ENGEO

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Geotechnical Investigation

Farringdon East Subdivision

514, 1/524, 2/524 and 550 Springston Rolleston Road

Springston

Christchurch

Submitted to:

Hughes Development Ltd

Canterbury

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ACENZ

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ENGEO Document Control:

Report Title	Geotechnical Investigation - Farringdon East Subdivision, 514, 1/524, 2/524 and 550 Springston Rolleston Road			
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1 Introduction

ENGEO Ltd was requested by Hughes Development Ltd to undertake a geotechnical investigation for the proposed Farringdon East Expanded Block subdivision, located at 514, 1/524, 2/524 and 550 Springston Rolleston Road, as outlined in our variation proposal (ref. P2016.000.248, dated 31 May 2017).

The purpose of this investigation was to determine a geological model of the site; assess the likely future land performance; comment on the suitability of the site for residential subdivision; address the requirements of Section 106 of the Resource Management Act (RMA); and provide recommendations for subdivision works and foundations for typical timber framed residential dwellings.

Our scope of works included the following:

- Complete a desktop study of relevant available geotechnical and geological publications, including the NZ Geotechnical and Environment Canterbury Databases.
- Undertake a geotechnical site walkover.
- Undertake five hand auger boreholes with associated Scala penetrometer tests to assess the near surface material types and strength characteristics.
- Organise and technically supervise the excavation of six test pits, including geotechnical logging of the exposed soils.
- Preparation of this report outlining our findings on the ground conditions and the suitability of the site for residential subdivision. This will include geotechnical advice on the likely foundation Technical Category, conceptual foundation recommendations for typical timber framed residential dwellings, and address likely geohazards as required by Section 106 of the RMA.

2 Site Description

The site covers a total area of 17.9 ha, and has the following legal descriptions (Selwyn District Council):

514 Springston Rolleston Road - Lot 1 DP 60199

1/524 Springston Rolleston Road - Lot 1 DP 367123

2/524 Springston Rolleston Road - Lot 1 DP 64812

550 Springston Rolleston Road - Lot 20 DP 65499

It is located approximately 2.5 km south of Rolleston town centre, and is bound to the south-west by Springston Rolleston Road and rural properties on the remaining sides (Figure 1).

Figure 1: Site Location

Aerial photograph sourced from Google Maps (retrieved June 2017). Not to scale.

The predominantly flat site is currently developed as residential lifestyle blocks, with associated agricultural land. Four dwellings are present on the site, with various associated garages and sheds.

Standing water was observed in irrigation trenches extending around the northern end of the site. The trenches are approximately 1 m wide and have water 0.1 m to 0.3 m deep. A small wetland / pond area is present on the northern side of the site. Due to the adjacent marshy ground it was difficult to determine the depth of this water, however it is interpreted to be shallow. These features are indicated on Figure 1. There are no significant watercourses in the area and the site is outside of the ECan defined flood zones as indicated on the Selwyn District Council (SDC) Operative District Plan (SDC, 2015).

The Canterbury Earthquake Recovery Authority (CERA, now disestablished) has categorised the site as 'N/A Rural & Unmapped', meaning future development can proceed following normal consenting processes.

3 Geological Model

3.1 Regional Geology

The site has been regionally mapped by GNS (Forsyth et al., 2008) as being underlain by grey river alluvium.

3.2 Geomorphology

The site comprises relatively flat ground, with gentle undulations and depressions in some areas. As evident on aerial imagery (Canterbury Maps, 2016) and observed during our site walkover conducted on 21 December 2016 and 12 June 2017, undulating and depressed ground can be attributed to paleo-channels, which traverse the site in a general northwest to southeast trend. Based on observations, silt and sand deposits with variable thickness (up to 1.2 m) are expected to have in-filled the paleo-channels where they have not remained as channel features. Inferred paleo-channels have been mapped to give an indication of areas with potential channel in-fill (Appendix 1).

3.3 Geohazards

3.3.1 Seismicity

There are no known or mapped faults in the immediate area of the site, however the site may be at risk of ground shaking induced by movement of proximal or distal faults.

The site is located between two recently discovered fault systems, the Greendale Fault and the Port Hills Fault, the ruptures of which initiated the ongoing Canterbury Earthquake Sequence (CES). The Greendale Fault has been mapped approximately 5 km northwest / west of the site and trends roughly east-west with a surface rupture of approximately 28 km (GNS, 2015), while the Port Hills Fault remains unmapped as the fault did not rupture at the surface. Movement on the Port Hills Fault is believed to have occurred at a depth of 1 km to 2 km below ground surface.

Large regional areas of faulting (GNS, 2015) namely the Ashley Fault, Porters Pass-Amberley Fault Zone, and the Hope and Alpine Faults, are further afield but present a high seismic hazard 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 250-300 years and is expected to produce a M8 earthquake. The last rupture on the Alpine Fault is believed to have occurred in 1717 (Pettinga et al., 2001).

3.3.2 Liquefaction and Lateral Spreading

The site is located within an area mapped as ‘damaging liquefaction unlikely’ (NZGD Map CGD5140, 2012).

3.4 Site Investigation

Site investigations to assess the shallow subsurface material types and strength characteristics were undertaken by ENGEO on 18 January, 19 January, 7 June and 12 June 2017. The investigations comprised 25 hand auger boreholes and 26 test pit investigations with associated Scala penetrometer tests.

The investigations revealed subsurface conditions across the site are consistent with the published geological mapping, as summarised in Table 1.

Table 1: Generalised Summary of Subsurface Conditions

Soil Type	Depth to Top of Layer (m)	Layer Thickness (m)	Density / Consistency	Comment
Topsoil	0.0	0.1 to 0.4	Variable: Very Soft to Hard	-
SILT and SAND	0.1 to 0.4	0.15 to 0.9	Very Soft to Soft / Firm to Hard	Not encountered in all test pits
Sandy GRAVEL and GRAVEL	0.1 to 1.2	Unknown	Medium Dense to Dense	-

Investigations undertaken within or adjacent to inferred paleo-channels revealed deeper silt deposits to depths up to 1.2 m.

“Good ground” (as defined in NZS 3604:2010) under static conditions was typically encountered below 0.3 m depth. Where softer silts were present within inferred paleo-channels, “good ground” was encountered consistently below 0.85 m depth.

Test locations are shown on the site plan presented in Appendix 1. Test pit and hand auger hole logs, showing detailed soil descriptions are presented in Appendices 2 and 3.

3.5 ECan Boreholes

A review of two deep ECan borehole logs located near the southern side of the site (M36/0204) and (M36/4654) was conducted (Canterbury Maps). The location of these boreholes is presented in Figure 2 and includes the well points on site that have no log data available. We have not considered the well logs from the adjacent properties. The logs from the two holes of interest are presented in Appendix 4 and indicate the site is underlain by a mixture of sandy gravels to depths of at least 46.2 m below ground level.

Figure 2: Nearby ECan Borehole Locations

Image sourced from Canterbury Maps (retrieved June 2017). Not to scale.

3.6 Groundwater

Groundwater is recorded in the surrounding boreholes between approximately 7 m and 13 m depth.

3.7 Site Seismic Class

In accordance with NZS 1170.5:2004, Class D applies to this particular site, defining it as a 'deep soft soil site'.

4 Liquefaction Assessment

Based on our site investigation and observations, and owing to the nature of the subsurface materials and depth to groundwater at the site, we consider the potential for liquefaction and lateral spreading on the site to be very low.

We therefore consider the site of the proposed subdivision to have Technical Category 1 (TC1) future land performance whereby future land damage from liquefaction is unlikely, and ground settlements are expected to be within normally accepted tolerances.

5 RMA Section 106 Requirements and Suitability to Subdivide

Section 106 of the Resource Management Act 1991 states a consent authority may refuse to grant a subdivision consent, or may grant a consent subject to specific consent conditions if the land is likely to be subject to the following:

- Erosion, including surface and subsurface erosion, associated with water and wind.
- Falling debris, including rockfall that could impact the site from upslope sources.
- Subsidence, which involves the removal of underlying support by natural or artificial means.
- Slippage, which is defined as the downslope transfer of materials by sliding and / or flowage.
- Inundation, which may be sourced from streams, coastal processes or excess precipitation.

Based on our observations and the nature of the site, its performance during the CES, and the site's distance from the nearest significant watercourse, we consider it is unlikely for the site to be subject to any of the above hazards and, as such, the site is considered suitable for subdivision from a geotechnical perspective.

6 Geotechnical Recommendations

6.1 Earthworks

Earthworks carried out for the subdivision shall be in accordance with NZS 4404:2010, Land Development and Subdivision Infrastructure and NZS 4431:1989, Code of Practice for Earthfilling for Residential Development. In particular, any areas to receive fill should be stripped of any vegetation, topsoil, non-engineered fill, soft or organic soils prior to fill placement.

