



18 December 2021

BGL Reference: 2067/02

(Name removed)

Email: [\(removed\)](#)

Dear Wilhelm

Re: **Geotechnical Report – 1 Kaioruru Lane, Charteris Bay – Lot 11, Black Rock Development**

### 1. Introduction

Further to your request Bell Geoconsulting Limited (BGL) is pleased to provide a geotechnical summary report regarding planned dwelling construction on what was formerly Lot 11, Black Rock Development, with a street address of 1 Kaioruru Lane. BGL provided geotechnical services to the subdivision on behalf of Opus International Consultants Ltd (now WSP), and certified the 50-lot development by way of BGL Report 1129/43 dated 20 April 2009. A series of geotechnical reports were subsequently provided during and following the 2010-2011 Canterbury Earthquake Sequence, including walkover inspections of infrastructure damage and earthworks performance. BGL has reported on foundation requirements for individual sections at Black Rock, including five others in Kaioruru Lane.

### 2. Site Description

Lot 11 is located at the intersection of Kaioruru Lane and Black Rock Road, the latter being the principal access to the development. An approximately 3m high stacked basalt wall is located on the southern part of Lot 11, and it was constructed by the contractor as part of the subdivision development: it was not damaged by earthquake shaking in any of the four main events. The engineered rock wall faces weak to moderately weak volcanic conglomerate, which forms part of the Hays Bay Volcanogenic Sequence and underlies the Stoddart Basalt dated between 7.0 and 5.8 million years before present (Hampton et al, 2012). Late Pleistocene airfall loess (yellow-brown clayey silt) discontinuously caps the Black Point peninsula, and is exposed on Lot 11 to a depth of ~1-2m (Appendix A). The site has been engineered as part of the Black Rock Development, and minor compacted loess fill has been placed on the eastern margin of the constructed building platform. BGL has been provided with a plan showing the proposed dwelling location and its setback distances from the various lot boundaries (Appendix A).

### 3. Geotechnical Investigations

Two hand augers and five Scala penetrometer (DCP) profiles have been completed within the planned dwelling footprint (Appendix A). The two hand augers (HA01 and HA02) terminated at depths of 0.7 and 0.8m below ground level (bgl), most probably due to proximity to the underlying volcanic conglomerate. The presence of angular basalt fragments to 30mm in size reflects engineered construction on the site during subdivision, and the 150-200mm of organic-rich topsoil was placed for erosion protection.

The Scala penetrometer (dynamic cone penetrometer or DCP) profiles show bearing increasing to effective refusal (20 blows/100mm) at depths between 0.5 and 1.0m bgl (Appendix A). DCP01 and DCP02 show a zone of low bearing between 0.8 and 0.9m bgl, before increasing rapidly in DCP02: this is interpreted as reflecting proximity to underlying weak bedrock at the two locations, but it is not evident in DCP03, DCP04 or DCP05. Ground bearing is considered satisfactory for a conventional gravel 'raft' foundation after stripping at least 200mm (including topsoil), and its replacement by AP65 or AP40.

#### 4. Building Act 2004 s71 Evaluation

Christchurch City Council has an obligation to ensure that none of the geotechnical hazards identified in s71 of the Building Act 2004 are present on site, or if so that these have been adequately remediated. Specific comments are as follows:

Erosion: Loess soils may be subject to erosion from water or wind, and maintenance of vegetation cover is the normal protection measure adopted. Lime stabilisation can be used for service trench backfilling or as part of the dwelling foundations (eg using 4% hydrated lime-stabilised SAP 20 beneath the slab).

Falling Debris: Lot 11 is remote (ie approximately 30m) from the steep face to the north-west, and is not subject to falling debris. No rockfalls affecting Kaioruru Lane occurred during 2010-2011 earthquakes.

Subsidence: Canterbury loess soils are not subject to liquefaction-induced subsidence, and no issues are anticipated with the engineered surface formed on Lot 11 subject to normal engineering prudence.

Slippage: There is no evidence for slippage on the well-vegetated slopes formed during subdivision, and none is anticipated with engineered construction of foundations. The low-bearing layer in DCP01 and DCP02 is localized and the overlying loess has satisfactory bearing (>300kPa ultimate). There is no evidence for instability associated with the rock facing wall on the lower (southern) part of Lot 11.

Inundation: The lot is not subject to inundation by overland flow given the stormwater control measures that were undertaken during subdivision development.

