

Geotechnical Investigation

Farringdon East Subdivision 514, 1/524, 2/524 and 550 Springston Rolleston Road Springston Christchurch

> Submitted to: Hughes Development Ltd Canterbury

ENGEO Limited

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ENGEO Document Control:

Report Title	Geotechnical Investigation - Farring 550 Springston Rolleston Road	jdon Ea	st Subdivision	, 514, 1/524, 2	2/524 and
Project No.	12903.000.000	Doc II)	021	
Client	Hughes Development Ltd	Client	Contact	Kelvin Bac	k
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Date	Revision Details/Status		WP	Author	Reviewer
16/6/17	Final		BK	LF	GM



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.



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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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- 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

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Engineering Geologist

Report reviewed by

Greg Martin, PEngGeol

Principal Engineering Geologist

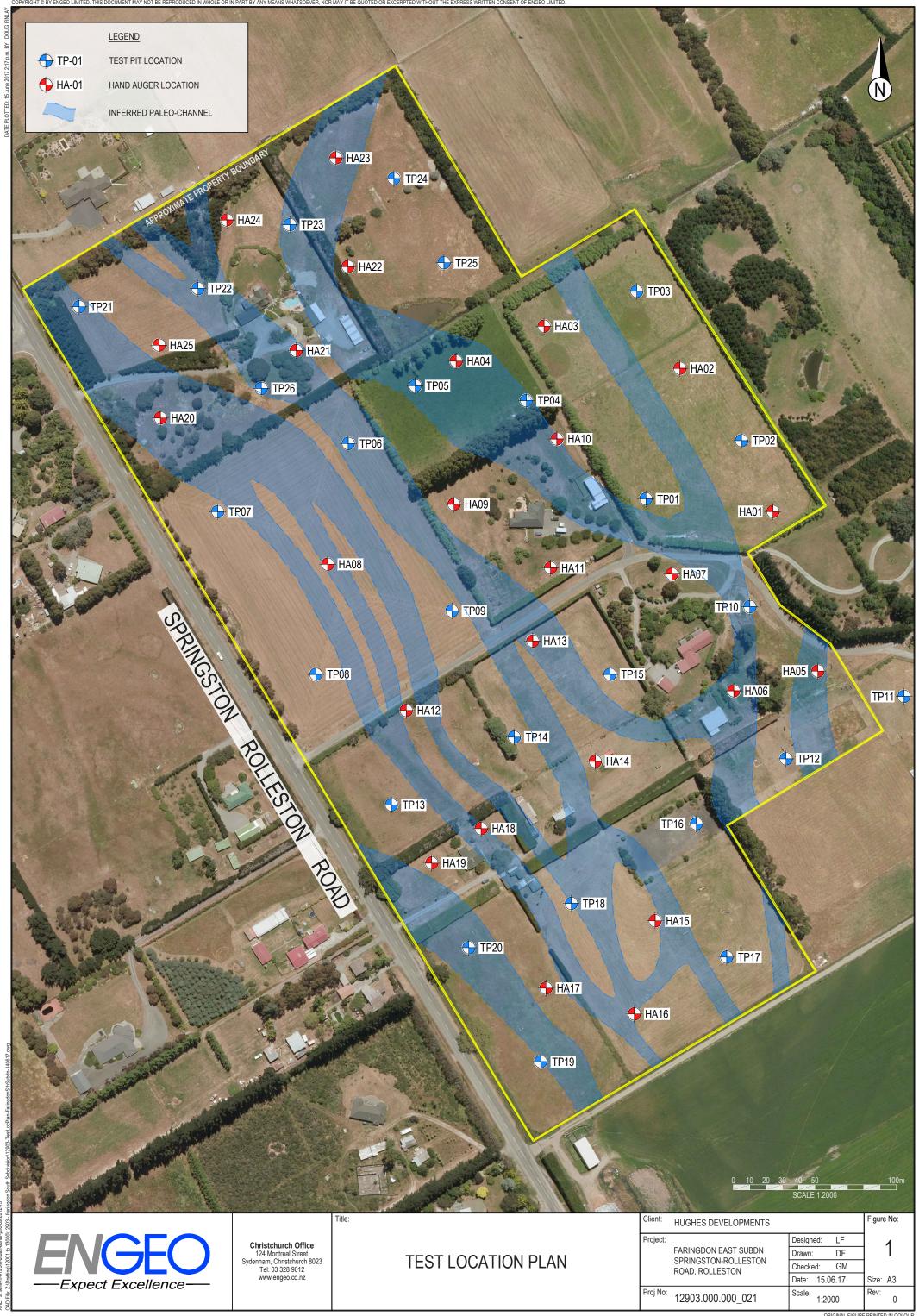




APPENDIX 1:

Site Plan and Test Locations







APPENDIX 2:

Test Pit Investigation Logs





Geotechnical Investigation
Springston-Rolleston Road
Rolleston

Client : Hughes Development Ltd Shear Vane No :
Date : 18/01/17 Logged By : EG

Max Test Pit Depth : 2 m Reviewed By : LF

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Geotechnical Investigation Springston-Rolleston Road Rolleston

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Geotechnical Investigation Springston-Rolleston Road Rolleston

Client: Hughes Development Ltd Shear Vane No: **Date**: 18/01/17 Logged By : EG

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Geotechnical Investigation Springston-Rolleston Road Rolleston

Scala Penetrometer met practical refusal

(no Scala data recorded below 0.6 m depth)

Client: Hughes Development Ltd Shear Vane No: Date: 18/01/17 Logged By : EG

Standing groundwater was not encountered

Max Test Pit Depth : 2 m

Reviewed By : LF Latitude :

Digger Type/Size : Bucket Excavator 12903.000.000 - 004 and 005 Longitude Bucket Type/Size : Excavatability (Relative Scale) Graphic Symbol Scala Penetrometer Symbol Moisture Cond. Shear Vane Consistency/ Density Index Water Level Undrained **DESCRIPTION** Depth (m) Shear Strength Material Blows per 100mm Peak/Remolded Harder nscs (Easier (kPa) 2 4 6 8 10 12 SILT with minor sand, trace gravel and rootlets; brown. Low plasticity. Sand, fine to medium, poorly graded [TOPSOIL]. TOPSOIL ML D St-H Fine to coarse GRAVEL with some sand and minor cobbles; brownish grey. Well graded, subrounded to subangular. Sand, fine to coarse, well graded. 0.5 Μ Becomes wet at 0.7 m depth. MD-D GW W 1.5 26/1/17 2.0 Depth of Excavation: 2 m Termination Condition: Target depth NZ MASTER DATA TEMPLATE.GDT GPJ TEST PITS. GEOSCIENCE TEST PIT LOG Test pit met target depth



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

Client: Hughes Development Ltd Shear Vane No: **Date**: 18/01/17 Logged By : EG Max Test Pit Depth : 2 m Reviewed By : LF Latitude :

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Bucket Type/Size :

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

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

(no Scala data recorded below 0.7 m depth)

Client: Hughes Development Ltd Shear Vane No: Date : 18/01/17 Logged By: RP Max Test Pit Depth : 2 m Reviewed By : LF Latitude :

Digger Type/Size : Bucket Excavator Bucket Type/Size

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-	TS			ML	SILT with trace gr brown. Low plasti	avel, sand and rootlets; city [TOPSOIL].	\(\frac{1}{12}\cdot\fra			St-VSt		•	
0.5 -	-			ML	plasticity.	and; greyish brown. Low			D	VSt-H			/×
1.5 -	ALLUVIUM			GW	cobbles and silt; to graded, subround well graded.	rse GRAVEL with trace prownish grey. Well ed. Sand, fine to coarse,			M	MD-D			
- i	L				Depth of Excavati Termination Cond	on: 2 m lition: Target depth							
Tes Sca	st pit	met targe	et depth	practi	cal refusal 0.7 m depth)	St TS	anding g	rour	idwa	ter was r	not encountered		_ ! _ !



