# Geotechnical Desktop Report

LOT 1 DP 3598 LOT 1 DP 11040 BLK XII R ANGIORA SD
110 Parsonage Road,
Woodend

## Submitted to:

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| Document Title | Geotechnical Desktop Report – LOT 1 DP 3598 and LOT 1 DP 11040, 110 Parsonage Road, Woodend | | |
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# 1 Executive Summary

Wiley Geotechnical Limited (WGL) was requested by Rainer and Ursula Hack to provide a Geotechnical Desktop Report for the proposed subdivision at LOT 1 DP 3598 and LOT 1 DP 11040, 110 Parsonage Road, Woodend (herein referred to as "the site"). The result of our investigation is documented in this report. Our findings and conclusions are summarised in the table below:

**Table 1: Summary of Findings**

| | | | |
|---|---|---|---|
| **Site Sub-soil Conditions** | | | |
| **GNS mapped geology:** | Alluvium | **Soil Classification (NZS 1170.5:2004):** | Class 'D' |
| **CERA zone:** | Green | **MBIE Technical Category:** | N/A - Rural and Unmapped |
| **Expected Soil Stratum:** | Up to 9 m of interbedded clayey silt, silt and sands, underlain by an intermediate gravel layer to 11 m, further underlain by silts and sands, to 20 m, alluvial gravel can be found below 20 m depth | | |
| **Groundwater Level:** | Expected at or below 1 m depth. | | |
| **Natural Hazards** | | | |
| **Flooding and Coastal Erosion:** | The majority of the site has no flood hazard, with two small areas of low flood hazard in a 200-year flood event.<br>The site is mapped outside the tsunami hazard area.<br>The site is located outside of coastal erosion hazard areas. | | |
| **Seismicity:** | No active faults are located on the site. | | |
| **Geotechnical Assessment** | | | |
| **Geotechnical Ultimate Bearing Capacity:** | Nearby subsurface data indicates an ultimate bearing capacity of 200 kPa is generally available in the surrounding area. Geotechnical soil bearing capacity at the site should be confirmed with on-site soil testing at subdivision consent stage. | | |
| **Liquefaction and Lateral Spread Risk:** | The site is located in an area mapped by WDC where" Liquefaction is possible". The neighbouring subdivision is geotechnically assessed to be TC2-equivalent. | | |
| **Conclusions and Recommendations** | | | |
| We consider the land at the site is suitable for residential use subject to adequate site-specific geotechnical investigation and assessment.<br>Further geotechnical soil testing should be undertaken at Subdivision Consent stage to determine soil type and strength characteristics, assess site-specific liquefaction and lateral spread hazards and to determine the site-specific MBIE Technical Category. | | | |

# 2 Introduction

At the instruction of our client, we have undertaken a geotechnical investigation at LOT 1 DP 3598 and LOT 1 DP 11040, 110 Parsonage Road, Woodend. This geotechnical report summarises our findings as per the brief given to us by our client. The purpose of the geotechnical investigation was to evaluate ground conditions at the site to support a Plan Change application.

The report may be used by our clients' appointed consultants for design purposes and by the local council/authority for corresponding consent application.

