

11 July 2018

Our ref: GENZTAUC13086AR-AF

The Lakes (2012) Ltd
C/- Harrison Grierson Consultants Ltd
Level 1 Harrison Grierson House
141 Cameron Road
Tauranga

Attention: Simon Maxwell

Dear Simon

The Lakes Stages 2U – Foley Grove Re-Subdivision Rev1

1. Introduction

As requested, Coffey Services (NZ) Ltd (Coffey) has prepared this report and attached information to assist builders and designers working on Lots 1 to 32, Foley Grove, Tauranga.

This area was previously referred to as Stage 2U of the Lakes Subdivision. Coffey presented a Geotechnical Completion Report (GCR) for Stage 2U in June 2017¹ which included specific design recommendations for the lots in this stage. Since the issue of the GCR the Stage 2U area has been re-subdivided to form a total of 32 new residential lots with associated reserve and road areas. This report presents excerpts from the GCR and updated information relevant to the new lots. It is to be provided to builders and designers working in this area.

The new lot layout is shown on the S&L Consultants Ltd Land Transfer Plan appended as Attachment 1 of this report. The original site plans for the Lakes subdivision are also appended as Attachments 2 to 6. An updated Lot Summary Table is provided as Attachment 7.

¹ Coffey Services (NZ) Ltd, 'The Lakes Stages 2UV – Geotechnical Completion Report', ref: GENZTAUC13086AR-AD, dated 16 June 2017.

2. Limitation

While this letter presents a summary of the geotechnical conditions for this area it does not provide a complete discussion of geotechnical issues affecting the Lakes Stage 2U area or previous earthworks undertaken on the site. It is therefore recommended that designers working on the new lots are also familiar with the contents of the original Stage 2U GCR¹.

It should be understood that this document does not represent a full geotechnical assessment report of the Foley Grove properties. Coffey has not been provided with, and has not reviewed, plans or details of the specific developments on each lot. It is recommended that a geotechnical professional is contacted if ground or development conditions differ from those described herein.

This report has been prepared for the use of our client, The Lakes (2012) Limited, their professional advisors and designers or builders in relation to the specific project described herein. No liability is accepted in respect of its use for any other purpose or by any other person or entity. All future owners of this property should seek professional geotechnical advice to satisfy themselves as to its ongoing suitability for their intended use.

This document should always be read in its entirety and is not to be split for further distribution.

3. Building Restriction Lines

Three Building Restriction Lines (BRL's) were placed on lots within Stage 2U. The BRL's are shown on Attachment 1 and Attachment 6 and affect the following new lots:

- Lots 1 to 17 – These lots are located above an up to 1V:3H batter which was formed around the western and northern boundaries of Stage 2U. This batter partly consists of previous engineered filling and partly of non-engineered landscape fill. The BRL on these lots is located along the crest of the batter and is intended to restrict development on the slope due to the potential for shallow slope movement and/or variable subgrade materials within the batter itself.
- Lot 17 – In addition to the BRL along the slope crest mentioned above, an up to 0.7m high retaining wall was constructed inside the property's boundary with Takitimu Drive. As this wall was not engineered designed, a BRL has been placed on this lot extending 2.0m inside the property boundary adjacent to the wall.
- Lots 22 to 26 & 32 – The boundaries of these lots with Takitimu Drive and Kennedy Road are supported by an up to 1.3m high retaining wall. This wall was engineer designed but this design did not allow for building loads. A BRL has therefore been located 1.5m inside the property boundary on the affected lots. On lot 32 the setback distance tapers off to 0m where the retaining wall ends.

3.1. Development on Lots with a BRL

The existence of the BRL on a lot does not explicitly preclude development in the restricted area. Any works within the BRL would however be subject to the following requirements:

- The foundations of any building, and or any proposed filling or retaining walls within the BRLs along the crest of the batter on Lots 1 to 17 would need to be assessed by a Tauranga City Council Category 1 Geo-Professional.
- The foundations of any dwelling or any proposed filling within the BRLs along the retaining walls on lots 17, 22 to 26 & 32 must be assessed by a chartered engineer (CPEng) with consideration given to the zone of influence of the adjacent retaining walls.

4. Erosion Protection

The batter to the west and north of Lots 1 to 9 was covered with a layer of 'Grassroots' (registered trademark) synthetic matting provided by Geofabrics Ltd to reduce the risk of erosion or scour of this slope as a result of flooding along the Kopurererua Stream. The Grassroots matting extends up to the 1 in 100 year flood level as shown on Attachment 6.

The Grassroots matting extends approximately 3m to 8m inside the boundaries of Lots 1 to 9. The owners of these lots will need to ensure that continuous grass cover is maintained within this area and that the integrity of the erosion matting is not compromised by future development or landscaping in this area.

5. Minimum Floor Levels

The original lots within Stage 2U were subject to minimum floor level restrictions imposed by Tauranga City Council (TCC) due possible flooding of the nearby Kopurererua Stream. The corresponding minimum levels for the new lots are summarised on Table 1 below. Levels are given in terms of RL (reduced level) to the Moturiki Datum, 1953 and are to be measured to the underside of the floor slab or floor joists per section DS-5.4.5 of the TCC IDC.

The original minimum levels provided by TCC are shown on attachment 8.

Table 1: Minimum Floor Levels

Lot #	Minimum Floor Level (m RL)	Lot #	Minimum Floor Level (m RL)
1	11.0	17	10.75
2	10.75	18	10.75
3	10.75	19	10.75
4	10.75	20	10.75
5	10.75	21	10.75
6	10.75	22	11.0
7	10.5	23	11.0
8	10.5	24	11.0
9	10.25	25	11.0
10	10.25	26	11.0
11	10.25	27	10.75
12	10.5	28	10.75
13	10.5	29	10.75
14	10.5	30	10.75
15	10.5	31	11.0
16	10.75	32	11.0

6. Foundation Design & Bearing Capacity

Soils below the new lots may at least partially liquefy during a strong earthquake leading to possible vertical and horizontal ground movement. The dwellings on these lots should therefore be supported by specifically designed 'enhanced' waffle slab type foundations such as those developed for the 'TC2' zone of the Christchurch rebuild. A geotechnical ultimate bearing capacity of 300kPa may be assumed for these lots as they are entirely underlain by engineered filling.

7. Variable Ground Conditions

It should be understood that due to the volcanic nature of the natural soils on the elevated terraces, it is possible that local soil conditions may vary from those discussed above. It is therefore important that any potentially soft or unsuitable soils encountered in the foundation excavations are brought to the attention of a geotechnical professional.

For and on behalf of Coffey



Rob Telford

Associate Engineering Geologist

Letter reviewed by:



**David Sullivan, BSc, MBA, CE (Calif.), MIPENZ, CPEng,
TCC Category 1 Geotechnical Engineer**

Principal Geotechnical Engineer

CPEng No. 1025183

Attachments

Important information about your Coffey report

Attachment 1 – S&L Land Transfer Plan

Attachments 2 to 6 – Site plans from original Stage 2U GCR

Attachment 7 – Updated Lot Summary Table

Attachment 8 – TCC Minimum Floor Levels

Important information about your Coffey Report

As a client of Coffey you should know that site subsurface conditions cause more construction problems than any other factor. These notes have been prepared by Coffey to help you interpret and understand the limitations of your report.

Your report is based on project specific criteria

Your report has been developed on the basis of your unique project specific requirements as understood by Coffey and applies only to the site investigated. Project criteria typically include the general nature of the project; its size and configuration; the location of any structures on the site; other site improvements; the presence of underground utilities; and the additional risk imposed by scope-of-service limitations imposed by the client. Your report should not be used if there are any changes to the project without first asking Coffey to assess how factors that changed subsequent to the date of the report affect the report's recommendations. Coffey cannot accept responsibility for problems that may occur due to changed factors if they are not consulted.

Subsurface conditions can change

Subsurface conditions are created by natural processes and the activity of man. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult Coffey to be advised how time may have impacted on the project.

Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from literature and external data source review, sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by earth, rock and time.

The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, owners should retain the services of Coffey through the development stage, to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

Your report will only give preliminary recommendations

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered as the project develops. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Coffey cannot be held responsible for such misinterpretation.

Your report is prepared for specific purposes and persons

To avoid misuse of the information contained in your report it is recommended that you confer with Coffey before passing your report on to another party who may not be familiar with the background and the purpose of the report. Your report should not be applied to any project other than that originally specified at the time the report was issued.

Important information about your Coffey Report

Interpretation by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, retain Coffey to work with other project design professionals who are affected by the report. Have Coffey explain the report implications to design professionals affected by them and then review plans and specifications produced to see how they incorporate the report findings.

Data should not be separated from the report

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way.

Logs, figures, drawings, etc. are customarily included in our reports and are developed by scientists, engineers or geologists based on their interpretation of field logs (assembled by field personnel) and laboratory evaluation of field samples. These logs etc. should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

Geoenvironmental concerns are not at issue

Your report is not likely to relate any findings, conclusions, or recommendations about the potential for hazardous materials existing at the site unless specifically required to do so by the client. Specialist equipment, techniques, and personnel are used to perform a geoenvironmental assessment. Contamination can create major health, safety and environmental risks.

If you have no information about the potential for your site to be contaminated or create an environmental hazard, you are advised to contact Coffey for information relating to geoenvironmental issues.

Rely on Coffey for additional assistance

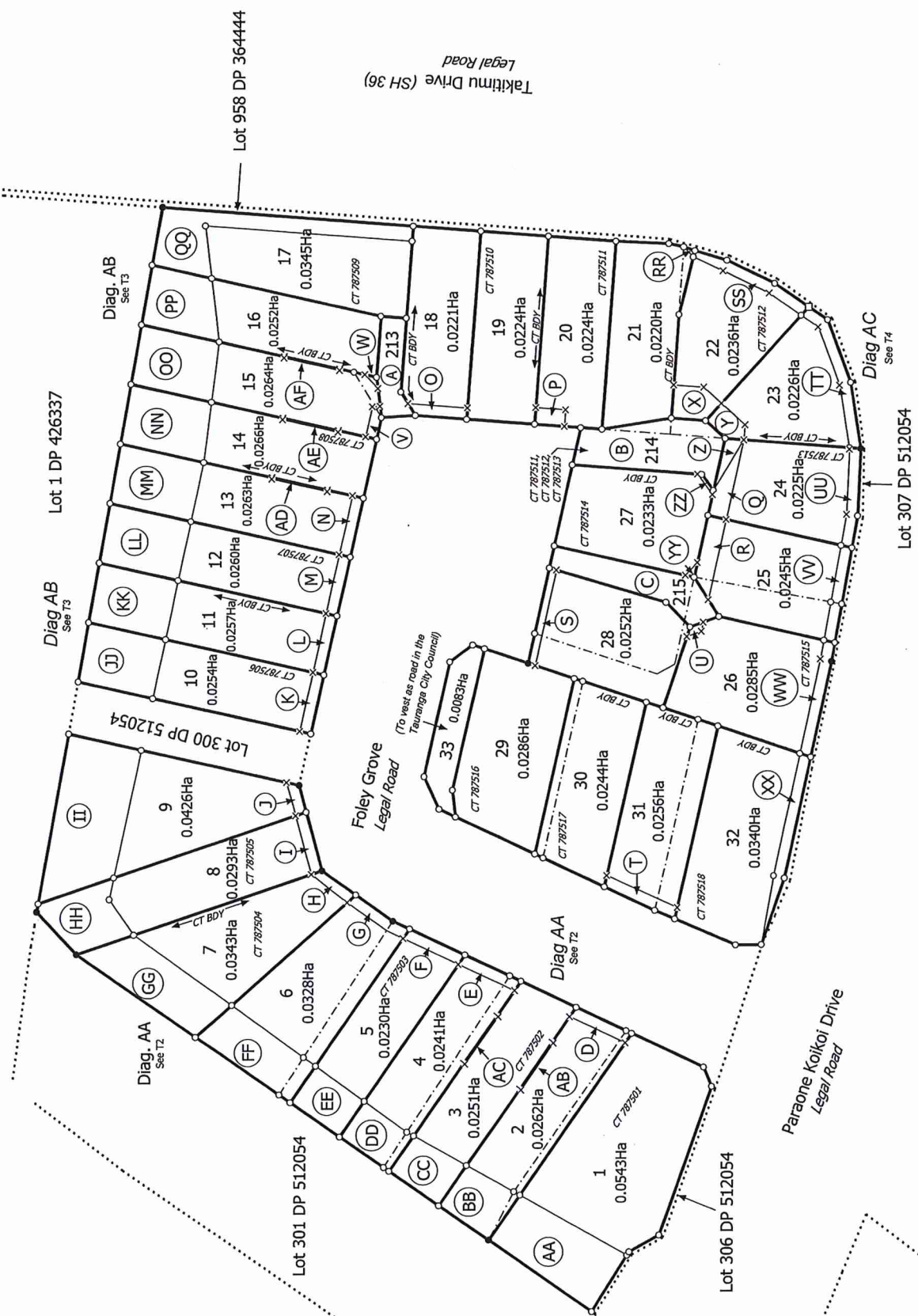
Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a project, from design to construction. It is common that not all approaches will be necessarily dealt with in your site assessment report due to concepts proposed at that time. As the project progresses through design towards construction, speak with Coffey to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

Responsibility

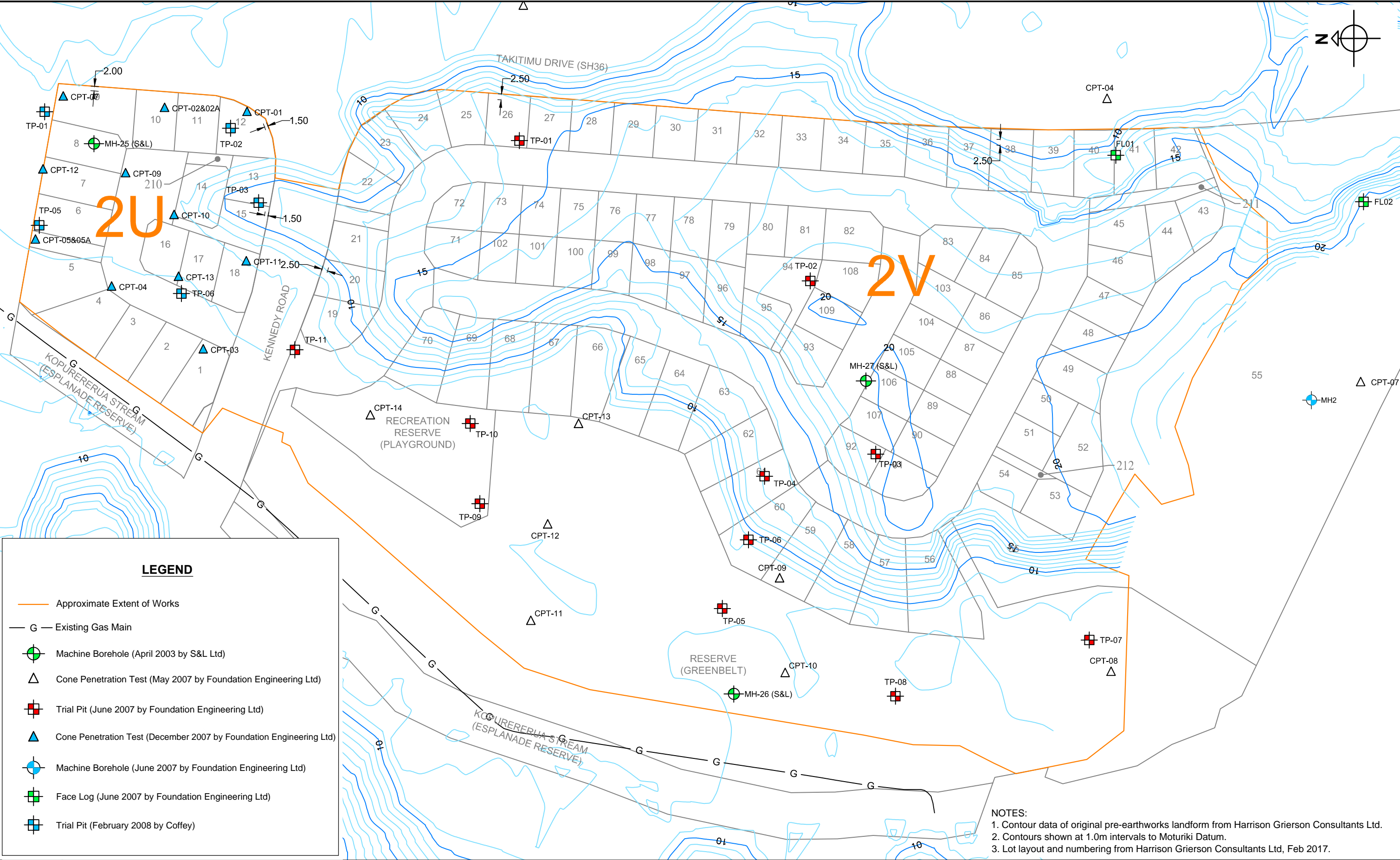
Reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than the design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Coffey to other parties but are included to identify where Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Coffey closely and do not hesitate to ask any questions you may have.



