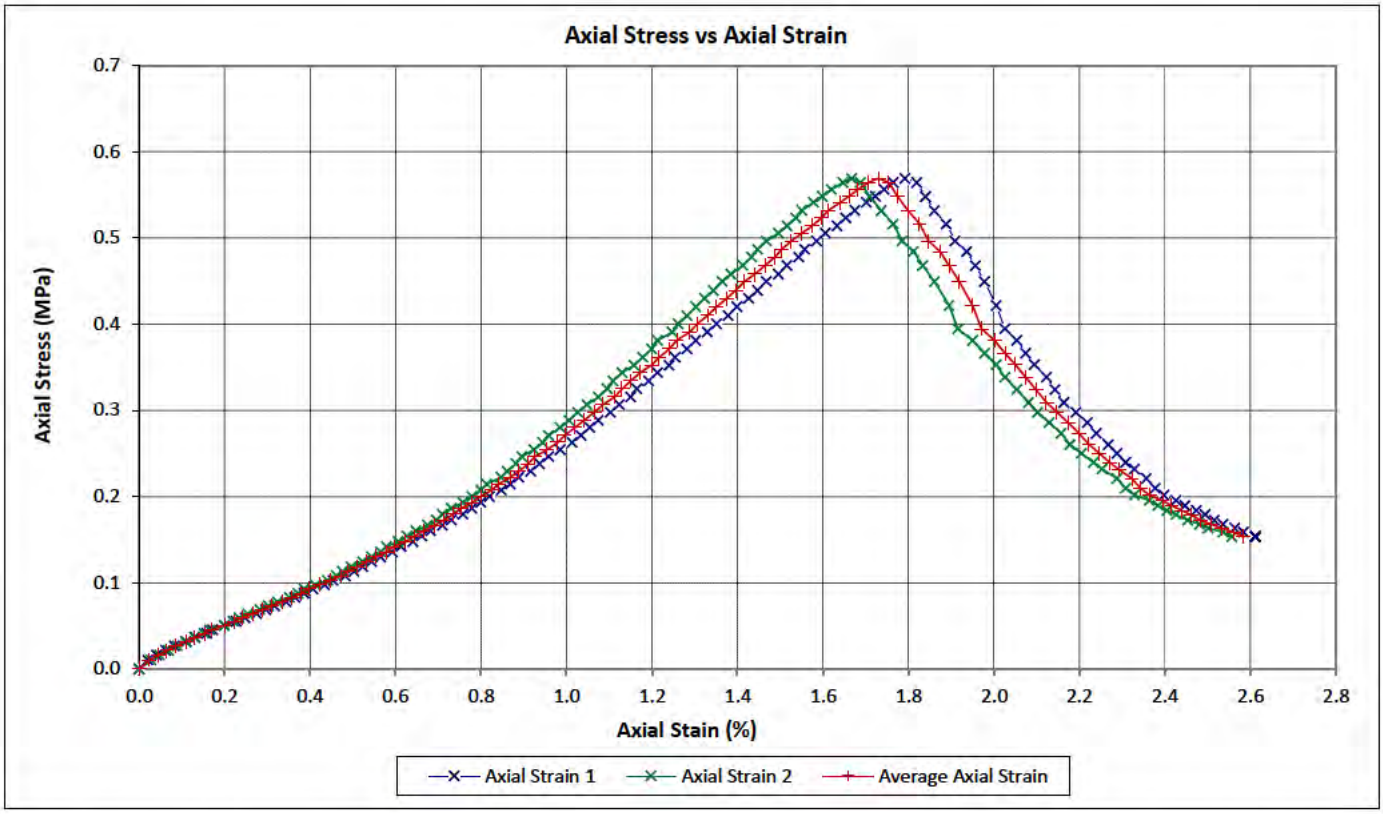
Geotechnics Project ID: 1103850.0000.01.0
Customer Project ID: 1103046
Test Schedule Reference: --

Site:	UoA Student Centre & Library	Location ID:	BH06
Sample Ref.:	-- Geotechnics ID: --	Depth (m):	15.83-15.98

Test method used: ASTM D7012-23 Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures (Method C and D)
ASTM D2216 Determination of Water (Moisture) Content of Soil and Rock by Mass

GRAPHS





Tested by:	MOKO/PIHE	Date:	17/09/2026	Approved by KTP:	YHW	Date:	22/09/2026

GEOTECHNICS

23 September 2026
Our Ref: 1103850.0000.2.0/Rep2
Customer Ref: 1103046

Tonkin & Taylor Limited
PO BOX 5271
AUCKLAND 1141

Attention: Tommy Lam

Dear Tommy

UoA Student Centre & Library

Laboratory Test Report

Samples from the above-mentioned site have been tested as received according to your instructions and the results are included in this report. Results apply only to the sample(s) tested.

Descriptions are enclosed for your information but are not covered under the IANZ endorsement of this report.

This report has been prepared for the benefit of Tonkin & Taylor Limited, with respect to the particular brief given to us and it cannot be relied upon in other contexts or for any other purpose without our prior review and agreement.