Fill may comprise clean natural sandy gravel or silty soils, or clean imported soils and / or granular fill, compacted to achieve no less than 95% of maximum dry density. Fill faces steeper than 2:1 and higher than 600 mm should be retained and referred back to ENGEO. Although unlikely, where any springs or groundwater seeps are encountered they should be intercepted with suitable drainage and discharged to a Council approved outlet.

All unretained batters of pond and stormwater drains constructed with the native sandy gravel material should be at an inclination of 1V:3H, with protection schemes in place to control erosion of the formed batters within the waterways.

A comprehensive earthworks specification should be provided to the earthworks contractor prior to starting excavations and an inspection / testing regime agreed, along with a robust erosion and sediment control plan.

6.2 Subdivision Roading

Vegetation, any organic or deleterious material, topsoil and non-engineered fill should be removed from the site under pavement areas prior to aggregate placement. Based on our observations during testing, we consider the natural ground below the topsoil at the site should provide an adequate subgrade for the proposed pavement areas.

6.3 Stormwater Control

Concentrated stormwater flows from all impermeable areas must be collected and carried in sealed pipes to the Council system or an alternative disposal point subject to approval from Council. Uncontrolled stormwater must not be allowed to saturate the ground as this will potentially affect future foundation performance both statically and during future seismic activity.

6.4 Foundations

Foundations for future proposed residential dwellings within the subdivision may comprise pad, strip or slab foundations designed in accordance with the provisions of NZS 3604 Timber Framed Buildings.

Site specific testing will be required for Building Consent, to confirm the bearing materials and capacity. For preliminary design, we anticipate that a geotechnical Ultimate Bearing Capacity of 300 kPa may be assumed for foundations bearing on natural silt, sandy gravel or engineered fill, below any topsoil. We anticipate this to be typically below 0.3 m depth based on our subsurface investigations.

7 References

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Canterbury Maps, Groundwater. Retrieved January2017, from http://canterburymaps.govt.nz/Viewer.

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GNS Science (2015). New Zealand Active Faults Database. Retrieved January 2017, from http://data.gns.cri.nz /af.

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Selwyn District Council (2015), Selwyn District Council Operative District Plan. Retrieved 2016, from http://www.selwyn.govt.nz/services/planning/district-plan.

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Standards Association of New Zealand (2010). NZS 3604:2010. Timber Framed Buildings.

Standards Association of New Zealand (2010). NZS 4404:2010. Land Development and Subdivision Infrastructure.

The Ministry of Business, Innovation, and Employment (2016). New Zealand Geotechnical Database. Retrieved June 2017, from https://www.nzgd.org.nz.

8 Limitations

i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Hughes Development Ltd, 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. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.

iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.

iv. This Limitation should be read in conjunction with the IPENZ/ACENZ Standard Terms of Engagement.

v. This report is not to be reproduced either wholly or in part without our prior written permission.

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.

Report prepared by

Lauren Foote

Engineering Geologist

Report reviewed by

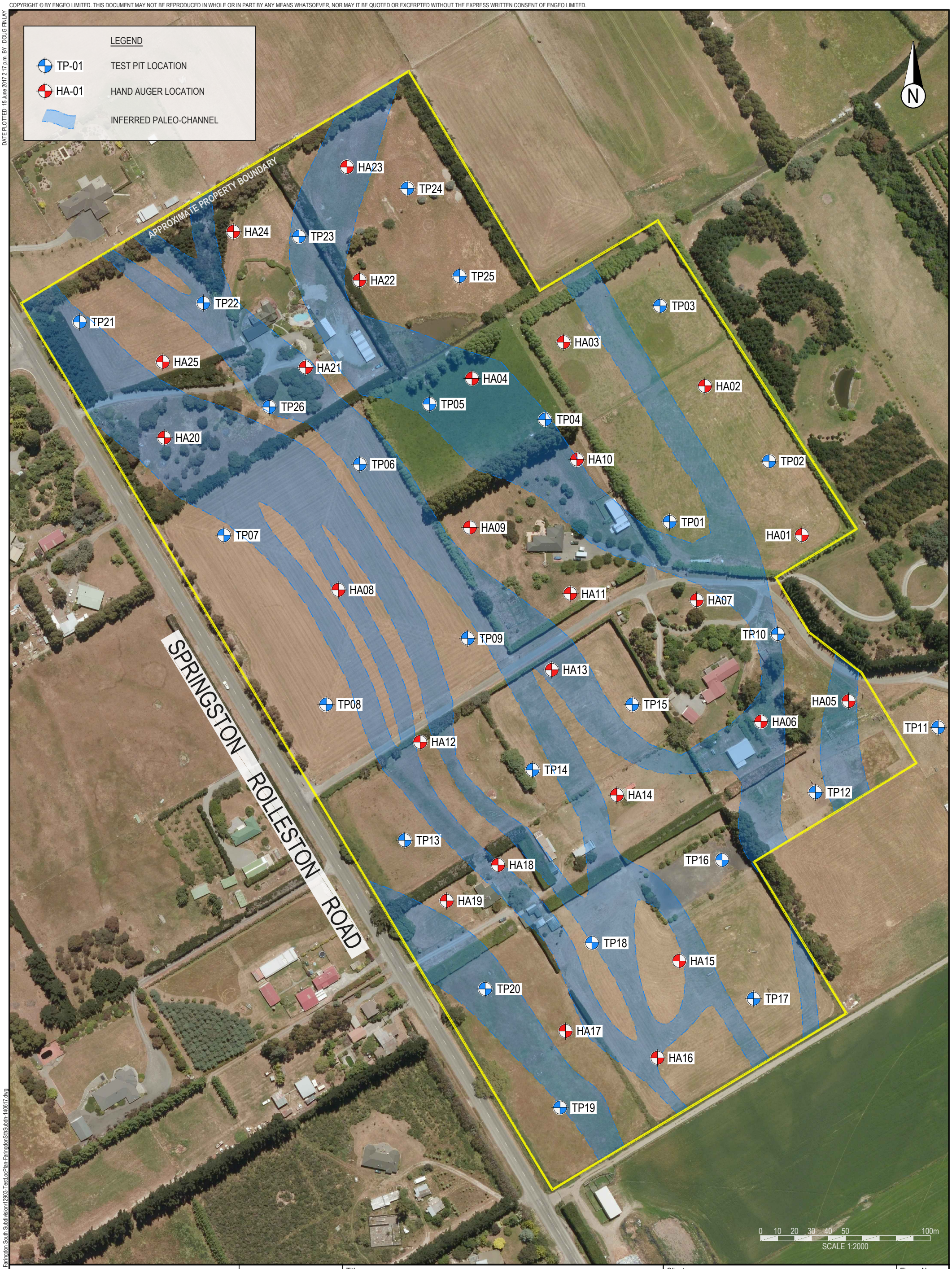
Greg Martin, PEngGeol

Principal Engineering Geologist

APPENDIX 1:

Site Plan and Test Locations

DATE PLOTTED: 15 June 2017 2:17 p.m. BY : DOUG FINLAY



ENGEO
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Tel: 03 328 9012
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Title: TEST LOCATION PLAN

Client: HUGHES DEVELOPMENTS

Project: FARINGDON EAST SUBDN
SPRINGSTON-ROLLESTON
ROAD, ROLLESTON

Designed: LF
Drawn: DF
Checked: GM
Date: 15.06.17

Proj No: 12903.000.000_021

Scale: 1:2000

Figure No: 1

Size: A3

Rev: 0

ORIGINAL FIGURE PRINTED IN COLOUR

XREFs: selwyn-0125m-urban-aerial-photos-2012-13
CAD File: Z:\Drafting\12001 to 13000\12903 - Faringdon South Subdivision\12903-TestLocPlan-FaringdonSthSubdn-140617.dwg

APPENDIX 2:

Test Pit Investigation Logs

LOG OF TEST PIT TP01

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Date : 18/01/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : EG
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TOPSOIL		ML	SILT with minor sand and trace rootlets; brown. Low plasticity. Sand, fine to medium, poorly graded [TOPSOIL].			D	St-H		>>
0.5	ALLUVIUM		GW	Fine to coarse GRAVEL with some sand; grey. Well graded, rounded to subrounded.			M	MD-D		
1.0										
1.5										
2.0				Depth of Excavation: 2 m Termination Condition: Target depth						>>

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test pit met target depth
Scala Penetrometer met practical refusal (no Scala data recorded from 0.3 m to 2.0 m depth).
Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 26/1/17

LOG OF TEST PIT TP02

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Date : 18/01/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : EG
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)
0.0	TS		ML	SILT with minor sand and trace rootlets; brown. Low plasticity. Sand, fine to medium, poorly graded [TOPSOIL].			D	St	
	ALLUVIUM		ML	SILT with some gravel and gravel; brownish grey. Low plasticity. Gravel, fine to medium, poorly graded, subrounded to subangular. Sand, fine, poorly graded.			M	VSt-H	
0.5			GP	Fine to coarse GRAVEL with trace cobbles and organics; brownish grey. Well graded, rounded to subangular.			W	MD-D	
1.0									
1.5									
2.0				Depth of Excavation: 2 m Termination Condition: Target depth					