Geotechnical Investigation Springston-Rolleston Road Rolleston 12903 000 000 - 004 and 005 Client: Hughes Development Ltd Shear Vane No: Date : 18/01/17 $\textbf{Logged By}: \mathsf{RP}$

Max Test Pit Depth : 2 m Reviewed By : LF Digger Type/Size : Bucket Excavator Latitude :

		Exca\ (Relati	atabilit ve Sca	y - E	5			•				mbol	_	.puc	ex <	Shear Var		Sca	la Pe	netro	met
Depth (m)	Material	Easier		Harder al K	2000		DES	CRIP'	TION			Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Undraine Shear Stren Peak/Remol (kPa)	igth		ws po	er 100 8	0mr 10
	TS			M	L.	SILT with brown. Lo	trace gr	ravel, sa	and an	d rootle	ets;	$\frac{1}{7}, \frac{1}{1}, \frac{1}{7}$			St						
- -				G\	W	Fine to co silt and tra graded, so well grade	arse GF ace cobb ubround	RAVEL bles: br	with so	ome sa	Well				MD-D				\(\frac{1}{\cdot \cdot \	•	
0.5 - - - -						Sandy fine cobbles; g Sand, fine	grey. We	ell grade	AVEL sub	with tra	ace ed.										
- 1.0 -	ALLUVIUM			GI	W									М	MD-D						
- - 1.5 - -																					
- - 2.0						Depth of E	Excavati	ion: 2 m	n Target d	deoth											
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Geotechnical Investigation Springston-Rolleston Road Rolleston

Client: Hughes Development Ltd Shear Vane No: **Date**: 18/01/17 Logged By: RP Max Test Pit Depth : 2 m Reviewed By : LF

1	129	03.0	00.000) - 00	04 and 005	Digger Type/Size Bucket Type/Size			valui		Latitude Longitude					_
Depth (m)	Material	Easier Bla (Rela)	avatability itive Scale	Symbo	DES	CRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)		cala P lows 4		100n	nn
-	TS			ML	SILT with trace gr brown. Low plastic	ravel, sand and rootlets city [TOPSOIL].			D	VSt-H		:)	_
- - - 0.5				GW	silt and trace cobb	RAVEL with some sand oles; brownish grey. Wed. Sand, fine to coars				MD-D					\(\)\	_
- - - -1.0	5				Sandy fine to coar cobbles; grey. We Sand, fine to coar	rse GRAVEL with trace ell graded, subrounded. se, well graded.										
- - -	ALLUVIUM			GW					М	MD-D						
1.5 - - - -	-															
- 2.0 -					Depth of Excavati Termination Cond	on: 2 m lition: Target depth										
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Geotechnical Investigation Springston-Rolleston Road Client: Hughes Development Ltd Shear Vane No: **Date**: 18/01/17 $\textbf{Logged By}: \mathsf{RP}$

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Depth (m)	Material	Easier Rela Easier	avatability tive Scale รู้ รู้ รู้	Symbo				D	ES	CR	RIPT	ΓΙΟΙ	N			Johan S. Johann	alapilic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	F	Shear eak/l	drain Stre	ed ength olded	١.	Blow	/s pe	netro er 10 8		nm
<u>-</u> -	TOPSOIL			ML		SILT Low							lets;	brov	vn.	1/ · ½	1.1/. 1.1/.	^	N	VSt-H					2	-4	•	•	10	
- -).5 - -				GW		Fine silt a grade well g	nd tr ed, s	ace	cob	bles	; bro	wnis	sh gr	ey. ۱	Vell				D	MD-D										
- - 1.0— - - 1.5 -	ALLUVIUM			GW		Sand cobb Sand	les;	grey	/. W	ell gi	rade	d, sı	ubrou	h tra	ce d.				М	MD-D										
- - - 2.0—						Dept Term							t dep	o th																
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Geotechnical Investigation
Springston-Rolleston Road
Rolleston

Client: Hughes Development Ltd

Date: 18/01/17

Logged By: EG

Max Test Pit Depth: 2 m

Reviewed By: LF

1	29	Rolle 03.000.000			Max Test Pit Depth Digger Type/Size Bucket Type/Size	: Bucket E	Exca	vator		Reviewed B Latitud Longitud	e :	
Depth (m)	Material	Excavatability (Relative Scale)) y	DES	CRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)		er 100mm 8 10 12
	TS		ML	SILT with trace sa Low plasticity [TO	and and rootlets; brown PSOIL].			D	Н		2 4 0	9
- 0.5 -			ML	SILT with some g brownish grey. Lo to medium, poorly subangular.	w plasticity. Gravel, fin graded, subrounded to	e		М	Н			**
-				cobbles and organ graded. Becomes moist at	nics; brownish grey. W	~ _						
- 1.0 - -	ALLUVIUM		GP						MD-D			
- 1.5 - - -								W				
2.0-				Depth of Excavati Termination Cond	on: 2 m lition: Target depth							
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Sca	la Pe	met target depthenetrometer me a data recorded	t practi	cal refusal 0.4 m depth)	iiiii <u>\</u>	Standing g	rour	ndwa	ter was r	not encountered		



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

Client: Hughes Development Ltd Shear Vane No: Date : 18/01/17 Logged By: RP Max Test Pit Depth : 2 m Reviewed By: LF Latitude :

Digger Type/Size : Bucket Excavator

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Depth (m)	Material	Exca (Relat	vatabil	Harder (alti	USCS Symbol			DE	SC	RIP	TIO	N			Graphic Symbol	Glapine Cymbol	Water Level	Moisture Cond.	Consistency/ Density Index	Sł Pe	Shear Undr near S ak/R (kl	aine Strei	ed nath		Blow	Pen s pe		0mm
<u>-</u>	TS			_	ML	SILT Low	with plasti	trace city [sano TOPS	d and	l roo	tlets;	brov	vn.	11.7	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\		ı	VSt-H						-	•	•	
-					ML	brow	with nish (arev.	Low	plast	icitv.	Gra	vel, f	ine I to					Н									
-).5 - - -						Fine cobb	ngula to co les, s Well	ar. Sa arse and a	and, f GRA and c	ine, p VEL organi	oorly with ics; l	y gra trace orow	ided. e			10000000		D										
- - - - -	ALLUVIUM				GP	Becc	omes	mois	et at 1	.0 m	dept	th.				300			MD-D									
1.5 - - - -	-			-	GW	cobb	dy fine les; g d, fine	rey.	Well	grade	ed, s	ubro	h tra	ce d.		NAC ACC		M	MD-D									
2.0 <u> </u>		L :	-::			Dept Term	h of E ninatio	Excav	vation onditi	n: 2 m on: T	n arge	t dep	oth															
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Geotechnical Investigation Springston-Rolleston Road Rolleston 12903.000.000 - 004 and 005

Client: Hughes Development Ltd Shear Vane No: Date: 18/01/17 Logged By: RP Max Test Pit Depth: 1.3 m Reviewed By : LF Digger Type/Size : Bucket Excavator Latitude :

Longitude :

Bucket Type/Size :

Excavatability (Relative Scale) Graphic Symbol Scala Penetrometer Symbol Moisture Cond. Shear Vane Consistency/ Density Index Water Level Undrained **DESCRIPTION** Depth (m) Shear Strength Material Blows per 100mm Peak/Remolded Harder nscs (Easier (kPa) 2 4 6 8 10 12 SILT with trace sand and rootlets; brown. Low plasticity [TOPSOIL]. 2 St-VSt ML SILT with trace sand; greyish brown. Low 0.5 VSt-H ML D Fine to coarse GRAVEL with some sand, trace silt and cobbles; grey. Well graded, subrounded. Sand, fine to coarse, well MD-D GW Depth of Excavation: 1.3 m Termination Condition: Practical refusal 1.5 26/1/17 2.0-NZ MASTER DATA TEMPLATE.GDT GPJ TEST PITS. GEOSCIENCE TEST PIT LOG

