Geotechnical Report for Proposed Sales Office - Lot 36 Stage 1A Manakura Neighbourhood, Karamu Subdivision

1  Introduction

As requested, we have investigated the ground conditions at the above site and write to confirm the foundation requirements for the proposed sales office building.

Preliminary building plans (Cook Costello; July 2018)\(^1\) provided to us by you indicate the sales office is a NZS3604 residential-style building. It is a 50m\(^2\) single-storey timber-framed structure, with a lightweight roof, lightweight cladding, and lightweight timber floor supported on concrete-encased timber piles, with some short strip footings for the deck.

This report is intended to be used as technical supporting documentation for Building Consent application purposes. We assume that Cook Costello will use our report for the specific structural and foundation design.

2  Ground model

Our knowledge of the ground model is based on information from a number of sources, including:

Subdivision investigation\(^2\) including shallow and deep testing. Aurecon’s report concluded “Based on our liquefaction assessment, we consider the site to behave similarly to MBIE Technical Category 1 (TC1)”. The surface geology is Springston Formation alluvium. Groundwater is at approximately 10m depth.

Subdivision earthworks engineering undertaken with Eliot Sinclair as designer and Engineer to Contract, and works constructed by Blakely Construction Limited. All controlled fill placed across the Stage 1 Karamu Subdivision area, including Lot 36, was supervised by an Engineer from Eliot Sinclair & Partners, and has been certified to NZS4431 and reported on in our Inspecting Engineers Report\(^3\). The existing topsoil layer was removed down to clean insitu silty sand or sandy silt, followed by placement of 200mm to 500mm of control fill material comprising silts or sands with minor gravel content.

Site-specific testing - see details below.

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\(^1\) Preliminary building plans; Cook Costello, 12 July 2018
\(^3\) “Inspecting Engineer’s Report (NZS4431) – Karamu Subdivision Stage 1A, Riccarton, Christchurch – Prepared for Ngai Tahu Property Ltd – 419748” and dated 2 August 2018.
3 Site-specific Testing

Testing within Lot 36 comprised: one shallow spade hole; one conventional Dynamic Cone Penetrometer (DCP); and three Hydraulic penetrometer tests. The Hydraulic penetrometer testing was undertaken by Canterbury Geotest Ltd\(^4\) using their hydraulic Scala rig. Table 1 presents the ground profile in Lot 36. The site investigation factual records are attached.

Table 1: Ground profile in Lot 36

<table>
<thead>
<tr>
<th>Depth</th>
<th>Soil Description</th>
<th>Information source</th>
</tr>
</thead>
<tbody>
<tr>
<td>0m to 0.4m</td>
<td>Silty TOPSOIL FILL</td>
<td>Spade hole following the earthworks.</td>
</tr>
<tr>
<td>0.4m to 0.9m</td>
<td>Controlled fill: Sandy SILT or Silty SAND FILL with minor to some gravel content.</td>
<td>Observations made during the earthworks.</td>
</tr>
<tr>
<td>0.9m to 1.4-1.8m</td>
<td>Insitu silts and sands.</td>
<td>Refusal depths from nearby CPTs undertaken by Aurecon.</td>
</tr>
<tr>
<td>1.4m-1.8m to 20m</td>
<td>Insitu sandy gravels.</td>
<td>Site wide subdivision testing by Aurecon.</td>
</tr>
</tbody>
</table>

4 http://geotest.co.nz/

4 Foundation Requirements

Test P01 and P04 indicate the underlying insitu soils have penetration resistances around 1.5 to 3.0 blows per 100mm. In terms of 'index' static bearing capacity, the Dynamic Scala and Hydraulic penetrometer test results in the insitu ground do not meet the minimum requirements of "Good Ground"\(^5\). Specific engineering design of the foundations is required. There is expected to be suitable bearing for the specific building.

Foundation details in NZS3604 cater for buildings up to three storeys, so we expect that the normal foundation details can be adopted for the specific building. The structural engineer is to determine the specific foundation detailing. A strength reduction factor of \(\phi_{bc}=0.5\) should be adopted in the foundation design.

5 Foundation Inspections

A suitably competent and experienced inspector should validate that the ground conditions exposed in the foundation excavations are consistent with the findings of this report and the design assumptions.

Loose material should be removed from the excavations and foundations should bear in the controlled fill and/or insitu soil.

Please contact us with **48 hours’ notice** if you wish for Eliot Sinclair & Partners to undertake these inspections.

Following a satisfactory inspection, we will provide a ‘Producer Statement - Construction Review’ to confirm the exposed ground conditions.

\(^5\) “Good Ground” is defined in the Acceptable Solutions and Verification Methods for the New Zealand Building Code B1 Structure, and also in NZS 3604:2011 “Timber Framed Buildings”.

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419748_Lot_36_Geotechnical_Report_Manakura
6 Disclaimer

Comments made in this report are based on reporting by others, our earthworks reporting, our soil investigations, and the Ministry of Business Innovation & Employment Guidelines\(^6\).