Scala Penetrometer
Blows per 100mm
2 4 6 8 10 12
>>

Test pit met target depth
Scala Penetrometer met practical refusal
(no Scala data recorded between 0.5 m and 2.0 m depth)

Standing groundwater was not encountered
TS = TOPSOIL

GEOSCIENCE TEST PIT LOG TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 26/1/17

LOG OF TEST PIT TP03

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Date : 18/01/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : EG
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm (2 4 6 8 10 12)
0.0	TS		ML	SILT with minor sand, trace gravel and rootlets; brown. Low plasticity. Sand, fine to medium, poorly graded [TOPSOIL].			D	St-H		>>
0.5	ALLUVIUM		GW	Fine to coarse GRAVEL with some sand and minor cobbles; brownish grey. Well graded, subrounded to subangular. Sand, fine to coarse, well graded.			M	MD-D		
1.0										
1.5										
2.0				Depth of Excavation: 2 m Termination Condition: Target depth						

Test pit met target depth
Scala Penetrometer met practical refusal
(no Scala data recorded below 0.2 m depth)

Standing groundwater was not encountered
TS = TOPSOIL

GEOSCIENCE TEST PIT LOG TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 26/1/17

LOG OF TEST PIT TP04

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Date : 18/01/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : EG
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TOPSOIL		ML	SILT with minor sand, trace gravel and rootlets; brown. Low plasticity. Sand, fine to medium, poorly graded [TOPSOIL].			D	St-H		
0.5	ALLUVIUM		GW	Fine to coarse GRAVEL with some sand and minor cobbles; brownish grey. Well graded, subrounded to subangular. Sand, fine to coarse, well graded.			M	MD-D		
1.0				Becomes wet at 0.7 m depth.			W			
1.5										
2.0				Depth of Excavation: 2 m Termination Condition: Target depth						

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12 (>>)

Test pit met target depth
Scala Penetrometer met practical refusal
(no Scala data recorded below 0.6 m depth)

Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 26/1/17

LOG OF TEST PIT TP05

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Date : 18/01/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : EG
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TOPSOIL		ML	SILT with trace gravel, sand and rootlets; brown. Low plasticity [TOPSOIL].			D	St-VSt		
0.3	ALLUVIUM		ML	SILT with minor sand; greyish brown. Low plasticity. Sand, fine to coarse, well graded.			M	H		
0.5			GW	Fine to coarse GRAVEL with some sand and trace cobbles; brownish grey. Well graded, subrounded. Sand, fine to coarse, well graded. Becomes wet at 0.7 m depth.			W	MD-D		
2.0				Depth of Excavation: 2 m Termination Condition: Target depth						

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test pit met target depth
Scala Penetrometer met practical refusal
(no Scala data recorded below 0.4 m depth)

Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 26/1/17

LOG OF TEST PIT TP06

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Date : 18/01/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TS		ML	SILT with trace gravel, sand and rootlets; brown. Low plasticity [TOPSOIL].				St-VSt		
0.5	ALLUVIUM		ML	SILT with trace sand; greyish brown. Low plasticity.			D	VSt-H		
1.0			GW	Sandy fine to coarse GRAVEL with trace cobbles and silt; brownish grey. Well graded, subrounded. Sand, fine to coarse, well graded.			M	MD-D		
1.5										
2.0				Depth of Excavation: 2 m Termination Condition: Target depth						

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test pit met target depth
Scala Penetrometer met practical refusal
(no Scala data recorded below 0.7 m depth)

Standing groundwater was not encountered
TS = TOPSOIL

GEOSCIENCE TEST PIT LOG TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 26/1/17

LOG OF TEST PIT TP07

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Date : 18/01/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm (2 4 6 8 10 12)
0.0	TS		ML	SILT with trace gravel, sand and rootlets; brown. Low plasticity [TOPSOIL].				St		
	ALLUVIUM		GW	Fine to coarse GRAVEL with some sand, silt and trace cobbles; brownish grey. Well graded, subrounded. Sand, fine to coarse, well graded.				MD-D		
0.5										
			GW	Sandy fine to coarse GRAVEL with trace cobbles; grey. Well graded, subrounded. Sand, fine to coarse.			M	MD-D		
1.0										
1.5										
2.0				Depth of Excavation: 2 m Termination Condition: Target depth						

Test pit met target depth
Scala Penetrometer met practical refusal
(no Scala data recorded below 0.3 m depth)

Standing groundwater was not encountered
TS = TOPSOIL

GEOSCIENCE TEST PIT LOG TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 26/1/17

LOG OF TEST PIT TP08

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Date : 18/01/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TS		ML	SILT with trace gravel, sand and rootlets; brown. Low plasticity [TOPSOIL].			D	VSt-H		
0.5	ALLUVIUM		GW	Fine to coarse GRAVEL with some sand, silt and trace cobbles; brownish grey. Well graded, subrounded. Sand, fine to coarse, well graded.				MD-D		
1.0			GW	Sandy fine to coarse GRAVEL with trace cobbles; grey. Well graded, subrounded. Sand, fine to coarse, well graded.			M	MD-D		
1.5										
2.0				Depth of Excavation: 2 m Termination Condition: Target depth						

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12 (>>)

Test pit met target depth
Scala Penetrometer met practical refusal
(no Scala data recorded below 0.4 m depth)

Standing groundwater was not encountered
TS = TOPSOIL

GEOSCIENCE TEST PIT LOG TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 26/1/17

LOG OF TEST PIT TP09

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Date : 18/01/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TOPSOIL		ML	SILT with trace sand and rootlets; brown. Low plasticity [TOPSOIL].				VSt-H		>>
0.5	ALLUVIUM		GW	Fine to coarse GRAVEL with some sand, silt and trace cobbles; brownish grey. Well graded, subrounded. Sand, fine to coarse, well graded.			D	MD-D		
1.0			GW	Sandy fine to coarse GRAVEL with trace cobbles; grey. Well graded, subrounded. Sand, fine to coarse, well graded.			M	MD-D		
1.5										
2.0				Depth of Excavation: 2 m Termination Condition: Target depth						

Scala Penetrometer: 2 4 6 8 10 12

Test pit met target depth
Scala Penetrometer met practical refusal
(no Scala data recorded below 0.3 m depth)

Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 26/1/17

LOG OF TEST PIT TP10

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Date : 18/01/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : EG
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TS		ML	SILT with trace sand and rootlets; brown. Low plasticity [TOPSOIL].			D	H		
	ALLUVIUM		ML	SILT with some gravel and sand; brownish grey. Low plasticity. Gravel, fine to medium, poorly graded, subrounded to subangular.			M	H		
0.5			GP	Fine to coarse GRAVEL with trace cobbles and organics; brownish grey. Well graded. Becomes moist at 0.7 m depth.			W	MD-D		
1.0										
1.5										
2.0				Depth of Excavation: 2 m Termination Condition: Target depth						

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Test pit met target depth
Scala Penetrometer met practical refusal
(no Scala data recorded below 0.4 m depth)

Standing groundwater was not encountered
TS = TOPSOIL

GEOSCIENCE TEST PIT LOG TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 26/1/17

LOG OF TEST PIT TP11

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Date : 18/01/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TS		ML	SILT with trace sand and rootlets; brown. Low plasticity [TOPSOIL].				VSt-H		
	ALLUVIUM		ML	SILT with some gravel and sand; brownish grey. Low plasticity. Gravel, fine to medium, poorly graded, subrounded to subangular. Sand, fine, poorly graded.				H		
0.5			GP	Fine to coarse GRAVEL with trace cobbles, sand and organics; brownish grey. Well graded, subrounded.			D			
1.0				Becomes moist at 1.0 m depth.				MD-D		
1.5			GW	Sandy fine to coarse GRAVEL with trace cobbles; grey. Well graded, subrounded. Sand, fine to coarse, well graded.			M	MD-D		
2.0				Depth of Excavation: 2 m Termination Condition: Target depth						

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12 (>>)

Test pit met target depth
Scala Penetrometer met practical refusal
(no Scala data recorded below 0.3 m depth)

Standing groundwater was not encountered
TS = TOPSOIL

LOG OF TEST PIT TP12

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Date : 18/01/17
Max Test Pit Depth : 1.3 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TS		ML	SILT with trace sand and rootlets; brown. Low plasticity [TOPSOIL].				St-VSt		
0.5	ALLUVIUM		ML	SILT with trace sand; greyish brown. Low plasticity.			D	VSt-H		
1.0			GW	Fine to coarse GRAVEL with some sand, trace silt and cobbles; grey. Well graded, subrounded. Sand, fine to coarse, well graded.				MD-D		
1.5				Depth of Excavation: 1.3 m Termination Condition: Practical refusal						
2.0										

