

# Ohoka Development

## Geotechnical Assessment Report - Fast-track Application

Carter Group Limited



**Reference: 773-CHCGE288040AB**

16 June 2025

# OHOKA DEVELOPMENT

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**Report reference number: 773-CHCGE288040AB**

16 June 2025

## PREPARED FOR

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## EXECUTIVE SUMMARY

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Carter Group Limited has commissioned Tetra Tech Coffey (NZ) Limited to undertake a geotechnical investigation in order to produce a geotechnical assessment report (GAR) to support the Fast-track Application of the proposed Ohoka Subdivision development located between Bradelys Road, Whites Road and Mill Road.

Tetra Tech Coffey undertook an investigation on 5 May 2021 carrying out 22 test pits across the site. On 14 August 2023 Tetra Tech Coffey installed 37 piezometers in 27 locations across the site to monitor groundwater levels. Between 17 and 26 March 2025 an additional 23 piezometers were installed in 21 locations targeting Stormwater Management Areas.

The key findings of this report include:

- The site is in an area mapped as 'damaging liquefaction is unlikely'.
- Topsoil thickness varies across the site but is generally less than 0.4m
- The site is typically underlain by 0.5-1.2m of clayey silt followed by a sandy gravel.
- A California Bearing Ratio (CBR) of 3.5% can generally be assumed in the subgrade.
- The site can be considered TC1 like.
- The site is suitable for subdivision development from a geotechnical perspective.

# CONTENTS

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<b>1.</b>	<b>INTRODUCTION</b> .....	<b>1</b>
<b>2.</b>	<b>SCOPE</b> .....	<b>1</b>
<b>3.</b>	<b>PROPOSED DEVELOPMENT</b> .....	<b>2</b>
<b>4.</b>	<b>DESKTOP STUDY</b> .....	<b>3</b>
<b>5.</b>	<b>SITE INVESTIGATION</b> .....	<b>4</b>
5.1	Original Investigation – 5 May 2021 .....	4
5.2	Initial Piezometer Installation – 14 August 2023 .....	4
5.3	Permanent Piezometer Installation – 17 to 26 March 2025 .....	5
<b>6.</b>	<b>GROUND MODEL</b> .....	<b>6</b>
6.1	Geology .....	6
6.2	Groundwater .....	6
6.2.1	Original Investigation – 5 May 2021 .....	6
6.2.2	Piezometer Monitoring .....	6
6.3	Subsurface Profile .....	6
6.4	Site Sub-Soil Class .....	8
<b>7.</b>	<b>NATURAL HAZARD ASSESSMENT</b> .....	<b>8</b>
7.1	Erosion .....	8
7.2	Falling Debris .....	8
7.3	Subsidence .....	8
7.3.1	Liquefaction Induced Settlement .....	8
7.3.2	Static Settlement .....	8
7.4	Slippage .....	8
7.5	Inundation .....	9
<b>8.</b>	<b>DESIGN CONSIDERATIONS</b> .....	<b>9</b>
8.1	Pavement Design .....	9
8.2	Earthworks .....	9
8.3	Waterway Bank Stability .....	9
<b>9.</b>	<b>CONCLUSIONS</b> .....	<b>9</b>
<b>10.</b>	<b>LIMITATIONS</b> .....	<b>10</b>
<b>11.</b>	<b>CLOSURE</b> .....	<b>10</b>

*Important Information about Your Tetra Tech Coffey Report*

## LIST OF TABLES

---

Table 1: Ohoka Development investigation data.....	4
Table 2: Initial piezometer installation investigation data.....	5
Table 3: Permanent piezometer installation depths.....	5
Table 4: Ohoka Development ground profile.....	6
Table 5: Depth to gravel from geotechnical investigation data.....	7
Table 6: Depth to gravel in initial piezometers.....	7

## APPENDICES

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<b>APPENDIX A: SITE PLAN.....</b>	<b>11</b>
<b>APPENDIX B: INVESTIGATION DATA.....</b>	<b>12</b>
<b>APPENDIX C: PIEZOMETER LOCATION PLANS.....</b>	<b>13</b>
<b>APPENDIX D: PIEZOMETER MONITORING DATA.....</b>	<b>14</b>

## 1. INTRODUCTION

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Carter Group Limited (Carter Group) has engaged Tetra Tech Coffey (NZ) Limited (Tetra Tech Coffey) to carry out a geotechnical investigation and assessment of suitability for the proposed Fast-track Application (Fast-track Approvals Act 2024 (FTAA2024)) and future subdivision of the proposed Ohoka Development at 531 and 535 Mill Road.

Our assessment has considered, in part, a geotechnical assessment of “any risk to the neighbourhood, the wider community, or the environment through natural hazards or hazardous installations” in accordance with clause 7(g) of Schedule 1 of the FTAA2024. In doing so, this assessment has undertaken an analysis in alignment with the items required by Section 106 of the Resource Management Act 1991 (RMA). In our opinion the site is considered geotechnically suitable for the Fast-track Application. Further investigations and design may need to be carried out for specific areas of the development.

Tetra Tech Coffey has previously prepared a Geotechnical Assessment Report (GAR) (to assist a plan change application) in 2021. The purpose of this report was to incorporate the information and findings of the 2021 GAR alongside new geotechnical data and to produce an updated geotechnical report to support a Fast-track application for the site.

This report should be read in conjunction with the Tetra Tech Coffey Detailed Site Investigation<sup>1</sup> being prepared to support the Fast-track Application.

## 2. SCOPE

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A scope of assessment work for the approximately 154.4 Ha total area of the site was developed and carried out by Tetra Tech Coffey, as outlined below:

- Review of previous geotechnical investigations including previous work on the site and surrounding area.
- Site walkover to assess geotechnical hazards.
- Site investigation comprising test pits and hand augered boreholes.
- Installation of groundwater monitoring wells across the site.
- Assessment of the geotechnical hazards at the site per Section 106 of the RMA.
- Geotechnical analyses and reporting.

Tetra Tech Coffey have considered the following in the preparation of this report:

- Existing geotechnical investigation data available from the New Zealand Geotechnical Database (NZGD) and Environment Canterbury well database.
- Our existing information for the site taken from the Tetra Tech Coffey 2021 GAR.
- Project correspondence with the wider Fast-track Application consultants engaged by Carter Group.

Reference has also been made to the MBIE Guidance Part D: Subdivisions, to confirm that the requirements outlined in these documents have been incorporated in this report.

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<sup>1</sup> Tetra Tech Coffey (2025) Detailed Site Investigation Ref 773-CHCGE288040AB

### 3. PROPOSED DEVELOPMENT

The proposed Fast-track Application area comprises six land parcels totalling approximately 154.4 Ha located to the southwest of Ohoka. The Fast-track Application area is bordered by Bradleys Road, Whites Road, Mill Road to the west, north and east respectively, and to the south by rural residential and farmland.

The site is predominantly flat with branches of the Ohoka Stream traversing the site. The site is currently used for farming and appears to have had the land usage for at least 100 years. A historic rail alignment is located near the northern boundary close to the intersection of Bradleys and Mill Roads.

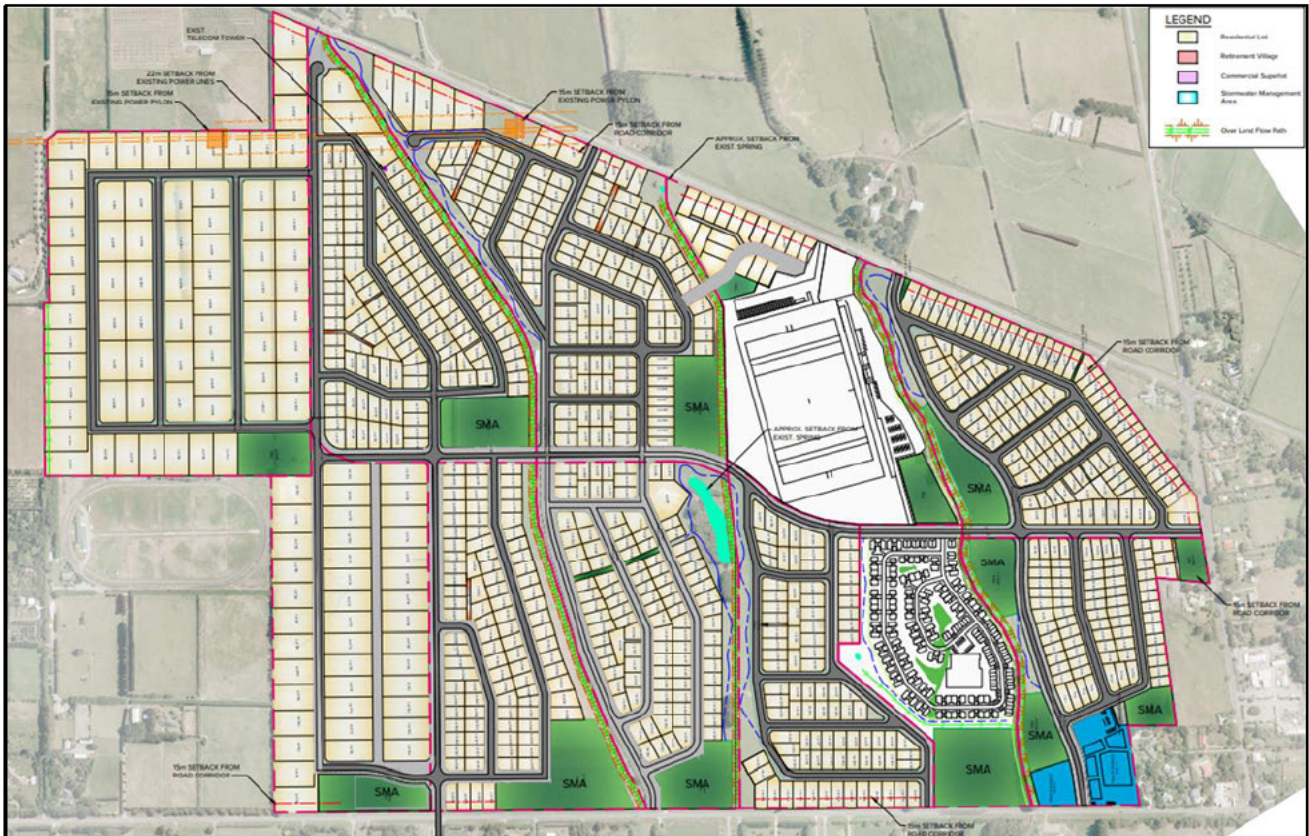


Figure 1: Proposed lot layout plan.

## 4. Desktop Study

The site is not in an area mapped for ground damage effects as part of the Canterbury Earthquake Sequence response. A report commissioned by ECan<sup>2</sup> mapped the site as being in an area where 'damaging liquefaction is unlikely'. An extract from the ECan report is shown in Figure 1 below with the site location indicated.

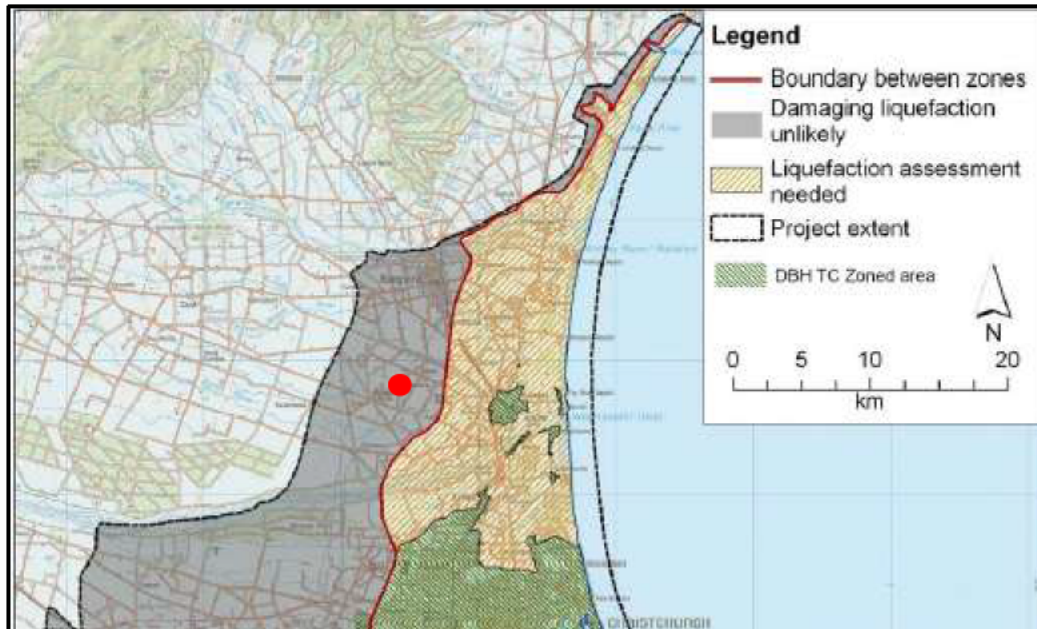


Figure 1: Extract from ECan liquefaction report (site location marked with red dot)

<sup>2</sup> ECan (2012), Review of liquefaction hazard information in Eastern Canterbury, including Christchurch City, and parts of Selwyn, Waimakariri and Hurunui Districts, ref. R12/83

## 5. SITE INVESTIGATION

### 5.1 ORIGINAL INVESTIGATION – 5 MAY 2021

The location of the geotechnical investigations carried out by Tetra Tech Coffey on the site to develop the ground models are provided in in Appendix A and are summarised in Table 1 below. Investigation logs are presented in Appendix B.

**Table 1: Ohoka Development investigation data**

Reference	Depth of test (metres below ground level)	Reference	Depth of test (metres below ground level)
TP1	1.7	TP18	1.2
TP2	1.9	TP19	1.4
TP3	2.0	TP20	1.4
TP4	0.6	TP21	1.6
TP5	1.0	TP22	1.4
TP6	1.6	BH1	16.5
TP7	1.6	BW24/0297	18.0
TP8	1.7	M35/0300	114.0
TP9	1.8	BW24/0520	11.2
TP10	1.4	M35/0595	9.8
TP11	1.2	M35/4428	20.3
TP12	1.6	M35/4795	13.0
TP13	1.25	M35/5609	18.8
TP14	1.5	M35/6483	20.0
TP15	1.5	M35/6688	18.0
TP16	1.7	M35/6773	24.0
TP17	1.0	M35/10517	23.2

BH1 was drilled (in 2011) under the supervision of Coffey for a Vodafone tower located on the site and the ECan well logs have been sourced from <https://www.ecan.govt.nz/data/well-search/>.

### 5.2 INITIAL PIEZOMETER INSTALLATION – 14 AUGUST 2023

On 14 August 2023, Tetra Tech Coffey installed 37 hand augered piezometers in 27 locations marked out by Inovo Projects Ltd. 10 of these locations were in nested pairs with the second piezometer (denoted by 'b') generally drilled to approximately 0.3-0.8m less than the adjacent installation. These secondary piezometers were installed with the intention of trying to differentiate between water in the upper soils (likely influenced by irrigation) and water in the shallow gravel layers. The depths to gravel were recorded for each location and are summarised below in Table 2.