BGL is satisfied that the positioning selected for the new dwelling is appropriate, with adequate setback from steeper parts of the section. Final foundation plans for the proposed house have not been sighted, but if cut to fill is adopted then earthworks will require engineering design and certification.

#### 5. Foundation Issues

The proposed building site slopes gently to the south-east, and is at least 4m from the rock facing wall. For a concrete slab footing cut to fill is appropriate after removal of topsoil, and subject to NDM testing of the placed engineered fill (eg AP65 or AP40). Pile foundations on the south-eastern side of the building platform are also an option, and DCP03, 04 and 05 show bearing of at least 8 blows/100mm ( $\geq 400$ kPa ultimate) below 0.6m bgl. It is recommended that piles are taken to at least 1.0m bgl if used: an engineered block wall on the downhill (southern and eastern) sides of the building footprint will require confirmation of bearing at the time of construction. PS4 certification of all earthworks will be required for foundations once final design is completed and construction carried out.

#### 6. Conclusions

- Lot 11 at Black Rock Development (street address 1 Kaioruru Lane) was engineered in accordance the required standards of the time, and the completion report (BGL Report 1129/43) records that the lot foundations comprised “*in situ loess and conglomerate*”. It was also noted that the lot was used for “*fill storage*” during subdivision construction.
- Two hand augers have been taken to 0.6-0.7m below ground level, and five DCPs show bearing in excess of 300kPa using the conversion of Stockwell (1977). Ground bearing  $\geq 8$  blows/100mm is recorded at a depth of 600mm bgl, although two Scala penetrometer profiles (DCP01 and DCP02) showed locally lower bearing between 800 and 900mm bgl. This is not geotechnically significant.

- The lot is suited to either cut/fill platform formation after topsoil removal, or to piling/block wall support on the downhill (south-eastern) side. The ~3m high stacked rock wall was constructed for facing of the cut volcanic conglomerate bedrock, which was exposed on the southern part of Lot 11. Any slab foundation is to be engineered, and lime-stabilisation (eg SAP20) may be appropriate.
- Lot 11 is not subject to erosion, falling debris, subsidence, slippage or inundation in terms of s71 of the Building Act 2004. All earthworks are to meet current Christchurch City Council standards, and PS4 certification by a geotechnical specialist will be required. Any cut or fill surfaces are to be inspected, and NDM testing undertaken where necessary. There are no concerns with the site.

## 7. References

BELL GEOCONSULTING LIMITED (2009) Black Rock Estate – Subdivision Works Completion BGL Report 1129/43 to Opus International Consultants Ltd dated 20 April 2009: 14p

HAMPTON, S J; COLE, J W; BELL, D H (2012) Syn-eruptive alluvial and fluvial volcanogenic systems within an eroding Miocene volcanic complex, Lyttelton Volcano, Banks Peninsula, New Zealand New Zealand Journal of Geology and Geophysics: 14p

STOCKWELL, M J (1977) Determination of allowable bearing pressure under small structures New Zealand Engineering 32(6): 132-135

