Appendix B

Geotechnical Assessment

Geotechnical Report for Proposed Plan Change

1, 2 & 10 /487 Weedons Road

Issue Date: **24 January 2025**

Miyamoto Ref: **200357-08-RP-001[0]**

Prepared for: **Yoursection Ltd**

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Report Tracking

Revision	Status	Date	Prepared by	Reviewed by
A	DRAFT	13 December 2024	J. Searle	J. Byron-Joyce
0	FINAL	24 January 2025	J. Byron-Joyce	C. McDermott

Authorisation

Author's Signature		**Approver's Signature**	
Name	Joseph Byron-Joyce	**Name**	Charles McDermott
Title	Senior Engineering Geologist BSc (Geology) CMEngNZ PEngGeol	**Title**	Technical Director (Geotechnics) BEng(Hons) CMEngNZ CPEng IntPE(NZ)

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1. Introduction

Miyamoto NZ Limited (Miyamoto) has been engaged by Yoursection Ltd to undertake a geotechnical investigation, evaluation and land suitability assessment as part of the proposed land reclassification and plan change encompassing 1,2 & 10 /487 Weedons Road, Rolleston, Canterbury.

Miyamoto have previously undertaken a geotechnical assessment for a similar purpose for the adjacent land encompassing 151 & 153 Lincoln Rolleston Road (report ref. 200357-002[A]) dated 25 November 2020, 148, 156 & 178 Lincoln Rolleston Road & 487 Weedons Road (report ref. 200357-01-RP-001[A]) dated 22 June 2022, and, 6/487 Weedons Road (report ref. 200357-08-RP-001[B]) dated 7 September 2022.

As part of this phase of works our assessment comprised the following:

- Research of available information; including historic reports, the New Zealand Geotechnical Database (NZGD), Selwyn District Council (SDC) and Environment Canterbury (ECan);
- Site walkover inspection of the land.
- Shallow field investigation comprising:
    - Mechanised Test pit Excavations (TP).
    - Mechanised Augered Boreholes (BH).
    - Dynamic cone penetrometer (DCP) testing.
- Geotechnical Assessment including high-level assessment of the site with regard to the Resource Management Act (RMA) Section 106.

This report presents the findings of our investigation and assessment which were carried out considering the Ministry of Business, Innovation & Employment (MBIE) Guidance documents 'Planning and engineering guidance for potentially liquefaction-prone land' (2017), 'Repairing and rebuilding houses affected by the Canterbury earthquakes' (2012), and the MBIE-NZGS 'Earthquake geotechnical engineering practice' Modules (2021).

It is noted that this report is limited to geotechnical assessment. Advice related to other development requirements (such as roading infrastructure, pavements, services, stormwater management and contaminated land) should be sought from appropriately qualified personnel.

2. Site Description

The site located in a rural setting in Rolleston, Canterbury (Selwyn District), encompassing Lot 2, Lot 3, and Lot 6 DP 47839 (1, 2 and 10 487 Weedons), refer to Figure 1 below. The land covers an area of approximately ~13 ha and comprises of two separate roughly rectangular parcels of land.

The site is predominantly flat with a global elevation difference of ~1.5 m (increasing towards the north-west). The land is predominantly used as mixed-farmland:

- The northern paddocks of 1/ 487 Weedons Road are occupied by a walnut orchard.
- The central paddocks of 1 & 2/ 487 Weedons Road are occupied by residential and auxiliary structures, and, producing and ornamental shrubs and trees.
- Residential structures occupy the northwestern paddocks of 10/ 487 Weedons Road.
- The southwestern paddocks of 2/ 487 Weedons Road are grass-covered.
- The central paddocks of 10/ 487 Weedons Road are grass-covered.
- A former quarry is located to the southeast of 10/ 487 Weedons Road.

Figure 1: Site Location / Layout Plan

3. Data Sources

The following sources of third-party information were considered and are referenced in this report:

- GNS Science - Geological Maps.
- New Zealand Geotechnical Database (NZGD).

- Environment Canterbury (ECan).
- Selwyn District Council (SDC).
- Canterbury Maps.

4. Geotechnical Assessment

Geological Setting

The geological map for the region (GNS 1:250,000 QMap) indicates that the site is underlain by modern river floodplain/low-level degradation terraces of unweathered, variably sorted gravel/sand/silt/clay.

Field Investigations

Miyamoto completed site-specific ground investigations on 23 October 2024 and 3 December 2024, comprising 13 No. mechanically augered boreholes (MA), 6 No. excavated test pits (TP) and accompanying Dynamic Cone Penetrometer (DCP) tests.

In addition to our site-specific investigation, we have also utilised available geotechnical information from our previous investigations and the NZGD, and a number of ECan well bores as part of our assessment.

The test locations are shown in Figure 2, the general details of the ground investigations are summarised in Table 1, and the engineering and well bore logs are presented in Appendix A.

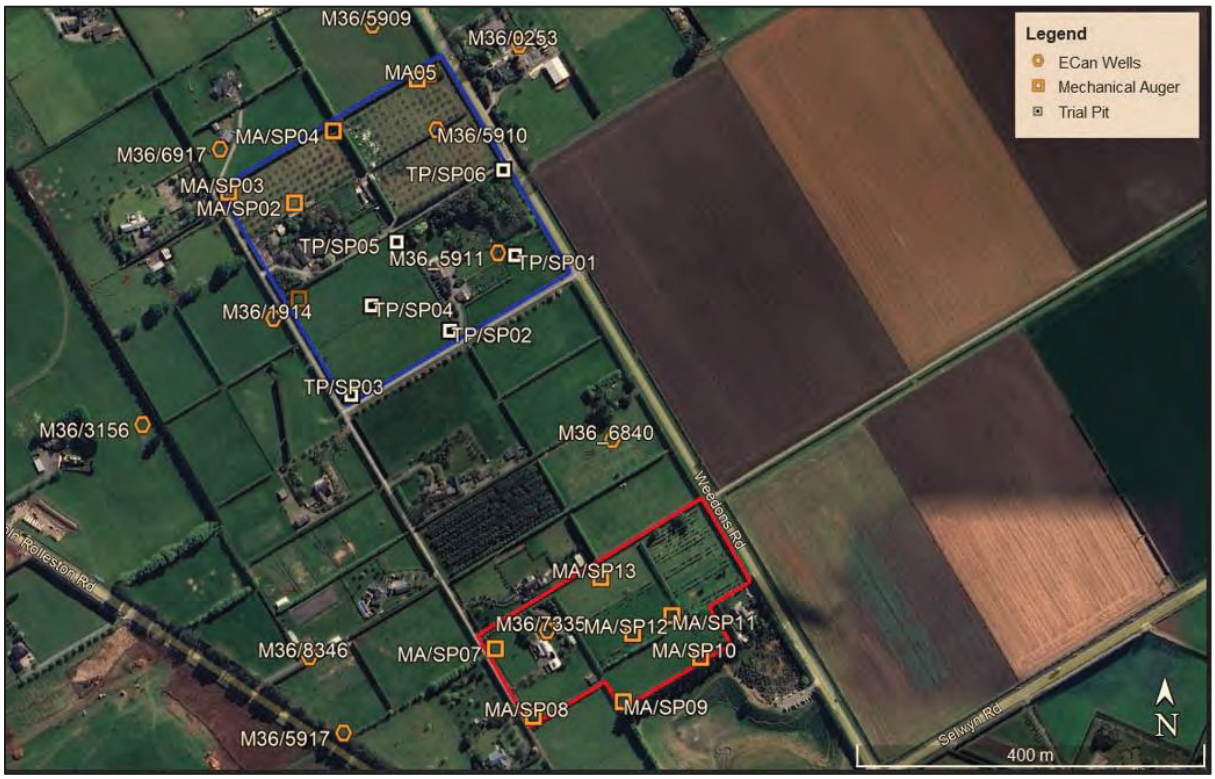


Figure 2: Ground Investigation Location Plan

Table 1: Summary of Ground Investigations

Test Ref.	Source	Source Ref.	Test Type	Depth (mbgl)
TP01 to TP06 and MA01 to MA13	This report		TP / MA / DCP	0.6 to 2.2
HA/DCP01 to HA/DCP09	Miyamoto	200357-3	HA / DCP	0.3 to 1.7
M36_0253, M36_59090 to M36_59111 and M36_6840	ECan	Various	Rotary / Cable Tool	38 to 100

Ground Conditions

The ground profile interpreted from the on-site shallow ground investigation, correlated with the available existing data, generally comprises a layer of topsoil (0.1 m to 0.3 m in thickness), overlying low plasticity, firm to very stiff Silt (locally Sandy) to between 0.6 m and 2.1 mbgl, below which dense to very dense Sandy / Silty Gravel and Cobbles are present to depth.

Boreholes logs for the ECan monitoring wells indicate that they primarily intersected gravelly soils.

Groundwater

Standing groundwater was not encountered during our site-specific investigation. Groundwater was encountered in nearby ECan well bores (refer Figure 2) at depths ranging 12 to 13 mbgl.

Liquefaction Assessment

The site is mapped in an area classified as 'Liquefaction Damage Unlikely' as per the Partially Operative Selwyn District Plan.

Additionally, the site is located within an area of 'low geotechnical risk' as defined by Selwyn District Council (McCahon, 2013).

Based on our assessment (including the site-specific ground conditions and groundwater regime) we concur that the risk of damaging effects from liquefaction at the site is low with the seismic performance expected to be equivalent to MBIE Technical Category (TC) 1 as per the MBIE Guidance (2012).

NZS1170.5 Site Sub-soil Class

Based on our geotechnical assessment, geological maps and other available information, NZS1170.5 Site Sub-soil Class D (deep or soft soil site) is considered appropriate for the site.

Flood Hazard

As per the Partially Operative Selwyn District Plan, areas of the site are mapped within the 'Plains Flood Management' area. The new 'Plains Flood Management' area covers much of the eastern plains beneath the foothills of the Southern Alps between the Waimakariri River and Rakaia River, in essence it covers most of the flat land between the main braided rivers. There is a requirement within the Partially Operative Selwyn District Plan to have minimum floor levels of 300 mm above the 200-year Annual Return Interval (ARI) flood event. The relative elevation of each lot with reference to 200-year ARI will need to be determined prior to building consent stage.

Assessment Against RMA Section 106

As per the requirements of Section 106 of the Resource Management Act (RMA) (2017), we have undertaken a high-level assessment of the significant geotechnical hazards that may affect the site. These hazards include, but are not limited to:

- Erosion;
- Falling debris;
- Slippage;
- Subsidence
- Inundation.

At the time of our site visit, there was no evidence of erosion or erosional features on site. The shallow soils could be vulnerable to erosion if the topsoil layer is removed and left unprotected for prolonged periods of time. This can be easily mitigated with appropriate design measures during construction.

Given the proximity of the site to any source, rockfall (falling debris) is not considered a risk to the site and given the site is generally flat with only a minor gradual change in elevation across the site, slope instability (slippage) is not considered to be a risk.

On the basis of our geotechnical assessment herein, we do not consider subsidence (under either static or seismic loading) to be a significant hazard for normal construction (i.e. NZS3604 compliant buildings).

As per the Partially Operative Selwyn District Plan, areas of the site are mapped within the 'Plains Flood Management' area. Requirements around building floor levels must be checked at building consent stage.

5. Development Considerations

At this stage in the project, the future development plans are not defined. However, considering likely residential subdivision similar to that in the local area, the following preliminary guidance is provided:

- Earthworks should be undertaken in general accordance with the requirements of NZS 4431:2022. All unsuitable materials should be stripped from the work areas and stockpiled clear of the operations or removed from site;
- Preliminarily, NZS3604 foundations are considered geotechnically feasible for NZS3604 compliant structures, subject to building-specific geotechnical investigations to assess the available bearing capacity.
- It is recommended that a flood assessment is completed in tandem or prior to earthworks cut and fill civil designs to determine appropriate ground elevations for future lots, given the proposed minimum 300 mm floor elevation above the 200-year ARI flood event.

It is noted that this report is limited to geotechnical assessment. Advice related to other development requirements (such as roading infrastructure, pavements, services, stormwater management and contaminated land) should be sought from appropriately qualified personal.

6. Conclusion

Based on our investigations and assessment, and provided that the geotechnical recommendations given in this report are followed, and the appropriate engineering measures implemented, we consider that the site is suitable for residential land use with such development unlikely to be affected nor worsen, accelerate or result in material damage.

7. Limitations

This report is subject to the following limitations:

- This report has been prepared by Miyamoto for the Client for the purpose/s agreed with the Client (Purpose). Miyamoto accepts no responsibility for the validity, appropriateness, sufficiency or consequences of the Client using the report for purposes other than for the Purpose.
- This report is not intended for general publication or circulation. This report is not to be reproduced by the Client except in relation to the Purpose, without Miyamoto's prior written permission. Miyamoto disclaims all risk and all responsibility to any third party.
- This report is provided based on the various assumptions contained in the report.
- Miyamoto's professional services are performed using a degree of care and skill reasonably exercised by reputable consultants providing the same or similar services as at the date of this report.
- The sub surface information has been obtained from investigation carried out at discrete locations, which by their nature only provide information about a relatively small volume of subsoils. While Miyamoto has taken reasonable skill and care in carrying out the investigation to determine the subsoil condition, the subsoil condition could differ substantially from the results of any sampling investigation. Miyamoto is not responsible for and does not accept any liability in respect of any difference between the actual subsoil conditions and the results of our investigation.
- A change in circumstances, facts, information after the report has been provided may affect the adequacy or accuracy of the report. Miyamoto is not responsible for the adequacy or accuracy of the report as a result of any such changes.
- This report is not to be reproduced, either wholly or in part, without our prior written permission.

If you have any queries or you require any further clarification on any aspects of this report, please do not hesitate to contact Miyamoto (NZ) Ltd.

References

Environment Canterbury. Canterbury Maps Viewer, http://canterburymaps.govt.nz/Viewer/#webmap

Environment Canterbury, Web app viewer - Flood Hazard, https://ecanmaps.ecan.govt.nz/portal/apps/webappviewer/index.html?id=57c74073c2f14a85ac0caf30073ae48a

Forsyth, P.J. ; Barrell, D.J.A. ; Jogens, R. (compilers) 2008. Geology of the Christchurch area. Institute of Geological and Nuclear Sciences 1: 250000 geological map 16. Lower Hutt, New Zealand.

