

16 August 2019

Document Ref: AKL2019-0136AB Rev 0

Maraetai Land Development Ltd
PO Box 8751,
Symonds Street,
Auckland 1150

Attention: David Page

RE: PRELIMINARY GEOTECHNICAL ASSESSMENT REPORT FOR 102 TOTARA ROAD, WHENUAPAI

1 INTRODUCTION

CMW Geosciences (CMW) has been engaged by Maraetai Land Development Limited to undertake a preliminary geotechnical assessment of 102 Totara Road, Whenuapai. This work has been carried out in accordance with our proposal referenced AKL2019-0136AA Rev.0 dated 07 August 2019.

We understand that this report will be used as part of a due diligence process for the possible development of the property into a residential subdivision. To date no design plans have been issued.

2 SITE DESCRIPTION AND DEVELOPMENT PLANS

2.1 Site Description

The site is legally described as Lot 1 DP 53062 with a total land area of 4.76 Hectares.

The site is rectangular in shape, bound by Totara Road in the east and McCaw Avenue in the south.

There is currently a dwelling with a barn located in the south west corner of the site which is accessed via Totara Road. A second dwelling accessed via McCaw Avenue is located on the southern boundary. The remainder of the site is grassed farmland, extending north to the boundary with the neighbouring property (Lot 2 DP 81411).

Overall, the site is near flat farmland with a slight south to north slope dropping from RL 25.5 to RL 22.5 over the entire site.

In the south east of the site there is a drainage channel with observed flowing water, fed from an outlet from a stormwater pond at the eastern end of McCaw Road. This drainage channel directs stormwater flow to a pipe which feeds through to the neighbouring property on the eastern boundary of the site.

In the south western corner of the site, another drainage channel appears to have been cut running north west to south east. Flowing water was also observed in this channel during the site work (13/08/19).

Surface water was ponded throughout the site.

Large gum trees are present along the north western boundary.

2.2 Development Plans

We have not been provided with development plans at the time of writing this report, but it is likely that earthworks to develop the proposed subdivision will involve relatively minor cut to fill to provide gently sloping or flat building platforms and associated infrastructure.

3 SITE HISTORY AND DESKTOP STUDY

Historic aerial photography viewed on the Auckland GIS viewer and from the Retrolens website indicates the south western dwelling on site was constructed between 1950 and 1972 and the second dwelling was constructed between 1996 and 2003. The 1996 aerial photograph shows a shed was erected on the northern boundary and was removed by 2010.

The historic photos show that the land was used for farming from at least 1940.

Our review of the publicly available historic aerial photos found no signs of major slope instability.

The drainage channel on the south eastern side of the site appears to have been modified between 2015 and 2017 during construction of the stormwater pond on the southern neighbouring property.

4 GEOLOGY

Published Geological Maps¹ suggest the site is underlain by alluvial deposits of Puketoka Formation (Tauranga Group) overlying alternating sandstone and siltstone (with variable volcanic content and interbedded volcanoclastic grits) of the Waitemata Group.

Tauranga Group alluvial deposits comprise Pliocene aged or late deposits including silts, clays and sands with possible peat or organic rich clay soils and carbonaceous deposits. Some volcanic deposits are also often encountered in these deposits. Accordingly, these deposits can be quite varied in their properties and may include soft and /or organic layers or deposits or soils that are sensitive to disturbance.

We typically observe the following stratigraphic traits within the alluvial soils in the Whenuapai Area:

- A thin organic topsoil which mantles the surface, generally becoming thicker in gully areas;
- A sub-topsoil horizon comprising sensitive pumiceous/tephritic silts that may be of variable thickness from absent to approximately 1 metre thick;
- Thick (>2 metres) horizons of highly plastic clay dominant soils with high water contents and variable strength. These clayey horizons can also include organic clay lenses of up to 1-2m thickness, typically within gully areas but occasionally also observed in paleochannels which are infilled former depressions in the land.
- Deeper horizons of clayey and sandy silts sit generally below the water table. These deposits are often thick (>2 metres), high in micaceous sand often with mica and pyrite clasts, generally saturated due to being capped by almost impermeable clay horizons above and are typically very stiff to hard/medium dense deposits.

Waitemata Group deposits are evident along much of the eastern coastline of the Auckland area formed during the Early Miocene in the submarine fan and basin floor depositional environments and typically consists of thick bedded sandstone and interbedded laminated mudstones/siltstones.

Residual soils formed by weathering and alteration of the parent sedimentary formation typically form silts and clays or mixtures of the two depending on groundwater conditions, faulting and land gradients.

¹ Edbrooke, S.W. (compiler) 2001, Geology of the Auckland Area, 1:250,000 Geological Map 3, GNS Science

5 FIELDWORK & FINDINGS

Our fieldwork was carried out on the 14th and 15th of August 2019 and included a site walkover by an Engineering Geologist and drilling of 5 hand auger boreholes to depths of up to 5 metres below current ground level or refusal.

Hand augers boreholes were logged by a CMW geologist to New Zealand Geotechnical Society guidelines for the field description of soil and rock. In situ strength testing was carried out at approximately 400mm intervals by use of a hand-held shear vane.

Refusal was met on hard ground within the hand augers and all boreholes were terminated before target depth. Dynamic Cone Penetrometer tests (DCP) were carried out in the base of hand augers until refusal.

Table 1 lists a summary of the hand auger findings, including the borehole depths, top soil thicknesses, depth to groundwater and the maximum and minimum vane shear strengths recorded in the soils encountered.

The locations of the boreholes are shown on Figure 1. Full borehole records are appended to this report.

Table 1: Brief Summary of Hand Auger Findings					
Hand auger	Depth (m)	Groundwater depth (m. bgl)	Peak vane shear strength (kPa)		Topsoil depth (m)
			Min	Max	
HA01-19	2.5	1.5	107	163	0.5
HA02-19	3.0	2.0	71*	153	0.4
HA03-19	3.8	2.2	86	169	0.2
HA04-19	3.6	2.5	71	153	0.2
HA05-19	4.1	1.2	107	147	0.4
DCP's were carried out in the base of the borehole until DCP refusal.					
* Very soft soils were encountered between 0.4m and 2.2m in this borehole and were unable to be tested using the shear vane. The minimum vane strength is likely less than 20kPa for this borehole.					

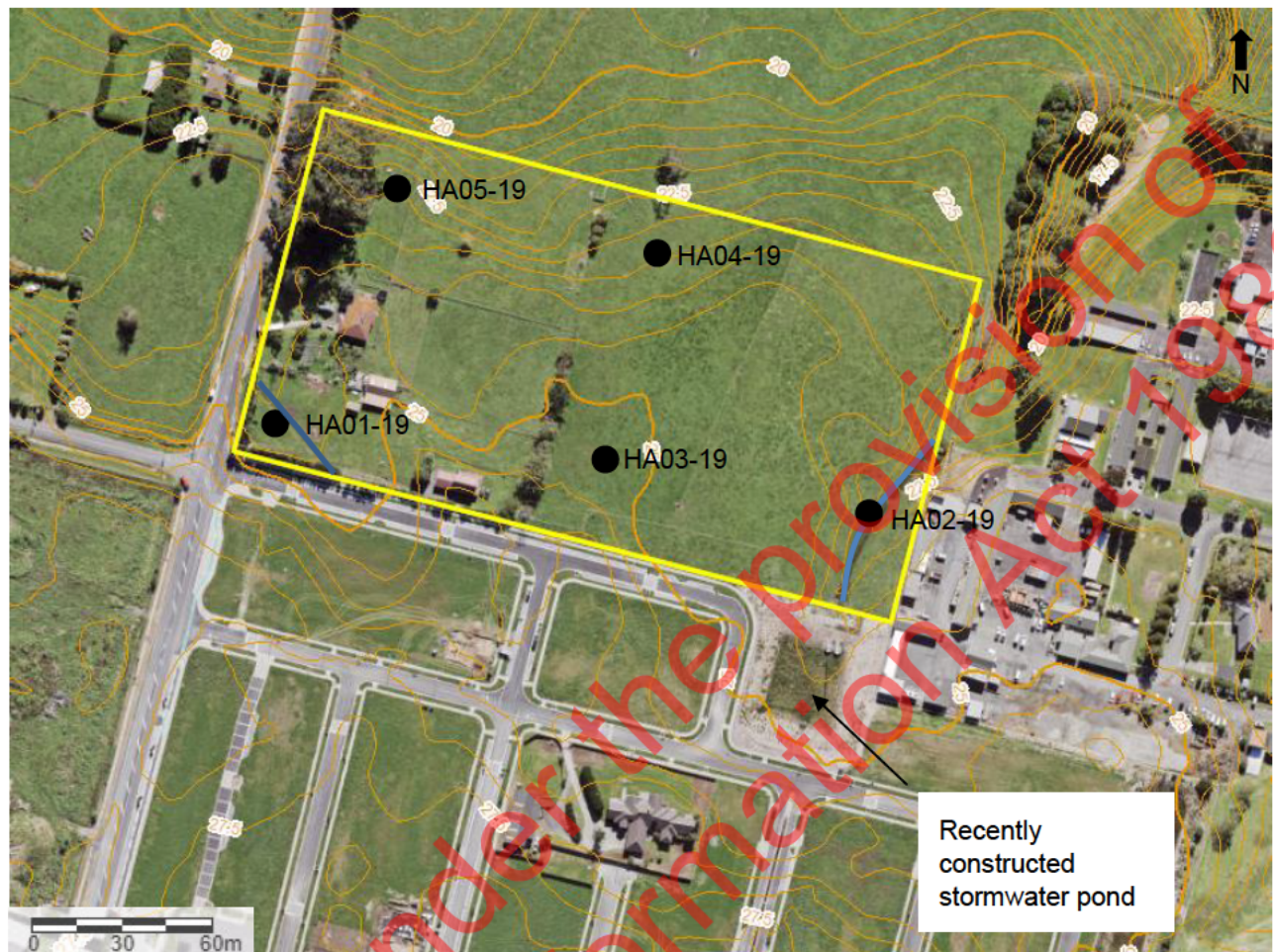


Figure 1 Site plan, development area is highlighted in yellow, the black dots depict hand auger locations and the blue lines represent flowing drainage channels observed during the site walkover (image from Auckland Council Geomaps)

5.1 Fill

No fill was identified in our site investigation; however, it is likely that minor filling has taken place around the existing house site and as part of general farm activities.

Fill is also likely to be present around the south eastern drainage channel, due to recent regrading and shaping noted on the historical aerial photography.

Once stripping of the site is complete, any uncertified fill should be removed, and the subgrade inspected by a geotechnical engineer.

5.2 Soils Encountered

Natural soils were encountered underlying the topsoil in all boreholes across the site.

Natural soils encountered predominantly comprised brown to greyish brown with orange and brown mottles, stiff to very stiff clays, from 0.2m up to approximately 4.1m depth. DCP tests typically refused within 2 metres below the base of the hand auger holes.

A layer of recent alluvium was encountered in HA02-19 and is described further in Section 5.3.

Some organic clays were encountered within the upper soil profile at depths described in Section 5.4.

We interpret the soils encountered to be Tauranga Group alluvial deposits and Recent Alluvium.

5.3 Recent Alluvium

Recent alluvium was encountered in HA02-19 between 0.4 and 2.2 metres depth. The recent alluvium was unable to be recovered in the hand auger and is interpreted to be very soft and saturated. It is likely that this material was deposited via the existing drainage channel in this area.

5.4 Organic Clays

Organic clays were encountered in HA03-19 from 2.2m to 3.8m depth.

5.5 Groundwater

Standing groundwater was encountered in all boreholes and ranged between 1.2m and 2.5m depth below the existing ground level.

It should be noted that these levels are indicative only and may vary seasonally and with rainfall.

6 PROJECT EVALUATION AND GEOTECHNICAL RISKS

On the basis of our site walkover, preliminary site investigation and desktop study we consider the subject site is generally suitable for a future residential subdivision, subject to the comments and recommendations below.

6.1 Permanent Slopes

Based on our desktop study, site walkover, and hand augers we have assessed the existing slopes, and consider the risk of overall slope instability of the site as low provided that the proposed development is appropriately retained and any batter slopes kept to 1(v) to 3(h) or less.

At the time of writing this report no designs had been issued and further detailed investigation and reporting is necessary.

Stability of the area next to the drainage channel on the south eastern boundary will need to be confirmed once final plans are issued.

6.2 Organic Clays

As described in Section 5.4, organic clays were encountered in HA03-19. Typically lenses of these organic rich horizons are discrete and dispersed but may be also present at other locations under the site.

These soils can be an issue for settlement/consolidation if significant fill is proposed over these soils, or if they are likely to be close to the foundation level of future buildings.

We consider that organic clays pose the most significant geotechnical risk to development of this site.

Engineering consideration will need to be given to the most appropriate options where these deposits lie within 2 metres of the finished ground surface. Depending on depths and thickness, options include undercutting and removal, raft foundations or piled foundations, amendments to road pavement designs and additional under cutting of service trenches.

6.3 Soft and Sensitive Soils in Earthworks and Foundations

Recent Alluvium was encountered in HA02-19, which is a very soft and sensitive soil. It is also possible that pumiceous silts may be present throughout the site, however they were not encountered during the ground investigation.

Depending on the final development plans, undercutting portions of soft and sensitive soils may be required. The recent alluvium is unlikely to be able to be reused, however the pumiceous silts can generally be suitable for use as engineered fill once conditioned and blended with more plastic soils (clays). Alternatively, suitable set back from the known area of the drainage channel when finalising development plans may be considered.

6.4 Building Foundations

Based on our geotechnical appraisal and investigations, we anticipate that NZS3604 type building development would be suitable in the natural clay deposits or in future engineered fill following the removal of any low strength and sensitive unsuitable deposits during earthworks.

Foundation systems for such buildings will need to take into account the expansive nature of the soils (see below) with rib raft type foundations likely for future buildings or specifically engineered shallow foundation system.

Expansive soils are classified in NZS3604 as those soils having a liquid limit of more than 50% and linear shrinkage of more than 15%.

Based on our visual tactile assessment of the clay soils on this site we anticipate the expansive site class for these soils to range from moderate (M) to highly (H1/H2).

Two soil samples were tested for expansivity at Lot 2 DP 81411 north of the site. The results of these tests confirmed the presence of expansive soils site class M.

6.1 Seismic Site Subsoil Class – (NZS 1170.5)

We have assessed the seismic site subsoil class to be C (Shallow Soil) in accordance with NZS 1170.5 section 3.1.1.

6.2 Earthworks

Earthworks shall be undertaken in accordance with NZS4431:1989 and the Auckland Council Code of Practice for Land Development and Subdivision.

Prior to any fill being placed it will be necessary to undercut all surface topsoil and fill to be stockpiled for later use or removed from site if in excess.

It is important that the stripped subgrade is inspected and approved by a geotechnical engineer prior to backfilling. Due to the historic land use described above in Section 3 it is likely large tree stumps and roots may be present in some areas of the stripped subgrade and therefore instruction will be given to remove this material prior to fill placing.

6.3 Trenching

Due to the presence of ponding surface water during our site investigation, trenching of services will require careful consideration and subsoil drains maybe required.

7 FUTURE WORK

Once a scheme and earthworks plan has been completed, CMW should be given the opportunity to assess and make comment on any likely geotechnical issues that may affect the proposed development. Further

investigation, stability analysis and/or specific geotechnical design and reporting will be scoped at this stage. Investigations should be planned to better define extent and depth of organic deposits.

8 LIMITATIONS

This report has been prepared for use by our client Maraetai Land Development Limited and their consultants, and Auckland Council. Liability for its use is limited to these parties and to the scope of work for which it was prepared as it may not contain sufficient information for other parties or for other purposes.

It should be noted that factual data for this report has been obtained from discrete locations using normal geotechnical investigation techniques. As such investigation methods 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 back to CMW immediately.

9 CLOSURE

We trust this report meets your requirements.

Should you require any further information or clarification regarding the information provided in this report, please do not hesitate to contact the undersigned.

For and on behalf of CMW Geosciences

Prepared by:



Chris Ritchie
Senior Engineering Geologist

Reviewed and authorised by:



Richard Knowles
Principal Geotechnical Engineer

Distribution: 1 electronic copy to David Page via email
Original held at CMW Geosciences

Appendices: Appendix A Borehole logs



Client: Maraetai Land Development
Project: 102 Totara Road, Whenuapai
Site Location: Whenuapai
Project No.: AKL2019-0136
Date: 13/08/2019
Borehole Location: See site plan



1:25 Sheet 1 of 1

Logged by: MMC	Position: E.1744064.0m N.5927382.0m	Elevation: RL 24.30m	Hole Diameter: 50mm
Checked by: CR	Survey Source: Auckland Council GIS	Datum: NZTM	Angle from horizontal: 90°

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Remarks: Groundwater encountered at 1.5mbgl.

CMW Geosciences

1:25 Sheet 1 of 1

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

Client: Maraetai Land Development
Project: 102 Totara Road, Whenuapai
Site Location: Whenuapai
Project No.: AKL2019-0136
Date: 13/08/2019
Borehole Location: See site plan



1:25 Sheet 1 of 1

Logged by: MMC	Position: E.1744212.0m N.5927365.0m	Elevation: RL 25.20m	Hole Diameter: 50mm
Checked by: CR	Survey Source: Auckland Council GIS	Datum: NZTM	Angle from horizontal: 90°

[illegible]

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.

1:25 Sheet 1 of 1

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.



1:26 Sheet 1 of 1

Logged by: MMC	Position: E.1744120.0m N.5927488.0m	Elevation: RL 22.75m	Hole Diameter: 50mm
Checked by: CR	Survey Source: Auckland Council GIS	Datum: NZTM	Angle from horizontal: 90°

[illegible]

Termination reason:	Refusal
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Remarks: Groundwater encountered at 1.2mbgl.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 3 - April 2018.