Diag. A



Lar	ict: South Auckland	Generated Plan nt: 09/05/2018 11:41am Page 10 of 14	Lots 1-33 and 213-215 Being Subdivision of Lots 1-18 and 210 DP 512054	Surveyor: Denis John McDonald Firm: S & L Consultants Ltd	Title Plan LT 518298 DRAFT
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LEGEND

— Approximate Extent of Works

— G — Existing Gas Main

Machine Borehole (April 2003 by S&L Ltd)

Cone Penetration Test (May 2007 by Foundation Engineering Ltd)

Trial Pit (June 2007 by Foundation Engineering Ltd)

Cone Penetration Test (December 2007 by Foundation Engineering Ltd)

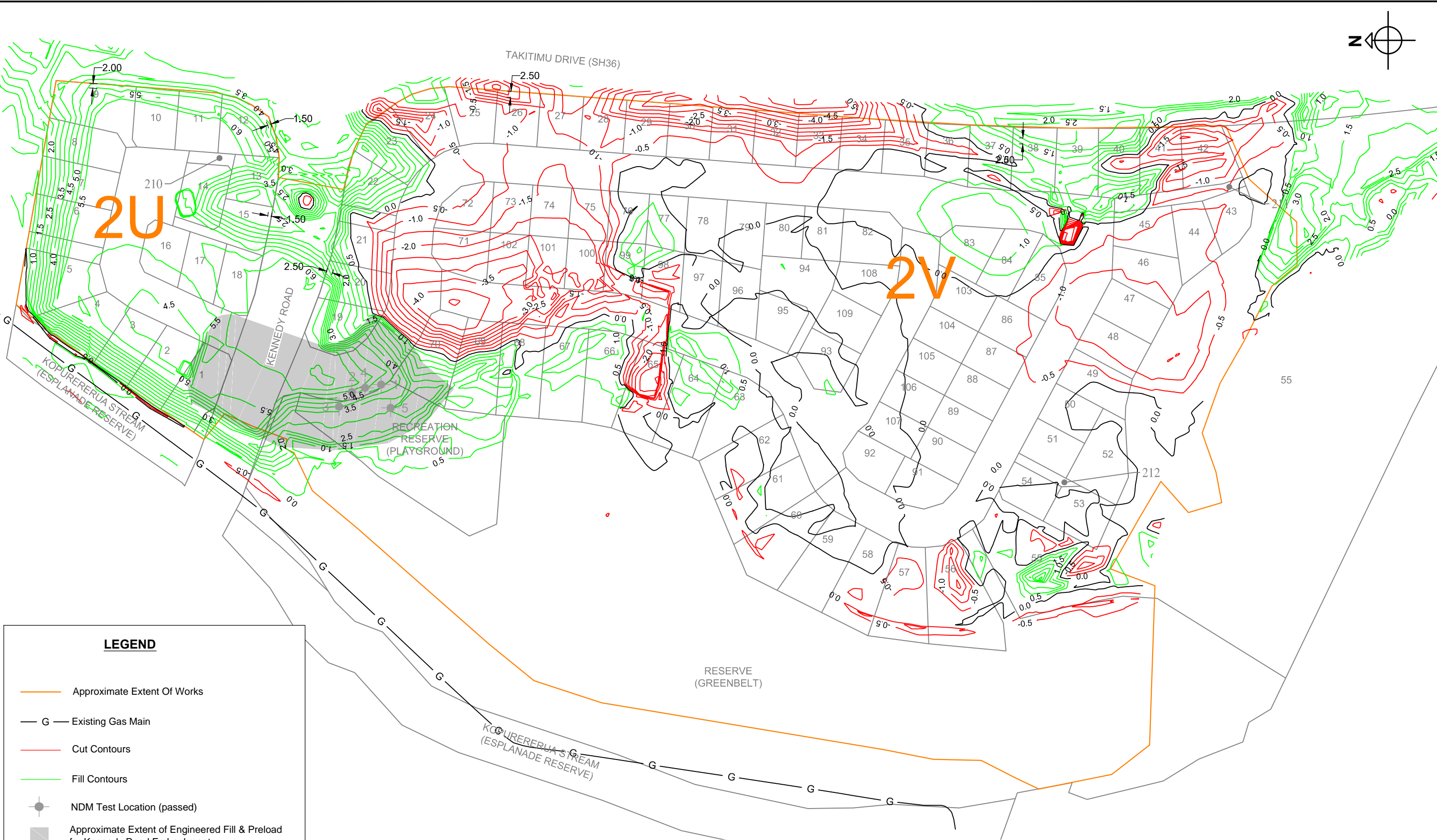
Machine Borehole (June 2007 by Foundation Engineering Ltd)

Face Log (June 2007 by Foundation Engineering Ltd)

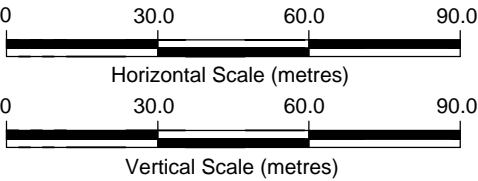
Trial Pit (February 2008 by Coffey)

NOTES:
1. Contour data of original pre-earthworks landform from Harrison Grierson Consultants Ltd.
2. Contours shown at 1.0m intervals to Moturiki Datum.
3. Lot layout and numbering from Harrison Grierson Consultants Ltd, Feb 2017.

revision	rev	description	drawn	approved	date	<div><div><div>030.060.090.0</div><div>Horizontal Scale (metres)</div></div><div><div>030.060.090.0</div><div>Vertical Scale (metres)</div></div></div>	drawn	DBC	<div><div>coffey</div><div>A TETRA TECH COMPANY</div></div>	client: The Lakes (2012) Ltd		
							approved	DAS		project: The Lakes Stage 2UV Geotechnical Completion Report		
							date	16-6-2017		title: Original Site Contour Plan		
							scale	1:1500		project no: 13086AR-AD		
							original size	A3		figu Attachment 2		



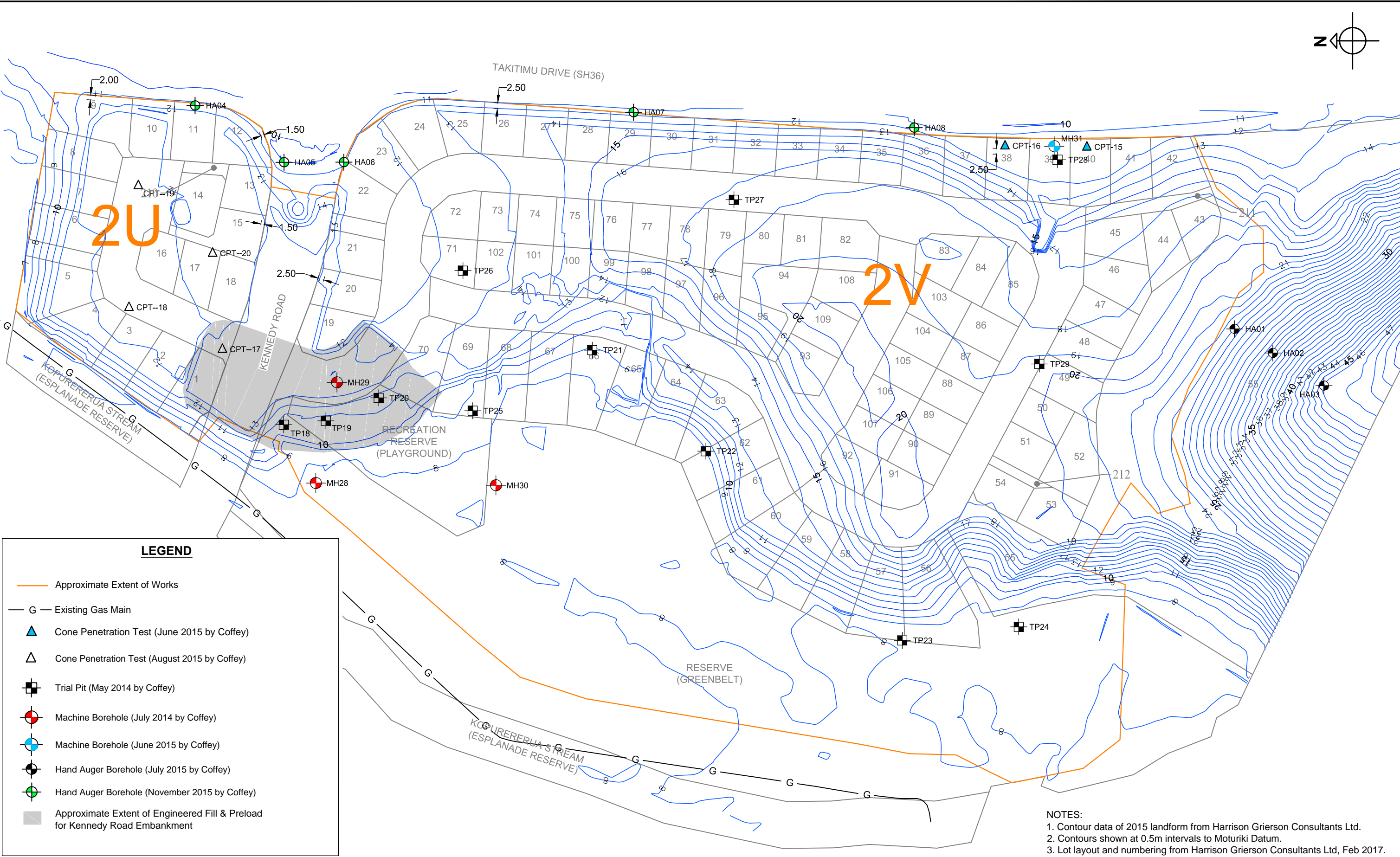
revision	rev	description				drawn	approved	date



drawn	DBC
approved	DAS
date	16-6-2017
scale	1:1500
original size	A3



client:	The Lakes (2012) Ltd	
project:	The Lakes Stage 2UV Geotechnical Completion Report	
title:	2007-2015 Earthworks Contour Plan	
project no:	13086AR-AD	figu Attachment 3

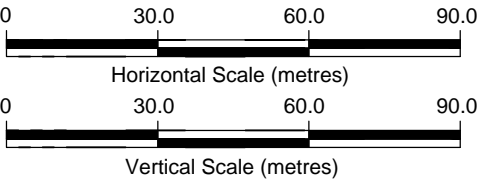


LEGEND

- Approximate Extent of Works
- G — Existing Gas Main
- ▲ Cone Penetration Test (June 2015 by Coffey)
- △ Cone Penetration Test (August 2015 by Coffey)
- ⊞ Trial Pit (May 2014 by Coffey)
- Machine Borehole (July 2014 by Coffey)
- Machine Borehole (June 2015 by Coffey)
- Hand Auger Borehole (July 2015 by Coffey)
- Hand Auger Borehole (November 2015 by Coffey)
- Approximate Extent of Engineered Fill & Preload for Kennedy Road Embankment

NOTES:
1. Contour data of 2015 landform from Harrison Grierson Consultants Ltd.
2. Contours shown at 0.5m intervals to Moturiki Datum.
3. Lot layout and numbering from Harrison Grierson Consultants Ltd, Feb 2017.

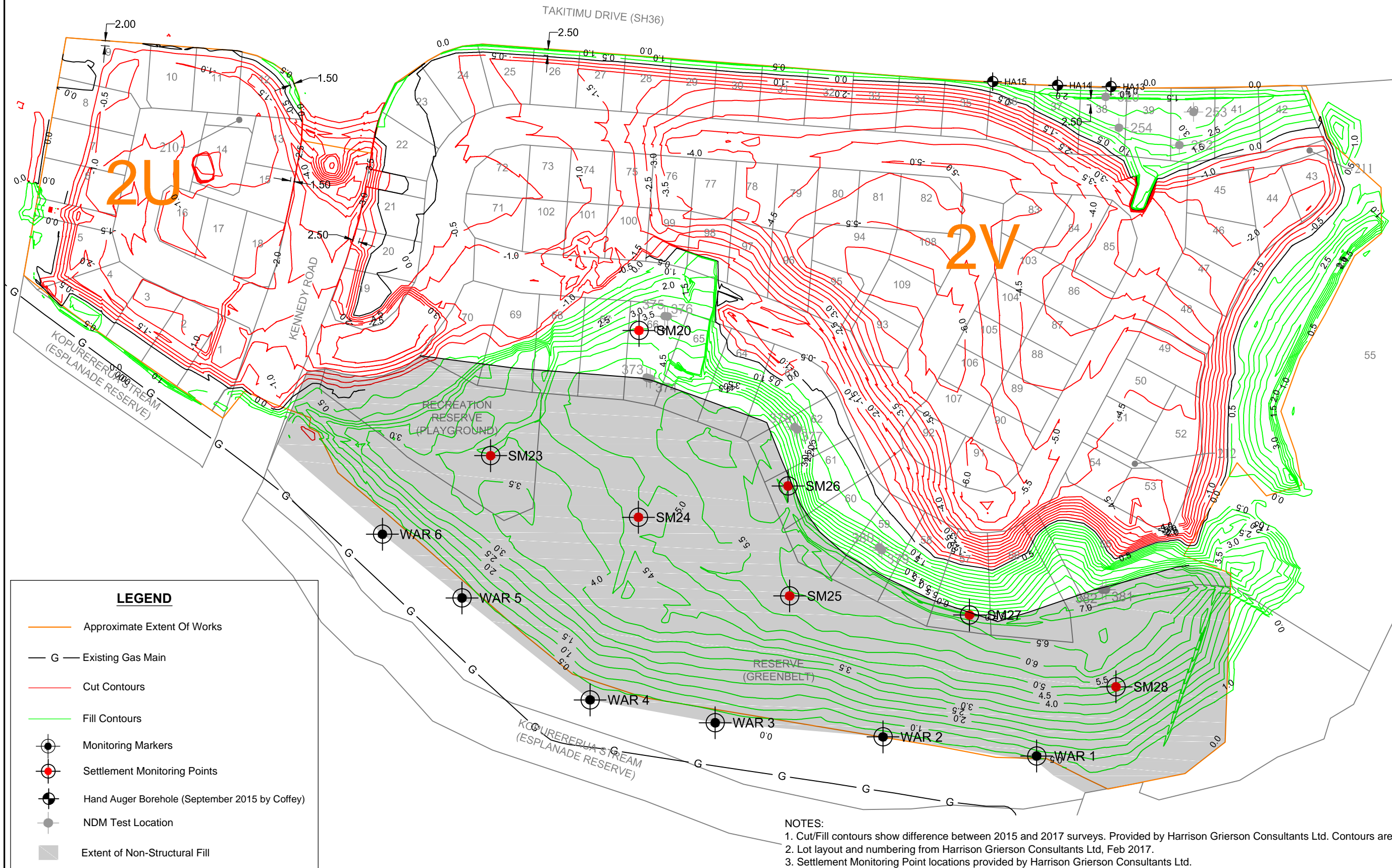
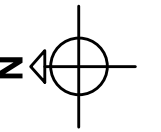
revision	rev	description	drawn	approved	date



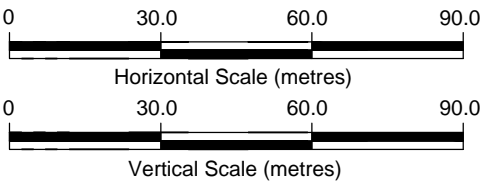
drawn	DBC
approved	DAS
date	16-6-2017
scale	1:1500
original size	A3



client:	The Lakes (2012) Ltd	
project:	The Lakes Stage 2UV Geotechnical Completion Report	
title:	2015 Contour Plan	
project no:	13086AR-AD	Attachment 4



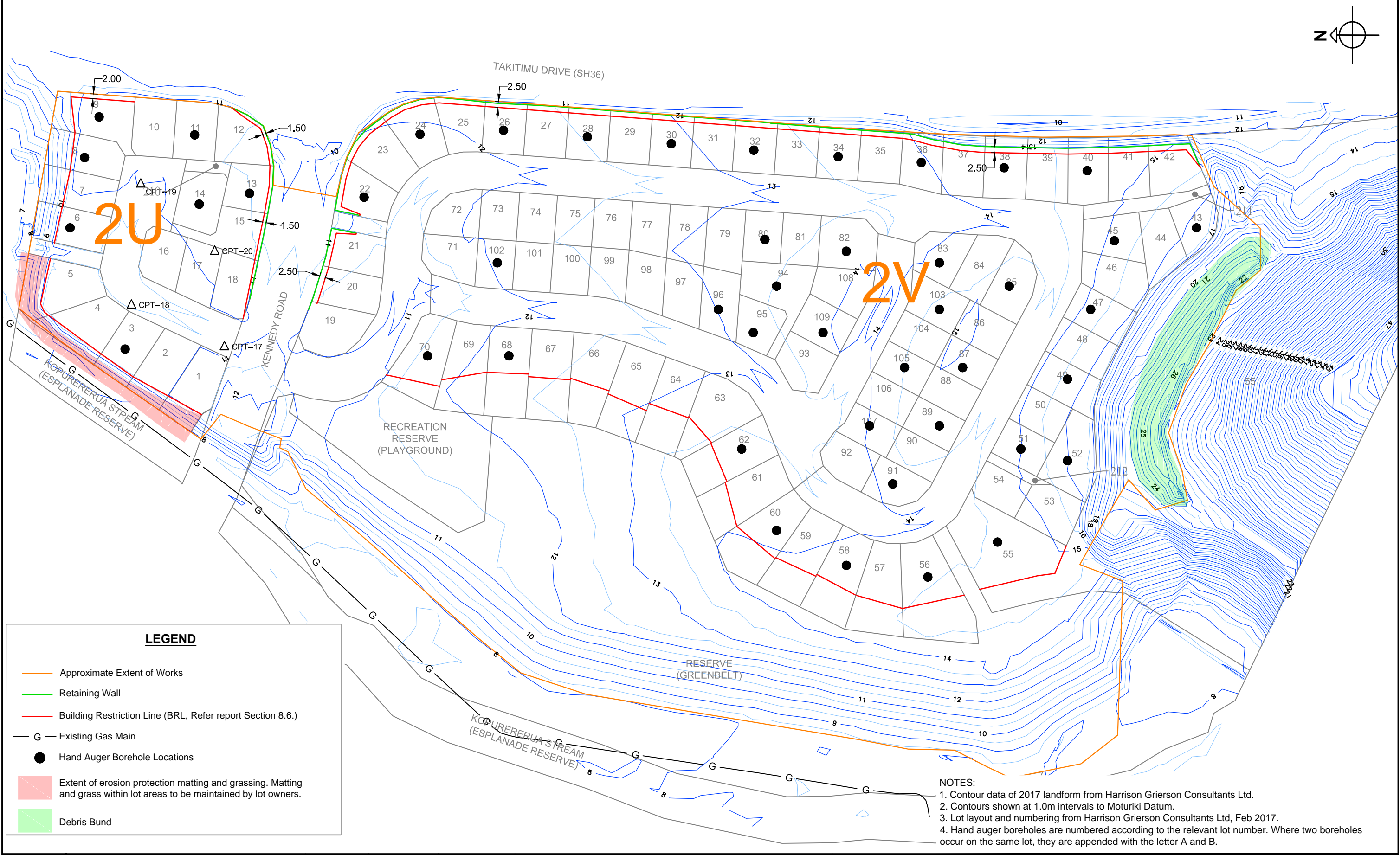
revision	rev	description				drawn	approved	date	



drawn	DBC
approved	DAS
date	16-6-2017
scale	1:1500
original size	A3



client:	The Lakes (2012) Ltd		
project:	The Lakes Stage 2UV Geotechnical Completion Report		
title:	2015-2017 Earthworks Contour Plan		
project no:	13086AR-AD	fi	Attachment 5

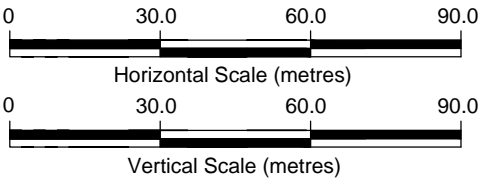


LEGEND

- Approximate Extent of Works
- Retaining Wall
- Building Restriction Line (BRL, Refer report Section 8.6.)
- G — Existing Gas Main
- Hand Auger Borehole Locations
- Extent of erosion protection matting and grassing. Matting and grass within lot areas to be maintained by lot owners.
- Debris Bund

- NOTES:
1. Contour data of 2017 landform from Harrison Grierson Consultants Ltd.
 2. Contours shown at 1.0m intervals to Moturiki Datum.
 3. Lot layout and numbering from Harrison Grierson Consultants Ltd, Feb 2017.
 4. Hand auger boreholes are numbered according to the relevant lot number. Where two boreholes occur on the same lot, they are appended with the letter A and B.

revision	rev	description				drawn	approved	date



drawn	DBC
approved	DAS
date	16-6-2017
scale	1:1500
original size	A3



client:	The Lakes (2012) Ltd		
project:	The Lakes Stages 2UV Geotechnical Completion Report		
title:	2017 Contour Plan		
project no:	13086AR-AD	fig	Attachment 6

DP No:	Lots 1 – 32, DP512054	Property Address	Foley Grove, Tauriko, Tauranga	RC No:	
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Lot No:	Area (m ²)	Subsurface data					Foundations		Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Building Platform	Compressible Soils	On-Site Effluent Disposal	Consent Notice	<div>For information purposes and to be read in conjunction with ‘The Lakes Stages 2UV – Geotechnical Completion Report’, ref: GENZTAUC13086AR-AD, dated 16 June 2017.</div>	Comments	
		Shear Strength (kPa) at 0.5m depth	Subdivision Filling		Natural Topography Unworked Y/N	Natural Topography Earthworked		Conventional Shallow Foundation to NZS 3604:2011 Y/N/NA												Specific Design Y/N/NA
			Y/N	Depth (m)		Y/N	Depth (m)													

For information purposes and to be read in conjunction with 'The Lakes Stages 2UV – Geotechnical Completion Report', ref: GENZTAUC13086AR-AD, dated 16 June 2017.

