

# Statement from the Listed Land Use Register

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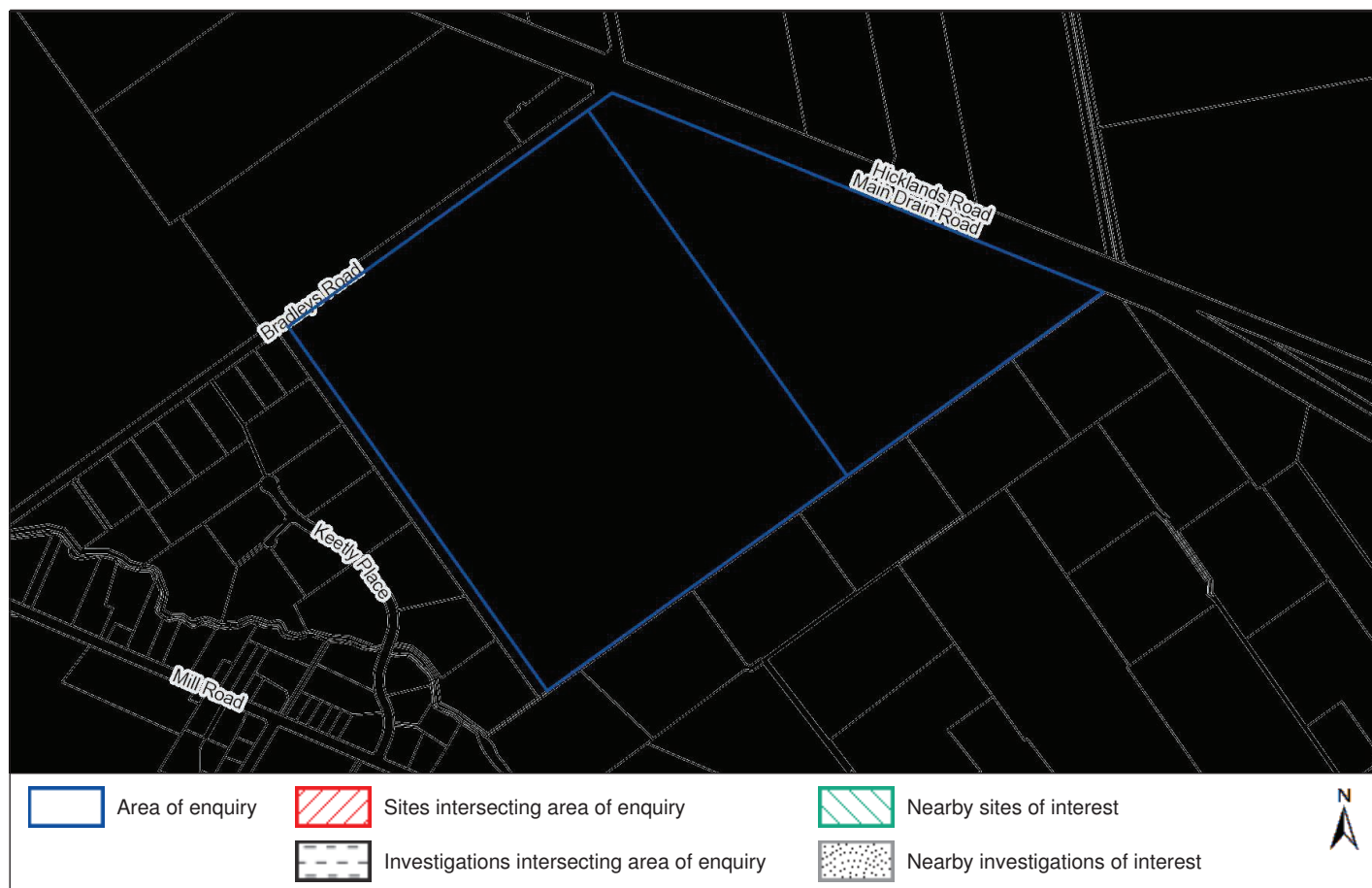
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<b>Date:</b>	15 March 2012		
<b>Land Parcels:</b>	• Pt RS 2561	Valuation No(s): 2174001000	
	• RS 2010	Valuation No(s): 2174000100	



## Summary of sites:

There are no sites associated with the area of enquiry.

Please note that the above table represents a summary of sites intersecting the area of enquiry within a 100m buffer.

For further information from Environment Canterbury, contact the Contaminated Sites Officer and refer to enquiry number 10352.