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



Geotechnical Investigation Springston-Rolleston Road Rolleston 12903 000 000 - 004 and 005 Client: Hughes Development Ltd Shear Vane No: Date : 18/01/17 $\textbf{Logged By}: \mathsf{RP}$

Max Test Pit Depth : 2 m Reviewed By : LF Digger Type/Size : Bucket Excavator Latitude :

		Excav (Relati	vatabili ve Sca	ty ale)	Symbol			_								ymbol	le/	Cond.	icy/		Shear Undr	aine	ed	s	cala	Per	netro	me	ete
Depth (m)	Material	Easier		Harder	USCS Sy			D	ES	CRII	PTI	ON				Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	SI P€	near (eak/R (kl	Strei emo Pa)	ngth Ided	2		s pe	er 10 8	0m 10	
	TS	:			ML	SILT brow	with	n trac	ce gr	avel,	sano FOP:	d and	d roo	tlets;	\ \frac{1}{2}	7			Н						:	:	:	:	
-					GW	Fine silt a	to co and tr led, s	oarse ace subro	e GR	RAVE ples; I ed. S	L wi	th so	me s	. We	II 🥇				MD-[)									
).5 - - - -						cobb	oles;	grey.	. We	rse G ell gra se, w	ded,	sub	roun	race ded.															
- 1.0— - -	ALLUVIUM				GW													М	MD-E										
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Geotechnical Investigation Springston-Rolleston Road Rolleston

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

Client: Hughes Development Ltd Shear Vane No: Date : 18/01/17 Logged By: RP

Max Test Pit Depth : 2 m Reviewed By : LF Digger Type/Size : Bucket Excavator Latitude :

-	129	03.000.000		4 and 005	Digger Type/Size : B Bucket Type/Size :	ucket E	xcav	/ator		Latitude Longitude		
Depth (m)	Material	Excavatability (Relative Scale)	USCS Symbol	DES	CRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Pene Blows per 2 4 6	
-	TS		ML GW	Fine to coarse GF silt and trace cobl	ravel, sand and rootlets; city [TOPSOIL]. RAVEL with some sand, oles; brownish grey. Well ed. Sand, fine to coarse,				VSt MD-D		•	>>
1.0-	ALLUVIUM		GW	Sandy fine to coa cobbles; grey. We Sand, fine to coar	rse GRAVEL with trace ell graded, subrounded. rse, well graded.			М	MD-D			
2.0				Depth of Excavati Termination Cond	on: 2 m lition: Target depth			T -				
l Sca	ala P	met target depth enetrometer met la data recorded	practi	cal refusal 0.3 m depth)	Sta TS	nding g = TOPS	roun SOIL	idwa	ter was r	not encountered		



Geotechnical Investigation Springston-Rolleston Road
Rolleston

Client: Hughes Development Ltd Shear Vane No: Date : 18/01/17 Logged By: RP Max Test Pit Depth : 2 m Reviewed By : LF

Depth (m)	Material	Excav (Relativ		Harder al K			С)ES	CRIF	PTIC	N			Graphic Symbol	,	Water Level	Working Co.	Consistency/ Density Index	Sh	hear Jndr ear S ak/Re (kf	aine Strer	d ngth	E		Per s pe		0m	ım
_	TS			М	L	SILT w brown.	ith tra Low إ	ice gr plasti	avel, s city [T	sand OPS	and r OIL].	ootle	ts;	7.7 7.7	· <u>\\</u> · <u>\</u>	С)	St-VSt						•				
- - - 0.5 -				Gl		Fine to silt and graded well gr	d trace I, subr	cobb	oles; b	rown	ish gı	rey. V	Vell					MD-D										_
- - - 1.0 -	ALLUVIUM					Sandy cobble Sand,	s; grev	y. We	II grad	ded, s	ubro	h tra unde	ce d.			N	1											
- - 1.5 - - -				Gl	N													MD-D										
2.0						Depth Termin	of Exc nation	cavati Cond	on: 2 i	m Targe	et dep	oth															Ī	Ī
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Geotechnical Investigation Springston-Rolleston Road
Rolleston

Client: Hughes Development Ltd Shear Vane No: Date : 18/01/17 Logged By : RP Max Test Pit Depth : 2 m Reviewed By : LF

1	29			ston - 00	4 and 005	Max Test Pit Depth Digger Type/Size Bucket Type/Size	: Bucket E	xca	vator		Reviewed B Latitud Longitud	e :	
Depth (m)	Material	Excavatab (Relative So is is e B	Harder (ale)	USCS Symbol	DES	CRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Blows	Penetrometer
	TS			ML	SILT with trace gr brown. Low plastic	avel and sand; greyish city.		>	D	Н		2 4	6 8 10 12
0.5 -					cobbles and silt: b	rse GRAVEL with trace rownish grey. Well ed. Sand, fine to coars							
- 1.0	ALLUVIUM			GW					M	MD-D			
- 1.5 - - - -													
2.0 -					Depth of Excavati Termination Cond	on: 2 m lition: Target depth	A						
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Sca	ıla Pe	met target d enetrometer a data reco	met	practi below	cal refusal 0.1 m depth)		Standing g			ter was r	not encountered		



Geotechnical Investigation Springston-Rolleston Road Rolleston

Client: Hughes Development Ltd Shear Vane No: Date : 19/01/17 Logged By: RP Max Test Pit Depth : 2 m Reviewed By : LF Digger Type/Size : Bucket Excavator Latitude :

		Exca	vatability						+	Buck					lod			ğ.		Sh	ear \	_	ude		ala P	enet	rom	et
Depth (m)	Material	Easier RleA	ive Scale	Š			С	DES	CR	IPT	101	١			Graphic Symbol	.	Water Level	Moisture Cond.	Consistency/ Density Index	U	ndrai ar St	ned reng nold	th	ВI: 2	ows 4	per 1		
-	TS			ML	SI Lo	ILT wi ow pla	th tra	ice s y [TC	and OPS0	and i	rootl	ets;	brow	n.	7 7. 7 7. 7 7.				F-St					•				
-				ML	SI pl	ILT wi asticit	th mi y. Sa	nor s	sand ine,	; gre poor	yish Iy gr	brov adec	wn. L d.	_OW				D	VSt-H								· · · · · · · · · · · · · · · · · · ·	_
0.5 - - - -	-				SI	andy f obbles ubrour aded.	; brov	wnisl	h gre	ey. W	/ell o	grade	ed,															
1.0 - - -	ALLUVIUM			GW														М										
1.5 - - - -	-																											
2.0 -				<u> </u>	D Te	epth o	f Exc ation	avat Cond	ion:	2 m n: Ta	rget	dep	th							_								
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Geotechnical Investigation Springston-Rolleston Road Rolleston Client : Hughes Development Ltd Shear Vane No :
Date : 19/01/17 Logged By : RP

Max Test Pit Depth : 2 m Reviewed By : LF
Digger Type/Size : Bucket Excavator Latitude :

_		Excavatabil (Relative Sc	lity ale)	Symbol			ymbol	le/	Cond.	ıcy/ idex	Shear Vane Undrained	Sca	la Per	netromet
Depth (m)	Material	Easier	Harder	USCS Sy	DESC	CRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Strength Peak/Remolded (kPa)		ows pe 4 6	er 100mr 8 10
_	TS			ML	SILT with trace sa Low plasticity [TOR	nd and rootlets; brown. PSOIL].	1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2			Н				•
- - 0.5 -				GW	and silt; greyish br subrounded. Sand	AVEL with some sand own. Well graded, , fine, poorly graded.			D	MD-D				
- - 1.0— - -	ALLUVIUM			GW	Sandy fine to coan cobbles; brownish subrounded. Sand graded.	se GRAVEL with trace grey. Well graded, , fine to coarse, well			M	MD-D				
- 1.5 - - -				Gvv					IVI					
- 2.0- -					Depth of Excavation Termination Condi	on: 2 m tion: Target depth	议							
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Geotechnical Investigation Springston-Rolleston Road Rolleston

