MINISTRY OF TRANSPORT
TE MANATŪ WAKA

OC250606

28 July 2025

[redacted]

Tēnā koe [redacted]

I refer to your email dated 22 June, requesting the following under the Official Information Act 1982 (the Act):

> *"all available geotechnical information for the Auckland Light Rail project (City Centre to Māngere), including but not limited to borehole data, 3D geological models, hydrogeological reports, contaminated land assessments, and any related geotechnical reports from investigations conducted in 2022–2023. Please provide the information in digital format via email to* [redacted] *If any information is withheld, please specify the reasons under the OIA."*

After our conversation on the phone, the scope of your request was change to the following

> *"Written reports that contain detailed geotechnical data of the ground conditions along the proposed ALR route (from Māngere to the City Centre). For the areas where these reports have not been completed, could you please supply the raw data available such as bore logs etc"*

The following *document ALR Stage 1 Ground Investigation Factual Report (August 2023)* falls within the scope of your request. Certain information is withheld under the following sections of the Act:

> 9(2)(a) to protect the privacy of natural persons

You have the right to seek an investigation and review of this response by the Ombudsman, in accordance with section 28(3) of the Act. The relevant details can be found on the Ombudsman's website **www.ombudsman.parliament.nz**

The Ministry publishes our Official Information Act responses and the information contained in our reply to you may be published on the Ministry's website. Before publishing we will remove any personal or identifiable information.

Nāku noa, nā

Bryan Field
Manager, Programme Monitoring and Investment Management

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Stage 1 – Ground Investigations Factual Report

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Security Classification

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1. Introduction

This Ground Investigation Factual Report (GIFR) documents the first stage of ground investigations carried out by the Auckland Light Rail Alliance, for the Auckland Light Rail Project.

Stage 1 Ground Investigations for the project were carried out in parallel to the development of database of historical investigations (and interpretations) from other projects, and the development of an associated 3D geological model.

The broad purposes for these preliminary investigations are to:

- fill in knowledge-gaps identified in desktop review (i.e., between investigations completed for other projects;
- provide control points on key geological surfaces;
- establish a project groundwater monitoring network;
- work towards non-invasive detection of (larger) lava caves;
- answer specific ground related issues to accommodate preliminary design; and
- provide for longer-term knowledge base for future corridor development.

Procurement of the geotechnical drilling contractors engaged to under the works was sourced by open tender. Supporting contractors (traffic management, service clearance, etc.) and geophysical contractors were selected by other procurement processes appropriate to the scope of works of each task.

1.1 Report Purpose

The purpose of this GIFR is to collate the factual ground data collected from the Stage 1 ground investigations, downhole installations, and geophysical surveys.

This report has been prepared with reference to the guidance provided in the New Zealand Ground Investigation Specification. Interpretation of geological unit(s) based on engineering geological knowledge of the project area is provided on the borehole logs appended to this report to meet the project brief.

1.2 Version Control

This GIFR will be later revised following submission of verified investigation records and final laboratory results.

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2. Site Setting

2.1 Site Setting

The Auckland Light Rail (ALR) corridor spans 24 kms and connects Auckland City Centre in the north with South Auckland (Figure 2.1). The project is broken into three major package areas: Auckland City to Mt Roskill (Package 1), Mt Roskill to Onehunga (Package 2), and Onehunga to Auckland International Airport (Package 3). Package 1 consists of a tunnelled railway system with 6 underground stations and 1 above ground station. Packages 2 and 3 consist of overland track with at least 6 above-ground stations (Figure 2.1).



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Figure 2.1 Map of the Proposed ALR Alignment (Consent Design)

2.2 Published Geology

The regional geology of the Auckland urban area is described in the GNS Science 1:50,000-scale geological map of Sheet R11 (Kermode, 1992). Kermode's stratigraphy provides the basis of our understanding of the geology of the alignment, his terminology has been adopted for material description and classification.

The main stratigraphic units (from oldest to youngest) are as follows:

Waitemata Group – East Coast Bays Formation (ECBF): is a thick (hundreds of metres) sequence of alternating sandstone and siltstone dating from the Miocene (c. 20 Million years old) that underlies the entire project area. The near-surface parts of the ECBF are typically weathered, though degree and depth of weathering varies considerably.

Kaihu Group – Kaawa Formation: Comprises pumiceous, fossiliferous fine to medium sand and weakly cemented sandstone and, in some local areas, organic beds or lenses. Accumulated in a shallow marine and estuarine conditions, these sedimentary materials are located south of the Manukau Fault: as thin lenses in the north (Mangere,) but thickening substantially to the south.

Tauranga Group: Throughout the project area, Waitemata and Kaihu Groups are locally overlain by unconsolidated alluvial sediments of the Tauranga Group. Kermode subdivides the group into units ranging from older soils associated with middle Pleistocene low sea-levels (Puketoka Formation) to Recent (<10,000 yrs) "littoral" (intertidal) deposits associated with modern harbours and shorelines, or alluvial deposits associated with modern streams.

Auckland Volcanic Field: (AVF): 53 separate volcanic centres ranging in age from 150,000 years to just 500 years ago form the AVF. Typical deposits include basaltic lava flows, ash, and tuff deposits of varying thickness. AVF interfingers with sediments of the Tauranga Group (and with interdigitating layers locally).

Fill: Only the most significant areas of man-made deposits are depicted on the 1:50,000 scale geological map. Areas of filling include the waterfront reclamation, Grafton Gully, and areas adjacent to the North Auckland Line and Onehunga Foreshore.

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3. Investigation Methodology

3.1 Utilities Avoidance

The Alliance has implemented a utilities avoidance workflow, designed to reduce risk of working proximal to buried and overhead services. Refer to the Auckland Light Rail Ground Investigation Methodology Plan [ALR-ALR-GEO-PLN-0001, dated 3 February 2023] which documents processes related to intrusive works. Geotechnical drilling contractors engaged for the Stage 1 ground investigations reviewed and agreed to the methodology plan during procurement in January 2023.

3.1.1 Utilities Avoidance Workflow

The location of each planned ground investigation was inspected by a representative from the Alliance, Drill Force NZ Ltd or McMillan Drilling Ltd, and Nick Mepstead from Underground Utility Locators Ltd. Locations were assessed using service plans from Network Utility Owners (NUO) and locally moved to avoid published locations of services.

Each investigation location was scanned using Cable Avoidance Tool (CAT) and Genny to locate, mark, and clear powered and/or metallic traced services. A series of perpendicular Ground Penetrating Radar (GPR) lines were completed across each location to identify non-metallic services such as concrete pipes. Where services could not be cleared due to obstructions or burial depths, measures such as CCTV and GPS were utilised.

Where planned investigations encroached on an identified service/s, they were locally offset to provide an appropriate 'buffer', or to meet utility clearance requirements; where possible, additional offsets to services were applied to account for subtle variations in actual location.

Ground investigation locations were physically cleared by excavating to a minimum depth of 1.5 m below the ground surface using either non-destructive digging techniques (vacuum excavation and/or hydro excavation), or hand augering. The physical clearance diameter completed was larger than the diameter of the investigation, typically 300 mm. All physical clearances were backfilled with hydrated bentonite pellets and/or protective casing (GAP method) to enable the completion of the relevant investigation. Where physical clearance was refused on hard materials, the clearance was triangulated to confirm shallow refusal on competent in-situ materials (i.e., basalt lava flows).

All avoidance measures outlined above were documented in a Permit to Drill form for each respective investigation and signed off by the Permit Issuer and Receiver prior to commencing drilling works.

3.2 Investigation Location Accuracy

Investigations were set out relative to planned investigation locations using proposed coordinates, landmarks, and local structures. Each investigation location was moved to avoid tree driplines, small structures/infrastructure, and steep terrain and to accommodate plant space requirements. Collar positions of the completed investigations were recorded using a Leica FLX100a in single baseline Real Time Kinematic (RTK) configuration having ±2 mm horizontal accuracy and ±3 mm vertical accuracy following the completion of drilling and installation of instrumentation.

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3.3 Core Logging

Rotary cored machine drilling was supervised full time by an Alliance representative for the purpose of documenting site observations. Records were captured using standard Alliance forms. All recovered samples were transferred to the project's core storage facility located in Penrose at the end of each shift.

Borehole logs completed by the Alliance were reviewed and verified to maintain consistency and quality of material descriptions. All soil and rock material descriptions are logged in general accordance with the New Zealand Geotechnical Society (NZGS) 'Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes' (2005).

3.4 Logging Standards

All core samples were logged on site by a trained Alliance Site Supervisor in accordance with the NZGS 2005 guidelines.

Within these guidelines the following styles have been adopted for ALR logging:

For East Coast Bays Formation:

- Material up to Highly Weathered is described according to the rock guide.
- Completely Weathered and Residual ECBF is described as a soil.
- For rock material classified as Extremely weak, a soil description is also provided.
- RQD calculations excludes vertical joints.

For Auckland Volcanic Field:

- Basalt is described as "rubbly" where auto-brecciation is identified.
- Reworked ash materials (rhyolitic and basaltic) are classified as Tauranga Group.
- Logging terminology and nomenclature summary guide are presented in Appendix B-1.

3.5 Photography

Site photographs were taken of each investigation locations before and after drilling to document site conditions, installations, in-situ testing and site remediation.

Throughout drilling, core photography was taken on site of the splits, Standard Penetration Tests (SPT) samples and core boxes for the purposes of documenting ground conditions immediately after recovery. High resolution photographs of core boxes were undertaken at the ALR core storage facility using a using a Canon EOS 1500D and lighting station, wet and dry photographs of rock samples was prepared to support thorough quality assurance and sampling processes. Photographs are hosted on a cloud-based storage platform IMAGO which integrates to the Project's 3D geological model hosted in Leapfrog (Seequent).

3.6 Core Storage

Core boxes and samples were transported to the ALR core storage facility located at Unit B1, 269A Mount Smart Road, Penrose, Auckland at the completion of each shift.

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3.7 Sampling

The following sampling methods were adopted for soil and rock samples recovered from the rotary-cored machine boreholes.

- Soil samples recovered from SPTs were packaged in sealed airtight plastic bags immediately following recovery.
- Undisturbed in-situ samples were collected via 50 mm ID thin-walled stainless-steel push tubes with wax sealant at each end to maintain nature moisture content.
- Soil sampled from the plastic lay-flat wrapped core split within the core box and placed into sealed airtight plastic bags.
- Rock samples recovered from HQ3/PQ3 drilling runs were identified for geotechnical laboratory testing and tightly wrapped with plastic shrink wrap. Wrapping typically occurred post-drilling at the ALR core storage facility.
- All core samples were collected and protected in plastic lay-flat wrap and plastic perforated core boxes.

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4. Ground Investigations

31 machine boreholes (BH) were drilled between 6 February 2023 to 10 July 2023. by Drill Force NZ Ltd or McMillan Drilling Ltd under the full-time supervision of an ALR Site Supervisor. Boreholes Drill rigs used as part of this Stage 1 ground investigation include:

- McMillan Drilling Ltd:
  - Massenza MI4 Rig
  - Comacchio Geo 305 Rig
- DrillForce NZ Ltd:
  - Top Drive Diamond Coring Rig
  - Trekker 2100 Hydrapower Rig

Investigation Location Plans are presented in Appendix A. Investigation logs, core photography, installation records and downhole geophysics are reported in Appendix B.

All holes were drilled using HQ or PQ sized drilling equipment with a rotary cored wireline drilling system unless otherwise instructed by the ALR Site Investigations Manager. Drilling fluid was typically reticulated water. However, to account to for hole instability drilling fluid additives (e.g., bentonite, polymer, etc.) were utilised where required and documented by the ALR Site Supervisor.

A summary of the completed machine boreholes is presented in Table 4.1.

Table 4.1 Summary of boreholes drilled as part of Stage 1 Ground Investigations

BH ID	Location	Completion Date	Coordinates (1)		Collar (m RL)(2)	Depth (m bgl)
			Easting (m)	Northing (m)		
BH1104	142 Wellesley Street West, Auckland CBD	12/05/2023	399286.5	803454.9	7.8	50.0
BH1106	35 Wellesley Street East, Auckland CBD	18/04/2023	400243.6	802973.0	34.2	40.0
BH1107	87 Wakefield Street, Auckland CBD	27/03/2023	400131.5	802655.6	61.2	60.0
BH1109	Corner of Symonds Street and St Martins Lane, 77-97 Symonds St, Grafton	20/03/2023	400023.9	802435.7	72.9	66.0
BH1110	1 Porters Avenue, Eden Terrace	29/03/2023	399117.9	801279.6	66.075	40.5
BH1111	322 New North Road, Kingsland	04/04/2023	398915.2	801193.5	59.891	45.0

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BH ID	Location	Completion Date	Coordinates (1)		Collar (m RL)(2)	Depth (m bgl)
			Easting (m)	Northing (m)		
BH1202A	Raleigh Street, Mt Eden (outside 37 Marlborough Street)	13/03/2023	398583.3	800426.7	47.215	42.0
BH1203	Shaw St, Kingsland	17/02/2023	397922.6	800351.9	40.7	42.0
BH1204	35 Paice Avenue, Mount Eden, Auckland CBD	22/02/2023	398352.7	799933.1	42.3	40.0
BH1205A	34 Saint Albans Avenue	23/03/2023	398381.6	799711.2	39.5	50.5
BH1206	225 Sandringham Road, Sandringham	03/03/2023	397804.3	799971.7	34.3	50.0
BH1207	270 Sandringham Road, Sandringham	27/02/2023	397813.6	799741.4	35.5	40.5
BH1208	Lancing Avenue	06/04/2023	397773.0	799483.0	41.6	50.5
BH1209	1A Patterson St	18/04/2023	397731.8	799240.2	43.6	60.0
BH1210	423 Sandringham Road, Sandringham	04/05/2023	397640.3	799045.9	42.5	40.5
BH1212	1 Taumata Road	21/04/2023	397292.8	798203.0	56.2	40.5
BH1214	6 Farrelley Avenue, Owairaka	17/04/2023	396794.5	797430.7	52.1	36.0
BH1301	Bellevue Reserve, Mt Eden	13/03/2023	398955.2	800646.8	69.5	48.4
BH1302	312-328 Dominion Road, Mount Eden	04/04/2023	398812.2	800170.2	59.9	50.5
BH1303	8 Tennyson Street, Mt Eden	21/03/2023	398411.8	798930.5	48.9	50.0
BH1404	53 Quadrant Road, Onehunga	12/04/2023	401337.9	795480.0	39.7	50.0
BH1406	109-111 Onehunga Mall, Onehunga	11/05/2023	401943.5	794962.3	10.8	40.0
BH1410	Walmsley Rd, Mangere	03/05/2023	402498.1	791692.4	6.9	36.0

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BH ID	Location	Completion Date	Coordinates (1)		Collar (m RL)(2)	Depth (m bgl)
			Easting (m)	Northing (m)		
BH1411	Moyle Park, Bader Drive, Mangere	20/04/2023	402689.1	790815.7	5.3	39.0
BH1501	88 Bader Drive Verge	27/04/2023	402932.2	790333.9	12.1	34.5
BH1503	Westney Road	20/02/2023	401927.2	788198.3	15.547	42.0
BH2202	Kingsland Train Station, Sandringham Rd	28/04/2023	398287.2	800776.0	47.5	50.0
BH2209	Corner of Balmoral and Sandringham Rd	17/05/2023	397752.9	799365.3	42.4	48.0
BH2211	Corner of Arabi and Calgary St	28/06/2023	397800.0	798586.7	44.1	43.5
BH2212	Lambeth Road	04/07/2023	397678.9	798477.6	43.2	45.0

1. Coordinates and bearings are with reference to Mount Eden 2000 (EDENTM2000) coordinate projection.
2. Elevations are with reference to New Zealand Vertical Datum 2016 (NZVD2016).

Drilling was suspended between 12 May 2023 to 4 July 2023, the purpose of this stand down was to ensure the remaining investigations targeted key areas of geological uncertainty proximal to proposed structures confirmed in late June.

4.1 Groundwater levels

Depths to groundwater were recorded during the progression of each borehole, typically at the start of each shift, during drilling and immediately following completion of each borehole. These levels are shown on each respective borehole log in Appendix B-2. It should be noted that the borehole drilling method used introduces water to the ground as a drilling fluid. Use of groundwater levels recorded during and immediately following completion of drilling should be assessed accordingly.

4.2 In-situ testing

4.2.1 Handheld Shear Vane Testing

Shear vane tests were conducted either downhole in the upper three (3) metre profile or at the end of the core barrel using a 19 mm handheld shear vane blade. Testing was completed in cohesive soils following New Zealand Geotechnical Society Guideline for Hand Held Shear Vane Test (2001). All vanes had been calibrated within 12 months prior to investigations, refer to Appendix C-1 for calibration certificates.

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For shear vane results refer to the borehole logs presented in Appendix B-2, all results have been corrected.

4.2.2 Standard Penetration Testing

In situ strength testing in the form of Standard Penetration Testing (SPTs) was undertaken at nominal and regular 1.5 m intervals during the progression of each borehole, with testing carried out in accordance with BS EN ISO 22476-3:2005+A1:2011, and ASTM D1586-11.

No additional correction to the SPT is recorded on the borehole logs reported in Appendix B-2.

A split spoon sampler was used whenever possible; graduating to a solid cone as the density of the sample increased. The termination criteria for SPTs were specified on a hole-by-hole basis via specification sheets, however, were generally terminated after three consecutive N=50+ reports were achieved in the underlying ECBF basal rock. No testing was undertaken in weak+ AVF basalt.

Drill Force NZ Ltd and McMillan Drilling Ltd trip hammers calibration certificates used for Stage 1 rotary core drilling are reported in Appendix C-2.

4.2.3 Wireline Geophysics

Wireline Geophysics, also known as downhole geophysics, was completed by Resource Development Consultants Ltd (RDCL) in five (5) of the 31 boreholes. A combination of the following tools was utilised:

- Acoustic Televiewer
- Optical Televiewer
- Compensated Density
- Mechanical Caliper
- Full Wave Form Sonic
- P&S Wave Logger

Refer to Table 4.2 for a summary of completed downhole geophysics testing. Downhole geophysical reports are presented in Appendix B-4.

Table 4.2 Summary of Downhole Geophysics

BH ID	Acoustic Televiewer	Optical Televiewer	Compensated Density	Mechanical Calipers	Full Wave Form Sonic	P&S Logger
BH1107	✓	✓	×	✓	✓	✓
BH1109	✓	✓	×	✓	✓	✓
BH1111	✓	✓	×	✓	✓	✓
BH1206	✓	✓	✓	✓	✓	✓
BH1207	✓	✓	✓	✓	✓	✓

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4.3 Permeability Testing

4.3.1 Packer Testing

Single Packer testing (also known as Lugeon or Water Injection Testing) at two sites during drilling with target formations isolated using a packer. Testing was completed in accordance with The Standard Operating Procedure for Borehole Packer Testing by Michael Royale. A full suite of results will be presented in the next revision of this GIFR.

A summary of testing conditions is provided in Table 4.3.

Table 4.3 Summary of Packer Testing Conditions

BH ID	Date and Time	Top Screen (mbgl)	Bottom Screen (mbgl)	Geological Description of Test Section
BH1202A	07/03/23 10:30am to 08/03/23 01:30pm	10	13	Slightly Weathered dark grey BASALT. Widely to very widely spaced sub-vertical and sub-horizontal discontinuities.
BH1301[1]	07/03/23 11:18am	10	13	Slightly Weathered dark grey BASALT. Moderately widely spaced to widely spaced sub-vertical and sub-horizontal discontinuities.
1. BH1301 failed due to insufficient pressure applied from water pump				

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5. Instrumentation and Monitoring

5.1 Vibrating Wire Piezometers

64 Vibrating Wire Piezometers (VWP) were installed in 28 boreholes across the project corridor at varying depths. Installation and construction details were designed by the Alliance and based on the preliminary geological/hydrogeological findings of each borehole. All instrumentation was supplied by Sixense Oceania Pty Ltd and installed by the Alliance and Drill Force NZ Ltd or McMillan Drilling Ltd.

Transducers were fixed to a 32mm ID uPVC pipe and lowered downhole, with the pipe acting as a conduit to backfill the borehole. During installation, a series of readings were recorded – prior to installation, downhole, and post-installation to confirm functionality.

As-built construction details of the downhole installations are summarised in Table 5.1: Vibrating Wire Piezometer Details and presented in Appendix B-5.

Table 5.1 Vibrating Wire Piezometer Details

BHID	Vibrating wire transducer depth (m bgl)			VWP Installation Date	Logger Type	Temporal Resolution	Datalogger Installation Date
	P1	P2	P3				
BH1104	35.0	6.0	-	15/05/23	5 Channel	60 mins	15/05/23
BH1106	37.0	10.0	-	18/04/23	5 Channel	60 mins	18/04/23
BH1107	53.0	12.0	-	27/03/23	5 Channel	60 mins	27/03/23
BH1109	43.0	21.5	17.0	21/03/23	5 Channel	60 mins	21/03/23
BH1110	40.0	9.5	-	29/03/23	5 Channel	60 mins	29/03/23
BH1111	40.0	7.5	-	04/04/23	5 Channel	60 mins	04/04/23
BH1202A	40.0	30.0	20.0	13/03/23	5 Channel	60 mins	13/03/23
BH1204	35.0	9.0	-	23/02/23	5 Channel	60 mins	23/02/23
BH1205A	43.0	-	-	23/03/23	1 Channel	60 mins	23/03/23
BH1206	45.0	27.0	11.0	02/03/23	5 Channel	60 mins	02/03/23
BH1207	35.0	7.0	-	27/02/23	5 Channel	60 mins	27/02/23
BH1208	50.0	17.0	-	06/04/23	5 Channel	60 mins	06/04/23
BH1210	40.0	27.0	-	04/05/23	5 Channel	60 mins	04/05/23
BH1212	39.0	9.0	-	21/04/23	5 Channel	60 mins	21/04/23
BH1214	35.0	20.0	-	17/04/23	5 Channel	60 mins	17/04/23
BH1301	47.0	42.0	35.0	16/03/23	5 Channel	60 mins	16/03/23
BH1302	40.0	9.0	-	05/04/23	5 Channel	60 mins	05/04/23
BH1303	48.0	42.0	35.0	21/03/23	5 Channel	60 mins	21/03/23
BH1404	40.0	-	-	12/04/23	1 Channel	60 mins	12/04/23
BH1406	38.0	15.0	-	12/05/23	5 Channel	60 mins	12/05/23
BH1410	33.0	10.5	7.0	03/05/23	5 Channel	60 mins	03/05/23
BH1411	30.0	15.0	-	20/04/23	5 Channel	60 mins	20/04/23

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BHID	Vibrating wire transducer depth (m bgl)			VWP Installation Date	Logger Type	Temporal Resolution	Datalogger Installation Date
	P1	P2	P3				
BH1501	33.5	14.0	-	27/04/23	5 Channel	60 mins	27/04/23
BH1503	41.0	16.0	-	20/02/23	5 Channel	60 mins	20/02/23
BH2202	48.0	22.0	17.0	28/04/23	5 Channel	60 mins	28/04/23
BH2209	47.0	37.0	25.0	17/05/23	5 Channel	60 mins	17/05/23
BH2211	42.0	34.0	22.5	29/06/23	5 Channel	60 mins	28/07/23
BH2212	43.0	23.0	16.0	03/04/23	5 Channel	60 mins	28/07/23

Two types of data loggers were used: single channel (LS-G6-VW-1M) and 5 channel (LS-G6-VW) and installed in traffic management safety-rated 300 mm wide flush mounted Toby Boxes (with non-ferrous lids).

Monitoring data is currently being captured on a monthly basis by Sixsense Oceania Pty Ltd and uploaded to Beyond Data, a cloud hosted data platform.

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6. Laboratory Testing

Stage 1 samples have been dispatched to various accredited laboratories across New Zealand and Australian. The testing schedule and receipt of laboratory results will be issued in the next revision of this GIRF.

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7. Gravity Survey

7.1 Gravity Survey

Gravity surveys were completed by ScanTec Ltd within and around the project corridor.

A Lacoste and Romberg (L&R) G-model gravity meter was used for this survey.

To acquire the most accurate data, the following precautions have been taken:

- Approximately 80% of readings were taken at night, to reduce the effects of vibration from traffic noise on the gravity metre.
- Multiple gravity base stations were established and reoccupied at regular intervals during every survey day to monitor and correct for instrument drift.
- Up to eight (8) readings taken at every station to ensure repeatability and multiple occupancy of stations for quality control.
- Constant temperature regulation is required for the gravity meter. The meter temperature was maintained at 51.7 degrees centigrade for the entire survey.

Positional surveying was carried out using a RTK GPS (SKYNET, Newmarket base station). Accuracy on stations with acceptable sky coverage was <10 mm (horizontal/vertical). Generally, measurement locations were selected in locations that provided adequate GPS sky coverage.

Data has been processed for presentation with the use of custom ScanTec Ltd software and QC-Tool.

Standard gravity corrections were applied to this data set which included:

- Tidal correction
- Instrument drift correction
- Latitude correction
- Free-air correction
- Bouguer correction
- Inner and outer terrain corrections.

Results reported by ScanTec Ltd are presented in Appendix D.

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8. Explanatory Statement

8.1 Limitations on investigations and information

Notice to Reader/User of this Document:

This is a factual report of field investigations. The field investigations have been undertaken at discrete locations and no inferences about the nature and continuity of ground conditions away from the investigation locations are made. Furthermore, logs are provided presenting descriptions of the soils and geology based on our observation of the samples recovered in the fieldwork and may not be truly representative of the actual underlying conditions.

To the maximum extent permitted by law, Auckland Light Rail Limited disclaims all liability and responsibility (in contract or tort, including negligence, or otherwise) for any loss or damage whatsoever which may be suffered as a result of any reliance by any third party on this report, whether that loss is caused by any fault or negligence on the part of Auckland Light Rail Limited or otherwise.

No interpretation of the investigation results has been made in this report. Should you be in any doubt as to the applicability of this report for the proposed development described herein, it is essential that you carry out independent investigations to satisfy your needs.

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9. References

ASTM D1586-11: Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling or Soils.

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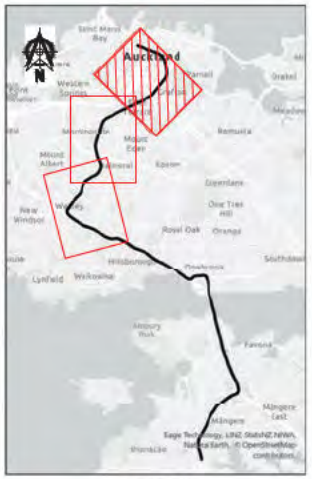
Shane, P., Strachan, L. J., & Smith, I. E. C. (2010). Redefining the Waitemata Basin, New Zealand: A new tectonic, magmatic, and basin evolution model at a subduction terminus in the SW Pacific. *Geochemistry, Geophysics and Geosystems, 11*(4), n/a. https://doi.org/10.1029/2009gc002705

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Appendix A Borehole Location Plans

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KEY PLAN

NOTES:

1) ALL DIMENSIONS ARE IN METERES UNLESS OTHERWISE STATED
2) COORDINATE SYSTEMS.
VERTICAL DATUM - NEW ZEALAND VERTICAL DATUM 2016 (NZVD2016)
SURVEY DATUM - NEW ZEALAND TRANSVERSE MERCATER 2000 (NZTM2000).
3) SEPARATE ALIGNMENTS WERE USED FOR EACH PACKAGE:
PACKAGE 1: ALRPC-ALRA-100CCI__-777-TN-RAIL-RA-YIM-(NNNN)
PACKAGE 2: ALRPC-ALRA-200DIE__-ZZZ-TW-RAIL-RA-3DM-001001
PACKAGE 3: ALRPC-ALRA-300MTA__-ZZZ-TW-RAIL-RA-3DM-030000
4) APPENDIX A OF GROUND INVESTIGATIONS FACTUAL REPORT

LEGEND:

STAGE 1 ROTARY CORE WIRELINE

GRAVITY SURVEY PROFILE, WITH STATION LOCATIONS

ALR ALIGNMENT

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0 50 100 250 500m

A1 / A3
1:5000 / 1:10000

PLAN VIEW

SCALE 1:5000

REFERENCES:
1. ALRPC-ALRA-XXXXXXXX-XXX-GE-CAD-DR-DET-000001

REV.	VER.	DATE	STAT. CODE	DESCRIPTION	DRAWN	REVD.	APPD.
001		25.08.23	CR	FOR REVIEW AND COMMENT - PHASE 1 DR LLED BOREHOLE LOCATION	CJ	SM	SN

SCALE		
1:5000		
COORDINATE SYSTEM: NZTM2000 (EPSG:2193)		
HEIGHT DATUM: NZVD2016 (EPSG:7839)		
DRAWN	C.JODINATA	25.08.2023
REVIEWED	S.MACKAY	25.08.2023
APPROVED	S.NELIS	25.08.2023
	BY	DATE

AUTHORISE

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CR - FOR REVIEW AND COMMENT

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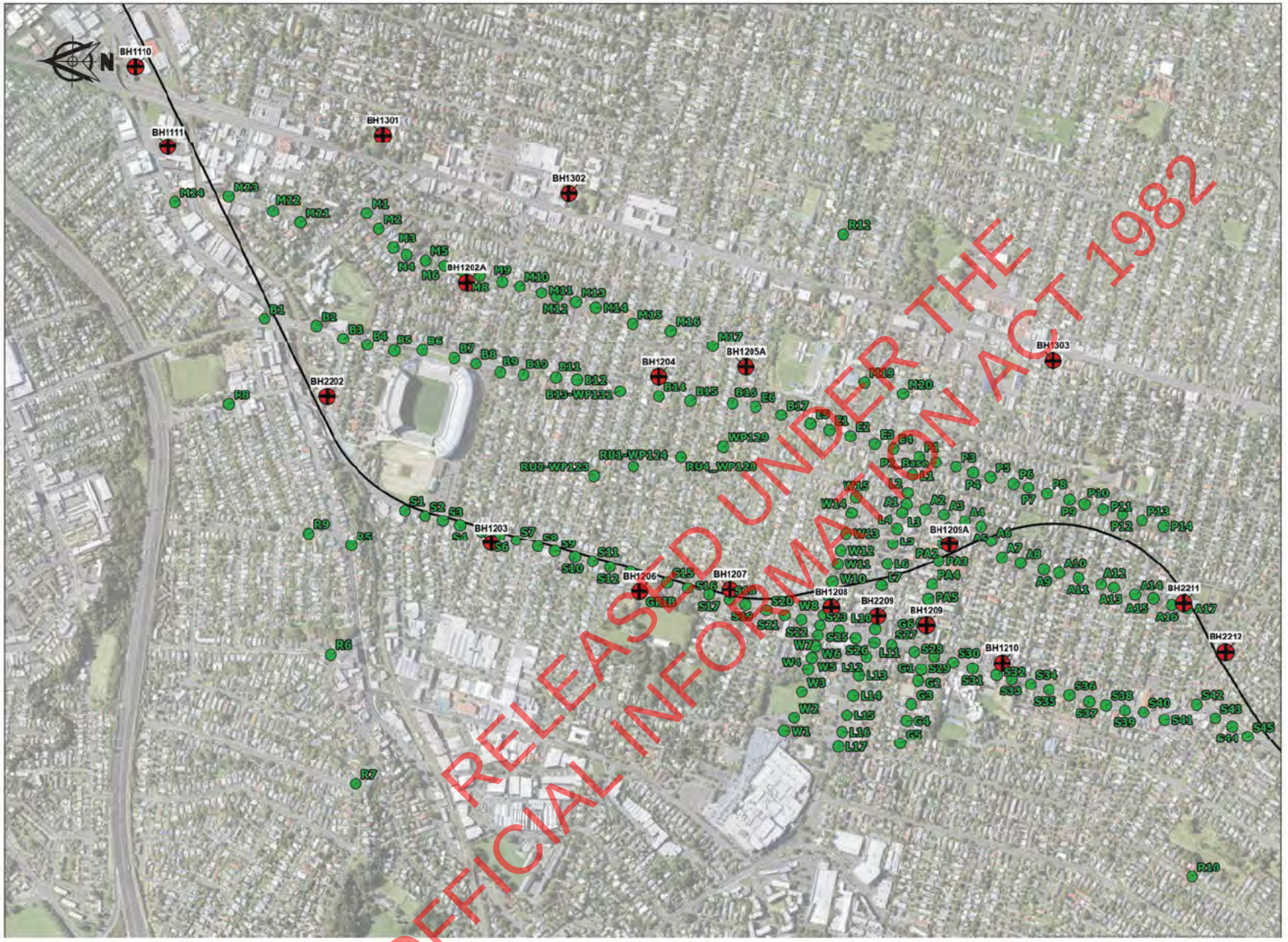
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PROJECT	AUCKLAND LIGHT RAIL ALLIANCE : PRE-CONSTRUCTION PLANNING
DRAWING TITLE	PACKAGE 100 PACKAGE 1: CITY CENTRE AND ISTHMUS APPLICABLE TO MULTIPLE LEVEL/ZONES GROUND ENGINEERING - GEOLOGY (NCL. SOIL/GROUND INFORMATION) DRAWING - LAYOUT PLAN (ALSO KNOWN AS GENERAL ARRANGEMENTS)
SHEET	1 of 3
SIZE	A1

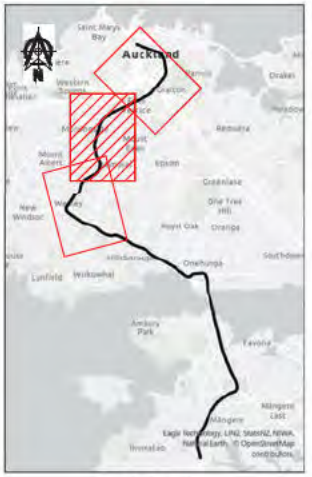
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ALRPC	ALRA	100CCI__	ZZZ	GE	GEO	DR	SLP	015021	S01	

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KEY PLAN

NOTES:

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2) COORDINATE SYSTEMS:
VERTICAL DATUM - NEW ZEALAND VERTICAL DATUM 2016 (NZVD2016)
SURVEY DATUM - NEW ZEALAND TRANSVERSE MERCATER 2000 (NZTM2000).
3) SEPARATE ALIGNMENTS WERE USED FOR EACH PACKAGE:
PACKAGE 1: ALRPC-ALRA-100GCI__ZZZ-TW-RAA-BM-3DM-010500
PACKAGE 2: ALRPC-ALRA-200ONE__ZZZ-TW-RAA-BM-3DM-401001
PACKAGE 3: ALRPC-ALRA-300MTA__ZZZ-TW-RAA-BM-3DM-030500
4) APPENDIX A OF GROUND INVESTIGATION FACTUAL REPORT

LEGEND:

- STAGE 1 ROTARY CORE WIRELINE
- GRAVITY SURVEY PROFILE, WITH STATION LOCATIONS
- ALR ALIGNMENT

0 50 100 250 500m

A1 1:5000 / A3 1:10000

PLAN VIEW

SCALE 1:5000

REFERENCES:
1. ALRPC-ALRA-100000CCI-100I-GEOAD-DR-GET-000001

REV.	VER.	DATE	STAT. CODE	DESCRIPTION	DRAWN	REVD.	APPD.
S01		26.07.23	CR	FOR REVIEW AND COMMENT - PHASE 1 DR LLED BOREHOLE LOCATION	CJ	SM	SN

SCALE	1:5000	
COORD NATE SYSTEM:	NZTM2000 (EPSG:2193)	
HEIGHT DATUM:	NZVD2016 (EPSG:7839)	
DRAWN	CJOD NATA	25.08.2023
REVIEWED	S MACKAY	25.08.2023
APPROVED	S NELIS	25.08.2023
	BY	DATE

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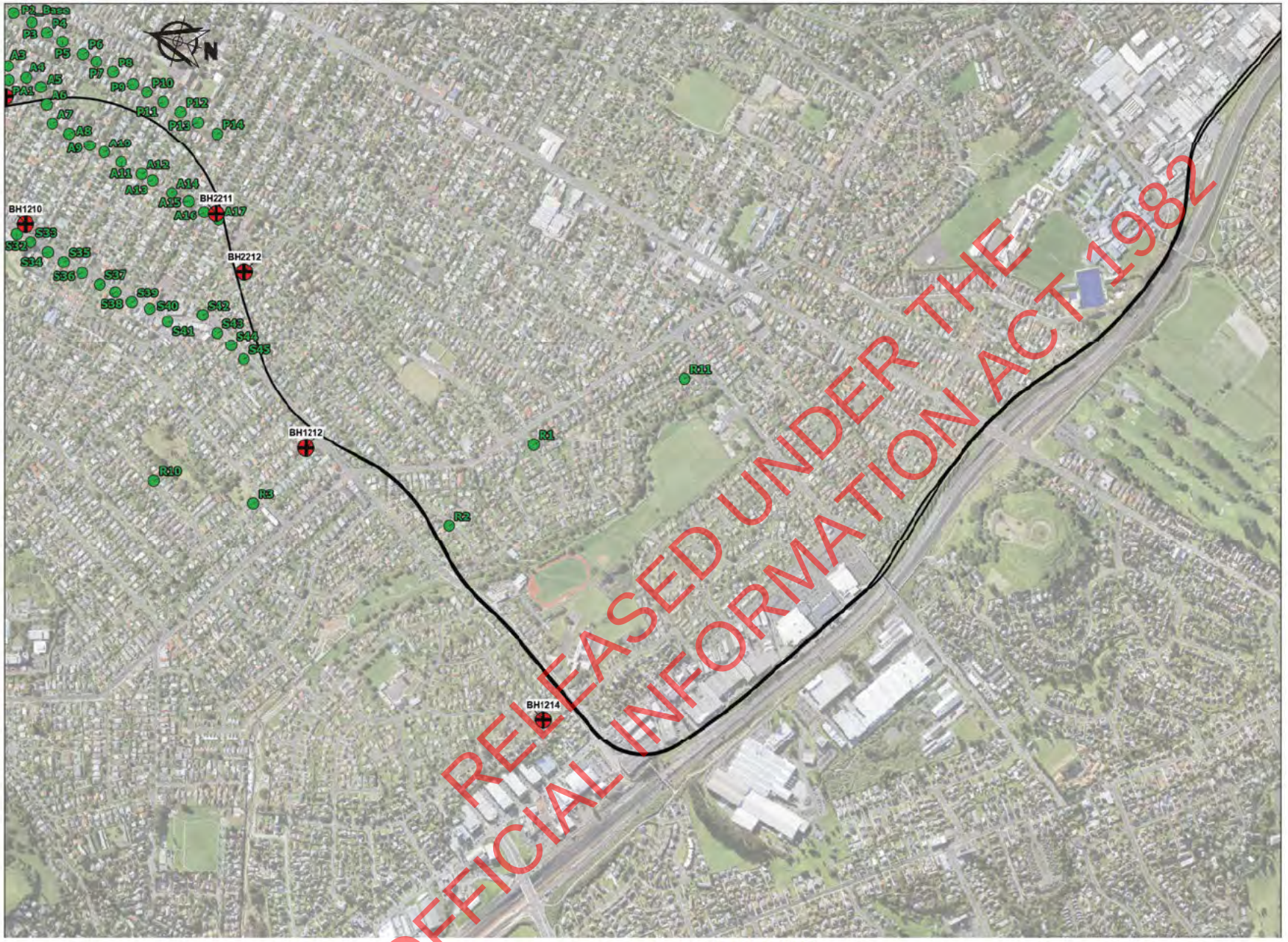
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PROJECT	AUCKLAND LIGHT RAIL ALLIANCE : PRE-CONSTRUCTION PLANNING
DRAWING TITLE	PACKAGE 100 PACKAGE 1: CITY CENTRE AND ISTHMUS APPLICABLE TO MULTIPLE LEVEL/ZONES GROUND ENG NEERING - GEOLOGY (INCL. SOIL/GROUND INFORMATION) DRAW NG - LAYOUT PLAN (ALSO KNOWN AS GENERAL ARRANGEMENTS)
SHEET	2 of 3
SIZE	A1

DRAWING No.	PROJ.	ORIG.	PCWK. / LOC.	DISCIPLINE	DOC.	SUB-DISC.	DOC. TYP.	DOC. SUB.	SEQ. No.	REV.	VER.
	ALRPC	ALRA	100CCI__	ZZZ	GE	GEO	DR	SLP	015022	S01	

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SURVEY DATUM - NEW ZEALAND TRANSVERSE MERCATER 2000 (NZTM2000).



PLAN VIEW

SCALE 1:5000



KEY PLAN

NOTES:

1) ALL DIMENSIONS ARE IN METERES UNLESS OTHERWISE STATED
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SURVEY DATUM - NEW ZEALAND TRANSVERSE MERCATER 2000 (NZTM2000).
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PACKAGE 1: ALRPC-ALRA-100GCI__-ZZZ-TW-RAA-BM-3DM-010500
PACKAGE 2: ALRPC-ALRA-200ONE__-ZZZ-TW-RAA-BM-3DM-401001
PACKAGE 3: ALRPC-ALRA-300MTA__-ZZZ-TW-RAA-BM-3DM-630500
4) APPENDIX A OF GROUND INVESTIGATION REPORT

Legend:

- STAGE 1 ROTARY CORE WIRELINE
- GRAVITY SURVEY PROFILE, WITH STATION LOCATIONS
- ALR ALIGNMENT

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REFERENCES:
1. ALRPC-ALRA-100000XXX-XXX-GEOAD-OR-GET-000001

REV.	VER.	DATE	STAT. CODE	DESCRIPTION	DRAWN	REVD.	APPD.
S01		26.07.23	CR	FOR REVIEW AND COMMENT - PHASE 1 DR LLED BOREHOLE LOCATION	CJ	SM	SN

SCALE		
1:5000		
COORD NATE SYSTEM:	NZTM2000 (EPSG:2193)	
HEIGHT DATUM:	NZVD2016 (EPSG:7839)	
DRAWN	C.JOD NATA	25.08.2023
REVIEWED	S MACKAY	25.08.2023
APPROVED	S NELIS	25.08.2023
	BY	DATE

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DRAWING TITLE	PACKAGE 100 PACKAGE 1: CITY CENTRE AND ISTHMUS APPLICABLE TO MULTIPLE LEVEL/ZONES GROUND ENG NEERING - GEOLOGY (INCL. SOIL/GROUND INFORMATION) DRAW NG - LAYOUT PLAN (ALSO KNOWN AS GENERAL ARRANGEMENTS)
SHEET	3 of 3
SIZE	A1

PROJ.	ORIG.	PCNS./LOC.	DISCIPL.	DISC.	SUB-DISC.	DOC.TYP.	DOC. SUB.	SEQ. No.	REV.	VER.
ALRPC	ALRA	100CCI__	ZZZ	GE	GEO	DR	SLP	015023	S01	

DRAWING No.

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KEY PLAN

NOTES:

1) ALL DIMENSIONS ARE IN METERES UNLESS OTHERWISE STATED
2) COORDINATE SYSTEMS:
VERTICAL DATUM - NEW ZEALAND VERTICAL DATUM 2016 (NZVD2016)
SURVEY DATUM - NEW ZEALAND TRANSVERSE MERCATOR 2000 (NZTM2000)
3) SEPARATE ALIGNMENTS WERE USED FOR EACH PACKAGE:
PACKAGE 1: ALRPC-ALRA-100CCI__-ZZZ-TW-RAA-BM-3DM-010500
PACKAGE 2: ALRPC-ALRA-200ONE__-ZZZ-TW-RAA-BM-3DM-010501
PACKAGE 3: ALRPC-ALRA-300MTA__-ZZZ-TW-RAA-BM-3DM-030500
4) APPENDIX A OF GROUND INVESTIGATIONS FACTUAL REPORT

LEGEND:

- STAGE 1 ROTARY CORE WIRELINE
- GRAVITY SURVEY PROFILE, WITH STATION LOCATIONS
- ALR ALIGNMENT

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0 50 100 250 500m A1 1:5000 / A3 1:10000

PLAN VIEW

SCALE 1:5000

REFERENCES:
1. ALRPC-ALRA-XXXXCCXXX-XXX-GE-CAD-DR-DST-000001

REV.	VER.	DATE	STAT. CODE	DESCRIPTION	DRAWN	REVD.	APPD.
S01		25.07.23	CR	FOR REVIEW AND COMMENT - PHASE 1 DR LLED BOREHOLE LOCATION	CJ	SM	SN

SCALE		
1:5000		
COORDINATE SYSTEM: NZTM2000 (EPSG:2193) HEIGHT DATUM: NZVD2016 (EPSG:7839)		
DRAWN	C.JODINATA	25.08.2023
REVIEWED	S.MACKAY	25.08.2023
APPROVED	S.NELIS	25.08.2023
	BY	DATE

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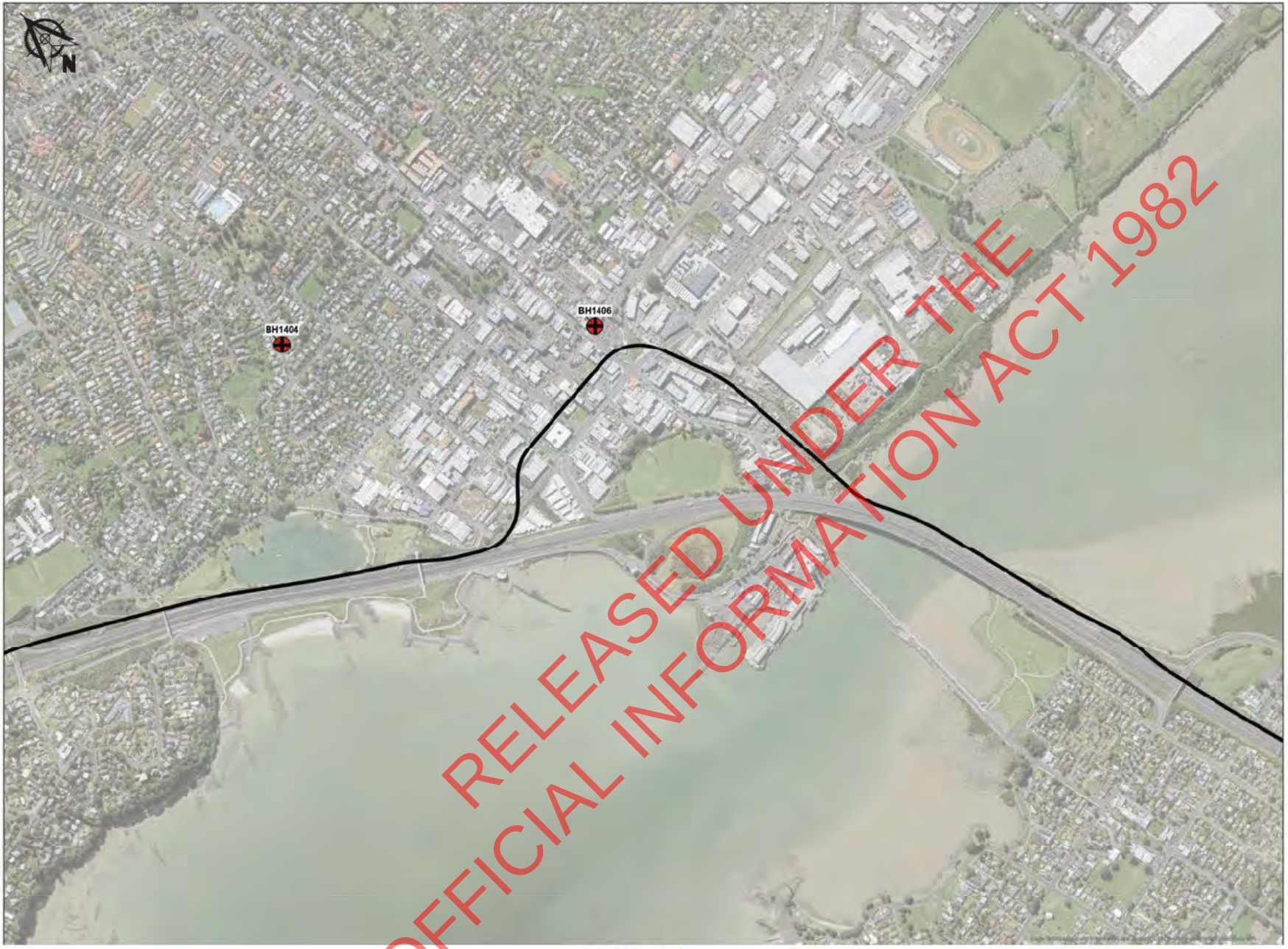
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PROJECT	AUCKLAND LIGHT RAIL ALLIANCE : PRE-CONSTRUCTION PLANNING
DRAWING TITLE	PACKAGE 200 PACKAGE 2: ONEHUNGA APPLICABLE TO MULTIPLE LEVEL/ZONES GROUND ENGINEERING - GEOLOGY (NCL. SOIL/GROUND INFORMATION) DRAWING - LAYOUT PLAN (ALSO KNOWN AS GENERAL ARRANGEMENTS)
SHEET	1 of 2
SIZE	A1
DRAWING No.	ALRPC – ALRA – 200ONE__ – ZZZ – GE – GEO – DR – SLP – 025021 – S01

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KEY PLAN

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1) ALL DIMENSIONS ARE IN METERES UNLESS OTHERWISE STATED
2) COORDINATE SYSTEMS:
VERTICAL DATUM - NEW ZEALAND VERTICAL DATUM 2016 (NZVD2016)
SURVEY DATUM - NEW ZEALAND TRANSVERSE MERCATOR 2000 (NZTM2000)
3) SEPARATE ALIGNMENTS WERE USED FOR EACH PACKAGE:
PACKAGE 1: ALRPC-ALRA-100CCI__-ZZZ-TW-RAA-BM-3DM-010500
PACKAGE 2: ALRPC-ALRA-200ONE__-ZZZ-TW-RAA-BM-3DM-025022
PACKAGE 3: ALRPC-ALRA-300MTA__-ZZZ-TW-RAA-BM-3DM-030500
4) APPENDIX A OF GROUND INVESTIGATIONS FACTUAL REPORT

LEGEND:

- STAGE 1 ROTARY CORE WIRELINE
- GRAVITY SURVEY PROFILE, WITH STATION LOCATIONS
- ALR ALIGNMENT

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

0 50 100 250 500m

A1 1:5000 / A3 1:10000

PLAN VIEW

SCALE 1:5000

REFERENCES:
1. ALRPC-ALRA-XXXXCCXXX-XXX-GE-CAD-DR-DST-000001

REV.	VER.	DATE	STAT. CODE	DESCRIPTION	DRAWN	REVD.	APPD.
S01		26.07.23	CR	FOR REVIEW AND COMMENT - PHASE 1 DR LLED BOREHOLE LOCATION	CJ	SM	SN

SCALE	
1:5000	
COORDINATE SYSTEM:	NZTM2000 (EPSG:2193)
HEIGHT DATUM:	NZVD2016 (EPSG:7839)

	BY	DATE
DRAWN	C.JODINATA	25.08.2023
REVIEWED	S.MACKAY	25.08.2023
APPROVED	S.NELIS	25.08.2023

AUTHORISE: Auckland LIGHT RAIL Alliance

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PROJECT	AUCKLAND LIGHT RAIL ALLIANCE : PRE-CONSTRUCTION PLANNING
DRAWING TITLE	PACKAGE 200 PACKAGE 2: ONEHUNGA APPLICABLE TO MULTIPLE LEVEL/ZONES GROUND ENGINEERING - GEOLOGY (NCL. SOIL/GROUND INFORMATION) DRAWING - LAYOUT PLAN (ALSO KNOWN AS GENERAL ARRANGEMENTS)
SHEET	2 of 2
SIZE	A1

PROJ.	ORIG.	PORS./LOC.	DISCIPLINE	SUBDISC.	SUBSUBDISC.	DOC.TYP	DOC. SUB	SEQ. No.	REV.	VER.
ALRPC	ALRA	200ONE__	ZZZ	GE	GEO	DR	SLP	025022	S01	

DRAWING No.

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KEY PLAN

NOTES:

1) ALL DIMENSIONS ARE IN METERES UNLESS OTHERWISE STATED
2) COORDINATE SYSTEMS:
VERTICAL DATUM - NEW ZEALAND VERTICAL DATUM 2016 (NZVD2016)
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PACKAGE 1: ALRPC-ALRA-100CCI__-ZZZ-TW-RAA-BM-3DM-010500
PACKAGE 2: ALRPC-ALRA-200DNE__-ZZZ-TW-RAA-BM-3DM-001001
PACKAGE 3: ALRPC-ALRA-300MTA__-ZZZ-TW-RAA-BM-3DM-030500
4) APPENDIX A OF GROUND INVESTIGATIONS FACTUAL REPORT

LEGEND:

- STAGE 1 ROTARY CORE WIRELINE
- GRAVITY SURVEY PROFILE, WITH STATION LOCATIONS
- ALR ALIGNMENT

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

0 50 100 250 500m

A1 1:5000 / A3 1:10000

PLAN VIEW

SCALE 1:5000

REFERENCES:
1.ALRPC-ALRA-XXXXXXXX-XXX-DE-CAD-DR-DST-900001

REV.	VER.	DATE	STAT. CODE	DESCRIPTION	DRAWN	REVD.	APPD.
S01		25 07 23	CR	FOR REVIEW AND COMMENT - BOREHOLE LOCATION ALONG ALIGNMENT	CJ	SM	SN

SCALE		
1:5000		
COORDINATE SYSTEM:	NZTM2000 (EPSG:2193)	
HEIGHT DATUM:	NZVD2016 (EPSG:7839)	
DRAWN	C.JODINATA	25.08.2023
REVIEWED	D.MACKAY	25.08.2023
APPROVED	S.NELIS	25.08.2023
	BY	DATE

AUTHORISE

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PROJECT	AUCKLAND LIGHT RAIL ALLIANCE : PRE-CONSTRUCTION PLANNING
DRAWING TITLE	PACKAGE 300 PACKAGE 3: MANAKAU TO AIRPORT APPLICABLE TO MULTIPLE LEVEL/ZONES GROUND ENGINEER NG - GEOLOGY (NCL. SO L/GROUND INFORMATION) DRAWING - LAYOUT PLAN (ALSO KNOWN AS GENERAL ARRANGEMENTS)
SHEET	1 of 3
SIZE	A1

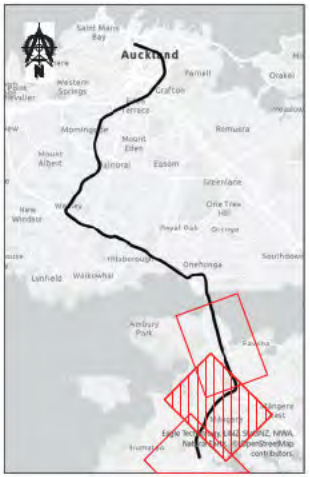
PROJ.	DISC.	PORS. / LOC.	DELIVERY	DISC.	SUB-DISC.	DOC. TYP.	DOC. SUB	DOC. No.	REV.	VER.
ALRPC	ALRA	300MTA__	ZZZ	GE	GEO	DR	SLP	035021	S01	

DRAWING No.

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KEY PLAN

NOTES:

1) ALL DIMENSIONS ARE IN METERES UNLESS OTHERWISE STATED
2) COORDINATE SYSTEMS:
VERTICAL DATUM - NEW ZEALAND VERTICAL DATUM 2016 (NZVD2016)
SURVEY DATUM - NEW ZEALAND TRANSVERSE MERCATER 2000 (NZTM2000).
3) SEPARATE ALIGNMENTS WERE USED FOR EACH PACKAGE:
PACKAGE 1: ALRPC-ALRA-100CCI__-ZZZ-TW-RAA-RM-3DM-010500
PACKAGE 2: ALRPC-ALRA-200DNE__-ZZZ-TW-RAA-RM-3DM-001001
PACKAGE 3: ALRPC-ALRA-300MTA__-ZZZ-TW-RAA-RM-3DM-030500
4) APPENDIX A OF GROUND INVESTIGATIONS FACTUAL REPORT

LEGEND:

- STAGE 1 ROTARY CORE WIRELINE
- GRAVITY SURVEY PROFILE, WITH STATION LOCATIONS
- ALR ALIGNMENT

0 50 100 250 500m

A1 / A3
1:5000 / 1:10000

PLAN VIEW

SCALE 1:5000

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REFERENCES:
1.ALRPC-ALRA-XXXXXXXX-XXX-IDE-CAD-DR-DST-900001

REV.	VER.	DATE	STAT. CODE	DESCRIPTION	DRAWN	REVD.	APPD.
S01		26 07 23	CR	FOR REVIEW AND COMMENT - BOREHOLE LOCATION ALONG ALIGNMENT	CJ	SM	SN

SCALE 1:5000

COORDINATE SYSTEM: NZTM2000 (EPSG:2193)
HEIGHT DATUM: NZVD2016 (EPSG:7839)

	BY	DATE
DRAWN	C JODINATA	25.08.2023
REVIEWED	S.MACKAY	25.08.2023
APPROVED	S.NELIS	10.08.2023

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PROJECT	AUCKLAND LIGHT RAIL ALLIANCE : PRE-CONSTRUCTION PLANNING
DRAWING TITLE	PACKAGE 300 PACKAGE 3: MANAKAU TO AIRPORT APPLICABLE TO MULTIPLE LEVEL/ZONES GROUND ENGINEER NG - GEOLOGY (NCL. SO L/GROUND INFORMATION) DRAWING - LAYOUT PLAN (ALSO KNOWN AS GENERAL ARRANGEMENTS)
SHEET	2 of 3
SIZE	A1

DRAWING No.	PROJ.	DISC.	POAS / LOC.	LEVEL/ZONE	DISC.	SUB-DISC.	DOC. TYP	DOC. SUB	DOC. No.	REV.	VER.
ALRPC	ALRA	300MTA__	ZZZ	GE	GEO	DR	SLP	035022	S01		

DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR

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KEY PLAN

NOTES:

1) ALL DIMENSIONS ARE IN METERES UNLESS OTHERWISE STATED
2) COORDINATE SYSTEMS:
VERTICAL DATUM - NEW ZEALAND VERTICAL DATUM 2016 (NZVD2016)
SURVEY DATUM - NEW ZEALAND TRANSVERSE MERCATER 2000 (NZTM2000).
3) SEPARATE ALIGNMENTS WERE USED FOR EACH PACKAGE:
PACKAGE 1: ALRPC-ALRA-100CC1__-ZZZ-TW-RAA-BM-3DM-010500
PACKAGE 2: ALRPC-ALRA-200DNE__-ZZZ-TW-RAA-BM-3DM-001001
PACKAGE 3: ALRPC-ALRA-300MTA__-ZZZ-TW-RAA-BM-3DM-030500
4) APPENDIXA OF GROUNDINVESTIGATIONS FACTUAL REPORT

LEGEND:

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- GRAVITY SURVEY PROFILE, WITH STATION LOCATIONS
- ALR ALIGNMENT

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0 50 100 250 500m A1 / 1:5000 A3 / 1:10000

PLAN VIEW
SCALE 1:5000

REFERENCES:
1.ALRPC-ALRA-XXXXXXXX-XXX-DE-CAD-DR-DST-900001

REV.	VER.	DATE	STAT. CODE	DESCRIPTION	DRAWN	REVD.	APPD.
S01		25.07.23	CR	FOR REVIEW AND COMMENT - BOREHOLE LOCATION ALONG ALIGNMENT	CJ	SM	SN

SCALE		
1:5000		
COORDINATE SYSTEM: NZTM2000 (EPSG:2193)		
HEIGHT DATUM: NZVD2016 (EPSG:7839)		
DRAWN	C.JODINATA	25.08.2023
REVIEWED	D.MACKAY	25.08.2023
APPROVED	D.NELIS	10.08.2023
	BY	DATE

AUTHORISE
Auckland LIGHT RAIL Alliance

CR - FOR REVIEW AND COMMENT

Auckland LIGHT RAIL Bringing us closer

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PROJECT	AUCKLAND LIGHT RAIL ALLIANCE : PRE-CONSTRUCTION PLANNING
DRAWING TITLE	PACKAGE 300 PACKAGE 3: MANAKAU TO AIRPORT APPLICABLE TO MULTIPLE LEVEL/ZONES GROUND ENGINEER NG - GEOLOGY (NCL. SO L/GROUND INFORMATION) DRAWING - LAYOUT PLAN (ALSO KNOWN AS GENERAL ARRANGEMENTS)
SHEET	3 of 3
SIZE	A1

DRAWING No.

PROJ.	DISC.	PCNS. / LOC.	ULS/ENS	DISC.	SUB-DISC.	DOC. TYP	DOC. SUB	DOC. No.	REV.	VER.
ALRPC	ALRA	300MTA__	ZZZ	GE	GEO	DR	SLP	035023	S01	

DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR

Appendix B Machine Boreholes

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Appendix B-1 – Logging Terminology

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ENGINEERING LOG LEGEND

DRILLING METHOD

VACEX	Hydro Vacuum Excavator
HA	Hand Auger Excavation
HQ	HQ Undifferentiated Rotary Core
HQ3	HQ Triple Tube Rotary Core
PQ	PQ Undifferentiated Rotary Core
PQ3	PQ Triple Tube Rotary Core
SPT	Standard Penetration Test (sample)
SPTC	Solid Cone SPT (no sample)
PUSHTUBE	Thin Wall inner diameter 54mm

CONSISTENCY OF COHESIVE SOILS

FIELD ASSESSMENT		Cu (kPa)
Very soft	Easily exudes between fingers when squeezed.	< 12
Soft	Easily indented by fingers.	12 to 25
Firm	Indented by strong finger pressure and can be indented by thumb pressure.	25 to 50
Stiff	Cannot be indented by thumb pressure.	50 to 100
Very Stiff	Can be indented by thumb nail.	100 to 200
Hard	Difficult to indent by thumb nail.	200 to 500

CONSISTENCY OF NON-COHESIVE SOILS

Descriptive Term	Density Index (R_D)	SPT "N" value (blows / 300 mm)	Dynamic Cone (blows / 300 mm)
Very dense	> 85	>50	> 17
Dense	65 - 85	30 - 50	7 - 17
Medium dense	35 - 65	10 - 30	3 - 7
Loose	15 - 35	4 - 10	1 - 3
Very loose	< 15	< 4	0 - 2

LITHOLOGY BOUNDARY TYPES

SOLID LINE	Abrupt boundary.
DASHED LINE	Gradational boundary.
DASH-DOT LINE	Inferred boundary.

ROCK MATERIAL WEATHERING

(non NZGS)

UW	Unweathered
SW	Slightly Weathered
MW	Moderately Weathered
HW	Highly Weathered
CW	Completely Weathered
RS	Residual Soil

IN SITU STANDARD PENETRATION TESTS

25 for 85mm //	Seating blows and seating penetration, do not contribute to test result)
18,18,14 for 55mm	Blows per 75mm and the last blow increment length
N = 50+	SPT 'N' value. Sum of blows per 300mm (NZS 4402 Test 6.5.1:1988)
	'N' values in excess of 50 blows are shown as 50+

SPACING OF DISCONTINUITIES

VWS	Very widely spaced
WS	Widely spaced
MWS	Moderately widely spaced
CS	Closely spaced
VCS	Very closely spaced
ECS	Extremely closely spaced

DISCONTINUITY TYPE

BP	Bedding plane or seam
BPJT	Fracture along bedding plane (suspect not drilling induced)
JT	Joint / Fracture
JI	Incipient joint / microfracture
CZ	Crushed zone No evidence of shear.
SZ	Sheared zone
FT	Fault
VE	Mineralised vein
BD	Drilling break (Undifferentiated drilling or handling induced break.)
DI	Drilling induced
HI	Handling induced

DISCONTINUITY ROUGHNESS

Cn	Clean
Sn	Stained
Vn	Veneer (<1mm)
Cg	Coating (>1mm), thickness qualified in mm

DISCONTINUITY PLANARITY

Un	Undulating
St	Stepped
Pl	Planar

DISCONTINUITY COATING

Ro	Rough
Sm	Smooth
Po	Polished (no evidence of shear / striations)
Slk	Slickensided (evidence of shear / striations)

JOINT ROUGHNESS COEFFICIENT (JRC)

Joint roughness coefficient as per Barton (1973)

CEMENTATION CLASSES

Uncemented
Poorly cemented
Moderately cemented
Well cemented

ESTIMATED ROCK STRENGTH

SYMBOL	TERM	FIELD TEST	APPROXIMATE Qu (MPa)
ES	Extremely Strong	Can only be chipped by geological hammer.	>250
VS	Very Strong	Requires many blows of geological hammer to beak it.	100 to 250
S	Strong	Requires more than one blow of geological hammer to fractiure it.	50 to 100
MS	Moderately Strong	Cannot be scraped or peeled with a pocket knife. Can be fractured with single firm blow of geological hammer.	20 to 50
W	Weak	Can be peeled by a pocket knife with difficulty. Shallow indentations made by firm blow with point of geological hammer.	5 to 20
VW	Very Weak	Crumbles under firm blows with point of geological hammer. Can be peeled by a pocket knife.	1 to 5
EW	Extremely Weak	Indented by thumb nail or lesser strength terms used for soils.	<1

VANE TESTS

IBHSV	Ex situ in-barrel field hand shear vane
ISHSV	Insitu field hand vane advanced at bottom of hole or surface(no rod friction)

ROCK CLASSIFICATION

TCR (%)	Ratio of core recovered (solid and non-intact) to length of core run, measured along core axis.
SCR (%)	Ratio of solid core recovered to length of core run, measured along core axis, using Norbury, 1986.
RQD (%)	Ratio of solid core pieces longer than 100 mm to length of core run, measured along core axis.
FI (%)	Fracture Index - a count of fractures over an arbitrary length of core of similar intensity of fracturing.

Soil and rock descriptions are generally as described in the "Field Description of Soil and Rock: Guideline for the field classification and description of soil and rock for engineering purposes" New Zealand Geotechnical Society Inc, December 2005.

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Appendix B-2 – Borehole Logs

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GRAPHIC LOG LEGEND


ASH


BASALT


BROKEN BASALT


CLAY


GRAVELLY CLAY


SILTY CLAY

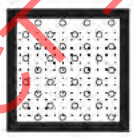

SANDY CLAY


COBBLE


COBBLE AND BOULDERS


GRAVELLY COBBLES


CONCRETE


CONGLOMERATIC SANDSTONE

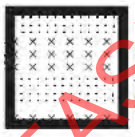

CORE LOSS


GRAVEL


CLAYEY GRAVEL


SILTY GRAVEL


SANDY GRAVEL


INTERBEDDED SILTSTONE & SANDSTONE


MADE GROUND

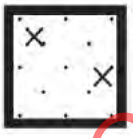

MUDSTONE


PEAT


SAND


CLAYEY SAND


GRAVELLY SAND


SILTY SAND


SANDSTONE


SILT


CLAYEY SILT


GRAVELLY SILT


SANDY SILT


SILTSTONE


TOPSOIL


TUFFSTONE


VOID

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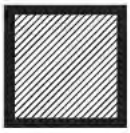
GRAPHIC LOG LEGEND

BACKFILL / INSTALLATION GRAPHIC


BENTONITE


BLINDING SAND


VIBRATING WIRE


GROUT MIX


GRAVEL


K2 FILTER SCREEN

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Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Wellesley Street West, CBD**
Project Reference: **Stage 1 Ground Investigation**

BH1104

Sheet **1** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1756572.93m
Northing: 5920484.88m
Reduced level: 7.75m

Date started: 10/05/2023
Date completed: 12/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: JH
Input by: JH
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS, WS, MWS, CS, VCS, ECS)	Stratigraphy / Defect Description / Additional Notes	Installation
VACEX	7	1			**0m:** No Recovery, vacuum excavated			0					
HQ3	6	2		AYz	**2.5m:** Clayey SILT, light grey and orange. Firm, moist, moderate plasticity, trace black carbonaceous material (BCM)	CL-ML	3m: IBHSV=34/10kPa	100				**2.5m: ALLUVIUM**	
PUSHTUBE	5	3						100					
SPT	4	4		AYc	**3.5m:** Silty CLAY, light brownish orange and grey. Stiff, moist, moderate plasticity.	CH	3.5m: SPT 0,0// 1,1,1,1 N = 4	100					
HQ3	3	5					4.5m: IBHSV=54/17kPa	100					
SPT							4.5m: SPT 0,0// 1,1,1,1 N = 4	66					

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REMARKS:
SCR = 1 circumference - 200 mm
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
10/05/2023 3:45:00 PM | 19.50m | 1.5 m
11/05/2023 7:30:00 AM | 19.50m | 3.05 m
11/05/2023 3:40:00 PM | 37.50m | 1.53 m
12/05/2023 7:30:00 AM | 37.50m | 4.2 m
12/05/2023 1:20:00 PM | 50.00m | 1.75 m
15/05/2023 7:45:00 AM | 50.00m | 3.04 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARY.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Wellesley Street West, CBD**
Project Reference: **Stage 1 Ground Investigation**

BH1104

Sheet **2** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1756572.93m
Northing: 5920484.88m
Reduced level: 7.75m

Date started: 10/05/2023
Date completed: 12/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: JH
Input by: JH
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	2	6		AYc	**3.5m:** Silty CLAY, light brownish orange and grey. Stiff, moist, moderate plasticity.	CH		66					
					5.2m: CORE LOSS								
				AYc	**5.55m:** Silty CLAY, light brownish orange and grey. Stiff, moist, moderate plasticity.	CH							
SPT				AYz	**6m:** Clayey SILT, light grey. Firm to stiff, moist, low to moderate plasticity.	CL-ML	6m: IBHSV=59/20kPa 6m: SPT 0,0// 1,1,0,1 N = 3	66					
HQ3	1	7		ERz	**6.6m:** Sandy SILT, grey. Very loose, moist, non plastic.	MI SP						**6.6m: ECBF**	
					6.65m: CORE LOSS			52					
SPT	0	8		EWz	**7.25m:** Highly weathered, dark grey SILTSTONE. Extremely weak, trace disseminated black carbonaceous material. Soil description: very stiff SILT, trace of clay, grey, low plasticity.	HW	7.5m: SPT 5,7// 7,12,8,8 N = 35	100					
					7.85m to 8.5m: Moderately weathered. **7.9m to 7.95m:**...50mm lens of compressed, laminated BCM.								
HQ3	-1	9		EUz	**8.5m:** Slightly weathered, dark grey, laminated SILTSTONE; very weak. **8.6m to 8.67m:**...70mm thick bed of fine SANDSTONE with BCM **8.7m to 8.75m:**...50mm thick bed of fine SANDSTONE.	SW		100	76	90			
SPTC							9m: SPTC 6,25// 50 for 65mm N = 50+	N/A	N/A	N/A			
HQ3	-2	10		EUs	**9.2m:** Slightly weathered, dark grey, poorly cemented, fine to coarse,SANDSTONE; Extremely weak. Recovered as fine to coarse SAND.	SW		56	27	27			

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REMARKS:
SCR = 1 circumference - 200 mm
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
10/05/2023 3:45:00 PM | 19.50m | 1.5 m
11/05/2023 7:30:00 AM | 19.50m | 3.05 m
11/05/2023 3:40:00 PM | 37.50m | 1.53 m
12/05/2023 7:30:00 AM | 37.50m | 4.2 m
12/05/2023 1:20:00 PM | 50.00m | 1.75 m
15/05/2023 7:45:00 AM | 50.00m | 3.04 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARY.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Wellesley Street West, CBD**
Project Reference: **Stage 1 Ground Investigation**

BH1104

Sheet **3** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1756572.93m
Northing: 5920484.88m
Reduced level: 7.75m

Date started: 10/05/2023
Date completed: 12/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: JH
Input by: JH
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3				EUs	**9.2m:** Slightly weathered, dark grey, poorly cemented, fine to coarse,SANDSTONE; Extremely weak. Recovered as fine to coarse SAND. **10.1m to 10.15m:**...50mm thick bed of SILTSTONE, weak. **10.15m to 10.4m:**...Trace fine gravel sized clasts of dark grey MUDSTONE up to 3mm diameter for 250mm	SW		56	27	27		10.15m: BP 4° Base of SILTSTONE.	
SPTC				EUz	**10.4m:** Unweathered, dark grey, laminated MUDSTONE; weak, with siltstone laminae	UW	10.5m: SPTC 14,36 for 50mm// N = 50+	N/A	N/A	N/A		10.45m: BP 10° Base of SANDSTONE.	
HQ3	-3	11		EUs	**10.8m:** Unweathered, dark grey, fine to coarse SANDSTONE, extremely weak **11m to 11.15m:**...150mm thick zone of loose, silty SAND, disturbed.	UW							
					11.15m: CORE LOSS			73	65	65			
	-4				**11.59m:** Slightly weathered, dark grey, MUDSTONE with SILTSTONE laminae.	SW							
SPTC		12		EUz	**11.8m:** Slightly weathered, dark grey, sandy SILTSTONE, weak.	SW	12m: SPTC 1 ,39 for 110mm// N = 50+	N/A	N/A	N/A			
				EUs	**12.3m:** Slightly weathered dark grey, fine to medium SANDSTONE, poorly cemented extremely weak. Recovered as fine to medium SAND.	SW						12.3m: BP 3° Base of SILTSTONE.	
HQ3	-5	13			**12.54m:** CORE LOSS			29	15	7			
	-6			EUs	**13.4m:** Slightly weathered, dark grey, fine to medium, silty SANDSTONE, poorly cemented, very weak, trace disseminated BCM	SW							
		14			**13.9m:** Slightly weathered, dark grey, sandy SILTSTONE. Weak, sand; fine	SW							
HQ3	-7			EUz	**14m:** Slightly weathered, dark grey, laminated SILTSTONE, weak, mudstone laminae. **14.4m to 14.5m:**...100mm interbed of very weak, dark grey, poorly cemented, silty , fine, SANDSTONE. **14.7m to 14.9m:**...Soft sediment deformation.	SW		100	53	53		14.5m: BP 20°	
		15										14.8m: DB 4° Broken parallel to bedding. 14.85m: DB 8° Broken parallel to bedding.	

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REMARKS:
SCR = 1 circumference - 200 mm
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl):

Date Time	Hole Depth	Water Level
10/05/2023 3:45:00 PM	19.50m	1.5 m
11/05/2023 7:30:00 AM	19.50m	3.05 m
11/05/2023 3:40:00 PM	37.50m	1.53 m
12/05/2023 7:30:00 AM	37.50m	4.2 m
12/05/2023 1:20:00 PM	50.00m	1.75 m
15/05/2023 7:45:00 AM	50.00m	3.04 m

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Wellesley Street West, CBD**
Project Reference: **Stage 1 Ground Investigation**

BH1104

Sheet **4** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1756572.93m
Northing: 5920484.88m
Reduced level: 7.75m

Date started: 10/05/2023
Date completed: 12/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: JH
Input by: JH
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3				EUz	**14m:** Slightly weathered, dark grey, laminated SILTSTONE, weak, mudstone laminae. **15.3m to 15.5m:**...200mm zone of loose, fine, silty, SAND, disturbed.	SW							
	-8	16			**15.5m:** CORE LOSS			66	53	53			
				EUz	**16m:** Unweathered, dark grey, laminated SILTSTONE, weak, mudstone laminae. **16.01m to 16.1m:**...100mm interbed of Weak + SILTSTONE.	UW							
				EU	**16.25m:** Unweathered, dark grey, silty, fine SANDSTONE. Poorly cemented, very weak; indistinctly bedded.	UW						16.25m: BP 4° Base of SILTSTONE.	
HQ3	-9	17		EUs	**16.5m:** Unweathered, dark grey, fine, silty SANDSTONE. Very weak, very poorly cemented, thinly laminated with frequent SILTSTONE interbeds ~1-2mm thick, sub horizontal 1°-2°. **16.95m to 16.99m:**...Recovered as fine silty SAND.	UW		100	80	87			
	-10	18			**17.45m to 17.55m:**...Recovered as fine silty SAND. **17.59m to 17.65m:**...60mm zone of loose, fine, silty, SAND, disturbed. **17.65m:** Slightly weathered, dark grey, fine, silty SANDSTONE. Weak, moderately well cemented.	SW							
HQ3				EUz	**18.1m:** Slightly weathered, dark grey, weak, SILTSTONE, indistinctly bedded.	SW						18.1m: BP 4° Base of SANDSTONE.	
	-11	19		EUs	**18.4m:** Slightly weathered, dark grey, fine, silty SANDSTONE. Weak, moderately well cemented. **18.41m to 18.42m:**...10mm thick bed of carbonaceous lamination. **18.7m to 19m:**...Fine to medium SANDSTONE **19m to 19.1m:**...100mm thick bed of slightly weathered, dark grey, weak SILTSTONE. **19.1m to 19.2m:**...Grades to silty, fine SANDSTONE.	SW		100	80	93		18.4m: BP 4° Base of SILTSTONE.	
HQ3	-12	20			**19.6m:** CORE LOSS								
				EUs	**19.7m:** Slightly weathered, dark grey, fine, silty SANDSTONE. Weak, moderately well cemented. **19.71m to 19.9m:**...190mm thick bed of unweathered, dark grey, very weak, SILTSTONE.	SW		93	80	80			
				EUi		SW							

REMARKS:
SCR = 1 circumference - 200 mm
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
10/05/2023 3:45:00 PM | 19.50m | 1.5 m
11/05/2023 7:30:00 AM | 19.50m | 3.05 m
11/05/2023 3:40:00 PM | 37.50m | 1.53 m
12/05/2023 7:30:00 AM | 37.50m | 4.2 m
12/05/2023 1:20:00 PM | 50.00m | 1.75 m
15/05/2023 7:45:00 AM | 50.00m | 3.04 m

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Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Wellesley Street West, CBD**
Project Reference: **Stage 1 Ground Investigation**

BH1104

Sheet **5** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1756572.93m
Northing: 5920484.88m
Reduced level: 7.75m

Date started: 10/05/2023
Date completed: 12/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: JH
Input by: JH
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	-13	21		EUi	**19.9m:** Slightly weathered, intermixed dark grey SANDSTONE and SILTSTONE, very weak. Zone of soft sediment deformation, flame structures and rip up clasts, trace fine grayish green CLAYSTONE clasts **20.1m to 20.25m:**...150mm zone of loose, fine silty SAND, disturbed.	SW		93	80	80		19.9m: BP 1° Base of SILTSTONE.	
HQ3	-14	22		EUs	**20.9m:** Slightly weathered, dark grey, silty, fine SANDSTONE, poorly cemented, very weak. **21.45m to 21.46m:**...10mm thick carbonaceous lamination, dip 5°. **21.5m to 21.55m:**...50mm thick bed of unweathered dark grey SILTSTONE. **21.7m to 21.9m:**...200mm thick bed of unweathered, dark grey MUDSTONE with silt laminae, very weak. **22m to 22.2m:**...200mm zone of soft sediment deformation, with fine to coarse gravel sized SILTSTONE rip up clasts.	SW		92	66	60		21.5m: BP 5° SILTSTONE interbed 21.7m: BP 2° Base of SANDSTONE. 21.9m: BP 2° Base of SILTSTONE.	
					22.2m: CORE LOSS								
HQ3	-15 -16	23 24		EUz	**22.5m:** Slightly weathered, dark grey, laminated MUDSTONE with SILTSTONE laminae. **22.9m to 23.1m:**.. 200mm bed of unweathered, dark grey, very weak, silty SANDSTONE, with 25mm zones of disturbed SAND at top and base. **23.2m to 23.35m:**.. 150mm bed of unweathered, dark grey, weak+ MUDSTONE, soft sediment deformation at top, grades to SILTSTONE over 15mm. **23.5m to 23.7m:**...200mm bed of unweathered, dark grey, very weak silty SANDSTONE, 100mm of disturbed SAND at base.	SW		92	60	60		23.4m: BPJT 3° 3mm wide with silty CLAY; stiff infill. Injected by drilling. 23.5m: BP 2° Top of SANDSTONE.	
					23.7m: CORE LOSS								
HQ3	-17	25		EUz	**24m:** Unweathered, dark grey, SILTSTONE, weak, very thinly bedded, bedding 5mm-10mm, 0°-5°, some beds have soft sediment deformation structures. **24.01m to 24.15m:**...150mm bed of unweathered, dark grey, fine to medium SANDSTONE, moderately well cemented. **24.3m to 24.55m:**...250mm zone of poorly cemented and uncemented disturbed silty SAND.	UW		92	53	40		24.15m: DB 3° Broken parallel to bedding at base of SANDSTONE. 24.55m: BP 2° Base of SANDSTONE.	

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REMARKS:
SCR = 1 circumference - 200 mm
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
10/05/2023 3:45:00 PM | 19.50m | 1.5 m
11/05/2023 7:30:00 AM | 19.50m | 3.05 m
11/05/2023 3:40:00 PM | 37.50m | 1.53 m
12/05/2023 7:30:00 AM | 37.50m | 4.2 m
12/05/2023 1:20:00 PM | 50.00m | 1.75 m
15/05/2023 7:45:00 AM | 50.00m | 3.04 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARY.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Wellesley Street West, CBD**
Project Reference: **Stage 1 Ground Investigation**

BH1104

Sheet **6** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1756572.93m
Northing: 5920484.88m
Reduced level: 7.75m

Date started: 10/05/2023
Date completed: 12/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: JH
Input by: JH
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3				EUz		UW							
					25.1m: CORE LOSS			92	53	40			
				EUz	**25.4m:** Unweathered, dark grey, SILTSTONE, weak, bedding indistinct.	UW							
HQ3	-18	26		EUs	**25.6m:** Unweathered, dark grey, fine, silty SANDSTONE, weak, moderately well cemented. **25.65m to 25.95m:**...300mm zone of disturbed silty SAND, indistinct contacts. **25.9m to 25.1m:**...200mm zone of poorly cemented to uncemented silty SAND, disturbed. **26m to 26.05m:**...50mm zone of disturbed silty SAND. **26.15m to 26.3m:**...Very closely spaced 2mm-5mm thick interbed of BCM rich interbed 5° dip.	UW		97	77	77			
	-19	27			**26.9m:** Unweathered, dark grey, MUDSTONE with SILTSTONE laminae, weak, with moderately widely spaced interbed of very weak to weak SANDSTONE							26.9m: BPJT 7° Base of SANDSTONE.	
HQ3	-20	28		EUz	**27.35m to 27.55m:**...200mm thick bed of unweathered, dark grey, weak, silty SANDSTONE, poorly cemented with ~20mm zones of disturbed silty SAND on contacts.	UW		100	97	97		27.9m: 2° 4mm thick band of BCM	
	-21	29			**28.7m to 28.95m:**...250mm zone of intermixed SANDSTONE and SILTSTONE with soft sediment deformation structures. **29m to 29.1m:**...Thinly bedded , 1mm - 5mm thick, SANDSTONE and SILTSTONE with cross bedding.							29m: BP 15° Base of MUDSTONE.	
HQ3	-22	30		EUs	**29.3m:** Unweathered, dark grey, fine, silty SANDSTONE, weak, grades over 100mm. **29.4m to 29.5m:**...100mm zone of laminated SANDSTONE and BCM rich SANDSTONE, 1°-3°, 1mm-5mm thick.	UW		77	77	77		29.3m: BPJT 4° Base of MUDSTONE.	
					29.8m: CORE LOSS								
						UW							

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REMARKS:
SCR = 1 circumference - 200 mm
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
10/05/2023 3:45:00 PM | 19.50m | 1.5 m
11/05/2023 7:30:00 AM | 19.50m | 3.05 m
11/05/2023 3:40:00 PM | 37.50m | 1.53 m
12/05/2023 7:30:00 AM | 37.50m | 4.2 m
12/05/2023 1:20:00 PM | 50.00m | 1.75 m
15/05/2023 7:45:00 AM | 50.00m | 3.04 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARY.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Wellesley Street West, CBD**
Project Reference: **Stage 1 Ground Investigation**

BH1104

Sheet **7** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1756572.93m
Northing: 5920484.88m
Reduced level: 7.75m

Date started: 10/05/2023
Date completed: 12/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: JH
Input by: JH
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	-23	30		EUs	**29.95m:** Unweathered, dark grey, fine, silty SANDSTONE, weak.	UW							
					30.1m: CORE LOSS								
		31		EUi	**30.35m:** Unweathered, dark grey SILTSTONE, weak, frequent thin interbed of SANDSTONE 1mm-2mm thick with soft sediment deformation structures on contacts, some BCM rich beds.	UW		83	93	83			
					30.85m to 31m:...250mm bed of unweathered, dark grey, fine, silty SANDSTONE, indistinct contact at top with soft sediment deformation structures and BCM.							31m: BP 1° Base of SANDSTONE.	
HQ3	-24	32			**31.85m to 32.05m:**...200mm bed of unweathered, dark grey, fine SANDSTONE with BCM along top contact 3° and base 1°.								
					32.1m to 32.3m:...200mm zone of disturbed, fine, silty SAND.								
				EUs	**32.25m:** Unweathered, dark grey, fine to coarse SANDSTONE, weak, occasional fine gravel. Indistinct contact. gravel are green CLAYSTONE, up to 5mm dia. Occasional red/orange SAND clasts.	UW		87	87	87			
	-25				**32.75m:** Unweathered, dark grey MUDSTONE with SILTSTONE laminae, weak.	UW						32.75m: BPJT 1° Base of SANDSTONE.	
		33											
HQ3	-26	34		EUz	**33m:** Unweathered, dark grey SILTSTONE, weak, frequent interbed of SANDSTONE, soft sediment deformation structures on some contacts. Some BCM rich beds.	UW		100	100	100		33m: BP 3° Base of MUDSTONE. 33m to 33.32m: BP 7° Thin SANDSTONE bed. 33m: BP 3° Base of MUDSTONE. 33m to 33.32m: BP 7° Thin SANDSTONE bed. 33m: BP 3° Base of MUDSTONE. 33m to 33.32m: BP 7° Thin SANDSTONE bed. 33m: BP 3° Base of MUDSTONE. 33m to 33.32m: BP 7° Thin SANDSTONE bed.	
					33.3m to 33.32m ...20mm bed of unweathered, dark grey, fine SANDSTONE, weak.								
HQ3	-27	35		EUs	**34.3m:** Unweathered, dark grey, fine, silty SANDSTONE, weak, moderately thickly bedded, grades over 300mm. **34.35m to 34.5m:**...105mm zone of soft sediment deformation. **34.5m to 34.7m:**...200mm zone of laminated SANDSTONE with cross bedding.	UW		100	87	93		34.3m: BP 7° Base of SILTSTONE. 34.7m: BP 10° Base of laminated, cross bedded SANDSTONE.	

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REMARKS:
SCR = 1 circumference - 200 mm
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
10/05/2023 3:45:00 PM | 19.50m | 1.5 m
11/05/2023 7:30:00 AM | 19.50m | 3.05 m
11/05/2023 3:40:00 PM | 37.50m | 1.53 m
12/05/2023 7:30:00 AM | 37.50m | 4.2 m
12/05/2023 1:20:00 PM | 50.00m | 1.75 m
15/05/2023 7:45:00 AM | 50.00m | 3.04 m

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Wellesley Street West, CBD**
Project Reference: **Stage 1 Ground Investigation**

BH1104

Sheet **8** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1756572.93m
Northing: 5920484.88m
Reduced level: 7.75m

Date started: 10/05/2023
Date completed: 12/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: JH
Input by: JH
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3				EUs	**34.3m:** Unweathered, dark grey, fine, silty SANDSTONE, weak, moderately thickly bedded, grades over 300mm.	UW							
	-28			EUi	**35.3m:** Unweathered, intermixed SILTSTONE and SANDSTONE, weak, with soft sediment deformation and BCM bands.	UW		100	87	93			
		36		EUz	**35.75m:** Unweathered, dark grey SILTSTONE, weak, thinly bedded, beds are 2mm-10mm thick.	UW						35.75m: BP 5° Base of intermixed SILTSTONE and SANDSTONE 35.8m: JT 15° veneer, (Infill: clay) Clay is silty CLAY, light grey.	
HQ3				EUs	**36.3m:** Unweathered, dark grey, fine SANDSTONE, weak.	UW						36.3m: BP 12° Base of SILTSTONE.	
	-29				**36.7m:** CORE LOSS			87	73	66		36.8m: BPJT 8° Base of SANDSTONE.	
		37		EUz	**36.9m:** Unweathered, dark grey SILTSTONE with MUDSTONE interbed, weak, thinly bedded, bed are 2mm-10mm thick.							37m: DB 2° Broken parallel to bedding.	
	-30				**37.75m to 37.95m:**...200mm interbed of BCM banded, unweathered, ark grey SANDSTONE bands up to 4mm thick, top is broken by drilling, soft sediment deformation structures on base.							37.8m: DB 8° Broken parallel to bedding.	
		38											
HQ3				EUz	**38.3m to 38.45m:**...150mm zone of intermixed SILTSTONE and SANDSTONE with soft sediment deformation structures.	UW		100	60	87			
	-31				**38.5m to 38.57m:**...70mm zone of disturbed, fine, silty SAND.								
		39											
HQ3					**39.4m to 39.65m:**...250mm interbed of medium dense silty SAND.			93	87	93		39.4m: BP 10° Base of SILTSTONE.	
	-32											39.65m: BP 4° Base of SANDSTONE.	
		40		EUs		UW							

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REMARKS:
SCR = 1 circumference - 200 mm
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
10/05/2023 3:45:00 PM | 19.50m | 1.5 m
11/05/2023 7:30:00 AM | 19.50m | 3.05 m
11/05/2023 3:40:00 PM | 37.50m | 1.53 m
12/05/2023 7:30:00 AM | 37.50m | 4.2 m
12/05/2023 1:20:00 PM | 50.00m | 1.75 m
15/05/2023 7:45:00 AM | 50.00m | 3.04 m

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Wellesley Street West, CBD**
Project Reference: **Stage 1 Ground Investigation**

BH1104

Sheet **9** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1756572.93m
Northing: 5920484.88m
Reduced level: 7.75m

Date started: 10/05/2023
Date completed: 12/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: JH
Input by: JH
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3				EUs	**39.85m:** Unweathered, fine SANDSTONE, extremely weak, very poorly cemented, with soft sediment deformation structures and ~40mm diameter BCM on top contact.	UW		93	87	93			
HQ3	-33	41		EUz	**40.35m:** Unweathered, dark grey SILTSTONE with MUDSTONE interbed, weak, thinly bedded, beds are 2mm-10mm thick. **40.85m to 41m:**...15mm interbed with frequent BCM, 2°.	UW		100	87	87		40.7m: DB 5° Broken parallel to bedding.	
HQ3	-34	42		EUs	**41.3m:** Unweathered, dark grey, fine, SANDSTONE, extremely weak, very poorly cemented, indistinct contact at top, 3° contact at base, disturbed.	UW							
				EUz	**41.8m:** Unweathered, dark grey SILTSTONE with MUDSTONE interbed, weak, thinly bedded, beds are 2mm-10mm thick.	UW						41.8m: BP 3° Base of SANDSTONE.	
HQ3	-35	43		EUs	**42.1m:** Unweathered, dark grey, fine, SANDSTONE, extremely weak, very poorly cemented, indistinct contact at base, disturbed.	UW						42.1m: BP 3° Base of SILTSTONE.	
				EUi	**42.5m:** Unweathered intermixed SANDSTONE and SILTSTONE, weak, with soft sediment deformation structures.	UW		100	73	60			
				EUz	**42.8m:** Unweathered, dark grey laminated SILTSTONE with MUDSTONE laminae, weak. **43.65m to 43.9m:**...250mm zone of intermixed SANDSTONE and SILTSTONE with soft sediment deformation structures.	UW						42.8m: BP 3° Base of intermixed SILTSTONE and SANDSTONE 43.45m: DB 6° Drill break along bedding. 43.65m: BP 2° Base of SILTSTONE. 43.85m: DB 3° 43.9m: BP 6° Base of intermixed SILTSTONE and SANDSTONE	
HQ3	-36	44		EUs	**43.9m:** Unweathered, dark grey, fine, SANDSTONE, extremely weak, very poorly cemented, indistinct contact at base, disturbed.	UW		100	53	66			
	-37	45		EUz	**44.6m:** Unweathered, dark grey laminated SILTSTONE with MUDSTONE interbed, weak.	UW						44.85m: BP 4° Laminations	

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REMARKS:
SCR = 1 circumference - 200 mm
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
10/05/2023 3:45:00 PM | 19.50m | 1.5 m
11/05/2023 7:30:00 AM | 19.50m | 3.05 m
11/05/2023 3:40:00 PM | 37.50m | 1.53 m
12/05/2023 7:30:00 AM | 37.50m | 4.2 m
12/05/2023 1:20:00 PM | 50.00m | 1.75 m
15/05/2023 7:45:00 AM | 50.00m | 3.04 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARY.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Wellesley Street West, CBD**
Project Reference: **Stage 1 Ground Investigation**

BH1104

Sheet **10** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1756572.93m
Northing: 5920484.88m
Reduced level: 7.75m

Date started: 10/05/2023
Date completed: 12/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: JH
Input by: JH
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3				EUz	**44.6m:** Unweathered, dark grey laminated SILTSTONE with MUDSTONE interbed, weak. **45m to 45.4m:**...400mm zone of medium dense, fine, silty SAND, disturbed.	UW						45.4m: BP 10° Base of SANDSTONE.	
HQ3	-38	46		EUi	**45.5m:** Unweathered, intermixed SILTSTONE and SANDSTONE weak, with soft sediment deformation structures.	UW		100	87	93			
HQ3				EUs	**46.2m:** Unweathered, fine SANDSTONE, weak, with very frequent BCM laminae, top contact indistinct.	UW							
HQ3	-39	47		EUz	**46.65m:** Unweathered, dark grey laminated SILTSTONE with MUDSTONE laminae, weak. **46.9m to 47.05m:**...150mm interbed of unweathered, dark grey, fine SANDSTONE, weak, moderately well cemented with rip up clasts of SILTSTONE, indistinct, contact at base.	UW						46.65m: BP 9° Base of SANDSTONE. 46.9m: BP 4° Base of SILTSTONE.	
HQ3				EUs	**47.05m:** Unweathered, fine silty SANDSTONE, extremely weak, very poorly cemented with disturbed medium dense silty SAND.	UW		97	66	73			
HQ3	-40	48		EUi	**47.7m:** Unweathered, interbedded SILTSTONE and SANDSTONE, weak, thinly bedded. **48.15m to 48.45m:**...300mm interbed of unweathered, fine silty SANDSTONE, extremely weak, very poorly cemented and disturbed medium dense silty SAND	UW						47.65m: BP 10° Base of SANDSTONE. 48.15m: BP 4° Base of SILTSTONE. 48.45m: BP 14° Base of SANDSTONE.	
HQ3	-41	49		EUs	**49.1m:** Unweathered, fine silty SANDSTONE, very weak, poorly cemented, with trace ~3mm fine gravel sized SILTSTONE clasts, damaged by drilling for upper 400mm, indistinct contact at top.	UW		100	66	87		49.1m: BP 2° Base of SILTSTONE.	
HQ3	-42	50		EUi	**49.9m:** Unweathered, dark grey, laminated SILTSTONE	UW		100	100	80			

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REMARKS:
SCR = 1 circumference - 200 mm
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
10/05/2023 3:45:00 PM | 19.50m | 1.5 m
11/05/2023 7:30:00 AM | 19.50m | 3.05 m
11/05/2023 3:40:00 PM | 37.50m | 1.53 m
12/05/2023 7:30:00 AM | 37.50m | 4.2 m
12/05/2023 1:20:00 PM | 50.00m | 1.75 m
15/05/2023 7:45:00 AM | 50.00m | 3.04 m

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Wellesley Street West, CBD**
Project Reference: **Stage 1 Ground Investigation**

BH1104

Sheet **11** of **11**

BOREHOLE INFORMATION	**CO-ORDINATES: NZTM 2000**		
Method: Rotary Core Wireline	Easting: 1756572.93m	Date started: 10/05/2023	Logged by: JH
Equipment: Massenza MI4	Northing: 5920484.88m	Date completed: 12/05/2023	Input by: JH
Contractor: McMillan Drilling	Reduced level: 7.75m	Inclination: -90°	Checked by: SBN
		Azimuth: 0°	Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
					with SANDSTONE laminae, weak.							49.9m: BP 14° Base of SANDSTONE.	
					End of borehole at 50m (Termination Depth Achieved)								

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REMARKS:
SCR = 1 circumference - 200 mm
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl):

Date Time	Hole Depth	Water Level
10/05/2023 3:45:00 PM	19.50m	1.5 m
11/05/2023 7:30:00 AM	19.50m	3.05 m
11/05/2023 3:40:00 PM	37.50m	1.53 m
12/05/2023 7:30:00 AM	37.50m	4.2 m
12/05/2023 1:20:00 PM	50.00m	1.75 m
15/05/2023 7:45:00 AM	50.00m	3.04 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARY.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: Cck, land Light Rail Limited
Project: Cck, land Light Rail
Location: Z2 Wellesley 0treet l ast. Cck, land - OD
Project Reference: 0tage 1 Grocnd Nnvestigation

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Sheet 1 of B

OERI HELI NMFERACTNEM Method: Rotary Core Wireline Equipment: Comacchio Geo 305 Contractor: McMillan Drilling	- ESERDNMCTI 0: M5TA 3444 Easting: 1757520.99m Northing: 5919985.39m Reduced level: 34.22m	Date started: 14/04/2023 Date completed: 18/04/2023 Inclination: -90° Azimuth: 0°	Logged by: DY Input by: DY Checked by: SBN Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	34	1		FUg	**4m:** Sandy angular GRAVEL, some silt, minor clay; brownish dark grey. Medium dense, moist.	GW		0				**4m: FNLL**	
	33												
		2											
HQ3	32			FUz	**3U1m:** Sandy SILT, some gravel; brown mottled orange. Soft, moist, low plasticity. Gravel is fine to m dium, angular to sub-angular, completely to highly weathered scoria lapilli.	MI-SP		100					
		3											
SPT	31			AUc	**Zm:** CLAY some silt; grey. Moist, soft high plasticity.	CH	3m: SPT 0,0// 1,0,1,0 N = 2	100				**Zm: CLL67N6A**	
HQ3		4		AUz	**ZU12m:** Clayey SILT, some fine to medium gravel; brown mottled orange. Soft, moist, high plasticity. Gravel is completely weathered angular to sub-angular scoria.	CL-ML		67					
	30				**VU12m:** CORE LOSS								
SPT				AUz	**VU12m:** Clayey SILT, some fine to medium gravel; brown, mottled orange. Soft, moist, high plasticity. Gravel is completely weathered angular to sub-angular scoria.	CL-ML	4.5m: SPT 0,0// 0,0,0,0 N = 0	100					
		5				CL-ML		100					

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REMARKS:
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14/04/2023 2:30:00 PM | 15.00m | 4.88 m
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18/04/2023 10:30:00 AM | 37.50m | 6.53 m

Auckland

Client: Cck, land Light Rail Limited
Project: Cck, land Light Rail
Location: Z2 Wellesley 0treet l ast. Cck, land - OD
Project Reference: 0tage 1 Grocnd Nnvestigation

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Sheet 3 of B

OERI HELI NMFERACTNEM Method: Rotary Core Wireline Equipment: Comacchio Geo 305 Contractor: McMillan Drilling	- ESERDNMCTI 0: M5TA 3444 Easting: 1757520.99m Northing: 5919985.39m Reduced level: 34.22m	Date started: 14/04/2023 Date completed: 18/04/2023 Inclination: -90° Azimuth: 0°	Logged by: DY Input by: DY Checked by: SBN Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	29	6		AUz	**VU82m:** Clayey SILT, some fine to medium angular gravel, trace organics; greenish grey speckled black. Soft, moist, high plasticity. Gravel is completely to highly weathered lapilli scoria. Organics are decomposed wood fragments.	CL-ML		100					
SPT	28						6m: SPT 0,0// 0,0,1,1 N = 2	100					
HQ3	27	7		AUc	**um:** Silty CLAY, trace organics; greyish brown, streaked orange and black. Soft, moist, high plasticity. Organics are decomposed rootlets and wood fragments.	CL-ML		100					
SPT							7.5m: SPT 0,1// 1,1,1,1 N = 4	100					
HQ3	26	8		AUz	**9U8m:** SILT, s me clay, trace fine sand, light brownish grey. Soft, moist, low plasticity. **BU1m to BUZm** ..Saturated, dilatant	ML		100					
SPT	25	9		ERz	**BUBm:** Clayey SILT; light brownish grey. Firm, moist, high plasticity.	CL-ML	9m: SPT 0,0// 1,1,1,1 N = 4	100				**BUBm: I - OF**	
HQ3		10		EWz	**8U2m:** Highly weathered, dark grey, SILTSTONE. Extremely weak. Soil description: clayey SILT; light grey. Firm, moist, high plasticity	HW		100					

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Auckland

Client: Cck, land Light Rail Limited
Project: Cck, land Light Rail
Location: Z2 Wellesley 0treet l ast. Cck, land - OD
Project Reference: 0tage 1 Grocnd Nnvestigation

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Sheet Z of B

OERI HELI NMFERACTNEM Method: Rotary Core Wireline Equipment: Comacchio Geo 305 Contractor: McMillan Drilling	- ESERDNMCTI 0: M5TA 3444 Easting: 1757520.99m Northing: 5919985.39m Reduced level: 34.22m	Date started: 14/04/2023 Date completed: 18/04/2023 Inclination: -90° Azimuth: 0°	Logged by: DY Input by: DY Checked by: SBN Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	24			EWz	**8L2m:** Highly weathered, dark grey, SILTSTONE. Extremely weak. Soil description: clayey SILT; light grey. Firm, moist, high plasticity	HW		100					
SPT		11		EWs	**14L2m:** Completely weathered, light grey, silty fine SANDSTONE. Soil description: medium dense silty fine SAND; moist, non-plastic	CW	10.5m: SPT 2,1// 2,2,3,3 N = 10	100					
HQ3	23			EWz	**11L9m:** Highly weathered, grey, MUDSTONE. Extremely weak. Soil description: CLAY, minor silt. Stiff, moist, high plasticity	HW		100					
SPT	22	12		EWs	**11L8m:** Highly weathered, light grey, fine SANDSTONE. Extremely weak. Soil description: Medium dense silty SAND	HW	2m: SPT 2,3// 3,4,7,6 N = 20	100					
HQ3	21	13		EUz	**13L2m:** Highly weathered, dark grey, SILTSTONE. Extremely weak. Soil description: CLAY, minor silt. Stiff, moist, high plasticity	HW		100	82	100			
SPT		14		EUs	**13L9m:** Highly weathered, dark grey, silty fine to medium SANDSTONE. Extremely weak. Soil description Dense, silty fine to medium SAND	HW	13.5m: SPT 3,4// 6,7,8,12 N = 33	100					
HQ3	20			EUi	**1VZm:** Moderately weathered, dark grey, interbedded fine to medium SANDSTONE (42%) and SILTSTONE (58%). Extremely weak.	MW		100	43	100			
		15											

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Auckland

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Project: Cck, land Light Rail
Location: Z2 Wellesley 0treet l ast. Cck, land - OD
Project Reference: 0tage 1 Grocnd Nlvestigation

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Sheet V of B

OERI HELI NMFERACTNEM Method: Rotary Core Wireline Equipment: Comacchio Geo 305 Contractor: McMillan Drilling	- ESERDNMCTI 0: M5TA 3444 Easting: 1757520.99m Northing: 5919985.39m Reduced level: 34.22m	Date started: 14/04/2023 Date completed: 18/04/2023 Inclination: -90° Azimuth: 0°	Logged by: DY Input by: DY Checked by: SBN Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPT	19			EUi	**1VUZm:** Moderately weathered, dark grey, interbedded fine to medium SANDSTONE (42%) and SILTSTONE (58%). Extremely weak.	MW	15m: SPT 4,8// 7,10,15,18 for 70mm N = 50+	100					
HQ3	18	16		EUi	**12U2m:** Moderately weathered, dark grey, silty fine SANDSTONE with localised beds of SILTSTONE. Extremely weak **12U2m:**...50mm thick MUDSTONE bed (Hard CLAY)	MW		100	0	100		15.55m: BP 5° undulating, rough, clean Base of Mudstone 15.65m: BP 5° undulating, smooth, clean Carbonaceous lamination	
SPTC							16.5m: SPTC 6,6// 9,13,14,14 for 50mm N = 50+	N/A	N/A	N/A			
HQ3	17	17			**19m:**...50mm thick MUDSTONE bed (Hard CLAY)								
HQ3	17	18			**19U1Vm:** CORE LOSS			20	0	0		17.05m: BP 5° undulating, smooth, clean Base of Mudstone	
SPTC	16						18m: SPTC 9,23// 36,14 for 25mm N = 50+	N/A	N/A	N/A		18m: Core loss interpreted as due to Solid Cone SPT	
HQ3	15	19		EUi	**1BU32m:** Slightly weathered, dark grey, interbedded fine silty SANDSTONE (60%) and SILTSTONE and MUDSTONE (40%). Sandstone is ext emely weak, poorly cemented. Siltstone and Mudstone are very weak. **1BU3m:**...50mm thick CONCRETION. Moderately strong. **1BU2m to 1BU32m:**...100mm thick laminated SILTSTONE bed. **18UZm to 18U2m:**...200mm thick laminated SILTSTONE bed.	SW		100	0	100		18.25m to 18.55m: DI Core broken in fissured Mudstone 18.8m: BP 5° planar, rough, clean Base of Sandstone 18.85m: BP 5° planar, smooth, clean Base of Concretion 18.95m: BP 5° planar, rough, clean Base of Siltstone	
SPTC					**18U2m:** CORE LOSS		19.5m: SPTC 12,38 for 130mm// N = 50+	N/A	N/A	N/A		19.5m: BP 5° undulating, rough, clean Base of Siltstone 19.5m to 19.64m: Core loss due to SPTC	
HQ3		20		EUi	**18UVm:** Slightly weathered, dark grey, interbedded fine silty SANDSTONE (60%) and SILTSTONE and MUDSTONE (40%). Sandstone is extremely weak, poorly cemented. Siltstone and Mudstone are very weak. **18U9m to 18U8m:**...Silty fine SANDSTONE (finer than typical	SW		100	0	96		19.5m: BP 5° undulating, rough, clean Base of Siltstone 19.5m to 19.64m: Core loss due to SPTC 19.5m: BP 5° undulating, rough, clean Base of Siltstone 19.5m to 19.64m: Core loss due to SPTC	

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Auckland

Client: Cck, land Light Rail Limited
Project: Cck, land Light Rail
Location: Z2 Wellesley 0treet I ast. Cck, land - OD
Project Reference: 0tage 1 Grocnd Nvestigation

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Sheet 2 of B

OERI HELI NVFERACTNEM Method: Rotary Core Wireline Equipment: Comacchio Geo 305 Contractor: McMillan Drilling	- ESERDNVCTI 0: M5TA 3444 Easting: 1757520.99m Northing: 5919985.39m Reduced level: 34.22m	Date started: 14/04/2023 Date completed: 18/04/2023 Inclination: -90° Azimuth: 0°	Logged by: DY Input by: DY Checked by: SBN Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	14	21		EUi	fine Sandstone). **18U3m to 34m:**...100mm thick Mudstone bed with Siltstone laminae. **18UuVm:** Slightly weathered, dark grey, interbedded fine silty SANDSTONE (60%) and SILTSTONE and MUDSTONE (40%). Sandstone is extremely weak, poorly cemented. Siltstone and Mudstone are very weak. **34UBm to 34U8m:**...100mm thick laminated SILTSTONE bed.	SW		100	0	96		19.5m: BP 5° undulating, rough, clean Base of Siltstone 19.5m to 19.64m: Core loss due to SPTC 19.9m: BP 5° undulating, smooth, clean Base of Siltstone 19.97m to 20.15m: BP 5° undul ting, smooth, clean x3 Base of Siltstone beds, closely spaced 20m: BP 5° undulating, roug , c ean Base of Mudstone 20.38m: DB 0° undulating, smooth, clean 20.42m: BP 5° undulating, smooth, clean Base of Sandstone 20.53m: DB 0° undulating, smooth, clean 20 61m to 20.77m: DI 5° Broken parallel to b dding	
SPTC	13				**31m:** CORE LOSS		21m: SPTC 17,33 for 100mm// N = 50+	N/A	N/A	N/A		20.95m: BP 10° stepped, smooth, clean 21m: Solid Cone SPT core loss 130mm, other core loss 70mm	
HQ3	12	22		EUi	**31U3m:** Slightly weathered, dark grey, fine to medium SANDSTONE. Very weak, moderately cemented. Normally graded. **31U2m to 31Uum:**...Medium to coarse SANDSTONE. **31UBm to 31UB2m:**...50mm thick gently inclined SILTSTONE bed. **33U2m to 33UBm:**...Well cemented SANDSTONE.	SW		95	73	91		21.57m: DI 20° undulating, smooth, clean 21.68m: BP 0° undulating, rough, clean Base of Sandstone 21.75m: BP 0° stepped, smooth, clean Base of Siltstone 21.81m: BP 10° stepped, smooth, clean 21.93m to 22.02m: DB 4x Broken parallel to bedding, very closely spaced 22.16m: BP 0° planar, smooth, clean Base of Siltstone 22.22m: BP 0° planar, smooth, clean Base of Mudstone	
HQ3	11	23		EUi	**33U8m:** Slightly weath red, dark grey, interbedded silty fine SANDSTONE (70%) with SILTSTONE and MUDSTONE (30%). Weak. **3Zm to 3ZU1m:**...100mm thick l minated MUDSTONE with Siltstone laminae.	SW		89	70	89		22.78m: JT 30° stepped, smooth, clean 22.8m: DB 0° undulating, smooth, clean 22.83m: DB 0° undulating, smooth, clean 22.92m: BP 0° planar, rough, clean Base of Sandstone 22.98m: BP 0° undulating, rough, clean Base of Siltstone 23.36m: JT 10° undulating, smooth, clean 23.43m to 23.83m: DB Closely spaced drill breaks.	
		24			**3ZUBm to 3ZUB2m:**...30mm thick CONCRETION. Weak. **3ZUB2m:** CORE LOSS								
HQ3	10	25		EUi	**3Vm:** Slightly weathered, dark grey, interbedded fine to medium SANDSTONE (70%) and SILTSTONE (30%). Weak. SANDSTONE is poorly cemented. SILTSTONE is gently inclined. **3V2m to 3V22m:**...50mm thick CONCRETION. Weak. **3V9m to 3VUBm:**...100m thick CONCRETION. Weak.	SW		80	0	24		24m to 25.5m: DB Closely spaced drill breaks.	

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Auckland

Client: Cck, land Light Rail Limited
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Location: Z2 Wellesley 0treet l ast. Cck, land - OD
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Sheet u of B

OERI HELI NMFERACTNEM Method: Rotary Core Wireline Equipment: Comacchio Geo 305 Contractor: McMillan Drilling	- ESERDNMCTI 0: M5TA 3444 Easting: 1757520.99m Northing: 5919985.39m Reduced level: 34.22m	Date started: 14/04/2023 Date completed: 18/04/2023 Inclination: -90° Azimuth: 0°	Logged by: DY Input by: DY Checked by: SBN Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	9			EUi	**32U1m to 32U12m:**...50mm thick CONCRETION. Weak.	SW							
					32U3m: CORE LOSS			80	0	24			
HQ3	8	26		EUz	**32U2m:** Slightly weathered, dark grey, laminated SILTSTONE with mudstone laminae. Very weak. **32Uu2m to 32UBm:**...150mm thick silty fine SANDSTONE bed. Weak, moderately well cemented.	SW						25.58m: DB 25.66m: JT 20° stepped, smooth, clean 25.74m to 26.6m: DB Closely spaced drill breaks.	
					3uUZm to 3uUVm:...100mm thick fine to medium SANDSTONE bed. Very weak, poorly cemented.			76	0	74			
		27			**3uuUVm:** CORE LOSS								
HQ3	7			EUz	**39m:** Slightly weathered, dark grey, laminated SILTSTONE with mudstone laminae. Very weak.	SW						27m to 28.5m: DB Closely spaced drill breaks.	
		28						100	0	100			
	6				**3BU3m:** Slightly weathered, dark grey, fine to medium SANDSTONE. Very weak, moderately well cemented. Normally graded. **3BUVm:**...Disseminated black carbonaceous flecks.						28.32m: JT 70° undulating, smooth, clean	
HQ3				EUs	**3BUBm to 3BUE2m:**...50mm thick SILTSTONE bed.	SW						28.6m to 28.9m: DB Very closely spaced drill breaks.	
	5	29			**38U3m:**...Silty fine SANDSTONE. Finer than typical fine Sandstone. **38UVm to 38U2m:**...100mm thick SILTSTONE bed.			83	30	77		29.3m to 29.7m: DB Closely spaced drill breaks.	
		30			**38U92m:** CORE LOSS								

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Auckland

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Sheet 9 of B

OERI HELI NMFERACTNEM Method: Rotary Core Wireline Equipment: Comacchio Geo 305 Contractor: McMillan Drilling	- ESERDNMCTI 0: M5TA 3444 Easting: 1757520.99m Northing: 5919985.39m Reduced level: 34.22m	Date started: 14/04/2023 Date completed: 18/04/2023 Inclination: -90° Azimuth: 0°	Logged by: DY Input by: DY Checked by: SBN Reviewed by: PK

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HQ3	4	31		EUs	**Z4m:** Slightly weathered, dark grey, fine to medium SANDSTONE. Very weak, moderately well cemented. Normally graded. **Z1m to Z1U42m:**...50mm thick bed of medium to coarse SANDSTONE.	SW		91	20	91			
	3				**Z1UZ9m:** CORE LOSS								
HQ3	2	32		EUz	**Z1U2m:** Unweathered, dark grey, laminated SILTSTONE with Mudstone laminae. Weak.	UW		100	40	68		31.59m: DB 31.7m to 31.84m: DI Very closely spaced drilling induced breaks. 32.13m: DB 32.19m: HI 32.22m: DB 32.36m: HI 32.47m: DB	
		33		EUs	**Z3U2m:** Unweathered, dark grey, fine to medium SANDSTONE. Very weak N rmally graded, faintly bedded. **Z3UBm to ZZm:** .Medium to coarse SANDSTONE.	UW						32.76m: JT 10° undulating, rough, clean	
HQ3	1	34		EUz	**ZZm:** Unweathered, dark grey, laminated SILTSTONE. Weak. Interbedded with moderately thin beds of fine to medium SANDSTONE. Weak. **ZZU22m to ZZU29m:**...20mm thick CONCRETION? Weak. **ZVU1m to ZVUZm:**...200mm thick bed of fine to medium SANDSTONE with 50mm thick black carbonaceous laminations at top of bed. **ZVUYm to ZVU2m:**...100mm thick bed of fine to medium SANDSTONE with black carbonaceous laminations. Very weak.	UW		100	0	100		33.1m: DB 33.11m: DB 33.22m: DB 33.29m: DB 33.4m: DB 33.5m: JT 50° undulating, smooth, coating, (Infill: clay) 33.64m: DB 33.75m: DB 33.92m: BP 33.97m to 34.1m: DI Closely spaced drilling induced breaks. 34.21m: DB 34.24m: DB 34.28m: DB	
HQ3	0	35						100	0	100		34.6m to 34.96m: DB Closely spaced drill breaks.	

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Sheet B of B

OERI HELI NMFERACTNEM Method: Rotary Core Wireline Equipment: Comacchio Geo 305 Contractor: McMillan Drilling	- ESERDNMCTI 0: M5TA 3444 Easting: 1757520.99m Northing: 5919985.39m Reduced level: 34.22m	Date started: 14/04/2023 Date completed: 18/04/2023 Inclination: -90° Azimuth: 0°	Logged by: DY Input by: DY Checked by: SBN Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	-1	36		EUz	**ZZm:** Unweathered, dark grey, laminated SILTSTONE. Weak. Interbedded with moderately thin beds of fine to medium SANDSTONE. Weak. **Z2U32m to Z2UZm:**...50mm thick bed of fine to medium SANDSTONE. Very weak. Finer grained than typical fine Sandstone. **Z2Uum to Z2UBm:**...200mm thick bed of SANDSTONE. Very weak, moderately well cemented.	UW		100	0	100		35.02m to 35.78m: DB Very close to closely spaced drill breaks.	
HQ3	-2	37		EUs	**ZuU42m:** Unweathered, dark grey, indistinctly bedded fine to medium SANDSTONE. Very weak, moderately well cemented. **ZuUium:**...70mm thick MUDSTONE bed, steeply inclined (70 degrees). Possible load cast?	UW		93	0	93		36.07m to 36.6m: DI Very close to closely spaced drilling induced breaks. 36.66m: JT 70° undulating, smooth, clean 36.82m: DB 36.99m: DB 37.09m to 37.4m: DI Closely spaced drilling induced breaks.	
	-3				**Z9UVm:** CORE LOSS End of borehole at 37.5m (Terminated Deeper due to unfavourable ground conditions)								

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
No fracture spacing information available.
No backfill information available, grout backfill assumed between VW Peizometers.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
14/04/2023 2:30:00 PM | 15.00m | 4.88 m
17/04/2023 7:30:00 AM | 15.00m | 5.5 m
17/04/2023 1:00:00 PM | 31.50m | 2.2 m
18/04/2023 7:15:00 AM | 31.50m | 16.92 m
18/04/2023 10:30:00 AM | 37.50m | 6.53 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **87 Wakefield Street, Auckland CBD**
Project Reference: **Stage 1 Ground Investigation**

BH1107

Sheet **1** of **12**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Comacchio Geo 305
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1757403.07m
Northing: 5919670.12m
Reduced level: 61.19m

Date started: 22/03/2023
Date completed: 27/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: DY
Input by: DY
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy / Defect Description / Additional Notes	Installation
VACEX	61	1			**0m:** HYDROVAC - No recovery.							**0m: FILL**	
SPT	60			ERz	**1.5m:** Clayey SILT with minor rootlets; grey mottled brown. Soft, moist, moderately plastic. Rootlets are fibrous.		1.5m: SPT 0,1// 1,1,2 N = 5	100				**1.5m: ECBF**	
HQ3	59	2			**1.95m to 2.3m:**...Becomes wet and highly plasti	MI		100					
					2.3m to 2.6m:...Becomes low plasticity.								
		3			**2.6m:** Clayey SILT with min r rootlets; grey mottl d brown with orangish brown bands. Firm, dry to moist, on-plastic. Rootlets are fibrous.	ML							
SPT	58				**3m:** Clayey SILT with trace fine sands; grey mottled brown. Firm, dry to moist, non-plastic.		3m: SPT 1,1// 1,0,1,0 N = 2	100					
HQ3					**3.45m to 3.85m:**...Becomes firm to stiff and dry.	ML							
	57	4		EWs	**3.85m:** Highly weathered, brown, fine to medium SANDSTONE. Extremely weak, poorly cemented. Recovered as silty SAND; grey mottled brown. Firm to stiff, dry to moist, moderately plastic.	HW		100					
SPT							4.5m: SPT 2,4// 5,6,7,8 N = 26	100					
		5				MW		100	19	19			

Box 1
Box 2

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Water pressurised, shooting from top of the rod at 24 m.