**Disclaimer:**

*The enclosed information is derived from Environment Canterbury's Listed Land Use Register and is made available to you under the Local Government Official Information and Meetings Act 1987 and Environment Canterbury's Contaminated Land Information Management Strategy (ECan 2009).*

*This information reflects Environment Canterbury's current understanding of this site, which is based only on the information thus far obtained by it and held on record concerning this site. It is released only as a copy of those records and is not intended to provide a full, complete or totally accurate assessment of the site. As a result, Environment Canterbury is not in a position to warrant that the information is complete or without error and accepts no liability for any inaccuracy in, or omission from, this information.*

*Any person receiving and using this information is bound by the provisions of the Privacy Act 1993.*



**Photo 1: View of the paddocks along the western boundary of the site**



**Photo 2: View of the paddocks in the southern portion of the site**



**Photo 3: View of the horse training track near the centre of the site**





**Photo 4: View of one of the chicken sheds**



**Photo 5: View of one of the chicken sheds**



**Photo 6: View inside the chicken sheds**



**Photo 7: View of the horse stables**



**Photo 8: View of the general farm storage area (showing the above ground fuel tank)**



**Photo 9: View of the implement shed within the general farm storage area**





**Photo 10: View of the haybarn within the general farming storage area**



**Photo 11: The sheep yard area located between the general farm storage area and the horse track**



**Photo 12: The possible foot rot trough / sheep dip within the sheep yard area**

## **Annexure 11**

## **Geotechnical Investigation by Geoscience Consulting**

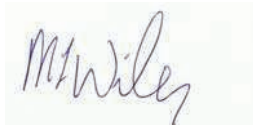
## Statement of Professional Opinion on the Suitability of Land for Building Construction

ISSUED BY: Geoscience Consulting (NZ) Ltd  
TO: Survus Consultants Limited  
TO BE SUPPLIED TO: Waimakariri District Council  
IN RESPECT OF: Geotechnical Investigation of subdivision into 69 Lots  
AT: 474 Bradleys Road, Ohoka

I, Matthew Wiley, on behalf of Geoscience Consulting (NZ) Ltd hereby confirm that:

1. I am a suitably qualified and experienced Principal Engineering Geologist and was retained by Survus Consultants Limited for the above development.
2. The extent of our investigations and the results of all tests carried out as outlined in the geotechnical report dated 4<sup>th</sup> April 2012.
3. In my professional opinion, not to be construed as a guarantee, I consider that:
  - a) The original ground not affected by filling is suitable for the erection thereon of buildings designed according to NZS 3604 provided that:
    - i) All topsoil is undercut from within the building footprint and a line projecting downward from the perimeter of foundations at 45°.
  - b) The original ground not affected by filling is suitable for the construction of a subdivision and are not subject to erosion, subsidence or slippage in accordance with the provisions of Section 106 of the Resource Management Act 1991.
4. This professional opinion is furnished to the territorial authority and Survus Consultants Limited for their purposes alone, on the express condition that it will not be relied upon by any other person and does not remove the necessity for the normal inspection of foundation conditions at the time of erection of any building.
5. This certificate will be read in conjunction with the geotechnical report referred to in Clause 2 above, and shall not be copied or reproduced.
6. The geotechnical engineering firm issuing this statement holds a current policy of professional indemnity insurance of no less than \$1,000,000.

For and on behalf of Geoscience Consulting (NZ) Ltd,



**Matt Wiley**

Director



## **GEOTECHNICAL INVESTIGATION**

**474 BRADLEYS ROAD, OHOKA,  
CANTERBURY**

SUBMITTED TO:

P & A BAGRIE  
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4 April 2012

**DISTRIBUTION**

1 Copy (PDF) – P & A Bagrie c/- Survus Consultants Ltd  
1 Copy – Geoscience Consulting (NZ) Ltd

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## 1 INTRODUCTION

Geoscience Consulting (NZ) Ltd (Geoscience) was requested by Survus Consultants (Survus) to undertake a geotechnical investigation of the residential property at 474 Bradleys, Christchurch (herein referred to as 'the site') as outlined in our proposal (reference P11483\_2, dated 2<sup>nd</sup> of March 2012).

We understand that the site is proposed to be subdivided into 69 residential lots. A Proposed Outline Development Plan prepared by Survus is included in Appendix 1. This plan depicts the proposed development layout.

This report should be read in conjunction with our Geotechnical Desktop Investigation Report prepared for this site dated 10<sup>th</sup> of February 2012 reference 12034\_1. Our scope of works for this report included the following:

- Mark out and geotechnically log materials from up to 12 test pits excavated across the site;
- Arrange for a subcontractor to undertake AutoScala Penetrometer testing to assess typical strength characteristics; and
- Presentation of a report outlining our findings on the ground conditions and the suitability of the site for residential subdivision. This will include general geotechnical advice on foundation conditions and address likely DBH Technical Category and Section 106 of the RMA matters.