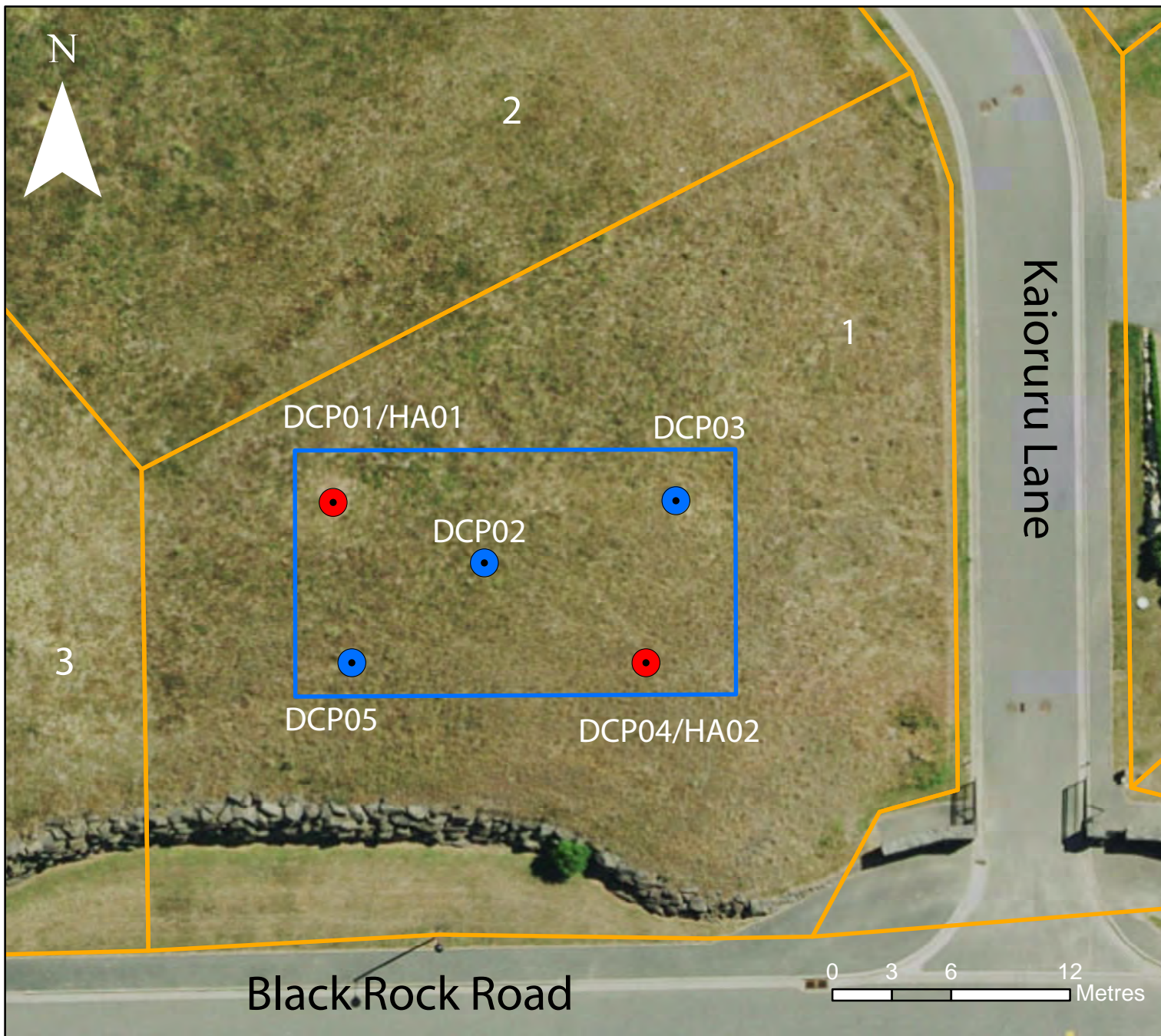
We trust that this report is sufficient for building consent purposes, and if further clarification or comment is required please contact the undersigned at [davidbell@bgconsult.co.nz](mailto:davidbell@bgconsult.co.nz) or on (027) 249 3896.

Yours sincerely



**David H Bell, PEngGeol**  
CMEngNZ Registration No 113121

**Appendix A: Shallow Geotechnical Investigation Data – 1 Kaioruru Lane**



## Legend

- Dynamic Core Penetrometer (DCP)
- Paired DCP and Handauger (DCP/HA)
- Property Outline
- 1 Kaioruru Lane Dwelling



Bell Geoconsulting Ltd  
PO Box 31-031  
Ilam, CHRISTCHURCH

### Appendix A

Site Plan of 1 Kaioruru Lane, Charteris Bay,  
showing property boundaries along with DCP and HA

Date :	<b>December 2021</b>
Drafted :	<b>K Rozmus</b>
Approved :	<b>D Bell</b>
Reference:	<b>BGL 2067</b>



