

301 & 303 BUCKLAND RD

GEOTECHNICAL REPORT - FOR LAND USE CHANGE

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1. Introduction

1.1 General

This Geotechnical Interpretative Report (GIR) has been prepared to provide geotechnical advice and recommendations to support the change in land use of 301 & 303 Buckland Road, Pukekohe. This report identifies any geohazards present at the site.

It is understood that the site is proposed to be re-zoned from Future Urban Zone to Business – General Business Zone (BGBZ). This geotechnical report is intended to support the Private Plan Change Request (PPR). It provides a preliminary assessment of the ground conditions and the key geotechnical considerations that could affect likely future development based on the rezoning and anticipated development types. Further investigation and analyses will be required to support detailed design of future buildings and infrastructure on the site.

1.2 Site Description

The proposed PPR is for two neighbouring properties, located at No. 301 and 303 Buckland Rd, Buckland. The site is presented in Figure 1-1 below and on Figure 925-1-001 in Appendix A. Both sites are currently used as pastoral land and have an approximate combined area of 7.86 HA. Each property has single storey dwellings with associated sheds and garages. Topography at the site slopes gently to moderately (~5-10°) toward the northeast from up to RL 86m at the western and southern boundaries down to RL 62m along Buckland Road in the east. There is a small gully situated near the centre of 301 Buckland Road. At the back of 303 Buckland Road, to the south, the topography drops away steeply.

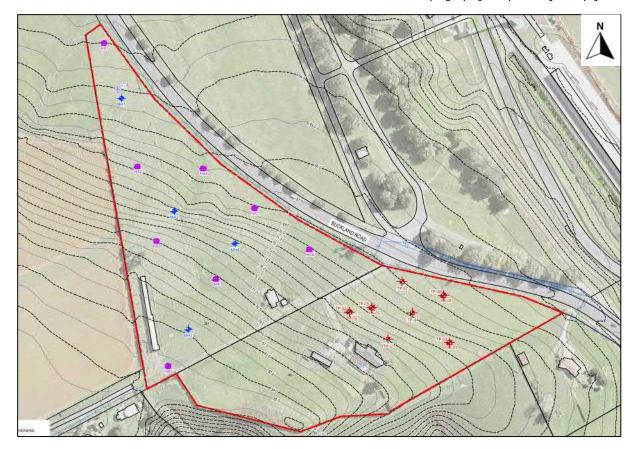


Figure 1-1: 301 – 303 Buckland Road, Pukekohe.

1.3 Proposed Development

We have not been provided any details of any future proposed development plans at the site, however we expect any new development will comprise light industrial and/or commercial buildings, similar to those located ~200m north on Manakau Road.



2. Published Geology

Based on a preliminary review of the published geological maps (see below) for the area, historical geotechnical investigation data from the New Zealand Geotechnical Database (NZGD), the sites are underlain by fine grained and coarse grained basalt and basanite rock associated with the Kerikeri Volcanic Group of the South Auckland Volcanic Field (SAVF) (Red in Figure 2-1 below). Based on the investigation data available for the sites and our knowledge of the local geology, the rock is overlain by a thick mantle of weathered ash / tuff and gravelly soils also from the AVF (light pink). Holocene river deposits (off white) are located directly north-east of the site.

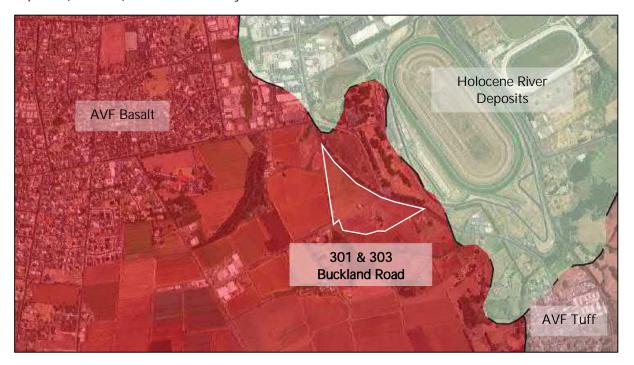


Figure 2-1: Geology of the Buckland area¹

¹ GNS Science. New Zealand Geology Web Map. 1:250K. https://data.gns.cri.nz/geology/

3. Geotechnical Investigations

3.1 Historical Investigations

A historical investigation has been carried out at each of the properties and referenced as part of this report. The first by Lander Geotechnical at 301 Buckland Road in January 2018 comprising:

- 9 Hand Auger Boreholes (HA) to depths up to 5.0m;
- 4 Machine Boreholes (MH) to a depth of 10.5m; and
- 1 Falling Head Percolation Test to 2.5m.

The results of this investigation are outlined in the Lander Geotechnical Investigation Report dated 23 July 2018².

Subsequently, an investigation was carried out by Initia at 303 Buckland Road on 16 and 23 October 2020. The investigation consisted of 7 No. Test Pits and 4 No. Hand Auger Boreholes to depths of between 2 m to 5 m. The results of this investigation are outlined in the Initia Geotechnical Assessment dated December 2020³.

A summary of the investigations is presented in Table 3-1 and Table 3-2 below. All investigation locations are presented on Figure 925-1-001 in Appendix A, and investigation logs are presented in Appendix B and Appendix C.

Table 3-1 - Summary of Lander Investigations

Investigation	Investigation Type	Coordinate	es (NZTM) ¹	Ground	Termination
ID		Easting (mE)	Northing (mN)	Surface Elevation ² (m RL)	Depth (m BGL)
HA01	Hand Auger Borehole	1769638	5879390	62.0	5.0
HA02	Hand Auger Borehole	1769669	5879265	69.8	5.0
HA03	Hand Auger Borehole	1769687	5879189	78.0	5.0
HA04	Hand Auger Borehole	1769736	5879261	67.0	0.5
HA05	Hand Auger Borehole	1769697	5879061	85.3	5.0
HA06	Hand Auger Borehole	1769747	5879149	78.2	5.0
HA07	Hand Auger Borehole	1769788	5879220	68.3	5.0
HA08	Hand Auger Borehole	1769843	5879177	70.3	5.0
P1	Falling Head Percolation Test	1769651	5879343	64.1	2.5
MH01	Machine Borehole	1769654	5879334	64.5	10.5
MH02	Machine Borehole	1769706	5879218	72.5	10.5
MH03	Machine Borehole	1769718	5879099	83.7	10.5
MH04	Machine Borehole	1769767	5879185	74.5	10.5

Note 1: Co-ordinate system – NZTM 2000. Test location coordinates are determined via hand-held GPS Survey, accuracy +/- 0.5m).

Note 2: Datum – AUCKHT 1946. Ground surface elevations are based on interpretation from Auckland Council Contours and are expected to be accurate + or – 0.5m.

³ Initia. Geotechnical Assessment. Proposed Industrial Yard Development – 303 Buckland Road, Pukekohe. Ref: P-000925 Rev 2. Dated December 2020.



² Lander Geotechnical. Geotechnical Investigation Report. 301 Buckland Road, Pukekohe. Ref: J00858. Dated 23 July 2018

Table 3-2 - Summary of Initia Investigations

Investigation	Investigation Type	Coordinate	es (NZTM) ¹	Ground	Termination
ID		Easting (mE)	Northing (mN)	Surface Elevation ² (m RL)	Depth (m BGL)
TP-01	Test Pit	1769921	5879085	74.0	2.6
TP-02	Test Pit	1769882	5879113	73.0	2.0
TP-03	Test Pit	1769983	5879080	71.0	5.0
TP-04	Test Pit	1769946	5879111	69.5	5.0
TP-05	Test Pit	1769905	5879117	71.5	5.0
TP-06	Test Pit	1769978	5879128	67.0	2.0
TP-07	Test Pit	1769936	5879143	68.0	2.0
HA-02	Hand Auger Borehole	1769882	5879113	73.0	4.0
HA-03	Hand Auger Borehole	1769983	5879080	71.0	5.0
HA-05	Hand Auger Borehole	1769905	5879117	71.5	5.0
HA-06	Hand Auger Borehole	1769978	5879128	67.0	4.0

Note 1: Co-ordinate system – NZTM 2000. Test location coordinates are determined via hand-held GPS Survey, accuracy +/- 0.5m).

Note 2: Datum – AUCKHT 1946. Ground surface elevations are based on interpretation from Auckland Council Contours and are expected to be accurate + or – 0.5m.

3.2 Laboratory Testing

The Lander investigation carried out laboratory testing on two samples taken from HA01 and HA05. Initia testing comprised bulk soil samples taken from TP-03, TP-04 and TP-05.

Table 3-3 and Table 3-4 below summarises the results from the laboratory testing undertaken at the site, test results are attached in Appendix D and Appendix E.

Table 3-3: Lander Geotechnical Laboratory Testing Summary

Sample Location	Depth interval (mBGL)	Liquid Limit	Plastic limit	Linear Shrinkage	Liquidity Index	Plasticity Index	Moisture Content (%)
HA01	1.5 - 2.0	104	74	21	0.2	30	79.1
HA05	1.5 – 2.1	114	80	24	-0.2	34	72.2

Table 3-4: Initia Laboratory Testing Summary

Sample Location	Depth interval (mBGL)	Allophane Content	Max Dry Density (t/m3)	Natural water content (%)	Optimum water content (%)	Liquid Limit	Plastic limit	Plasticity Index
TP-05	0.0 - 0.5	<5%		44.9				
TP-05	1.0 – 1.5	<5%	0.99	64.5	60.0			
TP-03	3.0 - 4.0		1.16	65.3	45.0			
TP-04	3.5 - 4.5			84.1		111	82	29
TP-05	3.5 - 4.5			79.9		93	70	23



4. Subsurface Conditions

4.1 General

The interpreted geotechnical model for the site is outlined below. The geotechnical investigations undertaken, and our understanding of the site geology, forms the basis of the recommendations and opinions presented within this report. The nature and continuity of the subsoils away from the investigation locations are inferred and it must be appreciated that the actual conditions may vary from the assumed model.

4.2 Soil Units

Based on a review of available geotechnical information the underlying geological conditions generally comprise:

- Topsoil;
- Non engineered fill;
- South Auckland Volcanic Field Ash

A summary of the geotechnical units identified beneath the site is presented in Table 4-1 below.

4.2.1 Topsoil

Topsoil was encountered at all investigation locations, with a thickness between 100 mm and 500 mm

4.2.2 Fill

Localised areas of fill were encountered at the 301 Buckland Road property in HA05, HA06, HA07 and P1 during the Lander investigation. The fill was typically a brown and orange/brown clayey silt, very stiff and moist, with a low plasticity. The fill was typically between 100mm and 600mm thick.

The fill is likely reworked ground from historical horticultural activities at the site.

4.2.3 South Auckland Volcanic Field

Weathered ash deposits from the South Auckland Volcanic Field were encountered in all the investigations. This typically comprised an orange/brown, yellow/brown or red/brown clayey silt, with low to high plasticity. Shear strengths ranged between 80 and 205+ kPa indicating stiff to hard soil, and SPT 'N' values were typically around 5 but ranged between 1 and 19.

Localised areas of firm and sensitive soils were encountered, typically between 4.5m and 9.0m within the machine boreholes. These shear strength readings and sensitivity observations may have been affected by drilling processes, therefore may be conservative.

Lab testing of the upper soils (TP-05, 0.0 - 1.5 m bgl) resulted in an allophane contents of less than 5%, however, testing of the deeper soils (TP-04 & TP-05, 3.5 - 4.5 m bgl) gave high liquid and plastic limits, indicating the potential for high allophane content.



Table 4-1: Summary of Geological Units.

Geological Unit	Soil Type	Depth to Top of Unit (m, BEGL)	Typical Layer Thickness (m)	In Situ Test Strength Pa range [typical value]	
				Undrained Shear Strength, Su (kPa);	SPT – N Values [Blows/300]
Topsoil	SILT, dark brown, firm, non-plastic, moist.	0.0	0.1 -0.5	N/A	-
Fill	Clayey SILT, brown mottled orange/brown. Very stiff, moist, low plasticity.	0.1	0.1 – 0.5	120	-
South Auckland Volcanic Field (Ash)	Clayey SILT, orange/brown, yellow/brown & red/brown, stiff to hard, low to high plasticity, moist.	0.2 - 0.6	2.3 – 4.9+	97-205+ [130]	1 – 19 [5]

4.3 Groundwater

Standing groundwater levels of between 2.5m and 4.2m were recorded in the hand auger boreholes during the Lander fieldwork at 301 Buckland Road. Water levels were recorded in the machine drilled boreholes eight days following the completion of the drilling programme The following table summarises the results.

Groundwater observed is likely to be perched and is unlikely to affect any construction activities.

BH No.	Date	Depth (BEGL)
MH01	1/2/18	3.65
MH02	1/2/18	3.0
MH03	1/2/18	4.73
MH04	1/2/18	Standpipe damaged
HA01	22/1/18	3.7
HA02	22/1/18	4.2
HA03	22/1/18	4.1
HA04	22/1/18	Groundwater not encountered
HA05	22/1/18	Groundwater not encountered
HA06	22/1/18	Groundwater not encountered
HA07	22/1/18	2.5
HA08	22/1/18	Groundwater not encountered



Groundwater was not encountered during the Initia investigation at 303 Buckland Road, which extended to depths of up to 5.0 m below existing ground level. We expect groundwater levels to vary seasonally with rainfall.



Geotechnical Considerations

The following geotechnical considerations are considered pertinent to the proposed re-zoning of the land and any subsequent development plans at the site. The geotechnical assessment below is a high level assessment of identified potential geotechnical constraints to the suitability of a land use change at the site from Future Urban to Business – General Business Zone (BGBZ), with the anticipated development types as discussed in Section 1.3 above. As mentioned earlier in this report, additional ground investigations and analysis will be required to support the detailed design and consenting stages of any future development at the site. The nature and continuity of the subsoils away from the site investigation locations is inferred bit it must be appreciated that actual conditions could vary from the assumed model.

The below principal Geotechnical considerations for the site are addressed in more detail in the below Section:

- Site seismicity/site subsoil class;
- Slope stability;
- Long term static settlement;
- Soil expansivity (shrink/swell);
- Foundation types for likely buildings; and
- Earthworks

5.1 Site Seismicity and Site Subsoil Class

5.1.1 Site Subsoil Class

The depth to engineering rock was not confirmed during the investigations carried out at the site, nor is there any deep geotechnical information available to confirm rock on any neighbouring sites.

In absence of a detailed site-specific seismic study, the site subsoil class has been assessed in accordance with NZS 1770.5:2004, Clause 3.1.3. The consistency of the soils beneath the site comprises stiff to hard cohesive South Auckland Volcanic Field volcanic ash. Based on boreholes approximately 800m away sourced from the New Zealand Geotechnical Database, the site is expected to be underlain by soils to at least 60m depth. On this basis, the site has been assessed as having a **site subsoil class of D – Deep soil**.

5.1.2 Design Seismic Parameters

Design peak ground acceleration and associated magnitude M_w for serviceability (SLS) and ultimate limit state (ULS) seismic design have been estimated in accordance with the MBIE Geotechnical guidelines and NZTA Bridge Manual, 3^{rd} Edition, 3^{rd} Amendment, using the following design assumptions:

- Design life of 50 years
- Importance Level IL2 (normal structures and structures not in other importance levels)
- Site Subsoil Class D Deep Soil
- Annual probability of exceedance for ULS of 1 in 500 years
- Annual probability of exceedance for SLS of 1 in 25 years.

The derived design earthquake parameters to be adopted for geotechnical design and liquefaction assessment are presented in Table 5-1.



Table 5-1: Summary of design peak ground acceleration (PGA) and associated magnitude Mw

Design Seismic Parameters	Serviceability Limit State	Ultimate Limit State
C _{0,1000}	0.2	2
Return Period Factor	0.25	1.0
Peak ground acceleration (PGA)	0.04	0.19 (1)
Effective Earthquake Magnitude Mw	5.9	6.5 ⁽¹⁾

Note 1: As a lower bound, the ultimate limit state effects to be designed for shall not be taken to be less than those due to a 6.5 magnitude earthquake at 20 km distance, for which a PGA coefficient of 0.19 g is derived in accordance with Bridge Manual, Table 6.3 minimum design requirements.

5.1.3 Liquefaction susceptibility

The soils underlying the site are fine grained and cohesive, comprising stiff to hard volcanic soils, and are therefore considered to have a negligible risk of liquefaction during both serviceability limit state (SLS) and ultimate limit state (ULS) seismic events. No specific design or detailing is required to address liquefaction effects.