Section 106 of the resource Management Act 1991 provides for the refusal of consent for the subdivision of land by a territorial authority where the issuing authority is not satisfied that adequate provision has been made for the protection of land or buildings against erosion, falling debris, subsidence, slippage or inundation from any source. Subsidence is deemed to include liquefaction induced ground deformation.

## 2 SITE DESCRIPTION

The site is located in Ohoka and is bound by Bradleys Road to the north, Paper Road to the west, Main Drain Road to the east and semi-rural (lifestyle) properties to the south (Figure 1).

The land is generally flat, with occasional very gentle undulations and predominantly comprises grassed paddocks for grazing livestock.

The existing homestead is located at the northern end of the site. The site also contains a stable block, horse training track and chicken farming facilities, although these areas are not shown for subdivision on the Survus plan.

Several shallow drainage channels traverse the site and flow into a larger drain located along the south-eastern boundary.

The following information was provided verbally by the property owner, Peter Bagrie:

- The depth to groundwater typically varies between 0.5 m in winter and 1.0 m in summer.
- It is understood that the shallow subsurface conditions include a clay pan underlain by gravel/shingle.
- No land damage was observed following the recent series of earthquakes to affect the Canterbury region.

Site photographs are presented in Appendix 2.



### **3 GEOLOGY**

The published geology for the area<sup>1</sup> shows it to be underlain by grey river alluvium beneath plains or low-level terraces.

We have carried out a review of the Environment Canterbury (ECan) well database<sup>2</sup>. Borelogs are available for two wells in the vicinity of the site namely M35/2622 and M35/1823. The well depths are 54 and 16 m respectively. The borelogs indicate the presence of gravel and sand layers to approximately 21 m depth, with surficial clay between approximately 0.5 and 1.5 m. We infer from the borelogs that the gravels become progressively more clay bound and denser (cemented in places) with depth. The ECan data also indicates that the average groundwater ranges between approximately 1.5 and 5 m depth.

### **4 GEOHAZARDS**

#### **4.1 Seismicity**

Historically, Christchurch City has been considered to be in a region of low concentrations of active faults and seismicity. However, the Canterbury region has recently had four earthquakes with magnitude greater than 6. As a result, there is a heightened level of seismic risk stemming from the recently discovered Greendale, Lyttelton and Port Hills Faults. The recent seismic activity in the Canterbury region is currently considered to have increased the probability of another large (M6.0 to 7.9) earthquake to 16%<sup>3</sup> between the time of writing and February 2013.

Preliminary mapping<sup>4</sup> of the recent faulting in Canterbury illustrates the approximate locations of the Greendale Fault and sub-surface Lyttelton Fault rupture, the distribution of associated aftershocks since the 4<sup>th</sup> of September 2010 event, and known active faults in the Canterbury area. Large regional areas of faulting<sup>1,5</sup> namely the Ashley Fault, Porters Pass-Amberley Fault Zone, and the Hope and Alpine Faults, are further afield but present a high seismic hazard risk to the Christchurch area due to the anticipated size of earthquakes generated. The largest of these faults is the Alpine Fault, which has a return period of 250 to 300 years and is expected to produce a M8 earthquake. The last rupture on the Alpine Fault is believed to have occurred in 1717<sup>6</sup>.

#### **4.2 Liquefaction and Lateral Spreading**

The site is located outside the “potentially liquefiable ground zone” and “lateral spread zone” identified by the Waimakariri District Council<sup>7</sup>, and we consider the potential for liquefaction and lateral spreading to be low owing to the nature of the subsurface materials<sup>1</sup> at the site as per our desktop study.

### **5 FIELD INVESTIGATIONS**

Geoscience carried out a site walkover in preparation of our desktop report, as well as observed the excavation of 12 test pits and arranged for AutoScala Penetrometer (Scala) testing to be carried out across the site.

#### **5.1 Site Walkover**

Geoscience carried out a walkover of the site on the 8th of February 2012 and did not observe evidence of land damage in the form of liquefaction or lateral spreading, nor did we observe obvious sources of potential land instability.

Wells were observed, with at least one well flowing strongly causing minor ponding on the ground surface.

Photographs taken during the walkover are attached.