GNS Science (2012). Review of liquefaction hazard information in eastern Canterbury, including Christchurch City and parts of Selwyn, Waimakariri and Hurunui Districts, Report No. R12/83

Ian MacCahon, 2013. Selwyn District Council 'Area of low geotechnical risk' map.

Ministry of Business, Innovation, and Employment, 2012. *Repairing and rebuilding houses affected by the Canterbury earthquakes.*

New Zealand Geotechnical Database. Accessed via Google Earth from https://www.nzgd.org.nz/.

New Zealand Geotechnical Society and Ministry of Business, Innovation and Employment, 2021. Earthquake geotechnical engineering practice Module 1: Overview of the guidelines

New Zealand Geotechnical Society and Ministry of Business, Innovation and Employment, 2021. Earthquake geotechnical engineering practice Module 2: Geotechnical investigations for earthquake engineering

New Zealand Geotechnical Society and Ministry of Business, Innovation and Employment, 2021. Earthquake geotechnical engineering practice Module 3: Identification, assessment and mitigation of liquefaction hazards

New Zealand Geotechnical Society and Ministry of Business, Innovation and Employment, 2021. Earthquake geotechnical engineering practice Module 4: Earthquake resistant foundation design

New Zealand Standard NZS1170.5 (2004). Structural Design Actions, Part 5: Earthquake Actions - New Zealand Standard.

New Zealand Standard NZS4431 (2022). Engineered fill construction for lightweight structures - New Zealand Standard.

Selwyn District Council - District Plan Online Maps, https://eplan.selwyn.govt.nz/eplan/#/Property/7941662.

Appendices

A. Ground Investigation Data

Miyamoto site-specific investigation logs

Selected ECan well bore logs

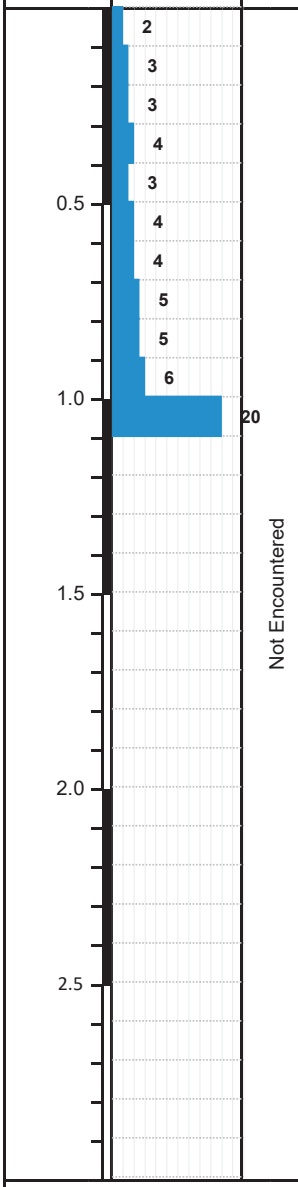
Refer to previous Miyamoto Report (200357-002-[B], dated 25 November 2020) for engineering logs in adjacent land

miyamoto. ENGINEERS+ CONSTRUCTION CONSULTANTS	*PROJECT NUMBER:*	**200357-8**
	CLIENT:	**Yoursection Ltd**
	TESTING COMPLETED:	**23 October 2024**

SHALLOW GROUND INVESTIGATION LOG

TP01

PROJECT:	**1 & 2 / 487 Weedons Road, Rolleston**				
LOGGED BY:	**JBJ**	*TOTAL TESTING DEPTH:*	**1.9 mbgl**	*HOLE DIAMETER:*	**50 mm**
PROCESSED BY:	**JS**	*TESTING METHOD:*	**TP**	*SHEAR VANE NUMBER:*	**N/A**
LOCATION:	**REFER TO SITE PLAN**	*GROUNDWATER LEVEL:*	**N/A**	This report may only be reproduced in full	



Depth (m)	*DCP Test Results (Blows per 100mm)*	*GWL*	*Soil Description*			*Sample Taken*	*Lab Testing*								*Shear Vane Reading (kPa) peak/remoulded*
							Atterberg Limits			*Grain Size*			*WC (%)*	*UW*	
			USC	*Soil Characteristics*	*Graphic Log*		*LL*	*PL*	*PI*	*GR*	*SA*	*FC*			
0	2	Not Encountered		TOPSOIL, SILT, dark brown-black, non-plastic to low plasticity, with rootlets, moist											
0.5	3 3 4 3 4 4 5 5 6		ML	Sandy SILT, non-plastic to low plasticity, brown, moist											
1.0	20		GM	Silty GRAVEL, fine to coarse grained, brown, moist From 1.3m, sandy, grey brown, cobbles up to 100mm											
1.5				TP01 Terminated at 1.7m - Target Strata											
2.0															
2.5															

LEGEND

ABBREVIATIONS

DCP	DYNAMIC CONE PENETROMETER	N/E	NOT ENCOUNTERED	LL	LIQUID LIMIT	GR	GRAVEL
HA	HAND AUGER	UTP	UNABLE TO PENETRATE	PL	PLASTIC LIMIT	SA	SAND
SV	SHEAR VANE	EOH	END OF HOLE	PI	PLASTICITY INDEX	FC	FINES CONTENT
GWL	GROUNDWATER LEVEL	UW	UNIT WEIGHT (kN/m^3)	WC	WATER CONTENT	▽	STANDING GWL
mbgl	METERS BELOW GROUND LEVEL						

NOTES

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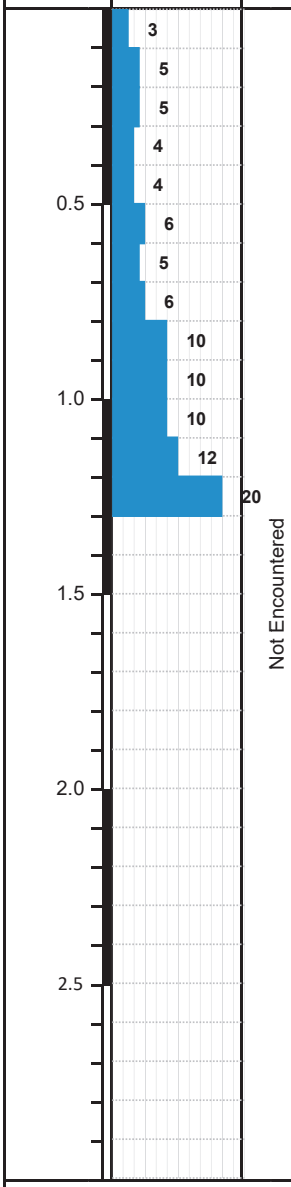
SHALLOW GROUND INVESTIGATION LOG

TP02

PROJECT:	**1 & 2 / 487 Weedons Road, Rolleston**				
LOGGED BY:	**JBJ**	*TOTAL TESTING DEPTH:*	**2.0 mbgl**	*HOLE DIAMETER:*	**50 mm**
PROCESSED BY:	**JS**	*TESTING METHOD:*	**TP**	*SHEAR VANE NUMBER:*	**N/A**
LOCATION:	**REFER TO SITE PLAN**	*GROUNDWATER LEVEL:*	**N/A**	This report may only be reproduced in full	



Depth (m)	*DCP Test Results (Blows per 100mm)*	*GWL*	*Soil Description*			*Sample Taken*	*Lab Testing*								*Shear Vane Reading (kPa) peak/remoulded*
							Atterberg Limits			*Grain Size*			*WC (%)*	*UW*	
			USC	*Soil Characteristics*	*Graphic Log*		*LL*	*PL*	*PI*	*GR*	*SA*	*FC*			
0.0				TOPSOIL, SILT, dark brown-black, non-plastic to low plasticity, with rootlets, moist											
0.5			ML	Sandy SILT, non-plastic to low plasticity, light brown, non-plastic to low plasticity, moist											
1.0															
1.5			GM	Silty GRAVEL, fine to coarse grained,pale brown, moist											
2.0				TP02 Terminated at 1.8m - Target Strata											
2.5															

LEGEND

ABBREVIATIONS

DCP	DYNAMIC CONE PENETROMETER	N/E	NOT ENCOUNTERED	LL	LIQUID LIMIT	GR	GRAVEL
HA	HAND AUGER	UTP	UNABLE TO PENETRATE	PL	PLASTIC LIMIT	SA	SAND
SV	SHEAR VANE	EOH	END OF HOLE	PI	PLASTICITY INDEX	FC	FINES CONTENT
GWL	GROUNDWATER LEVEL	UW	UNIT WEIGHT (kN/m^3)	WC	WATER CONTENT	▽	STANDING GWL
mbgl	METERS BELOW GROUND LEVEL						

NOTES

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PROJECT NUMBER:	**200357-8**
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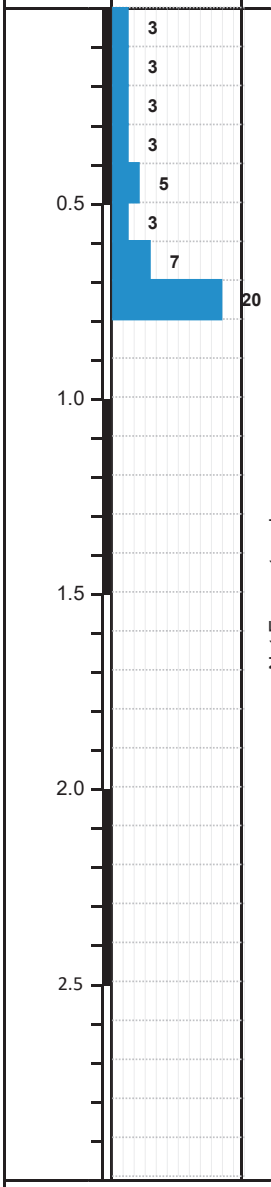
TESTING COMPLETED:	**23 October 2024**

SHALLOW GROUND INVESTIGATION LOG

TP03

PROJECT:	**1 & 2 /487 Weedons Road, Rolleston**				
LOGGED BY:	**JBJ**	*TOTAL TESTING DEPTH:*	**1.4 mbgl**	*HOLE DIAMETER:*	**50 mm**
PROCESSED BY:	**JS**	*TESTING METHOD:*	**TP**	*SHEAR VANE NUMBER:*	**N/A**
LOCATION:	**REFER TO SITE PLAN**	*GROUNDWATER LEVEL:*	**N/A**	This report may only be reproduced in full	



Depth (m)	*DCP Test Results (Blows per 100mm)*	*GWL*	*Soil Description*			*Sample Taken*	*Lab Testing*								*Shear Vane Reading (kPa) peak/remoulded*
							Atterberg Limits			*Grain Size*			*WC (%)*	*UW*	
			USC	*Soil Characteristics*	*Graphic Log*		*LL*	*PL*	*PI*	*GR*	*SA*	*FC*			
	3			TOPSOIL, SILT, dark brown-black, non-plastic to low plasticity, with rootlets, moist											
	3														
	3														
	3		ML	Sandy SILT, non-plastic to low plasticity, light brown, moist											
	5														
0.5	3														
	7		GW	Sandy GRAVEL, fine to coarse grained, grey brown, with cobbles up to 150mm											
	20														
1.0															
1.5		Not Encountered		TP03 Terminated at 1.4m - Target Strata											
2.0															
2.5															

LEGEND

ABBREVIATIONS

DCP	DYNAMIC CONE PENETROMETER	N/E	NOT ENCOUNTERED	LL	LIQUID LIMIT	GR	GRAVEL
HA	HAND AUGER	UTP	UNABLE TO PENETRATE	PL	PLASTIC LIMIT	SA	SAND
SV	SHEAR VANE	EOH	END OF HOLE	PI	PLASTICITY INDEX	FC	FINES CONTENT
GWL	GROUNDWATER LEVEL	UW	UNIT WEIGHT (kN/m^3)	WC	WATER CONTENT	▽	STANDING GWL
mbgl	METERS BELOW GROUND LEVEL						

NOTES

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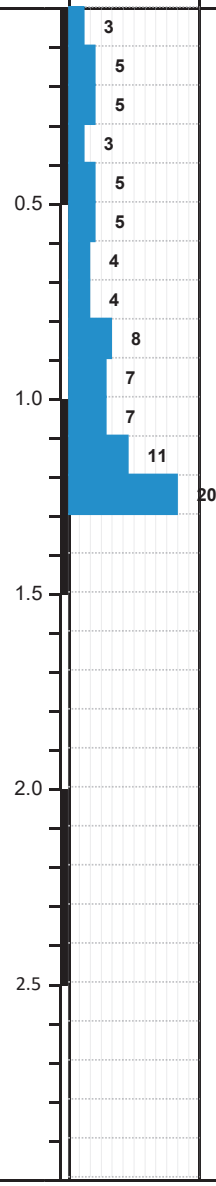
SHALLOW GROUND INVESTIGATION LOG

TP04

PROJECT:	**1 & 2 / 487 Weedons Road, Rolleston**				
LOGGED BY:	**JBJ**	*TOTAL TESTING DEPTH:*	**1.3 mbgl**	*HOLE DIAMETER:*	**50 mm**
PROCESSED BY:	**JS**	*TESTING METHOD:*	**TP**	*SHEAR VANE NUMBER:*	**N/A**
LOCATION:	**REFER TO SITE PLAN**	*GROUNDWATER LEVEL:*	**N/A**	This report may only be reproduced in full	



Depth (m)	*DCP Test Results (Blows per 100mm)*	*GWL*	*Soil Description*			*Sample Taken*	*Lab Testing*								*Shear Vane Reading (kPa) peak/remoulded*
							Atterberg Limits			*Grain Size*			*WC (%)*	*UW*	
			USC	*Soil Characteristics*	*Graphic Log*		*LL*	*PL*	*PI*	*GR*	*SA*	*FC*			
0.0	3			TOPSOIL, SILT, dark brown-black, non-plastic to low plasticity, with rootlets, moist											
0.5	5 5 3 5 5		ML	Sandy SILT, non-plastic to low plasticity, light brown, moist											
1.0	4 4 8 7 7 11		GW	Sandy GRAVEL, fine to coarse grained, grey brown, with cobbles up to 150mm											
1.2	20			Fom 1.2m, with cobbles up to 200mm											
1.3				TP04 Terminated at 1.3m - Refusal											
1.5															
2.0															
2.5															