# INVESTIGATION LOG

No.: DCP01 + DCP02 + DCP03

Job No.: BGL 2067

Sheet: 1 of 2

**Client:**  
Wilhelm Bisschoff

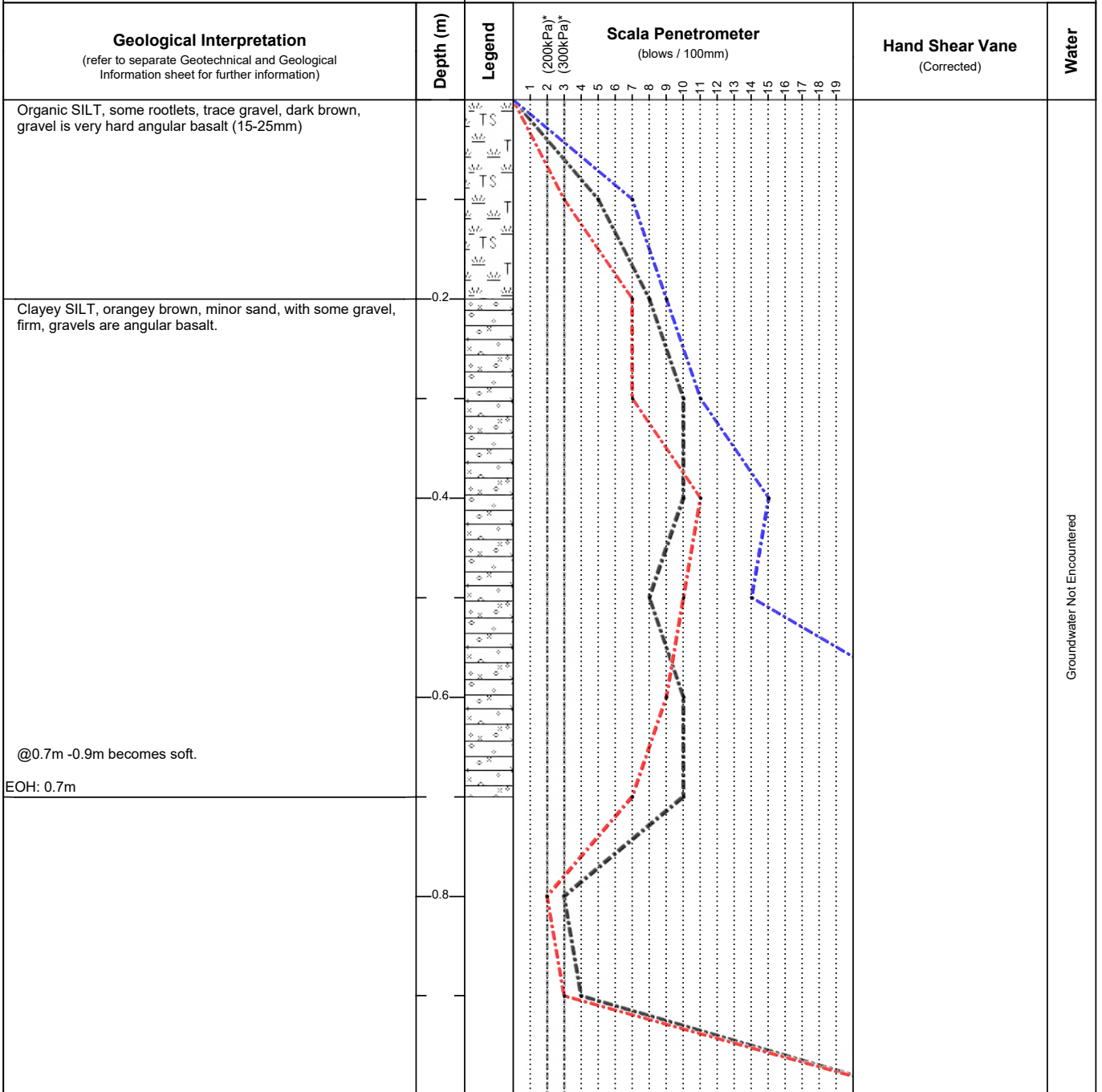
**Coordinates:**

**Ground Level:**

**Date:**  
14/12/2021

**Project:**  
BGL 2067 1 Kaioruru Lane

**Location:**  
1 Kaioruru Lane, Charteris Bay



Legend	Remarks
<ul style="list-style-type: none"> <li>--- DCP01</li> <li>-.- DCP02</li> <li>-.- DCP03</li> </ul>	
<p><b>Water</b></p> <ul style="list-style-type: none"> <li>▼ Standing Water Level</li> <li>↖ Out flow</li> <li>↗ In flow</li> </ul>	<p><b>Investigation Type</b></p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Hand Auger</li> <li><input type="checkbox"/> Test Pit</li> </ul>