Client: Hughes Development Ltd Shear Vane No: **Date**: 19/01/17 Logged By: RP Max Test Pit Depth : 2 m Reviewed By : LF

1	29	03.00	0.000	- 00	4 and 005	Digger Type/Size Bucket Type/Size			Tuto		Latitude Longitude					_
Depth (m)	Material	Excav (Relativ	ratability ve Scale) Harder Harder	USCS Symbol	DESC	CRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)		ala Pe ows p	oer 1		nm
_	TS			ML	SILT with trace sa Low plasticity [TO	and rootlets; brown PSOIL].				St		-	\			
-	-			ML	SILT with minor so plasticity. Sand, fin	and; greyish brown. Lo ne, poorly graded.	w		D	VSt-H					<u> </u>	_
- - 0.5 -				GW	Fine to coarse GF silt and trace cobb graded, subround medium, poorly gr	RAVEL with some sand oles; brownish grey. Wed. Sand, fine to aded.	, ,			MD-D						
- - 11.0 - - - - 11.5 - - -	ALLUVIUM			GW	cobbles; brownish	rse GRAVEL with trace grey. Well graded, I, fine to coarse, well			М	MD-D						
2.0					Depth of Excavation Termination Cond	on: 2 m ition: Target depth	, • (
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Geotechnical Investigation Springston-Rolleston Road
Rolleston

Client: Hughes Development Ltd Shear Vane No: **Date**: 19/01/17 Logged By : RP Max Test Pit Depth : 2 m Reviewed By : LF

1	29		Rolle 0.000		4 and 005	Max Test Pit Depth : Digger Type/Size : Bucket Type/Size :		xca	vator		Reviewed B Latitud Longitud	Э:	
Depth (m)	Material	Excavat (Relative	tability Scale) Larder Hacker	USCS Symbol	DES	CRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Scala Penetro Blows per 10	
<u>-</u>	TS		-	ML	SILT with trace sa Low plasticity [TO	and and rootlets; brown. PSOIL].		_	_	VSt		•	10 12
- 0.5 - - -				GW	and silt; greyish b	RAVEL with some sand rown. Well graded, d, fine, poorly graded.			D	MD-D			
1.0	ALLUVIUM			GW	cobbles; brownish	rse GRAVEL with trace a grey. Well graded, d, fine to coarse, well			M	MD-D			
2.0 -		- ! :			Depth of Excavati Termination Cond	on: 2 m lition: Target depth							
				- + + +									
Sca	la Pe	met targe enetrome	eter met	practi	cal refusal 0.3 m depth)		anding g			ter was r	not encountered		<u> </u>



Geotechnical Investigation Springston-Rolleston Road Rolleston 12903.000.000 - 021

Scala Penetrometer met practical refusal Standing groundwater was not encountered Client: Hughes Development Ltd Shear Vane No: Date: 07/06/17 Logged By: RP

Max Test Pit Depth : 2 m Reviewed By : LF Digger Type/Size : Bucket Excavator Latitude :

Longitude Bucket Type/Size : Excavatability (Relative Scale) Graphic Symbol Scala Penetrometer Moisture Cond. Symbol Shear Vane Consistency/ Density Index Water Level Undrained **DESCRIPTION** Depth (m) Shear Strength Material Blows per 100mm Peak/Remolded Harder nscs (Easier (kPa) 4 6 8 10 12 SILT with trace sand and rootlets; brown. TOPSOIL Low plasticity [TOPSOIL]. VS-S ML Silty fine to medium SAND; greyish brown. Poorly graded. VS-S SM 0.5 Sandy fine to coarse GRAVEL with some silt and trace cobbles; brownish grey. Well graded, subrounded. Sand, fine to medium, poorly graded. GW Sandy fine to coarse GRAVEL with minor cobbles. Well graded, subrounded. Sand, fine to coarse, well graded. MD-D 1.5 W GW 13/6/17 2.0 Depth of Excavation: 2 m Termination Condition: Practical refusal NZ MASTER DATA TEMPLATE.GDT GPJ TEST PITS. GEOSCIENCE TEST PIT LOG Excavator met target depth at 2.0 m depth.



Geotechnical Investigation Springston-Rolleston Road Rolleston 12903.000.000 - 021 Client : Hughes Development Ltd Shear Vane No :
Date : 07/06/17 Logged By : RP

Max Test Pit Depth : 2 m Reviewed By : LF
Digger Type/Size : Bucket Excavator Latitude :

Digger Type/Size : Bucket Excavator Latitude
Bucket Type/Size : Longitude

		12903.000	.000	- 021	Bucket Type/Size					Longitude) :	
Depth (m)	Material	Excavatability (Relative Scale)	Syn	DESC	CRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Blows	enetrometer per 100mm
-	TOPSOIL		ML	SILT with trace sa Low plasticity [TO	nd and rootlets; brown. PSOIL].	\(\frac{1}{12} \cdot \frac{1}{12}	_	VS-S		•		
0.5 -			ML	SILT with some sa plasticity. Sand, fir graded.	and; greyish brown. Low ne to medium, poorly				VSt-H			
-			GW	minor sand and tra	AVEL with some silt, ace cobbles; brownish subrounded. Sand, fine graded.			M	MD-D			<u>*</u> >>
1.0	ALLUVIUM			cobbles and trace	se GRAVEL with minor silt. Well graded, I, fine to coarse, well							
1.5 -	-		GW					W	MD-D			
2.0-				Depth of Excavation Termination Cond	on: 2 m ition: Practical refusal	1						
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Sca	ala P	or met target de enetrometer me g groundwater w	t practi	cal refusal			 	<u> </u>		+		



Geotechnical Investigation Springston-Rolleston Road Rolleston 12903.000.000 - 021

Client: Hughes Development Ltd Shear Vane No: Date : 07/06/17 Logged By : RP

Max Test Pit Depth : 2 m Reviewed By : LF Digger Type/Size : Bucket Excavator Latitude :

		129	03.0	000	.000	- 0	21						/Size									Lo	ngit	ude	:				
Depth (m)	Material	Easier (Rela	avatab tive S	y (ella) Harder Harder	USCS Symbol			D	ESC	RIP	TIO	N			Oronhio Oronhol	Grapnic Symbol	Water Level	Moisture Cond.	Consistency/	Density Index	Ur Shea Peak	ear \ ndrai ar St /Rer (kPa	ned reng nold				Pene per 6)mm
	TOPSOIL				ML	SIL	T with	h trac .ow p	ce sar lastic	nd, gr ity [T(avel a	and r OIL].	ootle	ts;	1/ · 3				S-F							•			
- - 0.5 - -						SIL	T with	h trad v. San	ce sar nd, fin	nd; gr ie, po	eyish orly g	i brov grade	vn. L d.	OW				М	F										
- - 1.0	ALLUVIUM				ML														St-V	'St									
- - 1.5 - - -	ALLI				GW	cob sub	bles	and to	race s	se GR silt. W , fine	ell g	radeo	d,			などなるとなる		w	MD-	-D									
2.0— -						Dep Ter	oth of mina	Exca tion C	avatio Condi	n: 2 n tion: F	n Practi	ical r	efusa	ıl		€													
	- + - + - +	- - - -	 		- - - - - - - - - - -	- -	 		- -	- + - - + -	 - -	 		- - - 	- - -	 	 	 	 -	— — — 	- - - - -		- + - + - +	- - - -	 	- - - 	 - - - -	- + -	- † - †
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Geotechnical Investigation Springston-Rolleston Road Rolleston 12903.000.000 - 021

Client: Hughes Development Ltd Shear Vane No: Date : 07/06/17 Logged By : RP

Max Test Pit Depth : 2 m Reviewed By : LF Digger Type/Size : Bucket Excavator Latitude :

		2903.0)00.	000	- 021	Bucket Type/Size	:				Longitud	e :			
Depth (m) Material	(Re	cavatak elative S	Harder (ale)	USCS Symbol	DES	CRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength Peak/Remolded (kPa)	Blo	ala Perows pe	er 100	0mn
TOPSOIL			<u>+</u>	ML	SILT with trace sa Low plasticity [TO	and and rootlets; brown PSOIL].		\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	V	VS-S		2	4 6	8	10
0.5 -				GW	sand and trace co	RAVEL with some silt, abbles; brownish grey. ounded. Sand, fine to aded.			М	MD-D					
- 					Sandy fine to coa cobbles and trace	rse GRAVEL with mind	or								
1.5 -				GW	subrounded. Sand graded.	d, fine to coarse, well			w	MD-D					
2.0					Depth of Excavati Termination Cond	on: 2 m lition: Practical refusal									
_ _				-				-	 				- - - - - -		- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
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Geotechnical Investigation Springston-Rolleston Road Rolleston 12903.000.000 - 021

Client: Hughes Development Ltd Shear Vane No: Date : 07/06/17 Logged By : RP Max Test Pit Depth : 2 m Reviewed By : LF Latitude :

Digger Type/Size : Bucket Excavator

		129	03.0)00.	.000	- 0	21				ucke			Size	:								Lo	ongi	itude	:					
Depth (m)	Material	Easier (Relati	avatab tive So	Harder Harder	USCS Symbol			D)ES	CRII	PTI	ON	1			-	Graphic Symbol	Water Level	Moisture Cond.	Consistency/	Jensity Index		near Indra ear S k/Re (kP	aine tren mol	d		Blow	Per s pe	er 10		ın
<u>-</u>	TOPSOIL			-	ML			th tra				ootle	ets;	brov	vn.		<u> </u>			s						•		<u> </u>	<u> </u>	10	-
-).5 - - -					GW	sar We	nd an ell gra	coars d traded, n, poo	ce co subr	bbles ound	s; br led.	own	ish (grey		けるいろいく			М	MD	-D										
- 1.0 - -	ALLUVIUM					col sul	obles	ine to and i	trace	silt. \	Wel	I gra	aded	,			XXX														
- 1.5 - - -					GW														W	MD	-D										
- 2.0						De Te	pth o	f Exc	avati Cond	on: 2 lition:	! m : Pra	actic	al re	efusa	al		Ş														
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Geotechnical Investigation Springston-Rolleston Road Rolleston 12903 000 000 - 021

Client: Hughes Development Ltd Shear Vane No: Date : 07/06/17 $\textbf{Logged By}: \mathsf{RP}$

Max Test Pit Depth : 2 m Reviewed By : LF Digger Type/Size : Bucket Excavator Latitude :

_		Exca (Rela	avatabi tive Sc	ility cale)	Symbol			ymbol	<u>e</u>	Cond.	ıcy/ idex	Shear Vane Undrained	Scala	Penetror	met
Depth (m)	Material	Easier		Harder	USCS Sy	DES	CRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Strength Peak/Remolded (kPa)	Blov 2 4	vs per 100	0mr 10
	TOPSOIL				ML	SILT with trace sa Low plasticity [TO	and and rootlets; brown PSOIL].	1. $\frac{1}{2^{\lambda}} \frac{1}{1_{\lambda'}} \cdot \frac{1}{2^{\lambda}} \frac{1}{1_{\lambda'}}$ $\frac{1}{2^{\lambda}} \cdot \frac{1}{2^{\lambda}} \cdot \frac{1}{2^{\lambda}} \frac{1}{1_{\lambda'}}$ $\frac{1}{2^{\lambda}} \cdot \frac{1}{2^{\lambda}} \cdot \frac{1}{2^{\lambda}} \frac{1}{2^{\lambda}}$			S-F		•		
-					ML	SILT with some s plasticity. Sand, fi graded.	and; greyish brown. Lo ne to medium, poorly	w		М	F-H				
0.5 - - - -					GW	sand and trace co	RAVEL with some silt, abbles; brownish grey. ounded. Sand, fine to raded.				MD-D			•	
- 1.0— - -	ALLUVIUM					cobbles and trace	rse GRAVEL with mind silt. Well graded, d, fine to coarse, well	or							
- 1.5 - - -	-				GW					W	MD-D				
2.0-						Depth of Excavati	on: 2 m lition: Practical refusal	XX.							
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APPENDIX 3:

Hand Auger Borehole Logs





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

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

	290	03.0	00.000 - 004 and 005	Hole De Hole Diame						gitud				
Depth (m)	Material	USCS Symbol	DESCRIPTION	I	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	2	Blow	s per	tromet 100mr 8 10	
_	TOPSOIL	ML	SILT with trace rootlets; brown. Lo		17 - 24 - 17 17 - 24 - 17 17 - 24 - 17 17 - 24 - 17	1)		VSt			•			
_	ALLUVIUM	ML	SILT; greyish brown. Low plasticit				D	Н						
0.5 –			End of Hole Depth: 0.4 m Termination Condition: Practical n	efusal										
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1.0-														
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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

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

			00.000 - 004 and 005	Hole Diamet	ter : 5	0 mr	n		Lor	ngitud	ᡛ.			
		loqu			/mbol	<u> </u>	ond.	,xy tex	Shear Vane		Scala	a Pene	etrome	ter
Depth (m)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Undrained Shear Strength (kPa) Peak/Remolded	2	Blov 4	vs per	100m 8 1	m 0 12
_	TOPSOIL	ML	SILT with trace rootlets; brown. Lo [TOPSOIL].		$\frac{1}{2^{4}} \frac{1}{1} \frac{1}{2^{4}} \cdot \frac{1}{2^{4}} $			St			•			
_	ALLUVIUM	ML	SILT; greyish brown. Low plasticity				D	Н						
- -			End of Hole Depth: 0.4 m Termination Condition: Practical re	efusal										
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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

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

	903.0	000.000 - 004 and 005	Hole Diamet	er : 50		n			gitude :			
Depth (m)	Material USCS Symbol	DESCRIPTION	ı	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		ws per	100mr	
	JIOPSOIL WF	SILT with trace rootlets; brown. Lo	<i>i.</i>	\(\frac{1}{2} \cdot \frac{1}{2}		St		•				
	ALLUVIUM TM	SILT; greyish brown. Low plasticit	y.			D	St-H					· · · · · · · · · · · · · · · · · · ·
_		End of Hole Depth: 0.3 m Termination Condition: Practical re	efusal									
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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 :

TOPSOIL Material	USCS Symbol	DESCRIPTION SILT with trace rootlets; brown. Lo	Graphie	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded			s per	tromet	
SOIL		SILT with trace rootlets; brown. Lo	w placticity		Σ	ပိပိ		2	4	6	8 10	_1:
TOT	ML	[TOPSOIL].	w plasticity	1 45		St						
ALLUVIUM	ML	SILT; greyish brown. Low plasticity	′.		D	Н				•		
		End of Hole Depth: 0.4 m Termination Condition: Practical re	fusal							:		
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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

Shear Vane No: $\textbf{Logged By}: \mathsf{EG}$ Reviewed By: LF Latitude :

			n		Lon					
lode	loqu.	<u> </u>	ond.	ex (Shear Vane		Scala	Pene	etromet	er
DESCRIPTION SSOSO	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Undrained Shear Strength (kPa) Peak/Remolded	2	Blows	s per	100mr 8 10	m) 12
SILT with trace rootlets; brown. Low [TOPSOIL].	plasticity			St			•			
SILT; greyish brown. Low plasticity. ML			D	St-H						
End of Hole Depth: 0.4 m Termination Condition: Practical refu	ısal									
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ger ma	et practical refusal at 0.4 m depth on	et practical refusal at 0.4 m depth on inferred gravel.	et practical refusal at 0.4 m denth on inferred gravel	at practical refusal at 0.4 m depth on inferred gravel	et practical refusal at 0.4 m depth on inferred gravel.	et practical refusal at 0.4 m depth on inferred gravel.	et practical refusal at 0.4 m depth on inferred gravel.	et practical refusal at 0.4 m depth on inferred gravel.	et practical refusal at 0.4 m depth on inferred gravel.	et practical refusal at 0.4 m depth on inferred gravel.