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12 (>>)

Test pit met practical refusal on hard ground
Scala Penetrometer met practical refusal
(no Scala data recorded below 0.6 m depth)

Standing groundwater was not encountered
TS = TOPSOIL

GEOSCIENCE TEST PIT LOG TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 26/1/17

LOG OF TEST PIT TP13

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Date : 18/01/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TS		ML	SILT with trace gravel, sand and rootlets; brown. Low plasticity [TOPSOIL].				H		
	ALLUVIUM		GW	Fine to coarse GRAVEL with some sand, silt and trace cobbles; brownish grey. Well graded, subrounded. Sand, fine to coarse, well graded.				MD-D		
0.5			GW	Sandy fine to coarse GRAVEL with trace cobbles; grey. Well graded, subrounded. Sand, fine to coarse, well graded.			M	MD-D		
1.0										
1.5										
2.0				Depth of Excavation: 2 m Termination Condition: Target depth						

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12 (>>)

Test pit met target depth
Scala Penetrometer met practical refusal
(no Scala data recorded below 0.2 m depth)

Standing groundwater was not encountered
TS = TOPSOIL

GEOSCIENCE TEST PIT LOG TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 26/1/17

LOG OF TEST PIT TP14

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Date : 18/01/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm (2 4 6 8 10 12)
0.0	TS		ML	SILT with trace gravel, sand and rootlets; brown. Low plasticity [TOPSOIL].				VSt		
	ALLUVIUM		GW	Fine to coarse GRAVEL with some sand, silt and trace cobbles; brownish grey. Well graded, subrounded. Sand, fine to coarse, well graded.				MD-D		
0.5				Sandy fine to coarse GRAVEL with trace cobbles; grey. Well graded, subrounded. Sand, fine to coarse, well graded.			M			
1.0			GW					MD-D		
1.5										
2.0				Depth of Excavation: 2 m Termination Condition: Target depth						

Test pit met target depth
Scala Penetrometer met practical refusal
(no Scala data recorded below 0.3 m depth)

Standing groundwater was not encountered
TS = TOPSOIL

GEOSCIENCE TEST PIT LOG TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 26/1/17

LOG OF TEST PIT TP15

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Date : 18/01/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TS		ML	SILT with trace gravel, sand and rootlets; brown. Low plasticity [TOPSOIL].			D	St-VSt		2 4 6 8 10 12
0.5	ALLUVIUM		GW	Fine to coarse GRAVEL with some sand, silt and trace cobbles; brownish grey. Well graded, subrounded. Sand, fine to coarse, well graded.				MD-D		>>
1.0			GW	Sandy fine to coarse GRAVEL with trace cobbles; grey. Well graded, subrounded. Sand, fine to coarse, well graded.			M	MD-D		
1.5										
2.0				Depth of Excavation: 2 m Termination Condition: Target depth						

Test pit met target depth
Scala Penetrometer met practical refusal
(no Scala data recorded below 0.3 m depth)

Standing groundwater was not encountered
TS = TOPSOIL

GEOSCIENCE TEST PIT LOG TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 26/1/17

LOG OF TEST PIT TP16

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Date : 18/01/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm (2 4 6 8 10 12)
0.0	TS		ML	SILT with trace gravel and sand; greyish brown. Low plasticity.			D	H		>>
0.5	ALLUVIUM		GW	Sandy fine to coarse GRAVEL with trace cobbles and silt; brownish grey. Well graded, subrounded. Sand, fine to coarse, well graded.			M	MD-D		
1.0										
1.5										
2.0				Depth of Excavation: 2 m Termination Condition: Target depth						

Test pit met target depth
Scala Penetrometer met practical refusal
(no Scala data recorded below 0.1 m depth)

Standing groundwater was not encountered
TS = TOPSOIL

GEOSCIENCE TEST PIT LOG TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 26/1/17

LOG OF TEST PIT TP17

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Date : 19/01/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TS		ML	SILT with trace sand and rootlets; brown. Low plasticity [TOPSOIL].			D	F-St		2 4 6 8 10 12
0.5	ALLUVIUM		ML	SILT with minor sand; greyish brown. Low plasticity. Sand, fine, poorly graded.				VSt-H		>>
1.0			GW	Sandy fine to coarse GRAVEL with trace cobbles; brownish grey. Well graded, subrounded. Sand, fine to coarse, well graded.			M			
1.5										
2.0				Depth of Excavation: 2 m Termination Condition: Target depth						

Test pit met target depth
Scala Penetrometer met practical refusal
(no Scala data recorded below 0.5 m depth)

Standing groundwater was not encountered
TS = TOPSOIL

GEOSCIENCE TEST PIT LOG TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 26/1/17

LOG OF TEST PIT TP18

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Date : 19/01/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TS		ML	SILT with trace sand and rootlets; brown. Low plasticity [TOPSOIL].				H		
0.5	ALLUVIUM		GW	Fine to coarse GRAVEL with some sand and silt; greyish brown. Well graded, subrounded. Sand, fine, poorly graded.			D	MD-D		
1.0			GW	Sandy fine to coarse GRAVEL with trace cobbles; brownish grey. Well graded, subrounded. Sand, fine to coarse, well graded.			M	MD-D		
1.5										
2.0				Depth of Excavation: 2 m Termination Condition: Target depth						

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12 >>

Test pit met target depth
Scala Penetrometer met practical refusal
(no Scala data recorded below 0.3 m depth)

Standing groundwater was not encountered
TS = TOPSOIL

GEOSCIENCE TEST PIT LOG TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 26/1/17

LOG OF TEST PIT TP19

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Date : 19/01/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TS		ML	SILT with trace sand and rootlets; brown. Low plasticity [TOPSOIL].				St		2 4 6 8 10 12
	ALLUVIUM		ML	SILT with minor sand; greyish brown. Low plasticity. Sand, fine, poorly graded.			D	VSt-H		>>
0.5			GW	Fine to coarse GRAVEL with some sand, silt and trace cobbles; brownish grey. Well graded, subrounded. Sand, fine to medium, poorly graded.				MD-D		
1.0			GW	Sandy fine to coarse GRAVEL with trace cobbles; brownish grey. Well graded, subrounded. Sand, fine to coarse, well graded.			M	MD-D		
1.5										
2.0				Depth of Excavation: 2 m Termination Condition: Target depth						

Test pit met target depth
Scala Penetrometer met practical refusal
(no Scala data recorded below 0.4 m depth)

Standing groundwater was not encountered
TS = TOPSOIL

GEOSCIENCE TEST PIT LOG TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 26/1/17

LOG OF TEST PIT TP20

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Date : 19/01/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TS		ML	SILT with trace sand and rootlets; brown. Low plasticity [TOPSOIL].				VSt		
0.5	ALLUVIUM		GW	Fine to coarse GRAVEL with some sand and silt; greyish brown. Well graded, subrounded. Sand, fine, poorly graded.			D	MD-D		
1.0			GW	Sandy fine to coarse GRAVEL with trace cobbles; brownish grey. Well graded, subrounded. Sand, fine to coarse, well graded.			M	MD-D		
1.5										
2.0				Depth of Excavation: 2 m Termination Condition: Target depth						

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12; >>

Test pit met target depth
Scala Penetrometer met practical refusal
(no Scala data recorded below 0.3 m depth)

Standing groundwater was not encountered
TS = TOPSOIL

GEOSCIENCE TEST PIT LOG TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 26/1/17

LOG OF TEST PIT TP21

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 021

Client : Hughes Development Ltd
Date : 07/06/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TOPSOIL		ML	SILT with trace sand and rootlets; brown. Low plasticity [TOPSOIL].				VS-S		
0.3	ALLUVIUM		SM	Silty fine to medium SAND; greyish brown. Poorly graded.				VS-S		
0.5			GW	Sandy fine to coarse GRAVEL with some silt and trace cobbles; brownish grey. Well graded, subrounded. Sand, fine to medium, poorly graded.			M	MD-D		
1.0			GW	Sandy fine to coarse GRAVEL with minor cobbles. Well graded, subrounded. Sand, fine to coarse, well graded.			W			
2.0				Depth of Excavation: 2 m Termination Condition: Practical refusal						

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Excavator met target depth at 2.0 m depth.
Scala Penetrometer met practical refusal
Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 13/6/17

LOG OF TEST PIT TP22

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 021

Client : Hughes Development Ltd
Date : 07/06/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TOPSOIL		ML	SILT with trace sand and rootlets; brown. Low plasticity [TOPSOIL].				VS-S		
			ML	SILT with some sand; greyish brown. Low plasticity. Sand, fine to medium, poorly graded.				VSt-H		
0.5	ALLUVIUM		GW	Fine to coarse GRAVEL with some silt, minor sand and trace cobbles; brownish grey. Well graded, subrounded. Sand, fine to medium, poorly graded.			M	MD-D		
1.0			GW	Sandy fine to coarse GRAVEL with minor cobbles and trace silt. Well graded, subrounded. Sand, fine to coarse, well graded.			W	MD-D		
1.5										
2.0				Depth of Excavation: 2 m Termination Condition: Practical refusal						