**Table 2: Initial piezometer installation investigation data.**

Reference	Installation depth (metres below ground level)	Termination criteria	Reference	Installation depth (metres below ground level)	Termination criteria
1	0.99	Refusal on gravel	14a	1.00	Refusal on gravel
2a	0.78	Refusal on gravel	15	0.85	Refusal on gravel
3	0.41	Refusal on gravel	16	0.62	Refusal on gravel
4	0.66	Refusal on gravel	17	0.66	Refusal on gravel
5	0.45	Refusal on gravel	19	0.60	Refusal on gravel
6a	1.01	Refusal on gravel	20a	0.97	Refusal on gravel
7a	1.05	Refusal on gravel	21	1.05	Refusal on gravel
8a	1.61	Refusal on gravel	22	0.44	Refusal on gravel
9a	0.88	Refusal on gravel	23	0.82	Refusal on gravel
10a	1.4	Refusal on gravel	25	0.50	Refusal on gravel
11a	0.85	Refusal on gravel	26	0.70	Refusal on gravel
12	0.71	Refusal on gravel	27	0.55	Refusal on gravel
13a	0.81	Refusal on gravel	30a	0.67	Refusal on gravel

### 5.3 PERMANENT PIEZOMETER INSTALLATION – 17 TO 26 MARCH 2025

Between 17 and 26 March 2025, McMillan Drilling installed permanent piezometer installations at 21 locations as identified by Inovo and PDP. These piezometers were typically installed to a depth of 3m with a screened portion in the lower 1m; with an additional piezometer installed adjacent to 2 piezometers as detailed in Table 3 below.

**Table 3: Permanent piezometer installation depths.**

Reference	Installation depth (metres below ground level)	Reference	Installation depth (metres below ground level)
1	3	13	3
2	3	14	3
3	3	15	3
4	3	16* <sup>B</sup>	0.75
5* <sup>A</sup>	0.65	17	3
6	3	18	3
7	3	19	3
8	3	20	3
9	3	21	3
10	3	22	3
11	3	23	3
12	3	-	

\*A: piezometer 5 adjacent to piezometer 4

\*B: piezometer adjacent to piezometer 20

## 6. GROUND MODEL

### 6.1 GEOLOGY

The geological map<sup>3</sup> of the area indicates that the site is underlain by “Brownish-grey river alluvium (Q2a).”

### 6.2 GROUNDWATER

#### 6.2.1 Original Investigation – 5 May 2021

Based on the geotechnical investigations carried out on site, groundwater was encountered between 0.9m and 1.5mbgl.

#### 6.2.2 Piezometer Monitoring

Tetra Tech Coffey has undertaken piezometer readings on 8 separate occasions from 14 August 2023 to 21 February 2025. Based on the results of the piezometer readings, depth to groundwater varied across the site with an average depth of 0.5mbgl. It was found across the site that water levels fluctuated in all piezometers typically less than 0.4m (averaging 0.2m). These readings have been included in Appendix D:. Monitoring of the permanent piezometers is currently being carried out. PDP have prepared a report commenting on groundwater in greater detail.

### 6.3 SUBSURFACE PROFILE

A summary of the ground model for the site is provided below:

**Table 4: Ohoka Development ground profile**

Description	Strength/consistency	Thickness (m)	Depth to top of layer (mbgl)
Silt (topsoil)	N/A	<0.4	0.0
Clayey Silt	Stiff to hard	0.5 to 1.2	0.4
Sandy Gravel, with minor silt lenses	Dense to very dense	>30*	0.6 to 1.5

\* Based on existing borehole and well information.

<sup>3</sup> Forsyth, P.J.; Barrell, D.J.A.; Jongens, R. (compilers) 2008: Geology of the Christchurch area: scale 1:250,000. Lower Hutt: GNS Science. Institute of Geological & Nuclear Sciences 1:250,000 geological map 16. 67 p. + 1 folded map

**Table 5: Depth to gravel from geotechnical investigation data**

Reference	Depth to gravel (metres below ground level)	Gravel RL (m)	Reference	Depth to gravel (metres below ground level)	Gravel RL (m)
TP1	0.7	21.05	TP18	0.9	23.6
TP2	0.8	22.2	TP19	1.1	21.9
TP3	1.5	21.75	TP20	1.0	25
TP4	Unknown	Unknown	TP21	0.9	26.85
TP5	0.7	23.3	TP22	0.8	20.7
TP6	0.8	20.7	BH1	1.5	26.0
TP7	0.7	22.3	BW24/0297	2.1	20.9
TP8	1.0	23.25	M35/0300	0.3	20.7
TP9	1.4	22.1	BW24/0520	0.6	19.9
TP10	1.0	20.5	*M35/0595	5.2	22.81
TP11	0.6	24.9	M35/4428	0.2	24.8
TP12	1.1	22.9	M35/4795	1.5	19.95
TP13	0.9	21.6	M35/5609	0.3	23.2
TP14	1.0	25	M35/6483	0.9	23.11
TP15	1.1	26.15	M35/6688	1.2	25.8
TP16	1.4	26.6	M35/6773	1.0	25
TP17	0.6	25.9	M35/10517	1.5	27

**Table 6: Depth to gravel in initial piezometers.**

Reference	Depth to gravel (metres below ground level)	Gravel RL (m)	Reference	Depth to gravel (metres below ground level)	Gravel RL (m)
1	0.99	25.45	14a	1	22.08
2a	0.78	26.29	15	0.85	20.84
3	0.41	23.94	16	0.62	20.79
4	0.66	23.21	17	0.66	20.44
5	0.45	25.64	19	0.6	22.14
6a	1.01	24.40	20a	0.97	19.10
7a	1.05	23.35	21	1.05	25.07
8a	1.61	21.84	22	0.44	25.05
9a	0.88	21.92	23	0.82	24.06
10a	1.4	22.50	25	0.5	19.88
11a	0.85	22.17	26	0.7	20.27
12	0.71	21.77	27	0.55	21.64
13a	0.81	20.86	30a	0.67	22.25

Fill was encountered along the alignment of the historic railway line, typically this comprised a sandy gravel and was up to 0.3m thick.

## 6.4 SITE SUB-SOIL CLASS

In accordance with NZS1170.5, Section 3.1.3, a subsoil classification of “Class D – Deep or soft soil sites” can be assumed for the site.

## 7. NATURAL HAZARD ASSESSMENT

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### 7.1 EROSION

The site has relatively flat topography and is bounded by newly developed residential areas as well as grassed paddock land. Provided appropriate stormwater systems are installed as part of the development, there will be few viable sources of erosion at this site.

### 7.2 FALLING DEBRIS

As there are no slopes or exposed hills or rock faces surrounding the site, there are no sources of falling debris at the site, or for the surrounding area.

### 7.3 SUBSIDENCE

#### 7.3.1 Liquefaction Induced Settlement

Saturated, loose, uniform fine grained alluvial soils are subject to seismic (liquefaction-induced) settlement during a significant earthquake. Liquefaction typically affects saturated, loose granular soils ranging from sandy silts to sands, but seismic shaking can also result in strength losses in fine-grained, cohesive soils. Liquefaction does not occur in dense, well-graded alluvial gravel soils that are present at this site.

While the silts found above gravel are potentially susceptible to liquefaction when saturated, this layer is typically less than 1.0m across the site. Due to this, coupled with the dense nature of the gravel encountered, liquefaction risk is considered to be negligible for this project.

#### 7.3.2 Static Settlement

Settlement is a crucial factor that can cause structure serviceability issues. Static load-induced settlement typically occurs in areas underlain by soft, compressible soils as a result of increased vertical stress (i.e building loads). As the site is underlain by stiff to hard clayey silts and then dense river gravels, static settlement is considered low risk for the site provided required earthworks are carried out to the relevant standard (NZS 4431:2022).

### 7.4 SLIPPAGE

We have not observed any sources of land instability on the site and due to the flat site topography, we consider there is no risk of slope failure across the majority of the site, while the risk of slope failure directly adjacent the streams is low. The appropriate design of batter slopes near waterways will mitigate this risk further.

## 7.5 INUNDATION

In relation to stormwater inundation, we recommend that drainage design and management at the site be addressed by specialist consultants as it is beyond the scope of this report. We expect that with appropriate stormwater and flood control systems, the risk of inundation will be low.

## 8. DESIGN CONSIDERATIONS

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### 8.1 PAVEMENT DESIGN

Based on a limited number of Dynamic Cone Penetrometer carried out across the site, a subgrade CBR of 3.5% in the existing ground can be used for initial pavement design. Subgrade improvements may be required to achieve this CBR in some areas. If fill is placed, the CBR of that area must be reevaluated.

To provide protection from potential elevated groundwater levels in the long term, we recommend installation of subsoil drains beneath road kerb lines to protect the pavement from possible damage.

### 8.2 EARTHWORKS

Where earthworks are to be carried out, topsoil should be stripped from earthworks areas and stockpiled for later use. Prior to filling, confirmation by Tetra Tech Coffey personnel of suitable stripping of topsoil will be required. Proof rolling to compact loose soils may be required prior to fill placement, this instruction will be provided by Tetra Tech Coffey if required, during construction.

Where fill material is encountered at the site during earthworks, it is recommended that this fill is excavated, checked for suitability and, if required, replaced with engineered fill according to NZS 4431:2022. This process also applies to any soft layers of organic silts, topsoil or other unsuitable material. It is recommended that any such excavation works, and placement of engineered fill be observed, tested, and/or approved by Tetra Tech Coffey personnel during construction.

Laboratory compaction tests within the past 6 months to assess the maximum dry density of on-site materials will be required prior to commencement of earthworks. A target maximum dry density (MDD) of 95% should be assumed as compaction criteria.

### 8.3 WATERWAY BANK STABILITY

Based on the current Ohoka Development plans and our understanding of the existing streams and waterways we consider that any waterway banks should be constructed at no greater than a 1(V):3(H) slope without specific engineering design. We recommend a setback of 2m from the crest of any banks for building development

## 9. CONCLUSIONS

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We consider that the site is suitable for development. Based on the mapped geology and on-site testing carried out to date, the site is considered TC1-like.

## 10. LIMITATIONS

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This report has been prepared solely for the use of our client, Carter Group Limited, their professional advisers and those performing decision-making functions under the FTAA in relation to the specific project described herein. No liability is accepted in respect of its use for any other purpose or by any other person or entity.

It is recommended that all other parties seek professional geotechnical advice to satisfy themselves as to its on-going suitability for their intended use.

As subsurface information has been obtained from discrete investigation locations, which by their nature only provide information about a relatively small volume of subsoils, there may be special conditions pertaining to this site which have not been disclosed by the investigation and which have not been taken into account in the report. If variations in the subsoils occur from those described or assumed to exist, then the matter should be referred to us immediately.

Please also refer to the enclosed *Important Information about Your Tetra Tech Coffey Report*.

## 11. CLOSURE

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If you have queries or require further clarification regarding aspects of this report, please contact the undersigned.

For and on behalf of Tetra Tech Coffey

Prepared by

**Chris Thompson**

BSc (Tech)

Associate Engineering Geologist

Reviewed by

**Andrew Jordan**

BSc CEngNZ (PEngGeol)

Associate Engineering Geologist

## IMPORTANT INFORMATION ABOUT YOUR TETRA TECH COFFEY REPORT

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As a client of Tetra Tech Coffey you should know that site subsurface conditions cause more construction problems than any other factor. These notes have been prepared by Tetra Tech Coffey to help you interpret and understand the limitations of your report.

### Your report is based on project specific criteria

Your report has been developed on the basis of your unique project specific requirements as understood by Tetra Tech Coffey and applies only to the site investigated. Project criteria typically include the general nature of the project; its size and configuration; the location of any structures on the site; other site improvements; the presence of underground utilities; and the additional risk imposed by scope-of-service limitations imposed by the client. Your report should not be used if there are any changes to the project without first asking Tetra Tech Coffey to assess how factors that changed subsequent to the date of the report affect the report's recommendations. Tetra Tech Coffey cannot accept responsibility for problems that may occur due to changed factors if they are not consulted.

### Subsurface conditions can change

Subsurface conditions are created by natural processes and the activity of man. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult Tetra Tech Coffey to be advised how time may have impacted on the project.

### Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from literature and external data source review, sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, owners should retain the services of Tetra Tech Coffey through the development stage, to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

### Your report will only give preliminary recommendations

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Tetra Tech Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered as the project develops. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Tetra Tech Coffey cannot be held responsible for such misinterpretation.

### Your report is prepared for specific purposes and persons

To avoid misuse of the information contained in your report it is recommended that you confer with Tetra Tech Coffey before passing your report on to another party who may not be familiar with the background and the purpose of the report. Your report should not be applied to any project other than that originally specified at the time the report was issued.

## Interpretation by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, retain Tetra Tech Coffey to work with other project design professionals who are affected by the report. Have Tetra Tech Coffey explain the report implications to design professionals affected by them and then review plans and specifications produced to see how they incorporate the report findings.

## Data should not be separated from the report

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, drawings, etc. are customarily included in our reports and are developed by scientists, engineers or geologists based on their interpretation of field logs (assembled by field personnel) and laboratory evaluation of field samples. These logs etc. should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

## Geoenvironmental concerns are not at issue

Your report is not likely to relate any findings, conclusions, or recommendations about the potential for hazardous materials existing at the site unless specifically required to do so by the client. Specialist equipment, techniques, and personnel are used to perform a geoenvironmental assessment. Contamination can create major health, safety and environmental risks. If you have no information about the potential for your site to be contaminated or create an environmental hazard, you are advised to contact Tetra Tech Coffey for information relating to geoenvironmental issues.

## Rely on Tetra Tech Coffey for additional assistance

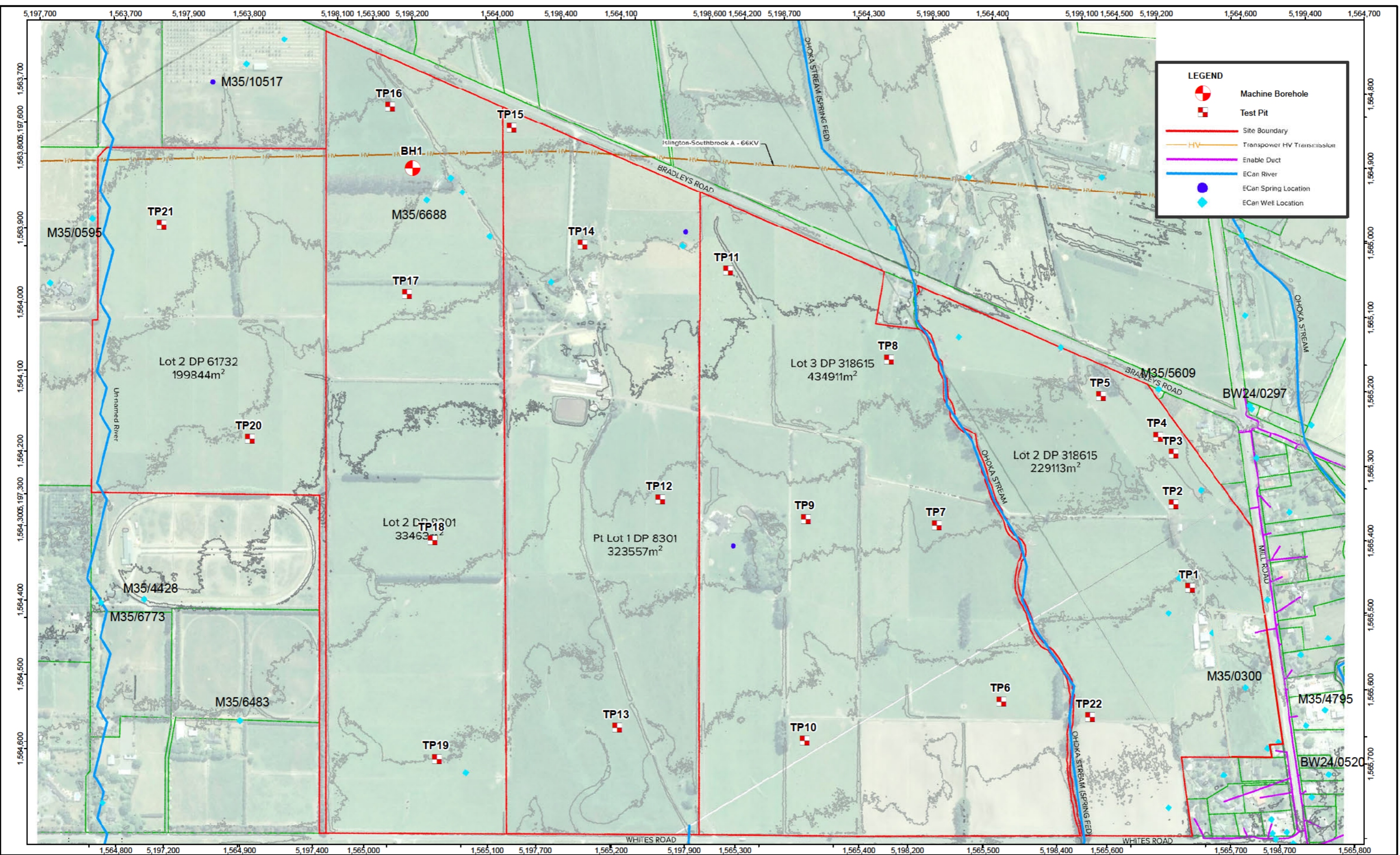
Tetra Tech Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a project, from design to construction. It is common that not all approaches will be necessarily dealt with in your site assessment report due to concepts proposed at that time. As the project progresses through design towards construction, speak with Tetra Tech Coffey to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

## Responsibility

Reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than the design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Tetra Tech Coffey to other parties but are included to identify where Tetra Tech Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Tetra Tech Coffey closely and do not hesitate to ask any questions you may have.

## APPENDIX A: SITE PLAN

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**LEGEND**

- Machine Borehole
- Test Pit
- Site Boundary
- HV Transmission
- Enable Duct
- ECan River
- ECan Spring Location
- ECan Well Location

no.	description	drawn	approved	date
A	ORIGINAL ISSUE	RZ	CT	14.05.21

0 60 120 180 240  
SCALE 1:5,000 (A3) METRES

Projection: NZGD 2000 New Zealand Transverse Mercator

drawn	RZ
approved	CT
date	14.05.2021
scale	AS SHOWN
original size	A3

**TETRA TECH**  
COFFEY

client:	ROLLESTON INDUSTRIAL DEVELOPMENT LTD.		
project:	535 MILL ROAD, OHOKA		
title:	SITE PLAN		
project no:	288040	figure no:	01
rev:	A		

MKD ref: 288040\_01\_GIS001\_1

## APPENDIX B: INVESTIGATION DATA

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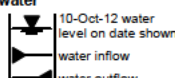
# Engineering Log - Excavation

client: **Rolleston Industrial Developments Limited**  
 principal: -  
 project: **535 Mill Road**  
 location: **Ohoka, Christchurch 7676**

Borehole ID: **TP01**  
 sheet: 1 of 1  
 project no. **773-CHCGE288040**  
 date started: **05 May 2021**  
 date completed: **05 May 2021**  
 logged by: **B. Chau**  
 checked by: **C. Thompson**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.: -  
 drill model: Hitachi 14t, Track mounted drilling fluid: Swamp Bucket hole diameter: vane id.: 1508

drilling information				material substance										
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations	
E N	1 2 3				0.5		ML	<b>SILT:</b> low plasticity, brown, with trace of rootlets.	D					TOPSOIL
							ML	<b>SILT:</b> low plasticity, brown-grey with orange mottling.	St - VSt			QUATERNARY ALLUVIUM		
							GW	<b>Sandy GRAVEL:</b> medium to coarse grained, grey with orange mottling.	W					
					2.0			Excavation TP01 terminated at 1.7 m Target depth						

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore	<b>support</b> M mud C casing N nil	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	<b>soil group symbol &amp; soil description</b> based on AS 1726:2017	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b>  <b>water</b> 	<b>moisture condition</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit		

CDF\_0\_9\_07\_LIBRARY.GLB.rev.AU Log C OF BOREHOLE: NON CORED + DCP CHCGE288040 GINT.GPJ <<DrawingFile>> 24/05/2021 12:06

# Engineering Log - Excavation

 client: **Rolleston Industrial Developments Limited**

principal: -

 project: **535 Mill Road**

 location: **Ohoka, Christchurch 7676**

 Borehole ID: **TP02**

sheet: 1 of 1

 project no. **773-CHCGE288040**

 date started: **05 May 2021**


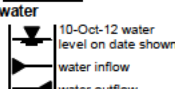
 date completed: **05 May 2021**

 logged by: **B. Chau**

 checked by: **C. Thompson**

 position: Not Specified      surface elevation: Not Specified      angle from horizontal: 90°      DCP id.:  
 drill model: Hitachi 14t, Track mounted      drilling fluid: Swamp Bucket      hole diameter:      vane id.: 1508

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
E N	1 2 3				0.5		ML	<b>SILT</b> : low plasticity, brown.	D				FILL  QUATERNARY ALLUVIUM
							ML	<b>Clayey SILT</b> : low - medium plasticity, pale brown with orange mottling.					
							GW	<b>Sandy GRAVEL</b> : medium to coarse grained, grey-brown.	W				
					1.0				S				
					2.0			Excavation TP02 terminated at 1.9 m Target depth					
					2.5								
					3.0								
					3.5								

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore	<b>support</b> M mud      N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	<b>soil group symbol &amp; soil description</b> based on AS 1726:2017	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b>  <b>water</b> 	<b>moisture condition</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit		

CDF\_0\_9\_07\_LIBRARY.GLB.rev.AU Log C OF BOREHOLE: NON CORED + DCP CHCGE288040 GINT.GPJ &lt;&lt;DrawingFile&gt;&gt; 24/05/2021 12:06

# Engineering Log - Excavation

 client: **Rolleston Industrial Developments Limited**

principal: -

 project: **535 Mill Road**

 location: **Ohoka, Christchurch 7676**

 Borehole ID: **TP03**

sheet: 1 of 1

 project no. **773-CHCGE288040**


 date started: **05 May 2021**

 date completed: **05 May 2021**

 logged by: **B. Chau**

 checked by: **C. Thompson**

 position: Not Specified      surface elevation: Not Specified      angle from horizontal: 90°      DCP id.:  
 drill model: Hitachi 14t, Track mounted      drilling fluid: Swamp Bucket      hole diameter:      vane id.: 1508

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
method & support: 1. auger drilling* 2. auger screwing* 3. hand auger washbore	penetration: 1. no resistance ranging to refusal 2. 10-Oct-12 water level on date shown 3. water inflow 4. water outflow	water level: 1.5m	VS 150/40 kPa  VS 120/21 kPa	RL: 0.5m to 1.5m	depth: 0.5m to 1.5m		ML	<b>SILT:</b> low plasticity, brown.	D				FILL    QUATERNARY ALLUVIUM
							GP	<b>Sandy GRAVEL:</b> brown-grey.					
							ML	<b>Clayey SILT:</b> medium plasticity, grey with orange mottling.					
							ML	<b>Clayey SILT:</b> low to medium plasticity, grey-brown with orange mottling.	W-S				
					1.5		GW	<b>Sandy GRAVEL:</b> medium to coarse grained, grey-brown, with trace of cobbles.	S				
					2.0	Excavation TP03 terminated at 2.0 m Target depth							

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore	<b>support</b> M mud C casing N nil	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	<b>soil group symbol &amp; soil description</b> based on AS 1726:2017	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>moisture condition</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit			

CDF\_0\_9\_07\_LIBRARY.GLB.rev.AU Log C OF BOREHOLE: NON CORED + DCP CHCGE288040 GINT.GPJ &lt;&lt;DrawingFile&gt;&gt; 24/05/2021 12:06

# Engineering Log - Excavation

 client: **Rolleston Industrial Developments Limited**

principal: -

 project: **535 Mill Road**

 location: **Ohoka, Christchurch 7676**

 Borehole ID: **TP04**

sheet: 1 of 1

 project no. **773-CHCGE288040**



 date started: **05 May 2021**


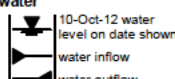
 date completed: **05 May 2021**

 logged by: **B. Chau**

 checked by: **C. Thompson**

 position: Not Specified      surface elevation: Not Specified      angle from horizontal: 90°      DCP id.:  
 drill model: Hitachi 14t, Track mounted      drilling fluid: Swamp Bucket      hole diameter:      vane id.: 1508

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
	1 2 3							SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components			● remoulded ○ peak		
		Not Encountered	VS 203/ 53 kPa		0.5		GP GW	<b>SILTY GRAVEL:</b> medium to coarse grained, pale brown, with trace of cobbles.	M				<b>FILL</b>
							ML	<b>Clayey SILT:</b> low to medium plasticity, grey-brown with orange mottling.	VSt - H				<b>QUATERNARY ALLUVIUM</b>
								Excavation TP04 terminated at 0.6 m Target depth					

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore	<b>support</b> M mud      N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	<b>soil group symbol &amp; soil description</b> based on AS 1726:2017	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b>  no resistance ranging to refusal	<b>moisture condition</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	

# Engineering Log - Excavation

 client: **Rolleston Industrial Developments Limited**

principal: -

 project: **535 Mill Road**

 location: **Ohoka, Christchurch 7676**

 Borehole ID: **TP05**

sheet: 1 of 1

 project no. **773-CHCGE288040**

 date started: **05 May 2021**


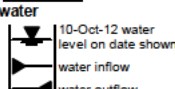
 date completed: **05 May 2021**

 logged by: **B. Chau**

 checked by: **C. Thompson**

 position: Not Specified      surface elevation: Not Specified      angle from horizontal: 90°      DCP id.: -  
 drill model: Hitachi 14t, Track mounted      drilling fluid: Swamp Bucket      hole diameter:      vane id.: 1508

drilling information				material substance					structure and additional observations		
method & support	penetration	water	samples & field tests	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)
method & support: 1. penetration 2. penetration 3. penetration L, N, VS 81/33 kPa				0.0 - 0.5	[Cross-hatched]	ML	<b>SILT:</b> low plasticity, pale brown.	D			
				0.5 - 1.0	[Diagonal lines]	ML	<b>Clayey SILT:</b> medium plasticity, grey-brown with orange mottling.	St			
				1.0 - 1.1	[Dotted]	ML	<b>SILTY GRAVEL:</b> medium to coarse grained, grey with orange staining.	D			
				1.0 - 1.1m			Excavation TP05 terminated at 1.0 m Target depth				DCP 1.0 - 1.1m: Refusal

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud      N nil C casing  <b>penetration</b>  <b>water</b> 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	<b>soil group symbol &amp; soil description</b> based on AS 1726:2017  <b>moisture condition</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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CDF\_0\_9\_07\_LIBRARY.GLB.rev.AU Log C OF BOREHOLE: NON CORED + DCP CHCGE288040 GINT.GPJ &lt;&lt;DrawingFile&gt;&gt; 24/05/2021 12:06


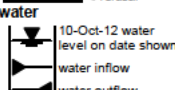
# Engineering Log - Excavation

client: **Rolleston Industrial Developments Limited**  
 principal: -  
 project: **535 Mill Road**  
 location: **Ohoka, Christchurch 7676**

Borehole ID: **TP06**  
 sheet: 1 of 1  
 project no. **773-CHCGE288040**  
 date started: **05 May 2021**  
 date completed: **05 May 2021**  
 logged by: **B. Chau**  
 checked by: **C. Thompson**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.: -  
 drill model: Hitachi 14t, Track mounted drilling fluid: Swamp Bucket hole diameter: vane id.: 1508

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
method & support: 1 2 3 Not Encountered	penetration: VS 156/ 42 kPa	water: Not Encountered	samples & field tests: VS 156/ 42 kPa	RL (m): 0.5 1.0 1.5 2.0 2.5 3.0 3.5	depth (m): 0.5 1.0 1.5 2.0 2.5 3.0 3.5		ML	<b>SILT:</b> low plasticity, brown, with trace of rootlets.	D				<b>TOPSOIL</b>  <b>QUATERNARY ALLUVIUM</b>  DCP 0.8 - 0.9m: Refusal
							ML	<b>Clayey SILT:</b> medium plasticity, pale grey with orange mottling.	VSt				
							GW	<b>Sandy GRAVEL:</b> medium to coarse grained, grey-brown with orange staining.	M	D			
Excavation TP06 terminated at 1.6 m Target depth													

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore	<b>support</b> M mud N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	<b>soil group symbol &amp; soil description</b> based on AS 1726:2017	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b>  <b>water</b> 	<b>moisture condition</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit		

# Engineering Log - Excavation

 client: **Rolleston Industrial Developments Limited**

principal: -

 project: **535 Mill Road**

 location: **Ohoka, Christchurch 7676**

 Borehole ID: **TP07**

sheet: 1 of 1

 project no. **773-CHCGE288040**

 date started: **05 May 2021**


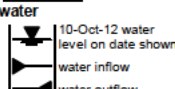
 date completed: **05 May 2021**

 logged by: **B. Chau**

 checked by: **C. Thompson**

 position: Not Specified      surface elevation: Not Specified      angle from horizontal: 90°      DCP id.:  
 drill model: Hitachi 14t, Track mounted      drilling fluid: Swamp Bucket      hole diameter:      vane id.: 1508

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
	1 2 3							SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components			● remoulded ● peak		
							ML	<b>SILT:</b> low plasticity, pale brown, with trace of rootlets.	D				<b>TOPSOIL</b>
			VS UTP		0.5		ML	<b>Clayey SILT:</b> pale grey-brown with orange mottling.	M	VSt - H			<b>QUATERNARY ALLUVIUM</b>
							GW	<b>Sandy GRAVEL:</b> medium to coarse grained, grey, with trace of cobbles.	S				
					1.0								
					1.5								
					2.0			Excavation TP07 terminated at 1.6 m Target depth					
					2.5								
					3.0								
					3.5								

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore	<b>support</b> M mud      N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	<b>soil group symbol &amp; soil description</b> based on AS 1726:2017	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b>  <b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>moisture condition</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit		


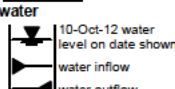
# Engineering Log - Excavation

client: **Rolleston Industrial Developments Limited**  
 principal: -  
 project: **535 Mill Road**  
 location: **Ohoka, Christchurch 7676**

Borehole ID: **TP08**  
 sheet: 1 of 1  
 project no. **773-CHCGE288040**  
 date started: **05 May 2021**  
 date completed: **05 May 2021**  
 logged by: **B. Chau**  
 checked by: **C. Thompson**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.: -  
 drill model: Hitachi 14t, Track mounted drilling fluid: Swamp Bucket hole diameter: vane id.: 1508

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
E N Not Encountered	1 2 3	Not Encountered	VS 75/ 30 kPa	0.5 1.0 1.5 2.0 2.5 3.0 3.5		ML	<b>SILT</b> : low plasticity, brown.	M					TOPSOIL  QUATERNARY ALLUVIUM  DCP: 1.0 - 1.1m: Refusal
			VS 165/ 33 kPa			ML	<b>Clayey SILT</b> : medium plasticity, grey with orange mottling.	St - VSt					
			GW			<b>Sandy GRAVEL</b> : medium to coarse grained, grey-brown, with trace of cobbles.	S	D					
Excavation TP08 terminated at 1.7 m Target depth													

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore	<b>support</b> M mud C casing N nil	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	<b>soil group symbol &amp; soil description</b> based on AS 1726:2017	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b>  <b>water</b> 	<b>moisture condition</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit		

# Engineering Log - Excavation

 client: **Rolleston Industrial Developments Limited**

principal: -

 project: **535 Mill Road**

 location: **Ohoka, Christchurch 7676**

 Borehole ID: **TP09**

sheet: 1 of 1

 project no. **773-CHCGE288040**

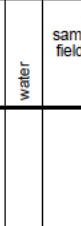
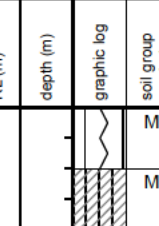
 date started: **05 May 2021**

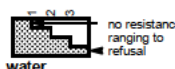
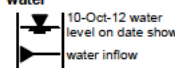
 date completed: **05 May 2021**

 logged by: **B. Chau**

 checked by: **C. Thompson**

 position: Not Specified      surface elevation: Not Specified      angle from horizontal: 90°      DCP id.:  
 drill model: Hitachi 14t, Track mounted      drilling fluid: Swamp Bucket      hole diameter:      vane id.: 1508

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
E N W	1 2 3		VS 114/ 31 kPa  VS 141/ 42 kPa	0.5  1.0  1.5  2.0  2.5  3.0  3.5		ML	<b>SILT:</b> low plasticity, brown.	M					<b>TOPSOIL</b>  <b>QUATERNARY ALLUVIUM</b>
						ML	<b>Clayey SILT:</b> medium plasticity, pale grey-brown with orange staining.	St - VSt					
						GW	<b>Sandy GRAVEL:</b> medium to coarse grained, grey.	S					
Excavation TP09 terminated at 1.8 m Target depth													

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore	<b>support</b> M mud      N nil C casing <b>penetration</b>  <b>water</b> 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	<b>soil group symbol &amp; soil description</b> based on AS 1726:2017  <b>moisture condition</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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# Engineering Log - Excavation

 client: **Rolleston Industrial Developments Limited**

principal: -

 project: **535 Mill Road**

 location: **Ohoka, Christchurch 7676**

 Borehole ID: **TP10**

sheet: 1 of 1

 project no. **773-CHCGE288040**


 date started: **05 May 2021**

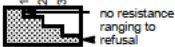
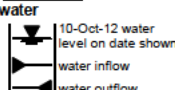
 date completed: **05 May 2021**

 logged by: **B. Chau**

 checked by: **C. Thompson**

 position: Not Specified      surface elevation: Not Specified      angle from horizontal: 90°      DCP id.:  
 drill model: Hitachi 14t, Track mounted      drilling fluid: Swamp Bucket      hole diameter:      vane id.: 1508

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
method & support: 1. penetration 2. penetration 3. penetration water: VS 90/ 28 kPa VS 132/ 15 kPa	penetration: 1. penetration 2. penetration 3. penetration	water: VS 90/ 28 kPa VS 132/ 15 kPa	samples & field tests: VS 90/ 28 kPa VS 132/ 15 kPa	RL (m): 0.5 1.0	depth (m): 0.5 1.0	graphic log: 	ML	<b>SILT:</b> low plasticity, brown.	M				structure and additional observations: TOPSOIL QUATERNARY ALLUVIUM
							ML	<b>Clayey SILT:</b> medium plasticity, grey with orange mottling.	St - VSt				
							GW	<b>Sandy GRAVEL:</b> medium to coarse grained, grey with orange mottling.	W				
Excavation TP10 terminated at 1.4 m Target depth													

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore	<b>support</b> M mud C casing N nil	<b>penetration</b>  no resistance ranging to refusal	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	<b>soil group symbol &amp; soil description</b> based on AS 1726:2017	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
<b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>moisture condition</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit				

CDF\_0\_9\_07\_LIBRARY.GLB.rev.AU Log C OF BOREHOLE: NON CORED + DCP CHCGE288040 GINT.GPJ &lt;&lt;DrawingFile&gt;&gt; 24/05/2021 12:06

# Engineering Log - Excavation

 client: **Rolleston Industrial Developments Limited**

principal: -

 project: **535 Mill Road**

 location: **Ohoka, Christchurch 7676**

 Borehole ID: **TP11**

sheet: 1 of 1

 project no. **773-CHCGE288040**

 date started: **05 May 2021**

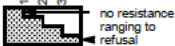
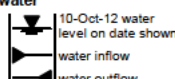
 date completed: **05 May 2021**

 logged by: **B. Chau**

 checked by: **C. Thompson**

 position: Not Specified      surface elevation: Not Specified      angle from horizontal: 90°      DCP id.:  
 drill model: Hitachi 14t, Track mounted      drilling fluid: Swamp Bucket      hole diameter:      vane id.: 1508

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
method & support: 1 2 3	penetration: 1 2 3	water: (indicated by arrows)	samples & field tests: VS 156/ 39 kPa	RL (m): (vertical scale)	depth (m): (vertical scale)	graphic log: (visual representation of soil layers)	ML	<b>SILT</b> : low plasticity, brown.	M				structure and additional observations: TOPSOIL QUATERNARY ALLUVIUM
							ML	<b>Clayey SILT</b> : medium plasticity, grey-brown with orange mottling.	VSt				
							GW	<b>Sandy GRAVEL</b> : medium to coarse grained, grey with orange staining.	W				
Excavation TP11 terminated at 1.2 m Target depth													

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore	<b>support</b> M mud      N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	<b>soil group symbol &amp; soil description</b> based on AS 1726:2017	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b>  no resistance ranging to refusal	<b>moisture condition</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit		
<b>water</b>  10-Oct-12 water level on date shown water inflow water outflow				

CDF\_0\_9\_07\_LIBRARY.GLB.rev.AU Log C OF BOREHOLE: NON CORED + DCP CHCGE288040 GINT.GPJ &lt;&lt;DrawingFile&gt;&gt; 24/05/2021 12:06

# Engineering Log - Excavation

 client: **Rolleston Industrial Developments Limited**

principal: -

 project: **535 Mill Road**

 location: **Ohoka, Christchurch 7676**

 Borehole ID: **TP12**

sheet: 1 of 1

 project no. **773-CHCGE288040**

 date started: **05 May 2021**

 date completed: **05 May 2021**

 logged by: **B. Chau**

 checked by: **C. Thompson**

 position: Not Specified      surface elevation: Not Specified      angle from horizontal: 90°      DCP id.: -  
 drill model: Hitachi 14t, Track mounted      drilling fluid: Swamp Bucket      hole diameter:      vane id.: 1508

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	vane shear & remoulded peak (kPa)	DCP (blows/100 mm)	structure and additional observations
method & support: 1. auger drilling* 2. auger screwing* 3. hand auger washbore	penetration: 1. 0-100 mm 2. 100-200 mm 3. 200-300 mm	water: 1. no resistance ranging to refusal 2. 10-Oct-12 water level on date shown 3. water inflow 4. water outflow	VS 124/ 43 kPa  VS 113/ 18 kPa	RL (m): 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5	depth (m): 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5		ML	<b>SILT:</b> low plasticity, brown.	M				<b>TOPSOIL</b>  <b>QUATERNARY ALLUVIUM</b>  DCP 1.0 - 1.1: Refusal
							ML	<b>Clayey SILT:</b> medium plasticity, brown-grey with orange staining.	VSt				
							GW	<b>Sandy GRAVEL:</b> medium to coarse grained, grey with orange staining.	W				
Excavation TP12 terminated at 1.6 m Target depth													

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore	<b>support</b> M mud      N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	<b>soil group symbol &amp; soil description</b> based on AS 1726:2017	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b> 	<b>moisture condition</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit		

CDF\_0\_9\_07\_LIBRARY.GLB.rev.AU Log C OF BOREHOLE: NON CORED + DCP CHCGE288040 GINT.GPJ &lt;-DrawingFile&gt;&gt; 24/05/2021 12:06

# Engineering Log - Excavation

 client: **Rolleston Industrial Developments Limited**

principal: -

 project: **535 Mill Road**

 location: **Ohoka, Christchurch 7676**

 Borehole ID: **TP13**

sheet: 1 of 1

 project no. **773-CHCGE288040**

 date started: **05 May 2021**

 date completed: **05 May 2021**

 logged by: **B. Chau**

 checked by: **C. Thompson**

 position: Not Specified      surface elevation: Not Specified      angle from horizontal: 90°      DCP id.:  
 drill model: Hitachi 14t, Track mounted      drilling fluid: Swamp Bucket      hole diameter:      vane id.: 1508

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
E N	1 2 3	Not Encountered	VS UTP  VS UTP		0.5		ML	<b>SILT</b> : low plasticity, brown.	M		remoulded peak		TOPSOIL  QUATERNARY ALLUVIUM
							ML	<b>Clayey SILT</b> : low to medium plasticity, grey with orange mottling.	VSt - H	VS UTP			
							GW	<b>Sandy GRAVEL</b> : medium to coarse grained, grey with orange staining, and trace of cobbles.	W	VS UTP			
					1.0								
					1.5			Excavation TP13 terminated at 1.25 m Target depth					
					2.0								
					2.5								
					3.0								
					3.5								

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud      N nil C casing  <b>penetration</b>  no resistance ranging to refusal  <b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	<b>soil group symbol &amp; soil description</b> based on AS 1726:2017  <b>moisture condition</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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# Engineering Log - Excavation

 client: **Rolleston Industrial Developments Limited**

principal: -

 project: **535 Mill Road**

 location: **Ohoka, Christchurch 7676**

 Borehole ID: **TP14**

sheet: 1 of 1

 project no. **773-CHCGE288040**



 date started: **05 May 2021**

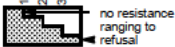
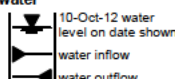
 date completed: **05 May 2021**

 logged by: **B. Chau**

 checked by: **C. Thompson**

 position: Not Specified      surface elevation: Not Specified      angle from horizontal: 90°      DCP id.:  
 drill model: Hitachi 14t, Track mounted      drilling fluid: Swamp Bucket      hole diameter:      vane id.: 1508

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
E N	1 2 3	Not Encountered	VS UTP		0.5		ML	<b>SILT:</b> low plasticity, brown.	D		100	10	TOPSOIL
							ML	<b>Clayey SILT:</b> low to medium plasticity, grey-brown with orange mottling.	VSt - H		150	10	
							SP	<b>SILTY SAND:</b> medium grained, yellow-brown with orange staining.	W - M		200	10	
					1.0		GW	<b>Sandy GRAVEL:</b> medium to coarse grained, brown-grey.	S		230	10	
					1.5			Excavation TP14 terminated at 1.5 m Target depth					
					2.0								
					2.5								
					3.0								
					3.5								

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore	<b>support</b> M mud      N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	<b>soil group symbol &amp; soil description</b> based on AS 1726:2017	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b>  no resistance ranging to refusal <b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>moisture condition</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit		

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# Engineering Log - Excavation

 client: **Rolleston Industrial Developments Limited**

principal: -

 project: **535 Mill Road**

 location: **Ohoka, Christchurch 7676**

 Borehole ID: **TP15**

sheet: 1 of 1

 project no. **773-CHCGE288040**

 date started: **06 May 2021**


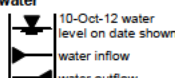
 date completed: **06 May 2021**

 logged by: **B. Chau**

 checked by: **C. Thompson**

 position: Not Specified      surface elevation: Not Specified      angle from horizontal: 90°      DCP id.:  
 drill model: Hitachi 14t, Track mounted      drilling fluid: Swamp Bucket      hole diameter:      vane id.: 1508

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
	1 2 3							SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components			● remoulded ● peak		
		Not Encountered	VS 209/ 62 kPa				ML	<b>SILT:</b> low plasticity, brown.	M				TOPSOIL
					0.5		ML	<b>Clayey SILT:</b> medium plasticity, grey with orange mottling.	VSt - H				QUATERNARY ALLUVIUM
					1.0		GW	<b>Sandy GRAVEL:</b> medium to coarse grained, grey with orange staining, and trace of cobbles.	M S				
					1.5			Excavation TP15 terminated at 1.5 m Target depth					
					2.0								
					2.5								
					3.0								
					3.5								

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud      N nil C casing  <b>penetration</b>  no resistance ranging to refusal  <b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	<b>soil group symbol &amp; soil description</b> based on AS 1726:2017  <b>moisture condition</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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CDF\_0\_9\_07\_LIBRARY.GLB.rev.AU Log C OF BOREHOLE: NON CORED + DCP CHCGE288040 GINT.GPJ &lt;&lt;DrawingFile&gt;&gt; 24/05/2021 12:06

# Engineering Log - Excavation

 client: **Rolleston Industrial Developments Limited**

principal: -

 project: **535 Mill Road**

 location: **Ohoka, Christchurch 7676**

 Borehole ID: **TP16**

sheet: 1 of 1

 project no. **773-CHCGE288040**

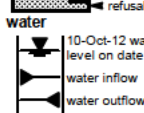

 date started: **06 May 2021**


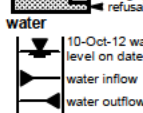
 date completed: **06 May 2021**

 logged by: **B. Chau**

 checked by: **C. Thompson**

 position: Not Specified      surface elevation: Not Specified      angle from horizontal: 90°      DCP id.: -  
 drill model: Hitachi 14t, Track mounted      drilling fluid: Swamp Bucket      hole diameter:      vane id.: 1508

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
E N Z	1 2 3		VS 166/ 67 kPa	0.5	0.5		ML	<b>SILT:</b> low plasticity, brown.	M				<b>TOPSOIL</b>  <b>QUATERNARY ALLUVIUM</b>
			VS 106/ 60 kPa				ML	<b>Clayey SILT:</b> low to medium plasticity, pale grey with orange mottling.	VSt				
			VS 54/ 21 kPa				GW	<b>Sandy GRAVEL:</b> medium to coarse grained, grey with orange staining, and trace of cobbles.	W				
					1.5			Excavation TP16 terminated at 1.7 m Target depth	S				
					2.0								
					2.5								
					3.0								
					3.5								

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud      N nil C casing  <b>penetration</b>  <b>water</b> 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	<b>soil group symbol &amp; soil description</b> based on AS 1726:2017  <b>moisture condition</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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# Engineering Log - Excavation

 client: **Rolleston Industrial Developments Limited**

principal: -

 project: **535 Mill Road**

 location: **Ohoka, Christchurch 7676**

 Borehole ID: **TP17**

sheet: 1 of 1

 project no. **773-CHCGE288040**


 date started: **06 May 2021**


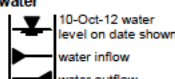
 date completed: **06 May 2021**

 logged by: **B. Chau**

 checked by: **C. Thompson**

 position: Not Specified      surface elevation: Not Specified      angle from horizontal: 90°      DCP id.:  
 drill model: Hitachi 14t, Track mounted      drilling fluid: Swamp Bucket      hole diameter:      vane id.: 1508

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
method & support: 1 2 3 E N Not Encountered	1 2 3 VS 209/ 33 kPa	Not Encountered	VS 209/ 33 kPa	RL (m) depth (m)	0.5 1.0 1.5 2.0 2.5 3.0 3.5		ML	<b>SILT:</b> low plasticity, brown.	M				<b>TOPSOIL</b>  <b>QUATERNARY ALLUVIUM</b>
							ML	<b>Clayey SILT:</b> low to medium plasticity, grey with orange mottling.	VSt - H				
							GW	<b>Sandy GRAVEL:</b> medium to coarse grained, grey with orange staining, and trace of cobbles.					
Excavation TP17 terminated at 1.0 m Target depth													

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore	<b>support</b> M mud      N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	<b>soil group symbol &amp; soil description</b> based on AS 1726:2017	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b>  no resistance ranging to refusal	<b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>moisture condition</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	

# Engineering Log - Excavation

 client: **Rolleston Industrial Developments Limited**

principal: -

 project: **535 Mill Road**

 location: **Ohoka, Christchurch 7676**

 Borehole ID: **TP18**

sheet: 1 of 1

 project no. **773-CHCGE288040**

 date started: **06 May 2021**


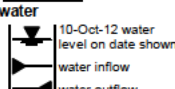
 date completed: **06 May 2021**

 logged by: **B. Chau**

 checked by: **C. Thompson**

 position: Not Specified      surface elevation: Not Specified      angle from horizontal: 90°      DCP id.:  
 drill model: Hitachi 14t, Track mounted      drilling fluid: Swamp Bucket      hole diameter:      vane id.: 1508

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
	1 2 3							SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components			● remoulded ● peak		
		Not Encountered	VS 70/ 34 kPa				ML	<b>SILT</b> : low plasticity, brown.	M				
					0.5		ML	<b>Clayey SILT</b> : medium plasticity, grey with orange mottling.		St			
					1.0		GW	<b>Sandy GRAVEL</b> : medium to coarse grained, grey with orange staining.					
					1.5			Excavation TP18 terminated at 1.2 m Target depth					
					2.0								
					2.5								
					3.0								
					3.5								

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore	<b>support</b> M mud      N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetrometer test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	<b>soil group symbol &amp; soil description</b> based on AS 1726:2017	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b>  <b>water</b> 		<b>moisture condition</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	

# Engineering Log - Excavation

 client: **Rolleston Industrial Developments Limited**

principal: -

 project: **535 Mill Road**

 location: **Ohoka, Christchurch 7676**

 Borehole ID: **TP19**

sheet: 1 of 1

 project no. **773-CHCGE288040**



 date started: **06 May 2021**


 date completed: **06 May 2021**

 logged by: **B. Chau**

 checked by: **C. Thompson**

 position: Not Specified      surface elevation: Not Specified      angle from horizontal: 90°      DCP id.: -  
 drill model: Hitachi 14t, Track mounted      drilling fluid: Swamp Bucket      hole diameter:      vane id.: 1508

drilling information				material substance										
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations	
method & support: 1. penetration 2. penetration 3. penetration U:      Z:	1. penetration 2. penetration 3. penetration	Not Encountered	VS UTP  VS UTP	RL (m) 0.5 1.0 1.5 2.0 2.5 3.0 3.5	depth (m)		ML	<b>SILT:</b> low plasticity, brown.	M		50	100		TOPSOIL
							ML	<b>Clayey SILT:</b> low to medium plasticity, grey with orange staining.	VSt - H		150	200		QUATERNARY ALLUVIUM
							GW	<b>Sandy GRAVEL:</b> medium to coarse grained, brown-grey with orange staining.	D		300	300		
Excavation TP19 terminated at 1.4 m Target depth														

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore	<b>support</b> M mud      N nil C casing	<b>penetration</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	<b>soil group symbol &amp; soil description</b> based on AS 1726:2017	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
<b>moisture condition</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit					

CDF\_0\_9\_07\_LIBRARY.GLB.rev.AU Log C OF BOREHOLE: NON CORED + DCP CHCGE288040 GINT.GPJ &lt;&lt;DrawingFile&gt;&gt; 24/05/2021 12:06

# Engineering Log - Excavation

 client: **Rolleston Industrial Developments Limited**

principal: -

 project: **535 Mill Road**

 location: **Ohoka, Christchurch 7676**

 Borehole ID: **TP20**

sheet: 1 of 1

 project no. **773-CHCGE288040**

 date started: **06 May 2021**

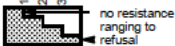
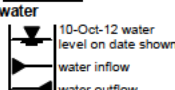
 date completed: **06 May 2021**

 logged by: **B. Chau**

 checked by: **C. Thompson**

 position: Not Specified      surface elevation: Not Specified      angle from horizontal: 90°      DCP id.: -  
 drill model: Hitachi 14t, Track mounted      drilling fluid: Swamp Bucket      hole diameter:      vane id.: 1508

drilling information				material substance							
method & support	penetration	samples & field tests	RL (m)	depth (m)	soil group symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
method & support: 1. auger drilling* 2. auger screwing* 3. hand auger water: Not Encountered	penetration: VS 171/ 36 kPa VS 203/ 46 kPa		RL (m): 0.5 1.0	depth (m): 0.5 1.0	ML	<b>SILT</b> : low plasticity, brown.	M				TOPSOIL  QUATERNARY ALLUVIUM
					ML	<b>Clayey SILT</b> : medium plasticity, brown-grey with orange mottling.	VSt				
					GW	<b>Sandy GRAVEL</b> : medium to coarse grained, brown-grey with orange staining.	D				
				1.5		Excavation TP20 terminated at 1.4 m Target depth					
				2.0							
				2.5							
				3.0							
				3.5							

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore	<b>support</b> M mud      N nil C casing <b>penetration</b>  <b>water</b> 	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	<b>soil group symbol &amp; soil description</b> based on AS 1726:2017  <b>moisture condition</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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# Engineering Log - Excavation

 client: **Rolleston Industrial Developments Limited**

principal: -

 project: **535 Mill Road**

 location: **Ohoka, Christchurch 7676**

 Borehole ID: **TP21**

sheet: 1 of 1

 project no. **773-CHCGE288040**


 date started: **06 May 2021**

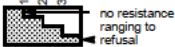
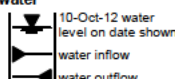
 date completed: **06 May 2021**

 logged by: **B. Chau**

 checked by: **C. Thompson**

 position: Not Specified      surface elevation: Not Specified      angle from horizontal: 90°      DCP id.:  
 drill model: Hitachi 14t, Track mounted      drilling fluid: Swamp Bucket      hole diameter:      vane id.: 1508

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
method & support: 1 2 3	penetration: 1 2 3	water: Not Encountered	samples & field tests: VS 151/ 60 kPa	RL (m): 0.5 1.0 1.5 2.0 2.5 3.0 3.5	depth (m): 0.5 1.0 1.5 2.0 2.5 3.0 3.5		ML	<b>SILT:</b> low plasticity, brown.	M				structure and additional observations: Excavation TP21 terminated at 1.6 m Target depth
							ML	<b>Clayey SILT:</b> low to medium plasticity, grey-brown with orange mottling.	VSt				
							GW	<b>Sandy GRAVEL:</b> medium to coarse grained, grey-brown with orange staining, and trace of cobbles.					

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore	<b>support</b> M mud      N nil C casing	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	<b>soil group symbol &amp; soil description</b> based on AS 1726:2017	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>penetration</b>  <b>water</b> 	<b>moisture condition</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit		

# Engineering Log - Excavation

 client: **Rolleston Industrial Developments Limited**

principal: -

 project: **535 Mill Road**

 location: **Ohoka, Christchurch 7676**

 Borehole ID: **TP22**

sheet: 1 of 1

 project no. **773-CHCGE288040**


 date started: **06 May 2021**


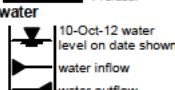
 date completed: **06 May 2021**

 logged by: **C. Thompson**

 checked by: **C. Thompson**

 position: Not Specified      surface elevation: Not Specified      angle from horizontal: 90°      DCP id.: -  
 drill model: Hitachi 14t, Track mounted      drilling fluid: Swamp Bucket      hole diameter:      vane id.: 1508

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
U N W	1 2 3				0.5 1.0 1.5 2.0 2.5 3.0 3.5		ML	<b>SILT:</b> low plasticity, brown.	M				TOPSOIL  QUATERNARY ALLUVIUM  DCP 1.0 - 1.1m: Refusal
							ML	<b>Clayey SILT:</b> medium plasticity, grey with orange mottling.	St - VSt				
							GW	<b>Sandy GRAVEL:</b> medium to coarse grained, grey-brown with orange staining.	D				
					1.5			Excavation TP22 terminated at 1.4 m Target depth					

<b>method</b> AD auger drilling* AS auger screwing* HA hand auger W washbore  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	<b>support</b> M mud      N nil C casing  <b>penetration</b>  no resistance ranging to refusal  <b>water</b>  10-Oct-12 water level on date shown water inflow water outflow	<b>samples &amp; field tests</b> B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	<b>soil group symbol &amp; soil description</b> based on AS 1726:2017  <b>moisture condition</b> D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	<b>consistency / relative density</b> VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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CDF\_0\_9\_07\_LIBRARY.GLB.rev.AU Log C OF BOREHOLE: NON CORED + DCP CHCGE288040 GINT.GPJ &lt;&lt;DrawingFile&gt;&gt; 24/05/2021 12:06

## Engineering Log - Machine Borehole

Client: **Vodafone NZ**

Date started: **7.7.2011**

Principal:

Date completed: **7.7.2011**

Project: **236 Bradleys Road, Ohoka**

Logged by: **SKK**

Machine Borehole

Location: **Refer to site plan**

Checked by: **NH**

Drill model & mounting: VTR9700-Track 70mm (DT)	Easting: 2474175 m	Slope: -90°	R.L. Surface: m	Vane No:
Hole diameter: mm	Drilling fluid:	Northing: 5759723 m	Bearing:	Datum: Ground

drilling information				material substance										rock mass defects						
stratigraphy	method	support	water	notes samples, tests, etc	RL	depth metres	graphic log	core recovery	classification symbol	material	moisture condition	consistency/density index	weathering alteration	estimated strength	vane shear (remoulded /peak) kPa	recovery %	RQD %	defect spacing mm	defect description	
										Soil - Soil type; colour, structure. Grading; bedding; plasticity, sensitivity. Secondary and minor components. Rock - Colour, fabric, rock type; discontinuities, additional information.									number, type, orientation, shape roughness, aperture, infill description (refer to defect description explanation sheet)	
																			particular	general
Topsoil										TOPSOIL; No core from 0.00 to 0.40m	M	F								
										TOPSOIL; dark grey friable topsoil with roots										
						1			ML	SILT with traces of rootlets; brownish grey (mottled), firm, low plasticity, homogeneous						73				
Springston Fm (sps)				SPT 11,15,21 N*=36					SP	SAND wity traces of rootlets; bluish grey, friable		D								
						2			GW	Sandy fine to coarse GRAVEL; grey coloured, sub-rounded to rounded, loose to medium dense, homogeneous						87				
				SPT 50 N*=R					GW	Sandy silty fine to coarse GRAVEL; brownish, sub-rounded to rounded, loose to medium dense, traces of silt		VD								
						3			GP	Medium to coarse GRAVEL; greyish colour, sub-rounded to rounded, very loose, bedded										
Burnham Formation (nth) of Quaternary Age				SPT 37,13 N*=R					GW	Sandy fine to medium GRAVEL; greyish, sub-angular to rounded, loose to medium dense, homogeneous						100				
						4			GP	Sandy fine to medium GRAVEL; greyish, sub-angular to rounded, loose to medium dense, homogeneous, more sandy										
				SPT 50 N*=R					GW	Sandy fine to coarse GRAVEL; greyish, sub-rounded to rounded, loose to medium dense, homogeneous										
						5														
				SPT 50 N*=R					GP	Sandy fine to medium GRAVEL; greyish, sub-angular to rounded, loose to medium dense, homogeneous, more sandy										
						6			GW	Sandy fine to coarse GRAVEL; greyish, sub-rounded to rounded, loose to medium dense, homogeneous										
				SPT 50 N*=R					SP	Medium to coarse SAND; greyish, loose, homogeneous										
						7			GW	Sandy fine to coarse GRAVEL; greyish, sub-rounded to rounded, loose to medium dense, homogeneous										
						8			GW	Medium to coarse SAND; greyish, loose, homogeneous										

<b>method</b> AD auger drilling OB open barrel TT triple tube W washbore <b>support</b> N nil C casing <b>vane shear (kPa)</b> ● remoulded × peak >>× peak greater than 200kPa UTP unable to penetrate	<b>classification symbols and soil description</b> based on Field Description of Soil and Rock, New Zealand Geotechnical Society Inc 2005 <b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter U <sub>63</sub> undisturbed sample 63mm diameter D disturbed sample N* SPT - sample recovered Nc SPT with solid cone Bs bulk sample E environmental sample	<b>water</b> ▼ 10/1/98 water level on date shown ▲ water inflow ▲ partial drill fluid loss ▲ complete drill fluid loss <b>moisture</b> D dry M moist W wet S saturated	<b>consistency/ density index</b> VS very soft S soft F firm St stiff VSt very stiff H hard VL very loose L loose MD medium dense D dense VD very dense	<b>weathering</b> UW unweathered SW slightly weathered MW moderately weathered HW highly weathered CW completely weathered RS residual soil <b>rock mass strength</b> EW extremely weak VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong
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MACHINE BOREHOLE GENZCHRI15188.GPJ COFFEY.GDT 2.9.11



## Engineering Log - Machine Borehole

Client: **Vodafone NZ**

Date started: **7.7.2011**

Principal:

Date completed: **7.7.2011**

Project: **236 Bradleys Road, Ohoka**

Logged by: **SKK**

Machine Borehole

Location: **Refer to site plan**

Checked by: **NH**

Drill model & mounting: VTR9700-Track 70mm (DT) Easting: 2474175 m Slope: -90° R.L. Surface: m Vane No:  
Hole diameter: mm Drilling fluid: Northing: 5759723 m Bearing: Datum: Ground

drilling information				material substance										rock mass defects																						
stratigraphy	method	support	water	notes samples, tests, etc	RL	depth metres	graphic log	core recovery	classification symbol	material	moisture condition	consistency/density index	weathering alteration	estimated strength					vane shear (remoulded /peak) kPa	recovery %	RQD %	defect spacing mm	defect description													
										Soil - Soil type, colour, structure. Grading; bedding; plasticity, sensitivity. Secondary and minor components. Rock - Colour, fabric, rock type; discontinuities, additional information.				EW	VW	W	MS	VS	ES	25	50	75	100	125	150	175	30	100	300	1000	5000	number, type, orientation, shape roughness, aperture, infill description (refer to defect description explanation sheet)				
									GW (cont)		W	VD																								
						17				BH01 terminated at 16.5 metres.																										
						18																														
						19																														
						20																														
						21																														
						22																														
						23																														
						24																														

<b>method</b> AD auger drilling OB open barrel TT triple tube W washbore <b>support</b> N nil C casing <b>vane shear (kPa)</b> ● remoulded × peak >>× peak greater than 200kPa UTP unable to penetrate	<b>classification symbols and soil description</b> based on Field Description of Soil and Rock, New Zealand Geotechnical Society Inc 2005 <b>notes, samples, tests</b> U <sub>50</sub> undisturbed sample 50mm diameter U <sub>63</sub> undisturbed sample 63mm diameter D disturbed sample N* SPT - sample recovered Nc SPT with solid cone Bs bulk sample E environmental sample	<b>water</b> ▼ 10/1/98 water level on date shown ▲ water inflow ▲ partial drill fluid loss ▲ complete drill fluid loss <b>moisture</b> D dry M moist W wet S saturated	<b>consistency/ density index</b> VS very soft S soft F firm St stiff VSt very stiff H hard VL very loose L loose MD medium dense D dense VD very dense	<b>weathering</b> UW unweathered SW slightly weathered MW moderately weathered HW highly weathered CW completely weathered RS residual soil <b>rock mass strength</b> EW extremely weak VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong
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MACHINE BOREHOLE GENZCHRI15188.GPJ COFFEY.GDT 2.9.11

# Borelog for well BW24/0297

Grid Reference (NZTM): 1576754 mE, 5210602 mN

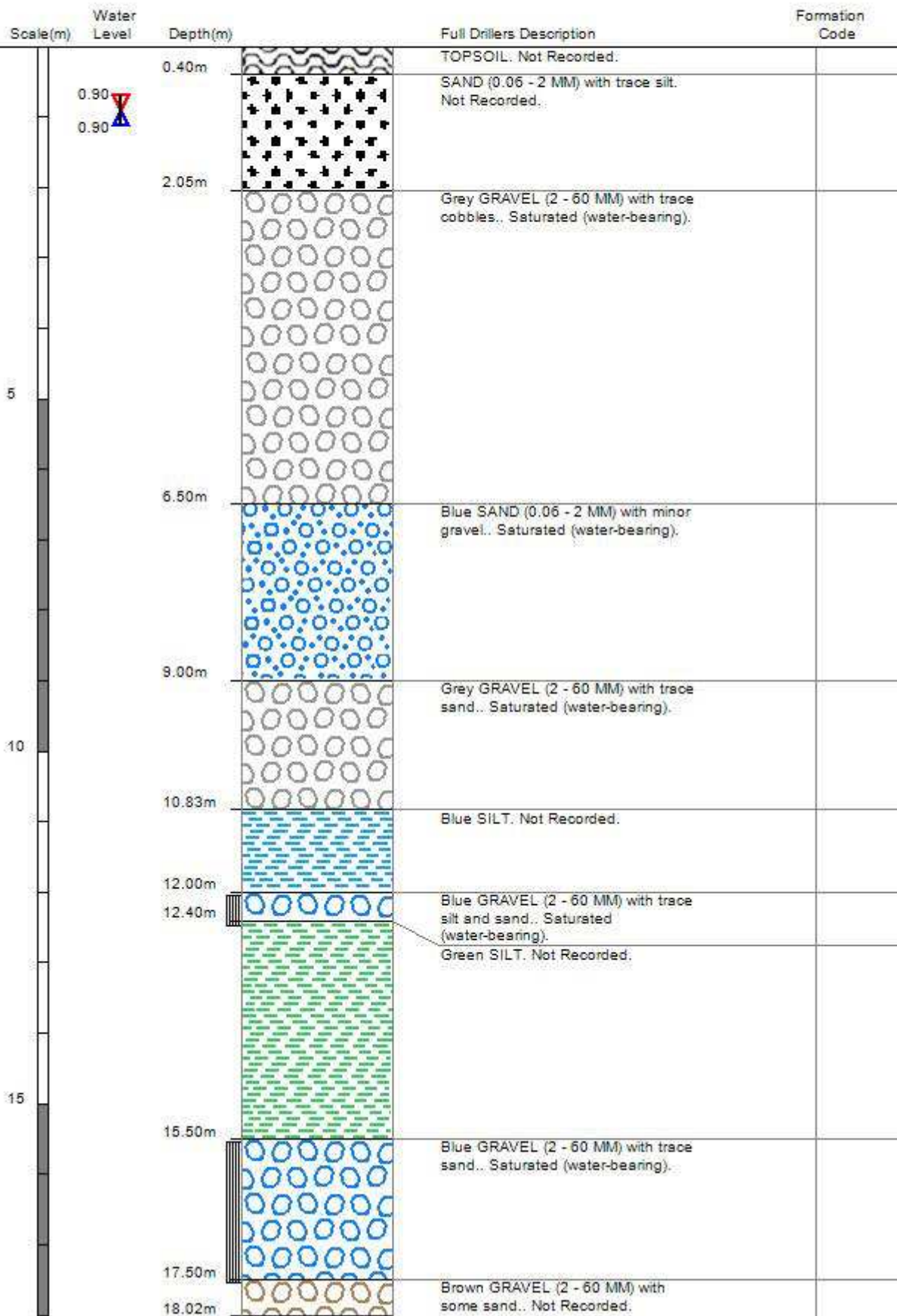
Location Accuracy: 10 - 50m

Ground Level Altitude: m +MSD Accuracy:

Driller: McMillan Drilling Ltd

Drill Method: Cable Tool

Borelog Depth: 18.0 m Drill Date: 21-Oct-2015



# Borelog for well M35/0300

Grid Reference (NZTM): 1565501 mE, 5198781 mN  
 Location Accuracy: 50 - 300m  
 Ground Level Altitude: 23.9 m +MSD Accuracy: < 0.5 m  
 Driller: Job Osborne (& Co/Ltd)  
 Drill Method: Unknown  
 Borelog Depth: 114.0 m    Drill Date: 07-Dec-1894



Scale(m)	Water Level	Depth(m)	Full Drillers Description	Formation Code
1	0.30m	0.30m	Topsoil	
2			Topsoil	
3			Loose shingle	
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18	18.29m	18.29m		
19			Loose shingle	
20			Hard shingle	
21				
22				
23				
24	24.40m	24.40m		
25			Hard shingle	
26			Close shingle	
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				
51				
52				
53				
54				
55				
56				
57				
58				
59	59.70m	59.70m		
60			Close shingle	
61			Hard shingle	
62				
63				
64				
65				
66				
67				
68				
69				
70	70.09m	70.09m		
71			Hard shingle	
72			Loose shingle	
73				
74				
75				
76	76.19m	76.19m		
77			Loose shingle	
78			Hard shingle	
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				
92				
93	93.00m	93.00m		
94			Hard shingle	
95			Loose shingle	
96				
97	97.50m	97.50m		
98			Loose shingle	
99			Hard shingle	
100				
101				
102				
103				
104				
105				
106	106.70m	106.70m		
107			Hard shingle	
108			Loose shingle	
109				
110				
111				
112				
113				
114	114.00m	114.00m		

# Borelog for well BW24/0520

Grid Reference (NZTM): 1565685 mE, 5198823 mN

Location Accuracy: 50 - 300m

Ground Level Altitude: m +MSD Accuracy:

Driller: Clemence Drilling Contractors

Drill Method: Rotary/Percussion

Borelog Depth: 11.2 m Drill Date: 05-Mar-2019



Scale(m)	Water Level	Depth(m)	Full Drillers Description	Formation Code
		0.20m	Not Logged GRAVEL (2 - 60 MM). Not Recorded.	
		0.60m	Not Logged TOPSOIL. Not Recorded.	
		2.40m	Not Logged clayey GRAVEL (2 - 60 MM). Not Recorded.	
5		5.00m	Not Logged gravelly CLAY. Not Recorded.	
		6.70m	Not Logged clayey GRAVEL (2 - 60 MM). Saturated (water-bearing).	
		8.20m	Not Logged clayey GRAVEL (2 - 60 MM). Saturated (water-bearing).	
10		11.22m		

# Borelog for well M35/0595

Grid Reference (NZTM): 1563949 mE, 5197621 mN

Location Accuracy: 2 - 15m

Ground Level Altitude: 30.8 m +MSD Accuracy: < 0.5 m

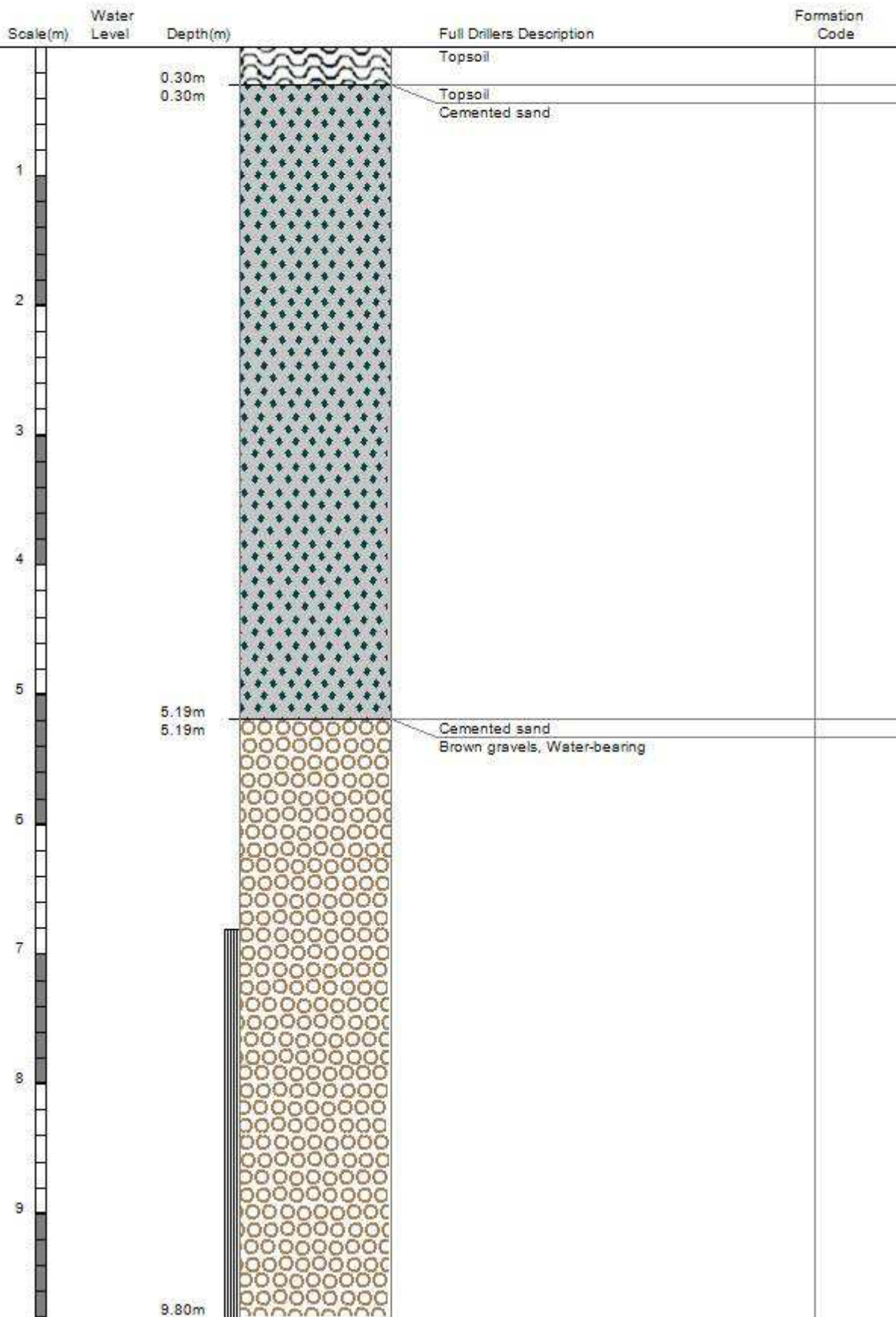
Driller: A M Bisley & Co

Drill Method: Auger Rig

Borelog Depth: 9.8 m Drill Date: 09-Aug-1967



**Environment  
Canterbury**  
Regional Council  
*Kaunihera Taiao ki Waitaha*



# Borelog for well M35/4428

Grid Reference (NZTM): 1564502 mE, 5197382 mN

Location Accuracy: 50 - 300m

Ground Level Altitude: 28.1 m +MSD Accuracy: < 0.5 m

Driller: A M Bisley & Co

Drill Method: Cable Tool

Borelog Depth: 20.3 m Drill Date:



**Environment  
Canterbury**  
Regional Council  
*Kaunihera Taiao ki Waitaha*

Scale(m)	Water Level	Depth(m)	Full Drillers Description	Formation Code
		0.20m	Topsoil	
		0.20m	Topsoil	
		1.30m	Silt and Grey gravel	
		1.30m	Silt and Grey gravel	
		1.50m	Yellow clay and gravel	
		1.50m	Yellow clay and gravel	
		1.50m	Medium gr, Brown gravel and sand	
5				
10				
15		14.40m	Medium gr, Brown gravel and sand	
		14.40m	Sandy Grey gravels	
		15.40m	Sandy Grey gravels	
		15.40m	Medium Brown/Grey stained gravel	
20		19.29m	Medium Brown/Grey stained gravel	
		19.29m	Sandy, medium Grey gravels and clay	
		20.29m		

# Borelog for well M35/4795

Grid Reference (NZTM): 1565596 mE, 5198870 mN

Location Accuracy: 1 - 2m

Ground Level Altitude: 21.1 m +MSD Accuracy: < 0.1 m

Driller: A M Bisley & Co

Drill Method: Driven Pipe

Borelog Depth: 13.0 m Drill Date: 01-Jul-1983



**Environment  
Canterbury**  
Regional Council  
*Kaunihera Taiao ki Waitaha*

Scale(m)	Water Level	Depth(m)	Full Drillers Description	Formation Code
		0.40m	Topsoil	
		0.80m	Blue clay	
1.02			Sand and clay	
1.25		1.50m	Bl/Gr gravel	
		4.40m	Brown stained gravel, Water-bearing	
5		5.60m	Brown and gr gravel and sand	
		7.80m	Med gr gravel, Water-bearing	
10		13.00m		

# Borelog for well M35/5609

Grid Reference (NZTM): 1565032 mE, 5198906 mN  
 Location Accuracy: 2 - 15m  
 Ground Level Altitude: 26.4 m +MSD Accuracy: < 0.5 m  
 Driller: McMillan Drilling Ltd  
 Drill Method: Cable Tool  
 Borelog Depth: 18.8 m Drill Date: 26-Jan-1989



Scale(m)	Water Level	Depth(m)	Full Drillers Description	Formation Code
			Topsoil	
		0.30m	Topsoil	
		0.30m	Brown silt, Black/Brown small to medium sandy gravels	
		1.20m	Brown silt, Black/Brown small to medium sandy gravels	
		1.20m	Black stained small to medium sandy gravels	
		3.50m	Black stained small to medium sandy gravels	
		3.50m	Medium Brown stained sandy gravels, trace Brown/Yellow clay, wl 2.4	
		4.19m	Medium Brown stained sandy gravels, trace Brown/Yellow clay, wl 2.4	
		4.19m	Grey/Brown small to medium sandy gravel, odd large stone, Water-bearing, wl 2.4 to end of well	
		4.80m	Grey/Brown small to medium sandy gravel, odd large stone, Water-bearing, wl 2.4 to end of well	
		4.80m	Very sandy Grey/Brown gravels nb	
		5.40m	Very sandy Grey/Brown gravels nb	
		5.40m	Brown and Black stained small to medium sandy gravels, Water-bearing	
5				
		9.10m	Brown and Black stained small to medium sandy gravels, Water-bearing	
		9.10m	Grey/Brown sandy gravels, trace Brown clay, Water-bearing	
		9.60m	Grey/Brown sandy gravels, trace Brown clay, Water-bearing	
		9.60m	Grey/Brown sandy gravels, Water-bearing	
10				
		10.70m	Grey/Brown sandy gravels, Water-bearing	
		10.70m	Grey/Brown sandy gravels, trace Brown clay, Water-bearing	
		11.80m	Grey/Brown sandy gravels, trace Brown clay, Water-bearing	
		11.80m	Grey/Brown sandy gravels, trace Brown clay, Water-bearing, very loose	
		13.20m	Grey/Brown sandy gravels, trace Brown clay, Water-bearing, very loose	
		13.20m	Grey/Brown sandy gravels, sticky	
		13.20m	Brown clay, Water-bearing	
		13.20m	Grey/Brown sandy gravels, trace Brown clay, Water-bearing	
		14.50m	Grey/Brown sandy gravels, sticky	
		14.50m	Brown clay, Water-bearing	
		14.50m	Grey/Brown sandy gravels, trace Brown clay, Water-bearing	
		15.60m	Grey/Brown sandy gravels, trace Brown clay, Water-bearing	
		15.60m	Small to medium Brown polished gravels, sandy large lumps, sticky	
		15.60m	Brown clay	
		16.10m	Small to medium Brown polished gravels, sandy large lumps, sticky	
		16.10m	Brown clay	
		16.10m	Grey/Brown small to medium sandy gravels, trace Black stained	
		16.79m	Grey/Brown small to medium sandy gravels, trace Black stained	
		16.79m	Pea gravels, Grey/Brown and sandy, trace Brown clay, free flowing	
		17.60m	Pea gravels, Grey/Brown and sandy, trace Brown clay, free flowing	
		17.60m	Small to medium Grey/Brown sandy gravels, trace Brown clay, Water-bearing	
		18.00m	Small to medium Grey/Brown sandy gravels, trace Brown clay, Water-bearing	
		18.00m	Small to medium Grey/Brown sandy gravels, trace Brown clay, Water-bearing, tighter	
		18.79m		

15

# Borelog for well M35/6483

Grid Reference (NZTM): 1564742 mE, 5197412 mN  
 Location Accuracy: 50 - 300m  
 Ground Level Altitude: 27.1 m +MSD Accuracy: < 0.5 m  
 Driller: Clemence Drilling Contractors  
 Drill Method: Cable Tool  
 Borelog Depth: 20.0 m Drill Date: 29-Nov-1990



Scale(m)	Water Level	Depth(m)	Full Drillers Description	Formation Code
			Clay and topsoil	
		0.89m 0.89m	Clay and topsoil Tight, compact gravel	
		3.00m 3.00m	Tight, compact gravel Loose gravel	
5		5.09m 5.09m 5.40m 5.40m	Loose gravel Tight claybound gravel Tight claybound gravel Sandy Water-bearing gravel	
10		9.69m 9.69m	Sandy Water-bearing gravel Tight claywashed gravel	
		11.30m 11.30m	Tight claywashed gravel Loose Water-bearing claywashed gravel	
15		14.60m 14.60m	Loose Water-bearing claywashed gravel Tight claybound gravel	
		18.00m 18.00m	Tight claybound gravel Good loose Water-bearing gravel	
		20.00m		

# Borelog for well M35/6688

Grid Reference (NZTM): 1564192 mE, 5198081 mN

Location Accuracy: 50 - 300m

Ground Level Altitude: 31.0 m +MSD Accuracy: < 0.5 m

Driller: McMillan Drilling Ltd

Drill Method: Cable Tool

Borelog Depth: 18.0 m Drill Date: 04-May-1992



**Environment  
Canterbury**  
Regional Council  
*Kaunihera Taiao ki Waitaha*

Scale(m)	Water Level	Depth(m)	Full Drillers Description	Formation Code
		0.40m	Topsoil	
		0.40m	Topsoil Brown clay	
		1.20m	Brown clay	
		1.20m	Brown sandy gravel and clay	
5				
10				
		11.80m	Brown sandy gravel and clay	
		11.80m	Brown stained sandy gravel	
15				
		18.00m		

# Borelog for well M35/6773

Grid Reference (NZTM): 1564472 mE, 5197322 mN  
 Location Accuracy: 50 - 300m  
 Ground Level Altitude: 28.1 m +MSD Accuracy: < 0.5 m  
 Driller: Clemence Drilling Contractors  
 Drill Method: Cable Tool  
 Borelog Depth: 24.0 m Drill Date: 10-Sep-1993



Scale(m)	Water Level	Depth(m)	Full Drillers Description	Formation Code
		0.30m	Topsoil	
		0.30m	Topsoil Yellow clay	
		1.00m	Yellow clay Heavy claywashed gravel	
		3.09m	Heavy claywashed gravel Good loose Water-bearing gravel	
		5.90m	Good loose Water-bearing gravel Tight sandy claybound gravel	
		7.00m	Tight sandy claybound gravel Water-bearing gravel	
		7.90m	Water-bearing gravel Tight silty claywashed gravel	
		12.90m	Tight silty claywashed gravel Good loose well sorted gravel	
		14.00m	Good loose well sorted gravel Tighter silty heavy claywashed gravel	
		22.40m	Tighter silty heavy claywashed gravel Good Water-bearing claywashed gravel	
		24.00m		

# Borelog for well M35/10517

Grid Reference (NZTM): 1563865 mE, 5197951 mN

Location Accuracy: 50 - 300m

Ground Level Altitude: 32.0 m +MSD Accuracy: < 2.5 m

Driller: Clemence Drilling Contractors

Drill Method: Rotary/Percussion

Borelog Depth: 23.2 m Drill Date: 08-Feb-2005



Scale(m)	Water Level	Depth(m)	Full Drillers Description	Formation Code
		0.50m	top soil	
		1.50m	solid yellow clay	
		3.70m	sandy gravel	
		4.00m	silty claybound gravel	
		4.55m	claywashed gravel	
5		5.50m	poor water-bearing gravel	
		5.80m	sandy claywashed gravel	
		8.20m	very sandy water-bearing gravel	
		11.50m	orange water-bearing gravel	
10		15.10m	very sandy water-bearing gravel	
		18.20m	better water-bearing gravel	
		18.80m	orange water-bearing gravel	
		23.16m	lightly stained water-bearing gravel	

## APPENDIX C: PIEZOMETER LOCATION PLANS

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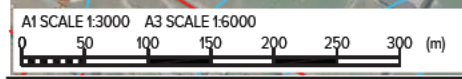


- NOTES**
1. LiDAR data from LINZ Data Service - 1m DEM
  2. LiDAR Major contours 5.0m interval, minor 1.0m.
  3. Boundary Information from LINZ Data Service
  4. Areas and dimensions are subject to final survey.
  5. Piezometer Locations and Levels from Inovo 14/08/23

- LEGEND**
- Site Boundary
  - High Voltage Power Cable
  - Major contour (5m intervals)
  - Minor contour (1.0m interval)

Territorial Authority: Waimakariri District Council  
 Application Address: Mill Road, Ohoka  
 Comprised In: 72971 - 3, CB19B/21, CB26B/467, CB33F/217 And 218, CB35A/112, CB36C/1075, CB742/18  
 Zone: Rural - Residential  
 Total Area: 155.70 ha  
 Legal Description: Lot 1&2 DP 55404, Lot 1-3 DP 318615, Part Lot 1 DP 2267 DP 8301, Lot 1 DP 55849, Lot 2 and Part Lot 1 DP 8301, Lot 2 DP 61732, Part RS 2220

- NOTES**
1. Areas and dimensions are subject to final survey.



Rev#	Description	Drawn	Date
A	INFORMATION	AN	15.08.23

**INNOVATION PROJECTS**  
 Level 1, 93 Manchester St, Christchurch 8022  
 Ph. 03 377 3290  
 11 Clayton St, Newmarket, Auckland 1149  
 Ph. 09 600 1099  
 www.inovo.nz

Scale A1 1:3000  
 Scale A3 1:6000  
 DO NOT SCALE FROM DRAWING

Drawn AN  
 Approved TDM  
 Date 15.08.23

Client **ROLLESTON INDUSTRIAL DEVELOPMENTS LTD**  
 Project **MILL ROAD OHOKA**

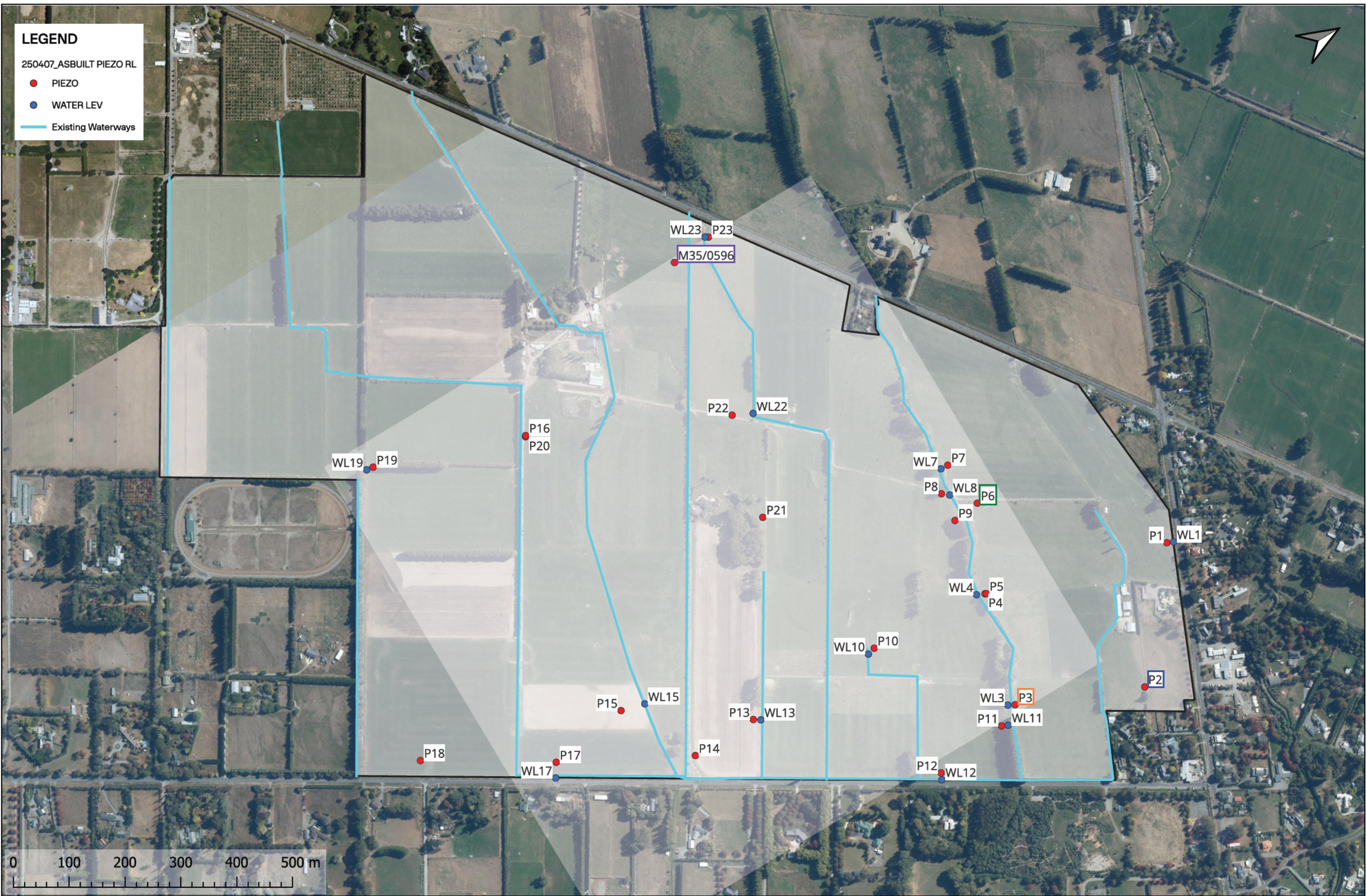
Drawing Title **PIEZO LOCATION OVERVIEW PLAN**

Status **FOR INFORMATION NOT FOR CONSTRUCTION**  
 Drawing No. **14895-E-102**  
 Rev **A**

**LEGEND**

250407\_ASBUILT PIEZO RL

- PIEZO
- WATER LEV
- Existing Waterways



Prepared By: Anunson Ott  
Date: 02/05/2025



Level 1, 93 Manchester Street,  
Christchurch  
Ph. 03 377 3290 11  
www.inovo.nz

Client



CARTER  
GROUP

Project

OHOKA FAST TRACK

Map Title

SURVEYED RL (m) FOR  
PIEZOMETERS 07/04/2025

Status

FOR INFORMATION

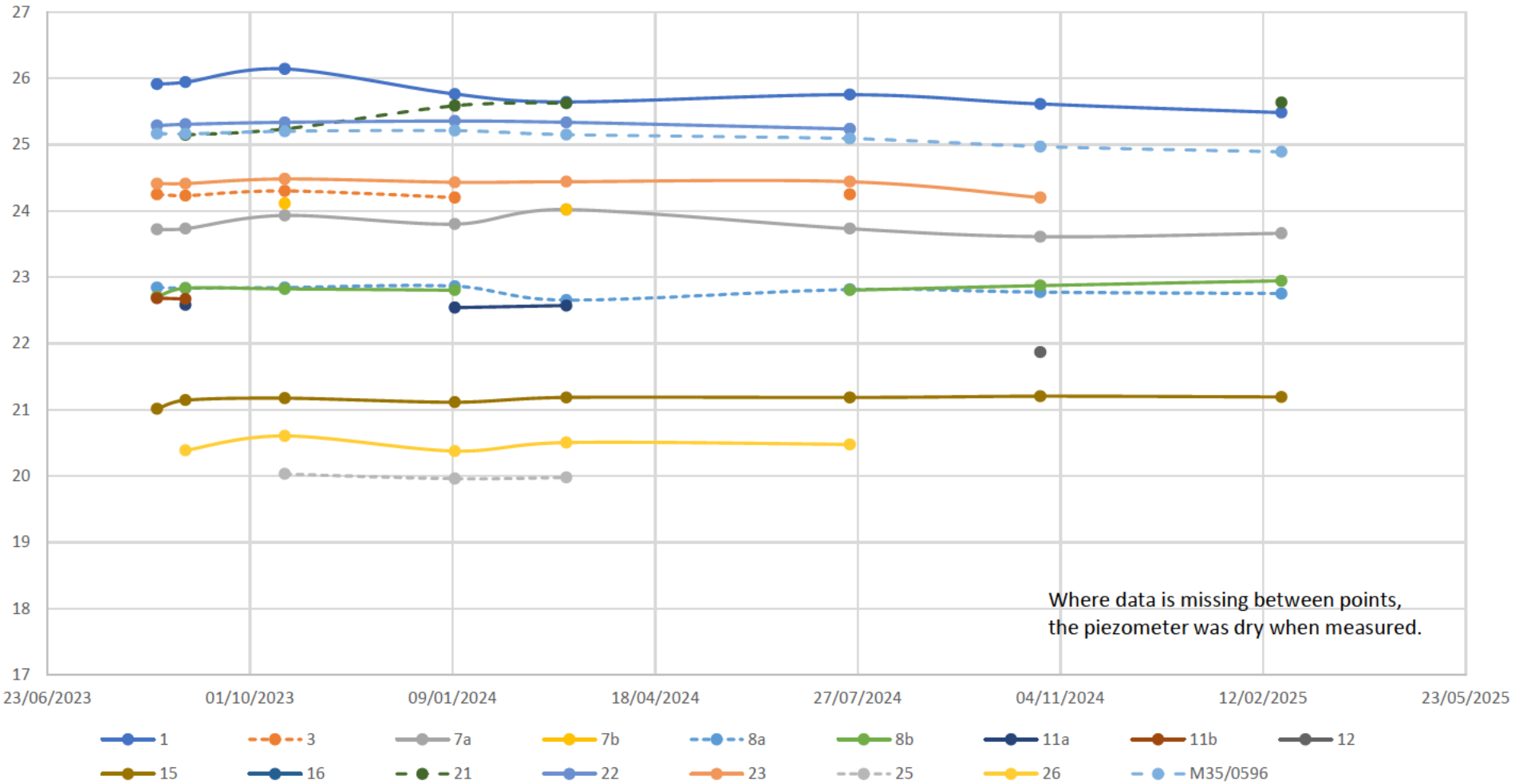
Map No. 16013-PIEZO-1

## APPENDIX D: PIEZOMETER MONITORING DATA

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Piezo number	N-S	E-W	vert	Driller / Surveyor	depth to bottom of hole (mbgl)	depth to water when drilled (mbgl)	Depth to ground water - mbgl							
							16/08/2023	30/08/2023	18/10/2023	10/01/2024	05/03/2024	23/07/2024	25/10/2024	21/02/2025
1	386437.104	824759.954	26.442	Alex & Louie	0.99		0.53	0.50	0.30	0.68	0.80	0.69	0.83	0.96
2a	386247.911	824530.99	27.074	Alex & Louie	0.78	-	Dry	Dry	0.66	0.68	Dry	Dry	Dry	Dry
2b			27.074	Alex & Louie	0.38		Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
3	386834.477	825069.316	24.35	Nathan & Paul	0.41	Dry	0.1	0.12	0.05	0.15	Dry	0.10	Dry	Dry
4	387094.844	825290.539	23.871	Nathan & Paul	0.66	Dry	Dry	0.62	0.21	0.37	0.35	0.33	0.58	0.39
5	386310.208	824223.163	26.094	Alex & Louie	0.45	Wet	Dry	0.30	0.21	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
6a	386605.656	824518.519	25.409	Alex & Louie	1.01	Dry	Dry	0.81	0.68	0.84	0.95	0.97	Dry	Dry
6b	386605.656	824518.519	25.409	Alex & Louie	0.9	Dry	Dry	0.71	0.65	0.77	Dry	Dry	Dry	Dry
7a	386824.365	824776.619	24.4	Alex & Louie	1.05	-	0.68	0.67	0.47	0.60	0.38	0.67	0.79	0.74
7b	386824.365	824776.619	24.4	Alex & Louie	0.46	-	Dry	Dry	0.29	Dry	0.38	Destroyed	Destroyed	Destroyed
8a	387034.131	824926.39	23.453	Alex & Louie	1.61	-	0.61	0.62	0.61	0.59	0.80	0.64	0.68	0.7
8b	387034.131	824926.39	23.453	Alex & Louie	0.84	-	0.75	0.62	0.63	0.65	Dry	0.65	0.58	0.51
9a	387368.831	825355.261	22.797	Nathan & Paul	0.88	0.9	0.64	0.69	0.66	Dry	Dry	0.72	Dry	Dry
9b	387368.831	825355.261	22.797	Nathan & Paul	0.5	-	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
10a	386834.514	824302.886	23.899	Alex & Louie	1.4	-	0.7	0.50	0.49	0.55	0.72	0.62	0.95	Dry
10b			23.899	Alex & Louie	0.73		Dry	0.47	0.51	Dry	Dry	Dry	Dry	Dry
11a	387048.085	824634.429	23.021	Alex & Louie	0.85	-	Dry	0.44	Dry	0.48	0.45	Unable to locate		
11b			23.021	Alex & Louie	0.47		0.34	0.35	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
12	387271.81	824963.194	22.479	Nathan & Paul	0.71	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0.61	Broken
13a	387474.775	825269.718	21.665	Nathan & Paul	0.81	Dry	0.34	0.38	0.27	0.49	Dry	0.40	Dry	Dry
13b			21.665	Nathan	0.51		Dry	0.34	0.27	Dry	Dry	0.38	Dry	Dry
14a	387033.883	824284.078	23.082	Alex & Louie	1	Wet	0.63	0.65	0.66	0.84	0.72	0.80	0.63	Dry
14b	387033.883	824284.078	23.082	Alex & Louie	0.49	Dry	Dry	Dry	0.34	Dry	Dry	Dry	0.44	Dry
15	387296.004	824627.821	21.693	Nathan & Paul	0.85	Dry	0.68	0.55	0.52	0.58	0.51	0.51	0.49	0.5
16	387433.398	824865.892	21.408	Nathan & Paul	0.62	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
17	387610.488	825148.502	21.095	Nathan & Paul	0.66	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
19	387263.033	825197.4	22.74	Nathan & Paul	0.6	Dry	Dry	Dry	0.18	0.44	Dry	0.35	Dry	0.38
20a	387765.591	825056.935	20.068	Nathan & Paul	0.97	Dry	0.87	0.73	0.65	0.86	Dry	0.76	Dry	Dry
20b	387765.591	825056.935	20.068	Nathan & Paul	0.55	Dry	Dry	Dry	0.48	0.30	Dry	Dry	Dry	Dry
21	386575.493	824878.52	26.115	Alex & Louie	1.05	-	Dry	0.97	0.88	0.53	0.49	Dry	Dry	Dry
22	386563.997	824949.357	25.486	Alex & Louie	0.44	-	0.2	0.18	0.15	0.13	0.15	0.25	Blocked	
23	386716.247	824785.289	24.88	Alex & Louie	0.82	-	0.47	0.47	0.40	0.45	0.44	0.44	0.68	Dry
25	387598.445	824781.845	20.379	Nathan & Paul	0.5	Dry	Dry	Dry	0.35	0.42	0.40	Destroyed	Destroyed	Destroyed
26	387448.255	824534.806	20.965	Nathan & Paul	0.7	Dry	Dry	0.58	0.36	0.59	0.46	0.49	Dry	Dry
27	387218.122	824172.953	22.194	Alex & Louie	0.55	-	Dry	Dry	Dry	Dry	Destroyed	Destroyed	Destroyed	Destroyed
30a	387068.124	824127.759	22.92	Alex & Louie	0.67	-	Dry	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
30b			22.92	Alex & Louie	0.32		Dry	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
M35/0596			25.86		2.91		0.695	0.70	0.66	0.65	0.71	0.77	0.89	0.97

Groundwater RL - Between Ohoka Stream and Ohoka South Branch







## APPENDIX E: PERSONNEL CV'S

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## EXPERIENCE SUMMARY

I'm passionate about helping clients solve their geotechnical problems by providing pragmatic advice and understanding each projects' goals.

I have undertaken geotechnical investigations for mine infrastructure, harbours and roading projects along with industrial, commercial and residential projects with soft soil, liquefaction-prone soil and land stability issues. I have managed geotechnical investigations for pipelines, subdivisions, and rail projects and bring a practical / rational approach to solving geotechnical problems. I have significant experience in geomorphological assessment and geological model development. I have worked across New Zealand, Australia and England.

As a team leader, I have been responsible for a team of up to 20 people and managing overall business performance with key focus on safety, staff development and achieving financial goals. I enjoy all scales of projects (from small residential to large infrastructure) and take satisfaction out of helping clients progress their projects, especially where ground conditions are difficult.

Notable projects include: Lyttelton Port of Christchurch Reclamation and Wharf projects, Kawarau Falls Bridge in Queenstown, New Children's Hospital in Perth, and the Lincoln South plan change and residential subdivision.



### EDUCATION

University of Waikato, Hamilton:  
Bachelor of Science  
(Technology)

### AREAS OF EXPERTISE

Earthquake Geotechnical  
Engineering  
Slope Stability Assessment  
Settlement Assessment  
Construction Monitoring  
Desktop Studies  
Site Investigations

### REGISTRATIONS/ AFFILIATIONS

Engineering New Zealand  
New Zealand Geotechnical  
Society

### OFFICE

Christchurch, New Zealand

### YEARS OF EXPERIENCE

~ 17

### CONTACT

## SELECTED PROJECT EXPERIENCE

---

### **Te Awaparahi Bay Stage 1 Land Reclamation Design and Construction, Lyttelton Port Company, 2015-2023**

- Project management and client correspondence for 32 ha site investigation, both on land and over water with investigations up to 185m deep.
- Ground model development in complex geological setting.
- Slope stability analysis for bund and breakwater.
- Settlement monitoring of reclamation and interpretation of monitoring data.
- Revised Detailed Design Report and carried out further analyses as part of the Peer Review Stage.

### **Various Plan Change projects (Lincoln South, Two Chain Road, Skellerup Block, Ohoka, Rolleston West, IPort Stage 13), Canterbury, New Zealand, 2020 – 2023**

- Project management of a geotechnical investigations and assessments for Plan Change applications. All projects involved:
  - Site walkovers and hazard mapping.
  - Assessment of natural hazards.
  - Geotechnical investigations to characterise the sites.
  - Development of ground models to define hazards.
  - Report preparation.
  - Evidence preparation and presentation at hearings where required.

### **Multiple Industrial Developments, Calder Stewart, Christchurch, 2018 - 2025**

- Site investigation, ground model development, geotechnical analyses and design for industrial buildings ranging in size from 2,000m<sup>2</sup> to >10,000m<sup>2</sup>.
- Worked with multiple design teams to develop solutions appropriate to each site and their geotechnical constraints. Solutions ranged from shallow foundations to deep piles or ground improvement depending on the required performance of each structure.
- Construction monitoring of earthworks, site works and ground improvement works.

### **Avon Loop Retirement Village, Christchurch, New Zealand, 2021 – 2023**

- Project management of a geotechnical investigation for multiple 6 storey apartment complexes adjacent to the Red Zone.
- Development of a ground model for this complex site.
- Liquefaction triggering analysis.
- Conceptual ground improvement design.
- Reinforced gravel raft design.

### **Kawarau Falls Bridge, Queenstown, McConnell Dowell, New Zealand, 2016 - 2019**

- Geotechnical design and management for the new bridge abutments.
- Construction monitoring for mechanically stabilised earth walls, retaining walls and general earthworks.
- Preparation of peer review responses.
- Preparation of completion documentation.

## EXPERIENCE SUMMARY

Nathan joined Tetra Tech Coffey in January 2022. Since joining he has worked on multiple projects for multiple clients including geotechnical field investigations, construction monitoring and creating concise reports summarising findings and providing advice.

Prior to working at Tetra Tech Coffey: Nathan joined OPUS (WSP) in 2012 working with the company for 10 years. Between 2016 and 2019 he attended the Auckland University of Technology leaving with a bachelor's degree in engineering. His experience with WSP-OPUS included geotechnical laboratory testing and field testing, inspections of tunnels, bridges, retaining walls, and houses.

## RELEVANT EXPERIENCE

### TETRA TECH COFFEY – GEOTECHNICAL ENGINEER

#### Carter Group

- Springs Road, Lincoln South (July 2022 – ongoing)
  - Investigations within a 223-hectare site for redevelopment into a 1700 section subdivision.
    - Hand auger investigations.
    - Piezometer installation and monitoring.
    - Monitoring and logging of boreholes.
    - Creation of long sections.
- Ohoka Development (July 2022 – ongoing)
  - Investigations within a 223-hectare site for redevelopment into a 1700 section subdivision.
    - Hand auger investigations.
    - Piezometer installation and monitoring.
    - Monitoring and logging of boreholes.
- IPort (November 2022 – 2024)
  - Ground investigation within a 48,000m<sup>2</sup> section for the purpose of the construction of a multi-storey warehouse.
    - Supervision and logging of 22 test pits carried out to depths of +4.5m below ground level.
    - Creating a preliminary geotechnical assessment report.
- Cathedral Square (March 2022 – 2024)
  - Supervision of construction of a multi-storey office building. This building is being constructed in place of an older structure which presents problems such as the discovery of an existing basement.
    - Construction monitoring.



#### EDUCATION

NZDE<sup>(civil)</sup> BE<sup>(Hons)</sup>(Construction)

#### AREA OF EXPERTISE

Geotechnical investigation,  
construction monitoring

#### TRAINING/CERTIFICATIONS

First Aid Certificate

#### OFFICE

Tetra Tech Coffey -  
Christchurch

#### YEARS OF EXPERIENCE

- Geotechnical Engineer – 7  
years  
- Engineering Technician – 5  
years

#### CONTACT



- Site testing monitoring and analysis.

### **Compass Pools**

- Multiple sites (2022 – ongoing)
  - Observations of subgrade within excavation for pools.
    - Visual inspections and field testing of subgrade.
    - Provision of construction observations for council.

### **Cashmere Estate Subdivision**

- Construction monitoring (January 2022 – 2025)
  - Frequent monitoring to ensure the earthworks and retaining wall are in accordance to the standards.
  - To assist in providing recommendations to any problems that may arise during construction.

### **Geotechnical Investigation**

- Various projects, (January 2022 – Present)
  - Scope out geotechnical investigation based on the proposed development.
  - Carrying out investigation, including liaising with client and contractors.
  - Provide a concise report based on our investigations and to provide any recommendations for foundation options.

## **WSP - GEOTECHNICAL ENGINEER**

### **New Zealand Transport Agency – Waka Kotahi**

- Northern Corridor Improvements (2020 - 2021)
  - Supervision of 35 bored piles in east coast bays formation.
  - Construction monitoring of the Constellation Busway

### **Auckland Transport**

- City Rail Link (2020 – 2021)
  - Supervision of construction of the mined Karangahape tunnels and stations.
  - Supervision of construction of the mined Mt Eden tunnel entrance.
  - monitoring of construction of the Tunnel boring machine between Mt Eden and Karangahape.
- Auckland Manukau Eastern Transport Initiative (2019 – 2020)
  - Construction monitoring of retaining walls including Mechanically Stabilised Earth walls, Driven Pile walls, Bored pile walls and Continuous Flight Auger pile walls.
  - Monitoring and logging of investigative bore holes.

Construction monitoring of the Constellation Busway

## **WSP – LABORATORY TECHNICIAN**

### **Multiple Clients**

- Geotechnical Laboratory technician (2018 - 2019)
  - Carrying out testing on fine soils, aggregates and concrete samples providing IANZ accredited results