Whilst every care was taken during our investigation and interpretation of subsurface conditions, there may well be subsoil strata and features that were not detected. Additionally, on-going seismicity in the general area may lead to deterioration or ground movement that could not have been anticipated at time of writing of this report.

The exposure of such conditions, occurrence of additional strong seismicity, or any future update of MBIE’s guidelines\(^6\) or the NZBC, may require a review of our recommendations. Eliot Sinclair & Partners should be contacted to confirm the validity of this report should this occur.

This report has been prepared for the benefit of Ngāi Tahu Property Ltd and the Christchurch City Council. No liability is accepted by this company or any employee of this company with respect to the use of this report by any other party.

Yours sincerely
ELIOT SINCLAIR & PARTNERS LTD

Prepared By:

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Reviewed & Approved for Release By:

Nick Harwood BE(Hons) MSc DIC IntPE(NZ) CMEngNZ CPEng (1007273)
Principal
Senior Geotechnical Engineer

Encl.

Site investigation logs (2 sheets)
Site test location plan (1 sheet)

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SITE INVESTIGATION RECORD

Client: Ngāi Tahu Property Ltd
Site: Stage 1a, Manakura Neighbourhood, Karamū Subdivision, Riccarton Park

SCALA PENETROMETER TEST RESULTS

Number of Blows per 100mm

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.2</td>
<td>0.4</td>
<td>0.6</td>
<td>0.8</td>
<td>1.0</td>
<td>1.2</td>
<td>1.4</td>
<td>1.6</td>
<td>1.8</td>
<td>2.0</td>
<td>2.2</td>
<td>2.4</td>
<td>2.6</td>
<td>2.8</td>
</tr>
</tbody>
</table>

SOIL PROFILE

Test Location - Lot 36, A

- FILL: silty TOPSOIL, with some gravel; dark brown. Damp; trace rootlets, (upper 100mm wet).
- Silty SAND, with some gravel; light brown. Moist.
- EOH: 0.45m - Target depth.
- 0.60m: Indicative controlled fill depth at P01.
- 0.80m: Indicative controlled fill depth at P02 and P03

COMMENTS

Scala penetrometer P01 undertaken by Canterbury Geotest Ltd using a Hydraulic penetrometer rig. P04 carried out by Eliot Sinclair using a standard hand DCP.

For test locations, refer to Eliot Sinclair & Partners drawing: "Geotechnical Test Locations and Controlled/Engineered Fill Thickness Contour Plan"; Project No. 419748; Set No. G7; Sht No. 0 to 4; Rev. A.
## SITE INVESTIGATION RECORD

**Client**  
Ngāi Tahu Property Ltd

**Site**  
Stage 1a, Manakura Neighbourhood, Karamū Subdivision, Riccarton Park

### SCALA PENETROMETER TEST RESULTS

<table>
<thead>
<tr>
<th>Number of Blows per 100mm</th>
<th>Depth (m)</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.2</td>
<td></td>
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<tr>
<td></td>
<td>0.4</td>
<td></td>
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<td></td>
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<td></td>
<td>3.0</td>
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</tr>
</tbody>
</table>

- 0.60m: Indicative controlled fill depth at P04.

### SOIL PROFILE

Minimum penetration resistance (based on 300mm wide footing founded at 300mm depth) required for "Good Ground" as defined in the Acceptable Solutions and Verification Methods for NZBC Clause B1 Structure.

### COMMENTS

For test locations, refer to Eliot Sinclair & Partners drawing: "Geotechnical Test Locations and Controlled/Engineered Fill Thickness Contour Plan"; Project No. 419748; Set No. G7; Sht No. 0 to 4; Rev. A.

### SITE PLAN

(Not to Scale)

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**Field Staff:**  
LBW

**Prepared By:**  
LBW

**Investigation Type**

- Hand Auger
- Spade Hole
- Test Pit

**Job Manager:**  
MAA

**Approved By:**  
NKH
Legend

- Controlled Fill Thickness
- Spade Hole Location
- Penetrometer Test Location
- Aurecon Borehole Location
- Aurecon CPT Location
- Aurecon Test Pit Location
- NZGD CPT Location

Notes:
1) The Aurecon test locations shown have been sourced from Aurecon New Zealand Limited - Champions Mile Geotechnical Investigation Report. Dated 23 September 2016. The coordinates of test locations have not been confirmed or verified by Eliot Sinclair.
2) Lots 6, and 8 have been amalgamated into one lot - Lot 6 under consent variation RMA/2017/2099/A

Area shown in grey has not been mapped at the time of plotting and site preparation.
All depths shown are below finished ground level.

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New Zealand Limited - Champions Mile Geotechnical Investigation consent variation RMA/2017/2099/A

KARAMO - Riccarton Park
Stage 1A

Geotechnical Test Locations and Controlled/Engineered Fill Thickness Contour Plan

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