5.2 Slope stability

Topography at the site slopes gently to moderately toward the northeast from RL 86.0m down to RL 62.0m along Buckland Road. A review of historic aerial photographs did not identify signs of deep-seated, global instability at the sites. No obvious signs of instability were noted as part of a site walkover of 303 Buckland Road by Initia in 2020. Similarly, Lander reported no obvious signs of instability at 301 Buckland Road on site during the time of their investigation in 2018. Given the gentle slopes, subsurface ground conditions and geomorphology of the site, instability of natural slopes is not considered to be a significant constraint for future development across the site generally. It is noted however, that, as discussed in Section 1.2 above, the neighbouring site to the south slopes relatively steeply down from the site boundary. These slopes appear to have some signs of instability based on a review of aerial photography. Accordingly for development immediately adjacent to the southern boundary a specific assessment of the stability of these slopes may be required, however it is not generally expected to constrain development on the subject site.

Notwithstanding, once development plans have been formalised, slope stability analyses may be required to support building consent applications where earthworks are proposed to form accessways and building platforms. Analyses will need to demonstrate that generally accepted factors of safety (e.g. those stipulated in Auckland Council Code of Practice for Land development and subdivision) can be achieved.

Given the strengths of the subsoils it is expected that required factors of safety could be demonstrated through the use of appropriate batter angles (likely to be in the order of 1 V : 2.5 H) and/or specifically designed retention or stabilisation measures.

5.3 Long term consolidation settlement

Based on the nature and strengths of the subsoils beneath the site, consolidation settlement is unlikely to constrain development on this site.

Further specific site investigation and analyses should be carried out to support building consent applications once loadings due to fill placement and/or building surcharges are known. Mitigation measures if required, could comprise:

- Specifically detailed foundations;
- Preload: or
- Specifically designed ground improvement.



5.4 Expansive soils

The site is underlain by fine grained cohesive South Auckland Volcanic Field ash. Two samples of ash tested by Lander at 301 Buckland Road² resulted in linear shrinkages of 21 to 24, and liquid limits between 104 and 114, indicating a high shrink/swell potential. The shrinking and swelling of surficial soils can result in foundation movement, which can distort the superstructure. If this movement occurs it typically manifests as cracking damage to foundations, rigid cladding systems and to the internal linings (ceilings and walls). Due to the nature of the damage mechanism, i.e. wetting and drying of the soils, thus tends to occur seasonally and effect only near surface soils which are subject to moisture change.

This risk of shrink/swell can be mitigated through foundation embedment and/or specific foundation detailing. Alternatively, ground improvement could be undertaken.

5.5 Foundations

The site is considered suitable for the support of typical light industrial and commercial buildings on shallow foundations embedded in AVF soils or engineered fill. A suitable foundation system would be conventional isolated strip and pad footings.

Foundations should be designed to accommodate the shrinking and swelling cycles mentioned above in Section 5.4.

5.6 Earthworks

Based on the test pits and laboratory testing as outlined in Section 3 above, we expect the soils below the topsoil layer will be suitable for reuse as engineered fill, however, they are generally wet of optimum water with the soils becoming wetter and more sensitive at depth. Some of the soils may require additional conditioning (drying) to achieve suitable water contents for earthworks compaction. It is noted however that the soils are expected to be allophanic. Allophanic soils require careful handling to allow effective compaction for earthworks. This is not considered to be a constraint on cut to fill earthworks on site but will need to be managed by the earthworks contractor for any future development.

Any significant earthworks proposed for the site should be assessed and designed by a geotechnical and civil engineer. Appropriate design details, such as subsoil drainage, benching of fill and control of surface water, will be required.



6. Further Work

Further investigations will likely be required to support the design of any future developments at the site. The volume and scope of investigations should be as appropriate for the scale and details of any proposed development.



7. Conclusions

The following conclusions are made in relation to land use change at 301 – 303 Buckland Road, Pukekohe:

- 1. The site is underlain by weathered ash deposits from the South Auckland Volcanic Field, with overlying topsoil up to 500mm thick, and localised areas of fill at 301 Buckland Road up to 600mm thick.
- 2. Perched groundwater levels of between 2.5m and 4.2m were recorded in the hand auger boreholes. Groundwater is not likely to affect construction activities.
- 3. The site has been assessed as having a site subsoil class of D Deep soil.
- 4. There is negligible risk of liquefaction at the site and no specific design or detailing is required to address liquefaction effects.
- 5. Instability of the natural slopes on the site is not generally expected to be a constraint for future development. Development immediately in the vicinity of the southern boundary may need to consider the stability of the relatively steep slopes in the neighbouring property. Slope stability assessments will likely be required for specific development proposals particularly where significant earthworks are proposed. However stability considerations are expected to be able to be adequately managed by the used of appropriate batter slopes, or the design of specific retention measures.
- 6. Consolidation settlement is not expected to constrain typically expected development of the site based on the natural and strengths of the subsoils. Specific settlement assessment will be required for future developments however in accordance with good engineering practice.
- 7. The subsoils are likely to be susceptible to volume expansivity (shrink/swell). However the effects can be mitigated through foundation embedment or specifically detailed reinforcement.
- 8. The site is considered suitable for the support of typical light industrial and commercial buildings on shallow foundations embedded in AVF soils or engineered fill. A suitable foundation system would be conventional isolated strip and pad footings.
- 9. In general, the soils below the topsoil layer will be suitable for reuse as engineered fill, however, they are generally wet of optimum with the soils becoming wetter and more sensitive at depth.
- 10. Based on our understanding of the local ground conditions and our experience with typical retail and commercial developments, i.e. lightly to moderately loaded buildings, we do not expect any significant geotechnical constraints to BGBZ development at the site. Provided that geotechnical considerations are addressed, along with specific investigations and assessment for any future development at the site, we expect the competent nature of the ground at the site to support a variety of development types and options.



8. Applicability

This report has been prepared for our client, Jason Woodyard and Stephen Smith, with respect to the brief provided to us. The advice and recommendations presented in this report should not be applied to any other project or used in any other context without prior written approval from Initia Limited.

This report is considered suitable to support a re-zoning application, however, further investigations and analyses will be required to support detailed design.

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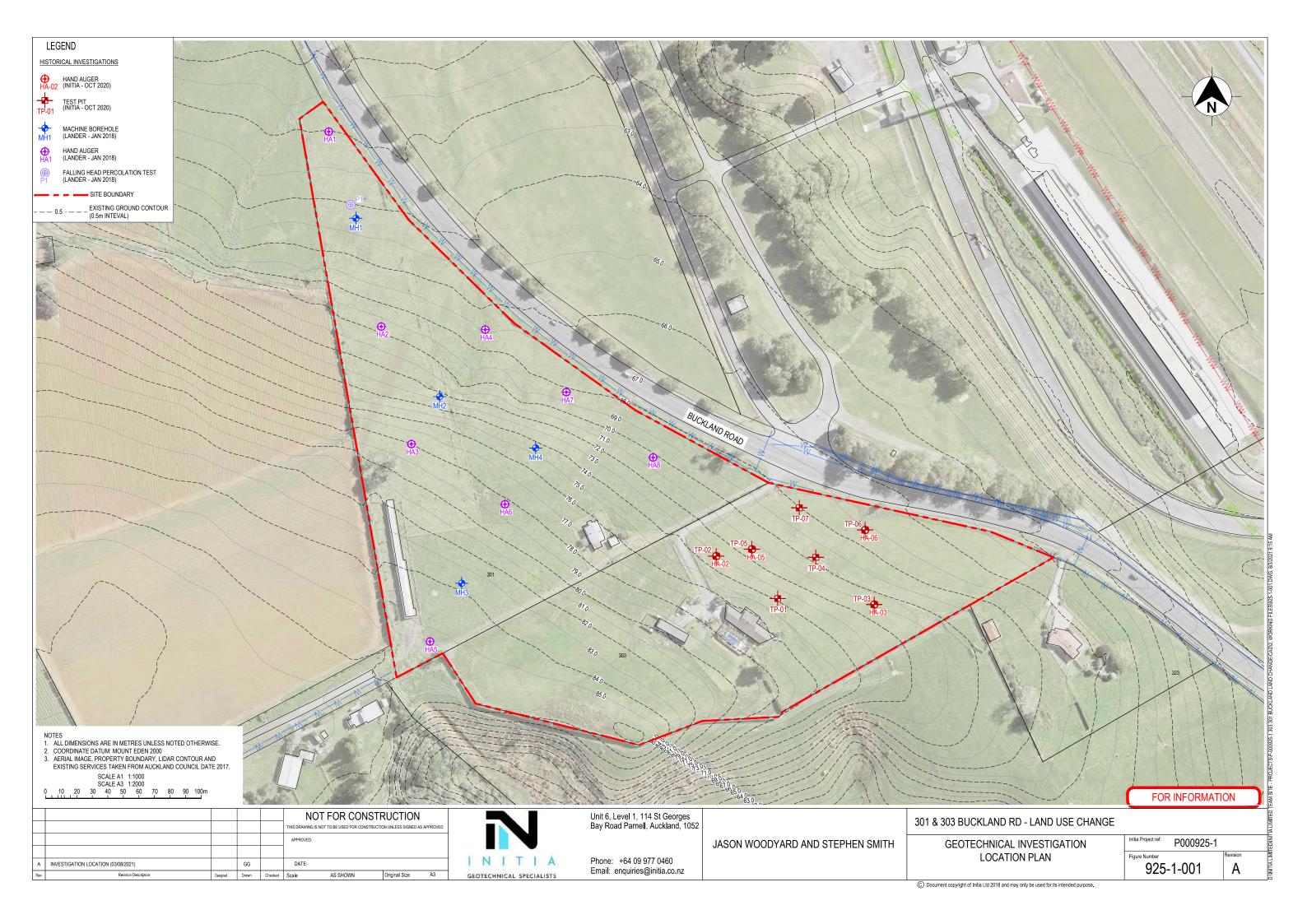
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Revision	Date	Revision detail	Author	Reviewer	Approved by				
-	07-09-21	First Issue	A. Klahn	N. Hickman	M. Wansbone				
Current R	evision	0	•	•					



Appendix A Figures



Appendix B Lander Investigation Logs

Client : Project	Client: PETEREX LIMITED Project Location: 1700 BUCKLAND ROAD, PUKEKOHE							er Bo	orehol		Sheet	HA 1 o	
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Borehole Location:	mN Description:	mE Refer to site plan	Grou	und R.L.		Legend	Depth (m)	Standing Water Level	Vane Shear(kPa) _{peak} / residual	Soil Sensitivity		ample a ratory / Test	
		SOIL DESCRIPT	ION				Δ	0) Š	 ⊗ ⊗	Š		Details	
TOPSOIL, w	vith minor root	let inclusions											
moderately :	sensitive, with	ge/brown and yellow/brow minor limonite [ASH] rithout limonite	vn. Very s	tiff, moist, low pla	asticity, .		- - - 0.5 - - - - -		188/54	3.5	D	ample fisturbed	i
becoming m	noist to wet	and yellow/brown mottled	l red/nink	intermived with	iaht		- - - - - 1.5		127/38	3.3	s	ample :	2
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- becoming si plasticity, in -	lightly clayey S termixed with i	SILT, mottled red/pink, yel minor grey, high plasticity	low/brow silty clay	n and grey, hard,	no to low		- - - 2.5 -	5	239+			Sample Disturbe	
becoming b	rown, loose to	medium dense, no plasti	city			**************************************	-3.0	▽	UTP		2	2.5-3.0n	1:
becoming c	layey SILT, ye	llow/brown, stiff, saturate	d, low pla	sticity, insensitive	•		- - 3.5 -		89/47	1.9			49
-		SILT, brown, hard, no to lo	ow plastic	sity			- -4.0 -		UTP				
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-					- K	111110	-6.0	33333	<u> </u>		 :::		******
	DER	Comments: Groundwater encounter UTP = unable to penetra	ate.	Borehole Diameter: 50mm Checked:	Topsoil Fill Clay		Sand Gravel Organic	AAAAAA AAAAAA AAAAAA AAAAAAA	Sandsto Siltstone	2 7 2 2 2 2 7 2 2 2 2 7 2 2 2 2 7 7 2 2	777	utonic o Core	:::::::
geotec	hnical	EOB = end of borehole.		Km	Silt **	×××××× ××××××	Pumice		Volcanio	, ;;;;;;			

Client: PETEREX LIMITED Project Location: 1700 BUCKLAND ROAD, PUKEKOHE					Aug	er Bo	orehol	le No.		HA02 of 9
Job Number:	J00858			Vane H		Logge	30	Processo	or: Date:	
Borehole Location: mN Description	n: Refer to site plan	ound R.L.		Legend	Depth (m)	Standing Water Level	Vane Shear(kPa) peak / residual	Soil Sensitivity	Sample Laboratory Tes Detai	/ Other t
TOPSOIL, with minor ro	SOIL DESCRIPTION			1111111		>	0, 0	0)	Detai	113
- TOFSOIL, WILL INITION	ottet molusions									
moderately sensitive, wi	nd pink/red mottled orange/brown. In the minor limonite, with minor organic ottled orange/brown, without organic	staining [ASH]	ow plasticity	(XXXXXX (XXXXXXX (XXXXXXX (XXXXXXX (XXXXXX	- - - 0.5		120/54	2.2		
- - -			- hard na	CXXXXXX CXXXXXX CXXXXXX CXXXXXX CXXXXXX CXXXXXX	- - -		222/56	4.0		
 to low plasticity, sensitive becoming brown, withou 	r SILT, light grey mottled orange/bro e, with minor light grey, high plastici it silty clay	wn and red/browi ty silty clay	n, nard, no		- 1.0 - -		222/56	4.0		
 becoming grey/brown becoming moderately se becoming brown, moist 					- - 1.5 -		213/65	3.3		
	very stiff, low plasticity, with trace to	minor manganes	e oxidation		- - - 2.0 -		158/75	2.1		
 becoming yellow/brown, becoming stiff 	wet, low to medium plasticity, without	out manganese ox	kidation		- - - 2.5 -		84/40	2.1		
 becoming slightly clayey becoming orange/brown 	SILT, brown, moist, no to low plast , hard, wet, no plasticity	icity			- - -3.0		239+			
					- - - - - 3.5		UTP			
moderately sensitive	yellow/brown, very stiff, wet to satura y SILT, brown, saturated, no to low p				- - -4.0 -	▽	116/47	2.5		
becoming hard					- - 4.5 - -		239+			
-1				(XXXXXXX (XXXXXXXX (XXXXXXXXXXXXXXXXXX	- -5.0		239+			
EOB at 5.0m. Target De	epth.				-		200.			
-					- -5.5 -					
-					-					
-	Comments:	Borehole Diameter:	Topsoil	1	-6.0		Sandston		Plutonic	<u> </u>
	Groundwater encountered 3.8m.	50mm	Fill	}}}}	ravel		Siltstone	222222222222222222222222222222222222222	No Core	
LANDER geotechnical	UTP = unable to penetrate. EOB = end of borehole.	Checked:	Clay	55555	rganic a	******** ********	Limeston	9	E	

Client :		PETEREX LIMITED				Aug	er Bo	orehol	e No.		HA03
Project	Locatio	n: 1700 BUCKLAND ROA	D, PUKEKOHE						S	Sheet 3	of 9
Job Nu	mber:	J00858			Vane H	lead: 00	Logge L	30.75C.782.70C	Processo LJ		.01.18
Borehole	mN	mE G	round R.L.			(iii	on Ja	Pa)	ty	Sample	and
Location:	Description:	Refer to site plan			Legend	Depth (m)	Standing Water Level	Vane Shear(kPa) peak / residual	Soil Sensitivity	Laboratory	/ Other
		SOIL DESCRIPTION					0 %	ς g	S	Deta	ils
TOPSOIL, w	vith minor roo	tlets									
oxidation [As	, orange/brow SH] nout mangane	n. Hard, moist, low plasticity, sen	sitive, with minor r	manganes	e	_ - - 0.5 -		232/40	5.8		
becoming br	rown		a.			- - 1.0 -		239+	88 0		
 becoming re becoming ve 		erately sensitive				- 1.5 -		193/88	2.2		
- -						2.0		186/80	2.3	¥.	
-						- - 2.5		195/81	2.4		
becoming we	et							195/88	2.2		
- - becoming st -	iff					- - - 3.5 -		97/34	2.9		
- - becoming ve - -	ery stiff				**************************************	- -4.0	∇	127/56	2.3		8
	aturated, sens ightly clayey : oxidation	sitive SILT, black mottled red/pink, no t	o low plasticity, wil	th minor		- 4.5 - -		135/29	4.7		
-	coming stiff, ir				******** ******* *******	- -5.0		83/47	1.8		
EOB at 5.0m	n. Target Dep	th.				- - - - -5.5 - -		03/4/	1.0		
		Comments:	Borehole Diameter:	Topsoil		—6.0	<u> </u>	Sandston	e AAAA	Plutonic	
LAND	DEP	Groundwater encountered 4.5m UTP = unable to penetrate.		Fill	//////	Gravel		Siltstone	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	No Core	
geotech	DER	EOB = end of borehole.	Checked:	Clay Silt		organic c	******	Limeston	000000	A	