## 5.2 Test Pits

Geoscience re-visited the site on the 22<sup>nd</sup> of March 2012 and completed logging of materials from 12 machine excavated test pits in the locations shown on Figure 1. The maximum depth of excavation was 3 m. Five piezometers were also installed in at various test pit locations for the purposes of environmental monitoring which will not be commented on herein. Our investigation findings are summarised in Table 1 below.

**Table 1: Summary of Typical Subsurface Conditions**

Depth (m)	Material Description	Material Type	Density/Consistency
0.0 - 0.30	SILT; dark brown. Low plasticity.	TOPSOIL	Firm
0.30 – 0.4	SILT; light brown with orange mottles. Low plasticity.	ALLUVIUM	Stiff
0.40 – 3.4	Sandy fine to coarse GRAVEL; brown to bluish grey, rounded, well graded. Sand is coarse.		Dense to Very Dense

Groundwater was encountered between approximately 1.0 and 1.7 m below the ground surface.

Full logs are presented in Appendix 3 and are written in accordance with the New Zealand Geotechnical Society 'Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes'<sup>8</sup>.

## 5.3 AutoScala Penetrometer Testing

The AutoScala is a small mechanical rig that pushes a Scala Penetrometer cone into the ground. The Scala testing was carried out on 30 March 2012 in the approximate locations shown on Figure 2.

The Scala testing was undertaken to assess the presence of "good ground", defined in NZS 3604:2011<sup>9</sup> as follows:

*"Where the number of blows per 100 mm depth of penetration below the underside of the proposed footing at each test site exceeds:*

- 5 down to a depth equal to twice the width of the widest footing; and*
- 3 at greater depths.*

A summary of the test results is presented in Table 2, and full results are presented in Appendix 4:

**Table 2: Summary of Scala Penetrometer Testing**

Test Number	Depth to Refusal (m)	Approx. Depth to “good ground” (m)	Test Number	Depth to Refusal (m)	Approx. Depth to “good ground” (m)
1	0.82	0.5	19	0.56	0.0
2	1.11	0.5	20	0.94	0.0
3	0.81	0.5	21	0.65	0.0
4	0.78	0.4	22	1.22	0.2
5	0.76	0.1	23	1.45	0.9
6	1.43	0.2	24	0.58	0.1
7	1.13	0.5	25	0.66	0.1
8	1.11	0.5	26	0.83	0.2
9	1.10	0.3	27	1.05	0.5
10	1.36	0.3	28	1.08	0.2
11	0.92	0.5	29	0.83	0.6
12	0.79	0.1	30	0.99	0.8
13	1.09	0.1	31	0.95	0.5
14	0.84	0.3	32	1.14	0.6
15	0.56	0.1	33	0.50	0.1
16	0.53	0.0	34	1.71	1.0
17	0.67	0.0	35	0.63	0.0
18	0.52	0.0	36	0.98	0.6

## 6 CONCLUSIONS

Based on our site investigation and assessment we conclude the following:

- ECan borehole logs in the area indicate the site is underlain by deep gravel deposits with groundwater approximately 1.4 m below ground level. This is consistent with the depth to groundwater encountered in the test pits.
- The soils encountered during our test pit investigation typically comprise 0.3 m of topsoil underlain by 0.1 to 0.2 m of stiff silt. Dense to very dense gravel was encountered below the silt layer. The gravel is anticipated to continue to depths of at least several tens of metres. The average depth to the top of the gravel is generally identified as being 0.5 m.



- AutoScala testing results indicate that the gravels encountered typically meet the requirements for “good ground” as defined by NZS3604:2011<sup>9</sup>.
- There is no evidence of any liquefaction having occurred at or near the site during recent large earthquakes. We consider the likelihood of liquefaction or lateral spreading occurring at the site to be very low based on the nature of the sub-surface materials (namely gravel).

Based on the above findings from our field investigations we consider the site characteristics to be consistent with a Technical Category 1 (TC1) classification<sup>10</sup>, as defined by CERA and the Department of Building and Housing, where:

*“Future land damage from liquefaction is unlikely. You can use standard foundations for concrete slabs or timber floors. Foundation requirements changed in 2011 and information is available on the Department of Building and Housing’s website”.*

## 7 RECOMMENDATIONS

It is our opinion that the site is generally suitable for the proposed future residential development.

Dwellings constructed in accordance with the requirements of NZS3604:2011<sup>9</sup> should be able to be supported on conventional shallow foundations. A geotechnical ultimate bearing capacity of 300 kPa should generally be available for all shallow foundations bearing on the natural dense gravel ground identified below approximately 0.5 m.

Any future earthworks activities proposed to be carried out as part of the site development works should be carried out in accordance with NZS4431: Code of Practice for Earth Fill for Residential Development<sup>11</sup>.