1	543	N/T	Y	4	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
2	262	N/T	Y	4	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
3	251	N/T	Y	4	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
4	241	>215	Y	3.5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	<p>Lots subject to the following geotechnical conditions and limitations:</p> <ul style="list-style-type: none"> Specifically designed 'enhanced' waffle slab foundations. Building Restriction Line Minimum floor levels Consent notice to ensure lot owners maintain continuous grass cover and erosion protection on slope down to Kopurererua Stream
5	230	>215	Y	3.5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
6	328	N/T	Y	3.5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
7	343	N/T	Y	3.5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
8	293	N/T	Y	3.5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
9	426	N/T	Y	3.5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	



SUMMARY OF GOTECHNICAL DATA FOR INDIVIDUAL LOTS

G3

INFRASTRUCTURE DEVELOPMENT CODE

Attachment 7

DP No:	Lots 1 – 32, DP512054	Property Address	Foley Grove, Tauriko, Tauranga	RC No:	
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Lot No:	Area (m ²)	Subsurface data					Foundations		Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Building Platform	Compressible Soils	On-Site Effluent Disposal	Consent Notice	<div>For information purposes and to be read in conjunction with ‘The Lakes Stages 2UV – Geotechnical Completion Report’, ref: GENZTAUC13086AR-AD, dated 16 June 2017.</div>	Comments	
		Shear Strength (kPa) at 0.5m depth	Subdivision Filling		Natural Topography Unworked Y/N	Natural Topography Earthworked		Conventional Shallow Foundation to NZS 3604:2011 Y/N/NA												Specific Design Y/N/NA
			Y/N	Depth (m)		Y/N	Depth (m)													

For information purposes and to be read in conjunction with 'The Lakes Stages 2UV – Geotechnical Completion Report', ref: GENZTAUC13086AR-AD, dated 16 June 2017.

10	254	UTP	Y	4	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
11	257	UTP	Y	4	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
12	260	N/T	Y	4.5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
13	263	N/T	Y	4.5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
14	266	UTP	Y	5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
15	264	UTP	Y	5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
16	252	UTP	Y	5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
17	345	UTP	Y	5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	

Lots subject to the following geotechnical conditions and limitations:

- Specifically designed 'enhanced' waffle slab foundations.
- Building Restriction Line
- Minimum floor levels



SUMMARY OF GOTECHNICAL DATA FOR INDIVIDUAL LOTS

INFRASTRUCTURE DEVELOPMENT CODE

G3

Attachment 7

DP No:	Lots 1 – 32, DP512054	Property Address	Foley Grove, Tauriko, Tauranga	RC No:	
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Lot No:	Area (m²)	Subsurface data					Foundations		Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Building Platform	Compressible Soils	On-Site Effluent Disposal	Consent Notice	<div>For information purposes and to be read in conjunction with ‘The Lakes Stages 2UV – Geotechnical Completion Report’, ref: GENZTAUC13086AR-AD, dated 16 June 2017.</div>	Comments	
		Shear Strength (kPa) at 0.5m depth	Subdivision Filling		Natural Topography Unworked Y/N	Natural Topography Earthworked		Conventional Shallow Foundation to NZS 3604:2011 Y/N/NA												Specific Design Y/N/NA
			Y/N	Depth (m)		Y/N	Depth (m)													

For information purposes and to be read in conjunction with 'The Lakes Stages 2UV – Geotechnical Completion Report', ref: GENZTAUC13086AR-AD, dated 16 June 2017.

18	221	N/T	Y	4.5	Y	N		N	Y	N	N	N	Y	N	Y	N	N	Y	Lots subject to the following geotechnical conditions and limitations: <ul style="list-style-type: none">Specifically designed 'enhanced' waffle slab foundations.Minimum floor levels
19	224	N/Y	Y	4.5	Y	N		N	Y	N	N	N	Y	N	Y	N	N	Y	
20	224	UTP	Y	4.5	Y	N		N	Y	N	N	N	Y	N	Y	N	N	Y	
21	220	UTP	Y	4.5	Y	N		N	Y	N	N	N	Y	N	Y	N	N	Y	
22	236	N/T	Y	4.5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	Lots subject to the following geotechnical conditions and limitations: <ul style="list-style-type: none">Specifically designed 'enhanced' waffle slab foundations.Building Restriction LineMinimum floor levels
23	226	N/T	Y	4.5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
24	225	UTP	Y	5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
25	245	UTP	Y	5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
26	285	N/T	Y	3.5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	



SUMMARY OF GOTECHNICAL DATA FOR INDIVIDUAL LOTS

G3

INFRASTRUCTURE DEVELOPMENT CODE

Attachment 7

DP No:	Lots 1 – 32, DP512054	Property Address	Foley Grove, Tauriko, Tauranga	RC No:	
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Lot No:	Area (m²)	Subsurface data					Foundations		Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Building Platform	Compressible Soils	On-Site Effluent Disposal	Consent Notice	<div>For information purposes and to be read in conjunction with ‘The Lakes Stages 2UV – Geotechnical Completion Report’, ref: GENZTAUC13086AR-AD, dated 16 June 2017.</div>	Comments	
		Shear Strength (kPa)	Subdivision Filling		Natural Topography Unworked	Natural Topography Earthworked		Conventional Shallow Foundation to NZS 3604:2011												Specific Design
			at 0.5m depth	Y/N		Depth (m)	Y/N													

For information purposes and to be read in conjunction with 'The Lakes Stages 2UV – Geotechnical Completion Report', ref: GENZTAUC13086AR-AD, dated 16 June 2017.

27	233	YTP	Y	3	Y	N		N	Y	N	N	N	Y	N	Y	N	N	Y	<p>Lots subject to the following geotechnical conditions and limitations:</p> <ul style="list-style-type: none"> Specifically designed 'enhanced' waffle slab foundations. Minimum floor levels
28	252	UTP	Y	3	Y	N		N	Y	N	N	N	Y	N	Y	N	N	Y	
29	286	N/T	Y	4	Y	N		N	Y	N	N	N	Y	N	Y	N	N	Y	
30	244	N/T	Y	4	Y	N		N	Y	N	N	N	Y	N	Y	N	N	Y	
31	256	N/T	Y	4	Y	N		N	Y	N	N	N	Y	N	Y	N	N	Y	
32	340	N/T	Y	4	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	<p>Lots subject to the following geotechnical conditions and limitations:</p> <ul style="list-style-type: none"> Specifically designed 'enhanced' waffle slab foundations. Building Restriction Line Minimum floor levels

Key:

DCP = Tested with Dynamic Cone Penetration (Scala); N/T = Not Tested; UTP = Unable To Penetrate

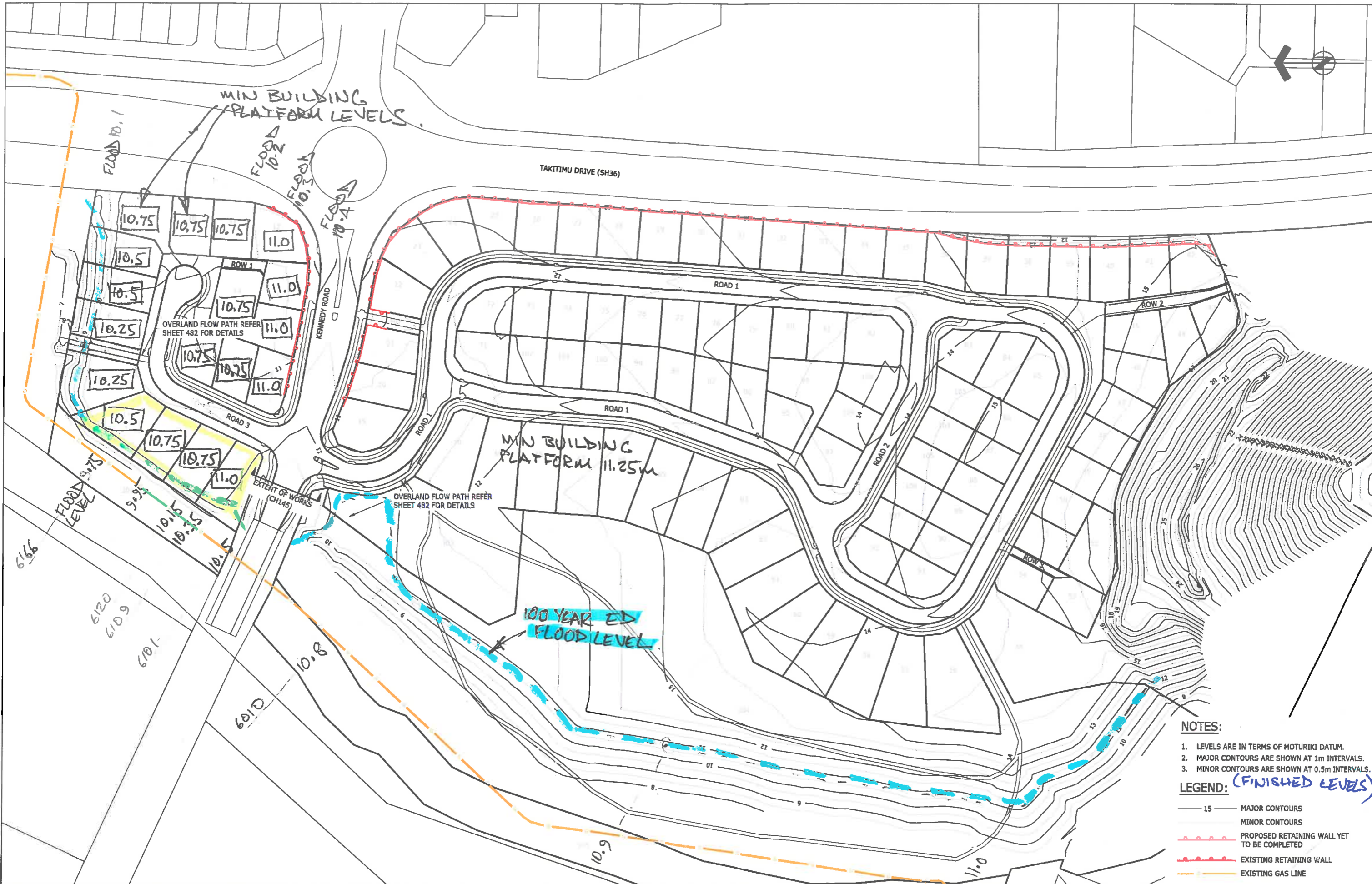


SUMMARY OF GOTECHNICAL DATA FOR INDIVIDUAL LOTS

INFRASTRUCTURE DEVELOPMENT CODE

G3

Attachment 7



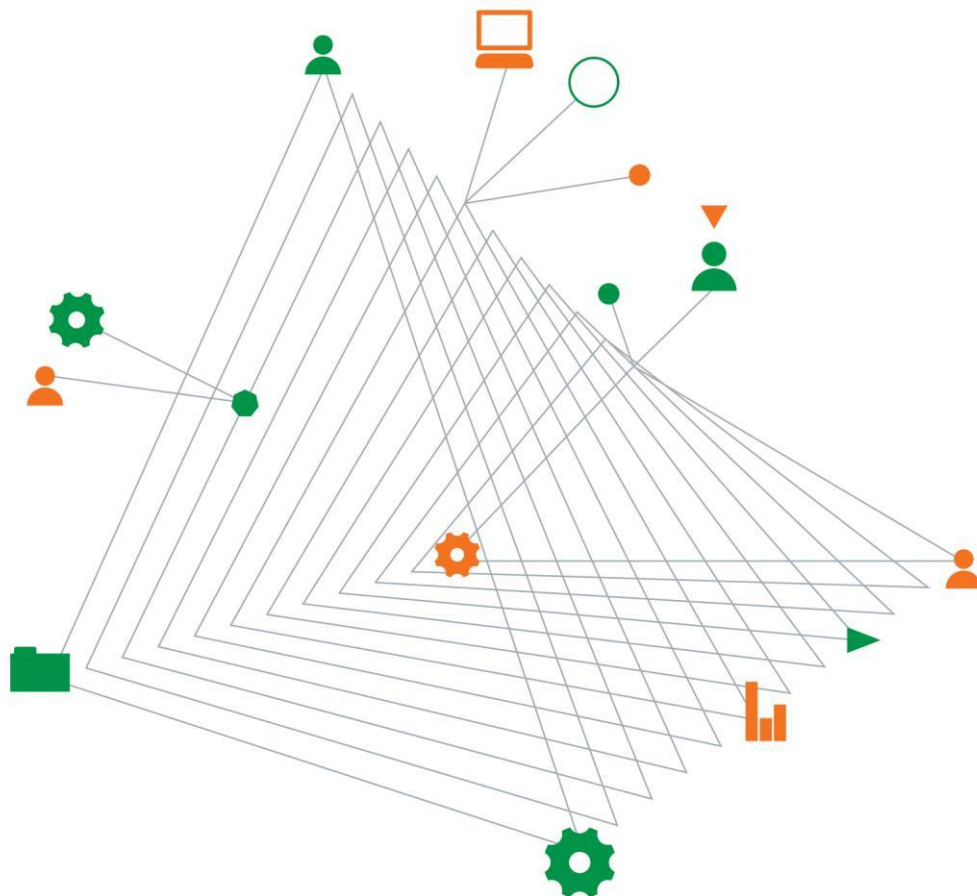
- NOTES:**
1. LEVELS ARE IN TERMS OF MOTURIKI DATUM.
 2. MAJOR CONTOURS ARE SHOWN AT 1m INTERVALS.
 3. MINOR CONTOURS ARE SHOWN AT 0.5m INTERVALS.
- LEGEND:** (FINISHED LEVELS)
- 15 MAJOR CONTOURS
 - MINOR CONTOURS
 - PROPOSED RETAINING WALL YET TO BE COMPLETED
 - EXISTING RETAINING WALL
 - EXISTING GAS LINE

ORIGINATOR: HEH			DATE: 06.05.16			SIGNED:			PLOT BY: TRS			PLOT DATE: 29.09.16			ASSOCIATION OF CONSULTING ENGINEERS NEW ZEALAND			ISO 9001 QUALITY ASSURED			PROJECT: Central THE LAKES (2012) LTD, TAURANGA			TITLE: STAGES 2UV CIVILS DESIGN CONTOURS Attachment 8			ISSUE STATUS: CONSTRUCTION		
DRAWN: HEH			DATE: 06.05.16			SIGNED:			SURVEY BY:			SURVEY DATE:			THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF, AND MAY NOT BE REPRODUCED OR ALTERED WITHOUT THE WRITTEN PERMISSION OF HARRISON GRIERSON CONSULTANTS LIMITED. NO LIABILITY SHALL BE ACCEPTED FOR UNAUTHORIZED USE OF THIS DRAWING.			TAURANGA OFFICE LEVEL 1 HARRISON GRIERSON HOUSE 141 CAMERON ROAD TAURANGA 3110 T +64 7 578 0022 W www.harrisongrierson.com			PROJECT: Central THE LAKES (2012) LTD, TAURANGA			TITLE: STAGES 2UV CIVILS DESIGN CONTOURS Attachment 8			ISSUE STATUS: CONSTRUCTION		
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REFER TO APPROVED MASTER DRAWINGS FOR ORIGINAL SIGNATURES File: TAURANGA N:\1510\139652_A 2UV CIVILS\CA\139652-01-201.DWG

100 YR ED

16 June 2017



Experience
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expertise

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The Lakes - Stages 2UV

Prepared for
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16 June 2017

Document authorisation

Our ref: GENZTAUC13086AR-AD

For and on behalf of Coffey

David Cullen
Engineering Geologist

Quality information

Revision history

Revision	Description	Date	Author	Reviewer	Signatory
V1	Final for Issue	16-6-2017	R Telford	D Sullivan	R Telford

Distribution

Report Status	No. of copies	Format	Distributed to	Date
V1	1	PDF + hardcopy	The Lakes (2012) Ltd	16/6/2017
V1	1	PDF	Harrison Grierson Consultants Ltd	16/6/2017
V1	1	PDF + hardcopy	Tauranga City Council	16/6/2017

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Important information about your Coffey Report

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Appendix D – Completion Test Data

Appendix E – Fill Test Results

Appendix F – Static Settlement Results

1. INTRODUCTION AND SCOPE

This Geotechnical Completion Report (GCR) has been prepared by Coffey Services (NZ) Ltd (Coffey) for The Lakes (2012) Limited following completion of earthworks for Stages 2U and 2V (collectively known as 2UV) of the Lakes Subdivision and in general accordance with the conditions of Council resource consent number RC25104.