LEGEND

ABBREVIATIONS

DCP	DYNAMIC CONE PENETROMETER	N/E	NOT ENCOUNTERED	LL	LIQUID LIMIT	GR	GRAVEL
HA	HAND AUGER	UTP	UNABLE TO PENETRATE	PL	PLASTIC LIMIT	SA	SAND
SV	SHEAR VANE	EOH	END OF HOLE	PI	PLASTICITY INDEX	FC	FINES CONTENT
GWL	GROUNDWATER LEVEL	UW	UNIT WEIGHT (kN/m^3)	WC	WATER CONTENT	▽	STANDING GWL
mbgl	METERS BELOW GROUND LEVEL						

NOTES

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SHALLOW GROUND INVESTIGATION LOG

TP05

PROJECT:	**1 & 2 / 487 Weedons Road, Rolleston**				
LOGGED BY:	**JBJ**	*TOTAL TESTING DEPTH:*	**1.6 mbgl**	*HOLE DIAMETER:*	**50 mm**
PROCESSED BY:	**JS**	*TESTING METHOD:*	**TP**	*SHEAR VANE NUMBER:*	**N/A**
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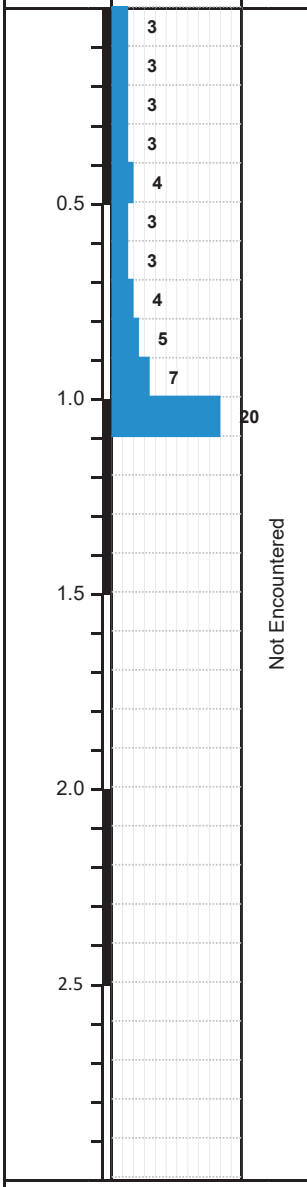

Depth (m)	*GWL*	*USC*	*Soil Characteristics*	*Graphic Log*	*Sample Taken*	*Atterberg Limits* LL	PL	PI	*Grain Size* GR	SA	FC	*WC (%)*	*UW*	*Shear Vane Reading (kPa) peak/remoulded*
0.0	Not Encountered		TOPSOIL, SILT, dark brown-black, non-plastic to low plasticity, with rootlets, moist											
0.5		ML	Sandy SILT, non-plastic to low plasticity, light brown, moist											125/42 95/24
1.0		GW	Sandy GRAVEL, fine to coarse grained, grey brown, moist											
1.5			TP05 Terminated at 1.6m - Target Strata											
2.0														
2.5														

LEGEND

ABBREVIATIONS

DCP	DYNAMIC CONE PENETROMETER	N/E	NOT ENCOUNTERED	LL	LIQUID LIMIT	GR	GRAVEL
HA	HAND AUGER	UTP	UNABLE TO PENETRATE	PL	PLASTIC LIMIT	SA	SAND
SV	SHEAR VANE	EOH	END OF HOLE	PI	PLASTICITY INDEX	FC	FINES CONTENT
GWL	GROUNDWATER LEVEL	UW	UNIT WEIGHT (kN/m^3)	WC	WATER CONTENT	▽	STANDING GWL
mbgl	METERS BELOW GROUND LEVEL						

NOTES

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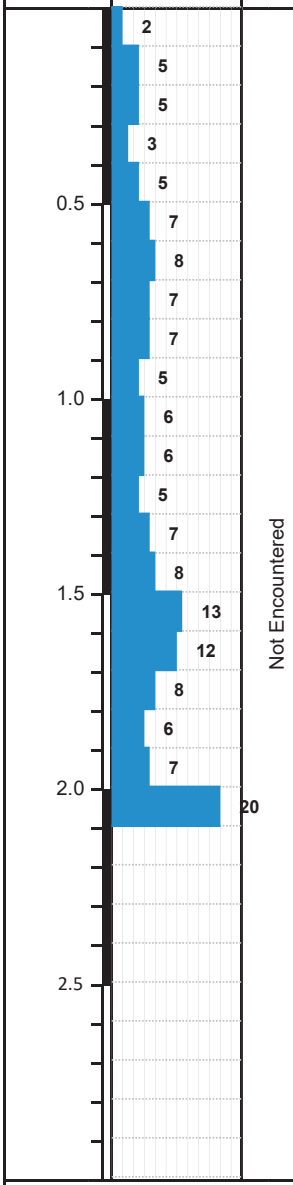
	CLIENT:	**Yoursection Ltd**
	TESTING COMPLETED:	**23 October 2024**

SHALLOW GROUND INVESTIGATION LOG

TP06

PROJECT:	**1 & 2 / 487 Weedons Road, Rolleston**				
LOGGED BY:	**JBJ**	*TOTAL TESTING DEPTH:*	**2.2 mbgl**	*HOLE DIAMETER:*	**50 mm**
PROCESSED BY:	**JS**	*TESTING METHOD:*	**TP**	*SHEAR VANE NUMBER:*	**N/A**
LOCATION:	**REFER TO SITE PLAN**	*GROUNDWATER LEVEL:*	**N/A**	This report may only be reproduced in full	



Depth (m)	*USC*	*Soil Characteristics*	*Graphic Log*	*Sample Taken*	*Lab Testing*								*Shear Vane Reading (kPa) peak/remoulded*
					Atterberg Limits			*Grain Size*			*WC (%)*	*UW*	
					LL	*PL*	*PI*	*GR*	*SA*	*FC*			
		TOPSOIL, SILT, dark brown-black, non-plastic to low plasticity, with rootlets, moist											
	ML	Sandy SILT, fine grained, light brown, non-plastic to low plasticity, moist Fom 0.5m, with orange mottling											
	SM	Silty SAND, fine to medium grained, pale brown											
	SP	SAND, fine to medium grained, pale brown											
	GM	Silty GRAVEL, fine to medium, pale brown											
		TP06 Terminated at 2.2m - Target Strata											

LEGEND

ABBREVIATIONS

DCP	DYNAMIC CONE PENETROMETER	N/E	NOT ENCOUNTERED	LL	LIQUID LIMIT	GR	GRAVEL
HA	HAND AUGER	UTP	UNABLE TO PENETRATE	PL	PLASTIC LIMIT	SA	SAND
SV	SHEAR VANE	EOH	END OF HOLE	PI	PLASTICITY INDEX	FC	FINES CONTENT
GWL	GROUNDWATER LEVEL	UW	UNIT WEIGHT (kN/m³)	WC	WATER CONTENT	▽	STANDING GWL
mbgl	METERS BELOW GROUND LEVEL						

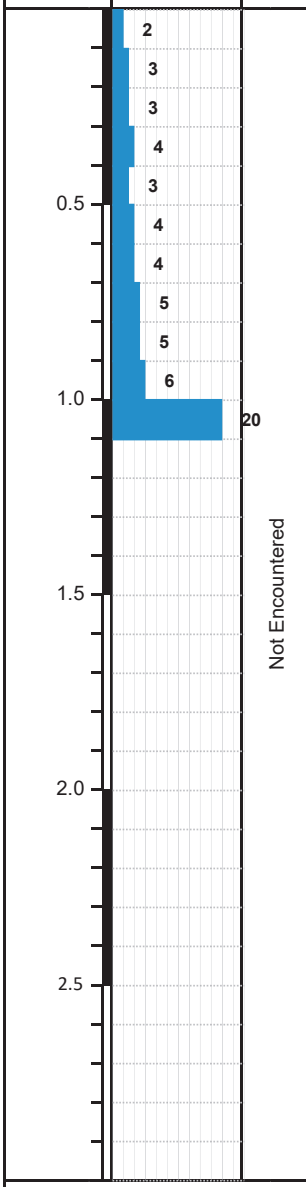
NOTES

miyamoto. ENGINEERS+ CONSTRUCTION CONSULTANTS	*PROJECT NUMBER:*	**200357-8**
	CLIENT:	**Yoursection Ltd**
	TESTING COMPLETED:	**23 October 2024**

SHALLOW GROUND INVESTIGATION LOG

MA01

PROJECT:	**1 & 2 / 487 Weedons Road, Rolleston**				
LOGGED BY:	**JBJ**	*TOTAL TESTING DEPTH:*	**1.1 mbgl**	*HOLE DIAMETER:*	**200 mm**
PROCESSED BY:	**JS**	*TESTING METHOD:*	**MA**	*SHEAR VANE NUMBER:*	**N/A**
LOCATION:	**REFER TO SITE PLAN**	*GROUNDWATER LEVEL:*	**N/A**	This report may only be reproduced in full	



Depth (m)	*DCP Test Results (Blows per 100mm)*	*GWL*	*Soil Description*			*Sample Taken*	*Lab Testing*								*Shear Vane Reading (kPa) peak/remoulded*
							Atterberg Limits			*Grain Size*			*WC (%)*	*UW*	
			USC	*Soil Characteristics*	*Graphic Log*		*LL*	*PL*	*PI*	*GR*	*SA*	*FC*			
0	2			TOPSOIL, SILT, dark brown-black, non-plastic to low plasticity, with rootlets, moist											
	3		ML	Sandy SILT, non-plastic to low plasticity, light brown, moist											
	3														
	4			Fom 0.5m, with orange mottling											
0.5	3														
	4														
	4														
	5														
	5														
1.0	6		GW	Sandy GRAVEL, fine to coarse, brown grey											
	20	Not Encountered		MA01 Terminated at 1.1m - Target Strata											
1.5															
2.0															
2.5															

LEGEND

ABBREVIATIONS

DCP	DYNAMIC CONE PENETROMETER	N/E	NOT ENCOUNTERED	LL	LIQUID LIMIT	GR	GRAVEL
HA	HAND AUGER	UTP	UNABLE TO PENETRATE	PL	PLASTIC LIMIT	SA	SAND
SV	SHEAR VANE	EOH	END OF HOLE	PI	PLASTICITY INDEX	FC	FINES CONTENT
MA	MECHANISED AUGER	UW	UNIT WEIGHT (kN/m^3)	WC	WATER CONTENT	▽	STANDING GWL
mbgl	METERS BELOW GROUND LEVEL	GWL	GROUNDWATER LEVEL				

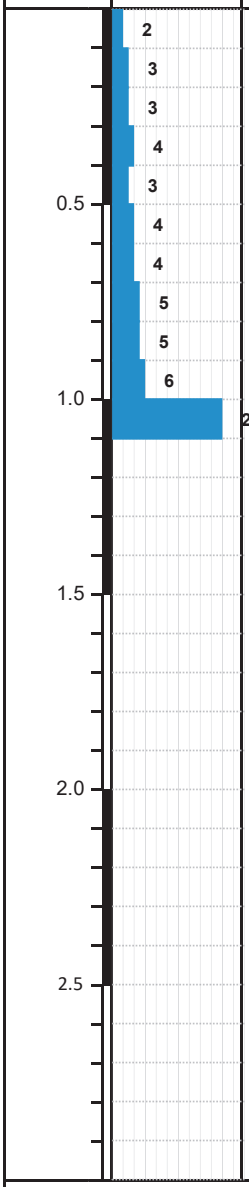
NOTES

miyamoto. ENGINEERS+ CONSTRUCTION CONSULTANTS	*PROJECT NUMBER:*	**200357-8**
	CLIENT:	**Yoursection Ltd**
	TESTING COMPLETED:	**23 October 2024**

SHALLOW GROUND INVESTIGATION LOG

MA02

PROJECT:	**1 & 2 / 487 Weedons Road, Rolleston**				
LOGGED BY:	**JBJ**	*TOTAL TESTING DEPTH:*	**1.7 mbgl**	*HOLE DIAMETER:*	**200 mm**
PROCESSED BY:	**JS**	*TESTING METHOD:*	**MA**	*SHEAR VANE NUMBER:*	**N/A**
LOCATION:	**REFER TO SITE PLAN**	*GROUNDWATER LEVEL:*	**N/A**	This report may only be reproduced in full	



Depth (m)	*DCP Test Results (Blows per 100mm)*	*GWL*	*Soil Description*			*Sample Taken*	*Lab Testing*								*Shear Vane Reading (kPa) peak/remoulded*
							Atterberg Limits			*Grain Size*			*WC (%)*	*UW*	
			USC	*Soil Characteristics*	*Graphic Log*		*LL*	*PL*	*PI*	*GR*	*SA*	*FC*			
0.0	2	Not Encountered		TOPSOIL, SILT, dark brown-black, non-plastic to low plasticity, with rootlets, moist											
	3		ML	Sandy SILT, non-plastic to low plasticity, light yellow brown											
0.5	3														
	4														
	3		SM	Silty SAND, fine to medium grained, grey brown, moist											
	4														
1.0	4														
	5														
	5														
	6														
	20		ML	SILT, non-plastic to low plasticity, light yellow brown											
1.5															
			GP	Sandy GRAVEL, fine to medium, brown grey											
2.0				MA02 Terminated at 1.7m - Target Strata											
2.5															

LEGEND

ABBREVIATIONS

DCP	DYNAMIC CONE PENETROMETER	N/E	NOT ENCOUNTERED	LL	LIQUID LIMIT	GR	GRAVEL
HA	HAND AUGER	UTP	UNABLE TO PENETRATE	PL	PLASTIC LIMIT	SA	SAND
SV	SHEAR VANE	EOH	END OF HOLE	PI	PLASTICITY INDEX	FC	FINES CONTENT
MA	MECHANISED AUGER	UW	UNIT WEIGHT (kN/m^3)	WC	WATER CONTENT	▽	STANDING GWL
mbgl	METERS BELOW GROUND LEVEL	GWL	GROUNDWATER LEVEL				