This report may be reproduced only in full.

Samples not destroyed during testing will be retained for one month from the date of this report before being discarded. If we can be of any further assistance, feel free to get in touch. Contact details are provided at the bottom of this page.

GEOTECHNICS LTD

Report approved by:



.....

Eliza Morton
Laboratory Manager
Key Technical Person

Authorised for Geotechnics by:



Digitally signed by Corey Papu-Gread
DN: cn=Corey Papu-Gread, c=NZ, o=Geotechnics , email=cpapu-gread@geotechnics.co.nz
Date: 2026.09.23 10:47:07 +12'00'

.....

Corey Papu-Gread
Project Director

ACCREDITED TESTING LABORATORY

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

23-Sept-26
\\ttgroup.local\corporate\GeotechnicsGroup\Projects\1103850\02 Soil\IssuedDocuments\Report 2

GEOTECHNICS
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Geotechnics Project ID 1103850.0000.2.0
Customer Project ID 1103046

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	**ID**	BH02		
	Description	UoA Student Centre & Library		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL1405.1		
	Reference	BH02	**Depth**	3-3.5m
	Description	Silty CLAY; light grey mottled orange. Soft, moist, high plasticity.		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

Liquid Limit	**81**
Plastic Limit	**28**
Plasticity Index	**52**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve.

Date Tested: 11/09/2026

This test result is IANZ accredited.

Approved by KTP	ELMO	**Date**	17/09/2026

Our Ref: 1103850.0000.2.0/Rep2

GEOTECHNICS
1 Hill Street
Onehunga
Auckland
New Zealand
p. +64 9 356 3510

Geotechnics Project ID 1103850.0000.2.0
Customer Project ID 1103046

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	**ID**	BH03		
	Description	UoA Student Centre & Library		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL1405.2		
	Reference	BH03	**Depth**	6-6.6m
	Description	Silty CLAY; grey. Soft, moist, high plasticity.		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

Liquid Limit	**92**
Plastic Limit	**30**
Plasticity Index	**62**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve.

Date Tested: 11/09/2026

This test result is IANZ accredited.

Approved by KTP ELMO **Date** 17/09/2026

Our Ref: 1103850.0000.2.0/Rep2

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Onehunga
Auckland
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Geotechnics Project ID 1103850.0000.2.0
Customer Project ID 1103046

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	**ID**	BH05		
	Description	UoA Student Centre & Library		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL1409.1		
	Reference	BH05	**Depth**	6-6.5m
	Description	Silty CLAY; grey mottled orange. Firm, moist, high plasticity.		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

Liquid Limit	**80**
Plastic Limit	**23**
Plasticity Index	**56**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve.

Date Tested: 14/09/2026

This test result is IANZ accredited.

Approved by KTP	ELMO	**Date**	17/09/2026

Our Ref: 1103850.0000.2.0/Rep2

GEOTECHNICS
1 Hill Street
Onehunga
Auckland
New Zealand
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Geotechnics Project ID 1103850.0000.2.0
Customer Project ID 1103046

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	**ID**	BH06		
	Description	UoA Student Centre & Library		
	Data	N/A		
SAMPLE	**Geotechnics ID**	AKL1409.2		
	Reference	BH06	**Depth**	6-6.5m
	Description	Silty CLAY; brownish grey. Firm, moist, high plasticity.		
SPECIMEN	**Reference**	-	**Depth**	-
	Description	-		

TEST RESULTS

Liquid Limit	**80**
Plastic Limit	**25**
Plasticity Index	**55**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve.

Date Tested: 14/09/2026

This test result is IANZ accredited.

Approved by KTP	ELMO	**Date**	17/09/2026

Our Ref: 1103850.0000.2.0/Rep2

GEOTECHNICS

Geotechnics Auckland

1 Hill Street
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Auckland 1643
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auckland@geotechnics.co.nz

Report Number	**1103850.0000.0.0/Rep 1**	**23-09-2026**
Test Schedule Reference	**NZG512_108**	

Customer Details

Customer	University of Auckland
Address	UoA Student Centre & Library
Project Name	UoA Student Centre & Library - Lab testing
Project ID	1103046

Laboratory Test Report

Liquid (4 point) and plastic limits, plasticity index - NZS 4402:1986 Test 2.2, 2.3, 2.4

Customer Sample Details

Location	**ID**	BH04				
	Description	N/A				
	Data	E°: N/A	N°: N/A	Level: N/A	Chainage: N/A	Offset: N/A
Sample	**Geotechnics ID**	A3630	**Date Sampled**	18-09-2026		
	Reference	BH04-01	**Depth From**	4.95 m	**to**	5.5 m
	Description	N/A				
Customer Instructions	N/A					

Test Results

Liquid Limit	76
Plastic Limit	25
Plasticity Index	51
Date Tested	18-09-2026

Test Remarks

- Condition of the sample as received: Natural.
- The sample used for testing: Fraction Passing a 425 µm sieve. Mechanically pushed through the sieve. Estimated retained: 15 %.
- Liquid limit device: Mechanical
- Plastic limit device: Manual
- Liquid limit grooving tool: Original (Metal)
- Laboratory Description: Silty CLAY; grey with mottled orange. Firm, moist, high plasticity.