This GCR contains the results of site investigations together with as-built plans derived from Harrison Grierson Consultants Ltd (HGCL) topographical data. It describes bulk earthworks completed during two main phases of work from 2007-2008 and 2015-2017.

The extent of earthworks observed by Coffey is shown on the appended plans (Figures 1 to 5, Appendix A). A Statement of Professional Opinion (Form G2) and Summary of Technical Data (Form G3) for the works described herein are also appended.

2. DESCRIPTION OF SUBDIVISION

Stages 2U and 2V of The Lakes subdivision (collectively known as Stages 2UV) are located between Takitimu Drive (State Highway SH26) and the Kopurererua Stream in Tauriko, Tauranga. Stage 2U is located at the northern end of the site and to the north of Kennedy Road. Stage 2V extends to the south of the Kennedy Road/Takitimu Drive intersection.

The site location and original ground contours are shown on Figure 1 in Appendix A. Before work began the site consisted of farmland and included a steep sided hill that sloped from the southern part of the property. This hillside grading out onto a lower-lying terrace at approximately RL 12m (Moturiki Datum, 1953). The terrace extended northwards through the central and eastern parts of the site and was elevated some 3 to 4 metres above the low-lying floodplain of the Kopurererua Stream to the west.

The original topography was modified by earthworks in 2007-2008 which included excavation of the lower level of the main terrace within Stage 2V and the placement of engineered fill in the vicinity of Kennedy Road. Fill was also placed to the north of Kennedy Road to form a new level terrace within Stage 2U. Although records from this period are incomplete, settlement monitoring data indicate that the fill within Stage 2U was placed in stages between 2008 and June 2012. It is understood that the majority of the fill material came from excavations and the removal of pre-load embankments for the Takitimu Road project.

In 2012 ownership of the Lakes subdivision passed from Grasshopper Farms Ltd to The Lakes (2012) Ltd who have since undertaken additional earthworks on site. These works included the construction and surcharging of a new road embankment leading from the Kennedy Road extension to Stage 2V, the lowering (excavation) of earlier filling within Stage 2U and the placement of structural and non-structural filling along the western margin of the Stage 2V lot area.

A minor amount of structural fill was also placed at the south-eastern corner of Stage 2V where the development abuts Takitimu Drive. This filling is supported by a specifically designed retaining wall. An approximately 2.5m high earth-fill debris bund was also constructed at the foot of the steep slope at the southern end of Stage 2V

Civil infrastructure for these stages of the subdivision was installed in 2016 and 2017.

3. RELATED REPORTS

The following documents were prepared prior to or during the design and development of Stages 2U and 2V:

1. *'Pyes Pa West Urbanisation Development, Tauranga – Geotechnical Assessment Report'*, report prepared by S&L Consultants Ltd (Ref: 16944, dated October 2003);
2. *'Geotechnical Investigation Report on Proposed High Density Residential Development Grasshopper Farms Area N, Tauriko, Tauranga'*, report prepared by Coffey (Ref: 13447, dated 4 July 2007);
3. *'Geotechnical Investigation Report on Proposed Residential Development Kennedy Road Extension, Grasshopper Farms, Tauranga'*, report prepared by Coffey (Ref: GEOTTAUC13717, dated 14 February 2008);
4. *'Geotechnical Investigation Report for Proposed Subdivision at Kennedy Road, Pyes Pa, Tauranga'*, report prepared by Coffey (Ref: GENZTAUC13086AL, dated 20 December 2013);
5. *'Summary of Prevailing Ground Conditions and Geotechnical Design for Proposed Accessway Embankment at Stage 2UV The Lakes, Pyes Pa'*, report prepared by Coffey (Ref: GENZTAUC13086AL, dated 31 October 2014);
6. *'Geotechnical Investigation and Plan Review Report - The Lakes Subdivision - Stage 2UV'*, report prepared by Coffey (Ref: GENZTAUC13086AL-AC, dated 24 July 2015);
7. *'The Lakes Stage 2U – Additional Geotechnical Assessment'*, report prepared by Coffey (Ref: GENZTAUC13086AR-AB, dated 20 August 2015);
8. *'The Lakes Stage 2UV – Retaining Wall Design & Noise Wall Foundations'*, report prepared by Coffey (Ref: GENZTAUC13086AR-AC, dated 23 December 2015).

3.1. Report Summary

The original geotechnical assessment for the Lakes subdivision was completed by S&L Consultants Ltd and contained an overview of geotechnical conditions for the entire Lakes project. The report concluded that the site was generally adequate for subdivision and residential development, subject to appropriate design and construction.

That report provided broad recommendations relating to general earthworks requirements and earthfill procedures over the low-lying Kopurererua Valley floor throughout the project site but did not go into specific detail for the current study area due to the scale of the previous studies.

Subsequent geotechnical investigation reports by Coffey summarised additional investigations that were completed to specifically assess the Stage 2UV area. These investigations generally confirmed the S&L conclusion that the site was adequate for subdivision. The Coffey reports also highlighted the potential for significant load-induced settlements below any filling on the Kopurererua Stream floodplain and seismic liquefaction below parts of Stage 2U. The subdivision scheme plan was therefore revised to place all the proposed residential lots on the terrace and better ground to the east of the site. The flood plain on the site's western boundary was developed as a reserve area.

4. INVESTIGATIONS COMPLETED

The geotechnical investigations on the site have been conducted three main stages during 2003, 2007-2008 and 2014-2015. The investigations completed are summarised below. Logs of each investigation are included in Appendix C.

2003

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- Machine Boreholes MB25 to MB27 drilled by S&L Ltd in April 2003 to up to 12m depth.

2007-2008

- CPT-01 to CPT-14 completed on 31 May 2007 on the southern hill and low-lying flood plain to depths of up to 20 metres.
- Machine auger borehole MH2 drilled in June 2007 over the elevated hill topography within the southern part of the site to 20m depth.
- Trial pits TP1 to TP11 excavated in June 2007 across the main terrace and flood plain areas to depths of up to 6 metres.
- Logging of exposed excavation faces within and surrounding the general development area (FL01 & FL02).
- CPT-01 to CPT-13 completed on 7 December 2007 and located at the northern end of the site in the vicinity of the Kennedy Road extension.
- Trial pits TP1 to TP6 excavated at the northern end of the site in February 2008.

2014-2015

- TP18 to TP29 excavated in May 2014 and located on the main terrace and at the foot of the escarpment to the low flood plain.
- Machine boreholes MH28 - MH30 drilled on the flood plain in July 2014.
- CPT-15 and CPT-16 located at the south-eastern corner of the site adjacent to Takitimu Drive in June 2015.
- Borehole MH31 also located adjacent to Takitimu Drive in June 2015.
- Hand augers HA01 to HA03 drilled on the steep southern slope in July 2015.
- CPT-17 to CPT-20 located within Stage 2U in August 2015.
- Hand augers HA04 to HA08 drilled near the retaining wall alignments in November 2015.

On completion of the bulk earthworks in 2016 and 2017, Coffey drilled a total of 50 hand-auger boreholes to target depths of 2m to 2.5m to confirm finished subgrade conditions within the site. The location of each borehole is shown on Figure 5. Logs of these boreholes are included in Appendix D. Although labels are not shown on the plan, the boreholes are numbered according to the relevant lot number. For example, the hand auger borehole on Lot 100 is referred to as HAL100.

5. OVERVIEW OF GEOLOGICAL CONDITIONS

The elevated topography across the Tauriko region is reported to be underlain by Pleistocene-age Te Ranga Ignimbrite comprising light grey, non-welded, silty sands. However, boreholes located on the southern hill encountered ancient alluvial deposits more consistent with the Matua Subgroup. These variable soils were also encountered in investigations on the main terrace.

The Matua Subgroup deposits on the southern hill and terrace are mantled by a sequence of volcanic ashes including the Hamilton Ash (very stiff clayey silt), Rotoehu Ash (silty sand to sandy silt) and post-Rotoehu Ashes (stiff to very stiff silts). This layer of ashes is approximately 4m thick but has been reduced across most of the site by excavation.

Investigations on the low-lying parts of the site encountered variable alluvial soils including clays, silts, sands and organic or peat horizons. These soils are present below the flood plain in the west of Stage 2V and much of 2U. Alluvial soils were also encountered in borehole MH31 (Lot 39), below approximately 3m to 4m of fill placed during construction of Takitimu Drive.

5.1. Groundwater

Groundwater is observed at shallow depth on the low-lying flood plain and is encountered at approximately RL7m in investigations in this area. Below the main terrace, groundwater was measured in MB27 at 11.5m depth or approximately RL 8m. These groundwater levels appear to be relatively consistent across the site.

6. EARTHWORKS OPERATIONS

6.1. Plant

Earthworks during the 2007-2008 season were completed by Bob Hicks Earthmovers Ltd and A&R Ltd Earthmoving Contractors. The earthworks contractor for the 2014-2017 period was JMC Civil Construction Ltd (JMC) and civil infrastructure was installed by Higgins Group Holdings Ltd (Higgins).

The main items of plant used during each of the bulk earthworks phase comprised Terex motor-scrappers and bulldozer or tractor towed 'scoops', hydraulic excavators, bulldozers, articulated all-terrain dump trucks (ADT's) and sheep's-foot rollers.

6.2. Construction Programme

As mentioned in Section 2 above, earthworks on this site have been carried out in two main phases in 2007-2013 and 2014-2017. Cut and fill contour plans of these stages of work are shown on Figures 2 and 3 in Appendix A. A more detailed description of the main works carried out in each earthworks season is provided below.

In 2010, work on the Lakes subdivision site ceased under the original developer, Grasshopper Farms Ltd, when that company went into receivership. Records from this time are incomplete until work started again on site under The Lakes (2012) Ltd in 2013.

6.2.1. 2007 – 2012

From photographs and settlement monitoring data provided to Coffey it is understood that work began on the site during the 2007-2008 earthworks season. Excavations were carried out at this time at the southern end of Stage 2V and a fill embankment was constructed along the Kennedy Road extension that passes through the site. From December 2008, filling was also placed within the Stage 2U area. This fill was placed in stages from 2008 to 2012 and it is understood that much of the material came from excavations and the removal of pre-load embankments along Takitimu Drive.

6.2.2. 2014 – 2015 Earthworks Season

During 2014-2015, spoil from excavation on other stages of The Lakes subdivision was temporarily stockpiled within Stage 2U. Structural filling was also placed to construct a new road embankment to provide access to Stage 2V from Kennedy Road. This filling included approximately 2m of surcharge fill to accelerate the settlement of the embankment. The approximate extent of the surcharged area is shown on Figures 2 and 3 in Appendix A.

Work in 2015 also included cleaning out and partial filling of a gully to the south of the access road embankment (in the vicinity of SM20 shown on Figure 4).

6.2.3. 2015 – 2016 Earthworks Season

Works during this period included further excavations and the construction of the earth-fill debris bund at the southern end of Stage 2V as well as additional structural filling on the western and south-

eastern parts of this stage. A significant volume of non-structural filling was placed over the low-lying floodplain to the west of the 2V area. This material largely comprised excess fill and unsuitable soils sourced from earthworks on other stages of the Lakes subdivision.

The ground surface within Stage 2U was lowered at this time with the removal of approximately 1.5m to 2m of the previous filling within the development area.

6.2.4. 2016 – 2017 Earthworks Season

The remaining earthworks were completed to form the current ground surface during the 2016-2017 earthworks season. These included the placement of additional non-structural filling over the floodplain area by JMC and minor amounts of structural filling by Higgins to adjust subgrade levels within specific lots in Stage 2U and at the northern end of 2V. Non-structural filling was also placed by Higgins around the northern and western boundaries of Stage 2U to form a more uniform batter in these areas.

The civil infrastructure was installed by Higgins and their sub-contractors during this time and was supervised by Harrison Grierson Consultants Ltd.

7. QUALITY CONTROL

7.1. Site Preparation Observations

The majority of earthworks on the site between 2008 and 2013 were undertaken during the construction of Takitimu Road. Much of this work was overseen by Coffey and other geotechnical engineers as part of the larger project. However, records and test results from this period are limited within the Lakes site.

From 2013 Coffey undertook regular observations to ensure topsoil, vegetation or unsuitable materials had been removed before filling.

7.2. Fill Control

It is understood the filling undertaken in 2007-2012 was placed to an engineered fill standard. However, Coffey has not been able to locate test records from this period to confirm fill compaction.

The filling placed between 2014 and 2017 was tested using a Nuclear Density Meter (NDM) and undrained shear strength measurements. The tests were carried out by Fulton Hogan Ltd on behalf of JMC. The test locations are shown on Figures 2 and 4. In addition to these laboratory tests, Coffey undertook our own observations using field shear vane measurements at random locations within the filling.

7.3. Compaction Control Criteria

The compaction control criteria for this project were specified using the minimum allowable shear strength and maximum allowable air voids method as defined below:

- Air voids percentage (defined in NZS 4402:1986 and as measured by NDM) targeting an average value less than 10% over any 10 consecutive tests and maximum single value no greater than 12%.
- Undrained shear strength measured by hand held shear vane calibrated using the NZGS 2001 method. A single undrained shear strength 'test' was defined as the average of four individual shear vane readings at each NDM location. The target test values were an average value greater than 150kPa and minimum single value no less than 140kPa.

7.4. Test Results

Nuclear Density Reports showing the results of the laboratory fill tests are included in Appendix E and the locations of the tests are shown on Figures 2 and 4. All tests met or exceeded the compaction control criteria given above. All NDM test results are IANZ (International Accreditation New Zealand) endorsed and further details are appended. The independent tests by Coffey also indicated the filling observed met or exceeded the required specification.

All results above refer to tests taken within structural filling. No tests were conducted in the non-structural filling placed over the low-lying flood plain, as this area has been designated as a recreational and greenbelt reserve. The area of non-structural filling can be seen in Figures 2 and 4.

8. ENGINEERING EVALUATION AND RECOMMENDATIONS

8.1. Fill Quality

Although test results for the filling within Stage 2U in 2007 to 2013 could not be located for this report, subsequent observations and investigations by Coffey indicate that this fill would meet the requirements of engineered fill as set out in the Tauranga City Council Infrastructure Development Code (TCC IDC) and relevant New Zealand standards. That is, the observed filling is 'clean' (free of organic soils or other unsuitable materials) and has an average undrained shear strength in excess of 150kPa.

Based on the appended earth fill quality control test data and reliance on the diligence of the bulk earthworks contractor at times when engineering staff were not present on site, the NDM results indicate that the structural fills placed by JMC and Higgins between 2014 and 2017 also meet or exceed the required standards. This is supported by the hand-auger boreholes drilled by Coffey within the filling.

Coffey observed the placement of the non-structural filling on the floodplain to the west of Stage 2V in 2014 to 2016 and around the western and northern boundaries of Stage 2U in 2017. While these areas did not require the same level of compaction or testing as the structural filling, it is considered that the non-structural earthworks were also carried out to an acceptable standard and in accordance with our recommendations.

8.2. Static Settlement

8.2.1. Stage 2U

The new residential lots within Stage 2U are located on filling that was placed from 2007 to 2012 over variable alluvial soils and a ridge of in-situ volcanic ash deposits. Settlements below this area were monitored as part of the Takitimu Drive construction works and data provided to Coffey indicates that the filling experienced significant total and differential settlements of between 0.04m and 1.6m. The data show that consolidation settlements below the fill were effectively complete by 2009 to 2013, depending on when the last stage of filling occurred at each location.

From 2012 to 2015, the only works within Stage 2U comprised the temporary stockpiling of spoils from other stages of the Lakes and the placement and removal of the surcharge over Kennedy Road (see Figures 2 & 3). In 2015 the entire Stage 2U development area was lowered by 1.5m to 2m to form the current ground surface. The works in 2015 mean that the building areas within Stage 2U were effectively surcharged by between 10kPa and 30kPa for a period of at least two years.

Based on the above, we consider that future development in the 2U area is unlikely to be affected by significant or excessive residual settlements. We note that we are also recommending that buildings

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in this zone are supported on specifically designed 'enhanced' raft type foundations which will further reduce the risk of adverse effects due to settlement.

8.2.2. Stage 2V

The large majority of filling within or adjacent to Stage 2V was non-structural and occurred outside the lot area for this stage. Static settlements below the non-structural filling were monitored at four locations shown as SM23 to 25 and SM28 on Figure 4. The monitoring pins consisted of steel rods attached to plates installed at the base of the filling. Plots of the data for these points are provided in Appendix F and show that the alluvial soils beneath this area have settled between 350mm and 900mm. The data indicate that this area may experience significant long-term creep settlements of up to 100mm to 300mm over the next 50 years.

Static settlements have also been monitored at three locations within the Stage 2V lot areas. SM20 is located in an infilled gully within Lot 66. SM26 and SM27 were installed in late 2016 to monitor settlements within Lots 56 and 60 respectively. The data from these pins are presented graphically in Appendix F and the settlement marker locations are shown on Figure 4. SM20 was seen to settle approximately 320mm as a result of the filling placed in this area. SM26 and SM27 each settled approximately 20mm to 40mm.

The settlement data for SM20, SM26 and SM27 also show that consolidation settlements within the finished lots is essentially complete at the time of writing. Long-term creep settlements below the lots should be less than 25mm over the next 50 years.

Based on the above discussion, we consider that future 'residual' settlements below the lots within both Stage 2U and 2V should be within the limits recommended by the New Zealand Building Code (Clause B1 and B1/VM4).

8.3. Proximity to Gas Main

The non-structural filling that was placed over the low-lying flood plain is close to the gas main which extends along the site's western boundary. To reduce the risk of damaging this service it was initially recommended that all earthworks be kept at least 30m from the pipe alignment. Monitoring points (steel 'warratahs') were installed approximately 10m from the toe of the batter and 20m from the gas pipe and regularly surveyed in three dimensions to measure any possible displacements due to the filling. The monitoring data showed no discernible horizontal or vertical ground movement as a result of the nearby filling.

Based on the above observation the non-structural filling was advanced to a line approximately 20m from the gas main. Continued monitoring showed no significant ground deformations between the toe of the fill embankment and gas pipe.

8.4. Liquefaction

Initial investigations on site identified possible areas of liquefaction prone soils, these being the alluvial soils below the flood plain in the west of Stage 2V and much of 2U, and also below the existing fill in proposed Lots 37 to 41. Calculations indicated these soils were likely to liquefy during a ULS earthquake. There was a low risk of localised liquefaction during a smaller serviceability limit state or SLS event.

The earthworks design on Lots 37 to 41 was revised following the assessment of possible liquefiable soils at this location. The wall alignment was moved to the west and the wall height was reduced to approximately 1.5m. It is considered that with these modifications the potential for excessive ground movement below these lots as a result of liquefaction is minor.

A specific site investigation and analyses were carried out to assess liquefaction below lots in Stage 2U in 2015. The results of this assessment were presented in the 20 August 2015 Coffey report (reference 7 in Section 3 above). The report concluded that liquefaction is unlikely to occur at this location during a 'Serviceability Limit State' (SLS) event.

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The analyses did identify a high likelihood of liquefaction below Stage 2U in an “Ultimate Limit State” (ULS) earthquake. The effects of this liquefaction would be reduced by the 3m to 4m thickness of non-liquefiable filling which underlies the finished lots in this area. We estimate that the finished lots may experience approximately 200mm of free field vertical settlement and up to 0.5m of lateral ground displacement in a ULS event.

Due to the potential for ground movement as a result of liquefaction below Stage 2U, we recommend that the future buildings in this area consist of ‘enhanced’ waffle-slab foundations such as those designed for the ‘TC2’ zones of the Christchurch rebuild. Specific foundation design recommendations are given in Section 8.9 below.

Design Earthquakes

A SLS earthquake as defined by New Zealand Standard NZS 1170 for this development would have a return period of 1 in 25 years. A typical dwelling designed to NZ standards may suffer minor damage in such an event but must remain ‘serviceable’ or habitable until it can be repaired. A ULS earthquake for this development would have a return period of 1 in 500 years. An appropriately designed dwelling may be extensively damaged or written off by such an earthquake but must remain safe for its occupants until they can be evacuated.

8.4.1. Reserve Area

We note that the reserve area formed on the non-structural filling to the west of the site would also be expected to be affected by significant vertical and horizontal ground movement as a result of earthquake induced liquefaction. This area is considered adequate for non-essential infrastructure and playgrounds, etc. However, if more significant structures are to be located in this zone it is recommended that a specific liquefaction risk assessment is carried out.

8.5. Slope Stability

The large majority of the new lots are located on flat or gently sloping ground with a low risk of instability. The exceptions to this are Lot 55 which includes the steep slope at the southern end of Stage 2V and Lots 1 to 9 which are located next to a 1V:3H batter that has been partially formed from non-engineered filling.

Development on Lots 1 to 9 is subject to a Building Restriction Line (BRL) discussed further in Section 8.6. Provided the development on these lots is carried out in accordance with the technical requirements of this line, we consider there is a low risk of instability on these sites.

8.5.1. Lot 55

While there was no obvious evidence of large-scale instability within Lot 55, the existing slope gradient of approximately 28° is likely to be close to the maximum stable gradient of the underlying soils. There was also visible evidence of shallow soil creep on this slope and the topography suggests the presence of colluvial soils at the slope toe. Analyses by Coffey and presented in our July 2015 Geotechnical Investigation and Review Report (reference 6 in Section 3 above) concluded the factors of safety for this slope were less than the minimum values required for residential development by the Tauranga City Council Infrastructure Development Code (TCC IDC) and New Zealand building code.

We therefore consider that the sloping portion of Lot 55 would not be adequately stable for residential development without specific input from a TCC Category 1 Geo-Professional. There is however adequate flat land for residential development at the northern end of the lot.

To protect the other lots at the south of Stage 2V from possible instability an approximately 2.5m high debris bund has been constructed between the slope and the adjacent lots as shown on Figure 5. We

consider this bund has been completed in accordance with our recommendations and design and that the lots below are adequately protected from possible slope debris.

The bund must be maintained at its current height and capacity. In the event of a landslide or significant accumulation of debris behind the bund, the bund will need to be cleared to maintain its current height and capacity. Responsibility for this work will fall on the owner of Lot 55 in which the bund is located. The owner of Lot 55 will also be responsible for maintaining the landscape planting which has been carried out on the bund.

We understand that the slope and hillside within Lot 55 may be incorporated into a future development. In the event that the slope height or gradient is reduced significantly the debris bund may become redundant and may be removed. This should be confirmed by a Tauranga City Council Category 1 Geo-Professional before work proceeds.

8.6. Building Restriction Lines

Five Building Restriction Lines (BRL's) have been placed on lots within Stage 2UV. The BRL's are shown on Figure 5 in Appendix A and affect the following lots:

- Lots 1 to 9 – These lots are located above an up to 1V:3H batter which has been formed around the western and northern boundaries of Stage 2U. This batter partly consists of previous engineered filling and partly of non-engineered landscape fill. The BRL on these lots is located along the crest of the batter and is intended to restrict development on the slope due to the potential for shallow slope movement and/or variable subgrade materials within the batter itself.
- Lot 9 – In addition to the BRL along the slope crest mentioned above, an up to 0.7m high retaining wall has been constructed inside the property's boundary with Takitimu Drive. As this wall was not engineered designed, a BRL has been placed on this lot extending 2.0m inside the property boundary adjacent to the wall.
- Lots 12, 13, 15 & 18 – The boundaries of these lots with Takitimu Drive and Kennedy Road are supported by an up to 1.3m high retaining wall. This wall was engineer designed but this design did not allow for building loads. A BRL has therefore been located 1.5m inside the property boundary on the affected lots. On lot 18 the setback distance tapers off to 0m where the retaining wall ends.
- Lots 20 to 42 – The boundaries of these lots with Takitimu Drive and Kennedy Road are also supported by an engineer designed retaining wall up to 1.5m high which was not designed to building loads. The BRL on lots 20 to 22 and 24 to 35 is located 2.5m inside the property boundary. Lots 21 and 22 also include tapering BRL setbacks along two short sections of wall on either side of a nearby Council walkway. The BRL on lots 23 and 36 to 42 is located 2.5m inside the toe of the retaining wall where the wall extends inside the property boundary.

This retaining wall also extends a small distance along the boundary of Lot 19. However, the length and height of the wall at this location is such that a BRL is not required on this lot.

- Lots 55 to 70 – these sites lie along the boundary between the structural and non-structural filling and underlying alluvial soils on the western margin of Stage 2V. The BRL on these lots has been positioned to set future development back from the zone of possible long-term differential settlements along this boundary.

8.6.1. Development on Lots with a BRL

It should be understood that the existence of the BRL on a lot does not explicitly preclude development in the restricted area. Any works within the BRL would however be subject to the following requirements:

- The foundations of any building, and or any proposed filling or retaining walls within the BRLs along the crest of the batter on Lots 1 to 9 and on 55 to 70 would need to be assessed by a Tauranga City Council Category 1 Geo-Professional.
- The foundations of any dwelling or any proposed filling within the BRLs along the retaining walls on lots 9, 12, 13, 15, 18 and 20 to 42 must be assessed by a chartered engineer (CPEng) with consideration given to the zone of influence of the adjacent retaining walls.

8.7. Erosion Protection

The batter to the west and north of Lots 1 to 5 in Stage 2U has been covered with a layer of 'Grassroots' (registered trademark) synthetic matting provided by Geofabrics Ltd to reduce the risk of erosion or scour of this slope as a result of flooding along the Kopurererua Stream. The Grassroots matting extends up to the 1 in 100 year flood level as shown on Figure 5.

The Grassroots matting extends approximately 3m to 8m inside the boundaries of Lots 1 to 5. The owners of these lots will need to ensure that continuous grass cover is maintained within this area and that the integrity of the erosion matting is not compromised by future development or landscaping in this area.

8.8. Minimum Floor Levels

Also due to the potential for flooding along the Kopurererua Stream, the lots within Stage 2UV are subject to minimum floor levels defined by the Tauranga City Council. The minimum levels are summarised on Table 1 below. Levels are given in terms of RL (reduced level) to the Moturiki Datum, 1953 and are to be measured to the underside of the floor slab or floor joists per section DS-5.4.5 of the TCC IDC.

Table 1: Stage 2U Minimum Floor Levels

Lot #	Minimum Floor Level (m RL)	Lot #	Minimum Floor Level (m RL)
1	11.0m	10	10.75m
2	10.75m	11	10.75m
3	10.75m	12	11.0m
4	10.5m	13	11.0m
5	10.25m	14	10.75m
6	10.25m	15	11.0m
7	10.5m	16	10.75m
8	10.5m	17	10.75m
9	10.75m	18	11.0m
All Lots within 2V (Lots 19 to 109)		11.25m	

We note that the large majority of lots within Stage 2V are already well above the minimum level and should therefore not be significantly affected.

8.9. Foundation Design & Bearing Capacity

As discussed in Section 8.4, soils below the lots within Stage 2U (i.e. Lots 1 to 18) may at least partially liquefy during a strong earthquake leading to possible vertical and horizontal ground movement. The dwellings within Stage 2U should therefore be supported by specifically designed 'enhanced' waffle slab type foundations such as those developed for the 'TC2' zone of the

Christchurch rebuild. A geotechnical ultimate bearing capacity of 300kPa may be assumed for these lots as they are entirely underlain by engineered filling.

While some lots within Stage 2V (Lots 19 to 109) are also underlain by engineered fill and the potential for liquefaction is lower in this area, most lots are at least partially located over Matua Subgroup materials which may contain relatively weak soils (i.e. peak undrained shear strength measurements as low as 50kPa). We therefore recommend that all dwellings on these lots be supported by specifically designed waffle slab foundations. A geotechnical ultimate bearing capacity of 200kPa should be assumed for this design.

We note that on many lots within Stage 2V the ground conditions may be better than assumed above. It should also therefore be possible to design the future building foundations on these lots using NZS 3604. However, this would require a site specific investigation and assessment by a chartered engineer (CPEng) prior to building consent to confirm ground conditions and bearing capacity.

8.10. Variable Ground Conditions

It should be understood that due to the volcanic nature of the natural soils on the elevated terraces, it is possible that local soil conditions may vary from those discussed above. It is therefore important that any potentially soft or unsuitable soils encountered in the foundation excavations are brought to the attention of a geotechnical professional.

9. CONCLUSION

Based on the observations and investigations presented in this report and with some reliance on the diligence of the earthworks contractors, it is concluded that the earthworks and subdivision of Stages 2U and 2V have been completed in general accordance with our previous recommendations, NZS 4431 and the Tauranga City Council Infrastructure Development Code.

This report presents site-specific recommendations including Building Restriction Lines (BRLs), specifically designed foundations, minimum floor levels and on-going maintenance requirements on some lots. A lot-by-lot summary of the recommendations and development requirements is given in Appendix B.

Provided the recommendations are followed and prudent development practices are adopted, it is considered that the finished lots are at low risk of erosion, falling debris, subsidence, inundation or liquefaction and these sites should therefore be adequate for residential development without the need for Section 72 restrictions under the New Zealand Building Act.

10. LIMITATIONS

This report has been prepared solely for the use of the client, The Lakes (2012) Limited, their professional advisers and the relevant Territorial Authorities in relation to the specific project described herein. No liability is accepted in respect of its use for any other purpose or by any other person or entity. All future owners of this property should seek professional geotechnical advice to satisfy themselves as to its ongoing suitability for their intended use.

The opinions, recommendations and comments given in this report result from the application of normal methods of site investigation. As the post construction factual evidence has been obtained solely from boreholes and test pits, which by their nature only provide information about a relatively small volume of subsoils, there may be special conditions pertaining to this site which have not been disclosed by the investigation and which have not been taken into account in the report.

For and on behalf of Coffey

Report Prepared By:



R TELFORD

TCC Category 1 Engineering Geologist

Report Reviewed By:



D SULLIVAN

Principal Geotechnical Engineer

BSc, MBA, CE (Calif.), MIPENZ, CPEng, TCC Category 1 Geotechnical Engineer

CPEng No. 1025183



Important information about your Coffey Report

As a client of Coffey you should know that site subsurface conditions cause more construction problems than any other factor. These notes have been prepared by Coffey to help you interpret and understand the limitations of your report.

Your report is based on project specific criteria

our report has been developed on the basis of your unique project specific requirements as understood by Coffey and applies only to the site investigated. Project criteria typically include the general nature of the project; its size and configuration; the location of any structures on the site; other site improvements; the presence of underground utilities; and the additional risk imposed by scope-of-service limitations imposed by the client. our report should not be used if there are any changes to the project without first asking Coffey to assess how factors that changed subsequent to the date of the report affect the report's recommendations. Coffey cannot accept responsibility for problems that may occur due to changed factors if they are not consulted.

Subsurface conditions can change

Subsurface conditions are created by natural processes and the activity of man. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult Coffey to be advised how time may have impacted on the project.

Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from literature and external data source review, sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by earth, rock and time.

The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, owners should retain the services of Coffey through the development stage, to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

Your report will only give preliminary recommendations

our report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered as the project develops. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Coffey cannot be held responsible for such misinterpretation.

Your report is prepared for specific purposes and persons

To avoid misuse of the information contained in your report it is recommended that you confer with Coffey before passing your report on to another party who may not be familiar with the background and the purpose of the report. our report should not be applied to any project other than that originally specified at the time the report was issued.

Important information about your Coffey Report

Interpretation by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, retain Coffey to work with other project design professionals who are affected by the report. Have Coffey explain the report implications to design professionals affected by them and then review plans and specifications produced to see how they incorporate the report findings.

Data should not be separated from the report

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way.

Logs, figures, drawings, etc. are customarily included in our reports and are developed by scientists, engineers or geologists based on their interpretation of field logs (assembled by field personnel) and laboratory evaluation of field samples. These logs etc. should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

Geoenvironmental concerns are not at issue

Our report is not likely to relate any findings, conclusions, or recommendations about the potential for hazardous materials existing at the site unless specifically required to do so by the client. Specialist equipment, techniques, and personnel are used to perform a geoenvironmental assessment. Contamination can create major health, safety and environmental risks.

If you have no information about the potential for your site to be contaminated or create an environmental hazard, you are advised to contact Coffey for information relating to geoenvironmental issues.

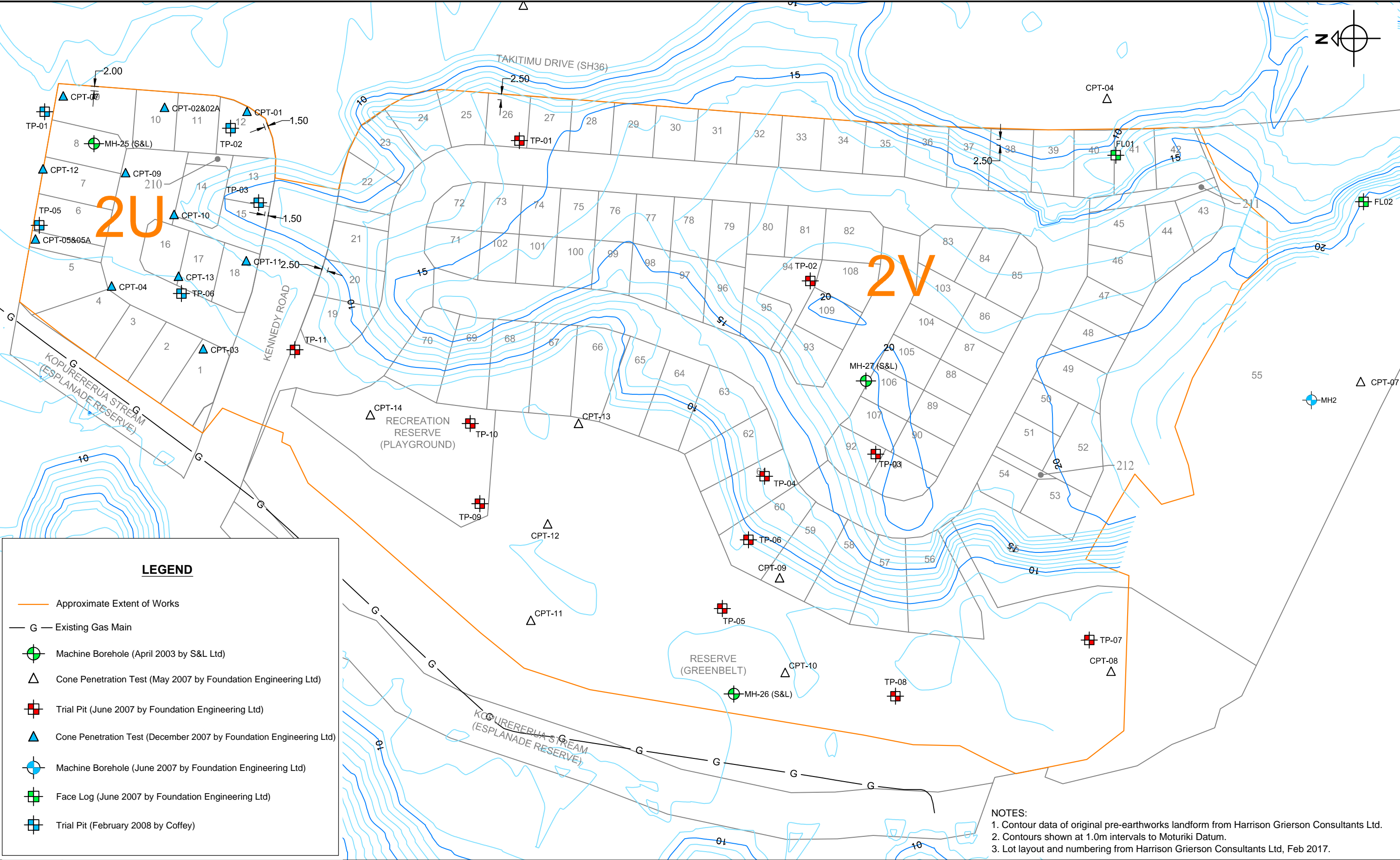
Rely on Coffey for additional assistance

Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a project, from design to construction. It is common that not all approaches will be necessarily dealt with in your site assessment report due to concepts proposed at that time. As the project progresses through design towards construction, speak with Coffey to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

Responsibility

Reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than the design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Coffey to other parties but are included to identify where Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Coffey closely and do not hesitate to ask any questions you may have.

Appendix A - Figures



LEGEND

— Approximate Extent of Works

G Existing Gas Main

Machine Borehole (April 2003 by S&L Ltd)

Cone Penetration Test (May 2007 by Foundation Engineering Ltd)

Trial Pit (June 2007 by Foundation Engineering Ltd)

Cone Penetration Test (December 2007 by Foundation Engineering Ltd)

Machine Borehole (June 2007 by Foundation Engineering Ltd)

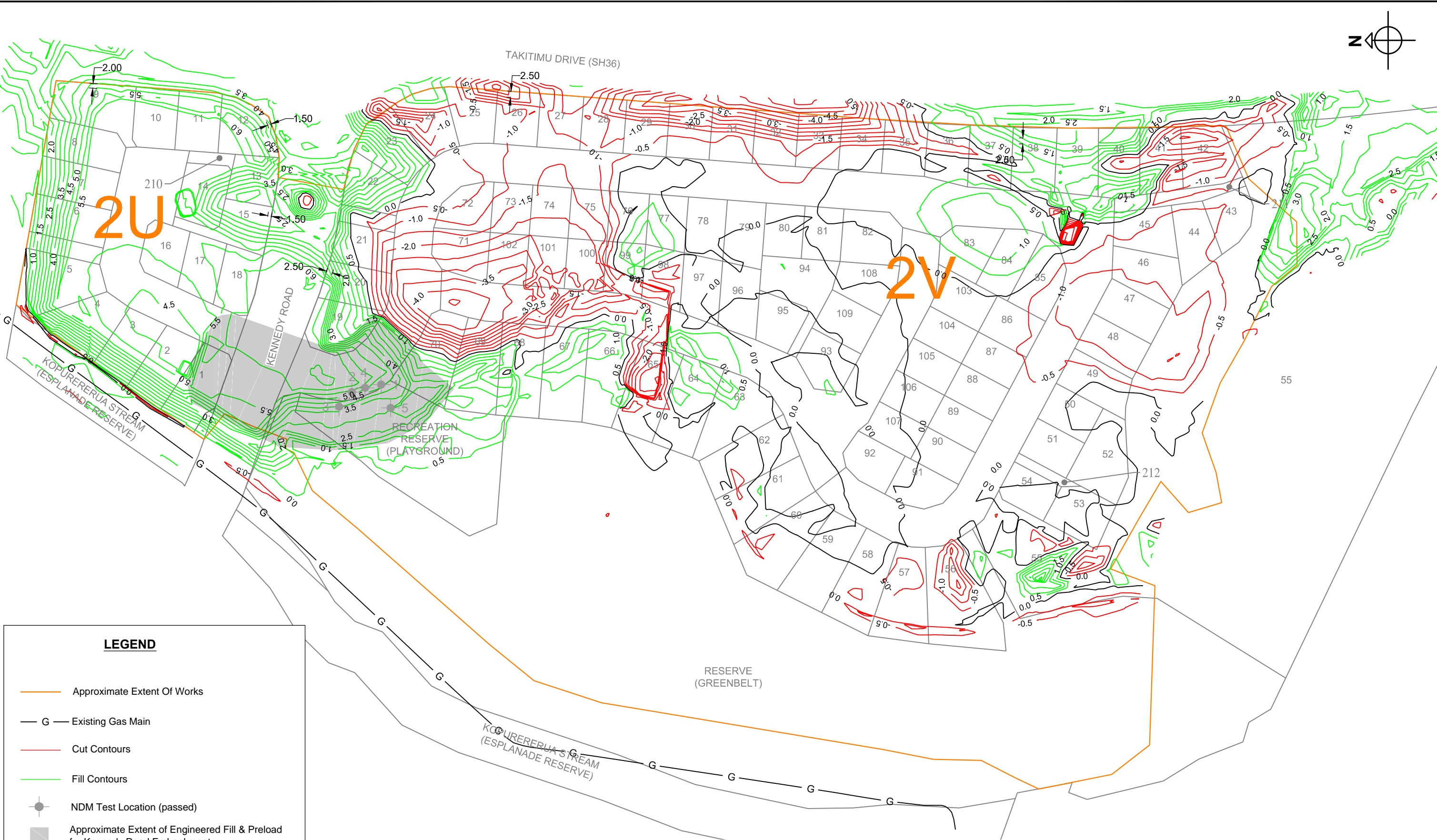
Face Log (June 2007 by Foundation Engineering Ltd)

Trial Pit (February 2008 by Coffey)

NOTES:
1. Contour data of original pre-earthworks landform from Harrison Grierson Consultants Ltd.
2. Contours shown at 1.0m intervals to Moturiki Datum.
3. Lot layout and numbering from Harrison Grierson Consultants Ltd, Feb 2017.

revision	rev	description				drawn	approved	date		<div><div>030.060.090.0</div><div>Horizontal Scale (metres)</div><div>030.060.090.0</div><div>Vertical Scale (metres)</div></div>	drawn	DBC	<div><div>coffey</div><div>A TETRA TECH COMPANY</div></div>			client: The Lakes (2012) Ltd				
											approved	DAS				project: The Lakes Stage 2UV Geotechnical Completion Report				
											date	16-6-2017				title: Original Site Contour Plan				
											scale	1:1500				project no: 13086AR-AD				
											original size	A3				figure no: 1				
rev:																			rev:	-

16/06/2017F:\1.GEN\1.GEOTECHNICS PROJECTS\13086AR THE LAKES 2UV CONSTRUCTION SUPERVISION\6. DRAWINGS\ICGL DRAWINGS\WORKING\DRAWING GCR\13086AR - STAGE 2UV GCR 16-6-2017.DWG



LEGEND

Approximate Extent Of Works

G

Existing Gas Main

Cut Contours

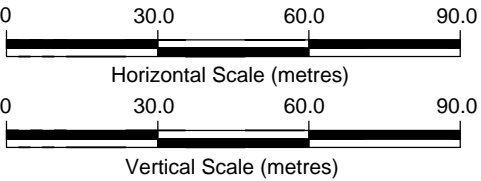
Fill Contours

NDM Test Location (passed)

Approximate Extent of Engineered Fill & Preload for Kennedy Road Embankment

NOTES:
1. Cut/Fill contours show difference between May 2007 and 2015 surveys. Provided by Harrison Grierson Consultants Ltd. Contours are at 1m intervals.
2. Lot layout and numbering from Harrison Grierson Consultants Ltd, Feb 2017.

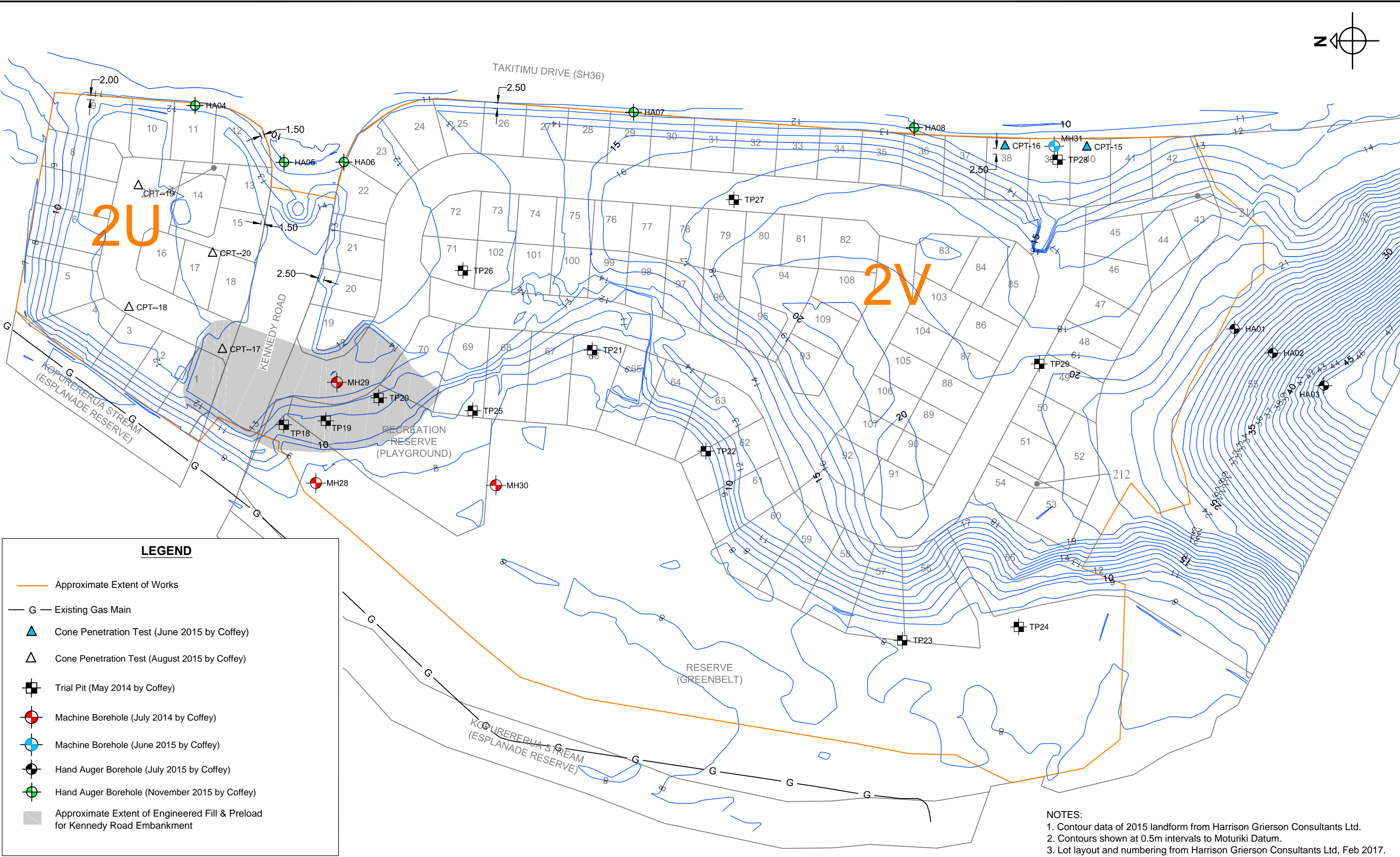
revision	rev	description				drawn	approved	date



drawn	DBC
approved	DAS
date	16-6-2017
scale	1:1500
original size	A3



client:	The Lakes (2012) Ltd		
project:	The Lakes Stage 2UV Geotechnical Completion Report		
title:	2007-2015 Earthworks Contour Plan		
project no:	13086AR-AD	figure no:	2
		rev:	-

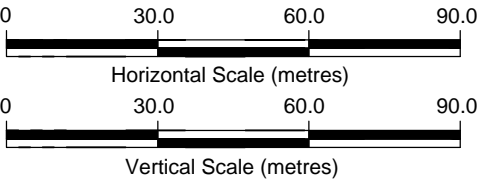


LEGEND

- Approximate Extent of Works
- Existing Gas Main
- Cone Penetration Test (June 2015 by Coffey)
- Cone Penetration Test (August 2015 by Coffey)
- Trial Pit (May 2014 by Coffey)
- Machine Borehole (July 2014 by Coffey)
- Machine Borehole (June 2015 by Coffey)
- Hand Auger Borehole (July 2015 by Coffey)
- Hand Auger Borehole (November 2015 by Coffey)
- Approximate Extent of Engineered Fill & Preload for Kennedy Road Embankment

NOTES:
1. Contour data of 2015 landform from Harrison Grierson Consultants Ltd.
2. Contours shown at 0.5m intervals to Moturiki Datum.
3. Lot layout and numbering from Harrison Grierson Consultants Ltd, Feb 2017.

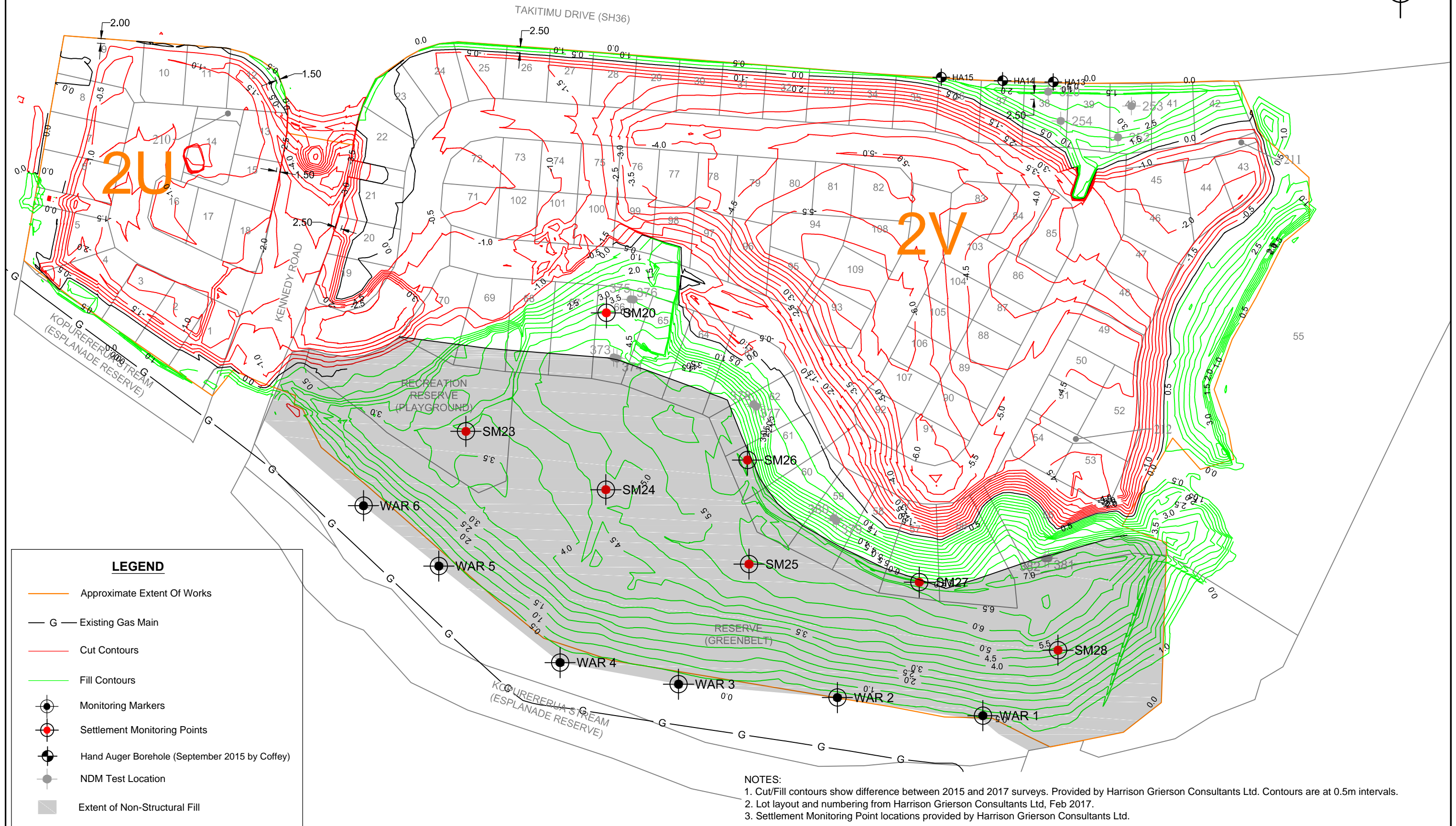
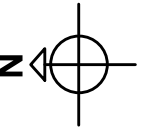
revision	rev	description		drawn	approved	date



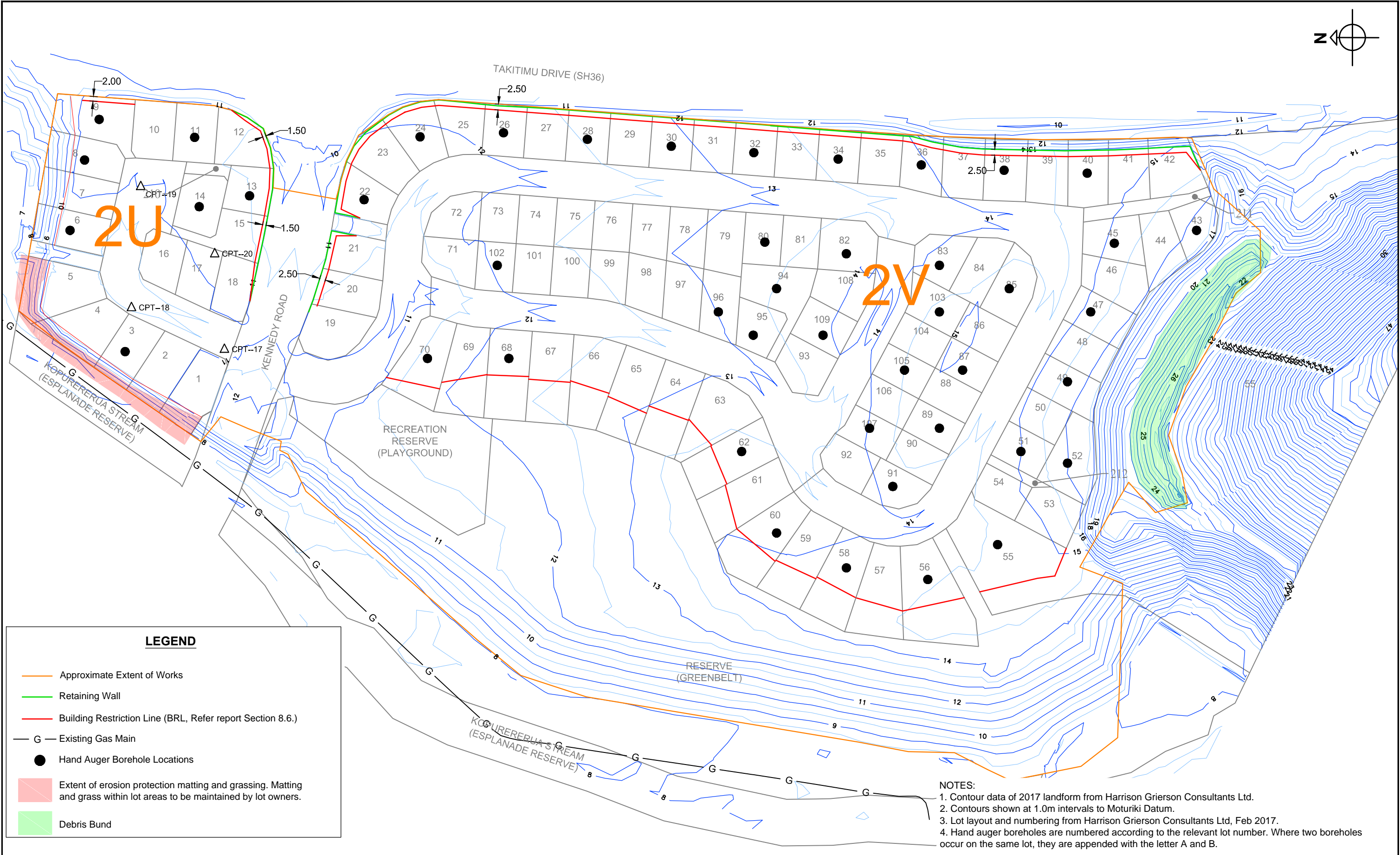
drawn	DBC
approved	DAS
date	16-6-2017
scale	1:1500
original size	A3



client:	The Lakes (2012) Ltd		
project:	The Lakes Stage 2UV Geotechnical Completion Report		
title:	2015 Contour Plan		
project no:	13086AR-AD	figure no:	3
		rev:	-



revision	rev	description	drawn	approved	date	<div><div>030.060.090.0</div><div>Horizontal Scale (metres)</div><div>030.060.090.0</div><div>Vertical Scale (metres)</div></div>	drawn	DBC	<div><div>coffey</div><div>A TETRA TECH COMPANY</div></div>	client: The Lakes (2012) Ltd		
							approved	DAS		project: The Lakes Stage 2UV Geotechnical Completion Report		
							date	16-6-2017		title: 2015-2017 Earthworks Contour Plan		
							scale	1:1500		project no: 13086AR-ADfigure no: 4rev: -		
							original size	A3				



LEGEND

Approximate Extent of Works

Retaining Wall

Building Restriction Line (BRL, Refer report Section 8.6.)