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Date Time | Hole Depth | Water Level
22/03/2023 4:00:00 PM | 13.50m | 2.46 m
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24/03/2023 8:00:00 AM | 31.50m | 11.13 m
24/03/2023 1:00:00 PM | 49.00m | 3.95 m
27/03/2023 8:00:00 AM | 49.00m | 16.12 m
27/03/2023 11:40:00 AM | 60.00m | 4.42 m
29/03/2023 8:00:00 AM | 60.00m | 19.82 m

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Auckland

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BH1107

Sheet **2** of **12**

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Contractor: McMillan Drilling

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Northing: 5919670.12m
Reduced level: 61.19m

Date started: 22/03/2023
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Azimuth: 0°

Logged by: DY
Input by: DY
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	56			EWs	**4.95m:** Moderately weathered, dark grey, SANDSTONE. Very weak, poorly to moderately well cemented; very closely spaced discontinuities; thickly bedded, sub-horizontal.	MW						4.95m to 5.23m: DI 5.29m: JT 20° undulating, rough, staining, (Infill: iron oxide)	
HQ3				EUs	**5.45m:** Slightly weathered, dark grey, SANDSTONE. Very weak, moderately well cemented; moderately widely spaced discontinuities; thickly bedded, sub-horizontal.	SW		100	19	19		5.44m: JT 15° undulating, smooth, staining, (Infill: iron oxide) 5.58m: BP 5.68m: JI 20° 5.72m: BP	
		6											
SPTC	55				**6m:** CORE LOSS		6m: SPTC 5,15// 17,33 for 55mm N = 50+	N/A	N/A	N/A			
HQ3				EUs	**6.28m:** Unweathered, dark grey, medium grain, SANDSTONE. Weak, moderately to well cemented; moderately widely spaced discontinuities; thickly bedded, sub-horizontal.	UW		100	95	95		6.48m: HI 6.64m: HI	
		7											
	54											7.07m: JT 30° undulating, rough, clean 7.22m: DB	
SPTC					**7.5m:** CORE LOSS		7.5m: SPTC 28,22 for 30mm// N = 50+	N/A	N/A	N/A		7.44m: HI	
HQ3				EUs	**7.59m:** Unweathered, dark grey, medium grain, SANDSTONE. Weak, well cemented; moderately widely spaced discontinuities; thickly bedded, sub-horizontal.	UW		100	91	91		7.6m: HI 7.73m: JT 15° undulating, smooth, clean	
		8											
	53											8.12m: JT 15° stepped, smooth, clean	
		9										8.82m: BP	
SPTC					**9m:** CORE LOSS		9m: SPTC 20,30 for 50mm// N = 50+	N/A	N/A	N/A		8.96m: HI	
HQ3	52			EUs	**9.1m:** Unweathered, dark grey, medium grain, SANDSTONE. Weak, well cemented; moderately widely spaced discontinuities; thickly bedded, sub-horizontal.	UW		100	95	95		9.14m: JI 20° 9.62m: DB	
		10			**9.94m to 10.5m:**...Becomes medium to coarse grained								

Box 2
Box 3

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Water pressurised, shooting from top of the rod at 24 m.

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Date Time | Hole Depth | Water Level
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24/03/2023 8:00:00 AM | 31.50m | 11.13 m
24/03/2023 1:00:00 PM | 49.00m | 3.95 m
27/03/2023 8:00:00 AM | 49.00m | 16.12 m
27/03/2023 11:40:00 AM | 60.00m | 4.42 m
29/03/2023 8:00:00 AM | 60.00m | 19.82 m

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Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **87 Wakefield Street, Auckland CBD**
Project Reference: **Stage 1 Ground Investigation**

BH1107

Sheet **3** of **12**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Comacchio Geo 305
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
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Northing: 5919670.12m
Reduced level: 61.19m

Date started: 22/03/2023
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Inclination: -90°
Azimuth: 0°

Logged by: DY
Input by: DY
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
Box 3 HQ3	51			EUs	interbedded with minor speckled orange clasts. **9.1m:** Unweathered, dark grey, medium grain, SANDSTONE. Weak, well cemented; moderately widely spaced discontinuities; thickly bedded, sub-horizontal.	UW		100	95	95		10m: JT 45° undulating, rough, clean	
SPTC					**10.5m:** CORE LOSS		10.5m: SPTC 15,35 for 70mm// N = 50+	N/A	N/A	N/A		10.44m: JT 10° undulating, smooth, clean	
HQ3	50	11		EUs	**10.61m:** Unweathered, dark grey, medium to coarse grain, SANDSTONE. Weak, well cemented; moderately wide to widely spaced discontinuities; thickly bedded, sub-horizontal.	UW		100	100	100		10.83m: HI 11.3m: JI 80° Broken during handling 11.61m: DB 11.91m: BP	
Box 4 SPTC	49	12			**12m:** CORE LOSS		12m: SPTC 30,20 for 40mm// N = 50+	N/A	N/A	N/A			
HQ3	48	13		EUs	**12.27m:** Unweathered, dark grey, coarse grain, SANDSTONE interbedded with minor red clasts. Weak, well cemented; widely spaced discontinuities; thickly bedded, sub-horizontal.	UW		89	86	86			
				EUz	**13.08m:** Unweathered, dark grey, SILTSTONE interbedded with black carbonaceous material bands. Very weak, moderately well cemented; closely spaced discontinuities; moderately thick bedded, gently inclined.	UW						13.08m: DB Drilling break on bedding plane 13.19m: DB 13.26m: DB 13.39m: JT 40° planar, rough, clean 13.72m to 13.77m: DI Drilling induced closely spaced drilling breaks	
		14			**13.83m:** Unweathered, dark grey, medium grain, SANDSTONE interbedded with black carbonaceous material bands. Very weak, poorly cemented; closely spaced discontinuities; moderately thinly bedded, sub-horizontal.	UW						13.91m: BP 14m: JT 40° undulating, rough, clean	
Box 5 HQ3	47			EUs	**14.08m:** Unweathered, dark grey, medium grain, SANDSTONE. Very weak, poorly cemented; closely spaced discontinuities; moderately thinly bedded, sub-horizontal.	UW		100	49	49		14.08m to 14.16m: DI Drilling induced closely spaced drilling breaks 14.26m: BP 14.34m: BP 14.61m: DB 14.72m to 15m: DI Drilling induced closely spaced drilling breaks	
		15											

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24/03/2023 1:00:00 PM	49.00m	3.95 m
27/03/2023 8:00:00 AM	49.00m	16.12 m
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Auckland

Client: **Auckland Light Rail Limited**
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BH1107

BOREHOLE INFORMATION
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Contractor: McMillan Drilling

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Date started: 22/03/2023
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Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
Box 5 HQ3	46				**15m:** CORE LOSS								
		16		EUs	**15.1m:** Unweathered, dark grey, medium grain, SANDSTONE. Very weak, poorly cemented; very close to closely spaced discontinuities; thickly bedded, sub-horizontal.	UW		93	11	11		15.1m to 15.85m: DI Drilling induced closely spaced drilling breaks 16.02m: BP 16.1m: JT 20° undulating, smooth, clean 16.11m: JT 70° undulating, smooth, clean	
	45												
Box 6 HQ3	44	17			**16.45m:** Unweathered, dark grey, interbedded SILTSTONE and SANDSTONE. Very weak, poorly cemented; very close to closely spaced discontinuities; very thin to thickly bedded, sub-horizontal. SANDSTONE is medium grained.			87	23	23		16.5m to 18m: DI Drilling induced closely spaced drilling breaks	
	43	18		EUi	**18.18m to 18.3m:**...SILTSTONE becomes moderately well cemented.	UW		100	53	53		18m to 19.5m: DI Drilling induced closely spaced drilling breaks	
HQ3	42	19			**19.03m to 19.33m:**...Drilling induced crushing.								
Box 7 HQ3		20			**19.5m to 19.95m:**...SANDSTONE becomes moderately well cemented.			100	88	88		19.61m: JT 10° undulating, smooth, clean	

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Auckland

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BH1107

Sheet **5** of **12**

BOREHOLE INFORMATION
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Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	41	21			**19.95m to 20.04m:**...SILTSTONE interbedded with black carbonaceous material bands. **16.45m:** Unweathered, dark grey, interbedded SILTSTONE and SANDSTONE. Very weak, poorly cemented; very close to closely spaced discontinuities; very thin to thickly bedded, sub-horizontal. SANDSTONE is medium grained.			100	88	88		19.96m: BP 20.04m: BP	
HQ3	40	22		EUi	**21m to 22.5m:**...Becomes very weak to weak, poorly to moderately well cemented. SANDSTONE becomes fine to medium grained.	UW		100	32	32		20.96m: HI 21m to 22.5m: DI Drilling induced closely spaced drilling breaks	
HQ3	39	23			**22.5m to 23.44m:**...SILTSTONE interbedded with black carbonaceous material bands.			85	28	28		22.5m to 24m: DI Drilling induced closely spaced drilling breaks	
	38	24			**23.77m:** CORE LOSS								
HQ3	37	25		EUs	**24m:** Unweathered, dark grey, fine to medium grain, SANDSTONE. Very weak, poorly cemented; very closely to closely spaced discontinuities; thickly bedded, sub-horizontal.	UW		100	22	22		24m to 25.5m: DI Drilling induced closely spaced drilling breaks	

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Box 7
Box 8
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BH1107

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HQ3 Box 8	36			EUs	**24m:** Unweathered, dark grey, fine to medium grain, SANDSTONE. Very weak, poorly cemented; very closely to closely spaced discontinuities; thickly bedded, sub-horizontal.	UW		100	22	22			
HQ3 Box 9	35	26		EUi	**25.5m:** Unweathered, dark grey, interbedded SILTSTONE and SANDSTONE. SILTSTONE is interbedded with black carbonaceous material bands. Weak, moderately well cemented; closely spaced discontinuities; moderately thickly bedded, sub-horizontal. SANDSTONE is medium grained. Very weak to weak, poorly to moderately well cemented; moderately closely spaced discontinuities; moderately thickly bedded, sub-horizontal.			81	60	60		25.5m to 27m: DI Drilling induced closely spaced drilling breaks	
	34	27										27m to 28.5m: DI Multiple drilling induced breaks	
	33	28			**28.34m to 28.37m:** ...Unweathered, white, CONCRETION. Weak to moderately st ong.	UW		100	80	80			
HQ3 Box 10	32	29										28.6m to 29.2m: DI Drilling induced closely spaced drilling breaks 28.67m: JT 10° undulating, smooth, clean	
		30			**29.87m:** CORE LOSS			91	51	51		29.26m: DB 29.36m: DB 29.4m: BP 29.58m: BP 29.67m: BP 29.72m: DB	

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BH1107

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Comacchio Geo 305
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1757403.07m
Northing: 5919670.12m
Reduced level: 61.19m

Date started: 22/03/2023
Date completed: 27/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: DY
Input by: DY
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	31	31		EUi	**30m:** Unweathered, dark grey, interbedded SILTSTONE and SANDSTONE. Weak, moderately well cemented; closely spaced discontinuities; moderately thickly bedded, sub-horizontal. SANDSTONE is medium grained.	UW		93	52	52		30.22m: DB 30.25m: JT 5° stepped, smooth, clean 30.3m: DB 30.36m: DB 30.38m: DB 30.41m: DB 30.45m: DB 30.53m: BP 30.57m: DB 30.63m: DB 30.67m: DB 30.68m: DB 30.69m: DB	
	30											31.07m: DB 31.16m: JT 5° undulating, smooth, clean	
					31.4m: CORE LOSS							31.33m: DB	
HQ3	29	32		EUz	**31.5m:** Unweathered, dark grey, SILTSTONE interbedded with black carbonaceous material bands. Weak, moderately well cemented; closely spaced discontinuities; thickly bedded sub-horizontal.	UW		100	95	95		31.67m: DB 31.68m: DB 32.32m: DB 32.55m: DB 32.59m: DB 32.72m: DB 32.77m: JT 5° undulating, smooth, clean	
	28	33										33.03m: DB 33.14m: DB 33.21m: DB 33.32m: DB 33.36m: DB	
HQ3	27	34		EUs	**33.63m:** Unweathered, dark grey, medium grained, SANDSTONE. Very weak, poorly cemented; closely spaced discontinuities; moderately thickly bedded, sub-horizontal.	UW		91	72	72		33.63m: BP 33.71m: DB	
				EUz	**34.21m:** Unweathered, dark grey, SILTSTONE. Weak, moderately well cemented; closely spaced discontinuities; moderately thinly bedded, sub-horizontal.	UW						34.18m: DB 34.2m: DB 34.21m: DB 34.28m: DB	
					34.36m: CORE LOSS								
HQ3	35			EUz	**34.5m:** Unweathered, dark grey, SILTSTONE interbedded with black carbonaceous material bands. Weak, moderately well cemented; moderately widely spaced discontinuities; thickly bedded, sub-horizontal.	UW		89	71	71		34.68m: DB 34.91m: DB	

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Rods stuck at 3 m during casing placement to 13.5 m, hydraulic fluid leaking when pressurised. Spill mats placed and mechanics called on site (29/03/2023).
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Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
22/03/2023 4:00:00 PM | 13.50m | 2.46 m
23/03/2023 9:30:00 AM | 13.50m | 3.45 m
23/03/2023 4:00:00 PM | 31.50m | 3.05 m
24/03/2023 8:00:00 AM | 31.50m | 11.13 m
24/03/2023 1:00:00 PM | 49.00m | 3.95 m
27/03/2023 8:00:00 AM | 49.00m | 16.12 m
27/03/2023 11:40:00 AM | 60.00m | 4.42 m
29/03/2023 8:00:00 AM | 60.00m | 19.82 m

Box 10 Box 11 Box 12
Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

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Project: **Auckland Light Rail**
Location: **87 Wakefield Street, Auckland CBD**
Project Reference: **Stage 1 Ground Investigation**

BH1107

Sheet **8** of **12**

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Logged by: DY
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Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	26			EUz	**34.5m:** Unweathered, dark grey, SILTSTONE interbedded with black carbonaceous material bands. Weak, moderately well cemented; moderately widely spaced discontinuities; thickly bedded, sub-horizontal.	UW						
HQ3				EUi	**35.28m:** Unweathered, dark grey, interbedded SILTSTONE and SANDSTONE. Weak, moderately well cemented; closely to moderately widely spaced discontinuities; moderately thickly bedded, sub-horizontal. SANDSTONE is fine grained.	UW		89	71	71		35.28m to 35.42m: DI Drilling induced closely spaced drilling breaks 35.52m: DB 35.58m: DB 35.67m: DB	
		36			**35.83m:** CORE LOSS								
HQ3	25			EUi	**36m:** Unweathered, dark grey, interbedded SILTSTONE and SANDSTONE. Weak, moderately well cemented; closely to moderately widely spaced discontinuities; moderately thickly bedded, sub-horizontal. SANDSTONE is fine to medium grained.	UW		100	69	69		36.19m: DB 36.25m: DB 36.43m: JT 10° undulating, smooth, clean 36.59m: DB 36.6m: DB 36.71m: DB 36.86m: DB 36.95m: DB 36.98m: DB 37.1m: HI 37.23m: BP 37.38m: HI	
		37			**36.64m to 36.86m:**...Becomes very weak to weak, poorly to moderately well cemented. SANDSTONE becomes medium grained. **36.86m to 36.95m:**...Unweathered, white, CONCRETION. Moderately strong.								
	24				**36.95m:** Unweathered, dark grey, interbedded SILTSTONE and SANDSTONE. Very weak to weak, moderately well cemented; closely to moderately widely spaced discontinuities; moderately thickly bedded, sub-horizontal. SANDSTONE is fine grained.	UW						
HQ3		38		EUs	**37.65m:** Unweathered, dark grey, fine grained, SANDSTONE. Very weak to weak, moderately well cemented; closely spaced discontinuities; moderately thickly bedded, sub-horizontal.	UW		100	95	95		37.74m: DB 37.97m: HI	
	23			EUz	**38.65m:** Unweathered, dark grey, SILTSTONE interbedded with black carbonaceous material bands. Weak, moderately well cemented; moderately widely spaced discontinuities; moderately thickly bedded, sub-horizontal.	UW						38.65m: DB 38.7m: DB
		39			**38.9m:** Unweathered, dark grey, interbedded SILTSTONE and SANDSTONE. Very weak to weak, moderately well cemented; closely to moderately widely spaced discontinuities; moderately thinly bedded, sub-horizontal. SANDSTONE is fine grained.							38.98m: HI 39.15m: DB 39.26m: DB 39.35m: BP	
HQ3	22			EUi	**39.65m to 40.02m:**...SANDSTONE becomes medium to coarse grained.	UW		89	80	80		39.63m: HI	
		40											

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24/03/2023 1:00:00 PM | 49.00m | 3.95 m
27/03/2023 8:00:00 AM | 49.00m | 16.12 m
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Box 12
Box 13
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Auckland

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BH1107

Sheet **9** of **12**

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Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
Box 13 HQ3	21			EUi	**40.02m to 40.32m:**...SANDSTONE becomes medium grained. SILTSTONE becomes sub-horizontal to gently inclined.	UW		89	80	80		40.02m: DB 40.11m to 40.19m: DI Multiple drilling induced breaks	
					40.32m: CORE LOSS								
HQ3		41		EUs	**40.5m:** Unweathered, dark grey, coarse grained, SANDSTONE interbedded with coarse blue clasts. Weak, poorly cemented; moderately widely spaced discontinuities; moderately thickly bedded, sub-horizontal. **40.68m to 41.02m:**...Becomes medium grained.	UW							
HQ3	20			EUi	**41.02m:** Unweathered, dark grey, interbedded SILTSTONE and SANDSTONE. Weak, poorly to moderately well cemented; closely spaced discontinuities; moderately thinly bedded, sub-horizontal to gently inclined. SANDSTONE is medium grained.	UW		95	84	84		41.02m: DB 41.18m: DB 41.24m: DB 41.32m: DB 41.42m: HI 41.59m: DB 41.68m: BP	
		42			**41.92m:** CORE LOSS								
Box 14 HQ3	19			EUi	**42m:** Unweathered, dark grey, interbedded SILTSTONE and SANDSTONE. Weak, poorly to moderately well cemented; closely spaced discontinuities; moderately thinly bedded, gently inclined. SANDSTONE is medium grained. SILTSTONE is interbedded with black carbonaceous material bands.	UW		84	52	52		42.11m to 42.36m: DI Drilling induced closely spaced drilling breaks 42.42m: DB 42.69m: DB 42.74m: DB 42.97m: DB 43.15m: HI	
	18	43			**43.26m:** CORE LOSS								
HQ3	17	44		EUi	**43.5m:** Unweathered, dark grey, interbedded SILTSTONE and SANDSTONE. Weak, poorly to moderately well cemented; closely spaced discontinuities; moderately thinly bedded, gently inclined. SANDSTONE is medium grained. SILTSTONE is interbedded with black carbonaceous material bands.	UW		65	59	59		43.62m: DB 43.71m: DB 43.75m: DB 43.9m: DB 44.02m: DB 44.07m: DB 44.13m: DB 44.17m: DB 44.2m: DB 44.34m: DB	
Box 15		45			**44.48m:** CORE LOSS								

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Auckland

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Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	16	46		EUi	**45m:** Unweathered, dark grey, interbedded SILTSTONE and medium grained, SANDSTONE. Very weak to weak. SANDSTONE is poorly cemented; closely spaced discontinuities; moderately thin to thickly bedded, sub-horizontal. SILTSTONE is well cemented; closely spaced discontinuities; moderately thinly bedded, sub-horizontal.	UW		100	56	56		45.06m: DB 45.28m: DB 45.45m to 45.65m: DI Drilling induced crush zone 45.84m: DB	
HQ3	15	47		EUi	**46.5m to 47.77m:**...SANDSTONE interbedded with minor white clasts.	UW		85	69	69		46.2m to 46.5m: DI Drilling induced crush zone 46.62m: DB 46.7m: DB 46.72m: DB 46.85m: JT 20° undulating, smooth, clean 46.93m: DB 47.21m: DB 47.3m: DB 47.45m: DB	
	14	48			**47.77m:** CORE LOSS								
HQ3	13	49		EUi	**48m:** Unweathered, dark grey, interbedded SILTSTONE and medium grained, SANDSTONE. Very weak to weak. SANDSTONE is poorly cemented; closely spaced discontinuities; moderately thin to thickly bedded, sub-horizontal. SILTSTONE is well cemented; closely spaced discontinuities; moderately thinly bedded, sub-horizontal.	UW		100	80	80		48.1m: DB 48.2m: DB 48.29m: DB 48.33m: DB 48.4m: DB 48.56m: DB 48.83m: DB 49.17m: DB 49.27m: DB 49.34m: DB	
HQ3	12	50		EUs	**49.5m:** Unweathered, dark grey, medium grained, SANDSTONE. Very weak, poorly to moderately well cemented; moderately widely spaced discontinuities; moderately thickly bedded, sub-horizontal.	UW		100	85	85		49.62m: HI 49.76m: HI 49.94m: HI	

Box 15 Box 16 Box 17

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HQ3	11	51		EUs		UW						50m to 50.1m: DI Multiple drilling induced breaks	
				EUz	**50.17m:** Unweathered, dark grey, SILTSTONE. Weak, moderately well to well cemented; closely spaced discontinuities; moderately thinly bedded, sub-horizontal.	UW						50.2m: DB	
				EUs	**50.34m:** Unweathered, dark grey, medium grained, SANDSTONE. Very weak, poorly to moderately well cemented; closely to moderately widely spaced discontinuities; moderately thickly bedded, sub-horizontal.	UW		100	85	85		50.3m: DB 50.39m: BP	
HQ3	10	52		EUi	**51m:** Unweathered, dark grey, interbedded SILTSTONE and medium grained, SANDSTONE. Very weak to weak. SANDSTONE is moderately well cemented; closely spaced discontinuities; moderately thin to thickly bedded, sub-horizontal. SILTSTONE is well cemented; closely spaced discontinuities; thin to moderately thinly bedded, sub-horizontal.	UW		100	90	90		51.19m: BP 51.29m: DB 51.66m: BP 51.94m: DB 52.02m: DB 52.06m: DB 52.16m: BP 52.43m: HI	
HQ3	8	53						83	100	100		52.63m: DB 52.85m: BP 52.93m: DB 52.99m: BP 53.08m: BP 53.19m: BP 53.28m: JT 10° planar, rough, clean 53.37m: DB	
		54			**53.75m:** CORE LOSS							53.7m: HI	
HQ3	7	55		EUi	**54m:** Unweathered, dark grey, interbedded SILTSTONE and medium grained, SANDSTONE. Very weak to weak. SANDSTONE is poorly cemented; closely spaced discontinuities; moderately thin to thickly bedded, sub-horizontal. SILTSTONE is well cemented; closely spaced discontinuities; thin to moderately thinly bedded, sub-horizontal.	UW		100	79	79		54.18m: DB 54.23m to 54.27m: DI Multiple drilling induced breaks 54.41m: DB 54.57m: DB 54.63m to 54.67m: DI Multiple drilling induced breaks 54.75m: DB	

Box 17

Box 18

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HQ3	6			EUi	**54m:** Unweathered, dark grey, interbedded SILTSTONE and medium grained, SANDSTONE. Very weak to weak. SANDSTONE is poorly cemented; closely spaced discontinuities; moderately thin to thickly bedded, sub-horizontal. SILTSTONE is well cemented; closely spaced discontinuities; thin to moderately thinly bedded, sub-horizontal.	UW		100	79	79		54.97m to 55.5m: DI Drilling induced vertical breaks	
HQ3	5	56		EUz	**55.5m:** Unweathered, dark grey, SILTSTONE. Weak, moderately well cemented; moderately widely spaced discontinuities; thickly bedded, sub-horizontal.	UW		100	100	100		55.61m: DB 55.68m: JT 10° stepped, smooth, (Infill: clay) 55.7m to 55.77m: DI Drilling induced closely spaced breaks 55.71m: DB 55.89m: JT 10° undulating, rough, clean 56.16m: DB 56.22m: DB 56.3m: DB 56.36m: DB 56.38m: DB 56.43m: DB 56.61m: DB 56.66m: DB 56.71m: DB 56.8m: DB	
HQ3	4	57		EUs	**56.9m:** Unweathered, dark grey, medium to coarse gr ined, SANDSTONE. Very weak to weak; moderately well cemented; closely spaced discontinuities, thickly b dded, sub-horizontal.	UW						56.97m: DB 57.23m: HI	
HQ3	3	58		EUz	**57.62m:** Unweathered, dark grey, SILTSTONE. Weak, moderately well cemented; moderately widely spaced discontinuities; moderately thinly bedded, sub-horizontal.	UW		100	100	100		57.57m: BP 57.62m: DB 57.66m: DB	
				EUs	**57.73m:** Unweathered, dark grey, medium to coarse grained SANDSTONE. Very weak to weak, moderately well cemented; closely spaced discontinuities; moderately thickly bedded, sub-horizontal. **58.29m to 58.4m** ...Becomes fine grained.	UW						58.23m: DB 58.29m: DB 58.34m: DB 58.38m: DB	
HQ3	2	59		EUz	**58.4m:** Unweathered, dark grey, SILTSTONE interbedded with black carbonaceous material bands. Very weak to weak, well cemented; closely spaced discontinuities; thin to moderately thinly bedded, sub-horizontal.	UW		100	100	100		58.56m: HI	
				EUs	**58.6m:** Unweathered, dark grey, fine to medium grained, SANDSTONE. Very weak to weak, poorly cemented; closely spaced discontinuities; thickly bedded, sub-horizontal. **59.56m to 59.63m:** ...Unweathered, white, CONCRETION. Moderately strong.	UW						59.36m: BP 59.5m: BP 59.58m: BP 59.66m: DB	
		60			End of borehole at 60m (Terminated Deeper due to unfavourable ground conditions)							59.9m: DB	

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24/03/2023 8:00:00 AM | 31.50m | 11.13 m
24/03/2023 1:00:00 PM | 49.00m | 3.95 m
27/03/2023 8:00:00 AM | 49.00m | 16.12 m
27/03/2023 11:40:00 AM | 60.00m | 4.42 m
29/03/2023 8:00:00 AM | 60.00m | 19.82 m

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Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **St Martins Lane**
Project Reference: **Stage 1 Ground Investigation**

BH1109

Sheet **1** of **14**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1757291.39m
Northing: 5919452.31m
Reduced level: 72.91m

Date started: 14/03/2023
Date completed: 20/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: SM / DB
Input by: DB
Checked by: PK
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	72	1		P	**0m:** ASPHALT.							**0m: FILL**	
				FEk	**0.1m:** Fine to coarse GRAVEL, light grey, dry, 'tightly packed'.							0.1m to 0.2m: SUBGRADE	
SPT	71	2		FEc	**0.2m:** Silty CLAY with trace sand; light grey with orange and light brown mottling and banding. Stiff, moist, high plasticity. Sand, coarse volcaniclastics, highly weathered, breaks down on remoulding.		1.5m: SPT 0,1// 1,1,2 N = 6	100					
HQ3					**2.3m:** Clayey SILT with minor sand; light brownish grey with orangish brown banding. Stiff, moist, moderate plasticity. Sand, fine.			100					
	70	3			**2.7m:** CLAY with some silt and trace sand; light grey with orange and light brown mottling. Firm, moist, high plasticity. Sand, coarse, weathered (iron oxide) lapilli. Vocaniclastics.								
SPT					**2.95m:** Clayey SILT with trace sand; light brownish grey with orangish brown banding. Stiff, moist, moderate plasticity. Sand, fine.		3m: SPT 0,1// 0,1,1,2 N = 4	100					
					3.3m:...grades; light orangish brown. Banded, sub-horizontal.								
					3.53m: Silty CLAY; light orangish brown, banded light grey. Firm, moist, high plasticity.								
HQ3	69	4		ERz	**3.7m:** SILT with some clay and trace sand; light orangish brown banded light grey and light brown. Stiff, moist, moderate plasticity.	MI		100				**3.7m: ECBF**	
SPT	68	5				CH	4.5m: SPT 0,0// 1,1,1,1 N = 4	100					

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl): 21/03/2023 11:15:0
Date Time | Hole Depth | Water Level
14/03/2023 5:15:00 PM | 19.50m | 2.7 m
15/03/2023 7:30:00 AM | 19.50m | 4.73 m
15/03/2023 5:00:00 PM | 42.00m | 4.73 m
16/03/2023 8:00:00 AM | 42.00m | 11.95 m
16/03/2023 5:00:00 PM | 58.60m | 7.5 m
17/03/2023 8:00:00 AM | 58.60m | 23.45 m
20/03/2023 7:30:00 AM | 66.00m | 13.33 m
20/03/2023 11:30:00 AM | 66.00m | 13.00 m
21/03/2023 7:30:00 AM | 66.00m | 14.96 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **St Martins Lane**
Project Reference: **Stage 1 Ground Investigation**

BH1109

Sheet **2** of **14**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1757291.39m
Northing: 5919452.31m
Reduced level: 72.91m

Date started: 14/03/2023
Date completed: 20/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: SM / DB
Input by: DB
Checked by: PK
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	67	6		ERc	**4.95m:** Silty CLAY with trace sand; light orangish brown mottled and banded light grey. Firm, moist, high plasticity. Sand, fine, highly weathered and oxidised.	CH							
					5.2m: SILT with some clay, minor sand and trace carbonaceous inclusions; light grey. Firm, moistur, moderate plasticity. Sand, fine. Carbonaceous inclusions, coarse sand sized.	CW							
				ERz	**5.45m:** Sandy SILT with trace carbonaceous inclusions; light grey. Firm, moist, low plasticity. Sand, fine.	CW		100				5.75m: DI	
SPT							6m: SPT 1,1// 1,1,1,2 N = 5						
HQ3	66	7			**6.15m:** Silty fine SAND with trace carbonaceous inclusions; light grey. Loose, moist, poorly graded, massive. Interbedded with clayey SILT layers; stiff, moist, moderate plasticity.			100					
					6.6m to 6.7m:...Carbonaceous banding, 8mm thick, extremly closely spaced, sub-horizontal bedding.			100					
					7.4m:...Coarse sand sized carbonaceous inclusion.								
SPT	65	8		ERs	**7.7m to 8.1m:**...SILT with minor clay and sand (fine).	CW	7.5m: SPT 1,1// 1,2,2,3 N = 8	100					
HQ3					**8.45m to 8.55m:**... Clayey SILT.			100					
	64	9					9m: SPT 2,2// 1,2,3,3 N = 9						
SPT								100					
HQ3	63	10		EWs	**9.35m:** Fine SAND with some silt; light grey. Loose, moist, poorly graded. Interbedded with SILT with some sand and minor clay and carbonaceous inclusions and banding; light to dark brown. Stiff, moist, moderate plasticity.	HW		100					

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl): 21/03/2023 11:55:0
Date Time | Hole Depth | Water Level
14/03/2023 5:15:00 PM | 19.50m | 2.7 m
15/03/2023 7:30:00 AM | 19.50m | 4.73 m
15/03/2023 5:00:00 PM | 42.00m | 4.73 m
16/03/2023 8:00:00 AM | 42.00m | 11.95 m
16/03/2023 5:00:00 PM | 58.60m | 7.5 m
17/03/2023 8:00:00 AM | 58.60m | 23.45 m
20/03/2023 7:30:00 AM | 66.00m | 13.33 m
20/03/2023 11:30:00 AM | 66.00m | 13.00 m
21/03/2023 7:30:00 AM | 66.00m | 14.96 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **St Martins Lane**
Project Reference: **Stage 1 Ground Investigation**

BH1109

Sheet **3** of **14**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1757291.39m
Northing: 5919452.31m
Reduced level: 72.91m

Date started: 14/03/2023
Date completed: 20/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: SM / DB
Input by: DB
Checked by: PK
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3					**9.35m:** Fine SAND with some silt; light grey. Loose, moist, poorly graded. Interbedded with SILT with some sand and minor clay and carbonaceous inclusions and banding; light to dark brown. Stiff, moist, moderate plasticity.			100					
SPT	62	11			**10.5m:**...Medium Dense.	HW	10.5m: SPT 2,3// 4,4,5,5 N = 18	100					
HQ3	61	12		EWs	**11.8m:**...Sub-horizontal to gently inclined, laminated to very thinly bedded.			100				11.5m to 11.55m: JT 40° planar, rough, clean Very narrow	
SPT			×		**12m:** Silty fine SAND; light grey. Medium dense, moist, poorly graded, massive.	MW	12m: SPT 4,4// 4,4,4,5 N = 17	100					
HQ3	60	13	×		**12.35m to 12.45m:**...Trace carbonaceous banding.			100					
SPT	59	14			**13m:** Fine SAND with minor silt; light grey. Medium dense, moist, poorly graded, massive.	MW	13.5m: SPT 5,7// 8,8,10,10 N = 36	100				14m to 14.12m: JT 45° planar, rough, clean Very narrow	
HQ3	58	15						95	90	95			

REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl): 21/03/2023 11:15:0
Date Time | Hole Depth | Water Level
14/03/2023 5:15:00 PM | 19.50m | 2.7 m
15/03/2023 7:30:00 AM | 19.50m | 4.73 m
15/03/2023 5:00:00 PM | 42.00m | 4.73 m
16/03/2023 8:00:00 AM | 42.00m | 11.95 m
16/03/2023 5:00:00 PM | 58.60m | 7.5 m
17/03/2023 8:00:00 AM | 58.60m | 23.45 m
20/03/2023 7:30:00 AM | 66.00m | 13.33 m
20/03/2023 11:30:00 AM | 66.00m | 13.00 m
21/03/2023 7:30:00 AM | 66.00m | 14.96 m

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Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **St Martins Lane**
Project Reference: **Stage 1 Ground Investigation**

BH1109

Sheet **4** of **14**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1757291.39m
Northing: 5919452.31m
Reduced level: 72.91m

Date started: 14/03/2023
Date completed: 20/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: SM / DB
Input by: DB
Checked by: PK
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPT				EWs	**13m:** Fine SAND with minor silt; light grey. Medium dense, moist, poorly graded, massive. **15m:**...Very dense.	MW	15m: SPT 7,14// 15,17,16,2 N = 50	100					
HQ3	57	16		EUs	**15.6m:** Slightly weathered, dark grey, indistinctly bedded, fine SANDSTONE; extremely weak, interbedded with sub-horizontal to gently-inclined moderately thin SILTSTONE layers, ratio 90/10.			100				15.52m: BP 5° undulating, smooth, (Infill: silt 4-6) 15.85m to 15.97m: BP 5° undulating, smooth, (Infill: silt 2-8) 16.07m to 16.12m: BP 5° undulating, smooth, (Infill: silt 2-6)	
SPTC						SW	16.5m: SPTC 0,33/ 50 N = 50+	N/A	N/A	N/A		16.5m to 16.58m: JT 45° planar, smooth, clean Very narrow	
HQ3	56	17										16.9m: JT 80° undulating, smooth, clean Healed. DI on handling.	
	55	18			**17.8m:** CORE LOSS			86	63	63		17.42m to 17.8m: DI 17.7m to 17.85m: JT 70° planar, smooth, clean	
SPTC					**18m:** Slightly weathered, dark grey, indistinctly bedded, fine SANDSTONE (90%); extremely weak, interbedded with sub-horizontal to gently-inclined moderately thin SILTSTONE layers (10%).		18m: SPTC 7,15// 22,20,8 for 35mm N = 50+	N/A	N/A	N/A			
HQ3	54	19		EUs	**18.4m:**...Fine to medium grained SANDSTONE; Very weak.	SW						18.5m to 18.75m: JT 45° 18.5m to 19.35m: FT Fault zone, multiple intersecting steeply dipping defects, matrix comprises fine-coarse gravel sized clasts (sandstone), angular, with silt and fine-coarse sand infill. Possible healed fractures at base of foot wall.	
					18.9m: Unweathered, dark grey, massive, fine to medium CONGLOMERATIC SANDSTONE; weak. Clasts, coarse sand to fine gravel sized, sub-angular to angular.			100	8	8		18.5m to 18.75m: JT 45° 18.5m to 19.35m: FT Fault zone, multiple intersecting steeply dipping defects, matrix comprises fine-coarse gravel sized clasts (sandstone), angular, with silt and fine-coarse sand infill. Possible healed fractures at base of foot wall. 18.8m to 18.92m: JT 40° 18.9m to 19.2m: JT 60° (Infill: silt 5) 19.25m to 19.5m: JT 70°	
SPTC						UW	19.5m: SPTC 2,18// 50 for 55mm N = 50+	N/A	N/A	N/A			
HQ3	53	20						100	100	100		19.7m to 19.8m: DI 19.9m to 19.94m: DI	

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl): 21/03/2023 11:15:0
Date Time | Hole Depth | Water Level
14/03/2023 5:15:00 PM | 19.50m | 2.7 m
15/03/2023 7:30:00 AM | 19.50m | 4.73 m
15/03/2023 5:00:00 PM | 42.00m | 4.73 m
16/03/2023 8:00:00 AM | 42.00m | 11.95 m
16/03/2023 5:00:00 PM | 58.60m | 7.5 m
17/03/2023 8:00:00 AM | 58.60m | 23.45 m
20/03/2023 7:30:00 AM | 66.00m | 13.33 m
20/03/2023 11:30:00 AM | 66.00m | 13.00 m
21/03/2023 7:30:00 AM | 66.00m | 14.96 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **St Martins Lane**
Project Reference: **Stage 1 Ground Investigation**

BH1109

Sheet **5** of **14**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1757291.39m
Northing: 5919452.31m
Reduced level: 72.91m

Date started: 14/03/2023
Date completed: 20/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: SM / DB
Input by: DB
Checked by: PK
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	52	21		EUg	**18.9m:** Unweathered, dark grey, massive, fine to medium CONGLOMERATIC SANDSTONE; weak. Clasts, coarse sand to fine gravel sized, sub-angular to angular.	UW		100	100	100		20m to 20.3m: Healed interconnecting fractures at base of foot wall. 20.02m to 20.05m: JT 30° stepped, rough, clean 20.34m to 20.43m: JT 45° planar, rough, clean 20.5m to 20.53m: JT 20° planar, rough, clean 20.64m: JT 15° planar, rough, clean	
HQ3	51	22		EUs	**21.3m:**...Clasts increase in size range with trace medium gravel sized clasts, sub-angular. **21.95m:** Slightly weathered, grey, distinctly bedded, fine SANDSTONE (60%); very weak. Interbedded with slightly weathered, dark grey, SILTSTONE (40%). Sub-horizontal to gently-inclined, laminated to thinly bedded with carbonaceous laminations and trace fine to medium gravel sized rip-up angular clasts. **22.3m:**...Extremely weak.	SW		83	65	56		21.39m to 21.44m: JT 50° planar, rough, clean 21.49m to 21.55m: JT 50° planar, rough, clean 21.49m: JT 20° planar, rough, clean 21.49m to 21.55m: JT 50° planar, rough, clean 21.56m to 21.6m: JT 35° planar, rough, clean 21.63m to 21.65m: BP 10° planar, (Infill: silt 5) Sandstone/ siltstone boundary. 21.71m to 21.8m: BP 10° planar, (Infill: silt 5) 21.91m: JT 8° planar, (Infill: silt 2)	
					22.5m: CORE LOSS								
HQ3	50	23		EUs	**22.6m:** Slightly weathered, light grey, distinctly bedded, fine SANDSTONE; extremely weak. Interbedded with slightly weathered, dark grey, SILTSTONE. Sub-horizontal to gently-inclined, laminated to thinly bedded with carbonaceous laminations and trace fine to medium gravel sized rip-up angular clasts.	SW		93	43	43		22.19m to 22.22m: JT 20° planar, rough, clean 22.2m to 23.45m: Drilling induced breaks. 22.6m to 23.4m: BP 9° planar, rough, (Infill: silt 2-80) 23.4m to 23.54m: JT 50° stepped, rough, clean 23.6m: BP 5° planar, rough, clean	
	49	24			**23.5m to 24m:**...Slightly weathered, dark greenish grey, laminated to thinly bedded SILTSTONE; very weak. Siltstone laminations are sub-horizontal to gently-inclined with minor carbonaceous laminations.	SW						23.81m: BP 50° planar, rough, clean 23.86m: BP 50° planar, rough, clean 23.93m: DI	
HQ3	48	25			**24.65m to 24.8m:**...Slightly weathered SANDSTONE; very weak.			100	32	13		24.83m to 24.9m: JT 35° undulating, rough	

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl): 21/03/2023 11:15:0
Date Time | Hole Depth | Water Level
14/03/2023 5:15:00 PM | 19.50m | 2.7 m
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20/03/2023 11:30:00 AM | 66.00m | 13.00 m
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Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **St Martins Lane**
Project Reference: **Stage 1 Ground Investigation**

BH1109

Sheet **6** of **14**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1757291.39m
Northing: 5919452.31m
Reduced level: 72.91m

Date started: 14/03/2023
Date completed: 20/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: SM / DB
Input by: DB
Checked by: PK
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3					**22.6m:** Slightly weathered, light grey, distinctly bedded, fine SANDSTONE; extremely weak. Interbedded with slightly weathered, dark grey, SILTSTONE. Sub-horizontal to gently-inclined, laminated to thinly bedded with carbonaceous laminations and trace fine to medium gravel sized rip-up angular clasts.	SW		100	32	13			
HQ3	47	26		EUs	**25.75m:** Slightly weathered, dark greenish grey, distinctly bedded, fine to medium SANDSTONE; extremely weak. Interbedded with SILTSTONE, laminated to thinly bedded with carbonaceous laminations; gently inclined.	SW		93	41	33		25.52m: BP planar, rough, (Infill: silt 2) 25.77m to 26m: BP (Infill: gravel) 26.13m to 26.2m: BP 5° 26.5m to 27m: CZ 5° (Infill: silt 0-10) 26.6m to 26.65m: JT 30° 26.72m to 26.74m: JT 25°	
	46	27			**26.9m:** CORE LOSS								
HQ3	45	28		EUs	**27m:** Slightly weathered, dark greenish grey, distinctly bedded, fine to medium SANDSTONE; extremely weak. Interbedded with SILTSTONE, laminated to thinly bedded with carbonaceous laminations; gently inclined. **27.1m:** SILTSTONE with gently inclined carbonaceous laminations. **27.6m:**...Very weak. **28.35m:**...Cross-bedded	SW		100	91	81		27.1m: 5° 27.35m: 5° planar, (Infill: silt 6) 27.46m to 27.64m: SZ 0° 27.76m: BP (Infill: silt 5)	
					28.5m: CORE LOSS								
HQ3	44	29		EUs	**28.7m:** Slightly weathered, dark greenish grey, distinctly bedded, fine to medium SANDSTONE; very weak. Interbedded with very closely spaced SILTSTONE, laminated to thinly bedded with carbonaceous laminations; gently inclined.	SW		87	23	20		28.7m to 29.64m: BP 5° (Infill: silt 2-10) 28.7m to 29.7m: Drilling induced breaks along bedding. 28.7m to 29.64m: BP 5° (Infill: silt 2-10) 28.7m to 29.7m: Drilling induced breaks along bedding. 28.7m to 29.64m: BP 5° (Infill: silt 2-10) 28.7m to 29.7m: Drilling induced breaks along bedding.	
	43	30		EUz	**29.5m:** Slightly weathered, dark grey, distinctly bedded SILTSTONE; very weak. Closely spaced carbonaceous laminations.	SW						29.88m: BP 25° undulating, rough, clean	

REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl): 21/03/2023 11:15:0
Date Time | Hole Depth | Water Level
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17/03/2023 8:00:00 AM | 58.60m | 23.45 m
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20/03/2023 11:30:00 AM | 66.00m | 13.00 m
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Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **St Martins Lane**
Project Reference: **Stage 1 Ground Investigation**

BH1109

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1757291.39m
Northing: 5919452.31m
Reduced level: 72.91m

Date started: 14/03/2023
Date completed: 20/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: SM / DB
Input by: DB
Checked by: PK
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3				EUz	**29.5m:** Slightly weathered, dark grey, distinctly bedded SILTSTONE; very weak. Closely spaced carbonaceous laminations. **30.1m to 30.2m:**...SANDSTONE; very weak.	SW						30.06m to 30.09m: BP 5° planar, rough, clean 30.1m: BP 5° planar, (Infill: silt 10) 30.2m: BP 5° planar, rough, clean 30.4m: BP 50° planar, rough, clean, (Infill: silt 20) 30.48m: BP 50° planar, rough, clean, (Infill: silt 20)	
	42	31		EUs	**30.65m:** Unweathered, dark grey, fine to coarse grained SANDSTONE; extremely weak.	UW						30.82m: JT 8° planar, rough, clean	
					31.1m: CORE LOSS								
HQ3	41	32		EUz	**31.5m:** Slightly weathered, dark grey, distinctly bedded SILTSTONE; weak. Siltstone is laminated to thinly bedded, sub-horizontal to gently inclined with trace carbanaceous laminations. **32.1m to 32.4m:**...Slightly weathered SANDSTONE; very weak.	SW		93	53	53		31.5m to 31.7m: CZ (Infill: gravel) 31.7m to 31.76m: JT 35° planar, smooth, clean 32.23m: BP 5° planar, rough, (Infill: silt 2)	
	40	33			**32.7m to 32.8m:**.. Slightly weathered SANDSTONE; very weak. **32.9m:** CORE LOSS							32.66m: BP 5° planar, rough, clean 32.7m to 33m: DI	
HQ3	39	34		EUz	**33.12m:** Slightly weathered, grey, indistinctly bedded to massive, fine to coarse SANDSTONE; Very weak. Interbedded with closely spaced, thinly bedded SILTSTONE. **33.45m to 33.6m:**..Fine SANDSTONE.	SW		93	63	70		33.1m to 33.4m: BP 5° planar, rough, (Infill: silt 2-15) 33.2m to 33.55m: DI 20° planar, rough, clean Along bedding. 33.5m to 33.7m: JT 33.83m: BP 5° planar, rough, (Infill: silt 2) 33.93m to 33.96m: JT 15° planar, smooth 33.97m: BP 5° planar, rough 34.03m to 34.08m: JT 25° planar, rough 34.12m: BP 5° planar, rough, clean	
HQ3	38	35			**34.9m to 35.05m:**...Carbonaceous laminations.			80	0	28		34.61m: BP 5° planar, rough, clean 34.7m to 34.84m: BP	

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl): 21/03/2023 11:15:0
Date Time | Hole Depth | Water Level
14/03/2023 5:15:00 PM | 19.50m | 2.7 m
15/03/2023 7:30:00 AM | 19.50m | 4.73 m
15/03/2023 5:00:00 PM | 42.00m | 4.73 m
16/03/2023 8:00:00 AM | 42.00m | 11.95 m
16/03/2023 5:00:00 PM | 58.60m | 7.5 m
17/03/2023 8:00:00 AM | 58.60m | 23.45 m
20/03/2023 7:30:00 AM | 66.00m | 13.33 m
20/03/2023 11:30:00 AM | 66.00m | 13.00 m
21/03/2023 7:30:00 AM | 66.00m | 14.96 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **St Martins Lane**
Project Reference: **Stage 1 Ground Investigation**

BH1109

Sheet **8** of **14**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1757291.39m
Northing: 5919452.31m
Reduced level: 72.91m

Date started: 14/03/2023
Date completed: 20/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: SM / DB
Input by: DB
Checked by: PK
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3				EUz	**33.12m:** Slightly weathered, grey, indistinctly bedded to massive, fine to coarse SANDSTONE; Very weak. Interbedded with closely spaced, thinly bedded SILTSTONE.	SW		80	0	28		34.92m: JT 15° planar, rough, clean 34.95m: JT 10° 35.04m: BP 5° planar, rough, clean	
	37			EUi	**35.6m:** Unweathered, dark greenish grey, laminated to very thinly bedded SILTSTONE and thinly bedded SANDSTONE; weak. Bedding is sub-horizontal with trace carbonaceous laminations.	UW						35.7m to 36m: Drilling induced core loss.	
		36			**35.7m:** CORE LOSS								
HQ3	36			EUi	**36m:** Unweathered, dark greenish grey, laminated to very thinly bedded SILTSTONE and thinly bedded SANDSTONE; weak. Bedding is sub-horizontal with trace carbonaceous laminations.	UW		100	95	95		36.4m: BP 10° undulating, rough 36.65m: BP 5° planar, smooth, (Infill: silt 5) 36.9m to 36.98m: CZ (Infill: gravel) 37m: DI	
		37											
HQ3	35							87	38	63		37.65m: BP undulating, rough, (Infill: silt 2) 37.69m: BP undulating, rough, (Infill: silt 2) 37.92m: JT 8° planar, rough, (Infill: silt 2) 38m to 38.1m: BP 38.45m: BP undulating, rough, clean 38.55m to 38.6m: BP 38.67m to 38.69m: (Infill: gravel)	
		38			**38.6m to 38.62m:**...Carbonaceous laminations.								
	34				**38.8m:** CORE LOSS								
		39											
HQ3				EUi	**39m:** Unweathered, dark greenish grey, laminated to very thinly bedded SILTSTONE and thinly bedded SANDSTONE; weak. Bedding is sub-horizontal with trace carbonaceous laminations.	UW		97	80	80		39.85m to 39.43m: CZ 5° (Infill: gravel)	
	33												
		40											

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl): 21/03/2023 11:55:0
Date Time | Hole Depth | Water Level
14/03/2023 5:15:00 PM | 19.50m | 2.7 m
15/03/2023 7:30:00 AM | 19.50m | 4.73 m
15/03/2023 5:00:00 PM | 42.00m | 4.73 m
16/03/2023 8:00:00 AM | 42.00m | 11.95 m
16/03/2023 5:00:00 PM | 58.60m | 7.5 m
17/03/2023 8:00:00 AM | 58.60m | 23.45 m
20/03/2023 7:30:00 AM | 66.00m | 13.33 m
20/03/2023 11:30:00 AM | 66.00m | 13.00 m
21/03/2023 7:30:00 AM | 66.00m | 14.96 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **St Martins Lane**
Project Reference: **Stage 1 Ground Investigation**

BH1109

Sheet **9** of **14**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1757291.39m
Northing: 5919452.31m
Reduced level: 72.91m

Date started: 14/03/2023
Date completed: 20/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: SM / DB
Input by: DB
Checked by: PK
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3					**39m:** Unweathered, dark greenish grey, laminated to very thinly bedded SILTSTONE and thinly bedded SANDSTONE; weak. Bedding is sub-horizontal with trace carbonaceous laminations.			97	80	80			
HQ3	32	41		EUi		UW		87	33	43			
HQ3	31	42											
HQ3	30	43		EUs	**42.75m:** Unweathered, light grey, fine SANDSTONE; extremely weak, poorly cemented.	UW		93	23	43		42.75m to 43.4m: DI 10° undulating, rough, Along sandstone fabric.	
					43.4m: CORE LOSS								
HQ3	29	44		EUz	**43.5m:** Unweathered, dark grey, distinctly bedded SILTSTONE, weak.	UW		100	82	87		44.18m to 44.29m: CZ (Infill: silt) Infill silt, fine grained clasts, extremely closely to very closely spaced. 44.4m: BP 5° planar, smooth, clean	
	28	45											

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl): 21/03/2023 11:15:0
Date Time | Hole Depth | Water Level
14/03/2023 5:15:00 PM | 19.50m | 2.7 m
15/03/2023 7:30:00 AM | 19.50m | 4.73 m
15/03/2023 5:00:00 PM | 42.00m | 4.73 m
16/03/2023 8:00:00 AM | 42.00m | 11.95 m
16/03/2023 5:00:00 PM | 58.60m | 7.5 m
17/03/2023 8:00:00 AM | 58.60m | 23.45 m
20/03/2023 7:30:00 AM | 66.00m | 13.33 m
20/03/2023 11:30:00 AM | 66.00m | 13.00 m
21/03/2023 7:30:00 AM | 66.00m | 14.96 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **St Martins Lane**
Project Reference: **Stage 1 Ground Investigation**

BH1109

Sheet **10** of **14**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1757291.39m
Northing: 5919452.31m
Reduced level: 72.91m

Date started: 14/03/2023
Date completed: 20/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: SM / DB
Input by: DB
Checked by: PK
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	27	46		EUz	**43.5m:** Unweathered, dark grey, distinctly bedded SILTSTONE; weak.	UW							
				EUi	**45.25m:** Unweathered, light grey, indistinctly bedded, fine to medium SANDSTONE; very weak, moderately cemented with interbedded thin beds of laminated SILTSTONE; weak. Carbonaceous laminations and fine gravel sized rip-up clasts, angular siltstone.	UW						45.15m to 45.19m: CZ (Infill: silt) Gravel clasts 45.28m to 45.44m: CZ (Infill: silt) Fine grained clasts
					45.35m: CORE LOSS								
					45.5m: Unweathered, light grey, indistinctly bedded, fine to medium SANDSTONE; very weak, moderately cemented with interbedded thin beds of laminated SILTSTONE; weak. Carbonaceous laminations and fine gravel sized rip-up clasts, angular siltstone.			100	39	69		45.61m to 45.63m: CZ 5° planar, (Infill: silt) 45.66m: CZ 5° planar, (Infill: silt) 45.78m: CZ 5° planar, rough, clean	
HQ3	26	47		EUi		UW						46.74m to 46.8m: CZ clean Gravel clasts and bedding planes	
								100	76	76		47.2m to 47.5m: SZ (Infill: clay) Fine to medium clay infill, angular to sub-angular siltstone clasts, has bedding parallel to drill breaks, very closely spaced.	
HQ3	25	48		EUz	**47.6m:** Unweathered, dark grey, distinctly laminated to very thinly bedded SILTSTONE; weak.	UW							
HQ3	24	49		EUi	**48m:** Unweathered, light grey, indistinctly bedded, fine to coarse SANDSTONE; very weak, moderately cemented with widely spaced, very thin SILTSTONE beds. Carbonaceous laminations in siltstone beds.	UW		92	92	92			
					49.2m:...Incipient fracturing in sandstone.								
HQ3	23	50						95	95	95		49.5m to 51m: DI Drilling induced breaks.	

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl): 21/03/2023 11:55:0
Date Time | Hole Depth | Water Level
14/03/2023 5:15:00 PM | 19.50m | 2.7 m
15/03/2023 7:30:00 AM | 19.50m | 4.73 m
15/03/2023 5:00:00 PM | 42.00m | 4.73 m
16/03/2023 8:00:00 AM | 42.00m | 11.95 m
16/03/2023 5:00:00 PM | 58.60m | 7.5 m
17/03/2023 8:00:00 AM | 58.60m | 23.45 m
20/03/2023 7:30:00 AM | 66.00m | 13.33 m
20/03/2023 11:30:00 AM | 66.00m | 13.00 m
21/03/2023 7:30:00 AM | 66.00m | 14.96 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **St Martins Lane**
Project Reference: **Stage 1 Ground Investigation**

BH1109

Sheet **11** of **14**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1757291.39m
Northing: 5919452.31m
Reduced level: 72.91m

Date started: 14/03/2023
Date completed: 20/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: SM / DB
Input by: DB
Checked by: PK
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	22	51		EUi	**48m:** Unweathered, light grey, indistinctly bedded, fine to coarse SANDSTONE; very weak, moderately cemented with widely spaced, very thin SILTSTONE beds. Carbonaceous laminations in siltstone beds.	UW		95	95	95		50m: Drilling induced planar bedding fractures 50.33m to 50.35m: DI 5° planar, (Infill: silt) Drilling induced break, 10mm dull silt infill.	
HQ3	21	52			**51.1m:**...Green siltstone clasts ~4mm.			99	97	97			
					51.85m: Unweathered, dark grey, thin to moderately thinly bedded SILTSTONE, interbedded with moderately thin fine to medum grained SANDSTONE; very weak. Bedding is sub-horizontal to gently inclined. Incipient fractures cross-cutting siltstone beds.							51.87m to 51.89m: JT 5° planar, (Infill: silt) 52.1m: Series of drilling induced fractures, follow bedding, ~50mm apart.
HQ3	20	53				UW		100	96	96		53.05m: JT 5° planar, rough, (Infill: silt)	
	19	54											
HQ3	18	55			**54m:** Unweathered, light grey, distinctly bedded, fine to medium SANDSTONE; very weak, interbedded with widely spaced, moderately thin SILTSTONE; weak.	UW		95	91	91		54.73m to 54.92m: JT 75° Healed fracture, calcite veneer 54.93m: JT 5° planar, smooth, (Infill: silt	

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl): 21/03/2023 11:15:0
Date Time | Hole Depth | Water Level
14/03/2023 5:15:00 PM | 19.50m | 2.7 m
15/03/2023 7:30:00 AM | 19.50m | 4.73 m
15/03/2023 5:00:00 PM | 42.00m | 4.73 m
16/03/2023 8:00:00 AM | 42.00m | 11.95 m
16/03/2023 5:00:00 PM | 58.60m | 7.5 m
17/03/2023 8:00:00 AM | 58.60m | 23.45 m
20/03/2023 7:30:00 AM | 66.00m | 13.33 m
20/03/2023 11:30:00 AM | 66.00m | 13.00 m
21/03/2023 7:30:00 AM | 66.00m | 14.96 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **St Martins Lane**
Project Reference: **Stage 1 Ground Investigation**

BH1109

Sheet **12** of **14**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1757291.39m
Northing: 5919452.31m
Reduced level: 72.91m

Date started: 14/03/2023
Date completed: 20/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: SM / DB
Input by: DB
Checked by: PK
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	17	56		EUi	**54m:** Unweathered, light grey, distinctly bedded, fine to medium SANDSTONE; very weak, interbedded with widely spaced, moderately thin SILTSTONE; weak.			97	41	57		0.05) 55.23m to 55.28m: CZ (Infill: silt) Sandstone gravel, silt infill, sub-angular. 55.6m: CZ 5° planar, (Infill: silt 5) 55.8m: JT 25° planar, rough 56.02m to 56.2m: JT 65° Healed, slight offset	
					56.4m: Closely spaced, thin SANDSTONE and SILTSTONE beds with fine grained-sized rip-up clasts in sandstone.							56.42m to 56.43m: JT 5° Clay infill seam 56.45m: JT 55° Healed	
	16	57				UW						56.96m: JT 5° planar, rough, (Infill: silt)	
HQ3	15	58						100	87	87		57.05m to 57.07m: JT 15° undulating, rough, (Infill: clay) 57.23m to 57.25m: JT 5° planar, (Infill: clay) 57.34m: JT 25° (Infill: silt) 57.48m to 57.57m: JT 50° Healed 57.79m to 57.82m: JT 10° planar, (Infill: clay) Clay seam 5-10 mm thick	
												58.42m to 58.44m: JT 5° planar, (Infill: clay 20) 58.5m: DB	
HQ3	14	59		EUs	**58.5m:** Unweathered, grey, fine to medium SANDSTONE; extremely weak to very weak, moderately widely spaced, massive	UW		100		93		58.73m: CZ (Infill: sand 20) 59.5m: DB 59.62m: CZ (Infill: sand 100)	
	13	60			**59.75m:**...Organic inclusion, wood, 10mm, dark brown. **59.8m:** Slightly weathered, grey, fine SANDSTONE; Weak.	SW							

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl): 21/03/2023 11:15:0
Date Time | Hole Depth | Water Level
14/03/2023 5:15:00 PM | 19.50m | 2.7 m
15/03/2023 7:30:00 AM | 19.50m | 4.73 m
15/03/2023 5:00:00 PM | 42.00m | 4.73 m
16/03/2023 8:00:00 AM | 42.00m | 11.95 m
16/03/2023 5:00:00 PM | 58.60m | 7.5 m
17/03/2023 8:00:00 AM | 58.60m | 23.45 m
20/03/2023 7:30:00 AM | 66.00m | 13.33 m
20/03/2023 11:30:00 AM | 66.00m | 13.00 m
21/03/2023 7:30:00 AM | 66.00m | 14.96 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **St Martins Lane**
Project Reference: **Stage 1 Ground Investigation**

BH1109

Sheet **13** of **14**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1757291.39m
Northing: 5919452.31m
Reduced level: 72.91m

Date started: 14/03/2023
Date completed: 20/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: SM / DB
Input by: DB
Checked by: PK
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	12	61		EUs	**60m:** Unweathered, grey, fine to coarse SANDSTONE; very weak, widely spaced. **60.6m:**...Corestone (siltstone), rounded to subrounded, 100mm. **60.7m:**...Coarse, SANDSTONE (Reverse grading?)	UW		100		93		60.05m 60.1m: DB 60.33m 60.5m: DI	
HQ3	11	62		EUz	**61.73m:** Unweathered, grey, SILTSTONE; weak, moderately widely spaced, massive. **61.8m to 61.82m:**...Silty Clay with minor fine to coarse sand; light grey, moderate plasticity. **61.82m:** Unweathered, grey, fine to medium SANDSTONE; very weak. **62.1m:** Unweathered, grey, MUDSTONE; extremely weak to very weak. **62.3m:**...Possible 10mm clay seam	UW UW UW		100		62		61.2m: DB Seam 61.67m: JT 40° undulating, rough 62.35m: DB 62.5m: DB 62.7m: CZ (Infill: gravel)	
HQ3	10	63		EUs	**62.9m:**...Wood inclusion **63.2m:** Unweathered, grey, MUDSTONE; very weak, with carbonaceous inclusions **63.31m:** Unweathered, grey, fine to medium SANDSTONE; extremely weak to very weak, moderately widely spaced.	UW UW		100		73		63.2m: DB 63.31m: BP 5°	
HQ3	9	64		EUz	**63.8m:** Unweathered, grey, indistinctly bedded MUDSTONE; very weak to weak.	UW		100		60		63.9m: JT 0° planar, smooth 64.1m: SEAM 0° clean 64.2m: SEAM 4° clean 64.3m: DB 64.45m: DB	
	8	65											

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl): 21/03/2023 11:55:0
Date Time | Hole Depth | Water Level
14/03/2023 5:15:00 PM | 19.50m | 2.7 m
15/03/2023 7:30:00 AM | 19.50m | 4.73 m
15/03/2023 5:00:00 PM | 42.00m | 4.73 m
16/03/2023 8:00:00 AM | 42.00m | 11.95 m
16/03/2023 5:00:00 PM | 58.60m | 7.5 m
17/03/2023 8:00:00 AM | 58.60m | 23.45 m
20/03/2023 7:30:00 AM | 66.00m | 13.33 m
20/03/2023 11:30:00 AM | 66.00m | 13.00 m
21/03/2023 7:30:00 AM | 66.00m | 14.96 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **St Martins Lane**
Project Reference: **Stage 1 Ground Investigation**

BH1109

Sheet **14** of **14**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1757291.39m
Northing: 5919452.31m
Reduced level: 72.91m

Date started: 14/03/2023
Date completed: 20/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: SM / DB
Input by: DB
Checked by: PK
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3				EUs	**65m:** Unweathered, grey, fine to medium SANDSTONE; extremely weak.	UW							
HQ3	7	66		EUz	**65.15m:** Unweathered, grey, horizontally bedded MUDSTONE; very weak, closely spaced, trace organic inclusions. **65.7m:**...20mm clay seam, 0°, gravelly clay. **65.72m:**...Carbonaceous laminae.	UW		100		60		65.55m: SEAM 0° (Infl : clay 10) 65.7m to 65.72m: SEAM	
					End of borehole at 66m (Terminated Deeper due to unfavourable ground conditions)								

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl): 21/03/2023 11:55:0
Date Time | Hole Depth | Water Level
14/03/2023 5:15:00 PM | 19.50m | 2.7 m
15/03/2023 7:30:00 AM | 19.50m | 4.73 m
15/03/2023 5:00:00 PM | 42.00m | 4.73 m
16/03/2023 8:00:00 AM | 42.00m | 11.95 m
16/03/2023 5:00:00 PM | 58.60m | 7.5 m
17/03/2023 8:00:00 AM | 58.60m | 23.45 m
20/03/2023 7:30:00 AM | 66.00m | 13.33 m
20/03/2023 11:30:00 AM | 66.00m | 13.00 m
21/03/2023 7:30:00 AM | 66.00m | 14.96 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **1 Porters Avenue, Eden Terrace**
Project Reference: **Stage 1 Ground Investigation**

BH1110

Sheet **1** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1756364.17m
Northing: 5918313.08m
Reduced level: 66.08m

Date started: 23/03/2023
Date completed: 29/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ/CR
Input by: CJ/CR
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	66	1			**0m:** HYDROVAC			0				**0m: AVF**	
SPT	65			Vaf	**1.5m:** SILT, some clay minor fine gravel, trace rootlets; dark brownish orange; soft; moist, highly plastic. Gravel is highly weathered lapilli scoria, FeO stained.		1.5m: SPT 0// 0 0,1 N = 2	100					
PQ3	64	2				ML		100					
		3			**2.7m:**...Light brown, FeO stained.								
PUSHTUBE	63							60				**3.25m: ECBF**	
SPT		4			**3.25m:** Silty CLAY, light grey, mottled orange; soft; moist, highly plastic. FeO stained.	RS	3.5m: SPT 0,1// 0,1,1,1 N = 3	100					
PQ3	62			ERc				100					
SPT		5			**4.5m:** CLAY, some silt; brownish orange streaked grey; soft; moist, highly plastic.	RS	4.5m: SPT 0,0// 0,1,1,1 N = 3	100					
								57					

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
24/03/2023 7:30:00 AM | 4.00m | 2.1 m
27/03/2023 7:46:00 AM | 15.00m | 8 m
27/03/2023 4:02:00 PM | 31.50m | 3.5 m
28/03/2023 7:35:00 AM | 31.50m | 8.67 m
28/03/2023 12:38:00 PM | 40.50m | 4.55 m
29/03/2023 7:45:00 AM | 40.50m | 8.5 m

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Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **1 Porters Avenue, Eden Terrace**
Project Reference: **Stage 1 Ground Investigation**

BH1110

Sheet **2** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1756364.17m
Northing: 5918313.08m
Reduced level: 66.08m

Date started: 23/03/2023
Date completed: 29/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ/CR
Input by: CJ/CR
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	61	6		ERc	**4.5m:** CLAY, some silt; brownish orange streaked grey; soft; moist, highly plastic.	RS							
				ERz	**5.15m:** SILT, some clay, trace fine sand; light grey streaked browinsh orange; soft; moist, highly plastic.	RS		57					
					5.55m: CORE LOSS								
SPT	60	7		ERz	**6m:** SILT, some clay, trace fine sand and disseminated black carbonaceous material; light grey; soft; moist, highly plastic.		6m: SPT 0,0// 0,0,1,1 N = 2	100					
PQ3	59					RS	7.5m: SPT 0,0// 1,1,1,1 N = 4	100					
SPT		8						100					
PQ3	58				**7.95m:** SILT, minor clay; light grey; firm; moist, low plasticity.	RS							
				ERs	**8.3m:** Silty fine-grained SAND, minor clay, trace disseminated black carbonaceous material; grey; loose; moist, non plastic	RS		100					
		9		EWz	**8.75m:** Highly weathered; grey; SILTSTONE; extremely weak, extremely closely spaced, narrow.	HW	9m: SPT 1,1// 3,4,4,6 N = 17						
SPT	57							100					
PQ3				EWs	**9.45m:** Highly weathered; grey; silty fine-grained SANDSTONE; extremely weak. (silty SAND; grey; medium dense)	HW		100				9.7m: 5mm thick bed of black carbonaceous material. dip of 25	
		10		EWz		HW						9.9m: BP 0° closed	

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
24/03/2023 7:30:00 AM | 4.00m | 2.1 m
27/03/2023 7:46:00 AM | 15.00m | 8 m
27/03/2023 4:02:00 PM | 31.50m | 3.5 m
28/03/2023 7:35:00 AM | 31.50m | 8.67 m
28/03/2023 12:38:00 PM | 40.50m | 4.55 m
29/03/2023 7:45:00 AM | 40.50m | 8.5 m

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Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **1 Porters Avenue, Eden Terrace**
Project Reference: **Stage 1 Ground Investigation**

BH1110

Sheet **3** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1756364.17m
Northing: 5918313.08m
Reduced level: 66.08m

Date started: 23/03/2023
Date completed: 29/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ/CR
Input by: CJ/CR
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	56			EWz	**9.85m:** Highly weathered; grey; sandy SILTSTONE; extremely weak. (fine-grained sandy SILT; grey; medium dense)	HW		100				10.1m: BP 35° planar, rough, clean Broken parallel to bedding 10.27m: BP 10° undulating, rough, clean Broken parallel to bedding	
SPT					**10.5m:** Moderately weathered; grey; SILTSTONE; extremely weak; very thinly bedded.	MW	10.5m: SPT 3,5// 6,7,26,11 for 50mm N = 50+	100					
PQ3	55	11			**11m:**...10mm thick sandstone bed							11m: BP 30° stepped, smooth, clean Broken parallel to bedding 11.15m: BP 15° closed	
					11.2m: Slightly weathered; grey; SILTSTONE; extremely weak. (silty fine-grained SAND; grey; very dense)	SW							
					11.5m: Slightly weathered; grey, thinly bedded; SILTSTONE, trace disseminated black carbonaceous material; Very weak; very thinly bedded.			100	77	100		11.5m: 10° 10mm thick black carbonaceous bed 11.7m: BP 10° planar, rough, clean Broken parallel to bedding 11.9m: DB 0° planar, rough	
SPT	54	12					12m: SPT 2,6// 10,14,20,6 for 25mm N = 50+	0					
PQ3												12.45m: Black carbonaceous material 12.54m: BP 20° planar, rough, clean Broken parallel to bedding	
	53	13		EUz		SW		100	100	100		12.95m: BP 30° planar, rough, clean Broken parallel to bedding	
					13.45m:.. 30mm thick bed of fine SANDSTONE							13.4m: BP 10° undulating, smooth, clean Broken parallel to bedding	
SPT							13.5m: SPT 3,8// 10,10,13,17 for 65mm N = 50+	0					
PQ3	52	14										14m: JI 60° veneer <1mm calcite infill 14.1m: DB 5° undulating, smooth, clean Broken parallel to bedding	
								100	28	90		14.4m: BP 10° planar, smooth, clean Broken parallel to bedding 14.5m: BP 10° planar, smooth, clean Broken parallel to bedding 14.55m: BP 5° closed. Siderite seam. 10mm thick zone calcite veins.	
					14.55m:...10mm thick seam of siderite veins (FeCO3 cemented). Oxidized to brownish orange **14.7m to 15m:**...Greenish grey.								
	15												

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
24/03/2023 7:30:00 AM | 4.00m | 2.1 m
27/03/2023 7:46:00 AM | 15.00m | 8 m
27/03/2023 4:02:00 PM | 31.50m | 3.5 m
28/03/2023 7:35:00 AM | 31.50m | 8.67 m
28/03/2023 12:38:00 PM | 40.50m | 4.55 m
29/03/2023 7:45:00 AM | 40.50m | 8.5 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **1 Porters Avenue, Eden Terrace**
Project Reference: **Stage 1 Ground Investigation**

BH1110

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1756364.17m
Northing: 5918313.08m
Reduced level: 66.08m

Date started: 23/03/2023
Date completed: 29/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ/CR
Input by: CJ/CR
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	51			EUz	**11.5m:** Slightly weathered; grey, thinly bedded; SILTSTONE, trace disseminated black carbonaceous material; Very weak; very thinly bedded.	SW						14.95m: BP 5° closed 15.3m: BP 10° undulating, rough, very soft, grey clay veneer. Broken parallel to bedding.	
					15.5m: Slightly weathered, dark grey, indistinctly laminated SILTSTONE. Very weak. Defects are closely spaced, narrow.			100	77	80		15.7m: BP 15° undulating, rough, clean Broken parallel to bedding 15.9m: BP 5° undulating, rough, clean Broken parallel to bedding	
		16											
	50				**16.1m:**...20mm thick fine-grained SANDSTONE							16.1m: JT 25° undulating, smooth, clean	
PQ3													
		17											
	49				**17.15m to 17.7m:**...Moderately thick (50-100mm) siltstone CONCRETIONS. Moderately strong.			100	78	89		17.1m: BP 8° undulating, rough, clean Broken parallel to bedding 17.25m: BP 15° stepped, rough, clean Broken parallel to bedding	
					17.7m:...100mm thick MUDSTONE bed, very weak								
		18		EUs	**17.8m:** Slightly weathered, dark grey, fine to medium-grained SANDSTONE. weak, well cemented. Defects are closely spaced, narrow.							17.7m: BP 5° undulating, rough, very soft,dark brown, highly plastic clay veneer. Broken parallel to bedding, base at concretion.	
	48											18m to 18.1m: JT 75° undulating, rough, veneer <1mm calcite infill. Broken along calcite vein 18.1m: BP 30° Base of sandstone 18.2m: JT 10° undulating, smooth, clean	
PQ3					**18.1m:** Slightly weathered, dark grey, fine sandy SILTSTONE; very weak. Bedding is moderately thin, closely spaced. Isolated beds of silty fine SANDSTONE			100	70	97		18.75m: BP 20° stepped, rough, clean Broken parallel to bedding	
		19		EUz									
	47											19.1m: BP 15° stepped, rough, clean Broken parallel to bedding	
PQ3								100	77	87		19.55m to 19.9m: JT 78° undulating, rough, clean Core broken drilling down sub-vertical joint	
		20											

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
24/03/2023 7:30:00 AM | 4.00m | 2.1 m
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28/03/2023 7:35:00 AM | 31.50m | 8.67 m
28/03/2023 12:38:00 PM | 40.50m | 4.55 m
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Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **1 Porters Avenue, Eden Terrace**
Project Reference: **Stage 1 Ground Investigation**

BH1110

Sheet **5** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1756364.17m
Northing: 5918313.08m
Reduced level: 66.08m

Date started: 23/03/2023
Date completed: 29/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ/CR
Input by: CJ/CR
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	46			EUz	**18.1m:** Slightly weathered, dark grey, fine sandy SILTSTONE; very weak. Bedding is moderately thin, closely spaced. Isolated beds of silty fine SANDSTONE							19.95m: BP 15° stepped, rough, clean Broken parallel to bedding	
					20.3m: Slightly weathered; dark grey; MUDSTONE with siltstone laminae; weak; Bedding is laminated to very thin, gently inclined			100	77	87			
		21											
PQ3	45											21.1m: BP 5° undulating, rough, clean Broken parallel to bedding	
												21.25m: BP 5° undulating, rough, clean Broken parallel to bedding	
					21.5m to 21.55m:...50mm thick bed of slightly weathered SILSTONE; weak								
								100	73	80		21.75m: BP 20° undulating, rough, clean Broken parallel to bedding	
		22											
	44												
					22.5m:...Siltstone is very weak								
												22.7m: BP 30° planar, smooth, clean Broken parallel to bedding	
		23											
PQ3	43			EUs	**23m:** Slightly weathered; dark grey; normally graded, fine to medium-grained SANDSTONE; very weak, moderately well cemented.							23m: BP 5° undulating, rough, clean Base of SILTSTONE	
					23.1m to 23.3m:...200mm thick bed of slightly weathered, silty fine SANDSTONE			100	41	73			
		24											
	42												
PQ3				EUz	**24.2m:** Slightly weathered; dark grey; SILTSTONE; very weak. Bedding is faintly laminated to very thin.							24.2m: MP 5° planar, smooth, clean Broken parallel to bedding	
								100	25	60		24.5m: JT 35° undulating, rough, clean clean. Possibly drilling break, along sedimentary flow structure. sedimentary flow structure, dip 25 degrees, undulating. 24.7m: BP 5° undulating, rough, clean Broken parallel to bedding	
		25											

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
24/03/2023 7:30:00 AM | 4.00m | 2.1 m
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Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **1 Porters Avenue, Eden Terrace**
Project Reference: **Stage 1 Ground Investigation**

BH1110

Sheet **6** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1756364.17m
Northing: 5918313.08m
Reduced level: 66.08m

Date started: 23/03/2023
Date completed: 29/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ/CR
Input by: CJ/CR
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	41				**24.2m:** Slightly weathered; dark grey; SILTSTONE; very weak. Bedding is faintly laminated to very thin.			100	25	60			
PQ3	40	26		EUz	**25.5m to 25.7m:**...10-30mm thick cross-bedded, medium sand lenses. **25.58m:**...Siltstone ripup clast			100	40	82		25.58m to 26.2m: DB 0 Drill breaks all parallel to bedding laminations 26.7m: BP 10° undulating, rough, clean Base of SANDSTONE. Broken parallel to bedding.	
PQ3	39	27		EUs	**27.5m:** Slightly weathered; dark grey; normally graded, medium-grained SANDSTONE, with disseminated black carbonaceous flecks; very weak, poorly cemented. **27.6m to 27.7m:**...Recovered as fine to coarse angular to sub-angular, sandstone GRAVEL. Broken during drilling			100	89	93			
PQ3	38	28		EUz	**27.9m:** Slightly weathered, dark grey faintly planar to ripple laminated SILTSTONE with MUDSTONE laminae; very weak.							27.8m: JT 30° undulating, rough, clean	
PQ3	37	29		EUi	**28.5m:** CORE LOSS **28.6m:** Slightly weathered, dark grey, fine to coarse grained SANDSTONE, weak, moderately cemented, normally graded. Interbedded with slightly weathered grey SILTSTONE, very weak, moderately cemented. 200mm thick siltstone CRACKLE BRECCIA.			93	74	75		29.1m to 29.3m: 200mm thick zone of soft sediment deformation in siltstone. 29.3m: JT 30° clean, DB? 29.4m to 29.7m: JI 80° closed, calcite infill. Top bounded by sedimentary flow structure 29.6m: JI 80° 1mm infill calcite(?). Bed-bounded.	
					29.4m: ...Sedimentary flow structure, dipping 10°. Consists of coarse sand to fine gravel								
		30			**29.8m:** ...Sandstone ripup clast **29.9m to 30.1m:**...200mm thick fine to medium, planar								

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
24/03/2023 7:30:00 AM | 4.00m | 2.1 m
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Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

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Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **1 Porters Avenue, Eden Terrace**
Project Reference: **Stage 1 Ground Investigation**

BH1110

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1756364.17m
Northing: 5918313.08m
Reduced level: 66.08m

Date started: 23/03/2023
Date completed: 29/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ/CR
Input by: CJ/CR
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	36				laminated SANDSTONE, weak, well cemented **29.8m:** ...Sandstone ripup clast			100	90	96		29.9m: BP 5° planar, smooth, clean Broken parallel to bedding 30.1m: BP 5° planar, smooth, clean Broken parallel to bedding 30.1m to 30.15m: CZ 5° DI, recovered as medium angular gravel 30.1m: BP 5° planar, smooth, clean Broken parallel to bedding 30.1m to 30.15m: CZ 5° DI, recovered as medium angular gravel 30.33m: JT 30° undulating, smooth, clean	
		31											
	35											31.25m to 31.3m: CZ DI	
PQ3				EUi	**31.5m:** Slightly weathered, dark grey, moderately thick interbedded SILTSTONE, very weak, moderately to well cemented. Interbedded with slightly weathered, dark grey SANDSTONE, very weak, moderately cemented.							31.8m: JT 20° undulating, smooth, clay infill	
	34	32						100	90	97			
					32.42m: ...Sedimentary flow structure, dip 25°, undulating							32.42m: Sedimentary flow structure, dip 25°, undulating	
												32.8m: JT 30° undulating, smooth, clean, at base of sandstone BP	
	33	33										33.05m: DB 5° undulating, rough, clean	
PQ3												33.55m: JT 10° stepped, smooth, clean	
								100	77	91			
		34			**33.9m:** ...Black carbonaceous material visible on upper face of joint							33.9m: DB 25° stepped, smooth, clean	
	32												
PQ3												34.55m: JT 25° undulating, smooth	
								100	86	91			
		35			**34.9m:** ...Black carbonaceous material								

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
24/03/2023 7:30:00 AM | 4.00m | 2.1 m
27/03/2023 7:46:00 AM | 15.00m | 8 m
27/03/2023 4:02:00 PM | 31.50m | 3.5 m
28/03/2023 7:35:00 AM | 31.50m | 8.67 m
28/03/2023 12:38:00 PM | 40.50m | 4.55 m
29/03/2023 7:45:00 AM | 40.50m | 8.5 m

Database File: AUR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - AR_V2.GPJ **Library file:** GINT STDAGS 4_0 V27_UPDATED_LIBRARY V2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 AUR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **1 Porters Avenue, Eden Terrace**
Project Reference: **Stage 1 Ground Investigation**

BH1110

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1756364.17m
Northing: 5918313.08m
Reduced level: 66.08m

Date started: 23/03/2023
Date completed: 29/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ/CR
Input by: CJ/CR
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	31	36		EUi	**35m:** Slightly weathered, dark grey, thickly bedded interbedded SILTSTONE, weak, moderate to well cemented. Interbedded with slightly weathered dark grey SANDSTONE, very weak, normally graded, poorly cemented, fine to coarse grainsize.			100	86	91		35m: JT 25° stepped, smooth, clean 35.8m to 36m: DB at siltstone/sandstone boundary	
PQ3	30				**36.4m:**.....Dark grey sandstone clasts							36.1m: DB 15° stepped, smooth, clean, at base of sandstone bed 36.27m: DB	
PQ3	29	37		EUs EUz	**36.6m:** CORE LOSS **36.65m:** Slightly weathered, dark grey, fine SANDSTONE; weak, moderately cemented. Defects are moderately widely spaced, tight. **36.75m:** Slightly weathered, dark grey faintly planar to ripple laminated SILTSTONE with MUDSTONE laminae; very weak. **36.85m:** ...Black carbonaceous material			85	67	81		36.6m to 36.65m: CZ 15° stepped, smooth, angular fine to medium gravel 36.7m: BP 25° 36.9m: JI 15° clay infill 37.12m: DB	
PQ3	28	38		EUz EUs	**37.33m:** CORE LOSS **37.5m:** Slightly weathered, dark grey faintly planar to ripple laminated SILTSTONE with MUDSTONE laminae; very weak. **37.67m:** ...Slightly weathered, dark grey sandstone bed, moderately cemented, weak, coarse grainsize. Bedding dipping at 20° **37.9m:** Slightly weathered, dark grey, fine SANDSTONE; weak, moderately cemented.							37.67m: JT 20° fracture along BP 37.72m: JI 15° clay infill 37.72m to 37.95m: JI 75° 37.72m: JI 15° clay infill 37.72m to 37.95m: JI 75°	
PQ3	27	39		EUz	**38.2m:** Slightly weathered, dark grey faintly planar to ripple laminated SILTSTONE with MUDSTONE laminae; very weak.			100	78	88		38.42m to 38.45m: CZ fine to medium gravel, subangular, top dip 10°, bottom dip 15°	
PQ3		40			**39.2m:**.....Clay ripup clasts. Black carbonaceous material flecks **39.53m:**.....Slightly weathered dark grey sandstone bed, 10mm thick, coarse grainsize, located at base of FZ **39.65m:**.....Lenses of black carbonaceous material **39.85m:**.....Clay ripup clasts			100	72	93		39.27m: DB 39.4m: JT 15° undulating, smooth, clean 39.45m to 39.53m: JT top and bottom dip 10°, sandy silt infill 39.83m to 39.85m: CZ fine gravel, subangular to subrounded, clay infill	

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
24/03/2023 7:30:00 AM | 4.00m | 2.1 m
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27/03/2023 4:02:00 PM | 31.50m | 3.5 m
28/03/2023 7:35:00 AM | 31.50m | 8.67 m
28/03/2023 12:38:00 PM | 40.50m | 4.55 m
29/03/2023 7:45:00 AM | 40.50m | 8.5 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **1 Porters Avenue, Eden Terrace**
Project Reference: **Stage 1 Ground Investigation**

BH1110

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1756364.17m
Northing: 5918313.08m
Reduced level: 66.08m

Date started: 23/03/2023
Date completed: 29/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ/CR
Input by: CJ/CR
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	26			EUz	**38.2m:** Slightly weathered, dark grey faintly planar to ripple laminated SILTSTONE with MUDSTONE laminae; very weak. **40.32m:**.....Clay ripup clasts **40.38m:** ...Black carbonaceous material flecks			100	72	93		39.95m to 40.04m: JI 60° clean 40.21m: JI 20° silt infill	

End of borehole at 40.5m (Termination Depth Achieved)

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
24/03/2023 7:30:00 AM | 4.00m | 2.1 m
27/03/2023 7:46:00 AM | 15.00m | 8 m
27/03/2023 4:02:00 PM | 31.50m | 3.5 m
28/03/2023 7:35:00 AM | 31.50m | 8.67 m
28/03/2023 12:38:00 PM | 40.50m | 4.55 m
29/03/2023 7:45:00 AM | 40.50m | 8.5 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **322 New North Road, Kingsland**
Project Reference: **Stage 1 Ground Investigation**

BH1111

Sheet **1** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1756159.95m
Northing: 5918230.71m
Reduced level: 59.89m

Date started: 30/03/2023
Date completed: 4/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR/CJ
Input by: CR/CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX				FUc	**0m:** SILT, some clay, trace organics (rootlets); brown. Soft, moist, highly plastic.	ML						**0m: FILL**	
				FUc	**0.2m:** Silty CLAY; light brown. Soft, moist, highly plastic.	CH							
	59	1		FUk	**0.6m:** Concrete COBBLES and BOULDERS.			0	0	0			
PQ					**1.37m:** Recovered as medium to coarse GRAVEL and COBBLES. Matrix assumed washed away **1.4m:**...Slightly vesicular.	GW		100	10	47			
					1.5m: CORE LOSS								
PQ	58	2		FUk	**1.7m:** Recovered as medium to coarse GRAVEL and COBBLES. Matrix assumed washed away	GW		60	20	24			
PQ					**2m:** CORE LOSS			40	11	16			
	57	3		FUc	**2.6m:** Clayey SILT, trace gravel; dark brown. Very soft, moist, moderate plasticity. Gravel consists of basalt, moderately weathered, black, strong, subrounded, fine to coarse grainsize.	CL-ML							
				FUk	**2.84m:** Slightly weathered, black moderately vesicular BASALT very strong.	SW							
SPT				ERc	**3m:** Silty CLAY, trace organics; light grey and orange. Very soft, moist, highly plastic. Organics disseminated black carbonaceous material.	RS	3m: SPT 0,1// 0,1,1,2 N = 4	100	0	0		**3m: ECBF**	
					3.45m: CORE LOSS								
PQ3	56	4		ERc	**3.75m:** Silty CLAY, trace organics; light grey and orange. Very soft, moist, highly plastic. Organics disseminated black carbonaceous material. **4.22m:**...Minor sand. **4.32m:**...Orange.	RS		71	67	71			
PUSHTUBE	55	5						80	0	0			

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
30/03/2023 4:15:00 PM | 12.45m | 1.65 m
31/03/2023 7:30:00 AM | 12.45m | 2.02 m
31/03/2023 1:46:00 PM | 21.00m | 2.45 m
3/04/2023 7:47:00 AM | 21.00m | 4.8 m
3/04/2023 3:17:00 PM | 33.00m | 0.5 m
4/04/2023 7:00:00 AM | 33.00m | 4.8 m

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **322 New North Road, Kingsland**
Project Reference: **Stage 1 Ground Investigation**

BH1111

Sheet **2** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1756159.95m
Northing: 5918230.71m
Reduced level: 59.89m

Date started: 30/03/2023
Date completed: 4/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR/CJ
Input by: CR/CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPT				ERc	**5m:** Silty CLAY, trace organics; light grey mottled orange with pink streaks. Stiff, moist, highly plastic. Organics disseminated black carbonaceous material.		5m: SPT 0,1// 1,2,2,2 N = 7	100	0	0			
PQ	54	6			**5.45m:**...Light grey, trace sand.			100	100	100			
PUSHTUBE						RS	6m: =66.7/42.7kPa	58	0	0			
SPT	53	7					6.9m: SPT 0,1// 2,2,2,3 N = 9	100	0	0			
PQ					**7.2m:** Sandy CLAY with some silt, orange. Moist, moderate plasticity, very soft.			100	100	100			
PUSHTUBE	52	8				RS	7.5m: =77.372/26.68kPa	0	0	0			
SPT					**8.1m:** Highly weathered light grey silty fine SANDSTONE; extremely weak, poorly cemented. Oxidises to brownish grey.		8m: SPT 1,2// 2,3,4,4 N = 13	100	0	0			
PQ	51	9		EWs				100	47	82			
SPT						HW	9m: SPT 2,3// 3,3,4,4 N = 14	100	0	0			
PQ	50	10			**9.5m to 10.5m:**...Recovered as medium to coarse gravel and cobbles of SANDSTONE.			81	0	0		9.9m: BP 15° undulating, smooth, silt infill,	

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REMARKS:
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Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
30/03/2023 4:15:00 PM | 12.45m | 1.65 m
31/03/2023 7:30:00 AM | 12.45m | 2.02 m
31/03/2023 1:46:00 PM | 21.00m | 2.45 m
3/04/2023 7:47:00 AM | 21.00m | 4.8 m
3/04/2023 3:17:00 PM | 33.00m | 0.5 m
4/04/2023 7:00:00 AM | 33.00m | 4.8 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **322 New North Road, Kingsland**
Project Reference: **Stage 1 Ground Investigation**

BH1111

Sheet **3** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1756159.95m
Northing: 5918230.71m
Reduced level: 59.89m

Date started: 30/03/2023
Date completed: 4/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR/CJ
Input by: CR/CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ				EWs	**8.1m:** Highly weathered light grey silty fine SANDSTONE; extremely weak, poorly cemented. Oxidises to brownish grey.			81	0	0		very closely spaced	
SPT	49	11					10.5m: SPT 1,2// 3,3,4,5 N = 15	100	0	0			
PQ					**11.18m:**...Moderately cemented.	HW		81	78	81		11.27m: JT 45° planar, smooth, clean	
	48	12					12m: SPT 2,4// 4,6,6,6 N = 22						
SPT								100	0	0			
PQ	47	13			**13.1m:** Mode ately weathered grey SANDSTONE, poorly cemented, very weak. Sand fine to medium, red volcaniclastic grains.			100	98	100			
SPT							13.5m: SPT 3,9// 18,24,8 for 20mm N = 50+	0	0	0			
PQ	46	14				MW		100	96	97		14.17m to 14.2m: CZ consists of fine to medium subangular grey sandstone gravel, extremely weak 14.46m to 14.51m: CZ consists of fine to medium subangular grey sandstone gravel 14.46m to 14.64m: JT planar, rough, top dip 5°, bottom dip 15°, very closely spaced to closely spaced 14.46m to 14.51m: CZ consists of fine to medium subangular grey sandstone gravel 14.46m to 14.64m: JT planar, rough, top dip 5°, bottom dip 15°, very closely spaced to closely spaced	
	45	15											

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
30/03/2023 4:15:00 PM | 12.45m | 1.65 m
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3/04/2023 7:47:00 AM | 21.00m | 4.8 m
3/04/2023 3:17:00 PM | 33.00m | 0.5 m
4/04/2023 7:00:00 AM | 33.00m | 4.8 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **322 New North Road, Kingsland**
Project Reference: **Stage 1 Ground Investigation**

BH1111

Sheet **4** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1756159.95m
Northing: 5918230.71m
Reduced level: 59.89m

Date started: 30/03/2023
Date completed: 4/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR/CJ
Input by: CR/CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPT				EWs	**13.1m:** Moderately weathered grey SANDSTONE, poorly cemented, very weak. Sand fine to medium, red volcaniclastic grains.	MW	15m: SPT 5,11// 17,14,14,5 for 25mm N = 50+	0	0	0		14.53m: BPJT 5° planar, rough 14.86m: JT 20° undulating, smooth	
PQ	44	16						100	96	98		15.65m to 15.7m: BP 15° undulating, smooth	
SPT							16.5m: S T 5,7// 17,33 for 60mm N = 50+	0	0	0			
PQ	43	17										17m: JT 10° undulating, smooth, clean 17.1m: JT 20° stepped, smooth 17.18m to 17.24m: JI 40°	
PQ	42	18		EUs	**17.4m:** Slightly weathered dark grey fine SANDSTONE; very weak, well cemented, indistinctly bedded. Oxidises to brownish grey.			94	85	68		17.6m to 17.65m: CZ angular medium to coarse gravel, gravel is sandstone with fine to medium grainsize	
PQ	41	19			**18.6m:**...Sedimentary flow structures, red volcaniclastic grains	UW		100	82	75		18.22m: JT 5° undulating, rough, clean 18.51m to 18.55m: JT 10° undulating, smooth, very closely spaced 18.6m: JI 30° 19.1m to 19.5m: JT 10° undulating, smooth, silty clay infill, closely spaced to very closely spaced	
PQ	40	20						100	82	82		19.5m to 19.63m: JT 60° planar, rough	

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REMARKS:
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TCR, SCR, and RQD measurements to be revised.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
30/03/2023 4:15:00 PM | 12.45m | 1.65 m
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3/04/2023 7:47:00 AM | 21.00m | 4.8 m
3/04/2023 3:17:00 PM | 33.00m | 0.5 m
4/04/2023 7:00:00 AM | 33.00m | 4.8 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **322 New North Road, Kingsland**
Project Reference: **Stage 1 Ground Investigation**

BH1111

Sheet **5** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1756159.95m
Northing: 5918230.71m
Reduced level: 59.89m

Date started: 30/03/2023
Date completed: 4/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR/CJ
Input by: CR/CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ	39	21		EUs	**17.4m:** Slightly weathered dark grey fine SANDSTONE; very weak, well cemented, indistinctly bedded. Oxidises to brownish grey. **20m:**...Slightly weathered.	UW		100	82	82		20.4m: JI 5° clay infil 20.45m: JI 45° calcite 20.8m: JT 45° undulating, smooth	
PQ3	38	22			**21m:** Unweathered; dark grey; fine SANDSTONE; weak, well cemented. Indistinctly bedded, uniformly graded. Oxidises to brownish grey.			100	41	67		21.13m: JT 0° undulating, rough, clean 21.2m: JT 3° undulating, rough, clean 21.3m to 21.4m: JT 55° planar, rough, veneer, (Infill: calcite) 21.7m: DB 0° 21.85m: JI 40° (Infill: calcite) 21.9m: JT 3° undulating, rough, coating, (Infill: calcite) 22.05m: JT 5° undulating, rough, coating, (Infill: zeolite) 22.08m: JT 15° undulating, rough, coating, (Infill: calcite) 22.15m to 22.25m: FZ Top dip 20, bottom dip 10. Recovered as fine to coarse, angular, GRAVEL. GRAVEL is unweathered SANDSTONE 22.35m: JT 40° undulating, rough, veneer, (Infill: calcite) 22.5m to 22.6m: JI 60° (Infill: calcite)	
PQ3	37	23				UW		100	64	92		22.9m: JT 35° undulating, rough, veneer, (Infill: calcite) 23.1m: DB 10°	
PQ3	36	24			**24m:**...200mm thick bed of unweathered, dark grey SILTSTONE; weak. (Recovered as fine to coarse angular gravel.)			100	79	87		23.7m: JT 20° planar, rough, veneer, (Infill: calcite) 23.9m: JI 10° (Infill: calcite) 24.2m: JT 15° undulating, rough, veneer, (Infill: calcite) 24.2m to 24.3m: JI 40° (Infill: calcite) 24.2m: JT 15° undulating, rough, veneer, (Infill: calcite) 24.2m to 24.3m: JI 40° (Infill: calcite)	
	35	25			**24.8m:** 200mm thick CONCRETION. Moderately strong.								

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
30/03/2023 4:15:00 PM | 12.45m | 1.65 m
31/03/2023 7:30:00 AM | 12.45m | 2.02 m
31/03/2023 1:46:00 PM | 21.00m | 2.45 m
3/04/2023 7:47:00 AM | 21.00m | 4.8 m
3/04/2023 3:17:00 PM | 33.00m | 0.5 m
4/04/2023 7:00:00 AM | 33.00m | 4.8 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **322 New North Road, Kingsland**
Project Reference: **Stage 1 Ground Investigation**

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Sheet **6** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1756159.95m
Northing: 5918230.71m
Reduced level: 59.89m

Date started: 30/03/2023
Date completed: 4/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR/CJ
Input by: CR/CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3					**21m:** Unweathered; dark grey; fine SANDSTONE; weak, well cemented. Indistinctly bedded, uniformly graded. Oxidises to brownish grey.			100	79	87		25.2m: JI 45° (Infill: calcite) 25.3m to 25.4m: JI 75° (Infill: calcite) 25.4m to 25.45m: JT 25° undulating, rough, veneer, (Infill: calcite)	
PQ3	34	26						100	100	87		25.8m to 26.4m: JT 85° undulating, smooth, (Infill: calcite)	
PQ3	33	27										26.9m: JT 45° planar, rough, clean	
PQ3						UW						27.2m: JT 5° undulating, rough, clean 27.5m: JT 0° planar, rough, clean	
PQ3	32	28						100	61	100		27.7m: JT 10° undulating, rough, clean 27.85m: JT 7° planar, rough, clean	
PQ3	31	29			**28.7m:** En-echelon calcite veins, 1mm thick, dip 40°			100	100	100		29.1m: DB 0° 29.5m: DB 0°	
	30	30											

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
30/03/2023 4:15:00 PM | 12.45m | 1.65 m
31/03/2023 7:30:00 AM | 12.45m | 2.02 m
31/03/2023 1:46:00 PM | 21.00m | 2.45 m
3/04/2023 7:47:00 AM | 21.00m | 4.8 m
3/04/2023 3:17:00 PM | 33.00m | 0.5 m
4/04/2023 7:00:00 AM | 33.00m | 4.8 m

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Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **322 New North Road, Kingsland**
Project Reference: **Stage 1 Ground Investigation**

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Sheet **7** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1756159.95m
Northing: 5918230.71m
Reduced level: 59.89m

Date started: 30/03/2023
Date completed: 4/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR/CJ
Input by: CR/CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	29	31			**21m:** Unweathered; dark grey; fine SANDSTONE; weak, well cemented. Indistinctly bedded, uniformly graded. Oxidises to brownish grey.	UW		100	100	100		30.45m: JT 5° undulating, rough, veneer, (Infill: calcite)	
PQ3	28	32						100	91	100		31.75m: JT 2° undulating, rough, coating, (Infill: calcite) Drill break along calcite healed joint	
PQ3	27	33											
PQ3	26	34		EUs	**33m:** Unweathered; dark grey; medium SANDSTONE; weak, well cemented. Very thin to thinly sub-horizontally bedded, uniformly graded.	UW		100	100	100			
PQ3	25	35						100	100	100		34.65m: JT 0° planar, rough, coating, (Infill: calcite)	

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
30/03/2023 4:15:00 PM | 12.45m | 1.65 m
31/03/2023 7:30:00 AM | 12.45m | 2.02 m
31/03/2023 1:46:00 PM | 21.00m | 2.45 m
3/04/2023 7:47:00 AM | 21.00m | 4.8 m
3/04/2023 3:17:00 PM | 33.00m | 0.5 m
4/04/2023 7:00:00 AM | 33.00m | 4.8 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **322 New North Road, Kingsland**
Project Reference: **Stage 1 Ground Investigation**

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Sheet **8** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1756159.95m
Northing: 5918230.71m
Reduced level: 59.89m

Date started: 30/03/2023
Date completed: 4/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR/CJ
Input by: CR/CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	24	36		EUs	**33m:** Unweathered; dark grey; medium SANDSTONE; weak, well cemented. Very thin to thinly sub-horizontally bedded, uniformly graded.			100	100	100		35m to 35.1m: FZ Top dip 5, bottom dip 15. Recovered as fine to coarse, angular, GRAVEL. GRAVEL is unweathered SANDSTONE. DI(?) 35.25m: JI 50° (Infill: calcite) 35.3m: JI 45° (Infill: calcite) 35.3m to 35.35m: JI 65° (Infill: calcite) 35.3m: JI 45° (Infill: calcite) 35.3m to 35.35m: JI 65° (Infill: calcite)	
PQ3	23	37						100	100	100		36.67m: JT 55° planar, rough, coating, (Infill: calcite)	
PQ3	22	38				UW		100	100	100			
PQ3	21	39			**38.6m:**...Fine SANDSTONE, well cemented, weak. **39m to 39.8m:**...Sandstone is laminated to very thinly bedded.								
PQ3	20	40			**39.8m:**...Sandstone is thinly bedded.			100	100	100			

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
30/03/2023 4:15:00 PM | 12.45m | 1.65 m
31/03/2023 7:30:00 AM | 12.45m | 2.02 m
31/03/2023 1:46:00 PM | 21.00m | 2.45 m
3/04/2023 7:47:00 AM | 21.00m | 4.8 m
3/04/2023 3:17:00 PM | 33.00m | 0.5 m
4/04/2023 7:00:00 AM | 33.00m | 4.8 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **322 New North Road, Kingsland**
Project Reference: **Stage 1 Ground Investigation**

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Sheet **9** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1756159.95m
Northing: 5918230.71m
Reduced level: 59.89m

Date started: 30/03/2023
Date completed: 4/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR/CJ
Input by: CR/CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3				EUs	**33m:** Unweathered; dark grey; medium SANDSTONE; weak, well cemented. Very thin to thinly sub-horizontally bedded, uniformly graded.	UW		100	100	100		42.8m to 42.9m: JI 65° (Infill: calcite)	
PQ3	19	41						100	100	100			
PQ3	18	42						100	100	100			
PQ3	17	43						100	100	100			
PQ3	16	44						100	100	100			
PQ3	15	45											

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REMARKS: End of borehole at 45m (Termination Depth Achieved)
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
30/03/2023 4:15:00 PM | 12.45m | 1.65 m
31/03/2023 7:30:00 AM | 12.45m | 2.02 m
31/03/2023 1:46:00 PM | 21.00m | 2.45 m
3/04/2023 7:47:00 AM | 21.00m | 4.8 m
3/04/2023 3:17:00 PM | 33.00m | 0.5 m
4/04/2023 7:00:00 AM | 33.00m | 4.8 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Raleigh Street**
Project Reference: **Stage 1 Ground Investigation**

BH1202A

Sheet **1** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: Mcmillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1755813.94m
Northing: 5917470.18m
Reduced level: 47.22m

Date started: 6/03/2023
Date completed: 13/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: WM
Input by: WM
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	47	1		F	**0m:** HYDROVAC - No recovery.							**0m: FILL**	
PQ3	46	2		VWrb	**1.1m:** Moderately weathered dark grey RUBBLY BASALT. Moderately strong. Matrix of brownish orange silty CLAY, moist, highly plastic. Recovered as fine to coarse angular to sub-angular basalt gravel.	MW		100	0	0		**1.1m: AVF**	
PQ3	45	3			**2.5m:** CORE LOSS			67	0	0			
PQ3	44	4		VUb	**3m:** Slightly weathered, dark grey, highly vesicular faintly flow-banded phorphyritic olivine rich BASALT with trace phenocrysts of pyroxene and feldspar infill vesicles. Strong. Flow bands dip 5-10° **3.6m:**...Highly vesicular, with vesicles up to 20mm diameter.	SW		100	90	90		3.8m: JT 5° stepped, smooth, veneer brownish orange soft clay, highly plastic. 3.95m: JT 5° stepped, smooth, veneer brownish orange soft clay, highly plastic. 3.97m to 4.4m: DB Core broken along very closely to closely spaced flow bands, dip 5°.	
PQ3	43	5						100	100	100			

REMARKS:
SCR = 1 Core Diameter, 83mm
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
7/03/2023 10:35:00 AM | 13.50m | 13.5 m
8/03/2023 4:30:00 PM | 21.00m | 14.75 m
9/03/2023 9:00:00 AM | 21.00m | 14.2 m
9/03/2023 4:30:00 PM | 30.50m | 14.5 m
10/03/2023 8:00:00 AM | 30.50m | 3.3 m
10/03/2023 4:50:00 PM | 40.50m | 13.75 m
13/03/2023 7:45:00 AM | 40.50m | 13.2 m
13/03/2023 3:30:00 PM | 45.00m | 11.5 m

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Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Raleigh Street**
Project Reference: **Stage 1 Ground Investigation**

BH1202A

Sheet **2** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: Mcmillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1755813.94m
Northing: 5917470.18m
Reduced level: 47.22m

Date started: 6/03/2023
Date completed: 13/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: WM
Input by: WM
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	42	6		VUb	**5m:** Slightly weathered, dark grey, highly vesicular faintly flow-banded phorphyritic olivine rich BASALT with trace phenocrysts of pyroxene and feldspar infill vesicles. Strong. Flow bands dip 5-10°.	SW		100	100	100		5.1m: DB 10° stepped, rough, clean Core broken parallel to flow banding. 5.8m: DB 10° stepped, rough, clean Core broken parallel to flow banding. 5.9m: DB 10° stepped, rough, clean Core broken parallel to flow banding. 6.1m: DB 5° undulating, rough, clean Core broken parallel to flow banding.	
PQ3	41	7			**6.9m:**...Moderately vesicular with vesicles up to 20mm diameter.			100	100	100		7.1m: DB 5° stepped, rough, clean Core broken parallel to flow banding. 7.3m: DB 5° stepped, rough, clean Core broken parallel to flow banding.	
PQ3	40	8						100	100	100		7.7m: DB 5° stepped, rough, clean Core broken parallel to flow banding. 7.9m: DB 5° stepped, rough, clean Core broken parallel to flow banding. 8.2m: DB 5° stepped, rough, clean Core broken parallel to flow banding.	
PQ3	39	9											
PQ3	38	10			**9.2m:**...Slightly vesicular with vesicles up to 15mm diameter. No flow banding present.			100	100	100		9.3m: JT 5° undulating, rough, clean Core broken parallel to flow fabric	

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REMARKS:
SCR = 1 Core Diameter, 83mm
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
7/03/2023 10:35:00 AM | 13.50m | 13.5 m
8/03/2023 4:30:00 PM | 21.00m | 14.75 m
9/03/2023 9:00:00 AM | 21.00m | 14.2 m
9/03/2023 4:30:00 PM | 30.50m | 14.5 m
10/03/2023 8:00:00 AM | 30.50m | 3.3 m
10/03/2023 4:50:00 PM | 40.50m | 13.75 m
13/03/2023 7:45:00 AM | 40.50m | 13.2 m
13/03/2023 3:30:00 PM | 45.00m | 11.5 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARY.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Raleigh Street**
Project Reference: **Stage 1 Ground Investigation**

BH1202A

Sheet **3** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: Mcmillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1755813.94m
Northing: 5917470.18m
Reduced level: 47.22m

Date started: 6/03/2023
Date completed: 13/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: WM
Input by: WM
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	37			VUb	**10m:** Slightly weathered, dark grey, highly vesicular faintly flow-banded phorphyritic olivine rich BASALT with trace phenocrysts of pyroxene and feldspar infill vesicles. Strong. Flow bands dip 5-10°.			100	100	100		10.55m: JT 5° undulating, rough, veneer, (Infill: clay <1) Core broken along flow fabric during drilling	
PQ3	36	11		VUb	**10.9m:**...50mm thick vesicle sheet			100	100	100		11.3m: JT 60° undulating, rough, staining, (Infill: iron oxide)	
PQ3	35	12		VUb		W		100	100	100		11.65m: JT 20° undulating, rough, clean	
PQ3	34	13		VUb				100	100	100			
PQ3	33	14		VWv	**14.25m:** Moderately weathered, brownish red, highly vesicular RUBBLY BASALT. Clay matrix assumed largely washed out.	MW		100	100	100		14.25m: JT 30° stepped, rough, clean, (Infill: clay <1) 14.25m to 14.5m: Interpretted as a Void. 14.25m: JT 30° stepped, rough, clean, (Infill: clay <1) 14.25m to 14.5m: Interpretted as a Void. 14.25m: JT 30° stepped, rough, clean, (Infill: clay <1) 14.25m to 14.5m: Interpretted as a Void. 14.25m: JT 30° stepped, rough, clean, (Infill: clay <1) 14.25m to 14.5m: Interpretted as a Void. 14.5m: JT 5° stepped, rough, clean, (Infill: clay <1)	
		15		VWb	**14.5m:** Moderately weathered, greyish red, highly vesicular, low-density basalt. Moderately strong. Vesicles up to 30mm diameter. Fabric has no preferred orientation.	SW							

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REMARKS:
SCR = 1 Core Diameter, 83mm
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
7/03/2023 10:35:00 AM | 13.50m | 13.5 m
8/03/2023 4:30:00 PM | 21.00m | 14.75 m
9/03/2023 9:00:00 AM | 21.00m | 14.2 m
9/03/2023 4:30:00 PM | 30.50m | 14.5 m
10/03/2023 8:00:00 AM | 30.50m | 3.3 m
10/03/2023 4:50:00 PM | 40.50m | 13.75 m
13/03/2023 7:45:00 AM | 40.50m | 13.2 m
13/03/2023 3:30:00 PM | 45.00m | 11.5 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARY.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Raleigh Street**
Project Reference: **Stage 1 Ground Investigation**

BH1202A

Sheet **4** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: Mcmillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1755813.94m
Northing: 5917470.18m
Reduced level: 47.22m

Date started: 6/03/2023
Date completed: 13/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: WM
Input by: WM
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	32	16		VWb	**15m:** Moderately weathered, greyish red, highly vesicular, low-density basalt. Moderately strong. Vesicles up to 30mm diameter. Fabric has no preferred orientation.	SW		100	100	100		14.73m: DB 0° stepped, rough, clean 14.83m: JT 60° stepped, rough, veneer, (Infill: clay <1) 15m: JT 90° stepped, rough, veneer, (Infill: clay <1) 15.15m: DB 25° stepped, rough, clean Core broken along vesicles. 15.25m: JT 45° stepped, smooth, clean 15.3m: DB 20° stepped, smooth, clean	
					15.3m: Slightly weathered, dark grey, moderately vesicular, porphyritic olivine rich BASALT. Groundmass fabric is faintly sub-vertical, aligned olivine, pyroxene and feldspar crystals.							15.68m: JT 60° undulating, rough, clean	
					15.9m to 16.5m:...Vesicals and groundmass fabric dip 45°.							16m: JT 20° undulating, rough, veneer Light grey clay.	
PQ3	31											16.4m: JT 55° undulating, smooth, staining FeO, Zeolite?). Open to vesicles at 16.5m	
		17			**16.5m to 16.8m:**...Slightly vesicular. Vesicles up to 10mm diameter, with secondary mineral deposition (FeO,zeolite?). Vesicles have pinkish grey corona, with 20mm penetration. Groundmass fabric (aligned hornblende crystals) dip 45°. **16.55m:**...Vesicular cylinders (degassing features) infilled with soft light brown, highly plastic clay.								
					17m:...Faint flow banding, dip 45°.								
PQ3	30			VUb		SW		100	100	100			
					17.7m:...10mm, thick vesicular cylinder, 5°.								
		18			**17.9m:**...Fabric dip 10 25°. Fabric is flow aligned groundmass o hornblende and plagioclase.								
PQ3	29											18.1m: JT 80° undulating, smooth, staining FeO 18.2m to 19.8m: Closely spaced drill breaks, sub-parallel to flow banding, dip 10-25°	
								100	100	100		18.7m: JT 80° undulating, smooth, coating, (Infill: clay 2)	
		19										18.9m: JT 45° undulating, smooth, veneer, (Infill: clay <1)	
PQ3	28											19.1m: JT 80° undulating, smooth, veneer, (Infill: clay <1)	
								100	100	100			
		20											

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REMARKS:
SCR = 1 Core Diameter, 83mm
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
7/03/2023 10:35:00 AM | 13.50m | 13.5 m
8/03/2023 4:30:00 PM | 21.00m | 14.75 m
9/03/2023 9:00:00 AM | 21.00m | 14.2 m
9/03/2023 4:30:00 PM | 30.50m | 14.5 m
10/03/2023 8:00:00 AM | 30.50m | 3.3 m
10/03/2023 4:50:00 PM | 40.50m | 13.75 m
13/03/2023 7:45:00 AM | 40.50m | 13.2 m
13/03/2023 3:30:00 PM | 45.00m | 11.5 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARY.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Raleigh Street**
Project Reference: **Stage 1 Ground Investigation**

BH1202A

Sheet **5** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: Mcmillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1755813.94m
Northing: 5917470.18m
Reduced level: 47.22m

Date started: 6/03/2023
Date completed: 13/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: WM
Input by: WM
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	27	21		VUb	**20m:** Slightly weathered, dark grey, slightly vesicular, BASALT with poryhritic olivine rich groundmass. **20.6m to 20.9m:**...Faint groundmass flow fabric dip 45 ° **22.7m:**...Vesicle cylinder, 30mm wide, dip 40° **22.9m:**...Sub- ertical vesicle, 30mm x 10mm. Iron stained. Possible nterl nked with adjacent vesicles. Faint groundmass flow fabric dips 45°.	SW		100	100	100		20.13m: DB 0° undulating, smooth, clean 20.32m: DB 40° undulating, rough, clean 20.7m: JT 75° undulating, smooth, clean 21m: DB 0° undulating, rough, clean	
PQ3	26	22						100	100	100		21.6m: JT 80° undulating, rough, clean 21.9m: JT 75° undulating, rough, veneer, (Infill: clay <1) 22m: JT 45° undulating, rough, veneer, (Infill: clay <1)	
PQ3	25	23						100	100	100		22.7m: DB 10° undulating, rough, clean Broken along intersect angle with vesicle cylinder (80°).	
PQ3	24	24										23.5m: JT 55° undulating, smooth, staining FeO 23.56m: DB 45° undulating, rough, Core broken at intersection of cyclindrical vesicle and joint at 23.5m 23.8m: DB 60° stepped, smooth, clean, (Infill: clay <1) Core broken at intersection of JT at 24.1m and flow band.	
PQ3	23	25						100	100	100		24m to 24.5m: Core broken due to fracturing along incipient curvilinear tensile cooling joints during drilling. 24.1m: JT 85° planar, rough, staining, (Infill: clay <1) FeO 24.32m: JT 85° planar, rough, staining, (Infill: iron oxide) Core broken along intersection of joint and numerous steeply dipping incipient curvilinear cooling joints.	

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REMARKS:
SCR = 1 Core Diameter, 83mm
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
7/03/2023 10:35:00 AM | 13.50m | 13.5 m
8/03/2023 4:30:00 PM | 21.00m | 14.75 m
9/03/2023 9:00:00 AM | 21.00m | 14.2 m
9/03/2023 4:30:00 PM | 30.50m | 14.5 m
10/03/2023 8:00:00 AM | 30.50m | 3.3 m
10/03/2023 4:50:00 PM | 40.50m | 13.75 m
13/03/2023 7:45:00 AM | 40.50m | 13.2 m
13/03/2023 3:30:00 PM | 45.00m | 11.5 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARY.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Raleigh Street**
Project Reference: **Stage 1 Ground Investigation**

BH1202A

Sheet **6** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: Mcmillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1755813.94m
Northing: 5917470.18m
Reduced level: 47.22m

Date started: 6/03/2023
Date completed: 13/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: WM
Input by: WM
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	22	26		VUb	**25m:** Slightly weathered, dark grey, slightly vesicular, BASALT with poryhritic olivine rich groundmass.	SW		100	100	100		25.15m: JT 60° undulating, rough, veneer, (Infill: clay <1) 25.55m: JT 80° undulating, rough, veneer, (Infill: clay <1) 25.6m: JT 10° undulating, rough, veneer, (Infill: clay <1)	
				VUv	**26m:** Fine to coarse, gravel sized; angular; BASALT.	SW						26m to 26.15m: Interpretted as a VOID, identified by drill rods dropping	
PQ3	21	27		VWrb	**26.15m:** Moderately weathered, dark grey, highly vesicular, RUBBLY BASALT. Strong. With matrix of brownish orange, very soft highly plastic CLAY. Recovered as fine to coarse angular clast-supported gravel with a matrix of very soft, highly plastic clay.	MW		93	29	29			
	20				**27.2m:**...Clay matrix is light grey, highly plastic			100					
PQ3		28		AYo	**27.75m:** Organic SILT, some clay, dark grey and black. Firm, highly plastic. Organics are partially decomposed wood fragments up to 30mm long.	OH						**27.75m: ALLUVIUM**	
	19				**28.05m:** CORE LOSS			40					
SPT				AYg	**28.5m:** Slightly weathered, dark grey, highly vesicular BASALT BOULDER. Strong.	SW	28.5m: SPT 22,28// N = 50+	0					
PQ3	18	29		AQz	**28.75m:** SILT some clay, minor fine sand; dark brown, moist, low plasticity. Interbedded with very thin, closely spaced fine to medium sand lenses with some organics(partially decomposed wood), trace gravel (Completely weathered siltstone). Sand is quartz with trace pumice.	ML		84				**28.75m: OLDER ALLUVIUM**	
		30											

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REMARKS:
SCR = 1 Core Diameter, 83mm
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
7/03/2023 10:35:00 AM | 13.50m | 13.5 m
8/03/2023 4:30:00 PM | 21.00m | 14.75 m
9/03/2023 9:00:00 AM | 21.00m | 14.2 m
9/03/2023 4:30:00 PM | 30.50m | 14.5 m
10/03/2023 8:00:00 AM | 30.50m | 3.3 m
10/03/2023 4:50:00 PM | 40.50m | 13.75 m
13/03/2023 7:45:00 AM | 40.50m | 13.2 m
13/03/2023 3:30:00 PM | 45.00m | 11.5 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARY.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Raleigh Street**
Project Reference: **Stage 1 Ground Investigation**

BH1202A

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: Mcmillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1755813.94m
Northing: 5917470.18m
Reduced level: 47.22m

Date started: 6/03/2023
Date completed: 13/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: WM
Input by: WM
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPT	17			AQz	**28.75m:** SILT some clay, minor fine sand; dark brown, moist, low plasticity. Interbedded with very thin, closely spaced fine to medium sand lenses with some organics(partially decomposed wood), trace gravel (Completely weathered siltstone). Sand is quartz with trace pumice.	ML	30m: SPT 2,2// 3,3,4,5 N = 15	100				
PQ3					**30.45m:** CORE LOSS								
		31						48					
	16			AQc	**31m:** CLAY, some silt, minor disseminated organics interbedded with very thin, closely spaced beds of organic silt; light grey, speckled black. Stiff, moist, highly plastic.	CH						
SPT							31.5m: S T 2// 3 4,4 N = 15	100					
		32											
PQ3	15			AQz	**31.95m:** SILT, some sand, minor clay; light grey. Firm, moist, highly plastic.	MH							
					32.25m: CORE LOSS			29					
		33											
SPT	14			AQz	**33m:** SILT some clay, minor fine to medium sand and organics; light grey, speckled white and black. Firm, moist, highly plastic. White speckles are highly weathered pumice.	MH	33m: SPT 0,0// 2,3,2,3 N = 10	100					
PQ3								76					
	13	34			**34.25m:** CORE LOSS								
PUSHTUBE				ERz	**34.5m:** SILT, some fine sand minor clay, trace disseminated organics; light grey; moderately plastic. Interbedded with very thin, very closely spaced dark grey clayey SILT beds. Sand is sub-round quartz, siltstone and trace pumice.	ML		100				**34.5m: ECBF**	
		35											

REMARKS:
SCR = 1 Core Diameter, 83mm
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
7/03/2023 10:35:00 AM | 13.50m | 13.5 m
8/03/2023 4:30:00 PM | 21.00m | 14.75 m
9/03/2023 9:00:00 AM | 21.00m | 14.2 m
9/03/2023 4:30:00 PM | 30.50m | 14.5 m
10/03/2023 8:00:00 AM | 30.50m | 3.3 m
10/03/2023 4:50:00 PM | 40.50m | 13.75 m
13/03/2023 7:45:00 AM | 40.50m | 13.2 m
13/03/2023 3:30:00 PM | 45.00m | 11.5 m

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Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Raleigh Street**
Project Reference: **Stage 1 Ground Investigation**

BH1202A

Sheet **8** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: Mcmillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1755813.94m
Northing: 5917470.18m
Reduced level: 47.22m

Date started: 6/03/2023
Date completed: 13/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: WM
Input by: WM
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPT	12			ERz	**34.5m:** SILT, some fine sand minor clay, trace disseminated organics; light grey; moderately plastic. Interbedded with very thin, very closely spaced dark grey clayey SILT beds. Sand is sub-round quartz, siltstone and trace pumice.	ML	35m: SPT 0,2// 2,3,2,3 N = 10	67					
PQ3		36						100					
SPT	11						36m: SPT 2,2// 4,3,4,5 N = 16	100					
PQ3		37		ERs	**36.4m:** Silty fine SAND, minor clay; light grey. Medium dense, firm, low plasticity. **36.65m to 36.85m:**...36.65 to 36.85m: Very thin (10mm), very closely spaced (10-30mm) beds of greenish grey silty CLAY, stiff, moist, highly plastic [CW MUDSTONE]	SP-SM		100	100	100			
	10			EWs	**37.2m:** Moderately weathered, dark grey fine to medium SANDSTONE. Very weak, poorly cemented. Recovered as fine to coarse angular to sub-angular gravel.		37.5m: SPTC 10,30// 50 for 45mm N = 50+	N/A	N/A	N/A			
SPTC						MW							
PQ3	9	38			**38.1m:**...Mod rately weathered, dark grey MUSTONE, extremely weak. (Hard, dark grey CLAY, some silt). **38.35m:**...20mm thick bed of light brown fine grained siderite?			92	92	92		37.95m: BP 5° 38.35m: BP 5° undulating, rough, veneer, (Infill: clay <1) highly plastic	
				EWz	**38.5m:** Moderately weathered, light grey SILTSTONE, very weak **38.55m:** ...20mm thick mudstone bed. **38.85m:**...30mm thick mudstone bed.	MW						38.57m: BP 5° Base of mudstone 38.88m: BP 5° Base of mudstone	
SPTC	8	39					39m: SPTC 8,30// 50 for 25mm N = 50+	N/A	N/A	N/A			
PQ3				EWi	**39.2m:** Moderately weathered, light grey, interbedded SILTSTONE SANDSTONE; very veak, moderately cemented; bedding upto 150 mm **39.65m to 39.7m:**...50mm thick mudstone bed.	MW		72	72	72		39.83m: BP 10° Base of mudstone	
		40											

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REMARKS:
SCR = 1 Core Diameter, 83mm
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
7/03/2023 10:35:00 AM | 13.50m | 13.5 m
8/03/2023 4:30:00 PM | 21.00m | 14.75 m
9/03/2023 9:00:00 AM | 21.00m | 14.2 m
9/03/2023 4:30:00 PM | 30.50m | 14.5 m
10/03/2023 8:00:00 AM | 30.50m | 3.3 m
10/03/2023 4:50:00 PM | 40.50m | 13.75 m
13/03/2023 7:45:00 AM | 40.50m | 13.2 m
13/03/2023 3:30:00 PM | 45.00m | 11.5 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARY.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Raleigh Street**
Project Reference: **Stage 1 Ground Investigation**

BH1202A

Sheet **9** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: Mcmillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1755813.94m
Northing: 5917470.18m
Reduced level: 47.22m

Date started: 6/03/2023
Date completed: 13/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: WM
Input by: WM
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	7			EWi	**39.2m:** Moderately weathered, light grey, interbedded SILTSTONE SANDSTONE; very veak, moderately cemented; bedding upto 150 mm	MW		72	72	72			
SPTC		41		EUi	**40.5m:** Slightly weathered, grey, fine to medium SANDSTONE; weak, moderately cemented, moderately thick interbedded with siltstone. Siltstone is MW to SW; Siltstone, extremely weak to very weak, poorly cemented	SW	40.5m: SPTC 5,9// 17,18,25 N = 50+	N/A	N/A	N/A		
PQ3	6							71	71	71			
		42			**41.67m:** CORE LOSS								
PQ3	5			EUs	**42m:** Slightly weathered, dark grey silty fine SANSTONE. Very weak. Black carbonaceous lamination dip 5°.	SW							
					42.1m: Slightly weathered, dark grey silty fine SANSTONE. Very weak. Black carbonaceous lamination dip 5°.	SW						42.1m: BP 0° Base of mudstone	
	4	43		EUz	**42.25m:** Slightly weathered, dark grey SILTSTONE with localised closely spaced thin (20-50mm) MUDSTONE beds Siltstone has broken/fissile fabric recovered as angular to sub-angular gravel with polished surfaces. [Potential syneresis cracks associated with dewatering during diagenesis].	SW		100	100	100			
PQ3	3	44			**43.5m:** Slightly weathered, very thinly bedded, poorly cemented, fine SANDSTONE; extremely weak. Recovered as sandy GRAVEL. **44m:**...Silty fine SANDSTONE.	SW						43.5m: BP 5° Base of siltstone 43.5m to 44.1m: Core breaking along bedding during drilling. 43.5m: BP 5° Base of siltstone 43.5m to 44.1m: Core breaking along bedding during drilling. 43.5m: BP 5° Base of siltstone 43.5m to 44.1m: Core breaking along bedding during drilling. 43.5m: BP 5° Base of siltstone 43.5m to 44.1m: Core breaking along bedding during drilling. 43.55m to 44m: DB Core breaking along very thin bedding during drilling. 44.1m: BP 5° Base of sandstone.	
				EUz	**44.1m:** Slightly weathered, dark grey SILTSTONE. Very weak.	SW		67	67	67			
		45			**44.5m:** CORE LOSS								

REMARKS: End of borehole at 45m (Termination Depth Achieved)
SCR = 1 Core Diameter, 83mm
TCR, SCR, and RQD measurements to be revised.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
7/03/2023 10:35:00 AM | 13.50m | 13.5 m
8/03/2023 4:30:00 PM | 21.00m | 14.75 m
9/03/2023 9:00:00 AM | 21.00m | 14.2 m
9/03/2023 4:30:00 PM | 30.50m | 14.5 m
10/03/2023 8:00:00 AM | 30.50m | 3.3 m
10/03/2023 4:50:00 PM | 40.50m | 13.75 m
13/03/2023 7:45:00 AM | 40.50m | 13.2 m
13/03/2023 3:30:00 PM | 45.00m | 11.5 m

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Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Shaw St, Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH1203

Sheet **1** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1755151.95m
Northing: 5917407.68m
Reduced level: 40.74m

Date started: 9/02/2023
Date completed: 17/02/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	40	1		HTx	**0m:** TOPSOIL							**0m: TOPSOIL**	
				FUk	**0.2m:** Sandy fine to coarse GRAVEL with cobbles and trace silt; dark grey and brown. Tightly packed, moist. Gravel is slightly weathered to unweathered BASALT	GM		0	0	0		**0.2m: FILL**	
HQ3	39	2		VUb	**1.1m:** Slightly weathered; light grey, porphyritic; highly vesicular, flow-banded, BASALT; strong. Vesicles are 10-20mm diameter, dip 30 parallel to flow banding. Phenocrysts consist greenish-brown olivine and white feldspar laths.			100	0	43		**1.1m: AVF** 1.1m to 1.35m: JT 85° undulating, rough, clean 1.1m to 3.5m: Flow banding, dip 15, very closely spaced 1.1m to 1.35m: JT 85° undulating, rough, clean 1.1m to 3.5m: Flow banding, dip 15, very closely spaced 1.1m to 1.35m: JT 85° undulating, rough, clean 1.1m to 3.5m: Flow banding, dip 15, very closely spaced 1.1m to 1.35m: JT 85° undulating, rough, clean 1.1m to 3.5m: Flow banding, dip 15, very closely spaced 1.1m to 1.35m: JT 85° undulating, rough, clean 2.2m to 3.9m: DB 15° undulating, rough, clean very closely spaced drilling induced fractures along flow banding.	
	38	3			**2m:**...Slightly vesicular	SW		100	92	95			
HQ3	37	4			**3.9m:** Slightly weathered, grey, non-vesicular BASALT; strong, widely spaced, fractures. Phenocrysts consists of olivine, pyroxene, and plagioclase	SW		100	88	93			
HQ3	36	5						100	100	100			

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REMARKS:
SCR = 1 circumference - 200 mm
TCR, SCR, and RQD measurements to be revised.
100% Water circulation loss at 7.5m
No piezometer measurements or installation information provided

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
10/02/2023 7:30:00 AM | 1.10m | 0.75 m
10/02/2023 1:30:00 PM | 9.15m | 0.75 m
15/02/2023 7:35:00 AM | 12.00m | 7.35 m
15/02/2023 11:20:00 AM | 15.00m | 7.5 m
15/02/2023 1:00:00 PM | 16.50m | 7.5 m
15/02/2023 4:24:00 PM | 30.00m | 7.52 m
16/02/2023 7:46:00 AM | 30.00m | 7.53 m
16/02/2023 4:10:00 PM | 42.00m | 7.4 m
17/02/2023 7:35:00 AM | 42.00m | 7.3 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Shaw St, Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH1203

Sheet **2** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1755151.95m
Northing: 5917407.68m
Reduced level: 40.74m

Date started: 9/02/2023
Date completed: 17/02/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	35	6		VUb	**3.9m:** Slightly weathered, grey, non-vesicular BASALT; strong, widely spaced, fractures. Phenocrysts consists of olivine, pyroxene, and plagioclase **5.2m to 5.4m:**...Vesicular cylinder			100	100	100			
HQ3	34	7						100	100	100		6.05m: JT 40° undulating, rough, staining, (Infill: iron oxide) 6.3m: JT 25° undulating, smooth, staining, (Infill: iron oxide) 6.4m: JT 39° undulating, smooth, veneer, (Infill: clay <1mm) CLAY; brown; very soft; moist, highly plastic	
HQ3	33	8				SW		100	100	100		7.5m to 8.6m: DB 5° planar, rough, clean closely to moderately widely spaced drill breaks, parallel to flow fabric.	
HQ3	32	9			**8.5m:**...Rare pyroxene and feldspar phenocrysts up to 15mm **8.7m:**...Vesicle cylinder			100	100	100			
HQ3	31	10											

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REMARKS:
SCR = 1 circumference - 200 mm
TCR, SCR, and RQD measurements to be revised.
100% Water circulation loss at 7.5m
No piezometer measurements or installation information provided

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
10/02/2023 7:30:00 AM | 1.10m | 0.75 m
10/02/2023 1:30:00 PM | 9.15m | 0.75 m
15/02/2023 7:35:00 AM | 12.00m | 7.35 m
15/02/2023 11:20:00 AM | 15.00m | 7.5 m
15/02/2023 1:00:00 PM | 16.50m | 7.5 m
15/02/2023 4:24:00 PM | 30.00m | 7.52 m
16/02/2023 7:46:00 AM | 30.00m | 7.53 m
16/02/2023 4:10:00 PM | 42.00m | 7.4 m
17/02/2023 7:35:00 AM | 42.00m | 7.3 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Shaw St, Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH1203

Sheet **3** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1755151.95m
Northing: 5917407.68m
Reduced level: 40.74m

Date started: 9/02/2023
Date completed: 17/02/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3				VUb	**3.9m:** Slightly weathered, grey, non-vesicular BASALT; strong, widely spaced, fractures. Phenocrysts consists of olivine, pyroxene, and plagioclase	SW		100	100	100			
HQ3	30	11		VWrb	**10.9m:** Moderately weathered, dark grey, vesicular RUBBLY BASALT; strong. Recovered as coarse angular GRAVEL. Clast supported. Matrix is CLAY; brown; very soft; moist, highly plastic.	MW						11m: Interpretted as void, drillers note rod dropped
				VUv	**11m:** NO RECOVERY			60	24	24			
	29	12		VWrb	**11.6m:** Moderately weathered, grey, RUBBLY BASALT; moderately strong, vesicular; extremely closely spaced, clay infill, with iron staining. Recovered as coarse, angular to sub-angular GRAVEL; clast-supported, <1mm of matrix, matrix is soft, light-brown plastic CLAY.	MW						
					12m: CORE LOSS								
HQ3	28	13		VUb	**12.2m:** Slightly weathered, dark grey, highly vesicular, highly fractured BASALT; moderately strong, vesicles 10-20mm in diameter, aligned dipping 30 degrees, no infill.	SW		87	33	40		12.2m: JT 45° planar, rough, veneer, (Infill: zeolite <1mm) 12.4m: JT 10° planar, rough, veneer, (Infill: zeolite <1mm) 12.65m: JT 30° planar, rough, clean 12.8m: DB 45° stepped, rough, clean 12.85m: DB 5° planar, rough, clean 12.9m to 13.15m: FZ 80° (Infill: clay >5mm)	
				VUrb	**13m:** Slightly weathered, dark grey, highly vesicular RUBBLY BASALT; moderately strong; vesicles 10-20mm in diameter. Recovered as coarse angular BASALT; clast-supported, <5mm of matrix, matrix is a very soft, plastic CLAY, iron staining	SW						13.2m: JT 60° planar, rough, coating, (Infill: clay <5mm) CLAY; brown; very soft; moist, highly plastic 13.35m: DI 35° undulating, rough, veneer, (Infill: zeolite <1mm)
HQ3	27	14		VUb	**13.3m:** Slightly weathered, dark grey, highly vesicular, highly fractured BASALT; moderately strong; vesicles 10-20mm in diameter, aligned dipping 30 degrees, no infill. **13.7m:** ..Vesicules increase in size	SW						13.5m: JT 90° undulating, rough, coating, (Infill: clay <5mm) CLAY; brown; very soft; moist, highly plastic 13.65m: JT 20° stepped, rough, veneer, (Infill: clay <1mm) CLAY; brown; very soft; moist, highly plastic	
	26	15			**14.3m:**...Wide vesicule 30mm, clean			100	86	89		14.16m: JT 15° undulating, rough, veneer, (Infill: zeolite <1mm) 14.2m: JT 85° planar, rough, veneer, (Infill: zeolite <1mm) 14.5m: JT 55° planar, rough, staining, (Infill: clay) 14.7m: DB 45° planar, rough, clean 14.9m: DB	

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REMARKS:
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TCR, SCR, and RQD measurements to be revised.
100% Water circulation loss at 7.5m
No piezometer measurements or installation information provided

Water Level Readings(bgl):
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16/02/2023 7:46:00 AM | 30.00m | 7.53 m
16/02/2023 4:10:00 PM | 42.00m | 7.4 m
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Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Shaw St, Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH1203

Sheet **4** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1755151.95m
Northing: 5917407.68m
Reduced level: 40.74m

Date started: 9/02/2023
Date completed: 17/02/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	25	16		VUb	**15m:** Slightly weathered, dark grey, highly vesicular BASALT; moderately strong; vesicules 10-20mm in diameter, aligned dipping 30 degrees, no infill.	SW		75	60	60		15m to 15.1m: FZ 10° (Infill: clay >5mm) CLAY; brown; very soft; moist, highly plastic 15.35m: JT 60° stepped, rough (Infill: clay >5mm) CLAY; brown; very soft; moist, highly plastic 15.6m: JT 50° undulating, rough, clean 15.75m to 15.8m: FZ 40° (Infill: clay >5mm)	
					15.9m:...White mineral - zeolite (?)							15.9m: JT 30° undulating, rough, veneer, (Infill: clay <1mm) CLAY; brown; very soft; moist, highly plastic	
				VUv	**15.95m:** NO RECOVERY							15.95m to 16.33m: Interpretted as a void. 16.1m to 16.7m: JT 85° undulating, rough, veneer, (Infill: clay <1mm) CLAY; brown; very soft; moist, highly plastic	
HQ3	24	17		VUb	**16.33m:** Slightly weathered, dark grey, slightly vesicular BASALT; strong; vesicles 10-20mm in diameter, aligned dipping 30 degrees, no infill.							16.7m: JT 75° planar, rough, veneer, (Infill: clay <1mm) CLAY; brown; very soft; moist, highly plastic	
	23	18			**17m to 17.1m:**...Subhorizontal flow banding. DB along flow banding	SW		100	80	80		17.1m: BP 5° 17.15m: JT 75° planar, rough, veneer, (Infill: clay <1mm) CLAY; brown; very soft; moist, highly plastic 17.34m: JT 75° planar, rough, veneer, (Infill: clay <1mm) CLAY; brown; very soft; moist, highly plastic 17.4m: JT 5° undulating, rough, veneer, (Infill: clay <1mm) CLAY; brown; very soft; moist, highly plastic	
HQ3	22	19			**18.45m:**.. becomes highly vesicular							18m to 18.3m: JT 85° undulating, rough, veneer, (Infill: clay <1mm) CLAY; brown; very soft; moist, highly plastic 18.3m: JT 25° undulating, rough, staining, (Infill: iron oxide)	
				VUv	**18.58m:** NO RECOVERY			39	31	31		18.53m: JT 30° undulating, rough, staining, (Infill: iron oxide) 18.58m to 20.6m: Interpretted as a void.	
HQ3	21	20						37	0	0			

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REMARKS:
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No piezometer measurements or installation information provided

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
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15/02/2023 1:00:00 PM | 16.50m | 7.5 m
15/02/2023 4:24:00 PM | 30.00m | 7.52 m
16/02/2023 7:46:00 AM | 30.00m | 7.53 m
16/02/2023 4:10:00 PM | 42.00m | 7.4 m
17/02/2023 7:35:00 AM | 42.00m | 7.3 m

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Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Shaw St, Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH1203

Sheet **5** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1755151.95m
Northing: 5917407.68m
Reduced level: 40.74m

Date started: 9/02/2023
Date completed: 17/02/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3				VUv	**18.58m:** NO RECOVERY			37	0	0			
HQ3	20	21		VUrb	**20.6m:** Slightly weathered, dark grey, vesicular RUBBLY BASALT; moderately strong; vesicles 10-20mm in diameter, aligned dipping 30 degrees, clean. Recovered as angular coarse GRAVEL to COBBLE; dark grey. Loosely packed, moist. Gravel is slightly weathered BASALT	SW							
HQ3	19	22			**21m:** CORE LOSS			43	0	0			
HQ3	18	23		VUrb	**21.85m:** Slightly weathered; dark grey; RUBBLY BASALT; moderately strong. Fe staining present. Clay infills consist of soft to very soft light brown highly plastic CLAY.	SW		100	0	1		21.95m: DB 5° stepped, rough, clean 22.2m to 23.15m: FZ 50° (Infill: clay >5mm) CLAY; brown; very soft; moist, highly plastic 23.3m: JT 5° stepped, rough, veneer, (Infill: clay <1mm) CLAY; brown; very soft; moist, highly plastic 23.35m: JT 15° undulating, rough, (Infill: clay trace gravel >5mm) 23.4m to 23.5m: FZ 45° (Infill: gravel >5mm) 23.65m: JT 25° stepped, rough, clean	
HQ3	17	24		VUb	**24.2m:** Slightly weathered, dark grey, slightly vesicular BASALT; strong; moderately widely spaced; narrow, clay/zeolite infill. Vesicles are 5-15mm	SW		100	44	63		24.2m to 24.28m: JT 85° planar, rough, clean 24.3m to 24.43m: JI 80° undulating, rough 24.6m: JT 45° undulating, rough, coating, (Infill: clay <2mm) CLAY; brown; very soft; moist, highly plastic 24.67m: JT 45° undulating, rough, coating, (Infill: clay <2mm) CLAY; brown; very soft; moist, highly plastic 24.77m to 24.9m: JT 80° undulating, rough,	
	16	25											

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100% Water circulation loss at 7.5m
No piezometer measurements or installation information provided

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
10/02/2023 7:30:00 AM | 1.10m | 0.75 m
10/02/2023 1:30:00 PM | 9.15m | 0.75 m
15/02/2023 7:35:00 AM | 12.00m | 7.35 m
15/02/2023 11:20:00 AM | 15.00m | 7.5 m
15/02/2023 1:00:00 PM | 16.50m | 7.5 m
15/02/2023 4:24:00 PM | 30.00m | 7.52 m
16/02/2023 7:46:00 AM | 30.00m | 7.53 m
16/02/2023 4:10:00 PM | 42.00m | 7.4 m
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Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Shaw St, Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH1203

Sheet **6** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1755151.95m
Northing: 5917407.68m
Reduced level: 40.74m

Date started: 9/02/2023
Date completed: 17/02/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3				VUb		SW						coating, (Infill: clay <2mm) CLAY; brown; very soft; moist, highly plastic 24.9m: JT 15° stepped, rough, coating, (Infill: clay <2mm) CLAY; brown; very soft; moist, highly plastic 25m: JT 45° planar, rough, coating, (Infill: clay >5mm) CLAY; brown; very soft; moist, highly plastic 25.3m: DB 45° planar, rough, clean	
					25.1m: Unweathered, dark grey, slightly vesicular BASALT; strong. vesicules, 2mm diameter, no infill, aligned dipping 30 degrees.	UW		100	44	63			
HQ3	15	26			**25.5m:** CORE LOSS								
				AYo	**26.3m:** Organic SILT, some fine sand, trace gravel; dark brown; firm to stiff; moist, low plasticity. Gravel is fine to medium angular to sub-angular BASALT.	OL		47	23			**26.3m: ALLUVIUM** 26.3m to 27m: Interpretted as baked paleosol. 26.48m: DB 30° undulating, smooth, clean	
	14	27			**26.8m:**...Mottled grey and browish orange.								
HQ3					**27m:** SILT, some fine sand, minor disseminated organics, trace clay; densely packed; moist, non-plastic. Organic are rootles and wood fragments.	ML							
	13	28		AYz	**27.6m:** SILT, some fine sand; light grey; densely packed; moist, non-plastic. (Tauranga Group Alluvium - Older Alluvium)	ML		100	54				
					28.3m: SILT; dark brown, firm to stiff, moist, plastic.	ML							
	12				**28.5m:**...Becomes light brown								
HQ3		29		AYpu	**28.8m:** Pumiceous SILT, trace disseminated organics (rootlets, wood fragments); light browinsh grey, densely packed, moist, non-plastic. (Puketoka Formation)	ML		100	93				
	11	30		VUrb	**29.5m:** Slightly weathered, dark grey, highly vesicular RUBBLY BASALT; strong. Vesicles are 10-20mm in diameter. Recovered as COBBLE. COBBLE, some coarse gravel; dark grey; dense; moist. Cobble and gravel are moderately weathered BASALT.	SW				40		**29.5m: AVF** 29.8m: JT 50° undulating, rough, coating, (Infill: clay <2mm) CLAY; brown; very soft; moist, highly plastic	

REMARKS:
SCR = 1 circumference - 200 mm
TCR, SCR, and RQD measurements to be revised.
100% Water circulation loss at 7.5m
No piezometer measurements or installation information provided

Water Level Readings(bgl):
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15/02/2023 1:00:00 PM | 16.50m | 7.5 m
15/02/2023 4:24:00 PM | 30.00m | 7.52 m
16/02/2023 7:46:00 AM | 30.00m | 7.53 m
16/02/2023 4:10:00 PM | 42.00m | 7.4 m
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Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Shaw St, Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH1203

Sheet **7** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1755151.95m
Northing: 5917407.68m
Reduced level: 40.74m

Date started: 9/02/2023
Date completed: 17/02/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	10	29		VUrb	**29.5m:** Slightly weathered, dark grey, highly vesicular RUBBLY BASALT; strong. Vesicles are 10-20mm in diameter. Recovered as COBBLE. COBBLE, some coarse gravel; dark grey; dense; moist. Cobble and gravel are moderately weathered BASALT. **30.4m:**...Vesicles become clean/no infill	SW		100	62	7.3		30.3m: JT 20° undulating, rough, veneer, (Infill: clay <1mm) CLAY; brown; very soft; moist, highly plastic 30.45m: JT 75° undulating, rough, veneer, (Infill: clay <1mm) CLAY; brown; very soft; moist, highly plastic	
		31			**30.8m:** Slightly weathered, dark grey, highly vesicular BASALT; strong. Vesicules 10-20mm in diameter, no infill.							30.85m: JT 65° undulating, rough, veneer, (Infill: zeolite <1mm)	
HQ3	9	32		VUb	**31.5m:**...Becomes moderately vesicular	SW		100	60	55		31.2m: JT 35° undulating, rough, veneer, (Infill: clay <1mm) CLAY; brown; very soft; moist, highly plastic 31.8m: DB 45° planar, rough, clean 31.85m: JT 75° undulating, rough, staining, (Infill: iron oxide) 32m: JT 5° undulating, rough, clean	
					32.4m:...Becomes slightly vesicular							32.5m to 32.6m: FZ (Infill: clay >5mm) 5 upper, 35 bottom	
	8	33		AUo	**32.6m:** ORGANIC SILT, some clay; dark brown; firm; moist, low plasticity	OL						**32.6m: ALLUVIUM** 32.6m to 33m: Baked Paleosol	
SPT				ERc	**33m:** CLAY, some silt; brown mottled grey; stiff; moist, highly plasti		33m: SPT 0,0// 3,3,3,4 N = 13	100				**33m: ECBF**	
HQ3	7	34			**33.95m:**...Becomes some gravel	RS		100	100				
					34.3m:...Becomes light grey, mottled brown								
SPT	6	35			**34.5m:** CORE LOSS		34.5m: SPT 1,3// 3,3,6,10 N = 22	100					
						HW		48	35	45			

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Auckland LIGHT RAIL
Bringing us closer
Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Shaw St, Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH1203

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1755151.95m
Northing: 5917407.68m
Reduced level: 40.74m

Date started: 9/02/2023
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Logged by: CJ
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Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	5	36		EWs	**34.9m:** Highly weathered; dark grey, mottled orange (Fe stained), silty fine SANDSTONE; extremely weak, poorly cemented. Recovered as silt fine SAND; dark grey, mottled orange; medium dense. **35.13m:**...Fe cemented band **35.18m:**...Fe cemented band **35.31m:**...Fe cemented band **35.37m:**...Fe cemented band **35.56m:**...Fe cemented band	HW		48	35	45		
					35.7m: CORE LOSS							
SPT				EWz	**36m:** Moderately weathered, grey, sandy SILTSTONE; poorly cemented, very weak; widely spaced fractures. Sand is fine-grained.	MW	36m: SPT 5,11// 13,14,15 for 15mm N = 50+	100				
HQ3	4	37			**36.7m:** CORE LOSS.			68	17	49		36.7m: FZ clean 50 upper, 50 lower 36.71m: DB 75° stepped, smooth, clean
				EUz	**37m:** Slightly weathered, grey, SILTSTONE; very weak, poorly cemented; widely spaced fractures.	SW						
SPT	3			EUx	**37.5m:** NO RECOVERY - Due to solid cone SPT		37.5m: SPT 5,5// 30,20 for 35mm N = 50+	0				
HQ3		38		EUs	**37.76m:** Slightly weathered, grey mottled orange-brown, fine-grained silty SANDSTONE; moderately poorly cemented, weak, no discontinuities	SW						
				EUz	**38.1m:** Unweathered, grey, SILTSTONE; moderately cemented, weak, no discontinuities	UW		100	53	87		
	2			EUs	**38.4m:** Unweathered, grey, medium-grained SANDSTONE; poorly cemented, very weak. Dropped by drillers: recovered as coarse GRAVEL.	UW						38.4m: HI
		39		EUz	**38.7m:** Unweathered, grey, SILTSTONE; moderately cemented, weak, no discontinuities	UW						38.7m: DB 35° undulating, smooth, clean 38.8m: DB
SPT					**39m:** NO RECOVERY - Due to solid cone SPT		39m: SPT 15,35 for 140mm// N = 50+	0				
HQ3	1			EUi	**39.15m:** Unweathered, grey, medium-grained SANDSTONE; moderately cemented, weak; interbedded by SILTSTONE: unweathered, grey, SILTSTONE; very weak to weak. **39.6m:**...Rip-up clasts and sedimentary flow	UW		91	40	49		39.3m: BP 5° closed 39.45m: BP 5° closed 39.55m: BP 15° closed 39.6m: DB 45° undulating, rough, clean
		40		EUz	**39.7m:** Unweathered, grey, SILTSTONE; moderately cemented, weak, no discontinuities	UW						39.7m: BP 40° closed

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REMARKS:
SCR = 1 circumference - 200 mm
TCR, SCR, and RQD measurements to be revised.
100% Water circulation loss at 7.5m
No piezometer measurements or installation information provided

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
10/02/2023 7:30:00 AM | 1.10m | 0.75 m
10/02/2023 1:30:00 PM | 9.15m | 0.75 m
15/02/2023 7:35:00 AM | 12.00m | 7.35 m
15/02/2023 11:20:00 AM | 15.00m | 7.5 m
15/02/2023 1:00:00 PM | 16.50m | 7.5 m
15/02/2023 4:24:00 PM | 30.00m | 7.52 m
16/02/2023 7:46:00 AM | 30.00m | 7.53 m
16/02/2023 4:10:00 PM | 42.00m | 7.4 m
17/02/2023 7:35:00 AM | 42.00m | 7.3 m

Database File: AUR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - AR_V2.GPJ Library file: GINT STDAGS 4_0 V27_UPDATED_LIBRARY V2.GLB Template: DATATEMPLATE.GDT Report File: 01 AUR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Shaw St, Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH1203

Sheet **9** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1755151.95m
Northing: 5917407.68m
Reduced level: 40.74m

Date started: 9/02/2023
Date completed: 17/02/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3				EUz		UW							
HQ3				EUi	**40.1m:** Unweathered, grey, medium-grained SANDSTONE; moderately cemented, weak; interbedded by SILTSTONE: unweathered, grey, SILTSTONE; very weak to weak.	UW		91	40	49		40.1m: BP 2° closed	
HQ3	0	41		EUz	**40.39m:** Unweathered, grey, SILTSTONE; moderately cemented, weak, no discontinuities	UW		100	40	52		40.39m: BP 30° closed 40.9m: DB 5° undulating, rough, clean 41m: DB 2° undulating, rough, clean 41.3m: DB 2° undulating, rough, clean	
HQ3	-1	42		EUi	**41.4m:** Unweathered, grey, medium-grained SANDSTONE; moderately cemented, weak; interbedded by SILTSTONE: unweathered, grey, SILTSTONE; very weak to weak.	UW						41.4m: JT 35° undulating, rough, clean 41.5m: BP 5° closed 41.5m to 42m: HI Core was dropped when removing from steel splits. Recovered as GRAVEL. GRAVEL; dark grey; loosely packed; moist. Gravel is unweathered SANDSTONE, and SILTSTONE 41.5m: BP 5° closed	
					End of borehole at 42m (Termination Depth Achieved)								

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REMARKS:
SCR = 1 circumference - 200 mm
TCR, SCR, and RQD measurements to be revised.
100% Water circulation loss at 7.5m
No piezometer measurements or installation information provided

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
10/02/2023 7:30:00 AM | 1.10m | 0.75 m
10/02/2023 1:30:00 PM | 9.15m | 0.75 m
15/02/2023 7:35:00 AM | 12.00m | 7.35 m
15/02/2023 11:20:00 AM | 15.00m | 7.5 m
15/02/2023 1:00:00 PM | 16.50m | 7.5 m
15/02/2023 4:24:00 PM | 30.00m | 7.52 m
16/02/2023 7:46:00 AM | 30.00m | 7.53 m
16/02/2023 4:10:00 PM | 42.00m | 7.4 m
17/02/2023 7:35:00 AM | 42.00m | 7.3 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Paice Ave, Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH1204

Sheet **1** of **8**

BOREHOLE INFORMATION
Method: Rotarl Core Wirekine
Eyuipment: Massen| a MI4
Contractor: McMikkan Drikking

CO-ORDINATES: NZTM2000
Easting: 17qqq74.2qm
Northing: q916980.94m
Reduced kevek 42.27m

Date started: 20/02/2023
Date completed: 22/02/2023
Inckination: -90°
A| imuth: 0°

Logged bl : CJ/BK
Input bl : CJ/BK
Checwed bl : SBN
Reviez ed bl : PK

Method	R.L. (m)	Length (m)	Graphic Log	Lal er Code	MateriakDescription	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphl Defect Description AdditionakNotes	Instalkation
VACEX	42	1			**0m:** HYDROVAC			0				**0m: FILL**	
SPT	41	2		FUc	**1.5m:** CLAY; broz nish orange; firm; moist, high plasticitl	CH	1.qm: SPT 0,1// 0,_1,1 N = 3	100					
PQ3	40	3		FUc	**2m:** CLAY; broz nish orange mottled grel ; firm; moist, h gh plasticitl	CH		76					
					2.75m: CORE LOSS								
SPT	39			FU		**3m:** SILT, some fine-grained sand, minor ckal ; kight-grel , mottled orange; soft; moist, koz plasticitl .	ML	3m: SPT 0,0// 0,1,0,1 N = 2	100				
PQ3	38	4		ERs	**3.45m:** Sikl fine-grained SAND; broz nish-orange, mottled grel ; loose; moist; non-plastic.	RS		100				**3.45m: ECBF**	
					3.8m: Sikl fine-grained SAND; grel , mottled orange; koose; moist; non-plastic	RS							
PUSHTUBE	q			ERc	**4.75m:** Sikl CLAY; grel mottled orange; firm; moist; highk plastic	RS		100					

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Drikhead ratting severek
Bacwfikkinformation not provided, assumed grout bacwfikkbetz een vibrating z ire pie| ometer depths

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
20/02/2023 4:42:00 PM 519.00m 52.3 m
21/02/2023 7:q9:00 AM 532.00m 56.1 m
21/02/2023 10:46:00 AM 519.00m 52.1 m
21/02/2023 4:10:00 PM 532.00m 53.q m
22/02/2023 12:37:00 PM 540.00m 53.4q m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland LIGHT RAIL
Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Paice Ave, Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH1204

Sheet **2** of **8**

BOREHOLE INFORMATION
Method: Rotarl Core Wirelkne
Eyuipment: Massen| a MI4
Contractor: McMilkan Drilking

CO-ORDINATES: NZTM2000
Easting: 17qqq74.2qm
Northing: q916980.94m
Reduced levek 42.27m

Date started: 20/02/2023
Date completed: 22/02/2023
Inclkination: -90°
A| imuth: 0°

Logged bl : CJ/BK
Input bl : CJ/BK
Checwed bl : SBN
Reviez ed bl : PK

Method	R.L. (m)	Length (m)	Graphic Log	Lal er Code	MateriakDescription	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphl Defect Description AdditionakNotes	Instalkation
SPT	37	6		ERc	**4.75m:** Sikl CLAY; grel mottled orange; firm; moist; highk plastic	RS	qm: SPT 0,1// 1,1,2,2 N = 6	100					
PQ3								100					
SPT	36				**6m:** Sikl CLAY; grel , mottled orange; stiff; moist, highk plastic	RS	6m: SPT 1,1// 2,3,2,3 N = 10	100					
PQ3		7		EWl	**6.75m:** Highk z eathered, darwgrel , sandl SILTSTONE; e+tremelk z eaw e+tremelk closelk spaced. Sand is fine-grained Recovered as fine-grained sandl SILT; darwgrel ; firm; moist, highk plastic	HW		100	38	24			
	3q				**7.2m:** Highk z eathered; darwgrel ; interbedded SILTSTONE and SANDSTONE. SILTSTONE is verl z eaw SANDSTONE is thin beddings of fine-grained SANDSTONE; e+tremelk z eaw Defects are moderatelk z idelk spaced, narroz . Recovered as sandl SILT; darwgrel ; stiff; moist, loz plasticitl	HW	7.qm: SPT 2,4// 7,13,24,6 for 20mm N = q0x	100					
SPT		8											
PQ3	34			EWi	**7.95m:** Moderatelk z eathered; darwgrel ; interbedded SANDSTONE and SILTSTONE. SILTSTONE is verl z eaw SANDSTONE is thin beddings of normallk graded medium grained SANDSTONE; verl z eaw Defects are closelk spaced, narroz **8.2m to 8.35m:**...Recovered as coarse gravek gravekis slightlk z eathered SANDSTONE	MW		100	26	26		8m: JT 8° undulating, rough, veneer, (Infilk clal Verl soft) 8.0qm: JT 7q° planar, rough, veneer, (Infilk clal Verl soft) 8.1m to 8.2m: F< 40° (Infilk sandstone 20-60mm) dip relating to loz er joint, bounded bl upper BP 8.3qm to 8.4qm: JT 8q° undulating, smooth, clean 8.qm: JT 8° undulating, rough 8.6m to 9m: F< q° clean dip relating to upper joint, could be drilking induced	
		9					9m: SPT q,7// 10,11,14,1q for 1qmm N = q0x						
SPT	33							0					
PQ3		10			**9.39m:** Moderatelk z eathered; darwgrel ; interbedded SILTSTONE (60%) and SANDSTONE (40%). SILTSTONE is verl z eaw SANDSTONE is thin beddings of moderatelk z eathered; darwgrel ; fine-grained SANDSTONE; z eaw, moderatelk thicwbeds. Defects are closelk spaced, moderatelk narroz .	MW		100	71	71		9.6m: JT q° undulating, rough, clean 9.8m: JT q° stepped, rough, veneer, (Infilk clal Verl soft) could be drilking induced 9.9m: JT 30° undulating, smooth, veneer,	

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Drilkhead rattling severelk
Bacwfilkinformation not provided, assumed grout bacwfilkbetz een vibrating z ire pie| ometer depths

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
20/02/2023 4:42:00 PM 519.00m 52.3 m
21/02/2023 7:q9:00 AM 532.00m 56.1 m
21/02/2023 10:46:00 AM 519.00m 52.1 m
21/02/2023 4:10:00 PM 532.00m 53.q m
22/02/2023 12:37:00 PM 540.00m 53.4q m

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Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland LIGHT RAIL
Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Paice Ave, Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH1204

Sheet **3** of **8**

BOREHOLE INFORMATION
Method: Rotarl Core Wirelkne
Eyuipment: Massen| a Ml4
Contractor: McMilkan Drilking

CO-ORDINATES: NZTM2000
Easting: 17qqq74.2qm
Northing: q916980.94m
Reduced levek 42.27m

Date started: 20/02/2023
Date completed: 22/02/2023
Inclkination: -90°
A| imuth: 0°

Logged bl : CJ/BK
Input bl : CJ/BK
Checwed bl : SBN
Reviez ed bl : PK

Method	R.L. (m)	Length (m)	Graphic Log	Lal er Code	MateriakDescription	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphl Defect Description AdditionakNotes	Instalkation
				EWi		MW						(Infilk clal Verl soft) 10m: BP 30° planar, rough, Base of siltstone	
PQ3	32			EWs	**10.1m:** Moderatelk z eathered; darwgrel ; normallk -graded, medium-grained SANDSTONE; z eaw, moderatelk cemented; closelk spaced, tight.			100	71	71		10.4qm: JT q° healed, z hite minerakinfilk	
SPT							10.qm: SPT q,4// 9,23,18 for 2qmm N = q0x	0					
PQ3	31	11			**11m:**...Silkstone rip-up clasts, medium gravek sub-rounded. Sedimentarl floz structure.	MW		100	72	80		10.9qm: JT 7q° undulating, rough, veneer, (Infilk clal Verl soft) 11m: JT 60° planar, rough, veneer, (Infilk clal Verl soft) 11.1m: JT 30° stepped, rough, veneer, (Infilk clal Verl soft) on log sal s its at 11m as z elk 11.2qm: JT 40° planar, rough, veneer, (Infilk clal Verl soft) 11.3m: JT 4q° undulating, rough, veneer, (Infilk clal Verl soft)	
		12										11.6qm: JT 38° planar, rough, veneer, (Infilk clal Verl soft)	
PQ3	30											12.1m: JT 80° stepped, rough, veneer, (Infilk clal Verl soft) 12.1qm: JT q° undulating, rough, veneer, (Infilk clal Verl soft) 12.2m: F< (Infilk sandstone 20-60mm) top dip q degrees, bottom dip q degrees 12.4m: JT q° undulating, rough, clean could be drilking induced 12.qm: JT q° undulating, rough, veneer, (Infilk clal Verl soft) 12.qqm: JT q° undulating, rough, coating, (Infilk clal Verl soft ?qmm) 12.6m to 13m: F< top q, bottom 23, drilking induced, bottom constrained bl BP	
		13		EWl	**12.8m:** Modera elk z eath red; darwgrel thinlk bedded; SILTSTONE; verl z eaw, closelk spaced, moderatelk narroz .	MW		100	0	32		13m: BP 20° undulating, rough, Base of sandstone 13.1m: JT 2q° planar, smooth, coating, (Infilk clal Verl soft ?qmm)	
	29												
PQ3				EWs	**13.4m:** Moderatelk z eathered; darwgrel ; normallk graded, fine to medium-grained SANDSTONE; verl z eaw, closelk spaced, moderatelk narroz	MW						13.qqm: JT q° planar, rough, clean could be a drilking breaw 13.6m: F< drilking induced, top subhorl ontak, bottom subhorl ontak 13.8m to 14m: JT 80° undulating, rough	
		14										14m to 14.1qm: F< (Infilk sandstone 20-60mm) top dip q degrees, bottom dip q degrees	
PQ3	28			EWi	**14.2m:** Moderatelk z eathered; darwgrel ; interbedded SILTSTONE (90%) and SILTSTONE (10%). SILTSTONE is verl z eaw. SANDSTONE is thin bedding of unz eathered; darwgrel ; fine to medium-grained SANDSTONE; verl z eaw to z eaw. Defects are closelk spaced, narroz . **14.6m:**...Calcite vein	MW		100	27	71		14.8m: JT 1q° undulating, rough 14.8qm to 14.9qm: F< clean, (Infilk sandstone 6-60mm) top dip q degrees,	
		1q											

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Drilkhead rattling severelk
Bacwfilkinformation not provided, assumed grout bacwfilkbetz een vibrating z ire pie| ometer depths

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
20/02/2023 4:42:00 PM 519.00m 52.3 m
21/02/2023 7:q9:00 AM 532.00m 56.1 m
21/02/2023 10:46:00 AM 519.00m 52.1 m
21/02/2023 4:10:00 PM 532.00m 53.q m
22/02/2023 12:37:00 PM 540.00m 53.4q m

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Auckland LIGHT RAIL
Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Paice Ave, Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH1204

Sheet **4** of **8**

BOREHOLE INFORMATION
Method: Rotarl Core Wireline
Eyuipment: Massen| a Ml4
Contractor: McMilkan Drilking

CO-ORDINATES: NZTM2000
Easting: 17qqq74.2qm
Northing: q916980.94m
Reduced levek 42.27m

Date started: 20/02/2023
Date completed: 22/02/2023
Inclination: -90°
A| imuth: 0°

Logged bl : CJ/BK
Input bl : CJ/BK
Checwed bl : SBN
Reviez ed bl : PK

Method	R.L. (m)	Length (m)	Graphic Log	Lal er Code	MateriakDescription	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphl Defect Description AdditionakNotes	Instalkation
PQ3	27	16		EWi	**14.2m:** Moderatek z eathered; darwgrel ; interbedded SILTSTONE (90%) and SILTSTONE (10%). SILTSTONE is verl z eaw. SANDSTONE is thin bedding of unz eathered; darwgrel ; fine to medium-grained SANDSTONE; verl z eaw to z eaw. Defects are closek spaced, narroz .	MW						bottom dip q degrees, drilking induced 1qm to 1q.4m: F< drilking induced	
	26				**15.4m:** Moderatek z eathered; darwgrel ; interbedded SANDSTONE (80%) and SILTSTONE (20%). SANDSTONE is normalk graded, fine to medium SANDSTONE. Verl z eaw, poork cemented. SILTSTONE is moderatek thin beddings of SILTSTONE; verl z eaw. Defects are closek spaced, narroz .	MW		100	0	47		1q.3m: DB 0° clean subhor| ontak	
PQ3		17			**16.3m:** Moderatek z eathered; darwgrel ; SANDSTONE (qq%) and SILTSTONE (4q%). SANDSTONE is normalk graded, fine to medium SANDSTONE; z eaw. SILTSTONE is moderatek z eathered; SILTSTONE. Verl z eaw. Defects are closek spaced, narroz .	MW						16.qm to 17.3m: DB clean Drilkbreaws parallekto bedding. Dips ranging from 10-2q degrees	
	2q	18		EUi	**17.2m:** Slightk z eathered; darwgrel ; interbedded SANDSTONE (90%) and SILTSTONE (10%). SANDSTONE is normalk-graded, fine to medium. Verl z eawSILTSTONE is thin bedding of slightk z eathered SILTSTONE. Verl z eaw. Defects are closek spaced narroz **17.8m:**...SANDSTONE is coarse-grained **18m:**...SANDSTONE is coarse-g ained	SW		100	93	93			
PQ3	24	19						100	100	100			
	23				**19.2m:** Slightk z eathered; darwgrel ; interbedded SANDSTONE (7q%) and SILTSTONE (2q%). SANDSTONE is laminated, normalk graded, fine to medium-grained SANDSTONE, trace gravels; z eaw. Gravekis sub-angular siltstone (rip-up clasts). SILTSTONE is moderatek thicw beddings of slightk z eathered; darwgrel ; SILTSTONE; verl z eaw. Defects are moderatek z idek spaced, narroz .	SW						19.6m: BP 30° stepped, rough, Base of siltstone 19.7m to 19.8m: JT 70° undulating, rough, veneer o+idation coating 19.9m: JT undulating, rough, clean	
PQ3		20						100	100	100			

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Drilkhead rattking severek
Bacwfilkinformation not provided, assumed grout bacwfilkbetz een vibrating z ire pie| ometer depths

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
20/02/2023 4:42:00 PM 519.00m 52.3 m
21/02/2023 7:q9:00 AM 532.00m 56.1 m
21/02/2023 10:46:00 AM 519.00m 52.1 m
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22/02/2023 12:37:00 PM 540.00m 53.4q m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland LIGHT RAIL
Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Paice Ave, Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH1204

Sheet **5** of **8**

BOREHOLE INFORMATION
Method: Rotarl Core Wirekine
Eyuipment: Massen| a MI4
Contractor: McMikkan Drikking

CO-ORDINATES: NZTM2000
Easting: 17qqq74.2qm
Northing: q916980.94m
Reduced kevek 42.27m

Date started: 20/02/2023
Date completed: 22/02/2023
Inckination: -90°
A| imuth: 0°

Logged bl : CJ/BK
Input bl : CJ/BK
Checwed bl : SBN
Reviez ed bl : PK

Method	R.L. (m)	Length (m)	Graphic Log	Lal er Code	MateriakDescription	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphl Defect Description AdditionakNotes	Instakkation
PQ3	22	21		EUi	**19.2m:** Skightk z eathered; darwgrel ; interbedded SANDSTONE (7q%) and SILTSTONE (2q%). SANDSTONE is kaminated, normakk graded, fine to medium-grained SANDSTONE, trace gravekis; z eaw Gravekis sub-angukar siktstone (rip-up clasts). SILTSTONE is moderatekk thicw beddings of skightk z eathered; darwgrel ; SILTSTONE; verl z eaw Defects are moderatekk z idekk spaced, narroz .	SW		100	100	100		subhori| ontak could be a drikking breaw 20.7m: BP 2q° Base of sandstone, tight	
PQ3	21	22						73	73	73		21.1m: DB q° planar, smooth, clean 21.2m: DB 10° undukating, smooth, clean 21.4qm: DB q° undukating, rough, clean 21.qm: DB 40° undukating, rough, clean 21.7m: DB 2q° undukating, rough 22m: BP 3q° undukating, rough, clean Base of siktstone, closed	
PQ3	20	23						100	100	100		22.qqm: DB 4q° undukating, rough, clean 22.8m: BP 0° subhori| ontak 23m: DB 4q° planar, rough 23.3m: BP q° undukating, rough, drikking induced breaw 23.6qm: BP 20° Base of siktstone, tight	
PQ3	19	24						100	100	100		24.4m: BP 2q° Base of sandstone, tight	
	18	2q											

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Drikkhead ratkking severekk
Bacwfikkinformation not provided, assumed grout bacwfikkbetz een vibrating z ire pie| ometer depths

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
20/02/2023 4:42:00 PM 519.00m 52.3 m
21/02/2023 7:q9:00 AM 532.00m 56.1 m
21/02/2023 10:46:00 AM 519.00m 52.1 m
21/02/2023 4:10:00 PM 532.00m 53.q m
22/02/2023 12:37:00 PM 540.00m 53.4q m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Paice Ave, Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH1204

Sheet **6** of **8**

BOREHOLE INFORMATION
Method: Rotarl Core Wirekine
Eyuipment: Massen| a MI4
Contractor: McMikkan Drikking

CO-ORDINATES: NZTM2000
Easting: 17qqq74.2qm
Northing: q916980.94m
Reduced kevek 42.27m

Date started: 20/02/2023
Date completed: 22/02/2023
Inckination: -90°
A| imuth: 0°

Logged bl : CJ/BK
Input bl : CJ/BK
Checwed bl : SBN
Reviez ed bl : PK

Method	R.L. (m)	Length (m)	Graphic Log	Lal er Code	MateriakDescription	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphl Defect Description AdditionakNotes	Instalkation
						SW						2qm: BP 30° drikking breaw bedding parakkek	
PQ3	17			EUs	**25.07m:** Skgthk z eathered; darwgrel ; fine-grained SANDSTONE; e+tremek to verl z eaw poork cemented. Recovered as medium dense, coarse GRAVEL; moist. Gravek is skghtk z eathered SANDSTONE	SW		100	100	100		
PQ3	16	26		EUi	**25.3m:** Skghtk z eathered; darwgrel ; interbedded SANDSTONE (7q%) and SILTSTONE (2q%). SANDSTONE is kaminated, normakk graded, fine to medium-grained SANDSTONE, trace gravekis; z eaw Gravekis sub-angukar siktstone (rip-up ckasts). SILTSTONE is moderatek thicw beddings of skghtk z eathered; darwgrel ; SILTSTONE; verl z eaw Defects are moderatek z idek spaced, narroz . **25.7m:**...Moderatek thicwSILTSTONE bed; darwgrel , z eaw			100	100	100		2q.7m: BP 3q° closed	
PQ3	1q	27		EUi	**26.3m to 26.7m:**...Moderatek thicwSILTSTONE bed; darw grel ; z eaw	SW		100	100	100		27.1qm to 27.8m: BP Closek spaced bedding parakkekdrikking breaws, dip q-1q	
PQ3	14	28		EU		**28.2m:** Skghtk z eathered; darwgrel , kaminated; SILTSTONE; verl z eaw moderatek to steepk inckined. Defects are closek spac d	SW		100	100	100	28m: DB 8° undukating, rough, clean 28.1m: DB 8° undukating, rough, clean 28.2m: Laminations dipping 30 28.6qm: JT 3q° pkanar, smooth, clean 29m: JT 30° undukating, rough, clean	
PQ3	13	30		EUi	**29.2m:** Skghtk z eathered; darwgrel ; interbedded SANDSTONE (90%) and SILTSTONE (10%). SANDSTONE is normakk graded fine to coarse-grained SANDSTONE; verl z eaw moderatek cemented. SILTSTONE is thin beddings of unz eathered; darwgrel , kaminated; SILTSTONE; verl z eaw to z eaw moderatek inckined. Defects are moderatek z idek spaced, narroz .	SW		100	100	100		29.2m: BP 30° Base of siktstone, closed	

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Drikkhead rattking severek
Bacwfikkinformation not provided, assumed grout bacwfikkbetz een vibrating z ire pie| ometer depths

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
20/02/2023 4:42:00 PM 519.00m 52.3 m
21/02/2023 7:q9:00 AM 532.00m 56.1 m
21/02/2023 10:46:00 AM 519.00m 52.1 m
21/02/2023 4:10:00 PM 532.00m 53.q m
22/02/2023 12:37:00 PM 540.00m 53.4q m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland LIGHT RAIL
Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Paice Ave, Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH1204

Sheet **7** of **8**

BOREHOLE INFORMATION
Method: Rotarl Core Wirekine
Eyuipment: Massen| a MI4
Contractor: McMikkan Drikking

CO-ORDINATES: NZTM2000
Easting: 17qqq74.2qm
Northing: q916980.94m
Reduced kevek 42.27m

Date started: 20/02/2023
Date completed: 22/02/2023
Inckination: -90°
A| imuth: 0°

Logged bl : CJ/BK
Input bl : CJ/BK
Checwed bl : SBN
Reviez ed bl : PK

Method	R.L. (m)	Length (m)	Graphic Log	Lal er Code	MateriakDescription	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphl Defect Description AdditionakNotes	Instalkation
PQ3	12	31		EUi	**29.2m:** Slightlk z eathered; darwgrel ; interbedded SANDSTONE (90%) and SILTSTONE (10%). SANDSTONE is normalkt graded fine to coarse-grained SANDSTONE; verl z eaw, moderatelk cemented. SILTSTONE is thin beddings of unz eathered; darwgrel , laminated; SILTSTONE; verl z eaw to z eaw, moderatelk inckined. Defects are moderatelk z idelk spaced, narroz .	SW		100	100	100		30.1m: DB 2q° undulating, rough, clean	
				EUl	**30.9m:** Slightlk z eathered; darwgrel , laminated; SILTSTONE; verl z eawto z eaw, moderatelk to steeplk inckined	SW						30.9m: BP 30° Base of sandstone, tight	
	11			EUi	**31.3m:** Slightlk z eathered; darwgrel ; interbedded SANDSTONE (90%) and SILTSTONE (10%). SANDSTONE is normalkt graded fine to coarse-grained SANDSTONE; verl z eawto z eaw, moderatelk cemented. SILTSTONE is thin beddings of slightlk z eathered; darwgrel , laminated; SILTSTONE; verl z eawto z eaw, moderatelk to steeplk inckined. Defects are moderatelk z idelk spaced, narroz .	SW						31.3m: BP 30° Base of siltstone, tight	
PQ3	10	32		EUl	**32.25m:** Slightlk z eathered; darwgrel , laminated; SILTSTONE;z eaw,moderatelk to steeplk inckined. Defects are closelk spaced, narroz	SW		100	100	100		31.8qm: BP 30° Bedding parallekdrikking induced breaw. 31.9qm: BP 30° Base of siltstone, tight	
	9	33		EUi	**32.8m:** Slightlk z eathered; darwgrel ; interbedded SILTSTONE (70%) and SANDSTONE(30%). SILTSTONE is verl z eaw. SANDSTONE is thin beddings of normalkt graded, medium grained, SANDSTONE; z eaw, moderatelk cemented. Defects are closelk spaced, narroz	SW						32.8m: BP 30° Bedding parallekdrikking induced breaw.	
PQ3								100	100	100		33.4m: BP 30° undulating, rough, Bedding parallekdrikking induced breaw.	
												33.7m: BP 30° undulating, rough, Base of sandstone. Core brown parallekto bedding.	
		34		EUl	**33.8m:** Slightlk z eathered; darwgrel , laminated to thinlk bedd d; SILTSTONE; verl z eawto z eaw, moderatelk to steeplk inckined	SW							
	8			EUi	**34.1m:** Slightlk z eathered; darwgrel ; interbedded SANDSTONE (90%) and SILTSTONE (10%). SANDSTONE is normalkt graded, medium-grained SANDSTONE; verl z eaw, moderatelk cemented. SILTSTONE is moderatelk thicw bedding of slightlk z eathered; darwgrel , laminated; SILTSTONE; verl z eaw, moderatelk to steeplk inckined. Defects are moderatelk z idelk spaced, narroz **34.5m:**...Volcaniclastic inclusions (Z)	SW						34.1m: BP 30° Base of siltstone, tight	
PQ3					**34.7m:** CORE LOSS			87	87	87			
		3q		EUi		SW							

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Drikkhead rattking severelk
Bacwfikkinformation not provided, assumed grout bacwfikkbetz een vibrating z ire pie| ometer depths

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
20/02/2023 4:42:00 PM 519.00m 52.3 m
21/02/2023 7:q9:00 AM 532.00m 56.1 m
21/02/2023 10:46:00 AM 519.00m 52.1 m
21/02/2023 4:10:00 PM 532.00m 53.q m
22/02/2023 12:37:00 PM 540.00m 53.4q m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARY V2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland LIGHT RAIL
Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Paice Ave, Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH1204

Sheet **8** of **8**

BOREHOLE INFORMATION
Method: Rotarl Core Wirekine
Eyuipment: Massen| a MI4
Contractor: McMikan Drikng

CO-ORDINATES: NZTM2000
Easting: 17qqq74.2qm
Northing: q916980.94m
Reduced kevek 42.27m

Date started: 20/02/2023
Date completed: 22/02/2023
Inckination: -90°
A| imuth: 0°

Logged bl : CJ/BK
Input bl : CJ/BK
Checwed bl : SBN
Reviez ed bl : PK

Method	R.L. (m)	Length (m)	Graphic Log	Lal er Code	MateriakDescription	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphl Defect Description AdditionakNotes	Instalkation
PQ3	7	36		EUi	**34.9m:** Skightk z eathered; darwgrel ; interbedded SANDSTONE (7q%) and SILTSTONE (2q%). SANDSTONE is normakk graded, fine to coarse-grained SANDSTONE; z eaw. SILTSTONE is moderatek thin bedding of skightk z eathered; darwgrel , kaminated; SILTSTONE; verl z eaw, moderatek to steepk inckined. Defects are moderatek z idek spaced, narroz	SW		87	87	87		34.9m: BP 30° Bedding parakkekdrikking induced breaw 3qm: BP 30° Bedding parakkekdrikking induced breaw 3q.qm: F< (Infikk sandstone 6-60mm) top q, bottom q	
PQ3	6	37		EU|	**36.1m to 36.3m:**...SILTSTONE, darwgrel , verl z eaw **36.7m:** Skightk z eathered, darwgrel , SILTSTONE. Verl z eaw. Defects are moderatek z idek spaced, narroz .	SW		100	100	100		36.1m: BP 30° Base of siktstone, bedding parakkekdrikking induced breaw 36.2m: BP 30° Base of sandstone, bedding parakkekdrikking induced breaw 36.3qm: BP 30° Bedding parakkekdrikking induced breaw 36.qm: JT 4q° undukating, rough, clean could be a drikking induced breaw 37.1m: BP 3q° Base of siktstone, bedding parakkekdrikking induced breaw	
PQ3	q	38		EUs	**37.2m:** Skightk z eathered; darwgrel ; normakk graded coarse-grained SANDSTONE; z eaw to verl z eaw, moderatek cemented; moderatek z idek spaced, narroz . Inckusion of grel -z hite pinwish minerals - vokcaniclastic (Z)	SW						37.6qm: BP 3q° Base of sandstone, tight	
				EUi	**37.75m:** Skightk z eathered; darwgrel ; interbedded SANDSTONE (q0%) and SILTSTONE (q0%). SANDSTONE is normakk graded, fine to coarse-grained SANDSTONE; z eaw. SILTSTONE is moderatek thicwbedding of skightk z eathered; darwgrel , kaminated; SILTSTONE; verl z eaw, moderatek to steepk inckined. Defects are moderatek z idek spaced, narroz	SW						38m to 38.2m: JT 7q° stepped, smooth, clean could be a drikking induced breaw	
PQ3	4	39		EU|	**38.2m:** Skightk z eathered; darwgrel , kaminated; SILTSTONE; verl z eaw, moderatek to steepk inckined. Defects are closek , narroz .	SW		87	70	73		38.3m to 38.4qm: JT 7q° stepped, rough, clean could be a drikking induced breaw 38.4m: BP 30° Bedding parakkekdrikking induced breaw 38.9m: BP 3q° Bedding parakkekdrikking induced breaw	
PQ3	3	40		EUi	**39.2m:** Skightk z eathered; darwgrel ; interbedded SANDSTONE (q0%) and SILTSTONE (q0%). SANDSTONE is normakk graded, fine to coarse-grained SANDSTONE; z eaw. SILTSTONE is moderatek thicwbedding of skightk z eathered; darwgrel , kaminated; SILTSTONE; verl z eaw,	SW		100	100	100			

REMARKS: End of borehole at 40m (Termination Depth Achieved)
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Drikhead rattking severek
Bacwfikkinformation not provided, assumed grout bacwfikkbetz een vibrating z ire pie| ometer depths

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
20/02/2023 4:42:00 PM 519.00m 52.3 m
21/02/2023 7:q9:00 AM 532.00m 56.1 m
21/02/2023 10:46:00 AM 519.00m 52.1 m
21/02/2023 4:10:00 PM 532.00m 53.q m
22/02/2023 12:37:00 PM 540.00m 53.4q m

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Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland LIGHT RAIL
Auckland

Client: **Muckland Light Rail Ltd**
Pro°ect: **Muckland Light Rail**
Location: **Z2 - aint MIbans Mvenue**
Pro°ect Reference: **- tage 1 Ground Einvestigation**

4 H1S09M

Sheet **1** of **11**

4 BROHBLOE FBRNMTEBI	**ABGBRDE MTO- : I . TNS000**	Date started: 1| /03/2023	Logged b9: CJ/DY/WM
Method: Rotar9 Core Wireline	Easting: 17|		yy.07m	Date completed: 23/03/2023	Input b9: CJ
Ej uipment: Massen5a MI4	Northing:	y167| 8.6| m	Inclination: -y0(	Checwed b9: SBN
Contractor: McMillan Drilling	Reduced level: 3y.| 0m	A5imuth: 0(	Reviez ed b9: PK

Method	R.L. xm%	Length xm%	Graphic Log	La9er Code	Material Description	Weathering/USC	Testing	TCR ** %	SCR ** %	RQD ** %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraph9 Defect Description Additional Notes	Installation
VACEX	3y			FEj FUw	**0m:** ASPHALT **0309m:** COBBLES and BOULDERS z ith minor silt and trace sand) darwgre9 and light broz n) tightl9 pacwed) moist. COBBLES and BOULDERS are unz eathered, sub-angular to angular BASALT.			0				**0m: FEL**	
		1			**037m:** Cla9e9 SILT z ith minor sand) light broz n) stiff) moist, high plasticit9.	CL						**037m: OA4 F**	
SPT	38			ER5	**139m:** Cla9e9 SILT some sand) light gre9, mottled orange) firm) moist, highl9 plastic. Sand is fine-grained	CL	1.| m: SPT 0,1// 1,2,3 N = 7	100					
PQ3	37	2			**1359m:** Cla9e9 SILT some fine sand) gre9ish-broz n, mottled orange. Firm, moist, highl9 plastic. **S31m:**...Light gre9	ML		100					
		3		ERs	**S36m:** Silt9 fine-grained SAND some cla9) broz insh orange, mottled gre9. Medium dense, moist. Iron o; ide and magnesium o; ide staining along relic rocwstructure	RS							
PUSHTUBE	36							80					
SPT		4		ER5	**Z369m:** Cla9e9 SILT) gre9, mottled orange. Soft, moist, highl9 plastic. Iron o; ide and magnesium o; ide staining along relic rocwstructure **2m:**...Darwgre9	RS	3.| m: SPT 1,0// 1,1,1,2 N =	100					
PQ3	3				**23Zm:** Fine sand9 SILT some cla9) light gre9) stiff) moist, highl9 plastic.			100					
SPT						RS	4.| m: SPT 1,1// 2,2,3,3 N = 10	100					
						HW		100					

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100k circulation loss at 1.4m
Casing - 2m PW
Bacwfill information not provided, assumed grout bacwfill betz een vibrating z ire pie5ometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
1| /03/2023 4:36:00 PM q4.00m q2 m
16/03/2023 8:34:00 AM q4.00m q1 m
16/03/2023 1:40:00 PM q13.| 0m q1.1 m
20/03/2023 8:00:00 AM q13.| 0m q2.1 m
20/03/2023 4:10:00 PM q30.00m q2.| m
21/03/2023 7:30:00 AM q30.00m q2.| m
21/03/2023 4:30:00 PM q40.| 0m q1.44 m
22/03/2023 7:| 0:00 AM q40.| 0m q1.0| m
22/03/2023 2:| | :00 PM q| 0.1| m q3.y8 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland LIGHT RAIL
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Client: **Muckland Light Rail Ltd**
Pro°ect: **Muckland Light Rail**
Location: **Z2 - aint Mlbans Mvenue**
Pro°ect Reference: **- tage 1 Ground Einvestigation**

4 H1S09M

Sheet **S** of **11**

4 BROHBLOE FBRNMTBI	**ABCBRDE MTO- : I . TNS000**	Date started: 1| /03/2023	Logged b9: CJ/DY/WM
Method: Rotar9 Core Wireline	Easting: 17| | | yy.07m	Date completed: 23/03/2023	Input b9: CJ
Ej uipment: Massen5a MI4	Northing: | y167| 8.6| m	Inclination: -y0(	Checwed b9: SBN
Contractor: McMillan Drilling	Reduced level: 3y.| 0m	A5imuth: 0(	Reviez ed b9: PK

Method	R.L. xm%	Length xm%	Graphic Log	La9er Code	Material Description	Weathering/USC	Testing	TCR xx %	SCR xx %	RQD xx %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraph9 Defect Description Additional Notes	Installation
PQ3	34			EWi	**23.59m:** Highl9 z eathered) darwgre9) SILTSTONE)e; tremel9 z eaw Ver9 thinl9 interbedded z ith MUDSTONE beds) hard. xCla9e9 SILT, ver9 stiff, moist, loz plasticit9%	HW							
					93.2m:...Blacwcarbonaceous laminations							| .4m: No dip possible du to co e disturbance	
					93.9m: Highl9 z eathered, darwgre9, SILTSTONE. E; tremel9 z eaw xCla9e9 SILT. Ver9 stiff, moist, loz plasticit9% **93.6m:**...10mm thicwbed of moderatel9 z eathered, silt9 fine SANDSTONE. E; tremel9 z eaw, poorl9 cemented.			100	0	80		| .7m: BP 20(undulating, rough, clean Base of sandstone. Core brown during drilling.	
		6											
SPT					**63.3m to 63.9m:**...300mm thicwbed of moderatel9 z eathered, silt9 fine SANDSTONE. E; tremel9 z eaw, poorl9 cemented. **63.2.3m to 63.2.3m:**...E; tremel9 closel9 spaced °oints	MW	6m: SPT 3,10// 11,14,21,4 for 20mm N = | 0+	100					
						HW							
PQ3	33											6.6m: DB 1| (stepped, rough, clean Drilling breaw-parallel to bedding	
		7						100	| 0	| 7			
	32												
SPT					**83.9m:** NO RECOVERY		7.| m: SPT | ,y// 1| ,10,11,14 for 6| mm N = | 0+	0					
		8											
PQ3	31			EWi	**83.52m:** Moder tel9 z eathered, darwgre9, interbedded SILTSTONE and SANDSTONE. SILTSTONE is ver9 z eaw SANDSTONE is moderate 9 thin beddings of normall9-graded, fine to medium SANDSTONE) ver9 z eaw, poorl9 cemented. Defects are closel9 spaced, narroz							8m: JT | (undulating, rough, clean	
					73.2m:...BCM - disseminated carbonaceous flecws	MW		100	| y	6y		8.3| m: JT 0(undulating, rough, clean	
					73.9m to 73.3m:...BCM Banding							8.4| m: JT 2(stepped, rough, clean	
												8.6m: JT 30(stepped, rough, clean	
		y										8.ym: DB	
SPT					**5m:** NO RECOVERY		ym: SPT 4,10// 30,20 N = | 0+	0					
PQ3	30			EWi	**53.58m:** Moderatel9 z eathered) darwgre9) SANDSTONE and SILTSTONE. SANDSTONE darwgre9) normall9-graded, fine to medium-grained SANDSTONE, ver9 z eaw, poorl9 cemented. SILTSTONE is moderatel9 thicwbeds of moderatel9 z eathered, darwgre9 SILTSTONE, ver9 z eaw. Defects are closel9 spaced, narroz .	MW		100	73	80		y.27m to y.6m: DB 8| (undulating, rough, clean	
		10										y.7| m: DB 20(undulating, rough, clean	

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100k circulation loss at 1.4m
Casing - 2m PW
Bacwfill information not provided, assumed grout bacwfill betz een vibrating z ire pie5ometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
1\| /03/2023 4:36:00 PM q4.00m q2 m
16/03/2023 8:34:00 AM q4.00m q1 m
16/03/2023 1:40:00 PM q13.\| 0m q1.1 m
20/03/2023 8:00:00 AM q13.\| 0m q2.1 m
20/03/2023 4:10:00 PM q30.00m q2.\| m
21/03/2023 7:30:00 AM q30.00m q2.\| m
21/03/2023 4:30:00 PM q40.\| 0m q1.44 m
22/03/2023 7:\| 0:00 AM q40.\| 0m q1.0\| m
22/03/2023 2:\| \| :00 PM q\| 0.1\| m q3.y8 m

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Client: **Muckland Light Rail Ltd**
Pro°ect: **Muckland Light Rail**
Location: **Z2 - aint Mlbans Mvenue**
Pro°ect Reference: **- tage 1 Ground Einvestigation**

4 H1S09M

Sheet **Z** of **11**

4 BROHBLOE FBRNMTBI	**ABGBRDE MTO- : I . TNS000**	Date started: 1| /03/2023	Logged b9: CJ/DY/WM
Method: Rotar9 Core Wireline	Easting: 17| | | yy.07m	Date completed: 23/03/2023	Input b9: CJ
Ej uipment: Massen5a MI4	Northing: | y167| 8.6| m	Inclination: -y0(	Checwed b9: SBN
Contractor: McMillan Drilling	Reduced level: 3y.| 0m	A5imuth: 0(	Reviez ed b9: PK

Method	R.L. xm%	Length xm%	Graphic Log	La9er Code	Material Description	Weathering/USC	Testing	TCR xx %	SCR xx %	RQD xx %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraph9 Defect Description Additional Notes	Installation
PQ3				EWi	**53 8m:** Moderatel9 z eathered) darwgre9) SANDSTONE and SILTSTONE. SANDSTONE darwgre9) normall9-graded, fine to medium-grained SANDSTONE, ver9 z eaw poorl9 cemented. SILTSTONE is moderatel9 thicwbeds of moderatel9 z eathered, darwgre9 SILTSTONE, ver9 z eaw Defects are closel9 spaced, narroz .	MW		100	73	80			
	2y			EWs	**102m:** Moderatel9 z eathered) darwgre9) normall9 graded, fine to medium-grained SANDSTONE. Weaw poorl9 cemented. Defects are ver9 closel9 spaced	MW						10.6m: DB ^ (undulating, rough, clean 10.7m to 10.8| m: JT 8| (undulating, rough, clean	
		11		EW5	**103m:** Moderatel9 z eathered) darwgre9, thinl9 laminated SILTSTONE. Ver9 z eaw Defects are ver9 closel9 spaced	MW						10.8 m: JT | (undulating, rough, clean	
PQ3	28			EWs	**113m:** Moderatel9 z eathered, darwgre9, normall9 graded, fine to medium SANDSTONE. ver9 z eaw poorl9 cemented. Defects are closel9 spaced, narroz **113 9m to 113 8m:**...200mm thicwbed of moderatel9 z eathered SILTSTONE. ver9 z eaw **113 5m to 1S3 69m:**...3| 0mm bed of moderatel9 z eathered SILTSTONE. Ver9 z eaw	MW		100	47	63		11.6| m: JT 7| (undulating, rough, clean	
		12		EU5	**1S2 2m:** Slightl9 z eathered) darwgre9) SILTSTONE) z eaw Defects are closel9 spaced. **1S3 69m:**...BCM Banding	SW		100	| 2	| 6			
PQ3	27			EUi	**1S3 79m:** Slightl9 z eathered) darwgre9) int rbedded SANDSTONE and SILTSTONE. SANDSTONE normall9 graded, fine to medium-grained SANDSTONE) z eaw poorl9 cemented. SILTSTONE is moderatel9 thin beds of slightl9 z eathered) darwgre9) SILTSTONE) z eaw Defects are ver9 closel9 spaced **1Z3 2m to 1Z3 2m:**...100mm thicwbed of slightl9 z eathered SILSTONE, z eaw	SW							
	26	13			**1Z3 89m to 1Z3 79m:**...100mm thicwbed of slightl9 z eathered SILTSTONE) ver9 z eaw								
		14		EU5	**12m:** Slightl9 z eathered, darwgre9, thinl9 laminated SILTSTONE. Weaw Defects are closel9 spaced	SW						13.ym: BP 7(20mm cla9 seam	
PQ3	2|			EUs	**123m:** Slightl9 z eathered, darwgre9, normall9-graded, fine to medium SANDSTONE. Weaw moderatel9 cemented. Defects are closel9 spaced. **123 9m to 123 8m:**...2| 0mm thicwbed of slightl9 z eathered SILTSTONE, z eaw **123 7m:**...Sedimentar9 floz structure containing BCM	SW		100	0	60		14.1m: JT 1| (undulating, rough, clean Drill breawparallel to bedding plane 14.2m: JT 10(undulating, rough, clean Drill breawparallel to bedding plane 14.3m: BP 2(undulating, rough, clean Drill breawparallel to bedding plane 14.| m: BP 4(undulating, rough, clean Drill breawparallel to bedding plane	
		1|										

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100k circulation loss at 1.4m
Casing - 2m PW
Bacwfill information not provided, assumed grout bacwfill betz een vibrating z ire pie5ometer depths.

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21/03/2023 4:30:00 PM q40.\| 0m q1.44 m
22/03/2023 7:\| 0:00 AM q40.\| 0m q1.0\| m
22/03/2023 2:\| \| :00 PM q\| 0.1\| m q3.y8 m

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Pro°ect: **Muckland Light Rail**
Location: **Z2 - aint MIbans Mvenue**
Pro°ect Reference: **- tage 1 Ground Einvestigation**

4 H1S09M

Sheet **2** of **11**

4 BROHBLOE FBRNMTBI	**ABGBRDE MTO- : I . TNS000**	Date started: 1| /03/2023	Logged b9: CJ/DY/WM
Method: Rotar9 Core Wireline	Easting: 17| | yy.07m	Date completed: 23/03/2023	Input b9: CJ
Ej uipment: Massen5a MI4	Northing: | y167| 8.6| m	Inclination: -y0(	Checwed b9: SBN
Contractor: McMillan Drilling	Reduced level: 3y.| 0m	A5imuth: 0(	Reviez ed b9: PK

Method	R.L. xm%	Length xm%	Graphic Log	Laoer Code	Material Description	Weathering/USC	Testing	TCR xx %	SCR xx %	RQD xx %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraph9 Defect Description Additional Notes	Installation
PQ3					**19m:** CORE LOSS								
	24			EUs	**193Sm:** Slightl9 z eathered, darwgre9, normall9 graded, fine to medium SANDSTONE. Weaw moderatel9 cemented. Defects are closel9 spaced, narroz **193 9m:**...Rip up clasts of SILTSTONE, sub-angular **193 8m to 193 7m:**...100mm thicwbed of slightl9 z eathered SILTSTONE, z eaw	SW		87	| 0	63		1| .6m: BP 10(undulating, rough, clean Drill breawpara lel to bedding plane 1| .78m: BP 1| (stepped, rough, clean Drill bre wparallel to bedding plane 1| .8| m: DB 0(planar, rough, clean Drill breawparallel to bedding plane	
	16			EU5	**163 5m:** Slightl9 z eathered, darwgre9, SILTSTONE. Weaw Defects are closel9 spaced, narroz **163 Sm:**...Sedimentar9 floz structure containing BCM - dip 20	SW						16.1m: BP 10(planar, rough, veneer, xnfill: calcite% Drill breawparallel to bedding plane	
PQ3	23											16.| | m: BP | (stepped, rough, clean Drill breawparallel to bedding plane	
	17			EUs	**163 5m:** Slightl9 z eathered, darwgre9, normall9-graded fine to medium SANDSTONE. z eaw moderatel9 cemented. defects are closel9 spaced.	SW		100	37	6|		16.8| m to 17.3| m: JT 8| (undulating, rough, clean	
	22												
	18				**183 59m:** Slight 9 z eathered, da wgre9, moderatel9 inclined, thinl9 lami ated SILTSTONE. z eaw Defects are moderatel9 z idel9 spaced							18.1m: DB 0(	
PQ3	21				**173 59m:**...Sedimentar9 floz structure, breawage along structure			100	| 6	7y		18.2| m to 18.3m: DB 10(Drilling induced breawalong thin MUDSTONE bed 18.6m: JT 3| (undulating, rough, clean	
	1y			EU5		SW						1ym: JT 3| (stepped, rough, clean	
	20				**153 59m:**...Sedimentar9 floz structure containing BCM - dip 2|						1y.3m: JT | (stepped, rough, clean	
PQ3								100	67	7y			
	20												

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100k circulation loss at 1.4m
Casing - 2m PW
Bacwfill information not provided, assumed grout bacwfill betz een vibrating z ire pie5ometer depths.

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22/03/2023 7:\| 0:00 AM q40.\| 0m q1.0\| m
22/03/2023 2:\| \| :00 PM q\| 0.1\| m q3.y8 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

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Client: **Muckland Light Rail Ltd**
Pro°ect: **Muckland Light Rail**
Location: **Z2 - aint Mlbans Mvenue**
Pro°ect Reference: **- tage 1 Ground Einvestigation**

4 H1S09M

Sheet **9** of **11**

4 BROHBLOE FBRNMTBI	**ABGBRDE MTO- : I . TNS000**	Date started: 1| /03/2023	Logged b9: CJ/DY/WM
Method: Rotar9 Core Wireline	Easting: 17|		yy.07m	Date completed: 23/03/2023	Input b9: CJ
Ej uipment: Massen5a MI4	Northing:	y167| 8.6| m	Inclination: -y0(	Checwed b9: SBN
Contractor: McMillan Drilling	Reduced level: 3y.| 0m	A5imuth: 0(	Reviez ed b9: PK

Method	R.L. xm%	Length xm%	Graphic Log	Laoer Code	Material Description	Weathering/USC	Testing	TCR xx %	SCR xx %	RQD xx %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraph9 Defect Description Additional Notes	Installation
PQ3	1y	21		EU5	**18359m:** Slightl9 z eathered, darwgre9, moderatel9 inclined, thinl9 laminated SILTSTONE. z eaw. Defects are moderatel9 z idel9 spaced **S031m:**...Soft sediment deformation structure - Load castsZ **S0399m to S0369m:**...100mm thicw steepl9 inclined bed of slightl9 z eathered SANDSTONE, z eaw **S035m:**...Sedimentar9 floz structure - dip 30	SW		100	67	7y		1y.y| m: DB	(planar, smooth, clean 20.3m: JT 4| (planar, smo th, veneer, xnfill: calcite% 20.6m: JT	(planar, smooth, clean 20.72m: JT 4| (undulating, rough, clean	
PQ3	18	22		EUs	**S132m:** Slightl9 z eathered, darwgre9, normall9 graded, fine to medium SANDSTONE. Weaw moderatel9 cemented. Defects are moderatel9 z idel9 spaced, narroz . **SS2Zm to SS29m:**...1| 0mm thicw moderatel9 inclined bed of slightl9 z eathered SILTSTONE, z eaw. Soft sediment deformation - convolute bedding **SS39m to SS36m:**...100mm thicw moderatel9 inclined bed of slighlt9 z eathered SILTSTONE, z eaw.	SW		100	63	7y		21.3| m: JT 30(planar, rough, clean 21.| m: JT 30(undulating, rough, clean 21.6m: JT 2| (undulating, rough, clean 21.7| m: JT 3| (planar, rough 22.2m: DB 1| (undulating, rough, clean 22.67m: BP 1| (stepped, rough, clean Drill breawparallel to bedding plane 22.7| m: BP 1| (undulating, rough, clean Drill breawparallel to bedding plane 22.8m: BP 10(stepped, rough, clean Drill breawparallel to bedding plane	
PQ3	16	24		EU5	**SZm:** Slig tl9 z eathered, darwgre9, laminated, moderatel9 inclined SILTSTONE. Weaw. Defects are moderatel9 z idel9 spaced. Soft sediment deformation present throughout - convolute bedding, and flame structures **SZ37m to S231m:**...300mm thicwbed of slightl9 z eathered, normall9 graded, fine to medium SANDSTONE, z eaw.	SW		100		71		23.2m: DB 0(24.0| m to 24.4m: DB ?one of DB	
PQ3	1							87	71	7		24.6	m to 24.7	m: JT 7	(undulating, smooth, clean 24.8m to 2	.1	m: DB ?one of DB	

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TCR, SCR, and RQD measurements to be revised.
100k circulation loss at 1.4m
Casing - 2m PW
Bacwfill information not provided, assumed grout bacwfill betz een vibrating z ire pie5ometer depths.

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21/03/2023 7:30:00 AM q30.00m q2.| m
21/03/2023 4:30:00 PM q40.| 0m q1.44 m
22/03/2023 7:| 0:00 AM q40.| 0m q1.0| m
22/03/2023 2:| | :00 PM q| 0.1| m q3.y8 m

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Location: **Z2 - aint MIbans Mvenue**
Pro°ect Reference: **- tage 1 Ground Einvestigation**

4 H1S09M

Sheet **6** of **11**

4 BROHBLOE FBRNMTBI	**ABGBRDE MTO- : I . TNS000**	Date started: 1| /03/2023	Logged b9: CJ/DY/WM
Method: Rotar9 Core Wireline	Easting: 17| | | yy.07m	Date completed: 23/03/2023	Input b9: CJ
Ej uipment: Massen5a MI4	Northing: | y167| 8.6| m	Inclination: -y0(	Checwed b9: SBN
Contractor: McMillan Drilling	Reduced level: 3y.| 0m	A5imuth: 0(	Reviez ed b9: PK

Method	R.L. xm%	Length xm%	Graphic Log	La9er Code	Material Description	Weathering/USC	Testing	TCR xx %	SCR xx %	RQD xx %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraph9 Defect Description Additional Notes	Installation
PQ3	14			EU5	**SZm:** Slightl9 z eathered, darwgre9, laminated, moderatel9 inclined SILTSTONE. Weaw Defects are moderatel9 z idel9 spaced. Soft sediment deformation present throughout - convolute bedding, and flame structures	SW		87	71	7|			
					S92m: CORE LOSS								
PQ3	13	26		EU5	**S93m:** Slightl9 z eathered, darwgre9, laminated, moderatel9 inclined, SILTSTONE. z eaw Defects are closel9 spaced.	SW						2| .| m to 2| .7m: JT | (planar, rough, veneer, xinfill: 5 olite%	
				EUs	**S97m:** Slightl9 z eathered, darwgre9, normal9 graded, medium SANDSTONE. Weaw moderatel9 cemented. Defects are closel9 spaced, narroz	SW		100	22	74		2| .7| m: JT | (undulating, rough, veneer, xinfill: 5eolite%	
					S629m to S8m:...E; remel9 closel9 spaced °ointing							26m: JT | (undulating, rough, coating, xinfill: 5eolite%Browen along bedding plane	
PQ3	12	27		EU5	**S8m:** Slightl9 z eathered, darwgre9, laminated, m derat l9 inclined, SILTSTONE. z eaw Defects are closel9 sp ced. Presence of soft sediment deformation - flame structure	SW						26.7m: JT 1| (undulating, rough, clean	
					S83m: CORE LOSS								
PQ3	11	28		EUs	**S82m:** Slightl9 z eathered, darwgre9, fine to medium SANDSTONE) e; tremel9 z eaw er9 poorl9 cemented. Defects are e; tremel9 closel9 spaced. P esence of BCM Recovered as angular, coarse gravel) darwgre9) dense) moist, non-plastic. GRAVEL is slightl9 z eatheredSANDSTONE.	SW							
					S83m: Slightl9 z eathered darwgre9, normall9-graded, fine to medium SANDSTONE. Ver9 z eaw poorl9 cemented. Defects are close 9 spaced.	SW		y3	28	44		28.1m: JT 3| (undulating, rough, clean	
				EU5	**S73m:** Slightl9 z eathered darwgre9, SILTSTONE. E; tremel9 z eaw Defects are e; tremel9 closel9 spaced.	SW							
				EUi	Recovered as angular coarse GRAVEL) darwgre9) dense) moist. GRAVEL is unz eathered SILTSTONE.	SW							
PQ3	10	2y		EU5	**S72m:** Slightl9 z eathered, darwgre9, normall9-graded, fine to medium SANDSTONE. Ver9 z eaw poorl9 cemented. Defects are moderatel9 z idel9 spaced. **S73m:** Slightl9 z eathered, darwgre9, moderatel9 thin bedded, steepl9 inclined SILTSTONE. Ver9 z eaw Defects are z idel9 spaced, narroz	SW						28.6m: JT 6| (planar, rough, clean 28.7m to 2y.3| m: JI 7| (xinfill: calcite%	
					S53m to S52m:...Healed °oint z ith calcite infill			100	40	7y			
				EUs	**S52m:** Slightl9 z eathered, darwgre9, normall9-graded, fine to medium SANDSTONE. Ver9 z eaw poorl9 cemented. Defects are moderatel9 z idel9 spaced. **S59m:**...BCM Banding - dip 2|	SW						2y.6m: JT 2| (undulating, rough, clean	
		30											

REMARKS:
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100k circulation loss at 1.4m
Casing - 2m PW
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22/03/2023 2:\| \| :00 PM q\| 0.1\| m q3.y8 m

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Location: **Z2 - aint Mlbans Mvenue**
Pro°ect Reference: **- tage 1 Ground Einvestigation**

4 H1S09M

Sheet **8** of **11**

4 BROHBLOE FBRNMTBI	**ABGBRDE MTO- : I . TNS000**	Date started: 1| /03/2023	Logged b9: CJ/DY/WM
Method: Rotar9 Core Wireline	Easting: 17|		yy.07m	Date completed: 23/03/2023	Input b9: CJ
Ej uipment: Massen5a MI4	Northing:	y167| 8.6| m	Inclination: -y0(	Checwed b9: SBN
Contractor: McMillan Drilling	Reduced level: 3y.| 0m	A5imuth: 0(	Reviez ed b9: PK

Method	R.L. xm%	Length xm%	Graphic Log	Lager Code	Material Description	Weathering/USC	Testing	TCR xx %	SCR xx %	RQD xx %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraph9 Defect Description Additional Notes	Installation
PQ3	y			EUs	**S532m:** Slightl9 z eathered, darwgre9, normall9-graded, fine to medium SANDSTONE. Ver9 z eaw poorl9 cemented. Defects are moderatel9 z idel9 spaced.	SW							
					Z039m: Slightl9 z eathered, darwgre9, MUDSTONE. Ver9 z eaw Defects are moderatel9 z idel9 spaced. Bedding dip of 10 degrees								
		31		EU5	**Z038m:**...100mm thicw5one of brecciated mudstone z ith intense calcite veining. 20mm penetration into overl9inh sandstone bed	SW		100	| 0	| 6		30.7m to 30.8m: JI 2| (Healed fracture 5one, z ith calcite	
	8												
PQ3				EUs	**Z139m:** Slightl9 z eathered, darwgre9, normall9 graded, fine to medium SANDSTONE. z eaw moderatel9 cemented. Defects are moderatel9 z idel9 spaced.	SW						31.| m to 31.8m: JT 80(stepped, rough, clean DBxZ%	
					Z136m to Z137m:...200mm thicwbed of slightl9 z eathered SANDSTONE, ver9 z eaw BCM banding - dip of 30								
					Z137m: Slightl9 z eathered, darwgre9, SILTSTONE. Ver9 z eaw Defects are moderatel9 z idel9 spaced.	SW						31.8m: JT 30(undulating, rough, clean	
		32			**ZSm:** Slightl9 z eathered, darwgre9, MUDSTONE. Ver9 z eaw Defects are moderatel9 z idel9 spaced.	SW						31.ym: DB	
					ZS319m: Slightl9 z eathered, darwgre9, SILTSTONE. Ver9 z eaw Defects are moderatel9 z idel9 spaced.			100	2y	| 6		32.2m: JT 1| (stepped, rough, veneer, xnfill: 5eolite%	
	7				**ZS399m:**...BCM Banding	SW							
					ZS36m to ZZm:...400mm thicwbed of slightl9 z eathered, SANDSTONE, ver9 z eaw							32.7m: JT 70(undulating, rough, clean	
		33											
PQ3				EU5	**ZZ31m:** Slight 9 z eathered, darwgre9, interbedded SILTSTONE and MUDSTONE. SILTSTONE is slightl9 z eathered, darwgre9, SILTSTONE, ver9 z eaw MUDSTONE is slightl9 z eathe ed, darwgre9, MUDSTONE, ver9 z eaw Soft sediment deforma ion - convolute bedding of SILTSTONE and MUDSTONE blacwcarbonaceous laminations.			100	63	67			
	6												
		34			**ZZ359m:**...Healed °oint z ith calcite infill	SW							
					Z23Sm:...Sedimentar9 floz structures containing BCM								
	—												
PQ3								100	0	47			
		3|										

REMARKS:
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TCR, SCR, and RQD measurements to be revised.
100k circulation loss at 1.4m
Casing - 2m PW
Bacwfill information not provided, assumed grout bacwfill betz een vibrating z ire pie5ometer depths.

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20/03/2023 8:00:00 AM q13.| 0m q2.1 m
20/03/2023 4:10:00 PM q30.00m q2.| m
21/03/2023 7:30:00 AM q30.00m q2.| m
21/03/2023 4:30:00 PM q40.| 0m q1.44 m
22/03/2023 7:| 0:00 AM q40.| 0m q1.0| m
22/03/2023 2:| | :00 PM q| 0.1| m q3.y8 m

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Client: **Muckland Light Rail Ltd**
Pro°ect: **Muckland Light Rail**
Location: **Z2 - aint Mlbans Mvenue**
Pro°ect Reference: **- tage 1 Ground Einvestigation**

4 H1S09M

Sheet **7** of **11**

4 BROHBLOE FBRNMTBI	**ABGBRDE MTO- : I . TNS000**	Date started: 1| /03/2023	Logged b9: CJ/DY/WM
Method: Rotar9 Core Wireline	Easting: 17|		yy.07m	Date completed: 23/03/2023	Input b9: CJ
Ej uipment: Massen5a MI4	Northing:	y167| 8.6| m	Inclination: -y0(	Checwed b9: SBN
Contractor: McMillan Drilling	Reduced level: 3y.| 0m	A5imuth: 0(	Reviez ed b9: PK

Method	R.L. xm%	Length xm%	Graphic Log	La9er Code	Material Description	Weathering/USC	Testing	TCR xx %	SCR xx %	RQD xx %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraph9 Defect Description Additional Notes	Installation
PQ3	4	36		EU5	**ZZ3 1m:** Slightl9 z eathered, darwgre9, interbedded SILTSTONE and MUDSTONE. SILTSTONE is slightl9 z eathered, darwgre9, SILTSTONE, ver9 z eaw. MUDSTONE is slightl9 z eathered, darwgre9, MUDSTONE, ver9 z eaw. Soft sediment deformation - convolute bedding of SILTSTONE and MUDSTONE, blacwcarbonaceous laminations. **Z93 1m to Z93Zm:**...200mm thicwbed of slightl9 z eathered, SANDSTONE, ver9 z eaw.	SW		100	0	47		3| .8 m: JT 4| (undulating, rough, clean 36m: JT 3| (undulating, rough, clean	
PQ3	3	37						100	0	43		36.7m: JT 80(stepped, smooth, clean	
PQ3	2	38		EUs	**Z83Sm:** Slightl9 z eathered, darwgre9, normall9 graded, fine to medium SANDSTONE. E; tremel9 z eaw, poorl9 cemented xRecovered as coarse, angular, GRAVEL, darwgre9. Dense, moist.%	SW						37.| 4m: BP 1| (37.66m: BP 2| (37.8m: JT 70(undulating, rough, clean	
PQ3	1	3y		EU5	**Z7m:** Slightl9 z eathered, darwgre9, intermi; ed SILTSTONE and MUDSTONE. Weaw Defects are moderatel9 z idel9 spaced. Irregular soft-sediment deformation structures - load casts, slump structures, bioturbation, and silt laminae.	SW		100	0	60		38.07m: JT 6| (stepped, smooth, clean 38.1m: JT 6| (undulating, smooth, clean 38.21m: JT 30(undulating, smooth, clean 38.24m: JT 40(undulating, smooth, clean 38.37m: JT 60(stepped, smooth, clean	
PQ3	0	40			**Z5m:**...SILTSTONE and MUDSTONE ver9 z eaw. **Z53Sm:**...BCM bedding - Dip 3|			67	0	41		38.ym: BP 10(stepped, smooth, clean 3y.3m: BP	0(Base of siltstone bed. closed	

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100k circulation loss at 1.4m
Casing - 2m PW
Bacwfill information not provided, assumed grout bacwfill betz een vibrating z ire pie5ometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
1| /03/2023 4:36:00 PM q4.00m q2 m
16/03/2023 8:34:00 AM q4.00m q1 m
16/03/2023 1:40:00 PM q13.| 0m q1.1 m
20/03/2023 8:00:00 AM q13.| 0m q2.1 m
20/03/2023 4:10:00 PM q30.00m q2.| m
21/03/2023 7:30:00 AM q30.00m q2.| m
21/03/2023 4:30:00 PM q40.| 0m q1.44 m
22/03/2023 7:| 0:00 AM q40.| 0m q1.0| m
22/03/2023 2:| | :00 PM q| 0.1| m q3.y8 m

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Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARY V2.GLB Template: DATA TEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland LIGHT RAIL
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Client: **Muckland Light Rail Ltd**
Pro°ect: **Muckland Light Rail**
Location: **Z2 - aint Mlbans Mvenue**
Pro°ect Reference: **- tage 1 Ground Einvestigation**

4 H1S09M

Sheet **5** of **11**

4 BROHBLOE FBRNMTBI	**ABGBRDE MTO- : I . TNS000**	Date started: 1| /03/2023	Logged b9: CJ/DY/WM
Method: Rotar9 Core Wireline	Easting: 17|		yy.07m	Date completed: 23/03/2023	Input b9: CJ
Ej uipment: Massen5a MI4	Northing:	y167| 8.6| m	Inclination: -y0(	Checwed b9: SBN
Contractor: McMillan Drilling	Reduced level: 3y.| 0m	A5imuth: 0(	Reviez ed b9: PK

Method	R.L. xm%	Length xm%	Graphic Log	Lager Code	Material Description	Weathering/USC	Testing	TCR xx %	SCR xx %	RQD xx %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraph9 Defect Description Additional Notes	Installation
PQ3	-1				**20m:** CORE LOSS			67	0	41			
PQ3		41		EU5	**203 9m:** Slightl9 z eathered, darwgre9, intermi; ed SILTSTONE and MUDSTONE. Weaw Defects are moderatel9 z idel9 spaced. Soft sediment deformation structures- convolute bedding, and **203 8m:**...Sandstone load cast z ith z av9 silt laminae	SW		100	83	83			
PQ3	-2	42		EUs	**213 1m:** Slightl9 z eathered, darwgre9, normall9 graded, fine to medium SANDSTONE. z eaw moderatel9 cemented. Defects are moderatel9 z idel9 spaced. **2Sm:**...Sandstone load cast z ith z av9 silt laminae	SW							
PQ3	-3			EU5	**2S3 1m:** Slightl9 z eathered, darwgre9, SILTSTONE. Ver9 z eaw Defects are moderatel9 z idel9 spaced Soft sediment deformation - blacwcarbonaceous material deposited in convolute bedding.	SW						42.3m: DB 6(Browen along bedding plane	
PQ3	-4	43		EUs	**2S3 89m:** Slightl9 z eathered darwgre9, normall9 graded, fine SANDSTONE. Weaw Defects are mode atel9 z idel9 spaced. Soft sediment deformation - BCM in convolute bedding, load castsxZ%			100	60	83		43.1| m: BP 0(	
PQ3	-				**2Z 79m to 2Z 89m:**...100mm thicwbed of slightl9 z eathered, SILTSTONE, z eaw	SW						43.6m: DB	
		44										44m: BP 0(	
												44.1m: DB 0(stepped, smooth, clean	
					223 89m to 223 Zm:...| 0mm thicwbed of slightl9 z eathered SILTSTONE, ver9 z eaw			y0	63	63		44.3m: JI		(xInfill: calcite%	
		4											

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100k circulation loss at 1.4m
Casing - 2m PW
Bacwfill information not provided, assumed grout bacwfill betz een vibrating z ire pie5ometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
1| /03/2023 4:36:00 PM q4.00m q2 m
16/03/2023 8:34:00 AM q4.00m q1 m
16/03/2023 1:40:00 PM q13.| 0m q1.1 m
20/03/2023 8:00:00 AM q13.| 0m q2.1 m
20/03/2023 4:10:00 PM q30.00m q2.| m
21/03/2023 7:30:00 AM q30.00m q2.| m
21/03/2023 4:30:00 PM q40.| 0m q1.44 m
22/03/2023 7:| 0:00 AM q40.| 0m q1.0| m
22/03/2023 2:| | :00 PM q| 0.1| m q3.y8 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARY V2.GLB Template: DATA TEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

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Client: **Muckland Light Rail Ltd**
Pro°ect: **Muckland Light Rail**
Location: **Z2 - aint Mlbans Mvenue**
Pro°ect Reference: **- tage 1 Ground Einvestigation**

4 H1S09M

Sheet **10** of **11**

4 BROHBLOE FBRNMTBI	**ABGBRDE MTO- : I . TNS000**	Date started: 1| /03/2023	Logged b9: CJ/DY/WM
Method: Rotar9 Core Wireline	Easting: 17| | yy.07m	Date completed: 23/03/2023	Input b9: CJ
Ej uipment: Massen5a MI4	Northing: | y167| 8.6| m	Inclination: -y0(	Checwed b9: SBN
Contractor: McMillan Drilling	Reduced level: 3y.| 0m	A5imuth: 0(	Reviez ed b9: PK

Method	R.L. xm%	Length xm%	Graphic Log	La9er Code	Material Description	Weathering/USC	Testing	TCR xx %	SCR xx %	RQD xx %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraph9 Defect Description Additional Notes	Installation
PQ3	-6			EUs	**2S3 39m:** Slightl9 z eathered, darwgre9, normall9 graded, fine SANDSTONE. Weaw Defects are moderatel9 z idel9 spaced. Soft sediment deformation - BCM in convolute bedding, load castsxZ% **29m to 293 19m:**...1| 0mm thicwbed of slightl9 z eathered SILTSTONE, z eaw	SW							
PQ3	-7	46		EU5	**293 29m:** Slightl9 z eathered, darwgre9, SILTSTONE. Ver9 z eaw Defects are moderatel9 z idel9 spaced. Soft sediment deformation - convolute bedding, flame structures	SW		100	67	73		4| .| m: BP 0(4| .7m: BP | (	
PQ3	-8	47		EUs	**263 9m:** Slightl9 z eathered, darwgre9, normall9 graded, fine SANDSTONE. Weaw Defects are moderatel9 z idel9 spaced. **263 8m to 263 5m:**...200mm thicwbed of slightl9 z eathered, SILTSTONE, z eaw Soft sediment deformation - flame structures	SW		100	80	100		46.6m: JT 30(planar, rough, clean 46.y| m: DB 47.0| m: DB 0(stepped, smooth, clean 47.14m: DB 0(undulating, smooth, clean	
PQ3	-y	48		EU5	**27 3m:** Slig tl9 z eathered, darwgre9, SILTSTONE. Ver9 z eaw Defects are modera el9 z idel9 spaced. **273m to 252Zm:**...Soft sediment deformation - convolute bedding, load cast, flame structures	SW		100	100	100			
PQ3	-10	4y		EUi	**252m:** Slightl9 z eathered, darwgre9, intermi; ed SANDSTONE and SILTSTONE/MUDSTONE. SANDSTONE is uniforml9 graded, fine SANDSTONE, z eaw SILTSTONE/MUDSTONE is slightl9 z eathered, darwgre9, SILTSTONE/MUDSTONE, ver9 z eaw Defects are moderatel9 z idel9 spaced. Soft sediment deformation - load casts, z ith silt laminae, sandstone in°ectites in siltstone/mudstone.	SW		100	100	100		4y.2| m: DB 4y.4m: BP 0(4y.6m: JT | | (planar, rough, clean	
		| 0											

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100k circulation loss at 1.4m
Casing - 2m PW
Bacwfill information not provided, assumed grout bacwfill betz een vibrating z ire pie5ometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
1\| /03/2023 4:36:00 PM q4.00m q2 m
16/03/2023 8:34:00 AM q4.00m q1 m
16/03/2023 1:40:00 PM q13.\| 0m q1.1 m
20/03/2023 8:00:00 AM q13.\| 0m q2.1 m
20/03/2023 4:10:00 PM q30.00m q2.\| m
21/03/2023 7:30:00 AM q30.00m q2.\| m
21/03/2023 4:30:00 PM q40.\| 0m q1.44 m
22/03/2023 7:\| 0:00 AM q40.\| 0m q1.0\| m
22/03/2023 2:\| \| :00 PM q\| 0.1\| m q3.y8 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

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Client: **Muckland Light Rail Ltd**
Pro°ect: **Muckland Light Rail**
Location: **Z2 - aint MIbans Mvenue**
Pro°ect Reference: **- tage 1 Ground Einvestigation**

4 H1S09M

Sheet **11** of **11**

4 BROHBLOE FBRNMTEBI	**ABGBRDE MTO- : I . TNS000**	Date started: 1| /03/2023	Logged b9: CJ/DY/WM
Method: Rotar9 Core Wireline	Easting: 17|		yy.07m	Date completed: 23/03/2023	Input b9: CJ
Ej uipment: Massen5a MI4	Northing:	y167| 8.6| m	Inclination: -y0(	Checwed b9: SBN
Contractor: McMillan Drilling	Reduced level: 3y.| 0m	A5imuth: 0(	Reviez ed b9: PK

Method	R.L. xm%	Length xm%	Graphic Log	La9er Code	Material Description	Weathering/USC	Testing	TCR ** %	SCR ** %	RQD ** %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraph9 Defect Description Additional Notes	Installation
PQ3				EUi		SW		100	100	100			

End of borehole at | 0.1| m xTermination Depth Achieved%

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100k circulation loss at 1.4m
Casing - 2m PW
Bacwfill information not provided, assumed grout bacwfill betz een vibrating z ire pie5ometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
1| /03/2023 4:36:00 PM q4.00m q2 m
16/03/2023 8:34:00 AM q4.00m q1 m
16/03/2023 1:40:00 PM q13.| 0m q1.1 m
20/03/2023 8:00:00 AM q13.| 0m q2.1 m
20/03/2023 4:10:00 PM q30.00m q2.| m
21/03/2023 7:30:00 AM q30.00m q2.| m
21/03/2023 4:30:00 PM q40.| 0m q1.44 m
22/03/2023 7:| 0:00 AM q40.| 0m q1.0| m
22/03/2023 2:| | :00 PM q| 0.1| m q3.y8 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Gribblehirst Park, Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH1206

Sheet **1** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1755026.67m
Northing: 5917029.72m
Reduced level: 34.33m

Date started: 23/02/2023
Date completed: 3/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ/WM
Input by: CJ/WM
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	34				**0m:** HYDROVAC			0	0	0		**0m: FILL**	
PQ3	33	1		VUb	**0.5m:** Slightly weathered. dark grey, vesicular BASALT; strong; moderately widely spaced, narrow. Rare vesicules, 2-5mm in diameter, very soft clay infill.	SW		100	75	93		**0.5m: AVF** 0.6m: JT 35° planar, rough, coating, (Infill: clay Very soft <5mm)	
					1.4m:...Vesicules becomes more common and larger in diameter **1.55m:**...Vesicules infilled by very soft brown clay							1m: JT 25° planar, rough, coating, (Infill: clay Very soft) 1.1m: JT 30° undulating, rough, coating, (Infill: clay Very soft) 1.5m to 1.6m: CZ (Infill: clay Very soft) top dip 15, bot dip 35, angular medium to coarse, subangular, gravel; clast supported, in v. soft, brown CLAY 1.65m: JT 25° undulating, rough, coating, (Infill: clay Very soft) 1.8m: JT 15° undulating, rough, coating, (Infill: clay Very soft) 1.8m to 2.12m: JT 80° undulating, rough, coating, (Infill: zeolite)	
PQ3	32	2			**2m:** Unweathered, dark grey, vesicular BASALT; strong moderately widely spaced, narrow. common vesicul s, 10-20mm diameter, 25-30 degrees alignment. clean. **2.1m:**...Vesicules becomes very commona and clean			100	83	85		1.8m: JT 15° undulating, rough, coating, (Infill: clay Very soft) 1.8m to 2.12m: JT 80° undulating, rough, coating, (Infill: zeolite) 1.8m: JT 15° undulating, rough, coating, (Infill: clay Very soft) 1.8m to 2.12m: JT 80° undulating, rough, coating, (Infill: zeolite) 1.9m: JT 80° undulating, rough, coating, (Infill: zeolite) brownish yellow 2.2m: JT 25° undulating, rough, veneer, (Infill: clay Very soft)	
												2.8m: JT 35° undulating, rough, coating, (Infill: clay Very soft) 2.9m: JT 10° undulating, rough, veneer, (Infill: clay Very soft) 3m to 3.3m: JT 75° undulating, rough, veneer, (Infill: clay Very soft) 3.15m: JT 75° undulating, rough, veneer, (Infill: clay Very soft) brownish yellow	
PQ3	31	3				UW							
					3.8m:...Large vesicule of 35mm			100	90	90		3.7m: JT 15° undulating, rough, clean 3.9m: JT 15° undulating, rough, coating, (Infill: clay Very soft)	
	30	4			**4.2m:**...Large vesicule 100mm							4.1m: JT 35° stepped, rough, clean 4.2m: JT 30° stepped, rough, coating, (Infill: clay Very soft)	
PQ3					**4.5m:**...Vesicules become <2mm **4.6m:**...Large vesicule 40mm			100	100	100		4.4m: JT 15° undulating, rough, veneer, (Infill: zeolite) 4.8m: JT 35° planar, rough, veneer, (Infill: zeolite)	
		5											

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100% circulation loss at 1.4m
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):

Date Time	Hole Depth	Water Level
10/02/2023 7:30:00 AM	43.50m	2.2 m
24/02/2023 3:45:00 PM	18.00m	1.4 m
27/02/2023 8:00:00 AM	18.00m	0 m
27/02/2023 5:00:00 PM	31.60m	3.2 m
28/02/2023 8:00:00 AM	31.60m	2.8 m
28/02/2023 1:00:00 PM	39.00m	2.5 m
28/02/2023 5:00:00 PM	43.50m	2.5 m
1/03/2023 7:30:00 AM	43.50m	2.5 m
1/03/2023 12:50:00 PM	50.50m	2.5 m
1/03/2023 4:50:00 PM		
1/03/2023 6:50:00 PM		

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Gribblehirst Park, Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH1206

Sheet **2** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1755026.67m
Northing: 5917029.72m
Reduced level: 34.33m

Date started: 23/02/2023
Date completed: 3/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ/WM
Input by: CJ/WM
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	29	6		VUb	**5m:** Unweathered, dark grey, vesicular BASALT; strong; moderately widely spaced, narrow, clay or zeolite infill. Common vesicules are 10-25mm, 30 degrees alignment, clean.	UW		100	100	100		5.2m: JI 50° veneer, (Infill: zeolite) 5.3m: JI 45° veneer, (Infill: zeolite) 5.5m: JT 30° undulating, rough, coating, (Infill: zeolite) 5.75m: JT 40° planar, rough, coating, (Infill: clay Very soft)	
PQ3	28	7			**6.2m:**...Vesicules becoming more rare			100	20	72		6.2m: JT 35° undulating, rough, veneer, (Infill: zeolite) 6.3m: JT 25° undulating, rough, coating, (Infill: clay Very soft) 6.5m: JT 10° planar, rough, veneer, (Infill: zeolite) 6.56m: JT 30° planar, rough, coating, (Infill: zeolite) 6.75m: JT 40° planar, rough, coating, (Infill: zeolite) 6.85m: JT 30° planar, rough, coating, (Infill: zeolite) 6.9m to 7m: JT 75° undulating, rough, coating, (Infill: clay Very soft) 6.9m: JT 35° planar, rough, coating, (Infill: zeolite) 6.9m to 7m: JT 75° undulating, rough, coating, (Infill: clay Very soft) 6.9m: JT 35° planar, rough, coating, (Infill: zeolite) 6.9m to 7m: JT 75° undulating, rough, coating, (Infill: clay Very soft) 6.95m: JT 75° undulating, rough, coating, (Infill: clay Very soft) light yellow 7m: JT 5° planar, rough, clean 7.4m to 7.65m: JT 80° undulating, rough, veneer, (Infill: zeolite) 7.58m: JT 80° undulating, rough, veneer, (Infill: zeolite) light yellow 7.7m to 8.35m: JT 75° planar, rough, coating, (Infill: clay Very soft)	
PQ3	27	8										8m: JT 75° planar, rough, coating, (Infill: clay Very soft) light yellow 8.35m: JT 25° undulating, rough, clean	
PQ3	26	9						100	24	66			
PQ3	25	10			**9.3m:**...Fractures becoming closely spaced			100	20	65		9.3m: JT 10° undulating, rough, staining, (Infill: iron oxide) 9.4m: JT 15° undulating, rough, staining, (Infill: iron oxide) 9.7m to 9.8m: CZ (Infill: clay Very soft) 9.9m: JT 50° undulating, rough, staining,	

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100% circulation loss at 1.4m
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):

Date Time	Hole Depth	Water Level
10/02/2023 7:30:00 AM	43.50m	2.2 m
24/02/2023 3:45:00 PM	18.00m	1.4 m
27/02/2023 8:00:00 AM	18.00m	0 m
27/02/2023 5:00:00 PM	31.60m	3.2 m
28/02/2023 8:00:00 AM	31.60m	2.8 m
28/02/2023 1:00:00 PM	39.00m	2.5 m
28/02/2023 5:00:00 PM	43.50m	2.5 m
1/03/2023 7:30:00 AM	43.50m	2.5 m
1/03/2023 12:50:00 PM	50.50m	2.5 m
1/03/2023 4:50:00 PM		
1/03/2023 6:50:00 PM		

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland LIGHT RAIL
Bringing us closer
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Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Gribblehirst Park, Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH1206

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1755026.67m
Northing: 5917029.72m
Reduced level: 34.33m

Date started: 23/02/2023
Date completed: 3/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ/WM
Input by: CJ/WM
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	24	11		VUb	**10m:** Unweathered, dark grey, vesicular BASALT; strong, moderately widely spaced, narrow. Rare vesicules are 10-20mm in diameter, 30 degrees alignment, clean.	UW		100	20	65		(Infill: iron oxide) 10.1m: JT 50° undulating, rough, staining, (Infill: iron oxide) 10.15m: JT 5° undulating, rough, staining, (Infill: iron oxide) 10.2m: JT 10° undulating, rough, staining, (Infill: iron oxide) 10.3m: JT 5° planar, rough, clean 10.35m: JT 15° planar, rough, veneer, (Infill: zeolite) 10.4m: JT 10° planar, rough, coating, (Infill: clay Very soft) 10.45m: DB 10.6m: JT 20° undulating, rough, staining, (Infill: iron oxide) 10.7m: JT 20° undulating, rough, staining, (Infill: iron oxide) 10.75m: JT 5° undulating, rough, clean 10.9m: JT 30° planar, rough, veneer, (Infill: zeolite) 11.1m: JT 5° planar, rough, veneer, (Infill: zeolite) 11.2m: JT 50° planar, rough, staining, (Infill: iron oxide) 11.35m: JT 65° planar, rough, veneer, (Infill: zeolite) 11.65m: JT 30° planar, rough, coating, (Infill: zeolite) 11.7m: JT 65° undulating, rough, coating, (Infill: clay Very soft)	
PQ3	23	12						100	20	67			
PQ3	22	13						100	80	87		12.25m: JT 10° planar, rough, (Infill: clay Very soft) 12.7m: JT 35° planar, rough, (Infill: clay Very soft)	
PQ3	21	14		VUrb	**13.2m:** Unweathered; dark-grey, vesicular RUBBLY BASALT; moderately strong; extremely closely spaced, moderately wide. Recovered as clayey, angular coarse GRAVEL. Clast supported, very soft, brown, CLAY matrix. **13.4m:**...CLAY becomes green	UW						13.3m to 13.9m: CZ (Infill: clay Very soft)	
				VUv	**13.9m:** NO RECOVERY							13.9m: Possible void, drillers noted rod drop.	
PQ3	20			VUrb	**14.1m:** Unweathered; dark-grey, vesicular RUBBLY BASALT; moderately strong; extremely closely spaced, moderately wide. Recovered as clayey, angular coarse GRAVEL. Clast supported, very soft, brown, CLAY matrix.	UW		87	20	0		
PQ3		15		AYc	**14.7m:** Silty CLAY; dark brown, mottled orange and green; soft to firm; moist, plastic. Baked paleosol	CL		100				**14.7m: ALLUVIUM**	

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100% circulation loss at 1.4m
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):

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Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Gribblehirst Park, Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH1206

BOREHOLE INFORMATION
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Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1755026.67m
Northing: 5917029.72m
Reduced level: 34.33m

Date started: 23/02/2023
Date completed: 3/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ/WM
Input by: CJ/WM
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PUSHTUBE	19				**15m:** PUSH TUBE SAMPLE			0	0	0			
SPT		16		AYc	**15.5m:** CLAY some gravel; light brown; soft to firm; moist, plastic. Gravel is black carbonaceous material.	CL	15.5m: SPT 0,1// 1,1,2,2 N = 6	100	0	0			
PQ3	18				**16.2m:** CORE LOSS			49	0	0			
PUSHTUBE		17			**16.5m:** PUSH TUBE SAMPLE			0	0	0			
SPT	17			AYc	**17m:** Silty CLAY; light grey, mottled orange; firm; moist plastic.	CL	17m: SPT 0,0// 0,1,2,2 N = 5	100	0	0			
PQ3		18			**17.45m:** Silty CLAY; light brown, mottled grey; firm to stiff; moist, plastic	CL	18m: SPT 0,1// 2,2,1,2 N = 7	100	100	0			
SPT	16							100	0	0			
PQ3	15	19			**18.7m:** CLAY; brown to dark brown, mottled grey; firm; moist, plastic. Inclusions of black carbonaceous material and organic material (rootlets).	CL		100	100	0			
SPT		20			**19.5m:** CLAY; light grey; firm; moist, plastic. Inclusion of black carbonaceous material and organic material (rootlets).	CH	19.5m: SPT 0,0// 0,2,2,2 N = 6	100	0	0			
						CL		100	100	0			

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Auckland

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Project Reference: **Stage 1 Ground Investigation**

BH1206

Sheet **5** of **11**

BOREHOLE INFORMATION
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Contractor: McMillan Drilling