**Contractor:**

**Rig/Plant Used:**

**Logged By:**  
K Rozmus

**Checked By:**  
D Bell

**Hole Depth:**  
0.7 m



# INVESTIGATION LOG

No.: DCP04 + DCP05

Job No.: BGL 2067

Sheet: 2 of 2

**Client:**

William

**Coordinates:**

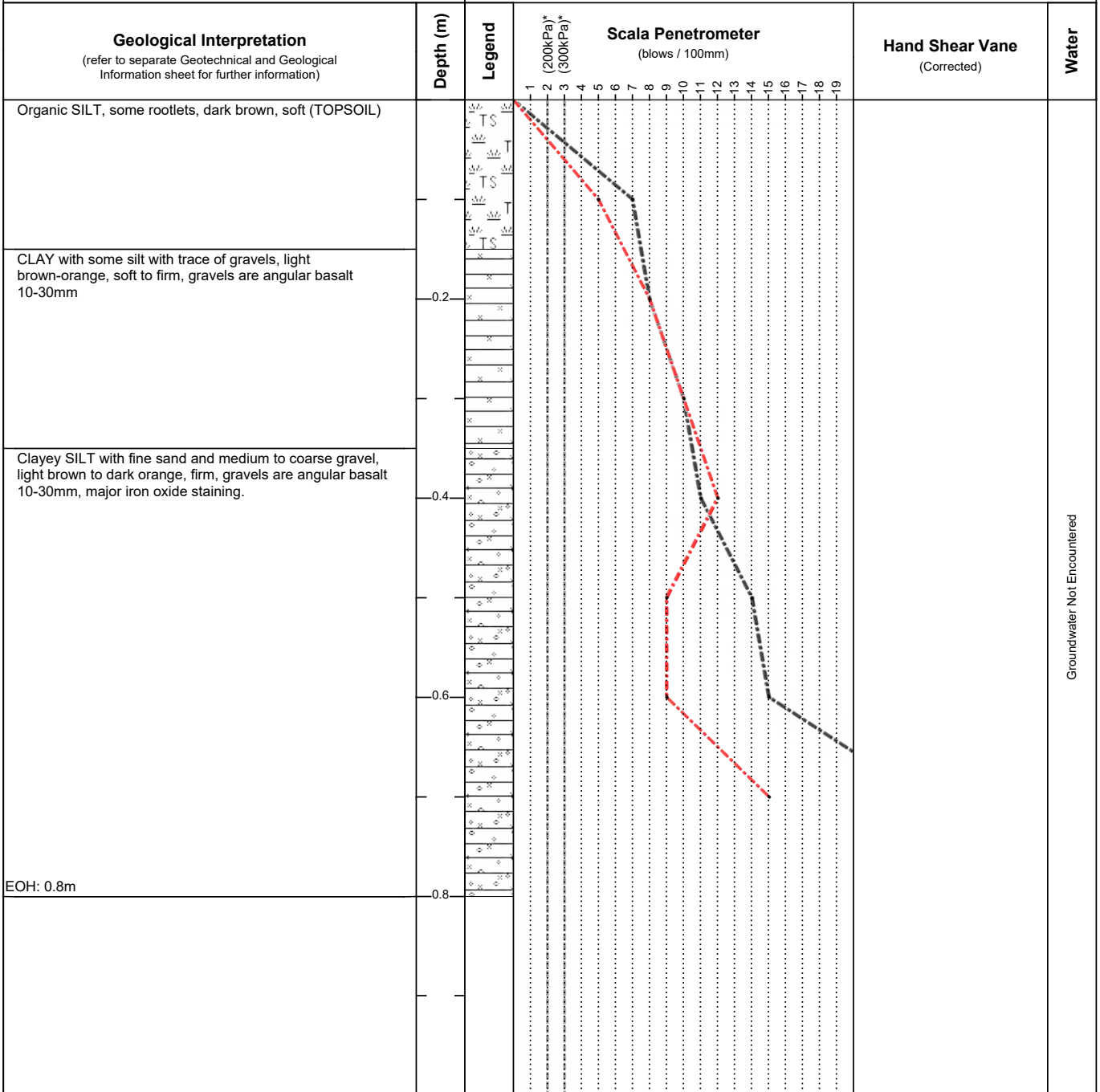
**Ground Level:**

**Date:**  
14/12/2021

**Project:**

1 Kaioruru Lane

**Location:**



Groundwater Not Encountered



Legend	Remarks
<p>--- DCP04</p> <p>- - - DCP05</p>	
<p><b>Water</b></p> <p>▼ Standing Water Level</p> <p>↖ Out flow</p> <p>↗ In flow</p>	<p><b>Investigation Type</b></p> <p><input checked="" type="checkbox"/> Hand Auger</p> <p><input type="checkbox"/> Test Pit</p>

**Contractor:**

**Rig/Plant Used:**

**Logged By:**  
K Rozmus

**Checked By:**  
D Bell

**Hole Depth:**  
0.8 m