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12 (>>)

Excavator met target depth at 2.0 m depth.
Scala Penetrometer met practical refusal
Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 13/6/17

LOG OF TEST PIT TP23

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 021

Client : Hughes Development Ltd
Date : 07/06/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0.0	TOPSOIL		ML	SILT with trace sand, gravel and rootlets; brown. Low plasticity [TOPSOIL].				S-F		
0.5	ALLUVIUM		ML	SILT with trace sand; greyish brown. Low plasticity. Sand, fine, poorly graded.			M	F		
1.0								St-VSt		
1.5			GW	Sandy fine to coarse GRAVEL with minor cobbles and trace silt. Well graded, subrounded. Sand, fine to coarse, well graded.			W	MD-D		
2.0				Depth of Excavation: 2 m Termination Condition: Practical refusal						

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12 (>>)

Excavator met target depth at 2.0 m depth.
Scala Penetrometer met practical refusal
Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 13/6/17

LOG OF TEST PIT TP24

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 021

Client : Hughes Development Ltd
Date : 07/06/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier–Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TOPSOIL		ML	SILT with trace sand and rootlets; brown. Low plasticity [TOPSOIL].				VS-S		
0.5	ALLUVIUM		GW	Fine to coarse GRAVEL with some silt, sand and trace cobbles; brownish grey. Well graded, subrounded. Sand, fine to medium, poorly graded.			M	MD-D		
1.0										
1.5			GW	Sandy fine to coarse GRAVEL with minor cobbles and trace silt. Well graded, subrounded. Sand, fine to coarse, well graded.			W	MD-D		
2.0				Depth of Excavation: 2 m Termination Condition: Practical refusal						

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12 (>>)

Excavator met target depth at 2.0 m depth.
Scala Penetrometer met practical refusal
Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 13/6/17

LOG OF TEST PIT TP25

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 021

Client : Hughes Development Ltd
Date : 07/06/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TOPSOIL		ML	SILT with trace sand and rootlets; brown. Low plasticity [TOPSOIL].				S		
0.5	ALLUVIUM		GW	Fine to coarse GRAVEL with some silt, sand and trace cobbles; brownish grey. Well graded, subrounded. Sand, fine to medium, poorly graded.			M	MD-D		
1.0			GW	Sandy fine to coarse GRAVEL with minor cobbles and trace silt. Well graded, subrounded. Sand, fine to coarse, well graded.			W	MD-D		
1.5										
2.0				Depth of Excavation: 2 m Termination Condition: Practical refusal						

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12

Excavator met target depth at 2.0 m depth.
Scala Penetrometer met practical refusal
Standing groundwater was not encountered

GEOSCIENCE TEST PIT LOG TEST PITS.GPJ NZ MASTER DATA TEMPLATE.GDT 13/6/17

LOG OF TEST PIT TP26

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 021

Client : Hughes Development Ltd
Date : 07/06/17
Max Test Pit Depth : 2 m
Digger Type/Size : Bucket Excavator
Bucket Type/Size :

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	Excavatability (Relative Scale) Easier – Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
0	TOPSOIL		ML	SILT with trace sand and rootlets; brown. Low plasticity [TOPSOIL].				S-F		
0.3	ALLUVIUM		ML	SILT with some sand; greyish brown. Low plasticity. Sand, fine to medium, poorly graded.			M	F-H		
0.5			GW	Fine to coarse GRAVEL with some silt, sand and trace cobbles; brownish grey. Well graded, subrounded. Sand, fine to medium, poorly graded.				MD-D		
1.0			GW	Sandy fine to coarse GRAVEL with minor cobbles and trace silt. Well graded, subrounded. Sand, fine to coarse, well graded.			W	MD-D		
2.0				Depth of Excavation: 2 m Termination Condition: Practical refusal						

Scala Penetrometer: Blows per 100mm — 2 4 6 8 10 12 (>>)

Excavator met target depth at 2.0 m depth.
Scala Penetrometer met practical refusal
Standing groundwater was not encountered

APPENDIX 3:

Hand Auger Borehole Logs

LOG OF AUGER HA01

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Client Ref. : N/A
Date : 18/01/17
Hole Depth : 0.4 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded
	TOPSOIL	ML	SILT with trace rootlets; brown. Low plasticity [TOPSOIL].				VSt	
	ALLUVIUM	ML	SILT; greyish brown. Low plasticity.			D	H	
			End of Hole Depth: 0.4 m Termination Condition: Practical refusal					
0.5								
1.0								
1.5								

Scala Penetrometer

Blows per 100mm

2 4 6 8 10 12

>>

Hand auger met practical refusal at 0.4 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.4 m depth.
Standing groundwater was not encountered

GEOSCIENCE HAND AUGER HAND AUGERS.GPJ NZ DATA TEMPLATE 2.GDT 25/1/17

LOG OF AUGER HA02

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Client Ref. : N/A
Date : 18/01/17
Hole Depth : 0.4 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	Scala Penetrometer Blows per 100mm
	TOPSOIL	ML	SILT with trace rootlets; brown. Low plasticity [TOPSOIL].				St		
	ALLUVIUM	ML	SILT; greyish brown. Low plasticity.			D	H		
			End of Hole Depth: 0.4 m Termination Condition: Practical refusal						

Scala Penetrometer: Blows per 100mm — 2, 4, 6, 8, 10, 12; >> at 0.4 m

0.5
1.0
1.5

Hand auger met practical refusal at 0.4 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.4 m depth.
Standing groundwater was not encountered

GEOSCIENCE HAND AUGER HAND AUGERS.GPJ NZ DATA TEMPLATE 2.GDT 25/1/17

LOG OF AUGER HA03

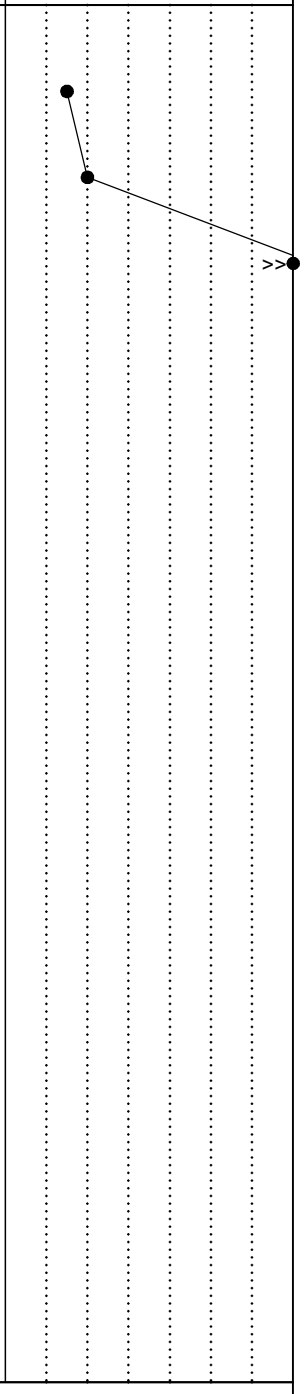
Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Client Ref. : N/A
Date : 18/01/17
Hole Depth : 0.3 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded
	TOPSOIL	ML	SILT with trace rootlets; brown. Low plasticity [TOPSOIL].				St	
	ALLUVIUM	ML	SILT; greyish brown. Low plasticity.			D	St-H	
			End of Hole Depth: 0.3 m Termination Condition: Practical refusal					

Scala Penetrometer
Blows per 100mm
2 4 6 8 10 12



0.5
1.0
1.5

Hand auger met practical refusal at 0.3 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.3 m depth.
Standing groundwater was not encountered

LOG OF AUGER HA04

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Client Ref. : N/A
Date : 18/01/17
Hole Depth : 0.4 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded
	TOPSOIL	ML	SILT with trace rootlets; brown. Low plasticity [TOPSOIL].				St	
	ALLUVIUM	ML	SILT; greyish brown. Low plasticity.			D	H	
			End of Hole Depth: 0.4 m Termination Condition: Practical refusal					
0.5								
1.0								
1.5								

Scala Penetrometer

Blows per 100mm

2 4 6 8 10 12

>>

Hand auger met practical refusal at 0.4 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.4 m depth.
Standing groundwater was not encountered