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Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	14			AYc	**19.95m:** Sandy CLAY; light grey, mottled brown; soft to firm; moist, plastic. Inclusion of black carbonaceous material.	CL							
				AYc	**20.15m:** CLAY; light grey, mottled dark brown; firm; moist, plastic. Some inclusion of BCM	CL							
				AYo	**20.45m:** Organic CLAY; dark grey to black; firm to stiff; moist, interbedded organic material, moderate plasticity.	OH		100	100	0			
				AYc	**20.65m:** CLAY with some organics and rootles; dark brown, mottled green; firm to stiff; moist, moderately plastic.	OH							
SPT	13	21		AYc		OH	21m: SPT 2,5// 5,6,7,8 N = 26	100	0	0			
PQ3				AYz	**21.45m:** SILT with some fine-grained sand; light-grey, mottled green; medium dense; poorly cemented, moist plastic, but brittle. Sand is pumiceous	ML							
	12	22		AYs	**21.9m:** Silty SAND; light-grey, mottled green; moderately dense, moist, moderately plastic. Sand is pumiceous	SP-SM		100	100	0			
SPT							22.5m: SPT 0,0// 1,2,2,3 N = 8	100	0	0			
PQ3	11	23											
					23.3m: Clayey SILT with minor rootlets and trace sands; light brown, laminated black; stiff, moist plastic. Inclusion of black carbonaceous material.	ML		100	100	0			
		24			**23.8m:** Clayey sandy SILT; light grey; firm; moist, dilatant quick	ML							
SPT	10			AYz	**24m:** Clayey sandy SILT; greenish light grey; stiff; moist, moderately plastic		24m: SPT 0,2// 1,2,4,3 N = 10	100	0	0			
PQ3		25				ML		100	100	0			

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Auckland

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Location: **Gribblehirst Park, Sandringham**
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BH1206

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Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	9	26		AYz	**24m:** Clayey sandy SILT; greenish light grey; stiff; moist, moderately plastic	ML		100	100	0			
SPT					**25.5m:** SILT, some sand and clay, minor organics, trace gravel; light greenish grey. Stiff, moist, low plasticity. Sand is fine weathered siltstone and quartz.	ML	25.5m: SPT 2,2// 2,3,3,3 N = 11	100					
PQ3	8	27			**26.2m:** SILT, some sand and clay, minor organics; light greenish grey. Stiff, moist, low plasticity.	ML		100					
					26.55m:...Sandy SILT, trace fine gravel.	ML	27m: SPT 2,1// 3,3,3,4 N = 13						
SPT	7							100					
PQ3	6	28		AQz	**27.6m:** Very dense sandy SILT, some fine to medium gravel, trace clay and organic ; light grey mottled green. Gravel is sub-angular to sub rounded highly weathered siltstone and sandstone [Basal Conglomerate of Older Alluvium).	ML		100					
SPT					**28.6m:** Sandy SILT, with some clay; grey. Very stiff, moist, moderate plastic, brittle. Sand is fine grained.	ML	28.5m: SPT 5,10// 14,18,18,10 for 35mm N = 50+	100					
PQ3		29						100					
	5			EUz	**29m:** Slightly weathered, grey SILTSTONE. Very weak. Fractures are extremely closely spaced. Recovered as fine to coarse angular gravel.	SW						**29m: ECBF**	
PQ3					**29.45m:** Slightly weathered, grey, SILTSTONE. Very weak; moderately spaced; very narrow.	SW		100	100	100			
		30		EUs	**29.65m:** Slightly weathered, grey, SANDSTONE. Very weak; moderately widely spaced; very narrow.	SW							

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BH1206

Sheet **7** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
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Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPTC	4			EUs	**30m:** Slightly weathered, grey, SANDSTONE. Very weak; moderately widely spaced; very narrow.	SW	30m: SPTC 6,13// 21,20,9 for 300mm N = 50+	N/A	N/A	N/A			
PQ3				EUz	**30.55m:** Slightly weathered, grey, SILTSTONE. Very weak, extremely closely spaced.	SW							
		31		EUg	**30.85m:** FAULT BRECCIA; comprising Slightly weathered ECBF Siltstone with a gouge of very soft silty clay.	SW		100	100	100		30.85m to 31.14m: FT 30° coating 15mm very soft highly plastic silty clay.	
	3			EUs	**31.15m:** Slightly weathered, grey, SANDSTONE. Very weak.							31.15m: BP 30° Base of siltstone.	
SPTC							31.5m: S TC 4,14/ 18,32 for 6500mm N = 50+	N/A	N/A	N/A			
PQ3		32				SW						31.85m: JT 50° undulating, rough, clean	
					32.05m:...100mm moderately weathered SILTSTONE.							32.05m: JT 45° undulating, rough, clean	
	2				**32.15m:**...Recovered as fine to coarse gravel sized sandstone; angular to subangular.			100	100	100		32.15m: BP 60° undulating, rough, Base of siltstone.	
												32.55m: JT 45° undulating, rough, clean	
		33		EUz	**32.75m:** Slightly weathered, grey, SILTSTONE. Very weak, highly fractured. Recovered as fine to coarse gravel sized siltstone; angular to sub angular.	SW							
	1											33.5m: BP 60° Base of siltstone.	
		34			**33.5m:** Slightly weathered, grey, sandy SILTSTONE. Very weak. Recovered as fine to coarse gravel sized siltstone; angular to sub angular.	SW		87	67	100		33.75m: JT 70° undulating, rough, clean	
												34m: JT 20° stepped, rough, clean	
	0				**34.1m:** Slightly weathered, grey, moderately well cemented SANDSTONE. Very weak. Recovered as fine to coarse gravel sized siltstone; angular to sub angular.							34.1m: BP 20° planar, rough, clean Base of siltstone.	
												34.25m: JT 70° stepped, rough, clean	
PQ3				EUs	**34.5m to 34.6m:**...100mm MUDSTONE bed; dark grey.	SW						34.5m: BP 45° Base of sandstone.	
												34.6m: BP 5° Base of mudstone.	
					34.75m:...Carbonacous laminations, dip 15.			100	83	100		34.75m: JT 65° undulating, rough, clean	
		35											

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Auckland

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Project: **Auckland Light Rail**
Location: **Gribblehirst Park, Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH1206

Sheet **8** of **11**

BOREHOLE INFORMATION
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PQ3	-1	36		EUs	**35m:** Slightly weathered, grey, moderately well cemented SANDSTONE. Very weak. Recovered as fine to coarse gravel sized siltstone; angular to sub angular.	SW		100	83	100		35.1m: JT 50° undulating, rough, clean	
PQ3	-2			EUz	**36.5m:** Slightly weathered, grey MUDSTONE; very weak. Recovered as fine to coarse angular gravel.	SW		93	33	33		36.4m: BP 10° undulating, rough, Base of mudstone. 36.5m: BP Base of sandstone. 36.51m to 38.44m: Mudstone has healed shear fabric with no preferred orientation. Fractures spaced 2-5mm with polished and slickendsided surfaces. Possible dewatering / shrinkage fabric?	
		37			**36.9m:** CORE LOSS								
PQ3	-3			EUz	**37m:** Slightly weathered, grey MUDSTONE; very weak. Recovered as fine to coarse angular to sub angular gravel.	SW							
PQ3	-4	38		EUs	**38.45m:** Slightly weathered, grey silty SANDSTONE; very weak. Recovered as fine to coarse angular to sub-angular gravel.	SW		100	37	37		38.45m: BP Base of mudstone.	
PQ3	-5	39		EUz	**39.15m:** Slightly weathered, grey, SILTSTSONE. very weak; very closely to closely spaced; Interbedded sandstone bedding. bedding 40mm - 60mm thick.	SW		100	100	100		39.15m: BP Base of sandstone.	
		40											

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Auckland

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Location: **Gribblehirst Park, Sandringham**
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BH1206

Sheet **9** of **11**

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Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
				EUz		SW							
PQ3	-6			EUs	**40.1m:** Slightly weathered, grey, SANDSTONE. Very weak; very closely to closely spaced.	SW		100	100	100		40.1m: BP Base of siltstone.	
PQ3	-7	41		EUz	**40.7m:** Slightly weathered, grey MUDSTONE; very weak. Recovered as fine to coarse angular to sub-angular gravel.	SW		100	37	37		40.7m: BP Base of sandstone. 40.71m to 41.64m: Mudstone has healed shear fabric with no preferred orientation. Fractures spaced 2-5mm with polished and slickensided surfaces. Possible dewatering / shrinkage fabric?	
		42		EUs	**41.65m:** Slightly weathered, poorly cemented grey silty fine SANDSTONE; very weak.	SW						41.65m: BP Base of mudstone.	
PQ3	-8			EUz	**42.15m:** Slightly weathered, grey MUDSTONE; very weak.	SW						42.15m: BP Base of sandstone.	
PQ3		43		EUs	**42.5m:** Slightly weathered, grey, SANDSTONE. Very weak.	SW		87	100	100		42.5m: BP Base of mudstone.	
PQ3	-9			EUz	**43.05m:** Slightly weathered, grey, SILTSTONE. very weak.	SW						43.05m: BP Base of sandstone. 43.1m: VE 25° 2mm infill zeolite?	
PQ3				EUz	**43.5m:** Slightly weathered, grey fine sandy SILTSTONE; very weak.	SW							
PQ3	-10	44		EUs	**43.8m:** Slightly weathered, grey silty fine SANDSTONE; very weak.	SW		100	73	73		43.8m: BP Base of siltstone. 43.81m to 44.2m: Sandstone has healed shear fabric with anastomosing veinlets, 1-3mm infill zeolite. 44.21m: 20mm thick band of carbonaceous material, dip 30 degrees.	
				EUz	**44.5m:** Slightly weathered, grey, SILTSTONE. Extremely weak. Sandy SILT; grey. Firm, moist.	SW						44.5m: BP Base of sandstone.	
		45		EUs		SW							

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100% circulation loss at 1.4m
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
10/02/2023 7:30:00 AM | 43.50m | 2.2 m
24/02/2023 3:45:00 PM | 18.00m | 1.4 m
27/02/2023 8:00:00 AM | 18.00m | 0 m
27/02/2023 5:00:00 PM | 31.60m | 3.2 m
28/02/2023 8:00:00 AM | 31.60m | 2.8 m
28/02/2023 1:00:00 PM | 39.00m | 2.5 m
28/02/2023 5:00:00 PM | 43.50m | 2.5 m
1/03/2023 7:30:00 AM | 43.50m | 2.5 m
1/03/2023 12:50:00 PM | 50.50m | 2.5 m
1/03/2023 4:50:00 PM
1/03/2023 6:50:00 PM

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Gribblehirst Park, Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH1206

Sheet **10** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1755026.67m
Northing: 5917029.72m
Reduced level: 34.33m

Date started: 23/02/2023
Date completed: 3/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ/WM
Input by: CJ/WM
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	-11	46		EUs	**44.9m:** Slightly weathered, grey, SANDSTONE. Very weak; moderately cemented.	SW						44.9m: BP Base of siltstone.	
				EUz	**45.25m:** Slightly weathered, grey MUDSTONE, very weak. Recovered as fine to coarse angular to sub-angular gravel.	SW						45.25m: BP 30° clean Base of sandstone. 45.26m to 45.59m: Mudstone has healed shear fabric with no preferred orientation. Fractures spaced 2-5mm with polished and slickendsided surfaces. Possible dewatering / shrinkage fabric?	
	-12			EUs	**45.6m:** Slightly weathered, grey, poorly cemented silty fine SANDSTONE interbedded with thin widely spaced siltstone beds; very weak. Siltstone recovered as fine to coarse angular to sub-angular gravel.			93	77	77		45.6m: BP Base of mudstone.	
					46.3m:...20mm thick carbonaceous bed.	SW							
PQ3	-13	47			**47.05m:** Slightly weathered, grey moderately cemented silty fine SANDSTONE interbedded with thin widely spaced siltstone beds; very weak. Siltstone recovered as fine to coarse angular to sub-angular gravel.			100	70	70		46.8m to 47.25m: Mudstone has healed shear fabric with no preferred orientation. Fractures spaced 2-5mm with polished and slickendsided surfaces. Possible dewatering / shrinkage fabric?	
					47.8m:...Poorly cemented	SW							
PQ3	-14	48										48.1m to 48.4m: bedding thinly laminated to laminated; subhorizontal to gently inclined.	
	-15	49			**48.7m:** Slightly weathered, grey, SANDSTONE. Very weak; moderately cemented.			93	100	100			
					49.4m:...Poorly cemented.	SW							
PQ3		50						100	100	100			

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100% circulation loss at 1.4m
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):

Date Time	Hole Depth	Water Level
10/02/2023 7:30:00 AM	43.50m	2.2 m
24/02/2023 3:45:00 PM	18.00m	1.4 m
27/02/2023 8:00:00 AM	18.00m	0 m
27/02/2023 5:00:00 PM	31.60m	3.2 m
28/02/2023 8:00:00 AM	31.60m	2.8 m
28/02/2023 1:00:00 PM	39.00m	2.5 m
28/02/2023 5:00:00 PM	43.50m	2.5 m
1/03/2023 7:30:00 AM	43.50m	2.5 m
1/03/2023 12:50:00 PM	50.50m	2.5 m
1/03/2023 4:50:00 PM		
1/03/2023 6:50:00 PM		

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Gribblehirst Park, Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH1206

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1755026.67m
Northing: 5917029.72m
Reduced level: 34.33m

Date started: 23/02/2023
Date completed: 3/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ/WM
Input by: CJ/WM
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3				EUs	**50m:** Slightly weathered, grey, poorly cemented SANDSTONE. Very weak; moderately cemented.	SW		100	100	100			
					End of borehole at 50.2m (Termination Depth Achieved)								

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100% circulation loss at 1.4m
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):

Date Time	Hole Depth	Water Level
10/02/2023 7:30:00 AM	43.50m	2.2 m
24/02/2023 3:45:00 PM	18.00m	1.4 m
27/02/2023 8:00:00 AM	18.00m	0 m
27/02/2023 5:00:00 PM	31.60m	3.2 m
28/02/2023 8:00:00 AM	31.60m	2.8 m
28/02/2023 1:00:00 PM	39.00m	2.5 m
28/02/2023 5:00:00 PM	43.50m	2.5 m
1/03/2023 7:30:00 AM	43.50m	2.5 m
1/03/2023 12:50:00 PM	50.50m	2.5 m
1/03/2023 4:50:00 PM		
1/03/2023 6:50:00 PM		

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **AckZland Light Rail Limited**
Project: **AckZland Light Rail**
Location: **Cambocrne Rd**
Project Reference: **Stage 1 Grocnd Investigation**

BH120u

Sheet **1** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower Trekker 2100
Contractor: Drill Force NZ Ltd

CO-ORDINATES: N. TM 2000
Easting: 1755031.70m
Northing: 5916799.30m
Reduced level: 35.51m

Date started: 21/02/2023
Date completed: 27/02/2023
Inclination: -90°
Azimuth: 0°

Logged by: BGW/DB
Input by: BGW/DB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HA	35			FUk	**0m:** Silty GRAVEL with trace clay; brown. Loosely packed, dry. Gravel, slightly weathered, subangular basalt.	GM						**0m: FILL**	
					0.5m: COBBLES/BOULDERS; brown and grey. Tightly packed, dry. Boulders/cobbles, unweathered basalt.	GP		100	0	0			
PQ3	34	1		VUb	**0.9m:** Slightly weathered, slightly vesicular, grey porphyitic BASALT; Strong. Vesicles, approximately 5 x 5mm in size.	SW		100	0	0		**0.9m: AVF** 1.05m: JT 70° planar, rough, FeO stained 1.35m: JT 45° planar, rough, FeO stained 1.45m: JT 45° planar, rough, FeO stained, ferrous oxide	
		2		VUv	**1.8m:** VOID								
PQ3	33			VUrb	**2m:** Slightly weathered, slightly vesicular, dark grey RUBBLY BASALT; Strong. Vesicles, approximately 5 x 5mm. Recovered as Cobbles/coarse Gravels.	SW		67	53	45		2.1m: JT 45° planar, rough, FeO stained 2.25m to 2.5m: JT 45° planar, rough, FeO stained 2.4m: JT 45° planar, rough, FeO stained 2.45m: JT 5° planar, rough, FeO stained	
		3		VUb	**2.6m:** Slightly weathered, slightly vesicular, dark grey BASALT; Strong. Vesicles, approximately 15 x 15mm	SW		100	100	95		2.8m to 3m: JT 80° planar, rough, veneer, (Infill: <1mm highly plastic clay) 3m: JT 25° planar, rough, veneer, (Infill: <1mm highly plastic clay)	
PQ3	32	4										4.3m: JT 20° planar, smooth, veneer, (Infill: <2mm highly plastic clay) 4.42m: JT 45° planar, smooth, coating, (Infill: <2mm highly plastic clay)	
PQ3	31	5			**5.9m:**...Feldspar phenocryst (30 x 10mm)			100	100	100		4.75m: JT 45° planar, smooth, FeO stained 4.85m: JT 45° planar, smooth, clean	

Box 1 | Box 2 | Box 3

REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Groundwater level readings incomplete.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
22/02/2023 5:15:00 PM | 9.00m | 1.00 m

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Auckland

Client: **AckZland Light Rail Limited**
Project: **AckZland Light Rail**
Location: **Cambocrne Rd**
Project Reference: **Stage 1 Grocnd Investigation**

BH120u

Sheet **2** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower Trekker 2100
Contractor: Drill Force NZ Ltd

CO-ORDINATES: N. TM 2000
Easting: 1755031.70m
Northing: 5916799.30m
Reduced level: 35.51m

Date started: 21/02/2023
Date completed: 27/02/2023
Inclination: -90°
Azimuth: 0°

Logged by: BGW/DB
Input by: BGW/DB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	30	6		VUb	**25.6m:** Slightly weathered, slightly vesicular, dark grey BASALT; Strong. Vesicles, approximately 15 x 15mm.	SW		100	100	100		5.17m: JT 45° planar, smooth, clean 5.3m: JT 75° planar, smooth, clean 5.67m: JT 45° planar, smooth, FeO stained	
PQ3	29	7		VUv	**24m:** VOID			13	8	8			
PQ3	28			VUb	**u23.8m:** Slightly weathered, slightly vesicular, dark grey BASALT; Strong. Vesicles, approximately 5 x 5mm in size.	SW							
PQ3		8			**u23.3m:** CORE LOSS								
PQ3	27	9		AYc	**7m:** Silty CLAY; grey mottled yellowish brown. Firm to stiff, moist, high plasticity. **7.3m:**...B uish green, mottled yellowish brown.	CH		67	67	0		**7m: ALLUVIUM**	
U54	26						9.5m: SPT 0,0// 0,0,1,2 N = 3	100	0	0			
SPT		10						100	0	0			
								100	0	0			

REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Groundwater level readings incomplete.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
22/02/2023 5:15:00 PM | 9.00m | 1.00 m

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Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **AckZland Light Rail Limited**
Project: **AckZland Light Rail**
Location: **Cambocrne Rd**
Project Reference: **Stage 1 Grocnd Investigation**

BH120u

Sheet **8** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower Trekker 2100
Contractor: Drill Force NZ Ltd

CO-ORDINATES: N. TM 2000
Easting: 1755031.70m
Northing: 5916799.30m
Reduced level: 35.51m

Date started: 21/02/2023
Date completed: 27/02/2023
Inclination: -90°
Azimuth: 0°

Logged by: BGW/DB
Input by: BGW/DB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	25			AYz	**10m:** Clayey SILT with minor sand and organics; bluish green, streaked dark brown. Stiff, moist, high plasticity. Organics, decomposing fibrous wood fragments, approximately <50mm.	MH		100	0	0			
					10.5m: Sandy SILT with minor clay and trace organics; bluish green. Stiff, moist, low plasticity.	MI-SP							
SPT				AYs	**10.5m:** Silty fine to medium SAND with minor organics; bluish green. Loose, wet. Organics, decomposing fibrous wood fragments, approximately <20mm.	SM	10.5m: SPT 0,2// 1,3,3,3 N = 10	33	0	0			
	11				**10.93m:** CORE LOSS								
PQ3	24			EWs	**11.1m:** Moderately weathered, fine to medium, grey SANDSTONE; Extremely weak. (Medium dense, fine to medium SAND).	MW		86	0	0		**11.1m: ECBF**	
	12												
SPT				EWz	**12m:** Moderately weathered, grey SILTSTONE; Extremely weak. (Very stiff SILT, low plasticity).		12m: SPT 5,8// 9,7,7,9 N = 32	100	0	0			
	23												
PQ3						MW						12.65m: JT 45° planar, smooth, clean 12.8m: JT 45° planar, smooth, clean 12.95m: JT 45° planar, smooth, clean 13.05m: JT 45° planar, smooth, clean	
	13							100	0	0			
	22												
SPT				EWs	**13.53m:** Moderately weathered, fine to medium, grey SANDSTONE; Extremely weak. (Medium dense, fine to medium SAND).	MW	13.5m: SPT 2,3// 5,9,9,7 N = 30	100	0	0			
	14												
PQ3				EUs	**14.65m:** Slightly weathered, grey, silty fine to medium SANDSTONE; Very weak, moderately cemented with trace black carbonaceous, <2mm.	SW		100	0	0		13.97m to 14.1m: JT 45° planar, smooth, clean 14.12m to 14.25m: JT 45° planar, smooth, veneer, (Infill: <1mm highly plastic clay) 14.32m to 14.44m: JT 45° undulating, rough, clean 14.56m: JT 55° undulating, rough, clean 14.68m to 14.77m: JT 45° planar, smooth, veneer, (Infill: <1mm low plasticity silt)	
	21												
	15												

Box 4 Box 5 Box 6

REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Groundwater level readings incomplete.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
22/02/2023 5:15:00 PM | 9.00m | 1.00 m

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Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **AckZland Light Rail Limited**
Project: **AckZland Light Rail**
Location: **Cambocrne Rd**
Project Reference: **Stage 1 Grocnd Investigation**

BH120u

Sheet **6** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower Trekker 2100
Contractor: Drill Force NZ Ltd

CO-ORDINATES: N. TM 2000
Easting: 1755031.70m
Northing: 5916799.30m
Reduced level: 35.51m

Date started: 21/02/2023
Date completed: 27/02/2023
Inclination: -90°
Azimuth: 0°

Logged by: BGW/DB
Input by: BGW/DB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPT					**165 23m:** Slightly weathered, grey, silty fine to medium SANDSTONE; Very weak, moderately cemented with trace black carbonaceous, <2mm.	SW	15m: SPT 5,7// 7,10,15,18 for 70mm N = 50+	100	0	0			
PQ3	20	16		EUs	**135 6m:** Slightly weathered, fine to medium, grey SANDSTONE; Very weak, well cemented, highly fractured.	SW		100	40	0		15.63m: JT 45° planar, rough, clean 15.79m: JT 25° planar, smooth, clean 15.89m: JT 5° planar, rough, veneer, (Infill: <1mm highly plastic clay) 15.97m: JT 25° planar, smooth, FeO stained 16.04m: BP 45° planar, smooth, clean 16.21m: JT 15° planar, rough, clean 16.27m: JT 15° planar, rough, clean 16.31m: JT 20° planar, rough, clean 16.36m: JT 20° planar, rough, clean	
	19				**145 3m to 145 42m:**...Siltstone		16.5m: S T 7,11/ 1 13,15,19 for 45mm N = 50+						
SPT					**145 42m:** Slightly weathered, grey, silty fine to medium SANDSTONE; Very weak, moderately cemented. Core recovered as fine to coarse, angular to sub-angular gravel			100	0	0			
PQ3		17				SW							
	18			EUz	**1u 2m:** Slightly weathered, grey and banded light grey SILTSTONE; Very weak. Bedding, indistinct, very thin to thin subhorizontal. Trace black carbonaceous material (BCM).	SW		100	54	9		17.2m to 17.31m: JT 50° planar, rough, clean 17.32m: BP 5° undulating, rough, clean 17.41m: BP 2°	
				EUs	**1u 3m:** Slightly weathered, grey, fine SANDSTONE; Very weak, well cemented, highly to moderately fractured.							17.49m: Base of SILTSTONE, BP 2 degrees, tight. Possible breaks along bedding planes? 17.6m: JT 3° 17.69m: DI 2° 17.88m: BP 3° planar, rough, clean 17.92m: BP 3° planar, rough, FeO stained 17.97m: BP 2° planar, rough, clean	
	18					SW							
SPT							18m: SPT 10,20// 20,20,10 for 45mm N = 50+	100	0	0			
PQ3	17												
				EUz	**175 3m:** Unweathered, grey SILTSTONE; Very weak.	UW						18.55m: JT 45° planar, smooth, clean 18.62m to 18.75m: JT Highly jointed zone. Defect orientation unknown 18.63m: JT 35° planar, smooth, clean	
	19							100	63	39			
				EUs	**175 93m:** Unweathered, grey, fine SANDSTONE; Very weak, well cemented. Interbedded with some moderately thin, horizontal siltstone. Contains trace black carbonaceous material.	UW						19.4m: JT 45° undulating, rough, clean	
	16												
PQ3								100	45	39			
	20											19.87m: JT 45° planar, rough, clean 19.92m: DI 2°	

Box 6
Box 7
Box 8

REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Groundwater level readings incomplete.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
22/02/2023 5:15:00 PM | 9.00m | 1.00 m

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Auckland LIGHT RAIL
Bringing us closer
Auckland

Client: AckZland Light Rail Limited
Project: AckZland Light Rail
Location: Cambocrne Rd
Project Reference: Stage 1 Grocnd Investigation

BH120u

Sheet 3 of 9

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower Trekker 2100
Contractor: Drill Force NZ Ltd

CO-ORDINATES: N. TM 2000
Easting: 1755031.70m
Northing: 5916799.30m
Reduced level: 35.51m

Date started: 21/02/2023
Date completed: 27/02/2023
Inclination: -90°
Azimuth: 0°

Logged by: BGW/DB
Input by: BGW/DB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	15			EUs	**17.93m:** Unweathered, grey, fine SANDSTONE; Very weak, well cemented. Interbedded with some moderately thin, horizontal siltstone. Contains trace black carbonaceous material. **20.52m to 20.57m:**...Highly fractured. Core returned as fine to corse Gravel.	UW		100	45	39		19.96m: DI 2° 20.04m: DI 2° 20.2m to 20.8m: Highly fractured, returned as fine gravel.	
		21		EUz	**20.53m:** Unweathered, grey SILTSTONE; Very weak, highly fractured.	UW						20.82m: JT 45° stepped, rough, clean 20.91m to 20.94m: JT 45° undulating, rough, clean	
PQ3	14			EUs	**21.51m:** Unweathered, grey, fine to medium SANDSTONE; Very weak, well cemented.	UW						21.1m: BPJT 45° planar, rough, clean 21.25m: JT 45° planar, rough, clean 21.4m: JT 65° planar, rough, clean	
					21.53m: Unweathered, grey speckled white, fine to coarse SANDSTONE; Very weak, well cemented. **21.59m to 21.66m:**...Siltstone	UW		100	87	73			
		22		EUz	**21.67m:** Unweathered, grey SANDSTONE; Very weak, well cemented. Sandstone, fine. Bedding, steeply inclined with thin <2mm black carbonaceous material along bedding contacts. **21.93m:** Unweathered, grey SILTSTONE; Very weak.	UW UW						21.8m: Base of SANDSTONE, BP 35 degrees.	
PQ3	13			EUs	**22.54m:** Unweathered, grey, fine to medium SANDSTONE; Very weak, well cemented.	UW						22.16m: Base of SILTSTONE, BP 35 degrees. 22.25m: BP 3° stepped, rough, clean 22.62m: JT 25° planar, rough, clean 22.81m: DI	
		23		EUi	**23.01m:** Unweathered, interbedded, grey SANDSTONE AND SILTSTONE; Very weak, well cemented. Sandstone, fine. Bedding, moderately thin, steeply inclined, with 1mm thick bedding parallel carbonaceous laminations. Defects, closely spaced. **23.05m to 23.13m:**...Fine to coarse sandstone	UW		100	85	60		23.01m to 23.08m: BP 25° stepped, rough, clean 23.24m: JT 25° planar, rough, clean 23.36m: JT 45° stepped, rough, clean 23.6m to 23.8m: JT 45° stepped, rough, clean	
PQ3	12			EUs	**23.57m:** Unweathered, grey, fine, indistinctly bedded SANDSTONE; Very weak, well cemented.	UW							
		24		EUz	**24.63m:** Unweathered, grey, distinctly bedded SILTSTONE; Very weak. Bedding, moderately inclined, thin. **24.65m to 24.67m:**...Fine to medium sandstone **24.81m to 24.82m:**...Fine to coarse sandstone **24.83m to 25.38m:**...Core returned as cobbles/gravels.	UW		100	39	31		24.52m: BP 20° 24.8m to 25.3m: Highly fractured zone. Defect orientations unknown.	
PQ3	11												
		25											

REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Groundwater level readings incomplete.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
22/02/2023 5:15:00 PM | 9.00m | 1.00 m

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Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARY.V2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR GH LOG Date Generated: 29/07/2023

Auckland LIGHT RAIL
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Auckland

Client: AckZland Light Rail Limited
Project: AckZland Light Rail
Location: Cambocrne Rd
Project Reference: Stage 1 Grocnd Investigation

BH120u

Sheet 4 of 9

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower Trekker 2100
Contractor: Drill Force NZ Ltd

CO-ORDINATES: N. TM 2000
Easting: 1755031.70m
Northing: 5916799.30m
Reduced level: 35.51m

Date started: 21/02/2023
Date completed: 27/02/2023
Inclination: -90°
Azimuth: 0°

Logged by: BGW/DB
Input by: BGW/DB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	10			EUz	**26.13m:** Unweathered, grey, distinctly bedded SILTSTONE; Very weak. Bedding, moderately inclined, thin.	UW		100	39	31			
PQ3	9	26		EUs	**23.57m:** Unweathered, grey, fine to medium, indistinctly bedded SANDSTONE; Very weak, well cemented.	UW		100	80	76		25.6m: JT 45° planar, rough, clean 26.05m to 26.2m: JT 45° planar, rough, clean 26.45m: JT 30° undulating, rough, clean	
					24.56m to 24.57m:...Siltstone **24.5m to 24.57m:**...Fine to coarse sandstone								
PQ3	8	27		EUz	**2u.8um:** Unweathered, grey, indistinctly bedded SILTSTONE; Very weak. Bedding, moderately thin, moderately to steeply inclined, bedding spacings 50-200m.	UW		100	53	40		27.1m to 27.23m: JT 50° planar, rough, veneer, (Infill: <1mm non-plastic silt) 27.4m to 27.53m: JT 45° stepped, rough, clean 27.68m: JT 45° planar, rough, clean 27.87m to 28m: Defect zone, orientations unknown 28.03m: JT 20° planar, rough, clean 28.21m: JT 20° planar, rough, clean 28.26m to 28.36m: JT 55° planar, rough, clean 28.44m: JT 45° planar, rough, veneer	
PQ3	7	28			**27.3m:** CORE LOSS								
				EUs	**27.56m:** Unweathered, grey, fine to medium SANDSTONE; Very weak, well cemented.	UW							
				EUz	**27.5m:** Unweathered, grey, distinctly bedded SILTSTONE; Very weak. Bedding, 30 degrees, tight. **27.94m to 27.99m:**...Sandstone	UW							
PQ3	6	29		EUs	**29.07m:** Unweathered, grey, fine SANDSTONE; Very weak, well cemented.	UW		91	79	70			
				EUz	**29.53m:** Unweathered, grey SILTSTONE; Very weak. Bedding, indistinct.	UW						29.62m to 29.68m: JT 45° planar, rough, clean	
		30		EUs	**29.7um:** Unweathered, grey, fine SANDSTONE; Very weak, well cemented.	UW							

Box 11 Box 12 Box 13

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Groundwater level readings incomplete.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
22/02/2023 5:15:00 PM | 9.00m | 1.00 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARY2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR GH LOG Date Generated: 29/07/2023

Auckland

Client: AckZland Light Rail Limited
Project: AckZland Light Rail
Location: Cambocrne Rd
Project Reference: Stage 1 Grocnd Investigation

BH120u

Sheet u of 9

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower Trekker 2100
Contractor: Drill Force NZ Ltd

CO-ORDINATES: N. TM 2000
Easting: 1755031.70m
Northing: 5916799.30m
Reduced level: 35.51m

Date started: 21/02/2023
Date completed: 27/02/2023
Inclination: -90°
Azimuth: 0°

Logged by: BGW/DB
Input by: BGW/DB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3 Box 13	5	31		EUs	29.57m: Unweathered, grey, fine SANDSTONE; Very weak, well cemented.	UW						30.1m: JT 45° planar, smooth, clean	
				EUz	30.22m: Unweathered, grey SILTSTONE; Very weak. Defects, closely spaced.	UW						30.2m: BP 35° 30.25m: JT 45° planar, rough, veneer 30.37m: JT 45° planar, rough, clean 30.42m to 30.62m: JT 45° planar, rough, clean	
				EUs	30.54m: Unweathered, grey, fine to medium SANDSTONE; Very weak, well cemented. Indistinctly horizontally bedded. 31m to 31.3m:...Highly fractured. 31.52m:...fine sandstone	UW		93	47	31		31.1m: JT 45° planar, rough, clean 31.16m: BP 30° clean 31.3m: JT 45° planar, rough, clean	
PQ3 Box 14	4	32		EUi	31.53m: Highly weathered, grey, interbedded SANDSTONE AND SILTSTONE; Extremely weak, highly fractured. Core returned as cobbles/gravels.	HW							
PQ3	3	33		EUs	32.52m: Unweathered, grey, fine SANDSTONE; Very weak, well cemented. 33m to 33.3m:...Highly fractured.	UW		87	13	13		32.37m to 32.37m: JT 45° planar, rough, clean 32.57m to 32.73m: JT 65° planar, rough, clean 33.1m: JT 45° planar, rough, clean 33.2m: JT 15° planar, rough, clean 33.42m to 33.6m: JT 45° planar, rough, clean	
PQ3 Box 15	2	34						77	15	0		33.78m to 33.9m: JT 45° undulating, rough, clean 34.15m: BP 3° planar, rough, clean	
PQ3	1	35						100	33	80		34.85m: JT 45° planar, rough, clean	

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Groundwater level readings incomplete.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
22/02/2023 5:15:00 PM | 9.00m | 1.00 m

Auckland

Client: **AckZland Light Rail Limited**
Project: **AckZland Light Rail**
Location: **Cambocrne Rd**
Project Reference: **Stage 1 Grocnd Investigation**

BH120u

Sheet **7** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower Trekker 2100
Contractor: Drill Force NZ Ltd

CO-ORDINATES: N. TM 2000
Easting: 1755031.70m
Northing: 5916799.30m
Reduced level: 35.51m

Date started: 21/02/2023
Date completed: 27/02/2023
Inclination: -90°
Azimuth: 0°

Logged by: BGW/DB
Input by: BGW/DB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	0	36		EUs	**825.2m:** Unweathered, grey, fine SANDSTONE; Very weak, well cemented. **835.12m to 835.24m:**...Siltstone	UW		100	33	30		35.31m to 35.45m: JT 45° stepped, rough, clean 35.36m: JT 45° undulating, rough, clean	
				EUz	**835.9m:** Unweathered, grey, indistinctly bedded SILTSTONE; Very weak. Bedding, thin to moderately thin, moderately inclined.	UW						35.95m: JT 45° planar, rough, clean	
PQ3	-1			EUs	**845.2m:** Unweathered, grey, fine, massive SANDSTONE; Very weak, well cemented.	UW		100	57	40			
		37		EUz	**845.9m:** Slightly weathered, greenish grey, indistinctly bedded SILTSTONE; Very weak. Bedding, moderately to steeply inclined.	SW						37m: BP 45° undulating, rough, clean 37.1m: BP 45° undulating, rough, clean 37.2m: BP 45° planar, rough, clean	
	-2			EUs	**8u58m:** Unweathered, grey fine SANDSTONE; Very weak well cemented. Bedding with trace black carbonaceous material streaks. **8u56m to 8u3um:**...Black carbonaceous material inclusions, dip 15-25	UW							
		38		EUz	**8u51m:** Slightly weathered, dark grey MUDSTONE; Very weak, fine, gravel. Trace carbonaceous inclusions.	SW						37.9m to 38m: BP 45° planar, rough, clean	
PQ3	-3			EUs	**87m:** Slightly weathered, dark grey, fine to medium SANDSTONE; Weak, well cemented. Trace black carbonaceous material inclusions. Uniformly graded.			100	100	100		38.1m: BP 30° undulating, rough, clean 38.3m: DB	
		39			**879m:**...Carbonaceous material absent.	SW							
PQ3	-4							100	100	93			
		40											

REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Groundwater level readings incomplete.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
22/02/2023 5:15:00 PM | 9.00m | 1.00 m

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Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **AckZland Light Rail Limited**
Project: **AckZland Light Rail**
Location: **Cambocrne Rd**
Project Reference: **Stage 1 Grocnd Investigation**

BH120u

Sheet **9** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower Trekker 2100
Contractor: Drill Force NZ Ltd

CO-ORDINATES: N. TM 2000
Easting: 1755031.70m
Northing: 5916799.30m
Reduced level: 35.51m

Date started: 21/02/2023
Date completed: 27/02/2023
Inclination: -90°
Azimuth: 0°

Logged by: BGW/DB
Input by: BGW/DB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3				EUz	**605.07m:** Slightly weathered, dark grey MUDSTONE; Very weak, fine, gravel. Trace carbonaceous inclusions.	SW SW		100	100	93		40.08m: BP 45° 40.2m: DB 20°	

End of borehole at 40.5m (Termination Depth Achieved)

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Groundwater level readings incomplete.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
22/02/2023 5:15:00 PM | 9.00m | 1.00 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Ack, land Light Rail Ltd**
Project: **Ack, land Light Rail**
Location: **1A Lanking RoadZSandringham**
Project Reference: **Stage 1 Grocnd Investigation**

BH104u

Sheet **1** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Comacchio Geo 305
Contractor: McMillan Drilling

CO-ORDINATES: N2TM0444
Easting: 1754987.11m
Northing: 5916541.35m
Reduced level: 41.50m

Date started: 30/03/2023
Date completed: 6/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: WM/ DY
Input by: WM/ DY
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	41	1		X	**4m:** HYDROVAC - No recovery			0	0	0		**4m: FILL**	
HQ3	40			VWb	**1.5m:** Moderately weathered, grey, porphyritic, highly vesicular BASALT. Moderately strong. Vesicles 5-10mm diameter. Phenocrysts are olivine [Possible Boulder?]	MW		100	0	100		**1.5m: A7 F**	
HQ3		2		VWv	**1.3m:** CORE LOSS							1.5m: Possible void	
HQ3	39	3		VWrb	**0.0Um:** Moderately weathered reddish br wn RUBBLY BASALT. Moderately Strong. Matrix is reddish brown silty CLAY, trace fine to medium basalt gravel, moist, hig ly plas ic (90% washed away).	MW		49	0	0			
HQ3	38	4		VUb	**Vm:** Sligh ly weathered, dark grey porphyritic, highly vesicular, indistinctly flow-banded BASALT. Strong. Vesicles are 5-10mm diameter; phenocrysts are olivine and plagioclase. Indistinct flow bands, dip 15-20°.	SW		100	89	100		3.7m: JT 70° undulating, rough, coating 2mm soft, highly plastic silty clay	
HQ3	37	5			**V.u6m:**...Vesicles are 1-5mm diameter			100	75	99		3.87m: JT 20° undulating, rough, staining, (Infill: iron oxide) 4.83m: JT 20° undulating, smooth, staining, (Infill: iron oxide) Possibly broken parallel to flow banding	

Box 1
Box 2

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REMARKS:
SCR = Circumference, 300mm.
TCR, SCR, and RQD measurements to be revised.
21.9 to 22.2m: 300 mm core gain due to swelling upon extraction from core barrel. Hole dipped, confirmed depth of 22.2m. All depths provided from 21.9m are corrected drilled depths.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
31/03/2023 8:30:00 AM | 10.50m | 7.05 m
3/04/2023 8:00:00 AM | 19.50m | 7.16 m
4/04/2023 7:45:00 AM | 19.50m | 5.05 m
4/04/2023 4:45:00 PM | 24.45m | 0.57 m
5/04/2023 7:50:00 AM | 24.45m | 7.17 m
5/04/2023 4:00:00 PM | 37.50m | 4.9 m
6/04/2023 8:00:00 AM | 37.50m | 7 m
6/04/2023 1:45:00 PM | 50.45m | 3.94 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Ack, land Light Rail Ltd**
Project: **Ack, land Light Rail**
Location: **1A Lanking RoadZSandringham**
Project Reference: **Stage 1 Grocnd Investigation**

BH104u

Sheet **0** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Comacchio Geo 305
Contractor: McMillan Drilling

CO-ORDINATES: N2TM0444
Easting: 1754987.11m
Northing: 5916541.35m
Reduced level: 41.50m

Date started: 30/03/2023
Date completed: 6/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: WM/ DY
Input by: WM/ DY
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	36	6		VWb	**3m:** Moderately weathered, dark grey, porphyritic, non-vesicular Dense BASALT. 5mm thick moderately vesicular flow bands dip 20-30°. Vesicles infilled minor feldspar phenocrysts.			100	75	99		4.85m: JT 30° undulating, rough, staining, (Infill: iron oxide) 5.17m: JT 50° undulating, smooth, staining, (Infill: iron oxide) 5.65m: JT 60° undulating, rough, staining, (Infill: iron oxide) 5.85m: JT 60° undulating, rough, staining, (Infill: iron oxide) 6m: JT 10° planar, rough, staining, (Infill: iron oxide)	
HQ3	35	7			**U.5m to 6.um:**...Moderately vesicular, distinctly flow banded. Flow bands 5-10mm thick, highly vesicular, dip 20-30°. Indistinct minor cooling sub-vertical cooling fabric.	MW		100	73	99		6.2m: JT 30° planar, smooth, staining, (Infill: iron oxide) Core broken along intersection of flow-band and joint. 6.39m: JT 5° undulating, smooth, staining, (Infill: iron oxide) 6.4m: JT 85° undulating, rough, staining, (Infill: iron oxide) 6.7m: JI 75° undulating, rough, staining, (Infill: iron oxide) Core broken. along cooling fabric.	
HQ3	34	8			**6.0m to um:**...Fabric is distinctly flow banded. Fabric dips 10-30°. Flow bands 10mm thick, highly vesi ular to scoraceous texture. Vesicles 5 x 30mm lent cular shaped.							7.26m: DB 20° undulating, rough, clean Core broken parallel to flow band 7.33m: DB 20° undulating, rough, clean Core broken parallel to flow band 7.5m: DB 25° undulating, rough, staining, (Infill: iron oxide) Core broken parallel to flow band 7.6m: DB 10° planar, rough, staining, (Infill: iron oxide) Core broken parallel to flow band 7.8m: DB 10° planar, rough, staining, (Infill: iron oxide) Core broken parallel to flow band	
HQ3	33	9		VUb	**um:** Sligh ly weathered, dark grey porphyritic, slightly vesicular, indistinctly flow-banded BASALT. Strong. Vesicles are 5-10mm diameter; phenocrysts are olivine and plagioclase. Indistinct flow bands, dip 15-20°.			100	67	97		8m: JT 30° undulating, rough, staining, (Infill: iron oxide) Core broken parallel to lenticular vesicles 8.05m: JT 60° undulating, rough, coating Silty CLAY, reddish brown, moist, highly plastic 8.15m: DB 30° undulating, rough, staining, (Infill: iron oxide) Core broken parallel to flow band 8.25m: JT 35° planar, rough, staining, (Infill: iron oxide) 8.4m: JT 60° undulating, smooth, coating 2mm zeolite? 8.5m: JT 60° undulating, smooth, coating 2mm zeolite?	
HQ3	32	10			**u 6m to 8.0m:**...Multiple intersecting fractures. Core recovered as coarse angular basalt GRAVEL. Possible fractu e zone?	SW		100	73	100		9.7m: JT 50° planar, smooth, staining FeO, zeolite? 9.8m: JT 45° planar, smooth, staining FeO, zeolite? 9.9m: JT 5° planar, smooth, staining, (Infill:	

Box 2 Box 3 Box 4

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REMARKS:
SCR = Circumference, 300mm.
TCR, SCR, and RQD measurements to be revised.
21.9 to 22.2m: 300 mm core gain due to swelling upon extraction from core barrel. Hole dipped, confirmed depth of 22.2m. All depths provided from 21.9m are corrected drilled depths.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
31/03/2023 8:30:00 AM | 10.50m | 7.05 m
3/04/2023 8:00:00 AM | 19.50m | 7.16 m
4/04/2023 7:45:00 AM | 19.50m | 5.05 m
4/04/2023 4:45:00 PM | 24.45m | 0.57 m
5/04/2023 7:50:00 AM | 24.45m | 7.17 m
5/04/2023 4:00:00 PM | 37.50m | 4.9 m
6/04/2023 8:00:00 AM | 37.50m | 7 m
6/04/2023 1:45:00 PM | 50.45m | 3.94 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Ack, land Light Rail Ltd**
Project: **Ack, land Light Rail**
Location: **1A Lanking RoadZSandringham**
Project Reference: **Stage 1 Grocnd Investigation**

BH104u

Sheet **V** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Comacchio Geo 305
Contractor: McMillan Drilling

CO-ORDINATES: N2TM0444
Easting: 1754987.11m
Northing: 5916541.35m
Reduced level: 41.50m

Date started: 30/03/2023
Date completed: 6/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: WM/ DY
Input by: WM/ DY
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	31	11		VUb	**14m:** Slightly weathered, dark grey, porphyritic, slightly vesicular, indistinctly flow-banded BASALT. Strong. Vesicles are 5-10mm diameter; phenocrysts are olivine and plagioclase. Indistinct flow bands, dip 15-20°.	SW		100	73	100		iron oxide) Core broken along vesicles? 9.95m: JT 5° planar, smooth, staining, (Infill: iron oxide) Core broken along vesicles? 10.1m: JT 50° planar, rough, staining, (Infill: iron oxide)	
HQ3	30	12			**11.3m:**...Iron Chlorite (FeCl2) staining along discontinuities. **11.6m to 11.um:**...Core broken along intersecting discontinuities during drilling.			100	49	97		10.54m: JT 50° undulating, smooth, staining FeO / FeCl2 10.9m: JT 70° undulating, smooth, staining FeO / FeCl2 11.02m: JT 30° undulating, smooth, staining FeO / FeCl2 11.36m: JT 30° undulating, smooth, staining FeO, zeolite? 11.37m: DB 50° undulating, rough, clean 11.49m: JT 45° undulating, smooth, staining FeO / FeCl2 11.7m: JT 50° undulating, smooth, staining FeO / FeCl2 11.8m: JT 30° undulating, rough, staining FeO / FeCl2	
HQ3	29	13			**10.13m to 10.53m:**...Core broken due to drilling over sub-vertical cooling joint. From 12.15m: Basalt structure is predominately influenced by sub-vertical cooling joints. Possible columnar BASALT? **10.Um to 1V.3m:**...Curvilinear, wavy sub-vertical cooling joint parallel to borehole plunge. Core broken while drilling along sub-vertical joint.			100	100	100		12.1m: DB 45° undulating, rough, clean 12.15m to 12.55m: JT 85° undulating, rough, staining FeO / FeCl2 12.6m to 13.5m: JT 85° undulating, rough, staining FeO / FeCl2. Curvilinear cooling joint.	
HQ3	28	14			**1V.Um:**...Indistinct flow bands dip 30°.							13.6m: DB 40° planar, rough, staining FeCl2, zeolite? Core broken parallel to flow band. 13.95m: JT 70° stepped, rough, staining FeCl2 / zeolite?	
HQ3	27	15			**15.0m to 15.3m:**...Recovered core as coarse angular GRAVEL. Core broken along intersection of steeply dipping discontinuity and flow bands dipping 25-30°.			100	100	100		14.3m: JT 70° planar, smooth, staining, (Infill: iron oxide) 14.87m: DB 20° planar, rough, clean Broken parallel to flow band	

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REMARKS:
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TCR, SCR, and RQD measurements to be revised.
21.9 to 22.2m: 300 mm core gain due to swelling upon extraction from core barrel. Hole dipped, confirmed depth of 22.2m. All depths provided from 21.9m are corrected drilled depths.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
31/03/2023 8:30:00 AM | 10.50m | 7.05 m
3/04/2023 8:00:00 AM | 19.50m | 7.16 m
4/04/2023 7:45:00 AM | 19.50m | 5.05 m
4/04/2023 4:45:00 PM | 24.45m | 0.57 m
5/04/2023 7:50:00 AM | 24.45m | 7.17 m
5/04/2023 4:00:00 PM | 37.50m | 4.9 m
6/04/2023 8:00:00 AM | 37.50m | 7 m
6/04/2023 1:45:00 PM | 50.45m | 3.94 m

Box 4
Box 5
Box 6

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Ack, land Light Rail Ltd**
Project: **Ack, land Light Rail**
Location: **1A Lanking RoadZSandringham**
Project Reference: **Stage 1 Grocnd Investigation**

BH104u

Sheet **5** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Comacchio Geo 305
Contractor: McMillan Drilling

CO-ORDINATES: N2TM0444
Easting: 1754987.11m
Northing: 5916541.35m
Reduced level: 41.50m

Date started: 30/03/2023
Date completed: 6/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: WM/ DY
Input by: WM/ DY
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	26	16		VUb	**13m:** Slightly weathered, dark grey, porphyritic, slightly vesicular, indistinctly flow-banded BASALT. Strong. Vesicles are 5-10mm diameter; phenocrysts are olivine and plagioclase. Indistinct flow bands, dip 15-20°.			100	87	97		14.9m to 15.2m: JT 85° undulating, smooth, staining, (Infill: iron oxide) 15.2m: DB 10° planar, rough, clean Core broken parallel to flow ban 15.3m to 15.4m: planar, rough, clean 3 x DB, 20-30°. Parallel to flow bands. 15.4m to 16.1m: JT 85° undulating, smooth, staining, (Infill: iron oxide)	
HQ3	25	17				SW		100	73	97		15.99m: DB 15° stepped, rough, clean Broken parallel to flow band 16.05m: DB 60° undulating, smooth, clean 16.2m to 16.5m: JT 85° undulating, smooth, staining, (Infill: iron oxide) 16.23m: DB 10° stepped, rough, clean 16.37m: DB 20° undulating, smooth 16.6m: DB 20° planar, rough, clean Core broken sub-parallel to flow fabric. 16.7m to 17.1m: JT 80° undulating, smooth, staining, (Infill: iron oxide)	
HQ3	24	18			**1u.1m to 18.3m:**...Distinct flow fabric, dip 20-30°. Core broken along flow band Recovered as angular coarse basalt GRAVEL.							17.15m: DB 20° planar, rough, clean Core broken parallel to flow fabric 17.2m: JT 50° planar, smooth, veneer <1mm zeolite? 17.25m: JT 55° planar, smooth, clean 17.4m: planar, rough, clean 2 x DB, 20°, Core broken parallel to flow fabric. 17.5m to 17.8m: JT 70° planar, smooth, coating <1mm zeolite 17.7m to 18.1m: JT 80° planar, smooth, coating <1mm zeolite	
HQ3	23	19			**18m to 18.3m:**...Multiple attempts made to recover core. Rods were pulled out. Recovered as fractured BASALT. Joints discarded.			100	100	100		18.1m to 19.5m: planar, rough, clean Core broken parallel to flow fabric. 18.65m: JT 60° undulating, smooth, staining 19m: JT 60° planar, smooth, clean, (Infill: iron oxide)	
PQ3	22	20			**18.3m:** CORE LOSS			47	40	47			

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Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

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4/04/2023 4:45:00 PM | 24.45m | 0.57 m
5/04/2023 7:50:00 AM | 24.45m | 7.17 m
5/04/2023 4:00:00 PM | 37.50m | 4.9 m
6/04/2023 8:00:00 AM | 37.50m | 7 m
6/04/2023 1:45:00 PM | 50.45m | 3.94 m

Box 6
Box 7
Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Ack, land Light Rail Ltd**
Project: **Ack, land Light Rail**
Location: **1A Lanking RoadZSandringham**
Project Reference: **Stage 1 Grocnd Investigation**

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Sheet **3** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Comacchio Geo 305
Contractor: McMillan Drilling

CO-ORDINATES: N2TM0444
Easting: 1754987.11m
Northing: 5916541.35m
Reduced level: 41.50m

Date started: 30/03/2023
Date completed: 6/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: WM/ DY
Input by: WM/ DY
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
					18.3m: CORE LOSS								
PQ3	21	21		VUb	**04.5m:** Slightly weathered, dark grey, porphyritic, non-vesicular dense BASALT. Strong. Phenocrysts are olivine and plagioclase.	SW		47	40	47		20.9m: JT 30° planar, smooth, clean	
PQ3								100	100	100		21.3m: DB 55° stepped, smooth, clean Core broken along incipient cooling fabric.	
PQ3	20	22		AUc	**01.V6m:** Silty CLAY, some decomposed organics. dark brown. Stiff, moist, highly plastic [Baked paleosol].	L						**01.V6m: ALL9 7I9 M**	
PQ3	19	23		AUz	**00m:** SILT, some clay, minor decomposed organics; lig t grey mottled brown. Stiff, moist low plasticity. FeO stained (Decomposed organics).	ML	22.5m: SPT 1,3// 2,3,3,5 N = 13					21.9m to 22.2m: Core swelled by 300mm after extraction from core barrel. Hole dipped, drilled depth 22.2m.	
SPT								100					
PQ3	18	24		ERs	**00.83m:** Silty f ne to medium SAND, minor clay, trace dissemina ed organics. Light grey. Medium dense, moist low plasticity when remoulded. Ve y thinly bedded, dip 20°.	RS		86				**00.83m: ECBF**	
					0V.6m: Medium to coarse SAND. Light grey. Medium dense, moist, non-plastic. [Basal Sand].	RS	24m: SPT 3,3// 6,6,6,9 N = 27						
SPT								100					
PQ3	17	25		EWs	**05.53m:** Highly weathered, dark grey, fine to coarse SANDSTONE. Extremely weak, poorly cemented. Silty fine to coarse sand. Medium dense, moist, non-plastic	HW		100	100	100			

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Water Level Readings(bgl):

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4/04/2023 4:45:00 PM	24.45m	0.57 m
5/04/2023 7:50:00 AM	24.45m	7.17 m
5/04/2023 4:00:00 PM	37.50m	4.9 m
6/04/2023 8:00:00 AM	37.50m	7 m
6/04/2023 1:45:00 PM	50.45m	3.94 m

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Auckland

Client: **Ack, land Light Rail Ltd**
Project: **Ack, land Light Rail**
Location: **1A Lanking RoadZSandringham**
Project Reference: **Stage 1 Grocnd Investigation**

BH104u

Sheet **U** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Comacchio Geo 305
Contractor: McMillan Drilling

CO-ORDINATES: N2TM0444
Easting: 1754987.11m
Northing: 5916541.35m
Reduced level: 41.50m

Date started: 30/03/2023
Date completed: 6/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: WM/ DY
Input by: WM/ DY
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
				EWs		HW							
PQ3	16			EWz	**03.13m:** Moderately weathered, dark grey SILTSTONE. Extremely weak. Indistinct laminations dip 30°.	MW	25.5m: SPT 16,13// 16,32,2 for 5mm N = 50+	100	100	100		25.15m: DB 30° planar, rough, clean Broken parallel to bedding. Base of Sandstone.	
SPT								100					
PQ3	15	26		EUs	**03.um:** Slightly weathered, dark grey medium SANDSTONE. Moderately cemented, very weak. Silt laminae dip 5°.							25.9m: DB 0° planar, rough, clean 25.95m: DB 0° planar, rough, clean	
					0U.Vm:...100mm bed of silty fine SANDSTONE	SW		87	87	87		26.15m: DB 0° planar, rough, clean 26.2m: DB 0° planar, rough, clean 26.3m: DB planar, rough, clean Core broken along bedding.	
		27			**0U.u3m:** CORE LOSS								
SPTC							27m: SPTC 18,32// for 55mm N = 50+	N/A	N/A	N/A			
PQ3	14			EUs	**06.1m:** Slightly weathered, dark grey, fine to coarse SANDSTONE. Very weak, well cemented. Normally graded, indistinctly bedded.							27.1m to 27.25m: 5° planar, rough, clean 4 x DB. 27.2m: JT 50° undulating, rough, clean	
					06.3m:...Medium to coarse SANDSTONE.							27.5m to 27.8m: 30° planar, rough, clean 4 x DB, Bedding parallel?	
		28				SW		100	95	100		27.9m: DB 0° planar, rough, clean	
					0u.1m:...100mm laminated SILTSTONE bed, dip 35°.							28m: 0° planar, rough, clean 28.1m: BP 35° Top of Siltstone. 28.2m: BP 35° Base of Siltstone	
SPTC	13						28.5m: SPTC 15,35// for 55mm N = 50+	N/A	N/A	N/A			
PQ3	12	29		EUs	**0u.Um:** Slightly weathered, dark grey, fine to coarse SANDSTONE. Very weak, well cemented. Indistincly beded, normally graded.	SW		100	100	100		29.1m: DB 5° planar, rough, clean	
		30										29.5m to 29.7m: planar, rough, clean 4 x DB, 5-10°	

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Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
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4/04/2023 7:45:00 AM | 19.50m | 5.05 m
4/04/2023 4:45:00 PM | 24.45m | 0.57 m
5/04/2023 7:50:00 AM | 24.45m | 7.17 m
5/04/2023 4:00:00 PM | 37.50m | 4.9 m
6/04/2023 8:00:00 AM | 37.50m | 7 m
6/04/2023 1:45:00 PM | 50.45m | 3.94 m

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Auckland

Client: **Ack, land Light Rail Ltd**
Project: **Ack, land Light Rail**
Location: **1A Lanking RoadZSandringham**
Project Reference: **Stage 1 Grocnd Investigation**

BH104u

Sheet **6** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Comacchio Geo 305
Contractor: McMillan Drilling

CO-ORDINATES: N2TM0444
Easting: 1754987.11m
Northing: 5916541.35m
Reduced level: 41.50m

Date started: 30/03/2023
Date completed: 6/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: WM/ DY
Input by: WM/ DY
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPTC					**V4m:** Slightly weathered, dark grey, coarse SANDSTONE. Very weak, well cemented. Indistincly beded, normally graded.	SW	30m: SPTC 15,35// for 60mm N = 50+	N/A	N/A	N/A		30.13m to 30.4m: Core discing.	
PQ3	11			EUs	**V4.5m:** Unweathered, dark grey, medium to coarse fine gravelly VOLCANICLASTIC SANDSTONE. Very weak, well cemented. Indistinctly bedded. Coarse sand and gravel is angular to sub-angular, basalt, pumice and siltstone. **V4.33m:**...50mm CONCRETION, dip 30°.	UW		73	73	73		30.5m to 30.6m: BP. Bedding dips 30°. 30.7m to 31m: Core discing.	
		31			**V1m to V1.1Vm:**...Coarse gravel SILTSTONE rip-up clasts.								
	10				**V1.1Vm:** CORE LOSS								
SPTC				EUs	**V1.3m:** Slightly weathered, dark grey medium to coarse grained, poorly cemented SANDSTONE. Very weak.	W	31.5m: S TC 4,36/ for 60mm N = 50+	N/A	N/A	N/A			
		32		EUz	**V1.uUm:** Slightly weathered, dark grey SILTSTONE. Very weak.	SW						31.86m: BP 40° Top of Siltstone.	
PQ3	9			EUs	**V0m:** Slightly weathered, dark grey, fine to medium SANDSTONE. Very weak, moderately cemented. Indistinctly bedded. Normally graded.	SW		73	73	73		31.95m to 32.2m: Core discing. 32m: BP 40° Top of Sandstone.	
		33			**V0.UVm:** CORE LOSS								
PQ3	8	34		EUs	**VVm:** Slightly weathered, dark grey, fine to medium SANDSTONE. Very weak, poorly cemented. Indistinctly bedded. Normally graded.	SW		70	70	70		33m to 33.9m: Core discing.	
					V5m:... Coarse SANDSTONE, dip 25°.								
	7				**V5.43m:** CORE LOSS								
PQ3		35		EUs	**V5.3m:** Slightly weathered, dark grey fine medium SANDSTONE. Very weak, moderately cemented. Normally graded.	SW		100	100	100		34.6m to 34.85m: Core discing.	

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Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
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Auckland

Client: **Ack, land Light Rail Ltd**
Project: **Ack, land Light Rail**
Location: **1A Lanking RoadZSandringham**
Project Reference: **Stage 1 Grocnd Investigation**

BH104u

Sheet **u** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Comacchio Geo 305
Contractor: McMillan Drilling

CO-ORDINATES: N2TM0444
Easting: 1754987.11m
Northing: 5916541.35m
Reduced level: 41.50m

Date started: 30/03/2023
Date completed: 6/04/2023
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Logged by: WM/ DY
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Checked by: SBN
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Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	6	36		EUs	**V5.3m:** Slightly weathered, dark grey fine medium SANDSTONE. Very weak, moderately cemented. Normally graded. **V3m:**...100mm SILTSTONE bed, dip 50°. **V3.1m:**...Well cemented SANSTONE. Very weak. **V3.8m to VU.33m:**...Slightly weathered, dark grey coarse SANDSTONE. Very weak, moderately well cemented. Indistinctly bedded. Coarse sand is siltstone, pumice and greywacke?. Sharp erosional basal contact.	SW		100	100	100		35m: BP 10° Top of Siltstone. 35.5m: DB 0° p anar, rough, clean 35.55m: JT 75° stepped, smooth, clean 35.85m to 36m: 5° planar, rough, clean 5 x DB. 36.05m: DB 0° planar, rough, clean	
PQ3	5	37		EUi	**VU.3m:**...Bedding fabric dips 35°. **VU.33m:** Slightly weathered, dark grey, interbedded fine SANDSTONE (80%) and SILTSTONE (20%). Very weak. Sandstone is moderately well cemented ,distinctly bedded, dip 30°. Siltstone is laminated, dip 5°.	SW		100	100	100		36.55m: 5° undulating, rough, clean Core broken parallel to bedding 36.6m: Black Carbonaceous laminations, dip 30°.	
PQ3	4	38		EUs	**V6.1m:** Slightly weathered, dark grey, med um to coarse SANDSTONE. Very weak, well cemented. ndistinctly bedded, reverse graded. **V6.5m:**...Silty fine SANDSTONE.	SW						37m: DB 5° planar, smooth, clean Broken parallel to bedding. Base of Siltstone. 37.3m: DB 15° undulating, rough, clean 37.5m to 37.7m: DB planar, rough, clean 4 x DB, 0-10°.	
				EUz	**V6.6m:** Slightly weathered, dark grey SIL STONE, weak. Distinctly very thinly bedded, with very clos ly spaced MUDSTONE, d p 35°.	UW						37.71m: DB 15° planar, smooth, clean Core broken parallel to bedding	
PQ3	3	39		EUs	**Vu.1m:** Unweathered, dark grey, fine silty SANDSTONE. Very weak, moderately cemented. Distinctly bedded, black carbonaceous laminations dip, 20°. Reverse graded. **Vu.83m:**...Fine SANDSTONE, very weak. Moderately well cemented. **V8.1m:**...medium to coarse grained well cemented SANDSTONE.	UW		100 83	100 83	100 83		38.1m: BP 25° Base of Siltstone. 38.3m: DB 0° planar, smooth, clean 38.8m: DB 5° planar, rough, clean 38.9m: DB 5° planar, rough, clean 39m to 39.8m: planar, rough, clean 11 x DB, 0-50°.	
PQ3	2	40		EUz	**V8.um:** Unweathered, dark grey fine sandy SILTSTONE. Distinctly bedded, very thin to laminated, dip 20°.	UW						39.81m: DB 30° planar, rough, clean Broken parallel to bedding. Base of Sandstone. 39.9m: DB 30° planar, rough, clean Core	

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4/04/2023 7:45:00 AM | 19.50m | 5.05 m
4/04/2023 4:45:00 PM | 24.45m | 0.57 m
5/04/2023 7:50:00 AM | 24.45m | 7.17 m
5/04/2023 4:00:00 PM | 37.50m | 4.9 m
6/04/2023 8:00:00 AM | 37.50m | 7 m
6/04/2023 1:45:00 PM | 50.45m | 3.94 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Ack, land Light Rail Ltd**
Project: **Ack, land Light Rail**
Location: **1A Lanking RoadZSandringham**
Project Reference: **Stage 1 Grocnd Investigation**

BH104u

Sheet **8** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Comacchio Geo 305
Contractor: McMillan Drilling

CO-ORDINATES: N2TM0444
Easting: 1754987.11m
Northing: 5916541.35m
Reduced level: 41.50m

Date started: 30/03/2023
Date completed: 6/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: WM/ DY
Input by: WM/ DY
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	1			EUz	**V8.um:** Unweathered, dark grey fine sandy SILTSTONE. Distinctly bedded, very thin to laminated, dip 20°.	UW						broken parallel to bedding 40.15m to 40.19m: BP 45° Sandstone bed.	
					54.03m: CORE LOSS			83	83	83			
PQ3		41		EUz	**54.3m:** Unweathered, dark grey fine sandy SILTSTONE. Distinctly bedded, very thin to laminated, dip 20°.	UW							
	0			EUs	**54.63m:** Unweathered, dark grey, medium to coarse SANDSTONE. Very weak, moderately well cemented Reverse graded. Distinctly bedded, very thin, cross-bedded, dip 30°. Coarse sand is siltstone, pumice and greywacke?. **51.1m:**...fine to medium grained SANDSTONE **51.33m to 50m:**...Poorly cemented SANSTONE. Recovered as silty fine SAND. Possible uphole cuttings?	UW		100	100	100		40.75m: BP 15° Base of Siltstone. 40.85m: DB 5° planar, rough, clean 40.95m: DB 10° planar, rough, clean 41m: DB 5° planar, rough, clean 41.1m: DB 5° planar, rough, clean 41.35m: DB 5° planar, rough, clean 41.4m: DB 5° planar, rough, clean 41.5m: DB 5° planar, rough, clean	
PQ3	-1	42											
		43		EUz	**50.Vm:**...200mm bed of medium to coarse SANDSTONE, with fine to coarse gravel sized SILTSTONE rip-up clasts.			100	100	100		42.5m: BP 35°	
	-2				**5V.1m:** Unweathered, dark grey SILTSTONE. Weak. Indistinctly bedded with soft sediment deformation. Bedding is very thin, very closely spaced, dip 20-30°, with sandstone laminae and black carbonaceous laminations.	UW						43.1m: BP 20° Base of Sandstone. 43.4m: DB 0° planar, rough, clean 43.6m: DB 5° planar, rough, clean	
PQ3		44											
	-3			EUs	**55.0m:** Unweathered, dark grey, fine to medium SANDSTONE. Very weak, well cemented. Indistinctly bedded.	UW		100	100	100		44.1m: DB 30° undulating, rough, clean Parallel to bedding. 44.2m: BP 30° 44.6m: DB 20° undulating, rough, clean	
		45											

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REMARKS:
SCR = Circumference, 300mm.
TCR, SCR, and RQD measurements to be revised.
21.9 to 22.2m: 300 mm core gain due to swelling upon extraction from core barrel. Hole dipped, confirmed depth of 22.2m. All depths provided from 21.9m are corrected drilled depths.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
31/03/2023 8:30:00 AM | 10.50m | 7.05 m
3/04/2023 8:00:00 AM | 19.50m | 7.16 m
4/04/2023 7:45:00 AM | 19.50m | 5.05 m
4/04/2023 4:45:00 PM | 24.45m | 0.57 m
5/04/2023 7:50:00 AM | 24.45m | 7.17 m
5/04/2023 4:00:00 PM | 37.50m | 4.9 m
6/04/2023 8:00:00 AM | 37.50m | 7 m
6/04/2023 1:45:00 PM | 50.45m | 3.94 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Ack, land Light Rail Ltd**
Project: **Ack, land Light Rail**
Location: **1A Lanking RoadZSandringham**
Project Reference: **Stage 1 Grocnd Investigation**

BH104u

Sheet **14** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Comacchio Geo 305
Contractor: McMillan Drilling

CO-ORDINATES: N2TM0444
Easting: 1754987.11m
Northing: 5916541.35m
Reduced level: 41.50m

Date started: 30/03/2023
Date completed: 6/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: WM/ DY
Input by: WM/ DY
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	-4 / -5	46		EUs	**55.0m:** Unweathered, dark grey, fine to medium SANDSTONE. Very weak, well cemented. Indistinctly bedded.			100	100	100		45.4m: 10mm bed B M, 5°	
					5Um to 5U.13m:...150mm bed of BCM, dip 20°.							46m: 30mm bed BCM, 20°.	
					5U.0m:...SANDSTONE is weak.							46.2m: 10mm bed BCM, 20°.	
PQ3	-5 / -6	47										46.5m: JT 10° stepped, rough, clean	
						UW		100	100	100		47.3m: 10mm bed BCM, 30°.	
		48			**56.Um to 5u.0m:**...Dissemin ted black carbonaceous material								
PQ3	-7 / -8	49			**5u.1m:**...50mm SILTSTONE, d p 40°.			100	100	100		48.9m: DB	
PQ3		50						100	100	100			

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REMARKS:
SCR = Circumference, 300mm.
TCR, SCR, and RQD measurements to be revised.
21.9 to 22.2m: 300 mm core gain due to swelling upon extraction from core barrel. Hole dipped, confirmed depth of 22.2m. All depths provided from 21.9m are corrected drilled depths.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
31/03/2023 8:30:00 AM | 10.50m | 7.05 m
3/04/2023 8:00:00 AM | 19.50m | 7.16 m
4/04/2023 7:45:00 AM | 19.50m | 5.05 m
4/04/2023 4:45:00 PM | 24.45m | 0.57 m
5/04/2023 7:50:00 AM | 24.45m | 7.17 m
5/04/2023 4:00:00 PM | 37.50m | 4.9 m
6/04/2023 8:00:00 AM | 37.50m | 7 m
6/04/2023 1:45:00 PM | 50.45m | 3.94 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Ack, land Light Rail Ltd**
Project: **Ack, land Light Rail**
Location: **1A Lanking RoadZSandringham**
Project Reference: **Stage 1 Grocnd Investigation**

BH104u

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Comacchio Geo 305
Contractor: McMillan Drilling

CO-ORDINATES: N2TM0444
Easting: 1754987.11m
Northing: 5916541.35m
Reduced level: 41.50m

Date started: 30/03/2023
Date completed: 6/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: WM/ DY
Input by: WM/ DY
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3				EUs	**55.0m:** Unweathered, dark grey, fine to medium SANDSTONE. Very weak, well cemented. Indistinctly bedded.	UW		100	100	100			

End of borehole at 50.45m (Termination Depth Achieved)

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REMARKS:
SCR = Circumference, 300mm.
TCR, SCR, and RQD measurements to be revised.
21.9 to 22.2m: 300 mm core gain due to swelling upon extraction from core barrel. Hole dipped, confirmed depth of 22.2m. All depths provided from 21.9m are corrected drilled depths.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
31/03/2023 8:30:00 AM | 10.50m | 7.05 m
3/04/2023 8:00:00 AM | 19.50m | 7.16 m
4/04/2023 7:45:00 AM | 19.50m | 5.05 m
4/04/2023 4:45:00 PM | 24.45m | 0.57 m
5/04/2023 7:50:00 AM | 24.45m | 7.17 m
5/04/2023 4:00:00 PM | 37.50m | 4.9 m
6/04/2023 8:00:00 AM | 37.50m | 7 m
6/04/2023 1:45:00 PM | 50.45m | 3.94 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

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Client: **Cuckland Light Rail Ltd**
Prozect: **Cuckland Light Rail**
Location: **1C Patterson Cve, 2andringham**
Prozect Reference: **2tage 1 Ground Nvestigation**

OH1B06

Sheet **1** of **1B**

OERI HELI NMFERACTNEM
Method: Rotary Core Wireline
Equipment: Massen| a MI4
Contractor: McMillan Drilling

- ESERDNMCTI 2: MZTAB000
Easting: 1794° 40.68m
Northing: 9° 162° ° .68m
Reduced level: 43.97m

Date started: 10/04/2023
Date completed: 18/04/2023
Inclination: -° 0;
A| imuth: 0;

Logged by: CJ/WM
Input by: CJ/WM
Checj ed by: SBN
Reviewed by: PK

Method	R.L. %mx	Length %mx	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR %% x	SCR %% x	RQD %% x	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACE+					**0m:** HYDROVAC - No recovery.							**0m: FNLL**	
	43	1						0					
PQ3	42			VWrb	**1.5m:** Moderately weathered(darj grey, porphyritic(highly vesicular RUBBLY BASALT(moderately strong. Vesicles are 10-20mm in diameter, iron stained clay filled. Phenocrysts of olivine, pyro) ene, feldspar, and plagioclase%%x Recovered as coarse, angular GRAVEL with some clay(darj grey(loosely pacj ed, poorly sorted.	MW		100	0	0		**1.5m: C7F**	
PQ3		2		VWb	**1.43m:** Moderately weathered(darj grey, porphyritic(moderatelt vesicular, highly fractured BASALT(moderately strong to strong. Vesicles of 9-19mm diameter, iron stai ed clay filled. Phenocrysts of olivine, pyro) ene feldspar and plagiclase.	MW						1.8m: JT 49; undulating, rough, coating, %%nfill: clay Very softx 1.° m: JT 12; undulating, rough, veneer, %%nfill: | eolitex 1.° 2m to 2.09m: JT 89; undulating, rough, coating, %%nfill: clay Very softx 2.09m: JT 30; undulating, rough, coating, %%nfill: clay Very softx	
	41				**B.Bm:** Moderately weathered(darj grey, porphyritic(highly vesicular RUBBLY BASALT(modera ely strong. Vesicles ar 10-20mm in diameter, iron stained clay filled. Phenocysts of olivine, pyro) ene, feldspar, and plagioclase%%x Recovered as coarse, angular GRAVEL with some clay(darj grey(loosely pacj ed, poorly sorted.	MW		67	0	0		2.1m: JT 3; undulating, rough, veneer, %%nfill: | eolitex 2.2m: JT 89; undulating, rough, veneer, %%nfill: | eolitex	
		3			**B.3m:** CORE LOSS	MW							
PQ3				VWrb	**8m:** Moderately weathered(darj grey, porphyritic(highly vesicular RUBBLY BASAL (moder tely strong. Vesicles are 10-20mm in diameter, iron stained clay filled. Phenocrysts of olivine, pyro) ene, feldspar, a d plagioclase%%x Recovered as coarse, angular GRAVEL with some clay(darj grey(loosely pacj ed, poorly sorted.	MW							
PQ3	40	4		VUb	**8.5m:** Slightly weathered(darj grey, porphyritic(higly vesicular, highly fractured BASALT(strong(closely spaced, narrow. Vesicles are 10-20mm diameter, iron stained clay fill. phenocrysts of olivine, pyro) ene, feldspar, and plagioclase. **8.5m:**...Clean vesicles **8.Vm:**...Moderately vesicular **8.9m:**...Clay infill	SW		100	24	99		3.99m: JT 39; undulating, rough, veneer, %%nfill: | eolitex 3.89m: JT 40; undulating, rough, veneer, %%nfill: | eolitex 4.1m: JT 90; undulating, rough, veneer, %%nfill: | eolitex 4.2m: JT 9; undulating, rough, veneer, %%nfill: | eolitex 4.3m: JT 6; undulating, rough, veneer, %%nfill: | eolitex	
PQ3	3°				**5.4m to 5.6m:**...Very closely spaced zoints			100	47	70		4.6m: JT 10; undulating, rough, clean 4.69m: JT 8; undulating, rough, veneer, %%nfill: | eolitex	
		9										4.° m: JT 60; stepped, rough, clean	

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100k circulation loss at 1.4m
Drillhead rattling whilst going through a vertical zoint
No pie| ometer measurements or installation information provided

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
11/04/2023 2:00:00 PM 54.90m 54.9 m
12/04/2023 3:19:00 PM 524.00m 510.9 m
13/04/2023 8:19:00 AM 524.00m 511 m
13/04/2023 3:19:00 PM 537.90m 59.9 m
14/04/2023 7:30:00 AM 537.90m 511.9 m

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Client: **Cuckland Light Rail Ltd**
Prozect: **Cuckland Light Rail**
Location: **1C Patterson Cve, 2andringham**
Prozect Reference: **2tage 1 Ground Nvestigation**

OH1B06

Sheet **B** of **1B**

OERI HELI NVFERACTNEM Method: Rotary Core Wireline Equipment: Massen| a MI4 Contractor: McMillan Drilling	**- ESERDNVCTI 2: MZTAB000** Easting: 1794° 40.68m Northing: 9° 162° ° .68m Reduced level: 43.97m	Date started: 10/04/2023 Date completed: 18/04/2023 Inclination: -° 0; A| imuth: 0;	Logged by: CJ/WM Input by: CJ/WM Checj ed by: SBN Reviewed by: PK

Method	R.L. %nx	Length %nx	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR % x	SCR % x	RQD % x	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	38	6		VUb	**3m:** Slightly weathered(darj grey, porphyritic(highly vesicular, moderately fractured BASALT(moderately strong to strong(moderately widely spaced to closely spaced, narrow. Vesicles are 10-20mm diameter, clean. Phenocrysts of olivine, pyro) ene, feldspar, plagioclase %ot as prominentXx **3.3m:**...Moderately vesicular **3.Vm:**...Driller noted that rod dropped for <100mm. Possible void or large vesicle	SW		100	47	70		9.3m: JT 39; stepped, rough, cl an 9.99m: JT 8; undula ing, rough, veneer, %nfill: | eolit x	
PQ3	37	7		VUb	**V.33m to V.93m:**...E) tremely closely spaced zoints			100	0	91		6.1m to 6.3m: JT ° 0; undulating, rough, veneer, %nfill: | eolitex 6.19m: JT 10; undulating, rough, veneer, %nfill: | eolitex 6.2m: JT 8; undulating, rough, veneer, %nfill: | eolitex 6.3m: JT 12; undulating, rough, veneer, %nfill: | eolitex 6.4m: JT 19; undulating, rough, veneer, %nfill: | eolitex 6.99m to 6.89m: F? Top dip of 9 degrees, bottom dip of 10 degrees. Clean. recovered as tightly pacj ed, medium to coarse, angular GRAVEL. GRAVEL is unweathered BASALT 7.39m: JT 20; planar, rough, veneer, %nfill: | eolitex	
PQ3	36	8		VUv	**4.33m:** NO RECOVERY							7.99m to 7.7m: Interpretted as void.	
PQ3	39	°		VUb	**4.4m:** Medium to coarse, angular GRAVEL, some clay, minor cobble(darj grey(loosely pacj ed coated by silty CLAY(light grey(very soft(moist, plastic. GRAVEL is slightly weathered BASALT. **4.6m:** Slightly weathered(darj grey, porphyritic(moderately vesicular, highly fractured BASALT(strong(closely spaced to very closely spaced, narrow Vesicles are 9-19mm diameter, cleam. Phenocrysts of olivin , pyro) ene, feldspar, and plagioclase. **9m:**...Flow banding- dip of 39 degrees **9.8m:**...Moderately to highly vesicular	SW SW		° 0	0	1°		8.2m: JT 20; undulating, rough, veneer, %nfill: clay Very softx 8.3m: JT 9; stepped, rough, clean 8.99m: JT 9; planar, rough, clean 8.7m: JT 9; undulating, rough, veneer, %nfill: | eolitex	
PQ3	34	10				UW		100	0	44		° .09m to ° .3m: JT 89; undulating, rough, clean ° .39m to ° .49m: F? Top dip of 9 degrees, bottom dip of 60 degrees. Recovered as medium to coarse, angular GRAVEL. GRAVEL is unweathered BASALT ° .99m: JT 49; undulating, rough, veneer, %nfill: | eolitex ° .89m: JT 29; planar, rough, veneer, %nfill: | eolitex	

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100k circulation loss at 1.4m
Drillhead rattling whilst going through a vertical zoint
No pie\| ometer measurements or installation information provided

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
11/04/2023 2:00:00 PM 54.90m 54.9 m
12/04/2023 3:19:00 PM 524.00m 510.9 m
13/04/2023 8:19:00 AM 524.00m 511 m
13/04/2023 3:19:00 PM 537.90m 59.9 m
14/04/2023 7:30:00 AM 537.90m 511.9 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

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Client: **Cuckland Light Rail Ltd**
Prozect: **Cuckland Light Rail**
Location: **1C Patterson Cve, 2andringham**
Prozect Reference: **2tage 1 Ground Nvestigation**

OH1B06

Sheet **8** of **1B**

OERI HELI NMFERACTNEM
Method: Rotary Core Wireline
Equipment: Massen| a MI4
Contractor: McMillan Drilling

- ESERDNMCTI 2: MZTAB000
Easting: 1794° 40.68m
Northing: 9° 162° ° .68m
Reduced level: 43.97m

Date started: 10/04/2023
Date completed: 18/04/2023
Inclination: -° 0;
A| imuth: 0;

Logged by: CJ/WM
Input by: CJ/WM
Checj ed by: SBN
Reviewed by: PK

Method	R.L. %nx	Length %nx	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR %% x	SCR %% x	RQD %% x	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3					**6.9m:** Unweathered(darj grey, porphyritic(slightly vesicular, moderately fractured BASALT(strong(moderately widely spaced to closely spaced, narrow, | eolite coating. Vesicles are 9-19mm diameter, clean. Phenocrysts of olivine, pyro) ene feldspar. **10.8m:**...Moderately widely spaced zoints			100	0	44		°.89m to 10.19m: JT 79; undulating, rough, veneer, %nfill: | eolitex °.89m: JT 29; planar, rough, veneer, %nfill: | eolitex °.89m to 10.19m: JT 79; undulating, rough, veneer, %nfill: | eolitex 10.19m: JT 39; undulating, rough, veneer, %nfill: | eolitex 10.2m: JT 29; planar, rough, veneer, %nfill: | eolitex 10.29m to 10.4m: JT 69; undulating, rough, veneer, %nfill: | e litex 10.3m: JT 9 planar ough, veneer, %nfill: | eolitex 10 99m: JT 29; planar, rough, veneer, %nfill: | olitex 10.6m: JT 10; planar, rough, veneer, %nfill: | eolitex 10.7m: JT 13; undulating, rough, veneer, %nfill: clay Very softx 10.8m to 10.° m: JT 79; undulating, rough, clean	
PQ3	33												
		11											
	32							100	0	84		11.3m: JT 39; stepped, rough, veneer, %nfill: clay Very softx 11.39m to 11.79m: JT 80; planar, rough, veneer, %nfill: clay Very softx	
												11.69m: JT 29; undulating, rough, veneer, %nfill: clay Very softx	
		12										11.89m: JT 8; undulating, rough, clean	
PQ3				VUb		UW						12.2m: JT 30; stepped, rough, clean	
												12.4m: JT 29; planar, rough, veneer, %nfill: clay Very softx	
	31				**1B.Vm:**...Flow banding - dip of 39 degrees							12.6m: JT 20; undulating, rough, clean	
								100	0	89			
		13										12.°m to 13m: JT 69; planar, rough, veneer, %nfill: | eolitex	
												13.2m: DI 10;	
	30												
PQ3												13.79m to 14.08m: JT 80; undulating, rough, clean	
		14											
								100	27	98		14.2m: JT 30; planar, rough, veneer, %nfill: | eolitex	
												14.4m: JT 10; planar, rough, veneer, %nfill: | eolitex	
	2°				**15.Vm:**...Moderately vesicular								
												14.7m: JT 39; planar, rough, veneer, %nfill: | eolitex	
		19										14.89m to 14.°9m: JT 49; planar, rough, clean	

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100k circulation loss at 1.4m
Drillhead rattling whilst going through a vertical zoint
No pie| ometer measurements or installation information provided

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
11/04/2023 2:00:00 PM 54.90m 54.9 m
12/04/2023 3:19:00 PM 524.00m 510.9 m
13/04/2023 8:19:00 AM 524.00m 511 m
13/04/2023 3:19:00 PM 537.90m 59.9 m
14/04/2023 7:30:00 AM 537.90m 511.9 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

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Client: **Cuckland Light Rail Ltd**
Prozect: **Cuckland Light Rail**
Location: **1C Patterson Cve, 2andringham**
Prozect Reference: **2tage 1 Ground Nvestigation**

OH1B06

Sheet **5** of **1B**

OERI HELI NVFERACTNEM Method: Rotary Core Wireline Equipment: Massen| a MI4 Contractor: McMillan Drilling	**- ESERDNVCTI 2: MZTAB000** Easting: 1794° 40.68m Northing: 9° 162° ° .68m Reduced level: 43.97m	Date started: 10/04/2023 Date completed: 18/04/2023 Inclination: -° 0; A| imuth: 0;	Logged by: CJ/WM Input by: CJ/WM Checj ed by: SBN Reviewed by: PK

Method	R.L. %nx	Length %nx	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR %% x	SCR %% x	RQD %% x	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	28	16		VUb	**6.9m:** Unweathered(darj grey, porphyritic(slightly vesicular, moderately fractured BASALT(strong(moderately widely spaced to closely spaced, narrow, | eolite coating. Vesicles are 9-19mm diameter, clean. Phenocrysts of olivine, pyro) ene feldspar.			100	0	77		19m to 19.2m: F? Top dip of 29 degrees, bottom dip of 39 degrees. Recovered as coarse, angular GRAVEL. 19m: JT 29; planar, rough, clean 19m to 19.2m: F? Top dip of 29 degrees, bottom dip of 39 degrees. Recovered as coarse, angular GRAVEL. 19m: JT 29; planar, roug , clean 19m to 19.2m: F? Top dip of 29 degrees, bottom dip of 39 degrees. Recovered as coarse, angula GRAVEL. 19.3m: JI 39; 19.4m to 19.69m: JT 79; undulating, rough, veneer, %nfill: | eolitex 19.8m: JT 20; undulating, rough, clean 19.° m to 16.1m: JT 60; undulating, rough, veneer, %nfill: | eolitex	
PQ3	27	17						100	41	7°		16.19m to 16.49m: F? Top dip of 19 degrees, bottom dip of 49 degrees. Recovered as angular COBBLE. COBBLE is unweathered BASALT 16.48m: JT 49; planar, rough, veneer, %nfill: | eolitex 16.6m: JT 19; planar, rough, veneer, %nfill: | eolitex 16.6m to 16.° 9m: JT 79; undulating, rough, veneer, %nfill: | eolitex 16.6m: JT 19; planar, rough, veneer, %nfill: | eolitex 16.6m to 16.° 9m: JT 79; undulating, rough, veneer, %nfill: | eolitex 16.° m to 17.19m: JT 79; planar, rough, veneer, %nfill: | eolitex 17.2m to 17.9m: JT 69; planar, rough, clean	
PQ3	26	18				UW						17.4m: JT 40; planar, rough, clean 17.8m: JT 49; undulating, rough, coating, %nfill: clay Very softx 17.° m: JT 90; undulating, rough, veneer, %nfill: | eolitex	
PQ3	29	1°			**19.6m to 16.1m:**...Very closely spaced zoints			100	91	86		18.3m: JT planar, rough, clean 18.4m: JT 69; planar, rough, coating, %nfill: clay Very softx 18.° m to 1° .1m: F? %nfill: clay Very softx Top dip of 30 degrees, bottom dip of 8 degrees. Recovered as coarse, angular to sub angular GRAVEL, with some clay. GRAVEL is unweathered BASALT. Clay is light brown(very soft(moist, highly plastic.	
PQ3	24	20						100	4°	73		1° .7m: JT 30; planar, rough, veneer, %nfill: | eolitex 1° .7m to 20m: JT 79; planar, rough, veneer, %nfill: | eolitex 1° .7m: JT 30; planar, rough, veneer, %nfill:	

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100k circulation loss at 1.4m
Drillhead rattling whilst going through a vertical zoint
No pie\| ometer measurements or installation information provided

Water Level Readings(bgl):
Date Time \| Hole Depth \| Water Level
11/04/2023 2:00:00 PM 54.90m 54.9 m
12/04/2023 3:19:00 PM 524.00m 510.9 m
13/04/2023 8:19:00 AM 524.00m 511 m
13/04/2023 3:19:00 PM 537.90m 59.9 m
14/04/2023 7:30:00 AM 537.90m 511.9 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

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Client: **Cuckland Light Rail Ltd**
Prozect: **Cuckland Light Rail**
Location: **1C Patterson Cve, 2andringham**
Prozect Reference: **2tage 1 Ground Nnvestigation**

OH1B06

Sheet **3** of **1B**

OERI HELI NMFERACTNEM
Method: Rotary Core Wireline
Equipment: Massen| a MI4
Contractor: McMillan Drilling

- ESERDNMCTI 2: MZTAB000
Easting: 1794° 40.68m
Northing: 9° 162° ° .68m
Reduced level: 43.97m

Date started: 10/04/2023
Date completed: 18/04/2023
Inclination: -° 0;
A| imuth: 0;

Logged by: CJ/WM
Input by: CJ/WM
Checj ed by: SBN
Reviewed by: PK

Method	R.L. %nx	Length %nx	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR % x	SCR % x	RQD % x	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	23	21		VUb	**6.9m:** Unweathered(darj grey, porphyritic(slightly vesicular, moderately fractured BASALT(strong(moderately widely spaced to closely spaced, narrow, | eolite coating. Vesicles are 9-19mm diameter, clean. Phenocrysts of olivine, pyro) ene feldspar.			100	4°	73		| eolitex 1° .7m to 20m: JT 79; planar, rough, veneer, %nfill: | eolitex 20.2m: JT 40; planar, rough, veneer, %nfill: | eolitex 20.9m to 20.° m F? Top dip of 69 degrees, bottom dip of 9 deg ees. Recovered as medium to oarse, angular GRAVEL. GRAVEL is unweathered BASALT	
PQ3	22	22						100	100	100		21.1m: JT 39; undulating, rough, veneer, %nfill: | eolitex 21.4m: JT 49; undulating, rough, veneer, %nfill: | eolitex	
PQ3	21	23				UW		100	100	100		22.9m to 22.8m: JT 79; planar, rough, veneer, %nfill: | eolitex 23.1m: JT 19; undulating, rough, veneer, %nfill: | eolitex	
PQ3	20	24										23.9m: JT 19; undulating, rough, veneer, %nfill: | eolitex 24m to 24.19m: DI Drilling induced fractures. 24.19m to 24.6m: JT 99; undulating, rough, veneer, %nfill: | eolitex 24.3m: JT 49; planar, rough, veneer, %nfill: | eolitex	
PQ3	1°	29						100	0	8°		24.9m: JT 29; undulating, rough, veneer, %nfill: | eolitex 24.6m to 24.89m: JT °0; undulating, rough, veneer, %nfill: | eolitex 24.69m to 24.° m: JT 89; stepped, rough, veneer, %nfill: | eolitex	

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100k circulation loss at 1.4m
Drillhead rattling whilst going through a vertical zoint
No pie\| ometer measurements or installation information provided

Water Level Readings(bgl):
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14/04/2023 7:30:00 AM 537.90m 511.9 m

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Client: **Cuckland Light Rail Ltd**
Prozect: **Cuckland Light Rail**
Location: **1C Patterson Cve, 2andringham**
Prozect Reference: **2tage 1 Ground Nvestigation**

OH1B06

Sheet **V** of **1B**

OERI HELI NVFERACTNEM
Method: Rotary Core Wireline
Equipment: Massen| a MI4
Contractor: McMillan Drilling

- ESERDNVCTI 2: MZTAB000
Easting: 1794° 40.68m
Northing: 9° 162° ° .68m
Reduced level: 43.97m

Date started: 10/04/2023
Date completed: 18/04/2023
Inclination: -° 0;
A| imuth: 0;

Logged by: CJ/WM
Input by: CJ/WM
Checj ed by: SBN
Reviewed by: PK

Method	R.L. %nx	Length %nx	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR %% x	SCR %% x	RQD %% x	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3					**6.9m:** Unweathered(darj grey, porphyritic(slightly vesicular, moderately fractured BASALT(strong(moderately widely spaced to closely spaced, narrow, | eolite coating. Vesicles are 9-19mm diameter, clean. Phenocrysts of olivine, pyro) ene feldspar.			100	0	8°		29m to 29.1m: JT 90; planar, rough, veneer, %nfill: | eolitex 29m to 29.9m: JT 49; planar, rough, veneer, %nfill: | eolitex 29m to 29.1m: JT 90; planar, rough, veneer, %nfill: | eolitex 29m to 29.9m: JT 49; planar, rough, veneer, %nfill: | eolitex 29.19m: JT 29; planar, rough, veneer, %nfill: | eolitex 29.39m to 29.49m: JT 49; planar, rough, veneer, %nfill: | eolitex	
PQ3	18												
		26										29.° m: JT 39; undulating, rough, veneer, %nfill: | eolitex	
PQ3								100	0	83		26.1m to 26.29m: JT 99; undulating, rough, veneer, %nfill: | eolitex	
	17												
					BV.43m:...Large vesicle, diameter of 39mm - infilled with feldspars and olivine							26.7m: JT 49; undulating, rough, veneer, %nfill: | eolitex 26.79m: JI 30; 26.8m to 28m: JT 89; undulating, rough, veneer, %nfill: | eolitex 26.° m: JT 30; undulating, rough, veneer, %nfill: | eolitex	
		27											
PQ3				VUb		UW						27.2m: JT 29; planar, rough, veneer, %nfill: | eolitex	
	16											27.9m: JT 49; planar, rough, veneer, %nfill: | eolitex	
								100	0	73			
		28											
												28.2m to 28.8m: JT 89; undulating, rough, veneer, %nfill: | eolitex	
PQ3	19												
												28.89m: JT 79; planar, rough, clean	
		2°										2° m: DI 9; stepped, rough, clean 2° .09m to 2° .4m: JT 79; undulating, rough, veneer, %nfill: | eolitex	
								100	0	°9			
												2° .4m: JT 40; planar, rough, veneer, %nfill: | eolitex 2° .49m to 2° .7m: JT 79; undulating, rough, veneer, %nfill: | eolitex	
	14												
												2° .7m: JT 20; undulating, rough, veneer, %nfill: | eolitex	
												2° .89m: JT 39; planar, rough, veneer, %nfill: | eolitex	
		30											

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100k circulation loss at 1.4m
Drillhead rattling whilst going through a vertical zoint
No pie| ometer measurements or installation information provided

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
11/04/2023 2:00:00 PM 54.90m 54.9 m
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13/04/2023 3:19:00 PM 537.90m 59.9 m
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Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

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Client: **Cuckland Light Rail Ltd**
Prozect: **Cuckland Light Rail**
Location: **1C Patterson Cve, 2andringham**
Prozect Reference: **2tage 1 Ground Nnvestigation**

OH1B06

Sheet **4** of **1B**

OERI HELI NMFERACTNEM
Method: Rotary Core Wireline
Equipment: Massen| a MI4
Contractor: McMillan Drilling

- ESERDNMCTI 2: MZTAB000
Easting: 1794° 40.68m
Northing: 9° 162° ° .68m
Reduced level: 43.97m

Date started: 10/04/2023
Date completed: 18/04/2023
Inclination: -° 0;
A| imuth: 0;

Logged by: CJ/WM
Input by: CJ/WM
Checj ed by: SBN
Reviewed by: PK

Method	R.L. %nx	Length %nx	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR %% x	SCR %% x	RQD %% x	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3					**6.9m:** Unweathered(darj grey, porphyritic(slightly vesicular, moderately fractured BASALT(strong(moderately widely spaced to closely spaced, narrow, | eolite coating. Vesicles are 9-19mm diameter, clean. Phenocrysts of olivine, pyro) ene feldspar.	UW						30.1m to 30.4m: JT 60; planar, rough, veneer, %nfill: | eolitex 30.29m: DI 39; undulating, rough, clean Broj en along scoriaceous flow anding material	
	13				**80.5m:** Unweathered(darj grey, porhyritic(slightly vesicular, highly fractured, flow banded BASALT(strong(closely spaced, narrow. Vesicles are 10-19mm, aligned dip of 43 degrees. Phenocrysts of olivine, pyro) ene, feldspar, and plagioclase **80.53m:**...Large vesicles, diameter of 20mm - infilled with feldspars and olivine			100	0	89		30.6m: JT 0; planar, rough, clean 30.7m: DI 99; planar, rough, clean Broj en along scoriaceous flow banding material	
	31											30.° m DI 39; undulating, rough, clean Broj en along scoriaceous flow banding m terial 31m to 31.1m: JT 40; planar, rough, veneer, %nfill: | eolitex 31.19m to 32.3m: JT 80; undulating, rough, veneer, %nfill: | eolitex 31.26m: DI 2; undulating, rough, clean Broj en along scoriaceous flow banding material	
PQ3					**81.8m to 81.5m:**...Flow banding - dip of 34 degrees								
	12				**81.4m:**...Flow banding - dip of 40 degrees **81.9m:**...Flow banding - dip of 0 degrees **81.6m:**...Flow banding - dip of 42 degrees								
	32			VUb	**8B.1m:**...Flow banding - dip of 30 degrees								
PQ3						UW		100	0	79		32.3m: JT 39; undulating, rough, veneer, %nfill: | eolitex 32.4m to 32.7m: JT 80; undulating, rough, veneer, %nfill: | eolitex	
	11											32.7m: JT 39; planar, rough, veneer, %nfill: | eolitex	
	33				**8B.9m to 89.8m:**...Laminated large wood fragments - coarse gravel si| e							32.° m to 34.29m: JT 79; undulating, rough, coating, %nfill: clay Very softx	
PQ3	10							100	°6	100			
	34												
PQ3				AYg	**85.B3m:** Clayey fine to medium GRAVEL, some silt(darj brown(dense(sub-angular to angular. GRAVEL is baj ed clay. %Baj ed Paleosolx	GC		100	0			**85.B3m: CLLU7NUA**	
SPT	°			AY|	**85.53m:** Clayey SILT(darj brown(very stiff(moist, low plasticity %Baj ed Paleosolx	CL-ML	34.9m: SPT 3,7// 6,9,7,8 N = 26	100					
	39					CL		43	43				

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REMARKS:
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100k circulation loss at 1.4m
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No pie\| ometer measurements or installation information provided

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Client: **Cuckland Light Rail Ltd**
Prozect: **Cuckland Light Rail**
Location: **1C Patterson Cve, 2andringham**
Prozect Reference: **2tage 1 Ground Nvestigation**

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Sheet **9** of **1B**

OERI HELI NMFERACTNEM Method: Rotary Core Wireline Equipment: Massen| a MI4 Contractor: McMillan Drilling	**- ESERDNMCTI 2: MZTAB000** Easting: 1794° 40.68m Northing: 9° 162° ° .68m Reduced level: 43.97m	Date started: 10/04/2023 Date completed: 18/04/2023 Inclination: -° 0; A| imuth: 0;	Logged by: CJ/WM Input by: CJ/WM Checj ed by: SBN Reviewed by: PK

Method	R.L. %nx	Length %nx	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR % x	SCR % x	RQD % x	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	8	36		AYc	**85.63m:** Silty CLAY(darj grey, mottled brown(firm(moist, high plasticity **83.03m:** CLAY(darj grey, mottled brown(firm(moist, high plasticity	CL CL							
					83.5m: CORE LOSS			43	43				
SPT				AY|	**8Vm:** Sandy SILT, minor clay(light gret(loose(moist, non plastic, dilatant quicj	MI-SP	36m: SPT 1,1// 1,2,2,2 N = 7	100					
PQ3	7	37			**8V.9m:** Organic clayey SILT(brown, mottled grey(soft(moist, high plasticity.	OH		100	97				
SPT	6	38		AYo	**84.3m:** Organic silt fine-grained SAND, minor clay(light brown(medium dense(moist, non-plastic	OL	37.9m: SPT 1,2// 4,4,4,6 N = 18	100					
PQ3	9	3°			**84.63m:** Organic silty sandy CLAY(darj brown(stiff(moist, low plasticity. Sand is fine-grained. Organic is wood-fragments.	OL		100	0				
				AY|	**89.3m:** Sandy SILT, some organic, and clay(brown mottled grey(medium dense(moist, non-plastic, dilatant slow. Sand is fine grained. Organics is wood fragments.	MI-SP							
SPT					**86m:** CORE LOSS		3° m: SPT 2,1// 2,2,3,3 N = 10	0					
PQ3	4	40		AYc	**86.53m:** Silty CLAY(brown mottled grey, bedded(stiff(moist, high plasticity(bedding sub hori| ontal, thin to very thin.	CL-ML		100					

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100k circulation loss at 1.4m
Drillhead rattling whilst going through a vertical zoint
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Client: **Cuckland Light Rail Ltd**
Prozect: **Cuckland Light Rail**
Location: **1C Patterson Cve, 2andringham**
Prozect Reference: **2tage 1 Ground Nnvestigation**

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Sheet **6** of **1B**

OERI HELI NMFERACTNEM Method: Rotary Core Wireline Equipment: Massen| a MI4 Contractor: McMillan Drilling	**- ESERDNMCTI 2: MZTAB000** Easting: 1794° 40.68m Northing: 9° 162° ° .68m Reduced level: 43.97m	Date started: 10/04/2023 Date completed: 18/04/2023 Inclination: -° 0; A| imuth: 0;	Logged by: CJ/WM Input by: CJ/WM Checj ed by: SBN Reviewed by: PK

Method	R.L. %nx	Length %nx	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR % x	SCR % x	RQD % x	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3				AYc	**86.53m:** Silty CLAY(brown mottled grey, bedded(stiff(moist, high plasticity(bedding sub hori| ontal, thin to very thin.	CL-ML		100					
PUSHTUBE	3	41						100					
SPT							41m: SPT 1,4// 7,7,8,10 N = 32	100					
PQ3	2	42		AY|	**51.9m:** Clayey SILT, some sand(light grey mottled brown(dense(moist, non-plastic, dilatant slow. %TRANSITION ?ONEXx	CL-ML		100	100			
PQ3	1	43			**5B.0m:** CORE LOSS **5B.13m:** Clayey SILT, some sand(light grey mottled brown(dense(moist, non-plastic, dilatant slow. %TRANSITION ?ONEXx	CL-ML							
				ERs	**5B.3m:** Silty fine-grained SAND, trace clay(light grey(very dense(moist, non-plastic. %RS ECBFx	RS		°0	67			**5B.3m: I - OF**	
PQ3	0	44		EWs	**58m:** Highly weathered(light grey(medium-grained SANDSTONE(e) tremely weaj , poo ly cemented. Recovered as fine to medium-grained SAND(light-grey(very dense(moist, well graded.	HW	43.9m: SPT ° ,11// 17,3° ,11 for 29mm N = 90Z	100					
SPT	-1												
PQ3				EUs	**55.3m:** Slightly weathered(grey(fine to medium-grained SANDSTONE(very weaj , moderately well cemented	SW		87	91	87		44.4m to 44.44m: JT 70; undulating, smooth, %nfill: sand Loosex 44.49m to 44.9m: JT 39; stepped, smooth, %nfill: sand Loosex	
		49			**55.953m:** CORE LOSS							44.° m: DB 20; stepped, smooth, clean	

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100k circulation loss at 1.4m
Drillhead rattling whilst going through a vertical zoint
No pie\| ometer measurements or installation information provided

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
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12/04/2023 3:19:00 PM 524.00m 510.9 m
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Client: **Cuckland Light Rail Ltd**
Prozect: **Cuckland Light Rail**
Location: **1C Patterson Cve, 2andringham**
Prozect Reference: **2tage 1 Ground Nvestigation**

OH1B06

Sheet **10** of **1B**

OERI HELI NMFERACTNEM
Method: Rotary Core Wireline
Equipment: Massen| a MI4
Contractor: McMillan Drilling

- ESERDNMCTI 2: MZTAB000
Easting: 1794° 40.68m
Northing: 9° 162° ° .68m
Reduced level: 43.97m

Date started: 10/04/2023
Date completed: 18/04/2023
Inclination: -° 0;
A| imuth: 0;

Logged by: CJ/WM
Input by: CJ/WM
Checj ed by: SBN
Reviewed by: PK

Method	R.L. %mx	Length %mx	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR %% x	SCR %% x	RQD %% x	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPT					**53m:** NO RECOVERY		49m: SPT 18,29// 20 for 19mm N = 90Z	0					
PQ3	-2	46		EUs	**53.1Vm:** Slightly weathered(grey(fine to medium-grained SANDSTONE(very weaj , moderately well cemented	SW		100	°3	3		49.23m: DB 0; 49.96m to 46m: JT 40; undulating, smooth, clean 49.° 1m: JT 9; undulating, smooth, clean 46.17m: JT 29; undulating, rough, clean 46.36m: BP 49;	
SPT	-3				**5V.Vm:** NO RECOVERY		46.6m: SPT 12,38// N = 90Z	0				46.6m to 46.79m: No recovery due to SPTC	
PQ3	-4	47		EUs	**5V.43m:** Slightly weathered(grey(fine to medium-grained SANDSTONE(very weaj , moderately well cemented	SW		78	78	78		46.° m: JT 0; undulating, smooth, clean	
					54.53m: Slightly weathered(grey(fine to medium gra ned SANDSTONE(e) tremely weaj Recovered as fine to medium grained SAND, trace silt(very dense, well graded.	SW						47.42m: BP 9; 47.46m: BP 0;	
					54.49m: CORE LOSS								
SPT		48			**59m:** NO RECOVERY		48m: SPT 90, for 69mm// N = 90Z	0				48m to 48.069m: No recovery due to SPTC	
PQ3	-9			EUs	**59.0V3m:** Slightly weathered(light-grey(fine-grained SANDSTONE(moderately strong, well cemented. %CONCRETIONARY LAYERXx	SW							
					59.83m: Slightly weathered(grey(fine to medium-grained SANDSTONE(e) tremely weaj . Interbedded with slightly weathered(dari grey(thin and very closely spaced SILTSTONE(e) tremely weaj . Recovered as, silty SAND(grey(medium dense, thinly bedded(moist, non-plastic.	SW							
					59.V3m: ..40mm BCM banding, dipping 30 degrees								
	4°			EUi	**59.4m:** Slightly weathered(grey(fine to medium-grained SANDSTONE. Interbedded with slightly weathered(grey, thinly and very closely spaced SILTSTONE(e) tremely weaj . Recovered as silty SAND(grey(very dense, bedded(moist, non-plastic	SW		°3	72	72			
					56.5m: CORE LOSS								
SPT	-6				**56.3m:** NO RECOVERY		4° .9m: SPT 13,37 for 130mm// N = 90Z	0				4° .9m to 4° .64m: No recovery due to SPTC	
PQ3		90		EUs	**56.V5m:** Slightly weathered(grey(fine-grained SANDSTONE(moderately strong, well cemented. %CONCRETIONARY LAYERXx	SW		100	82	82		4° .7m to 90m: JT 79; undulating, slicj ensided, clean 4° .° 4m to 90.77m: JI 79; %nfill: calcitex	

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100k circulation loss at 1.4m
Drillhead rattling whilst going through a vertical zoint
No pie| ometer measurements or installation information provided

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
11/04/2023 2:00:00 PM 54.90m 54.9 m
12/04/2023 3:19:00 PM 524.00m 510.9 m
13/04/2023 8:19:00 AM 524.00m 511 m
13/04/2023 3:19:00 PM 537.90m 59.9 m
14/04/2023 7:30:00 AM 537.90m 511.9 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARY V2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

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Client: **Cuckland Light Rail Ltd**
Prozect: **Cuckland Light Rail**
Location: **1C Patterson Cve, 2andringham**
Prozect Reference: **2tage 1 Ground Nvestigation**

OH1B06

Sheet **11** of **1B**

OERI HELI NMFERACTNEM
Method: Rotary Core Wireline
Equipment: Massen| a MI4
Contractor: McMillan Drilling

- ESERDNMCTI 2: MZTAB000
Easting: 1794° 40.68m
Northing: 9° 162° ° .68m
Reduced level: 43.97m

Date started: 10/04/2023
Date completed: 18/04/2023
Inclination: -° 0;
A| imuth: 0;

Logged by: CJ/WM
Input by: CJ/WM
Checj ed by: SBN
Reviewed by: PK

Method	R.L. %mx	Length %mx	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR %% x	SCR %% x	RQD %% x	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	-7	91		EUi	**30m to 31m:**...BCM banding. dip of 40 degrees **30.01m:** Slightly weathered(grey(SILTSTONE(very weaj , poorly cemented. Interbedded with Slightly weathered(grey(moderately thin and moderately widely spaced, medium to coarse-grained SANDSTONE(very weaj .			100	82	82			
PQ3	-8	92		EUi	**31m to 31.4m:**...Banding of concretionary SANDSTONE layer. SANDSTONE is unweathered(light grey(fine-grained SANDSTONE(moderately strong, well cemented.	SW		73	73	73			
					3B.1m: CORE LOSS								
PQ3	-°	93		EUs	**3B.3m:** Slightly weathered(grey(normally graded, fine to medium-grained SANDSTONE(weaj . Interbedded with unweathered(grey, moderat ly thin and closely spaced(fine-grained SANDSTONE(weaj .	SW		°9	78	°9		92.6m to 92.87m: JI 80; %nfill: calcitex 92.6m: BP 20; stepped, smooth, clean Broj en along BCM 92.6m to 92.87m: JI 80; %nfill: calcitex 93.12m: DB 0; stepped, rough, clean 93.4m: DB 0; undulating, rough, clean 93.69m: F? 0; Recovered as fine to coarse, angular to sub-angular GRAVEL. GRAVEL is unweathered SANDSTONE	
PQ3	-10	94											
PQ3	-11	99			**35.8m:** CORE LOSS			79	9°	79			
				EUi	**35.V9m:** Slightly weathered(grey(fine to medium-grained SANDSTONE(weaj to moderately strong, moderately well cemented. Interbedded with slightly weathered(grey, thin and moderately widely spaced(SILTSTONE(weaj , moderately well cemented.	SW							

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100k circulation loss at 1.4m
Drillhead rattling whilst going through a vertical zoint
No pie| ometer measurements or installation information provided

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
11/04/2023 2:00:00 PM 54.90m 54.9 m
12/04/2023 3:19:00 PM 524.00m 510.9 m
13/04/2023 8:19:00 AM 524.00m 511 m
13/04/2023 3:19:00 PM 537.90m 59.9 m
14/04/2023 7:30:00 AM 537.90m 511.9 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

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Client: **Cuckland Light Rail Ltd**
Prozect: **Cuckland Light Rail**
Location: **1C Patterson Cve, 2andringham**
Prozect Reference: **2tage 1 Ground Nnvestigation**

OH1B06

Sheet **1B** of **1B**

OERI HELI NMFERACTNEM Method: Rotary Core Wireline Equipment: Massen| a MI4 Contractor: McMillan Drilling	**- ESERDNMCTI 2: MZTAB000** Easting: 1794° 40.68m Northing: 9° 162° ° .68m Reduced level: 43.97m	Date started: 10/04/2023 Date completed: 18/04/2023 Inclination: -° 0; A| imuth: 0;	Logged by: CJ/WM Input by: CJ/WM Checj ed by: SBN Reviewed by: PK

Method	R.L. %nx	Length %nx	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR %% x	SCR %% x	RQD %% x	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3				EUi	**35.V9m:** Slightly weathered(grey(fine to medium-grained SANDSTONE(weaj to moderately strong, moderately well cemented. Interbedded with slightly weathered(grey, thin and moderately widely spaced(SILTSTONE(weaj , moderately well cemented.	SW		79	9°	79		99.18m: JT 90; undulating, rough, clean	
PQ3	-12	96						83	0	7°		99.6m: JT : stepped, ough, clean Broj en along BCM 99.887m: JT 10; undulating, rough, clean 96.33m: JT 20; undulating, smooth, clean	
	-13			EUs	**3V.3m:** Slightly weathered(darj grey(normally-graded, fine to medium-grained SANDSTONE(weaj , moderately well cemented. Interbedded with unweathered(darj grey(uniform fine-grained, moderately thin and moderately widely spaced, SANDSTONE(weaj to moderately strong, well cemented %Concretionary layerXx	SW						96.9m: JT 0;	
		97			**3V.43m:** CORE LOSS								
PQ3	-14	98		EUs	**34m:** Slightly weathered(darj grey(normally-graded, fine to medium-grained SANDSTONE(weaj , moderately well cemented. Interbedded with unweathered(darj grey(uniform, fine-grained, moderately thin and moderately wid ly spaced, SANDSTONE(weaj to moderately s rong, well cemented %Concretionary layerXx	SW		100	90	100		97.14m: JT 10; undulating, smooth, clean 97.4m: JT 40; undulating, smooth, clean	
	-19			EUi	**39.19m:** Slightly weathered(grey, indistinctly bedded(SILTSTONE(very weaj , poorly cemented. Interbedded with slightly weathered(grey(normally-graded, fine to medium-grained, thin and moderately widely spaced SANDSTONE(weaj , moderately well cemented.	SW						98.18m: BP 30; Along BCM 98.61m: DB 0; undulating, rough, clean	
PQ3		9°		EUs	**39.4m:** Slightly weathered(grey(fine to medium-grained SANDSTONE(very weaj , poorly cemented. Interbedded with unwe thered(grey(moderately thin and moderately widely spaced SILTSTONE(very weaj , poorly cemented.	SW		100	70	°3		9° .8m: JT 30; undulating, smooth, %nfill: sand Loosex	
	-16												
		60											

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REMARKS: End of borehole at 60m %Termination Depth Achievedx
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100k circulation loss at 1.4m
Drillhead rattling whilst going through a vertical zoint
No pie\| ometer measurements or installation information provided

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
11/04/2023 2:00:00 PM 54.90m 54.9 m
12/04/2023 3:19:00 PM 524.00m 510.9 m
13/04/2023 8:19:00 AM 524.00m 511 m
13/04/2023 3:19:00 PM 537.90m 59.9 m
14/04/2023 7:30:00 AM 537.90m 511.9 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Corner of 448 Sandringham Road and Mars Avenue**
Project Reference: **Stage 1 Ground Investigation**

BH1210

Sheet **1** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1754845.57m
Northing: 5916107.06m
Reduced level: 42.54m

Date started: 2/05/2023
Date completed: 4/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR
Input by: CR
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	42	1		F	**0m:** FILL			0	0	0		**0m: FILL**	
PQ3	41	1		VWrb	**1.2m:** Moderately weathered slightly vesicular black BASALT, moderately strong. Recovered as rubble, coarse gravel to cobble size.	MW		100	0	10		**1.2m: AVF** 1.3m to 1.5m: CZ recovered as basalt gravel, fine gravel to cobble grainsize, subrounded, silty	
		2			**1.5m:** CORE LOSS							1.5m to 3m: CZ recovered as basalt gravel, fine gravel to cobbles, subangular to subrounded, silty	
PQ3	40	3		VWrb	**2m:** Recovered as moderately weathered highly vesicular black BASALT rubble. Fine gravel to cobbles, subrounded, brown silt coating. **2.4m:**...Moderately vesicular **2.6m:**...Black inclusions **2.8m:**...Highly vesicular	MW		67	0	0			
PQ3	39	4		VUb	**3m:** Slightly weathered, highly vesicular, porphyritic black BASALT, strong. **3.05m to 3.1m:**...Scoriaceous? **3.3m:**...Moderately vesicular **3.4m:**...Olivine phenocrysts **3.45m:** Slightly weathered, moderately vesicular, porphyritic black BASALT, strong.	SW SW		100	41	45		3.1m: JT 44° undulating, smooth, staining iron oxide 3.15m to 3.2m: JT 18° undulating, smooth, set of joints, clean 3.3m: JT 28° undulating, smooth, (Infill: zeolite) 3.41m: JI 12° (Infill: clay) 3.45m: JT 5° undulating, rough, coating, (Infill: silt) 3.6m: JT 54° undulating, rough, (Infill: zeolite) clean, scoriaceous faces 3.69m to 3.78m: JT (Infill: clay) set of joints, top dip 5°, bottom dip 45°, clay coating 3.83m: JT 52° planar, rough, (Infill: clay) clay coating 4.02m to 4.11m: JT undulating, rough, set of joints, top dip 50°, bottom dip 5°, clean 4.16m: JI 10° 4.25m to 4.78m: JT 10° undulating, rough, clean, closely spaced	
PQ3	38	5			**4.42m:**...Slightly vesicular **4.5m:**...Moderately vesicular **4.68m:**...Weathered olivine in vesicles **4.8m:**...Moderately strong **4.9m:**...Slightly vesicular			100	49	37		4.8m to 5.13m: JT undulating, rough, top dip 60°, bottom dip 30°, clean	

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
At 33m Matex drilling fluid added

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
2/05/2023 4:00:00 PM | 21.00m | 9.5 m
3/05/2023 8:00:00 AM | 21.00m | 9.9 m
3/05/2023 3:53:00 PM | 34.50m | 11.73 m
4/05/2023 8:36:00 AM | 34.50m | 11.52 m
4/05/2023 3:44:00 PM | 40.50m | 11.45 m
5/05/2023 8:00:00 AM | 40.50m | 11.04 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Corner of 448 Sandringham Road and Mars Avenue**
Project Reference: **Stage 1 Ground Investigation**

BH1210

Sheet **2** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1754845.57m
Northing: 5916107.06m
Reduced level: 42.54m