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

Shear Vane No : $\textbf{Logged By}: \mathsf{EG}$ Reviewed By : LF Latitude :

1	129	03.0	00.000 - 004 and 005	Hole Diame			n		Lon	gitude :		
Depth (m)	Material	USCS Symbol	DESCRIPTION	I	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	Blows	Penetrom per 100n 6 8 1	
	TOPSOIL	ML	SILT with trace rootlets; brown. Lo	ow plasticity				St-H				•
	ALLUVIUM	ML	SILT with trace sand; greyish brov plasticity.	vn. Low	X. X2.		D	VSt-H				, , , , , , , , , , , , , , , , , , , ,
1.0	-		End of Hole Depth: 1 m Termination Condition: Practical re	efusal								
- 1.5 -	-											



Latitude :

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

Shear Vane No: Client: Hughes Development Ltd Client Ref. : N/A Logged By : EG Date : 18/01/17 Reviewed By: LF Hole Depth: 0.6 m

Longitude : Hole Diameter: 50 mm Graphic Symbol **JSCS Symbol** Moisture Cond. Consistency/ Density Index Shear Vane Undrained Shear Scala Penetrometer Water Level Depth (m) **DESCRIPTION** Material Strength (kPa) Peak/Remolded Blows per 100mm 6 8 10 12 SILT with trace sand and rootlets; brown. Low plasticity [TOPSOIL]. TOPSOIL F-VSt ML D SILT with trace sand; brownish grey with orange mottles. Low plasticity. >> Н ML0.5 End of Hole Depth: 0.6 m Termination Condition: Practical refusal 1.0-GEOSCIENCE HAND AUGER HAND AUGERS.GPJ NZ DATA TEMPLATE 2.GDT 25/1/17 1.5

Hand auger met practical refusal at 0.6 m depth on inferred gravel.

Scala Penetrometer met practical refusal at 0.4 m depth.



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: $\textbf{Logged By}: \mathsf{EG}$ Reviewed By: LF Latitude : Longitude :

	_		00.000 - 004 and 005	Hole Diamet	ter:5	0 mr	n		Lor	gitud	e :			
Depth (m)	Material	USCS Symbol	DESCRIPTION	l	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	2		s per	trome 100mi 8 10	
_	TOPSOIL	ML	SILT with trace sand and rootlets; plasticity [TOPSOIL].	brown. Low	\(\frac{1}{2}\), \(\frac{1}\), \(\frac{1}{2}\), \(\frac{1}\), \(\frac{1}{2			VSt-H					•	
_	ALLUVIUM	ML	SILT; brownish grey. Low plasticity	<i>y.</i>			D	Н						
-			End of Hole Depth: 0.4 m Termination Condition: Practical re	efusal										
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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

Shear Vane No : $\textbf{Logged By}: \mathsf{EG}$ Reviewed By : LF Latitude :

		J3.U	00.000 - 004 and 005	Hole Diameter				Lon	gitud				
Depth (m)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Scala Blows		etrome	
De	Ma	Sn	SILT with trace gravel, sand and re		Š × × × × × × × × × × × × × × × × × × ×	Σ	00		2	4	6	8 10) 1
			SILT with trace gravel, sand and re Low plasticity [TOPSOIL].	<u>17. · x</u>	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\								
_	TOPSOIL			<u>//.</u> : . <u>.</u>	<u>· · · · · · · · · · · · · · · · · · · </u>	D	St-H			.\			
_	TOP	ML		\(\frac{\sqrt{1}}{2}\).	· <u>' ' ' '</u>		Ot-11			7			
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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

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

				Hole Diame	eter : 5	0 mn	n		Lor	ngitud	le :				
		loqu		•	mbol	el	ond.	.y/ dex	Shear Vane		Scala	a Pe	netr	omet	er
Depth (m)	ərial	USCS Symbol	DESCRIPTION	J	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Undrained Shear Strength (kPa) Peak/Remolded		Blov	vs ne	er 10	00mn	n
Dep	Material	nsc			Grag	Wat	Mois	Con	- Garar torriordea	2			8		12
			SILT with trace gravel, sand and r Low plasticity [TOPSOIL].	ootlets; brown.	7. 31.1										
_	OIL				<u> </u>						•	:			
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_	4		SILT with trace sand; brownish gr plasticity.	ey. Low	<u> </u>			Н					•		
_		ML													
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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

Shear Vane No: $\textbf{Logged By}: \mathsf{EG}$ Reviewed By : LF Latitude :

	1290	03.0	00.000 - 004 and 005	Hole Diameter	: 50 mi				gitud				
Depth (m)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Scala Blows		romete	
Dep	Mat	OSO			Wat	Mois	Con		2		6 8		12
-	TOPSOIL	ML	SILT with trace sand, gravel and re Low plasticity [TOPSOIL].	potlets; brown.		D	VSt-H			•	•		·····/
_			End of Hole Depth: 0.3 m Termination Condition: Practical re	efusal	<u>'/1</u>								
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Geotechnical Investigation Springston-Rolleston Road Rolleston 12903.000.000 - 004 and 005

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

	1:	290	03.0	00.000 - 004 and 005	Hole Diame						gitud				
Denth (m)	Jepul (III)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	2		vs per	tromet 100mr 8 10	n
		TOPSOIL	ML	SILT with trace sand, gravel and re Low plasticity [TOPSOIL].	potlets; brown.				St			•			
	-	ALLUVIUM	ML	SILT with minor sand; greyish brown plasticity. Sand, fine.	wn. Low			D	VSt						
0.8	5 -			End of Hole Depth: 0.4 m Termination Condition: Practical re	fusal								•		**
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1.0	0-														
PJ NZ DATA TEMPLATE	_														
HAND AUGER HAND AUGERS.GPJ NZ DATA TEMPLATE Z.GDI 25/1/1/	5 -														

Hand auger met practical refusal at 0.4 m depth on inferred gravel. Scala Penetrometer met practical refusal at 0.6 m depth.



Client: Hughes Development Ltd

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

Client Ref. : N/A Date : 19/01/17 Hole Depth : 0.4 m

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

	290	03.0	00.000 - 004 and 005	Hole Diame	eter : 5	0 mr	n	Ī	Lor	gitude	:		
Depth (m)	Material	USCS Symbol	DESCRIPTION	I	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Scala Pe Blows p 4 6	er 100	_
	TOPSOIL	ML	SILT with trace sand, gravel and r Low plasticity [TOPSOIL].	ootlets; brown.	777. 4 77. 77. 77. 77. 77. 77. 77. 77.	2		St			•		
_	ALLUVIUM	ML	SILT with minor sand; greyish bro plasticity. Sand, fine.	wn. Low			D	VSt-H					
_			End of Hole Depth: 0.4 m Termination Condition: Practical re	efusal				L					: ; : :
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Latitude :

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

Shear Vane No: Client: Hughes Development Ltd Client Ref. : N/A Logged By : RP Date : 19/01/17 Reviewed By: LF Hole Depth: 0.3 m Hole Diameter 50 mm

		_			<u> </u>		ਰਂ							
Depth (m)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded				etrometer 100mm	•
De	Ma	SN				Wa	Mo	වීම්		2	4	6	8 10	12
_	TOPSOIL	ML	SILT with trace sand, gravel and ro Low plasticity [TOPSOIL].	ootlets; brown.	7. 3.1. 1. 3.1.			н					•	
_	ALLUVIUM	ML	SILT with minor sand; greyish brown plasticity. Sand, fine, poorly graded	vn. Low d.			D	Н						\\
			End of Hole Depth: 0.3 m Termination Condition: Practical re	efusal										
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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