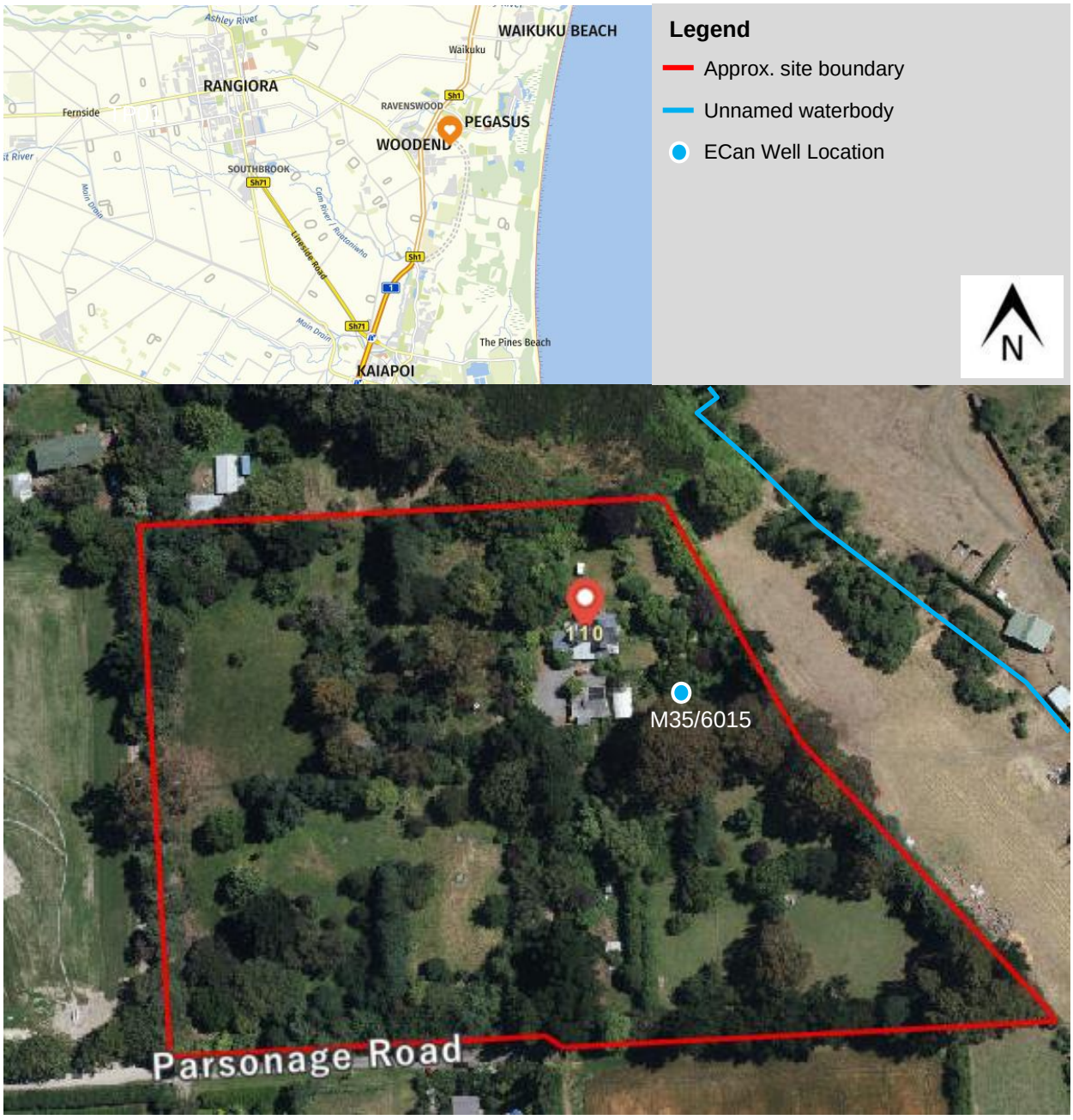
# 3 Site Description

**Table 2: Site Description**

| | |
|---|---|
| **Site Area:** | 3.709 ha |
| **Legal description** | LOT 1 DP 3598 LOT 1 DP 11040 BLK XII R ANGIORA SD |
| **Topography:** | Flat (<5°)* |
| **Site/Area Description:** | The site is located in a semi-rural area, bound by other rural-residential properties to the north, east and south, and to the west by a drainage reserve for a 152 Lot residential subdivision.<br>Woodend township is located approximately 830 m east of the site. Pegasus Golf Club is located approximately 100 m north of the site at its closest boundary.<br>Shallow drainage ditches are located along each side of Parsonage Road, including along the south boundary of the site.<br>An unnamed waterbody, indicated by Environment Canterbury to be a spring fed stream, is located approximately 35 m east of the site. Aerial photography shows the stream to be dry, with water located approximately 35 m north east of the site.<br>A pond located on Pegasus Golf Course is located approximately 390 m north east of the site. |

* Based on limited imagery available on Google Street View

**Figure 1: Site Location Plan**




Images sourced from Google Maps and Canterbury Maps. Well locations sourced from Environment Canterbury.