G

Existing Gas Main

Hand Auger Borehole Locations

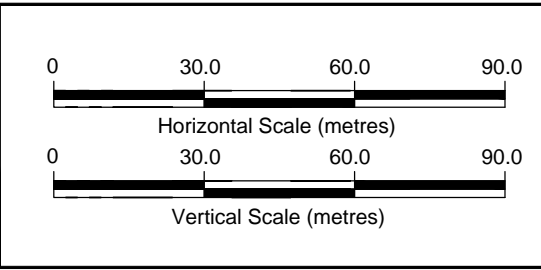
Extent of erosion protection matting and grassing. Matting and grass within lot areas to be maintained by lot owners.

Debris Bund

NOTES:

1. Contour data of 2017 landform from Harrison Grierson Consultants Ltd.
2. Contours shown at 1.0m intervals to Moturiki Datum.
3. Lot layout and numbering from Harrison Grierson Consultants Ltd, Feb 2017.
4. Hand auger boreholes are numbered according to the relevant lot number. Where two boreholes occur on the same lot, they are appended with the letter A and B.

revision	rev	description				drawn	approved	date



drawn	DBC
approved	DAS
date	16-6-2017
scale	1:1500
original size	A3



client:	The Lakes (2012) Ltd		
project:	The Lakes Stages 2UV Geotechnical Completion Report		
title:	2017 Contour Plan		
project no:	13086AR-AD	figure no:	5
		rev:	-

**Appendix B - Geotechnical Suitability Statement &
Geotechnical Data Summary Table**

CERTIFICATION

G2

STATEMENT OF PROFESSIONAL OPINION AS TO THE GEOTECHNICAL SUITABILITY OF LAND FOR BUILDING

NAME OF SUBDIVISION	The Lakes Stage 2UV
COUNCIL FILE NUMBER RC No:	25104
ENGINEER RESPONSIBLE FOR DEVELOPMENT:	Rob Telford, Coffey Services (NZ)
QUALIFICATIONS:	TCC Category 1 Eng-Geotechnical

I, Rob Telford of Coffey Services (NZ) Ltd.
(Full Name) (Name & Address of Firm)

Hereby confirm that;

1. I am a professional person, appropriately qualified with experience in geotechnical engineering to ascertain the suitability of the land for building development and was retained as the Soils Engineer to the above development.

2. An appropriate level of site investigation and construction supervision has been carried out under my direction and is described in my development evaluation report dated: 16/6/2017.....

3. In my professional opinion, not to be construed as a guarantee, I consider that;

a) Every part / the area shown in my report dated 16/6/2017 of each new allotment is suitable for the erection thereon of the building types appropriate to the zoning of the land, provided that: refer to Geotechnical Completion Report ref 773-GEN2-AVC BO86AR-AD 16/6/2017

b) The earth fills shown on the attached Plan No. Fig 2 & Fig 4 have been placed in accordance with the requirements of the Infrastructure Development Code.

c) The completed works give due regard to all land slope and foundation stability considerations.

d) ~~The filled ground is suitable for the erection thereon of residential buildings not requiring specific design in terms of NZS 3604: 2011 and related documents provided that:~~
refer Geotechnical Completion Report

e) ~~The original ground not affected by filling is suitable for the erection thereon of residential buildings not requiring specific design in terms of NZS 3604: 2011 and related documents provided that:~~
refer Geotechnical Completion Report

4. This professional opinion is furnished to the Council and the owner for their purpose alone, on the express condition that it will not be relied upon by any other person and does not remove the necessity for the normal inspection of foundation conditions at the time of erection for any dwelling

Signed .. Rob Telford

Date 16/6/2017



TaurangaCity

PRODUCER STATEMENT
SUITABILITY OF LAND FOR BUILDING DEVELOPMENT

INFRASTRUCTURE DEVELOPMENT CODE

G2

VERSION 1
July 2011

1

DP No:	Lot 852 DP473714 Lot 853 DP414134	Property Address	Kennedy Road, Tauriko	RC No:	25104
--------	--------------------------------------	------------------	-----------------------	--------	-------

Lot No:	Area (m ²)	Subsurface data						Foundations		Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Building Platform	Compressible Soils	On-Site Effluent Disposal	Consent Notice	Comments
		Shear Strength (kPa)	Subdivision Filling		Natural Topography Unworked	Natural Topography Earthworked		Conventional Shallow Foundation to NZS 3604:2011	Specific Design										
		at 0.5m depth	Y/N	Depth (m)	Y/N	Y/N	Depth (m)	Y/N/NA	Y/N/NA										

1	557	N/T	Y	4	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	Specifically designed 'enhanced' waffle slab foundations per Section 8.9 of Coffey GCR ref: GENZTAUC13086AR-AD. Also: <ul style="list-style-type: none"> BRL (GCR Section 8.6) Minimum floor levels (GCR Section 8.8)
2	540	N/T	Y	4	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
3	492	>215	Y	3.5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
4	612	N/T	Y	3.5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	Consent notice required to ensure lot owners maintain continuous grass cover and erosion protection on slope down to Kopurererua Stream, per GCR Section 8.7.
5	720	N/T	Y	3.5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
6	513	UTP	Y	4	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
7	524	N/T	Y	4.5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	Specifically designed 'enhanced' waffle slab foundations per Section 8.9 of Coffey GCR ref: GENZTAUC13086AR-AD. Also: <ul style="list-style-type: none"> Minimum floor levels (GCR Section 8.8)
8	523	UTP	Y	5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
9	652	UTP	Y	5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
10	446	N/T	Y	4.5	Y	N		N	Y	N	N	N	Y	N	Y	N	N	Y	
11	449	UTP	Y	4.5	Y	N		N	Y	N	N	N	Y	N	Y	N	N	Y	



SUMMARY OF GOTECHNICAL DATA FOR INDIVIDUAL LOTS

INFRASTRUCTURE DEVELOPMENT CODE

G3

VERSION 1

Julv 2011

1

DP No:	Lot 852 DP473714 Lot 853 DP414134	Property Address	Kennedy Road, Tauriko	RC No:	25104
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Lot No:	Area (m²)	Subsurface data					Foundations		Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Building Platform	Compressible Soils	On-Site Effluent Disposal	Consent Notice	Comments	
		Shear Strength (kPa) at 0.5m depth	Subdivision Filling		Natural Topography Unworked	Natural Topography Earthworked		Conventional Shallow Foundation to NZS 3604:2011 Y/N/NA											Specific Design Y/N/NA
			Y/N	Depth (m)		Y/N	Depth (m)												

12	482	N/T	Y	4.5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	Specifically designed 'enhanced' waffle slab foundations per Section 8.9 of Coffey GCR ref: GENZTAUC13086AR-AD.
13	384	UTP	Y	5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	Also: <ul style="list-style-type: none"> BRL (GCR Section 8.6) Minimum floor levels (GCR Section 8.8)
14	475	UTP	Y	3	Y	N		N	Y	N	N	N	Y	N	Y	N	N	Y	Specifically designed 'enhanced' waffle slab foundations per Section 8.9 of Coffey GCR ref: GENZTAUC13086AR-AD. Also: <ul style="list-style-type: none"> Minimum floor levels (GCR Section 8.8)
15	470	N/T	Y	3.5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	Specifically designed 'enhanced' waffle slab foundations per Section 8.9 of Coffey GCR ref: GENZTAUC13086AR-AD. Also: <ul style="list-style-type: none"> BRL (GCR Section 8.6) Minimum floor levels (GCR Section 8.8)
16	399	N/T	Y	4	Y	N		N	Y	N	N	N	Y	N	Y	N	N	Y	Specifically designed 'enhanced' waffle slab foundations per Section 8.9 of Coffey GCR ref: GENZTAUC13086AR-AD.
17	399	N/T	Y	4	Y	N		N	Y	N	N	N	Y	N	Y	N	N	Y	Also: <ul style="list-style-type: none"> Minimum floor levels (GCR Section 8.8)



SUMMARY OF GOTECHNICAL DATA FOR INDIVIDUAL LOTS

INFRASTRUCTURE DEVELOPMENT CODE

G3

VERSION 1

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1

DP No:	Lot 852 DP473714 Lot 853 DP414134	Property Address	Kennedy Road, Tauriko	RC No:	25104
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Lot No:	Area (m ²)	Subsurface data					Foundations		Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Building Platform	Compressible Soils	On-Site Effluent Disposal	Consent Notice	Comments	
		Shear Strength (kPa) at 0.5m depth	Subdivision Filling		Natural Topography Unworked Y/N	Natural Topography Earthworked		Conventional Shallow Foundation to NZS 3604:2011 Y/N/NA											Specific Design Y/N/NA
			Y/N	Depth (m)		Y/N	Depth (m)												

18	414	N/T	Y	4	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	Specifically designed 'enhanced' waffle slab foundations per Section 8.9 of Coffey GCR ref: GENZTAUC13086AR-AD. Also: <ul style="list-style-type: none"> BRL (GCR Section 8.6) Minimum floor levels (GCR Section 8.8)
19	524	N/T	Y	4	N	Y	1.5	N	Y	N	N	N	Y	N	Y	N	N	Y	Specifically designed waffle slab foundations per Section 8.9 of Coffey GCR ref: GENZTAUC13086AR-AD. Also: <ul style="list-style-type: none"> Minimum floor levels (GCR Section 8.8)
20	441	N/T	Y	4	N	Y	2.5	N	Y	Y	N	N	Y	N	Y	N	N	Y	Specifically designed waffle slab foundations per Section 8.9 of Coffey GCR ref: GENZTAUC13086AR-AD. Also: <ul style="list-style-type: none"> BRL (GCR Section 8.6) Minimum floor levels (GCR Section 8.8)
21	423	N/T	Y	1.5	N	Y	2.5	N	Y	Y	N	N	Y	N	Y	N	N	Y	
22	448	194	Y	2.5	N	Y	0.5	N	Y	Y	N	N	Y	N	Y	N	N	Y	
23	530	N/T	Y	4.5	N	Y	2	N	Y	Y	N	N	Y	N	Y	N	N	Y	
24	510	DCP	Y	2.5	N	Y	2.5	N	Y	Y	N	N	Y	N	Y	N	N	Y	



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DP No:	Lot 852 DP473714 Lot 853 DP414134	Property Address	Kennedy Road, Tauriko	RC No:	25104
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Lot No:	Area (m²)	Subsurface data					Foundations		Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Building Platform	Compressible Soils	On-Site Effluent Disposal	Consent Notice	Comments	
		Shear Strength (kPa) at 0.5m depth	Subdivision Filling		Natural Topography Unworked Y/N	Natural Topography Earthworked		Conventional Shallow Foundation to NZS 3604:2011 Y/N/NA											Specific Design Y/N/NA
			Y/N	Depth (m)		Y/N	Depth (m)												

25	424	N/T	Y	1	N	Y	1.5	N	Y	Y	N	N	Y	N	Y	N	N	Y	Specifically designed waffle slab foundations per Section 8.9 of Coffey GCR ref: GENZTAUC13086AR-AD. Also: <ul style="list-style-type: none">BRL (GCR Section 8.6)Minimum floor levels (GCR Section 8.8)
26	400	153	Y	1	N	Y	2	N	Y	Y	N	N	Y	N	Y	N	N	Y	
27	400	N/T	Y	1	N	Y	2.5	N	Y	Y	N	N	Y	N	Y	N	N	Y	
28	400	91	Y	1	N	Y	3.5	N	Y	Y	N	N	Y	N	Y	N	N	Y	
29	400	N/T	Y	1	N	Y	3.5	N	Y	Y	N	N	Y	N	Y	N	N	Y	
30	400	DCP	Y	1	N	Y	3.5	N	Y	Y	N	N	Y	N	Y	N	N	Y	
31	400	N/T	Y	1	N	Y	3.5	N	Y	Y	N	N	Y	N	Y	N	N	Y	
32	400	91	Y	1	N	Y	4	N	Y	Y	N	N	Y	N	Y	N	N	Y	
33	400	N/T	Y	1	N	Y	4	N	Y	Y	N	N	Y	N	Y	N	N	Y	
34	400	96	Y	1	N	Y	3.5	N	Y	Y	N	N	Y	N	Y	N	N	Y	
35	400	N/T	Y	1	N	Y	3.5	N	Y	Y	N	N	Y	N	Y	N	N	Y	



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DP No:	Lot 852 DP473714 Lot 853 DP414134	Property Address	Kennedy Road, Tauriko	RC No:	25104
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Lot No:	Area (m²)	Subsurface data					Foundations		Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Building Platform	Compressible Soils	On-Site Effluent Disposal	Consent Notice		Comments	
		Shear Strength (kPa) at 0.5m depth	Subdivision Filling		Natural Topography Unworked Y/N	Natural Topography Earthworked		Conventional Shallow Foundation to NZS 3604:2011 Y/N/NA												Specific Design Y/N/NA
			Y/N	Depth (m)		Y/N	Depth (m)													

36	427	79	Y	1.5	N	Y	3.5	N	Y	Y	N	N	Y	N	Y	N	N	Y	Specifically designed waffle slab foundations per Section 8.9 of Coffey GCR ref: GENZTAUC13086AR-AD. Also: • BRL (GCR Section 8.6) • Minimum floor levels (GCR Section 8.8)
37	470	N/T	Y	4.5	N	Y	3.5	N	Y	Y	N	N	Y	N	Y	N	N	Y	
38	484	>202	Y	4	N	Y	2	N	Y	Y	N	N	Y	N	Y	N	N	Y	
39	489	N/T	Y	5.5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
40	494	182	Y	5.5	N	Y	1	N	Y	Y	N	N	Y	N	Y	N	N	Y	
41	472	N/T	Y	4	N	Y	1.5	N	Y	Y	N	N	Y	N	Y	N	N	Y	
42	520	N/T	Y	2.5	N	Y	2.5	N	Y	Y	N	N	Y	N	Y	N	N	Y	
43	369	98	N		N	Y	2.5	N	Y	N	N	N	Y	N	Y	N	N	Y	Specifically designed waffle slab foundations per Section 8.9 of Coffey GCR ref: GENZTAUC13086AR-AD. Also: • Minimum floor levels (GCR Section 8.8)
44	458	N/T	N		N	Y	3	N	Y	N	N	N	Y	N	Y	N	N	Y	
45	454	>202	N		N	Y	2.5	N	Y	N	N	N	Y	N	Y	N	N	Y	
46	501	N/T	N		N	Y	3.5	N	Y	N	N	N	Y	N	Y	N	N	Y	



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Lot No:	Area (m²)	Subsurface data						Foundations		Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Building Platform	Compressible Soils	On-Site Effluent Disposal	Consent Notice	Comments
		Shear Strength (kPa)	Subdivision Filling		Natural Topography Unworked	Natural Topography Earthworked		Conventional Shallow Foundation to NZS 3604:2011	Specific Design										
		at 0.5m depth	Y/N	Depth (m)	Y/N	Y/N	Depth (m)	Y/N/NA	Y/N/NA										

47	449	>202	N		N	Y	4	N	Y	N	N	N	Y	N	Y	N	N	Y	Specifically designed waffle slab foundations per Section 8.9 of Coffey GCR ref: GENZTAUC13086AR-AD. Also: <ul style="list-style-type: none"> Minimum floor levels (GCR Section 8.8)
48	449	N/T	N		N	Y	4.5	N	Y	N	N	N	Y	N	Y	N	N	Y	
49	487	153	N		N	Y	5	N	Y	N	N	N	Y	N	Y	N	N	Y	
50	367	N/T	N		N	Y	4.5	N	Y	N	N	N	Y	N	Y	N	N	Y	
51	367	DCP	N		N	Y	4.5	N	Y	N	N	N	Y	N	Y	N	N	Y	
52	631	93	N		N	Y	4.5	N	Y	N	N	N	Y	N	Y	N	N	Y	
53	482	N/T	N		N	Y	4.5	N	Y	N	N	N	Y	N	Y	N	N	Y	
54	357	N/T	N		N	Y	4.5	N	Y	N	N	N	Y	N	Y	N	N	Y	Specifically designed waffle slab foundations per Section 8.9 of Coffey GCR ref: GENZTAUC13086AR-AD. Also: <ul style="list-style-type: none"> BRL (GCR Section 8.6) Minimum floor levels (GCR Section 8.8) Debris bund to be maintained (GCR Section 8.5.1)
55	26922	183	Y	5.5	N	Y	7	N	Y	Y	N	N	Y	N	Y	N	N	Y	



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DP No:	Lot 852 DP473714 Lot 853 DP414134	Property Address	Kennedy Road, Tauriko	RC No:	25104
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Lot No:	Area (m²)	Subsurface data					Foundations		Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Building Platform	Compressible Soils	On-Site Effluent Disposal	Consent Notice	Comments	
		Shear Strength (kPa) at 0.5m depth	Subdivision Filling		Natural Topography Unworked	Natural Topography Earthworked		Conventional Shallow Foundation to NZS 3604:2011 Y/N/NA											Specific Design Y/N/NA
			Y/N	Depth (m)		Y/N	Depth (m)												