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

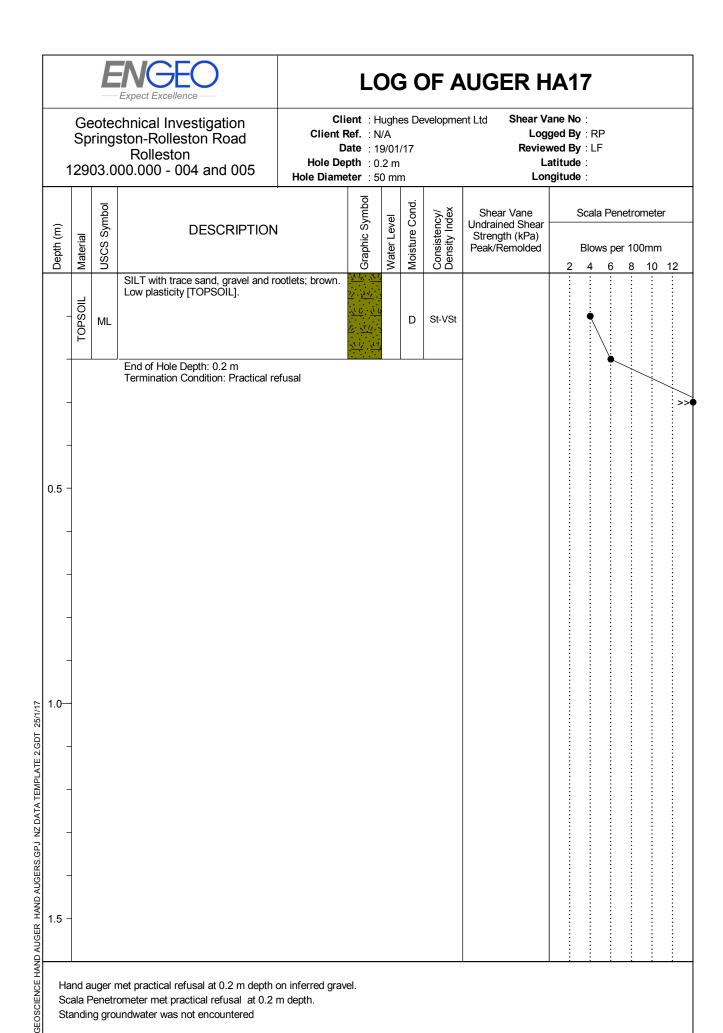
1	1290	J3.U	100.000 - 004 and 005	Hole Diame	ter : 5	50 mr	n		Lor	ngitude :
Depth (m)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	Scala Penetrometer Blows per 100mm
Dep	TOPSOIL Mate	DSN ML	SILT with trace sand, gravel and re Low plasticity [TOPSOIL].	potlets; brown.		Wat	Mois	Cou F-St		2 4 6 8 10 12
- 0.5	ALLUVIUM	ML	SILT with minor sand; greyish brouplasticity. Sand, fine, poorly graded	d. m depth.			D	Н	UtTP	
-			Sand, fine to medium, poorly grade End of Hole Depth: 0.7 m Termination Condition: Practical re							
- 1.0 -										
- 1.5 -										



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

Shear Vane No: Client: Hughes Development Ltd Client Ref. : N/A Logged By : RP **Date**: 19/01/17 Reviewed By: LF Hole Depth: 0.3 m Latitude : Hole Diameter : 50 mm 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			mete 0mm	
De	TOPSOIL Ma	SN ML	SILT with trace sand, gravel and roo Low plasticity [TOPSOIL].	lets; brown.	Ma M	Mo	S a F		2	4	6	8	10	12
_	ALLUVIUM TO	ML	SILT with minor sand; greyish brown plasticity. Sand, fine.	. Low		D	VSt-H							,
_			End of Hole Depth: 0.3 m Termination Condition: Practical refu	sal		I								
0.5 -														
_														
_														
1.0 -														
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-														
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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

1.5



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

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

	290	03.0	00.000 - 004 and 005	Hole Diame				Г		gitud				
Depth (m)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	2	Scala Blows	s per	100mr	
_	TOPSOIL	ML	SILT with trace sand, gravel and r Low plasticity [TOPSOIL].		717 7 77 7 7 77 7 7 77 7 7 74 74 7	17		VSt			•			
_	ALLUVIUM	ML	SILT with some sand; greyish broplasticity. Sand, fine, poorly grade	vn. Low d.			D	н						\(\)
0.5 -	-		End of Hole Depth: 0.4 m Termination Condition: Practical re	efusal										
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Geotechnical Investigation Springston-Rolleston Road Rolleston 12903.000.000 - 004 and 005

Shear Vane No: Client: Hughes Development Ltd Client Ref. : N/A Logged By: RP Date : 19/01/17 Reviewed By : LF Hole Depth: 0.3 m Latitude : Longitude : Hole Diameter : 50 mm

	290	3.0	00.000 - 004 and 005	Hole Diamet	ter : 5	0 mn	n		Lor	gitud	e :			
Depth (m)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Blow	s per	100m	m
	,	⊃ ML	SILT with trace sand, gravel and ro Low plasticity [TOPSOIL].	potlets; brown.	(D)	>	N	VSt		2	4	6	8 10	0 1
	ALLUVIUM	SP	Fine to medium SAND with some sbrown. Poorly graded.	silt; greyish			D	D				•	\.	
			End of Hole Depth: 0.3 m Termination Condition: Practical re	rfusal	er al ergae	1								
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1.5 -														



Geotechnical Investigation Springston-Rolleston Road Rolleston 12903 000 000

Client: Hughes Development Ltd

Shear Vane No :

Client Ref. :

 $\textbf{Logged By}: \mathsf{EG}$ Reviewed By : LF

Date : 12/06/17 Hole Depth : 0.3 m

Latitude :

		129	03.000.000 - 021	Hole Diame				Γ		gitude				
Depth (m)	Material	USCS Symbol	DESCRIPTION	I	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		cala Po		ometer Omm	
	TOPSOIL	ML	SILT with minor sand, trace grave brown. Low plasticity. Sand, fine, [TOPSOIL].	l and rootlets; poorly graded	6 37 37 37 37 37 37 37 37 37 37 37 37 37	M:	M	S-F		2	4 6	8	10 4	12
- 0.5 - -	-		End of Hole Depth: 0.3 m Termination Condition: Practical re	efusal									•	······································
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- 1.0— -	_													
-														
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Geotechnical Investigation Springston-Rolleston Road Rolleston 12903.000.000 - 021

Client: Hughes Development Ltd Client Ref. :

Shear Vane No : $\textbf{Logged By}: \mathsf{EG}$ Reviewed By: LF

Date: 12/06/17 Hole Depth : 0.5 m

Latitude :

		129	03.000.000 - 021	Hole Diame	eter : 5	0 mr	n	I	Lor	gitude				
Depth (m)	Material	USCS Symbol	DESCRIPTION	I	Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded				tromet	
-	TOPSOIL	ML	SILT with minor gravel, trace sand brown. Low plasticity. Gravel, fine poorly graded [TOPSOIL].	and rootlets; to medium,	6 4 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7		M	S-F		2	4	6	8 10) 12
- - 0.5 -	ALLUVIUM	ML	SILT with minor sand; brownish g plasticity.	rey. Low			w	S-F	υτρ					\.\.\.\.\.
- - - 1.0—														
-	-													