è

Client :	Location		TEREX LIMITI		PUKEKOHE			Aug	er Bo	rehol			HA04 of 9
Job Nu			0858				Vane I	Head:	Logge	8-00-00	Process LJ	or: Dat	
Borehole Location:	mN Description:		mE efer to site plan	Gro	und R.L.		Legend	Depth (m)	Standing Water Level	Vane Shear(kPa) peak / residual	Soil Sensitivity	Samp	ele and ery / Other
			L DESCRIPT	ION			Leg	Dep	Star Wate	Shea Peak/		Te De	est tails
_ some fine to	medium grav	v/brown. l el [TUFF]	oose to mediun	n dense,	moist, no plastici	750		- 0.5 - 1.0 - 1.5 - 2.0 - 2.5 3.0 3.5 	St	HS UTP		Scala Penetror Test (blows/1 - 6 - 17 - 3 - 3 - 4 - 2 - 2 - 5 - 18	tails meter
- - - -								- -5.5 - - -					
-		Comme	nts:		Borehole Diameter:	Topsoil		-6.0 Sand		Sandston	e	Plutonio	· ;;;;;;;;
LANI	DER	Groundy UTP = u	vater not encoun nable to penetra		50mm Checked:	Fill Clay	111111	Gravel Organic		Siltstone	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	No Con	е
geotec	nnical	EOB = e	nd of borehole.		Km	(Z)	XXXXXX	Pumice		Volcanic	******		

Client :	Landin	PETEREX		D, PUKEKOHE			Aug	er Bo	rehol			HA05
Job Nu	Location	J00858	KLAND KOA	D, FOREKOTIE		Vane H		Logged		Process	or : Date:	of 9 01.18
JOD NU			22	Victoria.		94			M	RG	22.	01.18
Borehole Location:	mN	mE_		ound R.L.		۾ ا	Œ	Standing Water Level	Vane Shear(kPa) peak / residual	_ vifty	Sample	and
Location.	Description:	Refer to s	ite plan			Legend	Depth (m)	Standater	Var near(ak / re	Soil Sensitivity	Laboratory Test	
TOPSOIL		SOIL DES	CRIPTION					0) \$	S a	Š	Detai	ls
clayey SILT		e to medium sand	, light brown, m	ottled orange/brov	wn. Very st	iff	‡					
	lasticity [FILL] . Hard, moist, med	dium plasticity [ASH1			-					
= 311ty OL7(1,	orange/brown	. Hara, moist, mot	aidiii pidottoky [1011		C-X-X-X-X-X-X-X-X-X-X-X-X-X-X-X-X-X-X-X	- 0.5		186+			
- -						-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x	t		MEDIA.		Sample	
_ clayey SILT	, orange/brow	n. Hard, moist, lo	w plasticity			******* *******	}				Disturbe 0.5-1.2n	
-						******	Ł.,		186+		0.0 1.21	
-						******* *******	- 1.0		100+			
_						******** ********	t				•	
7-5 ⊈-7						<u> </u>	-					- 1
-						******** *******	- 1.5		186+		П	
						******** *******	F				Sample	2
-:						******** ******** *******	-				Disturbe 1.5-2.1	ed
- - hecoming ve	ery stiff, wet, s	ensitive				(XXXXXX (XXXXXX (XXXXXX	- 2.0		111/22	5.0	1.5-2.1	
- becoming ve	siy suii, wet, s	Serialive					-			0.0	-	
<u></u>							_		16			
becoming sl	lightly clayey	SILT, orange/brow	n and red/brow	n, hard, wet			-		Treatment of			
						(XXXXXX	- 2.5		UTP			
 becoming c 	layey SILT, or	ange/brown, very	stiff			(XXXXXX (XXXXXX	-				Sample Disturb	
7.0 Es							Ĺ				2.5-3.0	
becoming n	noderatley ser	nsitive				(XXXXXX (XXXXXX (XXXXXX	-3.0		168/67	2.5		
						CXXXXXX CXXXXXX CXXXXXX	ľ					
- becoming re	ed/brown					******** ********	-					
						(XXXXXX (XXXXXX (XXXXXX	- - 3.5		124/57	2.2		
							- 3.3		124/37	2.2		
becoming m	ottled black w	vith some ash stre	aks			CXXXXX CXXXXX CXXXXX						
-						(XXXXXX (XXXXXX) (XXXXXX)	-					
-						******	-4.0		186+			
_												
_						122222 122222	t					
becoming s	tiff. without bla	ack mottling, insen	sitive			**************************************	-4.5		81/43	1.9		
-			1			******* *******	-					
						(XXXXX) (XXXXX)	E		1			
at 5.0m, bed	coming very s	tiff, moderately se	nsitive				-		404/57			
EOB at 5.0r	n. Target Dep	th.					-5.0		124/57	2.2	*	
-							Ł					
Ē							F					
-							-5.5					
							F					
-							ŀ					
_							-6.0					
		Comments:		Borehole Diameter:	Topsoil	WIIII	Sand		Sandston	e	Plutonic	
		Groundwater not	encountered.	50mm	Fill	*******	Gravel		Siltstone	222222 222222 222222 222722	ZZ ZZ No Core	
LANI	DER	UTP = unable to	penetrate.	Checked:	Clay	(((((Organic	******* ********	Limestone		益	
geotec	hnical	EOB = end of bo	rehole.	KM	100	XXXXXX	umice	******	Volcanic	200000		

	Client :			ETEREX LIMIT					Aug	er Bo	rehol	le No.		HA06
	Project	Location	n: 17	700 BUCKLAN	D ROAD	, PUKEKOHE		Vane H	la adı	Logged	ı Dur. T	Process	100 121 000 152	6 of 9 ite:
	Job Nu	mber:	JO	00858				vane F	D 7 10000 - 10000	The second	м М	RG		22.01.18
	Borehole Location:	mN Description:		mE Refer to site plar		und R.L.		Legend	Depth (m)	Standing Water Level	Vane Shear(kPa) peak / residual	Soil Sensitivity	Laborat	ple and ory / Other
			so	IL DESCRIP	TION			Lec	Dec	Sta	She	Sens		Test etails
	TOPSOIL		70											
				The second secon		ow plasticity [TUI	-F/FILL?]	133333	_					
-	SIITY CLAY,	orange/brown	. Hard, II	noist, low plastic	ily [ASH]				- - 0.5		186+			
-								-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x	-					
-	clayey SILT	with trace fine	e sand, o	orange/brown. H	ard, moist	, low plasticity			-					1
-									- 1.0		186+			
-								******* ******* *******	-					1
Ŀ	ha aomina t	ery stiff, mode	rataly so	naitivo				******* ******* *******	- 1.5		184/73	2.5		
	becoming w		rately se	HSILIVE					L		104/13	2.5		1
Ŀ								**************************************	_					
-									- 2.0		184/92	2.0		- 1
F	becoming o	range/brown n	nottled re	ed/brown				**************************************	E					
F								**************************************	F	6				
-	becoming s	lightly clayey S	SILT, ora	inge/brown, hard	d			X X X X X X X X X X X X X X X X X X X	- 2.5		UTP			
Ī	becoming c	layey SILT, ve	ery stiff						F					
L								******** ******* *******	-3.0		126/57	2.2		
	becoming re	ed/brown, hard	d					**************************************	F					
									F					
F									- 3.5		186+			
Ė	becoming v	erv stiff							ļ					8
L									- -4.0		168/61	2.8		
Ė									ţ					
E									Ė					
-	becoming re	ed/brown mott	led oran	ge/brown, insen	sitive				- 4.5		122/70	1.7		
E									Ė					
Ŀ	at 5.0, beco	ming moderat	tely sens	itive					- -5.0		100/38	2.6		
F	EOB at 5m.	Target Depth	i,						F 3.0		100/00	2.0		
F									_					
_									- 5.5					
F									E					
F														
=			Comm	ents:		Borehole Diameter:	Topsoil	1	-6.0 Sand		Sandstor	ne	Plutor	nic :++++++
			Ground	lwater not encou		50mm	Fill		Gravel		Siltstone	22777	222 222 No Co	
	LAN geotec	DER hnical		unable to peneto end of borehole		Checked:	Clay	******	Organic	******	Limestor	ne BBB	選	

Sometimals South Description: South Descripti	Client: PETEREX LIMITED Project Location: 1700 BUCKLAND ROAD, PUKEKOHE	ži.		Auge	er Bo	rehol			HA07
Dorehole Lossion: MRX							Process	or: Da	te:
TOPSOIL Clayer SILT, Introne maritted orange-brown. Very stiff, moist, low plasticity, sensitive, with at 0.3m, with occasional black and red mottles — 0.5 120/28 4.3 — 1.0 183/39 4.7 — 1.1 183/39 4.7 — 1.1 183/39 4.7 — 1.2 183/39 4.7 — 1.3 183/39 4.7 — 1.5 130/49 2.7 — 1.5 130/49 2.7 — 1.5 130/49 2.7 — 1.5 130/49 2.7 — 1.5 183/39 4.7 — 1.5 130/49 2.7 — 1.5 130/49 2.7 — 1.5 188/4 — 1.5 130/49 2.7 — 1.6 188/4 — 1.6 188/4 — 1.5 130/49 2.7 — 1.6 188/4 — 1.6 188/4 — 1.7 170/27 2.6 — 1.8 188/4 — 1.8 18	Borehole MN ME Ground R.L.							Sam Laborat	ple and ory / Other
Layery SILT, brown motited arage-brown. Very stiff, moist, lew plasticity, sensitive, with trace fine green SILT, light brownligrey streaked orange-brown. Very stiff, wet, low plasticity, sensitive (ASI) at 0.5m, becoming grey streaked orange-brown. Very stiff, wet, low plasticity, and 0.5m, becoming grey streaked orange, moderately sensitive 10.5 183/39 4.7 11.343 2.6 12.028 4.3 12.028 4.3 183/39 4.7 1.5 1134/3 2.6 1.6 1134/3 2.6 1.7 70/27 2.			Le	Del	Sta	√ She peak	Sen		
at 0.3m, with occasional black and red mottles -0.5	clayey SILT, brown mottled orange/brown. Very stiff, moist, low plasticity, se	nsitive, with		-					
clayer, SILT. Ight brownigrey streaked orange/brown. Very stiff, wet, low plasticity, servantive [ASI] at 0.8m, becoming grey streaked orange, moderately sensitive — 1.5	at 0.3m, with occasional black and red mottles			_		West Control	0.00040		
becoming grey streaked orange, moderately sensitive -1.5 183/39 4.7 -1.6 -1.5 -1.5 -1.5 -1.5 -1.6 -1.5 -1.5 -1.5 -1.5 -1.6 -1.5 -1.5 -1.5 -1.5 -1.6 -1.5 -1.5 -1.5 -1.6 -1.5 -1.5 -1.5 -1.6 -1.5 -1.5 -1.5 -1.6 -1.5 -1.5 -1.5 -1.6 -1.5 -1.5 -1.5 -1.6 -1.5 -1.5 -1.5 -1.6 -1.5 -1.5 -1.6 -1.5 -1.5 -1.7 -1.5 -1.5 -1.7 -1.5 -1.5 -1.7 -1.5 -1.5 -1.7 -1.5 -1.5 -1.7 -1.5 -1.5 -1.7 -1.5 -1.5 -1.7 -1.5 -1.5 -1.7 -1.5 -1.5 -1.7 -1.5 -1.5 -1.7 -1.5 -1.5 -1.7 -1.5 -1.5 -1.7 -1.5 -1.5 -1.7 -1.5 -1.5 -1.7 -1.5 -1.5 -1.7 -1.5 -1.5 -1.7 -1.5 -1.5 -1.7 -1.5 -1.5 -1.7 -1.5		sticity,		- 0.5 -		120/28	4.3		
becoming grey streaked orange, moderately sensitive -1.5	sensitive [ASH] at 0.8m, becoming grey								
becoming stiff becoming slightly clayery SILT, orange/brown, no to low plasticity, without sand and gravel becoming slightly clayery SILT, orange/brown, not low plasticity, without sand and gravel becoming orange/brown motiled red/brown, low plasticity, without sand and gravel becoming slightly clayery SILT, orange/brown, not low plasticity, without sand and gravel becoming stiff, poor sample recovery to 3.9m due to groundwater suction becoming stiff, poor sample recovery to 3.9m due to groundwater suction becoming red/brown, with normal sample recovery becoming hard becoming very stiff at 5.0m, becoming hard Comments: Groundwater encountered 2.7m, UTP = unable to penetrate, Edition of the comment of the comme	_ -			- 1.0		183/39	4.7		
becoming stiff becoming slightly clayery SILT, orange/brown, no to low plasticity, without sand and gravel becoming slightly clayery SILT, orange/brown, not low plasticity, without sand and gravel becoming orange/brown motiled red/brown, low plasticity, without sand and gravel becoming slightly clayery SILT, orange/brown, not low plasticity, without sand and gravel becoming stiff, poor sample recovery to 3.9m due to groundwater suction becoming stiff, poor sample recovery to 3.9m due to groundwater suction becoming red/brown, with normal sample recovery becoming hard becoming very stiff at 5.0m, becoming hard Comments: Groundwater encountered 2.7m, UTP = unable to penetrate, Edition of the comment of the comme	- - - hecoming wet		******** ******* *******						
becoming stiff becoming slight clayery SILT, crange/brown, no to low plasticity, without sand and gravel becoming grange/brown mottled red/brown, low plasticity, without sand and gravel becoming grange/brown mottled red/brown, low plasticity, without sand and gravel becoming stiff, poor sample recovery to 3.9m due to groundwater suction -3.5 57/23 2.5 becoming red/brown, with normal sample recovery becoming hard -4.5 171/62 2.8 at 5.0m, becoming hard EOB at 5.0m. Target Depth. -5.5 -6.0 Sand Sandsone -6.0 Sandsone -7.5 Sillatone -7.5 Sillaton			**************************************	— 1.5		113/43	2.6		
becoming stiff becoming slight clayery SILT, crange/brown, no to low plasticity, without sand and gravel becoming grange/brown mottled red/brown, low plasticity, without sand and gravel becoming grange/brown mottled red/brown, low plasticity, without sand and gravel becoming stiff, poor sample recovery to 3.9m due to groundwater suction -3.5 57/23 2.5 becoming red/brown, with normal sample recovery becoming hard -4.5 171/62 2.8 at 5.0m, becoming hard EOB at 5.0m. Target Depth. -5.5 -6.0 Sand Sandsone -6.0 Sandsone -7.5 Sillatone -7.5 Sillaton	-								
becoming hard, with trace fine to medium sand and fine pumiceous gravel becoming slightly clayey SiLT, orange/brown, no to low plasticity, without sand and gravel becoming orange/brown mottled red/brown, low plasticity -3.0 186+ -3.0 -3.0 186+ -3.0 18			TXXXXXX XXXXXX XXXXXXX XXXXXXX XXXXXXX XXXX	- 2.0		130/49	2.7		
becoming hard, with trace fine to medium sand and fine pumiceous gravel becoming slightly clayey SiLT, orange/brown, no to low plasticity, without sand and gravel becoming orange/brown mottled red/brown, low plasticity -3.0 186+ -3.0 -3.0 186+ -3.0 18			(XXXXXX) (XXXXXX) (XXXXXXX) (XXXXXXXX	-					
becoming slightly clayey SILT, orange/brown, no to low plasticity, without sand and grave becoming orange/brown mottled red/brown, low plasticity - 3.0 186+ -	becoming stiff		**************************************	- 2.5	☑.	70/27	2.6		
becoming orange/brown mottled red/brown, low plasticity -3.0 186+ -3.0 186+ -3.0 186+ -3.0 186+ -3.0 186+ -3.0 186+ -3.0 186+ -3.0 186+ -3.0 186+ -3.0 186+ -3.0 186+ -3.0 186+ -3.0 186+ -3.0 186+ -3.0 186+ -3.0 186+ -3.0 186+ -3.5 57/23 2.5 -4.0 UTP -4.0 UTP -4.5 171/62 2.8 -5.0 -5.5 -5.5 -5.5 -6.0		nd and grave				186+			
becoming red/brown, with normal sample recovery becoming hard -4.0 UTP -4.5 171/62 2.8 -5.0 186+ -5.5 -6.0 Comments: Groundwater encountered 2.7m. UTP = unable to penetrate. EOB = end of borehole.		J	**************************************	- -3.0		186+			
becoming red/brown, with normal sample recovery becoming hard -4.0 UTP -4.5 171/62 2.8 -5.0 186+ -5.5 -6.0 Comments: Groundwater encountered 2.7m. UTP = unable to penetrate. EOB = end of borehole.	-								
becoming red/brown, with normal sample recovery becoming hard -4.0 UTP -4.5 171/62 2.8 -5.0 186+ -5.5 -6.0 Comments: Groundwater encountered 2.7m. UTP = unable to penetrate. EOB = end of borehole.	hecoming stiff, poor sample recovery to 3.9m due to groundwater suction			-35		57/23	25		
becoming hard -4.0 -4.0 -4.5 -4.	-			-		01120	2.0		
becoming very stiff -4.5						LITTO			
at 5.0m, becoming hard EOB at 5.0m. Target Depth. -5.5 -6.0 Comments: Groundwater encountered 2.7m. UTP = unable to penetrate. EOB = end of borehole. Checked: EOB = end of borehole.	- becoming nard			-4.0 -		UIP			
at 5.0m, becoming hard EOB at 5.0m. Target Depth. -5.5 -6.0 Comments: Groundwater encountered 2.7m. UTP = unable to penetrate. EOB = end of borehole. Checked: EOB = end of borehole.									
EOB at 5.0m. Target Depth. 5.0 1864 5.0 6.0 Comments: Groundwater encountered 2.7m. UTP = unable to penetrate. EOB = end of borehole. Checked: EOB = end of borehole.	becoming very stiff			- 4.5		171/62	2.8		
EOB at 5.0m. Target Depth. 5.0 1864 5.0 6.0 Comments: Groundwater encountered 2.7m. UTP = unable to penetrate. EOB = end of borehole. Checked: EOB = end of borehole.									32
Comments: Groundwater encountered 2.7m. UTP = unable to penetrate. EOB = end of borehole. Comments: Groundwater encountered 2.7m. UTP = unable to penetrate. EOB = end of borehole. Checked: Clay Comments: Sand Sandstone Plutonic Fill Gravel Clay Organic Checked: Clay Corganic Comments: Comme			5333333	- 5.0		186+			
Comments: Groundwater encountered 2.7m. UTP = unable to penetrate. EOB = end of borehole. Comments: Groundwater encountered 2.7m. UTP = unable to penetrate. EOB = end of borehole. Checked: Clay Comments: Sand Sandstone Plutonic Fill Gravel Clay Organic Checked: Clay Corganic Comments: Comme				Ē					
Comments: Groundwater encountered 2.7m. UTP = unable to penetrate. EOB = end of borehole. Comments: Sand Sand Sandstone Plutonic Plutonic Plutonic Checked: Clay Crayel Clay Crayel Clay Corganic Checked: Clay Corganic Comments: Commen	[-			- 5.5					
Comments: Groundwater encountered 2.7m. UTP = unable to penetrate. EOB = end of borehole. Comments: Sand Sand Sandstone Plutonic Plutonic Plutonic Checked: Clay Crayel Clay Crayel Clay Corganic Checked: Clay Corganic Comments: Commen				-					
Groundwater encountered 2.7m. LANDER geotechnical Groundwater encountered 2.7m. Checked: Clay Clay Clay Commission Core Checked: Clay Corganic Commission Commission Core Commission		1 677	11111	1	111111		ļ	<u> </u>	* ++++++
geotechnical EOB = end of borehole.	Groundwater encountered 2.7m. 50mm))	}}}}}	- 6		N .	****	**	- 11111111
Silt XXXXXXX Pumice Volcanic		*XX	XXXXX			3	0	<u>E</u>	