We consider the original ground not to be subject to erosion, subsidence or slippage in accordance with the provision of Section 106 of the Resource Management Act 1991.

It should be noted that while we consider the site suitable for residential sub-division, this report is not intended for 224c sub-division sign off or for Building Consent purposes. The Waimakariri District Council guidelines indicate further geotechnical testing may be required for these consents. A geotechnical completion report will be provided following earthworks to confirm the site technical category and the specific foundation requirements. We assume this will be required as a condition of subdivision consent.

## 8 REFERENCES

- 1 Brown, L.J., Weeber, J.H., 1992: Sheet 1 - Geology of the Christchurch Urban Area 1:25,000. Institute of Geological and Nuclear Sciences, Lower Hutt.
- 2 <http://ecan.govt.nz/services/online-services/tools-calculators/pages/well-card.aspx>
- 3 <http://www.geonet.org.nz/canterbury-quakes/aftershocks/>
- 4 [http://www.geonet.org.nz/var/storage/images/media/images/news/2011/chch\\_seismicity\\_04\\_09\\_11/58577-1-eng-GB/Chch\\_Seismicity\\_04\\_09\\_11.jpg](http://www.geonet.org.nz/var/storage/images/media/images/news/2011/chch_seismicity_04_09_11/58577-1-eng-GB/Chch_Seismicity_04_09_11.jpg)
- 5 Rattenbury, M.S.; Townsend, D.B.; Johnston, M.R., 2006: Sheet 13 - Geology of the Kaikoura Area 1:250,000. Institute of Geological and Nuclear Sciences, Lower Hutt.
- 6 Pettinga J.R., Yetton M.D., Van Dissen R.J., and Downes G., 2001: Earthquake Source Identification and Characterisation for the Canterbury Region, South Island, New Zealand, Bulletin of the New Zealand Society for Earthquake Engineering, Vol 34, No. 4, pp 282-317
- 7 [http://www.waimakariri.govt.nz/Libraries/Maps\\_and\\_Plans/WDC\\_map\\_liquefaction\\_110701.sflb.a.shx](http://www.waimakariri.govt.nz/Libraries/Maps_and_Plans/WDC_map_liquefaction_110701.sflb.a.shx)

- 8 New Zealand Geotechnical Society, 2005: Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes.
- 9 Standards Association of New Zealand, 2011: Timber Framed Buildings – New Zealand, NZS 3604:2011. Standards New Zealand, Wellington.
- 10 [www.cera.govt.nz](http://www.cera.govt.nz)
- 11 Standards Association of New Zealand, 1989: Code of Practice for Earth Fill for Residential Development, NZS 4431:1989. Standards New Zealand, Wellington

We also acknowledge the New Zealand GeoNet project and its sponsors EQC, GNS Science and LINZ, for providing data used in this report.

## 9 LIMITATIONS

- (i) This report has been prepared for the use of our client, P. and A. Bagrie, 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) Assessments made in this report are based on the ground conditions indicated from published sources, site inspections and subsurface investigations described in this report based on accepted normal methods of site investigations. Variations in ground conditions may exist between test locations and therefore have not been taken into account in the report.
- (iii) This Limitation should be read in conjunction with the IPENZ/ACENZ Standard Terms of Engagement.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on 03 328 9012 if you require any further information.

For and on behalf of Geoscience Consulting (NZ) Ltd,



**Jana Kruyshaar**

Geotechnical Engineer



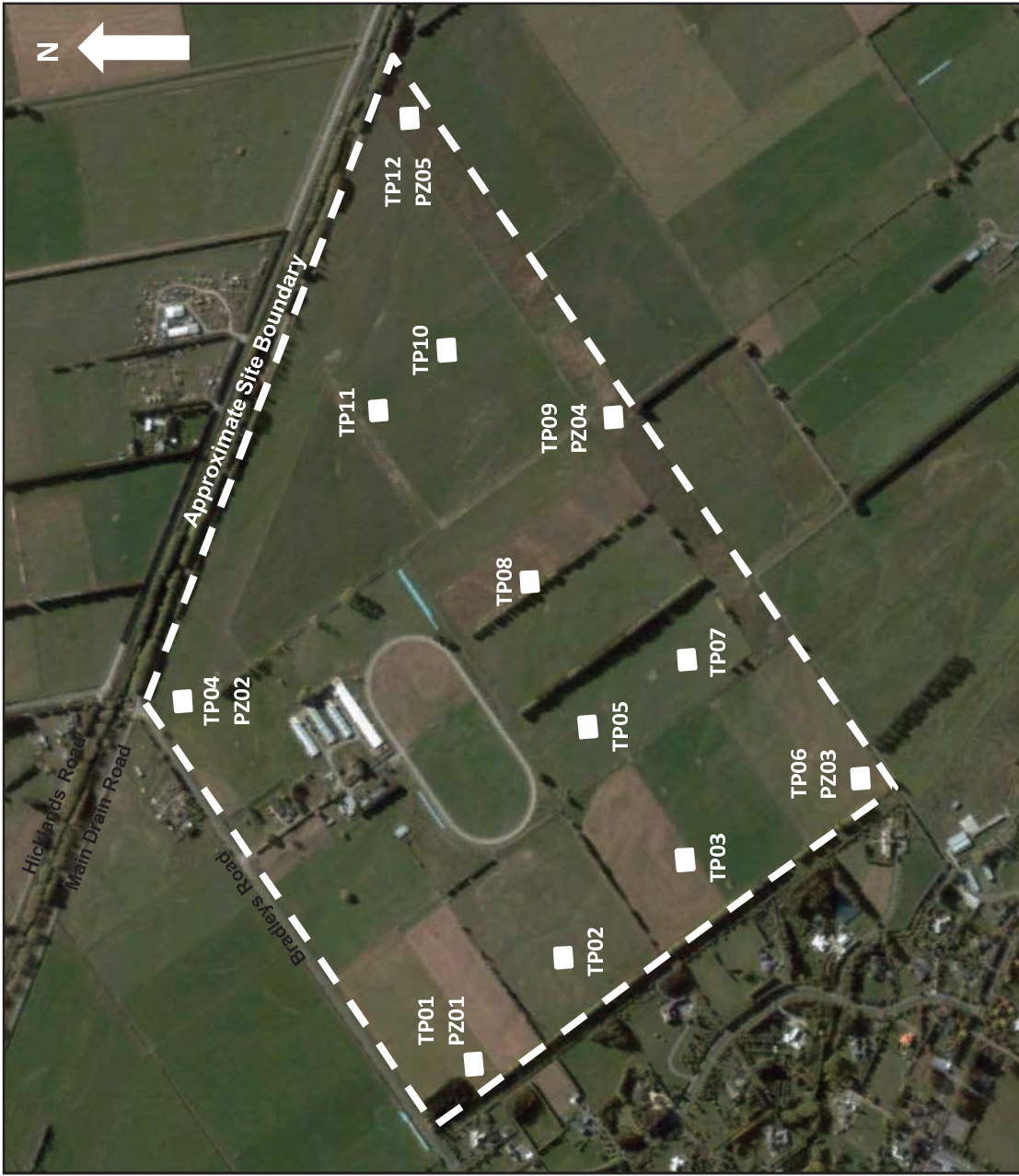
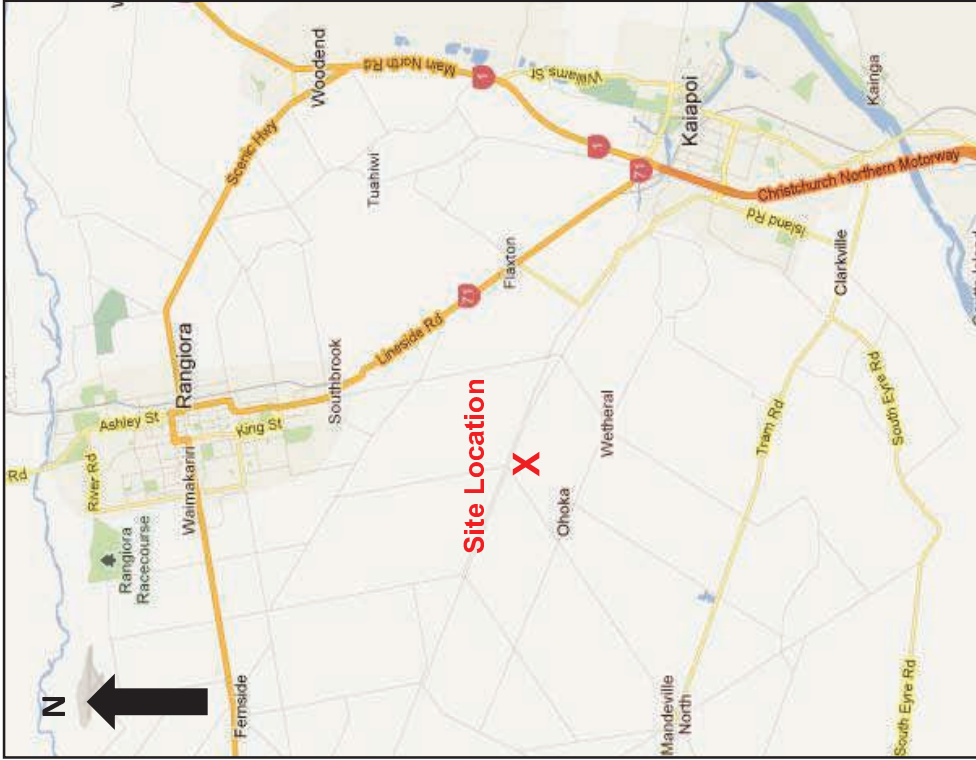
**Matt Wiley**