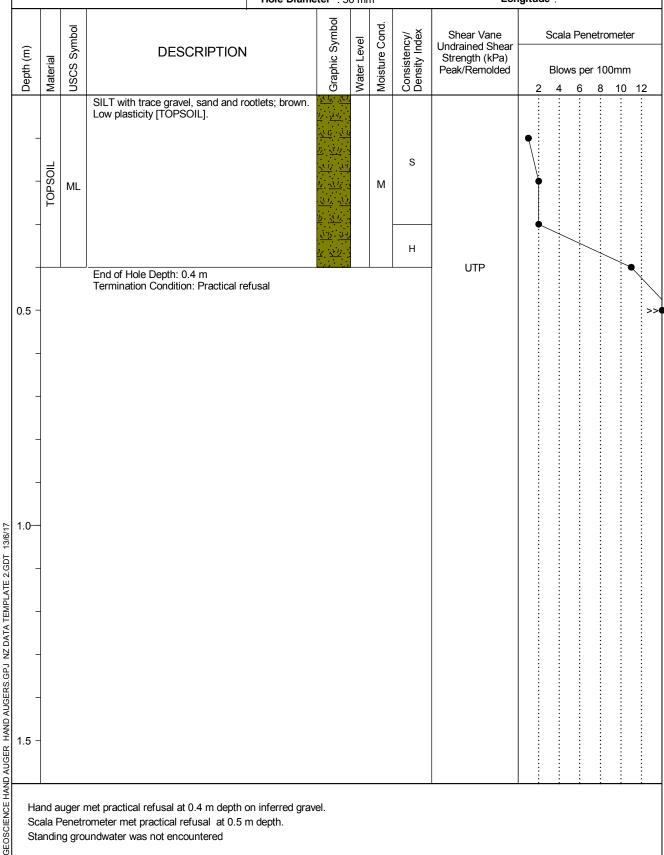
Geotechnical Investigation Springston-Rolleston Road Rolleston 12903.000.000 - 021

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 :



Hand auger met practical refusal at 0.4 m depth on inferred gravel.

Scala Penetrometer met practical refusal at 0.5 m depth.



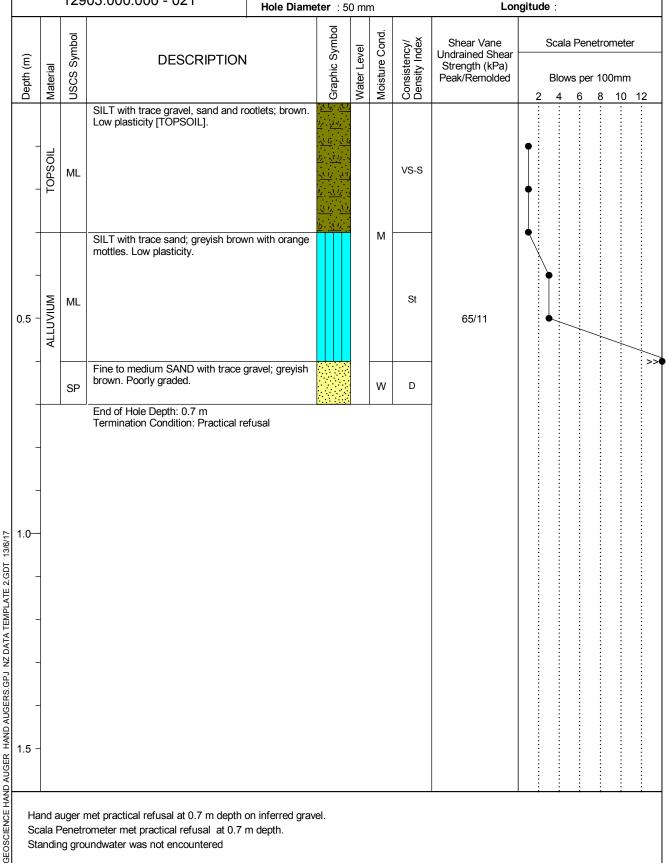
Geotechnical Investigation Springston-Rolleston Road Rolleston 12903.000.000 - 021

Client: Hughes Development Ltd Client Ref. :

Date : 12/06/17 Hole Depth: 0.7 m

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

Latitude : Longitude :



Hand auger met practical refusal at 0.7 m depth on inferred gravel.

Scala Penetrometer met practical refusal at 0.7 m depth.



Geotechnical Investigation Springston-Rolleston Road Rolleston 12903.000.000 - 021

Client: Hughes Development Ltd Client Ref. :

Shear Vane No : $\textbf{Logged By}: \mathsf{EG}$

Date: 12/06/17

Reviewed By: LF Latitude :

Hole Depth : 0.3 m

		129	03.000.000 - 021	Hole Diame	eter :5		n		Lor	gitu	de :				
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					
Dep	Mat	nsc				Wat		Con Den	1 can terrorded	2) 12
-	TOPSOIL	ML	SILT with trace sand, gravel and re Low plasticity [TOPSOIL].	ootlets; brown.			М	S-St							
			End of Hole Depth: 0.3 m Termination Condition: Practical re	afueal						:	:	<u></u>			:
			Termination Condition. Tractical re	iusai							i			\ 	\. ::
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Geotechnical Investigation Springston-Rolleston Road
Rolleston Client: Hughes Development Ltd

Client Ref. :

Date : 12/06/17 Hole Depth : 0.3 m

Shear Vane No :

 $\textbf{Logged By}: \mathsf{EG}$ Reviewed By : LF Latitude :

				Hole Diam	101 . 3	U 1111			Lor	Ē				
Depth (m)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Blo	la Per ws pe	er 100	
-	TOPSOIL	ח ML	SILT with minor sand and trace ro Low plasticity [TOPSOIL].	otlets; brown.	\(\frac{1}{2}\), \(\frac{1}\), \(\frac{1}{2}\), \(\frac{1}\), \(\frac{1}{2		M	S-F		•	2 4	6	8	12
_			End of Hole Depth: 0.3 m Termination Condition: Practical re	efusal	<u> </u>	<u> </u>		Н					\	····/·····
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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



	Water			Formation
Scale(m)	Level	Depth(m)	Full Drillers Description	Code
5		00000	Small medium gravel traces clay	SP-RI
10		0:0:0:0 0:0:0:0 0:0:0:0 0:0:0:0	Small medium gravel, sands C C C C C C C C C C C C C C C C C C	Ri
15		<u> </u>	Very tight sand and clay sealed off	RI
		15.40m 0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0:0	Small medium gravel sandy water back O'.	Ri
20): 0: 0 0: 0: 0 0: 0: 0		
		26.50m	Layer of orange silt	BR
		28.00m 0000000	Small medium gravel Brown stain Small medium gravel very sandy	BR
30			0'. 0'. 0'.	
35)::0::0: 0::0::0: 0::0::0:	.; .; .; .; .; .;	
⁴⁰ H		41.00m 41.50m	Layer of small gravel claybound very	LI
Н		0:0::0	tight	
45		46.20m	Medium small gravel well washed small amount sand	LI

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

Water

Borelog Depth: 27.4 m Drill Date: 01-Apr-1975



Formation

Scale(m)	Level	Depth(m)	Full Drillers Description	Code
П		0.30m		Topsoil	SP
5		0.30m	00000000 00000000 00000000 00000000 0000	Good clean Grey gravel	SP-RI
		9.10m	000000000		
		0.10	000000	Tight claybound Brown gravel	RI
10			000000		
Н		11.90m	000000000	Loose Brown gravel	RI
		12.50m	200000000	Hard compact big Brown gravel	RI
H		14.30m	000000000		RI
15		15.50m	200000000000 0000000000000000000000000	Loose small gravel	
ľ		17.10m	00000000	Hard clean gravel	RI
20		20.10m	000000 000000 000000 000000	Big rough hard Brown gravel	RI
25			00=000 000000 0=0000 000000 000000 000000	Loose Yellow claywash gravel	RI
		25.60m	000000	Big stones	BR?
Ī		26.20m	00=000	Loose claywash gravel	BR?
Ī		27.40m	000000		