Client :	Location	PETEREX LIMITED 1: 1700 BUCKLAND R	OAD PUKEKOHE			Aug	er Bo	rehol			IA08 of 9
Job Nu		J00858			Vane H		Logged		Process LJ	or: Date:	01.18
Borehole Location:	mN Description:	Refer to site plan	Ground R.L.		Legend	Depth (m)	Standing Water Level	Vane Shear(kPa) peak / residual	Soil Sensitivity	Sample Laboratory Test Detail	and / Other
TOPSOIL		SOIL DESCRIPTIO	N				>	0) 11	0)	Detail	13
The Pile Control of the State Control						_					
clayey SILT,	orange/brown	n. Hard, moist, low plasticity [,	ASH]			- - 0.5 - -		239+			
- - - -						- 1.0		239+			
=	oderately sen	sitive fine to coarse sand sized whi			- - - - - -		204/100	2.0			
- becoming sl -	ightly clayey S	SILT, no to low plasticity, extra			2.0		204/24	8.5			
-						- - 2.5		UTP		31	
 becoming m 		ry stiff, wet, low to medium pl sitive ow plasticity	asticity	4	188888	-3.0 -		170/73	2.3		
- becoming h	ard					- - 3.5		230/89	2.6		
intermixed v	vith moderatel	y thin bed of light grey, high p	plasticity silty clay			- -4.0 -		213/94	2.3		
becoming ve		with minor limonite silt clast ir		**************************************	- - 4.5 -		158/69	2.3			
_	270		Note that the second se		******** *******	_ -5.0		177/86	2.1		
EOB at 5.0r	n. Target Dep	th.				-5.0 - - - -5.5 - - -		77700	2.1		
		Comments:	Borehole Diameter;	Topsoil	3	Sand		Sandston	е	Plutonic	
LAN	DER hnical	Groundwater not encounters UTP = unable to penetrate. EOB = end of borehole.	Checked:	Fill Clay Silt	c	Gravel Organic Oumice	**************************************	Siltstone Limeston	e 12123 0 22123 0 22123	No Core	

Client :		PET	EREX LIMITED)				Aug	er Bo	rehol	e No			P1
Project	Location	1: 1700	BUCKLAND R	ROAD,	PUKEKOHE							Shee		of 9
Job Nu	mber:	J008	s58				Vane H	lead: 00	Logged L		Process LJ	or:	Date: 22.0	1.18
Borehole	mN	m	E	Groun	nd R.L.			(m)	ing	e (Pa) sidual	/ity	5	Sample	and
Location:	Description:		er to site plan				Legend	Depth (m)	Standing Water Level	Vane Shear(kPa) peak / residual	Soil Sensitivity	Lab	oratory / Test	
TORONI		SOIL	DESCRIPTIO	N					″ ≥	ഗ ജ	Ø.		Detail	S
		treaked bla	ck. Very stiff, mois	ist, low p	plasticity, with tra	ace fine		-						
gravel [TUF silty CLAY,		Very stiff, r	moist, medium pla	asticity,	moderately sen	sitive [ASH		_						
- with occasion	onal manganes	se oxidation					-1-1-1-1-1-1-1-1 -1-1-1-1-1-1-1 -1-1-1-1-1-1-1 -1-1-1-1-1-1-1	- 0.5		177/49	3.6			
_ with occasio	man mangano.	o oxidation						_						
clayey SILT	, orange/brow	n. Very stiff,	, moist, low plastic	icity, mo	derately sensitiv	/e	######################################	-1.0		158/54	2.9			
Ē								E 1.0		100/04	2.0			
with minor n	nanganese oxi	idation						E						- 1
_								-1.5		195/84	2.3			
-								F						
							**************************************	F						
becoming yegrey, high p	ellow/brown ar lasticity silty cl	nd light grey lay, without	mottled red/pink, manganese oxida	i, insens ation	itive, intermixed	with light	**************************************	- 2.0		154/86	1.8			
-								F						
	coming moder		ive					- 2.5		177/69	2.6			
EOB at 2.5r	n. Target Dept	th.						Ė			2006			
_								-						
-								-3.0						
-								E						
F								F						
-								- 3.5						
								Ė						
-			Ē.					-4.0						
-								-						
-								-						
-								- 4.5						
-								-						
Ŀ								- -5.0						
Ē								F 3.0						
F								E						
_								-5.5						
-								-						
F								-						
-		Comment	·e·	В	orehole Diameter:	Topsoil		-6.0 Sand	1	Sandstor	ne ::::	Ţ ↓ ↓	lutonic	::::::::
	OLY IS	Groundwa	ter not encounter	red.	50mm	Fill	}}}}}	Gravel		Siltstone	Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z	222	lo Core	CISTELL
LAN geotec			able to penetrate. d of borehole.	9	Checked:	Clay	(******* .	Organic	******	Limestor	ne Bis	選		

	Client :	PETEREX LI		AD D		OUE		IVIa	achi	ine	e E	Bore	eho			MH01
1	Project Location		AND RO	AD, P	UKEK	OHE	Ī	√ane Hea				By: Pr				e: 24.01.18
	Job Number:	J00858						307		AB	1	7	AB			te: 24.01.18
aphy	Borehole mN	mE				Ground R.L		747 19		Groundwater/	neter	Drilling Method . & Casing	Recovery (%)	(%)	Sample and Laboratory Test Details	Vane Dial / Sensitivity & SPT
Stratigraphy	Location: Description:	Refer to site plan		Ę.	£	Orientation:		vertical		pund	Piezometer	ng N Cas	over	RQD (%)	mple abora	ane [ensit
Stra	CORE D	ESCRIPTION		Legend	Depth (m)	DE	FE	CTS		9	ä	∭. ⊗	Rec	œ	Sa La	≥ o
	TOPSOIL				-						100					
	-				- 1							KE	9			
	_ clayey SILT, dark orange/	brown, Hard, moist, low	to medium	22222 22222	- 0.5	E	Bento	nite ———	_			BA				UTP
	_ plasticity _ at 0.7m, becoming orange			XXXXX XXXXX XXXXX	E							OPEN BARREL	100			
	plasticity, with some limonibecoming brown, very stiff,	te inclusions and stainir	ig .	22222 22222 22222 22222	- - 1.0						21111	ō	_			158/82 - 1.9
	- becoming blown, very sun, - -	, mediam placacity, mee	nouvo	XXXXX XXXXX XXXXX	- "								0			130/02 - 1.9
	- -			XXXXX XXXXX XXXXX	Ε Ι								100			112/66 - 1.7
	-			XXXXX XXXXX XXXXX	- 1.5 -								H			SPT at
	_			XXXXX XXXXX	Εl	43000							SPT			1.5-1.95m 3/4/4
	-			*****	2.0	Piezom screene 1.5-6m	ed fro	m	- 1	1						N=8
	-			XXXXX XXXXX XXXXX	-	1.0-011										
l	– —becoming orange/ brown			XXXXX XXXXX XXXXX	- - 2.5								92			
· ·	-			22222 22222 22222 22222	-								Configuration (Configuration)			
	- - 	nua modratalu sapsitiva		XXXXX XXXXX XXXXX	E.,											<u>1</u> 61/49 - 3.3
	becoming dark orange/ bro	own, modrately sensitive	ē:	XXXXX XXXXX XXXXX	3.0								-			SPT at
Ash	_			22222 22222 22222									SPT			3.0-3.45m 6/8/11 N=19
1	_			XXXXX XXXXX XXXXX	3.5	Groundwa			∇							M-18
	_			XXXXX XXXXX XXXXX		as measur 1.02.18: 3									(2) 	
1	becoming yellow/ brown			XXXXX XXXXX XXXXX	- 4.0								95		*:	
	=: =:			XXXXX XXXXX XXXXX XXXXX												
	becoming dark orange/ b	rown bard		XXXXX XXXXX XXXXX	- - -4.5											UTP
	_ becoming dark oranger b	iowii, nara		****	4.5								ļμ			SPT at 4.5-4.95m
ı	_			XXXXX XXXXX XXXXX XXXXX									SPT			4/2/4 N=6
	-			XXXXX XXXXX XXXXX	5.0								93			1,5
ı	-			2222	-											
ı	_			XXXXX XXXXX XXXXX	5.5								100			
l				XXXX) XXXXX XXXXX	E											
1	becoming slightly clayey S	SILT. very stiff, low plast	icitv.	***** *****	6.0											156/92 - 1.7
ı	insensitive, with occasiona	al manganese oxide inc	lusions	XXXX XXXX XXXX XXXX	-								SPT			SPT at 6.0-6.45m
	E			XXXX XXXX XXXX XXXX						l			S			2/2/3 N=5
	=			2223 2333 3333	6.5											100189G
1	F				F											
ı	_			****	7.0								86			
ı	_				‡										1	
	becoming stiff, quick				7.5								-	8		92/4 - 23.0
ı	Ė.			3333	j.								SPT			SPT at 7.5-7.95m
	-			X X X X X X X X X X X X X X X X X X X	E								1 20			1/2/5 N=7
		Comments:		18848	Drillin	g Fluid: Topso	lio		Sand				Sands	tone	Plu	itonic :::::::
	The state of				W	ater Fill			Grave	1		PWWW	Siltsto	ne z	ZZZZZZZ No	Core
	LANDER geotechnical		Town and the second		1	cked: Clay		xxxxxxx	Organ	- 1	000 000	00000	Limes	~		
	5	Driller: Pro-Drill	Rig: Tracto	or		KM Silt	× × ×	*******	Pumic	e	000		Volcar	nic 🖔		

	Client :	PETEREX LI					Ma	chi	ne E	3ore	eho			MH01	
	Project Location	1: 1700 BUCKL	AND ROA	AD, PL	JKEKOHE		Max - II		me d *	l			eet 2 o		SESM _e ntraction
	Job Number:	J00858					Vane Hea 307	1	AΒ		AB	sor :	Start Dat Finish Da		
phy	Borehole mN	mE			Grou	nd R.L.		_	Groundwater/ Piezometer	Drilling Method .	(%) /	(%	Sample and Laboratory Test Details	lal /	vity ⊤
Stratigraphy	Location: Description:	Refer to site plan		g		tation:	vertical	-	wpun	ng M Casi	Recovery (%)	RQD (%)	mple abora st De	ane D	Sensitivity & SPT
Stra	CORE D	ESCRIPTION		Legend	(m)	DEFI	ECTS		G Piệ	IIII 8	Rec	œ.	Sa La	>	Ś
Ash	slightly clayey SILT, pink/ moist, low to no plasticity, inclusions at 10.5m, becoming brown EOB at 10.5m. Target Dep	with occasional mangan	vn. Firm, ese oxide		= 8.5 = 9.0 = 9.5 = 10.0 = 10.5 = 11.0 = 11.5 = 12.0 = 12.5 = 13.0 = 13.5 = 14.0 = 14.5 = 15.0 = 15.5 = 16.0					OPEN BARREL	SPT 62 SPT 62			92/3	/8 - 5.8 SPT at -9.45m 1/1/1 N=2 /19 - 4.8 SPT at 5-10.95m 2/4/5 N=9
		Comments:			Drilling Fluid:	Topsoil		Sand			Sands	tone	P	utonic	*******
	THE STATE OF THE S			ļ	water	Fill		Gravel		6,6,6,6	Siltsto	É	2222222 No	Core	
	LANDER geotechnical		DAY UTT AF		Checked:	Clay		Organic		DATESTON OF	imes	×	经经 差		
		Driller: Pro-Drill	Rig; Tractor	r:	km	Silt	(XXXXXXXX) (XXXXXXXX)	Pumice	000		Volca	nic 🖔	******		









client:	PETEREX LIMITED	project no:	figure no:
project:	1700 BUCKLAND ROAD	J 00858	Figure MH01
	PUKEKOHE	compiled:	date:
title:	MH01 CORE PHOTOS	AB	25.01.18