Natural water content: 46.5 %

- Sample description follows the NZGS Guidelines for field description of soil and rock.

General Remarks

- Samples have been tested as received and according to your instructions. Results apply only to the sample(s) tested.
- This report has been prepared for the benefit of University of Auckland, with respect to the particular brief given to us and it cannot be relied upon in other contexts or for any other purpose without our prior review and agreement.
- Please reproduce this report in full when transmitting to others or including in internal reports.
- Samples not destroyed during testing will be retained for one month from the date of this report before being discarded. If we can be of any further assistance, feel free to get in touch.
- Sample descriptions are enclosed for your information but are not covered under the IANZ endorsement of this report.

GEOTECHNICS

Approved by KTP	Authorised by Project Director
Eliza Morton	Steven Anderson

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

www.geotechnics.co.nz

Appendix F Permeability Testings Results

Tonkin+Taylor

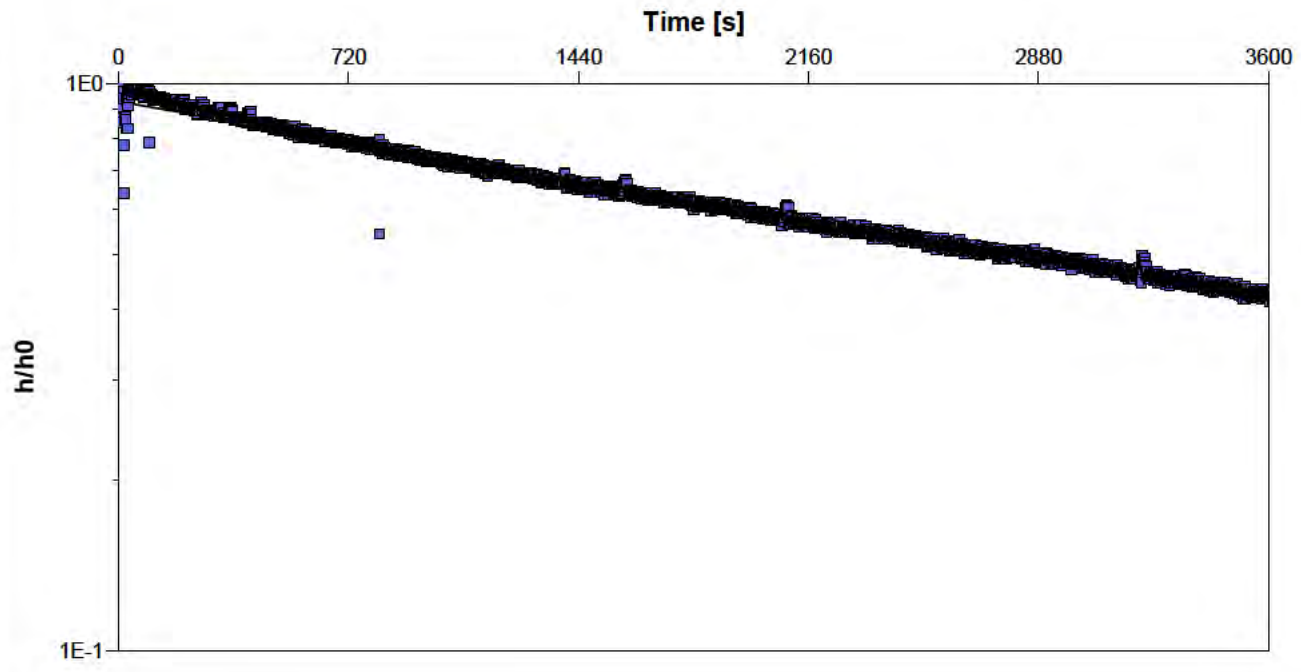
Slug Test Analysis Report

Project: UoA Student Centre & Library

Number: 1103046

Client: University of Auckland

Location: Princes Street	Slug Test: BH01 - Falling head test	Test Well: BH01
Test Conducted by: JASL		Test Date: 10/09/2026
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 5/10/2026
Aquifer Thickness: 5.63 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH01	1.91×10^{-7}	