# 4 Previous Geotechnical Report

## 4.1 Updated Geotechnical Assessment Report by Riley Consultants Ltd. (2014)

Riley Consultants Ltd (RCL) undertook a Geotechnical Assessment Report for the neighbouring residential subdivision to the west of the subject site. We summarise the relevant geotechnical information:

- The geological map of the area (Geological Map of New Zealand, Sheet 76 Kaiapoi, (1973)) indicates the site is underlain by Springston Formation glacial outwash deposits, comprising gravel, sand and silt. Near to the south east extent of the site, more recent alluvial deposits of the Yaldhurst member have been mapped. East of the site, Christchurch Formation dune sands are present.
- A subsurface investigation was undertaken, comprising fourteen hand augers, three machine boreholes and twelve Cone Penetrometer Tests (CPTs). Previous investigations, by others comprised 13 CPTs. The test data indicates, in general, the site comprises surficial topsoil underlain by variable lenses of silt and silty sand to around 4 m depth below existing ground level (bgl). Below 4 m bgl, test data indicates fine grained silt and clayey silt to between 5.3 m and 13.2 m bgl (east to west), further underlain by interbedded gravel and sand alluvial deposits, extending to depths greater than 20 m.
- Information from Environment Canterbury well M35/0552, located to the north of the site, indicates highest groundwater level is 1.64 m bgl and mean annual groundwater level is 2.55 m. Groundwater levels were recorded on 18 occasions between September 1977 and October 1986 in this well.
- Groundwater levels were measured in four existing standpipes in February 2011, November 2013 and January 2014, the records indicate groundwater levels between 0.7 m and 3.58 m bgl.
- Liquefaction analysis indicates the majority of the site meets the criteria of MBIE Technical Category 2 (TC2), with two locations on the western side of the site being indicative of TC3 conditions and SLS level**. Lateral spread toward the proposed stormwater attenuation basins on the eastern side of the site is considered unlikely owing to the design heigh of the basins and the depth to groundwater at the site.

** Since this report was released, liquefaction assessment methodology has been updated and the results may no longer be considered accurate.

# 5 Geotechnical Desktop Study

## 5.1 Geology

The site has been regionally mapped by GNS (Brown and Webber, 1992) to be underlain by sand and silt over bank deposits of Late Quaternary age.

## 5.2 Nearby Subsurface Data

WGL has reviewed the nearest subsurface data available on Environment Canterbury's Well Search website and the New Zealand Geotechnical Database (NZGD); listed in table 3 and presented in Figure 1.

**Table 3: Nearby sub-surface data**

| NZGD Identifier | Approx. Distance from site | Depth (m bgl) | Groundwater (m bgl) |
|---|---|---|---|
| M35/6015 | On site | 30 | Not recorded |
| HA_DCP_186401 | 40 m south west | 3 | 1.1 to 1.6 |
| M35/11589 | 85 m south west | 21.05 | 2.27 |
| TP_98791 | 110 m west | 2.6 | 1.3 |
| BW24/0631 | 150 m west | 29 | 3.37 |
| BH_37000 | 160 m west | 10 | 6.8 m*** |

*** Located near an existing irrigation well, depth to water may be effect of drawdown from nearby well.

The nearby subsurface data indicates surficial topsoil up to 0.3 m, underlain by interbedded clayey silt, silt and sand up to 20 m depth below ground level (bgl), with an interbed of sandy gravel at approximately 9 m to 11 m bgl. Below 20 m bgl, silty and sandy gravel mixtures are recoded to at least 30 m bgl.

Subsurface data is broadly consistent with published geological mapping.

# 6 Natural Hazards

## 6.1 Flood Hazard

We have reviewed the flooding hazards for the site on Waimakariri District Council's (WDC) Natural Hazards Interactive Viewer website. The map shows the majority of the site to have no flood hazard. Two locations on the south west corner and centre south of the site have a low flood hazard.

The site is outside the mapped tsunami hazard area.

## 6.2 Coastal Erosion

The WDC's Natural Hazards Interactive Viewer website indicates no coastal erosion hazard at the site.

## 6.3 Liquefaction Hazard

The Ministry of Business, Innovation and Employment (MBIE) has divided much of the greater Christchurch area into Technical Categories; however, the majority of the Waimakariri District has not been assigned a Technical Category, and has been zoned "Rural and unmapped".

The WDC's Natural Hazards Interactive Viewer website indicates the site is in an area where "Liquefaction damage is possible".

The neighbouring subdivision to the west has been categorised TC2 following a geotechnical assessment of the deep soil profile.

## 6.4 Seismicity

We have reviewed the WDC's Natural Hazards Interactive Viewer website and the GNS Active Faults Database, which show that no active faults are located on the site. The nearest known fault is the

Loburn Fault (#9573), located approximately 6.7 km north west of the site. Fault movement is dextral. The recurrence interval and the last event are listed as unknown.