	Client: PETEREX LIMITED					IVI	ach	ine l	3ore	eho	le l	Vo.	лН02
	Project Location: 1700 BUCKLANDS RO)AD,	PUKE	KOHE								eet 1 of	2
	Job Number: J00858					Vane He 307		gged I AB	3y: Pr	oces:	sor:		: 24.01.18 e: 24.01.18
ېږ کې	Borehole mN mE			Ground R.L				iter/	thod	(%)	~		2000
Stratigraphy	Location: Description: Refer to site plan			Orientation:		vertical		Groundwater/ Piezometer	g Met	Recovery (%)	RQD (%)	Sample and Laboratory Test Details	Vane Dial / Sensitivity & SPT
Stra	CORE DESCRIPTION	-egend	Depth (m)	DE	FE	CTS		Grou	Drilling Method & Casing	Reco	RO	San Lab Tes	Var Ser
Г	- TOPSOIL		-										
	clayey SILT, dark orange and brown. Hard, moist, low plastic	XXXX XXXX XXXX		Bent	onit	e	_		OPEN BARREL	9			- Vicence
	 becoming orange/brown mottled red/brown, with occasional limonite inclusions and staining 		- 0.5						OPE				UTP
										96			
	becoming very stiff, moderately sensitive		- 1.0								Š.		174/82 - 2.1
	-		-							92			
	becoming insensitive		- 1.5	Piezomel	ter								148/94 - 1.5 SPT at
				screened from 1.0r		-1	,			SPT			1.5-1.95m 2/3/4
	_		2.0	6.0m									N=7
	_												
	_		- 2.5							43			
				Groundwater	Lev	el as							
Ash	becoming stiff		3.0	measured on 1.02.18; 3.0m			∇					ī	92/52 - 1.8
										SPT		8	SPT at 3.0-3.45m 2/2/2
	-		3.5								7.004		N=4
			Ė							44			
	-		4.0							4			
	becoming brown speckled red/orange												
	becoming brown speckied redionalige		4.5										52/29 - 1.8
	Ē									SPT			SPT at 4.5-4.95m 1/1/1
	becoming pink/red mottled with red/orange		5.0										N=2
	_												
l	_		5.5							100			
l	- -												
	 becoming slightly clayey SILT, streaked red/orange and brown, quick 		6.0										69/4 - 17.6 SPT at
	_									SPT			6.0-6.45m 1/1/1
	_		6.5									-	N=2
	_												
l	_		7.0	Sa.						86			
	_												
l	becoming firm, sensitive	(XXXX) (XXXX) (XXXXX)	- 7.5							-			49/12 - 4.2 SPT at
ı	-									SPT			7.5-7.95m 0/1/2
_	Comments:	(XXXX)	= 8.0 Drilling	Fluid: Topsoi	F	IIIIII	Sand				ne:	Pluto	N=3
	Comments:		wat	100001		}}}}}	Gravel		2000	iltston	2.2	2222222 2222222 22222222 22222222 77222222	11111111
	LANDER geotechnical		Chec	Olay	000		Organio	WWWW.	L	imesto	ne		
	Driller: Pro-Drill Rig: Tractor	8	1CI	Silt	×××	******** I	Pumice	0000	V	olcani	c 👸	******	

	Client :	PETEREX L					M	achi	ne E	3ore	ho	le l	No.	MH02	
	Project Locatio	n: 1700 BUCKI	AND RO	AD, P	UKEKO	HE	7000	71:	12504	T _a			eet 2 of		
	Job Number:	J00858					Vane He 307		AB		RG	sor:		e: 24.01.1 te: 24.01.1	
ohy	Borehole mN	mE			(Ground R.L.	(11)		ater/ ter	thod	(%)	િ			
Stratigraphy	Location: Description:	Refer to site plan		ן ס		Orientation:	vertical		Groundwater/ Piezometer	ig Me Casir	Recovery (%)	RQD (%)	Sample and Laboratory Test Details	Vane Dial / Sensitivity	_ 0 ×
Stra	CORE D	DESCRIPTION		Legend	Depth (m)	DEF	ECTS		Grou	Drilling Method . & Casing	Rec	R	Sar La Tes	Va Se	
Ash	becoming brown, loose, becoming very loose, ext becoming clayey SILT, s with trace fine sand with trace fine sand in a	tiff, low to moderate plas	sticity,								81 SPT 85			49/12 - 1 SPT at 9.0-9.45 1/1/2 N=3	t
1	at 10.4m, becoming oran	ge/brown, with some lim	onite silt	XXXXX XXXXX XXXXX XXXXX XXXXX	- - - = 10.5									42/4 - 10	0.8
	EOB at 10.5m. Target De	epth			-10.5 -11.0 -11.5 -11.5 -12.0 -13.0 -14.0 -14.5 -15.0								,	SPT at 10.5-10.9 1/1/2 N=3	t
					15.5									5	
		Comments:			Drilling F			Sand	2000	s	andst	one	Plu	tonic	::::
	LANDED				wate	Fill		Gravel	- WW	<u><u><u></u></u></u>	Siltsto	Ē	ZZZZZZZZ No	Core	_
	LANDER geotechnical	Dellor B. B.	D1= =		Checke	Λ'	<xxxxxxxx< td=""><td>Organic</td><td>100000</td><td>2000</td><td>imest</td><td></td><td></td><td>_</td><td>-</td></xxxxxxxx<>	Organic	100000	2000	imest			_	-
		Driller: Pro-Drill	Rig: Tracto	F/	1	Silt	5000000000	Pumice	2222	7777	/olcar	IIC Ç	******		_





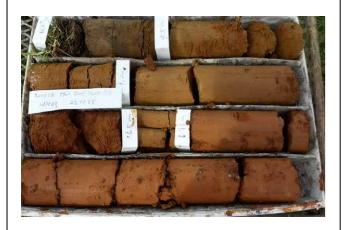




client:	PETEREX LIMITED		р	project no:	figure no:
project:	1700 BUCKLAND ROAD			J 00858	Figure MH02
		PUKEKOHE		ompiled:	date:
title:		MH02 CORE PHOTOS		AB	25.01.18

	Client :	PETEREX L	IMITED					Ma	achi	ne	Bore	eho	le N	Vo.	MI	103
	Project Location	n: 1700 BUCKI	AND ROAD), Pl	UKEK	OHE								eet 1	of	2
	Job Number:	J00858						Vane Hea 307	and the same	gged I AB	Ву: Рг	oces:	sor:			23.01.18 23.01.18
	100	mE				Ground R.L				iter/	thod	(%)	(
Stratigraphy	Location: Description:	Refer to site plan		σТ	_	Orientation	ŧ	vertical		Groundwater/ Piezometer	g Me	Recovery (%)	RQD (%)	Sample and Laboratory	t Det	Vane Dial / Sensitivity & SPT
Stra	CORE D	ESCRIPTION		Legend	Depth (m)	DE	EFE	CTS		Grou Pie;	Drilling Method . & Casing	Reco	RC	San	Tes	Se Se
	TOPSOIL clayey SILT, dark orange/	brown. Very stiff, moist	to dry, low		#0 #0					0,000,000						
	plasticity, moderately sens	sitive	1 X X		-						OPEN BARREL	64			201	awaren kenar
	becoming orange/ brown				- 0.5	В	ento	onite —			EN B	0			1	74/69 - 2.5
			XX		-				A		OPE	100				Name of
	becoming hard		XX XX XX XX		- 1.0										U	ITP
	E		X X X X X X X X X X X X X X X X X X X	X X X X X X X X X X X X	22 20 Fiz							100			2	211/49 - 4.3
	─becoming slightly clayey S - -	SIL1, red/ orange, low to	no plasticity	X X X X X X X X X X X X X X X X X X X	- 1.5 -	Piezomete						SPT				SPT at 1,5-1,95m
	_		XX XX XX XX XX	X X X X X X X X X X X X X X X X X X X	-	from 1.5m	to 6	.0m	>			S				3/4/6 N=10
	E		22 22 22 23 23 23	*** *** ***	- 2.0 -											
	_		*** *** ***	XXX XXX XXX XXX	- - - 2.5							100				
			XX XX XX XX	XXX XXX XXX XXX	-							-				
	becoming stiff, insensitive		**************************************	X X X X X X X X X X X X	- - - 3.0											86/66 - 1.3
Ash	The figure and the second the sec		XX XX XX XX	X X X X X X X X X X X X	-							SPT		×		SPT at 3.0-3.45m
			XX XX XX XX XX	X X X X X X X X X X X X	- - - 3.5							S			Ų.	2/1/2 N=3
			XX XX XX XX XX XX XX	X	-											
			XX XX XX XX	X X X X X X X X X X X X	- - 4.0							81				
	E		XX XX XX XX													
	 becoming moderately sen 	sitive, with some manga	inese oxide		- 4.5							_				79/34 - 2.3
	inclusions					Groundw as meas 1.02.18:	ured	on —	∇			SPT				SPT at 4.5-4.95m
	-				- - _{5.0}	1.02.16.	4.73	MIII.				0,				1/1/1 N=2
					-											
	-				- - 5.5							95				
ı	-											70.75				
	becoming mottled brown	and red/ orange, extra s	ensitive		6.0							_				82/8 - 10.3
	E				=							SPT				SPT at 6.0-6.45m 1/0/1
ı	_				6.5										f	N=1
					F											
ı	=				7.0							100				
	becoming slightly clayey s brown, low to no plasticity	SILT, mottled red/ pink a	and yellow/		-											
	_				7.5								-			66/8 - 8.3 SPT at
	E		de de la companya de		F							SPT				7.5-7.95m 1/0/2
-		Comments	X X	* <u>* * * *</u>	= 8.0 Drilling	Fluid: Topso	Ji E		Sand			Sandel	one	 	Pluton	N=2
		Comments:			-	iter Fill	-	1111111	Gravel	***	10,000	Siltsto		7777777	No Co	
	LANDER				Chec		, , , , ×	XXXXXXXX	Organio	2000	*****	_imest	E			(#)
	3	Driller: Pro-Drill	Rig: Tractor			Silt	222		umice	1		/olcar	ic 🖔	*******	2	

	Client :	PETEREX L					IVI	achi	ne l	3or	eho	le l	Vo.	MHO	3
I	Project Location	n: 1700 BUCKI	AND ROAD	, PUKEK	OHE					. 1			eet 2		
,	Job Number:	J00858					Vane He 307		AB		AB	sor:		Date: 23	
phy	Borehole mN	mE			Ground	d R.L.			ater/	Drilling Method	(%)	(%)			
Stratigraphy	Location: Description:	Refer to site plan	13	2	Orient	ation:	vertical		Groundwater/ Piezometer	ng Me	Recovery (%)	RQD (%	Sample and Laboratory	st De	Sensitivity & SPT
Stre	CORE D	ESCRIPTION		Depth (m)		DEF	ECTS		Gro		Rec	ŭ	Sal	e ≥	รู้ดั
	becoming brown, with son inclusions at 10.5m, becoming mode EOB at 10.5m. Target Del	ne fine to medium sand		9.0		DEFI			9	OPEN BARREL Dr	SPT 65 SPT 71 R			35 9.	6/4 - 8.8 SPT at 0-9.45m 1/1/2 N=3 SPT at 5-10.95m 1/1/3 N=4
Ш	-	<u> </u>		_ 16.0					1000				<u> </u>		
		Comments:			ater	Topsoil		Sand	\$88		Sandst	one:		Plutonic No Core	*******
	LANDER				o Military	Fill Clay	///////	Gravel Organic	2 222		Siltsto Limest	Ė	222222	140 Core	
	geotechnical	Driller: Pro-Drill	Rig: Tractor		1//	Silt	(XXXXXXX) (XXXXXXX) (XXXXXXX)	Pumice	10000		Volca				











client:	PETEREX LIMITED	project no:	figure no:
project:	1700 BUCKLAND ROAD	J 00858	Figure MH03
	PUKEKOHE	compiled:	date:
title:	MH03 CORE PHOTOS	AB	25.01.18

	Client :	PETEREX L	IMITED				IVI	achi	ine E	3ore	eho	le N	lo.	МН)4
	Project Location	n: 1700 BUCKL	AND ROAD, F	PUKEK	OHE								eet 1	of 2	
	Job Number:	J00858					Vane He 307		gged E AB		RG	or:			3.01.18 23.01.18
hy	Borehole mN	mE			Ground	d R.L.			ater/ ter	thod	(%)	~	and Sry	200	_i ₹.
Stratigraphy		Refer to site plan	1 25	-	Orienta	ation:	vertical		Groundwater/ Piezometer	g Me	Recovery (%)	RQD (%)	Sample and Laboratory	I Det	Vane Dial / Sensitivity & SPT
Strai	CORE D	ESCRIPTION	Legend	Depth (m)		DEF	ECTS		Grou Piez	Drilling Method . & Casing	Reco	RC	San	es es	Se Se
	_ TOPSOIL			-					8 8		88				
	- clayey SILT, dark orange, Hard, dry, low plasticity	/brown mottled orange/b	orown.	-			Bentonite	_						וט	Р
	at 0.5m, becoming orange	e and brown		- 0.5							92				
				-							0.520			Jan 22	the co
	-			- 1.0										UT	Р
				E			zometer				83				
	=			- 1.5		from	eened n -6.0m								FP SPT at
	_			E		1.0	J.JIII				SPT			1.5	5-1.95m 4/4/4
	-			2.0											N=8
	<u>-</u>			E											
	becoming red/orange		1	2.5							100				
	_														
	 becoming very stiff, insens inclusions and staining 	sitive, with occasional lin	nonite	3.0							Č.	9			9/82 - 1.8 SPT at
	<u> </u>										SPT				0-3.45m 2/2/4
				3.5											N=6
				E							794277				
Ash	=			4.0							86				
	_			E											
	becoming firm, extra sens	sitive		4.5										49	/4 - 12.25 SPT at
	<u>.</u> L			E							SPT			4	.5-4.95m 1/0/1
1	 with occasional mangane 	ese oxidation		5.0									ŀ		N=1
	-			5.5							86				
	E			E											
	becoming sensitive			6.0							L			4	9/8 - 6.1 SPT at
				ZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZ		¥7					SPT			6	5,0-6,45m 1/1/2
	- x		XXX	6.5											N=3
	F -		XXXX XXXX XXXX XXXX XXXX												
	F		XXXX XXXX XXXX XXXX XXXX	7.0							9/				
	=		XXXX XXXX XXXX XXXX XXXX	XXXXX											
	becoming mottled red/br	own and brown	XXXX XXXX XXXX XXXX XXXX	7.5										4	9/19 - 2.8
	-		XXX XXXX XXXX XXXX XXXX	XXX							SPT			7	SPT at 7.5-7.95m 1/0/2
L		Comments	XXXX XXXX XXXX	Brilling	Fluid:	Topecil		Sand	1 2323	 		One:		Plutonic	N=2
		Comments:			tor	Topsoil Fill		Gravel	***	35,5,5,5	Siltstor	2	222224	No Core	
	LANDER			Chec	ked:	Clay	(XXXXXXX	Organi	C MANA	******	imest	- 3			
L	geotechnical	Driller: Pro-Drill	Rig: Tractor	K	m s	Silt	(XXXXXXX) (XXXXXXX)	Pumice	9	\$ \$ \$ \$ \$ \$ \$ \ \$ \$ \$ \$ \$ \$ \$ \$ \$ \	Volcan	ic 🖔			

	Client :	PETEREX L	IMITED				Mac	hir	ne E	3ore	ho	le N	No.	лН04
	Project Location	n: 1700 BUCKI	AND ROAD, F	PUKEK	OHE								eet 2 of	2
	Job Number:	J00858		8			Vane Head: I 307		В		RG	sor:		: 23/01/18 e: 23/01/18
ohy	Borehole mN	mE			Ground	I R.L.		_	Groundwater/ Piezometer	thod	(%)	(9)	and ory ails	al /
Stratigraphy	Location: Description:	Refer to site plan	7 7	-	Orienta	ation:	vertical	_	zome	ng Me Casir	Recovery (%)	RQD (%)	Sample and Laboratory Test Details	Vane Dial / Sensitivity & SPT
Stra	CORE D	ESCRIPTION	Pegend	Depth (m)		DEFI	ECTS		Gro Pie	Drilling Method .	Reco	R	Sar	Sea
Ash				_										
A	-			- - - 8.5							06			
	slightly clayey SILT, red a streaks. Stiff, moist, low to with occasional sand sized	no plasticity, sensitive.		- "							0)			
	 with occasional sand sized becoming brown, medium 			9.0										66/19 - 3.5
		ruciise, seristive		- "							SPT			SPT at 9.0-9.45m
Tuff			X X X X X X X X X X X X X X X X X X X X	9.5							- 07			2/2/2 N=4
8	_		XXXX XXXX XXXX XXXX					1						
200	_		***** **** ****	_ _ 10.0							59			
	<u>-</u>		\$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$2 \$	Ē										
		240	\$2330 \$3330 \$3330	- 10.5										49/19 - 2.6
	- EOB at 10.5m. Target De	ptn									SPT			SPT at 10.5-10.95m
	_			- - 11.0									1	2/2/2 N=4
		9		=				-						
	_			- - 11.5										
	-			-										
				12.0										
	_			-		==								
	-			12.5	2									
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l				Ē	15\$								-	
_		Comments:		= 16.0 Drillin	g Fluid: 7	Горsoil	San	nd l		L	Sandst	tone	Plu	tonic :::::::
				Part of the Part o	ater -	Fill	Gra	100		8888	Siltsto	2 2	2222222	Core
	LANDER geotechnical	**************************************	Notes Nett W	- 00		Clay	Orga	(X-01)	222	2222	imest	Š	******	
		Driller: Pro-Drill	Rig: Tractor	14	-m	Silt	Pum	nice	0000	1111	Volca	nic 🖔		









client:	PETEREX LIMITED	project no:	figure no:
project:	1700 BUCKLAND ROAD	J 00858	Figure MH04
	PUKEKOHE	compiled:	date:
title:	MH04 CORE PHOTOS	AB	25.01.18

	STORM	IWATER	PERCOLAT	ION TE	ST	
Client:	PETEREX LIMITE	D			Job No:	J00858
Location:	1700 BUCKLAND	ROAD			Date:	23.01.18
	PUKEKOHE				Page	1 of 2
Hole No:	P1			Diameter	0.1	(m)
Location:	refer to site plan			Depth:	2.45	(m)
Weather co	nditions preceding	test:	dry			
Details of p	resoaking:		16 hours			
Time	Time	Depth	Water		Cum	
of Test	Interval	Reading	Depth		Time	
(hr.min)	(min)	(m)	(m)		(min)	
9:03	-	0.30	2.15		0	
9:04	1	0.36	2.09		1	
9:06	2	0.45	2.00		3	
9:08	2	0.53	1.92		5	
9:10	2	0.57	1.88		7	
9:15	5	0.70	1.75		12	
9:20	5	0.75	1.70		17	
9:40	20	0.87	1.58		37	
10:00	20	0.97	1.48		57	
10:20	20	1.03	1.42		77	
10:40	20	1.12	1.33		97	
11:00	20	1.15	1.30		117	
11:20	20	1.20	1.25		137	
11:40	20	1.23	1.22		157	
12:00	20	1.25	1.20		177	
12:20	20	1.28	1.17		197	
12:40	20	1.30	1.15		217	
13:00	20	1.35	1.10		237	
			Test	P1		
			Gradient	0.001	m/min	
			Percolation	0.02	L/m²/min	
						-



Lander Geotechnical Consultants Limited

P O Box 97 385, Manukau, Auckland 2241

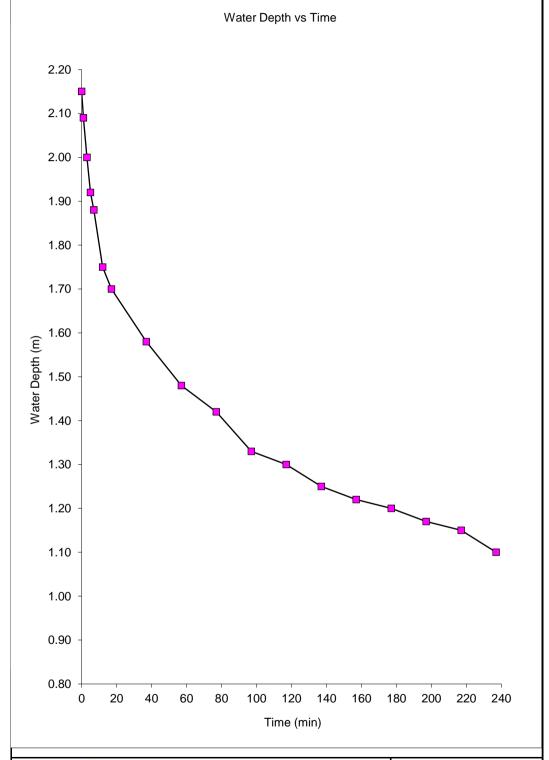
Phone: 027 488 6882

Email: shane@landergeotechnical.co.nz

Operator: KM

Checked: SL

	STORMWATE	R PERC	OLATIO	N TEST	
Client:	PETEREX LIMITED		Job No:	J00858	
Location:	1700 BUCKLAND ROAD		Date:	23.01.18	
	PUKEKOHE		Page	2 of 2	
Hole No:	P1	Diameter:	0.1	(m)	
Location:	refer to site plan	Depth:	2.5	(m)	





Lander Geotechnical Consultants Limited

P O Box 97 385, Manukau, Auckland 2241

Phone: 027 488 6882

Email: shane@landergeotechnical.co.nz Checked:

ΚM Operator:

SL

Appendix C Initia Investigation Logs





SITE LOCATION: 303 Buckland Road, Pukekohe

PROJECT: 303 Buckland Road

ELEVATION: 74m

CO-ORDINATES: 1769921mE, 5879085mN Co-ordinate system: NZTM Location method: GPSH

CONTRACTOR: Local Contractor

MACHINE: Excavator Datum: AUCKHT1946 Level method: CONTOUR OPERATOR: Eugene

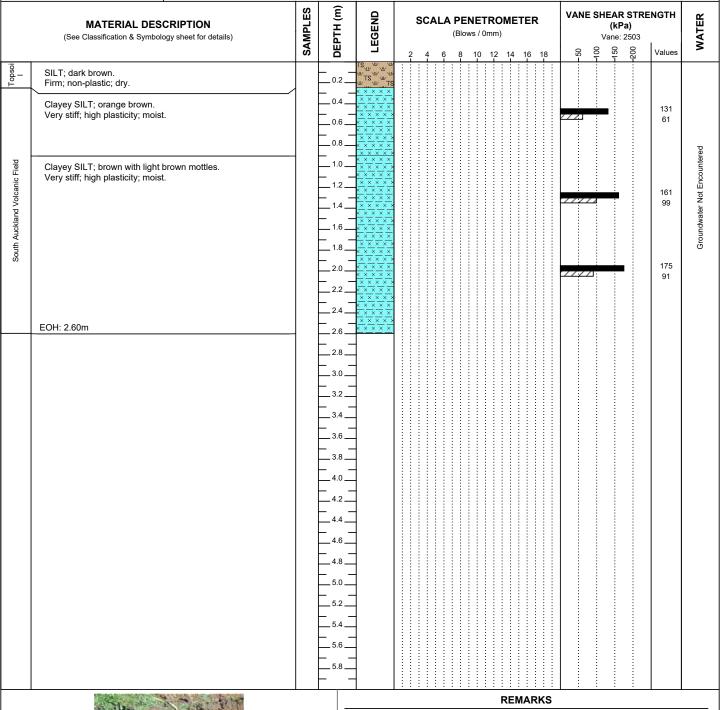
P-000925 **START DATE:** 16/10/2020 END DATE: 16/10/2020

TP-01

HOLE NO.:

Project Ref.:

LOGGED BY: QS CHECKED BY: MDH



Generated with CORE-GS by Geroc - Test Pit_Initia - 20/10/2020 1:10:27 pm

WATER INVESTIGATION TYPE ▼ Standing Water Level Hand Auger ← Out flow ✓ Test Pit

Page 1 of 1 Checked By: MDH



SITE LOCATION: 303 Buckland Road, Pukekohe

PROJECT: 303 Buckland Road

CO-ORDINATES: 1769882mE, 5879113mN Co-ordinate system: NZTM Location method: GPSH

ELEVATION: 73m MACHINE: Excavator Datum: AUCKHT1946

CONTRACTOR: Local Contractor **START DATE:** 16/10/2020 END DATE: 16/10/2020 Level method: CONTOUR OPERATOR: Eugene

LOGGED BY: QS CHECKED BY: MDH

HOLE NO.:

Project Ref.:

TP-02

P-000925

DEPTH (m) VANE SHEAR STRENGTH LEGEND SCALA PENETROMETER **MATERIAL DESCRIPTION** (kPa) (See Classification & Symbology sheet for details) Vane: 2503 8 20 10 12 14 16 Top soil SILT; dark brown. Firm; non-plastic; dry. 0.2 Clayey SILT; orange brown. 124 Very stiff; high plasticity; moist. Groundwater Not Encountered South Auckland Volcanic Field Clayey SILT; yellowish brown. Hard; high plasticity; moist. 204.54 1.8m: Grading to very stiff-EOH: 2.00m 190 **REMARKS**

Continued as hand auger. Refer to HA-02

WATER

▼ Standing Water Level

← Out flow

INVESTIGATION TYPE

Hand Auger

✓ Test Pit

Generated with CORE-GS by Geroc - Test Pit_Initia - 20/10/2020 1:10:29 pm



SITE LOCATION: 303 Buckland Road, Pukekohe

PROJECT: 303 Buckland Road

Project Ref.: P-000925

TP-03

HOLE NO.:

CO-ORDINATES: 1769983mE, 5879080mN Co-ordinate system: NZTM Location method: GPSH

CONTRACTOR: Local Contractor **ELEVATION**: 71m Datum: AUCKHT1946 MACHINE: Excavator Level method: CONTOUR OPERATOR: Eugene

START DATE: 16/10/2020 END DATE: 16/10/2020 LOGGED BY: QS

CHECKED BY: MDH

DEPTH (m) VANE SHEAR STRENGTH LEGEND SCALA PENETROMETER **MATERIAL DESCRIPTION** (kPa) (See Classification & Symbology sheet for details) Vane: 2503 8 20 Values 10 12 14 16 oil Oil SILT; dark brown. Firm; non-plastic; dry. Clayey silty; orange brown. 178 Very stiff; high plasticity; moist. Clayey SILT; brown with some grey mottles. 204.54 Hard; high plasticity; moist. 204.54 Clayey SILT; reddish brown. Hard; high plasticity; moist. Groundwater Not Encountered South Auckland Volcanic Field EOH: 5.00m Generated with CORE-GS by Geroc - Test Pit_Initia - 20/10/2020 1:10:30 pm **REMARKS**

WATER

▼ Standing Water Level

← Out flow

INVESTIGATION TYPE

Hand Auger

✓ Test Pit



SITE LOCATION: 303 Buckland Road, Pukekohe

PROJECT: 303 Buckland Road

Project Ref.: P-000925

TP-04

HOLE NO.:

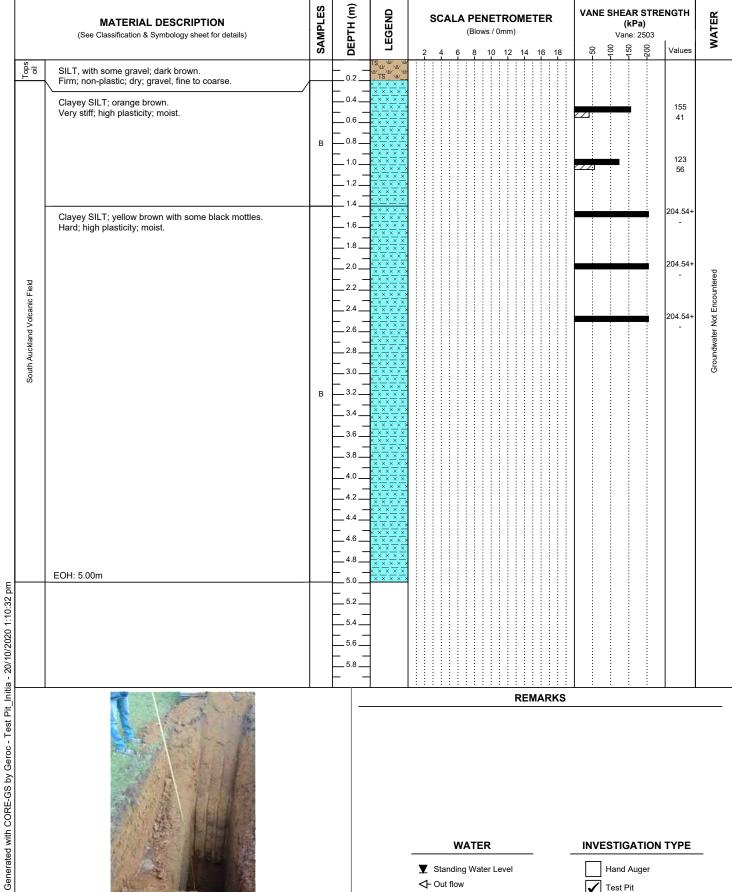
CO-ORDINATES: 1769946mE, 5879111mN Co-ordinate system: NZTM Location method: GPSH

CLIENT: Jason Woodyard

ELEVATION: 69.5m Datum: AUCKHT1946

CONTRACTOR: Local Contractor **START DATE:** 16/10/2020 MACHINE: Excavator END DATE: 16/10/2020 Level method: CONTOUR OPERATOR: Eugene

LOGGED BY: QS CHECKED BY: MDH





WATER INVESTIGATION TYPE Hand Auger Standing Water Level ← Out flow ✓ Test Pit

Page 1 of 1 Checked By: MDH



SITE LOCATION: 303 Buckland Road, Pukekohe

PROJECT: 303 Buckland Road

CO-ORDINATES: 1769905mE, 5879117mN

ELEVATION: 71.5m CONTRACTOR: Local Contractor

P-000925 START DATE: 16/10/2020 END DATE: 16/10/2020

TP-05

HOLE NO.:

Project Ref.:

Co-ordinate system: NZTM Location method: GPSH

CLIENT: Jason Woodyard

Datum: AUCKHT1946 MACHINE: Excavator Level method: CONTOUR OPERATOR: Eugene

LOGGED BY: QS CHECKED BY: MDH

GEOI	ECHNICAL SPECIALISTS				_	CHECKED	BY: MDH
	MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STR (kPa) Vane: 2503	ENGTH Values
Tops	SILT; dark brown. Firm; non-plastic; dry.	0		TS W W	2 4 6 8 10 12 14 16 18	- 50 - 100 - 150	values
	Clayey SILT; orange brown with some grey mottles. Very stiff; high plasticity; moist.	В	0.4 0.6 0.8	5 <u>* * * * * *</u> * * * * * * * * * * * * *		221	143 38
	Clayey SILT; brown with grey mottles. Very stiff to hard; high plasticity; moist.	В	1.0 — — 1.2 — 1.4	<u> </u>		2222	178 76
South Auckland Volcanic Field	Clayey SILT; reddish brown. Hard; high plasticity; moist.	В					204.54+
			5.0 				
					REMARKS	INVESTIGATION	I TYPE
					▼ Standing Water Level Out flow In flow	Hand Auger Test Pit	

Page 1 of 1 Checked By: MDH



SITE LOCATION: 303 Buckland Road, Pukekohe

Level method: CONTOUR OPERATOR: Eugene

PROJECT: 303 Buckland Road

CONTRACTOR: Local Contractor
MACHINE: Excavator

START DATE: 16/10/2020 END DATE: 16/10/2020 LOGGED BY: QS CHECKED BY: MDH

TP-06

P-000925

HOLE NO.:

Project Ref.:

DEPTH (m) VANE SHEAR STRENGTH LEGEND SCALA PENETROMETER MATERIAL DESCRIPTION (kPa) (See Classification & Symbology sheet for details) Vane: 2503 8 20 Values 10 12 14 16 SILT; dark brown. Firm; non-plastic; dry. Clayey SILT; orange brown. 120 Very stiff; high plasticity; moist. Groundwater Not Encountered South Auckland Volcanic Field 175 Clayey SILT; reddish brown. Very stiff; high plasticity; moist. - INTERBEDDED WITH -178 Silty CLAY; grey. Stiff; high plasticity; moist. Clayey SILT; light brown. Very stiff; high plasticity; moist. 161 EOH: 2.00m **REMARKS**

Continued as hand auger. Refer to HA-01

WATER

▼ Standing Water Level

← Out flow

In flow

INVESTIGATION TYPE

Hand Auger

✓ Test Pit

Generated with CORE-GS by Geroc - Test Pit_Initia - 20/10/2020 1:10:35 pm



ELEVATION: 68m

SITE LOCATION: 303 Buckland Road, Pukekohe

PROJECT: 303 Buckland Road

CLIENT: Jason Woodyard

CONTRACTOR: Local Contractor

Project Ref.: P-000925

TP-07

HOLE NO.:

CO-ORDINATES: 1769936mE, 5879143mN Co-ordinate system: NZTM Location method: GPSH

Datum: AUCKHT1946 MACHINE: Excavator Level method: CONTOUR OPERATOR: Eugene

START DATE: 16/10/2020 END DATE: 16/10/2020 LOGGED BY: QS

CHECKED BY: MDH

DEPTH (m) VANE SHEAR STRENGTH LEGEND SCALA PENETROMETER **MATERIAL DESCRIPTION** (kPa) (See Classification & Symbology sheet for details) Vane: 2503 20 8 Values 10 12 14 16 18 SILT; dark brown. Firm; non-plastic; dry. Clayey SILT; orange brown. Very stiff; high plasticity; moist. Groundwater Not Encountered Auckland Volcanic Field 167 Clayey SILT; reddish brown. Hard; high plasticity; moist. Clayey SILT; light brown. Hard; high plasticity; moist. EOH: 2.00m **REMARKS**

WATER

▼ Standing Water Level

← Out flow

In flow

INVESTIGATION TYPE

Hand Auger

✓ Test Pit

Generated with CORE-GS by Geroc - Test Pit_Initia - 20/10/2020 1:10:36 pm



SITE LOCATION: 303 Buckland Road, Pukekohe

PROJECT: 303 Buckland Road

CO-ORDINATES: 1769936mE, 5879128mN

P-000925 START DATE: 16/10/2020 END DATE: 16/10/2020

HA-02

HOLE NO.:

Project Ref.:

Co-ordinate system: NZTM Location method: GPSH

CLIENT: Jason Woodyard

ELEVATION: 73m Datum: AUCKHT1946 Level method: CONTOUR

LOGGED BY: QS CHECKED BY: MDH

FIND	MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	(Blows	ETROMETER s / 0mm) 10 12 14 16 18	VA	_	HEAR STRE (kPa) Vane: 2503	NGTH	WATER
	Test Pit 0.0 to 2.0 m (refer to TP-02)		0.2					Ţ	T 04		Groundwater Not Encountered
South Auckland Volcanic Field	Clayey SILT; light brown. Very stiff; high plasticity; moist. 3.6m: Grades to hard SILT, with some clay; orange brown. Hard; low plasticity; moist.		2.2					1 2 2		126 58 146 66 131 73 161 80 153 76 205+ -	Groundwater N
1144 - 1010 O TI	EOH: 4.00m		4.2								
		<u> </u>	-	1	 	REMARKS	:	•	: :		
Octobridge with Done - oo by Octobridge Trains August 11 to 200 to 11 to 200 to 12 to 10 to 200 to 11 to 10 to 200 to		1.27			WATER ▼ Standing Water ← Out flow In flow		IN'	На	TIGATION and Auger est Pit	ТҮРЕ	_

WATER	INVESTIGATION TYPE
▼ Standing Water Level <- Out flow	Hand Auger Test Pit



SITE LOCATION: 303 Buckland Road, Pukekohe

PROJECT: 303 Buckland Road

CO-ORDINATES: 1769983mE, 5879080mN ELEVATION: 71m Co-ordinate system: NZTM Datum: AUCKHT1946 Location method: GPSH Level method: CONTOUR HOLE NO.:

HA-03 Project Ref.:

P-000925 START DATE: 23/10/2020 END DATE: 23/10/2020

LOGGED BY: QS CHECKED BY: MDH

-	STEETINICAL STEETALISTS		1	_															_			СП	LUP	/ED	BT: NU	1
LIND	MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEРТН (m)	LEGEND		S	CA	٩L			NE ws /				ΕT	E	R		V	ANE	,	(k Vane	(Pa) e: 26	89	NGTH	WATER
		Ś	DE			2	4	6	}	8	10)	12	14	1	16	18	3		-50	7 00	-150	3 8	-200	Values	
Tops	SILT; dark brown. Firm; non-plastic; dry.		0.2	* * * * * * * * * * * * * * * * * * *											:										200+	
	Clayey SILT; orange brown.		0.4	<u> </u>																T	Ī		_		-	
	Very stiff to hard; high plasticity; moist.		0.6_	****** *****																-	_	_	_		200+	
		-	0.8_	× × × × ×	i					i		i													200+	
	Clayey SILT; brown with some grey mottles. Hard; high plasticity; moist.		1.0	<u> </u>																					-	
			1.2	<u> </u>															-	//	,	_	_		186 86	
			1.4	******																					200+	
	Clayey SILT; reddish brown.	1	1.6_	<u>××××</u>																Τ	Ī				-	
	Very stiff; high plasticity; moist.		1.8_	<u>x x x x x</u> x											į					÷	÷	_		i	200+	
			2.0	<u> </u>												į										70
ield			2.2																//	///					122 72	ıntere
anic F			2.4	<u> </u>												i				_					107	Encor
N V olc																				_					60	r Not
South Auckland Volcanic Field	2.6m: Grades to stiff		2.8	<u> </u>															7	//	-				97 64	Groundwater Not Encountered
uth Au			3.0	<u> </u>																					97	Groun
Sol			3.2	_ <u>*****</u>												į			Z	7	_				64	
	3.3m: Grades to very stiff	-	3.4	<u> </u>															//	//	÷				122 74	
																									100	
			3.6_	<u> </u>															7	ZZ	_				66	
			3.8_	<u> </u>																	_				100 63	
			4.0_	×××××																T						
			4.2	<u> </u>															7	4		1			114 50	
			4.4	<u> </u>																_	<u>.</u>	_			136	
			4.6 _	_ <u>* * * * * *</u>												i					4				100	
			4.8	× × × × × ×															7		Ż.		-		172 100	
	EOH: 5.00m	-	5.0	×××××																						
			5.2	7																						
			5.4							-		-														
			5.6 _													:										
			5.8 _	╡																						
			<u> </u>	-	į		-						:		-	÷				<u> </u>	<u> </u>			<u> </u>		
	P-000925 303 Buckland Road, Pukekohe													RE	M	ΑF	RK	S								

WATER	INVESTIGATION TYPE
▼ Standing Water Level Out flow In flow	Hand Auger Test Pit

Generated with CORE-GS by Geroc - Hand Auger_Initia - 13/11/2020 10:02:44 am



SITE LOCATION: 303 Buckland Road, Pukekohe

PROJECT: 303 Buckland Road

P-000925 START DATE: 23/10/2020 END DATE: 23/10/2020

HA-05

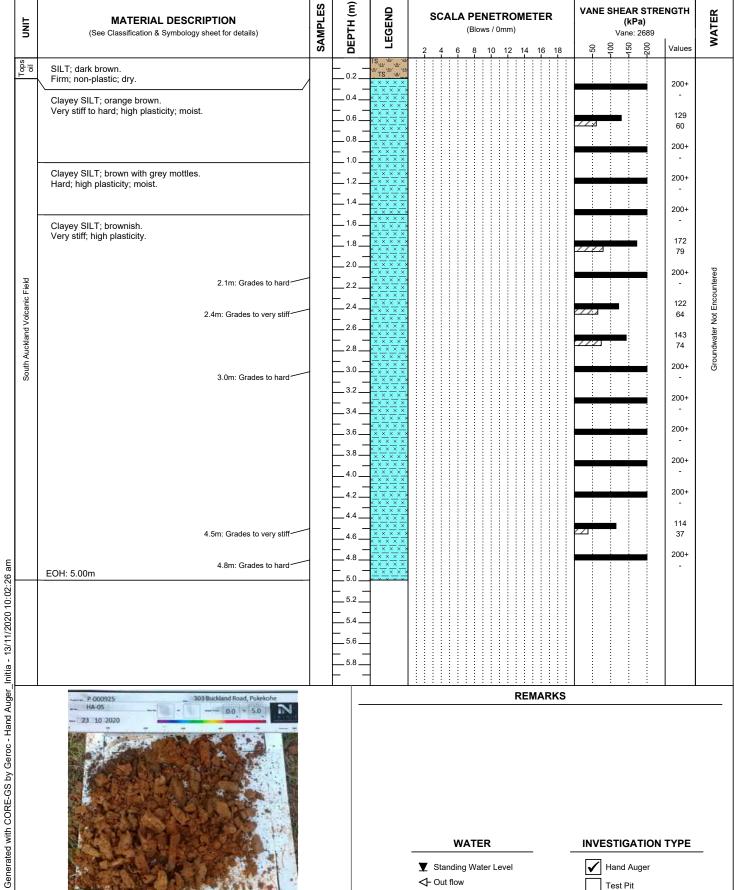
HOLE NO.:

Project Ref.:

CO-ORDINATES: 1769905mE, 5879117mN Co-ordinate system: NZTM Location method: GPSH

ELEVATION: 71.5m Datum: AUCKHT1946 Level method: CONTOUR

LOGGED BY: QS CHECKED BY: MDH



WATER INVESTIGATION TYPE ✓ Hand Auger Standing Water Level Out flow Test Pit



SITE LOCATION: 303 Buckland Road, Pukekohe

PROJECT: 303 Buckland Road

CLIENT: Jason Woodyard

Location method: GPSH

CO-ORDINATES: 1769882mE, 5879113mN
Co-ordinate system: NZTM

ELEVATION: 67m

Datum: AUCKHT1946

Level method: CONTOUR

HOLE NO.: HA-06

Project Ref.: P-000925

START DATE: 16/10/2020 END DATE: 16/10/2020 LOGGED BY: QS CHECKED BY: MDH

DEPTH (m) VANE SHEAR STRENGTH LEGEND **SCALA PENETROMETER** MATERIAL DESCRIPTION LIND (kPa) (See Classification & Symbology sheet for details) Vane: 2503 8 20 10 12 14 16 18 Test Pit 0.0 to 2.0 m (refer to TP-06) 0.2 Groundwater Not Encountered 161 Clayey SILT; light brown. Very stiff; high plasticity; moist. South Auckland Volcanic Field 205+ SILT, with some clay; brown. Hard; low plasticity; moist. EOH: 4.00m

INVESTIGATION TYPE
✓ Hand Auger

REMARKS

Checked By: MDH

Generated with CORE-GS by Geroc - Hand Auger Initia - 20/10/2020 1:10:39 pm

Page 1 of 1

Appendix D Lander Lab Testing Results





Coffey Services (NZ) Limited

144A Cryers Road, East Tamaki NZ 2013 PO Box 58877, Botany, Manukau NZ 2163

Phone: +64 9 272 3375 Fax: +64 9 272 3378

Report No: ETAM18S-00533-1 Issue No: 1

Tests indicated as not accredited are outside the scope of the laboratory's accreditation. {This document may not be altered or reproduced except in full. This report relates only to the positions



Approved Signatory: James McKelvey

(Senior Technician)
IANZ Accredited Laboratory Number:105

Date of Issue: 2/02/2018

Material Test Report

Client: Lander Geotechnical Consultants Limited

PO Box 97385 Manukau City 2241

Principal: Kyle Meffan

Project No.: 773-ETAM00588AA

J00858 - 1700 Buckland Road, Pukekohe **Project Name:**

Lot No.: -

TRN: -

Sample Details

Sample ID: ETAM18S-00533

Client Sample: S2

Date Sampled: 22/01/2018

Unknown (Sampled by Client) Source:

Material: Disturbed Soil Specification: NZ Grading Full

Sampling Method: Unknown (Not IANZ Endorsed) Project Location: 1700 Buckland Road, Pukekohe

Sample Location:

1.5 - 2.0 m

Test Results

Description	Method	Result Limits
Allophane Content	NZS 4402:1986 Test 3.4	5 - 7 %
Date Tested		1/02/2018

Comments

Work Order: ETAM18W00227 Tested By: CT



Coffey Services (NZ) Limited

144A Cryers Road, East Tamaki NZ 2013 PO Box 58877, Botany, Manukau NZ 2163

Phone: +64 9 272 3375 Fax: +64 9 272 3378

Report No: ETAM18S-00534-1

Issue No: 1

Tests indicated as not accredited are outside the scope of the laboratory's accreditation.
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ACCREDITED LABORATORY

Approved Signatory: James McKelvey (Senior Technician) IANZ Accredited Laboratory Number:105

Date of Issue: 2/02/2018

Material Test Report

Client: Lander Geotechnical Consultants Limited

PO Box 97385 Manukau City 2241

Principal: Kyle Meffan

Project No.: 773-ETAM00588AA

Project Name: J00858 - 1700 Buckland Road, Pukekohe

Lot No.: -

TRN: -

Sample Details

Sample ID: ETAM18S-00534

Client Sample: S2

Date Sampled: 22/01/2018

Source: Unknown (Sampled by Client)

Material:Disturbed SoilSpecification:NZ Grading Full

Sampling Method: Unknown (Not IANZ Endorsed)
Project Location: 1700 Buckland Road, Pukekohe

Sample Location: HA5

1.5 - 2.1 m

Test Results

Description	Method	Result Limits
Allophane Content	NZS 4402:1986 Test 3.4	5 - 7 %
Date Tested		1/02/2018

Comments

Work Order: ETAM18W0027 Tested By: CT



Coffey Services (NZ) Limited

144A Cryers Road, East Tamaki NZ 2013 PO Box 58877, Botany, Manukau NZ 2163

Phone: +64 9 272 3375 Fax: +64 9 272 3378

ANZ

Atterberg Classification Test Report

Client: Lander Geotechnical Consultants Limited

PO Box 97385 Manukau City 2241

Principal: Kyle Meffan

Project No.: 773-ETAM00588AA

Project Name: J00858 - 1700 Buckland Road, Pukekohe

Report No: CLAS:ETAM18S-00533

Issue No:1

This report replaces all previous issues of Report No. CLAS:ETAM18S-00533

Tests indicated as not accredited are outside the scope of

(This decum

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Approved Signatory: James McKelvey

Senior Technician

IANZ Accredited Laboratory Number: 105
Date of Issue: 02/02/2018

Date Sampled: 22/01/2018

Date Tested: 31/01/2018

Tested by: Nara Yoon

Sample Details

Sample Number: ETAM18S-00533

Project Location: 1700 Buckland Road, Pukekohe

Sample Location: HA1, 1.5 - 2.0 m

Laboratory test Procedures: Atterberg Limits [NZS 4402 Test 2.2, 2.3, 2.4, 2.6], Moisture Content [NZS 4402:1986 Test 2.1]

Sampling Method: Unknown (Not IANZ Endorsed)

Laboratory Data

Liquid Limit 104 Sample History: Natural state

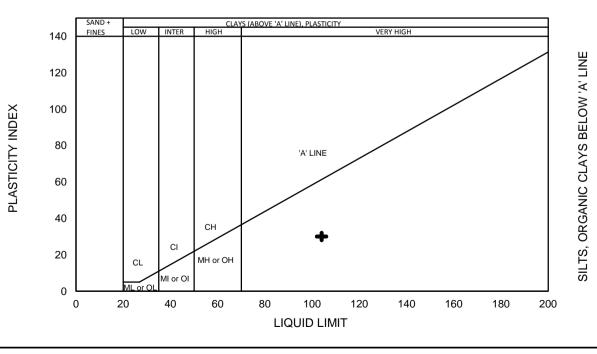
 Plastic Limit:
 74
 Fraction Tested:
 Passing 425μm sieve

 Plasticity Index:
 30
 Material Description:
 Disturbed Soil

Plasticity Index: 30
Linear Shrinkage: 21

#Liquidity Index (w-PL)/PI 0.2 Moisture Content (%) 79.1

CASAGRANDE PLASTICITY CHART



Comments:



Coffey Services (NZ) Limited

144A Cryers Road, East Tamaki NZ 2013 PO Box 58877, Botany, Manukau NZ 2163

Phone: +64 9 272 3375 Fax: +64 9 272 3378

Atterberg Classification Test Report

Client: Lander Geotechnical Consultants Limited

PO Box 97385 Manukau City 2241

Principal: Kyle Meffan

Project No.: 773-ETAM00588AA

Project Name: J00858 - 1700 Buckland Road, Pukekohe

Report No: CLAS:ETAM18S-00534

Issue No:1

This report replaces all previous issues of Report No. CLAS:ETAM18S-00534

Tests indicated as not accredited are outside the scope of

IANZ

{This document may not be altered or reproduced except in full. This report relates only to the positions tested.}

Approved Signatory: James McKelvey

Senior Technician

IANZ Accredited Laboratory Number: 105
Date of Issue: 02/02/2018

Date Sampled: 22/01/2018

Date Tested: 31/01/2018

Tested by: Nara Yoon

Sample Details

Sample Number: ETAM18S-00534

Project Location: 1700 Buckland Road, Pukekohe

Sample Location: HA5, 1.5 - 2.1 m

Laboratory test Procedures: Atterberg Limits [NZS 4402 Test 2.2, 2.3, 2.4, 2.6], Moisture Content [NZS 4402:1986 Test 2.1]

Sampling Method: Unknown (Not IANZ Endorsed)

Laboratory Data

Liquid Limit 114 Sample History: Natural state

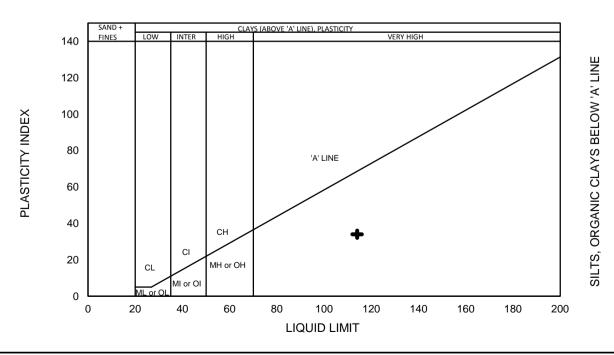
Plastic Limit: 80 Fraction Tested: Passing 425 µm sieve

Plasticity Index: 34 Material Description: Disturbed Soil

Linear Shrinkage: 24

#Liquidity Index (w-PL)/PI -0.2 Moisture Content (%) 72.2

CASAGRANDE PLASTICITY CHART



Comments:

RUZ/A Issue Date: 19/09/2017

PARTICLE SIZE DISTRIBUTION

HYDROMETER NZS 4402:1986 TEST 2.8.4



Tests / comments outside the scope of laboratory's

J. McKelvey Approved Signatory

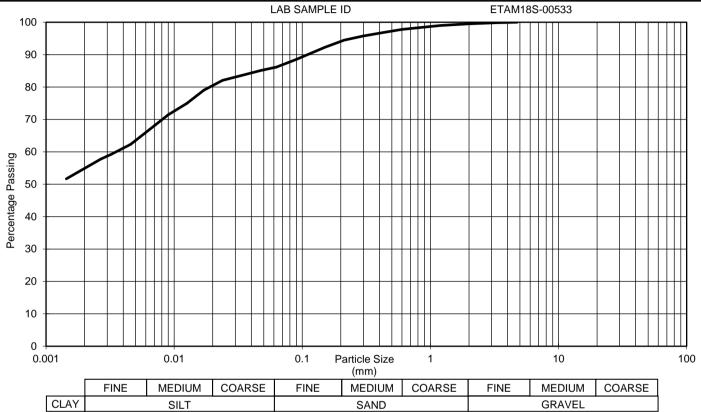
773-ETAM00588AA JOB NO

PROJECT J00858 - 1700 Buckland Road, Pukekohe Lander Geotechnical Consultants Limited CLIENT

HA1 **BOREHOLE NO**

CLIENT REF S2

DEPTH 1.5 - 2.0 m



Tested from 'As received natural' state without pretreatment

pH 8.5

Solid Density 2.75 Assumed

'As received' natural water content 79.1 %

Percentage passing obtained by difference

SIZE	FRACTION	RANGE		*Size parameters	
O.Z.L	1131011011	mm	%	diam _{% passing}	mm
COBBLES		> 60		d ₈₅	0.046
GRAVEL	Coarse	60 - 20		d ₆₀	0.0035
	Medium	20 - 6		d ₅₀	-
	Fine	6 - 2		d ₃₀	-
	Coarse	2 - 0.6	2	d ₁₅	-
SAND	Medium	0.6 - 0.2	4	d ₁₀	-
	Fine	0.2 - 0.06	8	d_5	-
	Coarse	0.06-0.02	6	*Uniformity (Coefficient
SILT	Medium	0.02-0.006	14	C _u	=
	Fine	0.006-0.002	12	*Curvature Coefficient	
CLAY		<0.002	54	C _c	-



Coffey Services (NZ) Limited (Lab - East Tamaki) 144A Cryers Road, East Tamaki, Auckland NZ 2013 PO Box 58877, Botany, Auckland NZ 2163 Phone: +64 9 272 3375, Fax: +64 9 272 3378 www.coffey.com

DATE

2.02.18

CHECKED

JM

PARTICLE SIZE DISTRIBUTION

HYDROMETER NZS 4402:1986 TEST 2.8.4



Tests / comments laboratory's

outside the scope of

773-ETAM00588AA JOB NO

PROJECT J00858 - 1700 Buckland Road, Pukekohe Lander Geotechnical Consultants Limited CLIENT

HA5 **BOREHOLE NO CLIENT REF** S2 **DEPTH** 1.5 - 2.1 m

J. McKelvey Approved Signatory ETAM18S-00534 LAB SAMPLE ID 100 90 80 70 60 Percentage Passing 50 40 30 20 10 0 0.001 0.01 0.1 Particle Size 10 100 (mm) **FINE** MEDIUM COARSE **FINE** MEDIUM COARSE **FINE** MEDIUM COARSE CLAY

Tested from 'As received natural' state without pretreatment

SILT

pH 8.0

Solid Density 2.75 Assumed

GRAVEL

'As received' natural water content 72.2 %

Percentage passing obtained by difference

SIZE	FRACTION	RANGE		*Size para	ameters
0.22		mm	%	diam _{% passing}	mm
COBBLES		> 60		d ₈₅	0.0091
GRAVEL	Coarse	60 - 20		d ₆₀	-
	Medium	20 - 6		d ₅₀	-
	Fine	6 - 2		d ₃₀	-
	Coarse	2 - 0.6		d ₁₅	-
SAND	Medium	0.6 - 0.2	1	d ₁₀	-
	Fine	0.2 - 0.06	4	d_5	-
	Coarse	0.06-0.02	4	*Uniformity (Coefficient
SILT	Medium	0.02-0.006	10	C_{u}	-
	Fine	0.006-0.002	10	*Curvature Coefficient	
CLAY		<0.002	71	C _c	-

SAND



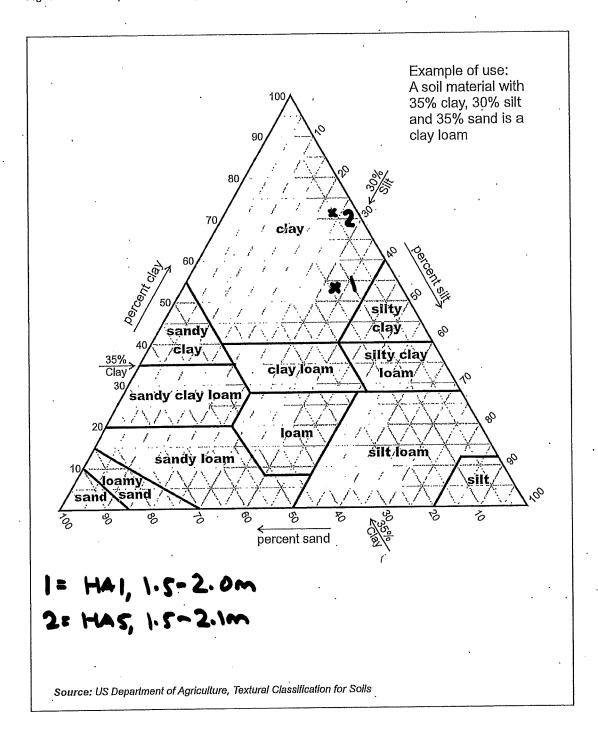
Coffey Services (NZ) Limited (Lab - East Tamaki) 144A Cryers Road, East Tamaki, Auckland NZ 2013 PO Box 58877, Botany, Auckland NZ 2163 Phone: +64 9 272 3375, Fax: +64 9 272 3378 www.coffey.com

DATE 2.02.18

CHECKED

JM

Figure D1: US Department of Agriculture Textural Classification for Soils



Appendix E Initia Lab Testing Results





Drury Quarry Corner Quarry / Fitzgerald Roads, Drury Auckland www.stevenson.co.nz

Test Number: 203061 Report Number: 36953T

Date of Issue: 2nd November 2020 Page 1 of 2 Pages

FINAL REPORT FOR INITIA LTD

Clients Address: PO Box 47647

Ponsonby

AUCKLAND 1144

Attention: Kent Dalziel

Reference: P-000925

Subject: **SOIL TESTING**

Clients Instructions: Conduct the tests as detailed below on the soil sample received

Test Methods: 1. NZS4402: 1986: Test

2.1: Determination of the Water Content

4.1.1: Determination of the Dry Density/Water Content Relationship

- NZ Standard Compaction Test

3.4: Detection of the Presence of Allophane in Soils

2. NZ Geotechnical Society, Guideline - 2001

Determining the Shear Strength of a Cohesive Soil using a Hand Held

Shear Vane

Date Sampled: 16th October 2020

Date Received: 23rd October 2020

Date of Tests: October 2020

Description of Sample: Clayey Silt, (Ash)

Location: **TP-05-02**, **1.0-1.5m**

Project Name: 303 Buckland Road

Notes: i. Field sample received in its natural state.

ii. Sampling of soil is not covered by this report.

for STEVENSON AGGREGATES LTD

T A WHITMORE

IANZ APPROVED SIGNATORY

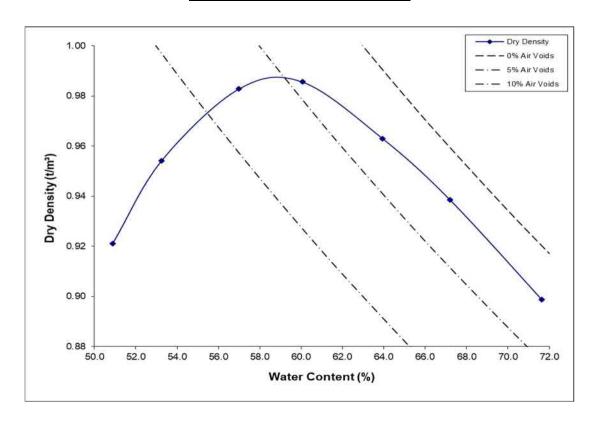


All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

TEST RESULTS

Material:	Clayey Silt, (ASH)	Test No:	203061	
Location:	TP-05-02, 1.0-1.5m			
Project Name:	303 Buckland Road	Reference No.:	P-000925	

NZ STANDARD COMPACTION



Maximum Dry Density (t/m³)	Optimum Water	Solid Density	Natural
	Content	Assumed	Water Content
	(%)	t/m³	%
0.99	60.0	2.70	64.5

Water Content	(%)	50.9	53.3	57.0	60.1	63.9	67.2	71.6
Dry Density	(t/m³)	0.92	0.95	0.98	0.99	0.96	0.94	0.90
Shear Strength	(kPa)	UTP	UTP	UTP	185	142	88	46
Remould Shear Strength	(kPa)	-	-	-	-	62	32	8

Note: i. UTP = Unable to Penetrate.

ii. Test performed on material passing the 19.0mm sieve (97%)

ALLOPHANE TEST RESULTS

Sample	Allophane Content %
TP-05-02, 1.0-1.5m	< 5%



Drury Quarry Corner Quarry / Fitzgerald Roads, Drury Auckland www.stevenson.co.nz

Test Number: 203060 Report Number: 36942T

Date of Issue: 2nd November 2020 Page 1 of 1 Pages

FINAL REPORT FOR INITIA LTD

Clients Address: PO Box 47647

Ponsonby

AUCKLAND 1144

Attention: Kent Dalziel

Reference: P-000925

Subject: AGGREGATE TESTING

Clients Instructions: Conduct the tests as detailed below on the soil sample received.

Test Methods: 1. NZS4402: 1986: Tests

2.1: Determination of the Water Content

2.2: Determination of Liquid Limit2.3: Determination of Plastic Limit2.4: Determination of Plasticity Index

Date Sampled: 16th October 2020

Date Received: 23rd October 2020

Date of Test: October 2020

Description of Sample: Clayey Silt, (ASH)

Location: **TP-05-03**, **3.5-4.5m**

Project Name: 303 Buckland Road

TEST METHOD	RESULT	SPECIFICATION
Natural Water Content (%)	79.9	
Liquid Limit	93	-
Plastic Limit	70	-
Plasticity Index	23	-

Notes: i. Field sample received in its natural state.

ii. Sampling of soil is not covered by this report.

iii. Plasticity Index Test performed on material passing 0.425mm sieve.

for STEVENSON AGGREGATES LTD

T A WHITMORE

IANZ APPROVED SIGNATORY



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation



Drury Quarry Corner Quarry / Fitzgerald Roads, Drury Auckland www.stevenson.co.nz

Test Number: 203059 Report Number: 36943T

Date of Issue: 2nd November 2020 Page 1 of 1 Pages

FINAL REPORT FOR INITIA LTD

Clients Address: PO Box 47647

Ponsonby AUCKLAND 1144

AUCKLAND 114

Attention: Kent Dalziel

Reference: P-000925

Subject: AGGREGATE TESTING

Clients Instructions: Conduct the tests as detailed below on the soil sample received.

Test Methods: 1. NZS4402: 1986: Tests

2.1: Determination of the Water Content

2.2: Determination of Liquid Limit2.3: Determination of Plastic Limit2.4: Determination of Plasticity Index

Date Sampled: 16th October 2020

Date Received: 23rd October 2020

Date of Test: October 2020

Description of Sample: Clayey Silt, (ASH)

Location: **TP-04-02**, **3.5-4.5m**

Project Name: 303 Buckland Road

TEST METHOD	RESULT	SPECIFICATION
Natural Water Content (%)	84.1	-
Liquid Limit	111	-
Plastic Limit	82	-
Plasticity Index	29	-

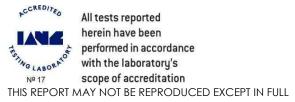
Notes: i. Field sample received in its natural state.

ii. Sampling of soil is not covered by this report.

iii. Plasticity Index Test performed on material passing 0.425mm sieve.

for STEVENSON AGGREGATES LTD







Drury Quarry Corner Quarry / Fitzgerald Roads, Drury Auckland www.stevenson.co.nz

Test Number: 203062 Report Number: 36944T

Date of Issue: 2nd November 2020 Page 1 of 1 Pages

FINAL REPORT FOR INITIA LTD

Clients Address: PO Box 47647

Ponsonby AUCKLAND 1144

Attention: Kent Dalziel

Reference: TP-05-01

Subject: AGGREGATE TESTING

Clients Instructions: Conduct the tests as detailed below on the soil sample received.

Test Methods:

1. NZS4402: 1986: Test

2.1: Determination of the Water Content

3.4: Detection of the Presence of Allophane in Soils

Date Sampled: 16th October 2020

Date Received: 23rd October 2020

Date of Test: October 2020

Description of Sample: Clayey Silt, (ASH)

Location: **P-000925**, **0.0 – 0.5m**

Project Name: 303 Buckland Road

TEST RESULTS

Sample	Natural Water Content %	Allophane Content %
Source TP-05-01	44.9	< 5%

Notes: i. Field sample received in its natural state.

ii. Sampling of soil is not covered by this report.

for STEVENSON AGGREGATES LTD

T A WHITMORE

IANZ APPROVED SIGNATORY



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation



Drury Quarry Corner Quarry / Fitzgerald Roads, Drury Auckland www.stevenson.co.nz

Test Number: 203058 Report Number: 36952T

Date of Issue: 2nd November 2020 Page 1 of 2 Pages

FINAL REPORT FOR INITIA LTD

Clients Address: PO Box 47647

Ponsonby

AUCKLAND 1144

Attention: Kent Dalziel

Reference: P-000925

Subject: **SOIL TESTING**

Clients Instructions: Conduct the tests as detailed below on the soil sample received

Test Methods: 1. NZS4402: 1986: Test

2.1: Determination of the Water Content

4.1.1: Determination of the Dry Density/Water Content Relationship

- NZ Standard Compaction Test

2. NZ Geotechnical Society, Guideline - 2001

Determining the Shear Strength of a Cohesive Soil using a Hand Held

Shear Vane

Date Sampled: 16th October 2020

Date Received: 23rd October 2020

Date of Tests: October 2020

Description of Sample: Clayey Silt, (Ash)

Location: **TP-03-02, 3.0-4.0m**

Project Name: 303 Buckland Road

Notes: i. Field sample received in its natural state.

ii. Sampling of soil is not covered by this report.

for STEVENSON AGGREGATES LTD

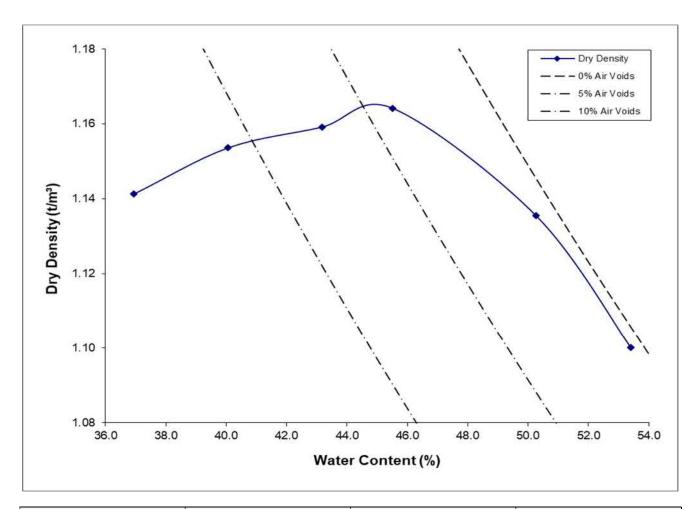
T A WHITMORE

IANZ APPROVED SIGNATORY

TEST RESULTS

Material: Clayey Silt, (ASH)		Test No:	203058
Location:	TP-03-02, 3.0-4.0m		
Project Name:	303 Buckland Road	Reference No.:	P-000925

NZ STANDARD COMPACTION



Maximum Dry Density (t/m³)	Density Content		Natural Water Content %	
1.16	45.0	2.70	65.3	

Water Content (%	36.9	40.1	43.2	45.5	50.3	53.4
Dry Density (t/m³	1.14	1.15	1.16	1.16	1.16	1.14
Shear Strength (kPa	UTP	UTP	UTP	185	131	86
Remould Shear Strength (kPa	-	-	-	48	24	24

Note:

i. UTP = Unable to Penetrate.

ii. Test performed on material passing the 19.0mm sieve (97%)