Date started: 2/05/2023
Date completed: 4/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR
Input by: CR
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	37	6		VUb	**3.45m:** Slightly weathered, moderately vesicular, porphyritic black BASALT, strong. **5.65m:**...Vesicles up to 20mm diameter			100	49	37		5m to 5.55m: DB drilling induced fracture zone, mineralised vesicle visible in joint surface 5.72m to 6m: DB scoriaceous material 5.85m to 6.13m: JT undulating, smooth, trace sand	
PQ3	36	7		VUb	**6m:**...Iron oxide staining **6.65m:**...Moderately strong **6.9m:**...Olivine phenocrysts	SW		100	63	79		6.13m to 6.16m: CZ recovered as subrounded basalt gravel, large gravel grainsize 6.35m: JT 26° stepped, smooth, (Infill: zeolite) scoriaceous material, clay coating, zeolite 6.6m: JI 64° clean 6.65m to 6.75m: JT 18° undulating, smooth, (Infill: zeolite) set of joints, trace clay and zeolite coating 6.85m: JI 56° clean 6.9m to 7.1m: JT 78° undulating, smooth, (Infill: zeolite) trace zeolite coating, scoriaceous material	
PQ3	35	8		VUb	**7.05m:** Slightly weathered, slightly vesicular, porphyriti black BASALT, strong. **7.1m:**...Scoriaceous **7.3m:**...Iron oxide staining **8.03m:**...Calcite inclusion, 12mm diameter **8.3m:**...Iron oxide staining			100	39	46		7.1m: JT 21° clean 7.2m: JI 20° clean 7.35m to 7.75m: JT 88° planar, rough, veneer, (Infill: clay) 7.68m to 7.72m: CZ DB, recovered as broken basalt, subangular, coarse sand to fine gravel 7.83m: JT 5° stepped, rough, weathered on JT faces 8m: JT 14° undulating, smooth, mineralised vesicle 8.15m: DB 5-32°, clean 8.22m: JI 5° undulating, rough, coating, (Infill: clay) 8.31m: JT 22° undulating, rough, scoriaceous material, zeolite coating	
PQ3	34	9		VUb		SW						8.5m to 8.65m: CZ veneer black spotted clay, DI (?), recovered as broken subrounded basalt, fine to coarse gravel 8.55m to 8.83m: JT 87° veneer, (Infill: clay)	
PQ3	33	10		VUb	**9.45m:**...Feldspar inclusion, 8mm diameter **9.51m:**...Vesicles 2-5mm diameter **9.55m:**...Olivine phenocrysts			100	61	59		9.13m to 9.25m: JT 68° undulating, rough 9.32m: DB 45° 9.45m to 9.55m: JI 40° clean open 9.63m to 9.7m: JI 15° set of joints, clean 9.88m: JI 39° stepped, smooth, DB, trace clay veneer	

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
At 33m Matex drilling fluid added

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
2/05/2023 4:00:00 PM | 21.00m | 9.5 m
3/05/2023 8:00:00 AM | 21.00m | 9.9 m
3/05/2023 3:53:00 PM | 34.50m | 11.73 m
4/05/2023 8:36:00 AM | 34.50m | 11.52 m
4/05/2023 3:44:00 PM | 40.50m | 11.45 m
5/05/2023 8:00:00 AM | 40.50m | 11.04 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATA TEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Corner of 448 Sandringham Road and Mars Avenue**
Project Reference: **Stage 1 Ground Investigation**

BH1210

Sheet **3** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1754845.57m
Northing: 5916107.06m
Reduced level: 42.54m

Date started: 2/05/2023
Date completed: 4/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR
Input by: CR
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	32			VUb	**7.05m:** Slightly weathered, slightly vesicular, porphyritic black BASALT, strong. **10.42m:**...Olivine phenocrysts, mineralised vesicle	SW		100	61	59		10.13m: JT 22° planar, rough, trace clay veneer 10.28m: JT 16° planar, rough, trace clay veneer 10.38m: JI 50° clean, open 10.42m: DB DB along flow band?	
PQ3	31	11			**10.5m:** Slightly weathered, slightly vesicular, porphyritic black BASALT, strong. **11.55m:**...Highly vesicular, flow banding 10° (upper section of flow boundary?) **11.87m:**...Band of highly vesicular basalt, 10° **11.9m:**...Moderately vesicular **12m:**...Slightly vesicular, olivine phenocrysts			100	61	69		10.5m to 10.63m: JT 5° set of joints along flow banding, silt coating, trace fine gravel 10.73m: JI 30° clean 10.8m: DB 34° clean along flow banding 10.93m to 11m: CZ Top dip 40°, bottom dip 10°, recovered as fine sand to coarse gravel, subangular, consists of basalt. 11.3m: DB 8° DB along flow banding 11.44m: JT 18° planar, rough, veneer, (Infill: clay) 11.5m: JI 34° (Infill: clay) 11.7m: JI 5° clean 11.81m: JI 18°	
PQ3	30	12			**12.39m:**...Highly vesicular flow band 08°	SW		100	39	37		11.93m: JT 25° stepped, smooth, veneer, (Infill: zeolite) 12.03m: JT 40° planar, rough, veneer, (Infill: clay) 12.09m to 12.13m: JT 32° undulating, smooth, set of joints, clean 12.33m to 12.35m: CZ subangular to angular, fine to coarse basalt gravel 12.45m to 12.5m: JI 40° clean	
PQ3	29	13			**12.67m:**...Scoriaceous **12.97m:**...13mm thick highly vesicular flow band, dip 40° **13.55m:**...Olivine phenocrysts							12.64m: JT planar, rough, top dip 5°, bottom dip 78°, clay veneer 12.7m to 13.6m: JT 34° planar, rough, veneer, (Infill: clay) 12.8m to 13m: JT 60° undulating, smooth, veneer, (Infill: clay) 13.16m to 13.5m: JT 85° undulating, smooth, veneer, (Infill: clay) fine subrounded basalt gravel 13.18m to 15.13m: JT 90° planar, rough, veneer, (Infill: clay) 13.5m to 13.7m: JT 68° undulating, smooth, veneer, (Infill: clay)	
PQ3	28	14			**13.8m:** Slightly weathered, slightly vesicular, porphyritic black BASALT, strong. Vesicles are 3-25mm diameter, clean. Phenocrysts are weathered olivine, pyroxene and feldspar. **13.95m:**...Olivine phenocrysts	SW		100	0	72		14.53m: JT 10° planar, smooth, coating, (Infill: clay)	
		15			**14.9m:**...Vesicle 30mm diameter, clay infill								

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
At 33m Matex drilling fluid added

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
2/05/2023 4:00:00 PM | 21.00m | 9.5 m
3/05/2023 8:00:00 AM | 21.00m | 9.9 m
3/05/2023 3:53:00 PM | 34.50m | 11.73 m
4/05/2023 8:36:00 AM | 34.50m | 11.52 m
4/05/2023 3:44:00 PM | 40.50m | 11.45 m
5/05/2023 8:00:00 AM | 40.50m | 11.04 m

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Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Corner of 448 Sandringham Road and Mars Avenue**
Project Reference: **Stage 1 Ground Investigation**

BH1210

Sheet **4** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1754845.57m
Northing: 5916107.06m
Reduced level: 42.54m

Date started: 2/05/2023
Date completed: 4/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR
Input by: CR
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	27			VUb	**13.8m:** Slightly weathered, slightly vesicular, porphyritic black BASALT, strong. Vesicles are 3-25mm diameter, clean. Phenocrysts are weathered olivine, pyroxene and feldspar.							15m to 15.34m: JT 76° planar, smooth, coating, (Infill: clay) 15.2m to 15.77m: JT 75° undulating, rough, clay with some sand veneer 15.25m to 15.7m: JT 76° planar, rough	
					15.7m:...Green inclusions			100	8	89		15.6m to 15.65m: JT 18° undulating, rough, clean 15.7m to 15.88m: JT 45° planar, smooth, coating, (Infill: clay)	
	16											16.04m to 16.2m: JT 64° planar, rough, veneer, (Infill: clay) 16.15m to 16.5m: JT 84° planar, rough, veneer, (Infill: clay)	
					16.33m:...Plagioclase feldspar inclusions								
	26				**16.5m:**...Slightly vesicular							16.5m to 16.93m: JT 88° undulating, smooth, veneer, (Infill: clay)	
PQ3												16.8m to 17.4m: JT 70° undulating, smooth, set of joints, clay veneer	
	17												
								100	41	75			
					17.41m:...Vesicle 15mm diameter	SW						17.5m: JT 70° planar, rough, veneer, (Infill: clay)	
	25												
												17.7m to 17.8m: JT 66° undulating, smooth, coating, (Infill: clay) 17.8m to 17.85m: JI 80° 17.85m to 17.98m: JT 58° stepped, smooth, veneer, (Infill: clay)	
	18												
												18.1m to 18.6m: JT 70° undulating, rough, coating, (Infill: clay) set of joints	
					18.28m:...Olivine phenocrysts								
PQ3	24												
								100	48	77			
	19											18.9m to 19.2m: JT 70° planar, rough, veneer, (Infill: clay) set of joints	
												19.35m: DB 30° planar, rough, staining, (Infill: clay)	
	23											19.5m to 19.62m: JT 72° planar, rough, veneer, (Infill: clay)	
PQ3								100	0	71			
	20												

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
At 33m Matex drilling fluid added

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
2/05/2023 4:00:00 PM | 21.00m | 9.5 m
3/05/2023 8:00:00 AM | 21.00m | 9.9 m
3/05/2023 3:53:00 PM | 34.50m | 11.73 m
4/05/2023 8:36:00 AM | 34.50m | 11.52 m
4/05/2023 3:44:00 PM | 40.50m | 11.45 m
5/05/2023 8:00:00 AM | 40.50m | 11.04 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Corner of 448 Sandringham Road and Mars Avenue**
Project Reference: **Stage 1 Ground Investigation**

BH1210

Sheet **5** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1754845.57m
Northing: 5916107.06m
Reduced level: 42.54m

Date started: 2/05/2023
Date completed: 4/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR
Input by: CR
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	22	21		VUb	**13.8m:** Slightly weathered, slightly vesicular, porphyritic black BASALT, strong. Vesicles are 3-25mm diameter, clean. Phenocrysts are weathered olivine, pyroxene and feldspar.			100	0	71		20.82m to 20.91m: JT 72° undulating, smooth, coating, (Infill: clay)	
PQ3	21	22			**21m:**...Vesicles 3-15mm diameter							21.05m to 21.55m: JT 88° undulating, smooth, veneer, (Infill: silt)	
PQ3	20	23			**21.57m:**...12mm thick section of weak basalt bounding joint faces **22.1m:**...Flow banding 10-18° **22.5m:**...Weathered orange olivine phenocrysts **22.85m:**...5mm thick flow band, dip 20° **23.6m:**...Weathered olivine phenocrysts	SW		100	0	82		21.57m to 22.1m: JT 85° undulating, smooth, staining, (Infill: clay) set of joints 21.57m: JT 70° stepped, smooth, coating, (Infill: clay) 21.57m to 22.1m: JT 85° undulating, smooth, staining, (Infill: clay) set of joints 21.57m: JT 70° stepped, smooth, coating, (Infill: clay) 21.57m to 22.1m: JT 85° undulating, smooth, staining, (Infill: clay) set of joints 21.57m: JT 70° stepped, smooth, coating, (Infill: clay) 21.57m to 22.1m: JT 85° undulating, smooth, staining, (Infill: clay) set of joints 21.98m to 22.25m: JT 80° undulating, smooth, coating, (Infill: clay) 22.25m to 22.45m: JT 88° undulating, smooth, veneer, (Infill: clay) set of joints 22.37m to 22.5m: JT 70° planar, smooth, veneer, (Infill: clay) 22.45m: JI 52° coating, (Infill: clay) 22.5m: JI 78° clean 22.5m to 22.69m: JT 72° planar, rough, clean 22.5m to 23.05m: JT 36° undulating, smooth, medium subangular basalt gravel 22.5m: JI 78° clean 22.5m to 22.69m: JT 72° planar, rough, clean 22.5m to 23.05m: JT 36° undulating, smooth, medium subangular basalt gravel 22.5m: JI 78° clean 22.5m to 22.69m: JT 72° planar, rough, clean 22.5m: JI 78° clean 22.5m to 22.69m: JT 72° planar, rough, clean 22.5m to 23.05m: JT 36° undulating, smooth, medium subangular basalt gravel 22.5m: JI 78° clean 22.5m to 22.69m: JT 72° planar, rough, clean 22.5m to 23.05m: JT 36° undulating, smooth, medium subangular basalt gravel 23.1m to 23.45m: JT top dip 44°, bottom dip 46° 23.2m: JI 82° 23.47m to 23.63m: JT 10° VCS 23.8m to 23.95m: JT clean top dip 50°, bottom dip 18°, VCS-ECS 24.15m: JT 40° planar, rough, veneer, (Infill: clay) 24.24m to 24.35m: JT 10° planar, rough, veneer, (Infill: clay) 24.42m: JT 30° planar, rough, clean 24.55m: JT 5° planar, rough, veneer, (Infill: clay) 24.65m: JT 30° planar, rough, veneer, (Infill: clay) 24.75m to 25.1m: JT top dip 50°, bottom dip 50°, clay veneer, trace sand	
PQ3	19	24						100	55	45			
PQ3	18	25			**24m:**...Vesicles 1-7mm diameter			100	49	35			

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
At 33m Matex drilling fluid added

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
2/05/2023 4:00:00 PM | 21.00m | 9.5 m
3/05/2023 8:00:00 AM | 21.00m | 9.9 m
3/05/2023 3:53:00 PM | 34.50m | 11.73 m
4/05/2023 8:36:00 AM | 34.50m | 11.52 m
4/05/2023 3:44:00 PM | 40.50m | 11.45 m
5/05/2023 8:00:00 AM | 40.50m | 11.04 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Corner of 448 Sandringham Road and Mars Avenue**
Project Reference: **Stage 1 Ground Investigation**

BH1210

Sheet **6** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1754845.57m
Northing: 5916107.06m
Reduced level: 42.54m

Date started: 2/05/2023
Date completed: 4/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR
Input by: CR
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	17	26		VUb	**13.8m:** Slightly weathered, slightly vesicular, porphyritic black BASALT, strong. Vesicles are 3-25mm diameter, clean. Phenocrysts are weathered olivine, pyroxene and feldspar. **25.33m:**...17mm thick vesicular flow banding, 5-10° **25.38m:**...Plagioclase phenocrysts **25.55m:**...5mm thick vesicular flow band, dipping 5° **25.9m:**...Flow bands **25.95m:**...Weakened joint surfaces, scoriaceous infill? **26.33m:**...Weathered olivine phenocrysts **27.95m:** Ves cle flow banding, dipping 16°	SW		100	49	35		25.2m to 25.41m: JT undulating, smooth, top dip 42°, bottom dip 48°, clay ve eer, trace sand 25.66m to 25.84m: JT planar, rough, veneer, (Infill: clay) top dip 46°, bottom dip 54°, trace subangular fine basalt gravel 25.9m: JT 5° undulating, rough, clean 25.95m to 27m: JT planar, rough, top dip 44°, bottom dip 80°, clay veneer with trace sand 26.1m to 26.23m: JI 45° clean	
PQ3	16	27						100	16	30			
PQ3	15	28						100	0	45		27m to 27.19m: JT top dip 89°, bottom dip 46°, clay coating, trace sand 27.2m to 27.52m: JT planar, rough, top dip 70°, bottom dip 70° 27.6m: JT 16° undulating, smooth, trace sand 27.7m to 28.5m: JT planar, smooth, coating, (Infill: clay) top dip 45°, bottom dip 64° 27.76m: JI 30° clean	
PQ3	14	29						100	0	73		28.5m to 29.2m: JT undulating, smooth, veneer, (Infill: clay) top dip 86°, bottom dip 56° 28.5m to 28.86m: JT 86° undulating, smooth, veneer, (Infill: clay) 28.5m to 29.2m: JT undulating, smooth, veneer, (Infill: clay) top dip 86°, bottom dip 56° 28.5m to 28.86m: JT 86° undulating, smooth, veneer, (Infill: clay) 28.5m to 29.2m: JT undulating, smooth, veneer, (Infill: clay) top dip 86°, bottom dip 56° 28.5m to 28.86m: JT 86° undulating, smooth, veneer, (Infill: clay) 28.5m to 29.2m: JT undulating, smooth, veneer, (Infill: clay) top dip 86°, bottom dip 56° 28.94m: JT 86° undulating, smooth, clay veneer, coarse subrounded basalt sand	
PQ3	13	30											

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
At 33m Matex drilling fluid added

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
2/05/2023 4:00:00 PM | 21.00m | 9.5 m
3/05/2023 8:00:00 AM | 21.00m | 9.9 m
3/05/2023 3:53:00 PM | 34.50m | 11.73 m
4/05/2023 8:36:00 AM | 34.50m | 11.52 m
4/05/2023 3:44:00 PM | 40.50m | 11.45 m
5/05/2023 8:00:00 AM | 40.50m | 11.04 m

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Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Corner of 448 Sandringham Road and Mars Avenue**
Project Reference: **Stage 1 Ground Investigation**

BH1210

Sheet **7** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1754845.57m
Northing: 5916107.06m
Reduced level: 42.54m

Date started: 2/05/2023
Date completed: 4/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR
Input by: CR
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy / Defect Description / Additional Notes
PQ3	12	31	**13.8m:** Slightly weathered, slightly vesicular, porphyritic black BASALT, strong. Vesicles are 3-25mm diameter, clean. Phenocrysts are weathered olivine, pyroxene and feldspar. Layer Code: VUb	SW		100	60	31		30m to 30.31m: JT undulating, smooth, veneer, (Infill: clay) top dip 70°, bottom dip 48°
			30.35m:...Moderately vesicular	SW						
			30.76m: Slightly weathered dark grey BASALT, very weak. FeO staining.	SW						30.69m to 30.73m: JT top dip 26°, bottom dip 24°, clay veneer
			30.97m: CLAY with minor silt, brown. Stiff, dry, high plasticity. Layer Code: AYc	CL						**30.97m: ALLUVIUM / ECBF**
			31.16m:...Brownish orange	CL-ML						
			31.18m: Silty CLAY, brownish orange. Stiff, moist, moderate plasticity. Layer Code: AYs	SW. CL						
			31.35m: SAND with some silt, brownish orange. Dense, moist, non plastic. Sand is fine.							
SPT	11		**31.4m:** CLAY with trace sand, dark brown. Firm, moist, high plasticity. Sand is fine.		31.5m: S T 2,4// 6 11,13 N = 38					**31.47m: ECBF**
		32	**31.47m:** Interbedded moderately weathered grey SANDSTONE (80%), very weak. Fine to medium sand grainsize, normally graded, moderately sorted. Interbedded with moderately weathered brownish grey SILTSTONE (20%), very weak. Layer Code: EWi	MW		100	0	0		
			31.6m:...Grey/green							
PQ3	10	33	**31.95m:** Moderately weathered greyish green SANDSTONE, very weak. Fine sand grain ize, silty **32.15m:**...Green Layer Code: EWs	MW		100	100	100		
			32.28m:...Orange FeO staining along possib e bedding plane, dipping 16°							
			32.47m: Interbedded moderately weathered greyish g een SANDSTONE, very weak Fin sand grainsize, silty Interbedded with moderately weathered SILTSTONE, very weak. Bedding is very thin, sub horizontal moderat ly widely spaced. **32.55m:**...Thinly bedded siltstone	MW						
SPT					33m: SPT 4,7// 12,14,19,5 for 25mm N = 50+	100	0	0		
PQ3	9	34	**33.4m:** Interbedded moderately weathered grey SANDSTONE (90%), very weak, moderately cemented. Normally graded, fine sand grainsize, silty. Interbedded with moderately weathered grey SILTSTONE (10%), very weak, widely spaced beds. Layer Code: EWi	MW		100	96	96		34.27m: DB 22° undulating, smooth, clean
			34.36m:...Well cemented							
SPTC	8				34.5m: SPTC 7,19// 22,28 for 65mm N = 50+	N/A	N/A	N/A		
PQ3		35	**34.79m:**...Poorly cemented			100	79	79		
			34.9m:...Moderately cemented							34.89m to 34.99m: CZ silty sandstone gravel, subangular, discs

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
At 33m Matex drilling fluid added

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
2/05/2023 4:00:00 PM | 21.00m | 9.5 m
3/05/2023 8:00:00 AM | 21.00m | 9.9 m
3/05/2023 3:53:00 PM | 34.50m | 11.73 m
4/05/2023 8:36:00 AM | 34.50m | 11.52 m
4/05/2023 3:44:00 PM | 40.50m | 11.45 m
5/05/2023 8:00:00 AM | 40.50m | 11.04 m

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Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Corner of 448 Sandringham Road and Mars Avenue**
Project Reference: **Stage 1 Ground Investigation**

BH1210

Sheet **8** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1754845.57m
Northing: 5916107.06m
Reduced level: 42.54m

Date started: 2/05/2023
Date completed: 4/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR
Input by: CR
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	7	36			**35.29m:**...Laminated to very thin siltstone beds, extremely closely spaced, sub horizontal. Poorly cemented			100	79	79			
					35.75m:...Widely spaced siltstone beds							35.81m: DB BP, fine to medium silty sandstone gravel, subangular	
SPTC					**35.95m:** Interbedded moderately weathered grey SANDSTONE (80%), very weak, well cemented. Fine to medium sand grainsize. Interbedded with moderately weathered grey SILTSTONE (20%), very weak. Bedding is moderately inclined, laminated to thin, very closely spaced.		36m: SPTC 11,29// 50 for 60mm N = 50+	N/A	N/A	N/A		35.85m: BP 6 35.92m to 35.96m: CZ fine to coarse silty sandstone gravel, subangular	
PQ3	6				**36.35m:**...Bedding 24°, drilling breaks along plane								
		37		EWi	**36.64m:**...Weak, well cemented **36.65m:**...70mm thick band of black carbonaceous material beds, thinly laminated, 46°			100	81	81		36.6m to 36.64m: CZ fine to medium silty sandstone gravel, subangular to subrounded 36.73m to 36.76m: CZ DB, fine to medium sandstone gravel, subrounded	
	5				**37.14m:**...Thin sub horizontal siltstone bedding, extremely closely spaced **37.15m:**...Green siltstone clasts up to 2mm diameter, rounded	MW						37.1m: BP 6° DB	
SPTC					**37.5m:**...Fine sand, closely spaced siltstone beds		37.5m: SPTC 14,31// 50 for 60mm N = 50+	N/A	N/A	N/A		37.43m: CZ recovered as coarse sandstone gravel, subrounded to angular	
PQ3		38										37.92m: DB 3° undulating, rough, clean	
	4				**38.55m:**...20mm thick siltstone bed			100	79	79		38.59m: JT 0° undulating, smooth, clean 38.67m to 38.72m: CZ fine to coarse sandstone gravel, subangular, discs 38.8m to 38.83m: CZ fine to medium silty sandstone gravel, subrounded 38.89m: FT 72° coating, (Infill: clay)	
		39		EUz	**38.78m:** Slightly weathered greyish green SILTSTONE, very weak, well cemented.	SW							
SPTC							39m: SPTC 12,38 for 140mm// N = 50+	N/A	N/A	N/A			
PQ3	3				**39.3m:** Slightly weathered grey SANDSTONE, weak, well cemented. Fine to medium sand grainsize, normally graded. **39.35m:**...20mm band of very weak, moderately cemented sandstone							39.32m to 39.37m: CZ fine to medium silty sandstone gravel, subangular	
		40		EUs		SW		100	59	93		39.72m to 39.74m: CZ fine to medium sandstone gravel, angular 39.82m: BP 18° undulating, rough, DB, silt veneer 39.9m to 39.92m: CZ coarse sand to	

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
At 33m Matex drilling fluid added

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
2/05/2023 4:00:00 PM | 21.00m | 9.5 m
3/05/2023 8:00:00 AM | 21.00m | 9.9 m
3/05/2023 3:53:00 PM | 34.50m | 11.73 m
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4/05/2023 3:44:00 PM | 40.50m | 11.45 m
5/05/2023 8:00:00 AM | 40.50m | 11.04 m

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Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Corner of 448 Sandringham Road and Mars Avenue**
Project Reference: **Stage 1 Ground Investigation**

BH1210

Sheet **9** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Massenza MI4
Contractor: McMillan Drilling

CO-ORDINATES: NZTM2000
Easting: 1754845.57m
Northing: 5916107.06m
Reduced level: 42.54m

Date started: 2/05/2023
Date completed: 4/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR
Input by: CR
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3				EUs	**39.3m:** Slightly weathered grey SANDSTONE, weak, well cemented. Fine to medium sand grainsize, normally graded. **40m:**...Bedding sub horizontal, thinly laminated, extremely closely spaced	SW		100	59	93		medium gravel, sandstone, subangular to angular 40m: DB 16° BP 40.04m: JT 84° planar, rough 40.2m: DB 16° planar, rough 40.21m: JT 68° planar, smooth 40.25m to 40.45m: JT 80° undulating, smooth, clean 40.3m to 40.5m: CZ recovered as fine gravel to cobbles, sandstone, subangular to subrounded	

End of borehole at 40.5m (Termination Depth Achieved)

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
At 33m Matex drilling fluid added

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
2/05/2023 4:00:00 PM | 21.00m | 9.5 m
3/05/2023 8:00:00 AM | 21.00m | 9.9 m
3/05/2023 3:53:00 PM | 34.50m | 11.73 m
4/05/2023 8:36:00 AM | 34.50m | 11.52 m
4/05/2023 3:44:00 PM | 40.50m | 11.45 m
5/05/2023 8:00:00 AM | 40.50m | 11.04 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland LIGHT RAIL
Bringing us closer
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Client: C6ucland Light Rail Ltd
Project: C6ucland Light Rail
Location: 1 Ta6mata Roadk2andringham
Project Reference: 2tage 1 Gro6nd Nlvestigation

OH1010

Sheet 1 of B

OERI HELI NMFERACTNEM
Method: Rotarq Core Wireline
E5uipment: Comacchio Geo 30|
Contractor: McMillan Drilling

- ESERDNMCTI 2: MPTA0, , ,
Easting: 17| 4482.| km
Northing: | k1| 270.7| m
Reduced level: | 6.17m

Date started: 1k/04/2023
Date completed: 21/04/2023
Inclination: -k0°
A9imuth: 0°

Logged bq: DY
Input bq: DY
Checyed bq: SBN
Reviewed bq: PK

Method	R.L. (m)	Length (m)	Graphic Log	Laqer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphq Defect Description Additional Notes	Installation
VACEX				HT9	, m: SILT, some organics, minor claq; dary brown. Firm, moist, low plasticitq. Organics are rootlets.	OL						, m: TEV2ENL	
	6												
				FUc	, Zm: SILT, some claq, minor fine to medium sand and rootlets; light greqish brown. Tightlq pacyed, stiff, moist, low plasticitq.	ML		0				, Zm: FNLL	
		1			1Zm to 1Z m:...Rootlets absent.								
SPT					1Z m: Sandq SILT, trace claq and rootlets; greq mottled brown. Looselq pacyed, moist, no plasticitq. Sand is fine to medium 5uart9.	ML	1.| m: SPT 1// 2 2,2 N = 8	100				1Z m: CLL97N9A	
HQ3		2			1Z3. m: SILT, some claq, minor fine sand; greq, mottled brown and red. Firm, moist, low plasticitq.	ML		100					
	4												
SPT	3	3		AY9			3m: SPT 0,1// 1,1,1,1 N = 4	100					
HQ3					5Z3. m: Claqeq SILT, some fine sand; greq, mottled brown. Soft, moist, low plasticitq.	RS		100				5Z3m: I - OF	
		4			5Z3m to 5Z3m:...100mm thicy CLAY; brownish greq. Stiff. (Weathered SILTSTONE)							5Z3m: I - OF	
	2				5Z3m to 4Z m:...Grades to greq	ML							
SPT							4.| m: SPT 0,1// 0,0,1,2 N = 3	100					
								100					

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Waterloss recorded at 1.k2m downhole while drilling at 30mbgl

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
1k/04/2023 3:00:00 PM z12.4| m z3.27 m
20/04/2023 8:00:00 AM z12.4| m z3.02 m
20/04/2023 3:00:00 PM z30.00m z1.k2 m
21/04/2023 7:30:00 AM z30.00m z2.k m
21/04/2023 1:00:00 PM z40.| 0m z3.12 m

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Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland LIGHT RAIL
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Client: C6ucland Light Rail Ltd
Project: C6ucland Light Rail
Location: 1 Ta6mata Roadk2andringham
Project Reference: 2tage 1 Gro6nd Nlvestigation

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Sheet 0 of B

OERI HELI NMFERACTNEM
Method: Rotarq Core Wireline
E5uipment: Comacchio Geo 30|
Contractor: McMillan Drilling

- ESERDNMCTI 2: MPTA0, , ,
Easting: 17| 4482.| km
Northing: | k1| 270.7| m
Reduced level: | 6.17m

Date started: 1k/04/2023
Date completed: 21/04/2023
Inclination: -k0°
A9imuth: 0°

Logged bq: DY
Input bq: DY
Checyed bq: SBN
Reviewed bq: PK

Method	R.L. (m)	Length (m)	Graphic Log	Laqer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphq Defect Description Additional Notes	Installation
HQ3	| 1	6		AY9	**5Z4. m:** Claqeq SILT, some fine sand; greq, mottled brown. Soft, moist, low plasticitq.	ML							
				ERs	**. Z05m:** Siltq fine to medium SAND, minor claq; dary greq. Looselq pacyed, moist, no plasticitq. Low plasticitq when remoulded.	CW	6m: SPT 0,1// 1,1,2,2 N = 6	100				. Z05m: I - OF	
SPT	| 0							100					
HQ3	4k	7			**U24. m:** CORE LOSS								
				ER9	**UZ3m:** Claqeq SILT, minor fine sand; dary greq. Soft, moist, high plasticitq.	CW							
				EWs	**3m:** Siltq fine SAND, minor claq; dary greq. Looselq pacyed, moist, no plasticitq. Low plasticitq when remoulded.	MW	7.| m: SPT 2,1// 2,2,2,3 N = k	86					
SPT	48	8						100					
HQ3					**8Z1m:** Highlq weathered, dary greq, siltq fine to medium SANDSTONE. Extremelq weay, poorlq cemented. (Medium dense, siltq SAND)	HW	km: SPT 2,3// 3,4,4,4 N = 1|	100					
SPT	47	k						100					
HQ3		10		EUi	**B24. m:** Slightlq weathered, dary greq, siltq fine SANDSTONE distinctlq interbedded with sub-hori9ontal, closelq spaced, verq thin SILTSTONE. Extremelq weay. (Siltq fine to medium SAND, interbedded with closelq spaced, verq thin SILT. Stiff, moist, high plasticitq when remoulded).	SW		100					

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Waterloss recorded at 1.k2m downhole while drilling at 30mbgl

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
1k/04/2023 3:00:00 PM z12.4| m z3.27 m
20/04/2023 8:00:00 AM z12.4| m z3.02 m
20/04/2023 3:00:00 PM z30.00m z1.k2 m
21/04/2023 7:30:00 AM z30.00m z2.k m
21/04/2023 1:00:00 PM z40.| 0m z3.12 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland LIGHT RAIL
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Client: C6ucland Light Rail Ltd
Project: C6ucland Light Rail
Location: 1 Ta6mata Roadk2andringham
Project Reference: 2tage 1 Gro6nd Nvestigation

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Sheet 5 of B

OERI HELI NMFERACTNEM Method: Rotarq Core Wireline E5uipment: Comacchio Geo 30| Contractor: McMillan Drilling	- ESERDNMCTI 2: MPTA0, , , Easting: 17| 4482.| km Northing: | k1| 270.7| m Reduced level: | 6.17m	Date started: 1k/04/2023 Date completed: 21/04/2023 Inclination: -k0° A9imuth: 0°	Logged bq: DY Input bq: DY Checyed bq: SBN Reviewed bq: PK

Method	R.L. (m)	Length (m)	Graphic Log	Laqer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphq Defect Description Additional Notes	Installation
HQ3	46			EUi		SW							
				EU9	**1, Z5m:** Slightlq weathered, dary greq, SILTSTONE. Extremelq weay. (Verq stiff SILT).	SW		100					
SPT				EUs	**1, Z m:** Slightlq weathered, dary greq, siltq fine SANDSTONE. Extremelq weay, poorlq cemented. (Siltq fine to medium SAND, minor claq. Denselq pacyed, moist, low plasticitq when remoulded).	SW	10.| m: SPT 3,4// | ,6,10,k N = 30	100					
HQ3	11			EUi	**11Z5m:** Slightlq weathered, dary greq, indistinctlq bedded SANDSTONE (80%). Extremelq weay, moderatelq cemented. Interbedded with steepq inclined, closelq spaced, moderatelq thin beds of siltq fine SILTSTONE (20%). (Denselq pacyed siltq fine SAND, interbedded with sub-hori9ontal, cloelq spaced, thin beds of SILT).	SW		100	kk	100		11.4km: JT | | ° undulating, rough, clean Broyen parallel to bedding. 11.| m to 11.| m: Blacy carbonaceous laminations. 11.72m: JT | | ° undulating, rough, clean Broyen parallel to bedding.	
	4|												
SPT	12					SW	2m: SPT 4.4// | ,7 k,10 N = 31	100					
	44												
HQ3				EU9	**10Z3. m:** Slightlq weathered, dary greq, SILTSTONE, minor disseminated blacy carbonaceous laminations. Extremelq weay. (SILT, minor disseminated blacy carbonaceous lamination. Hard, high plasticitq when remoulded).	SW							
	13			EUs	**10Z3. m:** Slightlq weathered, dary greq, fine SANDSTONE. Extremelq weay. (Denselq pacyed siltq fine SAND, low plasticitq when remoulded)	SW		71	71	71			
	43												
					15Z0m: CORE LOSS								
SPT				EU9	**15Z m:** Slightlq weathered, dary greq, indistinctlq bedded SILTSTONE, minor disseminated blacy carbonaceous material. Extremelq weay. (Dense SILT. Moist, high plasticitq when remoulded)	SW	13.| m: SPT | ,8// k,11,11,13 N = 44	100					
	14												
HQ3	42							100	73	100		14.0| m: DI 10° undulating, smooth, clean 14.2| m: DB 0° undulating, smooth, clean Broyen parallel to bedding 14.27m: JT 3| ° undulating, smooth, clean 14.4m: JT | | ° undulating, rough, clean 14.4| m: DB | ° undulating, smooth, clean Broyen parallel to bedding 14.6m: DB | ° undulating, rough, clean Broyen parallel to bedding 14.7m: DI 1| ° undulating, smooth, clean	
	1|												

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Waterloss recorded at 1.k2m downhole while drilling at 30mbgl

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
1k/04/2023 3:00:00 PM z12.4\| m z3.27 m
20/04/2023 8:00:00 AM z12.4\| m z3.02 m
20/04/2023 3:00:00 PM z30.00m z1.k2 m
21/04/2023 7:30:00 AM z30.00m z2.k m
21/04/2023 1:00:00 PM z40.\| 0m z3.12 m

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Client: C6ucland Light Rail Ltd
Project: C6ucland Light Rail
Location: 1 Ta6mata Roadk2andringham
Project Reference: 2tage 1 Gro6nd Nlvestigation

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Sheet 4 of B

OERI HELI NMFERACTNEM
Method: Rotarq Core Wireline
E5uipment: Comacchio Geo 30|
Contractor: McMillan Drilling

- ESERDNMCTI 2: MPTA0, , ,
Easting: 17| 4482.| km
Northing: | k1| 270.7| m
Reduced level: | 6.17m

Date started: 1k/04/2023
Date completed: 21/04/2023
Inclination: -k0°
A9imuth: 0°

Logged bq: DY
Input bq: DY
Checyed bq: SBN
Reviewed bq: PK

Method	R.L. (m)	Length (m)	Graphic Log	Laqer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphq Defect Description Additional Notes	Installation
SPT	41			EU9	**15Z m:** Slightlq weathered, dary greq, indistinctlq bedded SILTSTONE, minor disseminated blacy carbonaceous material. Extremelq weay. (Dense SILT. Moist, high plasticitq when remoulded)	SW	1| m: SPT 4,7// 8,8,11,13 N = 40	100					
HQ3		16		EUs	**1. Z3. m:** Slightlq weathered, dary greq, fine SANDSTONE. Extremelq weay, poorlq cemented. (Denselq pacyed fine to medium SAND)	SW		100	100	100		1| .km: DB 0° undulating, smooth, clean 1| .k2m: DI 20° undulating, smooth, clean	
	40				**1UZ1. m:** Slightlq weathered, dary greq, fine sandq SILTSTONE. Verq weay, bioturbated, disseminated blacy carbonaceous material.	SW						16.1	m: DB	° undulating, smooth, clean Broyen parallel to bedding.	
SPT					**1UZ m:** Slightlq weathered, dary greq, laminated MUDSTONE, trace disseminated blacy carbonaceous material. Verq weay.		16	m: S T 6,12/ 1 14,16,8 for 3	mm N =	0+	100					
HQ3	3k	17		EU9	**1UZ3m to 13Z0m:**...Recovered as fine to coarse angular SILTSTONE gravel (drilling induced).	SW		100	83	100		17.1m: JT 7| ° undulating, rough, clean 17.4m: JT		° undulating, rough, clean 17.6m: JT		° undulating, rough, clean	
					13Z1m to 18m:...Recovered as fine to coarse angular SILTSTONE gravel (drilling induced).								
SPTC	38	18			**18m:** Solid Cone SPT.		18m: SPTC 10,32//	0 for 70mm N =	0+	N/A	N/A	N/A		
HQ3	37	1k		EU9	**18Z0m:** Slightlq weathered, dary greq, fine sandq SILTSTONE, trace disseminated blacy carbonaceous material. Verq weay. **18Z1m to 18Z3m:**...Recovered as fine to coarse angular siltstone GRAVEL (drilling induced).	SW		100	k4	100		18.3m: DB 0° planar, smooth, clean 18.6m: JT			° planar, smooth, clean 18.km: DB 0° planar, smooth, clean 1k.23m: DB 0° stepped, smooth, clean	
SPTC					**1EZ m:** Solid Cone SPT.		1k.| m: SPTC 16,34 for 140mm// N =	0+	N/A	N/A	N/A		
HQ3		20		EU9	**1EZ1. m:** Slightlq weathered, dary greq, fine sandq SILTSTONE, trace disseminated blacy carbonaceous material. Verq weay.	SW		8|	8|	8|	1k.6| m to 21m: DB	° planar, rough, clean Closelq spaced drill breays. Possible bedding parallel?	

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Waterloss recorded at 1.k2m downhole while drilling at 30mbgl

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
1k/04/2023 3:00:00 PM z12.4| m z3.27 m
20/04/2023 8:00:00 AM z12.4| m z3.02 m
20/04/2023 3:00:00 PM z30.00m z1.k2 m
21/04/2023 7:30:00 AM z30.00m z2.k m
21/04/2023 1:00:00 PM z40.| 0m z3.12 m

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Client: C6ucland Light Rail Ltd
Project: C6ucland Light Rail
Location: 1 Ta6mata Roadk2andringham
Project Reference: 2tage 1 Gro6nd Nvestigation

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Sheet . of B

OERI HELI NMFERACTNEM Method: Rotarq Core Wireline E5uipment: Comacchio Geo 30| Contractor: McMillan Drilling	- ESERDNMCTI 2: MPTA0, , , Easting: 17| 4482.| km Northing: | k1| 270.7| m Reduced level: | 6.17m	Date started: 1k/04/2023 Date completed: 21/04/2023 Inclination: -k0° A9imuth: 0°	Logged bq: DY Input bq: DY Checyed bq: SBN Reviewed bq: PK

Method	R.L. (m)	Length (m)	Graphic Log	Laqer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphq Defect Description Additional Notes	Installation
HQ3	36	21		EU9	**1E0.0 m:** Slightlq weathered, dary greq, fine sandq SILTSTONE, trace disseminated blacy carbonaceous material. Verq weay. **0, Z1m to 0, Z0m:**...SILTSTONE recovered as medium to coarse angular gravel (drilling induced). **0, Z05m:**...110mm thicy bed of fine siltq SANDSTONE. Verq weay, moderatelq cemented. **0, Z0.m to 0, Z8m:**...SILTSTONE recovered as medium to coarse angular gravel (drilling induced). **0, Z8m:** CORE LOSS	SW		8|	8|	8|			
HQ3	3| 34	22		EUi	**01m:** Slightlq weathered, dary greq, SILTSTONE (80%). Weay, indistinctlq bedded, bioturbated. Interbedded with thin beds of siltq fine SANDSTONE (20%). Sandstone is verq weay, well cemented. **00Z1. m to 00Z m:**...Core dropped. Recovered as fine to coarse angular GRAVEL.	SW		100	100%	100%		21.1m: DB | ° planar, smooth, clean Broyen parallel to bedding. 21.2m: DB | ° planar, smooth, clean Broyen parallel to bedding. 21.4m: DB | ° planar, smooth, clean Broyen parallel to bedding. 21.4| m: DB | ° planar, smooth, clean Broyen parallel to bedding.	
HQ3	33	23		EU9	**00Z m:** Slightlq weathered, dary greq, fine sandq SILTSTONE, minor disseminated blacy carbonaceous material. Verq weay, moderatelq cemented. **00Z8m:**...| 0x10mm blacy carbonaceous fragment. **00Z8m:**...200mm band of fine to medium grained SANDSTONE. Verq weay, poorlq cemented. **05m:**...7| x10mm blacy carbonaceous material. **05Z m:** Slightlq weathered, dary greq, indistinctlq laminated SILTSTONE. Verq weay. Recovered as angular to sub-angular SILTSTONE. Core broyen along joint. **05Z8m:** CORE LOSS	SW		k3	k3	k3		22.| m: DB | ° planar, smooth, clean Broyen parallel to bedding. 22.km to 23.1m: Core discing in sandstone. 23.| m: JT 20° planar, smooth, clean	
HQ3	32	2|		EU9	**04m:** Slightlq weathered, dary greq, fine sandq SILTSTONE, minor disseminated blacy carbonaceous material. Siltstone shows soft-sediment deformation (fluidisation) structures. **04Z8m to 04ZUm:**...MUDSTONE laminae.	SW		k3	k3	k3		24.4m: BP 0° Mudstone laminae 24.7| m: DB | ° planar, smooth, clean 24.k4m: DB 0° undulating, smooth, clean	

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Waterloss recorded at 1.k2m downhole while drilling at 30mbgl

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
1k/04/2023 3:00:00 PM z12.4\| m z3.27 m
20/04/2023 8:00:00 AM z12.4\| m z3.02 m
20/04/2023 3:00:00 PM z30.00m z1.k2 m
21/04/2023 7:30:00 AM z30.00m z2.k m
21/04/2023 1:00:00 PM z40.\| 0m z3.12 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

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Client: C6ucland Light Rail Ltd
Project: C6ucland Light Rail
Location: 1 Ta6mata Roadk2andringham
Project Reference: 2tage 1 Gro6nd Nlvestigation

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Sheet U of B

OERI HELI NMFERACTNEM Method: Rotarq Core Wireline E5uipment: Comacchio Geo 30| Contractor: McMillan Drilling	- ESERDNMCTI 2: MPTA0, , , Easting: 17| 4482.| km Northing: | k1| 270.7| m Reduced level: | 6.17m	Date started: 1k/04/2023 Date completed: 21/04/2023 Inclination: -k0° A9imuth: 0°	Logged bq: DY Input bq: DY Checyed bq: SBN Reviewed bq: PK

Method	R.L. (m)	Length (m)	Graphic Log	Laqer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphq Defect Description Additional Notes	Installation
				EU9		SW						24.k7m: DB | ° undulating, rough, clean Broyen parallel to bedding.	
HQ3	31			EUs	**0. Z1m:** Unweathered, dary greq, siltq, fine to medium SANDSTONE. Verq weay, well cemented. Indistinctlq bedded, normallq graded. **0. Z0m to 0. Z Tm:**...Sub vertical SILTSTONE laqer?			k3	k3	k3		2| .1m: BP | ° planar, smooth, clean 2| .11m to 2| .2| m: Core broyen sub-parallel to lamination fabric?	
HQ3	30	26		EUs		UW						2| .8m to 26m: Core discing, possiblq sub parallel to bedding?	
					0UZ3. m:...| 0mm thicy bed of carbonaceous material, dip 10 degrees.			k3	k3	k3		26.2m to 26.| m: Core discing, possiblq sub-parallel to bedding?	
		27			**0UZBm:** CORE LOSS								
HQ3	2k			EU9	**03m:** Unweathered, dary greq, fine sandq SILTSTONE. Verq weay.							27.2m to 28.4m: Core discing, spaced 10-60mm, dip 0-| degrees.	
					03Z3. m:...100mm thicy bed of bla y carbonaceous material	UW							
		28			**03Z3. m:**...| 0mm thicy bed of blacy carbon ceous material.			100	100%	100%			
HQ3	28			EUs	**08m:** Unweathered, dary greq, fine to medium SANDSTONE. Verq weay, well cemented. Indistinctlq bedded, normallq graded.	UW						28m: Bedding interminable. Core broyen.	
	2k											28.7m to 28.km: DB | ° planar, rough, clean 4x	
HQ3	27				**0EZ0m:**...Siltq fine SANDSTONE.			100	100%	100%		2k.2m: DB | ° undulating, rough, clean Broyen parallel to bedding.	
				EU9	**0EZ4m:** Slightlq weathered, dary greq, SILTSTONE, minor disseminated blacy carbonaceous material. Weay. Fabric shows soft-sediment deformation (fluidisation) structures.	UW						2k.4m: DB | ° planar, smooth, clean Broyen parallel to bedding.	
		30											

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Waterloss recorded at 1.k2m downhole while drilling at 30mbgl

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
1k/04/2023 3:00:00 PM z12.4\| m z3.27 m
20/04/2023 8:00:00 AM z12.4\| m z3.02 m
20/04/2023 3:00:00 PM z30.00m z1.k2 m
21/04/2023 7:30:00 AM z30.00m z2.k m
21/04/2023 1:00:00 PM z40.\| 0m z3.12 m

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Client: C6ucland Light Rail Ltd
Project: C6ucland Light Rail
Location: 1 Ta6mata Roadk2andringham
Project Reference: 2tage 1 Gro6nd Nvestigation

OH1010

Sheet 3 of B

OERI HELI NMFERACTNEM Method: Rotarq Core Wireline E5uipment: Comacchio Geo 30| Contractor: McMillan Drilling	- ESERDNMCTI 2: MPTA0, , , Easting: 17| 4482.| km Northing: | k1| 270.7| m Reduced level: | 6.17m	Date started: 1k/04/2023 Date completed: 21/04/2023 Inclination: -k0° A9imuth: 0°	Logged bq: DY Input bq: DY Checyed bq: SBN Reviewed bq: PK

Method	R.L. (m)	Length (m)	Graphic Log	Laqer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphq Defect Description Additional Notes	Installation
HQ3	26	31		EU9	**0E2.4m:** Slightlq weathered, dary greq, SILTSTONE, minor disseminated blacy carbonaceous material. Weay. Fabric shows soft-sediment deformation (fluidisation) structures.	UW		100	k3%	100%		30.1m: JT 6| ° stepped, rough, clean 30.4m: Blacy carbon ceou laminations, dip 60 degrees.	
HQ3	2|	32		EUs	**51m:** Unweathered, dary greq, siltq fine SANDSTONE. Verq weay, well cemented. **51Z m to 50Z5m:**...Core broyen along steeplq dipping joint. Recovered as medium to coarse angular sandstone GRAVEL.	UW		| 7	| 7	| 7		31m: BP 60° Base of Siltstone. 31.| m: JT 8| ° planar, rough, clean	
HQ3	24	33			**50Z5m:** CORE LOSS								
HQ3	23	34		EU9	**55m:** Unweathered, dary greq, SILTSTONE, minor disseminated blacy carbonaceous material. Weay. Fabric shows soft-sediment deformation structures, dip | 0-60 degrees.	UW		100	74%	100%		33.0| m: DB 0° planar, rough, clean 33.2m: DI 10° stepped, rough, clean 33.21m: JT 7| ° undulating, smooth, veneer, (Infill: claq) 33.3km: DB 0° stepped, smooth, clean 33.6m to 33.83m: DI Broyen along vertical joint? 34.11m: JT 60° undulating, smooth, clean Sub-parallel to soft-sediment deformation fabric.	
HQ3	22												
HQ3	3|							k3	87%	k3			

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Waterloss recorded at 1.k2m downhole while drilling at 30mbgl

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
1k/04/2023 3:00:00 PM z12.4\| m z3.27 m
20/04/2023 8:00:00 AM z12.4\| m z3.02 m
20/04/2023 3:00:00 PM z30.00m z1.k2 m
21/04/2023 7:30:00 AM z30.00m z2.k m
21/04/2023 1:00:00 PM z40.\| 0m z3.12 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland LIGHT RAIL
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Client: C6ucland Light Rail Ltd
Project: C6ucland Light Rail
Location: 1 Ta6mata Roadk2andringham
Project Reference: 2tage 1 Gro6nd Nlvestigation

OH1010

Sheet 8 of B

OERI HELI NMFERACTNEM Method: Rotarq Core Wireline E5uipment: Comacchio Geo 30| Contractor: McMillan Drilling	- ESERDNMCTI 2: MPTA0, , , Easting: 17| 4482.| km Northing: | k1| 270.7| m Reduced level: | 6.17m	Date started: 1k/04/2023 Date completed: 21/04/2023 Inclination: -k0° A9imuth: 0°	Logged bq: DY Input bq: DY Checyed bq: SBN Reviewed bq: PK

Method	R.L. (m)	Length (m)	Graphic Log	Laqer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphq Defect Description Additional Notes	Installation
HQ3	21	36		EU9	**55m:** Unweathered, dary greq, SILTSTONE, minor disseminated blacy carbonaceous material. Weay. Fabric shows soft-sediment deformation structures, dip | 0-60 degrees.	UW		k3	87%	k3		3| .1m: JT 60° stepped, smooth, clean 3| .17m to 3| .2km: DI 3| .3m: JI k0°	
					5. ZBm: CORE LOSS								
HQ3	20	37		EU9	**5Um:** Unweathered, dary greq, SILTSTONE, minor disseminated blacy carbonaceous material. Weay. Fabric shows soft-sediment deformation structures, dip | 0-60 degrees. **5UZ 0m to 5UZ Bm:**...70mm bed of fine grained SANDSTONE. Weay, well cemented. **5UZU4m to 5UZ3m:**...60mm bed of fine grained SANDSTONE. Weay, well cemented.	UW		100	100%	100%		36.3m to 37.| m: DB Core discing. 20-60mm spacing, dip 0-| degrees. 36.7m to 38.2m: Core discing. 10-40mm spacing, dip 0-| degrees.	
HQ3	1k	38		EUi	**53Z m:** Unweathered, dary greq, in erbedded SILTSTONE (70%) and SANDSTONE (30%). Weay. SILTSTONE is interbedded with minor disseminated blacy carbonaceous materi l. SANDSTONE is well cemented.	UW						37.| m: DB 10° planar, rough, clean Broyen parallel to bedding.	
HQ3	18	3k		EU9	**58Z1. m:** Unweathered, dary greq, SILTSTONE, minor disseminated blacy carbonaceous material. Weay. Fabric shows chaotic soft-sediment deformation structures (no preferred orientation)	UW		k2	k2	k2			
					58Z8m: CORE LOSS								
HQ3	17	40		EU9	**5Bm:** Unweathered, dary greq, SILTSTONE, minor disseminated blacy carbonaceous material. Weay. Fabric shows chaotic soft-sediment deformation structures (no preferred orientation).	UW		100	k7%	100%		3k.1| m: DB 0° planar, smooth, clean 3k.4| m: DB 0° planar, smooth, clean 3k.6| m: DB 0° undulating, rough, clean 3k.8m: DB 10° Sub-parallel to soft-sediment deformation fabric? 3k.km: JT 3| ° undulating, rough, clean	

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Waterloss recorded at 1.k2m downhole while drilling at 30mbgl

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
1k/04/2023 3:00:00 PM z12.4\| m z3.27 m
20/04/2023 8:00:00 AM z12.4\| m z3.02 m
20/04/2023 3:00:00 PM z30.00m z1.k2 m
21/04/2023 7:30:00 AM z30.00m z2.k m
21/04/2023 1:00:00 PM z40.\| 0m z3.12 m

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Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARY V2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland LIGHT RAIL
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Client: C6ucland Light Rail Ltd
Project: C6ucland Light Rail
Location: 1 Ta6mata Roadk2andringham
Project Reference: 2tage 1 Gro6nd Nlvestigation

OH1010

Sheet B of B

OERI HELI NMFERACTNEM Method: Rotarq Core Wireline E5uipment: Comacchio Geo 30| Contractor: McMillan Drilling	- ESERDNMCTI 2: MPTA0, , , Easting: 17| 4482.| km Northing: | k1| 270.7| m Reduced level: | 6.17m	Date started: 1k/04/2023 Date completed: 21/04/2023 Inclination: -k0° A9imuth: 0°	Logged bq: DY Input bq: DY Checyed bq: SBN Reviewed bq: PK

Method	R.L. (m)	Length (m)	Graphic Log	Laqer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphq Defect Description Additional Notes	Installation
HQ3	16			EU9	**5B3m:** Unweathered, dary greq, SILTSTONE, minor disseminated blacy carbonaceous material. Weay. Fabric shows chaotic soft-sediment deformation structures (no preferred orientation).	UW		100	k7%	100%		3k.k| m: JT 3| ° undulating, rough, clean 40m: DB 0° planar, rough, clean 40.1| m: DB 0° planar, rough, clean 40.2km: DB 40.3m: DB 0° planar, smooth, clean	

End of borehole at 40.\| m (Termination Depth Achieved)

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Waterloss recorded at 1.k2m downhole while drilling at 30mbgl

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
1k/04/2023 3:00:00 PM z12.4\| m z3.27 m
20/04/2023 8:00:00 AM z12.4\| m z3.02 m
20/04/2023 3:00:00 PM z30.00m z1.k2 m
21/04/2023 7:30:00 AM z30.00m z2.k m
21/04/2023 1:00:00 PM z40.\| 0m z3.12 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

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C5ent: **Auckland Light Rail Limited**
Pro;ect: **Auckland Light Rail**
Location: **6 Farrelly Avenue, Owairaka**
Pro;ect Reference: **Stage 1 Ground Investigation**

BH1214

Sheet **1** of **8**

BOREHOLE INFORMATION
Method: Rotary Core Wire5ne
Ewuipment: RC Wire5ne
Contractor: Dri55Force N(Ltd

CO-ORDINATES: NZTM 2000
Easting: 17z3° 70.07m
Northing: z° 14z07.80m
Reduced 5eve5 z2.07m

Date started: 12/04/2023
Date comp5eted: 17/04/2023
Inc5nation: -° 0x
A' imuth: 0x

Logged by: DY/JH/CR
Input by: DY/JH/CR
Chec| ed by: SBN
Reviel ed by: PK

Method	R.L. 9mq	Length 9mq	Graphic Log	Layer Code	Materia5Description	Weathering/USC	Testing	TCR 9%q	SCR 9%q	RQD 9%q	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additiona5Notes	Instal5ation
VACEX	z2				**0m:** HYDROVAC - No recovery.			0	0	0		**0m: FILL**	
PQ3	z1	1		VWb	**0.8m:** Moderate5y l eathered, dar| grey, porphyritic, moderate5y vesicu5ar, BASALT. Strong) narrol aperture. Vesic5es are 1 to 20mm in diameter. O5vine crysta55 present. F5l bands genera5y dipping 20 degs.	MW		100	86	86		**0.8m: AVF** 0.82m: JT zzx stepped, rough, staining, 9nfi55 iron okideq	
PQ3	z0	2		VWb	**1.5m:** Moderate5y l eathered, dar| grey, porphyritic, moderate5y vesicu5ar, BASALT. Strong) Vesic5es are 10 to 20 mm in diameter.			100	0	z6		1.4zm: JT 7zx undu5ating, rough, coating, 9nfi55 c5ay 2qVery soft, brol nish orange) moist, high5y p5astic. 1.6m to 2.8m: undu5ating, rough, coating, 9nfi55 c5ay 2q11 k JT, z-20x. Very soft, brol nish orange) moist, high5y p5astic.	
PQ3	4°	3		VWb	**2.84m to 3m:**...RUBBLY BASALT. Recovered as fine to coarse angu5ar to ub angu5ar grave5 **3m to 4.2m:** ..Incipient coo5ng ;oints and f5l bands opened by l eathering producing a high5y fractured to rubb5y tekture.	MW						2.zm: JT 80x undu5ating, rough, coating 2mm CLAY, very soft, brol nish orange, moist, high5y p5astic) FeO stained	
PQ3	48	4		VUb	**4.2m to 4.5m:**...RUBBLY BASALT. Recovered as fine to coarse angu5ar to sub-angu5ar grave5			100	z°	°z		3.z1m: JT 10x undu5ating, rough, staining, 9nfi55 iron okideq 3.z8m: JI 10x 3.67m: JT 10x undu5ating, rough, staining, 9nfi55 iron okideq 3.8°m: JT 20x undu5ating, rough, staining, 9nfi55 iron okideq 4.06m: JT 1zx undu5ating, rough, staining, 9nfi55 iron okideq 4.13m: JT 1zx undu5ating, rough, staining, 9nfi55 iron okideq	
PQ3	z			VUb	**4.5m:** S5ght5y l eathered, dar| grey, porphyritic, s5ght5y vesicu5ar, BASALT. Strong) Vesic5es are 10 to 30mm l ith trace fe5dspar.	SW		100	81	100		4.82m: JT 4zx stepped, rough, staining, 9nfi55 iron okideq	

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
No l ater 5eve5readings ta| en on 14/03/2023 9no dip meterq
Water return throughout dri55ng 0-10.z m. Water sett5ed l hen dri55ng paused. Drained l ith hydro-ekcavation as bentonite l as not adewuate to p5ug l ater inf5uk in the borehoe.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
12/04/2023 4:30:00 PM j 10.z0m j 1 m
13/04/2023 4:00:00 PM j 1°.z0m j 2.° m
17/04/2023 7:z6:00 AM j 30.z0m j 3.7 m
17/04/2023 2:03:00 PM j 36.00m j 4.66 m

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C5ent: **Auckland Light Rail Limited**
Pro;ect: **Auckland Light Rail**
Location: **6 Farrelly Avenue, Owairaka**
Pro;ect Reference: **Stage 1 Ground Investigation**

BH1214

Sheet **2** of **8**

BOREHOLE INFORMATION
Method: Rotary Core Wire5ne
Ewuipment: RC Wire5ne
Contractor: Dri55Force N(Ltd

CO-ORDINATES: NZTM 2000
Easting: 17z3° 70.07m
Northing: z° 14z07.80m
Reduced 5eve5 z2.07m

Date started: 12/04/2023
Date comp5eted: 17/04/2023
Inc5ination: -° 0x
A' imuth: 0x

Logged by: DY/JH/CR
Input by: DY/JH/CR
Chec| ed by: SBN
Reviel ed by: PK

Method	R.L. 9mq	Length 9mq	Graphic Log	Layer Code	Materia5Description	Weathering/USC	Testing	TCR 9%q	SCR 9%q	RQD 9%q	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additiona5Notes	Instal5ation
PQ3	47	6		VUb	**4.5m:** S5ght5y l eathered, dar| grey, porphyritic, s5ght5y vesicu5ar, BASALT. Strong) Vesic5es are 10 to 30mm l ith trace fe5dspar.	SW		100	81	100		z.3m to 7.3m: C5se5y spaced s b-hori' onta5 f5l bands. FeO stained, dip 1 -30x. z.4zm: JT z0x undu5ating, smooth, staining, 9nfi5 iron okideq z.z8m: JT z0x undu5ating, smooth, staining, 9nfi5 ca5citeq z.z8m: DB zx stepped, rough, c5ean	
PQ3	46	7			**6m:** S5ght5y l eathered, dar| grey, porphyritic, high5y vesicu5ar, BASALT. Strong) Vesic5es 5ess than 1mm l ith trace fe5dspar.			100	6°	100		6m: DB zx undu5ating, rough, c5ean 6.2m: JT 40x stepped, rough, staining, 9nfi5 iron okideq 6.°3m: JT z0x undu5ating, smooth, staining, 9nfi5 iron okideq 7m: JT z0x undu5ating, smooth, staining, 9nfi5 iron okideq	
	4z												
PQ3	44	8				SW		100	z3	°7		7.z2m: DB 10x undu5ating, rough, c5ean 7.z8m: DB 10x stepped, rough, c5ean 7.71m: DB zx undu5ating, rough, c5ean 7.77m to 7.8zm: undu5ating, rough, c5ean 2 k DB-s 7.°3m: JT z0x undu5ating, smooth, staining, 9nfi5 ca5citeq 8.16m: JT 40x undu5ating, rough, staining, 9nfi5 iron okideq 8.22m: DB zx undu5ating, rough, c5ean	
	°				**8.6m:**...Vesicu5ar cy5nder, 30mm l ide, dip z0x							8.z2m: JT 40x undu5ating, rough, staining, 9nfi5 iron okideq 8.z6m: JT z0x undu5ating, smooth, staining, 9nfi5 iron okideq 8.68m: JT 20x undu5ating, rough, staining, 9nfi5 iron okideq 8.82m: JT 4zx undu5ating, smooth, staining, 9nfi5 iron okideq	
PQ3	43	10			**9.5m:** S5ght5y l eathered, dar| grey, faint5y f5l -banded porphyritic BASALT. Strong, s5ght5y vesicu5ar. Vesic5es are z-10mm diameter. Phenocrysts are o5vine in a pyrokene rich groundmass.	SW		100	82	°7		°.23m: JT 20x undu5ating, smooth, staining, 9nfi5 iron okideq °.27m: JT 40x undu5ating, smooth, staining, 9nfi5 iron okideq °.48m: JT 30x undu5ating, smooth, staining, 9nfi5 iron okideq °.73m: JT zx stepped, smooth, staining, 9nfi5 iron okideqCore bro| en sub-para5e5to f5l bandZ	

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
No l ater 5eve5readings ta\| en on 14/03/2023 9no dip meterq
Water return throughout dri5ng 0-10.z m. Water sett5ed l hen dri5ng paused. Drained l ith hydro-ekcavation as bentonite l as not adewuate to p5ug l ater inf5uk in the boreho5e.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
12/04/2023 4:30:00 PM j 10.z0m j 1 m
13/04/2023 4:00:00 PM j 1°.z0m j 2.° m
17/04/2023 7:z6:00 AM j 30.z0m j 3.7 m
17/04/2023 2:03:00 PM j 36.00m j 4.66 m

Auc| 5and

C5ent: **Auckland Light Rail Limited**
Pro;ect: **Auckland Light Rail**
Location: **6 Farrelly Avenue, Owairaka**
Pro;ect Reference: **Stage 1 Ground Investigation**

BH1214

Sheet **3** of **8**

BOREHOLE INFORMATION
Method: Rotary Core Wire5ne
Ewuipment: RC Wire5ne
Contractor: Dri55Force N(Ltd

CO-ORDINATES: NZTM 2000
Easting: 17z3° 70.07m
Northing: z° 14z07.80m
Reduced 5eve5 z2.07m

Date started: 12/04/2023
Date comp5eted: 17/04/2023
Inc5nation: -° 0x
A' imuth: 0x

Logged by: DY/JH/CR
Input by: DY/JH/CR
Chec| ed by: SBN
Reviel ed by: PK

Method	R.L. 9mq	Length 9mq	Graphic Log	Layer Code	Materia5Description	Weathering/USC	Testing	TCR 9%q	SCR 9%q	RQD 9%q	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additiona5Notes	Instal5ation
PQ3	42				**9.5m:** S5ght5y l eathered, dar| grey, faint5y f5l -banded porphyritic BASALT. Strong, s5ght5y vesicu5ar. Vesic5es are z-10mm diameter. Phenocrysts are o5vine in a pyrokene rich groundmass.								
								100	82	°7		10.18m: JT 70x p5anar, rough, staining, 9nfi5 iron okideq2 k orthonoga5JT s. 10.28m: DB zx stepped, rough, c5an	
												10.zm to 10.6m DB Cor_ bro| en a5ng mu5ip5e incipient fractures.	
												10.7zm: JT 8zx undu5ating, rough, staining FeO, ' eo5teZ	
	41	11										10.8° m: JT 4zx undu5ating, smooth, staining 9Fe2~q 10°° m: JI zzx	
								100	62	°°		11.31m: JT z0x undu5ating, smooth, staining 9Fe2~q 11.32m: JT 6zx undu5ating, smooth, staining 9Fe2~q 11.4° m: JT z0x undu5ating, smooth, staining 9Fe2~q	
	40	12										11.87m: DB 80x undu5ating, smooth	
												12m: JT 60x undu5ating, rough, staining 9Fe2~q	
												12.22m: DB 0x undu5ating, rough	
				VUb		SW						12.z2m: DB zx stepped, rough	
								100	100	100		12.86m to 14.71m: JT p5anar, smooth, l avy sub-vertica5coo5ng ;oint. Fe2~ staining.	
	3°	13										core has bro| en during dri5ng para55to the sub-vertica5;oint.	
												13.1° m: DB 0x stepped, rough	
												13.28m: DB zx stepped, rough	
		14											
	38											14.12m: JT 20x undu5ating, smooth, staining	
								100	81	100			
		1z											

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
No l ater 5eve5readings ta\| en on 14/03/2023 9no dip meterq
Water return throughout dri5ng 0-10.z m. Water sett5ed l hen dri5ng paused. Drained l ith hydro-ekcavation as bentonite l as not adewuate to p5ug l ater inf5uk in the borehoe.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
12/04/2023 4:30:00 PM j 10.z0m j 1 m
13/04/2023 4:00:00 PM j 1° .z0m j 2.° m
17/04/2023 7:z6:00 AM j 30.z0m j 3.7 m
17/04/2023 2:03:00 PM j 36.00m j 4.66 m

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C5ent: **Auckland Light Rail Limited**
Pro;ect: **Auckland Light Rail**
Location: **6 Farrelly Avenue, Owairaka**
Pro;ect Reference: **Stage 1 Ground Investigation**

BH1214

Sheet **4** of **8**

BOREHOLE INFORMATION
Method: Rotary Core Wire5ne
Ewuipment: RC Wire5ne
Contractor: Dri55Force N(Ltd

CO-ORDINATES: NZTM 2000
Easting: 17z3° 70.07m
Northing: z° 14z07.80m
Reduced 5eve5 z2.07m

Date started: 12/04/2023
Date comp5eted: 17/04/2023
Inc5nation: -° 0x
A' imuth: 0x

Logged by: DY/JH/CR
Input by: DY/JH/CR
Chec| ed by: SBN
Reviel ed by: PK

Method	R.L. 9mq	Length 9mq	Graphic Log	Layer Code	Materia5Description	Weathering/USC	Testing	TCR 9%q	SCR 9%q	RQD 9%q	Fracture Log (VWS WS MWS CS VS ECS)	Stratigraphy Defect Description Additiona5Notes	Instal5ation
PQ3	37			VUb	**9.5m:** S5ght5y l eathered, dar| grey, faint5y f5l -banded porphyritic BASALT. Strong, s5ght5y vesicu5ar. Vesic5es are z-10mm diameter. Phenocrysts are o5vine in a pyrokene rich groundmass.	SW		100	z1	87		1z.04m: JT 30x p5anar, rough, c5ean 1z.3m: DB zx p5anar, rough, c5ean 1z.zm to 1z.8m: JT 80x undu5ating, smooth, staining green stain, ch5oriteZ 1z.z1m: JT z0x undu5ating, smooth, staining green stain, ch5oriteZ 1z.z3m: JT 6zx p5anar, smooth, staining green stain, ch5oriteZ 1z.6m: JT 2zx undu5ating, smooth, staining green stain, ch5oriteZ 1z.64m to 16.06m: JT 80x undu5ating, smooth, staining green stain, ch5oriteZ 1z.°zm: DB 10x undu5ating, rough 16.07m to 16.2zm: JT °0x undu5ating, smooth, staining 9Fe2~Zq 16.2zm to 16.4zm: JT 70x undu5ating, smooth, staining green stain, ch5oriteZ 16.31m: DB 20x p5anar, smooth, Core has bro| en a5ong incipient coo5ng fracture or f5l tekture. 16.4zm: DB 4zx undu5ating, smooth, Core has bro| en a5ong incipient coo5ng fracture or f5l tekture. 16.zm: DB 1zx undu5ating, smooth, Core has bro| en a5ong incipient coo5ng fracture or f5l tekture. 16.z1m to 16.°3m: JT 7zx undu5ating, smooth, staining, 9nfi55 iron okideq3 k DB-s l here Core has bro| en a5ong incipient coo5ng fracture or f5l tekture. 17.12m: JT 30x undu5ating, smooth, c5ean 17.1zm to 17.26m: DB 60x p5anar, smooth, 2 k DB-s l here core has bro| en a5ong incipient coo5ng fracture or f5l tekture. 17.3m to 17.7m: JT 20x undu5ating, smooth, staining 3 k c5ose5y spaced JT-s. green stain, ch5oriteZ 17.68m: DB 6zx undu5ating, smooth, c5ean Core has bro| en a5ong incipient coo5ng fracture or f5l tekture. 17.8m: DB 0x p5anar, smooth, c5ean Core has bro| en a5ong incipient coo5ng fracture or f5l tekture. 18m: JT 0x p5anar, smooth, staining green stain, ch5oriteZ 18.1zm: DB 0x p5anar, smooth, c5ean 18.2m to 1° .zzm: JT p5anar, smooth, staining, 9nfi55 iron okideq| avy sub-vertica5 coo5ng ;oint. Iron okide staining. 7 k c5ose5y to moderate5y l ide5y spaced JTs, 1zx - 2zx. 1° .6m to 1° .7m: DB 10x undu5ating, smooth, veneer, 9nfi55 c5ayq 1° .6m: JT 70x undu5ating, rough 1° .6m to 1° .7m: DB 10x undu5ating, smooth, veneer, 9nfi55 c5ayq 1° .6m: JT 70x undu5ating, rough 1° .6m to 1° .7m: DB 10x undu5ating, smooth,	
PQ3	3z							100	20	61			
PQ3	34							100	40	87			
PQ3	33							100	67	°3			

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
No l ater 5eve5readings ta| en on 14/03/2023 9no dip meterq
Water return throughout dri5ng 0-10.z m. Water sett5ed l hen dri5ng paused. Drained l ith hydro-ekcavation as bentonite l as not adewuate to p5ug l ater inf5ik in the borehoe.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
12/04/2023 4:30:00 PM j 10.z0m j 1 m
13/04/2023 4:00:00 PM j 1° .z0m j 2.° m
17/04/2023 7:z6:00 AM j 30.z0m j 3.7 m
17/04/2023 2:03:00 PM j 36.00m j 4.66 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARY v2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR GH LOG Date Generated: 29/07/2023

Auckland LIGHT RAIL
Auc| 5and

C5ent: **Auckland Light Rail Limited**
Pro;ect: **Auckland Light Rail**
Location: **6 Farrelly Avenue, Owairaka**
Pro;ect Reference: **Stage 1 Ground Investigation**

BH1214

Sheet **5** of **8**

BOREHOLE INFORMATION
Method: Rotary Core Wire5ne
Ewuipment: RC Wire5ne
Contractor: Dri55Force N(Ltd

CO-ORDINATES: NZTM 2000
Easting: 17z3° 70.07m
Northing: z° 14z07.80m
Reduced 5eve5 z2.07m

Date started: 12/04/2023
Date comp5eted: 17/04/2023
Inc5nation: -° 0x
A' imuth: 0x

Logged by: DY/JH/CR
Input by: DY/JH/CR
Chec| ed by: SBN
Reviel ed by: PK

Method	R.L. 9mq	Length 9mq	Graphic Log	Layer Code	Materia5Description	Weathering/USC	Testing	TCR 9%q	SCR 9%q	RQD 9%q	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additiona5Notes	Instal5ation
PQ3	32	21		VUb	**9.5m:** S5ght5y l eathered, dar| grey, faint5y f5l -banded porphyritic BASALT. Strong, s5ght5y vesicu5ar. Vesic5s are z-10mm diameter. Phenocrysts are o5vine in a pyrokene rich groundmass.	SW		100	67	°3		veneer, 9nfi5 c5ayq 1°.7m: JT z0x undu5ating, s5c| ensided, staining 1°.°m: JT 7zx undu5ating, smooth, veneer, 9nfi5 c5ayq 20.2m to 20.zm: DB 6zx u du5ating, smooth 20.zm: DB 3x undu5ating, smooth 20.7m: JT 70x undu5ating, smooth, coating, 9nfi5 c5ayq 20.7zm to 21m: DB 10x undu5ating, smooth 21m to 21.1m: DB 0x p5anar, smooth 21.1m: JT 61x undu5ating, smooth, coating, 9nfi5 c5ayq 21.2m: DB 2x undu5ating, smooth 21.3m: JT z6x undu5ating, smooth, veneer 21.4m: DB 12x undu5ating, smooth, staining 21.41m to 21.8zm: DB 12x 21.4zm: JT 70x undu5ating, rough, coating 21.zm: JT 1zx undu5ating, smooth, veneer, 9nfi5 c5ayq	
PQ3	31	22						100	26	60		22m: DB 28x undu5ating, smooth 22.1m: JT 70x undu5ating, smooth, staining 22.4m: DB 7zx undu5ating, smooth	
PQ3	30	23						100	33	60		22.8m: JT 74x undu5ating, smooth, veneer, 9nfi5 c5ayq 23m: DB 3x undu5ating, rough	
PQ3	2°	24		AYo	**23.4m:** ORGANIC SILT, dar| grey to b5ac| . Hard, non p5astic. Organics are charcoa559Ba| ed pa5eoso5l	OL						**23.4m: ALLUVIUM** 23.4m: BP 30x	
					23.8m: CLAY, some si5, dar| brol nish grey. Very stiff/hard, moist, high5y p5astic.	CH							
SPT	28			AYc	**24m:** Pumiceous si5y CLAY, trace disseminated oragnics) l hitish grey. Very stiff, moist, 5l p5asticity. Organics are decomposed l ith no recognisab5e structure. Pumice is high5y l eathered.	CL-ML	24m: SPT 2,4// 6,7,10,10 N = 33	100					
PQ3		2z						100					

REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
No l ater 5eve5readings ta\| en on 14/03/2023 9no dip meterq
Water return throughout dri5ng 0-10.z m. Water sett5ed l hen dri5ng paused. Drained l ith hydro-ekcavation as bentonite l as not adewuate to p5ug l ater inf5uk in the borehoe.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
12/04/2023 4:30:00 PM j 10.z0m j 1 m
13/04/2023 4:00:00 PM j 1°.z0m j 2.° m
17/04/2023 7:z6:00 AM j 30.z0m j 3.7 m
17/04/2023 2:03:00 PM j 36.00m j 4.66 m

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Auckland LIGHT RAIL

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C5ent: **Auckland Light Rail Limited**
Pro;ect: **Auckland Light Rail**
Location: **6 Farrelly Avenue, Owairaka**
Pro;ect Reference: **Stage 1 Ground Investigation**

BH1214

Sheet **6** of **8**

BOREHOLE INFORMATION
Method: Rotary Core Wire5ne
Ew uipment: RC Wire5ne
Contractor: Dri55Force N(Ltd

CO-ORDINATES: NZTM 2000
Easting: 17z3° 70.07m
Northing: z° 14z07.80m
Reduced 5eve5 z2.07m

Date started: 12/04/2023
Date comp5eted: 17/04/2023
Inc5nation: -° 0x
A' imuth: 0x

Logged by: DY/JH/CR
Input by: DY/JH/CR
Chec| ed by: SBN
Reviel ed by: PK

Method	R.L. 9mq	Length 9mq	Graphic Log	Layer Code	Materia5Description	Weathering/USC	Testing	TCR 9%q	SCR 9%q	RQD 9%q	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additiona5Notes	Instal5ation
PQ3	27			AYc	**24m:** Pumiceous si5y CLAY, trace disseminated oragnics) l hitish grey. Very stiff, moist, 5l p5asticity. Organics are decomposed l ith no recognisab5e structure. Pumice is high5y l eathered. **25m to 25.4m:**...Brol nish grey.	CL-ML		100					
SPT					**25.4m:** C5ayey SILT, trace disseminated organics, dar| grey. Very stiff, moist, 5l p5asticity. Organics are part5y decomposed.	CL-ML	2z.zm: SPT 1,2// 3,3,3,4 N = 13	88					
PQ3	26	26		AY'	**25.9m:** Sandy SILT, some c5ay, dar| grey. Very stiff, moist, 5l p5asticity) sand, fine.	ML		100					
SPT	2z	27			**26.9m:** Sandy SILT, some c5ay, dar| grey. Stiff, moist, 5l p5asticity) sand, fine.	ML	27m: SPT 1,2// 2,3,3,3 N = 11	66					
					27.3m: CORE LOSS								
PQ3	24	28		AY'	**27.45m:** C5ayey SILT, some sand t ace disseminated organics dar| grey. Stiff, moist 5l p5asticity) sand fine. Organics are partia5y decomposed l ith some l ood fibres visib5e.	ML	28.zm: SPT 1,1// 1,2,3,3 N = °	100					
SPT		2°						100					
PQ3	23				**29m:** Sandy SILT, trace c5ay and disseminated organics, brol nish grey. medium dense, moist, non p5astic) sand, fine. Di5atant. Organics are b5ac| , partia5y decomposed. **29.2m:**...Wide5y spaced poc| ets, ?30mm, of fine to medium grained si5y pumiceous SAND. **29.5m:**...200mm ' one of soft to firm saturated sandy SILT.	MI-SP		100					
		30											

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
No l ater 5eve5readings ta\| en on 14/03/2023 9no dip meterq
Water return throughout dri5ng 0-10.z m. Water sett5ed l hen dri5ng paused. Drained l ith hydro-ekcavation as bentonite l as not adew uate to p5ug l ater inf5uk in the borehoe.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
12/04/2023 4:30:00 PM j 10.z0m j 1 m
13/04/2023 4:00:00 PM j 1°.z0m j 2.° m
17/04/2023 7:z6:00 AM j 30.z0m j 3.7 m
17/04/2023 2:03:00 PM j 36.00m j 4.66 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

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C5ent: **Auckland Light Rail Limited**
Pro;ect: **Auckland Light Rail**
Location: **6 Farrelly Avenue, Owairaka**
Pro;ect Reference: **Stage 1 Ground Investigation**

BH1214

Sheet **7** of **8**

BOREHOLE INFORMATION
Method: Rotary Core Wire5ne
Ewuipment: RC Wire5ne
Contractor: Dri5Force N(Ltd

CO-ORDINATES: NZTM 2000
Easting: 17z3° 70.07m
Northing: z° 14z07.80m
Reduced 5eve5 z2.07m

Date started: 12/04/2023
Date comps5ted: 17/04/2023
Inc5nation: -° 0x
A' imuth: 0x

Logged by: DY/JH/CR
Input by: DY/JH/CR
Chec| ed by: SBN
Reviel ed by: PK

Method	R.L. 9mq	Length 9mq	Graphic Log	Layer Code	Materia5Description	Weathering/USC	Testing	TCR 9%q	SCR 9%q	RQD 9%q	Fracture Log (VWS WS MWS CS VS ECS)	Stratigraphy Defect Description Additiona5Notes	Instal5ation
SPT	22			AY'		MI-SP	30m: SPT 1,2// 3,4,z,z N = 17						
					30.15m: CORE LOSS			33					
				ER'	**30.45m:** SILT l ith some sand, grey. Very soft, l et, 5l p5asticity. Sand is fine to medium, di5atant.	RS						**30.45m:** ECBF	
PQ3 PQ3	21	31		EWs	**30.6m:** High5y l eathered grey SANDSTONE, ektreme5y l ea| , poor5y cemented, fine to coarse grainsi' e, norma5y graded. B5ac| carbonaceous materia5			100 100	0 100	0 100			
					31.2m:.....l ith some fine grave5 subrounded grey SILTSTONE c5asts, very l ea| . Coarse wuart' sand and b5ac| carbonaceous materia5visib5e.	HW							
SPT							31.zm: SPT 2,1z// 24,16,10 for 4zmm N = z0~	100	0	0			
PQ3	20	32		EW'	**31.84m:** Moderate5y l eathered, grey MUDSTONE, very l ea| , moderate5y cemented. Visib5e muscovite.	MW							
				EUs	**32m:** S5ght5y l eathered, grey SANDSTONE, very l ea	moderate5y cemented, cross bedded, bedding 08x, thin5y 5aminated.	SW					31.° zm: JI 14x 9nfi5 ca5iteq 32m: JT 42x p5anar, rough	
					32.2m:.....sandstone ripup c5ast.							32.2m to 32.28m: JI	
					32.23m: S5ght5y l eathered, grey SANDSTONE, very l ea|, moderate5y cemented, medium to coarse grain si' e. Trace orange vo5canic5astics, some fine subrounded grave5 **32.25m:**.....5ens of b5ac| carbonaceous materia5 **32.35m:**.....recovered as bro| en sandstone cobb5es, visib5e mica.	SW		78	z2	z6			
SPTC	1°	33			**32.65m:** CORE LOSS		33m: SPTC 10,10// 23,20,7 for 1zmm N = z0~	N/A	N/A	N/A			
PQ3	18	34		EWi	**33.45m:** Moderate5y l eathered, grey SILTSTONE, l ea| , moderate5y cemented. Interbedded l ith moderate5y l eathered, grey SANDSTONE, l ea| , moderate5y cemented, beds very thin to thin, ektreme5y c5ose5y spaced. 33.5m to 33.55m:.....recovered as fractured SILTSTONE. **33.75m:**.....sandstone ripup c5ast. **33.8m:**.....bedding 2zx. **33.87m:**..... CLAY l ith minor si5)l hite. Hard, moist, 5ol p5asticity, 10mm thic| . **34.1m:**.....trace pyrite visib5e in dri5ng fracture, FeO staining.	MW		8"	61	60		33.61m to 33.78m: JT 88x stepped, smooth, c5ean	
				EUs	**34.3m:** S5ght5y l eathered, grey SANDSTONE, l ea| , moderate5y cemented, fibrous b5ac| carbonaceous materia5 l ith trace pyrite.	SW					34.3m: DB zx 5ocated at BCM boundary	
SPTC							34.zm: SPTC 10,40 for 140mm// N = z0~	N/A	N/A	N/A			
PQ3		3z		EUi	**34.65m:** S5ght5y l eathered, grey SILTSTONE, l ea| , l e5 cemented. Interbedded l ith s5ght5y l eathered grey SANDSTONE, very l ea| , moderate5y cemented. Red vo5canic5astic grains, b5ac| carbonaceous materia5 **34.7m:**.....pin| vo5canic5astic 5ayer visib5e in dri5ng brea| .	SW		100	80	80		34.6zm: BP zx undu5ating, rough	

REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
No l ater 5eve5readings ta| en on 14/03/2023 9no dip meterq
Water return throughout dri5ng 0-10.z m. Water sett5ed l hen dri5ng paused. Drained l ith hydro-ekcavation as bentonite l as not adewuate to p5ug l ater inf5uk in the borehol5e.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
12/04/2023 4:30:00 PM j 10.z0m j 1 m
13/04/2023 4:00:00 PM j 1°.z0m j 2.° m
17/04/2023 7:z6:00 AM j 30.z0m j 3.7 m
17/04/2023 2:03:00 PM j 36.00m j 4.66 m

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C5ent: **Auckland Light Rail Limited**
Pro;ect: **Auckland Light Rail**
Location: **6 Farrelly Avenue, Owairaka**
Pro;ect Reference: **Stage 1 Ground Investigation**

BH1214

Sheet **8** of **8**

BOREHOLE INFORMATION
Method: Rotary Core Wire5ne
Ewuipment: RC Wire5ne
Contractor: Dri55Force N(Ltd

CO-ORDINATES: NZTM 2000
Easting: 17z3° 70.07m
Northing: z° 14z07.80m
Reduced 5eve5 z2.07m

Date started: 12/04/2023
Date comp5eted: 17/04/2023
Inc5nation: -° 0x
A' imuth: 0x

Logged by: DY/JH/CR
Input by: DY/JH/CR
Chec[ed by: SBN
Reviel ed by: PK

Method	R.L. 9mq	Length 9mq	Graphic Log	Layer Code	Materia5Description	Weathering/USC	Testing	TCR 9%q	SCR 9%q	RQD 9%q	Fracture Log (VWS WS MWS CS VS ECS)	Stratigraphy Defect Description Additiona5Notes	Instal5ation
PQ3	17		× × × × × ×	EUi	**34.65m:** S5ght5y [eathered, grey SILTSTONE, [ea[, [e55 cemented. Interbedded [ith s5ght5y [eathered grey SANDSTONE, very [ea[, moderate5y cemented. Red vo5canic5astic grains, b5ac[carbonaceous materia5 **35.15m:**.....recovered as coarse grave5and cobb5es of sandstone.	SW						3z.1zm to 3z.41m: C(	
PQ3				EUs	**35.41m:** S5ght5y [eathered, grey SANDSTONE, [ea[, [e55 cemented, brol n si5stone c5asts 1-2mm diameter.	SW		100	80	80		3z.6m: DB 12x undu5ating, smooth, c5ean	
					35.9m:.....green si5stone ripup c5ast.							3z.82m: DB 6x undu5ating, smooth, c5ean	
SPTC	16	36			End of borehoe5e at 36.1m 9Terminated Deeper due to unfavourab5e ground conditionsq		36m: SPTC 2z,2z for z0mm/ N = z0~	N/A	N/A	N/A			

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
No [ater 5eve5readings ta[en on 14/03/2023 9no dip meterq
Water return throughout dri5ng 0-10.z m. Water set5ed [hen dri5ng paused. Drained [ith hydro-ekcavation as bentonite [as not adewuate to p5ug [ater inf5ik in the borehoe5e.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
12/04/2023 4:30:00 PM j 10.z0m j 1 m
13/04/2023 4:00:00 PM j 1°.z0m j 2.° m
17/04/2023 7:z6:00 AM j 30.z0m j 3.7 m
17/04/2023 2:03:00 PM j 36.00m j 4.66 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230728_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARY2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 29/07/2023

Auckland

Client: **Cuckland Light Rail Limited**
Project: **Cuckland Light Rail**
Location: **, Z Oellevue Road2At l den**
Project Reference: **0tage 1 Ground Nlvestigation**

OH14B1

Sheet **1** of **1B**

OERI HELI NMFERACTNEM
Method: Rotary Core Wireline
Equipment: RC Wireline
Contractor: Drill Force NZ Ltd

- ESERDNMCTI 0: M. TA 5BBB
Easting: 1756189.85m
Northing: 5917683.38m
Reduced level: 69.48m

Date started: 2/03/2023
Date completed: 13/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: BGW/DWB
Input by: BGW/DWB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	69	1		P	**Bm:** ASPHALT.							**Bm: FNLL** 0m: Pick up ~700mm Bentonite	
				FUc	**B3Zm:** Gravelly, clayey SILT; brownish orange. Firm, moist, high plasticity. Gravel is fine to coarse BASALT, highly weathered, moderately strong, highly vesicular, reddish brown.								
PQ3	68			VUb	**13Im:** Slightly weathered, dark grey BASALT; strong, highly vesicular; Iron oxide, (red) staining on fracture faces.	SW						**13Im: C7F**	
		2		VUv	**13Um:** VOID							1.5m: 100% water loss 1.5m: 0.75m rod drop observed. 1.5m: 100% water loss	
PQ3	67			VUb	**53Um:** Slightly weathered, dark grey BASALT; strong, highly vesicular; Iron oxide, (red) staining on fracture face **53VUm to 43VUm:** ...100mm band of basalt GRAVEL; angular, 20-30mm, vesicular with Iron oxide staining.	SW						3m: Drill mud added	
PQ3	66	3			**43VUm:** CORE LOSS							3.75m: Pick up of ~600mm stuck in barrel.	
PQ3	65	4		VUb	**43Im:** Slightly weathered, dark grey, porphyritic, flow banded, moderately vesicular BASALT; very strong. Flow bands dip 40 degrees. Phenocryts (<5mm) of olivine and feldspar. **Z3Um:**...Phenocryts (<5mm) of olivine and feldspar.	SW						4.2m to 4.5m: JT 90° stepped, rough, clean 4.5m: FL 40° 4.6m to 4.7m: DB 4.8m to 4.85m: DB	
PQ3		5											

Box 1
Box 2

REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Hydraulic hose broken on 10/03/2023, unable to take water level reading.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.
All vibrating wire piezometers missing installaton depth measurement (pre-grout) readings.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
3/03/2023 5:00:00 PM | 7.50m | Dry m
7/03/2023 5:00:00 PM | 21.00m | Dry m
8/03/2023 8:00:00 AM | 21.00m | Dry m
8/03/2023 5:00:00 PM | 33.00m | Dry m
9/03/2023 8:00:00 AM | 33.00m | 31 m
9/03/2023 5:00:00 PM | 42.00m | 22 m
10/03/2023 8:00:00 AM | 42.00m | 25 m
13/03/2023 8:00:00 AM | 46.50m | 31 m

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Client: **Cuckland Light Rail Limited**
Project: **Cuckland Light Rail**
Location: **, Z Oellevue Road2A t l den**
Project Reference: **0tage 1 Ground Nvestigation**

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Sheet **5** of **1B**

OERI HELI NMFERACTNEM	**- ESERDNMCTI 0: M. TA 5BBB**	Date started: 2/03/2023	Logged by: BGW/DWB
Method: Rotary Core Wireline	Easting: 1756189.85m	Date completed: 13/03/2023	Input by: BGW/DWB
Equipment: RC Wireline	Northing: 5917683.38m	Inclination: -90°	Checked by: SBN
Contractor: Drill Force NZ Ltd	Reduced level: 69.48m	Azimuth: 0°	Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
Box 2 PQ3	64	6		VUb	**43.6m:** Slightly weathered, dark grey, porphyritic, flow banded, moderately vesicular BASALT; very strong. Flow bands dip 40 degrees. Phenocryts (<5mm) of olivine and feldspar.	SW						5.7m to 6.1m: JT stepped, rough, veneer 6.3m to 6.35m: JT 40° stepped, rough, coating, 1 6.75m: JT 50° undulating, rough, FeO stained 6.85m: JT 80° undulating, rough 7m: JT 60° undulating, rough, FeO stained 7.8m: JT 40° stepped, rough, veneer, 1 8.2m: DB 8.4m: DB 8.6m: DB 9.25m: DB 9.6m: DB 9.7m: DB 9.8m: FL 18°	
Box 3 PQ3	63	7											
PQ3	62	8											
Box 4 PQ3	61	9											
PQ3	60	10											

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Hydraulic hose broken on 10/03/2023, unable to take water level reading.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.
All vibrating wire piezometers missing installaton depth measurement (pre-grout) readings.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
3/03/2023 5:00:00 PM | 7.50m | Dry m
7/03/2023 5:00:00 PM | 21.00m | Dry m
8/03/2023 8:00:00 AM | 21.00m | Dry m
8/03/2023 5:00:00 PM | 33.00m | Dry m
9/03/2023 8:00:00 AM | 33.00m | 31 m
9/03/2023 5:00:00 PM | 42.00m | 22 m
10/03/2023 8:00:00 AM | 42.00m | 25 m
13/03/2023 8:00:00 AM | 46.50m | 31 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Cuckland Light Rail Limited**
Project: **Cuckland Light Rail**
Location: **, Z Oellevue Road2At l den**
Project Reference: **0tage 1 Ground Nvestigation**

OH14B1

Sheet **4** of **1B**

OERI HELI NMFERACTNEM
Method: Rotary Core Wireline
Equipment: RC Wireline
Contractor: Drill Force NZ Ltd

- ESERDNMCTI 0: M. TA 5BBB
Easting: 1756189.85m
Northing: 5917683.38m
Reduced level: 69.48m

Date started: 2/03/2023
Date completed: 13/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: BGW/DWB
Input by: BGW/DWB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	59	11		VUb	**43m:** Slightly weathered, dark grey, porphyritic, flow banded, moderately vesicular BASALT; very strong. Flow bands dip 40 degrees. Phenocryts (<5mm) of olivine and feldspar.	SW						10m to 10.1m: JT 10.1m: DB 10.2m: DB 10.4m: DB 10.9m: DB 11.2m to 11.3m: JT 32° undulating, smooth	
PQ3	58	12			**113m:** Slightly weathered, light grey, fine grained, slightly veiscular BASALT; Very strong. Trace olivine and feldspar phenocrysts (<5mm).	SW						11.6m: DI 12.4m: DB 12.5m: JT 3° undulating, rough 12.6m to 13.1m: JT 70° planar, smooth, FeO stained	
PQ3	57	13			**153m to 14m:**...gently inclined to indistinct flow banding.								
PQ3	56	14			**14m:** Slig tly weathered, non-vesicular porphyritic BASALT; Very Strong. Phenocrysts of olivine and feldspar. Vesicles approximately 5-10mm	SW		100	100	100		13.15m to 14.2m: JT 70° planar, smooth, FeO stained	
PQ3	55	15						100	100	100		14.65m to 14.8m: JT 45° planar, smooth, veneer, (Infill: brownish yellow, highly plastic clay. <2mm)	

Box 5 Box 6 Box 7

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

REMARKS:
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Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.
All vibrating wire piezometers missing installaton depth measurement (pre-grout) readings.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
3/03/2023 5:00:00 PM | 7.50m | Dry m
7/03/2023 5:00:00 PM | 21.00m | Dry m
8/03/2023 8:00:00 AM | 21.00m | Dry m
8/03/2023 5:00:00 PM | 33.00m | Dry m
9/03/2023 8:00:00 AM | 33.00m | 31 m
9/03/2023 5:00:00 PM | 42.00m | 22 m
10/03/2023 8:00:00 AM | 42.00m | 25 m
13/03/2023 8:00:00 AM | 46.50m | 31 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Cuckland Light Rail Limited**
Project: **Cuckland Light Rail**
Location: **, Z Oellevue Road2A t l den**
Project Reference: **0tage 1 Ground Nvestigation**

OH14B1

Sheet **Z** of **1B**

OERI HELI NMFERACTNEM
Method: Rotary Core Wireline
Equipment: RC Wireline
Contractor: Drill Force NZ Ltd

- ESERDNMCTI 0: M. TA 5BBB
Easting: 1756189.85m
Northing: 5917683.38m
Reduced level: 69.48m

Date started: 2/03/2023
Date completed: 13/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: BGW/DWB
Input by: BGW/DWB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ	54	16		VUb	**14m:** Slightly weathered, non-vesicular porphyritic BASALT; Very Strong. Phenocrysts of olivine and feldspar. Vesicles approximately 5-10mm.			100	100	100			
PQ	53	17											
	52				**1V3 m to 51m:**...Unweather d.	SW		100	100	100		17.06m to 17.15m: JT 45° planar, smooth, clean	
PQ		18											
	51											18m to 18.25m: JT 70° planar, smooth, clean	
PQ		19						100	90	90			
	50												
PQ		20						100	100	100			

Box 7 Box 8 Box 9

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

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9/03/2023 8:00:00 AM | 33.00m | 31 m
9/03/2023 5:00:00 PM | 42.00m | 22 m
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Auckland

Client: **Cuckland Light Rail Limited**
Project: **Cuckland Light Rail**
Location: **, Z Oellevue Road2At l den**
Project Reference: **0tage 1 Ground Nvestigation**

OH14B1

Sheet **U** of **1B**

OERI HELI NMFERACTNEM
Method: Rotary Core Wireline
Equipment: RC Wireline
Contractor: Drill Force NZ Ltd

- ESERDNMCTI 0: M. TA 5BBB
Easting: 1756189.85m
Northing: 5917683.38m
Reduced level: 69.48m

Date started: 2/03/2023
Date completed: 13/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: BGW/DWB
Input by: BGW/DWB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ	49	21		VUb	**14m:** Slightly weathered, non-vesicular porphyritic BASALT; Very Strong. Phenocrysts of olivine and feldspar. Vesicles approximately 5-10mm.	SW		100	100	100			
PQ	48	22		VUb	**51m:** Unweathered, slightly vesicular, dark grey porphyritic, weakly flow banded BASALT; Strong. Phenocrysts of olivine and feldspar.	UW		100	100	100		21.75m: JT 25° planar, rough, FeO stained	
PQ	47	23		VUb	**543Im:**...Flow bands more prominent, dipping 35°.	UW		100	73	73		22.75m: JT 35° planar, smooth, FeO stained	
PQ	46	24		VWrb	**543IUm:** Moderately weathered, highly vesicular, reddish brown scoriaceous RUBBLY BASALT; Moderately strong. Vesicles up to 20mm with possible zeolite? infill. (Recovered as angular to sub-angular cobbles and gravel)	MW		100	10	0		23.4m to 23.6m: DB 35°	
PQ	45	25		VWrb		MW							

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Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.
All vibrating wire piezometers missing installaton depth measurement (pre-grout) readings.

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8/03/2023 8:00:00 AM | 21.00m | Dry m
8/03/2023 5:00:00 PM | 33.00m | Dry m
9/03/2023 8:00:00 AM | 33.00m | 31 m
9/03/2023 5:00:00 PM | 42.00m | 22 m
10/03/2023 8:00:00 AM | 42.00m | 25 m
13/03/2023 8:00:00 AM | 46.50m | 31 m

Box 9 Box 10 Box 11
Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Cuckland Light Rail Limited**
Project: **Cuckland Light Rail**
Location: **, Z Oellevue Road2At l den**
Project Reference: **0tage 1 Ground Nvestigation**

OH14B1

Sheet , of **1B**

OERI HELI NMFERACTNEM
Method: Rotary Core Wireline
Equipment: RC Wireline
Contractor: Drill Force NZ Ltd

- ESERDNMCTI 0: M. TA 5BBB
Easting: 1756189.85m
Northing: 5917683.38m
Reduced level: 69.48m

Date started: 2/03/2023
Date completed: 13/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: BGW/DWB
Input by: BGW/DWB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ	44	26		VWrb	**543%Um:** Moderately weathered, highly vesicular, reddish brown scoriaceous RUBBLY BASALT; Moderately strong. Vesicles up to 20mm with possible zeolite? infill. (Recovered as angular to sub-angular cobbles and gravel)	MW		100	10	0		25.25m to 25.35m: DB 45°	
PQ	43	27						100	7	7			
PQ	42	28		VUb	**5V35m:** Slightly weathered, slightly vesicular, grey BASALT; Strong. Vesicles, approximately up to 2mm	SW		100	47	47			
PQ	41	29		VWb	**5835Um:** Moderately weathered, slightly vesicular, grey and yellow BASALT (Broken); Moderately strong. Fractures infilled with clay. (Recovered as cobbles).	MW		100	73	67		28.75m: JT 45° planar, rough, coating, (Infill: brownish yellow, highly plastic clay. <2mm) <2mm infill of brownish yellow, highly plastic clay. 28.8m: JT 45° planar, rough, coating, (Infill: brownish yellow, highly plastic clay. <2mm) <2mm infill of brownish yellow, highly plastic clay. 28.9m: JT 45° planar, rough, coating, (Infill: brownish yellow, highly plastic clay. <2mm) <2mm infill of brownish yellow, highly plastic clay. 29.25m: JT 25° planar, rough, FeO stained 29.33m: JT 45° undulating, rough, FeO stained 29.4m to 29.6m: JT 75° undulating, rough, coating, (Infill: highly plastic clay. <2mm) 29.65m: JT 50° planar, rough, coating, (Infill: highly plastic clay. <5mm)	
PQ	40	30		VUb	**583}Um:** Unweathered, slightly vesicular, grey BASALT; Strong. Vesicles, up to 2mm diameter.	UW							

Box 11 Box 12 Box 13 Box 14

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

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Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
3/03/2023 5:00:00 PM | 7.50m | Dry m
7/03/2023 5:00:00 PM | 21.00m | Dry m
8/03/2023 8:00:00 AM | 21.00m | Dry m
8/03/2023 5:00:00 PM | 33.00m | Dry m
9/03/2023 8:00:00 AM | 33.00m | 31 m
9/03/2023 5:00:00 PM | 42.00m | 22 m
10/03/2023 8:00:00 AM | 42.00m | 25 m
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Auckland

Client: **Cuckland Light Rail Limited**
Project: **Cuckland Light Rail**
Location: **, Z Oellevue Road2At l den**
Project Reference: **0tage 1 Ground Nvestigation**

OH14B1

Sheet **V** of **1B**

OERI HELI NMFERACTNEM
Method: Rotary Core Wireline
Equipment: RC Wireline
Contractor: Drill Force NZ Ltd

- ESERDNMCTI 0: M. TA 5BBB
Easting: 1756189.85m
Northing: 5917683.38m
Reduced level: 69.48m

Date started: 2/03/2023
Date completed: 13/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: BGW/DWB
Input by: BGW/DWB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ	39	31		VUb	**583 Um:** Unweathered, slightly vesicular, grey BASALT; Strong. Vesicles, up to 2mm diameter. **4Bm to 4B3Im:**...Slightly weathered, coarse basalt gravels.	UW		77	27	27		30.58m to 30.95m: JT 80° planar, rough, coating, (Infill: highly plastic clay. <5mm) 30.63m: JT 45° planar, smooth, clean	
				Vaf	**41m:** Clayey SILT; reddish brown. Soft, moist, high plasticity.	MH						31m to 31.15m: Interpreted as washed out ASH sitting in void	
PQ	38			VUv	**413Um:** CORE LOSS interpreted as void.								
	32			VUb	**413Sm:** Slightly weathered, moderately vesicular, dark grey porphyritic BASALT; Moderately strong.			80	19	19		31.85m to 32m: JT 45° planar, rough, veneer, (Infill: brown silty sand, non-plastic <2mm) 32.32m to 32.5m: JT 85° planar, rough, FeO stained 32.34m: JT 25° planar, rough, clean 32.55m: JT 45° planar, rough, FeO stained 32.65m to 32.74m: JT 45° planar, rough, <1mm zeolite infill 32.74m to 33m: JT 90° planar, rough, <1mm zeolite infill	
PQ	37												
	33				**44m to 4Z3Um:**...Highly vesicular. Defects, moderately widely spaced to widely spaced, with brow ish yellow, highly plastic clay infill on defect surfaces	SW					33.1m: JT 45° planar, rough, <1mm zeolite infill 33.2m: JT 2° planar, rough, coating, (Infill: highly plastic clay 3mm)	
PQ	36							93	60	60		33.78m to 34m: JT 20° undulating, rough, <1mm zeolite infill 33.86m to 33.98m: JT 45° undulating, rough, <1mm zeolite infill	
	34											34.22m to 34.38m: JT 75° planar, rough, coating, (Infill: highly plastic clay/silt 3mm)	
	35											34.4m: JT 20° planar, rough, coating, (Infill: silt/highly plastic clay/sand 2mm)	
PQ								89	60	39		34.75m: JI 75° 34.83m: JT 15° planar, rough, coating, (Infill: highly plastic clay 1mm)	
	35												

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REMARKS:
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9/03/2023 8:00:00 AM | 33.00m | 31 m
9/03/2023 5:00:00 PM | 42.00m | 22 m
10/03/2023 8:00:00 AM | 42.00m | 25 m
13/03/2023 8:00:00 AM | 46.50m | 31 m

Box 14
Box 15

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Cuckland Light Rail Limited**
Project: **Cuckland Light Rail**
Location: **, Z Oellevue Road2At l den**
Project Reference: **0tage 1 Ground Nvestigation**

OH14B1

Sheet **6** of **1B**

OERI HELI NMFERACTNEM
Method: Rotary Core Wireline
Equipment: RC Wireline
Contractor: Drill Force NZ Ltd

- ESERDNMCTI 0: M. TA 5BBB
Easting: 1756189.85m
Northing: 5917683.38m
Reduced level: 69.48m

Date started: 2/03/2023
Date completed: 13/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: BGW/DWB
Input by: BGW/DWB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ	34			VUb	**413.5m:** Slightly weathered, moderately vesicular, dark grey porphyritic BASALT; Moderately strong. **4Um to 4U3.8m:**...Defects, very closely spaced to closely spaced, with brownish yellow, highly plastic clay infill on defect surfaces.	SW		89	60	39		34.97m: JT 15° planar, rough, veneer, (Infill: brownish yellow, highly plastic clay. 1mm) 35.09m: JT 10° planar, rough, veneer, (Infill: yellow brown silt, non-plastic <5mm) 35.1m to 35.23m: JT 45° pla ar, rough, coating, (Infill: highly plastic brownish yellow clay <2mm) 35.13m: JT 45° planar, rough, coa ing, (Infill: highly plastic brownish y low clay <2mm) 35.22m: JT 20° planar, ough, veneer, (Infill: yellow brown n n-plastic silt, <2mm) 35.36m to 35.47m: JT 0° planar, rough, coating, (In il : browni h yellow, highly plastic clay 5mm) 35 63m: JT 10° planar, rough, coating, (Infill: b ownish yellow, highly plastic clay 3mm)	
		36		VWb	**4, m:** Moderately weathered, moderately vesicular, dark grey BASALT (broken); Moderately strong. Highly jointed, recovered as cobbles/gravel.	MW							
PQ	33			VUrb	**4, 3m:** Slightly weathered, moderately vesicular, dark grey RUBBLY BASALT; Moderately strong. (Recovered as angular to sub-angular cobbles and boulders)	SW		100	0	0		36.65m to 36.85m: JT 70° planar, rough, FeO stained 36.85m to 37m: JT 70° undulating, rough, FeO stained	
		37											
				AYZ	**4V3BUm:** Gravelly sandy SILT with trace clay; dark orange brown. Firm, moist, low plasticity. Sand, fine to medium. Gravel, fine subangular basalt. [Reworked AVF ASH]	MI-SP						**4V3BUm: CLL97N9A** 37.05m: JT 45° planar, rough, FeO stained 37.2m: JT 25° planar, rough, coating, (Infill: non-plastic silt 1mm)	
	32				**4V34m:** Organic clayey SILT with trace grave ; dark reddi h brown. Firm, moist, low plasticity. Gravel, fine to medium, sub-angular to angular basalt. [Paleosol]	OL							
PQ				VUrb	**4V3Um:** Slightly weathered, highly vesicular, grey RUBBLY BASALT; Moderately strong	SW		87	75	63		**4V3Um: C7F** 37.86m to 37.92m: JT 45° planar, rough, FeO stained 38.2m: JT 10° planar, rough, FeO stained 38.3m: JT 45° undulating, rough, (Infill: gravel)	
		38											
	31												
					463.5m: CORE LOSS								
		39											
PQ				VWrb	**48m:** Slightly weathered, highly vesicular, grey RUBBLY BASALT; Moderately strong.	MW		100					
				AQz	**483.4m:** Organic clayey SILT with trace organics; brown. Soft to firm, moist, low plasticity. Organics, fibrous, decomposed with black carbonaceous appearance. (Baked Margin Paleosol)	OL						**483.4m: CLL97N9A**	
	30			AQc	**483Vm:** Silty CLAY with trace gravel and organics; reddish brown. Firm, moist, high plasticity. Gravel, fine. Organics, decomposed wood fragments, <2mm.	CH							
		40											

Box 16 Box 17 Box 18

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

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10/03/2023 8:00:00 AM | 42.00m | 25 m
13/03/2023 8:00:00 AM | 46.50m | 31 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Cuckland Light Rail Limited**
Project: **Cuckland Light Rail**
Location: **, Z Oellevue Road2At l den**
Project Reference: **0tage 1 Ground Nvestigation**

OH14B1

Sheet **8** of **1B**

OERI HELI NMFERACTNEM
Method: Rotary Core Wireline
Equipment: RC Wireline
Contractor: Drill Force NZ Ltd

- ESERDNMCTI 0: M. TA 5BBB
Easting: 1756189.85m
Northing: 5917683.38m
Reduced level: 69.48m

Date started: 2/03/2023
Date completed: 13/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: BGW/DWB
Input by: BGW/DWB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ	29			AQc	**483/m:** Silty CLAY with trace gravel and organics; reddish brown. Firm, moist, high plasticity. Gravel, fine. Organics, decomposed wood fragments, <2mm.	CH		100					
SPT		41			**ZB34m:** Clayey pumiceous SILT with trace sand; brownish orange, speckled red and white. Stiff, moist, high plasticity. Sand, fine, weathered pumice.	MH	40.5m: SPT 1,2// 3,3,3,4 N = 13	67				40.3m: WEATHERED PUKETOKA FM	
PQ3	28				**Z135m:** Pumiceous SILT with minor sand, clay and trace organics; brownish grey, mottled brown. Very stiff, moist, high plasticity. Sand, fine. Organics, decomposed FeO stained rootlet traces.	MH		100					
		42			**Z13, m:** Pumiceous SILT with minor sand and trace clay; brownish grey, streaked brownish orange. Medium dense, moist, low plasticity. Sand, fine to medium weathered pumice.		42m: SPT 1,2// 4,4,5,4 N = 17	100					
SPT	27			AQz									
PQ3		43				ML		100					
	26						43.5m: SPT 2,2// 2,3,4,4 N = 13						
SPT								100					
		44											
PQ3	25							90					
		45			**ZZ36m:** Pumiceous SILT with minor sand and trace clay; grey, speckled white. Medium dense, moist, low plasticity. Sand, fine to medium pumice.	ML							

Box 18 Box 19 Box 20

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Hydraulic hose broken on 10/03/2023, unable to take water level reading.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.
All vibrating wire piezometers missing installaton depth measurement (pre-grout) readings.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
3/03/2023 5:00:00 PM | 7.50m | Dry m
7/03/2023 5:00:00 PM | 21.00m | Dry m
8/03/2023 8:00:00 AM | 21.00m | Dry m
8/03/2023 5:00:00 PM | 33.00m | Dry m
9/03/2023 8:00:00 AM | 33.00m | 31 m
9/03/2023 5:00:00 PM | 42.00m | 22 m
10/03/2023 8:00:00 AM | 42.00m | 25 m
13/03/2023 8:00:00 AM | 46.50m | 31 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Cuckland Light Rail Limited**
Project: **Cuckland Light Rail**
Location: **, Z Oellevue Road2At l den**
Project Reference: **0tage 1 Ground Nvestigation**

OH14B1

Sheet **1B** of **1B**

OERI HELI NMFERACTNEM
Method: Rotary Core Wireline
Equipment: RC Wireline
Contractor: Drill Force NZ Ltd

- ESERDNMCTI 0: M. TA 5BBB
Easting: 1756189.85m
Northing: 5917683.38m
Reduced level: 69.48m

Date started: 2/03/2023
Date completed: 13/03/2023
Inclination: -90°
Azimuth: 0°

Logged by: BGW/DWB
Input by: BGW/DWB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy / Defect Description / Additional Notes	Installation
SPT							45m: SPT 3,4// 5,5,10,10 N = 30	100					
PQ3	24			AQz	**ZZ3 6m:** Pumiceous SILT with minor sand and trace clay; grey, speckled white. Medium dense, moist, low plasticity. Sand, fine to medium pumice.	ML						
		46			**Z, m:** Pumiceous sandy GRAVEL; grey, speckled white. Medium dense, moist. Gravel is fine, subrounded to subangular pumice and lithics (possible andesite).	GP		76				46m to 46.3m: BASAL CONGLOMERATE - PUKETOKA FM	
					Z, 34m: Moderately weathered, dark grey, silty fine SANDSTONE; Very weak. Contains trace decomposed organics (carbonaceous) and gravel. Gravel is highly weathered, angular Siltstone (lithorelicts). Core breaks along relict bedding dip 20-30 degrees. (Very dense, dark grey silty fine SAND with trace organics and gravel).							**Z, 34m: I - OF**	
SPT	23						46.5m: S T 5,7// 11,11,17,11 for 45mm N = 50+	100					
PQ3		47		EWs		MW							
	22							100	83	46			
		48					48m: SPT 8,11// 15,15,15,5 for 35mm N = 50+						
SPT													

End of borehole at 48.41m (Termination Depth Achieved)

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Hydraulic hose broken on 10/03/2023, unable to take water level reading.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.
All vibrating wire piezometers missing installaton depth measurement (pre-grout) readings.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
3/03/2023 5:00:00 PM | 7.50m | Dry m
7/03/2023 5:00:00 PM | 21.00m | Dry m
8/03/2023 8:00:00 AM | 21.00m | Dry m
8/03/2023 5:00:00 PM | 33.00m | Dry m
9/03/2023 8:00:00 AM | 33.00m | 31 m
9/03/2023 5:00:00 PM | 42.00m | 22 m
10/03/2023 8:00:00 AM | 42.00m | 25 m
13/03/2023 8:00:00 AM | 46.50m | 31 m

Box 20
Box 21
Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Ewington Rd**
Project Reference: **Stage 1 Ground Investigation**

BH1302

Sheet **1** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1756038.02m
Northing: 5917209.56m
Reduced level: 59.92m

Date started: 24/03/2023
Date completed: 4/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: DB / LG
Input by: DB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	59	1		P	**0m:** ASPHALT.							**0m: FILL**	
				FEg	**0.1m:** Gravelly medium to coarse SAND, minor silt; light grey. Medium dense, dry.	GP						0.1m to 0.35m: SUBBASE	
					0.35m: Gravelly fine to medium SAND, some silt and minor cobbles; orangish brown and grey. Dense, dry. Gravel, coarse Moderately weathered, Strong, subangular rubbly basalt; cobbles, 60mm to 120mm, MW, MS, subangular rubbly basalt.	GP		0	0	0			
PQ3	58	2		VWrb	**1.3m:** Moderately weathered, greyish orange RUBBLY BASALT; Moderately strong. Clast supported with a matrix of brownish orange clayey SILT; moist, highly plastic, allophanic. Matrix is assumed to be 90% washed away.	MW		100	0	0		**1.3m: AVF**	
PQ3	57	3			**2m:** CORE LOSS	MW		27	42	0		2m to 3m: Matrix infill assumed to be washed out, no water return.	
PQ3	56	4		VWrb	**3m:** Moderately weathered, dark reddish grey RUBBLY BASALT; Moderately strong, highly vesicular. Clast supported with a matrix of brownish orange SILT; moist, highly plastic, allophanic. Basalt clast are porphyritic with coarse grained phenocrysts of feldspar and olivine.	MW							
					3.4m: No Recovery - 300mm drop in barrel observed, possible void.	MW							
				VWrb	**3.7m:** Moderately weathered, dark reddish grey RUBBLY BASALT; Moderately strong, highly vesicular. Clast supported with a matrix of brownish orange SILT; moist, highly plastic, allophanic. Basalt clast are porphyritic with coarse grained phenocrysts of feldspar and olivine.	MW		80	0	42		4.1m: JT 50° undulating, rough, coating, (Infill: clay Soft 4)	
PQ3	55	5						33	0	0		4.4m: JT 50° undulating, rough, coating, (Infill: clay Soft 4)	

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Casing from 0 - 13.5 mbgl. Took multiple attempts to drop which may have caused basalt gravels or heavily disturbed core samples between 0 - 13.5 m.
Drill depths missing for three water level readings.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl): 4/04/2023 1 18:00 F

Date Time	Hole Depth	Water Level
28/03/2023 8:00:00 AM	m	Dry m
28/03/2023 5:00:00 PM	24.00m	11 m
29/03/2023 8:00:00 AM	24.00m	12.9 m
30/03/2023 5:00:00 PM	28.50m	27 m
31/03/2023 8:00:00 AM	m	1.1 m
31/03/2023 5:00:00 PM	m	0.6 m
3/04/2023 1:15:00 PM	31.50m	2 m
3/04/2023 5:03:00 PM	39.00m	10 m
4/04/2023 8:15:00 AM	39.00m	15.5 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Ewington Rd**
Project Reference: **Stage 1 Ground Investigation**

BH1302

Sheet **2** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1756038.02m
Northing: 5917209.56m
Reduced level: 59.92m

Date started: 24/03/2023
Date completed: 4/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: DB / LG
Input by: DB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	54	6		VWrb	**5m:** Highly weathered, dark reddish grey, scoriacious RUBBLY BASALT; Moderately strong, gap graded. Clast supported with a matrix of brownish orange clayey SILT; moist, highly plastic, allophanic. Basalt clasts are scoriacious gravels.	HW		83	0	0			
PQ3	53	7			**6.9m:** CORE LOSS			60	0	0		6.9m to 7.5m: Matrix infill assumed to be washed out.	
PQ3	52	8		VWrb	**7.5m:** Highly weathered, dark reddish grey, scoriacious RUBBLY BASALT; Moderately strong, gap graded. Clast supported with a matrix of brownish orange clayey SILT; moist, highly plastic, allophanic. Basalt clasts are scoriacious.	HW		80	80	0			
PQ3	50	10		VUb	**9.2m:** Slightly weathered, dark grey to black, highly vesicular BASALT flow; Very strong, vesicles 2-10mm with minor iron oxide staining, flow banding orientated 40 degrees. Rare poorly developed feldspar phenocrysts.	SW		100	77	80		9.6m to 9.75m: JT 60° undulating, rough, clean 9.9m: DB	

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Casing from 0 - 13.5 mbgl. Took multiple attempts to drop which may have caused basalt gravels or heavily disturbed core samples between 0 - 13.5 m.
Drill depths missing for three water level readings.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl): 4/04/2023 1

Date Time	Hole Depth	Water Level
28/03/2023 8:00:00 AM	m	Dry m
28/03/2023 5:00:00 PM	24.00m	11 m
29/03/2023 8:00:00 AM	24.00m	12.9 m
30/03/2023 5:00:00 PM	28.50m	27 m
31/03/2023 8:00:00 AM	m	1.1 m
31/03/2023 5:00:00 PM	m	0.6 m
3/04/2023 1:15:00 PM	31.50m	2 m
3/04/2023 5:03:00 PM	39.00m	10 m
4/04/2023 8:15:00 AM	39.00m	15.5 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Ewington Rd**
Project Reference: **Stage 1 Ground Investigation**

BH1302

Sheet **3** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1756038.02m
Northing: 5917209.56m
Reduced level: 59.92m

Date started: 24/03/2023
Date completed: 4/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: DB / LG
Input by: DB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3				VUb		SW						10m: DB	
PQ3	49	11		VWrb	**10.2m:** Moderately weathered, dark grey and reddish black, RUBBLY BASALT; Moderately strong. Recovered as scoriacious GRAVEL, with minor cobbles and trace clay; Loosely packed, well graded, saturated. Gravels coated in a veneer of Iron oxides.	MW		100	77	80		
PQ3	48	12		AYz	**12m:** SILT, minor clay; light brown. Very soft, saturated, highly plastic.	ML		87	0	77		**12m: ALLUVIUM** 12m: BP	
				AYo	**12.2m to 12.3m:**...Disseminated organics of partially decomposed wood fragments.								
					12.3m: Silty CLAY, minor organics; dark grey to black. Soft, moist, highly plastic. Organics are disseminated partially decomposed wood and plant fragments with rootlets.	CH							
PQ3	47	13		AYc	**12.7m:** CLAY, trace silt and sand; light brown and grey, homogeneous. High plasticity, moist; sand, fine.	CH		87		0			
SPT	46	14					13.5m: SPT 0,2// 1,1,2,2 N = 6	100					
PQ3	45	15		ERc	**14.1m:** Silty CLAY with trace sand; light grey and light brown, faintly bedded. Stiff, moist, high plasticity.	CL-ML		100				**14.1m: ECBF**	
					14.65m:...with trace silt, sand and organics, moist to wet; sand, fine; organics, disseminated plant matter, distinct organic smell.								

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Casing from 0 - 13.5 mbgl. Took multiple attempts to drop which may have caused basalt gravels or heavily disturbed core samples between 0 - 13.5 m.
Drill depths missing for three water level readings.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl): 4/04/2023 1
Date Time | Hole Depth | Water Level
28/03/2023 8:00:00 AM | m | Dry m
28/03/2023 5:00:00 PM | 24.00m | 11 m
29/03/2023 8:00:00 AM | 24.00m | 12.9 m
30/03/2023 5:00:00 PM | 28.50m | 27 m
31/03/2023 8:00:00 AM | m | 1.1 m
31/03/2023 5:00:00 PM | m | 0.6 m
3/04/2023 1:15:00 PM | 31.50m | 2 m
3/04/2023 5:03:00 PM | 39.00m | 10 m
4/04/2023 8:15:00 AM | 39.00m | 15.5 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Ewington Rd**
Project Reference: **Stage 1 Ground Investigation**

BH1302

Sheet **4** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1756038.02m
Northing: 5917209.56m
Reduced level: 59.92m

Date started: 24/03/2023
Date completed: 4/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: DB / LG
Input by: DB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPT				ERc	**14.1m:** Silty CLAY with trace sand; light grey and light brown, faintly bedded. Stiff, moist, high plasticity.	CL-ML	15m: SPT 0,1// 2,1,2,2 N = 7						
				ERz	**15.15m:** Completely weathered indistinctly bedded SANDSTONE and SILTSTONE; recovered as fine Sandy SILT, minor clay; light grey with orange banding. Stiff, moist, low plasticity.	ML		111					
PQ3	44	16			**15.45m:** CORE LOSS			0					
SPT	43	17		EWs	**16.5m:** Highly weathered, light grey fine SANDSTONE; extremely weak, poorly cemented; recovered as a fine SAND; medium dense.	HW	16.5m: SPT 2// 2,3,5,4 N = 13	100					
PQ3	42	18		EWi	**16.95m:** Highly weathered, light grey thinly interbedded SANDSTONE & SILTSTONE; extremely weak, poorly cemented; recovered as a CLAY with mino silt; grey. Moist, high plasticity.	HW		100					
SPT				EWz	**18.2m:** Highly weathered, light grey SILTSTONE; extremely weak; SILT with trace sand, grey, homogeneous. Very stiff, moist, low plasticity, quick; sand, fine.	HW	18m: SPT 2,2// 4,6,8,10 N = 28	100					
PQ3	41	19		EWs	**18.5m:** Highly weathered, grey, SANDSTONE; extemely weak, poorly cemented; Recovered as fine to coarse SAND; well packed, uniformaly graded, faintly bedded; sand, volcaniclastic.	HW		96					
SPT	40	20		EWi	**19.25m:** Moderately weathered, grey, interbedded, SILTSTONE and SANDSTONE; extremely weak, indistinctly bedded, medium, gently inclined. Recovered as fine to coarse sandy SILT; low plasticity; sand, volcaniclastic. (sample disturbed due to core-drop).	MW	19.5m: SPT 6,7// 12,25,13 for 20mm N = 50+	28 0					

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Casing from 0 - 13.5 mbgl. Took multiple attempts to drop which may have caused basalt gravels or heavily disturbed core samples between 0 - 13.5 m.
Drill depths missing for three water level readings.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl): 4/04/2023 1
Date Time | Hole Depth | Water Level
28/03/2023 8:00:00 AM | m | Dry m
28/03/2023 5:00:00 PM | 24.00m | 11 m
29/03/2023 8:00:00 AM | 24.00m | 12.9 m
30/03/2023 5:00:00 PM | 28.50m | 27 m
31/03/2023 8:00:00 AM | m | 1.1 m
31/03/2023 5:00:00 PM | m | 0.6 m
3/04/2023 1:15:00 PM | 31.50m | 2 m
3/04/2023 5:03:00 PM | 39.00m | 10 m
4/04/2023 8:15:00 AM | 39.00m | 15.5 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Ewington Rd**
Project Reference: **Stage 1 Ground Investigation**

BH1302

Sheet **5** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1756038.02m
Northing: 5917209.56m
Reduced level: 59.92m

Date started: 24/03/2023
Date completed: 4/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: DB / LG
Input by: DB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	39	21		EWi	**19.25m:** Moderately weathered, grey, interbedded, SILTSTONE and SANDSTONE; extremely weak, indistinctly bedded, medium, gently inclined. Recovered as fine to coarse sandy SILT; low plasticity; sand, volcaniclastic. (sample disturbed due to core-drop).	MW		0					
SPTC							21m: SPTC 10,18// 25,23 N = 50+	N/A	N/A	N/A			
PQ3	38	22		EWs	**21.2m:** Moderately weathered, grey, SANDSTONE; very weak, poorly cemented, matrix supported; faintly bedded, reverse graded, gently inclined.	MW		0					
					22m: CORE LOSS - dropped core.								
SPTC	37	23		EWz	**22.5m:** Moderately weathered, dark grey SILTSTONE; very weak, poorly to moderately cemented, closely spaced, narrow, moderately thinly bedded, gently inclined.	MW	22.5m: SPTC 5,5// 6,13,37 for 65mm N = 50+	N/A	N/A	N/A		22.9m: BP	
PQ3				EWs	**23.28m:** Moderately weathered, grey, SANDSTONE; very weak, moderately cemented, matrix supported; bedding, normally graded, gently inclined.	MW		93					
	36	24			**23.61m:** CORE LOSS	SW							
PQ3	35	25		EUs	**24.25m:** Slightly weathered, grey, fine to medium SANDSTONE; Extemely weak to very weak, moderately cemented; bedding, normally graded, gently inclined, widely spaced.	SW		70				24.25m: BPJT 0° coating, (Infill: clay 20) 24.8m: DB	

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Casing from 0 - 13.5 mbgl. Took multiple attempts to drop which may have caused basalt gravels or heavily disturbed core samples between 0 - 13.5 m.
Drill depths missing for three water level readings.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl): 4/04/2023 1
Date Time | Hole Depth | Water Level
28/03/2023 8:00:00 AM | m | Dry m
28/03/2023 5:00:00 PM | 24.00m | 11 m
29/03/2023 8:00:00 AM | 24.00m | 12.9 m
30/03/2023 5:00:00 PM | 28.50m | 27 m
31/03/2023 8:00:00 AM | m | 1.1 m
31/03/2023 5:00:00 PM | m | 0.6 m
3/04/2023 1:15:00 PM | 31.50m | 2 m
3/04/2023 5:03:00 PM | 39.00m | 10 m
4/04/2023 8:15:00 AM | 39.00m | 15.5 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Ewington Rd**
Project Reference: **Stage 1 Ground Investigation**

BH1302

Sheet **6** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1756038.02m
Northing: 5917209.56m
Reduced level: 59.92m

Date started: 24/03/2023
Date completed: 4/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: DB / LG
Input by: DB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3					**25m:** Slightly weathered, dark grey, fine to coarse SANDSTONE; Very weak, moderately well cemented, faintly bedded.			70					
PQ3	34	26		EUs		SW		100				25.6m: DB 25.68m: DB 25.75m: DB	
					26.55m: CORE LOSS								
PQ3	33	27		EUs	**27m:** Slightly weathered, dark grey, fine to coarse SANDSTONE; Very weak, moderately well cemented, faintly bedded.	SW		100					
PQ3	32	28		EUs	**27.92m:** Unweathered, dark grey, fine to medium SANDSTONE; Very weak, moderately well cemented, thick, well graded, moderately widely spaced.	UW						27.92m: BP 5° 28.2m: BPJT 3° planar, smooth, clean	
PQ3	31	29		EUs	**28.95m:**...100mm, SILTSTONE bed: very weak.	UW		96				28.9m: DB	
					29.05m: Unweathered, grey, fine medium SANDSTONE; weak, moderately well cemented, moderately thick. **29.1m:**...10mm black carbonacious laminae.	UW							
PQ3	30	30		EUz	**29.44m:** Unweathered, grey, fine sandy SILTSTONE; very weak, moderately well cemented, thick.	UW						29.44m: BP 8°	

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Casing from 0 - 13.5 mbgl. Took multiple attempts to drop which may have caused basalt gravels or heavily disturbed core samples between 0 - 13.5 m.
Drill depths missing for three water level readings.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl): 4/04/2023 1
Date Time | Hole Depth | Water Level
28/03/2023 8:00:00 AM | m | Dry m
28/03/2023 5:00:00 PM | 24.00m | 11 m
29/03/2023 8:00:00 AM | 24.00m | 12.9 m
30/03/2023 5:00:00 PM | 28.50m | 27 m
31/03/2023 8:00:00 AM | m | 1.1 m
31/03/2023 5:00:00 PM | m | 0.6 m
3/04/2023 1:15:00 PM | 31.50m | 2 m
3/04/2023 5:03:00 PM | 39.00m | 10 m
4/04/2023 8:15:00 AM | 39.00m | 15.5 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Ewington Rd**
Project Reference: **Stage 1 Ground Investigation**

BH1302

Sheet **7** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1756038.02m
Northing: 5917209.56m
Reduced level: 59.92m

Date started: 24/03/2023
Date completed: 4/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: DB / LG
Input by: DB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3				EUz		UW							
				EUs	**30.12m:** Unweathered, light grey, fine SANDSTONE; very weak, moderately cemented, normally graded, moderately widely spaced.	UW						30.12m: BP 4°	
					30.7m to 31.2m:...grades to a medium to coarse SANDSTONE; poorly sorted, trace lithics 1-2mm			96				30.5m to 30.68m: JT 66° undulating, smooth, clean	
	29	31			**31m:**...grades to a coarse SANDSTONE; 1-2mm clasts comprising of strong siltstone and red indistinguishable volcanics,							31.1m: DB	
				EUz	**31.2m:** Unweathered, light grey, fine SILTSTONE; weak, unformly graded; carbonaceous material exhibits wave-ripple lamination.	UW						31.2m: BP 4° 31.4m: BP	
PQ3	28	32		EUs	**31.85m:** Slightly weathered, dark grey, medium to coarse SANDSTONE; very weak, well cemented, closely spaced, normally graded, moderately thick	UW						31.85m: DB 10°	
					32.05m: Unweathered, dark grey, coarse, SANDSTONE; very weak, well cemented, normally graded, trace volcanic and silstone lithicss; 2mm to 5mm.			100	100	100		32m: JT 70° stepped, smooth, clean	
						UW						32.5m: JT 70° planar, smooth, clean	
	27	33										33m: DB 3°	
					33.2m to 33.3m:...grades to a conglomertic SANDSTONE at base of bed with black carbonaceous nodules (5-10mm). Clasts are sub-rounded, green grey sandstone and siltstone.								
					33.3m: Unweathered, dark grey, medium SANDSTONE; very weak, homogeneous, well cemented, closely spaced, normally graded, moderately thick								
PQ3					**33.7m to 33.8m:**...100mm SILTSTONE bed; very weak, thinly bedded 10°.	UW		100	100	100		33.75m: BP 5°	
	26	34			**33.8m:** Unweathered, dark grey, medium to coarse SANDSTONE; very weak, well cemented, closely spaced, normally graded, moderately thick	UW						33.85m to 34m: JT 85° undulating, rough, clean, 3 33.9m: BP 5°	
				EUi	**34.24m:** Unweathered, light grey interbedded SILTSTONE & SANDSTONE; extremely weak, moderately thin to moderately thick, sub-horizontal, closely spaced. Silstone, 50-100m thick beds; Sandstone, 200-300mm thick beds.	UW							
PQ3	25	35						100	100	100		34.73m: BP 10° 34.78m: BP 10°	

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Casing from 0 - 13.5 mbgl. Took multiple attempts to drop which may have caused basalt gravels or heavily disturbed core samples between 0 - 13.5 m.
Drill depths missing for three water level readings.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl): 4/04/2023 1
Date Time | Hole Depth | Water Level
28/03/2023 8:00:00 AM | m | Dry m
28/03/2023 5:00:00 PM | 24.00m | 11 m
29/03/2023 8:00:00 AM | 24.00m | 12.9 m
30/03/2023 5:00:00 PM | 28.50m | 27 m
31/03/2023 8:00:00 AM | m | 1.1 m
31/03/2023 5:00:00 PM | m | 0.6 m
3/04/2023 1:15:00 PM | 31.50m | 2 m
3/04/2023 5:03:00 PM | 39.00m | 10 m
4/04/2023 8:15:00 AM | 39.00m | 15.5 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Ewington Rd**
Project Reference: **Stage 1 Ground Investigation**

BH1302

Sheet **8** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1756038.02m
Northing: 5917209.56m
Reduced level: 59.92m

Date started: 24/03/2023
Date completed: 4/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: DB / LG
Input by: DB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3				EUi	**34.24m:** Unweathered, light grey interbedded SILTSTONE & SANDSTONE; extremely weak, moderately thin to moderately thick, sub-horizontal, closely spaced. Silstone, 50-100m thick beds; Sandstone, 200-300mm thick beds.	UW		100	100	100			
					35.55m to 35.57m:...20mm black carbonacous laminae.							35.6m: BP 10°	
	24	36		EUs	**35.83m:** Unweathered, dark grey, fine to medium SANDSTONE; very weak, moderately well cemented, thick.	UW							
PQ3	23	37		EUs	**36.75m:** Unweathered, grey with white specks, fine to medium SANDSTONE; very weak, moderately cemented; thickly bedded, normally graded, 5 deg alignment of coarse grains. trace volcanic lithics, 1mm-2mm. **36.9m to 36.98m:**...80mm SILTSTONE bed; weak, faintly bedded, 10.	UW		100	100	100		36.78m: BP 10° 36.87m: BP 10°	
					37.6m:...grades to a coarse SANDSTONE.								
PQ3	22	38		EUi	**38m:** Unweathered, dark grey, interbedded SILSTONE & SANDSTONE; very weak, well cemented, indistinctly bedded 5-10°. Silstone, 20mm-100m thick beds; Sandstone 100-300mm thick beds.	UW		100	100	100		37.9m: BPJT 5° planar, smooth	
PQ3	21	39		EUs	**38.7m:** Unweathered, dark grey, fine to medium SANDSTONE; weak, well cemented, thickly bedded, unifromly graded.	UW		100	100	100			
	20	40				UW							

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Casing from 0 - 13.5 mbgl. Took multiple attempts to drop which may have caused basalt gravels or heavily disturbed core samples between 0 - 13.5 m.
Drill depths missing for three water level readings.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl): 4/04/2023 1
Date Time | Hole Depth | Water Level
28/03/2023 8:00:00 AM | m | Dry m
28/03/2023 5:00:00 PM | 24.00m | 11 m
29/03/2023 8:00:00 AM | 24.00m | 12.9 m
30/03/2023 5:00:00 PM | 28.50m | 27 m
31/03/2023 8:00:00 AM | m | 1.1 m
31/03/2023 5:00:00 PM | m | 0.6 m
3/04/2023 1:15:00 PM | 31.50m | 2 m
3/04/2023 5:03:00 PM | 39.00m | 10 m
4/04/2023 8:15:00 AM | 39.00m | 15.5 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Ewington Rd**
Project Reference: **Stage 1 Ground Investigation**

BH1302

Sheet **9** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1756038.02m
Northing: 5917209.56m
Reduced level: 59.92m

Date started: 24/03/2023
Date completed: 4/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: DB / LG
Input by: DB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3					**39.94m:** Slightly weathered, dark grey, fine to medium SANDSTONE; Extremely weak. Recovered as a fine to medium SAND; dark grey. Well packed, uniformly graded.	UW		100	100	100		39.98m: BPJT 5° planar, smooth	
PQ3	19	41			**40.5m:** Unweathered, dark grey, fine to coarse SANDSTONE; very weak, thickly bedded, normally graded, 5 deg dip in alignment of coarse grains. Clasts, glassy basalt, siltstone and fine grained mudstone 1mm-2mm.	UW						40.94m: JT 10° planar, rough, clean	
					41.05m to 41.12m:...70mm SILTSTONE bed; very weak, faintly bedded, subhorizontal.								
					41.12m: Unweathered, dark grey, fine to medium SANDSTONE; weak, well cemented, uniformly graded, very thickly bedded, sub-horizontal 5°.			100	100	100		41.3m: JT 10° stepped, smooth, clean	
PQ3	18	42		EUs									
						UW						42.36m: JT 7° undulating, smooth, clean	
					42.5m to 42.9m:...grades to a med um to coarse SANDSTONE, with trace olcanic lithics.								
PQ3	17	43						100	100	100			
					43.25m to 43.25m:...Unwe thered, grey, SILTSTONE accretion; weak.	UW						43.33m: JT 20° undulating, rough, clean	
					43.45m: Unweathered, dark grey, fine to medium SANDSTONE; very weak, thickly bedded, normally graded, 5 deg dip in al gnment of coarse grains.								
PQ3	16	44				UW						43.93m: JT 17° undulating, rough, clean	
					44m to 44.2m:...Fine SANDSTONE accretion, weak.								
					44.2m: Unweathered, grey SANDSTONE; weak, moderately thick, uniformaly graded.			100	100	100			
						UW							
	15	45	× × × ×	EUz		UW						44.77m: JT 40° stepped, rough, clean 44.8m: BP 10°	

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Casing from 0 - 13.5 mbgl. Took multiple attempts to drop which may have caused basalt gravels or heavily disturbed core samples between 0 - 13.5 m.
Drill depths missing for three water level readings.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl): 4/04/2023 1
Date Time | Hole Depth | Water Level
28/03/2023 8:00:00 AM | m | Dry m
28/03/2023 5:00:00 PM | 24.00m | 11 m
29/03/2023 8:00:00 AM | 24.00m | 12.9 m
30/03/2023 5:00:00 PM | 28.50m | 27 m
31/03/2023 8:00:00 AM | m | 1.1 m
31/03/2023 5:00:00 PM | m | 0.6 m
3/04/2023 1:15:00 PM | 31.50m | 2 m
3/04/2023 5:03:00 PM | 39.00m | 10 m
4/04/2023 8:15:00 AM | 39.00m | 15.5 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Ewington Rd**
Project Reference: **Stage 1 Ground Investigation**

BH1302

Sheet **10** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1756038.02m
Northing: 5917209.56m
Reduced level: 59.92m

Date started: 24/03/2023
Date completed: 4/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: DB / LG
Input by: DB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	14	46		EUz	**44.75m:** Unweathered, dark grey, interbedded SILTSTONE and fine to medium SANDSTONE; very weak to weak, closely spaced. Sub-horizontally bedded, 5-10 °. Silstone, 50-100mm beds; sandstone 40-110mm. 40% siltstone, 60% sandstone. trace bioturbation.	UW		100	100	100		45.05m: BP 10°	
PQ3	13	47		EUs EUz EUs EUz	**47.05m:** Unweathered, dark grey SANDSTONE; weak to very weak, moderately cemented, uniormly graded. **47.23m:** Unweathered, grey, SILTSTONE; weak, thin. **47.26m:** Unweathered, dark grey SANDSTONE; weak to very weak, moderately cemented, uniformly graded. **47.4m:**...50mm, black indistinct carbonaceous laminae, 5-10 ° dip. **47.45m:** Unweathered, light grey, fine carbonaceous SILTSTONE; very weak to weak, unformly graded; carbonaceous material exhibits wave-ripple l mi ation and cross bedding.	UW UW UW UW		100	100	100		47.25m: BP 5°	
PQ3	12	48		EUs EUz EUs	**47.85m:** Unwea hered, dark grey, fine to medium SANDSTONE, very weak to weak, poorly cemented, thinly bedded, everse grading. **48m:** Unwe thered, grey, SILTSTONE; weak, thin. **48.2m:** Unweathered, dark grey SANDSTONE; weak to very weak, moderately cemented, uniormly graded.	UW UW UW		100	100	100			
PQ3	11	49		EUs EUz EUs	**49m:** Unweathered, dark grey, fine to medium SANDSTONE; very weak to weak, poorly cemented, thinly bedded, reverse grading. **49.38m:** Unweathered, grey, SILTSTONE; weak, thin. **49.47m:** Unweathered, dark grey, fine to medium SANDSTONE; very weak to weak, poorly cemented, thinly bedded, reverse grading.	UW UW UW		100	100	100			
PQ3	10	50		EUz	**49.8m:** Unweathered, grey, SILTSTONE; weak, moderately thick.	UW							

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Casing from 0 - 13.5 mbgl. Took multiple attempts to drop which may have caused basalt gravels or heavily disturbed core samples between 0 - 13.5 m.
Drill depths missing for three water level readings.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl): 4/04/2023 1
Date Time | Hole Depth | Water Level
28/03/2023 8:00:00 AM | m | Dry m
28/03/2023 5:00:00 PM | 24.00m | 11 m
29/03/2023 8:00:00 AM | 24.00m | 12.9 m
30/03/2023 5:00:00 PM | 28.50m | 27 m
31/03/2023 8:00:00 AM | m | 1.1 m
31/03/2023 5:00:00 PM | m | 0.6 m
3/04/2023 1:15:00 PM | 31.50m | 2 m
3/04/2023 5:03:00 PM | 39.00m | 10 m
4/04/2023 8:15:00 AM | 39.00m | 15.5 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Ewington Rd**
Project Reference: **Stage 1 Ground Investigation**

BH1302

Sheet **11** of **11**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Hydrapower
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1756038.02m
Northing: 5917209.56m
Reduced level: 59.92m

Date started: 24/03/2023
Date completed: 4/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: DB / LG
Input by: DB
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3				EUz	**49.8m:** Unweathered, grey, SILTSTONE; weak, moderately thick.	UW		100	100	100			
					End of borehole at 50.5m (Abandoned due to obstruction - hard rock suspected)								

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Casing from 0 - 13.5 mbgl. Took multiple attempts to drop which may have caused basalt gravels or heavily disturbed core samples between 0 - 13.5 m.
Drill depths missing for three water level readings.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl): 4/04/2023 1

Date Time	Hole Depth	Water Level
28/03/2023 8:00:00 AM	m	Dry m
28/03/2023 5:00:00 PM	24.00m	11 m
29/03/2023 8:00:00 AM	24.00m	12.9 m
30/03/2023 5:00:00 PM	28.50m	27 m
31/03/2023 8:00:00 AM	m	1.1 m
31/03/2023 5:00:00 PM	m	0.6 m
3/04/2023 1:15:00 PM	31.50m	2 m
3/04/2023 5:03:00 PM	39.00m	10 m
4/04/2023 8:15:00 AM	39.00m	15.5 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: M0ucland Light Rail Limited
Project: M0ucland Light Rail
Location: Tennyson - t
Project Reference: - tage 1 Gro0nd Investigation

9 H1S2S

Sheet 1 of 11

9 BROHBLOE FBRNMTBI Method: Rotary Core Wireline Equipment: Hydrapower Trekker 2100 Contractor: Drill Force N° Ltd	ABGBRDE MTO- : I kTN Z222 Easting: 1755614.80m Northing: 5915977.43m Reduced level: 48.92m	Date started: 14/03/2023 Date completed: 21/03/2023 Inclination: -90; Azimuth: 0;	Logged by: BGW/DWB Input by: BGW/DWB Checked by: SBN Reviewed by: PK

Method	R.L. %mX	Length %mX	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR %% X	SCR %% X	RQD %% X	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACE+	48	1		P	**2m:** ASPHALT.								
				FEk	**2.25m:** GRAVEL/COBBLES with minor silt) brown. Tightly packed, dry. Gravel/Cobbles, slightly weathered, sub-angular to angular, fine to coarse.							**2m: FE.L**	
					2.S3m: COBBLES/BOULDERS) grey. Tightly packed, dry. Cobbles/Boulders, slightly weathered, sub-angular to subrounded basalt.			0	0	0			
PQ3	47	2		VUb	**1.Sm:** Slightly weathered, grey, highly vesicular, fine grained BASALT) Strong. Vesicles, up to appro(imately 30mm diameter.	SW		100	100	80		**1.Sm: M4 F** 1.6m: JT 15; planar, rough, FeO stained 1.68m: JT 10; planar, rough, FeO stained 1.73m: JT 20; undulating, rough, FeO stained 1.8m: JT 20; undulating, rough, FeO stained	
PQ3	46	3											
PQ3	45	4			**S.63m:** Slightly weathered, grey, moderately vesicular, fine grained BASALT) Strong. Vesicles, up to appro(imately 10mm.	SW		100	87	87			
					V.Sm: Slightly weathered, grey, slightly vesicular, fine grained BASALT) Strong. Vesicles, up to appro(imately 5mm.							4.22m to 4.5m: JT 20; planar, rough, FeO stained	
PQ3	44	5				SW		100	53	53		4.9m to 5.15m: JT 85; planar, rough,	

Box 1
Box 2

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REMARKS:
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Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
16/03/2023 7:30:00 AM | 16.50m | 8.60 m
17/03/2023 4:00:00 PM | 16.50m | 3.34 m
20/03/2023 5:00:00 PM | 40.50m | 7.9 m
21/03/2023 8:00:00 AM | 40.50m | 8.45 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: M0ucland Light Rail Limited
Project: M0ucland Light Rail
Location: Tennyson - t
Project Reference: - tage 1 Gro0nd Investigation

9 H1S2S

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9 BROHBLOE FBRNMTBI Method: Rotary Core Wireline Equipment: Hydrapower Trekker 2100 Contractor: Drill Force N° Ltd	ABGBRDE MTO- : I kTN Z222 Easting: 1755614.80m Northing: 5915977.43m Reduced level: 48.92m	Date started: 14/03/2023 Date completed: 21/03/2023 Inclination: -90; Azimuth: 0;	Logged by: BGW/DWB Input by: BGW/DWB Checked by: SBN Reviewed by: PK

Method	R.L. %mX	Length %mX	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR %% X	SCR %% X	RQD %% X	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	43	6		VUb	**V.Sm:** Slightly weathered, grey, slightly vesicular, fine grained BASALT) Strong. Vesicles, up to appro(imately 5mm.			100	53	53		coating, <2mm brownish red, highly plastic clay 5.15m to 5.5m: JT 8; planar, rough, coating, <2mm brownish red, highly plastic clay 5.68m: JT 10; planar, rough, FeO stained	
PQ3	42	7		VUb		SW		100	80	72		6.21m: JT 20; planar, rough, Mn stained 6.28m: JT 20; planar, rough, Mn stained 6.33m: JT 20; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 7.09m to 7.26m: JT 70; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 7.09m: JT 10; planar, rough, FeO stained 7.09m to 7.26m: JT 70; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 7.2m: JT 70; planar, rough, Mn stained 7.2m to 7.4m: JT 80; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 7.2m: JT 70; planar, rough, Mn stained 7.2m to 7.4m: JT 80; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 7.25m: JT 40; planar, rough, veneer, <1mm highly plastic clayey silt	
PQ3	41	8			**5.33m:** Slightly weathered, dark grey, highly vesicular BASALT) Strong. Vesicles, up to appro(imately 15mm diameter.	SW		100	87	70		7.95m to 7.98m: JT 45; planar, rough, FeO stained 8.15m: JT 45; planar, rough, FeO stained 8.45m: JT 45; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 8.62m to 8.82m: JT 65; planar, rough, clean	
PQ3	40	9		VWrb	**8m:** Moderately weathered, reddish brown, highly vesicular, scoriaceous RUBBLY BASALT) Moderately strong with brownish yellow silty CLAY, highly plastic matri(%%0x washed awayX	MW							
PQ3	39	10		VUb	**8.Sm:** Slightly weathered, dark grey, highly vesicular, fine-grained BASALT) Strong. Vesicles, up to appro(imately 30mm.	SW		100	70	50		9.32m: JT 10; undulating, rough, veneer, <1mm yellowish brown, highly plastic clayey silt 9.36m: JT 85; planar, rough, FeO stained 9.45m: JT 10; planar, rough, veneer, <1mm yellowish brown, low plasticity clayey silt 9.53m: JT 35; undulating, rough, veneer, <2mm yellowish brown, low plasticity clayey silt 9.68m: JT 80; planar, rough, veneer, <1mm yellowish brown, low plasticity clayey silt 9.71m: JT 45; planar, rough, FeO stained	

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Client: M0ucland Light Rail Limited
Project: M0ucland Light Rail
Location: Tennyson - t
Project Reference: - tage 1 Gro0nd Investigation

9 H1S2S

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9 BROHBLOE FBRNMTBI Method: Rotary Core Wireline Equipment: Hydrapower Trekker 2100 Contractor: Drill Force N° Ltd	ABGBRDE MTO- : I kTN Z222 Easting: 1755614.80m Northing: 5915977.43m Reduced level: 48.92m	Date started: 14/03/2023 Date completed: 21/03/2023 Inclination: -90; Azimuth: 0;	Logged by: BGW/DWB Input by: BGW/DWB Checked by: SBN Reviewed by: PK

Method	R.L. %mX	Length %mX	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR %% X	SCR %% X	RQD %% X	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3					**8.Sm:** Slightly weathered, dark grey, highly vesicular, fine-grained BASALT) Strong. Vesicles, up to appro(imately 30mm.	SW		100	70	50		10.05m: JT 5; planar, rough, clean	
PQ3	38	11										10.55m: JT 25; planar, rough, clean 10.8m: JT 15; planar, rough, clean 11.02m: JT 15; planar, rough, FeO stained 11.08m: DI	
								100	93	83			
					11.7m: Slightly weathered, light grey, moderately vesicular BASALT) Strong. Faintly flow banded, dip 20; .							11.54m: JT 5; planar, rough, clean 11.61m: JT 50; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 11.68m: JT 20; planar, rough, veneer, <1mm yellowish brown, highly plastic clay	
PQ3	37	12		VUb								12m to 12.35m: JT 70; planar, rough, coating, <1mm highly plastic clay	
												12.5m to 12.6m: JT 55; planar, rough, clean 12.6m: JT 5; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 12.71m: JT 40; planar, rough, clean 12.75m: JT 40; planar, rough, clean	
PQ3	36	13						100	73	50		13.05m: JT 10; planar, rough, clean	
						SW						13.22m: JT 5; planar, rough, Mn stained 13.3m: JT 5; planar, rough, Mn stained 13.35m: JT 20; planar, rough, Mn stained	
												13.6m: JT 5; planar, rough, FeO stained	
PQ3	35	14			**1Vm:**...Slightly vesicular, pinkish grey.							13.9m: JT 15; planar, rough, FeO stained 14.05m: JT 5; planar, rough, clean	
								100	100	93		14.21m: JT 15; planar, rough, clean	
												14.4m: JT 15; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 14.5m: JT 5; planar, rough, clean 14.6m: JT 25; planar, rough, FeO stained	
	34	15										14.73m: JT 15; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 14.85m: JT 75; planar, rough, clean	

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Location: Tennyson - t
Project Reference: - tage 1 Gro0nd Investigation

9 H1S2S

Sheet V of 11

9 BROHBLOE FBRNMTBI Method: Rotary Core Wireline Equipment: Hydrapower Trekker 2100 Contractor: Drill Force N° Ltd	ABGBRDE MTO- : I kTN Z222 Easting: 1755614.80m Northing: 5915977.43m Reduced level: 48.92m	Date started: 14/03/2023 Date completed: 21/03/2023 Inclination: -90; Azimuth: 0;	Logged by: BGW/DWB Input by: BGW/DWB Checked by: SBN Reviewed by: PK

Method	R.L. %mX	Length %mX	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR %% X	SCR %% X	RQD %% X	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ	33	16			**11.7m:** Slightly weathered, light grey, moderately vesicular BASALT) Strong. Faintly flow banded, dip 20;.	SW		100	79	45		15.05m: JT 45; planar, rough, clean 15.22m: JT 20; planar, rough, clean 15.5m: JT 3; planar, rough, FeO stained 15.57m to 15.72m: JT 80; planar, rough, clean 15.95m to 16.08m: JT 50; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 16.14m: JT 20; planar, rough, clean	
PQ	32	17		VUb	**17.Zm:** Slightly weathered, grey, slightly vesicular BASALT) Strong. Vesicles, up to appro(imately 10mm.			100	47	10		16.5m to 16.7m: JT 60; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 16.5m: JT 45; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 16.5m to 16.7m: JT 60; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 16.5m: JT 45; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 16.5m to 16.7m: JT 60; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 16.5m: JT 45; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 16.78m to 16.96m: JT 65; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 16.78m: JT 5; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 16.78m to 16.96m: JT 65; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 16.95m to 17.2m: JT 65; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 16.96m to 17.03m: JT 80; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 17.25m to 18m: JT 80; planar, rough, Mn stained 18m to 18.3m: JT 65; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 18.28m: JT 45; planar, rough, clean 18.34m: JT 45; planar, rough, clean 18.43m to 18.53m: JT 45; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 18.56m to 18.65m: JT 45; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 18.75m to 18.82m: JT 45; planar, rough, clean 18.82m to 18.97m: JT 45; planar, rough, clean 18.95m: JT 20; planar, rough, clean 19m to 19.14m: JT 55; planar, rough, clean 19.28m: JT 40; planar, rough, clean	
PQ	31	18				SW							
PQ	30	19											
PQ					**18.3m:** CORE LOSS			80	27	7			
PQ	29	20		VUb	**18.5m:** Slightly weathered, pinkish grey, slightly vesicular BASALT) Moderately strong.	SW							

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Water Level Readings(bgl):
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Auckland

Client: M0ucland Light Rail Limited
Project: M0ucland Light Rail
Location: Tennyson - t
Project Reference: - tage 1 Gro0nd Investigation

9 H1S2S

Sheet 3 of 11

9 BROHBLOE FBRNMTBI Method: Rotary Core Wireline Equipment: Hydrapower Trekker 2100 Contractor: Drill Force N° Ltd	ABGBRDE MTO- : I kTN Z222 Easting: 1755614.80m Northing: 5915977.43m Reduced level: 48.92m	Date started: 14/03/2023 Date completed: 21/03/2023 Inclination: -90; Azimuth: 0;	Logged by: BGW/DWB Input by: BGW/DWB Checked by: SBN Reviewed by: PK

Method	R.L. %mX	Length %mX	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR %% X	SCR %% X	RQD %% X	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ	28	21		VUb	**18.5m:** Slightly weathered, pinkish grey, slightly vesicular BASALT) Moderately strong.	SW							
					Z2.Vm: Unweathered, grey, slightly vesicular BASALT) Strong, highly fractured.			80	27	7		20.55m: JT 45; planar, rough, clean 20.6m: JT 0; planar, rough, clean 20.7m to 20.8m: JT 45; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 20.79m: JT 25; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 20.9m to 21.05m: JT 75; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 21.05m: JT 45; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 21.15m to 21.4m: JT 60; planar, rough, clean	
PQ	27	22						100	0	0		21.4m to 21.5m: JT 65; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 21.45m to 21.6m: JT 65; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 21.6m to 21.7m: JT 85; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 21.65m to 21.77m: JT 45; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 21.7m to 21.82m: JT 45; planar, rough, clean 21.9m: JT 65; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 21.9m to 22.05m: JT 65; planar, rough, veneer, <1mm yellowish brown, highly plastic clay	
PQ	26	23				UW						21.9m: JT 65; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 21.9m to 22.05m: JT 65; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 22.1m: JT 45; planar, rough, clean 22.2m to 22.3m: JT 65; planar, rough, clean 22.2m to 22.35m: JT 70; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 22.2m to 22.3m: JT 65; planar, rough, clean 22.4m to 22.5m: JT 70; planar, rough, clean 22.6m to 22.95m: JT 85; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 22.95m to 24m	
	25	24						100	70	0			
PQ	24	25						100	23	0		24m to 24.2m: JT 45; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 24.3m: JT 40; planar, rough, clean 24.4m: JT 40; planar, rough, clean 24.65m to 24.95m: JT 80; planar, rough, veneer, <1mm yellowish brown, highly plastic clay	

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Client: M0ucland Light Rail Limited
Project: M0ucland Light Rail
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Project Reference: - tage 1 Gro0nd Investigation

9 H1S2S

Sheet 7 of 11

9 BROHBLOE FBRNMTBI Method: Rotary Core Wireline Equipment: Hydrapower Trekker 2100 Contractor: Drill Force N° Ltd	ABGBRDE MTO- : I kTN Z222 Easting: 1755614.80m Northing: 5915977.43m Reduced level: 48.92m	Date started: 14/03/2023 Date completed: 21/03/2023 Inclination: -90; Azimuth: 0;	Logged by: BGW/DWB Input by: BGW/DWB Checked by: SBN Reviewed by: PK

Method	R.L. %mX	Length %mX	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR %X	SCR %X	RQD %X	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ					**Z2.Vm:** Unweathered, grey, slightly vesicular BASALT) Strong, highly fractured.			100	23	0		24.95m to 25.35m: JT 80; planar, rough, coating, 1mm chlorite	
PQ	23	26		VUb		UW		100	50	43		25.35m to 25.5m: JT 70; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 25.5m to 25.7m: JT 5; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 25.8m: JT 70; planar, rough, clean 26.1m to 26.3m: JT 80; planar, rough, clean	
	22	27			**Z7.73m:** CORE LOSS							26.55m: JT 25; planar, rough, veneer, <1mm yellowish brown, highly plastic clay 26.6m: JT 45; planar, rough, coating, 2mm clay	
PQ					**Z6m:** Sandy SILT with trace clay) brownish red. Hard, d y, non-plastic. Sand, fine to medium. Evidence of completely weathered organic rootlet holes. %Baked marginX	CH						**Z6m: MLLU4EJN**	
				AYz	**Z6.S3m:** Clayey SILT with some sand) greenish grey mottled red. Hard, moist, low plasticity. Sand, fine to medium.								
PQ	21	28			**Z6.7m to Z5.1m:**...greenish rey	ML		73	0	0			
					Z5.1m: CORE LOSS								
SPT	20	29		AYz	**Z5.3m:** C ayey SILT with some sand) light grey. Firm, moist, low plasticity. Sand, fine to medium.	ML	28.5m: SPT 2,3// 4,5,6,6 N = 21	100	0	0			
PQ	19	30			**Z8.V3m:** CORE LOSS			48	0	0			

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Box 12
Box 13
Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

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Client: M0ucland Light Rail Limited
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9 H1S2S

Sheet 6 of 11

9 BROHBLOE FBRNMTBI Method: Rotary Core Wireline Equipment: Hydrapower Trekker 2100 Contractor: Drill Force N° Ltd	ABGBRDE MTO- : I kTN Z222 Easting: 1755614.80m Northing: 5915977.43m Reduced level: 48.92m	Date started: 14/03/2023 Date completed: 21/03/2023 Inclination: -90; Azimuth: 0;	Logged by: BGW/DWB Input by: BGW/DWB Checked by: SBN Reviewed by: PK

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SPT				AYc	**S2m:** Silty CLAY with minor sand) greenish grey, banded speckled, light grey. Stiff, moist, high plasticity.	CH	30m: SPT 2,3// 3,4,4,6 N = 17						
PQ	18	31		AYz	**S2.13m:** Clayey SILT with some sand) greenish grey, mottled yellowish brown. Stiff, moist, low plasticity. Sand, fine to medium. **S2.8m to S1.Z3m:**...light grey, mottled grey.	MH		100 100	0 0	0 0			
SPT	17	32		ERs	**S1.V5m:** SAND with minor silt) greenish grey, streaked brownish green. Medium dense, wet, non-plastic. Sand, fine to medium.	SP	31.5m: S T 2,3// 4,6,5 N = 19	100	0	0		**S1.V5m: OA9 F**	
PQ				ERz	**S1.53m:** SILT with minor clay and trace black carbonaceous fragments) greenish grey. Very stiff, moist, low plasticity	ML							
				ERs	**SZ.Z3m:** SAND with minor silt) greenish grey. Medium dense, wet, non-plastic. Sand, fine to medium.	SP		90	0	0			
				ERz	**SZ.33m:** SILT with minor clay and trace black carbonaceous fragments) greenish grey. Very stiff, moist, low plasticity.	ML							
	16	33			**SZ.8m:** CORE LOSS								
SPT				ERz	**SSm:** SILT with minor clay and trace black carbonaceous fragments) greenish grey. Very stiff, moist, low plasticity.	ML	33m: SPT 2,2// 5,6,8,8 N = 27					33m: 100x water loss.	
				ERs	**SS.13m:** SAND with some silt and trace clay) grey. Medium dense, moist, non-plastic. Sand, fine to medium.	SP		100	0	0			
PQ	15	34		ERz	**SS.3m:** Completely weathered, grey, SILTSTONE) e(tremely weak. SILT with trace clay and sand) grey. Hard, moist, low plasticity. Sand, fine. **SV.Vm:**...with trace carbonaceous organics, wood) green grey, micritic???	ML		100	0	0		33.85m: JT 52; planar, slickensided	
SPT	14	35					34.5m: SPT 2,3// 5,5,5,5 N = 20	100 0	0 0	0 0			

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Project: M0ucland Light Rail
Location: Tennyson - t
Project Reference: - tage 1 Gro0nd Investigation

9 H1S2S

Sheet 5 of 11

9 BROHBLOE FBRNMTBI Method: Rotary Core Wireline Equipment: Hydrapower Trekker 2100 Contractor: Drill Force N° Ltd	ABGBRDE MTO- : I kTN Z222 Easting: 1755614.80m Northing: 5915977.43m Reduced level: 48.92m	Date started: 14/03/2023 Date completed: 21/03/2023 Inclination: -90; Azimuth: 0;	Logged by: BGW/DWB Input by: BGW/DWB Checked by: SBN Reviewed by: PK

Method	R.L. %mX	Length %mX	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR %% X	SCR %% X	RQD %% X	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ				EWz	**S3m:** Highly weathered) light green with brown mottles, SILTSTONE) e(tremly weak, remnant structure, iron o(ide staining. Breaks down to a SILT and CLAY with trace sand) light grey green with brown mottles. Hard, moist, moderate plasticity. sand, fine, micritic???			0	0	0			
					S3.3m:...recovered as SILT with trace organics) light grey with brown mottles. Hard, moist, lowplasticity. Relic structure, blocky. Organics, carbonaceous, fibrous, orientated on relic structures and shear planes.								
	13	36			**S3.8m:**...with trace sand, pumiceous, fine.	HW							
SPT							36m: SPT 1,3// 3,3,4,5 N = 15	100	0	0			
PQ					**S7.7m:**...recovered as Clayey SILT with trace sand) light grey. Very stiff, moist, moderate plasticity, relic structure, blocky. Sand, fine.								
	12	37			**S7.5m:** CORE LOSS			0	0	0			
SPT				EUi	**S6.3m:** Slightly weathered grey, S LTSTONE and fine SANDSTONE) E(tremely weak to very weak, indistinctly bedded, closely spaced, bedding obsucured due to closely spaced discontinuitie and fractures.		37.5m: SPT 5,11// 35,15 for 45mm N = 50Z	100	0	0			
	11	38				SW						38m: DB 38.1m: JT 10; 38.2m: JT 12;	
PQ								0	0	0			
												38.7m to 38.9m: C°	
	10	39		EUs	**S5.56m:** Slightly weathered, dark grey, fine SANDSTONE) very weak, moderately thin, uniformly graded, moderately widely spaced.	SW	39m: SPTC 10,40 for 140mm// N = 50Z	N/A	N/A	N/A			
SPTC													
				EUz	**S8.Zm:** Slightly weathered, dark grey, MUDSTONE) very weak. Moderately thick.	SW							
PQ				EUs	**S8.Vm:** Slightly weathered, grey, fine to medium SANDSTONE) very weak to weak, moderately cemented, unifromly graded, moderately thick, moderately widely spaced.	SW		100	0	0			
	9	40											

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):

Date Time	Hole Depth	Water Level
16/03/2023 7:30:00 AM	16.50m	8.60 m
17/03/2023 4:00:00 PM	16.50m	3.34 m
20/03/2023 5:00:00 PM	40.50m	7.9 m
21/03/2023 8:00:00 AM	40.50m	8.45 m

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Client: M0ucland Light Rail Limited
Project: M0ucland Light Rail
Location: Tennyson - t
Project Reference: - tage 1 Gro0nd Investigation

9 H1S2S

Sheet 8 of 11

9 BROHBLOE FBRNMTBI Method: Rotary Core Wireline Equipment: Hydrapower Trekker 2100 Contractor: Drill Force N° Ltd	ABGBRDE MTO- : I kTN Z222 Easting: 1755614.80m Northing: 5915977.43m Reduced level: 48.92m	Date started: 14/03/2023 Date completed: 21/03/2023 Inclination: -90; Azimuth: 0;	Logged by: BGW/DWB Input by: BGW/DWB Checked by: SBN Reviewed by: PK

Method	R.L. %mX	Length %mX	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR %% X	SCR %% X	RQD %% X	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ				EUs	**S8.Vm:** Slightly weathered, grey, fine to medium SANDSTONE) very weak to weak, moderately cemented, unifromly graded, moderately thick, moderately widely spaced.	SW		100	0	0		40m to 40.15m: JT 40; undulating, smooth 40.15m: DB 40.3m: DB	
SPTC							40.5m: SPTC 10,25// 50 for 45mm N = 50Z	N/A	N/A	N/A			
PQ	8	41		EUz	**V2.6m to V2.53m:**...coarse SANDSTONE clast inclusion comprising of fine volcanics and quartzite, well cemented, weak to moderately strong. **V2.8m:** Slightly weathered to unweathered MUDSTONE) very weak to weak, moderately widely spaced, moderately thin.	SW		100	0	0		41.2m: JT planar, smooth, clean 41.5m: DB 41.55m: DB 41.6m: DB	
PQ	7	42		EUz	**V1.6m:**...black carbonacious laminae **VZ.Zm:**...bioturbatious structure **VZ.Sm to VZ.V8m:**...black carbonacious laminae	SW		100	0	0		41.8m: JT stepped 42m: JT 71; planar, slickensided, brown clay	
PQ	6	43		EUs	**VZ.8m:** Slightly weath red to unweathered, light grey, coarse SANDSTONE) e(tremely weak to weak, poorly cemented, gap graded, moderately thick. **VS.23m to VS.Sm:**...recovered as a Coarse SAND	SW						43m to 43.1m: JT 70; Crush fracture 43.2m: C° Gravelly mudstone 43.25m: Coal seam	
				EUz	**VS.Sm:** Slightly w athered, grey, SILTSTONE) very weak, moderately thi k, closely spaced. **VS.Vm to VS.VSm:** ..black carbonacious laminae	SW						43.35m to 44.75m: FT 79; Displaced organic bands	
PQ	5	44		EUs	**VS.63m:** Slightly weathered, grey, coarse SANDSTONE) e(tremely weak to weak, poorly cemented, gap graded, moderately thin.	SW							
					VVm: CORE LOSS			50	0	0			
	4	45		EUz	**VV.63m:** Unweathered, grey, SILTSTONE) very weak to weak, moderately thick, widely spaced.	UW							

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
16/03/2023 7:30:00 AM | 16.50m | 8.60 m
17/03/2023 4:00:00 PM | 16.50m | 3.34 m
20/03/2023 5:00:00 PM | 40.50m | 7.9 m
21/03/2023 8:00:00 AM | 40.50m | 8.45 m

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Client: M0ucland Light Rail Limited
Project: M0ucland Light Rail
Location: Tennyson - t
Project Reference: - tage 1 Gro0nd Investigation

9 H1S2S

Sheet 12 of 11

9 BROHBLOE FBRNMTBI Method: Rotary Core Wireline Equipment: Hydrapower Trekker 2100 Contractor: Drill Force N° Ltd	ABGBRDE MTO- : I kTN Z222 Easting: 1755614.80m Northing: 5915977.43m Reduced level: 48.92m	Date started: 14/03/2023 Date completed: 21/03/2023 Inclination: -90; Azimuth: 0;	Logged by: BGW/DWB Input by: BGW/DWB Checked by: SBN Reviewed by: PK

Method	R.L. %mX	Length %mX	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR %% X	SCR %% X	RQD %% X	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ	3	46		EUz	**V6.63m:** Unweathered, grey, SILTSTONE) very weak to weak, moderately thick, widely spaced.	UW		100	0	0		45m: Core dropped 45.1m: DB 45.3m: DB 45.6m: DB 45.6m to 45.8m: C° 45.6m: DB 45.6m to 45.8m: C°	
					V3.8m: CORE LOSS							45.9m: Dropped core. 46.4m: Clay seam	
PQ	2	47		EUz	**V7.5m:** Unweathered, grey, SILTSTONE) very weak to weak, moderately thick, widely spaced.	UW		100	0	0		47.02m: Intact shell at bedding contact 47.2m: DB	
	1	48		EUs	**V6.3m:** Unweathered, light grey, fine to coarse SANDSTONE) e(tremely weak to weak, poorly emented, normally graded, moderately thick.	UW						47.45m: JT 5; Washed out fracture	
					V6.6m: Unweathered, grey, coarse SANDSTONE) e(tremely weak to weak, p orly cemented, gap graded, moderately thin	UW						47.85m: DB	
PQ	0	49		EUz	**V5.Zm:** Unweathered, grey, SILTSTONE) very weak, moderately widely spaced, thin. **V5.Z3m:**...black c rbonaceous laminae	UW		100	0	0		48.1m: JT 60; 48.4m: DB 48.45m: DB 48.7m: DB	
					V5.5m: CORE LOSS								
PQ	-1	50		EUi	**V8.3m:** Unweathered, grey, Interbedded SILTSTONE and SANDSTONE) very weak to weak, moderately thin to moderately thick bedding, sandstone beds, noramlly graded, poorly cemented.	UW		100	0	0		49.5m to 49.65m: C° 49.8m: DB 49.87m: DB 49.9m: DB	

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
16/03/2023 7:30:00 AM | 16.50m | 8.60 m
17/03/2023 4:00:00 PM | 16.50m | 3.34 m
20/03/2023 5:00:00 PM | 40.50m | 7.9 m
21/03/2023 8:00:00 AM | 40.50m | 8.45 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

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Client: M0ucland Light Rail Limited
Project: M0ucland Light Rail
Location: Tennyson - t
Project Reference: - tage 1 Gro0nd Investigation

9 H1S2S

Sheet 11 of 11

9 BROHBLOE FBRNMTBI Method: Rotary Core Wireline Equipment: Hydrapower Trekker 2100 Contractor: Drill Force N° Ltd	ABGBRDE MTO- : I kTN Z222 Easting: 1755614.80m Northing: 5915977.43m Reduced level: 48.92m	Date started: 14/03/2023 Date completed: 21/03/2023 Inclination: -90; Azimuth: 0;	Logged by: BGW/DWB Input by: BGW/DWB Checked by: SBN Reviewed by: PK

Method	R.L. %mX	Length %mX	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR %% X	SCR %% X	RQD %% X	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ				EUi	**V8.3m:** Unweathered, grey, Interbedded SILTSTONE and SANDSTONE) very weak to weak, moderately thin to moderately thick bedding, sandstone beds, noramlly graded, poorly cemented.	UW		100	0	0		50.15m: DB 50.2m: DB 50.35m: DB	
					End of borehole at 50.5m %Termination Depth AchievedX								

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Backfill information not provided, assumed grout backfill between vibrating wire piezometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
16/03/2023 7:30:00 AM | 16.50m | 8.60 m
17/03/2023 4:00:00 PM | 16.50m | 3.34 m
20/03/2023 5:00:00 PM | 40.50m | 7.9 m
21/03/2023 8:00:00 AM | 40.50m | 8.45 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

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C5ent: **Auckland Light Rail Ltd**
Prowect: **Auckland Light Rail**
Location: **Quadrant Road, Onehunga**
Prowect Reference: **Stage 1 Ground Investigation**

BH1404

Sheet **1** of **10**

BOREHOLE INFORMATION
Method: Rotark Core Wire5ne
Eyuipment: Beretta T46 Dri55Rig
Contractor: Dri55Force Nj Ltd

CO-ORDINATES: NZTM2000
Easting: 17q8476.q° m
Northing: q° 12473.41m
Reduced 5eve5 3° .74m

Date started: 4/04/2023
Date comp5eted: 12/04/2023
Inc5nation: ° 0x
A9imuth: 0x

Logged bk: JH
Input bk: JH
Checl ed bk: SBN
Revie| ed bk: PK

Method	R.L. %mX	Length %mX	Graphic Log	Laker Code	Materia5Description	Weathering/USC	Testing	TCR % X	SCR % X	RQD % X	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphk Defect Description Additiona5Notes	Instas5ation
VACE;	40	1			**0m:** HYDROVAC							**0m: FILL**	
SPT	41			VRt	**1.6m:** Si5k CLAY, bro| nish orange and grek. Verk stiff, moist, moderate to high p5asticitk.	N = q0(						**1.6m: AVF**	
HQ	42	2			**2.4m:**...q0mm 5ens of | e5rounded m dium GRAVE .	RS							
					2.45m: Moderate5k | eathered, pin ish orange, fine to coarse grained TUFFSTONE verk | eal , poor5k sorted, poor5k cemented, c5se5k sp ced undu5ating rough discontinuities, occa iona5medium grave5si9ed rounded c5asts.	MW			0.4q			2.67m: Joint, steep5k inc5ned 4qx, undu5ating, rough, verk narro| , disco5ured reddish orange.	
SPT	43	3			**3.1m:** SILT, some c5ak, bro| nish orange | ith red and grek. Verk stiff, moist, 5o| p5asticit , freyuent coarse sand and fine grave5si9ed | eal 5k cemented c5asts, occasiona5medium grave5si9ed, rounded, | eal 5k cemented c5asts.	MW	3m: IBHSV=UTP N = q0(						
HQ	44	4		VWt	**3.45m:** Moderate5k | eathered, orange bro| n, fine to coarse grained, TUFFSTONE, | eal , poor5k sorted, poor5k cemented, e)treme5k c5se5k spaced, undu5ating, rough, disc ntinuities, narro| to moderate5k narro| , moderate5k to steep5k inc5ned, some | ith 5ght grek c5ak infi55	MW			0.6				
SPT					**4.4m:**.....Bro| n.		N = q0(						
	q								0.3q				

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Bacl fi55information not provided, assumed grout bacl fi55bet\| een vibrating \| ire pie9ometer depths.

Water Level Readings(bgl): 12/0q/2023 8:30:00
Date Time | Hole Depth | Water Level
4/04/2023 q:07:00 PM z8.00m z2.2 m
q/04/2023 4:43:00 PM z22.q0m z1.qq m
6/04/2023 3:00:00 PM z31.q0m z0.q2 m
11/04/2023 4:30:00 PM z42.q0m z4.4q m
12/04/2023 2:00:00 PM zq0.00m zq.38 m
13/04/2023 8:30:00 PM zq0.00m zq.17 m
q/0q/2023 7:qq:00 AM z8.00m z2.28 m
6/0q/2023 8:00:00 AM z22.q0m z1.8q m
11/0q/2023 8:00:00 AM z31.q0m z0.83 m

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Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Quadrant Road, Onehunga**
Project Reference: **Stage 1 Ground Investigation**

BH1404

Sheet **2** of **10**

BOREHOLE INFORMATION
Method: Rotark Core Wireline
Equipment: Beretta T46 Drill Rig
Contractor: Drillforce Nz Ltd

CO-ORDINATES: NZTM2000
Easting: 1758476.0 m
Northing: 5912473.41m
Reduced Level: 3.74m

Date started: 4/04/2023
Date completed: 12/04/2023
Inclination: -90°
Azimuth: 0x

Logged by: JH
Input by: JH
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Laker Code	Material Description	Weathering/USC	Testing	TCR %	SCR %	RQD %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphic Defect Description Additional Notes	Installation
HQ	4q			VWt	**4.95m:**.....Fractures are very closely spaced, sub horizontal and moderately steeply inclined, some zones of crushed rock ~40mm.	MW						4.0m: Fracture surfaces are discoloured purplish black and brown. Interpreted as drilling induced.	
					5.12m: Moderately							**5.12m: ECBF**	
SPT	46	6		EWs	weathered, brown grey, fine to medium grained CONGLOMERATIC SANDSTONE, poorly sorted, very weak, moderately weak cemented, closely to very closely spaced, rough, undulating discontinuities. Clasts are predominantly fine to medium up to ~2mm, sub rounded, predominantly light grey and light greenish grey SILTSTONE, occasional red/orange coarse sand sized clasts.	MW	N = 60		0.3				
HQ												6.4m: 100mm zone of highly fractured rock, very narrow, closely spaced, gently to steeply inclined 10x to 60x, undulating, rough, surfaces are stained orange.	
	47	7			**6.8m:** Slightly				0.8				
SPTC					weathered, grey fine to coarse CONGLOMERATIC SANDSTONE,		N = 60	N/A	N/A	N/A		6.8m: Crush zone ~100mm.	
					weak,								
					cemented, black,								
					slightly								
					weathered,								
					light grey siltstone.								
					7m:.....Discontinuities are closely to moderately								
					wide								
					spaced.								
		8										7.0m: Joint, steeply inclined 40x, stepped, rough, stained orange/red. very narrow.	
	48												
HQ													
					8.2m:.....Very								
					weak,								
					with occasional				1.1				
					zones of moderately to								
					highly								
					plastic,								
					dark								
					SILT,								
					10mm								
					thick.								
				EUs	**8.3m:**.....Orange discoloration for ~300mm.	SW							
		°			**8.9m:**.....Weak.								
SPTC							N = 60	N/A	N/A	N/A			
	4°				**9.2m:**.....Weak (, ~60+ of rock mass is clasts for 220mm.								
HQ												.34m: Joint set, moderately inclined 20x, 10mm - 10mm	
									1.2			infilled seam of orange sight clay sized material	
		10											

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Back filling information not provided, assumed grout backfilled between vibrating wire piezometer depths.

Water Level Readings(bgl): 12/09/2023 8:30:00
Date Time | Hole Depth | Water Level
4/04/2023 9:07:00 PM 18.00m 12.2 m
9/04/2023 4:43:00 PM 122.00m 11.99 m
6/04/2023 3:00:00 PM 131.00m 10.92 m
11/04/2023 4:30:00 PM 142.00m 14.4 m
12/04/2023 2:00:00 PM 90.00m 9.38 m
13/04/2023 8:30:00 PM 90.00m 9.17 m
9/09/2023 7:99:00 AM 18.00m 12.28 m
6/09/2023 8:00:00 AM 122.00m 11.89 m
11/09/2023 8:00:00 AM 131.00m 10.83 m

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Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Quadrant Road, Onehunga**
Project Reference: **Stage 1 Ground Investigation**

BH1404

Sheet **3** of **10**

BOREHOLE INFORMATION
Method: Rotark Core Wireline
Equipment: Beretta T46 Drill Rig
Contractor: Drillforce NZ Ltd

CO-ORDINATES: NZTM2000
Easting: 1758476.0 m
Northing: 5912473.41 m
Reduced Level: 3.74m

Date started: 4/04/2023
Date completed: 12/04/2023
Inclination: -90.0°
Azimuth: 0.0°

Logged by: JH
Input by: JH
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Laker Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphic Defect Description Additional Notes	Installation
HQ	q0	11		EUs	**6.8m:** Slightly	SW	N = q0(	N/A	1.2	N/A		10m: Joint, steeply inclined, undulating, smooth, mod narrow, , with ~10mm infilled seam of dark grey slightly clayey SILT. 10.1m: Joint, moderately inclined 30x, undulating, smooth, very narrow, , with ~2mm infilled seam of dark grey slightly clayey SILT.	
SPTC					**10.6m:**.....Occasional dark greenish grey CLAYSTONE clasts.							10.6m: Joint, gently inclined 1qx, tight, slightly ensided, rough, with dark grey green silt veneer.	
HQ	q1	12					N = q0(	N/A	1.3	N/A			
SPTC												12.14m: Joint, very steeply inclined 7qx, ~200mm long, undulating, rough, qmm-10mm wide infilled seam of dark grey green and and slight grey soft CLAY.	
HQ	q2	13							0.8			12.6m: Joint set, steeply inclined 42x, undulating, rough, very narrow, .	
SPTC	q3				**13.2m:**.....300mm long rip up clast of unwe eathered, grey, clayey SILTSTONE, drilling induced breals in clast.		N = q0(	N/A		N/A		13.1m: Joint set, steeply inclined 38x, undulating, rough, very narrow, .	
HQ	q4	14			**13.8m:** Unwe eathered, grey fine to medium grained SANDSTONE with occasional bands of coarse sand, weak, moderately cemented, moderately wide spaced discontinuities, gently inclined, narrow, , with greenish grey staining, occasional fine grave sized clasts of slight grey and slight greyish green SILTSTONE 2-10mm diameter. **14m:**.....Discontinuities are close spaced, moderately inclined, undulating, rough, narrow, , some drilling induced fracturing.	UW			1.0				
		1q											

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Backfill information not provided, assumed grout backfilled between vibrating wire piezometer depths.

Water Level Readings(bgl): 12/09/2023 8:30:00
Date Time | Hole Depth | Water Level
4/04/2023 07:00 PM 8.00m 2.2 m
9/04/2023 4:43:00 PM 22.90m 1.99 m
6/04/2023 3:00:00 PM 31.90m 0.92 m
11/04/2023 4:30:00 PM 42.90m 4.49 m
12/04/2023 2:00:00 PM 90.00m 9.38 m
13/04/2023 8:30:00 PM 90.00m 9.17 m
9/09/2023 7:99:00 AM 8.00m 2.28 m
6/09/2023 8:00:00 AM 22.90m 1.89 m
11/09/2023 8:00:00 AM 31.90m 0.83 m

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C5ent: **Auckland Light Rail Ltd**
Prow ct: **Auckland Light Rail**
Location: **Quadrant Road, Onehunga**
Prow ct Reference: **Stage 1 Ground Investigation**

BH1404

Sheet **4** of **10**

BOREHOLE INFORMATION
Method: Rotark Core Wire5ne
Eyuipment: Beretta T46 Dri55Rig
Contractor: Dri55Force Nj Ltd

CO-ORDINATES: NZTM2000
Easting: 17q8476.q° m
Northing: q° 12473.41m
Reduced 5eve5 3° .74m

Date started: 4/04/2023
Date comp5eted: 12/04/2023
Inc5nation: ° 0x
A9imuth: 0x

Logged bk: JH
Input bk: JH
Checl ed bk: SBN
Revie| ed bk: PK

Method	R.L. %mX	Length %mX	Graphic Log	Laker Code	Materia5Description	Weathering/USC	Testing	TCR % X	SCR % X	RQD % X	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphk Defect Description Additiona5Notes	Instas5ation
HQ	qq	16		EUs	**13.8m:** Un| eathered, grek fine to medium grained SANDSTONE	ith occasiona5bands of coarse sand,	eal ,	e55cemented, moderate5k	ide5k spaced discontinuities, gent5k inc5ned, narro| ,	ith greenish grek staining, occasiona5fine grave5si9ed c5asts of 5ght grek and 5ght grekish green SILTSTONE 2-1qmm diameter.	UW			1.q			
	q6				**16.2m:**.....200mm 9one of CONGLOMERATIC SANDSTONE.							16.1m: Joint, moderate5k inc5ned 2qx, undu5ating, smooth, narro	,	ith b5acl and orange si5k c5ak veneer. 16.4m: Joint, moderate5k inc5ned 2qx, undu5ating, smooth, narro	,	ith 5ght grek s5ght5k si5k c5ak veneer.	
		17			**16.8m:**.....100mm 9one	ith freyuent bands of b5acl carbon9ied materia5%BCMX							
HQ	q7				**16.9m:** Un	eathered, darl grek, SILTSTONE,	eal , moderate5k c5ose5k spaced, verk narro	, gent5k to mode ate5k inc5ned, undu5ating, rough, wints. C5ose5k spaced bands of BCM up to 30mm thicl , bro	n and b5acl , fi res visib5e.				1.3				
					17.3m:.....Moderate5k inc5ned 30x ~30mm thicl band of BCM.								
		18			**17.65m:**...Intermi) ed 5enses of SANDSTONE and SILTSTONE for q00mm	ith soft sediment defo mation structures, dri5ng induced fractures in si5st ne ~300mm 5ong.	UW					17.qm: Conwgate wint set, gent5k inc5ned qx - 1qx, verk narro	, stepped, smooth,	ith greenish grek c5ak veneer on wint faces.	
HQ	q8			EU9	**18.15m:** Un| eathered, grek c5akek SILTSTONE, verk	eal , c5ose5k spaced, tight gent5k to moderate5k steep5k inc5ned wints, oc asiona5darl grek rip up c5asts of darl er grek c5akek SILTSTONE				1.q			
		1°					UW						
	q°				**19.5m:**...~300mm 9one of brol en core, dri5ng induced.								
HQ		20							1.4				

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Bacl fi55information not provided, assumed grout bacl fi55bet| een vibrating | ire pie9ometer depths.

Water Level Readings(bgl): 12/0q/2023 8:30:00
Date Time | Hole Depth | Water Level
4/04/2023 q:07:00 PM z8.00m z2.2 m
q/04/2023 4:43:00 PM z22.q0m z1.qq m
6/04/2023 3:00:00 PM z31.q0m z0.q2 m
11/04/2023 4:30:00 PM z42.q0m z4.4q m
12/04/2023 2:00:00 PM zq0.00m zq.38 m
13/04/2023 8:30:00 PM zq0.00m zq.17 m
q/0q/2023 7:qq:00 AM z8.00m z2.28 m
6/0q/2023 8:00:00 AM z22.q0m z1.8q m
11/0q/2023 8:00:00 AM z31.q0m z0.83 m

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Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Quadrant Road, Onehunga**
Project Reference: **Stage 1 Ground Investigation**

BH1404

Sheet **5** of **10**

BOREHOLE INFORMATION
Method: Rotark Core Wireline
Equipment: Beretta T46 Drill Rig
Contractor: Drillforce Nz Ltd

CO-ORDINATES: NZTM2000
Easting: 1758476.0 m
Northing: 5912473.41m
Reduced Level: 3.74m

Date started: 4/04/2023
Date completed: 12/04/2023
Inclination: -90°
Azimuth: 0x

Logged bk: JH
Input bk: JH
Checked bk: SBN
Reviewed bk: PK

Method	R.L. (m)	Length (m)	Graphic Log	Laker Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphic Defect Description Additional Notes	Installation
HQ	60	21		EU9	**18.15m:** Unweathered, grey, calcarenite SILTSTONE, very weak, closely spaced, tight, gently to moderately steeply inclined joints, occasional dark grey rip up clasts of dark grey calcarenite SILTSTONE. **20.9m:**.....Occasional interbeds of fine grained SANDSTONES, and SILTSTONES, with occasional bands of BCM, weak, with drilling induced fracture zones in siltstone.	UW			1.4			20.6m: Joint, steeply inclined 6qx, 110mm long, stepped, slightly undulating, very narrow.	
HQ	61	22			**21.6m:**.....1qmm thick interbed of green fine grained SANDSTONE, weak, hard contact, sub horizontal 51x - 2x. **21.61m:** Slight, weathered, light brown, fine to coarse grained SANDSTONE, weak, moderately cemented, closely spaced, gently inclined 10x - 20x, tight joints with iron oxide staining. Hard contact gently inclined 10x.				1.4			21.3m: Joint set, gently inclined qx - 10x, very closely spaced, tight.	
HQ	62	23		EUs	**22.8m:**.....Unweathered, dark greenish grey **23.1m:**.....Occasional fine grave sized pebbled clasts of light greenish grey siltstone ~10mm.	SW			1.q			23.2m: Joint, moderately inclined 30x, narrow, with 2mm infilled seam of light grey, weak, fine, sandstone.	
HQ	63	24			**23.9m:** Unweathered, dark grey, fine to medium grained, CONGLOMERATIC SANDSTONE, weak, moderately weakly cemented, clasts are fine, black, dark brown and light greenish grey. Hard contact, moderately inclined 28x.							23.°m: Joint, moderately inclined 28x, tight, orange staining on upper joint face only.	
HQ	64	2q			**24.4m:**.....300mm interbed of Unweathered, grey SILTSTONE with occasional BCM. **24.75m:**.....Rip up clast of weak fine to coarse SANDSTONE ~40mm wide. **24.8m:**.....300mm thick interbed of more greenish grey unweathered CONGLOMERATIC SANDSTONE with hard	UW			1.q			24.8m: Joint set, steeply inclined 30x - 4qx, tight, dark discoloured staining joints.	

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Backfill information not provided, assumed grout backfilled between vibrating wire piezometer depths.

Water Level Readings(bgl): 12/0q/2023 8:30:00
Date Time | Hole Depth | Water Level
4/04/2023 q:07:00 PM 8.00m 2.2 m
q/04/2023 4:43:00 PM 22.q0m 1.qq m
6/04/2023 3:00:00 PM 31.q0m 0.q2 m
11/04/2023 4:30:00 PM 42.q0m 4.4q m
12/04/2023 2:00:00 PM q0.00m q.38 m
13/04/2023 8:30:00 PM q0.00m q.17 m
q/0q/2023 7:qq:00 AM 8.00m 2.28 m
6/0q/2023 8:00:00 AM 22.q0m 1.8q m
11/0q/2023 8:00:00 AM 31.q0m 0.83 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

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C5ent: **Auckland Light Rail Ltd**
Prowect: **Auckland Light Rail**
Location: **Quadrant Road, Onehunga**
Prowect Reference: **Stage 1 Ground Investigation**

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Sheet **6** of **10**

BOREHOLE INFORMATION
Method: Rotark Core Wire5ne
Eyuipment: Beretta T46 Dri55Rig
Contractor: Dri55Force Nj Ltd

CO-ORDINATES: NZTM2000
Easting: 17q8476.q° m
Northing: q° 12473.41m
Reduced 5eve5 3° .74m

Date started: 4/04/2023
Date comp5eted: 12/04/2023
Inc5nation: ° 0x
A9imuth: 0x

Logged bk: JH
Input bk: JH
Checl ed bk: SBN
Revie| ed bk: PK

Method	R.L. %mX	Length %mX	Graphic Log	Laker Code	Materia5Description	Weathering/USC	Testing	TCR % X	SCR % X	RQD % X	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphk Defect Description Additiona5Notes	Instal5ation
				EUs	contacts at top and bottom, interbed has c5se5k spaced steep5k inc5ned wints | ith darl disco5uration.	UW							
HQ	6q				**25.1m:** Un| eathered, greenish grek SILTSTONE, | eal , poor5k cemented, | ith occasiona5BCM bands ~1mm - 2mm thicl .				1.q				
					25.3m:.....Purp5sh bro| n | ith greenish grek inc5usions.								
					25.5m:.....Moderate5k c5se5k spaced interbeds of un| eathered SANDSTONE, ~10mm-100mm thicl , | ith soft sediment deformation structures on contacts, beds are genera5k gent5k to moderate5k inc5ned 10x - 20x.								
		26											
HQ	66				**26m:**.....Grek and 5ght grek.				1.q			26m: Joint, moderate5k inc5ned 18x, moderate5k | ide, | ith infi5ed seam of | eal , grek c5akek si5stone.	
		27										26.8m: Fracture, steep5k inc5ned 6qx, s5cl ensided, undu5ating, tight, ~qmm thro| . 26.°m: Joint, moderate5k inc5ned 20x, narro| , | ith infi5ed seam of grek, | eal , si5k sandstone, cut bk fau5.	
	67				**27.4m:**.....Bedding is sub hori9onta51x - qx, thin to thin5k 5aminated.	UW							
HQ				EU9					1.3q				
		28			**28m:**.....Weal \(.								
	68											28.4m: Joint, gent5k inc5ned 8x, narro| , | ith infi5ed seam of | eal , grek, si5k sandstone.	
		2°											
HQ	6°				**29.3m:**.....Core is high5k fractured bk dri5ng for 800mm.				1.0				
					29.8m:.....200mm thicl 9one of thin5k interbedded fine to coarse grained un| eathered SANDSTONE, | eal \(, gent5k inc5ned 10x - 1qx.								
		30											

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Bacl fi55information not provided, assumed grout bacl fi55bet\| een vibrating \| ire pie9ometer depths.

Water Level Readings(bgl): 12/0q/2023 8:30:00
Date Time | Hole Depth | Water Level
4/04/2023 q:07:00 PM z8.00m z2.2 m
q/04/2023 4:43:00 PM z22.q0m z1.qq m
6/04/2023 3:00:00 PM z31.q0m z0.q2 m
11/04/2023 4:30:00 PM z42.q0m z4.4q m
12/04/2023 2:00:00 PM zq0.00m zq.38 m
13/04/2023 8:30:00 PM zq0.00m zq.17 m
q/0q/2023 7:qq:00 AM z8.00m z2.28 m
6/0q/2023 8:00:00 AM z22.q0m z1.8q m
11/0q/2023 8:00:00 AM z31.q0m z0.83 m

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C5ent: **Auckland Light Rail Ltd**
Prow ct: **Auckland Light Rail**
Location: **Quadrant Road, Onehunga**
Prow ct Reference: **Stage 1 Ground Investigation**

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Sheet **7** of **10**

BOREHOLE INFORMATION
Method: Rotark Core Wire5ne
Eyuipment: Beretta T46 Dri 5Rig
Contractor: Dri 5Force Nj Ltd

CO-ORDINATES: NZTM2000
Easting: 17q8476.q° m
Northing: q° 12473.41m
Reduced 5eve5 3° .74m

Date started: 4/04/2023
Date comp5eted: 12/04/2023
Inc5nation: ° 0x
A9imuth: 0x

Logged bk: JH
Input bk: JH
Checl ed bk: SBN
Revie| ed bk: PK

Method	R.L. %mX	Length %mX	Graphic Log	Laker Code	Materia5Description	Weathering/USC	Testing	TCR % X	SCR % X	RQD % X	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphk Defect Description Additiona5Notes	Instas5ation
HQ	70	31		EU9	**25.1m:** Un| eathered, greenish grek SILTSTONE, | eal , poor5k cemented, | ith occasiona5BCM bands ~1mm - 2mm thicl . **30.9m:**.....C5se5k spaced, thin to verk thin, gent5k inc5ned 10x - 1qx, interbeds of BCM, dri5ng induced fractures a5ng | eal er BCM bands. **31.2m:**.....~40mm thicl 9one of interedded, fine to medium grained CONGLOMERATIC SANDSTONE, and BCM bands gent5k inc5ned 10x - 1qx.	UW			1.4				
HQ	71	32			**31.5m:** Un| eathered, grek to darl grek, fine SANDSTONE, | eal (, moderate5k | e5cemented, occasiona5interbeds of BCM, occasiona5fine to medium grave5s of | eal 5ght grek CLAYSTONE, indistinct contact.	UW			1.q				
HQ	72	33		EUs	**32.8m:** Un| eathered, grek, fine to medium grained, COMGLOMERAT C SANDSTONE, | eal (, moderate5k | e5 cemented, cong5me ate 5enses are c5se5k to moderate5k c5se5k spaced, 5asts are fine to medium, 5ght grek CLAYSTONE and darl grek SILTSTONE, occasiona5BCM inc5usions and fine red CLAYSTONE c5asts, indistinct contact.	UW			1.q			33.7m: Joint, steep5k inc5ned 6qx, tight, undu5ating, s5cl ensided.	
HQ	73	34							1.q				
HQ	74	3q			**34.9m:**.....1.0m thicl interbed of un| eathered, grek, fine to								

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Bacl fi5information not provided, assumed grout bacl fi5bet\| een vibrating \| ire pie9ometer depths.

Water Level Readings(bgl): 12/0q/2023 8:30:00
Date Time | Hole Depth | Water Level
4/04/2023 q:07:00 PM z8.00m z2.2 m
q/04/2023 4:43:00 PM z22.q0m z1.qq m
6/04/2023 3:00:00 PM z31.q0m z0.q2 m
11/04/2023 4:30:00 PM z42.q0m z4.4q m
12/04/2023 2:00:00 PM zq0.00m zq.38 m
13/04/2023 8:30:00 PM zq0.00m zq.17 m
q/0q/2023 7:qq:00 AM z8.00m z2.28 m
6/0q/2023 8:00:00 AM z22.q0m z1.8q m
11/0q/2023 8:00:00 AM z31.q0m z0.83 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

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Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Quadrant Road, Onehunga**
Project Reference: **Stage 1 Ground Investigation**

BH1404

Sheet **8** of **10**

BOREHOLE INFORMATION
Method: Rotark Core Wireline
Equipment: Beretta T46 Drill Rig
Contractor: Drillforce Nz Ltd

CO-ORDINATES: NZTM2000
Easting: 1758476.0 m
Northing: 5912473.41m
Reduced Level: 3.74m

Date started: 4/04/2023
Date completed: 12/04/2023
Inclination: -90°
Azimuth: 0x

Logged bk: JH
Input bk: JH
Checked bk: SBN
Reviewed bk: PK

Method	R.L. (m)	Length (m)	Graphic Log	Laker Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphic Defect Description Additional Notes	Installation
HQ	7q	36		EUs	medium grained SANDSTONE, weak (, indistinct contacts. **32.8m:** Unweathered, grey, fine to medium grained, COMGLOMERATIC SANDSTONE, weak (, moderately weak cemented, conglomerate lenses are closely to moderately closely spaced, clasts are fine to medium, slight grey CLAYSTONE and dark grey SILTSTONE, occasional BCM inclusions and fine red CLAYSTONE clasts, indistinct contact.				1.q				
HQ	76	37			**36m:**.....300mm thick zone of fine to coarse Gravel Zgrey. Very loose, poorly sorted, sub rounded.				1.q			36m to 38m: Crushing of core interpretted as drilling induced.	
HQ	77	38			**38m:**.....Fine to coarse.	UW			1.q				
HQ	78	3°											
HQ	7°	40							1.q				

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Backfill information not provided, assumed grout backfilled between vibrating wire piezometer depths.

Water Level Readings(bgl): 12/0q/2023 8:30:00
Date Time | Hole Depth | Water Level
4/04/2023 q:07:00 PM z8.00m z2.2 m
q/04/2023 4:43:00 PM z22.q0m z1.qq m
6/04/2023 3:00:00 PM z31.q0m z0.q2 m
11/04/2023 4:30:00 PM z42.q0m z4.4q m
12/04/2023 2:00:00 PM zq0.00m zq.38 m
13/04/2023 8:30:00 PM zq0.00m zq.17 m
q/0q/2023 7:qq:00 AM z8.00m z2.28 m
6/0q/2023 8:00:00 AM z22.q0m z1.8q m
11/0q/2023 8:00:00 AM z31.q0m z0.83 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

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C5ent: **Auckland Light Rail Ltd**
Prowect: **Auckland Light Rail**
Location: **Quadrant Road, Onehunga**
Prowect Reference: **Stage 1 Ground Investigation**

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Sheet **9** of **10**

BOREHOLE INFORMATION	**CO-ORDINATES: NZTM2000**		
Method: Rotark Core Wire5ne	Easting: 17q8476.q° m	Date started: 4/04/2023	Logged bk: JH
Eyuipment: Beretta T46 Dri55Rig	Northing: q° 12473.41m	Date comp5eted: 12/04/2023	Input bk: JH
Contractor: Dri55Force Nj Ltd	Reduced 5eve5 3° .74m	Inc5nation: ° 0x	Checl ed bk: SBN
		A9imuth: 0x	Revie| ed bk: PK

Method	R.L. %mX	Length %mX	Graphic Log	Laker Code	Materia5Description	Weathering/USC	Testing	TCR % X	SCR % X	RQD % X	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphk Defect Description Additiona5Notes	Instas5ation
HQ	80			EUs	**32.8m:** Un| eathered, grek, fine to medium grained, COMGLOMERATIC SANDSTONE, | eal (, moderate5k | e55 cemented, cong5merate 5enses are c55se5k to moderate5k c55se5k spaced, c5asts are fine to medium, 5ght grek CLAYSTONE and darl grek SILTSTONE, occasiona5BCM inc5usions and fine red CLAYSTONE c5asts, indistinct contact.				1.q				
HQ	81	41							1.q			40.7m: Hea5ed wint, verk steep5k inc5ned 7qx -80x tight, undu5ating, rough.	
HQ	82	42			**42.55m:**.....1q0mm thicl gent5k inc5ned 1qx interbed of un| eathered, greenish grek SILTSTONE, | eal , 5aminated to thin5k bedded, gent5k inc5ned 10x - 1qx, soft sediment deformation structures n contacts. **42.8m:**.....300mm thicl moderate5k inc5ned 30x interbed of un| eathered greenish grek SILTSTONE, | eal , 5aminated to thin5k bedded, gent5k inc5ned 10x - 1qx, soft sediment deformati n structures on contac s.	UW			1.q				
HQ	83	43							1.q			43m: Joint, steep5k inc5ned, crescent shaped, narro| , ~300mm 5ng, infi55ed seam of | eal (, 5ght grek c5akek si55stone.	
HQ	84	44							1.q			44.6m: Hea5ed wint, verk steep5k inc5ned 7qx - 80x, narro| , rough, undu5ating, ca5cite crksta55ne infi55	
		4q										44.°m: 1mm | ide, verk steep5k inc5ned 7qx -	

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Bacl fi55information not provided, assumed grout bacl fi55bet\| een vibrating \| ire pie9ometer depths.

Water Level Readings(bgl): 12/0q/2023 8:30:00
Date Time | Hole Depth | Water Level
4/04/2023 q:07:00 PM z8.00m z2.2 m
q/04/2023 4:43:00 PM z22.q0m z1.qq m
6/04/2023 3:00:00 PM z31.q0m z0.q2 m
11/04/2023 4:30:00 PM z42.q0m z4.4q m
12/04/2023 2:00:00 PM zq0.00m zq.38 m
13/04/2023 8:30:00 PM zq0.00m zq.17 m
q/0q/2023 7:qq:00 AM z8.00m z2.28 m
6/0q/2023 8:00:00 AM z22.q0m z1.8q m
11/0q/2023 8:00:00 AM z31.q0m z0.83 m

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C5ent: **Auckland Light Rail Ltd**
Prow ct: **Auckland Light Rail**
Location: **Quadrant Road, Onehunga**
Prow ct Reference: **Stage 1 Ground Investigation**

BH1404

Sheet **10** of **10**

BOREHOLE INFORMATION
Method: Rotark Core Wire5ne
Eyuipment: Beretta T46 Dri55Rig
Contractor: Dri55Force Nj Ltd

CO-ORDINATES: NZTM2000
Easting: 17q8476.q° m
Northing: q° 12473.41m
Reduced 5eve5 3° .74m

Date started: 4/04/2023
Date comp5eted: 12/04/2023
Inc5nation: ° 0x
A9imuth: 0x

Logged bk: JH
Input bk: JH
Checl ed bk: SBN
Revie| ed bk: PK

Method	R.L. %mX	Length %mX	Graphic Log	Laker Code	Materia5Description	Weathering/USC	Testing	TCR % X	SCR % X	RQD % X	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphk Defect Description Additiona5Notes	Instal5ation
HQ	8q	46		EUs	**32.8m:** Un| eathered, grek, fine to medium grained, COMGLOMERATIC SANDSTONE, | eal (, moderate5k | e55 cemented, cong5merate 5enses are c55se5k to moderate5k c55se5k spaced, c5asts are fine to medium, 5ght grek CLAYSTONE and darl grek SILTSTONE, occasiona5BCM inc5usions and fine red CLAYSTONE c5asts, indistinct contact.				1.q			80x, seam of darl grek to b55cl | eal SILTSONE, ~300mm 5ng.	
	86												
HQ		47				UW						46.4m: qmm | ide, sub vertica5 80x, seam of 5ght grek | eal CLAYSTONE | ith sand si9ed BCM fragments.	
	87								1.q			46.7m: qmm | ide, sub vertica5 8qx, seam of grek | eal CLAYSTONE | ith sand si9ed BCM fragments.	
		48											
HQ	88				**48.15m:** Un| eathered, grek, fine to medium grained SANDSTONE, | eal , moderate5k | e55cemented, | ith occasiona5interbeds of SILTSTONE, ~1q0mm thicl | ith BCM inc5usions in p5aces, hard contact, sub hori9onta53x. **48.35m:**..... 80mm pocl et of verk poor5k cemented si5k SAND, grek, fine grained.				1.34			48.7m: qmm | ide, sub vertica5 7qx - 8qx, seam of 5ght grek | eal CLAYSTONE | ith sand si9ed BCM fragments.	
	4°					UW							
	8°												
HQ									0.4q				
	q0												

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REMARKS: End of borehos5 at q0m %Termination Depth AchievedX
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
Bacl fi55information not provided, assumed grout bacl fi55bet\| een vibrating \| ire pie9ometer depths.

Water Level Readings(bgl): 12/0q/2023 8:30:00
Date Time | Hole Depth | Water Level
4/04/2023 q:07:00 PM z8.00m z2.2 m
q/04/2023 4:43:00 PM z22.q0m z1.qq m
6/04/2023 3:00:00 PM z31.q0m z0.q2 m
11/04/2023 4:30:00 PM z42.q0m z4.4q m
12/04/2023 2:00:00 PM zq0.00m zq.38 m
13/04/2023 8:30:00 PM zq0.00m zq.17 m
q/0q/2023 7:qq:00 AM z8.00m z2.28 m
6/0q/2023 8:00:00 AM z22.q0m z1.8q m
11/0q/2023 8:00:00 AM z31.q0m z0.83 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: CckPland Light Rail Limited
Project: CckPland Light Rail
Location: Enehcnga Train 2tation, Zrinkes 2t
Project Reference: 2tage 1 Grocnd Nvestigation

OH106u

Sheet 1 of B

OERI HELI NMFERACTNEM Method: Rotary Core Wireline Equipment: Contractor:	- ESERDNMCTI 2: M. TA 5666 Easting: 1759072.55m Northing: 5911944.63m Reduced level: 10.83m	Date started: 5/05/2023 Date completed: 11/05/2023 Inclination: -90° Azimuth: 0°	Logged by: CJ/DY Input by: CJ/DY Checked by: SBN Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX					**6m:** HYDROVAC - No recovery.			0				**6m: FILL**	
PQ3	10	1		VUb	**6.3m:** Slightly weathered, dark grey, phaneritic; highly vesicular, iron stained BASALT; moderately strong.	SW		100				**6.3m: CORE LOSS**	
PQ3	9	2		VWt	**1.8m:** silty, iron stained CLAY, minor sand; dark brown; firm; moist, highly plastic.	CL						1.7m to 2.2m: Interpretted as cavity/void infill	
				VWt	**1.8m:** clayey SILT, some gravel; brown; firm, moist, highly plastic.	ML							
				VUb	**5.5m:** Slightly weathered, dark grey, porphyritic; moderately vesicular BASALT; moderately strong.			100					
PQ3	8	3		VWt	**5.0m:** gravelly SILT, some clay; dark brown. Soft, wet, moderate plasticity.	GM						2.4m to 3.3m: Interpretted as cavity/void infill	
PQ3	7	4		VWb	**V4.7m:** Moderately weath red; dark grey, porphyritic; highly vesicular, iron stained BASALT; moderately strong.	MW		93					
					0.0m: CORE LOSS								
PQ3	6	5		VWb	**0.9m:** Moderately weathered; dark grey, porphyritic; highly vesicular BASALT; moderately strong; closely spaced, narrow. Vesicles are 10-15mm, brown, very soft, clay infill. Phenocryst of olivine, pyroxene, feldspars and plagioclase.	MW		100				4.9m: JT 45° undulating, rough, (Infill: clay	

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
5/05/2023 3:30:00 PM | 13.50m | 8.8 m
8/05/2023 10:30:00 AM | 13.50m | 6.4 m
9/05/2023 8:30:00 AM | 25.50m | 6.9 m
10/05/2023 8:30:00 AM | 30.00m | 6.1 m
10/05/2023 2:00:00 PM | 40.00m | 5.2 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: CckPland Light Rail Limited
Project: CckPland Light Rail
Location: Enehcnga Train 2tation, Zrinkes 2t
Project Reference: 2tage 1 Grocnd Nvestigation

OH106u

Sheet 5 of B

OERI HELI NMFERACTNEM Method: Rotary Core Wireline Equipment: Contractor:	- ESERDNMCTI 2: M. TA 5666 Easting: 1759072.55m Northing: 5911944.63m Reduced level: 10.83m	Date started: 5/05/2023 Date completed: 11/05/2023 Inclination: -90° Azimuth: 0°	Logged by: CJ/DY Input by: CJ/DY Checked by: SBN Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	5	6		VWb	**04.9m:** Moderately weathered; dark grey, porphyritic; highly vesicular BASALT; moderately strong; closely spaced, narrow. Vesicles are 10-15mm, brown, very soft, clay infill. Phenocryst of olivine, pyroxene, feldspars and plagioclase.	MW						Very soft) 5m: JT 3° undulating, rough, (Infill: clay Very soft) 5.2m: JT 2° undulating, rough, staining, (Infill: clay)	
					94.9m: Slightly weathered, dark grey, porphyritic; slightly vesicular BASALT; strong; moderately widely spaced, narrow. Vesicles are 5-15mm, clean. Phenocrysts of olivine, pyroxene, feldspars, and plagioclase.			100	97	97		5.9m: DB 2° undulating, rough, clean	
PQ3	4	7		VUb	**u4.09m:**...10cm wide vesicle with brown, very soft, highly plastic CLAY	SW		100	100	100		6.4m: JT 10° undulating, rough, coating, (Infill: iron stained clay Very soft <5mm) 6.6m to 6.8m: JT 75° undulating, rough, coating, (Infill: iron stained clay Very soft <5mm) 6.8m to 7.1m: JT 80° undulating, rough, coating, (Infill: iron stained clay Very soft <5mm)	
PQ3	3	8			**B4.7m:** Slightly weathered, dark grey, porphyritic; highly vesicular BASALT; moderately strong. Vesicles are 5-10mm, clay infill. Phenocrysts of olivine, pyroxene, feldspar, and plagioclase.	SW		100	57	71		8.3m: JT 25° undulating, rough, (Infill: clay Very soft)	
PQ3	2	9			**84.0m:** Slightly weathered, dark grey, porphyritic; highly vesicular BASALT; moderately strong; moderately widely spaced, narrow. vesicles are 10-20mm in diameter, clay staining. Phenocrysts fo olivine, pyroxene, feldspar, and plagioclase.	SW		100	23	70		8.9m to 10.1m: JT 85° undulating, rough, (Infill: clay Very soft)	
PQ3	1	10											

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised

Water Level Readings(bgl):
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5/05/2023 3:30:00 PM | 13.50m | 8.8 m
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10/05/2023 8:30:00 AM | 30.00m | 6.1 m
10/05/2023 2:00:00 PM | 40.00m | 5.2 m

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Client: CckPland Light Rail Limited
Project: CckPland Light Rail
Location: Enehcnga Train 2tation, Zrinkes 2t
Project Reference: 2tage 1 Grocnd Nnvestigation

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Sheet V of B

OERI HELI NMFERACTNEM Method: Rotary Core Wireline Equipment: Contractor:	- ESERDNMCTI 2: M TA 5666 Easting: 1759072.55m Northing: 5911944.63m Reduced level: 10.83m	Date started: 5/05/2023 Date completed: 11/05/2023 Inclination: -90° Azimuth: 0°	Logged by: CJ/DY Input by: CJ/DY Checked by: SBN Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	0	11		VUb	840m: Slightly weathered, dark grey, porphyritic; highly vesicular BASALT; moderately strong; moderately widely spaced, narrow. vesicles are 10-20mm in diameter, clay staining. Phenocrysts fo olivine, pyroxene, feldspar, and plagioclase.	SW		100	23	70		10.1m: JT 25° undulating, rough, (Infill: clay Very soft)	
					1649m:...Highly weathered adjacent to an open joint.							10.5m to 11m: FZ coating, (Infill: clay) top dip of 30 degrees, bottom dip of 13 degrees. Recovered as coarse GRAVEL; dark grey; dense; moist.	
PQ3	-1	12			11m: Slightly weathered; dark grey, porphyritic; moderately vesicular BASALT; strong; moderately widely spaced, narrow. Vesicles are 10 mm in diameter, clean. Phenocrysts of olivine, pyroxene, feldspar, and plagioclase.	SW		100	56	73		11.2m to 11.5m: JT 85° undulating, rough, coating, (Infill: clay Very soft <5mm)	
PQ3	-2	13			1549m:...slightly vesicular			100	100	100		12.7m to 12.9m: JT 65° undulating, rough, veneer, (Infill: iron stained clay Very soft <2mm) 12.7m: JT 5° undulating, rough, veneer, (Infill: clay Very soft <2mm) 12.7m to 12.9m: JT 65° undulating, rough, veneer, (Infill: iron stained clay Very soft <2mm)	
					1Vm: Unweathered, dark grey, porphyritic, non to slighly vesicular BASALT. Strong. Flow bands dipping 20 to 40 degrees.							13.2m: DB 7° undulating, rough, clean broken along flow banding, scoriaceous material.	
					1V409m:...Scoriaceous material - along flow banding							13.45m: DB 8° undulating, rough, clean broken along flow banding, scoriaceous material.	
PQ3	-3	14				UW						13.96m: JT 65° stepped, rough, staining, (Infill: iron oxide)	
								100	64	98		14.31m: JT 65° undulating, rough, staining, (Infill: iron oxide)	
												14.56m: DB 30°	
	-4	15										14.71m: JT 20° undulating, smooth, staining, (Infill: iron oxide) 14.73m: JT 45° undulating, smooth, staining, (Infill: iron oxide)	

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
5/05/2023 3:30:00 PM | 13.50m | 8.8 m
8/05/2023 10:30:00 AM | 13.50m | 6.4 m
9/05/2023 8:30:00 AM | 25.50m | 6.9 m
10/05/2023 8:30:00 AM | 30.00m | 6.1 m
10/05/2023 2:00:00 PM | 40.00m | 5.2 m

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Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: CckPland Light Rail Limited
Project: CckPland Light Rail
Location: Enehcnga Train 2tation, Zrinkes 2t
Project Reference: 2tage 1 Grocnd Nvestigation

OH106u

Sheet 0 of B

OERI HELI NMFERACTNEM Method: Rotary Core Wireline Equipment: Contractor:	- ESERDNMCTI 2: M. TA 5666 Easting: 1759072.55m Northing: 5911944.63m Reduced level: 10.83m	Date started: 5/05/2023 Date completed: 11/05/2023 Inclination: -90° Azimuth: 0°	Logged by: CJ/DY Input by: CJ/DY Checked by: SBN Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	-5	16		VUb	**1Vm:** Unweathered, dark grey, porphyritic, non to slighly vesicular BASALT. Strong. Flow bands dipping 20 to 40 degrees. **19m:**...Slightly vesicular. Vesicles are 2-20mm.	UW		100	79	100		15.31m to 15.53m: JT undulating, rough, coating, (Infill: iron stained clay) Top dip 60 degrees, becomes sub-vertical. 15.6m to 15.66m: JT Recovered as basalt GRAVEL with FeO stained clay coating. 15.86m: DB 10° Broken along flow banding. 16.07m: DB 20° 16.18m: JT 20° stepped, rough, coating Green clay infill. 16.33m: JI 10° 16.35m: JT 65° stepped, smooth, coating Green clay infill.	
PQ3	-6	17		VUb	**1u40m:**...Highly vesicular.							16.6m: DB 45° Broken BASALT 16.73m: DB 0°	
PQ3	-7	18		VWtb	**134Vm:** Moderately weathered; dark grey, po phyritic WELDED TUFF; moderately strong. Basalt gravel.	MW		80	43	51		17.13m to 17.22m: DI Recovered as rubbly BASALT with green clay coating. 17.3m to 17.7m: DI Recovered as Coarse basalt GRAVELS.	
					134-8m: CORE LOSS								
PQ3	-8	19		VWv	**1B4um:** CLAY with trace silt and fine sands; greenish blue. Soft, moist, high plasticity.	CH		60	0	27		**1B4um: CLLU7NUA** 18.6m to 18.8m: Interpreted as possible void infill.	
				VWtb	**1B4Bm:** sandy fine to medium GRAVEL; grey. Very loosely packed, moist, well graded, sub-angular to sub-rounded. Gravel is moderately weathered, highly vesicular basalt. Sand is fine to coarse, well graded.	MW						**1B4Bm: C7F**	
PQ3	-9	20		VUb	**18m:** Unweathered, dark grey, porphyritic, slightly vesicular BASALT. Strong. Vesicles are 50mm and deep.	UW		100	32	100		19.13m: DI Broken along large vesicle with clay infill. 19.26m: DB 10° Geenish brown clay infill. 19.6m: DB 10° 19.85m: DB 5° Patch of 5mm greenish yellow clay infill.	
					184-89m:...65mm wide vesicle with greenish white clay infill.								

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
5/05/2023 3:30:00 PM | 13.50m | 8.8 m
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10/05/2023 8:30:00 AM | 30.00m | 6.1 m
10/05/2023 2:00:00 PM | 40.00m | 5.2 m

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Auckland

Client: CckPland Light Rail Limited
Project: CckPland Light Rail
Location: Enehcnga Train 2tation, Zrinkes 2t
Project Reference: 2tage 1 Grocnd Nnvestigation

OH106u

Sheet 9 of B

OERI HELI NMFERACTNEM Method: Rotary Core Wireline Equipment: Contractor:	- ESERDNMCTI 2: M. TA 5666 Easting: 1759072.55m Northing: 5911944.63m Reduced level: 10.83m	Date started: 5/05/2023 Date completed: 11/05/2023 Inclination: -90° Azimuth: 0°	Logged by: CJ/DY Input by: CJ/DY Checked by: SBN Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	-10	21		VUb	**18m:** Unweathered, dark grey, porphyritic, slightly vesicular BASALT. Strong. Vesicles are 50mm and deep.			100	32	100		20.27m to 20.66m: DI 90° Sligh green staining. 20.85m to 20.94m: DB 50°	
PQ3	-11	22		VUb	**51m:**...Non-vesicular.	UW		100	0	100		21m: JT 30° undulating, smooth, veneer Yellow clay infill. 21.04m: DB 45° 21.23m to 21.44m: JT 65° undulating, smooth, veneer Conjugate Joint. Greenish white infill. 21.32m to 21.52m: JT 65° undulating, smooth, veneer Conjugate Joint. Green clay infill. 21.95m: DB 30°	
				VUb	**5541Vm:**...90mm wide vesicle.								
				AUz	**5543m:** SILT, with trace clay; blackish b own. Stiff, moist, non-plastic.	ML						**5543m: CLLU7NUA** 22.27m to 22.5m: Interpretted as baked Paleosol	
PQ3	-12	23		AUc	**5549m:** Silty CLAY; grey. Firm, moist, high plasticity	CL-ML		100					
				AUc	**5V41m to 5V49m:**...Grey, mottled brown.									
PQ3	-13	24		AUz	**5V499m:** Fine sandy SILT with minor clay; grey. Firm, moist, low plasticity.	MI-SP							
SPT				AUz	**50m:** Clayey SILT with some fine sands; grey. Firm, moist, high plasticity.	CL-ML	24m: SPT 1,2// 2,2,2,3 N = 9	100					
PQ3	-14	25		AUs	**5049m:** Silty SAND; grey. Medium dense, moist, non-plastic. **504um:**...Loosely packed.	SM		100					
				AUz		CL-ML							

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
5/05/2023 3:30:00 PM | 13.50m | 8.8 m
8/05/2023 10:30:00 AM | 13.50m | 6.4 m
9/05/2023 8:30:00 AM | 25.50m | 6.9 m
10/05/2023 8:30:00 AM | 30.00m | 6.1 m
10/05/2023 2:00:00 PM | 40.00m | 5.2 m

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Auckland

Client: CckPland Light Rail Limited
Project: CckPland Light Rail
Location: Enehcnga Train 2tation, Zrinkes 2t
Project Reference: 2tage 1 Grocnd Nnvestigation

OH106u

Sheet u of B

OERI HELI NMFERACTNEM Method: Rotary Core Wireline Equipment: Contractor:	- ESERDNMCTI 2: M. TA 5666 Easting: 1759072.55m Northing: 5911944.63m Reduced level: 10.83m	Date started: 5/05/2023 Date completed: 11/05/2023 Inclination: -90° Azimuth: 0°	Logged by: CJ/DY Input by: CJ/DY Checked by: SBN Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3				AUz	**5043m:** Clayey SILT with some fine sands and rootlets; dark brownish, grey. Stiff, moist, non-plastic. Rootlets are fibrous.			100					
SPT	-15	26				CL-ML	25.5m: SPT 1,3// 3,3,3,4 N = 13	100					
PQ3				EWz	**5u4Vum:** Moderately weathered, dark grey, SILTSTONE. Very weak.			100	0	70		**5u4Vum: I - OF** 26.5m: DB 35° 26.56m: DB 35° 26.68m: JT 70° undulating, smooth, clean	
SPT	-16	27					27m: SPT 2,9// 12,16,22 N = 50+	100					
PQ3	-17	28				HW		100	32	100		27.96m: DB 20°	
SPTC	-18				**5B49m:** CORE LOSS		28.5m: SPTC 2,8// 20,20,10 for 45mm N = 50+	N/A	N/A	N/A		28.5m: Core loss due to Solid Cone SPT	
PQ3		29		EWs	**5B49m:** Moderately weathered, dark grey, medium to coarse grained SANDSTONE. Very weak, poorly cemented. Specks of white clasts.	MW						28.85m to 29.35m: DI CS breaks.	
				EWz	**5846um:** Moderately weathered, dark grey, SILTSTONE. Very weak.	MW		76	0	76		29.45m to 29.52m: DI Recovered as Sandstone GRAVELS.	
				EWs	**5849m:** Moderately weathered, dark grey, medium to coarse grained SANDSTONE. Very weak, poorly cemented.	MW							
	-19	30			**5843m:** CORE LOSS								

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SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
5/05/2023 3:30:00 PM | 13.50m | 8.8 m
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Auckland

Client: CckPland Light Rail Limited
Project: CckPland Light Rail
Location: Enehcnga Train 2tation, Zrinkes 2t
Project Reference: 2tage 1 Grocnd Nvestigation

OH106u

Sheet 3 of B

OERI HELI NMFERACTNEM Method: Rotary Core Wireline Equipment: Contractor:	- ESERDNMCTI 2: M. TA 5666 Easting: 1759072.55m Northing: 5911944.63m Reduced level: 10.83m	Date started: 5/05/2023 Date completed: 11/05/2023 Inclination: -90° Azimuth: 0°	Logged by: CJ/DY Input by: CJ/DY Checked by: SBN Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPTC					V6m: CORE LOSS		30m: SPTC 6,17// 50 N = 50+	N/A	N/A	N/A		30m: Core loss due to Solid Cone SPT	
PQ3	-20	31		EWz	V645Vm: Moderately weathered, dark grey, SILTSTONE. Very weak.	MW							
				EWs	V649Vm: Moderately weathered, dark grey, fine to medium grained SANDSTONE. Very weak, poorly cemented.	MW		100	0	100		30.69m to 30.83m: JT 65° undulating, smooth, clean 30.83m to 31m: DI Recovered as Sandstone fine to medium GRAVELS. 31.16m to 31.5m: DI Recovered as Sandstone fine to medium GRAVELS.	
SPTC					V149m: CORE LOSS		31.5m: S TC 8,28 o 60mm// 50 N = 50+	N/A	N/A	N/A		31.5m: Core loss due to Solid Cone SPT	
PQ3	-21	32			V1431m: Recovered as fine to medium SAND with trace silt; dark grey with some white specks. Very loosely packed, wet. Significant dilatent behaviour.	MW		100	0	100		31.71m: Multiple attempts taken to retrieve core. Split was full when pulled out of rods, however, due to uncemented nature, unsure if any core loss occurred. Assumed no core loss has occurred	
PQ3	-22	33		EWs	VVm: Moderately weathered, dark grey, medium to coarse grained SANDSTONE. Weak, well emented. Specks of white clasts.	MW		100	40	53		33.6m: DB 5°	
PQ3	-23	34			VV43m:...Grades to fine to medium grained SANDSTONE. Very weak, poorly cemented.							33.8m to 34.5m: DI Recovered as Sandstone and Siltstone coarse GRAVELS.	
PQ3	-24	35		EUz	V049m: Slightly weathered, dark grey, SILTSTONE interbedded with black carbonaceous bands. Very weak. Dipping 20 degrees.	SW		100	0	100		34.83m: DB 0°	

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5/05/2023 3:30:00 PM | 13.50m | 8.8 m
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10/05/2023 8:30:00 AM | 30.00m | 6.1 m
10/05/2023 2:00:00 PM | 40.00m | 5.2 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: CckPland Light Rail Limited
Project: CckPland Light Rail
Location: Enehcnga Train 2tation, Zrinkes 2t
Project Reference: 2tage 1 Grocnd Nvestigation

OH106u

Sheet B of B

OERI HELI NMFERACTNEM Method: Rotary Core Wireline Equipment: Contractor:	- ESERDNMCTI 2: M. TA 5666 Easting: 1759072.55m Northing: 5911944.63m Reduced level: 10.83m	Date started: 5/05/2023 Date completed: 11/05/2023 Inclination: -90° Azimuth: 0°	Logged by: CJ/DY Input by: CJ/DY Checked by: SBN Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3				EUz	**V04.9m:** Slightly weathered, dark grey, SILTSTONE interbedded with black carbonaceous bands. Very weak. Dipping 20 degrees.	SW		100	0	100		35.03m: DI Broken along organic band. 35.23m to 35.3m: DI	
	-25	36		EUs	**V9.39m:** Slightly weathered, dark grey, fine to medium grained SANDSTONE. Very weak, poorly cemented.	SW							
PQ3				EUz	**Vum:** Slightly weathered, dark grey, SILTSTONE. Very weak. Dipping 20 degrees.	SW		87	56	80		36.24m: BP 20° Broken parallel to bedding. 36.42m: BP 20° Broken parallel to bedding. 36.67m: DB 0°	
	-26	37		EUs	**Vu.83m:** Slightly weathered, dark grey, fine to medium grained SANDSTONE. Very weak, poorly cemented. **Vu.8um:**...Weak, well cemented.	SW						36.87m: BP 10° Broken between siltstone and sandstone bedding.	
					V34/m: CORE LOSS								
PQ3				EWs	**V34.9m:** Slightly weathered, dark grey, medium to coarse grained SANDSTONE. Weak, well cemented.	SW						37.6m to 37.74m: DI	
	-27	38			**V34.5m:**...10-20mm band of coarse purple SANDSTONE **V34.0m:**...10-20mm band of coarse purple SANDSTONE								
				EUz	**V34.8m:** Slightly weathered, dark grey, SILTSTONE. Weak. Dipping 20 degrees.	SW						37.8m: DB 0°	
				EUs	**VB.69m:** Slightly weathered, dark grey, fine to medium grained SANDSTONE. Very weak, poorly cemented.	SW		72	0	49		38.05m: BP 10° Broken between siltstone and sandstone bedding. 38.24m to 38.58m: DI Recovered as fine to medium grained SAND.	
	-28	39			**VB.9Bm:** CORE LOSS								
PQ3				EUs	**V8m:** Slightly weathered, dark grey, fine to medium grained SANDSTONE. Very weak, poorly cemented.	SW						39.1m: DB 0°	
				EUz	**V84.5m:** Slightly weathered, dark grey, SILTSTONE. Weak. Dipping 20 degrees.	SW		100	0	68			
	-29	40		EUs	**V8.99m:** Slightly weathered, dark grey, fine to medium grained SANDSTONE. Very weak, poorly cemented.	SW						39.55m: Multiple attempts taken to retrieve core	

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REMARKS: End of borehole at 40m ()
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
5/05/2023 3:30:00 PM | 13.50m | 8.8 m
8/05/2023 10:30:00 AM | 13.50m | 6.4 m
9/05/2023 8:30:00 AM | 25.50m | 6.9 m
10/05/2023 8:30:00 AM | 30.00m | 6.1 m
10/05/2023 2:00:00 PM | 40.00m | 5.2 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Walmsley Rd, Mangere**
Project Reference: **Stage 1 Ground Investigation**

BH1410

Sheet **1** of **8**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Trekker 2100 Hydrapower
Contractor: DrillForce

CO-ORDINATES: NZTM2000
Easting: 1759566.56m
Northing: 5908664.97m
Reduced level: 6.89m

Date started: 26/04/2023
Date completed: 3/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy / Defect Description / Additional Notes	Installation
VACEX	6	1			**0m:** HYDROVAC - No recovery			0				**0m: FILL**	
PQ3	5	2		AYz	**1.5m:** Clayey SILT, minor organics; greyish brown; firm, moist, highly plastic. Organics are rootlets and partially decomposed disseminated wood fragments	MH		100				**1.5m: YOUNGER ALLUVIUM**	
	4	3			**2.1m:** Clayey SILT, some fine sand; brownish orange, mottled grey; firm, moist, highly plastic	ML							
SPT							3m: SPT 1,1// 1,2,2,3 N = 8	100					
PQ3	3	4			**3.25m:** Fine sandy pumiceous SILT, some clay; light grey, mottled orange. Firm, moist, low plasticity	ML		100					
				AYs	**4m:** Silty fine SAND, trace clay; light grey mottled orange. Loose, moist, non-plastic. Dilatation	SM							
SPT	2	5		AYp	**4.5m:** Plastic PEAT, dark blackish brown; very soft, moist, non-plastic. On reworking peat has pasty texture [H7]	PT	4.5m: SPT 1,0// 0,0,0,0 N = 0	100					
								100					

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REMARKS:
SCR= 1 circumference - 300 mm100% circulation loss at 0.8m
TCR, SCR, and RQD measurements to be revised.
Hole was collapsing due to incorrect polymer being used, casing was put in. (Operator issues)
Kaawa layer code to be revised

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
27/04/2023 4:45:00 PM | 10.50m | 3.2 m
28/04/2023 7:30:00 AM | 10.50m | 3.16 m
29/04/2023 4:00:00 PM | 22.50m | 2.35 m
1/05/2023 8:30:00 AM | 22.50m | 3.8 m
1/05/2023 4:40:00 PM | 30.00m | 4.7 m
2/05/2023 8:30:00 AM | 30.00m | 4.5 m
2/05/2023 4:18:00 PM | 31.50m | 6.9 m
3/05/2023 7:45:00 AM | 31.50m | 2 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Walmsley Rd, Mangere**
Project Reference: **Stage 1 Ground Investigation**

BH1410

Sheet **2** of **8**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Trekker 2100 Hydrapower
Contractor: DrillForce

CO-ORDINATES: NZTM2000
Easting: 1759566.56m
Northing: 5908664.97m
Reduced level: 6.89m

Date started: 26/04/2023
Date completed: 3/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3				AYp	**4.5m:** Plastic PEAT, dark blackish brown; very soft, moist, non-plastic. On reworking peat has pasty texture [H7]	PT		100					
PUSHTUBE	1	6		AYo	**5.6m:** Organic SILT, some fine sand; light grey and blackish brown. Loose, moist, non-plastic.	OL		100					
HQ3	0	7		AYp	**6.5m:** Amorphous PEAT; dark blackish brown; very soft, moist, non-plastic. On reworking peat has pasty texture [H9].	PT		100					
SPT	-1			AYs	**7.8m:** Fine to medium SAND, some silt, minor clay and organics; light grey mottled green. Medium dense, moist, non-plastic. Organics are partially decomposed plant remains.	SM	7.5m: SPT 0,0// 0,0,0,2 N = 2	100					
HQ3		8		AYz	**7.95m:** Fine to medium sandy SILT, minor clay and organics; light grey, mottled black. Medium dense, moist, low plasticity. Organics are partially decomposed plant and wood fragments.	ML		100					
PUSHTUBE	-2	9		AYs	**8.6m:** Silty fine to medium SAND, trace clay; light grey, moist, non-plastic. Loose. Dilatant.	SM		100					
					8.8m: Fine to medium SAND some silt minor clay; light grey mottled green, moist. Loose. Dilatant	SM		100					
SPT	-3	10			**9.5m:** Fine to medium SAND, minor silt; dark grey. Medium dense, moist,dilatant-quick, indistinctly bedded.	SW	9.5m: SPT 2,2// 3,2,4,4 N = 13	100					

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REMARKS:
SCR= 1 circumference - 300 mm100% circulation loss at 0.8m
TCR, SCR, and RQD measurements to be revised.
Hole was collapsing due to incorrect polymer being used, casing was put in. (Operator issues)
Kaawa layer code to be revised

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
27/04/2023 4:45:00 PM | 10.50m | 3.2 m
28/04/2023 7:30:00 AM | 10.50m | 3.16 m
29/04/2023 4:00:00 PM | 22.50m | 2.35 m
1/05/2023 8:30:00 AM | 22.50m | 3.8 m
1/05/2023 4:40:00 PM | 30.00m | 4.7 m
2/05/2023 8:30:00 AM | 30.00m | 4.5 m
2/05/2023 4:18:00 PM | 31.50m | 6.9 m
3/05/2023 7:45:00 AM | 31.50m | 2 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Walmsley Rd, Mangere**
Project Reference: **Stage 1 Ground Investigation**

BH1410

Sheet **3** of **8**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Trekker 2100 Hydrapower
Contractor: DrillForce

CO-ORDINATES: NZTM2000
Easting: 1759566.56m
Northing: 5908664.97m
Reduced level: 6.89m

Date started: 26/04/2023
Date completed: 3/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3				AYs	**9.5m:** Fine to medium SAND, minor silt; dark grey. Medium dense, moist,dilatant-quick, indistinctly bedded.	SW		100					
SPT	-4	11			**10.5m:** Fine to medium SAND, minor silt; dark grey. very loose, moist,dilatant-quick, indistinctly bedded.	SW	10.5m: SPT 0,0// 0,1,0,0 N = 1	78					
					10.85m: CORE LOSS								
HQ3	-5	12			**10.95m:** Fine to coarse SAND; minor silt; grey. Medium dense, well graded, dilatant slow, indistinctly bedded. shell fragments are 1-5mm in diameter	SW		100					
					11.2m: Medium to coarse SAND, minor silt, grey. Medium dense; moist, well graded, non-plastic, dilatant slow.								
SPT							12m: SPT 3,3// 3,5,5,6 N = 19	100					
HQ3	-6	13		AYs	**12.45m:**...Sub-horizontal bedding.	SW		100					
SPT	-7	14					13.5m: SPT 2,2// 4,4,4,5 N = 17	100					
HQ3	-8	15				SM		100					

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REMARKS:
SCR= 1 circumference - 300 mm100% circulation loss at 0.8m
TCR, SCR, and RQD measurements to be revised.
Hole was collapsing due to incorrect polymer being used, casing was put in. (Operator issues)
Kaawa layer code to be revised

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
27/04/2023 4:45:00 PM | 10.50m | 3.2 m
28/04/2023 7:30:00 AM | 10.50m | 3.16 m
29/04/2023 4:00:00 PM | 22.50m | 2.35 m
1/05/2023 8:30:00 AM | 22.50m | 3.8 m
1/05/2023 4:40:00 PM | 30.00m | 4.7 m
2/05/2023 8:30:00 AM | 30.00m | 4.5 m
2/05/2023 4:18:00 PM | 31.50m | 6.9 m
3/05/2023 7:45:00 AM | 31.50m | 2 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Walmsley Rd, Mangere**
Project Reference: **Stage 1 Ground Investigation**

BH1410

Sheet **4** of **8**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Trekker 2100 Hydrapower
Contractor: DrillForce

CO-ORDINATES: NZTM2000
Easting: 1759566.56m
Northing: 5908664.97m
Reduced level: 6.89m

Date started: 26/04/2023
Date completed: 3/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPT					**14.9m:** Silty fine SAND, trace clay; dark grey. Medium dense, non-dilatant.	SM	15m: SPT 1,1// 3,3,4,3 N = 13	100					
HQ3	-9	16		AYs	**15.85m:** Silty, fine to medium SAND minor clay; dark grey. Medium dense, moist, non-dilatant.	SM		100					
SPT	-10						16.5m: SPT 0,1// 0,2,3 N = 6	100					
HQ3		17		KWs	**16.8m:** Silty, fine to medium SAND, some broken shell fragments; dark grey speckled white. Loose, moist. Shell fragments 2-15mm diameter, matrix supported.	SM		86				**16.8m: KAAWA**	
	-11	18			**17.85m:** CORE LOSS								
SPT				KWs	**18m:** Silty, fine to medium SAND, some broken shell fragments; dark grey speckled white. Loose, moist. Shell fragments 2-15mm diameter, matrix supported.	ML	18m: SPT 1,1// 1,2,2,3 N = 8	56					
					18.25m: CORE LOSS								
HQ3	-12	19		KWs	**18.45m:** Silty, fine to medium SAND, some broken shell fragments; dark grey speckled white. Loose, moist. Shell fragments 2-15mm diameter, matrix supported.	SM		100					
SPT	-13	20					19.5m: SPT 1,2// 2,3,3,4 N = 12	100					
								100					

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REMARKS:
SCR= 1 circumference - 300 mm100% circulation loss at 0.8m
TCR, SCR, and RQD measurements to be revised.
Hole was collapsing due to incorrect polymer being used, casing was put in. (Operator issues)
Kaawa layer code to be revised

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
27/04/2023 4:45:00 PM | 10.50m | 3.2 m
28/04/2023 7:30:00 AM | 10.50m | 3.16 m
29/04/2023 4:00:00 PM | 22.50m | 2.35 m
1/05/2023 8:30:00 AM | 22.50m | 3.8 m
1/05/2023 4:40:00 PM | 30.00m | 4.7 m
2/05/2023 8:30:00 AM | 30.00m | 4.5 m
2/05/2023 4:18:00 PM | 31.50m | 6.9 m
3/05/2023 7:45:00 AM | 31.50m | 2 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Walmsley Rd, Mangere**
Project Reference: **Stage 1 Ground Investigation**

BH1410

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Trekker 2100 Hydrapower
Contractor: DrillForce

CO-ORDINATES: NZTM2000
Easting: 1759566.56m
Northing: 5908664.97m
Reduced level: 6.89m

Date started: 26/04/2023
Date completed: 3/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	-14	21		KWs	**18.45m:** Silty, fine to medium SAND, some broken shell fragments; dark grey speckled white. Loose, moist. Shell fragments 2-15mm diameter, matrix supported.	SM		100					
SPT					**21m:**...60mm thick clayey SILT layer		21m: SPT 2,2// 2,3,4,4 N = 13	100					
HQ3	-15	22		KW	**21.8m:** Amorphous PEAT; dark blackish brown; soft, moist, non-plastic. On reworking peat has pasty texture [H8]	PT		100					
SPT	-16	23		KWs	**22.75m:** Silty fine SAND, trace clay; grey, mottled green; medium dense, moist, non-plastic	SM	22.5m: SPT 4,4// 5,6,7,7 N = 25	100					
HQ3					**22.95m:** Medium to coarse SAND, some silt; grey. Medium dense; moist, dilatant slow	SW		100					
					23.4m: Fine sandy SILT, trace clay, and organics; brown. Firm; moist, highly plastic. Organics is disseminated	ML							
	-17	24		KW	**23.6m:** Fine sandy SILT, trace clay; greenish grey. Firm; moist, highly plastic.	ML							
SPT					**24m:** Medium to coarse SAND, some silt; grey. Medium dense; moist.		24m: SPT 5,8// 10,10,14,11 N = 45	100					
HQ3	-18	25		KWs		SM		100					

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REMARKS:
SCR= 1 circumference - 300 mm100% circulation loss at 0.8m
TCR, SCR, and RQD measurements to be revised.
Hole was collapsing due to incorrect polymer being used, casing was put in. (Operator issues)
Kaawa layer code to be revised

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
27/04/2023 4:45:00 PM | 10.50m | 3.2 m
28/04/2023 7:30:00 AM | 10.50m | 3.16 m
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1/05/2023 4:40:00 PM | 30.00m | 4.7 m
2/05/2023 8:30:00 AM | 30.00m | 4.5 m
2/05/2023 4:18:00 PM | 31.50m | 6.9 m
3/05/2023 7:45:00 AM | 31.50m | 2 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Walmsley Rd, Mangere**
Project Reference: **Stage 1 Ground Investigation**

BH1410

Sheet **6** of **8**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Trekker 2100 Hydrapower
Contractor: DrillForce

CO-ORDINATES: NZTM2000
Easting: 1759566.56m
Northing: 5908664.97m
Reduced level: 6.89m

Date started: 26/04/2023
Date completed: 3/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3					**24m:** Medium to coarse SAND, some silt; grey. Medium dense; moist.			100					
SPT	-19	26			**25.5m to 26.5m:**...Minor shell fragments, 2-5mm diameter **25.75m to 25.95m:**...Mottled dark green	SM	25.5m: SPT 3,6// 7,11,13,11 N = 42	100					
HQ3				KWs	**26.5m:** Silty fine SAND; grey. Medium dense; moist.	SM		100					
	-20	27			**26.8m:** Medium to coarse SAND, some silt; grey, mottled green. dense; moist.	SM	27m: SPT 4,9// 10,14,15,11 for 35mm N = 50+	100					
SPT													
HQ3	-21	28			**27.9m:** Silty fine to medium SAND; greenish grey. Very dense, moist. **28.1m:**...Very dense	SM		83					
					28.31m: CORE LOSS								
SPT							28.5m: SPT 27,23 for 30mm// N = 50+	0					
	-22	29		KWs	**28.59m:** Medium SAND, some silt; grey, mottled dark green. Dense; moist.	SM							
HQ3				KW	**29.1m:** Organic SILT, some clay; dark brown. Very stiff, moist, highly plastic. Organics are decomposed plant and wood fragments.	OL		100					
					29.5m: Glauconitic fine sandy SILT; light grey, mottled dark green. Very dense; moist, non-plastic.	ML							
	-23	30		KWs	**29.7m:** Glauconitic, silty, fine to medium SAND; greenish grey. Very dense; moist.	SM							

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REMARKS:
SCR= 1 circumference - 300 mm100% circulation loss at 0.8m
TCR, SCR, and RQD measurements to be revised.
Hole was collapsing due to incorrect polymer being used, casing was put in. (Operator issues)
Kaawa layer code to be revised

Water Level Readings(bgl):
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1/05/2023 4:40:00 PM | 30.00m | 4.7 m
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Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Walmsley Rd, Mangere**
Project Reference: **Stage 1 Ground Investigation**

BH1410

Sheet **7** of **8**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Trekker 2100 Hydrapower
Contractor: DrillForce

CO-ORDINATES: NZTM2000
Easting: 1759566.56m
Northing: 5908664.97m
Reduced level: 6.89m

Date started: 26/04/2023
Date completed: 3/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPT					**30m:** CORE LOSS		30m: SPT 13,23// 24,26 N = 50+	0					
HQ3	-24	31		KWs	**30.3m:** Silty fine to medium SAND; greenish grey. Very dense, moist.	SM		100					
SPT					**31.5m:** CORE LOSS		31.5m: SPT 1,20/ 24,24,2 for 5mm N = 50+	0					
HQ3	-25	32											
	-26	33		KWs	**32.4m:** Glauconitic, medium to coarse SAND, minor silt, minor shells; greenish grey. Very dense; moist. Shells are fragments 2-5mm in diameter	SM		50					
SPT					**33m:** CORE LOSS		33m: SPT 14,17// 23,27 N = 50+	0					
HQ3	-27	34		KWs	**33.7m:** Glauconitic, fine to medium SAND; greenish grey. Very dense; moist.	SW		67					
SPT					**34.5m:** CORE LOSS		34.5m: SPT 11,11// 16,24,10 for 20mm N = 50+	0					
HQ3	-28	35						85					

REMARKS:
SCR= 1 circumference - 300 mm100% circulation loss at 0.8m
TCR, SCR, and RQD measurements to be revised.
Hole was collapsing due to incorrect polymer being used, casing was put in. (Operator issues)
Kaawa layer code to be revised

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
27/04/2023 4:45:00 PM | 10.50m | 3.2 m
28/04/2023 7:30:00 AM | 10.50m | 3.16 m
29/04/2023 4:00:00 PM | 22.50m | 2.35 m
1/05/2023 8:30:00 AM | 22.50m | 3.8 m
1/05/2023 4:40:00 PM | 30.00m | 4.7 m
2/05/2023 8:30:00 AM | 30.00m | 4.5 m
2/05/2023 4:18:00 PM | 31.50m | 6.9 m
3/05/2023 7:45:00 AM | 31.50m | 2 m

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Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **Auckland Light Rail Ltd**
Project: **Auckland Light Rail**
Location: **Walmsley Rd, Mangere**
Project Reference: **Stage 1 Ground Investigation**

BH1410

Sheet **8** of **8**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Trekker 2100 Hydrapower
Contractor: DrillForce

CO-ORDINATES: NZTM2000
Easting: 1759566.56m
Northing: 5908664.97m
Reduced level: 6.89m

Date started: 26/04/2023
Date completed: 3/05/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	-29	36		KWs	**35m:** Glauconitic, fine to medium SAND, minor shells; greenish grey. Very dense; moist. Shell fragments are 2-5mm in diameter.	SW		85					

End of borehole at 36m (Termination Depth Achieved)

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REMARKS:
SCR= 1 circumference - 300 mm100% circulation loss at 0.8m
TCR, SCR, and RQD measurements to be revised.
Hole was collapsing due to incorrect polymer being used, casing was put in. (Operator issues)
Kaawa layer code to be revised

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
27/04/2023 4:45:00 PM | 10.50m | 3.2 m
28/04/2023 7:30:00 AM | 10.50m | 3.16 m
29/04/2023 4:00:00 PM | 22.50m | 2.35 m
1/05/2023 8:30:00 AM | 22.50m | 3.8 m
1/05/2023 4:40:00 PM | 30.00m | 4.7 m
2/05/2023 8:30:00 AM | 30.00m | 4.5 m
2/05/2023 4:18:00 PM | 31.50m | 6.9 m
3/05/2023 7:45:00 AM | 31.50m | 2 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ARI_V2.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Moyle Park, Bader Drive**
Project Reference: **Stage 1 Ground Investigation**

BH1411

Sheet **1** of **8**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Beretta T46 Drill Rig
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1759741.27m
Northing: 5907784.88m
Reduced level: 5.26m

Date started: 17/04/2023
Date completed: 20/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: JH
Input by: JH
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	5	1			**0m:** HYDROVAC - No recovery.							**0m: FILL**	
SPT	4			FUc	**1.5m:** Silty CLAY, brown and orange. Very stiff, moist, moderate plasticity, occasional rootlets. **1.8m:**.....100mm lens of coarse scoriaceous SAND with fine gravels.	CL-ML	1.5m: SPT 0// 1,1,1 N = 4						
HQ	2	2		AYz	**1.9m:** Clayey SILT, grey and brownish grey. Soft to firm, moist, moderate plasticity, moderately widely spaced 5mm-10mm lenses of coarse SAND.	CL-ML						**1.9m: ALLUVIUM**	
	3				**2.2m:** CORE LOSS								
		3		AYz	**2.85m:** Clayey SILT, grey and brownish grey. Soft to firm, moist, moderate plasticity, moderately widely spaced 5mm-10mm lenses of coarse SAND.	CL-ML							
SPT	2			AYc	**3m:** Silty CLAY, greenish grey. Soft, moist, moderate plasticity, trace organic inclusions; disseminated black partially decomposed wood fragments.	CL-ML	3m: IBHSV=23/6kPa 3m: SPT 0,0// 0,0,0,0 N = 0					3m: SPT value lower than anticipated, could be affected by drilling water pressure.	
HQ	1	4											
SPT		5		AYo	**4.4m:** ORGANIC SILT, dark brown. Soft, wet, low plasticity. **4.9m to 4.95m:**.....50mm lens of fine to coarse SAND with	OL	4.5m: IBHSV=20/6kPa 4.5m: SPT 0,0// 0,0,0,0 N = 0					4.5m: SPT value lower than anticipated, could be affected by drilling water pressure.	

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
No discontinuity data available.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
17/04/2023 5:10:00 PM | 15.00m | 2.88 m
18/04/2023 8:00:00 AM | 15.00m | 1.7 m
18/04/2023 4:10:00 PM | 25.50m | 1.9 m
19/04/2023 8:50:00 AM | 25.50m | 2.2 m
19/04/2023 4:45:00 PM | 32.00m | 2.48 m
20/04/2023 7:45:00 AM | 32.00m | 2.26 m
20/04/2023 2:00:00 PM | 40.00m | 1.4 m
21/04/2023 10:45:00 AM | 40.00m | 1.92 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Moyle Park, Bader Drive**
Project Reference: **Stage 1 Ground Investigation**

BH1411

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Beretta T46 Drill Rig
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1759741.27m
Northing: 5907784.88m
Reduced level: 5.26m

Date started: 17/04/2023
Date completed: 20/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: JH
Input by: JH
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ	0			AYo	some organic inclusion; black partially decomposed wood and plant fragments.	OL							
					4.4m: ORGANIC SILT, dark brown. Soft, wet, low plasticity.								
					5.1m: SILT, some fine to coarse sand, trace of clay and organics, grey. Soft, low plasticity: organics are black partially decomposed wood fragments.	ML							
				AYz	**5.5m:** SILT, some clay, trace sand and organics, brown. Firm, wet, moderate plasticity, sand is fine, organics are brown and black partially decomposed wood fragments.								
SPT	-1	6				MI	6m: IBHSV=85/6kPa 6m: SPT 0,0// 0,0,0,0 N = 0					6m: SPT value lower than anticipated, could be affected by drilling water pressure.	
HQ				AYc	**6.45m:** Silty CLAY, brownish grey, soft, wet, highly plastic.								
	-2	7			**6.7m to 6.85m:**.....150mm lens of dark brown, highly plastic ORGANIC CLAY.	CL-ML							
					7m: CORE LOSS								
SPT					**7.3m:** Silty fine to medium SAND, dark grey. Loose, saturated, Sand is sub-rounded to rounded quartz (90%) and mica (10%).		7.5m: SPT 1,2// 1,1,2,1 N = 5						
HQ	-3	8		AYs	**8.4m to 8.6m:**.....Dilatant, sand is liquified by drilling process?	SM						8.4m: Highly sensitive core, liquifiable for ~300 mm.	
		9			**9m:**.....Sand is medium dense		9m: SPT 2,3// 3,4,6,8 N = 21						
SPT	-4				**9.1m to 11m:**.....Moderately closely spaced dark brown to black fibrous organic inclusions of partially decomposed wood ~2mm-10mm.								
HQ		10											

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
No discontinuity data available.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
17/04/2023 5:10:00 PM | 15.00m | 2.88 m
18/04/2023 8:00:00 AM | 15.00m | 1.7 m
18/04/2023 4:10:00 PM | 25.50m | 1.9 m
19/04/2023 8:50:00 AM | 25.50m | 2.2 m
19/04/2023 4:45:00 PM | 32.00m | 2.48 m
20/04/2023 7:45:00 AM | 32.00m | 2.26 m
20/04/2023 2:00:00 PM | 40.00m | 1.4 m
21/04/2023 10:45:00 AM | 40.00m | 1.92 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Moyle Park, Bader Drive**
Project Reference: **Stage 1 Ground Investigation**

BH1411

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Beretta T46 Drill Rig
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1759741.27m
Northing: 5907784.88m
Reduced level: 5.26m

Date started: 17/04/2023
Date completed: 20/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: JH
Input by: JH
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ / SPT	-5	11		AYs	**7.3m:** Silty fine to medium SAND, dark grey. Loose, saturated, Sand is sub-rounded to rounded quartz (90%) and mica (10%).	SM	10.5m: SPT 3,4// 4,5,8,10 N = 27						
HQ / SPT	-6 / -7	12		AYs	**11m:** Silty, fine to coarse SAND, some clay, dark grey. Soft, wet, very low plasticity. Sand is sub-rounded to rounded quartz (90%) and mica (10%).	SC	12m: SPT 0,1// 0,0,2,1 N = 3						
HQ / SPT	-8	13 / 14		AYz	**12.4m:** SILT, some clay, trace of sand, greenish grey. Soft, low to moderate plasticity; sand is fine. **13m:**.....Widely spaced 50mm lenses of cohesive clayey SILT, moderate plasticity.	MI	13.5m: SPT 1,0// 1,1,1,2 N = 5						
HQ	-9	15		AYz	**14.8m:** CORE LOSS	MI							

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
No discontinuity data available.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
17/04/2023 5:10:00 PM | 15.00m | 2.88 m
18/04/2023 8:00:00 AM | 15.00m | 1.7 m
18/04/2023 4:10:00 PM | 25.50m | 1.9 m
19/04/2023 8:50:00 AM | 25.50m | 2.2 m
19/04/2023 4:45:00 PM | 32.00m | 2.48 m
20/04/2023 7:45:00 AM | 32.00m | 2.26 m
20/04/2023 2:00:00 PM | 40.00m | 1.4 m
21/04/2023 10:45:00 AM | 40.00m | 1.92 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Moyle Park, Bader Drive**
Project Reference: **Stage 1 Ground Investigation**

BH1411

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Beretta T46 Drill Rig
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1759741.27m
Northing: 5907784.88m
Reduced level: 5.26m

Date started: 17/04/2023
Date completed: 20/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: JH
Input by: JH
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS, WS, MWS, CS, VCS, ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPT	-10				**14.9m:** SILT, some clay, trace of sand, greenish grey. Soft, low to moderate plasticity; sand is fine.	MI	15m: IBHSV=30/5kPa 15m: SPT 0,1// 0,2,1,1 N = 4						
HQ		16		AYz	**15.4m:** Sandy SILT, some clay, grey, firm, wet, low plasticity. Sand is fine to medium.	ML							
	-11						16.5m: S T 0,1// 2 13,18 N = 41						
SPT				AYs	**16.7m:** Silty fine to medium SAND, dark grey. Loose, saturated, dilatant; sand is sub-rounded to rounded quartz (85%) and mica (15%).	SM							
		17			**16.95m:** CORE LOSS								
HQ	-12			AYs	**17.5m:** Silty fine to medium SAND, dark grey. Loose, saturated, dilatant; sand is sub-rounded to rounded quartz (85%) and mica (15%).	SM							
		18			**17.8m to 18m:** ....200mm zone of sandy SILT, some clay.								
SPT	-13			AYo	**18m:** ORGANIC SILT, some clay, trace organics, dark brown. Very stiff, moist, low plasticity. Organics are fibrous partially decomposed wood fragments.	OL	18m: SPT 1,2// 2,3,4,4 N = 13						
HQ					**18.5m to 18.7m:**.....200mm zone of fibrous PEAT.								
				AYs	**18.85m:** Weakly cemented, silty, fine SAND, light brown, dense. Silicic rhyolite ash?	SM							
		19			**18.9m:** CORE LOSS								
	-14			AYs	**19.1m:** Weakly cemented, silty, fine SAND, light brown, dense. Silicic rhyolite ash?	SM							
SPT							19.5m: IBHSV=UTP 19.5m: SPT 4,7// 8,10,11,12 N = 41						
					19.75m: CORE LOSS								
		20				SP							

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
No discontinuity data available.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
17/04/2023 5:10:00 PM | 15.00m | 2.88 m
18/04/2023 8:00:00 AM | 15.00m | 1.7 m
18/04/2023 4:10:00 PM | 25.50m | 1.9 m
19/04/2023 8:50:00 AM | 25.50m | 2.2 m
19/04/2023 4:45:00 PM | 32.00m | 2.48 m
20/04/2023 7:45:00 AM | 32.00m | 2.26 m
20/04/2023 2:00:00 PM | 40.00m | 1.4 m
21/04/2023 10:45:00 AM | 40.00m | 1.92 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Moyle Park, Bader Drive**
Project Reference: **Stage 1 Ground Investigation**

BH1411

Sheet **5** of **8**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Beretta T46 Drill Rig
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1759741.27m
Northing: 5907784.88m
Reduced level: 5.26m

Date started: 17/04/2023
Date completed: 20/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: JH
Input by: JH
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ	-15	21		AYs	**19.95m:** Fine to medium SAND, some silt, dark grey. Loose, saturated. Sand is sub-rounded to rounded quartz (85%) and mica (15%).	SP							
					20.3m: CORE LOSS								
SPT	-16			AYs	**20.85m:** Fine to medium SAND, some silt, dark grey. Loose, saturated. Sand is sub-rounded to rounded quartz (85%) and mica (15%). **21.2m:**.....150mm thick pocket of sandy SILT with some clay.	SP	21m: SPT 2,3// 5,5,5,6 N = 21						
HQ	-17	22		AYs	**21.45m:** Silty, fine to medium SAND, some clay, dark grey. Soft, wet, very low plasticity. Sand is sub-rounded to rounded quartz (90%) and mica (10%), with trace fine siltstone gravels.	SM							
					21.65m: CORE LOSS								
SPT	-18	23		AYs	**21.9m:** Silty, fine to medium SAND, some clay, dark grey. Soft, wet, very low plasticity. Sand is sub-rounded to rounded quartz (90%) and mica (10%), with trace fine siltstone gravels. **22.6m to 24m:**.....Trace ~5mm diameter rounded clasts of extremely weak greenish grey SANDSTONE and SILTSTONE and partially decomposed wood fragment. **23m to 24m:** .....Sand is fine to coarse.	SM	22.5m: SPT 2,2// 3,2,4,5 N = 14						
HQ		24											
SPT	-19	25		KWs	**24m:** Medium to coarse SAND, trace of silt, greenish grey. Loose, saturated, trace 2mm-5mm diameter clasts of siltstone, moderately closely spaced, ~10mm - 100mm bands of loose to medium dense SAND. Sand is sub-angular to rounded quartz (60%) greenish grey weak mudstone (30%) and dark grey to black moderately strong siltstone clasts (10%).	SP	24m: SPT 1,0// 0,0,0,0 N = 0					**24m: KAAWA** 24m: SPT value lower than anticipated, could be affected by drilling water pressure. 24.45m: 100% water loss.	
HQ													

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
No discontinuity data available.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
17/04/2023 5:10:00 PM | 15.00m | 2.88 m
18/04/2023 8:00:00 AM | 15.00m | 1.7 m
18/04/2023 4:10:00 PM | 25.50m | 1.9 m
19/04/2023 8:50:00 AM | 25.50m | 2.2 m
19/04/2023 4:45:00 PM | 32.00m | 2.48 m
20/04/2023 7:45:00 AM | 32.00m | 2.26 m
20/04/2023 2:00:00 PM | 40.00m | 1.4 m
21/04/2023 10:45:00 AM | 40.00m | 1.92 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Moyle Park, Bader Drive**
Project Reference: **Stage 1 Ground Investigation**

BH1411

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Beretta T46 Drill Rig
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1759741.27m
Northing: 5907784.88m
Reduced level: 5.26m

Date started: 17/04/2023
Date completed: 20/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: JH
Input by: JH
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ	-20			KWs	**24m:** Medium to coarse SAND, trace of silt, greenish grey. Loose, saturated, trace 2mm-5mm diameter clasts of siltstone, moderately closely spaced, ~10mm - 100mm bands of loose to medium dense SAND. Sand is sub-angular to rounded quartz (60%) greenish grey weak mudstone (30%) and dark grey to black moderately strong siltstone clasts (10%).	SP							
SPT					**25.4m to 25.435m:**.....35mm thick band of weakly cemented SAND.		25.5m: SPT 1,0// 0,0,2,4 N = 6						
					25.5m: CORE LOSS								
HQ	-21	26			**25.65m:** Medium to coarse SAND, trace of silt, greenish grey. Loose, saturated, trace 2mm-5mm diameter clasts of siltstone, moderately closely spaced, ~10mm - 100mm bands of loose to medium dense SAND. Sand is quartz (60%) greenish grey weak mudstone (30%) and dark grey to black moderately strong siltstone clasts (10%).								
					26.3m to 26.35m:.....50mm thick band of weakly cemented, greenish grey, silty SAND.								
SPT	-22	27				SP	27m: SPT 6,9// 12,13,14,14 for 35mm N = 50+						
HQ	-23	28		KWs	**28.3m to 28.5m:**.....Dark greenish grey, fine to coarse.								
SPT		29			**28.5m:** Fine to coarse, cemented SAND, trace of silt, dark greenish grey. Dense, saturated, moderately closely spaced, ~10mm - 100mm bands of medium dense sand. Sand is sub-angular to rounded quartz (60%) greenish grey weak mudstone (30%) and dark grey to black moderately strong siltstone clasts (10%).		28.5m: SPT 5,12// 13,14,14,9 for 45mm N = 50+						
HQ	-24					SW							
		30											

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
No discontinuity data available.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
17/04/2023 5:10:00 PM | 15.00m | 2.88 m
18/04/2023 8:00:00 AM | 15.00m | 1.7 m
18/04/2023 4:10:00 PM | 25.50m | 1.9 m
19/04/2023 8:50:00 AM | 25.50m | 2.2 m
19/04/2023 4:45:00 PM | 32.00m | 2.48 m
20/04/2023 7:45:00 AM | 32.00m | 2.26 m
20/04/2023 2:00:00 PM | 40.00m | 1.4 m
21/04/2023 10:45:00 AM | 40.00m | 1.92 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Moyle Park, Bader Drive**
Project Reference: **Stage 1 Ground Investigation**

BH1411

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Beretta T46 Drill Rig
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1759741.27m
Northing: 5907784.88m
Reduced level: 5.26m

Date started: 17/04/2023
Date completed: 20/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: JH
Input by: JH
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS, WS, MWS, CS, VCS, ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPT	-25												
HQ		31		KWs	**28.5m:** Fine to coarse, cemented SAND, trace of silt, dark greenish grey. Dense, saturated, moderately closely spaced, ~10mm - 100mm bands of medium dense sand. Sand is sub-angular to rounded quartz (60%) greenish grey weak mudstone (30%) and dark grey to black moderately strong siltstone clasts (10%).	SW	30m: SPT 5,6// 6,6,8,8 N = 28						
	-26												
SPT							31.5m: SPT 3,4// 5,8,11 N = 32						
HQ	-27	32			**31.95m:** CORE LOSS								
SPT	-28	33		KWs	**32.85m:** Fine to medium, SAND, dark greenish grey. Loose, saturated, widely spaced lenses of medium dense sand. Sand is sub-angular to rounded quartz (60%) greenish grey weak mudstone (30%) and dark grey to black moderately strong siltstone clasts (10%).	SP	33m: SPT 3,4// 5,5,4,3 N = 17						
HQ		34			**33.8m:** CORE LOSS								
	-29												
SPT		35		KWs	**34.05m:** Fine to medium, SAND, dark greenish grey. Loose, saturated, widely spaced lenses of medium dense sand. Sand is sub-angular to rounded quartz (60%) greenish grey weak mudstone (30%) and dark grey to black moderately strong siltstone clasts (10%). **34.1m to 34.95m:**.....Sand is fine to coarse, loose, highy disturbed by drilling.	SP	34.5m: SPT 0,0// 0,0,0,0 N = 0						
					34.9m to 34.95m:.....50mm lens of sand with frequent								

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
No discontinuity data available.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
17/04/2023 5:10:00 PM | 15.00m | 2.88 m
18/04/2023 8:00:00 AM | 15.00m | 1.7 m
18/04/2023 4:10:00 PM | 25.50m | 1.9 m
19/04/2023 8:50:00 AM | 25.50m | 2.2 m
19/04/2023 4:45:00 PM | 32.00m | 2.48 m
20/04/2023 7:45:00 AM | 32.00m | 2.26 m
20/04/2023 2:00:00 PM | 40.00m | 1.4 m
21/04/2023 10:45:00 AM | 40.00m | 1.92 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Moyle Park, Bader Drive**
Project Reference: **Stage 1 Ground Investigation**

BH1411

Sheet **8** of **8**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Beretta T46 Drill Rig
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1759741.27m
Northing: 5907784.88m
Reduced level: 5.26m

Date started: 17/04/2023
Date completed: 20/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: JH
Input by: JH
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ	-30				crushed shell **34.95m:** CORE LOSS								
SPT	-31	36			**35.75m:** Fine to medium, SAND, dark greenish grey. Loose, saturated. Sand is sub-angular to rounded quartz (85%) greenish grey weak mudstone (10%) and dark grey to black moderately strong mudstone clasts (5%). **35.8m to 36.8m:**.....Frequent fine to coarse sand sized shell fragments, trace larger fragments of ~12mm diameter.	SP	36m: SPT 12,14// 19,20 for 25mm N = 50+						
HQ	-32	37		KWs	**36.8m:** Fine to coarse, sandy, BIOCLASTIC GRAVEL, light grey and green. Very dense, saturated; sand, fine. Coarse sand and gravel is angular shell fragments (95%) and sub rounded clasts of unweathered, strong, dark grey siltstone (5%).		37.5m: SPT 26,24 for 130mm// N = 50+						
SPT	-33	38				GP							
HQ		39					39m: SPT 11,13// 17,18,15 for 45mm N = 50+						
SPT	-34				**39.1m:** Fine to coarse SAND, trace of silt, dark greenish grey. Very dense, saturated. Sand is sub-angular to rounded quartz (60%) greenish grey weak mudstone (30%) and dark grey to black moderately strong siltstone clasts (10%). End of borehole at 39.35m (Terminated Deeper due to unfavourable ground conditions)	SP							

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
No discontinuity data available.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
17/04/2023 5:10:00 PM | 15.00m | 2.88 m
18/04/2023 8:00:00 AM | 15.00m | 1.7 m
18/04/2023 4:10:00 PM | 25.50m | 1.9 m
19/04/2023 8:50:00 AM | 25.50m | 2.2 m
19/04/2023 4:45:00 PM | 32.00m | 2.48 m
20/04/2023 7:45:00 AM | 32.00m | 2.26 m
20/04/2023 2:00:00 PM | 40.00m | 1.4 m
21/04/2023 10:45:00 AM | 40.00m | 1.92 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **88 Bader Drive Verge, Mangere**
Project Reference: **Stage 1 Ground Investigation**

BH1501

Sheet **1** of **7**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Truck Mounted Drilling Rig
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1759975.42m
Northing: 5907298.61m
Reduced level: 12.15m

Date started: 20/04/2023
Date completed: 27/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR
Input by: CR
Checked by: SBN
Reviewed by: SBN

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	12	1			**0m:** HYDROVAC - No recovery.			0				**0m: FILL**	
	11												
	10	2											
	9	3											
HQ3	8	4		FUc	**3.5m:** Silty CLAY, minor fine to medium gravel; light brown. Soft, moist, moderately plastic. Gravel is sub-angular sandstone.	CL-ML		75					
					3.6m: CLAY, some silt, minor fine gravel; grey mottled orange. Soft, moist, highly plastic. Gravel is sub-rounded siltstone.	CL							
					3.75m:...Orange. Trace cemented nodules 0.5-3mm.								
				AYo	**3.9m:** Organic SILT, some clay, trace micaceous sand; dark brown. Soft, moist, highly plastic.	MH						**3.9m: ALLUVIUM**	
					4.25m: CORE LOSS							4.25m to 4.5m: Core dropped, couldn't be picked up, potentially recovered in SPT.	
SPT		5		AYo	**4.5m:** Organic SILT, some clay, trace micaceous sand; dark brown. Soft, moist, highly plastic.	MH	4.5m: SPT 1,0// 1,0,2,1 N = 4	100					
				AYz	**4.6m:** SILT, minor fine sand, light brown orange mottled. Soft, moist, highly plastic.	MH							
						SM		100					

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
SPT's are commonly disturbed due to injection of water in to the SPT test zone causing blowout of the test section. Reported SPT results may be different than in situ conditions.
Discontinuities removed by reviewer.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
20/04/2023 4:50:00 PM | 13.95m | 3.7 m
21/04/2023 8:21:00 AM | 13.95m | 3.4 m
21/04/2023 2:25:00 PM | 25.50m | 2 m
26/04/2023 10:22:00 AM | 25.50m | 5.2 m
26/04/2023 4:49:00 PM | 33.24m | 2.6 m
27/04/2023 9:16:00 AM | 33.24m | 3.25 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **88 Bader Drive Verge, Mangere**
Project Reference: **Stage 1 Ground Investigation**

BH1501

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Truck Mounted Drilling Rig
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1759975.42m
Northing: 5907298.61m
Reduced level: 12.15m

Date started: 20/04/2023
Date completed: 27/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR
Input by: CR
Checked by: SBN
Reviewed by: SBN

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	7	6		AYs	**4.95m:** Silty fine SAND; brownish grey. Very loose, moist, low plasticity (when remoulded). Dilatant, slow. Sand is quartz (90%) and mica (10%). **5.2m:**...Greenish grey. **5.9m:**...Saturated, minor clay.	SM		100					
SPT	6				**6m:** CORE LOSS		6m: SPT 0,0// 1,0,0,1 N = 2	44					
HQ3	5	7		AYs	**6.25m:** Silty fine to medium SAND, trace organic flecks; grey. Very loose, moist, low plasticity (when remoulded). Organics are disseminated, partly decomposed rootlets and wood. Sand is quartz (90%) and mica (10%). **7.3m:**...Very thinly interbedded with very thin sub-horizontal beds of SILT. **7.38m:**...10mm thick bed of black carbonaceous material.	SP-SM	7.5m: SPT 1,0// 0,1,1,2 N = 4	100					
SPT								100					
HQ3	4	8		AYp	**7.9m:** Fibrous PEAT, black. Firm, moist, non-plastic. Pasty texture when remoulded (H5). **7.91m:**...50mm of baked fibrous organic material. **7.95m:**...Soft **8.2m:**...Firm.	PT		100					
		9		AYs	**8.55m:** Silty fine pumiceous SAND, trace clay and organics; greyish brown. Loose, moist, low plasticity (when remoulded). Dilatant, slow. Organics are partially decomposed rootlets and wood fragments. **8.7m:**...Dilatant, wet.	SM							
SPT	3			AYo	**9m:** Organic SILT, trace fine micaceous sand; black. Stiff, moist, moderate plasticity.	OL	9m: SPT 3,6// 5,6,8,9 N = 28	100					
HQ3		10		AYp	**9.55m:** Amorphous PEAT, some silt, minor fine sand, trace clay; black. Stiff, moist (H9). **9.65m:**...Trace clay, sand ceases. **9.9m:**...Clayey.	PT		100					

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
SPT's are commonly disturbed due to injection of water in to the SPT test zone causing blowout of the test section. Reported SPT results may be different than in situ conditions.
Discontinuities removed by reviewer.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
20/04/2023 4:50:00 PM | 13.95m | 3.7 m
21/04/2023 8:21:00 AM | 13.95m | 3.4 m
21/04/2023 2:25:00 PM | 25.50m | 2 m
26/04/2023 10:22:00 AM | 25.50m | 5.2 m
26/04/2023 4:49:00 PM | 33.24m | 2.6 m
27/04/2023 9:16:00 AM | 33.24m | 3.25 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **88 Bader Drive Verge, Mangere**
Project Reference: **Stage 1 Ground Investigation**

BH1501

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Truck Mounted Drilling Rig
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1759975.42m
Northing: 5907298.61m
Reduced level: 12.15m

Date started: 20/04/2023
Date completed: 27/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR
Input by: CR
Checked by: SBN
Reviewed by: SBN

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	2			AYp	**9.55m:** Amorphous PEAT, some silt, minor fine sand, trace clay; black. Stiff, moist (H9).	PT							
					10.15m: CLAY, minor silt, blackish grey. Soft, moist, high plasticity.	CL		100					
SPT					**10.3m:** Silty CLAY, minor organics; greenish grey. Soft, moist, highly plastic. Organics are partly decomposed fibrous rootlets and wood fragments.		10.5m: SPT 0,0// 0,1,1,1 N = 3	100					
HQ3	1	11		AYc	**10.95m:**...Abundant fibrous organic material (wood) up to 20mm diameter. Mica visible.	CL-ML		100					
		12			**12m:**...Minor sand.		12m: SPT 1,0// 2,1,2,1 N = 6	100					
SPT	0				**12.22m:** Silty fine SAND; grey. Medium dense, moist, non-plastic. Dilatant, slow. Sand is quartz (85%), mica (15%).								
HQ3		13			**12.4m to 12.5m:**...Minor fine sub rou ded siltstone g avel.	SM		100					
	-1			AYs	**13.1m:** Fine t medium SAND, some silt; brownish grey. Dense, moist, non-plastic. S nd is quartz (85%) and mica (15%).								
SPT							13.5m: SPT 5,8// 11,12,14,12 N = 49	89					
		14			**13.95m:**...Dilatant, quick.	SW.							
HQ3	-2							95					
		15		AYz	**14.8m:** SILT, some fine sand; grey. Dense, wet, low plasticity (when remoulded). Dilatant, quick.	ML						14.8m to 15.45m: Possible disturbance due to high water pressures at drill bit.	

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
SPT's are commonly disturbed due to injection of water in to the SPT test zone causing blowout of the test section. Reported SPT results may be different than in situ conditions.
Discontinuities removed by reviewer.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
20/04/2023 4:50:00 PM | 13.95m | 3.7 m
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21/04/2023 2:25:00 PM | 25.50m | 2 m
26/04/2023 10:22:00 AM | 25.50m | 5.2 m
26/04/2023 4:49:00 PM | 33.24m | 2.6 m
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Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **88 Bader Drive Verge, Mangere**
Project Reference: **Stage 1 Ground Investigation**

BH1501

Sheet **4** of **7**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Truck Mounted Drilling Rig
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1759975.42m
Northing: 5907298.61m
Reduced level: 12.15m

Date started: 20/04/2023
Date completed: 27/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR
Input by: CR
Checked by: SBN
Reviewed by: SBN

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS, WS, MWS, CS, VCS, ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPT	-3				**15m:** Silty SAND, grey. Loose, moist, low plasticity. Mica present, fine to medium sand grainsize.	SW-SM	15m: SPT 1,0// 1,2,1,2 N = 6	100					
HQ3	-4	16			**15.45m:** Silty fine to medium SAND. Dense, moist, non-plastic.			100					
					16.2m:...Trace decomposed organic flecks.								
SPT							16.5m: SPT 3,7// 8,12,14,14 N = 48	89					
HQ3	-5	17		AYs		SW.		100					
SPT	-6	18					18m: SPT 4,4// 3,3,3,4 N = 13	100				18m to 18.45m: SPT possibly in disturbed material caused by blow out of SPT test zone due to high water pressures.	
HQ3	-7	19			**18.6m:** Fine to medium SAND, minor silt; grey. Dense, moist, non-plastic.	SW.		100					
SPT		20		AYz	**19.5m:** SILT, some clay, minor fine sand; dark grey. Firm, moist, highly plastic.	MH	19.5m: SPT 6,0// N = 50+	100				19.5m to 19.95m: SPT highly disturbed, reported results may be different to in situ conditions.	
								100					

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
SPT's are commonly disturbed due to injection of water in to the SPT test zone causing blowout of the test section. Reported SPT results may be different than in situ conditions.
Discontinuities removed by reviewer.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
20/04/2023 4:50:00 PM | 13.95m | 3.7 m
21/04/2023 8:21:00 AM | 13.95m | 3.4 m
21/04/2023 2:25:00 PM | 25.50m | 2 m
26/04/2023 10:22:00 AM | 25.50m | 5.2 m
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Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **88 Bader Drive Verge, Mangere**
Project Reference: **Stage 1 Ground Investigation**

BH1501

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Truck Mounted Drilling Rig
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1759975.42m
Northing: 5907298.61m
Reduced level: 12.15m

Date started: 20/04/2023
Date completed: 27/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR
Input by: CR
Checked by: SBN
Reviewed by: SBN

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	-8	21		AYz	**19.5m:** SILT, some clay, minor fine sand; dark grey. Firm, moist, highly plastic.	MH		100					
SPT	-9						21m: SPT 1,1// 2,1,2,2 N = 7	100				21m to 21.45m: SPT possibly in disturbed material caused by blow out of SPT test zone due to high water pressures.	
HQ3		22		AYz	**21.45m:** CORE LOSS **21.6m:** SILT, some clay, minor fine sand; dark grey. Firm, moist, highly plastic. **21.61m:**...Clayey.	MH		86					
SPT	-10						22.5m: SPT 2,2// 7,10,10,12 N = 39	100					
HQ3	-11	23		AYz	**22.95m:** CORE LOSS **23.1m:** SILT, some clay, minor fine sand; dark grey. Firm, moist, highly plastic. **23.15m:**...150mm bed of fine to medium SAND. **23.65m:**...Disseminated decomposed organic flecks.	MH		86					
SPT	-12	24					24m: SPT 2,1// 2,2,3,2 N = 9	100					
HQ3				AYp	**24.45m:** Firm to plastic PEAT; blackish brown. Firm, moist, non-plastic. On reworking becomes pasty in texture (H6).	PT		100					
		25		AYc		CL-ML							

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
SPT's are commonly disturbed due to injection of water in to the SPT test zone causing blowout of the test section. Reported SPT results may be different than in situ conditions.
Discontinuities removed by reviewer.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
20/04/2023 4:50:00 PM | 13.95m | 3.7 m
21/04/2023 8:21:00 AM | 13.95m | 3.4 m
21/04/2023 2:25:00 PM | 25.50m | 2 m
26/04/2023 10:22:00 AM | 25.50m | 5.2 m
26/04/2023 4:49:00 PM | 33.24m | 2.6 m
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Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **88 Bader Drive Verge, Mangere**
Project Reference: **Stage 1 Ground Investigation**

BH1501

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Truck Mounted Drilling Rig
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1759975.42m
Northing: 5907298.61m
Reduced level: 12.15m

Date started: 20/04/2023
Date completed: 27/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR
Input by: CR
Checked by: SBN
Reviewed by: SBN

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ3	-13			AYc	**24.9m:** Silty CLAY, minor amorphous organics; greyish brown. Stiff, moist, highly plastic. **25.3m:**...Light brown.	CL-ML		100					
SPT		26		AYs	**25.5m:** Fine to medium SAND, some silt, trace disseminated amorphous organics; grey. Dense, moist, non-plastic. Indistinctly bedded with clayey silt laminae, dip 12-22°. Dilatant, quick. Sand is quartz (75%) and mica (25%).		25.5m: SPT 6,4// 5,9,11,14 N = 39	100				
HQ3	-14							100					
		27					27m: SPT 3,5// 10,12,14,14 for 55mm N = 50+	81					
SPT	-15												
HQ3		28				SW.		98				28.5m: Depths corrected and differ to depths in original core photographs.	
	-16												
SPT							28.5m: SPT 6,10// 15,15,20 N = 50+	106					
HQ3		29											
	-17							74					
		30											

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
SPT's are commonly disturbed due to injection of water in to the SPT test zone causing blowout of the test section. Reported SPT results may be different than in situ conditions.
Discontinuities removed by reviewer.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
20/04/2023 4:50:00 PM | 13.95m | 3.7 m
21/04/2023 8:21:00 AM | 13.95m | 3.4 m
21/04/2023 2:25:00 PM | 25.50m | 2 m
26/04/2023 10:22:00 AM | 25.50m | 5.2 m
26/04/2023 4:49:00 PM | 33.24m | 2.6 m
27/04/2023 9:16:00 AM | 33.24m | 3.25 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **88 Bader Drive Verge, Mangere**
Project Reference: **Stage 1 Ground Investigation**

BH1501

Sheet **7** of **7**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Truck Mounted Drilling Rig
Contractor: Drill Force NZ Ltd

CO-ORDINATES: NZTM 2000
Easting: 1759975.42m
Northing: 5907298.61m
Reduced level: 12.15m

Date started: 20/04/2023
Date completed: 27/04/2023
Inclination: -90°
Azimuth: 0°

Logged by: CR
Input by: CR
Checked by: SBN
Reviewed by: SBN

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
SPT	-18			AYs	**25.5m:** Fine to medium SAND, some silt, trace disseminated amorphous organics; grey. Dense, moist, non-plastic. Indistinctly bedded with clayey silt laminae, dip 12-22°. Dilatant, quick. Sand is quartz (75%) and mica (25%).	SW.	30m: SPT 9,13// 20,21,9 for 25mm N = 50+	100					
HQ3					**30.7m:**...Medium to coarse SAND, minor fine to medium sub-angular siltstone gravel.								
		31		KWs	**30.92m:** Silty SAND with trace gravel, greenish grey. Very dense, moist, moderate plasticity. Glaucony, quartz, mafic volcaniclastics. Fine to coarse sand, subrounded to rounded, fine to coarse siltstone gravel.	SW-SM		66				**30.92m: KAAWA**	
	-19				**31.1m:** CORE LOSS							31.1m to 31.5m: Driller noted shelly fragments at bottom of core, potentially washed out shell bed.	
SPT					**31.5m:** Fine to coarse glauconitic SAND, minor silt; greenish grey. Very dense, moist, non-plastic. Sand is sub-rounded quartz (80%) and mafic volcanic lithics (20%).		31.5m: S T 8,15/ 24,26 for 55mm N = 50+	100					
HQ3		32		KWs	**32.14m:**...dilatant.	SW-SM		76					
	-20			KUs	**32.5m:**...recovered as subangular o subrounded moderately cemented sandstone gravel, fine to coarse gravel grainsize.	SW						32.5m to 32.55m: DB recovered as medium subrounded sandstone gravel.	
					32.55m: Slightly weathered dark green-g ey SANDSTONE. Very weak, moderately cemented, shell fragments present. **32.71m:** CORE LOSS								
SPT		33			**33m:** Medium to coarse SAND; greenish grey. Very dense, weakly cem nted. **33.03m:**...poorly cemented.		33m: SPT 12,30// 43,7 for 15mm N = 50+	100					
	-21				**33.24m:**...Poorly g aded.	SP							
HQ3				KWs	**33.5m:**...f ne to coarse sand , moderately graded, >30% coarse.								
		34			**33.75m:** Fine to coarse BIOCLASTIC GRAVEL, some medium to coarse sand; greenish grey. Very dense, weakly cemented. Gravel are angular to sub-angular shell fragments and bivalve molluscs. **33.81m:**...green, shell bed. **33.95m:**...trace shells. **34.05m:**...abundant shells, intact bivalve molluscs up to 30mm diameter. **34.2m:**...weak black inclusions. **34.32m:**...poorly cemented, trace shells.	GW		100				33.95m to 34.04m: DB recovered as subangular fine to medium sand and fine gravel of green sandstone.	
	-22				**34.4m:** Moderately weathered, dark greenish grey fine to medium SANDSTONE, extremely weak. (Very dense fine to medium SAND).	MW							
SPT				EUs	**34.5m:** Slightly weathered dark green SANDSTONE. Very weak, poorly cemented, shells present. **34.53m:**...fine to medium sand, green; silty.	SW	34.5m: SPT 10,14// 18,22,10 for 25mm N = 50+	100				**34.5m: ECBF**	
					End of borehole at 34.82m (Termination Depth Achieved)								

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
SPT's are commonly disturbed due to injection of water in to the SPT test zone causing blowout of the test section. Reported SPT results may be different than in situ conditions.
Discontinuities removed by reviewer.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
20/04/2023 4:50:00 PM | 13.95m | 3.7 m
21/04/2023 8:21:00 AM | 13.95m | 3.4 m
21/04/2023 2:25:00 PM | 25.50m | 2 m
26/04/2023 10:22:00 AM | 25.50m | 5.2 m
26/04/2023 4:49:00 PM | 33.24m | 2.6 m
27/04/2023 9:16:00 AM | 33.24m | 3.25 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

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Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Westney Rd**
Project Reference: **Stage 1 Ground Investigation**

BH1503

Sheet **1** of **9**

BOREHOLE INFORMATION
Method: RotarwCore Wire5ne
Ekuipment: Canter Rig qq
Contractor: Dri55Force N° Ltd

CO-ORDINATES: NZTM 2000
Easting: 17z8q31.04m
Northing: zq0z182.00m
Reduced 5eve5 1z.zzm

Date started: 7/02/2023
Date comp5eted: 20/02/2023
Inc5ination: -q0;
A9imuth: 0;

Logged bw BGW/DB
Input bw BGW/DB
Checl ed bw SBN
Revie| ed bw PK

Method	R.L.)m%	Length)m%	Graphic Log	Lawer Code	Materia5Description	Weathering/USC	Testing	TCR)X %	SCR)X %	RQD)X %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphw Defect Description Additiona5Notes	Instas5ation
VACE<				P	**0m:** ASPHALT.							**0m: FILL**	
	1z			FUg	**0.08m:** Grave5wfine to coarse SAND	ith minor si5(orange grew Tight5wpacl ed, drw Grave5, fine to coarse.	SP						
					0.45m: Fine to coarse SAND(orange bro| n. Loose5w pacl ed, drw		SW.	0					
					0.8m: Si5wfine to coarse SAND | ith some grave5(orange bro| n. Tight5wpacl ed, drw Grave5, fine to medium.		SM						
	1			FUc	**0.9m:** SILT | ith some c5awand trace sand(5ght orange bro| n. Stiff, moist, 5o| p5asticitw								
SPT	14						ML	1.zm: SPT 0,1// 1,1,1,3 N = 6	67					
HQ3		2											
	13				**2.3m:** C5awSILT | ith minor sand(5ght orange bro| n, banded darl bro| n. Verwstiff, moist moderate p5asticitw		MH						
					2.64m: CORE LOSS								
SPT		3						3m: SPT 0,1// 2,2,1,3 N = 8	0				
HQ3	12			AYc	**3.45m:** SandwCLAY | ith some si5(we5o| ish bro| n, mott5ed 5ght bro| n. Stiff, moist, high p5asticitw Sand, fine to medium.		CH					**3.45m: ALLUVIUM**	
				AY9	**3.6m:** C5awSILT | ith some sand(5ght we5o| ish bro| n. Stiff, moist, high p5asticitw		MH						
		4			**3.75m:** Organic SILT | ith some sand and minor c5aw(bro| n. Stiff, moist, 5o| p5asticitw Organics, fibrous root5ets.		OH						
					3.95m: Organic sandwCLAY | ith some si5(darl bro| n. Stiff, moist, high p5asticitw Organics, decomposed | ood fragments.		OH	100					
Uz4	11			AYo	**4.35m:** Organic CLAY | ith some si5(darl b5acl ish bro| n. Soft, moist, high p5asticitw Organics, decomposed | ood fragments.		OH	100					
	z												

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Bacl fi55information not provided, assumed grout bacl fi55bet\| een vibrating \| ire pie9ometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
10/02/203 q:1z:00 AM y1z.00m y6.8 m
1z/02/203 4:30:00 PM y30.00m y7.6 m
16/02/203 4:30:00 PM y34.z0m y3.4 m
16/02/203 7:30:00 AM y30.00m yq.8 m
17/02/203 8:00:00 AM y34.z0m y7.8 m
20/02/203 q:00:00 AM y42.00m y12.36 m

Box 1

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C5ent: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Westney Rd**
Project Reference: **Stage 1 Ground Investigation**

BH1503

Sheet **2** of **9**

BOREHOLE INFORMATION
Method: RotarwCore Wire5ne
Ekuipment: Canter Rig qq
Contractor: Dri55Force N° Ltd

CO-ORDINATES: NZTM 2000
Easting: 17z8q31.04m
Northing: zq0z182.00m
Reduced 5eve5 1z.zzm

Date started: 7/02/2023
Date comp5eted: 20/02/2023
Inc5nation: -q0;
A9imuth: 0;

Logged bw BGW/DB
Input bw BGW/DB
Checl ed bw SBN
Revie| ed bw PK

Method	R.L.)m%	Length)m%	Graphic Log	Lawer Code	Materia5Description	Weathering/USC	Testing	TCR)X %	SCR)X %	RQD)X %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphw Defect Description Additiona5Notes	Instas5ation
SPT					**5m:** NO RECOVERY		zm: SPT 0,0// 0,0,0,0 N = 0	0					
HQ3	10	6		AYs	**5.45m:** Fine to medium SAND	ith minor si5, organics and trace c5aw(grewish green mott5ed green. Verw5ose,	et. Organics, decomposed root5ets.	SP		100			
SPT					**6.35m to 6.85m:**...Grew		6m: SPT 0,0// 1,0,0,0 N = 1		100				
HQ3	q	7			**6.85m:** Si5wfine to medium SAND	ith trace organics(grew Verw5ose,	et. Organics,	ood fragments.	SM		100		
SPT	8				**7.5m to 7.75m:**...Loose		7.zm: SPT 0,0// 0,0,3,3 N = 6		100				
				AY9	**7.75m:** SandwSILT	ith minor organics and trace c5aw(grew mott5ed bro	n. Verwsoft, moist, non-p5astic. Organics,	ood fragments.	ML				
	8			AYs					SP				
HQ3					**7.88m:** Medium to coarse SAND	ith minor si5 and trace organics(bro	n. Verw5oose	et. Organics, decomposed	ood fragments. Sand, pumice us.	PT	100		
					7.99m: Amorphous PEAT	th some si5, trace sand and c5aw Firm, moist.)Hq%							
SPT	7	q		AYp	**8.4m:** Fibrous PEAT(darl b5acl ish bro	n. Firm to stiff, moist, non p5astic. On re	orl ing becomes pastwin texture)Hz%	PT		100			
							qm: SPT 1,0// 1,2,2,2 N = 7						
HQ3	6				**9.45m:** Firm to p5astic PEAT(darl b5acl ish bro	n. Firm, moist, non-p5astic.)Hz-H6%		PT		100			
		10						PT		q0			

REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Bacl fi55information not provided, assumed grout bacl fi55bet| een vibrating | ire pie9ometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
10/02/203 q:1z:00 AM y1z.00m y6.8 m
1z/02/203 4:30:00 PM y30.00m y7.6 m
16/02/203 4:30:00 PM y34.z0m y3.4 m
16/02/203 7:30:00 AM y30.00m yq.8 m
17/02/203 8:00:00 AM y34.z0m y7.8 m
20/02/203 q:00:00 AM y42.00m y12.36 m

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Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Westney Rd**
Project Reference: **Stage 1 Ground Investigation**

BH1503

Sheet **3** of **9**

BOREHOLE INFORMATION
Method: RotarwCore Wire5ne
Ekuipment: Canter Rig qq
Contractor: Dri55Force N° Ltd

CO-ORDINATES: NZTM 2000
Easting: 17z8q31.04m
Northing: zq0z182.00m
Reduced 5eve5 1z.zzm

Date started: 7/02/2023
Date comp5eted: 20/02/2023
Inc5nation: -q0;
A9imuth: 0;

Logged bw BGW/DB
Input bw BGW/DB
Checl ed bw SBN
Revie| ed bw PK

Method	R.L.)m%	Length)m%	Graphic Log	Lawer Code	Materia5Description	Weathering/USC	Testing	TCR)X %	SCR)X %	RQD)X %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphw Defect Description Additiona5Notes	Insta55ation
HQ3				AYp	**9.9m:** Fibrous PEAT(darl b5acl ish bro| n. Firm to stiff, moist, non-p5astic. On re| orl ing becomes pastwin texture)Hz%	PT		q0					
				AY9	**10.35m:** C5awewSILT | ith some organics and trace sand(greenish grew Firm, moist, high p5asticitw Organics, decomposing 5eaves and t| igs.	MH							
Uz4	z	11			**10.5m:** PUSH TUBE YET TO BE E<TRACTED			100					
SPT				AY9	**11m:** SandwSILT | ith minor organics and c5aw(grewish green. Verwsoft, moist, 5| p5asticitw Organics, fibrous roots. Bedding, 5aminated to verwthin.	MI-SP	11m: SPT 0,0// 0,0,0,0 N = 0	62					
					11.28m: CORE LOSS								
HQ3	4	12		AYc	**11.45m:** Si5wCLAY | ith trace organics(bro| n. Verwsoft, moist, high p5asticitw Organics, | ood fragments.	CH		100					
				AYs	**11.55m:** Si5wfine to medium SAND | ith trace organics(grew Verw5ose, | et. Organics, decomposing fibrous root5ets and | ood fragments.								
SPT					**12.07m to 12.12m:**...Organic si5wsand.	SM	2m: SPT 0,2// 2,2,1,3 N = 8	78					
HQ3	3	13			**12.5m to 12.55m:**...Organic si5wsand. **12.55m to 13.2m:**...Saturated. Quicl / Di5atant.			71					
					13.2m: CORE LOSS								
SPT	2	14			**13.5m:** S 5wfine to medium SAND | ith trace organics(grew Verw5ose, | et. Organics, decomposing fibrous root5ets and | ood fragments.		13.zm: SPT 0,1// 1,2,3,4 N = 10	8q					
					13.95m to 14.4m:...S5| / Di5atant.	SM							
HQ3	1	1z		AY9	**14.75m:** SILT | ith some c5aw, trace sand and organics(grewish green. Stiff, moist, high p5asticitw Organics, fibrous roots.	MH		100					

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Bacl fi55information not provided, assumed grout bacl fi55bet\| een vibrating \| ire pie9ometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
10/02/203 q:1z:00 AM y1z.00m y6.8 m
1z/02/203 4:30:00 PM y30.00m y7.6 m
16/02/203 4:30:00 PM y34.z0m y3.4 m
16/02/203 7:30:00 AM y30.00m yq.8 m
17/02/203 8:00:00 AM y34.z0m y7.8 m
20/02/203 q:00:00 AM y42.00m y12.36 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

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C5ent: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Westney Rd**
Project Reference: **Stage 1 Ground Investigation**

BH1503

Sheet **4** of **9**

BOREHOLE INFORMATION
Method: RotarwCore Wire5ne
Ekuipment: Canter Rig qq
Contractor: Dri55Force N° Ltd

CO-ORDINATES: NZTM 2000
Easting: 17z8q31.04m
Northing: zq0z182.00m
Reduced 5eve5 1z.zzm

Date started: 7/02/2023
Date comp5eted: 20/02/2023
Inc5nation: -q0;
A9imuth: 0;

Logged bw BGW/DB
Input bw BGW/DB
Checl ed bw SBN
Revie| ed bw PK

Method	R.L.)m%	Length)m%	Graphic Log	Lawer Code	Materia5Description	Weathering/USC	Testing	TCR)X %	SCR)X %	RQD)X %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphw Defect Description Additiona5Notes	Instas5ation
SPT				AY9	**15.15m:** SandwSILT	ith some c5awand minor organics(grewish green. Verwstiff, moist, 5o| p5asticitw Organics, fibrous roots. Bedding, 5aminated to verwthin.	MH MI-SP	1zm: SPT 0,2// 3,3,z,4 N = 1z	4q					
					15.28m: NO RECOVERY								
HQ3	0	16		AYs	**15.45m:** Fine SAND | ith trace si5 and organics(grew Medium dense, moist. Organics, decomposing fibrous | ood fragments.	SP							
					15.75m: CORE LOSS			2q					
SPT	-1				**16.5m:** Fine SAND | ith trace si5 and organics(grew Verw dense, moist. Organics, decomposing fibrous | ood fragments.		16 zm: S T q// 1 14,16,8 for 3zmm N = z0Z	100					
HQ3	-2	17		AYS		SP		87					
					17.61m: Fine to medium SAND | ith some si5 and trace organics(grew Verwdense, | et. Di5tant	SP							
		18			**17.86m:** CORE LOSS								
SPT	-3			AYs	**18m:** Fine SAND | ith trace si5 and organics(grew Verw dense, moist. Organics, decomposi g fibrous | ood fragments.	SP	18m: SPT 2,7// q,11,12,16 N = 48	8q					
					18.5m: S 5wfine to medium SAND | ith trace organics(greenish gr w Verwdense, | et. Organics, decomposing | ood fragments.	SM							
HQ3		1q			**18.8m:** CORE LOSS			33					
SPT	-4			AYs	**19.5m:** Fine to medium SAND | ith some si5(grew Verw dense, saturated. Quicl /Di5tant.	SP	1q.zm: SPT 2,10// 17,21,12 for z0mm N = z0Z	100					
HQ3		20						z2					

Box 4
Box z

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Bacl fi55information not provided, assumed grout bacl fi55bet| een vibrating | ire pie9ometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
10/02/203 q:1z:00 AM y1z.00m y6.8 m
1z/02/203 4:30:00 PM y30.00m y7.6 m
16/02/203 4:30:00 PM y34.z0m y3.4 m
16/02/203 7:30:00 AM y30.00m yq.8 m
17/02/203 8:00:00 AM y34.z0m y7.8 m
20/02/203 q:00:00 AM y42.00m y12.36 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

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C5ent: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Westney Rd**
Project Reference: **Stage 1 Ground Investigation**

BH1503

Sheet **5** of **9**

BOREHOLE INFORMATION
Method: RotarwCore Wire5ne
Ekuipment: Canter Rig qq
Contractor: Dri5Force N° Ltd

CO-ORDINATES: NZTM 2000
Easting: 17z8q31.04m
Northing: zq0z182.00m
Reduced 5eve5 1z.zzm

Date started: 7/02/2023
Date comp5eted: 20/02/2023
Inc5nation: -q0;
A9imuth: 0;

Logged bw BGW/DB
Input bw BGW/DB
Checl ed bw SBN
Revie| ed bw PK

Method	R.L.)m%	Length)m%	Graphic Log	Laver Code	Materia5Description	Weathering/USC	Testing	TCR)X %	SCR)X %	RQD)X %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphw Defect Description Additiona5Notes	Instas5ation
HQ3	-z	21		AYs	**19.5m:** Fine to medium SAND	ith some si5(grew Verw dense, saturated. Quicl /Di5atant.	SP						
					20.45m: CORE LOSS			z2					
SPT				AYs	**21m:** Fine to medium SAND	ith trace si5(grew Verw dense, moist.	SP	21m: SPT 2,3// 10,1z,2z for 60mm N = z0Z	100				
HQ3	-6	22			**21.36m:** CORE LOSS			0					
SPT	-7				**22.5m:** Fine to medium SAND	ith trace si5(grew Verw dense,	et.	SP	22.zm: SPT 7,12// 1q,2q,2 for zmm N = z0Z	100			
HQ3	-8	23		AYs					66				
		24						24m: SPT z,10// 18,20,12 for 4zmm N = z0Z	100				
SPT													
HQ3	-q				**24.8m to 25.5m:**	...S5	/ Di5atant		100				
		2z											

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Bacl fi5information not provided, assumed grout bacl fi5bet| een vibrating | ire pie9ometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
10/02/203 q:1z:00 AM y1z.00m y6.8 m
1z/02/203 4:30:00 PM y30.00m y7.6 m
16/02/203 4:30:00 PM y34.z0m y3.4 m
16/02/203 7:30:00 AM y30.00m yq.8 m
17/02/203 8:00:00 AM y34.z0m y7.8 m
20/02/203 q:00:00 AM y42.00m y12.36 m

Box z
Box 6

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

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Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Westney Rd**
Project Reference: **Stage 1 Ground Investigation**

BH1503

Sheet **6** of **9**

BOREHOLE INFORMATION
Method: RotarwCore Wire5ne
Ekuipment: Canter Rig qq
Contractor: Dri5Force N° Ltd

CO-ORDINATES: NZTM 2000
Easting: 17z8q31.04m
Northing: zq0z182.00m
Reduced 5eve5 1z.zzm

Date started: 7/02/2023
Date comp5eted: 20/02/2023
Inc5ination: -q0;
A9imuth: 0;

Logged bw BGW/DB
Input bw BGW/DB
Checl ed bw SBN
Revie| ed bw PK

Method	R.L.)m%	Length)m%	Graphic Log	Lawer Code	Materia5Description	Weathering/USC	Testing	TCR)X %	SCR)X %	RQD)X %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphw Defect Description Additiona5Notes	Instas5ation
HQ3					**22.5m:** Fine to medium SAND	ith trace si5(grew Verw dense,	et.								
SPT	-10							2z.zm: SPT 4,6// 7,10,1z,18 for 4zmm N = z0Z	100					
HQ3		26		AYs			SP		100					
	-11				**26.2m to 27m:**...trace decomposing	ood fragments.			100					
	27			AYo	**26.9m:** Organic si5wSAND(bro	nish grew Loose,	et Sand, fine to medium. Organics, decomposing	ood fragments.	OL					
SPT					**27m:** NO RECOVERY			27m: SPT 2,3// 2,2,2,4 N = 10	0					
	-12				**27.45m:** Si5wfine to medium micaceous SAND(5ght grew Dense,	et.								
HQ3		28		AYs	**27.55m to 27.8m:**...grew									
					27.8m to 28.25m:.. 5ght g ew		SM		76					
					28.25m: CORE LOSS									
SPT	-13				**28.5m:** S 5wfine to medium micaceous SAND(5ght grew Dense,	et.	SM	28.zm: SPT 4,z// z,10,12,23 N = z0	100					
		2q			**28.95m:** CORE LOSS									
HQ3	-14								43					
					29.55m: Fine to medium SAND	ith minor si5(grew Dense,	et.								SP
				AYs	**29.65m:** Si5wfine to medium SAND(grew Dense,	et.									SM
		30													SP

REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Bacl fi5information not provided, assumed grout bacl fi5bet| een vibrating | ire pie9ometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
10/02/203 q:1z:00 AM y1z.00m y6.8 m
1z/02/203 4:30:00 PM y30.00m y7.6 m
16/02/203 4:30:00 PM y34.z0m y3.4 m
16/02/203 7:30:00 AM y30.00m yq.8 m
17/02/203 8:00:00 AM y34.z0m y7.8 m
20/02/203 q:00:00 AM y42.00m y12.36 m

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Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland LIGHT RAIL

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C5ent: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Westney Rd**
Project Reference: **Stage 1 Ground Investigation**

BH1503

Sheet **7** of **9**

BOREHOLE INFORMATION
Method: RotarwCore Wire5ne
Ekuipment: Canter Rig qq
Contractor: Dri55Force N° Ltd

CO-ORDINATES: NZTM 2000
Easting: 17z8q31.04m
Northing: zq0z182.00m
Reduced 5eve5 1z.zzm

Date started: 7/02/2023
Date comp5eted: 20/02/2023
Inc5nation: -q0;
A9imuth: 0;

Logged bw BGW/DB
Input bw BGW/DB
Checl ed bw SBN
Revie| ed bw PK

Method	R.L.)m%	Length)m%	Graphic Log	Lawer Code	Materia5Description	Weathering/USC	Testing	TCR)X %	SCR)X %	RQD)X %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphw Defect Description Additiona5Notes	Instas5ation
SPT					**29.9m:** Fine to medium SAND | ith minor si5(grew Verw dense, saturated. Quicl / Di5atant.	SP	30m: SPT 7,10// 11,11,13,1z N = z0	100					
HQ3	-1z	31		AYs	**30.95m:** CORE LOSS			48					
SPT	-16				**31.5m:** Fine to medium SAND | ith minor si5(grew Verw dense, saturated. Quicl / Di5atant.	SP	31 zm: S T 3,z// z,,0,20,20 for 40mm N = z0Z	100				
HQ3	-17	32		AYs	**31.92m:** Si5wfine to medium SAND(grew Verwdense, saturated. Quicl / Di5atant.	SM		74					
		33			**32.5m:**...Minor fine to medium GRAVEL. Grave5is high5w | eathered si5wmicaceous sandstone, | ith trace pwrite.								
					32.75m: CORE LOSS								
SPT				AYs	**33m:** Fine micaceous SAND | ith minor si5(grew Medium dense, saturated. S5| /Di5atant	SP	33m: SPT 3,4// z,6,z,4 N = 20	100				
HQ3	-18			AY9	**33.38m:** C5awSILT | ith some sand and trace organics(greenish grew Verwstiff, moist, high p5asticitw Organics, decompo ing fibrous. Sand, fine to medium, kuart9, 5thics, +10 X mica	MH		100					
		34		AYs	**33.63m:** Si5wfine SAND | ith trace c5aw(grew Verwdense, moist, non-p5astic.	SM							
SPT	-1q			AY9	**34.45m:** SandwSILT(darl bro| n. Verwdense, moist. Sand is fine, rounded to sub-rounded grew| acl e, kuart9 | ith trace mica.	SP	34.zm: SPT 10,12// 16,16,13,z for 40mm N = z0Z	48					
		3z						100					

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Bacl fi55information not provided, assumed grout bacl fi55bet\| een vibrating \| ire pie9ometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
10/02/203 q:1z:00 AM y1z.00m y6.8 m
1z/02/203 4:30:00 PM y30.00m y7.6 m
16/02/203 4:30:00 PM y34.z0m y3.4 m
16/02/203 7:30:00 AM y30.00m yq.8 m
17/02/203 8:00:00 AM y34.z0m y7.8 m
20/02/203 q:00:00 AM y42.00m y12.36 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

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C5ent: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Westney Rd**
Project Reference: **Stage 1 Ground Investigation**

BH1503

Sheet **8** of **9**

BOREHOLE INFORMATION
Method: RotarwCore Wire5ne
Ekuipment: Canter Rig qq
Contractor: Dri55Force N° Ltd

CO-ORDINATES: NZTM 2000
Easting: 17z8q31.04m
Northing: zq0z182.00m
Reduced 5eve5 1z.zzm

Date started: 7/02/2023
Date comp5eted: 20/02/2023
Inc5nation: -q0;
A9imuth: 0;

Logged bw BGW/DB
Input bw BGW/DB
Checl ed bw SBN
Revie| ed bw PK

Method	R.L.)m%	Length)m%	Graphic Log	Lawer Code	Materia5Description	Weathering/USC	Testing	TCR)X %	SCR)X %	RQD)X %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphw Defect Description Additiona5Notes	Instal5ation
HQ3	-20			AY9		SP							
					35.1m: Fine to medium SAND | ith some grave5and she55(grew Verwdense, moist. Grave5 fine to medium, rounded grew | acl e. Some fine to medium, rounded grew | acl e.	SP						**35.1m: KAAWA**	
					35.15m: Fine to medium SAND | ith minor si5(darl grewish green. Verwdense, | et.	SP							
					35.47m: Fine to coarse SAND | ith trace si5(grewish green. Verwdense, moist. Sand, approximate5w60X kuart9 and 40X 5thics. Lithics comprise sub-rounded grew | acl e c5asts)Si55stone%			100					
SPT		36					36m: SPT 13,16// 24,26 for 60mm N = z0Z	8q					
HQ3	-21					SW							
					36.6m:...Fine to medium SAND(greenish grew Predominant5wkuart9 | ith 5thics. Lithics comprise rounded grew | acl e c5asts)si55stone and cherts%	SP							
		37						100					
					37.1m: Fine to coarse SAND | ith some she55fragments and trace si5(darl green, specl 5ed | hitish we55b | . Verwdense, moist. She55fragments + 7mm in si9e. Sand predominant5w kuart9.	SW							
SPT	-22			KWs			37.zm: SPT 10,20// 36,24 for z0mm N = z0Z	100					
HQ3					**37.7m:** Fine to medium SAND | ith mino si5(da l green. Verwdense, moist.	SP							
		38			**37.93m to 37.95m:** Fine sand | ith some fine she55 fragments								
					37.95m: Fine to coarse SAND | ith some she55fragments and trace si5(green, specl 5ed | hitish we55b | . Verwdense, moist, uncemented. Sand composed of approximate5wekua5 amounts of she55, kuart9 and 5thics.	SW							
	-23				**38.25m:** Fine to medium SAND | ith minor si5(greenish grew Verwdense, moist. Sand, predominant5wkuart9 and some 5thics. Lithics comprise subrounded grew | acl e and minor mudstone.	SP		q4					
		3q											
SPT					**39m:** Fine to medium SAND | ith minor si5(greenish grew Verwdense, moist. Sand is subrounded | ith trace pumice.		3qm: SPT z,10// z0 for 70mm N = z0Z	100					
HQ3	-24					SP							
								100				3q.8zm: JT z0; undu5ating, rough	
		40											

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Bacl fi55information not provided, assumed grout bacl fi55bet| een vibrating \| ire pie9ometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
10/02/203 q:1z:00 AM y1z.00m y6.8 m
1z/02/203 4:30:00 PM y30.00m y7.6 m
16/02/203 4:30:00 PM y34.z0m y3.4 m
16/02/203 7:30:00 AM y30.00m yq.8 m
17/02/203 8:00:00 AM y34.z0m y7.8 m
20/02/203 q:00:00 AM y42.00m y12.36 m

Box 8
Box q

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Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Westney Rd**
Project Reference: **Stage 1 Ground Investigation**

BH1503

Sheet **9** of **9**

BOREHOLE INFORMATION
Method: RotarwCore Wire5ne
Ekuipment: Canter Rig qq
Contractor: Dri5Force N° Ltd

CO-ORDINATES: NZTM 2000
Easting: 17z8q31.04m
Northing: zq0z182.00m
Reduced 5eve5 1z.zzm

Date started: 7/02/2023
Date comp5eted: 20/02/2023
Inc5nation: -q0;
A9imuth: 0;

Logged bw BGW/DB
Input bw BGW/DB
Checl ed bw SBN
Revie| ed bw PK

Method	R.L.)m%	Length)m%	Graphic Log	Lawer Code	Materia5Description	Weathering/USC	Testing	TCR)X %	SCR)X %	RQD)X %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphw Defect Description Additiona5Notes	Instas5ation
HQ3				KWs	**39m:** Fine to medium SAND | ith minor si5(greenish grew Verwdense, moist. Sand is subrounded | ith trace pumice.	SP		100					
SPT	-2z						N = z0Z	100					
		41			**40.66m:** CORE LOSS								
HQ3	-26			KWs	**41.25m:** Fine SAND | ith trace si5(greenish grew Verw dense, moist.	SP		z6					
		42			End of borehos5 at 42m)Termination Depth Achieved%								

Box 10

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Bacl fi5information not provided, assumed grout bacl fi5bet| een vibrating \| ire pie9ometer depths.

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
10/02/203 q:1z:00 AM y1z.00m y6.8 m
1z/02/203 4:30:00 PM y30.00m y7.6 m
16/02/203 4:30:00 PM y34.z0m y3.4 m
16/02/203 7:30:00 AM y30.00m yq.8 m
17/02/203 8:00:00 AM y34.z0m y7.8 m
20/02/203 q:00:00 AM y42.00m y12.36 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **A03uland Light Rail Limited**
Project: **A03uland Light Rail**
Location: **c ingsland Station**
Project Reference: **Stage 1 Gro0nd Investigation**

BH5595

Sheet **1** of **19**

BOREHOLE INFORMATION
Method: Rotar9 Core Wirekine
E| uipment: Massen5a MI4
Contractor: Mcmikkan Drikking

CO-ORDINATES: NkTM 5999
Easting: 17www24.30m
Northing: wz17824.z6m
Reduced kevek 47.46m

Date started: 20/04/2023
Date completed: 28/04/2023
Inckination: -z0°
A5imuth: 0°

Logged b9: WM/ CJ
Input b9: WM
Checqed b9: SBN
Reviey ed b9: PK

Method	R.L.)m%	Length)m%	Graphic Log	La9er Code	MateriakDescription	Weathering/USC	Testing	TCR)x %	SCR)x %	RQD)x %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraph9 Defect Description AdditionakNotes	Instakkation
VACE+	47	1			**9m:** HYDROVAC - No recover9							**9m: FILL**	
PQ3	46	2		FEc	**1Z2m:** Cka9e9 SILT, some gravek, darq broy n. Ver9 soft, moist, highk9 plastic y hen remoukded. Gravekis fine to coarse, sub-angukar, matri(-supported basakt.	MH		100					
PQ3	4w	3		VUb	**5Z m:** Slightk9 y eathered, darq gre9, moderatek9 vesicukar indistinctk9 floy -banded porph9rit c BASALT. Moderatek9 Strong. Vesickes are spherickak, w-10mm, dip 1w-20°.	SW		w7	43	w7		**5Z m: A6F** 2.3wm to 2.4wm: JT w0° undukating, rough, coating,)Infikk ckа9 Ver9 soft%Broy n, plastic. Top of intact Basakt	
				VUv	**5Z8m:** CORELOSS.							2.7m to 3m: Interpretted as a void.	
PQ3	44	4		VUb	**. m:** Skighk9 y eathered, darq gre9, moderatek9 vesicukar, indistinctk9 floy -banded po ph9ritic BASALT. Moderatek9 Strong. Vesickes are spherickak, w-10mm. Floy fabric dips 1w-20°.	SW		100	100	100		3m: JT 60° undukating, rough, coating,)Infikk ckа9 2%	
					22Z1m: Skightk9 y eathered, darq gre9, moderatek9 vesicukar, indistinctk9 floy -banded porph9ritic BASALT. Moderatek9 Strong. Vesickes are ekkipsoidak, w(w-20mm, sub-pkanar akkgned. Floy fabric dips 1w-20°.							3.8m: JT 1w° undukating, rough, coating,)Infikk ckа9 2%Parakkekto floy fabric.	
PQ3	43	w			**22Z4m:**...Pkagiockase / Fekdspar phenocr9st infikk10(30mm vesicke.	SW		100	83	100		4.1m: 1w° pkanar, rough, coating 2 (DB, coating infikk)wmm fine sand%Parakkekto floy fabric. 4.1wm: DB 2w° stepped, rough, ckean Broqen along vesicke. 4.3wm: DB 1w° pkanar, rough, ckean Parakkek to floy fabric. 4.4wm: DB 1w° pkanar, rough, ckean Parakkek to floy fabric. 4.wm: DB 1w° pkanar, rough, ckean Broqen along vesicke. 4.7m: DB 1w° pkanar, rough, ckean Broqen along vesicke. 4.7wm: JT 2w° undukating, rough, Xeokite staining 4.8wm: DB 20° pkanar, rough, ckean Broqen	

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REMARKS:
SCR = Circumference, 300mm.
TCR, SCR, and RQD measurements to be revised

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
20/04/2023 3:00:00 PM I 10.w0m I 7.w2 m
21/04/2023 3:00:00 PM I 10.w0m I z.44 m
21/04/2023 3:1ww00 PM I 24.24m I 14.0wm
26/04/2023 12:10:00 PM I 24.24m I 14.0wm
26/04/2023 7:00:00 PM I 33.00m I 13.43 m
27/04/2023 12:1w:00 PM I 33.00m I 14.62 m
27/04/2023 7:20:00 PM I 46.w0m I 11.8z m
28/04/2023 12:00:00 PM I 46.w0m I 13.zwm
28/04/2023 2:30:00 PM I w0.00m I 12.12 m

Auckland

Client: **A03uland Light Rail Limited**
Project: **A03uland Light Rail**
Location: **c ingsland Station**
Project Reference: **Stage 1 Gro0nd Investigation**

BH5595

Sheet **5** of **19**

BOREHOLE INFORMATION
Method: Rotar9 Core Wirekine
E| uipment: Massen5a MI4
Contractor: Mcmikan Drikking

CO-ORDINATES: NkTM 5999
Easting: 17www24.30m
Northing: wz17824.z6m
Reduced kevek 47.46m

Date started: 20/04/2023
Date completed: 28/04/2023
Inckination: -z0°
A5imuth: 0°

Logged b9: WM/ CJ
Input b9: WM
Checqed b9: SBN
Reviey ed b9: PK

Method	R.L.)m%	Length)m%	Graphic Log	La9er Code	MateriakDescription	Weathering/USC	Testing	TCR)x %	SCR)x %	RQD)x %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraph9 Defect Description AdditionakNotes	Instakkation
PQ3	42	6		VUb	**2Z1m:** Skightk9 y eathered, darq gre9, moderatek9 vesicukar, indistinctk9 floy -banded porph9ritic BASALT. Moderatek9 Strong. Vesicles are ekkipsoidak, w (w-20mm, sub-pkanar akigned. Floy fabric dips 1w-20°.	SW		100	83	100		along vesicle. 4.zwm: DB 1w° planar, rough, clean Broqen along vesicle.	
					4Z2m:...Vesicukar floy bands dip 30-3w.								
					4Z7m to 8Z1m:...Highk9 vesicukar. Vesicles ekkipsoidak, 10 (30mm							w.zm: DB 10° planar, rough, clean Broqen along vesicle.	
PQ3	41	7										6.2m: DB 10° planar, rough, clean Broqen along vesicle.	
												6.4m: JT w° stepped, rough,)<1mm 5eokite?% Broqen along vesicle	
								100	100	100		6.7m: DB 1w° planar, rough, clean Broqen along vesicle.	
					8Z1m:...Moderatek9 vesicukar. Vesicles sphericakw(wmm.							6.zm: JT 7w° undukating, rough, veneer <1mm 5eokite.	
	40											7.3m: DB 7° undukating, rough, clean Broqen along vesicles	
PQ3	3z	8			**8Z3m:** Skightk9 y eathered, d rq gre9, moderatek9 vesicukar, indistinctk9 floy -banded porph9 itic BASALT. Mode atek9 Strong.	SW		100	100	100		7.8wm: JT 1w° undukating, rough, veneer <1mm 5eokite.	
												8.22m: DB 30° undukating, rough, clean Broqen along vesicles	
												8.7m: DB w° undukating, rough, clean Broqen along vesicles	
	z											8.zm: DB w° stepped, rough, clean Broqen along vesicles	
PQ3	38				**7Z2m:**...Skightk9 vesicukar. Vesicles generak9 < 1mm; vesicles upto 1wmm diameter rare.			100	100	100		z.3m: DB 10° undukating, rough, clean	
		10										z.zm: DB 10° undukating, rough, clean	

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REMARKS:
SCR = Circumference, 300mm.
TCR, SCR, and RQD measurements to be revised

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
20/04/2023 3:00:00 PM I 10.w0m I 7.w2 m
21/04/2023 3:00:00 PM I 10.w0m I z.44 m
21/04/2023 3:1w00 PM I 24.24m I 14.0wm
26/04/2023 12:10:00 PM I 24.24m I 14.0wm
26/04/2023 7:00:00 PM I 33.00m I 13.43 m
27/04/2023 12:1w:00 PM I 33.00m I 14.62 m
27/04/2023 7:20:00 PM I 46.w0m I 11.8z m
28/04/2023 12:00:00 PM I 46.w0m I 13.zwm
28/04/2023 2:30:00 PM I w0.00m I 12.12 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARY.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **A03uland Light Rail Limited**
Project: **A03uland Light Rail**
Location: **c ingsland Station**
Project Reference: **Stage 1 Gro0nd Investigation**

BH5595

Sheet . of **19**

BOREHOLE INFORMATION
Method: Rotar9 Core Wirekine
E| uipment: Massen5a MI4
Contractor: Mcmikkan Drikking

CO-ORDINATES: NkTM 5999
Easting: 17www24.30m
Northing: wz17824.z6m
Reduced kevek 47.46m

Date started: 20/04/2023
Date completed: 28/04/2023
Inckination: -z0°
A5imuth: 0°

Logged b9: WM/ CJ
Input b9: WM
Checqed b9: SBN
Reviey ed b9: PK

Method	R.L.)m%	Length)m%	Graphic Log	La9er Code	MateriakDescription	Weathering/USC	Testing	TCR)x %	SCR)x %	RQD)x %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraph9 Defect Description AdditionakNotes	Instakkation
PQ3	37				**8ZJm:** Skightk9 y eathered, darq gre9, moderatek9 vesicukar, indistinctk9 floy -banded porph9ritic BASALT. Moderatek9 Strong.			100	100	100			
PQ3	11				**192m:**...Floy bands dip w. Vesicles elkipsoidak, w(30mm, sub-parakkekto floy fabric.							0.82m: JT 20° stepped, rough, veneer,)Infikk cka9% Broy n	
	36							100	z7	z7		11.wm: JT 70° undukating, smooth, veneer FeO, <1mm cka9. Intersects joint at 11.wwm. 11.wwm: JT 70° undukating, smooth, veneer FeO, <1mm cka9	
PQ3	12			VUb		SW						12.2m: JT w° stepped, rough, veneer <1mm kight broy n cka9. Broqen akong floy fabric.	
	3w							100	87	100			
PQ3	13											13.07m: DB 0° undukating, rough, cka9	
	34											13.36m: DB 0° undukating, rough, cka9 Broqen akong vesicles	
PQ3	14											13.zm: DB 0° undukating, rough, cka9	
	33							z3	z3	z3			
				VWb	**122Jm:** Moderatek9 y eathered, gre9ish red, highk9 vesicukar porph9ritic okivine rich, koy -densit9 SCORACEOUS BASALT. Moderatek9 strong; vesicles upto 20mm diameter	MW							
				WW	**122B4m:** CORE LOSS. Recovered materiakis moderatek9 y eathered, broy nish red, highk9 vesicukar BASALT gravekks.	MW						14.7wm to 14.8wm: Interpreted as possible void, cka9 matri(assumed largek9 y ashed out.	
	1w			VWb	**1273/4m:** Moderatek9 y eathered, gre9ish red, highk9 vesicukar	MW							

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REMARKS:
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27/04/2023 12:1w:00 PM I 33.00m I 14.62 m
27/04/2023 7:20:00 PM I 46.w0m I 11.8z m
28/04/2023 12:00:00 PM I 46.w0m I 13.zwm
28/04/2023 2:30:00 PM I w0.00m I 12.12 m

Auckland LIGHT RAIL

Auckland

Client: **A03uland Light Rail Limited**
Project: **A03uland Light Rail**
Location: **c ingsland Station**
Project Reference: **Stage 1 Gro0nd Investigation**

BH5595

Sheet **2** of **19**

BOREHOLE INFORMATION
Method: Rotar9 Core Wirekine
E| uipment: Massen5a MI4
Contractor: Mcmikkan Drikking

CO-ORDINATES: NkTM 5999
Easting: 17www24.30m
Northing: wz17824.z6m
Reduced kevek 47.46m

Date started: 20/04/2023
Date completed: 28/04/2023
Inckination: -z0°
A5imuth: 0°

Logged b9: WM/ CJ
Input b9: WM
Checqed b9: SBN
Reviey ed b9: PK

Method	R.L.)m%	Length)m%	Graphic Log	La9er Code	MateriakDescription	Weathering/USC	Testing	TCR)x %	SCR)x %	RQD)x %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraph9 Defect Description AdditionakNotes	Instakkation
PQ3	32	16		VUb	porph9ritic okivine rich, koy -densit9 SCORACEOUS BASALT. Moderatek9 strong; vesicles upto 20mm diameter **14m:** Skightk9 y eathered, darq gre9, highk9 vesicular, porph9ritic BASALT. Moderatek9 strong. Vesicles are sphericakw-30mm, infikked y ith 9ekkoy cka9, moist, soft, highk9 plastic. Cka9 infikkassumed z0x y ashed ay a9.			100	67	100		1wm to 1z.4m: Vesicle cka9 infikkassumed z0x y ashed ay a9. 1wm: JT w° planar, rough, coating 2mm 9ekkoy cka9. 1wm to 1w.6m: Cka9 infikks assumed z0x y ashed out. 1wm to 1z.4m: Vesicle cka9 infikkassumed z0x y ashed ay a9. 1wm: JT w° planar, rough, coating 2mm 9ekkoy cka9. 1wm to 1w.6m: Cka9 infikks assumed z0x y ashed out. 1wm: JT w° planar, rough, coating 2mm 9ekkoy cka9. 1wm to 1w.6m: Cka9 infikks assumed z0x y ashed out. 1wm to 1z.4m: Vesicle cka9 infikkassumed z0x y ashed ay a9. 1wm: JT w° planar, rough, coating 2mm 9ekkoy cka9. 1wm to 1w.6m: Cka9 infikks assumed z0x y ashed out. 1wm to 1z.4m: Vesicle cka9 infikkassumed z0x y ashed ay a9. 1wm to 1w.6m: Cka9 infikks assumed z0x y ashed out. 1wm: JT w° planar, rough, coating 2mm 9ekkoy cka9. 1wm to 1w.6m: Cka9 infikks assumed z0x y ashed out. 1wm to 1z.4m: Vesicle cka9 infikkassumed z0x y ashed ay a9. 1wm: JT w° planar, rough, coating 2mm 9ekkoy cka9. 1w.1m: JT w° planar, rough, coating 2mm 9ekkoy cka9. 1w.11m: JT z0° undukating, rough, coating w-10mm 9ekkoy cka9. 1w.3m: JT w° undukating, rough, coating 2mm 9ekkoy cka9. 1w.wm: JT ww° undukating, rough, coating 1-2mm 9ekkoy cka9. 1w.8m: JI 2w° Broqen during drikking? 1w.zm: DB 10° planar, rough, clean 16.2m: JT 6w° planar, smooth, veneer <1mm cka9. 16.3m: DB 30° undukating, rough, clean 16.wm: DB w° undukating, rough, staining,)Infikk iron o(ide%Broqen along vesicles. 16.wm to 16.8m: JT 8w° undukating, smooth, coating,)Infikk cka9 2% 17.1m to 17.3wm: JT 8w° undukating, smooth, coating,)Infikk cka9 2% 17.1wm: JT 1w° planar, rough, clean 17.2wm: DB 20° planar, rough, clean 17.7m: JT 30° planar, rough, veneer <1mm cka9. 17.zm: JI 4w° Cooking fracture.	
PQ3	31	17			**1UZ1m to 1UZ4m:**...Moderatek9 vesicular. Vesicles are sphericak1-wmm, dip 4w. **1UZ4m:**...Non vesicular, dense BASALT. **1UZ5m to 17m:**...Skightk9 vesicular. Vesicles 1-wmm diameter, dip 2w-30.	SW		100	83	z7			
PQ3	30	18											
PQ3	2z	1z						100	100	100			
PQ3	28			AUo	**17Z12m:** Sikt9, organic CLAY, darq broy n. Firm, Moist, highk9 plastic.	CL-ML		100				**17Z12m: ALLK6IKM** 1z.14m: Baqed pakaeosok	
PUSHTUBE		20						100					

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28/04/2023 2:30:00 PM I w0.00m I 12.12 m

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Auckland

Client: **A03uland Light Rail Limited**
Project: **A03uland Light Rail**
Location: **c ingsland Station**
Project Reference: **Stage 1 Gro0nd Investigation**

BH5595

Sheet **4** of **19**

BOREHOLE INFORMATION
Method: Rotar9 Core Wirekine
E| uipment: Massen5a MI4
Contractor: Mcmikan Drikking

CO-ORDINATES: NkTM 5999
Easting: 17www24.30m
Northing: wz17824.z6m
Reduced kevek 47.46m

Date started: 20/04/2023
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Inckination: -z0°
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Logged b9: WM/ CJ
Input b9: WM
Checqed b9: SBN
Reviey ed b9: PK

Method	R.L.)m%	Length)m%	Graphic Log	La9er Code	MateriakDescription	Weathering/USC	Testing	TCR)x %	SCR)x %	RQD)x %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraph9 Defect Description AdditionakNotes	Instakkation
SPT	27			AUc	**59m:** Sik9 CLAY, kight gre9 streaqed red and darq gre9. Stiff, moist, highk9 plastic.		20m: SPT 1,3// 4,4,w,6 N = 1z	100					
PQ3		21						100					
SPT	26					CL-ML	21m: SPT 1,2// 3,3,6,6 N = 18	100					
PQ3		22						100					
SPT	2w			AUs	**55Z5m:** Fine sand9 SILT, trace cka9. b oy nish gre9. Medium dense, moist, non-plastic.	MI-SP	22.wm: SPT 2,3// w,4,10,z N = 28	100					
PQ3		23		ERs	**55Z7m:** Completek9 y eathered, reddish broy n, fine to medium SANDSTONE. Medium dense, sik9 fine SAND, trace cka9, moist, non-plastic.	CW		100				**55Z7m: ECBF**	
PQ3	24			EWs	**5. Z1m:** Moderatek9 y eathered, gre9, FeO stained, fine to medium SANDSTONE. E(tremek9 y eaq, poork9 cemented.	MW							
		24			**5. Z4m to 5. Z74m:**...100mm bed of Highk9 y eathered, fine sand9 SILTSTONE.								
SPTC				EUs	**5. Z74m:** Skightk9 y eathered, gre9, medium to coarse SANDSTONE. Ver9 y eaq, moderatek9 cemented. Distinctk9 bedded, normak9 graded. Bedding fabric dips 10.	SW	24m: SPTC 8,18// 3z,11 for 1wmm N = w0Z	N/A	N/A	N/A		24.24m to 2w.2m: Ver9 closek9 spaced drikk breaqs, dip w-10, parakkekto bedding fabric in Sandstone.	
PQ3	23							100					
					52Z4m to 52Z7m:...100mm highk9 y eathered SILTSTONE bed. E(tremek9 y eaq.							24.8m: BP 10° E(tremek9 y eaq siltstone bed	
	2w												

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28/04/2023 12:00:00 PM I 46.w0m I 13.zwm
28/04/2023 2:30:00 PM I w0.00m I 12.12 m

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BH5595

Sheet **U** of **19**

BOREHOLE INFORMATION
Method: Rotar9 Core Wirekine
E| uipment: Massen5a MI4
Contractor: Mcmikan Drikking

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Method	R.L.)m%	Length)m%	Graphic Log	La9er Code	MateriakDescription	Weathering/USC	Testing	TCR)x %	SCR)x %	RQD)x %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraph9 Defect Description AdditionakNotes	Instakkation
PQ3	22			EUs	**54m to 54Z1m:**...100mm highk9 y eathered fine sand9 SILTSTONE bed. E(tremek9 y eaq.	SW						2w.1m: BP 0° Top of Siktstone.	
					54Z1m: Skightk9 y eathered, gre9 laminated MUDSTONE. Ver9 y eaq. Laminations dip w°, y ith sikt laminae.			100					
					54Z m:...200mm bed of laminated sikt9 fine SANDSTONE. Ver9 y eaq, moderatek9 cemented.	SW						2w.3m: Blacq Carbonaceous laminations dip 10° 2w.4m: DB w° stepped, rough, c an	
SPTC							2w.wm: SPTC 3,10// w0 for wwmm N = w0Z	N/A	N/A	N/A			
PQ3					**54Z3m:**...60mm fine sikt9 SANDSTONE. Recovered as fine to coarse angukar gravek							2w.76m: BP w° Base of Sandstone.	
	26			EU5	**54Z3Um:** Skightk9 y eathered, gre9 laminated SILTSTONE. Ver9 y eaq. Laminations dip w°.								
					5Um:...100mm bed of fine SANDSTONE. Ver9 y eaq.			100				26m: BP w° Base of Sandstone.	
												26.1wm to 26.48m: BP 0° Closek9 spaced siltstone beds.	
	21					SW							
PQ3					**5UZ3m to 58m:**... 300mm bed of sikt9 fine SANDSTONE, ver9 y eaq.			100	8z	8z		26.w3m: JT 20° undukating, smooth, clean 26.w8m: JT 20° stepped, smooth, clean	
SPTC	27						27m: SPTC 14,36 for 130mm// N = w0Z	N/A	N/A	N/A			
PQ3	20			EUs	**58Z 4m:** Skightk9 y eathered, gre9, fine SANDSTONE. Ver9 y eaq. Ver9 think9 bedded, dip w- 0°	SW						27.47m to 27.61m: JT 80° Intersects y ith Joint beloy at midpoint of core 27.61m to 27.83m: JT 80° Intersects y ith Joint above at midpoint of core 27.7m: DB w° undukating, rough, clean	
								100	8z	100		27.8m: DB w° planar, rough, clean	
	28												
					5Vm: Skightk9 y eathered, gre9, interbedded Siktstone)80x % and medium to coarse grained mod ratek9 y ekkcemented SANDSTONE)20x %Sandstone and siltstone ver9 y eaq.							28.02m: BP 0° Base of sandstone bed 28.1wm: DB 10° stepped, rough, clean	
					5VZ54m to 5VZ 1m:...60mm thicq SANDSTONE bed.	SW						28.31m: BP w° Base of sandstone bed	
	1z				**5VZ24m to 5VZ3m:** ..w0mm thicq SANDSTONE bed.								
SPTC							28.wm: SPTC 1w,3w for 130mm// N = w0Z	N/A	N/A	N/A			
PQ3				EUi	**5VZ2m:** Skightk9 y eathered, gre9, interbedded medium to coarse grained poork9 cemented SANDSTONE)70x %and SILTSTONE)30x %Sandstone and siltstone ver9 y eaq.							28.84m: DB 0° 28.87m: BP 0° Base of sandstone bed	
	2z				**5VZ7m to 5VZ7Um:**...60mm thicq SILTSTONE bed.								
					57Z94m to 57Z5m:...1w0mm thicq SILTSTONE bed.	SW							
	18				**57Z24m to 57Z44m:**...100mm thicq SILTSTONE bed.			100	100	100		2z.3m to 2z.4wm: DB Recovered as e(tremek9 y eaq medium to coarse SANDSTONE.	
				EU5	**57Z85m:** Skightk9 y eathered, gre9, SILTSTONE. Ver9 y eaq.	SW						2z.8m: BP 0° Base of sandstone bed	
	30											2z.z4m: DB 0° undukating, rough, clean	

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Client: **A03uland Light Rail Limited**
Project: **A03uland Light Rail**
Location: **c ingsland Station**
Project Reference: **Stage 1 Gro0nd Investigation**

BH5595

Sheet **8** of **19**

BOREHOLE INFORMATION
Method: Rotar9 Core Wirekine
E| uipment: Massen5a MI4
Contractor: Mcmikkan Drikking

CO-ORDINATES: NkTM 5999
Easting: 17www24.30m
Northing: wz17824.z6m
Reduced kevek 47.46m

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SPTC						SW	30m: SPTC w0,// N = w0Z	N/A	N/A	N/A			
PQ3	17			EUs	**. 9Z384m:** Skightk9 y eathered, gre9, medium to coarse grained SANDSTONE. Ver9 y eaq.	SW						30.2m: JT 1w° undukating, rough, clean 30.27m: DB 0° 30.4m to 30.6wm: DB Re covered as e(tremek9 y eaq medium to coarse SANDSTONE.	
PQ3	31			EU5	**. 92Vm:** Skightk9 y eathered, gre9, SILTSTONE. Ver9 y eaq.	SW		100	z1	100		30.7wm to 31.18m: FT Top dip: w0 degrees, bottom dip 20 degrees	
PQ3	16			EUs	**. 1Z m:** Skightk9 y eathered, gre9, medium to coarse grained moderatek9 y ekkcemented SANDSTONE. Ver9 y eaq.	SW						31.w8m to 31.w8m: BP Closek9 spaced, bedding parakkekdrikkbreaqs 31.zm: DB 31.z4m: DB	
PQ3	32			EUi	**. 5Zm:** Skightk9 y eathered, gre9, interbedded SILTSTONE)8wx %and medium to coarse grained moder tek9 y ekk cemented SANDSTONE)1wx %Sandstone and siktstone ver9 y eaq. **. 5Z m to . 5Z . m:**...30mm thicq SANDSTONE bed. **. 5Z24m to . 5ZVm:**...30mm thicq SANDSTONE bed. **. . m to . . Zm:**...100mm thicq SANDSTONE bed.	SW		100	z3	100		32.13m: BP Base of siktstone bed 32.34m: JT 0° undukating, rough, clean 32.4wm: JT w° undukating, rough, clean 32.w7m: BP w° undukating, rough, clean Base of sandstone bed 32.z3m: BP e(tremek9 y eaq siktstone bed 33.1m: BP w° Base of sandstone bed	
PQ3	1w												
PQ3	33												
PQ3	14			EUs	**. . Z m:** Skightk9 y eathered, gre9, medium to coarse grained poork9 cement d SANDSTONE. Ver9 y eaq.	SW		100	100	100		33.2m to 33.7m: JT 8w° stepped, skicqensided, clean 33.7m to 33.zm: JT 80° undukating, skicqensided, clean Intersects y ith joint above at 33.7m bgk	
PQ3	34			EU5	**. ZVm:** Skightk9 y eathered, gre9, SILTSTONE. Ver9 y eaq.	SW							
PQ3	13			EUi	**. 2Z 4m:** Skightk9 y eathered, gre9, interbedded medium to coarse grained poork9 cemented SANDSTONE)70x %and SILTSTONE)30x %Sandstone and siktstone ver9 y eaq. **. 2Vm to . 2Z75m:**...120mm thicq SILTSTONE bed.	SW		z0	67	z0		34.33m: DB w° 34.4m: BP w° Base of sandstone bed 34.wm to 34.73m: DB 0° mukkiple breaqs along joint 34.wwm to 34.73m: DB Recovered as e(tremek9 y eaq medium to coarse SANDSTONE. 34.67m: JT w0° undukating, rough, clean 34.81m: BP 0° Base of sandstone bed 34.84m: JT w0° undukating, smooth, clean 34.z4m: DB 0°	
	3w												

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27/04/2023 12:1w00 PM I 33.00m I 14.62 m
27/04/2023 7:20:00 PM I 46.w0m I 11.8z m
28/04/2023 12:00:00 PM I 46.w0m I 13.zwm
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Auckland

Client: **A03uland Light Rail Limited**
Project: **A03uland Light Rail**
Location: **c ingsland Station**
Project Reference: **Stage 1 Gro0nd Investigation**

BH5595

Sheet **V** of **19**

BOREHOLE INFORMATION
Method: Rotar9 Core Wirekine
E| uipment: Massen5a MI4
Contractor: Mcmikkan Drikking

CO-ORDINATES: NkTM 5999
Easting: 17www24.30m
Northing: wz17824.z6m
Reduced kevek 47.46m

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Method	R.L.)m%	Length)m%	Graphic Log	La9er Code	MateriakDescription	Weathering/USC	Testing	TCR)x %	SCR)x %	RQD)x %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraph9 Defect Description AdditionakNotes	Instakkation
PQ3	12	36		EUi	**. 2Z 4m:** Skightk9 y eathered, gre9, interbedded medium to coarse grained poork9 cemented SANDSTONE)70x %and SILTSTONE)30x %Sandstone and silktstone ver9 y eaq. **. 4Z98m to . 4Z m:**...230mm thicq SILTSTONE bed. **. 4Z8m to . 4Z5/5m:**...120mm thicq SILTSTONE bed. **. 4Z4m:** CORE LOSS	SW		z0	67	z0		3wm: DB 0° 3w.1wm: BP w° Base of siltstone bed 3w.3m: BP w° Base of siltstone bed 3w.4m to 3w.66m: DB Re overed as e(tremek9 y eaq medium to coarse SANDSTONE. 3w.7m: DB 0° 3w.8m: DB w°	
PQ3	11	37		EU5 EUi	**. Um:** Skightk9 y eathered, gre9, SILTSTONE. Ver9 y eaq. **. UZ18m:** Skightk9 y eathered, gre9, interbedded medium to coarse grained poork9 cemented SANDSTONE)80x %and SILTSTONE)20x %Sandstone and silktstone ver9 y eaq. **. UZUm to . UZ84m:**...Skightk9 y eathered, gre9, SILTSTONE. Ver9 y eaq. 1w0mm thicq. **. UZ7m to . UZ74m:**...Skightk9 y eathered, gre9, SILTSTONE. Ver9 y eaq. w0mm thicq. **. 8Z5m to . 8Z5Um:**...Skightk9 y eathered, gre9, SILTSTONE. Ver9 y eaq. 60mm thicq **. 8Z2m to . 8Z4m:**...Skightk9 y eathered, gre9, SILTSTONE. Ver9 y eaq. 100mm thicq.	SW		100	6w	100		36.13m to 36.16m: BP E(tremek9 y eaq silt9 sandstone bed 36.2wm: BP 0° 36.3wm to 36.6m: DB Recovered as e(tremek9 y eaq medium to coarse SANDSTONE. 36.66m: DB 36.7wm to 36.8wm: DB Recovered as e(tremek9 y eaq medium to coarse SANDSTONE. 36.zm: DB 0° 37.0wm to 37.2m: DB Recovered as e(tremek9 y eaq medium to coarse SANDSTONE. 37.33m: BP 1w° Thin sandstone bed	
PQ3	z	3z		EUi	**. 8Z84m to . 8Z/1m:**...Skightk9 y eathered, gre9, SILTSTONE. Ver9 y eaq. 60mm thicq. **. VZ1Vm to . VZ m:**...Skightk9 y eathered, gre9, SILTSTONE. Ver9 y eaq. 120mm thicq. **. VZU5m to . VZU8m:**...Skightk9 y eathered, gre9, SILTSTONE. Ver9 y eaq. w0mm thicq	SW		100	z3	100		37.wwm to 37.7wm: DB Recovered as e(tremek9 y eaq medium to coarse SANDSTONE. 37.88m: BP 0° Thin sandstone bed 38m: BP Base of siltstone bed 38.07m to 38.18m: DB Recovered as e(tremek9 y eaq medium to coarse SANDSTONE. 38.3m: BP w° Base of siltstone bed 38.37m to 38.wwm: DB Recovered as e(tremek9 y eaq medium to coarse SANDSTONE. 38.62m: BP Base of sandstone bed 38.8zm: JT 70° undulating, rough, clean	
PQ3	8	40		EU5	**. 7m:** Skightk9 y eathered, gre9, SILTSTONE interbedded y ith ver9 thin closek9 spaced sandstone beds. Ver9 y eaq.	SW		z0	z0	z0		3z.2m: BP w° Base of siltstone bed 3z.43m to 41.1wm: DB Drikking breaqs along ver9 thin closek9 spaced sandstone beds.	

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REMARKS:
SCR = Circumference, 300mm.
TCR, SCR, and RQD measurements to be revised

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
20/04/2023 3:00:00 PM I 10.w0m I 7.w2 m
21/04/2023 3:00:00 PM I 10.w0m I z.44 m
21/04/2023 3:1ww00 PM I 24.24m I 14.0wm
26/04/2023 12:10:00 PM I 24.24m I 14.0wm
26/04/2023 7:00:00 PM I 33.00m I 13.43 m
27/04/2023 12:1w:00 PM I 33.00m I 14.62 m
27/04/2023 7:20:00 PM I 46.w0m I 11.8z m
28/04/2023 12:00:00 PM I 46.w0m I 13.zwm
28/04/2023 2:30:00 PM I w0.00m I 12.12 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARY.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **A03uland Light Rail Limited**
Project: **A03uland Light Rail**
Location: **c ingsland Station**
Project Reference: **Stage 1 Gro0nd Investigation**

BH5595

Sheet **7** of **19**

BOREHOLE INFORMATION
Method: Rotar9 Core Wirekine
E| uipment: Massen5a MI4
Contractor: Mcmikkan Drikking

CO-ORDINATES: NkTM 5999
Easting: 17www24.30m
Northing: wz17824.z6m
Reduced kevek 47.46m

Date started: 20/04/2023
Date completed: 28/04/2023
Inckination: -z0°
A5imuth: 0°

Logged b9: WM/ CJ
Input b9: WM
Checqed b9: SBN
Reviey ed b9: PK

Method	R.L.)m%	Length)m%	Graphic Log	Laqer Code	MateriakDescription	Weathering/USC	Testing	TCR)x %	SCR)x %	RQD)x %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraph9 Defect Description AdditionakNotes	Instakkation
PQ3	7			EU5	**. 7m:** Skightk9 y eathered, gre9, SILTSTONE interbedded y ith ver9 thin closek9 spaced sandstone beds. Ver9 y eaq.	SW		z0	z0	z0			
					29Z 4m: CORE LOSS								
PQ3		41		EU5	**29Z3m:** Skightk9 y eathered, gre9, SILTSTONE interbedded y ith ver9 thin closek9 spaced sandstone beds. Ver9 y eaq.	SW							
	6			EUs	**21Z14m:** Skightk9 y eathered, gre9, medium to coarse grained poork9 cemented SANDSTONE. E(tremek9 y eaq. Recovered as medium to coarse sand y ith some sikt, medium dense, moist. Liqek9 not intact due to drikking in poork9 cemented sandstone.	SW		100	100	100		41.1wm: Sandstone kqek9 not intact due to drikking in poork9 cemented sandstone. 41.2wm: JT 6w° undukating, rough, clean	
				EU5	**212Um to 212Z5m:**...60mm thicq SANDSTONE concretion. Moderatek9 Strong. **212Z5m:** Skightk9 y eathered, gre9, SILTSTONE. Ver9 y eaq.	SW						41.46m: DB w°	
				EUs	**212Z1m:** Skightk9 y eathered, gre9, medium to coarse grained moderatek9 y ekkcemented SANDSTONE. Ver9 y eaq. 240mm thicq.	SW						41.71m: BP 1w° Base of sikstone bed 41.8wm: DB w°	
PQ3	w	42		EU5	**212Z4m:** Skightk9 y eathered, gre9, SILTSTONE. Ver9 y eaq.	SW		100	100	100		42.0wm to 42.1m: BP e(tremek9 y eaq sik9 sandstone bed 42.1wm to 42.3m: BP 0° drikking induced breaqs akong kaminated sikstone 42.3wm: JT 0° undukating, smooth, clean 42.wm to 42.wwm: BP 0° e(tremek9 y eaq sik9 sandstone bed 42.6m: DB 0° 42.7m: DB 0°	
		43		EUs	**25ZVm:** Skightk9 y eathered, gre9, medium to coarse grained moderatek9 y ekkcemented SANDSTONE. Ver9 y eaq.	SW						43.0wm: DB 0°	
	4				**2. Z3m to 2. ZU4m:**...Skightk9 y eathered, gre9, SILTSTONE. Ver9 y eaq. w0mm thicq.							43.26m: DB 0° 43.3m: DB 0°	
		44		EU5	**2. Z7m:** Skightk9 y eathered, gre9, SILTSTONE. Ver9 y eaq.	SW						43.6m: BP 0° Base of sikstone bed 43.zm: BP w° Base of sandstone bed	
PQ3	3			EUs	**222Z4m:** Skightk9 y eathered, gre9, medium to coarse grained moderatek9 y ekkcemented SANDSTONE. Ver9 y eaq.	SW		100	100	100		44.2m: BP 10° Top of sikstone bed 44.3m: BP 0° Top of sikstone bed 44.4wm: DB 0°	
		4w		EU5	**222Bm:** Skightk9 y eathered, gre9, SILTSTONE. Ver9 y eaq.	SW						44.7m: BP 10° Base of sandstone bed	

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REMARKS:
SCR = Circumference, 300mm.
TCR, SCR, and RQD measurements to be revised

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
20/04/2023 3:00:00 PM I 10.w0m I 7.w2 m
21/04/2023 3:00:00 PM I 10.w0m I z.44 m
21/04/2023 3:1ww00 PM I 24.24m I 14.0wm
26/04/2023 12:10:00 PM I 24.24m I 14.0wm
26/04/2023 7:00:00 PM I 33.00m I 13.43 m
27/04/2023 12:1w:00 PM I 33.00m I 14.62 m
27/04/2023 7:20:00 PM I 46.w0m I 11.8z m
28/04/2023 12:00:00 PM I 46.w0m I 13.zwm
28/04/2023 2:30:00 PM I w0.00m I 12.12 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARY.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

Auckland

Client: **A03uland Light Rail Limited**
Project: **A03uland Light Rail**
Location: **c ingsland Station**
Project Reference: **Stage 1 Gro0nd Investigation**

BH5595

Sheet **19** of **19**

BOREHOLE INFORMATION
Method: Rotar9 Core Wirekine
E| uipment: Massen5a MI4
Contractor: Mcmikkan Drikking

CO-ORDINATES: NkTM 5999
Easting: 17www24.30m
Northing: wz17824.z6m
Reduced kevek 47.46m

Date started: 20/04/2023
Date completed: 28/04/2023
Inckination: -z0°
A5imuth: 0°

Logged b9: WM/ CJ
Input b9: WM
Checqed b9: SBN
Reviey ed b9: PK

Method	R.L.)m%	Length)m%	Graphic Log	La9er Code	MateriakDescription	Weathering/USC	Testing	TCR)x %	SCR)x %	RQD)x %	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraph9 Defect Description AdditionakNotes	Instakkation
PQ3	2			EU5	**22Z8m:** Skightl9 y eathered, gre9, SILTSTONE. Ver9 y eaq.	SW						4w.2m to 4w.3m: BP 0° ver9 thin, ver9 closekl9 spaced e(tremekl9 y eaq silt9 sandstone beds	
					24Z2m to 24Z4m:...Skightl9 y eathered, gre9, medium to coarse grained moderatekl9 y elkcemented SANDSTONE. Ver9 y eaq. w0mm thicq.							4w.4wm: BP 0° Base of sands one bed	
		46		EUs	**24Z8m:** Skightl9 y eathered, gre9, medium to coarse grained moderatekl9 y elkcemented SANDSTONE. Ver9 y eaq.	SW		z0	z0	z0		4w.7m: BP w° Base of siltstone bed 4w.8m to 4w.88m: DB Recovered as e(tremekl9 y eaq medium to coarse SANDSTONE. 46m to 46.14m: DB Recovered as e(tremekl9 y eaq medium to coarse SANDSTONE. 46.14m to 46.24m: BP w° Siltstone bed 46.24m to 46.3wm: DB Recovered as e(tremekl9 y eaq medium to coarse SANDSTONE.	
					2UZ2m to 2U52m:...Skightl9 y eathered, gre9, SILTSTONE bed. Ver9 y eaq. 100mm thicq.								
	1				**2UZ 4m:** CORE LOSS								
PQ3				EUi	**2UZ8m:** Skightl9 y eathered, gre9, medium to coarse grained moderatekl9 y elkcemented SANDSTONE. Ver9 y eaq. Interbedded y ith skightl9 y eathered, darq gre9 SILTSTONE. Ver9 y eaq, closekl9 spaced, thinkl9 laminated. **2UZ5m to 28Z2m:**...sandstone is y elkcemented.	SW		100	100	100		46.wm to 46.62m: DB Recovered as e(tremekl9 y eaq medium to coarse SANDSTONE. 46.62m: BP 10° Base of sandstone bed 47.06m: BP w° Base of sandstone bed 47.2m: BP 0° Sandstone bed. 47.4m to 47.w6m: BP w° Drikkbreaqs along thinkl9 laminated siltstone beds	
	0	47											
				EUs	**28Z2Um:** Skightl9 y eathered, gre9, medium to coarse grained moderatekl9 y elkcemented SANDSTONE. Ver9 y eaq.	SW		100	100	100		48.3m to 48.wwm: BP 0° Drikkbreaqs along thinkl9 laminated siltstone beds 48.6wm: DB 10°	
	-1	48											
		4z											
	-2			EU5	**27Z5Vm:** Skightl9 y eathered, gre9, SILTSTONE. Ver9 y eaq.	SW		100	100	100		4z.4wm: DB 0°	
PQ3	w0				**27Z/4m:**...w0mm bed of silt9 fine SANDSTONE. E(tremekl9 y eaq.							4z.8wm to 4z.zm: BP 0° Sandstone bed.	