GEOSCIENCE HAND AUGER HAND AUGERS.GPJ NZ DATA TEMPLATE 2.GDT 25/1/17

LOG OF AUGER HA05

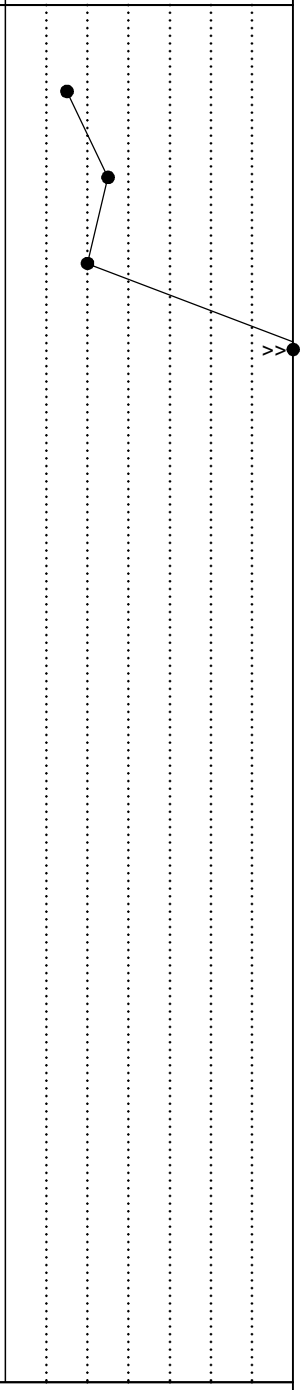
Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Client Ref. : N/A
Date : 18/01/17
Hole Depth : 0.4 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : EG
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded
	TOPSOIL	ML	SILT with trace rootlets; brown. Low plasticity [TOPSOIL].				St	
	ALLUVIUM	ML	SILT; greyish brown. Low plasticity.			D	St-H	
			End of Hole Depth: 0.4 m Termination Condition: Practical refusal					

Scala Penetrometer
Blows per 100mm
2 4 6 8 10 12



0.5
1.0
1.5

Hand auger met practical refusal at 0.4 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.4 m depth.
Standing groundwater was not encountered

LOG OF AUGER HA06

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Client Ref. : N/A
Date : 18/01/17
Hole Depth : 1 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : EG
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	Scala Penetrometer Blows per 100mm
0	TOPSOIL	ML	SILT with trace rootlets; brown. Low plasticity [TOPSOIL].				St-H		
0.5	ALLUVIUM	ML	SILT with trace sand; greyish brown. Low plasticity.			D	VSt-H		>> >>
1.0			End of Hole Depth: 1 m Termination Condition: Practical refusal						
1.5									

Hand auger met practical refusal at 1 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.8 m depth.
Standing groundwater was not encountered

GEOSCIENCE HAND AUGER HAND AUGERS.GPJ NZ DATA TEMPLATE 2.GDT 25/1/17

LOG OF AUGER HA07

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Client Ref. : N/A
Date : 18/01/17
Hole Depth : 0.6 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : EG
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded
	TOPSOIL	ML	SILT with trace sand and rootlets; brown. Low plasticity [TOPSOIL].				F-VSt	
0.5	ALLUVIUM	ML	SILT with trace sand; brownish grey with orange mottles. Low plasticity.			D	H	
			End of Hole Depth: 0.6 m Termination Condition: Practical refusal					
1.0								
1.5								

Scala Penetrometer

Blows per 100mm

2 4 6 8 10 12

>>

Hand auger met practical refusal at 0.6 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.4 m depth.
Standing groundwater was not encountered

GEOSCIENCE HAND AUGER HAND AUGERS.GPJ NZ DATA TEMPLATE 2.GDT 25/1/17

LOG OF AUGER HA08

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Client Ref. : N/A
Date : 18/01/17
Hole Depth : 0.4 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : EG
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded
	TOPSOIL	ML	SILT with trace sand and rootlets; brown. Low plasticity [TOPSOIL].				VSt-H	
	ALLUVIUM	ML	SILT; brownish grey. Low plasticity.			D	H	
			End of Hole Depth: 0.4 m Termination Condition: Practical refusal					

Scala Penetrometer
Blows per 100mm
2 4 6 8 10 12
>>

0.5
1.0
1.5

Hand auger met practical refusal at 0.4 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.4 m depth.
Standing groundwater was not encountered

GEOSCIENCE HAND AUGER HAND AUGERS.GPJ NZ DATA TEMPLATE 2.GDT 25/1/17

LOG OF AUGER HA09

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Client Ref. : N/A
Date : 18/01/17
Hole Depth : 0.3 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : EG
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	Scala Penetrometer Blows per 100mm
0.0	TOPSOIL	ML	SILT with trace gravel, sand and rootlets; brown. Low plasticity [TOPSOIL].			D	St-H		
			End of Hole Depth: 0.3 m Termination Condition: Practical refusal						

Scala Penetrometer: Blows per 100mm — 2, 4, 6, 8, 10, 12; >> at 0.4 m depth

Hand auger met practical refusal at 0.3 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.4 m depth.
Standing groundwater was not encountered

LOG OF AUGER HA10

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Client Ref. : N/A
Date : 18/01/17
Hole Depth : 0.4 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : EG
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded
	TOPSOIL	ML	SILT with trace gravel, sand and rootlets; brown. Low plasticity [TOPSOIL].			D	St-VSt	
	A	ML	SILT with trace sand; brownish grey. Low plasticity.				H	
			End of Hole Depth: 0.4 m Termination Condition: Practical refusal					

Scala Penetrometer
Blows per 100mm
2 4 6 8 10 12
0.5
1.0
1.5
>>

Hand auger met practical refusal at 0.4 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.5 m depth.
Standing groundwater was not encountered
A = ALLUVIUM

GEOSCIENCE HAND AUGER HAND AUGERS.GPJ NZ DATA TEMPLATE 2.GDT 25/1/17

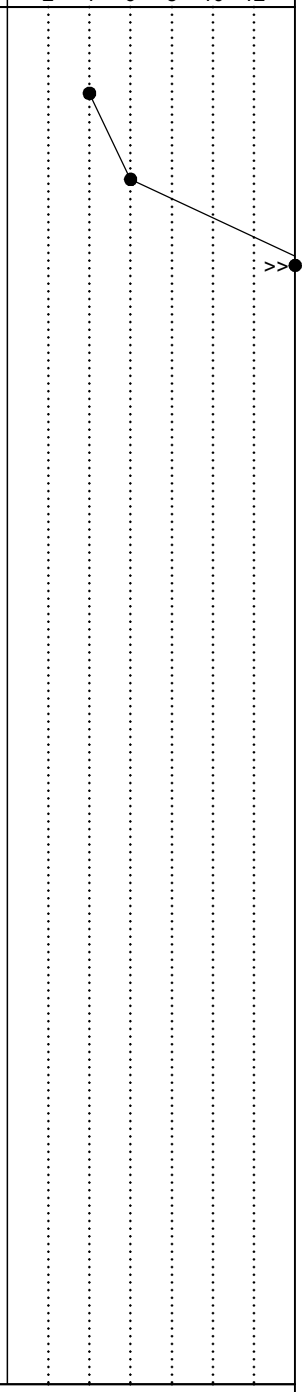
LOG OF AUGER HA11

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Client Ref. : N/A
Date : 18/01/17
Hole Depth : 0.3 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : EG
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	Scala Penetrometer Blows per 100mm
0.0	TOPSOIL	ML	SILT with trace sand, gravel and rootlets; brown. Low plasticity [TOPSOIL].			D	VSt-H		
			End of Hole Depth: 0.3 m Termination Condition: Practical refusal						



Hand auger met practical refusal at 0.3 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.3 m depth.
Standing groundwater was not encountered

LOG OF AUGER HA12

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Client Ref. : N/A
Date : 19/01/17
Hole Depth : 0.4 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded
	TOPSOIL	ML	SILT with trace sand, gravel and rootlets; brown. Low plasticity [TOPSOIL].				St	
	ALLUVIUM	ML	SILT with minor sand; greyish brown. Low plasticity. Sand, fine.			D	VSt	
			End of Hole Depth: 0.4 m Termination Condition: Practical refusal					

Scala Penetrometer

Blows per 100mm

2 4 6 8 10 12

>>

0.5

1.0

1.5

Hand auger met practical refusal at 0.4 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.6 m depth.
Standing groundwater was not encountered