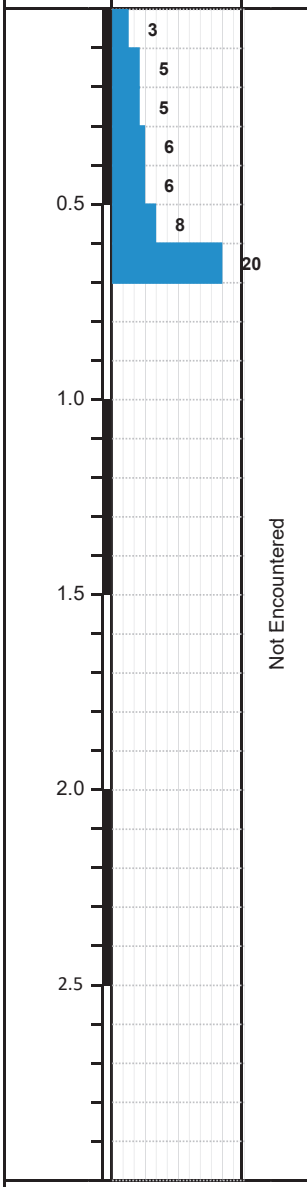
NOTES

miyamoto. ENGINEERS+ CONSTRUCTION CONSULTANTS	*PROJECT NUMBER:*	**200357-8**
	CLIENT:	**Yoursection Ltd**
	TESTING COMPLETED:	**23 October 2024**

SHALLOW GROUND INVESTIGATION LOG

MA03

PROJECT:	**1 & 2 / 487 Weedons Road, Rolleston**				
LOGGED BY:	**JBJ**	*TOTAL TESTING DEPTH:*	**0.8 mbgl**	*HOLE DIAMETER:*	**200 mm**
PROCESSED BY:	**JS**	*TESTING METHOD:*	**MA**	*SHEAR VANE NUMBER:*	**N/A**
LOCATION:	**REFER TO SITE PLAN**	*GROUNDWATER LEVEL:*	**N/A**	This report may only be reproduced in full	



Depth (m)	*DCP Test Results (Blows per 100mm)*	*GWL*	*Soil Description*			*Sample Taken*	*Lab Testing*								*Shear Vane Reading (kPa) peak/remoulded*
							Atterberg Limits			*Grain Size*			*WC (%)*	*UW*	
			USC	*Soil Characteristics*	*Graphic Log*		*LL*	*PL*	*PI*	*GR*	*SA*	*FC*			
0	3			TOPSOIL, SILT, dark brown-black, non-plastic to low plasticity, with rootlets, moist											
	5		ML	Sandy SILT, non-plastic to low plasticity, light yellow brown											
0.5	5		GW	Sandy GRAVEL, fine to coarse , with cobbles up to 200mm											
	6			MA03 Terminated at 0.8m - Target Strata											
	6														
1.0	8														
	20	Not Encountered													
1.5															
2.0															
2.5															

LEGEND

ABBREVIATIONS

DCP	DYNAMIC CONE PENETROMETER	N/E	NOT ENCOUNTERED	LL	LIQUID LIMIT	GR	GRAVEL
HA	HAND AUGER	UTP	UNABLE TO PENETRATE	PL	PLASTIC LIMIT	SA	SAND
SV	SHEAR VANE	EOH	END OF HOLE	PI	PLASTICITY INDEX	FC	FINES CONTENT
MA	MECHANISED AUGER	UW	UNIT WEIGHT (kN/m^3)	WC	WATER CONTENT	▽	STANDING GWL
mbgl	METERS BELOW GROUND LEVEL	GWL	GROUNDWATER LEVEL				

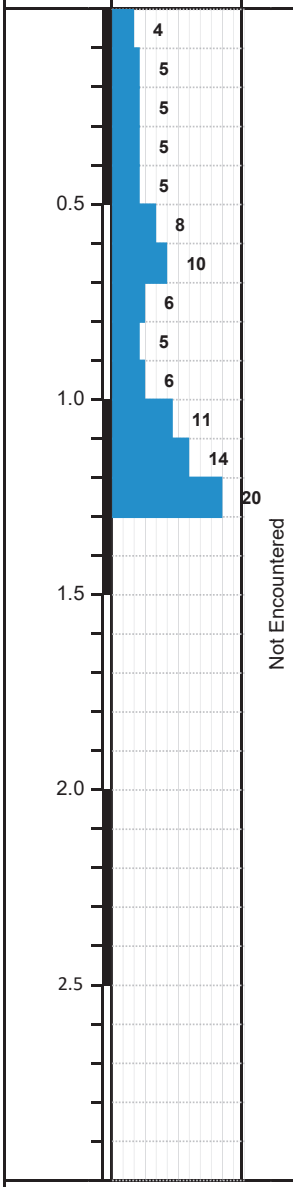
NOTES

miyamoto. ENGINEERS+ CONSTRUCTION CONSULTANTS	*PROJECT NUMBER:*	**200357-8**
	CLIENT:	**Yoursection Ltd**
	TESTING COMPLETED:	**23 October 2024**

SHALLOW GROUND INVESTIGATION LOG

MA04

PROJECT:	**1 & 2 / 487 Weedons Road, Rolleston**				
LOGGED BY:	**JBJ**	*TOTAL TESTING DEPTH:*	**1.6 mbgl**	*HOLE DIAMETER:*	**200 mm**
PROCESSED BY:	**JS**	*TESTING METHOD:*	**MA**	*SHEAR VANE NUMBER:*	**N/A**
LOCATION:	**REFER TO SITE PLAN**	*GROUNDWATER LEVEL:*	**N/A**	This report may only be reproduced in full	



Depth (m)	*DCP Test Results (Blows per 100mm)*	*GWL*	*Soil Description*			*Sample Taken*	*Lab Testing*								*Shear Vane Reading (kPa) peak/remoulded*
							Atterberg Limits			*Grain Size*			*WC (%)*	*UW*	
			USC	*Soil Characteristics*	*Graphic Log*		*LL*	*PL*	*PI*	*GR*	*SA*	*FC*			
0.0	4			TOPSOIL, SILT, dark brown-black, non-plastic to low plasticity, with rootlets, moist											
	5		SM	Silty SAND, fine to medium grained, light brown											
	5														
	5														
0.5	8			At 0.6m, silt absent											
	10														
	6														
	5		SP	SAND, fine grained, pale yellow brown, dry (loess)											
	6														
1.0	11														
	14														
	20														
1.5		Not Encountered	GW	Sandy GRAVEL, fine to coarse, grey brown											
				MA04 Terminated at 1.6m - Target Strata											
2.0															
2.5															

LEGEND

ABBREVIATIONS

DCP	DYNAMIC CONE PENETROMETER	N/E	NOT ENCOUNTERED	LL	LIQUID LIMIT	GR	GRAVEL
HA	HAND AUGER	UTP	UNABLE TO PENETRATE	PL	PLASTIC LIMIT	SA	SAND
SV	SHEAR VANE	EOH	END OF HOLE	PI	PLASTICITY INDEX	FC	FINES CONTENT
MA	MECHANISED AUGER	UW	UNIT WEIGHT (kN/m^3)	WC	WATER CONTENT	▽	STANDING GWL
mbgl	METERS BELOW GROUND LEVEL	GWL	GROUNDWATER LEVEL				

NOTES

miyamoto. ENGINEERS+ CONSTRUCTION CONSULTANTS	*PROJECT NUMBER:*	**200357-8**
	CLIENT:	**Yoursection Ltd**
	TESTING COMPLETED:	**23 October 2024**

SHALLOW GROUND INVESTIGATION LOG

MA05

PROJECT:	**1 & 2 / 487 Weedons Road, Rolleston**				
LOGGED BY:	**JBJ**	*TOTAL TESTING DEPTH:*	**0.8 mbgl**	*HOLE DIAMETER:*	**200 mm**
PROCESSED BY:	**JS**	*TESTING METHOD:*	**MA**	*SHEAR VANE NUMBER:*	**N/A**
LOCATION:	**REFER TO SITE PLAN**	*GROUNDWATER LEVEL:*	**N/A**	This report may only be reproduced in full	

Depth (m)	*DCP Test Results (Blows per 100mm)*	*GWL*	*Soil Description*			*Sample Taken*	*Lab Testing*								*Shear Vane Reading (kPa) peak/remoulded*
							Atterberg Limits			*Grain Size*			*WC (%)*	*UW*	
			USC	*Soil Characteristics*	*Graphic Log*		*LL*	*PL*	*PI*	*GR*	*SA*	*FC*			
0.5		Not Encountered		TOPSOIL, SILT, dark brown-black, non-plastic to low plasticity, with rootlets, moist											
			ML	Sandy SILT, non-plastic to low plasticity, brown, trace of coarse gravel At 0.4m, pale brown											
			GM	Silty GRAVEL, fine to coarse, grey brown											
1.0				MA04 Terminated at 0.8m - Target Strata											
1.5															
2.0															
2.5															

LEGEND

ABBREVIATIONS

DCP	DYNAMIC CONE PENETROMETER	N/E	NOT ENCOUNTERED	LL	LIQUID LIMIT	GR	GRAVEL
HA	HAND AUGER	UTP	UNABLE TO PENETRATE	PL	PLASTIC LIMIT	SA	SAND
SV	SHEAR VANE	EOH	END OF HOLE	PI	PLASTICITY INDEX	FC	FINES CONTENT
MA	MECHANISED AUGER	UW	UNIT WEIGHT (kN/m^3)	WC	WATER CONTENT	▽	STANDING GWL
mbgl	METERS BELOW GROUND LEVEL	GWL	GROUNDWATER LEVEL				

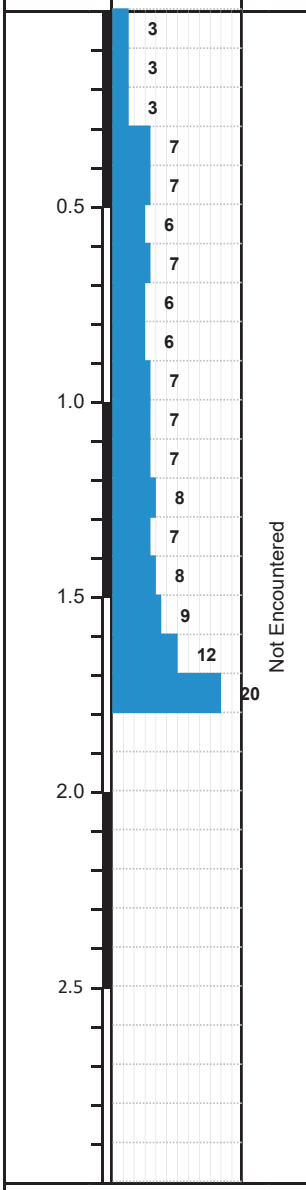
NOTES

miyamoto. ENGINEERS+ CONSTRUCTION CONSULTANTS	*PROJECT NUMBER:*	**200357-8**
	CLIENT:	**Yoursection Ltd**
	TESTING COMPLETED:	**23 October 2024**

SHALLOW GROUND INVESTIGATION LOG

MA06

PROJECT:	**1 & 2 / 487 Weedons Road, Rolleston**				
LOGGED BY:	**JBJ**	*TOTAL TESTING DEPTH:*	**1.8 mbgl**	*HOLE DIAMETER:*	**200 mm**
PROCESSED BY:	**JS**	*TESTING METHOD:*	**MA**	*SHEAR VANE NUMBER:*	**N/A**
LOCATION:	**REFER TO SITE PLAN**	*GROUNDWATER LEVEL:*	**N/A**	This report may only be reproduced in full	



Depth (m)	*USC*	*Soil Characteristics*	*Graphic Log*	*Sample Taken*	*Lab Testing*								*Shear Vane Reading (kPa) peak/remoulded*
					Atterberg Limits			*Grain Size*			*WC (%)*	*UW*	
					LL	*PL*	*PI*	*GR*	*SA*	*FC*			
0.0		TOPSOIL, SILT, dark brown-black, non-plastic to low plasticity, with rootlets, moist											
0.1	SP	SAND, fine to medium grained, light brown, trace silt, moist											
0.8		At 0.8m, silty											
1.0	SP	SAND, fine grained, pale yellow brown, dry (loess)											
1.8	GW	Sandy GRAVEL, fine to coarse											
		MA06 Terminated at 1.8m - Target Strata											

LEGEND

ABBREVIATIONS

DCP	DYNAMIC CONE PENETROMETER	N/E	NOT ENCOUNTERED	LL	LIQUID LIMIT	GR	GRAVEL
HA	HAND AUGER	UTP	UNABLE TO PENETRATE	PL	PLASTIC LIMIT	SA	SAND
SV	SHEAR VANE	EOH	END OF HOLE	PI	PLASTICITY INDEX	FC	FINES CONTENT
MA	MECHANISED AUGER	UW	UNIT WEIGHT (kN/m^3)	WC	WATER CONTENT	▽	STANDING GWL
mbgl	METERS BELOW GROUND LEVEL	GWL	GROUNDWATER LEVEL				

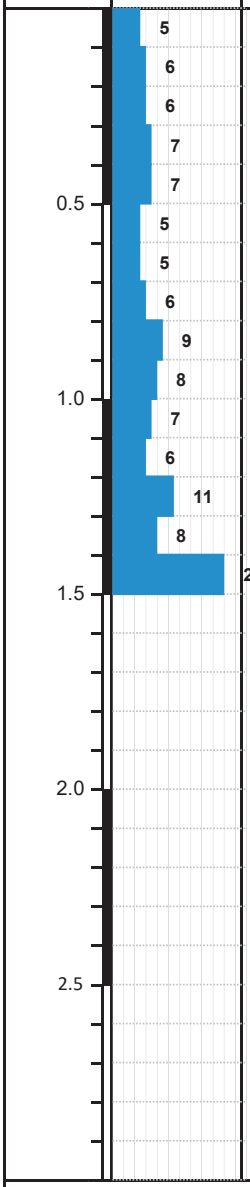
NOTES

miyamoto. ENGINEERS+ CONSTRUCTION CONSULTANTS	*PROJECT NUMBER:*	**200357-8**
	CLIENT:	**Yoursection Ltd**
	TESTING COMPLETED:	**3 December 2024**

SHALLOW GROUND INVESTIGATION LOG

MA07

PROJECT:	**10 / 487 Weedons Road, Rolleston**				
LOGGED BY:	**JBJ**	*TOTAL TESTING DEPTH:*	**1.6 mbgl**	*HOLE DIAMETER:*	**200 mm**
PROCESSED BY:	**JBJ**	*TESTING METHOD:*	**MA**	*SHEAR VANE NUMBER:*	**N/A**
LOCATION:	**REFER TO SITE PLAN**	*GROUNDWATER LEVEL:*	**N/A**	This report may only be reproduced in full	



Depth (m)	*USC*	*Soil Characteristics*	*Graphic Log*	*Sample Taken*	*Atterberg Limits* LL	PL	PI	*Grain Size* GR	SA	FC	*WC (%)*	*UW*	*Shear Vane Reading (kPa) peak/remoulded*
		TOPSOIL, SILT, dark brown-black, non-plastic to low plasticity, with rootlets, moist											
	SM	Silty SAND, fine to medium grained, light brown											
	ML	Sandy SILT, low plasticity , pale brown, dry											
	SP	SAND, fine to medium grained, light brown											
	GW	Sandy GRAVEL, fine to coarse, grey brown											
		MA07 Terminated at 1.6m - Target Strata											

LEGEND

ABBREVIATIONS

DCP	DYNAMIC CONE PENETROMETER	N/E	NOT ENCOUNTERED	LL	LIQUID LIMIT	GR	GRAVEL
HA	HAND AUGER	UTP	UNABLE TO PENETRATE	PL	PLASTIC LIMIT	SA	SAND
SV	SHEAR VANE	EOH	END OF HOLE	PI	PLASTICITY INDEX	FC	FINES CONTENT
MA	MECHANISED AUGER	UW	UNIT WEIGHT (kN/m^3)	WC	WATER CONTENT	▽	STANDING GWL
mbgl	METERS BELOW GROUND LEVEL	GWL	GROUNDWATER LEVEL				

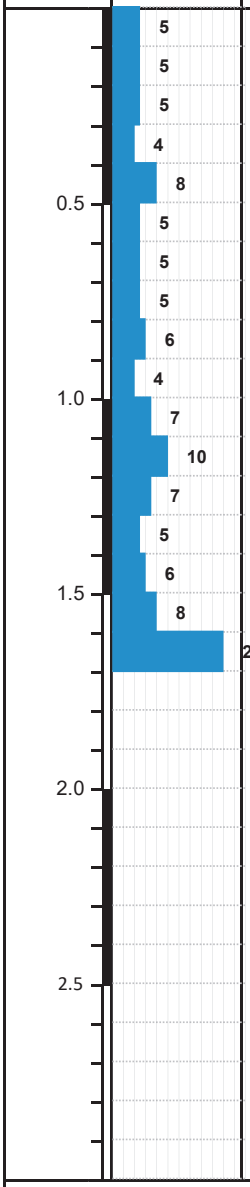
NOTES

miyamoto. ENGINEERS+ CONSTRUCTION CONSULTANTS	*PROJECT NUMBER:*	**200357-8**
	CLIENT:	**Yoursection Ltd**
	TESTING COMPLETED:	**3 December 2024**

SHALLOW GROUND INVESTIGATION LOG

MA08

PROJECT:	**10 / 487 Weedons Road, Rolleston**				
LOGGED BY:	**JBJ**	*TOTAL TESTING DEPTH:*	**1.8 mbgl**	*HOLE DIAMETER:*	**200 mm**
PROCESSED BY:	**JBJ**	*TESTING METHOD:*	**MA**	*SHEAR VANE NUMBER:*	**N/A**
LOCATION:	**REFER TO SITE PLAN**	*GROUNDWATER LEVEL:*	**N/A**	This report may only be reproduced in full	



Depth (m)	USC	Soil Characteristics	Graphic Log	Sample Taken	Lab Testing: Atterberg Limits LL	PL	PI	Grain Size GR	SA	FC	WC (%)	UW	Shear Vane Reading (kPa) peak/remoulded
0.0		TOPSOIL, SILT, dark brown-black, non-plastic to low plasticity, with rootlets, moist											
0.3	SM	Silty SAND, fine to medium grained, pale brown											
0.6		At 0.6m, silt absent											
0.8	ML	Sandy SILT, low plasticity, pale brown, dry											
1.6	GW	Sandy GRAVEL, fine to coarse, grey brown											
1.8		MA08 Terminated at 1.8m - Target Strata											

LEGEND

ABBREVIATIONS

DCP	DYNAMIC CONE PENETROMETER	N/E	NOT ENCOUNTERED	LL	LIQUID LIMIT	GR	GRAVEL
HA	HAND AUGER	UTP	UNABLE TO PENETRATE	PL	PLASTIC LIMIT	SA	SAND
SV	SHEAR VANE	EOH	END OF HOLE	PI	PLASTICITY INDEX	FC	FINES CONTENT
MA	MECHANISED AUGER	UW	UNIT WEIGHT (kN/m^3)	WC	WATER CONTENT	▽	STANDING GWL
mbgl	METERS BELOW GROUND LEVEL	GWL	GROUNDWATER LEVEL				

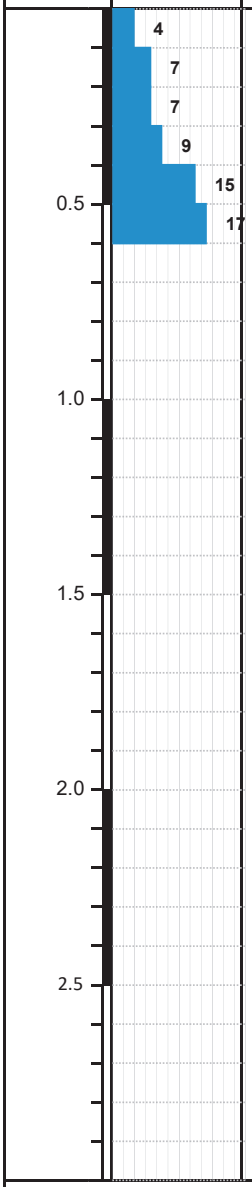
NOTES

miyamoto. ENGINEERS+ CONSTRUCTION CONSULTANTS	*PROJECT NUMBER:*	**200357-8**
	CLIENT:	**Yoursection Ltd**
	TESTING COMPLETED:	**3 December 2024**

SHALLOW GROUND INVESTIGATION LOG

MA09

PROJECT:	**10 / 487 Weedons Road, Rolleston**				
LOGGED BY:	**JBJ**	*TOTAL TESTING DEPTH:*	**1.8 mbgl**	*HOLE DIAMETER:*	**200 mm**
PROCESSED BY:	**JBJ**	*TESTING METHOD:*	**MA**	*SHEAR VANE NUMBER:*	**N/A**
LOCATION:	**REFER TO SITE PLAN**	*GROUNDWATER LEVEL:*	**N/A**	This report may only be reproduced in full	



Depth (m)	*DCP Test Results (Blows per 100mm)*	*GWL*	*Soil Description*			*Sample Taken*	*Lab Testing*								*Shear Vane Reading (kPa) peak/remoulded*
							Atterberg Limits			*Grain Size*			*WC (%)*	*UW*	
			USC	*Soil Characteristics*	*Graphic Log*		*LL*	*PL*	*PI*	*GR*	*SA*	*FC*			
0	4			TOPSOIL, SILT, dark brown-black, non-plastic to low plasticity, with rootlets, moist											
	7		SP	SAND, fine grained, light brown (Loess)											
	7														
	9														
0.5	15														
	17														
1.0															
1.5		Not Encountered	ML	SILT, low plasticity, pale brown, dry, hard											
			GW	Sandy GRAVEL, fine to coarse, grey brown											
2.0				MA09 Terminated at 1.8m - Target Strata											
2.5															

LEGEND

ABBREVIATIONS

DCP	DYNAMIC CONE PENETROMETER	N/E	NOT ENCOUNTERED	LL	LIQUID LIMIT	GR	GRAVEL
HA	HAND AUGER	UTP	UNABLE TO PENETRATE	PL	PLASTIC LIMIT	SA	SAND
SV	SHEAR VANE	EOH	END OF HOLE	PI	PLASTICITY INDEX	FC	FINES CONTENT
MA	MECHANISED AUGER	UW	UNIT WEIGHT (kN/m^3)	WC	WATER CONTENT	▽	STANDING GWL
mbgl	METERS BELOW GROUND LEVEL	GWL	GROUNDWATER LEVEL				

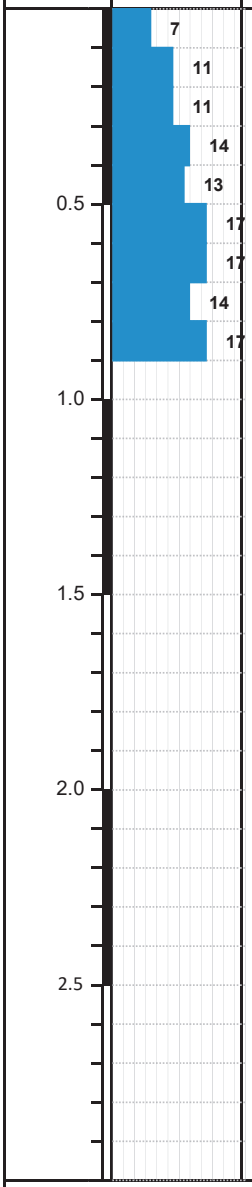
NOTES

miyamoto. ENGINEERS+ CONSTRUCTION CONSULTANTS	*PROJECT NUMBER:*	**200357-8**
	CLIENT:	**Yoursection Ltd**
	TESTING COMPLETED:	**3 December 2024**

SHALLOW GROUND INVESTIGATION LOG

MA10

PROJECT:	**10 / 487 Weedons Road, Rolleston**				
LOGGED BY:	**JBJ**	*TOTAL TESTING DEPTH:*	**1.6 mbgl**	*HOLE DIAMETER:*	**200 mm**
PROCESSED BY:	**JBJ**	*TESTING METHOD:*	**MA**	*SHEAR VANE NUMBER:*	**N/A**
LOCATION:	**REFER TO SITE PLAN**	*GROUNDWATER LEVEL:*	**N/A**	This report may only be reproduced in full	



Depth (m)	*DCP Test Results (Blows per 100mm)*	*GWL*	*Soil Description*			*Sample Taken*	*Lab Testing*								*Shear Vane Reading (kPa) peak/remoulded*
							Atterberg Limits			*Grain Size*			*WC (%)*	*UW*	
			USC	*Soil Characteristics*	*Graphic Log*		*LL*	*PL*	*PI*	*GR*	*SA*	*FC*			
0				TOPSOIL, SILT, dark brown-black, non-plastic to low plasticity, with rootlets, moist											
			SP	SAND, fine grained,with minor silt, pale yellow brown (Loess)											
1.5			GW	Sandy GRAVEL, fine to coarse, grey brown											
				MA10 Terminated at 1.6m - Target Strata											

LEGEND

ABBREVIATIONS

DCP	DYNAMIC CONE PENETROMETER	N/E	NOT ENCOUNTERED	LL	LIQUID LIMIT	GR	GRAVEL
HA	HAND AUGER	UTP	UNABLE TO PENETRATE	PL	PLASTIC LIMIT	SA	SAND
SV	SHEAR VANE	EOH	END OF HOLE	PI	PLASTICITY INDEX	FC	FINES CONTENT
MA	MECHANISED AUGER	UW	UNIT WEIGHT (kN/m^3)	WC	WATER CONTENT		STANDING GWL
mbgl	METERS BELOW GROUND LEVEL	GWL	GROUNDWATER LEVEL				

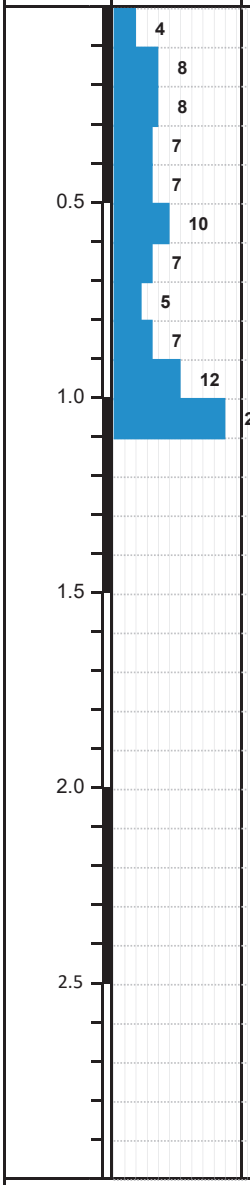
NOTES

miyamoto. ENGINEERS+ CONSTRUCTION CONSULTANTS	*PROJECT NUMBER:*	**200357-8**
	CLIENT:	**Yoursection Ltd**
	TESTING COMPLETED:	**3 December 2024**

SHALLOW GROUND INVESTIGATION LOG

MA11

PROJECT:	**10 / 487 Weedons Road, Rolleston**				
LOGGED BY:	**JBJ**	*TOTAL TESTING DEPTH:*	**1.6 mbgl**	*HOLE DIAMETER:*	**200 mm**
PROCESSED BY:	**JBJ**	*TESTING METHOD:*	**MA**	*SHEAR VANE NUMBER:*	**N/A**
LOCATION:	**REFER TO SITE PLAN**	*GROUNDWATER LEVEL:*	**N/A**	This report may only be reproduced in full	