Principal Engineering Geologist



## FIGURES

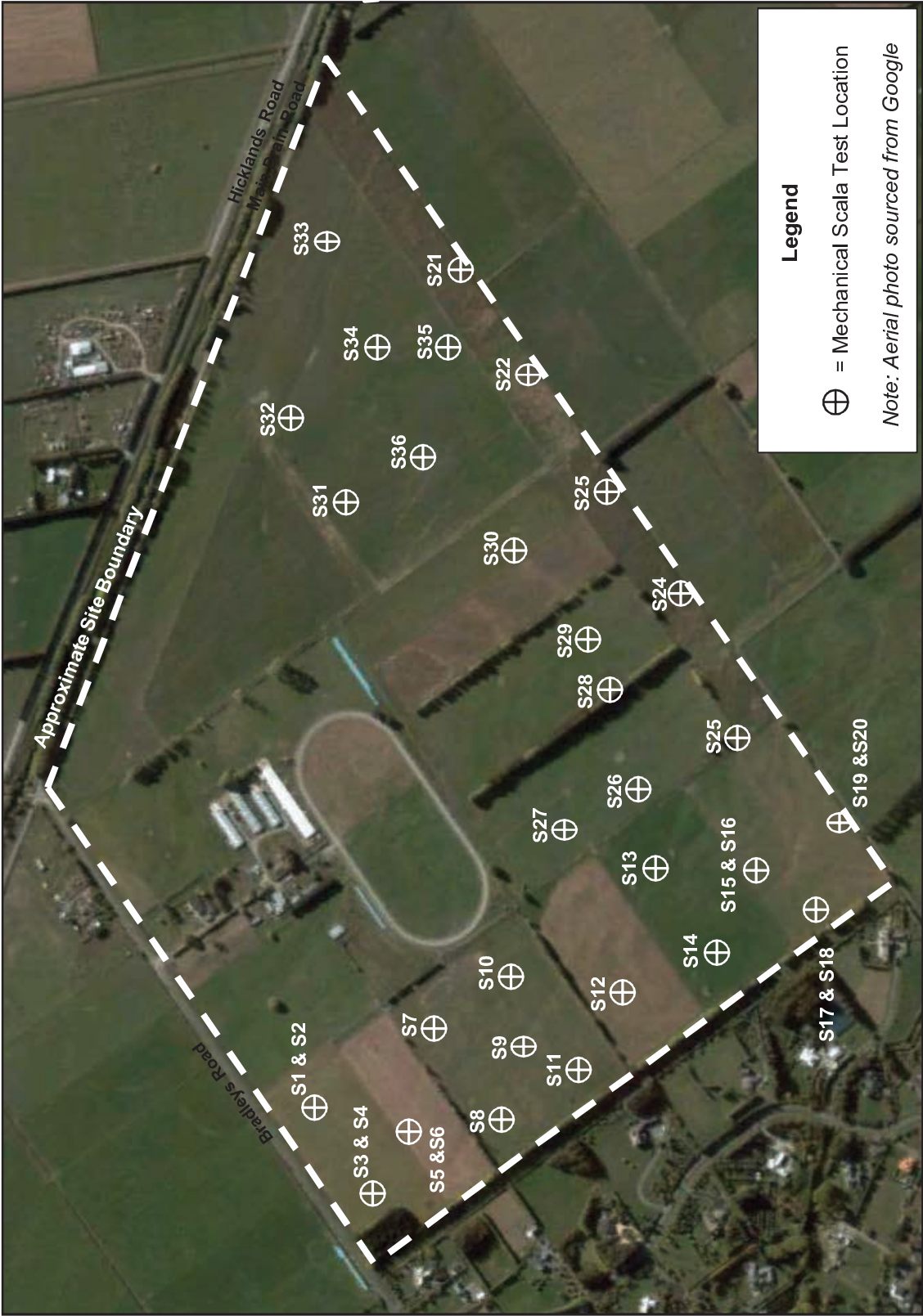




Note: Aerial photo and Map sourced from Google



Date	March-12	Client	Survus Consultants Limited		
Drawn by	CM	Project	474 Bradleys Road, Ohoka		
Approved by	MW	Description	Site Location Plan		
Scale	NTS	Figure Number	1	Project Number	12034_2