Tonkin+Taylor

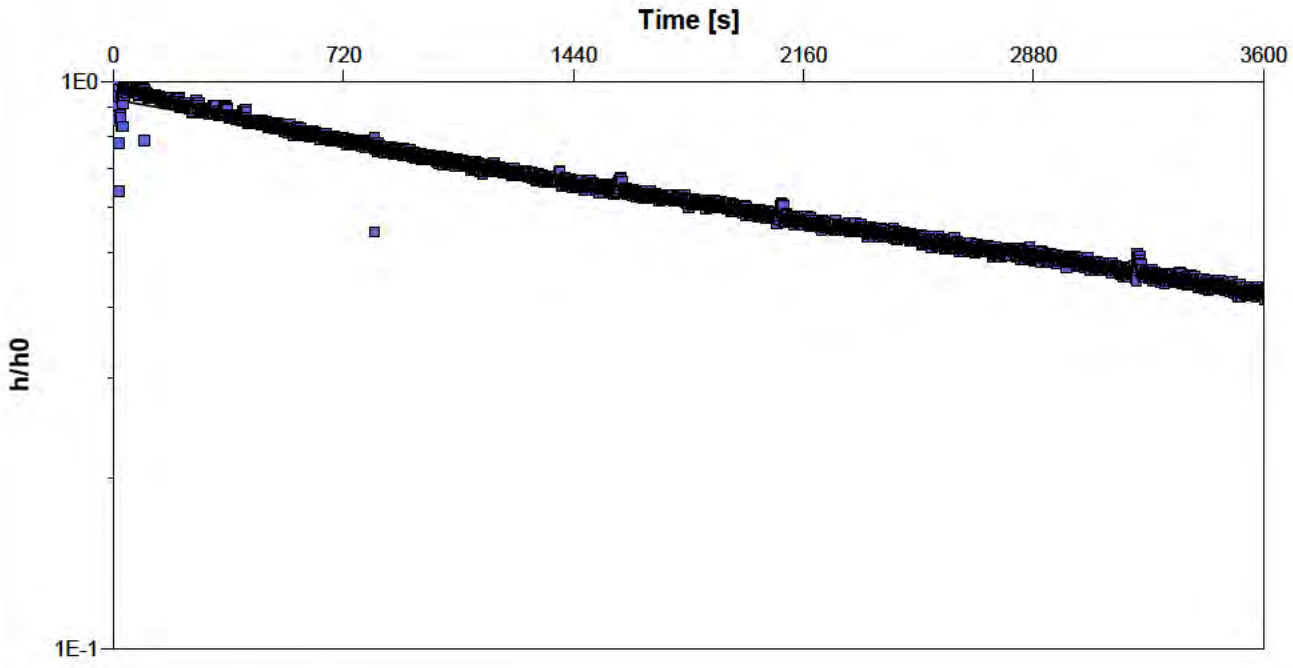
Slug Test Analysis Report

Project: UoA Student Centre & Library

Number: 1103046

Client: University of Auckland

Location: Princes Street	Slug Test: BH01 - Falling head test	Test Well: BH01
Test Conducted by: JASL		Test Date: 10/09/2026
Analysis Performed by: BRAL	Bouwer & Rice	Analysis Date: 5/10/2026
Aquifer Thickness: 5.63 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH01	1.45×10^{-7}	

Tonkin+Taylor

Slug Test - Analyses Report

Project: UoA Student Centre & Library

Number: 1103046

Client: University of Auckland

Location: Princes Street	Slug Test: BH01 - Falling head test	Test Well: BH01
Test Conducted by: JASL		Test Date: 10/09/2026
Aquifer Thickness: 5.63 m		

	Analysis Name	Analysis Performed	Analysis Date	Method name	Well	T [m²/s]	K [m/s]	S
1	Hvorslev	BRAL	5/10/2026	Hvorslev	BH01		1.91×10^{-7}	
2	Bouwer & Rice	BRAL	5/10/2026	Bouwer & Rice	BH01		1.45×10^{-7}	

Tonkin+Taylor

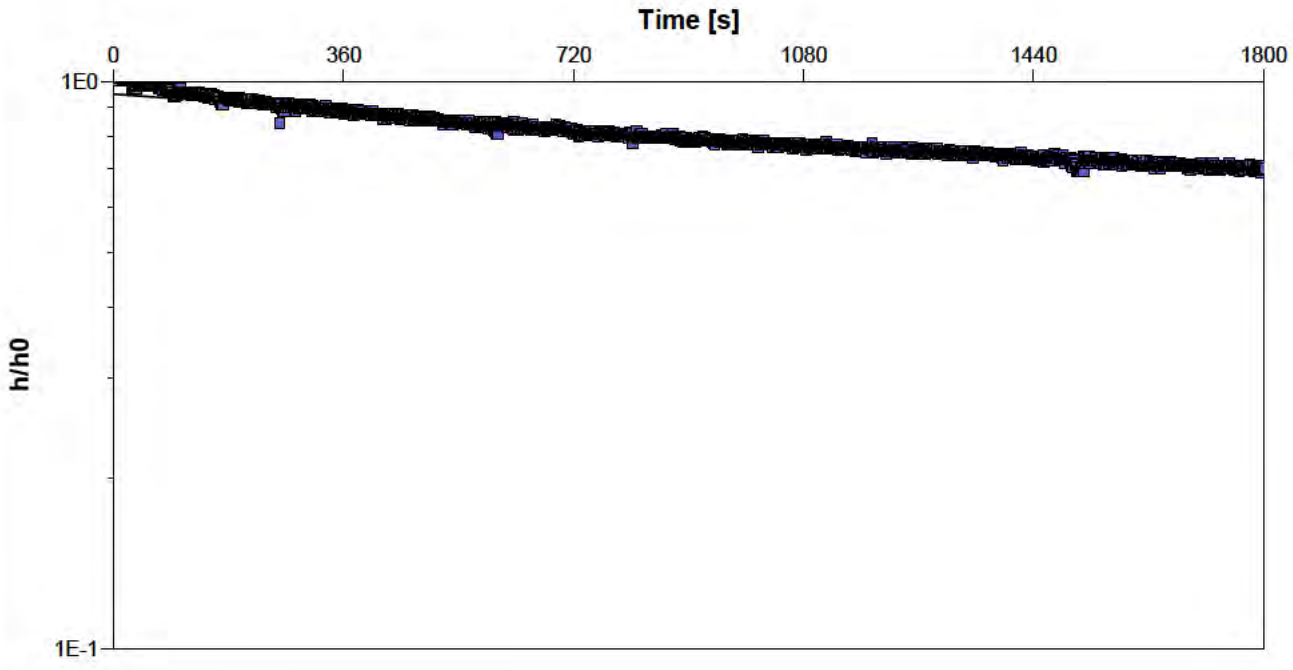
Slug Test Analysis Report

Project: UoA Student Centre & Library

Number: 1103046

Client: University of Auckland

Location: Princes Street	Slug Test: BH01 - Rising head test	Test Well: BH01
Test Conducted by: JASL		Test Date: 10/09/2026
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 5/10/2026
Aquifer Thickness: 5.63 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH01	1.58×10^{-7}	

Tonkin+Taylor

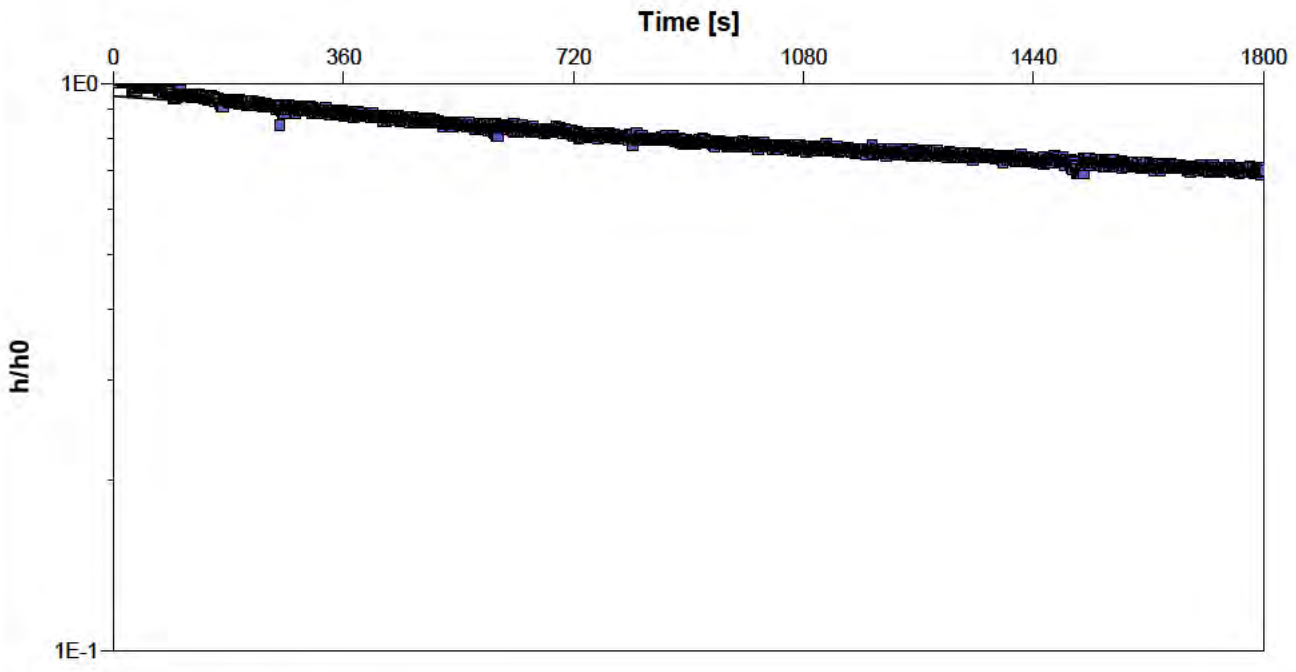
Slug Test Analysis Report

Project: UoA Student Centre & Library

Number: 1103046

Client: University of Auckland

Location: Princes Street	Slug Test: BH01 - Rising head test	Test Well: BH01
Test Conducted by: JASL		Test Date: 10/09/2026
Analysis Performed by: BRAL	Bouwer & Rice	Analysis Date: 5/10/2026
Aquifer Thickness: 5.63 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH01	1.20×10^{-7}	

Tonkin+Taylor

Slug Test - Analyses Report

Project: UoA Student Centre & Library

Number: 1103046

Client: University of Auckland

Location: Princes Street	Slug Test: BH01 - Rising head test	Test Well: BH01
Test Conducted by: JASL		Test Date: 10/09/2026
Aquifer Thickness: 5.63 m		

	Analysis Name	Analysis Performed	Analysis Date	Method name	Well	T [m²/s]	K [m/s]	S
1	Hvorslev	BRAL	5/10/2026	Hvorslev	BH01		1.58×10^{-7}	
2	Bouwer & Rice	BRAL	5/10/2026	Bouwer & Rice	BH01		1.20×10^{-7}	

Tonkin+Taylor

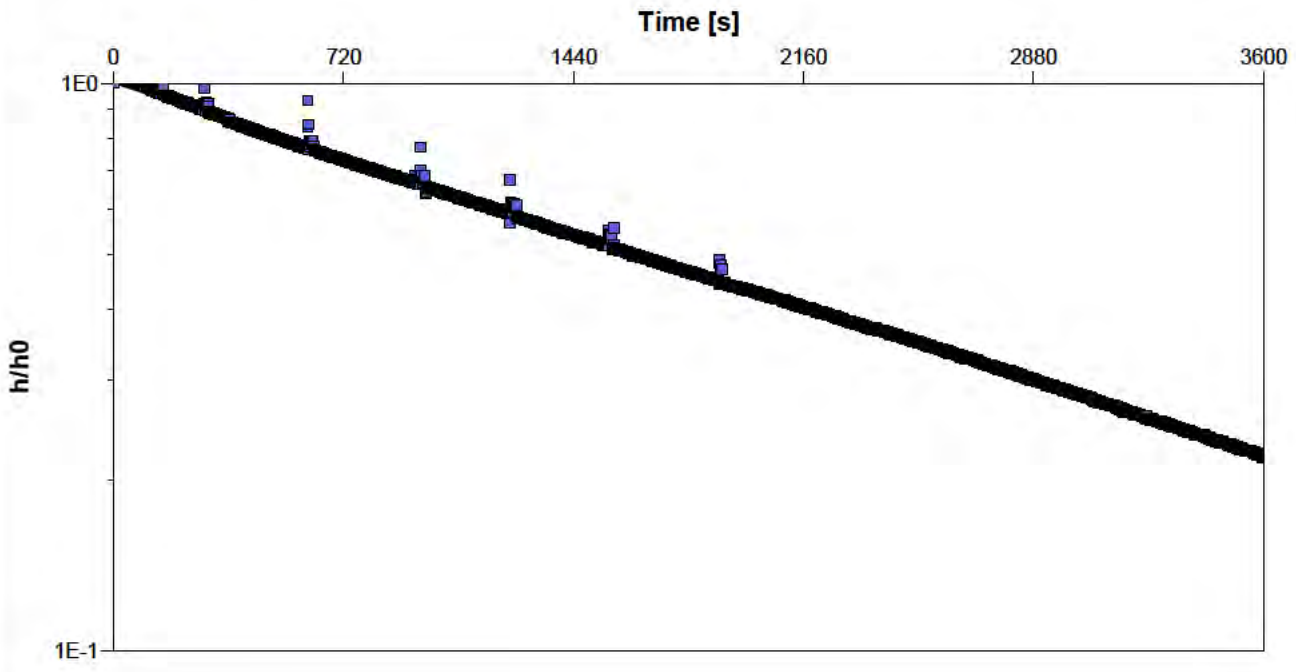
Slug Test Analysis Report

Project: UoA Student Centre & Library

Number: 1103046

Client: University of Auckland

Location: BH03 (Deep)	Slug Test: BH03 (Deep) - Falling head	Test Well: BH03
Test Conducted by: JASL		Test Date: 10/09/2026
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 18/09/2026
Aquifer Thickness: 5.55 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH03	2.23×10^{-7}	

Tonkin+Taylor

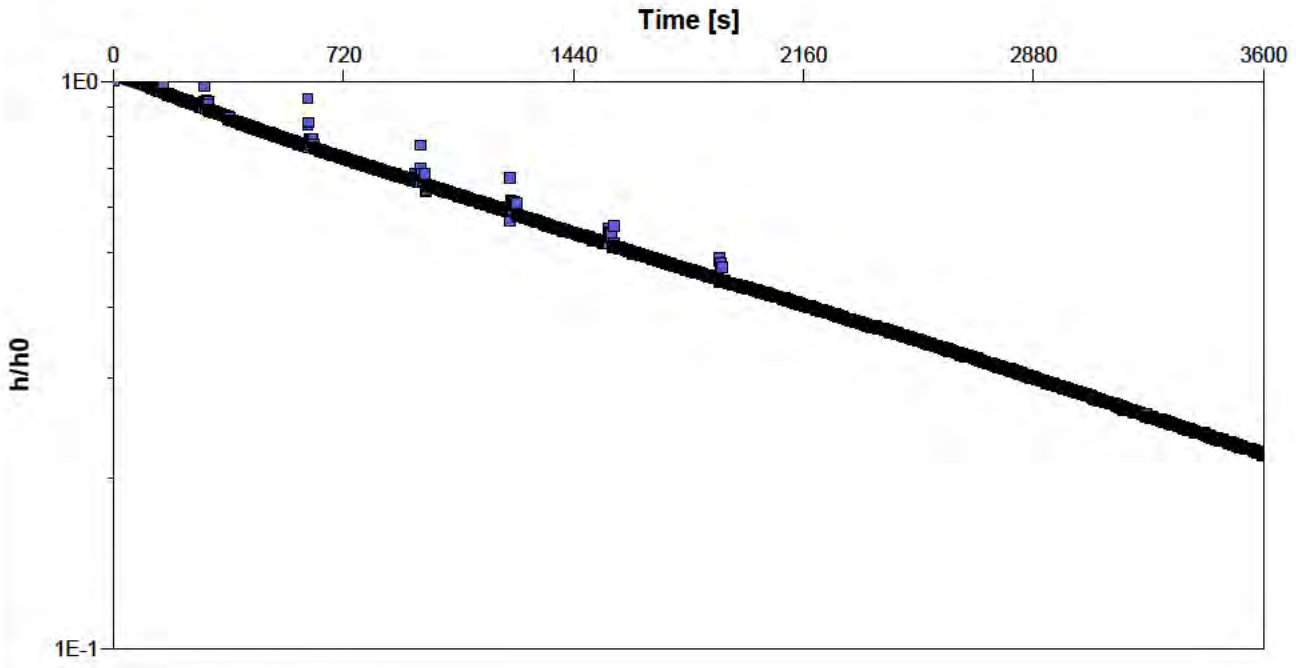
Slug Test Analysis Report

Project: UoA Student Centre & Library

Number: 1103046

Client: University of Auckland

Location: BH03 (Deep)	Slug Test: BH03 (Deep) - Falling head	Test Well: BH03
Test Conducted by: JASL		Test Date: 10/09/2026
Analysis Performed by: BRAL	Bouwer & Rice	Analysis Date: 5/10/2026
Aquifer Thickness: 5.55 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH03	1.69×10^{-7}	

Tonkin+Taylor

Slug Test - Analyses Report

Project: UoA Student Centre & Library

Number: 1103046

Client: University of Auckland

Location: BH03 (Deep)	Slug Test: BH03 (Deep) - Falling head	Test Well: BH03
Test Conducted by: JASL		Test Date: 10/09/2026
Aquifer Thickness: 5.55 m		

	Analysis Name	Analysis Performed	Analysis Date	Method name	Well	T [m²/s]	K [m/s]	S
1	Hvorslev	BRAL	18/09/2026	Hvorslev	BH03		2.23×10^{-7}	
2	Bouwer & Rice	BRAL	5/10/2026	Bouwer & Rice	BH03		1.69×10^{-7}	

Tonkin+Taylor

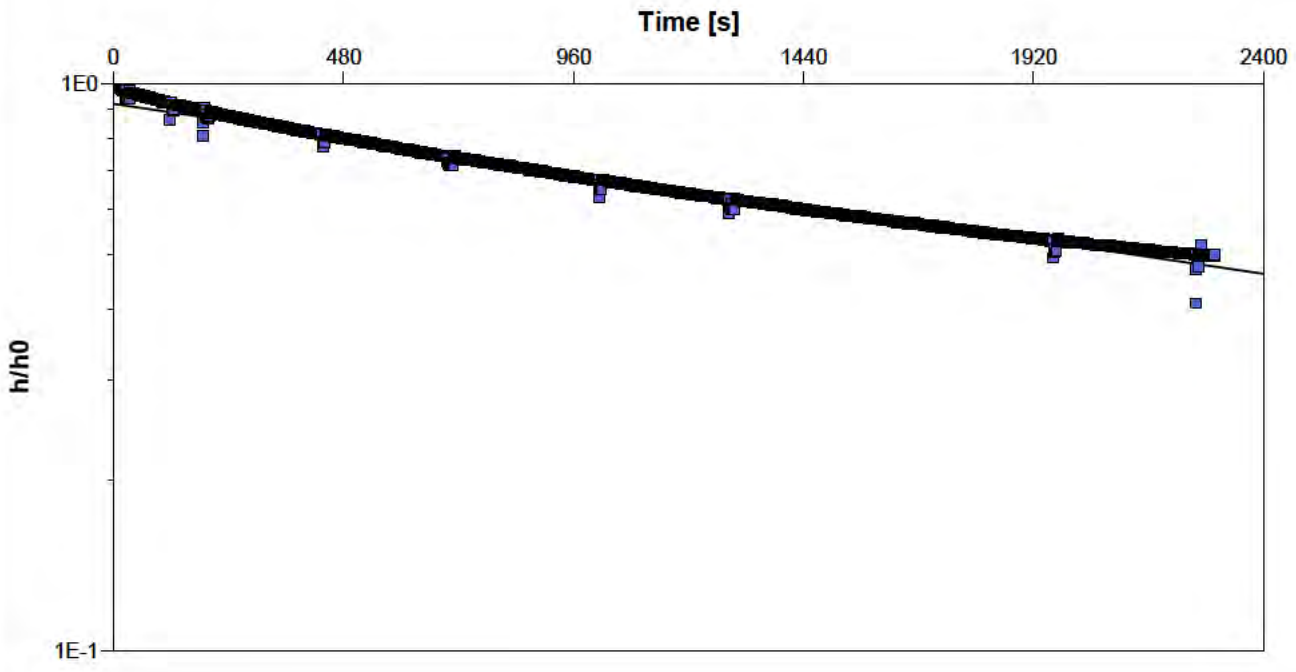
Slug Test Analysis Report

Project: UoA Student Centre & Library

Number: 1103046

Client: University of Auckland

Location: BH03 (Deep)	Slug Test: BH03 (Deep) - Rising Head	Test Well: BH03
Test Conducted by: JASL		Test Date: 18/09/2026
Analysis Performed by: BRAL	Hvorslev	Analysis Date: 18/09/2026
Aquifer Thickness: 5.55 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
BH03	1.53×10^{-7}	

Tonkin+Taylor

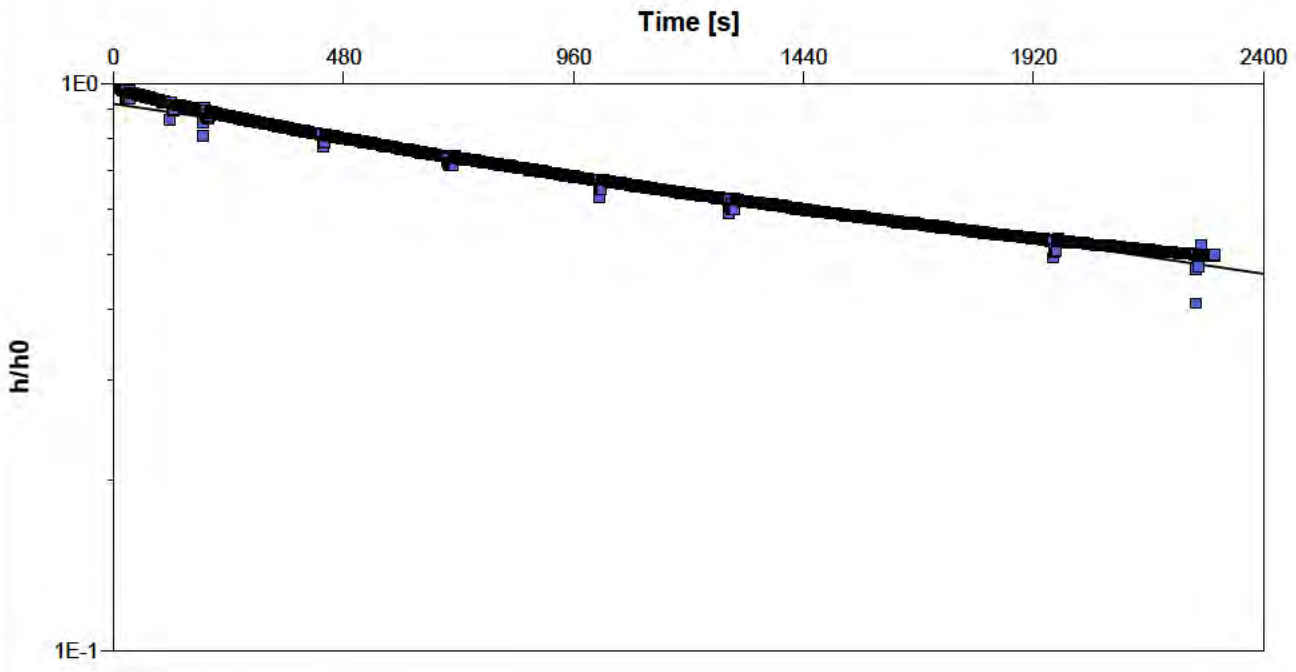
Slug Test Analysis Report

Project: UoA Student Centre & Library

Number: 1103046

Client: University of Auckland

Location: BH03 (Deep)	Slug Test: BH03 (Deep) - Rising Head	Test Well: BH03
Test Conducted by: JASL		Test Date: 18/09/2026
Analysis Performed by: BRAL	Bouwer & Rice	Analysis Date: 5/10/2026
Aquifer Thickness: 5.55 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH03	1.16×10^{-7}	

Tonkin+Taylor

Slug Test - Analyses Report

Project: UoA Student Centre & Library

Number: 1103046

Client: University of Auckland

Location: BH03 (Deep)	Slug Test: BH03 (Deep) - Rising Head	Test Well: BH03
Test Conducted by: JASL		Test Date: 18/09/2026
Aquifer Thickness: 5.55 m		

	Analysis Name	Analysis Performed	Analysis Date	Method name	Well	T [m²/s]	K [m/s]	S
1	Hvorslev	BRAL	18/09/2026	Hvorslev	BH03		1.53×10^{-7}	
2	Bouwer & Rice	BRAL	5/10/2026	Bouwer & Rice	BH03		1.16×10^{-7}	



Together we create + sustain a better world