GEOSCIENCE HAND AUGER HAND AUGERS.GPJ NZ DATA TEMPLATE 2.GDT 25/1/17

LOG OF AUGER HA13

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

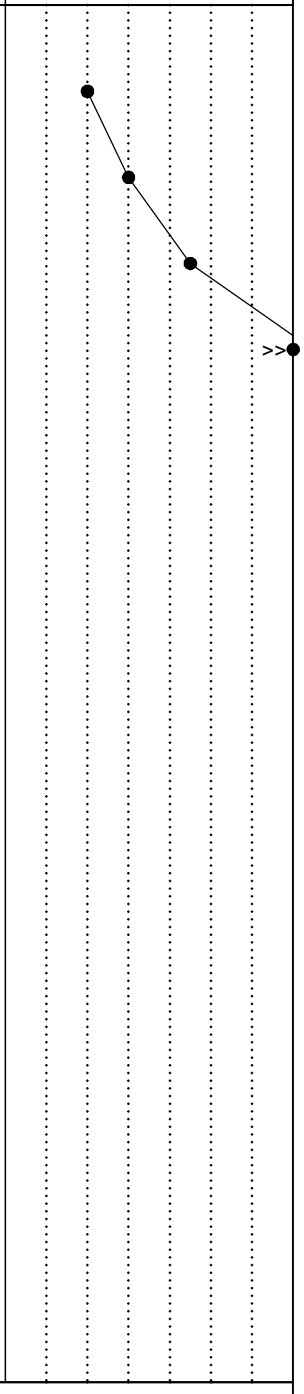
Client : Hughes Development Ltd
Client Ref. : N/A
Date : 19/01/17
Hole Depth : 0.4 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded
	TOPSOIL	ML	SILT with trace sand, gravel and rootlets; brown. Low plasticity [TOPSOIL].				St	
	ALLUVIUM	ML	SILT with minor sand; greyish brown. Low plasticity. Sand, fine.			D	VSt-H	
			End of Hole Depth: 0.4 m Termination Condition: Practical refusal					

Scala Penetrometer

Blows per 100mm



Hand auger met practical refusal at 0.4 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.4 m depth.
Standing groundwater was not encountered

LOG OF AUGER HA14

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Client Ref. : N/A
Date : 19/01/17
Hole Depth : 0.3 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	Scala Penetrometer Blows per 100mm (2 4 6 8 10 12)
	TOPSOIL	ML	SILT with trace sand, gravel and rootlets; brown. Low plasticity [TOPSOIL].			D	H		
	ALLUVIUM	ML	SILT with minor sand; greyish brown. Low plasticity. Sand, fine, poorly graded.				H		
			End of Hole Depth: 0.3 m Termination Condition: Practical refusal						>>
0.5									
1.0									
1.5									

Hand auger met practical refusal at 0.3 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.3 m depth.
Standing groundwater was not encountered

LOG OF AUGER HA15

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Client Ref. : N/A
Date : 19/01/17
Hole Depth : 0.7 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded
	TOPSOIL	ML	SILT with trace sand, gravel and rootlets; brown. Low plasticity [TOPSOIL].				F-St	
0.5	ALLUVIUM	ML	SILT with minor sand; greyish brown. Low plasticity. Sand, fine, poorly graded. Some sand encountered from 0.5 m depth. Sand, fine to medium, poorly graded.			D	H	UtTP
			End of Hole Depth: 0.7 m Termination Condition: Practical refusal					
1.0								
1.5								

Scala Penetrometer

Blows per 100mm

2 4 6 8 10 12

>>

Hand auger met practical refusal at 0.7 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.7 m depth.
Standing groundwater was not encountered

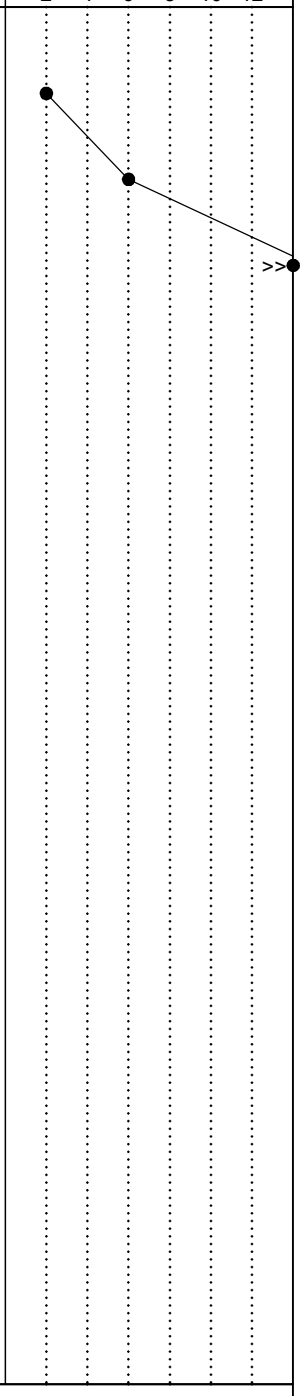
LOG OF AUGER HA16

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Client Ref. : N/A
Date : 19/01/17
Hole Depth : 0.3 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	Scala Penetrometer Blows per 100mm
	TOPSOIL	ML	SILT with trace sand, gravel and rootlets; brown. Low plasticity [TOPSOIL].				F		
	ALLUVIUM	ML	SILT with minor sand; greyish brown. Low plasticity. Sand, fine.			D	VSt-H		
			End of Hole Depth: 0.3 m Termination Condition: Practical refusal						



0.5
1.0
1.5

Hand auger met practical refusal at 0.3 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.3 m depth.
Standing groundwater was not encountered

LOG OF AUGER HA17

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Client Ref. : N/A
Date : 19/01/17
Hole Depth : 0.2 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	Scala Penetrometer Blows per 100mm
	TOPSOIL	ML	SILT with trace sand, gravel and rootlets; brown. Low plasticity [TOPSOIL].			D	St-VSt		
			End of Hole Depth: 0.2 m Termination Condition: Practical refusal						

Scala Penetrometer: Blows per 100mm — 2, 4, 6, 8, 10, 12; >>

0.5
1.0
1.5

Hand auger met practical refusal at 0.2 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.2 m depth.
Standing groundwater was not encountered

GEOSCIENCE HAND AUGER HAND AUGERS.GPJ NZ DATA TEMPLATE 2.GDT 25/1/17

LOG OF AUGER HA18

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

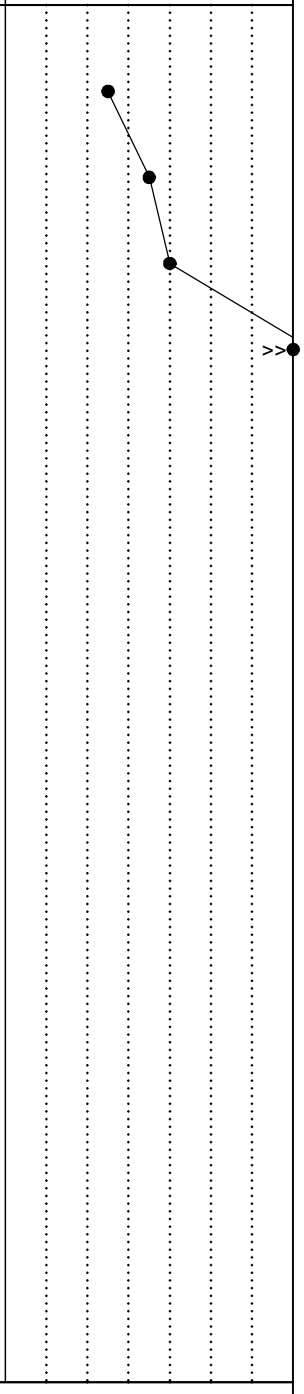
Client : Hughes Development Ltd
Client Ref. : N/A
Date : 19/01/17
Hole Depth : 0.4 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded
	TOPSOIL	ML	SILT with trace sand, gravel and rootlets; brown. Low plasticity [TOPSOIL].				VSt	
	ALLUVIUM	ML	SILT with some sand; greyish brown. Low plasticity. Sand, fine, poorly graded.			D	H	
			End of Hole Depth: 0.4 m Termination Condition: Practical refusal					

Scala Penetrometer

Blows per 100mm



Hand auger met practical refusal at 0.4 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.4 m depth.
Standing groundwater was not encountered

LOG OF AUGER HA19

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 004 and 005

Client : Hughes Development Ltd
Client Ref. : N/A
Date : 19/01/17
Hole Depth : 0.3 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : RP
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded
	TS	ML	SILT with trace sand, gravel and rootlets; brown. Low plasticity [TOPSOIL].				VSt	
	ALLUVIUM	SP	Fine to medium SAND with some silt; greyish brown. Poorly graded.			D	D	
			End of Hole Depth: 0.3 m Termination Condition: Practical refusal					

Scala Penetrometer

Blows per 100mm

2 4 6 8 10 12

>>

0.5

1.0

1.5

Hand auger met practical refusal at 0.3 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.4 m depth.
Standing groundwater was not encountered
TS = TOPSOIL

GEOSCIENCE HAND AUGER HAND AUGERS.GPJ NZ DATA TEMPLATE 2.GDT 25/1/17

LOG OF AUGER HA20

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 021

Client : Hughes Development Ltd
Client Ref. :
Date : 12/06/17
Hole Depth : 0.3 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : EG
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	Scala Penetrometer Blows per 100mm
0	TOPSOIL	ML	SILT with minor sand, trace gravel and rootlets; brown. Low plasticity. Sand, fine, poorly graded [TOPSOIL].			M	S-F		
			End of Hole Depth: 0.3 m Termination Condition: Practical refusal						

Scala Penetrometer: Blows per 100mm — 2, 4, 6, 8, 10, 12; >> at 0.5 m

Hand auger met practical refusal at 0.3 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.5 m depth.
Standing groundwater was not encountered