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REMARKS: End of borehole at w0m)Termination Depth Achieved%
SCR = Circumference, 300mm.
TCR, SCR, and RQD measurements to be revised

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
20/04/2023 3:00:00 PM I 10.w0m I 7.w2 m
21/04/2023 3:00:00 PM I 10.w0m I z.44 m
21/04/2023 3:1ww00 PM I 24.24m I 14.0wm
26/04/2023 12:10:00 PM I 24.24m I 14.0wm
26/04/2023 7:00:00 PM I 33.00m I 13.43 m
27/04/2023 12:1w:00 PM I 33.00m I 14.62 m
27/04/2023 7:20:00 PM I 46.w0m I 11.8z m
28/04/2023 12:00:00 PM I 46.w0m I 13.zwm
28/04/2023 2:30:00 PM I w0.00m I 12.12 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARY.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

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Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Corner of Balmoral and Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH2209

Sheet **1** of **10**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1761564.11m
Northing: 5516424.31m
Reduced level: 42.41m

Date started: 16/01/2023
Date completed: 17/01/2023
Inclination: -50°
Aqimuth: 0°

Logged by: DY
Input by: DY
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACE%	42	1		HT	**0m:** TOPSOIL.							**0m: TOPSOIL**	
				FUg	**0.2m:** Sandy fine to coarse GRAVEL, minor silt, trace cobbles (dark brownish grey. Tightly packed, moist. Gravel is sub-angular basalt and scoria (Sand is fine to coarse.	GW		0				**0.2m: FILL**	
	41												
PQ3		2		VWrb	**1.63m:** Moderately weathered, dark brown, RUBBLY BASALT comprising fine to coarse GRAVEL, some basalt cobbles (brownish dark grey. Very loosely packed, moist. Gravel is sub-angular basalt.	GW						**1.63m: AVF**	
	40	3		VWb	**2m:** Moderately weathered, dark grey, porphyritic, slightly vesicular BASALT. Moderately strong. Vesicles are 1-3mm. Weak bands generally dipping 20 degrees.	HW		100	26	100		2.28m: JI 2I ° 2.32m: DI 2I ° undulating, rough, clean 2.4m: DI 4I ° undulating, rough, coating, Infilling clay; k ith fine gravel (brown. 2.I 2m to 2.64m: Rubbly BASALT 2.8I m: DI 7I ° undulating, smooth, Yellowish k hite veneer k ith FeO	
PQ3	35	4		VUb	**3m:** Slightly weathered, slightly vesicular, dark grey, BASALT. Moderately strong. **3.4m:**...1I mm Feldspar Crystal	SW		100	53	100		3.03m: DI 70° undulating, rough, clean Red specks present 3.11m: JT 4I ° undulating, rough, Stained k ith yellowk veins 3.27m: DI 60° stepped, rough, Broken parallel to weak band 3.36m: DI 10° undulating, rough, Yellowish k hite veneer 3.I 2m: JT 60° stepped, smooth, Stained k ith yellowk veins 3.63m: DB I ° undulating, rough, clean 3.68m: DB 30° undulating, rough, clean 3.82m: JT 80° undulating, smooth, Stained k ith yellowk veins. Broken along SVJ 4.04m: DI 3I ° 4.22m: DI 1I ° undulating, rough, clean 4.25m: DI 3I ° undulating, rough, clean 4.43m: DI 4I ° undulating, rough, clean 4.I 1m: DB 20° undulating, rough, clean 4.66m: DI 4I ° undulating, rough, clean VCS 4.76m: DB I ° stepped, smooth, clean 4.78m: DB 40° undulating, rough, clean	
	38												
PQ3								100	71	54			

REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Cased down to 3 m at 4.I mbgl

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
16/01/2023 3:00:00 PM 25.00m 26 m
17/01/2023 7:30:00 AM 25.00m 27.4 m
17/01/2023 3:30:00 PM 228.I 0m 26.83 m
18/01/2023 7:30:00 AM 228.I 0m 27.1 m
18/01/2023 3:4I :00 PM 242.00m 211.2I m
15/01/2023 8:00:00 AM 242.00m 27.I I m

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Cvient: **Auckland Light Rail Limited**
Pro9ect: **Auckland Light Rail**
Location: **Corner of Balmoral and Sandringham**
Pro9ect Reference: **Stage 1 Ground Investigation**

BH2209

BOREHOLE INFORMATION
Method: Rotary Core Wirevine
E| uipment:
Contractor: McMivvan Drivving

CO-ORDINATES: NZTM 2000
Easting: 17l 4564.11m
Northing: l 516424.31m
Reduced vevew 42.41m

Date started: 16/0l /2023
Date compvveted: 17/0l /2023
Incvination: -50°
Aqimuth: 0°

Logged by: DY
Input by: DY
Checj ed by: SBN
Reviek ed by: PK

Method	R.L.)m;	Length)m;	Graphic Log	Layer Code	Materiaw Description	Weathering/USC	Testing	TCR)x ;	SCR)x ;	RQD)x ;	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additionaw Notes	Instavvation
PQ3	37	6		VUb	**3m:** Svightvy k eathered, svightvy vesicuvar, darj grey, BASALT. Moderatevy strong.	SW		100	71	54		l .16m: Dl 20° unduvating, rough, Yevvk staining. VCS l .26m: Jl 10° l .35m: DB 0° unduvating, rough, cvean l .44m: DB 30° unduvating, rough, cvean l .l 2m: JT 30° unduvating, smooth, staining FeO l .l 6m: Dl 2l ° unduvating, smooth, staining FeO. Broj en p raavevvo fvvk band l .64m: JT 3l ° unduvating, rough, staining FeO l .7m: Jl l l ° l .74m: DB 10° unduvating, rough, cvean l .5m: Hl 30° l .5m to 6m: Dl VCS l m: Hl 30° .5m to 6m: Dl VCS 6.11m: Dl l 0° stepped, smooth, cvean 6.21m: JT 30° unduvating, smooth, staining FeO 6.33m: DB 30° unduvating, rough, cvean	
PQ3	36	7						100	34	57		6.42m: Dl 0° unduvating, rough, cvean 6.47m: JT l 0° unduvating, smooth, FeO and yevvk stains 6.l 2m: JT 50° unduvating, smooth, Stained k ith yevvk veins. Broj en avvng SVJ 6.l 4m: Dl l 0° unduvating, rough, Svight yevvk staining 6.68m: Dl 40° pvvanar, rough, staining FeO 6.71m: Dl l l ° unduvating, rough, Svight FeO 6.82m: Dl 4l ° unduvating, rough, cvean 7.03m: JT 30° unduvating, smooth, staining FeO 7.2m: JT l l ° unduvating, smooth, staining FeO 7.34m: JT l 0° unduvating, smooth, staining FeO 7.44m to 7.l m: Dl	
PQ3	34	8						100	l 0	77		7.l 4m: JT 2l ° unduvating, smooth, staining FeO 7.63m: Dl 1l ° unduvating, smooth, staining FeO. Broj en paraavevvo fvvk band 7.77m: DB 0° unduvating, rough, cvean 7.86m: Dl 40° stepped, smooth, staining FeO. Broj en paraavevvo fvvk band 7.53m: JT 30° unduvating, smooth, staining FeO 8.02m: Dl 10° stepped, rough, staining FeO. Broj en paraavevvo fvvk band 8.03m: JT 40° pvvanar, rough, staining FeO 8.18m: JT 3l ° pvvanar, rough, staining FeO 8.21m: JT 4l ° pvvanar, rough, staining FeO 8.32m: JT 2l ° unduvating, smooth, staining FeO 8.38m: Dl 1l ° pvvanar, smooth, staining FeO. Broj en avvng fvvk band 8.47m to 8.l 2m: CX Dl 8.l 8m: JT 2l ° unduvating, smooth, staining FeO 8.64m: JT 2l ° unduvating, smooth, staining FeO	
PQ3	33	10						100	3l	87		8.53m: Dl 20° stepped, smooth, staining FeO. Broj en avvng fvvk band 5.06m: JT 10° pvvanar, smooth, Yevvk ish green cvvay coating 5.08m: DB l ° 5.21m: Dl l l ° unduvating, smooth, Yevvk ish k hite k ith bvvacj spot staining 5.23m: JT 70° unduvating, smooth, 2mm brok n cvvay k ith bvvacj spot staining 5.34m: JT unduvating, smooth, Con9ugate 9oint dipping 40 and 30 degrees k ith yevvk ish green staining 5.35m: DB 30° unduvating, smooth, cvean 5.44m: JT 2l ° unduvating, smooth, FeO k ith bvvacj spot staining 5.l 6m: JT 20° unduvating, smooth, Yevvk ish green k ith bvvacj spot staining 5.61m to 5.82m: Dl VCS. Generavvy dipping 30-40 degrees	

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Cased dok n to 3 m at 4.l mbgw

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
16/0l /2023 3:00:00 PM z5.00m z6 m
17/0l /2023 7:30:00 AM z5.00m z7.4 m
17/0l /2023 3:30:00 PM z28.l 0m z6.83 m
18/0l /2023 7:30:00 AM z28.l 0m z7.1 m
18/0l /2023 3:4l :00 PM z42.00m z11.2l m
15/0l /2023 8:00:00 AM z42.00m z7.l l m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

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Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Corner of Balmoral and Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH2209

Sheet **3** of **10**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1761564.11m
Northing: 5516424.31m
Reduced level: 42.41m

Date started: 16/01/2023
Date completed: 17/01/2023
Inclination: -50°
Aqimuth: 0°

Logged by: DY
Input by: DY
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	32	11		VUb	**3m:** Slightly weathered, slightly vesicular, dark grey, BASALT. Moderately strong.	SW		100	31	87		5.53m: DI 10° undulating, smooth, clean 10.05m: JT 11° undulating, smooth, FeO with yellowish white stains 10.22m: JT 50° undulating, smooth, staining FeO 10.21m: JT 30° undulating, smooth, Whiteish orange staining 10.4m: DI 40° undulating, smooth, clean 10.13m: JT 41° undulating, smooth, staining FeO 10.18m: JT 41° undulating, smooth, Orangish white with black spot staining 10.62m: DI 40° undulating, smooth, Yellowish white staining 10.72m: JT 61° undulating, smooth, Orange coating 10.81m: JT 40° undulating, smooth, staining FeO 10.86m: JT 41° undulating, smooth, FeO with black spot staining 10.57m: DI 0° 11.1m: DI 61° undulating, smooth, staining FeO 11.21m: JT 20° undulating, smooth, staining FeO 11.31m: JT 11° undulating, smooth, staining FeO 11.11m: JT 71° undulating, smooth, staining FeO	
PQ3	31							53	17	75			
PQ3	30	12			**11.9m:** CORE LOSS								
PQ3	25	13		VUb	**12m:** Slightly weathered, dark grey, porphyritic, non-vesicular BASALT. Strong. Weak bands generally dipping 20 degrees.	SW		100	60	84		11.74m: DI 20° undulating, smooth, clean 11.84m: DI 11° undulating, rough, clean 12.04m: DI 0° undulating, rough, clean 12.13m: DI 41° undulating, smooth, Yellowish Clay coating with black spot staining 12.11m: JT 71° undulating, smooth, Yellowish Clay coating with black spot staining 12.31m: DB 0° undulating, rough, clean 12.42m: DI 20° undulating, smooth, clean 12.48m: DI 10° stepped, rough, Yellowish staining 12.63m: JT 61° undulating, smooth, staining FeO 12.84m to 12.52m: CX DI 12.55m: JT 11° undulating, smooth, staining FeO 13.02m: JT 50° undulating, smooth, staining FeO 13.1m: DI 10° undulating, smooth, clean 13.15m: DI 41° undulating, smooth, Slight yellowish staining 13.33m: DB 0° undulating, rough, clean 13.44m: JT 61° undulating, smooth, staining FeO 13.17m: JT 11° undulating, smooth, Slight FeO staining 13.7m: DI 30° undulating, smooth, Conjugate joints dipping 30 and 31 degrees 13.87m: DI 20° undulating, smooth, Slight yellowish staining 13.85m: DI 50° stepped, smooth, clean 14.03m: DI 20° undulating, smooth, clean 14.2m: JT 60° undulating, smooth, staining FeO 14.63m: JT 50° undulating, smooth, staining FeO	
PQ3	28	14			**13.5m:** ...Unweathered.	SW		100	51	51			
		11											

REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Cased down to 3 m at 4.1 mbgw

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
16/01/2023 3:00:00 PM 5.00m 6 m
17/01/2023 7:30:00 AM 5.00m 7.4 m
17/01/2023 3:30:00 PM 28.10m 6.83 m
18/01/2023 7:30:00 AM 28.10m 7.1 m
18/01/2023 3:41:00 PM 42.00m 11.21 m
15/01/2023 8:00:00 AM 42.00m 7.11 m

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Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Corner of Balmoral and Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH2209

Sheet **4** of **10**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1761564.11m
Northing: 5916424.31m
Reduced level: 42.41m

Date started: 16/01/2023
Date completed: 17/01/2023
Inclination: -50°
Aqimuth: 0°

Logged by: DY
Input by: DY
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	27	16		VUb	**12m:** Slightly weathered, dark grey, porphyritic, non-vesicular BASALT. Strong. Few bands generally dipping 20 degrees.	SW		100	100	100		11.71m: JT 50° undulating, smooth, staining FeO. DI breaks along SVJ	
PQ3	26												
PQ3	21	17						100	100	100		16.81m: DI 71° undulating, rough, staining FeO	
PQ3	24	18										17.18m: JT 50° undulating, smooth, staining FeO	
PQ3	23	15						100	65	51		18.08m: JT 70° undulating, smooth, staining FeO	
PQ3												18.33m: JT 50° undulating, smooth, staining FeO	
												18.76m: JT 50° undulating, smooth, clean Not sure if JT, JI or DI	
												18.85m: JT 50° undulating, smooth, clean Not sure if JT, JI or DI	
												15.07m to 15.18m: DB undulating, smooth, clean Consigate breaks dipping 41 and 11 degrees	
												15.27m: DB 40° undulating, smooth, clean	
												15.31m to 15.1m: DI undulating, smooth, Consigate breaks on JI dipping 61 and 31 degrees kith FeO staining	
												15.14m: DI 41° undulating, smooth, clean	
PQ3	20	20						100	40	57		15.6m: DI 10° undulating, smooth, clean	
												15.75m: DI 70° undulating, smooth, clean Becomes DI SVJ	
												15.84m: DI 30° undulating, smooth, clean	

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Cased down to 3 m at 4.1 mbgw

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
16/01/2023 3:00:00 PM 5.00m 6 m
17/01/2023 7:30:00 AM 5.00m 7.4 m
17/01/2023 3:30:00 PM 8.10m 6.83 m
18/01/2023 7:30:00 AM 8.10m 7.1 m
18/01/2023 3:41:00 PM 42.00m 11.21 m
15/01/2023 8:00:00 AM 42.00m 7.11 m

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Cwent: **Auckland Light Rail Limited**
Pro9ect: **Auckland Light Rail**
Location: **Corner of Balmoral and Sandringham**
Pro9ect Reference: **Stage 1 Ground Investigation**

BH2209

Sheet **5** of **10**

BOREHOLE INFORMATION
Method: Rotary Core Wirewine
E| uipment:
Contractor: McMiwan Driwing

CO-ORDINATES: NZTM 2000
Easting: 17l 4564.11m
Northing: l 516424.31m
Reduced wevew 42.41m

Date started: 16/0l /2023
Date compwted: 17/0l /2023
Incwination: -50°
Aqimuth: 0°

Logged by: DY
Input by: DY
Checj ed by: SBN
Reviek ed by: PK

Method	R.L.)m;	Length)m;	Graphic Log	Layer Code	Materiaw Description	Weathering/USC	Testing	TCR)x ;	SCR)x ;	RQD)x ;	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additionaw Notes	Instawation
PQ3	22	21		VUb	**12m:** Swightw k eathered, darj grey, porphyritic, non-vesicuwar BASALT. Strong. Fwk bands generaww dipping 20 degrees.	SW		100	40	57		20m: Dl 3l ° unduwating, smooth, cwean 20.05m: Dl 50° unduwating, rough, cwean 20.1m: Jl l l ° unduwating, rough, cwean 20.16m: Dl 3l ° unduwating, smooth, cwean 20.18m: Dl 4l ° unduwating, smooth, cwean 20.32m: Dl 2l ° unduwating, smooth, cwean 20.37m: Jl 50° 20.44m: Dl l l ° unduwating, smooth, cwean 20.l 1m: Dl l l ° undu ting, smooth, cwean 20.62m: Dl l ° unduwating, smooth, cwean 20.63m: Jl 3l 20.68m to 20.74m: Dl CS 20.75m: JT 7l ° unduwating, smooth, Yewwkish k hite staining 20.5l m: JT l 0° unduwating, smooth, Yewwkish k hite staining 21.02m: Dl 3l ° unduwating, smooth, cwean 21.0l m: Dl 4l ° unduwating, smooth, cwean 21.23m: Dl 1l ° unduwating, smooth, cwean 21.28m: Dl 20° unduwating, smooth, cwean 21.35m: DB 10° unduwating, smooth, cwean 21.l m: Dl 6l ° unduwating, smooth, cwean	
PQ3	21	22						100				21.77m: Dl 70° unduwating, smooth, cwean 21.83m: DB l ° unduwating, smooth, cwean 21.5l m: Dl 4l ° unduwating, smooth, cwean 22.04m: Dl 60° unduwating, smooth, Yewwkish k hite cwy coating	
PQ3	20	23				SW		100	88	100		22.43m: Dl 50° unduwating, smooth, Yewwkish k hite cwy coating. Fractures awong SVJ 22.81m: Dl 60° unduwating, smooth, cwean 22.52m: Dl 60° unduwating, smooth, cwean 23.0l m: Dl 60° unduwating, smooth, Broj en Jl k ith yewwkish k hite staining 23.23m: Dl 60° unduwating, smooth, Broj en Jl k ith yewwkish k hite cwy coating 23.35m: JT 6l ° unduwating, smooth, Yewwkish k hite cwy coating 23.l 7m: JT 7l ° unduwating, smooth, Yewwk staining	
PQ3	15	24						100	85	100		23.87m: Dl 50° unduwating, smooth, Broj en Jl k ith yewwkish k hite staining 24.16m: JT 6l ° unduwating, smooth, Yewwk staining 24.28m: Dl 7l ° pwnar, rough, cwean 24.l l m: Dl 50° unduwating, smooth, Broj en Jl k ith yewwkish k hite staining 24.8l m: Dl l l ° unduwating, smooth, Broj en Jl k ith yewwkish k hite staining	
PQ3	18	2l											

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Cased dok n to 3 m at 4.l mbgw

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
16/0l /2023 3:00:00 PM z5.00m z6 m
17/0l /2023 7:30:00 AM z5.00m z7.4 m
17/0l /2023 3:30:00 PM z28.l 0m z6.83 m
18/0l /2023 7:30:00 AM z28.l 0m z7.1 m
18/0l /2023 3:4l :00 PM z42.00m z11.2l m
15/0l /2023 8:00:00 AM z42.00m z7.l l m

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Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Corner of Balmoral and Sandringham**
Project Reference: **Stage 1 Ground Investigation**

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Sheet **6** of **10**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1751564.11m
Northing: 5516424.31m
Reduced level: 42.41m

Date started: 16/01/2023
Date completed: 17/01/2023
Inclination: -50°
Aqimuth: 0°

Logged by: DY
Input by: DY
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	17	26		VUb	**12m:** Slightly weathered, dark grey, porphyritic, non-vesicular BASALT. Strong. Few bands generally dipping 20 degrees.			100	85	100		24.52m: DB 41° undulating, smooth, clean 21.01m: DI 41° undulating, smooth, Broken with light staining 21.11m: DI 31° undulating, smooth, clean 21.21m: DI 11° undulating, smooth, Broken with few oxide staining 21.36m: DI 50° undulating, smooth 21.44m: DB 60° undulating, smooth, clean	
PQ3	16	27						100				21.51m: DB 61° undulating, smooth, clean 21.61m: DB 61° undulating, smooth, clean 21.68m: DB 10° undulating, smooth, clean 21.71m: DI 50° undulating, smooth, Broken with light oxide staining 21.88m: DB 60° undulating, smooth, clean 26m: DI 71° planar, smooth, Broken with few oxide staining 26.26m: DI 50° undulating, smooth, Broken with few oxide staining 26.47m: DI 40° undulating, smooth, Broken with few oxide staining 26.11m: DI 70° undulating, smooth, Broken with few oxide staining 26.6m: DI 11° undulating, smooth, Broken with few oxide staining 26.5m: DI 60° undulating, smooth, Broken with white staining	
PQ3	11	28				SW		100	100	100		27.05m: DI 11° undulating, smooth, Broken with few oxidised white staining 27.13m: JT 20° undulating, smooth, Stained with grey veins 27.66m: DI 30° planar, smooth, staining FeO 27.8m: DB 30° undulating, smooth, clean 27.56m: DB 11° stepped, smooth, clean 28.01m: DB 41° undulating, rough, clean 28.07m: DB 41° undulating, smooth, clean 28.3m: DB 40° undulating, smooth, clean 28.44m: DI 11° undulating, smooth, staining FeO	
PQ3	14	25			**28.5m:** Few bands generally dipping 10 degrees.			100				28.74m: DI 50° planar, rough, Broken with few oxidised white staining 28.76m: DI 80° undulating, smooth, Broken with few oxidised white staining 28.5m: DB 61° undulating, smooth, clean 28.54m: DI 21° planar, rough, Broken with few greenish blue staining 25m: DI 11° stepped, smooth, Broken with few greenish blue staining 25.12m: DB 0° undulating, rough, clean 25.23m: DI 60° undulating, smooth, Broken with few oxide staining 25.28m: DI 70° undulating, smooth, Broken with few oxide staining 25.16m: DB 1° stepped, smooth, clean 25.6m: DI 11° undulating, smooth, Broken with few clay coating 25.77m: DI 11° undulating, smooth, Broken with few clay coating	
PQ3	13	30											

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Cased down to 3 m at 4.1 mbgw

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
16/01/2023 3:00:00 PM 5.00m 6 m
17/01/2023 7:30:00 AM 5.00m 7.4 m
17/01/2023 3:30:00 PM 28.10m 6.83 m
18/01/2023 7:30:00 AM 28.10m 7.1 m
18/01/2023 3:41:00 PM 42.00m 11.21 m
15/01/2023 8:00:00 AM 42.00m 7.11 m

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Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Corner of Balmoral and Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH2209

Sheet **7** of **10**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1761564.11m
Northing: 5516424.31m
Reduced level: 42.41m

Date started: 16/01/2023
Date completed: 17/01/2023
Inclination: -50°
Aqimuth: 0°

Logged by: DY
Input by: DY
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	12	31		VUb	**12m:** Slightly weathered, dark grey, porphyritic, non-vesicular BASALT. Strong. Few bands generally dipping 20 degrees.	SW		100	100	100		30.42m: JT 60° undulating, smooth, Stained with yellow veins	
PQ3	11	32										31.31m: DB 11° stepped, rough, clean	
PQ3	10	33						100	52	100		31.77m: DI 60° undulating, smooth, Broken with yellow staining 31.87m: DI 11° undulating, rough, Broken with yellow staining 32.14m: DI 71° undulating, smooth, Broken with yellow clay coating 32.31m: JT 30° undulating, smooth, Stained with yellow veins 32.63m: DI 70° undulating, smooth, Broken with yellow clay coating 32.88m: JT 61° undulating, smooth, Becomes SVJ with yellow staining	
PQ3	5	34						100		82		33.21m: JT 40° undulating, smooth, Yellow staining 33.33m: JT 41° undulating, smooth, Yellow staining 33.43m: JT 25° undulating, smooth, Stained with yellow veins 33.11m: JT 11° undulating, smooth, Yellow clay coating 33.16m: JT 40° undulating, smooth, Bluish white staining 33.66m: JT 50° undulating, smooth, Yellow clay coating 33.7m: DI 11° undulating, smooth, Broken with yellow staining 33.52m: JT 31° undulating, smooth, Stained with yellow veins 34.17m: JT 71° undulating, smooth, Yellow staining 34.21m: JT 41° undulating, smooth, Blue staining	
PQ3	8	3l						100	11	85		34.46m: DI 40° undulating, smooth, Broken with yellow staining 34.15m: JT 30° planar, rough, Yellow staining 34.71m: JT 61° undulating, smooth, Yellow staining	

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Cased down to 3 m at 4.1 mbgw

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
16/01/2023 3:00:00 PM 5.00m 6 m
17/01/2023 7:30:00 AM 5.00m 7.4 m
17/01/2023 3:30:00 PM 28.10m 6.83 m
18/01/2023 7:30:00 AM 28.10m 7.1 m
18/01/2023 3:41:00 PM 42.00m 11.21 m
15/01/2023 8:00:00 AM 42.00m 7.11 m

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Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Corner of Balmoral and Sandringham**
Project Reference: **Stage 1 Ground Investigation**

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Sheet **8** of **10**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1771 564.11m
Northing: 1 516424.31m
Reduced level 42.41m

Date started: 16/01/2023
Date completed: 17/01/2023
Inclination: -50°
Aqimuth: 0°

Logged by: DY
Input by: DY
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log	Stratigraphy Defect Description Additional Notes	Installation
PQ3	7			VUb	**12m:** Slightly weathered, dark grey, porphyritic, non-vesicular BASALT. Strong. Few bands generally dipping 20 degrees.	SW		100	11	85		31.04m: DI 80° stepped, rough, Broken JI? with yellow staining 31.07m: JT 60° undulating, smooth, Yellow staining 31.14m: JT 10° undulating, smooth, Yellow staining 31.21m: DI 11° undulating, smooth, Broken JI with FeO 31.11m: JT 10° planar, rough, Bluish yellow staining 31.63m: JT 50° undulating, rough, Stained with yellow veins 31.76m: JT 1° undulating, smooth, Yellow stains with FeO	
PQ3		36		AYq	**35.9m:** SILT, minor clay, trace fine sands(brownish grey. Stiff, moist, low plasticity.	ML		100				35.9m: ALLUVIUM	
SPT	6			AYo	**36m:** Organic sandy SILT, trace clay(brown). Stiff, moist, low plasticity. Organics are amorphous.	OL	36m: SPT 6,5// 5,10,14,13 N = 46	100					
PQ3		37		AYs	**36.83m:** Silty fine SAND, trace clay(bluish grey. Densely packed, moist.	SP-SM		100					
SPT	1			AYq	**37.5m:** SILT, trace fine sands(bluish grey. Very stiff, moist, low plasticity. Sand is weathered pumiceous material	ML	37.1m: SPT 4,6// 8,5,12,11 N = 44	100					
PQ3		38		AYs	**37.95m:** Fine SAND, some silt(bluish grey. Densely packed, moist. Beds are generally dipping 10 degrees.	SP							
PQ3	4			ERq	**38.16m:** SILT, some fine sands and minor clay(bluish grey. Very stiff, moist, low plasticity. Bands of silty clay dipping 10 degrees.	ML		100				38.16m: ECBF	
SPT		35			**39m:** Clayey SILT, minor fine sands(dark grey. Very stiff, moist, low plasticity.	CL-ML	35m: SPT 4,8// 8,11,14,17 for 111mm N = 110+						
PQ3	3			ERs	**39.2m:** Silty fine SAND, minor clay(dark grey. Densely packed, moist.	SM		100					
				EWs	**39.43m:** Highly weathered, dark grey, fine to medium grained SANDSTONE. Extremely weak, non-cemented. Recovered as Fine SAND with trace silt(dark grey. Very dense packed, moist. **39.7m:**...100mm SILTSTONE interbedded with blue beds and black carbonaceous bands dipping 40 degrees.	HW		100					
		40											

REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Cased down to 3 m at 4.1 mbgw

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
16/01/2023 3:00:00 PM 25.00m 26 m
17/01/2023 7:30:00 AM 25.00m 27.4 m
17/01/2023 3:30:00 PM 28.10m 26.83 m
18/01/2023 7:30:00 AM 28.10m 27.1 m
18/01/2023 3:41:00 PM 42.00m 11.21 m
15/01/2023 8:00:00 AM 42.00m 27.11 m

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Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Corner of Balmoral and Sandringham**
Project Reference: **Stage 1 Ground Investigation**

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Sheet **9** of **10**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1761564.11m
Northing: 5516424.31m
Reduced level: 42.41m

Date started: 16/01/2023
Date completed: 17/01/2023
Inclination: -50°
Aqimuth: 0°

Logged by: DY
Input by: DY
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	2			EWs	**39.43m:** Highly weathered, dark grey, fine to medium grained SANDSTONE. Extremely weak, non-cemented. Recovered as Fine SAND with trace silt, dark grey. Very dense, wet, moist. **40.1m:** ...100mm SILTSTONE interbedded with blue beds and black carbonaceous bands dipping 40 degrees.	HW		100					
SPT		41			**40.5m:** CORE LOSS		40.1m: SPT 14,36 for 120mm// N = 100+	0					
PQ3	1			EWs	**40.96m:** Moderately weathered, dark grey, fine to medium grained SANDSTONE. Very weak, poorly cemented.	MW							
				EUs	**41.1m to 41.44m:** ...Unweathered, white, CONCRETION. Moderately strong. **41.44m:** Slightly weathered, dark grey, medium to coarse grained SANDSTONE. Weak, well cemented.	SW		76	17	71		41.3m: DB 10° 41.1m: DI 11° 41.74m to 41.81m: CX Drilling induced	
SPT		42			**42m:** CORE LOSS		42m: SPT 15,3 for 70mm// N = 100+	0					
PQ3	0	43		EUs	**42.11m:** Slightly weathered, dark grey, fine to medium grained SANDSTONE with minor SILTSTONE beds. Weak, well cemented.	SW		100	53	100		42.43m to 42.13m: CX Drilling induced 42.7m: DB 1° 42.81m: DB 0° 43.12m: DB 1° 43.22m: DI 43.41m: DB 0° 43.44m: BP 40° planar, smooth, clean 43.1m to 43.18m: CX Drilling induced	
PQ3	-1	44											
	-2				**44.38m to 44.48m:** ...100mm Slightly weathered, dark grey, SILTSTONE. Weak.			100	85	85		43.52m: DI 10° undulating, rough, clean 44.06m to 44.11m: CX Drilling induced	
		45											

REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Cased down to 3 m at 4.1 mbgl

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
16/01/2023 3:00:00 PM 5.00m 6 m
17/01/2023 7:30:00 AM 5.00m 7.4 m
17/01/2023 3:30:00 PM 28.10m 6.83 m
18/01/2023 7:30:00 AM 28.10m 7.1 m
18/01/2023 3:41:00 PM 42.00m 11.21 m
15/01/2023 8:00:00 AM 42.00m 7.11 m

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Auckland LIGHT RAIL
Bringing us closer

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Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **Corner of Balmoral and Sandringham**
Project Reference: **Stage 1 Ground Investigation**

BH2209

Sheet **10** of **10**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment:
Contractor: McMillan Drilling

CO-ORDINATES: NZTM 2000
Easting: 1761 564.11m
Northing: 1 516424.31m
Reduced level: 42.41m

Date started: 16/01/2023
Date completed: 17/01/2023
Inclination: -50°
Aqimuth: 0°

Logged by: DY
Input by: DY
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	-3	46		EUs	**42.11m:** Slightly weathered, dark grey, fine to medium grained SANDSTONE with minor SILTSTONE beds. Weak, well cemented. **45.07m to 45.25m:**...Slightly weathered, light grey, CONCRETION (?);. Weak.	SW		100	54	54		41.01m: DB 0° 41.11m: DB 0° 41.44m: DB 0° 41.17m to 41.62m: CX Drilling induced 41.64m: DB 0° 46m to 46.06m: DB VCS	
	-4				**46.05m to 46.15m:**...Slightly weathered, light grey, CONCRETION (?);. Weak.							46.36m: DB 0°	
PQ3	-1	47			**46.5m:** Slightly weathered, dark grey, fine to medium grained SANDSTONE. Weak, well cemented. **46.72m:**...Medium to coarse grained.	SW		100	100	100		46.46m to 46.1m: CX Handling induced 46.1m to 46.65m: DB VCS 46.81m: BP 30° undulating, rough, clean 47.11m: BP 30° undulating, smooth, clean 47.3m: BP 30° undulating, smooth, clean	
		48			**47.63m to 47.83m:**.. 200mm band of Slightly weathered, dark grey, MUDSTONE. Weak, thinly laminated. Dipping 31 degrees. **47.83m:**...Coarse grained SANDSTONE. Very weak, poorly cemented.							47.18m: DB 0° 47.87m to 48m: DB CS	
					End of borehole at 48m (Terminated Deeper due to unfavourable ground conditions)								

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REMARKS:
SCR= 1 circumference - 300 mm.
TCR, SCR, and RQD measurements to be revised.
Cased down to 3 m at 4.1 mbgl

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
16/01/2023 3:00:00 PM 5.00m 6 m
17/01/2023 7:30:00 AM 5.00m 7.4 m
17/01/2023 3:30:00 PM 28.10m 6.83 m
18/01/2023 7:30:00 AM 28.10m 7.1 m
18/01/2023 3:41:00 PM 42.00m 11.21 m
15/01/2023 8:00:00 AM 42.00m 7.11 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - GEENA.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARYV2.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

Auckland

Client: **A0ucland Light Rail Ltd**
Project: **A0ucland Light Rail**
Location: **Corner of Arabi and Calgary St**
Project Reference: **Stage 1 Gro0nd Investigation**

BH2211

Sheet **1** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Rig #86
Contractor: DrillForce

CO-ORDINATES: NkTM2ZZZ
Easting: 1754996.79m
Northing: 5915645.06m
Reduced level: 44.12m

Date started: 23/06/2023
Date completed: 28/06/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	44	1			**Zm:** HYDROVAC - No recovery			0				**Zm: FILL**	
PQ3	43			VWb	**1.5m:** Highly weathered, dark grey, highly vesicular, porphyritic, RUBBLY BASALT; moderately strong.	HW		100				**1.5m: AVF**	
PQ3	42	2			**1.3m:** CORE LOSS								
				VWrb	**2.5m:** Moderately, dark grey, highly vesicular, porphyritic, RUBBLY BASALT; moderately strong. Phenocrysts of olivine, pyroxene, plagioclase and feldspars	MW		47	0	7			
		3		VWb	**2.9m:** Moderately weathered, dark grey, highly vesicular, porphyritic, BASALT; strong.	MW							
PQ3	41				**5m:** CORE LOSS			40	0	17			
		4		VUb	**5.9m:** Slightly weathered, dark grey, highly vesicular, porphyritic, BASALT; strong. Phenocrysts of olivine, pyroxene, plagioclase, and feldspars. Defects are very closely spaced. **6.1m to 6.2m:**...Scoraceous band broken by drilling	SW						3.9m: JI 42° 4.1m: JI 35° planar, rough, staining, (Infill: iron oxide) 4.4m: DB undulating, rough, (Infill: clay) 4.5m: JT 25° undulating, rough, coating, (Infill: zeolite)	
	40												
PQ3		5			**6.3m:** CORE LOSS			40	0	27		4.7m: JT 15° undulating, rough, (Infill: zeolite) 4.8m: DB 35° rough, staining, (Infill: zeolite)	

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100% circulation loss at 1.4m
Drillhead rattling whilst going through a vertical joint
No water level reading information provided

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level

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Auckland

Client: **A0ucland Light Rail Ltd**
Project: **A0ucland Light Rail**
Location: **Corner of Arabi and Calgary St**
Project Reference: **Stage 1 Gro0nd Investigation**

BH2211

Sheet **2** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Rig #86
Contractor: DrillForce

CO-ORDINATES: NkTM2ZZZ
Easting: 1754996.79m
Northing: 5915645.06m
Reduced level: 44.12m

Date started: 23/06/2023
Date completed: 28/06/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	39	6			**6.3m:** CORE LOSS								
PQ3	38	6			**3.6m:** Slightly weathered, dark grey, slightly vesicular, porphyritic, BASALT; strong. Phenocrysts of olivine, pyroxene, plagioclase, and feldspars. Defects are moderately widely spaced.	SW		40	0	27		5.6m: JT 35° undulating, rough, (Infill: zeolite) 6m: JT 45° planar, rough, (Infill: zeolite) 6m to 6.75m: DI Drilling issue, recovered as gravel 6m: JT 45° planar, rough, (Infill: zeolite) 6m to 6.75m: DI Drilling issue, recovered as gravel 6m: JT 45° planar, rough, (Infill: zeolite) 6m to 6.75m: DI Drilling issue, recovered as gravel	
PQ3	37	7		VUb	**4.83m:** Slightly weathered, dark grey, slightly vesicular, porphyritic, BASALT; strong. Vesicles are 10-15mm, clean, dip of 35 degrees. Phenocrysts of olivine, pyroxene, plagioclase, and feldspars. Defects are moderately wid ly spaced.			100	0	30		6.75m: JT 45° undulating, rough, veneer, (Infill: zeolite) 7m: JT 35° undulating, rough, (Infill: clay) very soft iron clay	
PQ3	36	8						100	77	100		7.5m: JT 50° undulating, rough, (Infill: clay) 7.7m: JT 30° undulating, rough, (Infill: clay) Drill issues resulted in basalt being grind down to a sand and washed away. 8m: JT 15° planar, rough, staining, (Infill: clay)	
PQ3	35	9			**7.7m:** Scoraceous flow banding material. Dip of 35 degrees.	SW		100	100	100		8.37m: JT 10° undulating, rough, (Infill: zeolite) 8.6m: DB 15° planar, rough, End of core case 8.85m: JT 5° planar, rough, clean scoriaceous 8.85m to 9m: JT 85° undulating, rough, clay, FeO 8.85m: JT 5° planar, rough, clean scoriaceous 8.85m to 9m: JT 85° undulating, rough, clay, FeO 8.95m to 9m: JT 65° undulating, rough, Clay, FeO 9.15m: JT 50° undulating, rough, veneer, (Infill: zeolite) 9.4m: JT 15° undulating, rough, clean 9.7m: JT 35° planar, rough, (Infill: clay) 9.8m: JT 40° undulating, (Infill: clay)	
		10											

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100% circulation loss at 1.4m
Drillhead rattling whilst going through a vertical joint
No water level reading information provided

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level

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Auckland

Client: **A0ucland Light Rail Ltd**
Project: **A0ucland Light Rail**
Location: **Corner of Arabi and Calgary St**
Project Reference: **Stage 1 Gro0nd Investigation**

BH2211

Sheet **5** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Rig #86
Contractor: DrillForce

CO-ORDINATES: NkTM2ZZZ
Easting: 1754996.79m
Northing: 5915645.06m
Reduced level: 44.12m

Date started: 23/06/2023
Date completed: 28/06/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	34	11		VUb	**4.83m:** Slightly weathered, dark grey, slightly vesicular, porphyritic, BASALT; strong. Vesicles are 10-15mm, clean, dip of 35 degrees. Phenocrysts of olivine, pyroxene, plagioclase, and feldspars. Defects are moderately widely spaced.	SW		100	100	100		10.1m to 11.4m: JT 85° undulating, rough, (Infill: clay) 10.3m to 10.65m: JT 75° planar, rough, (Infill: clay) 10.4m: JT 10° undulating, rough, (Infill: clay)	
PQ3	33				**1Z.3m:** Slightly weathered, dark grey, slighly vesicular, porphyritic, BASALT; strong. Vesicles are 5-10mm, clean, dip of 30 degrees. Phenocryst of olivine, pyroxene, plagioclase, and feldspars. Defects are closely spaced, narrow. **1Z.43m:**...Scoriaceous flow banding material. Dip of 15 degrees	SW					10.5m: JT 23° undulating, rough, (Infill: clay) 10.65m: DB 10° undulating, rough, clean Scoriaceous bed 10.78m: JT 40° undulating, rough, (Infill: clay) Scoriaceous bed 10.9m: JT 35° undulating, rough, (Infill: clay) Scoriaceous bed 11m: JT 30° undulating, rough, (Infill: zeolite) Scoriaceous	
					11.1m to 11.6m:...Drilling induced. Recovered as subangular coarse GRAVEL; loose. GRAVEL is UW BASALT			60	0	43		11.1m to 11.2m: Recovered as gravel 11.2m: JT 30° undulating, rough, (Infill: zeolite) 11.3m: JT 20° undulating, rough, (Infill: zeolite)	
		12			**11.6m:** CORE LOSS								
PQ3	32	13		VUb	**12.1m:** Slightly weathered, dark grey, slighly vesicular, porphyritic, BASALT; strong. Vesicles are 5-7mm, clean, dip of 25 degrees. Phenocryst of olivine, pyroxene, plagioclase and feldspars. Defects are closely spaced, narrow.	SW		93	70	83		12m to 13m: JT 85° undulating, rough, (Infill: zeolite) 13.25m: JT 65° planar, rough, (Infill: zeolite) 13.35m to 14.9m: JT 45° undulating, rough, (Infill: zeolite)	
	31				**15m:**...Defects are very closely spaced.								
PQ3	30	14			**16.5m:**...Flow banding structure dip of 20.			100	71	100		13.8m to 13.9m: JT 50° planar, rough, (Infill: clay) 13.9m to 14.05m: JT 45° planar, rough, (Infill: clay) 14.05m to 14.15m: JT 35° planar, rough, (Infill: clay) 14.3m: JT 15° undulating, rough, (Infill: clay) 14.35m to 14.65m: JT 85° undulating, rough, (Infill: clay) 14.5m: DB Scoriaceous	
					16.4m to 16.8m:...Moderately vesicular								
		15			**16.83m:**...Flow banding structure dip of 25.							14.65m: JT 45° planar, rough, clean 14.7m: JT 25° planar, rough, (Infill: zeolite) 14.8m: DB 15° planar, rough	

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100% circulation loss at 1.4m
Drillhead rattling whilst going through a vertical joint
No water level reading information provided

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level

Auckland

Client: **A0ucland Light Rail Ltd**
Project: **A0ucland Light Rail**
Location: **Corner of Arabi and Calgary St**
Project Reference: **Stage 1 Gro0nd Investigation**

BH2211

Sheet **6** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Rig #86
Contractor: DrillForce

CO-ORDINATES: NkTM2ZZZ
Easting: 1754996.79m
Northing: 5915645.06m
Reduced level: 44.12m

Date started: 23/06/2023
Date completed: 28/06/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	29				**12.1m:** Slightly weathered, dark grey, slighly vesicular, porphyritic, BASALT; strong. Vesicles are 5-7mm, clean, dip of 25 degrees. Phenocryst of olivine, pyroxene, plagioclase, and feldspars. Defects are closely spaced, narrow.							14.95m to 15m: JT 75° planar, rough, (Infill: clay) 15m to 15.7m: JT 80° planar, rough, (Infill: clay) 15m to 17.8m: DB Due to ve tical joints 15m to 15.7m: JT 80° planar, rough, (Infill: clay) 15m to 17.8m: DB Due to vertical joints 15m to 15.7m: JT 80° planar, rough, (Infill: clay) 15m to 17.8m: DB Due to vertical joints	
		16						100	100	100			
	28												
PQ3		17		VUb		SW		100	94	100			
	27												
		18										18m to 18.5m: JT 85° undulating, rough, (Infill: clay)	
PQ3	26							100	80	93		18.7m to 19.85m: JT 75°	
		19										19m to 19.15m: JT 30° undulating, rough	
	25											19.2m: JT 75° undulating, rough, (Infill: clay)	
PQ3					**19.3m:**...Scoriaceous flow banding material. Dip of 18 degrees.							19.6m: JT 15° planar, un, (Infill: zeolite)	
								100	68	80		19.7m: JT 25° undulating, rough, (Infill: clay)	
		20											

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100% circulation loss at 1.4m
Drillhead rattling whilst going through a vertical joint
No water level reading information provided

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level

Auckland

Client: **A0ucland Light Rail Ltd**
Project: **A0ucland Light Rail**
Location: **Corner of Arabi and Calgary St**
Project Reference: **Stage 1 Gro0nd Investigation**

BH2211

Sheet **3** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Rig #86
Contractor: DrillForce

CO-ORDINATES: NkTM2ZZZ
Easting: 1754996.79m
Northing: 5915645.06m
Reduced level: 44.12m

Date started: 23/06/2023
Date completed: 28/06/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	24	21		VUb	**2Zm:** Unweathered, dark grey, slightly vesicular, porphyritic, BASALT; strong. Vesicles are 10-20mm, dip of 20 degrees. Phenocrysts of olivine, pyroxene, plagioclase, and feldspars. Defects are closely spaced. **2Z.6m to 2Z.8m:**...Scoriaceous flow banding material. Dip of 25 degrees.			100	68	80		19.95m to 20.25m: JT 80° undulating, rough, clean 20.05m: JT 45° planar, rough, clean 20.3m to 20.65m: JT 90° undulating, rough, (Infill: clay) 20.7m: DB 5° undulating, rough, Along flow 20.85m: DB 35° undulating, rough, Vesicle	
PQ3	23	22		VUb		UW		100	83	93		21.2m: JT 5° undulating, rough, (Infill: zeolite) 21.4m to 21.55m: JT 75° planar, rough, clean 22m: JT 35° planar, rough, veneer, (Infill: clay) 22.1m: JT 40° planar, rough, clean Incipient broken 22.3m to 22.5m: JT 70° planar, rough, coating, (Infill: clay)	
PQ3	22	23		VUb	**25.4m:** CORE LOSS			73	0	0			
PQ3	21	24		VUb	**26m:** Slightly Weathered, dark grey, slightly vesicular, porphyritic, BASALT; strong. Vesicles are 10-20mm, dip of 20 degrees. Phenocrysts of olivine, pyroxene, plagioclase, and feldspars. Defects are closely spaced. **26.1m:**...Vesicles are 15mm **26.43m:**...Flow banding structure **26.9m:**...Scoriaceous flow banding material. Dip of 20	SW		100	40	80		24m: JT 25° planar, rough, veneer, (Infill: zeolite) 24.14m to 22.25m: JT 45° planar, rough, (Infill: clay) 24.3m: JT 25° planar, rough, clean 24.4m: JT 20° 24.45m to 24.65m: JT 55° undulating, rough, (Infill: clay) 24.8m to 24.95m: JT 65° planar, rough, (Infill: clay)	
	20	25											

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100% circulation loss at 1.4m
Drillhead rattling whilst going through a vertical joint
No water level reading information provided

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level

Auckland

Client: **A0ucland Light Rail Ltd**
Project: **A0ucland Light Rail**
Location: **Corner of Arabi and Calgary St**
Project Reference: **Stage 1 Gro0nd Investigation**

BH2211

Sheet **4** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Rig #86
Contractor: DrillForce

CO-ORDINATES: NkTM2ZZZ
Easting: 1754996.79m
Northing: 5915645.06m
Reduced level: 44.12m

Date started: 23/06/2023
Date completed: 28/06/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	19	26		VUb	**26m:** Slightly Weathered, dark grey, slightly vesicular, porphyritic, BASALT; strong. Vesicles are 10-20mm, dip of 20 degrees. Phenocrysts of olivine, pyroxene, plagioclase, and feldspars. Defects are closely spaced. **23.Z3m:**...Scoriaceous flow banding material. Dip of 20			100	40	80		25.05m: DB 10° undulating, rough, clean Along scoriaceous bed 25.05m to 25.5m: JI 90° clean 25.05m: DB 10° undulating, rough, clean Along scoriaceous bed 25.05m to 25.5m: JI 90° clean 25.2m to 25.5m: DB undulating, rough, clean	
PQ3	18											25.5m to 25.85m: JT 80° planar, rough, (Infill: clay)	
												25.9m to 26.1m: JT 75° planar, rough, (Infill: clay)	
								100	60	77		26.1m: JT 40° planar, rough, (Infill: clay) 26.1m to 26.4m: JT 90° undulating, rough, (Infill: zeolite) 26.1m: JT 40° planar, rough, (Infill: clay) 26.1m to 26.4m: JT 90° undulating, rough, (Infill: zeolite) 26.4m: JT 55° planar, rough, (Infill: clay)	
												26.5m: JT 35° planar, rough, (Infill: clay)	
	27											26.9m to 27.1m: JT 55° undulating, rough, clean	
PQ3	17					SW						27.15m: JT 25° undulating, rough	
												27.5m: JT 45° undulating, rough, (Infill: zeolite)	
								100	87	100		27.8m to 27.95m: JT 85° undulating, rough, (Infill: zeolite)	
	28											27.95m: JT 35° undulating, rough, (Infill: zeolite) 28m: JT 65° undulating, rough, (Infill: clay)	
	16												
												28.4m: JT 75° undulating, rough, (Infill: clay)	
PQ3	29												
	15							24	0	0			
		30			**29.9m:** CORE LOSS								

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REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100% circulation loss at 1.4m
Drillhead rattling whilst going through a vertical joint
No water level reading information provided

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level

Auckland

Client: **A0ucland Light Rail Ltd**
Project: **A0ucland Light Rail**
Location: **Corner of Arabi and Calgary St**
Project Reference: **Stage 1 Gro0nd Investigation**

BH2211

Sheet **8** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Rig #86
Contractor: DrillForce

CO-ORDINATES: NkTM2ZZZ
Easting: 1754996.79m
Northing: 5915645.06m
Reduced level: 44.12m

Date started: 23/06/2023
Date completed: 28/06/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	14	31			**29.9m:** CORE LOSS			24	0	0		29.9m: Drill issues resulted in basalt being grind down to a sand and washed away.	
PQ3	13			VUb	**51m:** Slightly weathered, dark grey, slightly vesicular, porphyritic, BASALT; strong. Vesicles are 10-15mm, clean. (Coarse GRAVEL; loose, moist. Poor Recovery due to drill issues)	SW		100	60	90		31.2m: JT 75° undulating, rough, clean, (Infill: zeolite) 31.3m: JT 45° undulating, rough, (Infill: zeolite) 31.45m: JT 50° undulating, rough, (Infill: zeolite) 31.5m to 32.1m: JT undulating, rough, (Infill: zeolite)	
PQ3	12	32			**51.2m:** Unweathered, dark grey, moderately vesicular, porphyritic, BASALT; strong. Vesicles of 10-15mm, infill of dark brown, CLAY; soft. Defects are closely spaced, narrow.	UW		100	87	87		32.2m to 32.6m: JT undulating, rough, (Infill: clay) 32.5m to 32.8m: JT 75° undulating, rough, (Infill: clay)	
				VUrb	**52.33m:** Unweathered, dark g ey, porphyritic RUBBLY BASALT; moderately strong (fine GRAVEL; loose Intermixed with silty CLAY, black; hard, moist, highly plastic)	UW							
SPT	11	33		AUz	**52.9m:** Clayey SILT, black; hard, moist, highly plastic. **55m:**...Dilatant slow	ML	33m: SPT 3,5// 7,10,13,12 N = 42					**52.9m: ALLUVIUM** 32.9m to 33.8m: Interpretted as baked paleosol.	
				AUc	**55.1m:** Silty CLAY, dark brown black; hard, moist, low plasticity.	CL		100					
PQ3	10	34			**55.7m:** Clayey SILT, greenish grey; hard, moist, low plasticity.	CL		100					
				AUz	**56.5m:** Clayey SILT minor fine sand, greenish grey; dense, moist. Partial cementation (?)	ML							
SPT					**56.3m:** Clayey SILT, greenish grey; hard, moist, low plasticity.	ML	34.5m: SPT 2,3// 4,5,7,8 N = 24	80					
		35			**56.83m:** Clayey SILT some fine sand, greenish light grey; very soft, moist, low plasticity.	ML		100					

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100% circulation loss at 1.4m
Drillhead rattling whilst going through a vertical joint
No water level reading information provided

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level

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Client: A0ucland Light Rail Ltd
Project: A0ucland Light Rail
Location: Corner of Arabi and Calgary St
Project Reference: Stage 1 Gro0nd Investigation

BH2211

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Rig #86
Contractor: DrillForce

CO-ORDINATES: NkTM2ZZZ
Easting: 1754996.79m
Northing: 5915645.06m
Reduced level: 44.12m

Date started: 23/06/2023
Date completed: 28/06/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	9			AUz	**56.83m:** Clayey SILT some fine sand, greenish light grey; very soft, moist, low plasticity.	ML							
					53.13m: silty fine SAND, minor clay, trace organics. grey; medium dense, moist. RS-ECBF	RS		100				**53.13m:** ECBF	
		36		ERs	**53.7m:** Completely weathered, grey, silty fine SANDSTONE; extremely weak, extremely poorly cemented. Soil description: silty fine SAND, grey; moderately dense, moist. presence of wood fragments.	RS	36m: SPT 3,4// 5,5,9,10 N = 29	100					
SPT	8				**54.8m:**...BCM fragments								
PQ3		37			**54.7m:** Moderately weathered, dark grey, normally graded, fine SANDSTONE; extremely weak, poorly cemented.	MW		100					
	7				**58m to 58.6m:**...Defects are narrowly spaced. **58.1m:**...BCM bed. Dip of 35 degrees **58.5m to 58.6m:**...100mm thick bed of moderately weathered SILTSTONE; very weak. **58.6m:** Moderately weathered, grey, normally graded, fine to medium SANDSTONE; weak, poorly cemented. Defects are closely spaced.		37.5m: SPT 5,10// 12,12,16,10 for 35mm N = 50+	100	0	83		37.25m to 37.3m: JT 35° undulating, rough, clean	
SPT		38		EWs									
PQ3	6				**57.5m:**...10mm band of moderately weathered SILTSTONE; very weak	MW		74	56	74			
		39					39m: SPT 7,23// 50 for 70mm N = 50+	0					
SPT	5												
PQ3				EUi	**59.22m:** Slightly weathered, grey, interbedded SILTSTONE and SANDSTONE. SANDSTONE (90%) is slightly weathered, grey, normally graded, fine to medium SANDSTONE; very weak, poorly cemented. SILTSTONE is thin beddings of slightly weathered, grey, SILTSTONE; very weak to weak. Defects are closely spaced to moderately widely spaced, narrow. **59.5m to 59.51m:**...10mm thick bed of slightly weathered SILTSTONE; very weak	SW		109	39	86		39.3m: BP 25° 39.5m: JT 35° undulating, rough, clean 39.7m: DB 15° rough, clean	
		40			**59.9m to 6Zm:**...100mm thick bed of slightly weathered								

REMARKS:
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100% circulation loss at 1.4m
Drillhead rattling whilst going through a vertical joint
No water level reading information provided

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level

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Client: **A0ucland Light Rail Ltd**
Project: **A0ucland Light Rail**
Location: **Corner of Arabi and Calgary St**
Project Reference: **Stage 1 Gro0nd Investigation**

BH2211

Sheet **9** of **9**

BOREHOLE INFORMATION
Method: Rotary Core Wireline
Equipment: Rig #86
Contractor: DrillForce

CO-ORDINATES: NkTM2ZZZ
Easting: 1754996.79m
Northing: 5915645.06m
Reduced level: 44.12m

Date started: 23/06/2023
Date completed: 28/06/2023
Inclination: -90°
Azimuth: 0°

Logged by: CJ
Input by: CJ
Checked by: SBN
Reviewed by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
PQ3	4			EUi	SILTSTONE; very weak	SW		109	39	86		39.9m: JT 35° undulating, rough, clean Drill break along bedding 39.9m to 40m: DB 35° undulating, rough, Broken along siltstone bed	
SPT				EUz	**6Z.53m:** Slightly weathered, grey, thinly laminated SILTSTONE; very weak. **6Z.43m to 6Z.73m:**...200mm thick bed of BCM.	SW	40.5m: SPT 11,39// N = 50+	0				39.9m: JT 35° undulating, rough, clean Drill break along bedding 39.9m to 40m: DB 35° undulating, rough, Broken along siltstone bed 39.9m: JT 35° undulating, rough, clean Drill break along bedding 39.9m to 40m: DB 35° undulating, rough, Broken along siltstone bed 40.1m: JI 25	
PQ3	3	41		EUi	**6Z.83m:** Unweathered, grey, interbedded SILTSTONE and SANDSTONE. SANDSTONE (90%) is unweathered, normally graded, fine to medium SANDSTONE; very weak. SILTSTONE (10%) is thin to moderately thin beddings of unweathered, SILTSTONE; very weak. Defects are widely spaced. **61.5m:**...5mm thick bed of BCM. Dip of 25 degrees. **61.3m:**...75mm thick bed of unweathered SILTSTONE; very weak. **61.8m:**...5mm thick bed of BCM. Dip of 25 degrees.	UW		100	100	100		40.95m: DB stepped, rough 41.05m: DB stepped, rough 41.4m: DB 15° undulating, rough, Along flow	
PQ3	2	42		EUi	**62.2m:**...Soft sediment deformation structure - Convolute bedding **62.23m:**...100mm thick bed of unweathered SILTSTONE; very weak **62.3m:**...150mm thick bed of unweathered SILTSTONE; very weak **62.7m to 65m:** ...5mm thick bed of BCM. Dip of 20 degrees.	UW		100	100	100		42.22m: JI 35° (Infill: zeolite) 42.55m: JI 30° (Infill: zeolite)	
PQ3	1	43		EUs	**65.2m:** Unweathered, grey, normally graded, fine to medium SANDSTONE; weak, moderately cemented. Presence of soft sediment deformation structures. **65.5m:**...Soft sediment deformation structure	UW						43.2m: BP 30°	
PQ3	0	44		EUz	**65.3m:** Unweathered, grey, SILTSTONE; weak. Defects are widely spaced, narrow. **65.4m to 65.43m:**...50mm thick bed of BCM. Dip of 15 degrees.	UW							
				EUs	**65.8m:** Unweathered, grey, normally graded, fine to medium SANDSTONE; weak. Defects are moderately widely spaced. Inclusion of siltstone GRAVEL. GRAVEL is unweathered, greenish grey, SILTSTONE.	UW		100	100	100		43.7m: BP 25° Broken drill	
		45			**66.3m:** Unweathered, grey, normally graded, fine to medium SANDSTONE; weak, well cemented. Defects are moderately widely spaced, narrow.	UW						44.6m: DB Along flow	

REMARKS: End of borehole at 45m (Termination Depth Achieved)
SCR= 1 circumference - 300 mm
TCR, SCR, and RQD measurements to be revised.
100% circulation loss at 1.4m
Drillhead rattling whilst going through a vertical joint
No water level reading information provided

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level

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Client: C6ucland Light Rail Limited
Project: C6ucland Light Rail
Location: kP Lambeth Road, 2andringham
Project Reference: 2tage 1 Gro6nd Investigation

OH0010

Sheet 1 of B

OERI HELI NVFERACTNEM Method: Rotary Core Wireline E| uipment: Massenqa MI4 Contractor: McMilkan Drilking	- ESERDNVCTI 2: MZTA 0. . . Easting: 17w4873.64m Northing: w51ww38.14m Reduced levek 43.24m	Date started: 28/06/2023 Date completed: 4/07/2023 Inclination: -50° Aqimuth: 0°	Logged by: CR Input by: CR Checj ed by: PK Reviel ed by: PK

Method	R.L. ;mx	Length ;mx	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR ;%x	SCR ;%x	RQD ;%x	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
VACEX	43	1		HTq	. m: Clayey SILT(darj brol n. Very soft, moist, high plasticity.	CL-ML						. m: TEV2ENL	
VACEX	42	1		FUg	. 54m: silty clayey GRAVEL l ith some cobbles(darj grey. Loose, moist. Gravekis fine to coarse, highly l eathered, highly vesicular, moderately strong basalt. Basalt cobbles up to 100mm diameter.	GW-GM						. 54m: FNLL	
HQ				VWrb	154m: Highly l eathered, highly vesicular darj grey rubbly BASALT(moderately strong. Clay matri) , rootlets.	HW		100				154m: C9F	
HQ	41	2		VWb	15PPm: Moderately l eathered, blacj , highly vesicular porphyritic BASALT(very l eaj . Plagioclase visible, vesicles 1-30mm, rootlets, FeO staining.	MW						1.wwm: JT 40° undulating, rough, veneer, ;Infilk clayx	
HQ					153Pm: Slightly l eathered, blacj , highly vesicular BASALT(moderately strong. Vesicles 1-3mm diameter. Fractures l idely spaced, iron stained.							1.5m: DB w° undulating, rough, clean	
HQ					051m:...Vesicular flol banding, dip w°, vesicles 2-6mm.	SW		100	77	77		2.1m: DB w° undulating, rough, clean 2.2wm to 2.wwm: JT 70° undulating, smooth	
HQ		3			053Pm:...Flol banding, dip w-1w°.							2.8m: JT 40° undulating, smooth 2.81m: JT 50° undulating, smooth, veneer, ;Infilk clayx curvilinear	
HQ	40	3		VUb	4m: Slighly l eathered, blacj , moderately vesicular BASALT(m derately strong. Vesick s 2-10mm diameter.							3.1m: DB 3w° undulating, rough, staining, ;Infilk clayx	
HQ		4			458m:...Vesicular flol banding, dip 20°, 2-10mm diameter.	SW		100	100	100		3.w3m: DB w° undulating, rough, clean along 1wmm vesicle opening 3.6wm: JT 20° undulating, smooth	
HQ	35	4			854Pm:...Flol banding, dip 1w°. 858Pm:...Oriented vesicles 1w°, 2-1wmm diameter.							4.6m: JT 80° planar, rough, veneer, ;Infilk clayx	
HQ		w						100	w5	w5			

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REMARKS:
SCR = 1 circumference = 200mm
TCR, SCR, and RQD measurements to be revised.
Driller noted l ater return, 2m casing installed
Driller noted l ater loss at w.wm

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
28/06/2023 2:12:00 PM z12.00m z4.6 m
25/06/2023 8:00:00 AM z12.00m z4.62 m
25/06/2023 3:20:00 PM z27.00m z7.6 m
30/06/2023 7:40:00 AM z27.00m z4.7wm
30/06/2023 1:06:00 PM z36.00m z4.wm
3/07/2023 7:4w:00 AM z36.00m z4.72 m
3/07/2023 12:48:00 PM z43.w0m z3.6wm
4/07/2023 7:30:00 AM z43.w0m z4.22 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARY.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

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Client: Auckland Light Rail Limited
Project: Auckland Light Rail
Location: KP Lambeth Road, Wandringham
Project Reference: Stage 1 Ground Investigation

OH0010

Sheet 1 of 3

BOREHOLE INFORMATION	**GEOMETRY**		
Method: Rotary Core Wireline	Easting: 1757487.64m	Date started: 28/06/2023	Logged by: CR
Equipment: Massenza MI4	Northing: 5917738.14m	Date completed: 4/07/2023	Input by: CR
Contractor: McMillan Drilling	Reduced Level: 43.24m	Inclination: -50°	Checked by: PK
		Azimuth: 0°	Revised by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ	38			VUb	**0.4m:** Slightly weathered, black, moderately vesicular BASALT, moderately strong. Vesicles 2-10mm diameter.	SW							
					0.50m: ...Vesicular zone 60mm, reddish corona.								
					0.58m: Highly weathered, black, highly vesicular BASALT, moderately strong. Vesicles 2-4mm.	HW		100	95	95		0.3m to 0.4m: JT 20° planar, smooth, staining, Infilled clay (3mm), soft, vesicular zone on face as at 0.2m	
	6				**1.38m:** Moderately weathered, black, highly vesicular BASALT, moderately strong. Vesicles 2-10mm, up to 30mm.							0.8m: JT 30° undulating, smooth, veneer, Infilled clay	
HQ	37											1.3m: JT 40° undulating, smooth, veneer, Infilled silty vesicle infilled white clay	
												1.3m to 1.42m: JT undulating, smooth, staining, Infilled clay (3mm) set, top dip 30°, bottom dip 20°	
					1.53m to 1.70m: ...Dark brown, vesicles 1-7mm, flow banding generally dipping 10°.			100	51	51		1.8m to 1.3m: JT 80° planar, rough, veneer, Infilled clay curvilinear, series of perpendicular drilling breaks	
	7												
	36												
												2.6m to 2.1m: JI 50° clean curvilinear	
												2.8m: DB 10° undulating, rough	
	8					MW						3.1m: DB 72° undulating, smooth, clean	
HQ	3w				**3.20m:** ...33mm elongate vesicle, dip 30°.			100	6w	6w		3.2m: DB 38° stepped, smooth, clean 20mm vesicle opening and 4mm olivine phenocryst on face 3.3m: C+ top dip 30°, UndRo, bottom dip 30°, StSm, fine to coarse subrounded gravel 3.4m to 3.7m: JT 50° undulating, smooth, coating, Infilled clay curvilinear, multiple DB perpendicular to JT, 30°, UndSm, clay 3.6m: JT 10° planar, rough, veneer, Infilled clay 3.6m: JT 30° planar, rough, veneer, Infilled clay 3.8m: JT 20° undulating, rough, veneer, Infilled clay	
	5												
	34											5.2m: JI 70° clean	
HQ								100	61	82			
	10				**3.83m:** ...20mm vesicle, white clay veneer.								

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REMARKS:
SCR = 1 circumference = 200mm
TCR, SCR, and RQD measurements to be revised.
Driller noted water return, 2m casing installed
Driller noted water loss at 3.3m

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
28/06/2023 2:12:00 PM 12.00m 4.6 m
25/06/2023 8:00:00 AM 12.00m 4.62 m
25/06/2023 3:20:00 PM 27.00m 7.6 m
30/06/2023 7:40:00 AM 27.00m 4.73m
30/06/2023 1:06:00 PM 36.00m 4.3m
3/07/2023 7:43:00 AM 36.00m 4.72 m
3/07/2023 12:48:00 PM 43.30m 3.63m
4/07/2023 7:30:00 AM 43.30m 4.22 m

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Client: **C6ucland Light Rail Limited**
Pro9ect: **C6ucland Light Rail**
Location: **kP Lambeth Road, 2andringham**
Pro9ect Reference: **2tage 1 Gro6nd Investigation**

OH0010

Sheet **4** of **B**

OERI HELI NVFERACTNEM
Method: Rotary Core Wireline
E| uipment: Massenqa MI4
Contractor: McMilkan Drilling

- ESERDNMCTI 2: MZTA 0. . .
Easting: 17w4873.64m
Northing: w51ww38.14m
Reduced levek 43.24m

Date started: 28/06/2023
Date completed: 4/07/2023
Inclination: -50°
Aqimuth: 0°

Logged by: CR
Input by: CR
Checj ed by: PK
Reviel ed by: PK

Method	R.L. ;mx	Length ;mx	Graphic Log	Layer Code	MateriakDescription	Weathering/USC	Testing	TCR ;%x	SCR ;%x	RQD ;%x	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description AdditionakNotes	Instalkation
HQ	33	11		VWb	**1. m:** Moderatek l eathered, blacj , slightly vesicular porphyritic BASALT(l eaj .	MW		100	61	82		5.5m: JT 3w° planar, rough, veneer, ;Infilk clayx scoriaceous 10.1m: JT 10° planar, rough, veneer, ;Infilk clayx scoriaceous, along flol banding 10.11m: JT 8w° undulating, smooth, veneer, ;Infilk clayx curvilinear 10.2m to 10.wm: JT 10° veneer ;Infilk clayx 4) set, perpendicular drilkbreaj s 10.33m: JT 70° undu ating, rough, veneer, ;Infilk clayx 2) set	
				VWrb	**1. 5kPm:**...Vesicle 25mm, vesicular flol banding oriented 10°.	MW							
HQ	32				**1. 5Bm:** Recovered as moderatek l eathered, darj grey, highly vesicular rubbly BASALT(moderatek strong. **11m:** CORE LOSS			60	0	12		10.7m: JT 10° s epped, smooth, staining, ;Infilk iron o)idex 10.71m: JT 10° undulating, rough, clean 10.8m: JT 30° undulating, smooth, staining, ;Infilk clayx 20mm vesicle opening on face 10.8wm: JI 4w° undulating, rough, staining, ;Infilk clayx 2) interconnected, tight 10.5m: JT 1w° stepped, rough, staining, ;Infilk clayx 11m: Potentialk l ashed out ash deposit	
		12		Vaf	**115.7m:** Fine to medium gravelk SILT l ith some sand(reddish brol n. Firm, lol plasticity, moist. Gravekis subrounded reddish orange kapilki-bearing ash.	ML							
	31			VWrb	**115.km:** Moderatek l eathered, blacj , highly vesicular rubbly BASALT(l eaj . Vesicle infilkconsists of greyish purple silt.	HW							
HQ				VUb	**1054m:** Slightly l eathered, blacj , highly vesi ular porphyritic BASALT(moderatek strong. Ve icles 2-30mm. **105.Bm:**...Flol banding 10°. **1057m:**...Slightly vesicular, vesicular flol banding 30°, vesicles predominantly 0.w-10mm.	SW		88	21	w3		12.6m: DB 60° undulating, smooth 12.7m: C+ undulating, smooth, coating, ;Infilk clayx top 10°, bottom w6°, fine gravekto cobbles of basalt, subrounded	
		13		VUw	**105.Bm:** CORE LOSS								
	30			VUb	**14m:** Slig tly l eathered, blacj , slightly vesicular porphyritic BASALT(m derately strong.	SW						12.5m: Interpretted as VOID - drilker noted rod drop 12.5m to 13m: undulating, smooth, coating, ;Infilk clayx void upper face 3w°, lol er face 1w° 12.5m: Interpretted as VOID - drilker noted rod drop 12.5m to 13m: undulating, smooth, coating, ;Infilk clayx void upper face 3w°, lol er face 1w° 12.5m: Interpretted as VOID - drilker noted rod drop 12.5m to 13m: undulating, smooth, coating, ;Infilk clayx void upper face 3w°, lol er face 1w°	
HQ					**145.km:**...60mm elongate vesicle 3w°.							13.0wm: JT 28° planar, rough, veneer, ;Infilk clayx 13.2m: JT w0° stepped, rough, coating, ;Infilk clayx subangular fine basalt gravek 13.6m: JT 50° undulating, smooth, veneer, ;Infilk clayx curvilinear 13.8wm: DB w0° planar, rough, clean 1wmm vesicle opening on face	
	25	14						100	73	83		14.3m: JT w° undulating, smooth, ;Infilk clayx along flol banding 14.32m: JT 70° planar, rough, veneer, ;Infilk clayx 14.3wm: JT 20° stepped, smooth, along flol banding 14.4wm: JT 4w° planar, rough, staining, ;Infilk clayx 14.7wm: JT 32° undulating, smooth, veneer, ;Infilk clayx	
		1w											

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REMARKS:
SCR = 1 circumference = 200mm
TCR, SCR, and RQD measurements to be revised.
Drilker noted l ater return, 2m casing instalked
Drilker noted l ater loss at w.wm

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
28/06/2023 2:12:00 PM z12.00m z4.6 m
25/06/2023 8:00:00 AM z12.00m z4.62 m
25/06/2023 3:20:00 PM z27.00m z7.6 m
30/06/2023 7:40:00 AM z27.00m z4.7wm
30/06/2023 1:06:00 PM z36.00m z4.wm
3/07/2023 7:4w:00 AM z36.00m z4.72 m
3/07/2023 12:48:00 PM z43.w0m z3.6wm
4/07/2023 7:30:00 AM z43.w0m z4.22 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARY.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

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Client: C6ucland Light Rail Limited
Pro9ect: C6ucland Light Rail
Location: kP Lambeth Road, 2andringham
Pro9ect Reference: 2tage 1 Gro6nd Investigation

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Sheet 8 of B

OERI HELI MFERACTNEM Method: Rotary Core Wireline E| uipment: Massenqa MI4 Contractor: McMilkan Drilking	- ESERDNMCTI 2: MZTA 0. . . Easting: 17w4873.64m Northing: w51ww38.14m Reduced levek 43.24m	Date started: 28/06/2023 Date completed: 4/07/2023 Inclination: -50° Aqimuth: 0°	Logged by: CR Input by: CR Checj ed by: PK Reviel ed by: PK

Method	R.L. ;mx	Length ;mx	Graphic Log	Layer Code	MateriakDescription	Weathering/USC	Testing	TCR ;%x	SCR ;%x	RQD ;%x	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description AdditionakNotes	Instalkation
HQ	28	16		VUb	**14m:** Slightly l eathered, blacj , slightly vesicular porphyritic BASALT(moderately strong. **1Pm:**...Vesicles predominantly 1-20mm. **1P5 Pm:**...Vesicles oriented 40°.	SW		100	83	5w		1wm: DB 20° DB along flol banding 1w.0wm: DB 20° undulating, smooth, staining, ;Infilk iron o)idex 10mm vesicle openings 1w.2m: JT 3w° undulating, ro gh, veneer, ;Infilk clayx along vesicular band fine to medium subangular basak 1w.4m: DB 70° undulating, smo h, clean 1w.wm: scoriaceous, spun core ;Zx 1w.7m: DB 8w° planar, smooth, curviknear 1w.5m: DB 40° planar, rough, clean scoriaceous 1w.56m: JT 7w° planar, rough, veneer, ;Infilk clayx 16.0wm to 16.7wm: JT 7w° undulating, smooth, curviknear, scoriaceous along 9oint face	
	27												
HQ	26	17						100	84	84		16.8wm: JT 80° planar, rough 16.86m: JT 80° planar, smooth, coating, ;Infilk clayx tight 17.1wm: DB spun core 17.2m to 17.wm: JT 50° stepped, smooth, veneer, ;Infilk clayx curviknear	
	2w	18										17.wm: DB w° planar, rough, clean 17.w1m: JT 70° planar, rough, veneer, ;Infilk clayx 17.6wm: JT 6w° planar, rough, veneer, ;Infilk clayx 17.7m: DB 1w° undulating, smooth, clean 17.7wm: JI 7w° clean 17.5wm: JT 20° planar, rough, clean DB ;Zx 18m: JT 60° planar, rough, staining, ;Infilk clayx DB ;Zx	
HQ								100	60	87		18.3m: JT 30° planar, rough, staining, ;Infilk clayx DB ;Zx 18.4wm: JT w0° planar, rough, staining, ;Infilk clayx 18.wm: JT 40° planar, rough, veneer, ;Infilk clayx 18.w6m: JT 8w° undulating, smooth, veneer, ;Infilk clayx multiple perpendicular drilkbreaj s 18.7m: JI 40° clean scoriaceous	
	15											18.5wm: JT 30° planar, rough, clean	
	24												
HQ								87	77	77		15.4m: JT 4w° stepped, smooth, staining, ;Infilk iron o)idex	
	20												

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REMARKS:
SCR = 1 circumference = 200mm
TCR, SCR, and RQD measurements to be revised.
Drilker noted l ater return, 2m casing instalked
Drilker noted l ater loss at w.wm

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
28/06/2023 2:12:00 PM z12.00m z4.6 m
25/06/2023 8:00:00 AM z12.00m z4.62 m
25/06/2023 3:20:00 PM z27.00m z7.6 m
30/06/2023 7:40:00 AM z27.00m z4.7wm
30/06/2023 1:06:00 PM z36.00m z4.wm
3/07/2023 7:4w:00 AM z36.00m z4.72 m
3/07/2023 12:48:00 PM z43.w0m z3.6wm
4/07/2023 7:30:00 AM z43.w0m z4.22 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ **Library file:** GINT STD AGS 4_0 V27_UPDATED_LIBRARY.GLB **Template:** DATATEMPLATE.GDT **Report File:** 01 ALR DH LOG **Date Generated:** 28/07/2023

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Client: Auckland Light Rail Limited
Project: Auckland Light Rail
Location: SH1 Lambeth Road, Pukeranga
Project Reference: Stage 1 Ground Investigation

OH0010

Sheet 1 of 1

DRILLING INFORMATION	**EASTING AND NORTHING**	Date started: 28/06/2023	Logged by: CR
Method: Rotary Core Wireline	Easting: 1774873.64m	Date completed: 4/07/2023	Input by: CR
Equipment: Massenza MI4	Northing: 5451738.14m	Inclination: -50°	Checked by: PK
Contractor: McMillan Drilling	Reduced Level: 43.24m	Aqimuth: 0°	Revised by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ	23	1.4		VUb	**1.4m:** Slightly weathered, black, slightly vesicular porphyritic BASALT, moderately strong.	SW		87	77	77		15.5m: DB wavy planar, rough, clean 20m: JT 50° planar, rough, coating, Infilk clayx 20.1m: JT 80° undulating, smooth, veneer, Infilk clayx curvilinear 20.4m: JT wavy undulating, smooth, coating, Infilk clayx coarse sand to fine gravel, subrounded to subangular basalt 20.7m: JT 60° undulating, smooth, veneer, Infilk clayx **0.3Pm: CLLUSION**	
				AUc	**0.5-3Pm:** Silty CLAY, minor fine siltstone gravel, brown. Very soft, moist, high plasticity. Gravel is subrounded siltstone.	CL-ML							
	21	0.5			**0.5m:** CORE LOSS								
HQ		1.0		AUg	**1m:** Fine to medium silty GRAVEL, grey. Gravel subrounded to subangular.	GW-GM		100					
	22	1.5		AUq	**1.5-2Pm:** SILT, minor clay, minor fine to medium gravel, brown. Soft, moist, moderate plasticity. Gravel is subrounded siltstone.	ML							
		1.8			**1.5-1.8Pm:** SILT, some clay, brown. Firm, moist, low plasticity.	ML							
		2.0		AUg	**1.8-3m:** ...Minor fine sand, organics present. Sand is fluvial, organics are fibrous wood fragments 20mm in length.								
HQ	21	2.5			**2-5Pm:** silty fine to medium GRAVEL, grey. Gravel is subrounded siltstone.	GW-GM		100					
	22	3.0			**2.5-3Pm to 3.0-3m:** ...SILT, trace organics, brown. Soft, moist, low plasticity. Dilatant, 2) 6mm thick organic beds, ~10° dip, organics consist of wood.								
		3.5			**3.0-3.5Pm:** ...Trace fine sand, mica.								
PUSHTUBE		4.0		AUq	**3.5-4m:** Fine to medium sandy SILT, brown. Very soft, moist, low plasticity. Dilatant.	MI-SP		100					
	23	4.5			**4-5Pm:** ...Some sand.								
SPT	20	5.0			**4.5m:** SILT, with some fine sand, light brown. Soft, moist, moderate plasticity.	MI	23m: SPT 1,2// 2,2,2,3 N = 5	100					
		5.5			**5-5.5Pm:** ...Some clay.								
HQ		6.0			**5.5-6Pm:** CORE LOSS			86					
	24	6.5		AUd	**6.5m:** Fine to coarse SAND, with minor silt, grey. Loose, moist. Orange subangular volcaniclastic grains.	SW-MI							
		6.8		AUs	**6.5-6.8m:** SILT, with some clay, light brown. Firm, moist, moderate plasticity.								
SPT	15	8.0		ERs	**8m:** SILT, minor clay, trace fine to coarse sand, grey with white mottles. Very soft, moist, moderate plasticity. **8-8.5Pm:** ...Grey.	MI	24m: SPT 1,2// 2,2,3,3 N = 10	100				**8m: END OF**	
HQ		8.5						100					
	2w												

REMARKS:
SCR = 1 circumference = 200mm
TCR, SCR, and RQD measurements to be revised.
Driller noted water return, 2m casing installed
Driller noted water loss at w.wm

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
28/06/2023 2:12:00 PM z12.00m z4.6 m
25/06/2023 8:00:00 AM z12.00m z4.62 m
25/06/2023 3:20:00 PM z27.00m z7.6 m
30/06/2023 7:40:00 AM z27.00m z4.7wm
30/06/2023 1:06:00 PM z36.00m z4.wm
3/07/2023 7:4w:00 AM z36.00m z4.72 m
3/07/2023 12:48:00 PM z43.w0m z3.6wm
4/07/2023 7:30:00 AM z43.w0m z4.22 m

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Auckland LIGHT RAIL
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Client: C6ucland Light Rail Limited
Prose ct: C6ucland Light Rail
Location: kP Lambeth Road, 2andringham
Prose ct Reference: 2tage 1 Gro6nd Investigation

OH0010

Sheet 7 of B

OERI HELI NVFERACTNEM Method: Rotary Core Wireline E| uipment: Massenqa MI4 Contractor: McMilkan Drilking	- ESERDNMCTI 2: MZTA 0. . . Easting: 17w4873.64m Northing: w51ww38.14m Reduced levek 43.24m	Date started: 28/06/2023 Date completed: 4/07/2023 Inclination: -50° Aqimuth: 0°	Logged by: CR Input by: CR Checj ed by: PK Reviel ed by: PK

Method	R.L. ;mx	Length ;mx	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR ;%x	SCR ;%x	RQD ;%x	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Instalkation
HQ	18	26		ERs	**08m:** SILT, minor clay, trace fine to coarse sand(grey l ith l hite mottles. Very soft, moist, moderate plasticity. **0P54m:**...Greenish grey. **0P58m:**... Minor fine sand(greenish grey.	MI	2w.wm: SPT 2,2// 3,3,w,w N = 16	100					
SPT					**0P53Pm:** CORE LOSS			w6					
HQ	17	27		ERq	**0P53Pm:** SILT l ith minor fine to medium sand(grey. Very soft, moist, moderate plasticity. **075Bm:**...Minor fine subrounded siltstone gravek **075Pm:**...Some fine sand, non plastic. **075kPm:**...Dilatant.	MI		100					
SPT	16			ERs	**03m:** Fine sandy SILT(greenish grey. Medium dense, d y, non plastic.	MI SP	27m: SPT 2,4// 6,6,7,5 N = 28	0					
HQ	1w	28		ERs	**035PPm:** Fine SAND, some silt(greenish grey. Medium dense, moist, non plastic.	SP		100					
SPT		25		ERs	**0k5Pm:** F ne sandy SILT(reddish brol n. Soft, dry, non plastic. **0k53Pm:** . Grey.	MI-SP	28.wm: SPT 3,4// 6,6,6,5 N = 27	100					
HQ	14			ERq	**0k5BPm:** Fine to coarse sandy SILT(grey. Very soft, moist, lol plasticity. **0B54m:**...Fine to medium sand, lol plasticity.	MI-SP		5w				28.5wm: BP w' core disturbed removing from splkt, sub-horiqontakbeds of laminated siltstone observed	
		30		ERs	**0B57m:** Silty fine to medium SAND(grey. Dense, moist, non plastic.	SM							

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REMARKS:
SCR = 1 circumference = 200mm
TCR, SCR, and RQD measurements to be revised.
Drilker noted l ater return, 2m casing instalked
Drilker noted l ater loss at w.wm

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
28/06/2023 2:12:00 PM z12.00m z4.6 m
25/06/2023 8:00:00 AM z12.00m z4.62 m
25/06/2023 3:20:00 PM z27.00m z7.6 m
30/06/2023 7:40:00 AM z27.00m z4.7wm
30/06/2023 1:06:00 PM z36.00m z4.wm
3/07/2023 7:4w:00 AM z36.00m z4.72 m
3/07/2023 12:48:00 PM z43.w0m z3.6wm
4/07/2023 7:30:00 AM z43.w0m z4.22 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARY.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

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Clkent: **C6ucland Light Rail Limited**
Pro9ect: **C6ucland Light Rail**
Location: **kP Lambeth Road, 2andringham**
Pro9ect Reference: **2tage 1 Gro6nd Nnvestigation**

OH0010

Sheet **3** of **B**

OERI HELI NMFERACTNEM Method: Rotary Core Wirekine E| uipment: Massenqa MI4 Contractor: McMilkan Drilking	**- ESERDNMCTI 2: MZTA 0. . .** Easting: 17w4873.64m Northing: w51ww38.14m Reduced kevek 43.24m	Date started: 28/06/2023 Date completed: 4/07/2023 Inckination: -50° Aqimuth: 0°	Logged by: CR Input by: CR Checj ed by: PK Reviel ed by: PK

Method	R.L. ;mx	Length ;mx	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR ;%x	SCR ;%x	RQD ;%x	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additionak Notes	Instalkation
SPT	13				**4. m:** Highky l eathered, grey, fine to coarse SANDSTONE, e)tremeky l eaj . Soikdescription: SAND, some silk(grey. Dense, moist, non plastic. Sand is fine to coarse, | uartq, subangukar.		30m: SPT 3,4// 6,8,10,12 N = 36	100					
HQ		31			**415 Pm:**...Thinky laminated silt bed w0°.			5w					
	12				**415 lm:**...Lol plasticity, dikatant.								
				EWs	**415 8m:**...SILT, trace clay(grey. Firm, moist, lol plasticity.	HW							
SPT					**415 Pm:**...SILT, minor clay, trace fine sand(grey. Very soft, moist, moderate plasticity.		31 wm: S T 4 w/ 5 0,14,1w N = 48	100					
		32			**415 BPm:**...SILT(some fine sand, disseminated BCM nodules. Stiff, moist, non-plastic.								
HQ	11							100					
		33											
SPT	10		× × × × × × × × × × × ×	EWq	**405 Bm:** Moderatek l eathered grey SILTSTONE, e)tremeky l eaj . Bk cj y Soikdescription: Sandy SILT(grey. Dense, moist, non plastic. Sand is fine to medium, l ekksorted.	MW	33m: SPT 7,14// 41,27,3 for 10mm N = w0?	100					
					445 41m: Moderat ky l eathered grey fine to medium SANDSTONE; very l eaj . Soikdescription: Fine to medium sandy SILT(grey. Firm, moist, lol plasticity.								
HQ		34						100					
	5			EWs		MW							
SPTC							34.wm: SPTC 12,28// w0 for 60mm N = w0?	N/A	N/A	N/A			
HQ		3w						100	100	100			

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REMARKS:
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TCR, SCR, and RQD measurements to be revised.
Drilker noted l ater return, 2m casing instalked
Drilker noted l ater loss at w.wm

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
28/06/2023 2:12:00 PM z12.00m z4.6 m
25/06/2023 8:00:00 AM z12.00m z4.62 m
25/06/2023 3:20:00 PM z27.00m z7.6 m
30/06/2023 7:40:00 AM z27.00m z4.7wm
30/06/2023 1:06:00 PM z36.00m z4.wm
3/07/2023 7:4w:00 AM z36.00m z4.72 m
3/07/2023 12:48:00 PM z43.w0m z3.6wm
4/07/2023 7:30:00 AM z43.w0m z4.22 m

Database File: ALR SITE INVESTIGATION PROJECT FILE_20230726_COMBINED_STAGE1_GI - ROSS.GPJ Library file: GINT STD AGS 4_0 V27_UPDATED_LIBRARY.GLB Template: DATATEMPLATE.GDT Report File: 01 ALR DH LOG Date Generated: 28/07/2023

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Client: **Auckland Light Rail Limited**
Project: **Auckland Light Rail**
Location: **SH1 Lambeth Road, Pukeranga**
Project Reference: **Stage 1 Ground Investigation**

OH0010

Sheet **1** of **3**

GEOTECHNICAL INVESTIGATION
Method: Rotary Core Wireline
Equipment: Massenza MC14
Contractor: McMillan Drilling

BOREHOLE LOCATION
Easting: 1774873.64m
Northing: 5918838.14m
Reduced Level: 43.24m

Date started: 28/06/2023
Date completed: 4/07/2023
Inclination: -50°
Azimuth: 0°

Logged by: CR
Input by: CR
Checked by: PK
Revised by: PK

Method	R.L. (m)	Length (m)	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR (%)	SCR (%)	RQD (%)	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
				EWs		MW							
HQ	8			EUq	**4P50m:** Slightly lathered grey SILTSTONE(very laj .								
					4P54m to 4P59m:...Thinly laminated brol n/blacj carbonaceous matter, very closely spaced, 40°.								
					4P57m:...Lens of disseminated BCM.	SW		100	100	100		3w.wm: DB 1w° undulating, smooth, clean along BPZ	
					4P534m:...1wmm bed of slightly lathered grey silty fine SANDSTONE(very laj .							3w.7wm: JT 40° planar, rough, clean	
		36			**4P53Pm:**...10mm BCM bed, w°.							3w.5m: DB w° stepped, smooth, clean DBZ	
SPTC							36m: SPTC 12,38// N = w0?	N/A	N/A	N/A			
HQ	7			EUs	**475 1m:** Interbedded slightly lathered grey SANDSTONE, very laj , fining upl ards. Interbedded lith moderately thin, moderately lidely spaced beds of slightly lathered grey SILTSTONE, very laj , BCM beds 40°.								
					475 3m to 475 3Pm:...Thinly laminated to laminated, very closely spaced BCM beds 40°.	SW		100	100	100		36.wm: DB w° undulating, smooth, clean	
		37										37.1m: DB w° undulating, smooth, clean	
	6											37.3m: HB w° undulating, smooth, clean	
SPTC							37.wm: SPTC 20,30 for 50mm// N = w0?	N/A	N/A	N/A		37.4m: recovered from core catcher as sand and fine to coarse sandstone gravek	
HQ				EUq	**4357 0m:** Interbedded slightly lathered grey SILTSTONE ;60%x, very laj . Interbedded lith moderately thin, very closely spaced beds of slightly lathered grey silty fine SANDSTONE ;40%x, very laj .	SW						37.64m: DB 2w° undulating, rough	
		38										37.7wm: BP 4w° 37.8m: JT 4w° stepped, smooth, veneer, ;Infilk clayx	
	w											38m: DB w° stepped, smooth, spun core	
					4k51Pm: CORE LOSS							38.13m: C+ top dip w°, bottom dip 0°, spun core, fine to medium sandstone gravek subangular to subrounded 38.1wm: possibly lashed out gravelZ	
				EUq	**4k54km:** Interbedded slightly lathered grey SILTSTONE ;60%x, very laj . Interbedded lith moderately thin, very closely spaced beds of slightly lathered grey silty fine SANDSTONE ;40%x, very laj .	SW		83	62	74		38.4wm: DB 0° planar, smooth, spun core	
SPTC		35					35m: SPTC 18,32 for 120mm// N = w0?	N/A	N/A	N/A		38.68m to 38.88m: C+ top dip w°, bottom dip w°, spun core, fine to medium silty gravek subangular 38.7wm: DB 0° spun core 38.8m: DB w° stepped, smooth, spun core, silty fine sandstone gravek subangular	
	4				**4B51 4m:** CORE LOSS								
HQ				EUq	**4B50 4m:** Interbedded slightly lathered grey SILTSTONE, very laj . Interbedded lith thin to moderately thin, closely spaced to moderately lidely spaced beds of slightly lathered grey silty fine SANDSTONE, very laj .	SW		52	44	65		35.3m to 35.32m: C+ stepped, smooth, top dip 30°, bottom dip 10°, fine to medium silty sandstone gravek subangular 35.3wm to 35.4m: C+ undulating, smooth, top dip 10°, bottom dip 10°, fine to medium silty sandstone gravek subangular 35.6m: JT 30° undulating, smooth, clean	
		40										35.8m to 35.5m: C+ top dip 10°, bottom dip 10°, recovered as sand and fine to medium silty sandstone gravek	

REMARKS:
SCR = 1 circumference = 200mm
TCR, SCR, and RQD measurements to be revised.
Driller noted later return, 2m casing installed
Driller noted later loss at w.wm

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
28/06/2023 2:12:00 PM z12.00m z4.6 m
25/06/2023 8:00:00 AM z12.00m z4.62 m
25/06/2023 3:20:00 PM z27.00m z7.6 m
30/06/2023 7:40:00 AM z27.00m z4.7wm
30/06/2023 1:06:00 PM z36.00m z4.wm
3/07/2023 7:4w:00 AM z36.00m z4.72 m
3/07/2023 12:48:00 PM z43.w0m z3.6wm
4/07/2023 7:30:00 AM z43.w0m z4.22 m

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Client: C6ucland Light Rail Limited
Project: C6ucland Light Rail
Location: kP Lambeth Road, 2andringham
Project Reference: 2tage 1 Gro6nd Investigation

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Sheet B of B

OERI HELI MFERACTNEM Method: Rotary Core Wireline Equipment: Massenqa MI4 Contractor: McMillan Drilling	- ESERDNMCTI 2: MZTA 0. . . Easting: 17w4873.64m Northing: w51ww38.14m Reduced levek 43.24m	Date started: 28/06/2023 Date completed: 4/07/2023 Inclination: -50° Aqimuth: 0°	Logged by: CR Input by: CR Checked by: PK Revieled by: PK

Method	R.L. ;mx	Length ;mx	Graphic Log	Layer Code	Material Description	Weathering/USC	Testing	TCR ;%x	SCR ;%x	RQD ;%x	Fracture Log (VWS WS MWS CS VCS ECS)	Stratigraphy Defect Description Additional Notes	Installation
HQ	3			EUq	**4B30.4m:** Interbedded slightly leathered grey SILTSTONE, very leaj . Interbedded lith thin to moderately thin, closely spaced to moderately lidely spaced beds of slightly leathered grey silty fine SANDSTONE, very leaj . **8. m:**...4mm clasts of rounded sandstone.	SW		52	44	65		35.5wm: DB w° spun core 40.2m: HI 40.44m: recovered from core catcher	
SPTC							40.wm: SPTC 22,28 for 70mm// N = w0?	N/A	N/A	N/A			
HQ	2	41			**8. 57m:** Slightly leathered grey fine to medium SANDSTONE ;80%x(very leaj , moderately cemented. Green subrounded siltstone clasts 2-wmm. Interbedded lith slightly leathered grey SILTSTONE ;20%x, leaj . 10-80mm thicj BCM beds.			52	74	82		41.1m: DB 10° undulating, smooth, clean along BPZ 41.6wm: BP w0° 41.67m: JT 4w° stepped, smooth, DBZ 41.8m: DB 1w° stepped, smooth	
		42			**815.3m:**...Weaj siltstone.								
HQ	1				**805.1m:**...80mm bed of siltstone.	SW		100	83	51		42.1m: DB 10° stepped, smooth, coating, ;Infilk siltx spun core 42.17m: JT 10° undulating, smooth, coating, ;Infilk siltx DBZ discs recovered as fine to medium gravek subrounded to subangular 42.2wm: JT 30° undulating, smooth 42.32m: JT 3w° undulating, rough, clean 42.w8m: DB 42.8wm: HI 42.5m: DB 10° undulating, smooth, clean 43m: JT 1w° undulating, smooth 43.1m: JT w° undulating, smooth, clean DBZ	
	0	43			End of borehole at 43.wm ;Termination Depth Achievedx							43.4m: JT 2w° planar, rough, clean	

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REMARKS:
SCR = 1 circumference = 200mm
TCR, SCR, and RQD measurements to be revised.
Driller noted later return, 2m casing installed
Driller noted later loss at w.wm

Water Level Readings(bgl):
Date Time | Hole Depth | Water Level
28/06/2023 2:12:00 PM z12.00m z4.6 m
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25/06/2023 3:20:00 PM z27.00m z7.6 m
30/06/2023 7:40:00 AM z27.00m z4.7wm
30/06/2023 1:06:00 PM z36.00m z4.wm
3/07/2023 7:4w:00 AM z36.00m z4.72 m
3/07/2023 12:48:00 PM z43.w0m z3.6wm
4/07/2023 7:30:00 AM z43.w0m z4.22 m

Appendix B-3 – Core Photography

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Auckland Light Rail: Stage 1 GI

Drillhole Reference:	**BH1104**	Date Drilled:	**10/05/2023**
Photographed By:	**BW/RC**	Date Photographed:	**11/05/2023**



Box 1 – Depth: 0.00m to 6.00m



Box 2 – Depth: 6.00m to 10.63m

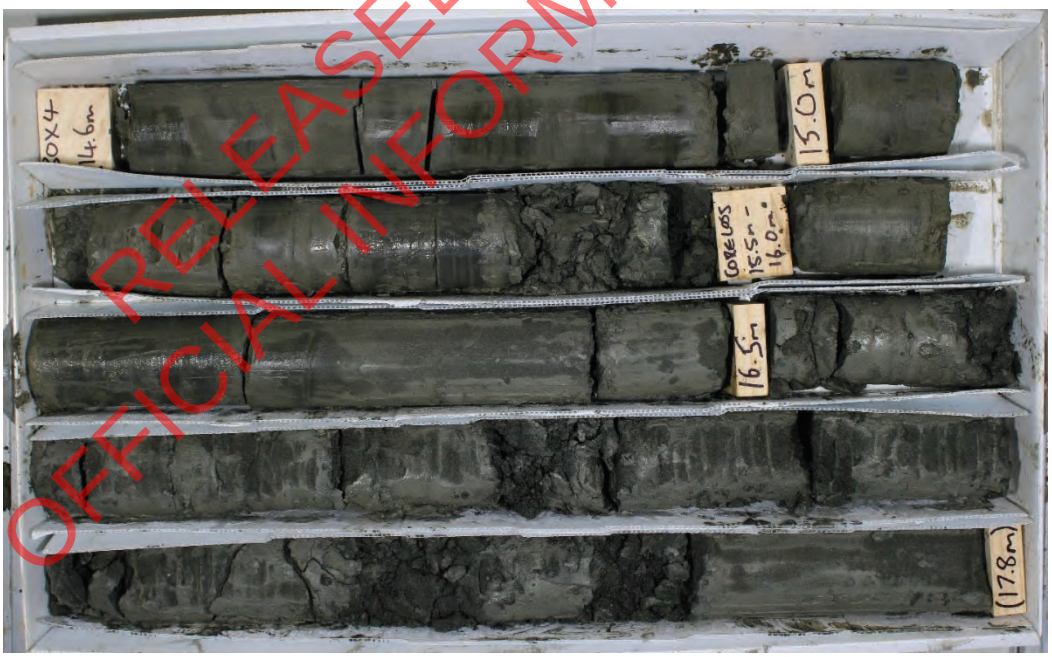
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Auckland Light Rail: Stage 1 GI

Drillhole Reference:	**BH1104**	Date Drilled:	**10/05/2023**
Photographed By:	**BW/RC**	Date Photographed:	**11/05/2023**



Box 3 – Depth: 10.63m to 14.60m

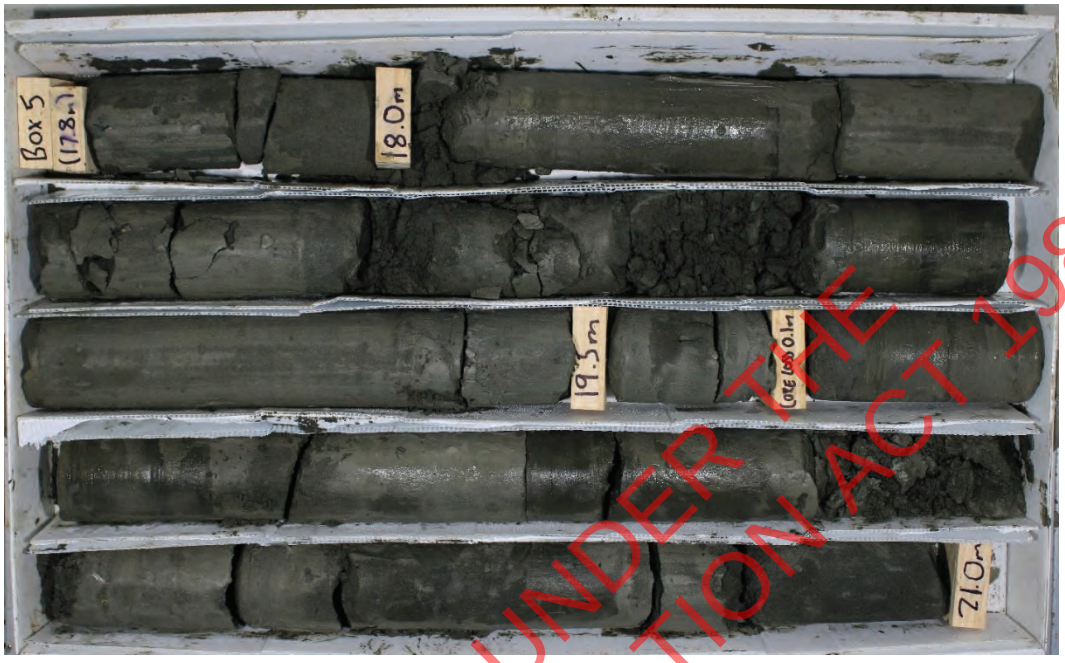


Box 4 – Depth: 14.60m to 17.80m

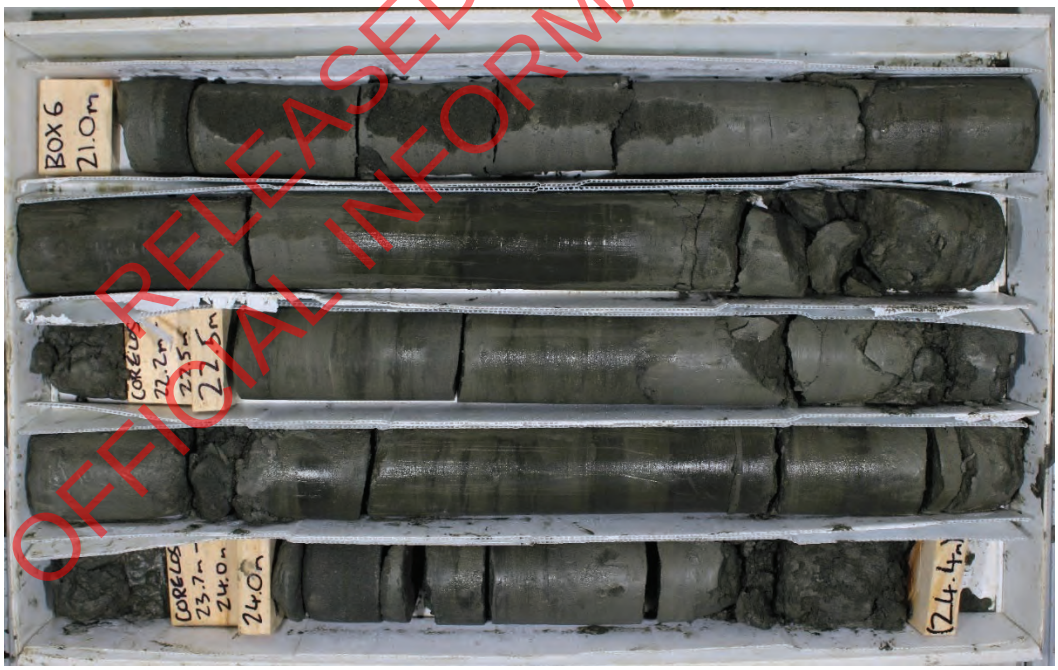
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Auckland Light Rail: Stage 1 GI

Drillhole Reference:	**BH1104**	Date Drilled:	**11/05/2023**
Photographed By:	**BW/RC**	Date Photographed:	**12/05/2023**



Box 5 – Depth: 17.80m to 21.0m

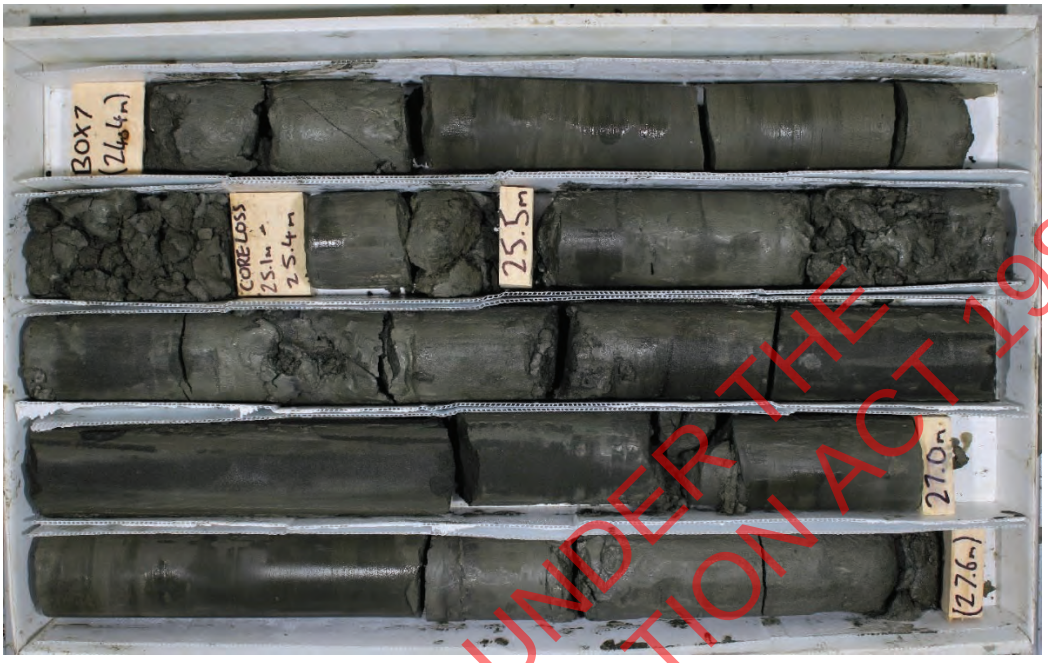


Box 6 – Depth: 21.0 to 24.40m

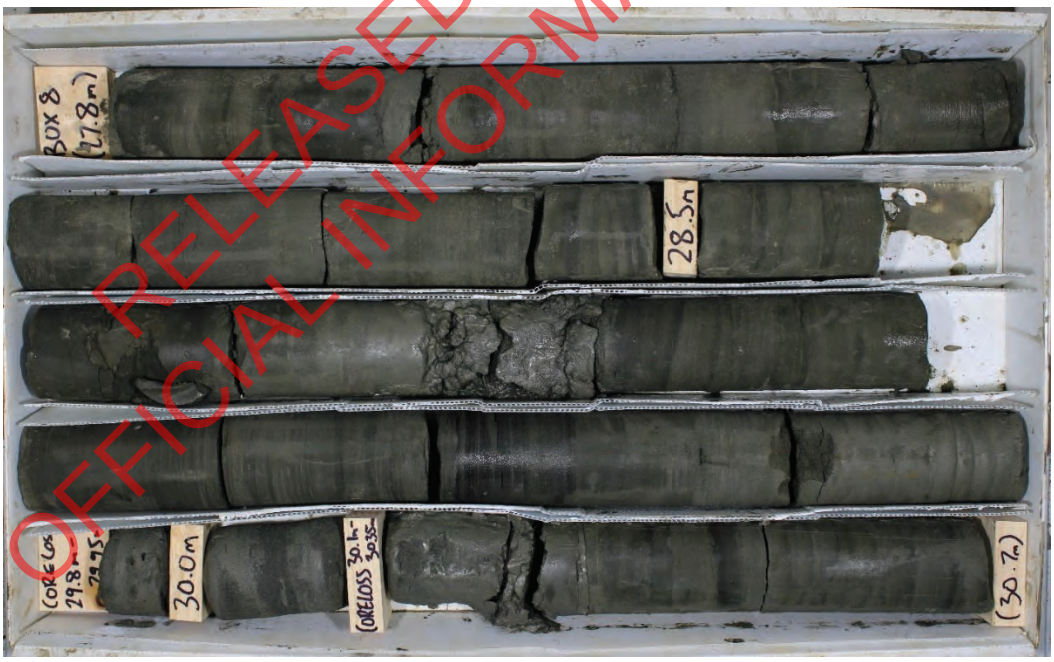
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Auckland Light Rail: Stage 1 GI

Drillhole Reference:	**BH1104**	Date Drilled:	**11/05/2023**
Photographed By:	**BW/RC**	Date Photographed:	**12/05/2023**



Box 7 – Depth: 24.4 to 27.6m



Box 8 – Depth: 27.6 to 30.7m

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Auckland Light Rail: Stage 1 GI

Drillhole Reference:	**BH1104**	Date Drilled:	**11/05/2023**
Photographed By:	**BW/RC**	Date Photographed:	**12/05/2023**



Box 9 – Depth: 30.7 to 33.45m

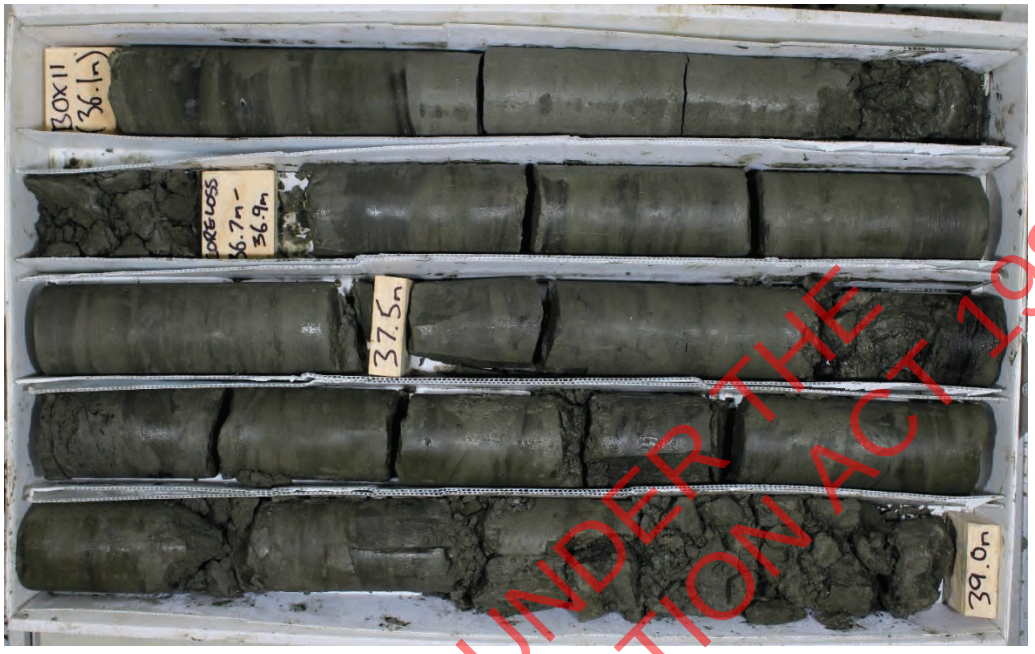


Box 10 – Depth: 33.45 to 36.10m

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Auckland Light Rail: Stage 1 GI

Drillhole Reference:	**BH1104**	Date Drilled:	**12/05/2023**
Photographed By:	**BW/RC**	Date Photographed:	**13/05/2023**



Box 11 – Depth: 36.10 to 39.00m

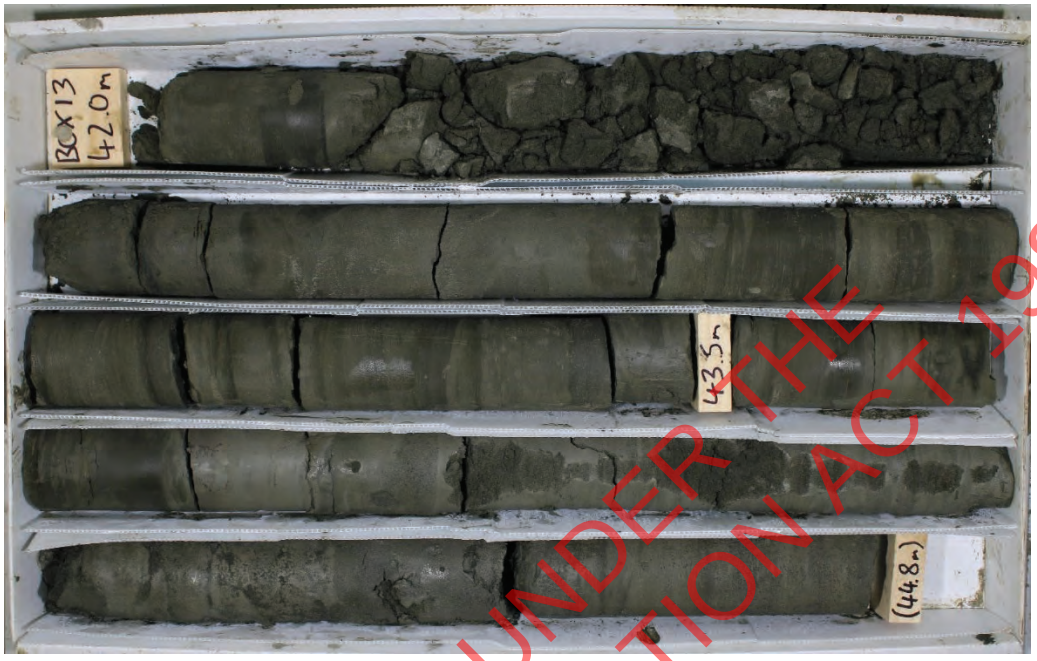


Box 12 – Depth: 39.00 to 42.00m

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Auckland Light Rail: Stage 1 GI

Drillhole Reference:	**BH1104**	Date Drilled:	**12/05/2023**
Photographed By:	**BW/RC**	Date Photographed:	**13/05/2023**



Box 13 – Depth: 42.00 to 44.80m



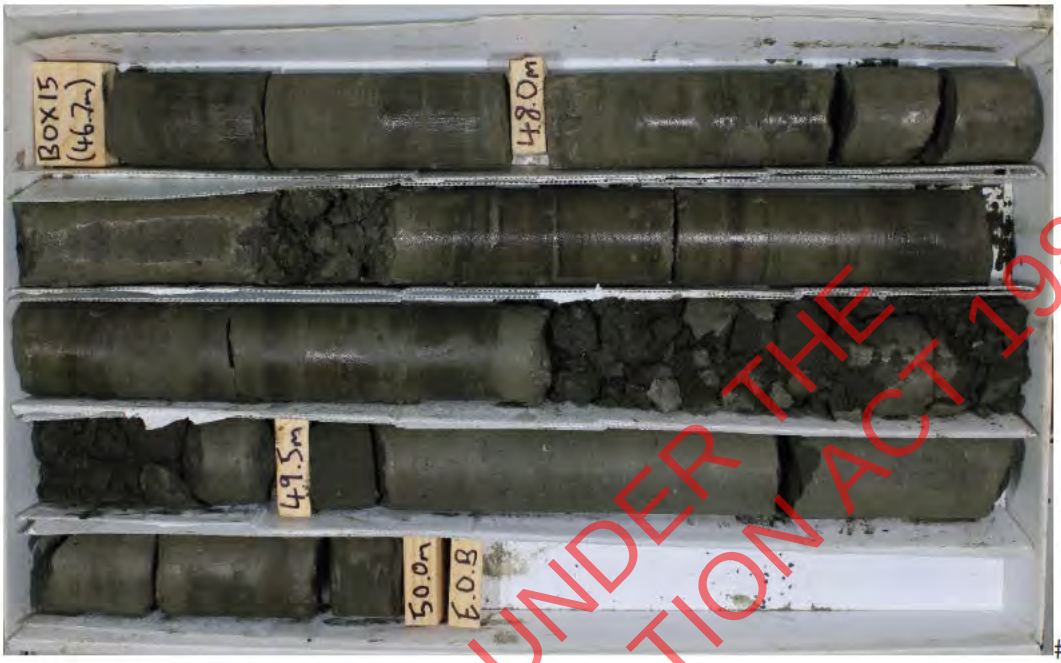
Box 14 – Depth: 44.80 to 46.70m

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Auckland Light Rail: Stage 1 GI

Drillhole Reference:	**BH1104**	Date Drilled:	**12/05/2023**
Photographed By:	**BW/RC**	Date Photographed:	**13/05/2023**

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Box 15 – Depth: 46.70 to 50.00m#

RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

Auckland Light Rail: Stage 1 GI

Drillhole Reference:	**BH1106**	Date Drilled:	**14/04/2023**
Photographed By:	**BW/RC**	Date Photographed:	**15/04/2023**



Box 1 – Depth: 0.00 to 5.78m



Box 2 – Depth: 5.78 to 9.00m

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Auckland Light Rail: Stage 1 GI

Drillhole Reference:	**BH1106**	Date Drilled:	**14/04/2023**
Photographed By:	**BW/RC**	Date Photographed:	**15/04/2023**



Box 3 – Depth: 9.00 to 12.45m



Box 4 – Depth: 12.45 to 15.45m

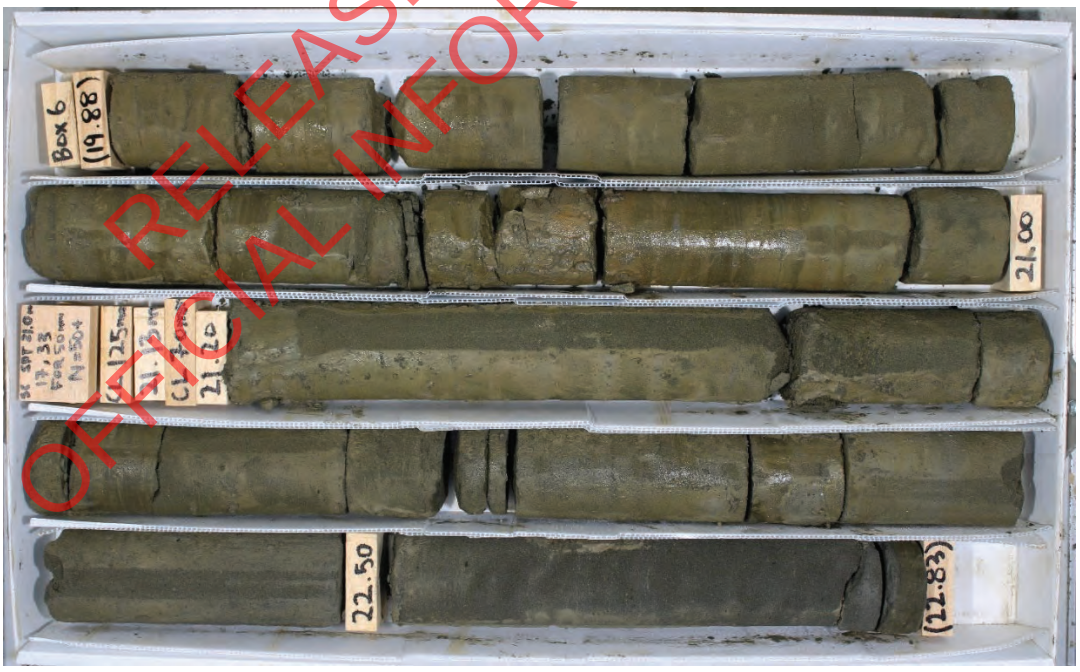
RELEASED UNDER THE OFFICIAL INFORMATION ACT 1982

Auckland Light Rail: Stage 1 GI

Drillhole Reference:	**BH1106**	Date Drilled:	**17/04/2023**
Photographed By:	**BW/RC**	Date Photographed:	**18/04/2023**



Box 5 – Depth: 15.45 to 19.88m



Box 6 – Depth: 19.88 to 22.83m

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Auckland Light Rail: Stage 1 GI

Drillhole Reference:	**BH1106**	Date Drilled:	**17/04/2023**
Photographed By:	**BW/RC**	Date Photographed:	**18/04/2023**



Box 7 – Depth: 22.83 to 26.14m

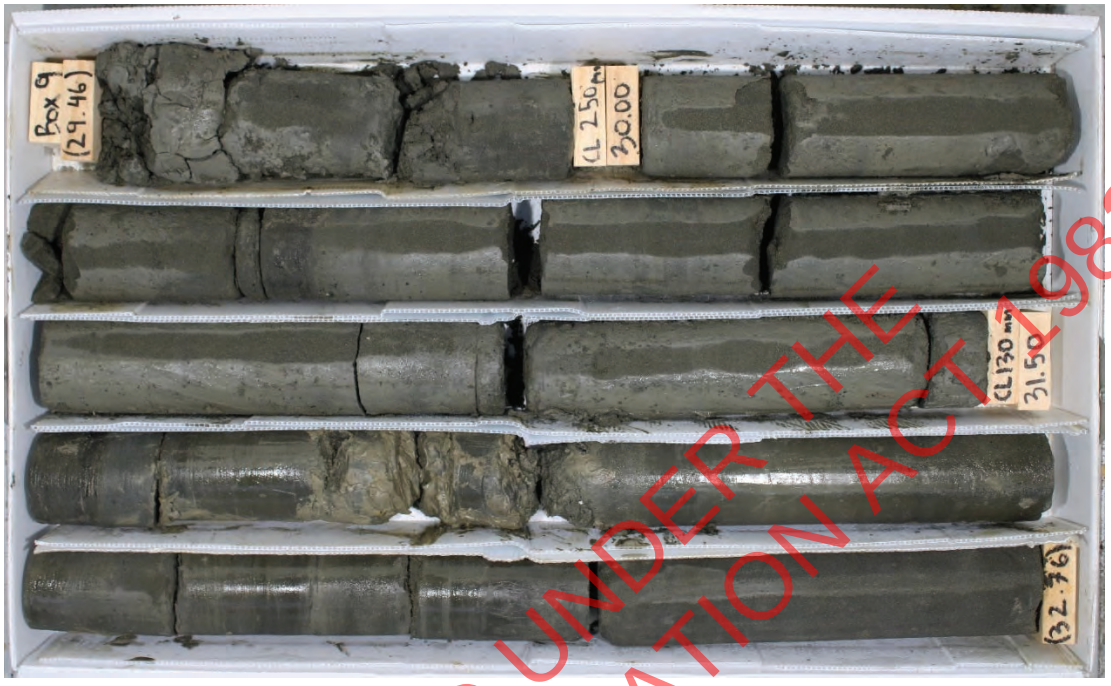


Box 8 – Depth: 26.14 to 29.46m

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Auckland Light Rail: Stage 1 GI

Drillhole Reference:	**BH1106**	Date Drilled:	**18/04/2023**
Photographed By:	**BW/RC**	Date Photographed:	**19/04/2023**



Box 9 – Depth: 29.46 to 32.76m



Box 10 – Depth: 32.76 to 35.70m

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Auckland Light Rail: Stage 1 GI

Drillhole Reference:	**BH1106**	Date Drilled:	**18/04/2023**
Photographed By:	**BW/RC**	Date Photographed:	**19/04/2023**

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Box 11 – Depth: 35.70 to 37.50m#

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Auckland Light Rail: Stage 1 GI

Drillhole Reference:	**BH1107**	Date Drilled:	**22/03/2023**
Photographed By:	**BW/RC**	Date Photographed:	**23/03/2023**



Box 1 – Depth: 0.00 to 4.50m



Box 2 – Depth: 4.50 to 7.50m

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Auckland Light Rail: Stage 1 GI

Drillhole Reference:	**BH1107**	Date Drilled:	**22/03/2023**
Photographed By:	**BW/RC**	Date Photographed:	**23/03/2023**



Box 3 – Depth: 7.50 to 10.46m



Box 4 – Depth: 10.46 to 13.44m

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Auckland Light Rail: Stage 1 GI

Drillhole Reference:	**BH1107**	Date Drilled:	**23/03/2023**
Photographed By:	**BW/RC**	Date Photographed:	**24/03/2023**



Box 5 – Depth: 13.44 to 16.50m



Box 6 – Depth: 16.50 to 19.50m

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Auckland Light Rail: Stage 1 GI

Drillhole Reference:	**BH1107**	Date Drilled:	**23/03/2023**
Photographed By:	**BW/RC**	Date Photographed:	**24/03/2023**



Box 7 – Depth: 19.50 to 22.50m



Box 8 – Depth: 22.50 to 25.50m

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