Depth (m)	*DCP Test Results (Blows per 100mm)*	*GWL*	*Soil Description*			*Sample Taken*	*Lab Testing*								*Shear Vane Reading (kPa) peak/remoulded*
							Atterberg Limits			*Grain Size*			*WC (%)*	*UW*	
			USC	*Soil Characteristics*	*Graphic Log*		*LL*	*PL*	*PI*	*GR*	*SA*	*FC*			
0	4			TOPSOIL, SILT, dark brown-black, non-plastic to low plasticity, with rootlets, moist											
	8		SM	Silty SAND, fine to medium grained, light brown											
	8														
	7														
0.5	7														
	10														
	7														
	5		ML	SILT, non- low plasticity, pale brown, dry											
	7														
1.0	12														
	20	Not Encountered	GW	Sandy GRAVEL, fine to coarse, grey brown											
1.5															
				MA11 Terminated at 1.6m - Target Strata											
2.0															
2.5															

LEGEND

ABBREVIATIONS

DCP	DYNAMIC CONE PENETROMETER	N/E	NOT ENCOUNTERED	LL	LIQUID LIMIT	GR	GRAVEL
HA	HAND AUGER	UTP	UNABLE TO PENETRATE	PL	PLASTIC LIMIT	SA	SAND
SV	SHEAR VANE	EOH	END OF HOLE	PI	PLASTICITY INDEX	FC	FINES CONTENT
MA	MECHANISED AUGER	UW	UNIT WEIGHT (kN/m^3)	WC	WATER CONTENT	▽	STANDING GWL
mbgl	METERS BELOW GROUND LEVEL	GWL	GROUNDWATER LEVEL				

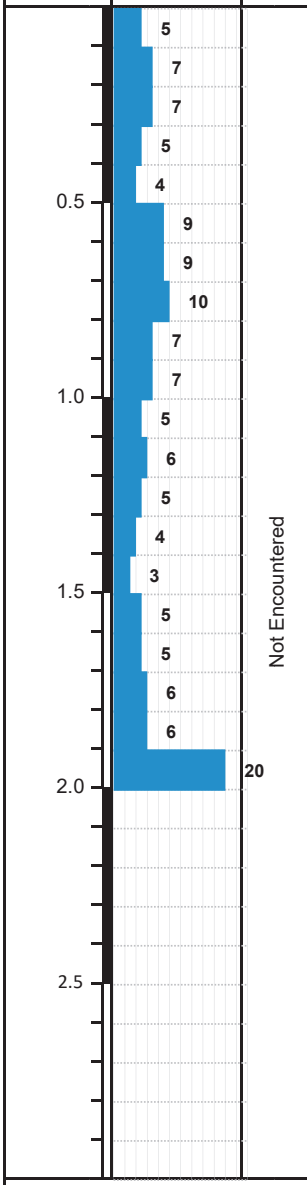
NOTES

miyamoto. ENGINEERS+ CONSTRUCTION CONSULTANTS	*PROJECT NUMBER:*	**200357-8**
	CLIENT:	**Yoursection Ltd**
	TESTING COMPLETED:	**3 December 2024**

SHALLOW GROUND INVESTIGATION LOG

MA12

PROJECT:	**10 / 487 Weedons Road, Rolleston**				
LOGGED BY:	**JBJ**	*TOTAL TESTING DEPTH:*	**2.2 mbgl**	*HOLE DIAMETER:*	**200 mm**
PROCESSED BY:	**JBJ**	*TESTING METHOD:*	**MA**	*SHEAR VANE NUMBER:*	**N/A**
LOCATION:	**REFER TO SITE PLAN**	*GROUNDWATER LEVEL:*	**N/A**	This report may only be reproduced in full	



Depth (m)	DCP Test Results (Blows per 100mm)	GWL	Soil Description: USC	Soil Description: Soil Characteristics	Soil Description: Graphic Log	Sample Taken	Lab Testing: Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Grain Size GR	Grain Size SA	Grain Size FC	WC (%)	UW	Shear Vane Reading (kPa) peak/remoulded
				TOPSOIL, SILT, dark brown-black, non-plastic to low plasticity, with rootlets, moist											
			ML	Sandy SILT, low plasticity, pale brown, dry											
			GW	Sandy GRAVEL, fine to coarse, grey brown											
				MA12 Terminated at 2.2m - Target Strata											

LEGEND

ABBREVIATIONS

DCP	DYNAMIC CONE PENETROMETER	N/E	NOT ENCOUNTERED	LL	LIQUID LIMIT	GR	GRAVEL
HA	HAND AUGER	UTP	UNABLE TO PENETRATE	PL	PLASTIC LIMIT	SA	SAND
SV	SHEAR VANE	EOH	END OF HOLE	PI	PLASTICITY INDEX	FC	FINES CONTENT
MA	MECHANISED AUGER	UW	UNIT WEIGHT (kN/m^3)	WC	WATER CONTENT	▽	STANDING GWL
mbgl	METERS BELOW GROUND LEVEL	GWL	GROUNDWATER LEVEL				

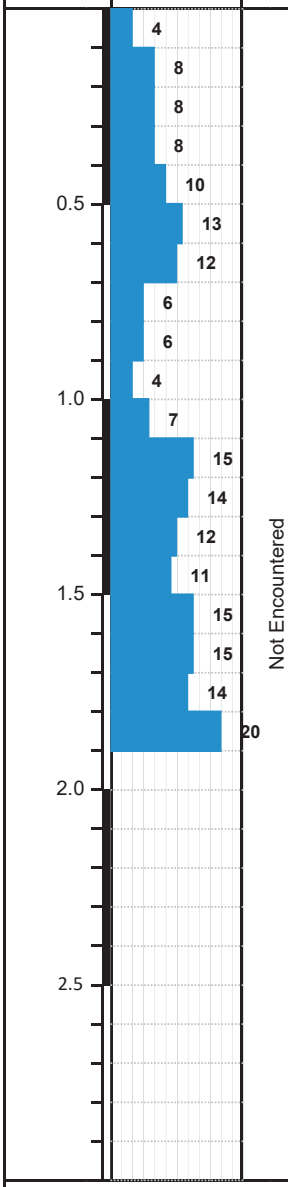
NOTES

miyamoto. ENGINEERS+ CONSTRUCTION CONSULTANTS	*PROJECT NUMBER:*	**200357-8**
	CLIENT:	**Yoursection Ltd**
	TESTING COMPLETED:	**3 December 2024**

SHALLOW GROUND INVESTIGATION LOG

MA13

PROJECT:	**10 / 487 Weedons Road, Rolleston**				
LOGGED BY:	**JBJ**	*TOTAL TESTING DEPTH:*	**2.2 mbgl**	*HOLE DIAMETER:*	**200 mm**
PROCESSED BY:	**JBJ**	*TESTING METHOD:*	**MA**	*SHEAR VANE NUMBER:*	**N/A**
LOCATION:	**REFER TO SITE PLAN**	*GROUNDWATER LEVEL:*	**N/A**	This report may only be reproduced in full	



Depth (m)	*DCP Test Results (Blows per 100mm)*	*GWL*	*Soil Description*			*Sample Taken*	*Lab Testing*								*Shear Vane Reading (kPa) peak/remoulded*
							Atterberg Limits			*Grain Size*			*WC (%)*	*UW*	
			USC	*Soil Characteristics*	*Graphic Log*		*LL*	*PL*	*PI*	*GR*	*SA*	*FC*			
0				TOPSOIL, SILT, dark brown-black, non-plastic to low plasticity, with rootlets, moist											
			ML	Sandy SILT, low plasticity, pale brown, dry											
				MA13 Terminated at 0.6m - Early termination due to mechanical issue											

LEGEND

ABBREVIATIONS

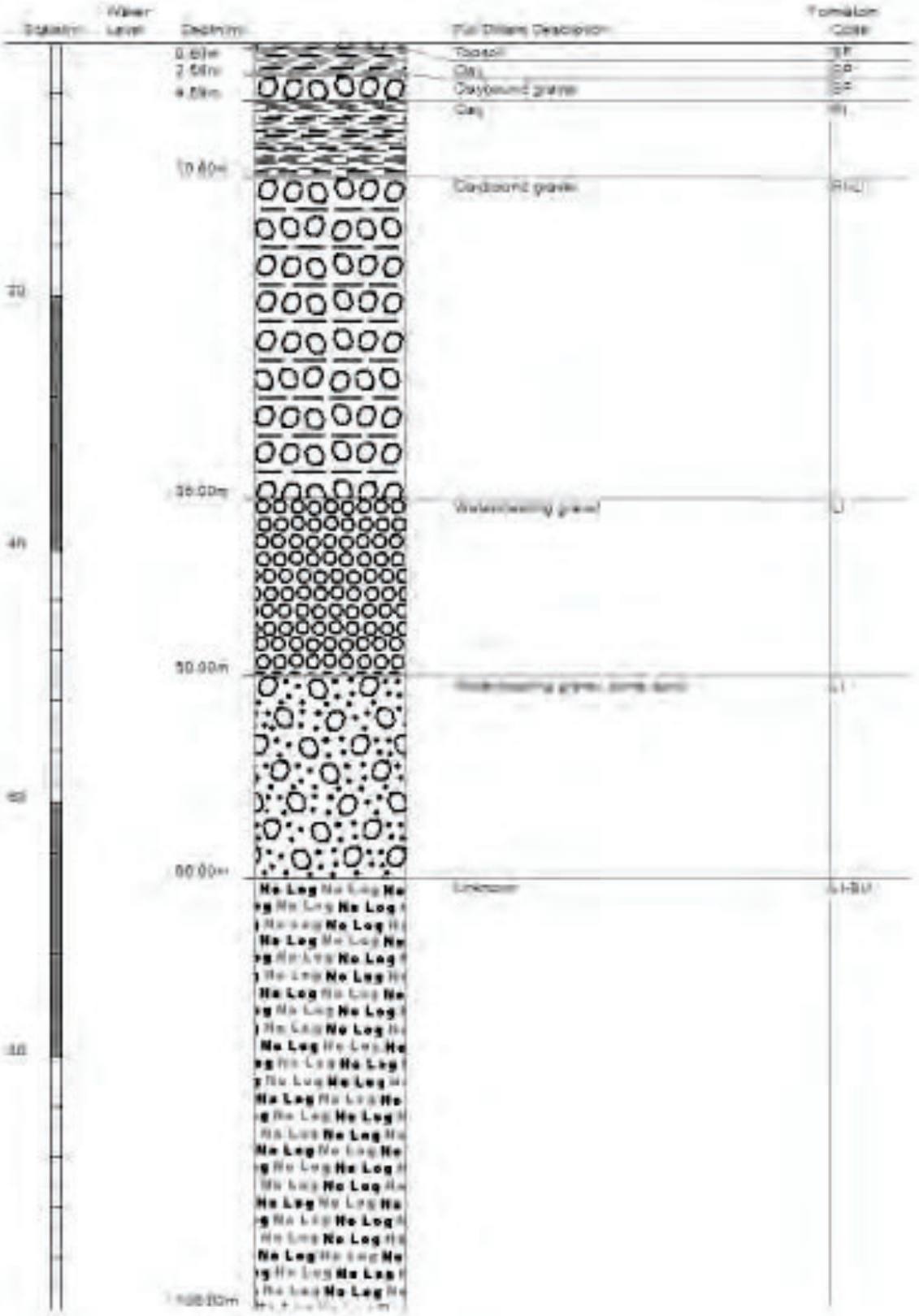
DCP	DYNAMIC CONE PENETROMETER	N/E	NOT ENCOUNTERED	LL	LIQUID LIMIT	GR	GRAVEL
HA	HAND AUGER	UTP	UNABLE TO PENETRATE	PL	PLASTIC LIMIT	SA	SAND
SV	SHEAR VANE	EOH	END OF HOLE	PI	PLASTICITY INDEX	FC	FINES CONTENT
MA	MECHANISED AUGER	UW	UNIT WEIGHT (kN/m^3)	WC	WATER CONTENT	▽	STANDING GWL
mbgl	METERS BELOW GROUND LEVEL	GWL	GROUNDWATER LEVEL				

NOTES

Borelog for well M36/1914

Grid Reference (NZTM): 1653309 mE 5171594 mN
Location Accuracy: 2 - 15m
Ground Level Altitude: 37.0 m +MSD Accuracy: < 0.5 m
Driller: A M Bisley & Co
Drill Method: Cable Tool
Borelog Depth: 100.0 m Drill Date: 26-Mar-1964

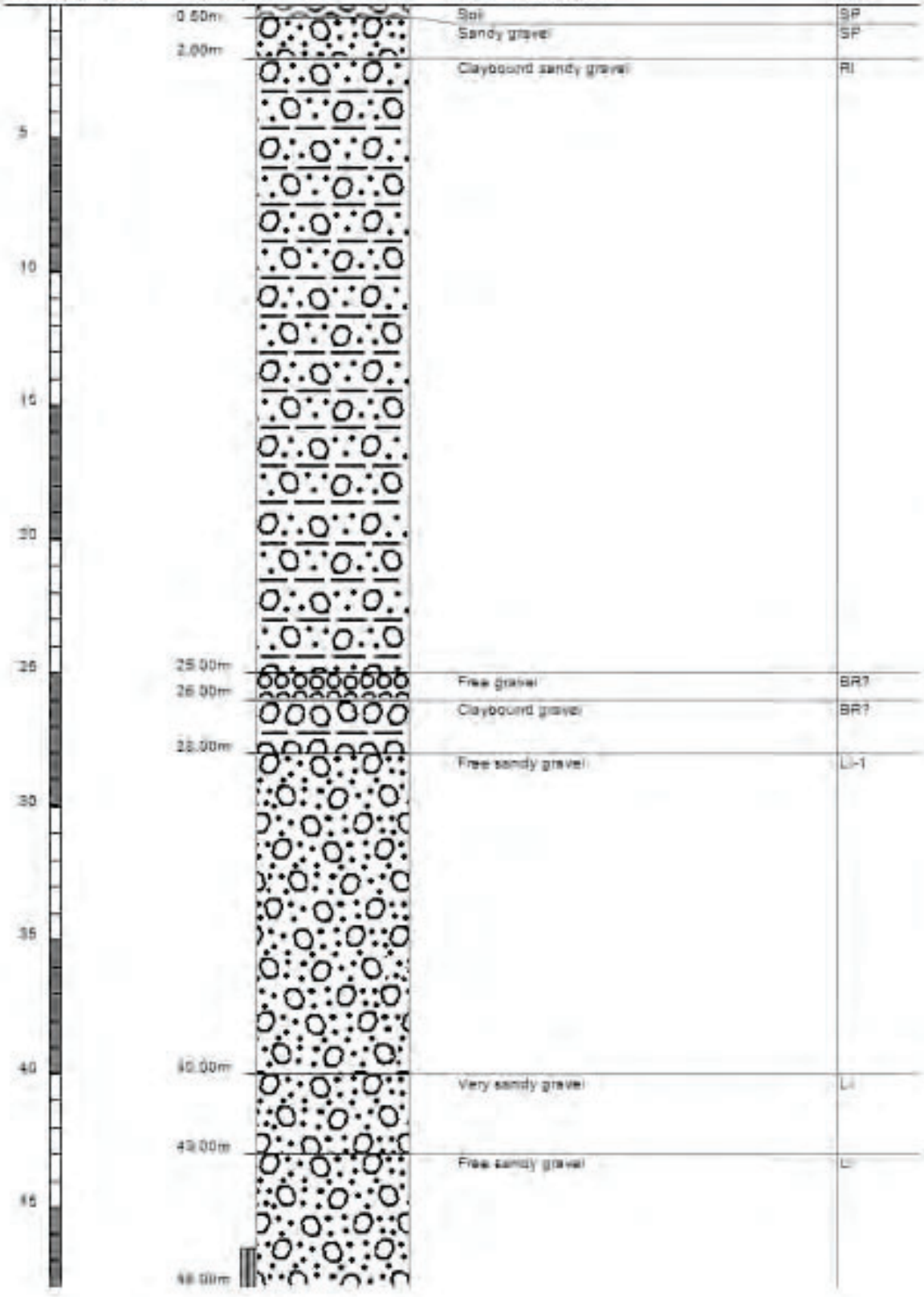
Environment Canterbury Regional Council



Borelog for well M36/5909

Grid Reference (NZTM): 1553366 mE, 5171950 mN
Location Accuracy: 50 - 300m
Ground Level Altitude: 38.6 m +MSD Accuracy: < 2.5 m
Driller: Smiths Welldrilling
Drill Method: Rotary Rig
Borelog Depth: 48.0 m Drill Date: 04-Apr-2000

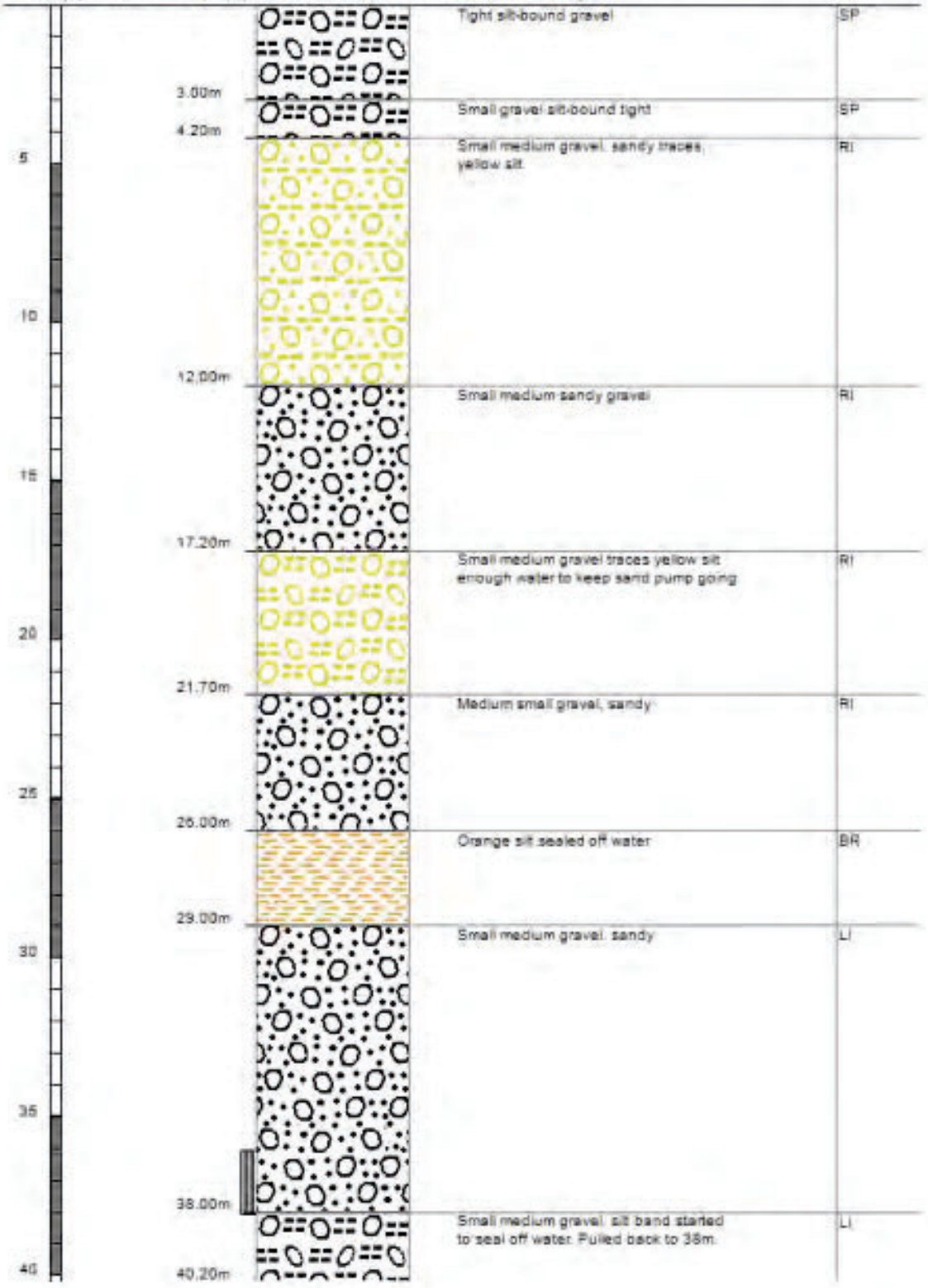
Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha



Borelog for well M36/5910

Grid Reference (NZTM): 1553446 mE, 5171830 mN
Location Accuracy: 10 - 50m
Ground Level Altitude: 37.8 m +MSD Accuracy: < 2.5 m
Driller: Dynes Road Drilling
Drill Method: Cable Tool
Borelog Depth: 40.2 m Drill Date: 15-Jan-2001

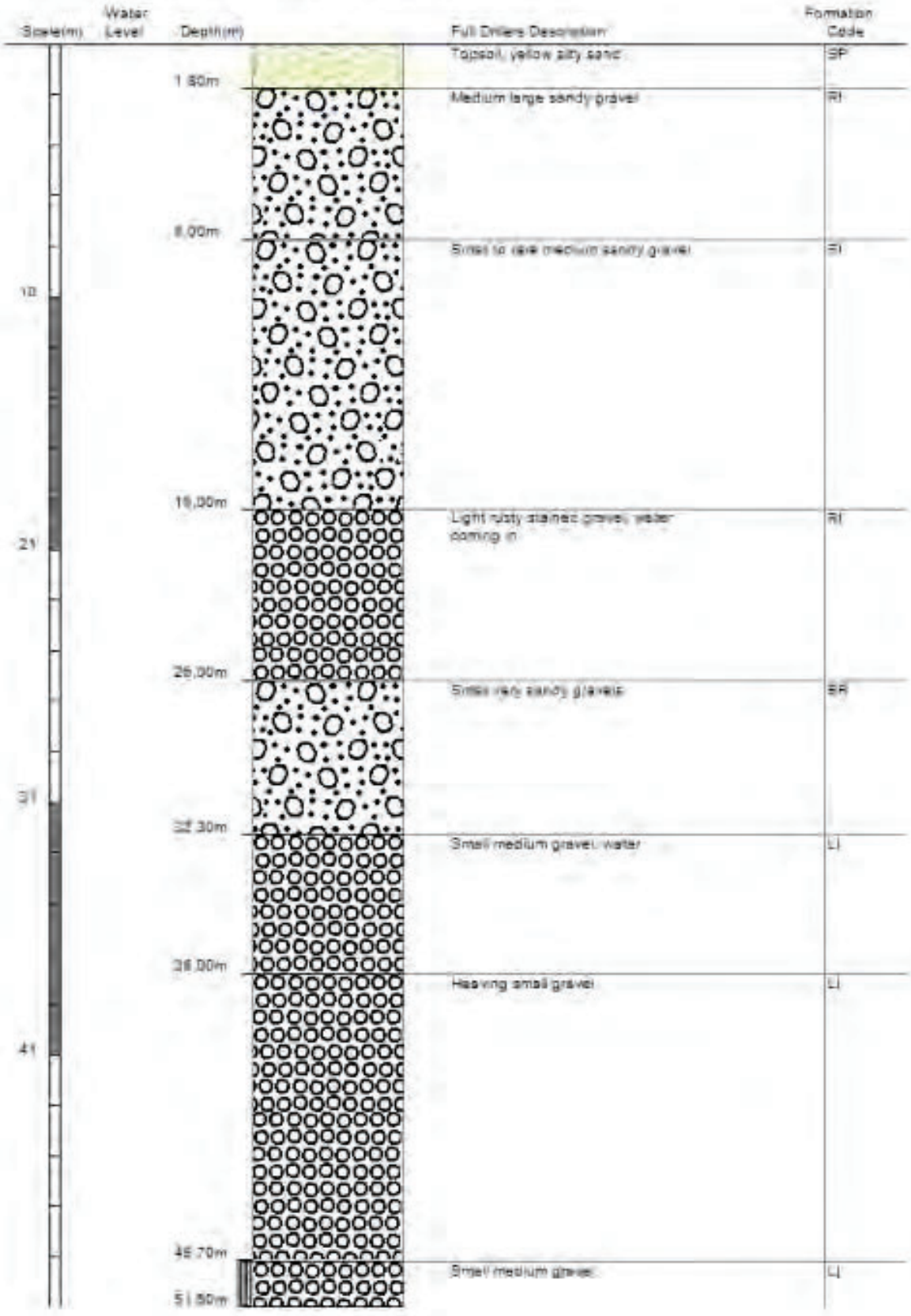
Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha



Borelog for well M36/5911

Grid Reference (NZTM): 1553526 mE 5171710 mN
Location Accuracy: 50 - 300m
Ground Level Altitude: 37.4 m +MSD Accuracy: < 2.5 m
Driller: Dynes Road Drilling
Drill Method: Cable Tool
Borelog Depth: 51.6 m Drill Date: 26-Aug-2002

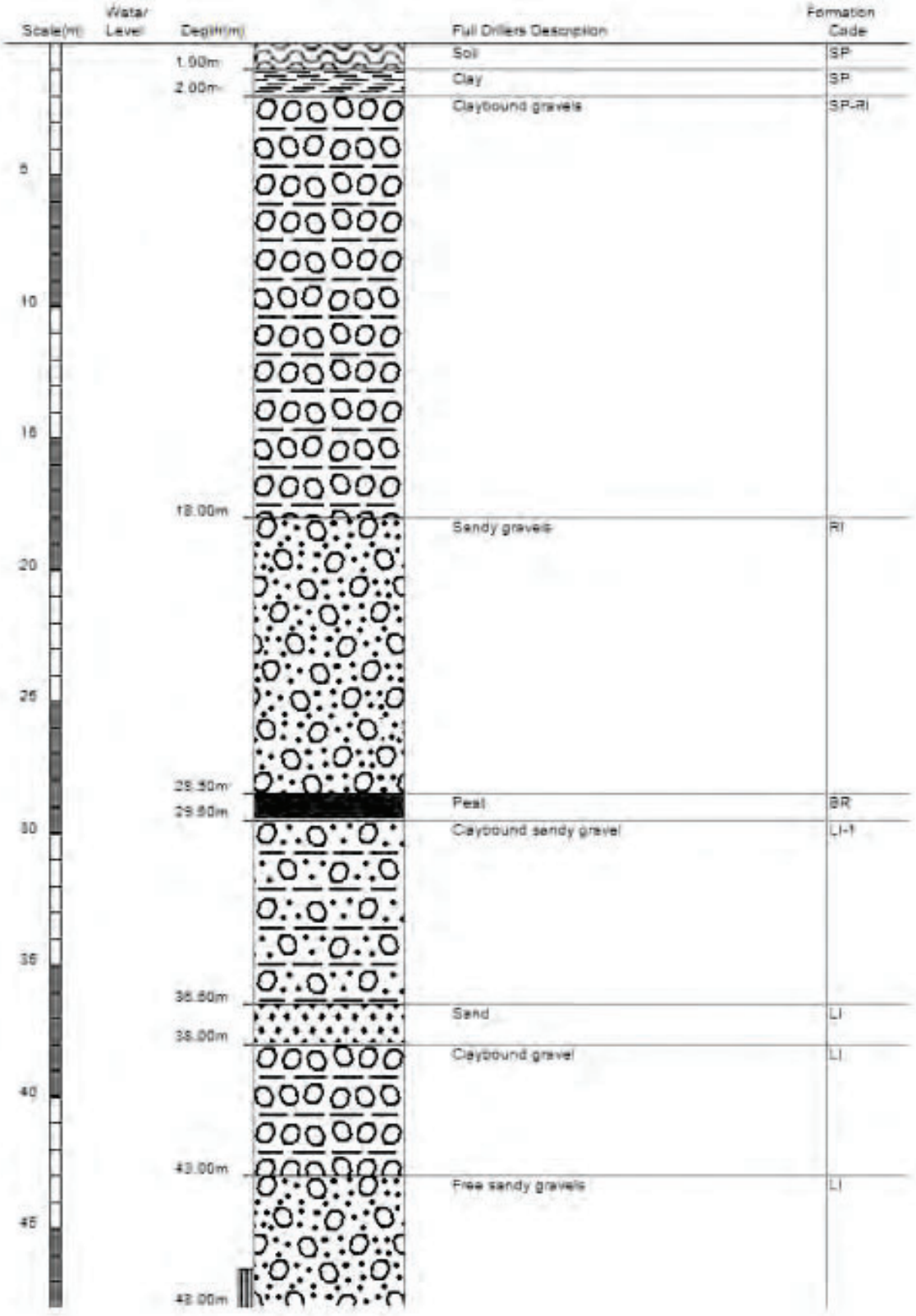
Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha



Borelog for well M36/6840

Grid Reference (NZTM): 1553670 mE, 5171476 mN
Location Accuracy: 2 - 15m
Ground Level Altitude: 36.4 m +MSD Accuracy: < 0.5 m
Driller: Smiths Welldrilling
Drill Method: Rotary Rig
Borelog Depth: 48.0 m Drill Date: 20-Jul-2000

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha



12 December 2024

Att: Dean Gregory & Hamish Wheelans
Yoursection Ltd

Technical Memorandum: Soakage Testing at 1/487 Weedons Road, Rolleston

MNZ Ref: 220357-8 TM-001[A]

1. Introduction

Miyamoto New Zealand Ltd (Miyamoto) have been engaged by Yoursection Ltd to complete soakage testing at 487 Weedons Road. Miyamoto completed the following scope of works:

- Engage and supervise drilling contractor to complete soakage testing.
- Prepare a technical memorandum report detailing the results and findings.

Soakage testing was completed at 1/487 Weedons Road and comprised of drilling two boreholes to 4.5 m depth, with soakage testing was completed at the base of the boreholes using water from a 10,000-liter water cart. It is understood that results from the soakage testing will likely inform the design of possible future land developments within the wider area.

2. Site Location

The location of testing is shown below in figure 1. Two boreholes and associated soakage testing was completed at the eastern and western end of 1/487 Weedons Road, Rolleston, within grassed paddocks to the east of the Rolleston township.

Figure 1: Test locations

3. Site Geology

3.1 Mapped Geology

The mapped geology for the site comprises of modern river floodplain/low-level degradation terraces of unweathered, variably sorted gravel/sand/silt/clay. Typically, the surficial deposits of silt and sand overlying sandy gravel comprise a combination of alluvial silts and sands and aeolian / windblown (Loess) silt and fine sand deposits.

3.2 Gound Profile

The following ground profile was encountered in boreholes BH01 and BH02 and has been interpreted from nearby well data. The soil was logged from disturbed cuttings, with depth of gravel determined from observing drilling progress and response. Grain size is interpretive and based on experience within the geology. Ground water was not encountered and is expected at greater than 10 m depth.

Table 1: Ground Conditions Summary

Layer	Typical thickness (m)	Soil Description
Tp	0.3	Topsoil, SILT, brown
ML / SM	1.0* to 2.5**	Sandy SILT and Silty SAND, pale brown
GW	51.6***	Sandy GRAVEL, fine to coarse grained, grey, sub-rounded to rounded, with inclusions of cobbles

*BH02, **BH01, ***Maximum depth of well log M36_5911 located at 1/487 Weedons Road. Boreholes BH01 and BH02 terminated at 4.5m bgl.

Well bore data sourced from Environment Canterbury's Well Search database has been reviewed when preparing this report. Wellbore with ID M36_5911 located at 1/487 Weedons Road terminates at 51.6m bgl. The well log indicates 1.8 m of SILT overlying Sandy GRAVEL to 51.6 m. Ground water appears to have been encountered at 19 m below ground within the unconfined gravel aquifer, and approximately 12 m below ground level (bgl) within the 'confined', likely artesian water bearing strata the with well screen located at 49.7 to 51.6 m bgl.

The sandy gravel deposits beneath surficial sand and silt soils are typically free draining at some depth below the ground surface. The surficial deposits of silt overlying the gravel (which are often Loess / aeolian derived and likely hydrophobic) can infill the free draining sandy gravel voids over time, typically to between 0.3 and 1.0 m below the top of the gravel deposits. See figure 2 below for typical appearance of the sandy gravel deposits in Rolleston.

Figure 2: An excavation in a neighbouring subdivision showing typical sandy gravel deposits.

4. Soakage Testing

4.1 Drilling and Equipment

Soakage testing was completed within two separate boreholes (BH01 and BH02) with 154 mm internal diameter, 186 mm external diameter steel casing, and drilled to 4.5 m below ground level (bgl). The boreholes were completed by East Coast Drilling on 21 November 2024 using a truck mounted water well drilling rig. Casing was advanced immediately behind the drill string, with soil cuttings removed via compressed air and disposed of adjacent to the borehole.

Borehole soakage testing is preferred within the sandy gravel deposits as it allows a smaller total surface area to be tested (versus a machine excavated test pit) and hence reducing water demand, making it possible to sustain a fixed head during a soakage test. The depth of boreholes and soakage testing was determined based on past soakage testing in the area and the approximate depth of future soak pits. A 3.5 mm gauge well screen was installed at the base of the borehole to enable a casing to be raised or lowered if required.

Water was delivered to the borehole via a pump and water cart with 10,000 litre capacity. Water flow rates were measured using a Euromag electromagnetic flow meter connected in parallel between the water cart and borehole. An electronic dip meter was used to measure the water level within casing when performing soakage testing.

Borehole casing, flow meter, and well screen is shown below in figures 3 and 4.

Figure 3: The flow meter used during testing set inline between water cart and top of steel casing (left). The 6 meter long, 154 mm ID, 184 mm OD streel casing prior to advancing into ground to 4.5m bgl for soakage testing.

Figure 4: The 0.5 m long 3.5 mm gauge well screen inserted at the base of casing (left). Euromag flow meter with flow reported in litres per second and volume in cubic meters (m^3) providing values to the nearest to 0.1 m^3 increment.

4.2 Soakage Testing Methodology

Steel cased boreholes were advanced to 4.5 m bgl within the sandy gravel deposits at 1/487 Weedons Road for both BH01 and BH02, with a well screen (see figure 4) inserted at the base of the casing. The depth of the boreholes approximates the depth of future soak pit design.

Three constant head soakage tests and one falling head test was performed in total following pre-soaking of boreholes BH01 and BH02. The boreholes were not filled for 4 hours prior to the constant head test in either BH01 or BH02 as the drainage rate is too high to maintain a head of water within the borehole for more than a few minutes (or seconds). A presoak of approximately 200 litres of water was completed 3 times per borehole. Testing was completed in general accordance with Tauranga City Council's (TCC) Infrastructure Development Code, Appendix F.3.1 and F.3.2[1].

One constant head test was completed in BH01 with casing elevated 0.5 m from the base of the borehole. Casing was elevated to 0.5 m above the base (4.0 m bgl) to allow some sidewall soakage as it is possible the base of the borehole is 'contaminated' with fine sediment restricting drainage. This methodology was derived from previous testing completed in the area by PDP Ltd for GW Wilfield. The elevation of casing height was reduced in future tests within BH02 to reduce water consumption, with casing at 4.5 m bgl (not elevated above base) and 4.35 m bgl (elevated 0.15 m above base) in test 1 and 2 within BH02 respectively.

4.3 BH01 Soakage Tests

Water consumption with casing elevated 0.5 m above the base of the borehole resulted in the 6 m column of water draining within 3 seconds during the pre-soakage. Due to the high rate of soakage it was not possible to complete a falling head test in BH01 with casing at 0.5 m above the base of the borehole. A total of ~600 litres of water was used during the three pre-soaks.

[1] Tauranga City Council (TCC). October 2021. 'Infrastructure Development Code'. Design Standard DS-5 Stormwater.

BH01 Constant Head Soakage Test 1: A water flow rate of 20 litres per second (72,000 litres per hour) was required (maximum flow rate of water cart pump) during the fixed head test to maintain a head of 2.9 m (1.6 m bgl). The constant head soakage test in BH01 was completed in less than 8 minutes (465 Seconds) consuming ~9,400 litres of water. The test was completed when the water cart was empty. The total soakage area is calculated at 0.320 m^2 resulting in a soakage rate of 225 meters per hour (m/hr).

4.4 BH02 Soakage Tests

Two constant head soakage tests were completed in borehole BH02, with the first test (Test 1) completed within BH02 with the casing base at 4.5 m bgl (not elevated). The second test (Test 2) within BH02 was completed with casing elevated 0.15 m above the base (4.35 m bgl).

It was possible to complete a falling head soakage test within BH02 when casing was not elevated above the base of the borehole. With the base of casing at 4.5 m bgl, a full 6 m column of water within the casing drained in ~4 minutes. By comparison, when casing was elevated 0.15 m above the base of the borehole in test 2, the full column of water drained in ~30 seconds.

Table 2: BH02 Falling Head Soakage Test with Casing at 4.5 m bgl

Time (seconds)	Head height (falling head)	Soakage rate (m/hr)
0	6.0	-
30	4.5	~124
60	3.3	~99
90	2.3	~82
120	2.0	~58
150	1.3	~58
180	0.6	~50
210	0.3	~25
240	0.2	~8

The falling head soakage test completed in borehole BH02 prior to the constant head soakage tests resulted in comparable soakage rates to a constant head with a 4.5 m water head height. The constant head Soakage test is considered more representative of the performance of ground soakage when considering the head height of water within a soak pit near the limits of capacity. Given that the falling head test was performed using manual measurements of water head using an electronic dip meter, there is a large degree of inaccuracy when compared to the constant head test.

BH02 Constant Head Soakage Test 1: A water flow rate of 1.35 litres per second (4,860 litres per hour) was required to maintain a head of ~4.5 m (0.0 m bgl). The test was completed over 11 minutes (660 seconds) consuming ~900 litres of water. The total soakage area is calculated at 0.027 m^2 resulting in a soakage rate of 180 meters per hour (m/hr).

BH02 Constant Head Soakage Test 2: A water flow rate of 4.86 litres per second (17,496 litres per hour) was required to maintain a head of ~4.5 m (0.0 m bgl). The test was completed over 25 minutes (1500 seconds) consuming ~7300 litres of water while maintaining a head of ~4.5 m (0.0 m bgl). Total soakage area is calculated at 0.115 m^2 resulting in a soakage rate of 152 meters per hour (m/hr).

4.5 Constant Head Soakage Test Results Summary

The results from the soakage tests completed on 21 November 2024 completed at 1/487 Weedons Road in Boreholes BH01 and BH02 are summarised below in table 3 below.

Table 3: Constant Head Soakage Summary

Test No.	Casing height above base (m)	Diameter of borehole (m)	Test Soakage Area (m^2)	Flow Rate with Stabilised Head (liters/ second)	Stabilised Head (m)	Soakage Rate (m/hr)
BH01 – Test 1	0.5	0.186	0.320	20.0	2.9	225
BH02 – Test 1	0.0	0.186	0.027	1.35	4.5	180
BH02 – Test 2	0.15	0.186	0.115	4.86	4.5	152

Measured soakage rates were greater in BH01, this is likely due to a slight variation in ground conditions between the two test locations. The driller noted that it felt like cobbles towards the base of BH01 versus gravel in BH02. It should be noted that the higher recorded soakage rate in BH01 was achieved with a lower head height (2.9 m) and hence if a higher flow rate from the water cart was available, soakage rates would have likely been higher than recorded. Based on the testing, sidewall soakage area within the borehole contributed proportionally to the overall soakage rates. Considerable additional soakage is achieved when casing is lifted above the base of the borehole.

5. Discussion and Recommendations

The sandy gravel soils which are encountered beneath a thin (1.0 – 2.5m) deposit of silt and sand at the site has very high soakage potential. Past soakage tests in the area completed by PDP ltd achieved similar results with unfactored rates of between 120 and 204 meters per hour (m/hr).

It is recommended that the lowest value of stabilised soakage rate of 152 m/hr is used in design with a factor of safety of 3 applied, resulting in a factored design value of 50 m/hr (50,000 mm/hr). A soakage rate of 50 m/hr is considered appropriate in soak pit design where similar geology is encountered, and the soak pit depth is approximately 4.0 to 4.5 m depth. The upper 0.3 to 1.0 m of gravel deposits can become infilled with fine sediment from the overlying fine grained soils reducing soakage potential, so it is important to design soak pits with a base depth which is greater than 1.0 m below the top of the sandy gravel deposits i.e. the depth of overlying soils (sand and silt) plus 1.0 m minimum.

Maintenance of the soakage system is required to ensure high soakage rates are maintained. A reduction in design soakage value could account for some future clogging of the soakage system form fine sediment. Table 4 below is taken from the Auckland Council's 'Stormwater Disposal via Soakage in the Auckland Region' 2013 report[2] and details results from a clogging assessment completed by PDP in the Auckland region. Based on table 4, within a residential subdivision, some maintenance is expected to be required prior to 18 years after construction to maintain design drainage levels.

Table 4: Soak pit clogging results (Auckland Region)

Sediment Loading (kg/ha/yr)	Time to clog base of soak pit (months)	Time to clog soak pit flow below design flow (years)
5000 (construction site or bare soil)	2	1.5
1500 (industrial site)	6	4.5
350 (residential site)	10	18

[2] Auckland Council. October 2013. Stormwater Disposal via Soakage in the Auckland Region' Section 7.3.2.3, table 8.

Sediment Loading (kg/ha/yr)	Time to clog base of soak pit (months)	Time to clog soak pit flow below design flow (years)
20 (roof runoff)	186	>30

Verification testing in the form of full-scale soakage testing is recommended following completion of soak pit construction. It is likely that no water 'return' will be achieved during the full-scale soakage testing due to the high rate of soakage, i.e. it should not be possible to measure a head of water when completing the test. This may provide sufficient evidence that the soakage system is functioning as intended.

6. Limitations

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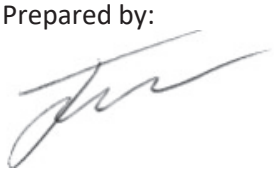
- A change in circumstances, facts, information after the memorandum has been provided may affect the adequacy or accuracy of the memorandum. Miyamoto is not responsible for the adequacy or accuracy of the memorandum as a result of any such change.

7. Closure

If you have any queries or you require any further clarification on any aspects of this memorandum, please do not hesitate to contact Miyamoto International (NZ) Ltd.

Prepared by:



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