LOG OF AUGER HA21

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 021

Client : Hughes Development Ltd
Client Ref. :
Date : 12/06/17
Hole Depth : 0.5 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : EG
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded
	TOPSOIL	ML	SILT with minor gravel, trace sand and rootlets; brown. Low plasticity. Gravel, fine to medium, poorly graded [TOPSOIL].			M	S-F	
	ALLUVIUM	ML	SILT with minor sand; brownish grey. Low plasticity.			W	S-F	UTP
0.5			End of Hole Depth: 0.5 m Termination Condition: Practical refusal					
1.0								
1.5								

Scala Penetrometer

Blows per 100mm

2 4 6 8 10 12

>>

Hand auger met practical refusal at 0.5 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.5 m depth.
Standing groundwater was not encountered

LOG OF AUGER HA22

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 021

Client : Hughes Development Ltd
Client Ref. :
Date : 12/06/17
Hole Depth : 0.4 m
Hole Diameter : 50 mm

Shear Vane No : 2022
Logged By : EG
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	Scala Penetrometer Blows per 100mm
0	TOPSOIL	ML	SILT with trace gravel, sand and rootlets; brown. Low plasticity [TOPSOIL].			M	S		
							H	UTP	
0.4			End of Hole Depth: 0.4 m Termination Condition: Practical refusal						
0.5									>>
1.0									
1.5									

Scala Penetrometer: Blows per 100mm — 2, 4, 6, 8, 10, 12

Hand auger met practical refusal at 0.4 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.5 m depth.
Standing groundwater was not encountered

GEOSCIENCE HAND AUGER HAND AUGERS.GPJ NZ DATA TEMPLATE 2.GDT 13/6/17

LOG OF AUGER HA23

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 021

Client : Hughes Development Ltd
Client Ref. :
Date : 12/06/17
Hole Depth : 0.7 m
Hole Diameter : 50 mm

Shear Vane No : 2022
Logged By : EG
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded
	TOPSOIL	ML	SILT with trace gravel, sand and rootlets; brown. Low plasticity [TOPSOIL].				VS-S	
	ALLUVIUM	ML	SILT with trace sand; greyish brown with orange mottles. Low plasticity.			M	St	65/11
0.5		SP	Fine to medium SAND with trace gravel; greyish brown. Poorly graded.			W	D	
			End of Hole Depth: 0.7 m Termination Condition: Practical refusal					
1.0								
1.5								

Scala Penetrometer

Blows per 100mm

2 4 6 8 10 12

>>

Hand auger met practical refusal at 0.7 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.7 m depth.
Standing groundwater was not encountered

LOG OF AUGER HA24

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 021

Client : Hughes Development Ltd
Client Ref. :
Date : 12/06/17
Hole Depth : 0.3 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : EG
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	Scala Penetrometer Blows per 100mm
0	TOPSOIL	ML	SILT with trace sand, gravel and rootlets; brown. Low plasticity [TOPSOIL].			M	S-St		
			End of Hole Depth: 0.3 m Termination Condition: Practical refusal						

Hand auger met practical refusal at 0.3 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.4 m depth.
Standing groundwater was not encountered

GEOSCIENCE HAND AUGER HAND AUGERS.GPJ NZ DATA TEMPLATE 2.GDT 13/6/17

LOG OF AUGER HA25

Geotechnical Investigation
Springston-Rolleston Road
Rolleston
12903.000.000 - 021

Client : Hughes Development Ltd
Client Ref. :
Date : 12/06/17
Hole Depth : 0.3 m
Hole Diameter : 50 mm

Shear Vane No :
Logged By : EG
Reviewed By : LF
Latitude :
Longitude :

Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	Scala Penetrometer Blows per 100mm
0	TOPSOIL	ML	SILT with minor sand and trace rootlets; brown. Low plasticity [TOPSOIL].			M	S-F		
							H		
			End of Hole Depth: 0.3 m Termination Condition: Practical refusal						
0.5									
1.0									
1.5									

Scala Penetrometer: Blows per 100mm — 2, 4, 6, 8, 10, 12; >> at end of hole

Hand auger met practical refusal at 0.3 m depth on inferred gravel.
Scala Penetrometer met practical refusal at 0.3 m depth.
Standing groundwater was not encountered

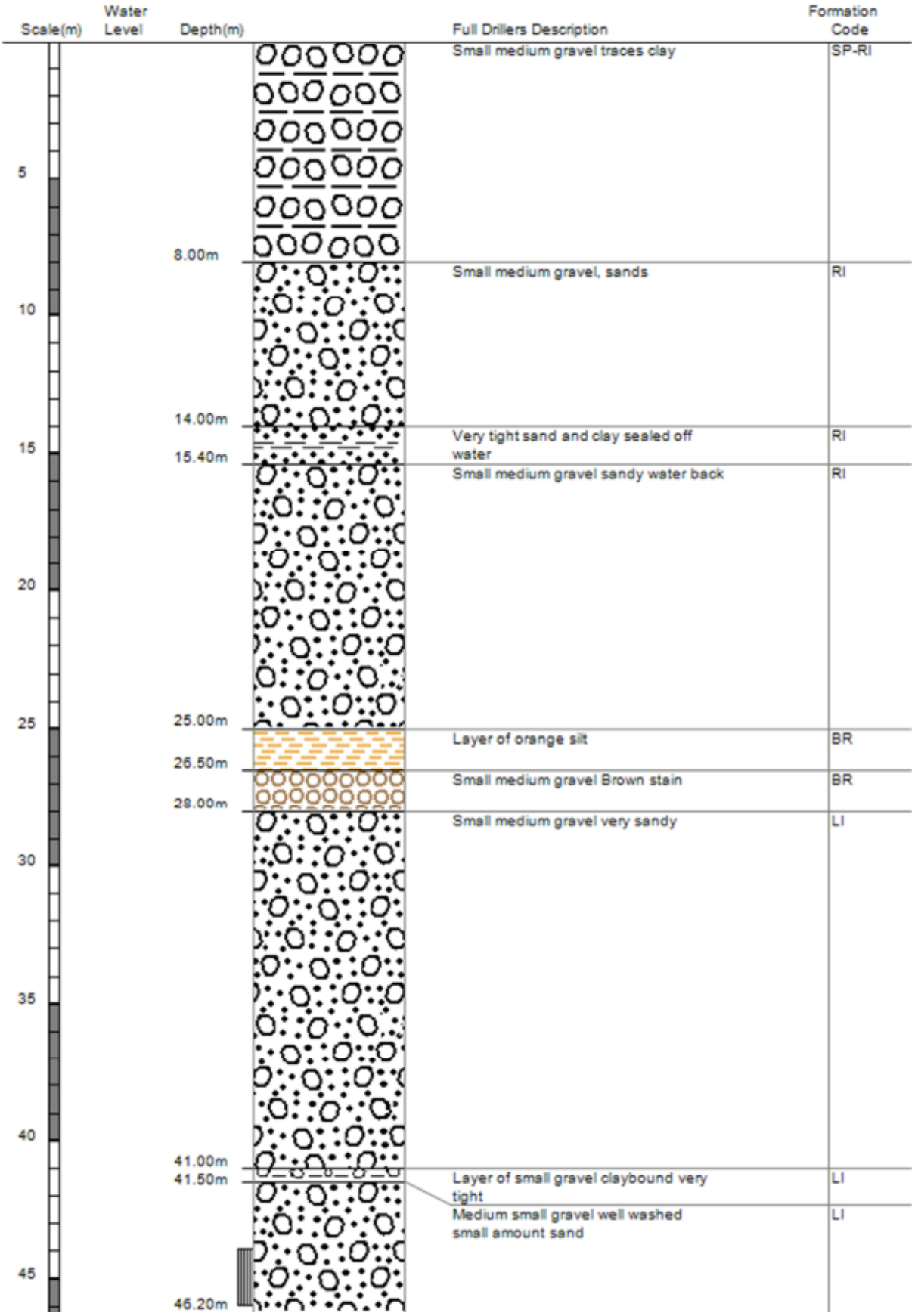
APPENDIX 4:

ECan Well Logs

Borelog for well M36/4654

Grid Reference (NZTM): 1551472 mE, 5171149 mN
Location Accuracy: 2 - 15m
Ground Level Altitude: 40.3 m +MSD Accuracy: < 2.5 m
Driller: Dynes Road Drilling
Drill Method: Rotary/Percussion
Borelog Depth: 46.2 m Drill Date: 01-Sep-1993

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha



Borelog for well M36/0204

Grid Reference (NZTM): 1551407 mE, 5170991 mN
Location Accuracy: 50 - 300m
Ground Level Altitude: 39.4 m +MSD Accuracy: < 2.5 m
Driller: J W Horne (& Co)
Drill Method: Unknown
Borelog Depth: 27.4 m Drill Date: 01-Apr-1975

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha