

Date: 30 August 2023
Project No: LTC21220-A
Revision: B



Ngai Tahu Property
115 Eureka Street, Aranui
Attention: Simon Tucker

LandTech Consulting Ltd
Email: info@landtech.nz
Postal: PO Box 119, Christchurch 8013
Auckland Office: 09 930 9334
15C Paramount Drive, Henderson
Christchurch Office: 03 390 1371
11B Carlyle Street, Sydenham

**RE: SHALLOW SOIL TEST REPORT
FUTURE RESIDENTIAL FOUNDATIONS
LOT 20, 115 EUREKA STREET, ARANUI**

www.landtech.nz

1.0 Introduction & Background

LandTech Consulting Ltd (LandTech) were engaged by Ngai Tahu Property to carry out lot specific shallow soil testing at Lot 20, 115 Eureka Street, Aranui (the site). The purpose of the shallow soil testing is to confirm subsurface conditions and provide geotechnical recommendations with regards to future residential foundations within the site.

We previously investigated the underlying larger property, which this lot has been formed from, to support the corresponding Resource Consent for the subdivision. Our findings are presented in a report titled: *Geotechnical Investigation Report for Proposed Residential Subdivision 115 Eureka Street, Aranui*, project reference: LTC21220, Revision B, dated 13 September 2021.

LandTech has been retained to monitor earthworks and ground remediation for the subdivision site. As earthworks are ongoing across the wider subdivision site at the time of preparing this letter, we have yet to prepare an Earthworks Completion Report for the subdivision. However, earthworks were completed at this particular lot prior to our current shallow soil testing and had been carried out to the appropriate engineering standards. Therefore, this report is considered relevant for the current ground conditions beneath the lot and appropriate to support future dwelling foundation design. Should additional earthworks take place within the Lot following the date of our investigation, then the results of this shallow soil report may need to be reassessed.

2.0 Shallow Soil Testing

LandTech investigated the site on 27 April 2023, conducting two hand augers with corresponding Scala Penetrometer tests (SPs) and two additional SPs. The locations of the hand auger and SPs were measured using inferred lot boundaries and are approximate only. The test locations are shown on our LandTech *Test Location Plan*, Drawing No. Lot 20/ TLP, attached to this report.

Soil types and conditions within the hand augers were logged by LandTech technical staff in accordance with New Zealand Geotechnical Society *Guideline for the Description of Soil and Rock for Engineering Purposes* (2005). The hand auger logs for each hole are attached.

Our SP testing was carried out in accordance with NZS 4402:1988, Test 6.5.2, *Dynamic Cone Penetrometer*. The SP results are also attached.

Topsoil was encountered within the hand augers from the ground surface to between 0.3m and 0.4m depths, which was typically a dark brown minor to some silt and sand material with trace gravel. Engineered fill was encountered below the topsoil to the base of auger holes, which was a compacted brown sand with trace of silt material. The hand augers were terminated at 1.2m depth below ground level to avoid damage to the geotextile layer which was installed at 1.5m depth below ground level. Groundwater was not encountered during testing.

As part of the subdivision earthworks, ground improvement consisting of a reinforced raft is being constructed across the site, which we observed the subgrade excavations for and monitored construction. The reinforced engineered fill raft comprises 250mm compacted sand layers, with a total thickness of 1200mm, capped with 300mm of topsoil. A layer of geotextile (AS410) was installed at the base of the engineered fill raft and three geogrid layers (Duragrid 40/40) were installed within it for reinforcement (at the base, 250mm, and 750mm).

SPs at each of the four locations returned results between 3 and 10 blows per 100mm penetration below the topsoil and within the engineered fill layer. SPs were terminated at 0.9m depth to confirm near surface bearing capacities, and to avoid damage to the geogrids and geotextile. In addition, the density of the engineered fill and bearing capacity of its underlying subgrade have been confirmed via extensive geotechnical inspection and fill compaction testing during subdivision earthworks.

3.0 Foundation Recommendations

From our previous investigation in support of the subdivision, we concluded that TC2 foundations in accordance with MBIE Guidelines (December 2012) may be used at this site following subdivision earthworks and ground remediation (reinforced engineered fill raft). Our current lot-specific shallow soil testing confirms such foundations remain appropriate. In particular, we confirm Option 4 enhanced slab foundations are required.

All foundations must be embedded to a minimum depth of 0.4m below ground level, where an Ultimate Bearing Capacity of 200kPa and a strength reduction factor of (ϕ_s) 0.5 is available. Foundations excavations should expose engineered fill of appropriate bearing capacity. All topsoil and unsuitable materials should be removed below foundations and floor slab areas, and where required layers of compacted hardfill should be placed to the underside of foundations.

The ground improvement could not extend all the way up to the southwestern boundary of the lot on account of temporary batters of approximately 1V :1H being formed down from the boundaries during construction to allow for the formation of the engineered fill raft. Therefore, a no-build setback to the greater of 2.0m, the depth of ground remediation, or the sum of the permanent cut face (existing ground level to finished ground level) plus the depth of ground remediation along these boundaries, shall be created along the corresponding boundaries. With reference to the Davie Lovell-Smith As-Built Earthworks Plans completed for the subdivision, the maximum depth of ground remediation was 1.4m, while the maximum permanent cut face is 0.4m high along some of the boundaries. Therefore, the 2.0m no-build setback governs along these boundaries to external neighbouring properties.

4.0 Limitations

This shallow soil testing report has been prepared for our client, Ngai Tahu Property, to support foundation design and corresponding Building Consent applications for future housing within the corresponding lot. This report shall not be extrapolated for other nearby sites or used for any other purposes without the express approval of LandTech and our client.

The findings of this report are based on the results of testing conducted at point locations and within the agreed scope of works. Therefore, while we have attempted to conduct a thorough investigation of soils across the site, local subsurface conditions could vary from those used in our geotechnical model, as soils can vary naturally and due to previous human activities. LandTech has no control over and should not be held accountable for these variations. Should exposed soil conditions vary from those described herein, we request to be informed so that we may assess the continued applicability of our recommendations.

Our geotechnical investigation described in this report was confined to geotechnical aspects of the site only and did not involve an assessment for environmental contaminants. Our investigation and analyses have not taken into account possible fault rupture that may cause deformations and displacements of the ground directly below the site. These assessments are outside the scope of our geotechnical engagement.

If you have any queries regarding this report, please contact the undersigned at your convenience.

Yours faithfully,

LandTech Consulting Limited

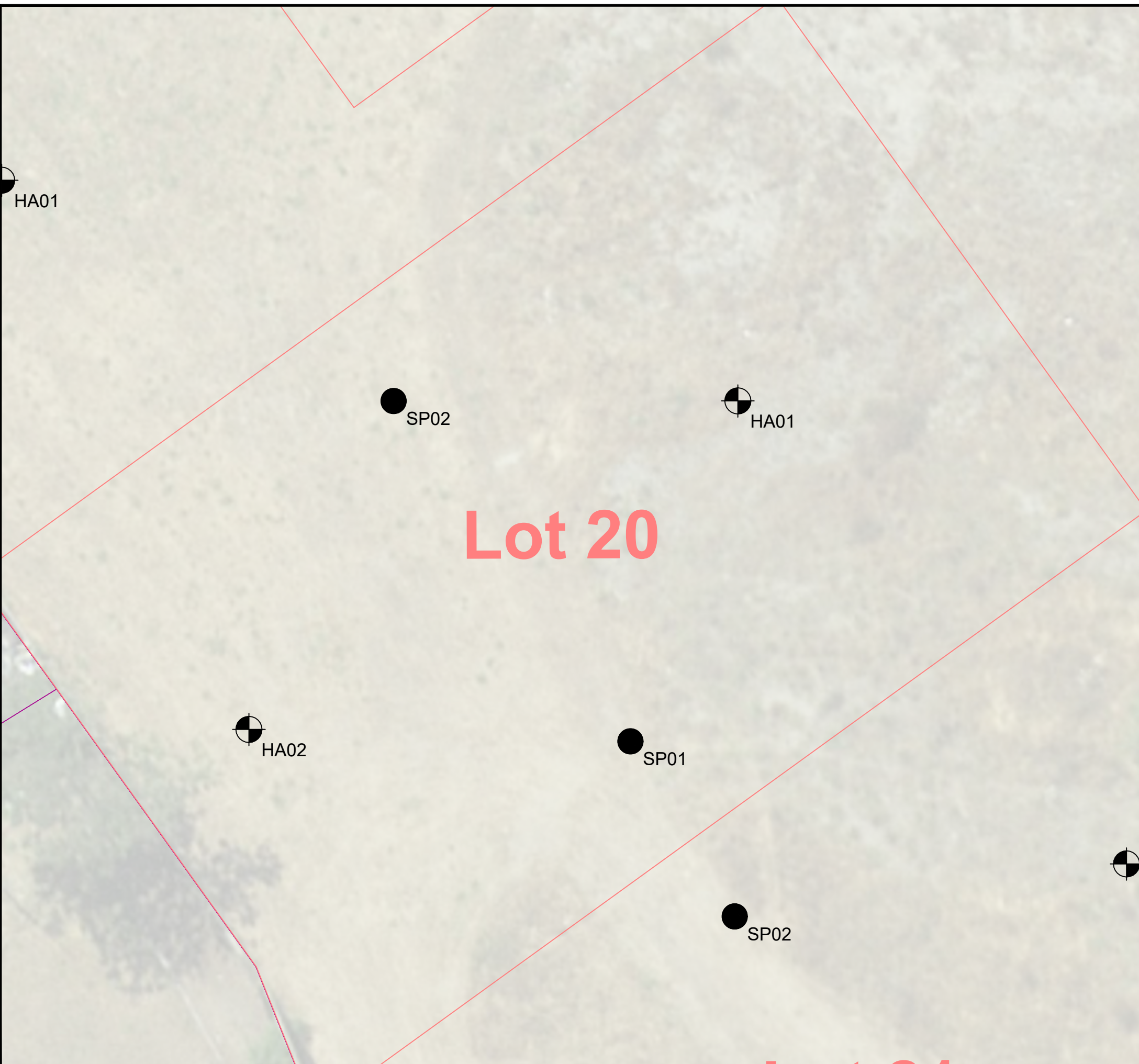


Prepared By: Remus Marchis – Engineering Geologist
BSc (geology), PMEG



Authorised By: Dwayne Wilson - Director
CMEngNZ, CPEng, IntPE(NZ)

Attachments: Test Location Plan
Test Results



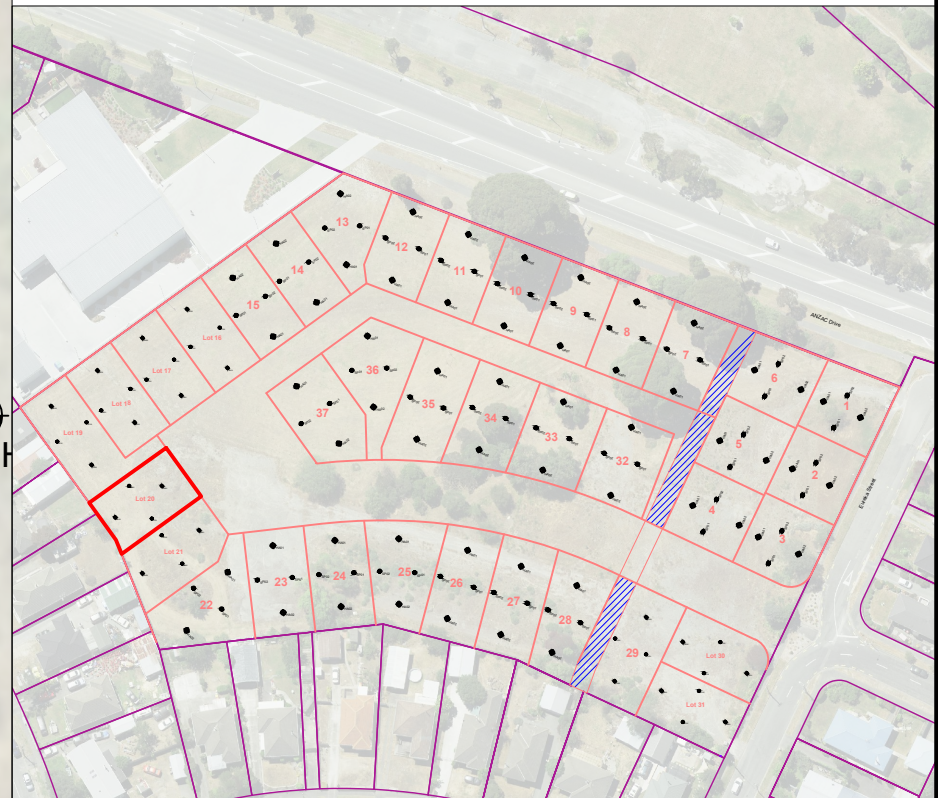
KEY:

-  HA01 LandTech Consulting Ltd. augerhole locations, drilled 27 April 2023
-  SP01 LandTech Consulting Ltd. DCP test location, tested 27 April 2023
-  Proposed boundary
-  Existing boundary



NOTES:

Locations of features approximate only
 Original sheet size A3
 Boundary information on this *Test Location Plan* adapted from LINZ website: www.data.linz.govt.nz (accessed 23 March 2023)
 Location of proposed lot boundaries adapted from Davie Lovell-Smith drawing titled: Proposed Subdivision, dated May 2021



| AMENDMENTS | | |
|------------|-----|-------------------|
| DATE | REV | DESCRIPTION |
| 27/04/2023 | A | Issued for report |
| 30/08/2023 | B | Drawing amendment |
| | | |
| | | |

Check all dimensions and levels on site before commencing construction.
 This drawing and design remains the property of LandTech Consulting Ltd. and may not be reproduced without approval and permission from LandTech Consulting Ltd.

Test Location Plan
 Lot 20, 115 Eureka Street,
 ARANUI, CHRISTCHURCH



Christchurch Office:
 118 Carlyle Street, Sydenham, Christchurch 8023
 Auckland Office:
 15C Paramount Drive, Henderson, Auckland 0610
 Postal Address:
 PO Box 119, Christchurch 8013
 Website: www.landtech.nz Email: info@landtech.nz

| | | |
|---------------------------------------|--------------------------------|--------------------------------|
| Drawing No: Lot 20/TLP | Drawn by: RM | Date: 30 August 2023 |
| Scale: 1: 100 (A3) 1: 2000 (A3) | Checked by: D Wilson | Revision: B |
| Filename: LTC21220 - A - Drawings.dwg | | |

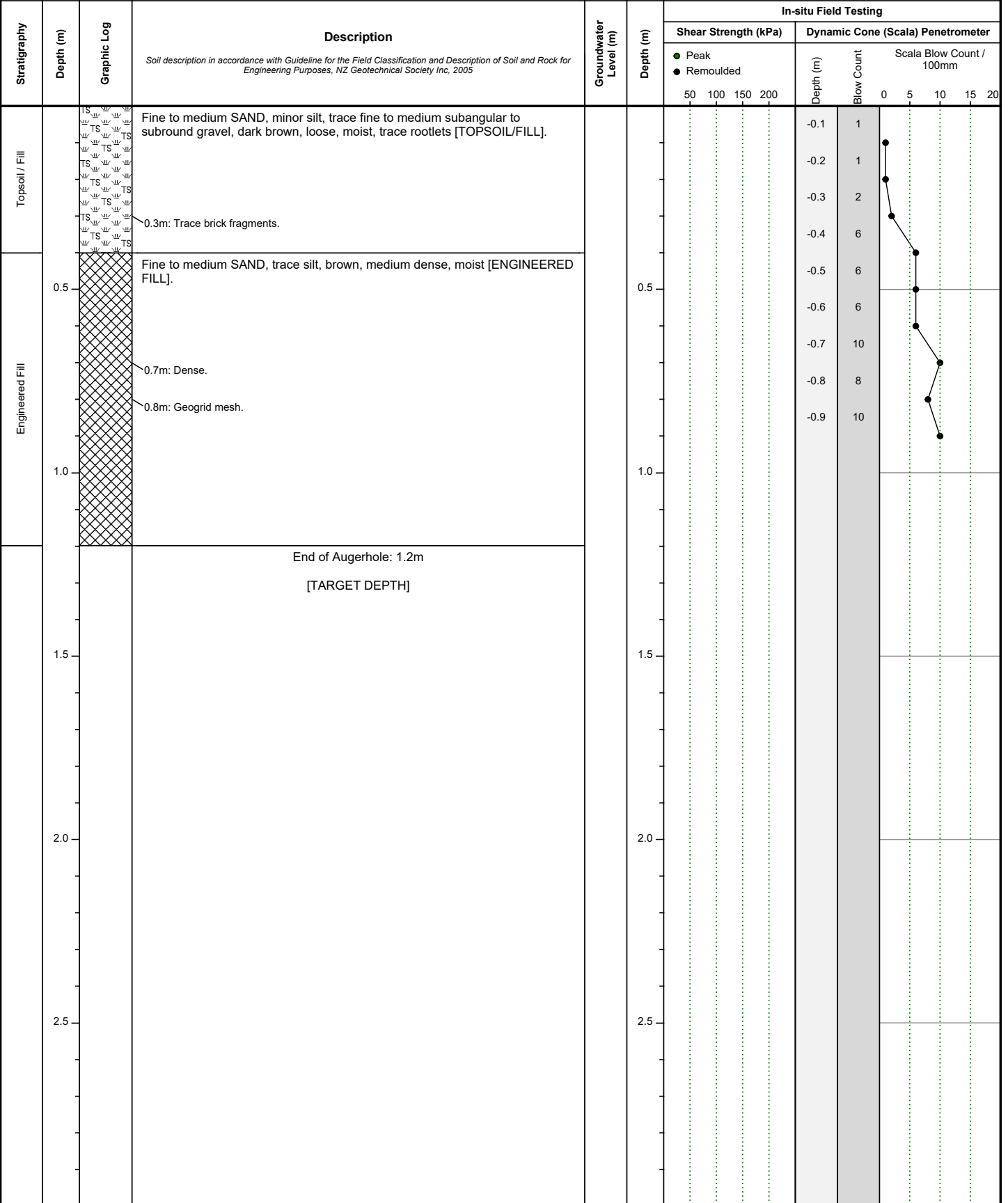


Client: Ngai Tahu Property
 Project: Lot Specific Testing
 Address: 115 Eureka Street, Aranui, Christchurch

Augerhole No.: LOT 20 - HA01

Sheet No.: 1 of 1

Project No.: LTC21220-A Coordinates: NZTM2000: E1576276.53, N5182988.68 Logged By: SS
 Drill Type: 50mm Hand Auger Reduced Level: 3.50m (LVD1937) Shear Vane No.:
 Date Started: 27-Apr-23 Ground Conditions: Near Level, Topsoil & Grass Calibration Factor:
 Date Finished: 27-Apr-23 Groundwater Level (m): Not Encountered Calibration Date:



Target depth achieved.

In-situ testing in accordance with the following standards:
 Scala Penetrometer Testing: NZS 4402:1988, Test 6.5.2, Dynamic Cone Penetrometer
 Shear Vane Testing: Guideline for Hand Held Shear Vane Test, NZGS, August 2001

Generated with CORE-GS by Geroc - LandTech - Hand Auger / Test Pit - 27/04/2023 2:30:53 pm

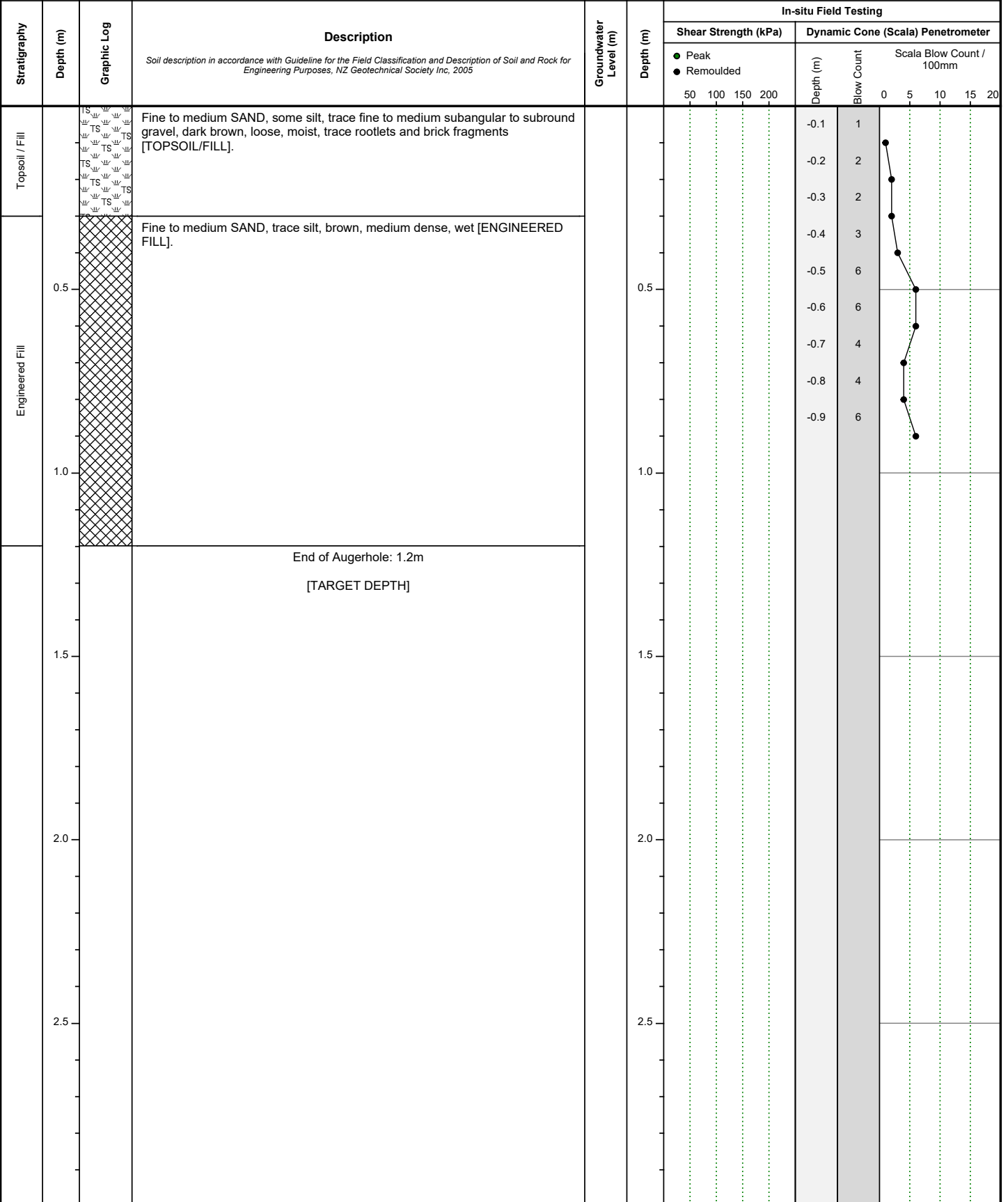


Client: Ngai Tahu Property
 Project: Lot Specific Testing
 Address: 115 Eureka Street, Aranui, Christchurch

Augerhole No.: LOT 20 - HA02

Sheet No.: 1 of 1

Project No.: LTC21220-A Coordinates: NZTM2000: E1576264.17, N5182980.38 Logged By: KP
 Drill Type: 50mm Hand Auger Reduced Level: 3.50m (LVD1937) Shear Vane No.:
 Date Started: 27-Apr-23 Ground Conditions: Near Level, Topsoil & Grass Calibration Factor:
 Date Finished: 27-Apr-23 Groundwater Level (m): Not Encountered Calibration Date:



Target depth achieved.

In-situ testing in accordance with the following standards:
 Scala Penetrometer Testing: NZS 4402:1988, Test 6.5.2, Dynamic Cone Penetrometer
 Shear Vane Testing: Guideline for Hand Held Shear Vane Test, NZGS, August 2001



Client: Ngai Tahu Property
 Project: Lot Specific Testing
 Address: 115 Eureka Street, Aranui, Christchurch

LOT 20 - SP01

LOT 20 - SP02

Tested By: SS
 Ground Conditions: Near Level, Topsoil & Grass
 Coordinates: NZTM2000 E 1576273.81
 N 5182980.07
 Test Date: 27-Apr-23

Tested By: KP
 Ground Conditions: Near Level, Topsoil & Grass
 Coordinates: NZTM2000 E 1576267.83
 N 5182988.67
 Test Date: 27-Apr-23

Tested By:
 Ground Conditions:
 Coordinates:
 Test Date:

