Attachment 8

Geotech Memo





TECHNICAL MEMORANDUM

DATE: 05 March 2025 **W-P REF**: 1496-01-24

TO: Ministry of Justice c/- The Building Intelligence Group

ATTN: s 9(2)(a)

FROM: \$ 9(2)(a) , CPEng, FEngNZ

RE: Geotechnical Memorandum to support a referral Fast Track application at 14 Edmonton

Road, Henderson

No. of Pages: 6 + attachments (site investigations, CV for \$ 9(2)(a)

Introduction

The Ministry of Justice (MoJ) proposes to lodge a Notice of Requirement application for a referral project under the Fast Track Approvals Act 2024 for a new Justice Facility at 14 Edmonton Road in Henderson, Auckland.

Wentz-Pacific Ltd (WP) has been retained to undertake geotechnical investigation and assessment of the proposed site for a new courthouse building, located at 14 Edmonton Road, Henderson. A The purpose of this memorandum is to:

- summarise the site investigations undertaken to date;
- provide an overview of the project requirements from a geotechnical engineering perspective;
- identify the potential geotechnical constraints associated with the site, and potential adverse effects of the development proposal; and,
- provide high-level comment on recommendations / mitigation measures that are likely to be required to address any geotechnical constraints or potential adverse effects.

A summary of preliminary conclusions and geotechnical recommendations is also included. A CV with the memo author's qualifications is contained in Attachment A.

Proposed Development and Geotechnical Engineering Requirements

The MoJ has purchased the site at 14 Edmonton Road in anticipation of building a new 'Justice Facility'. Given the proposal is for Notice of Requirement Application and the development proposal for a future building is not confirmed or known, the investigation and assessment provided in this memorandum is based on the concept development scheme for a future building envelope.

s 9(2)(ba)(i)

s 9(2)(ba)(i) . No major

earthworks are anticipated to support the construction of a future building on the site.

The geotechnical engineering requirements for the site are considered to be primarily related to foundation support and recommendations for typical minor earthworks related to foundation excavation and site stripping.

Site Investigations to Date

Shallow investigations

Soil & Rock Consultants¹ drilled five hand auger boreholes across the site in August 2018 to depths of between 3 and 5 m below existing ground level (bgl). Within the boreholes shear vane testing at 0.5 metre intervals was carried out to similar depths, and dynamic cone penetrometer (DCP) testing carried out of the base of the boreholes to depths of up to 6.8 m (where practical refusal was encountered in hard material). The approximate locations of the hand auger boreholes are shown in Attachment B, and logs of the hand auger boreholes and DCP testing are contained in Attachment C.

Deep investigations

WP commissioned several deep site investigations at the site in September 2024. Four cone penetrometer tests (CPT01-CPT04) were performed at the approximate locations shown in Figure 1. The CPTs were advanced to depths of between about 6.7 and 13.4 m below existing ground (bgl) where practical refusal was encountered in inferred rock (East Coast Bays Formation). Two deep boreholes (BH01 and BH02) were drilled at the approximate locations shown in Figure 1. The boreholes were drilled to depths of 13.7 and 10.7 m, respectively, and terminated in confirmed bedrock (East Coast Bays Formation). The approximate locations of the deep investigations are shown in Attachment B, and logs of the CPTs and boreholes are contained in Attachment D.

A 3 m deep piezometer was installed in BH01 to allow periodic measurement of the groundwater at this location.

Site Conditions

The roughly rectangular-shaped and flat-lying site encompasses approximately 4450 m². The majority of the site is paved car parking, and part of the parking appears to be used for a bicycle track. A few established trees occupy parts of the perimeter of the site.

The site is bordered the north by the Oratia stream, the Alderman restaurant and Falls Park. Alderman Drive and Edmonton Road run along the west and south sides of the site, respectively. To the east, the site is bounded by the driveway into the Korean Presbyterian Church and primary residential properties beyond.

Generalised Ground Conditions

Published geological information² shows the site to be surfaced with late Pliocene to middle Pleistocene-aged alluvial sediments of the Puketoka Formation (Pup). The deep site investigations confirmed that these shallow sediments are underlain by early Miocene-aged sedimentary rock of the East Coast Bays Formation (Mwe).

²Edbrooke, S.W. (compiler), 2001. <u>Geology of the Auckland area.</u> Institute of Geological and Nuclear Sciences 1:250,000 geological map 3.



¹Geotechnical Due-Diligence Investigation at 14 Edmonton Road, Henderson, Rev C, 13 February 2004, Soil & Rock Consultants.

The ground profile at the site generally consists of:

 ~ 0.2 to 0.6 m: TOPSOIL and / or undocumented FILL

~0.6 to 6 m: Firm to very stiff, moderately to highly plastic silty CLAY and clayey SILT

(Puketoka Formation alluvium)

~6 to 13 m: Dense SAND (residual soil) over very weak, completely to moderately weathered

SANDSTONE (ECBF). The depth to rock appears to be shallowest in centre of site

and deepens to the east and west

The depth to slightly weathered ECBF rock was proven in the deep boreholes at a depth of about 12 m in BH01 in the northeastern corner of the site, and about 8 m in BH02 in the southwestern corner of the site.

Groundwater

Groundwater was measured (at the time of drilling) in three of the 2018 hand auger boreholes located in the central and eastern half of the site, at depths ranging from 0.8 m to 2.6 m. A 3 m deep piezometer was installed in borehole MH01, located in the northeast corner of the site. This borehole is located relatively close to Oratia Stream which runs relatively close to the northern site boundary.

The groundwater levels measured in the piezometer were:

05 September 2024: 2.4 m
12 September 2024: 2.3 m
19 September 2024: 2.0 m

Wet to saturated soils were logged in both of the deep boreholes at a depth of about 4 m.

The invert of the nearby Oratia Stream was visually estimated to be about 6 m lower than the car park where the piezometer is located. Topographic contour information on the Auckland Council website³ shows the invert to be about 5 m lower than the car park.

Based on the above information, it is inferred that there is a perched water layer across the site at a depth of around 2 m, and possibly shallower in some areas, but that the "permanent" groundwater level is deeper – around 4 m (i.e., closer to the level of the nearby Oratia Stream). This will need to be confirmed by further measurements and possibly installation of a second piezometer should the depth to groundwater be required for design and / or construction.

NZS 1170.5 Site Subsoil Class

Based on the results of our deep investigations, the site subsoil class is 'Class C – shallow soil' as defined by NZS 1170.5:2004.

³Auckland Council (2024). GeoMaps, viewed 23 October, https://geomapspublic.auckland council.govt.nz/viewer/index.html



Potential Geological / Geotechnical Constraints and Hazards

Landsliding, Erosion, Subsidence

The site is flat lying and not bordered by steeply sloping terrain or ground that otherwise appears to be potentially unstable or prone to slippage. At the time of our site investigation, no evidence of erosion or ground subsidence was observed, and the risk of these is considered to be very low.