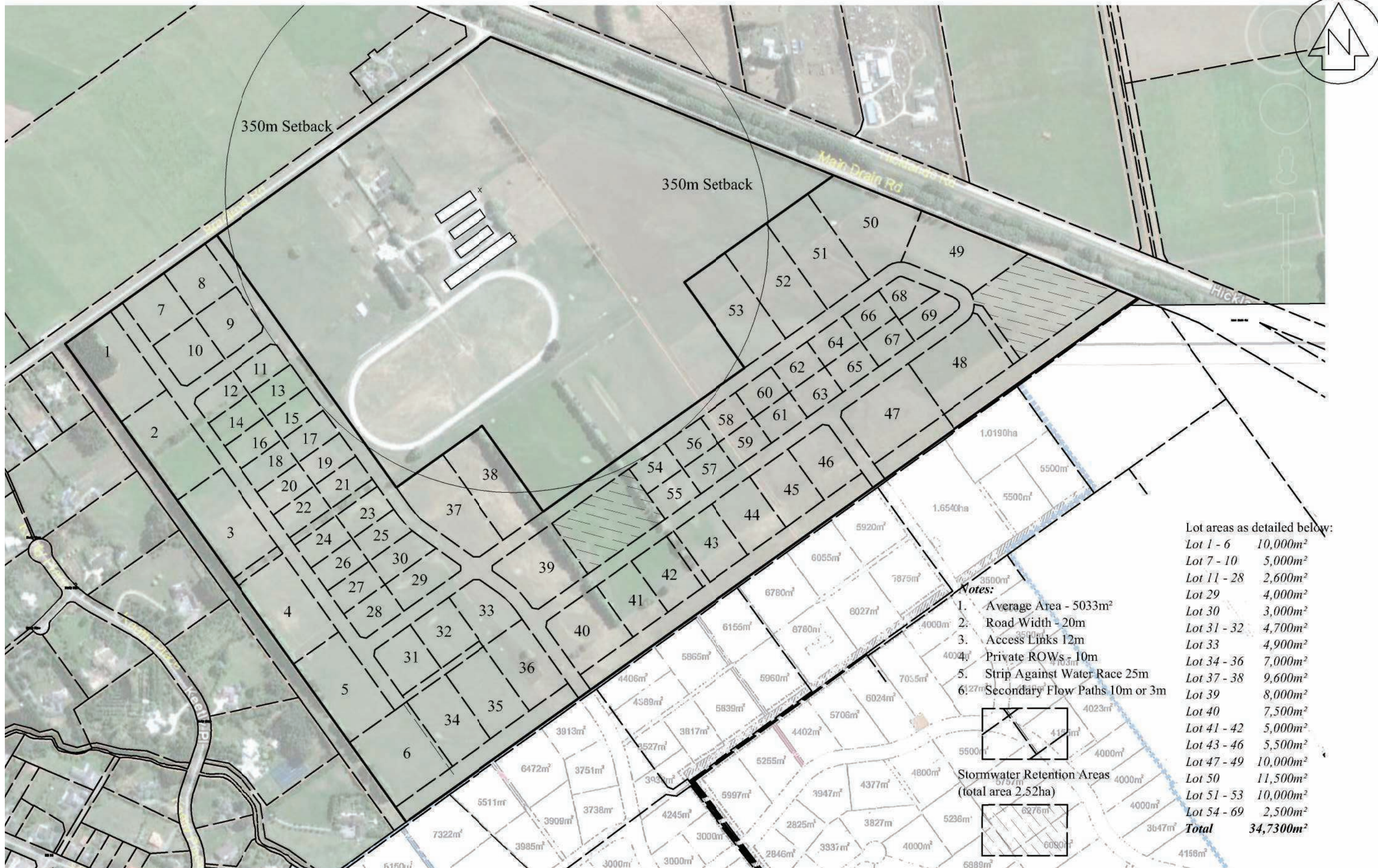
Date	March-12	Client	Survus Consultants Limited		
Drawn by	CM	Project	474 Bradleys Road, Ohoka		
Approved by	MW	Description	AutoScala Test Locations		
Scale	NTS	Figure Number	2	Project Number	12034_2



## APPENDIX 1

### Proposed Outline Development Plan







## **APPENDIX 2**

### Site Photographs