# 7 Geotechnical Assessment

## 7.1 Geological Ground Model

Based on the nearby subsurface data available on the NZGD information from RCL's Geotechnical Assessment Report for the neighbouring site, we consider that the geology of the ground is likely to comprise topsoil to approximately 0.3 m bgl, underlain by interbedded clayey silt, silt and sand up to 20 m depth below ground level (bgl), with an intermediate layer of sandy gravel at approximately 9 m to 11 m bgl. Silty and sandy gravel layers are expected below 20 m bgl.

Based on nearby subsurface data, groundwater is expected below 1 m depth, subject to seasonal variations and weather events.

## 7.2 Soil Classification

For the purpose of seismic design, we consider the soil classification to be 'Class D – Deep or Soft Soil", in accordance with NZS 1170.5:2004.

## 7.3 NZs3604 Assessment

WGL has reviewed nearby subsurface data available on the NZGD and from RCL' s Geotechnical Assessment Report to assess the subsurface strength profile and to evaluate whether ground in the general area is likely to meet the requirements of 'good ground', defined in NZS 3604:2011.

Given the neighboring site is assessed by RCL as TC2 equivalent, we consider "Good Ground" in accordance to NZs 3604:2011 is not met because the ground deformation is likely to exceed 25 mm.

**This data is not site-specific and variations in soil type and soil strength can occur over short distances**. Geotechnical soil bearing capacity at the site should be determined during the on-site soil testing at subdivision and& building consent stage.

# 8 Assessment Against RMA Section 106

Assessment against Section 106 of the Resource Management Act is a requirement for potential future subdivision.

We have assessed the natural hazards associated with the site in accordance with Section 106 of the Resource Management Act. We consider the current ground surface not to be presently subject to erosion, subsidence, falling debris, slippage or inundation by soil or rock in accordance with the provision of Section 106 of the Resource Management Act 1991.

The Waimakariri District Council's (WDC) Natural Hazards Interactive Viewer website shows the site to have either no flood hazard or a low flood hazard.

The site is located within an area where "Liquefaction damage is possible" based on the WDC's natural hazard map. The neighbouring subdivision has been assessed to be TC2. Further assessment should be undertaken at the site in the event Subdivision Consent is sought.

We do not consider that residential use of the land is likely to accelerate, worsen or result in material damage to the land provided that the proper engineering practices are followed during any development, including those recommended in this report.

# 9 Conclusion

Based on our discussion above, we consider the site is geotechnically suitable for the proposed residential development subject to adequate site-specific geotechnical investigation and assessment. We summarise the primary geotechnical conclusions and recommendations of this assessment:

- The geotechnical soil investigation indicates that the general stratigraphy of the ground underlying the site comprises topsoil to approximately 0.3 m, underlain by interbedded clayey silt, silt and sand up to 20 m depth below ground level (bgl), with an intermediate layer of sandy gravel at approximately 9 m to 11 m bgl. Silty and sandy gravel layers are expected below 20 m bgl.
- Groundwater is expected below 1 m bgl under static conditions, based on groundwater data obtained in our desktop study, subject to seasonal variation and rainfall events.
- In terms of NZS 1170, Class D sub-soil conditions (deep or soft soils) are assessed to underlie the site due to the considerable depth to inferred bedrock based on the geology of the area.
- The site is located within an area where “Liquefaction damage is possible”. The neighbouring subdivision has been assessed to be TC2. Further assessment should be undertaken at the site in the event Subdivision Consent is sought.

# 10 Recommendations

We recommend that further soil testing is undertaken on the site at Subdivision Consent stage, including:

- Shallow hand auger boreholes to determine the subsurface material types and strength characteristics.
- Cone Penetrometer Tests (CPT) to a target depth of 15 m or refusal to determine the soil types and strength characteristics.
- Liquefaction analysis using the on-site CPT data to determine technical category for the site. The number of geotechnical soil tests undertaken at the site shall be determined based on the proposed subdivision plan and in accordance with MBIE guidance documents.

# 11 References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The Ministry of Business, Innovation, and Employment (2016). New Zealand Geotechnical Database. Retrieved February 2024, from https://www.nzgd.org.nz

Waimakariri District Council. Natural Hazards Interactive Viewer website. Retrieved February 2024, from https://waimakariri.maps.arcgis.com/apps/instant/portfolio/index.html?appid=c6bc05f87d4f47ecae975e5241657913

## 12 Limitations

i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Rainer and Ursula Hack, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.

ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.

iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

iv. This Limitation should be read in conjunction with the Engineering New Zealand/ACENZ Standard Terms of Engagement.

v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned, if you require any further information.

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