No mitigation required.

Falling Debris

There are no uphill sources of debris that can impact this site.

No mitigation required.

Liquefaction Hazard

WP's analysis has confirmed that the site soils are not susceptible to liquefaction due to their predominantly fine-grained and plastic nature (shallow clayey and silty soils) and dense state (underlying sandy residual soil from weathering of East Coast Bays formation).

No mitigation required.

Expansive Soils

The near-surface soils found in the hand auger holes are generally characterised as having slight to moderate plasticity, but some highly plastic clayey soils were found at a depth of around 1 m. In the absence of specific laboratory testing to confirm otherwise, the shallow soils should be assumed to be 'Site Class H – Highly Expansive' as described in B1/AS1 or 'H1' as per AS 2870:2011.

Mitigation through standard engineering design.

Compressible Soils

The alluvial Puketoka Formation soils at the site vary in strength and stiffness both vertically and horizontally across the site. However, the site investigations to date have not identified any peat, highly organic, or otherwise very weak and/or compressible soils.

No mitigation required. Deep piles required to support structure as discussed below.

Flooding potential

A small portion of the northern part of the site is shown to be located within an Auckland Councilidentified 'flood plain' area (Geomaps, 2025) – indicating that it is predicted to be covered by water as a result of a 1 in 100-year flood. An overland flow path identified as draining an area of between 3 ha and 100 ha with southerly flow direction is also shown to run through the central portion of the site. The potential for flooding at the site is being assessed by others and has not been addressed by WP.



Conclusions and Recommendations

Geotechnical constraints / potential adverse effects of proposed development

No significant geotechnical constraints have been identified on the site and a future building is not considered to have any adverse effects from a geotechnical perspective. The multi-storey structure will require deep foundations (e.g., bored concrete piles) which is not uncommon for support of heavy structures on relatively soft alluvial Puketoka Formation soils.

WP understands that there may be a requirement to include a suspended floor slab to accommodate overland flow beneath the building during a flood event. The floor slab would be structurally designed to span between pile caps and / or foundation beams and comprise typical engineering design without need for special mitigation measures from a geotechnical perspective.

Foundation Considerations

A future building will require a deep pile foundation extending into the slightly weathered East Coast Bays Formation rock. The depth to the top of a suitable founding layer for end-bearing piles (i.e., slightly weathered ECBF rock) is anticipated to range from about 8 m in the western part of the site to about 13 m in the eastern part, and possibly somewhat shallower in the central part of the site.

For conceptual design, an Ultimate Limit State design bearing capacity of 2 MPa can be assumed for bored concrete piles founded in slightly weathered ECBF. This is based on a geotechnical strength reduction factor (ϕ_g) of 0.5 for all load combinations including earthquake overstrength.

The soils supporting shallow foundation beams should be assumed to be highly reactive / expansive (i.e., Site Class H – Highly Expansive in B1/AS1 or H1 in AS 2870:2011) for conceptual design. The reactivity class should be confirmed with appropriate laboratory testing for later stages of design.

Earthworks Considerations

Based on the information from the 2018 Soil & Rock Consultants shallow investigations, it should be assumed that in the order of 0.4 m of topsoil and/or undocumented fill will need to be removed from within building footprints, car parks and driveways, etc. Site earthworks are not anticipated to extend to the perched or permanent ground water tables (depth of about 2 to 2.5 m), hence dewatering of excavations is not anticipated.



Applicability and Limitations

WP's work was completed in general accordance with WP's consultant agreement with the Ministry of Justice (MoJ) dated 21 August 2024. This memorandum was prepared solely for the use of the Ministry of Justice (the Client) and their project consultants with respect to the particular brief given to WP. No other entity or person shall use or rely upon this memorandum without prior review and written agreement by us. This memorandum is for information only and is not intended to be used for design or building consent.

WP's services consist of professional opinions and conclusions developed in accordance with generally accepted geotechnical engineering principles and practices. There is no other warranty, either expressed or implied.

The opinions and recommendations in this memorandum are based on subsurface information collected from discrete investigation / test locations, and the subsurface conditions away from these locations are inferred. It must be appreciated that the actual soil conditions could vary from those described herein.



ATTACHMENT A

CV OF s 9(2)(a)





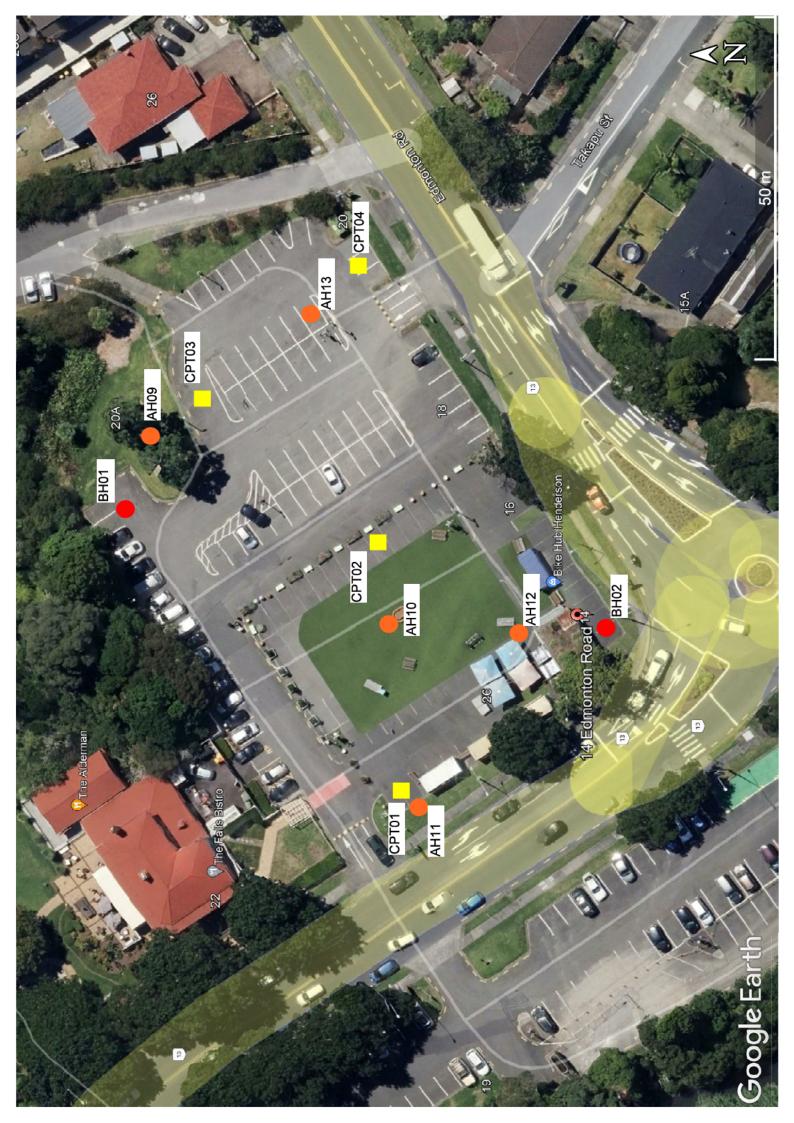






ATTACHMENT B LOCATIONS OF SITE INVESTIGATIONS





ATTACHMENT C 2018 SITE INVESTIGATION DATA





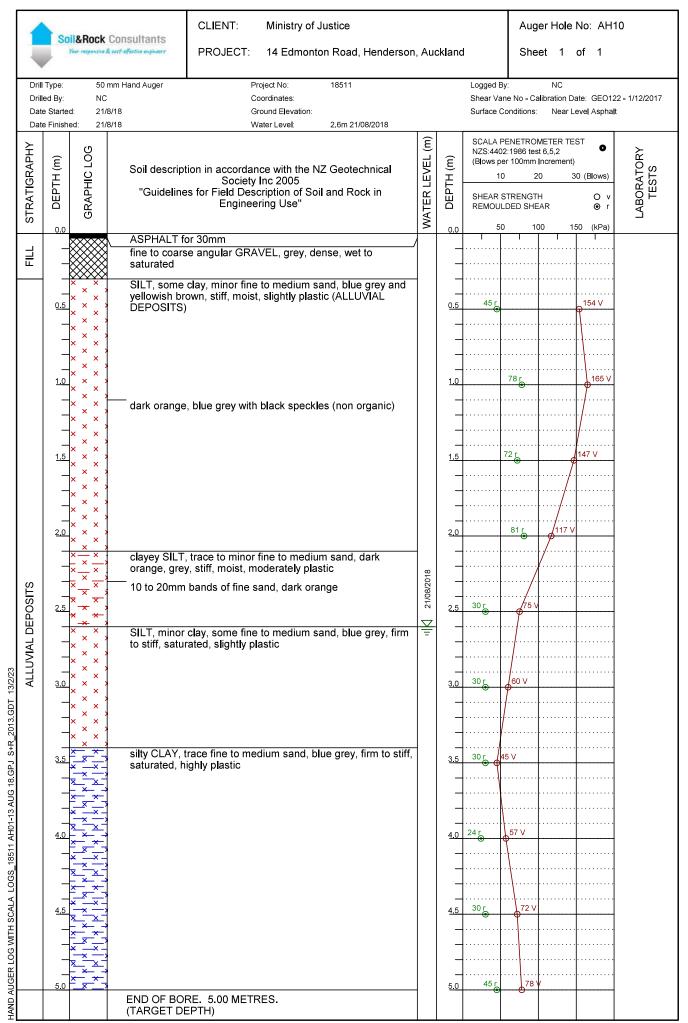
CLIENT: Ministry of Justice

PROJECT: 14 Edmonton Road, Henderson, Auckland

Auger Hole No: AH09

Sheet 1 of 1

1		Tour responsive a	cost-effective engineers	PROJECT: 14 Edmon	ton Road, Henderson	i, Auc	Kland		She	et 1	of 1	
Dril Da	ll Type: lled By: te Starte te Finish	DG d: 21/8		Project No: Coordinates: Ground Elevation: Water Level:	18511 0.8m 21/08/2018							8 - 21/12/2017
STRATIGRAPHY	DEPTH (m)	GRAPHIC LOG		ion in accordance with the I Society Inc 2005 s for Field Description of So Engineering Use"		WATER LEVEL (m)	DEPTH (m)	NZS:440 (Blows p 1 SHEAR	STRENGT LDED SHE	t 6.5.2 Increment) 0 3 H :AR	0 (Blows) ○ v ⊙ r	LABORATORY TESTS
TS	0.0	1/ 1/1/ 1/	SILT, some plastic (TOP	clay, trace fine sand, brown SO I L)	, firm, wet, slightly		0.0	1	0 10 		50 (kPa)	
		× × × × × × × × × × × × × × × × × × ×	very stiff, we DEPOSITS)	clay to clayey, minor fine sa t, slightly to moderately plas	nd, orange brown, stic (ALLUV I AL							
	0.5	× × ×		ge, moderately plastic		21/08/2018	0.5	36 r			162 V	
	_	× × × × × × × × × × × × × × × × × × ×	some clay, s streaks	ome fine sand, orange, wet	red with orange	11 21/	-				ļ	
	1.0	× × × × × ×	some fine sa	and, saturated		-	<u>1.0</u>	36 [•••••	148 V	
		× × × × × ×		erately plastic			_					
	1.5	× × × × × × × × × × × × × × × × × × ×	some clay, c	ark orange, orange, yellow	streaks, slightly		_ _ 1.5	36 <u>r</u>			144 V	
	1.5	× ^ × } × × × }					1.5	•				
	_	× ^ × } × × × }										
	<u>2.0</u>	× × × × ×					<u>2.0</u>	36 г		126	V	
S	_	× × × × × × × × × × × × × × × × × × ×	Silty CLAY,	yellow, stiff, saturated, highl	y p l astic	-						
POSIT	<u></u>	* _ × _ > × _ × _ >						58	ار د	108 V		
ALLUVIAL DEPOSITS	_	<u>× × </u> × × · · · ·	orange and	light grey					/ /	/ 		
	_		firm						/			
13/2	3 <u>.0</u>	X_X_X_	CII T aama		and light bluich		3 <u>.0</u>	27 r	64 V			
2013.GI	_	^ × ^ × × × ×		clay, some fine to medium s aturated, slightly plastic	sand, light bluish							
PJ S4R	3.5	× × × × × × × × × × × × × × × × × × ×	Clayey SILT moderately i	, trace fine sand, light grey, blastic	firm, saturated,	1	<u>3.5</u>	23 r 4	0 V	• • • • • • • • • • • • • • • • • • • •		
NUG 18.C	_	× × ×	SILT, some	clay, some fine to medium s	sand, light blue. firm.	$\mid \mid$						
H01-13 /		× × × × ×	saturated		· · · · · · · · · · · · · · · · · · ·		_	27 r	63 V			
18511 A.	4.0 —	× × × × × × × × × × × × × × × × × × ×					<u>4.0</u> —	- · · · · · · · · · · · · · · · · · · ·				
		× ^ × } × × × }										
H SCALA	<u>4.5</u>	× ^ × } × × × }					<u>4.5</u>	32 [68 V			
00 WIT		× · × · × · × · ×		um sandy SILT, minor clay, on to slightly plastic	grey, stiff,							
HAND AUGER LOG WITH SCALA LOGS_18511 AH01-13 AUG 18.GPJ S+R_2013.GDT	5.0	× . × , × , × , × , × , × , × , × , × ,					<u> </u>	36 r		94 V		
HAND A			END OF BOF (TARGET DE	RE. 5.00 METRES. :PTH)				0				

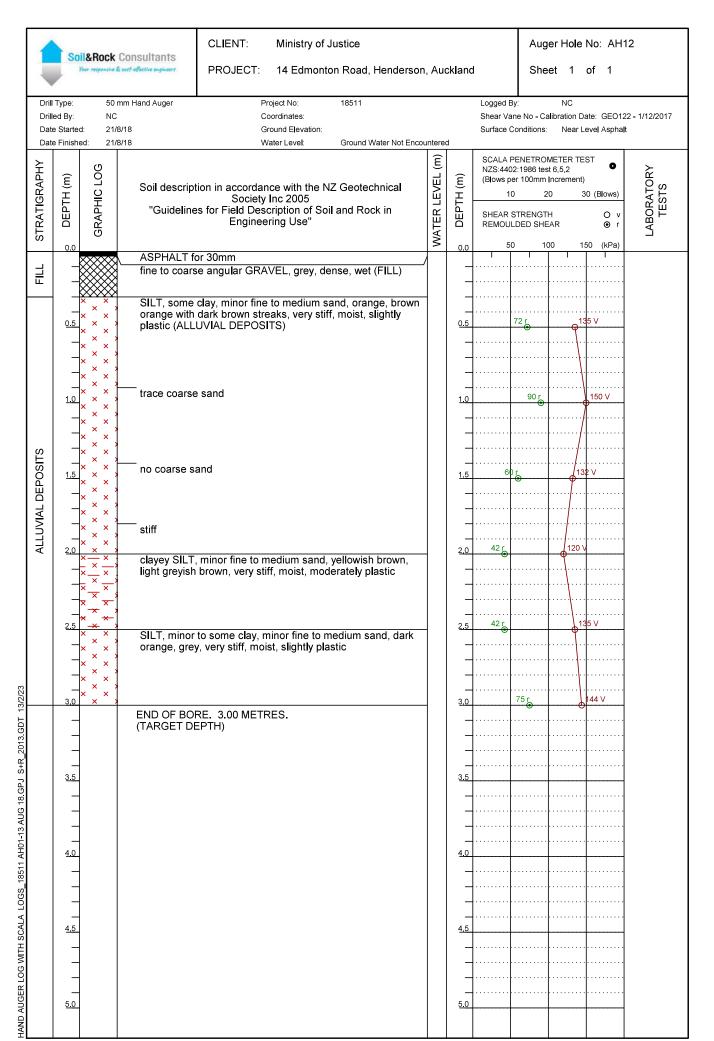


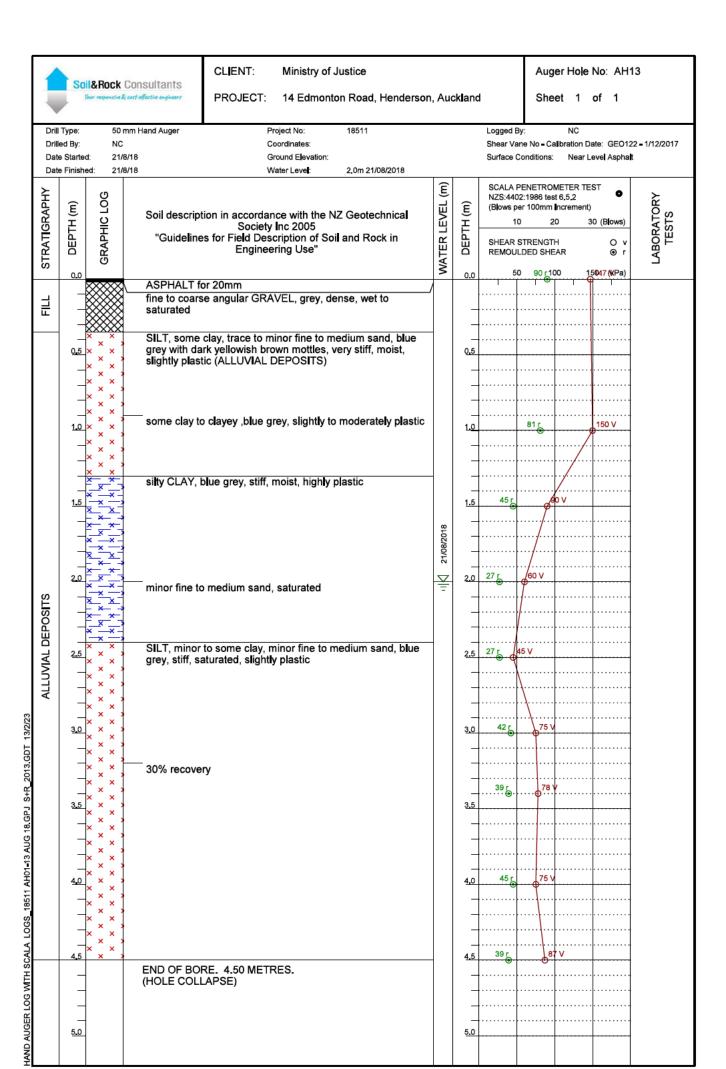


HAND AUGER LOG WITH SCALA LOGS_18511 AH01-13 AUG 18.GPJ S+R_2013.GDT 13/2/23

CLIENT: Ministry of Justice Auger Hole No: AH11

PROJECT: 14 Edmonton Road, Henderson, Auckland Sheet 1 of 1 Drill Type: 50 mm Hand Auger Project No: 18511 DG Logged By: Shear Vane No - Calibration Date: DR1768 - 21/12/2017 Drilled By DG Coordinates: Date Started: 21/8/18 Ground Elevation: Surface Conditions: Slightly Sloping Grass Date Finished 21/8/18 Water Level: Ground Water Not Encountered SCALA PENETROMETER TEST Ξ STRATIGRAPHY NZS:4402:1986 test 6.5.2 GRAPHIC LOG LABORATORY LEVEL DEPTH (m) Ξ (Blows per 100mm Increment) Soil description in accordance with the NZ Geotechnical 10 20 30 (Blows) DEPTH Society Inc 2005 "Guidelines for Field Description of Soil and Rock in WATER SHEAR STRENGTH Engineering Use" REMOULDED SHEAR ● 1 150 (kPa) SILT, trace clay, brown, firm, wet, non plastic (TOPSOIL/FILL) silty fine to coarse angular GRAVEL, some fine to coarse 믚 sand, brown, dark grey, loose, moist, silt is TOPSOIL wet, some cobbles of basalt to 120mm Ø SILT, some clay, some fine to medium sand intermixed with TOPSOIL (SILT, minor clay), brown, orange, stiff, moist, 6 slightly plastic clayey SILT, minor fine to medium sand, orange brown, orange yellow brown, very stiff, moist, moderately plastic (ALLÚVÍAL DEPOSITS) some light blue mottles 148 V 1.0 orange brown, yellow brown some clay to clayey, stiff, slightly to moderately plastic /₁₁₂ v ALLUVIAL DEPOSITS a 8mm Ø root very stiff SILT, some fine to medium sand to sandy, minor clay, orange brown, dark orange, stiff to very stiff, moist, non to slightly plastic SILT, some clay, some fine to medium sand, orange brown, stiff to very stiff, moist, slightly platic clayey SILT, minor fine to medium sand, orange brown, stiff to very stiff, moist, moderately plastic silty CLAY, dark orange, orange, light grey, very stiff, moist, highly plastic 76 r END OF BORE. 3.00 METRES. (TARGET DEPTH) <u>3.5</u> 4.0 4.0 <u>4.5</u> <u>4.5</u> 5.0 <u>5.0</u>







289 Lincoln Road, Waitakere 0612 PO Box 21-424 Henderson, Waitakere 0650 09 835 1740 Fax 09 835 1847 www.soilandrock.co.nz



SCALA PENETROMETER SHEET - TABLE OF BLOWS PER INCREMENT

JOB NAME: 14 Edmonton Road, Henderson JOB NO: 18511 TESTED BY: DEG/JL/NC DATE: 21/08/2018

Depth of Penetration [mm] AH09 AH10 AH11 AH12 AH13 DEPTH START[m] \$ 5.00 \$ 5.00 3.00 3.00 4.50 50 mm SUNK SUNK 1 0.5 1 100 1 2 0.5 2 150 1 2 1 1 200 1 2 1 2 250 1 1 1 1 300 1 1 3 1 2 400 2 2 5 1 2 450 2 2 5 1 2 450 2 2 5 1 2 450 2 2 5 1 2 450 2 2 5 1 2 550 2 2 7 1 4 4 600 2 2 6 1 5
DEPTH START[m]
50 mm SUNK SUNK 1 0.5 1 100 2 0.5 2 150 2 11 1 200 1 2 1 1 250 1 2 1 1 300 1 1 3 1 2 400 2 2 5 1 2 400 2 2 5 1 2 450 2 2 5 1 2 450 2 2 5 1 2 550 2 2 7 1 4 600 2 2 6 1 5 650 2 3 6 1 6 6 700 2 1 10 2 5 1 800 2 3 10 2 4 4
50 mm SUNK SUNK 1 0.5 1 100 2 0.5 2 150 2 11 1 200 1 2 1 1 250 1 2 1 1 300 1 1 3 1 2 400 2 2 5 1 2 400 2 2 5 1 2 450 2 2 5 1 2 450 2 2 5 1 2 550 2 2 7 1 4 600 2 2 6 1 5 650 2 3 6 1 6 6 700 2 1 10 2 5 1 850 2 2 10 2 6 1
100 150
150
200
250
300
350
400 2 2 5 1 2 450 2 2 5 1 2 500 1 2 5 1 4 550 2 2 7 1 4 600 2 2 6 1 5 650 2 3 6 1 6 700 2 1 10 2 5 750 2 2 10 2 4 800 2 3 10 2 4 850 2 2 10 2 6 950 2 3 2 4 1000 2 3 3 10 1050 3 2 5 8 1100 3 4 4 10 1150 3 4 4 10 1250 3 4 4 10 1350 4 8 7 12 1450 4
450 2 2 5 1 2 500 1 2 5 1 4 550 2 2 7 1 4 600 2 2 6 1 5 650 2 3 6 1 6 700 2 1 10 2 5 750 2 2 10 2 4 800 2 3 10 2 4 850 2 2 10 2 6 950 2 3 2 4 1000 2 3 3 10 1050 3 2 5 8 1100 3 4 4 10 1250 3 4 4 10 1350 4 8 7 12 1400 5 20+ 8 12 1450 4 8 10
500 1 2 5 1 4 550 2 2 7 1 4 600 2 2 6 1 5 650 2 3 6 1 6 700 2 1 10 2 5 750 2 2 10 2 4 800 2 3 10 2 4 850 2 2 10 2 6 900 2 2 10 2 6 950 2 3 2 4 1000 2 3 3 10 1050 3 2 5 8 1100 3 4 4 10 1150 3 4 3 10 1250 3 4 4 10 1350 4 8 7 12
550 2 2 7 1 4 600 2 2 6 1 5 650 2 3 6 1 6 700 2 1 10 2 5 750 2 2 10 2 4 800 2 3 10 2 4 850 2 2 10 2 6 900 2 2 10 2 6 950 2 3 2 4 10 1050 3 2 5 8 10 1100 3 4 4 10 10 1250 3 4 4 10 1300 10 1350 4 8 7 12 1400 10 10 10 10 10 10 10 10 10 10 10 10 10
600 2 2 6 1 5 650 2 3 6 1 6 700 2 1 10 2 5 750 2 2 10 2 4 800 2 3 10 2 4 850 2 2 10 2 6 900 2 2 10 2 6 950 2 3 2 4 1000 2 3 3 10 1050 3 2 5 8 1100 3 4 4 10 1250 3 4 4 10 1300 3 4 4 10 1350 4 8 7 12 1400 5 20+ 8 12 1450 4 8 10
650 2 3 6 1 6 700 2 1 10 2 5 750 2 2 10 2 4 800 2 3 10 2 4 850 2 2 10 2 6 900 2 2 10 2 6 950 2 3 2 4 1000 2 3 3 10 1050 3 2 5 8 1100 3 4 4 10 1150 3 4 3 10 1250 3 4 4 10 1300 3 4 4 10 1350 4 8 7 12 1400 5 20+ 8 12 1450 4 8 12
700 2 1 10 2 5 750 2 2 10 2 4 800 2 3 10 2 4 850 2 2 10 2 6 900 2 2 10 2 6 950 2 3 2 4 1000 2 3 3 10 1050 3 2 5 8 1100 3 4 4 10 1150 3 4 3 10 1250 3 4 4 10 1300 3 4 4 10 1350 4 8 7 12 1400 5 20+ 8 12 1450 4 8 10
750 2 2 10 2 4 800 2 3 10 2 4 850 2 2 10 2 6 900 2 2 10 2 6 950 2 3 2 4 1000 2 3 3 10 1050 3 2 5 8 1100 3 4 4 10 1150 3 4 3 10 1250 3 4 4 10 1300 3 4 5 10 1350 4 8 7 12 1400 5 20+ 8 12 1450 4 8 10
800 2 3 10 2 4 850 2 2 10 2 6 900 2 2 10 2 6 950 2 3 2 4 1000 2 3 3 10 1050 3 2 5 8 1100 3 4 4 10 1150 3 4 3 10 1250 3 4 4 10 1300 3 4 5 10 1350 4 8 7 12 1400 5 20+ 8 12 1450 4 8 10
850 2 2 10 2 6 900 2 2 10 2 6 950 2 3 2 4 1000 2 3 3 10 1050 3 2 5 8 1100 3 4 4 10 1150 3 4 3 10 1250 3 4 4 10 1300 3 4 5 10 1350 4 8 7 12 1400 5 20+ 8 12 1450 4 8 10
900 2 2 10 2 6 950 2 3 2 4 1000 2 3 3 10 1050 3 2 5 8 1100 3 4 4 10 1150 3 4 3 10 1250 3 4 4 10 1300 3 4 4 10 1350 4 8 7 12 1400 5 20+ 8 12 1450 4 8 10
950 2 3 2 4 1000 2 3 3 10 10 1050 3 2 5 8 1100 3 4 4 10 1150 3 4 3 8 12 1200 4 4 4 3 10 1250 3 4 4 10 1300 3 4 5 10 1350 4 8 7 12 1450 4 10 1500 4 10 10 10 10 10 10 10 10 10 10 10 10 10
1000 2 3 3 10 1050 3 2 5 8 1100 3 4 4 10 1150 3 4 3 8 1200 4 4 3 10 1250 3 4 4 10 1300 3 4 5 10 1350 4 8 7 12 1400 5 20+ 8 12 1450 4 8 10
1050 3 2 5 8 1100 3 4 4 10 1150 3 4 3 8 1200 4 4 3 10 1250 3 4 4 10 1300 3 4 5 10 1350 4 8 7 12 1400 5 20+ 8 12 1450 4 8 10
1100 3 4 4 10 1150 3 4 3 8 1200 4 4 3 10 1250 3 4 4 10 1300 3 4 5 10 1350 4 8 7 12 1400 5 20+ 8 12 1450 4 8 10
1150 3 4 3 8 1200 4 4 3 10 1250 3 4 4 10 1300 3 4 5 10 1350 4 8 7 12 1400 5 20+ 8 12 1450 4 8 10
1200 4 4 3 10 1250 3 4 4 10 1300 3 4 5 10 1350 4 8 7 12 1400 5 20+ 8 12 1450 4 8 10
1250 3 4 4 10 1300 3 4 5 10 1350 4 8 7 12 1400 5 20+ 8 12 1450 4 8 10
1300 3 4 5 10 1350 4 8 7 12 1400 5 20+ 8 12 1450 4 8 1500 4 10
1350
1400 5 20+ 8 12 1450 4 8 1500 4 10
1450 4 8 1500 4 10
1500 4 10
1600 7 10
1650 10 10
1700 11 10
1750 14
1800 20+
1850
1900
1950
2000
DEPTH END [m] → 6.80 6.40 3.90 4.70 5.90

Testing Method: NZS 4402:1988 Test 6.5.2 Dynamic Cone Penetrometer

ATTACHMENT D 2024 SITE INVESTIGATION DATA



	BOREHOLE LOG engineers • scientists												MH01 Project ID: 27042							
	lient: rojec			Contractor: Pro-Drill Ltd (Akl) Rig: SLG									D: 27042 e: 03/09/2024							
	_	ocation: 14 Edmonton Road, Henderson Test Location: See plan				Dri	iller:		Clutch			En	d Da	ite:	03	/09/2	024			
L	ocate	ed By: Site plan/map					evati		s: 5917489mN, 1745742m 6,5m	=			id: tum:		izvi irou	0201 nd	ь			
RL (m)	Geology	Material Description	Depth (m)	Graphic Log	In Situ Testing SPT blows/75mm Shear vane peak/residual	Strength	Weathering	Defect Spacing	Defects and Drilling Remarks	Depth (m)	Drilling Method	TCR (%)	RQD (%)	Sampling	Water in/out flow	Backfill/	Installation/ Groundwater			
9.		Material extracted by Hydro Excavation.	_1_							1	Hydrovac	0				5 Bentonite	0.0000			
50.		Sity CLAY (Alluvial Soil); brown and grey mottled light brown. Very stiff; moist; high plasticity; insensitive; with minor limonite.		x x x x x x x x x x x x x x x x x x x	1/1//1/1/2/2 N = 6					- 2	SPT	100								
₹.		2,75m: becoming orange and grey mottled light brown; with trace limonite		x x x x x x x x	138 / 81 kPa						Open Barrel	58			ervations during drilling					
		Silty CLAY; orange/brown mottled grey. Very stiff; moist; medium plasticity; with some limonite staining.	_3_	x x x x x x x x x x x x x x x x x x x	1/1//1/1/1/1 N = 4					-3	SPT	100			No groundwater obsen	vel				
	Puketoka Formation		4.	× × × × × × × × × × × × × × × × × × ×						_ 4	Open Barrel	53			No	Grave				
2		Clayey SILT, with minor sand; brown/grey. Firm; wet to saturated; low plasticity; sand, fine.	5		34 / 15 kPa 0/0//0/0/1/0 N = 1						SPT	100								
- .		5.10m: becoming orange/brown Silty CLAY; light grey. Firm; wet to saturated; high plasticity. 5.30m: becoming light brown/grey, with organic staining 5.40m: with 50mm bed andy SILT, with minor day, Firm; wet to saturated; bow plasticity. 5.50m: with trace medium sand sized organic inclusions		× × × × × × × × × × × × × × × × × × ×							Open Barrel	100					\$50,50,50,50,50,50,50,50,50,50,50,50,50,5			
R	Remarks: Defect spacing and RQD should be considered to						DATI 0/09/2		LEVEL REMARK	— Н	ole Depth: Inclinati									
```	be conservative as a proportion of the defects are likely to be drilling induced.				1 1	12	/09/20	024	2.30			13.65 ed By		+	Chec	90.0 <b>ked</b>				
M	ateri	als are described in general accordance with N	IZG	S 'Fie	_							MK		4	Checked By: JL Sheet 1 of 3					
D	escri	ption of Soil and Rock' (2005).	1					- 1	F	INAI	-	- 1	Sh	ieet 1	i ot 3					

Γ												Но	e N	o.:								
	en	gineers • scientists		E	BORE	REHOLE LOG									MH01							
	lient roje							ctor	: Pro-Drill Ltd (Akl)					ID:								
	_	ocation: 14 Edmonton Road, Henderson				_	Rig: SLG Driller: Clutch							ite:	03	03/09/2024 03/09/2024						
		ocation: See plan ed By: Site plan/map						inate	es: 5917489mN, 1745742mE 6,5m				Grid: NZVD2016  Datum: Ground									
۴	T	еч ву. Зне рынинар	In Situ	LIE	val		6,5111		T_	Dai	Lunn			iiu								
RL (m)	Geology	Material Description	Depth (m)	Graphic Log	Testing  SPT blows/75mm  Shear vane peak/residual	Strength	Weathering	Defect Spacing	Defects and Drilling Remarks	Depth (m)	<b>Drilling Method</b>	TCR (%)	RQD (%)	Sampling	Water in/out flow	Backfill/ Installation/ Groundwater						
٣	F E	Sandy SILT, with minor day; grey. Firm; wet; low plasticity.	Ĭ	×××	09/01/1/19/24a N = 9	"	_	ľ	Drining Komarko	<u> </u>	Ī		_	Ű	^							
	Puketoka F	Clayey SILT, with trace sand; dark grey. Hard; moist; low plasticity; sand, fine.	† 	× × × × × × × × × × × × × × × × × × ×							SPT	100				000000000000000000000000000000000000000						
		Silty SAND (Residual Soil), with trace clay; dark grey. Dense; moist; non-plastic.	7.	× × × × × × × × ×						7 -	Open Barrel	92				\(\frac{1}{2}\cdot\) \(\frac\dot\) \(\frac{1}{2}\cdot\) \(\frac\dot\) \(\frac{1}\cdot\) \(\fr						
7	st Bays Formatio			× × × × × × × × × × × × × × × × × × ×	5/5//6/9/10/15 N = 40	EW	RS				SPT	0				0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0						
-5	Residual East Coast Bays Formation	8.50m: with very thin bed of carbonaceous material	9.	× × × × × × × × × × × × × × × × × × ×	7/7//8/9/10/15					- 8 -	Triple tube	100			ervations during drilling	ravel  C. 20, 20, 20, 20, 20, 20, 20, 20, 20, 20,						
				× × × × ×	N = 42						SPT	0			No groundwater obs	5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0						
4		Moderately weathered; dark grey; SILTSTONE; very weak.		-		vw	ΜV	cs	9,60m: 4 Joints, P <b>l</b> anar, 80°-90° Rough to10m		tube				No gi	00000000000000000000000000000000000000						
	East Coast Bays Formation	Weathered SANDSTONE; dark grey; Extremely weak.	10.	× × × × ×				MW S	9,95m: Parting, Planar, 70°-90°, Rough 10.20m: 3 Joints, Planar, 80°90°, Rough to 10,5m	-10-	Triple tube	100	63									
md cc:01:6 970:	nered East Coas			× × × × × ×	9/11//13/15/20 for 10mm N = 50+	EW	cw	MW S			SPT	100	0									
by Geroc - Machine Borenoje Log V3 - 31710/2024 5:10:33 pm -5	Weathered	Moderately weathered; dark grey; SILTSTONE; very weak.  11.20m: with thin bed very dense silty Sand to extremely weak SANDSTONE,	111			vw	MVV	/ CS	11.10m: 8 Joints, Planar, 80°90°, / Rough to12.0m	-11-	Triple tube	100	58			0(2, 0,000)2, 0,000(2,000) 0(2,000)2, 0,000(2,000) 0(2,000)2, 0,000 0,000 0 000,000 0,000 0,000						
deroc	$\vdash$	Slightly weathered; dark grey; Fine to medium grained SANDSTONE; weak.	†			w	sw	ws		‡ :	1					00000						
å R	Remarks: Defect spacing and RQD should be considered to					DATE LEVEL REMARK Hole						epth	L 1:	닊	ncli	్లి సిన్నార్లు nation:						
200						19/09/2024 2.00 12/09/2024 2.30					1	3.65	;	1		90.00						
Materials are described in general accordance with NZGS 'Field						5/	09/20	024	2.40	Lo		d By MK	:	ľ	hec	ked By: JL						
	escr	ption of Soil and Rock' (2005).	Ciu					MK F <b>I</b> NAL					Sheet 2 of 3									

	en	gineers • scientists	BORE	HC	DL	Æ	LOG	Hole No.: MH01										
	lient rojec					Co Rig		ctor	: Pro-Drill Ltd (Akl) SLG					D: 27042 e: 03/09/2024				
s	ite L	ocation: 14 Edmonton Road, Henderson		Dri	ller:		Clutch						e: 03/09/2024 e: 03/09/2024					
		.ocation: See plan ed By: Site plan/map			ordi vati		s: 5917489mN, 1745742mE 6.5m			Gri	id: tum		NZVI Brou	D2016				
۲		ou by. One planimap	T		In Situ		, vai		0,011	Τ	Ţ	<u> </u>	<u> </u>	Ė				
RL (m)	Geology	Material Description	Depth (m)	Graphic Log	Testing  SPT blows/75mm  Shear vane peak/residual	Strength	Weathering	Defect Spacing	Defects and Drilling Remarks	Depth (m)	<b>Drilling Method</b>	TCR (%)	RQD (%)	Sampling	Water in/out flow	Backfill/ Installation/ Groundwater		
Γ		[CONT] Slightly weathered; dark grey; Fine to medium grained SANDSTONE; weak.	Ŧ		12/20//31/19 for 20mm N = 50+					-	SPT	0	0			0000		
φ	Less Weathered East Coast Bays Formation		_13.			w	sw	ws	12,35m: Joint, Planar, 70°, Rough / 13,20m: 1 Joint, Planar to curved, 70°, Rough	_13_	Triple tube	60	60		No groundwater observations during drilling	Gravel  Gravel  Gravel  A. V. S. G. G. A. V. S. G. G. S. V. S. G. G. G. S. S. G. G. G. S. S. G. G. G. S. G.		
-	✝	EOH: 13.65m	† '	000000	7/43 N = 50+	Г				ļ :	PR.	0	0			0.2.0.		
8- 6- 01- 11- R			_16.							_16								
R	ema	rks: Defect spacing and RQD should be cor be conservative as a proportion of the of	nside defec	red to	1	19								<del>ٔ</del> ٔ	Inclination:			
L		likely to be drilling induced.			1	1 12/09/2024 2.30						3.65 d By MK		+	90.00 Checked By:			
M	ateri escri	als are described in general accordance with ption of Soil and Rock' (2005).	eld	1   5/09/2024   2.40   Logg								+	Sł	JL Sheet 3 of 3				

Γ		1):		_	ODE	<u></u>	ار ا	_	1.00			Но	le N								
L	eng	ineers • scientists			OKE	REHOLE LOG									MH02						
	lient: rojec					Contractor: Pro-Drill Ltd (Akl) Rig: SLG									D: 27042 e: 03/09/2024						
	-	ocation: 14 Edmonton Road, Henderson				Driller: Clutch							d Da	ite:	: 03/09/2024						
L	ocate	Test Location: See plan ed By: Site plan/map						ınate ion:	s: 5917418mN, 1745721mE 7,4m			Gr Da	ıd: tum:		iZVL Groui	02016 nd					
RL (m)	Geology	Material Description	Depth (m)	Graphic Log	In Situ Testing SPT blows/75mm Shear vane	Strength	Weathering	Defect Spacing	Defects and	Depth (m)	Drilling Method	TCR (%)	RQD (%)	Sampling	Water in/out flow	Backfill/ Installation/ Groundwater					
٣	9	Materials extracted by Hydro Excavation.		9	peak/residual	Ġ	>		Drilling Remarks		_	F	~	Š	>	8 = 5					
7			_1_							_ 1 _	Hydrovac	0									
		1.50m: with sandy fine to medium gravel  Sity CLAY (Alluvial Soil); orange and grey streaked light brown. Very stiff; moist; high plasticity.		× × × × × × × ×	1/1//1/1/1/2 N = 5					2 -	SPT	100									
۵.	rmation	Silty CLAY; orange and grey mottled light brown. Stiff; moist; high plasticity; moderately sensitive.		× × × × × × × × × × × × × × × × × × ×							Open Barrel	95			ervations during drilling						
4.	Puketoka Form	Sandy SILT, with trace clay; light brown mottled light grey/blue, Very loose; saturated; non-plastic; with trace fine gravel sized, rounded pumice and clay clasts.		× × × × × × × × × × × × × × ×	89 / 37 kPa 0/0//1/0/0/0 N = 1					_ 3 _	SPT	100			No groundwater observล						
		Silty CLAY, with minor sand; orange motiled grey. Stiff; moist to wet; medium plasticity; sand, fine.		× × × × × × × × × × × × × × × × × × ×						4	Open Barrel	100			No						
۳.		Silty fine to coarse SAND, with trace clay; dark grey. Loose; saturated; non-plastic; with trace fine gravel sized, rounded pumice and clay dasts.		× × × × ×	21417710140140						odo										
	mation	4,65m: with 20mm bed of limonite  Silty medium SAND (Residual Soil); dark grey.  Dense; moist; non-plastic; with coarse white sand sized clasts.		× × × × ×	3/4//7/8/10/12 N = 37					5_5	SPT	100									
2 .	Residual East Coast Bays Formation	5,80m: becoming silty fine sand, with occasional carbonaceous laminae		× × × × × × × × × ×		EW	RS				Triple tube	62									
R	emai	rks: Defect spacing and RQD should be consibe conservative as a proportion of the de					DAT	Ē	LEVEL   REMARK	Но		<b>epth</b> 0.65		٦	ncli	nation:					
		likely to be drilling induced. Some gravel falling downhole over first run	·	Logge								+	90.00 Checked By:								
M D	ateria	als are described in general accordance with Notion of Soil and Rock' (2005).	eld	1								+	JL Sheet 1 of 2								

Γ												Но	e N	o.:			
BOREHOLE LOG  engineers • scientists													MH02				
- 1	lie	ent: Wentz-Pacific Ltd				Contractor: Pro-Drill Ltd (Akl)							Project ID: 27042 Start Date: 03/09/20				
	•	ject: Geotechnical Investigation Location: 14 Edmonton Road, Henderson				Rig: SLG  Driller: Clutch								/09/2024 /09/2024			
_		t Location: See plan				Driller: Clutch Coordinates: 5917418mN, 1745721mE						Gri				02016	
Ŀ	OC:	ated By: Site plan/map				Ele	vati	on:	7,4m	_	_	Dat	tum	G	rou	nd	
(m)	Goology		Depth (m)	Graphic Log	In Situ Testing SPT blows/75mm Shear vane peak/residual	Strength	Weathering	Defect Spacing	Defects and Drilling Remarks	Depth (m)	<b>Drilling Method</b>	TCR (%)	RQD (%)	Sampling	Water in/out flow	Backfill/ Installation/ Groundwater	
		[CONT] Silty medium SAND (Residual Soil); dark grey. Dense; moist; non-plastic; with coarse white sand sized clasts.		× × × × × × × × × × × × × × × × × × ×	1/2//6/7/12/15 N = 40	EW	RS				SPT	0					
	Control over Country	Completely weathered; dark grey; medium SANDSTONE; extremely weak.	7.			EW	cw	cs	6.45m: 3 Joints, Planar, 80°-90°, Rough to 6.80m	7 -	Triple tube	99	90				
	Monthoom	Weathered		- -	3/7//17/20/13 for 30mm N = 50+						SPT	0	0		Irilling		
7	1	Slightly weathered; dark grey; SANDSTONE; very weak.  8.20m: coarsing downwards to coarse SANDSTONE  8.50m: becoming fine SANDSTONE, with occasional carbonaceous laminae	. 8.					cs	8.10m: 4 Joints, P <b>l</b> anar, 80°-90° , / Rough to 8,50m	8.	Triple tube	100	99		groundwater observations during drilling		
6	1000	carbonaceous laminae  skeed to the control of the control of the carbonaceous laminae  skeed to the control of the carbonaceous laminae  graph of the carbon	9		9/29//38/12 for 25mm N = 50+	vw	sw		9.30m: 8 Joints, Planar, 90°, Smooth to 10m, generally along medium/ SANDSTONE beds to 10.0m	9-	SPT	0	0		5 oN		
5		10,10m: with 30mm bed of medium SANDSTONE	_10.					MW S		_10_	Triple tube	94	75				
	+	10.40m: with 30mm bed of medium SANDSTONE  EOH: 10.65m		19888	9/41 for 70mm N = 50+					<u> </u>	SPT	0	0				
by Geroc - Machine Borehoje Log v3 - 31/10/2024 3:19:13 pm -4			_11_		1, - 507					11							
βF	em	narks: Defect spacing and RQD should be consi	de	red to	PIEZO		DATE		LEVEL   REMARK	Но	le D	epth	:	닊	ncli	nation:	
2 2 3 3 1		be conservative as a proportion of the def likely to be drilling induced. Some gravel								Hole Depth: 10.65				90.00			
falling downhole over first run  Materials are described in general accordance with NZGS 'Field										Lo		d By MK	:	ľ	Chec	ked By: JL	
	esc	erials are described in general accordance with N cription of Soil and Rock' (2005).	JU FI	, N							NAL		1	Sh	eet 2 of 2		