56	1087	183	Y	7	N	Y	5.5	N	Y	Y	N	N	Y	N	Y	N	N	Y	Specifically designed waffle slab foundations per Section 8.9 of Coffey GCR ref: GENZTAUC13086AR-AD. Also: <ul style="list-style-type: none">BRL (GCR Section 8.6)Minimum floor levels (GCR Section 8.8)
57	726	N/T	Y	7	N	Y	5.5	N	Y	Y	N	N	Y	N	Y	N	N	Y	
58	724	183	Y	7	N	Y	4	N	Y	Y	N	N	Y	N	Y	N	N	Y	
59	731	N/T	Y	6.5	N	Y	2	N	Y	Y	N	N	Y	N	Y	N	N	Y	
60	802	183	Y	6.5	N	Y	0.5	N	Y	Y	N	N	Y	N	Y	N	N	Y	
61	722	N/T	Y	6.5	N	Y	0.5	N	Y	Y	N	N	Y	N	Y	N	N	Y	
62	716	183	Y	6	N	Y	0.5	N	Y	Y	N	N	Y	N	Y	N	N	Y	
63	700	N/T	Y	5.5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
64	704	N/T	Y	5.5	Y	N		N	Y	Y	N	N	Y	N	Y	N	N	Y	
65	702	N/T	Y	5.5	N	Y	3	N	Y	Y	N	N	Y	N	Y	N	N	Y	
66	698	N/T	Y	5	N	Y	3	N	Y	Y	N	N	Y	N	Y	N	N	Y	



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Lot No:	Area (m ²)	Subsurface data					Foundations		Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Building Platform	Compressible Soils	On-Site Effluent Disposal	Consent Notice	Comments	
		Shear Strength (kPa) at 0.5m depth	Subdivision Filling		Natural Topography Unworked Y/N	Natural Topography Earthworked		Conventional Shallow Foundation to NZS 3604:2011 Y/N/NA											Specific Design Y/N/NA
			Y/N	Depth (m)		Y/N	Depth (m)												

67	699	N/T	Y	5	N	Y	1	N	Y	Y	N	N	Y	N	Y	N	N	Y	Specifically designed waffle slab foundations per Section 8.9 of Coffey GCR ref: GENZTAUC13086AR-AD. Also: <ul style="list-style-type: none"> BRL (GCR Section 8.6) Minimum floor levels (GCR Section 8.8)
68	698	94	Y	5	N	Y	4	N	Y	Y	N	N	Y	N	Y	N	N	Y	
69	698	N/T	Y	5	N	Y	5	N	Y	Y	N	N	Y	N	Y	N	N	Y	
70	709	81	Y	5.5	N	Y	5	N	Y	Y	N	N	Y	N	Y	N	N	Y	
71	426	N/T	N		N	Y	4.5	N	Y	N	N	N	Y	N	Y	N	N	Y	Specifically designed waffle slab foundations per Section 8.9 of Coffey GCR ref: GENZTAUC13086AR-AD. Also: <ul style="list-style-type: none"> Minimum floor levels (GCR Section 8.8)
72	390	>202	N		N	Y	2	N	Y	N	N	N	Y	N	Y	N	N	Y	
73	341	N/T	N		N	Y	3	N	Y	N	N	N	Y	N	Y	N	N	Y	
74	341	>202	N		N	Y	3	N	Y	N	N	N	Y	N	Y	N	N	Y	
75	341	N/T	N		N	Y	3.5	N	Y	N	N	N	Y	N	Y	N	N	Y	
76	341	>202	N		N	Y	3.5	N	Y	N	N	N	Y	N	Y	N	N	Y	
77	360	N/T	N		N	Y	4	N	Y	N	N	N	Y	N	Y	N	N	Y	



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DP No:	Lot 852 DP473714 Lot 853 DP414134	Property Address	Kennedy Road, Tauriko	RC No:	25104
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Lot No:	Area (m²)	Subsurface data						Foundations		Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Building Platform	Compressible Soils	On-Site Effluent Disposal	Consent Notice	Comments
		Shear Strength (kPa)	Subdivision Filling		Natural Topography Unworked	Natural Topography Earthworked		Conventional Shallow Foundation to NZS 3604:2011	Specific Design										
		at 0.5m depth	Y/N	Depth (m)	Y/N	Y/N	Depth (m)	Y/N/NA	Y/N/NA										

100	341	N/T	N		N	Y	4	N	Y	N	N	N	Y	N	Y	N	N	Y	Specifically designed waffle slab foundations per Section 8.9 of Coffey GCR ref: GENZTAUC13086AR-AD. Also: • Minimum floor levels (GCR Section 8.8)
101	341	N/T	N		N	Y	5	N	Y	N	N	N	Y	N	Y	N	N	Y	
102	341	183	N		N	Y	5	N	Y	N	N	N	Y	N	Y	N	N	Y	
103	417	89	N		N	Y	5	N	Y	N	N	N	Y	N	Y	N	N	Y	
104	341	N/T	N		N	Y	5.5	N	Y	N	N	N	Y	N	Y	N	N	Y	
105	340	133	N		N	Y	6	N	Y	N	N	N	Y	N	Y	N	N	Y	
106	341	N/T	N		N	Y	6	N	Y	N	N	N	Y	N	Y	N	N	Y	
107	346	107	N		N	Y	6	N	Y	N	N	N	Y	N	Y	N	N	Y	
108	423	N/T	N		N	Y	6	N	Y	N	N	N	Y	N	Y	N	N	Y	
109	418	94	N		N	Y	6	N	Y	N	N	N	Y	N	Y	N	N	Y	



SUMMARY OF GOTECHNICAL DATA FOR INDIVIDUAL LOTS

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DP No:	Lot 852 DP473714 Lot 853 DP414134	Property Address	Kennedy Road, Tauriko	RC No:	25104
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Lot No:	Area (m²)	Subsurface data					Foundations		Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Building Platform	Compressible Soils	On-Site Effluent Disposal	Consent Notice	Comments	
		Shear Strength (kPa) at 0.5m depth	Subdivision Filling		Natural Topography Unworked Y/N	Natural Topography Earthworked		Conventional Shallow Foundation to NZS 3604:2011 Y/N/NA											Specific Design Y/N/NA
			Y/N	Depth (m)		Y/N	Depth (m)												

Key:

DCP = Tested with Dynamic Cone Penetration (Scala); N/T = Not Tested; UTP = Unable To Penetrate



SUMMARY OF GOTECHNICAL DATA FOR INDIVIDUAL LOTS

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Appendix C - Investigation Data



Borehole No. MB 25

Sheet: 1 of 3

Site: Pyes Pa West Urbanisation

Job No. 16944 Date Excavated: 12-30/4/03 RL Ground:

Logged By: MHA

Description of Soil	Soil Symbol	Depth (m)	SPT	GROUNDWATER	CORE RECOVERY	Undrained Shear Strength (kPa)		
						50	100	150
TOPSOIL	WW	0.0						
	WW	0.1						
	WW	0.2						
SILT: Very clayey, slightly cohesive cream brown with 5% wood soft	X X	0.3						
	X X	0.4						
	X X	0.5						
SPT 300mm RECOVERY	NON ORGANIC	0.6						
Very clayey, cream brown silt with 5% wood	X X	0.7						
5-10% wood, stringy	X X	0.8						
PERICLITE: Fine grained cream silt, medium Dense, sensitive, Dilatant	P P	0.9						
	P P	1.0						
	P P	1.1						
SILT: 20-30% Brown organic amorphous organic material 5-10% wood Soft, highly compressible: no Recovery SPT @ 3.0m.	ORGANIC SOILS	1.2						
		1.3						
		1.4						
		1.5						
		1.6						
		1.7						
		1.8						
		1.9						
		2.0						
		2.1						
		2.2						
		2.3						
		2.4						
		2.5						
		2.6						
		2.7						
		2.8						
		2.9						
		3.0						
		3.1						
		3.2						
		3.3						
		3.4						
		3.5						
		3.6						
		3.7						
		3.8						
		3.9						
		4.0						
		4.1						
		4.2						
		4.3						
		4.4						
		4.5						
EXCAVATION METHOD: 100mm Ø MACHINE AUGER Et HOLLOW SPT								



Borehole No. MB 25

Site:

Pyes Pa West Urbanisation

Sheet: 2 Of: 3

Job No. 16944

Date Excavated: W-30/4/03

RL Ground:

Logged By: MLT

Description of Soil

ORGANICS

Soil Symbol

Depth (m)

Undrained Shear Strength (kPa)

50 100 150

ORGANIC SILT

SILT : Grey - soft, highly compressible
SPT 450 RECOVERYSlightly (25%) organic
Dark brown, slight peaty
smellSPT 450 : Non organic, soft grey
RECOVERY silt

Soft grey silt

pumicite : fine grained silt, grey
Dense, compactSPT 450 : Dense grey compact
RECOVERY pumicite - fine grained
silt

grey Dense pumicite

ORGANIC

NON ORGANIC

NON ORGANIC

NON ORGANIC

NON ORGANIC

NON ORGANIC

NON ORGANIC

NON ORGANIC

NON ORGANIC

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NON ORGANIC

NON ORGANIC

NON ORGANIC

SINKS UNDER
WEIGHT
OF RODS
N=0SINKS UNDER
WEIGHT OF
RODS
N=0

100g

100g

100g

60-70g

N=6

EXCAVATION METHOD: 100mm Ø MACHINE AUGER & HOLLOW SPT



Sheet: 3 Of: 3

Job No. 16944

Date Excavated: W-30/4/03

RL Ground:

Logged By: *MAH*

Description of Soil

Soil Symbol

Depth (m)

Undrained Shear Strength
(kPa)

50

100

150

SPT NO RECOVERY : DENSE

EOB @ 9.5m: TARGET DEPTH

EXCAVATION METHOD: 100mm ϕ MACHINE AUGER & HOLLOW SPT



Borehole No. MB 26

Site:

Pyes Pa West Urbanisation

Sheet: 1 Of: 3

Job No. 16944

Date Excavated: W. 30/4/03.

RL Ground:

Logged By: MH

Description of Soil	Soil Symbol	Depth (m)	SPT	GROUNDWATER	CORE RECOVERY	Undrained Shear Strength (kPa)		
						50	100	150
SAND: very silty, pale brown, medium Dense		0.5		DURING DRILLING	100%			
clayey grey silt		1.0						
brown yellow sand, medium Dense		1.5		N<1	100%			
grey sand, loose		2.0						
CLAY: very silty, grey, soft		2.5		100%	100%			
		3.0						
SAND: very silty, grey, loose		3.5		N<1	100%			
		4.0						

NON ORGANIC SEDIMENTS

EXCAVATION METHOD: 100mm ϕ MACHINE AUGER & HOLLOW SPT



Borehole No. MB 26

Site:

Pyes Pa West Urbanisation

Sheet: 2 of 3

Job No. 16944

Date Excavated: W. 30/4/03

RL Ground:

Logged By: MAA

Description of Soil	Soil Symbol	Depth (m)	CODE RECOVERY	Undrained Shear Strength (kPa)		
				50	100	150
SPT 450 RECOVERY Very silty sand, pale grey, Dense	X	2				
	X	3				
	X	3	N=6			
Silty pale grey sand Dense	X	5.0				
Reddy brown spongy wood	WOOD	5.5	100%			
Gravelly medium Dense sand	X	6.0				
Very silty sand, pale grey medium Dense: no Recovery in SPT.	X	6.2	N=4			
	X	6.5				
	X	7.0	80-90%			
	X	7.5				
MEDIUM DENSE DENSE	X	8.0	N=11			
	X	8.5				
SAND: Very silty, grey, Dense	X	9.0	20-30%			
	X	9.5				
	X	10.0				

EXCAVATION METHOD:



Borehole No. MB 26

Site:

Pyes Pa West Urbanisation

Sheet: 3 Of: 3

Job No. 16944

Date Excavated: W. 30/4/03

RL Ground:

Logged By: MAA

Description of Soil

Soil Symbol

Depth (m)

Undrained Shear Strength
(kPa)

50 100 150

SPT NO RECOVERY : DENSE

FOR @ 9.5m : TARGET DEPTH

EXCAVATION METHOD: 100mm ϕ MACHINE AUGER & HOLLOW SPT



Borehole No. MB 27

Site:

Pyes Pa West Urbanisation

Sheet: 1 Of: 3

Job No. 16944

Date Excavated: TH - 1/5/03

RL Ground:

Logged By: Malt

Description of Soil

Soil Symbol

Depth (m)

SPT

GROUNDWATER

CORE RECOVER

Undrained Shear Strength (kPa)

50 100 150

Topsoil

SILT Very clayey, moderately cohesive
orange yellow, very stiff, slightly
moist [POST ROTOHEM]

SPT 200mm: Very clayey cohesive silt
RECOVERY brown yellow, very stiff

Very clayey moderately
cohesive brown yellow silt

Coarse grained bright
orange, stiff, moist
clayey, pale brown yellow

SPT 450 Coarse grained, gritty, non
RECOVERY cohesive silt, brown yellow
very stiff, medium dense

very clayey, slightly cohesive
pale brown, stiff

SAND: Pumice, pale grey, loose

SILT: Very clayey, cohesive, brown
orange, stiff, moist

Slightly clayey, slightly cohesive
cream

YOUNGER ASHES

OLDER ASHES

MATHA

EXCAVATION METHOD: 100 mm ϕ MACHINE AUGER Et HOLLOW SPT



Borehole No. MB 27

Site:

Pyes Pa West Urbanisation

Sheet: 2 Of: 3

Job No. 16944

Date Excavated: TH - 1/5/03

RL Ground:

Logged By: MAA

Description of Soil	Soil Symbol	Depth (m)	SPT	CORE RECOVERY	Undrained Shear Strength (kPa)		
					50	100	150
SILT: pumiceous, Very clayey, slightly cohesive, cream, stiff (Medium Dense), sensitive, Dilatant SPT 450 mm Recovery @ 4.5m	x x	1	1	100%			
		1	1				
		2	N=3				
		5.0					
SPT 450 RECOVERY Fine grained cream silt slightly cohesive, cream stiff (medium Dense) sensitive, Dilatant	x x	5.5		100%			
		6.0					
		6.5	N=1				
		7.0					
SAND: pumiceous, Very Sultry, Cream, loose Very moist: SPT @ 7.5m 100% Recovery Cream silt Very Sultry cream sand	x x	7.5	2	100%			
		8.0	4				
		8.5	6 N=6				
		9.0					
Spongy brown wood	W	9.5		100%			
		10.0					
PUMICITE: fine grained silt, cream slightly cohesive, firm to stiff medium Dense, sensitive, Dilatant	P A	10.5		100%			
		11.0					

EXCAVATION METHOD: 100mm ϕ MACHINE: AUGER Et HOLLOW SPT



Borehole No. MB 27

Site:

Pyes Pa West Urbanisation

Sheet: 3 Of: 3

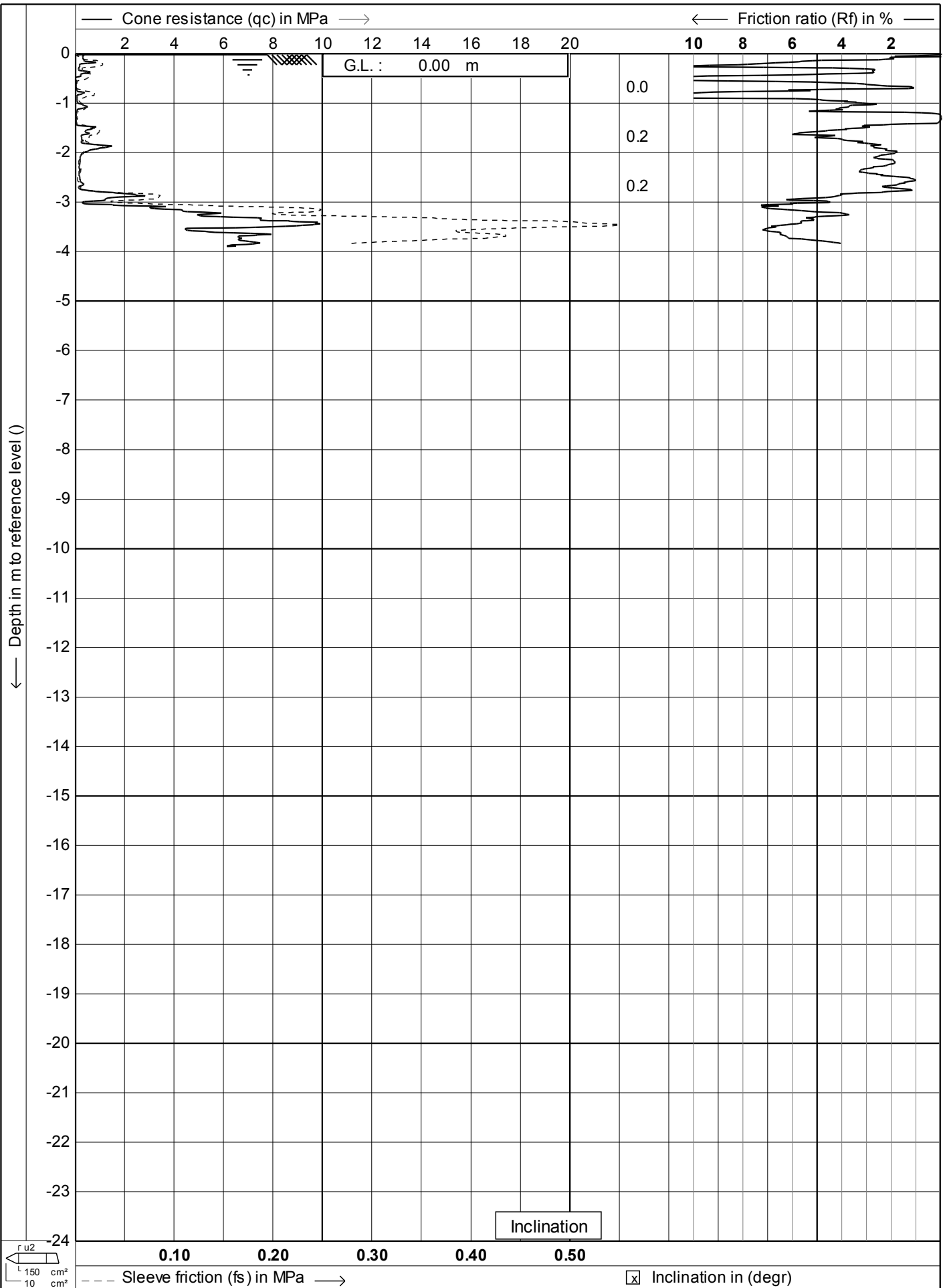
Job No. 16944

Date Excavated: TH 1/5/03

RL Ground:

Logged By: MHH

Description of Soil	Soil Symbol	Depth (m)	SPT	GROUNDWATER	Undrained Shear Strength (kPa)		
					50	100	150
SPT 650 RECOVERY	fine grained cream pumice, firm (medium dense), sensitive, Dilatant	0.0	1				
		0.2	2				
	Brown yellow sand, medium dense slightly moist	0.2	2	N=4			
		0.5					
		1.0					
		1.5					
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Test according A.S.T.M. Standard D 5778-95

Project : **Subdivision Investigations**

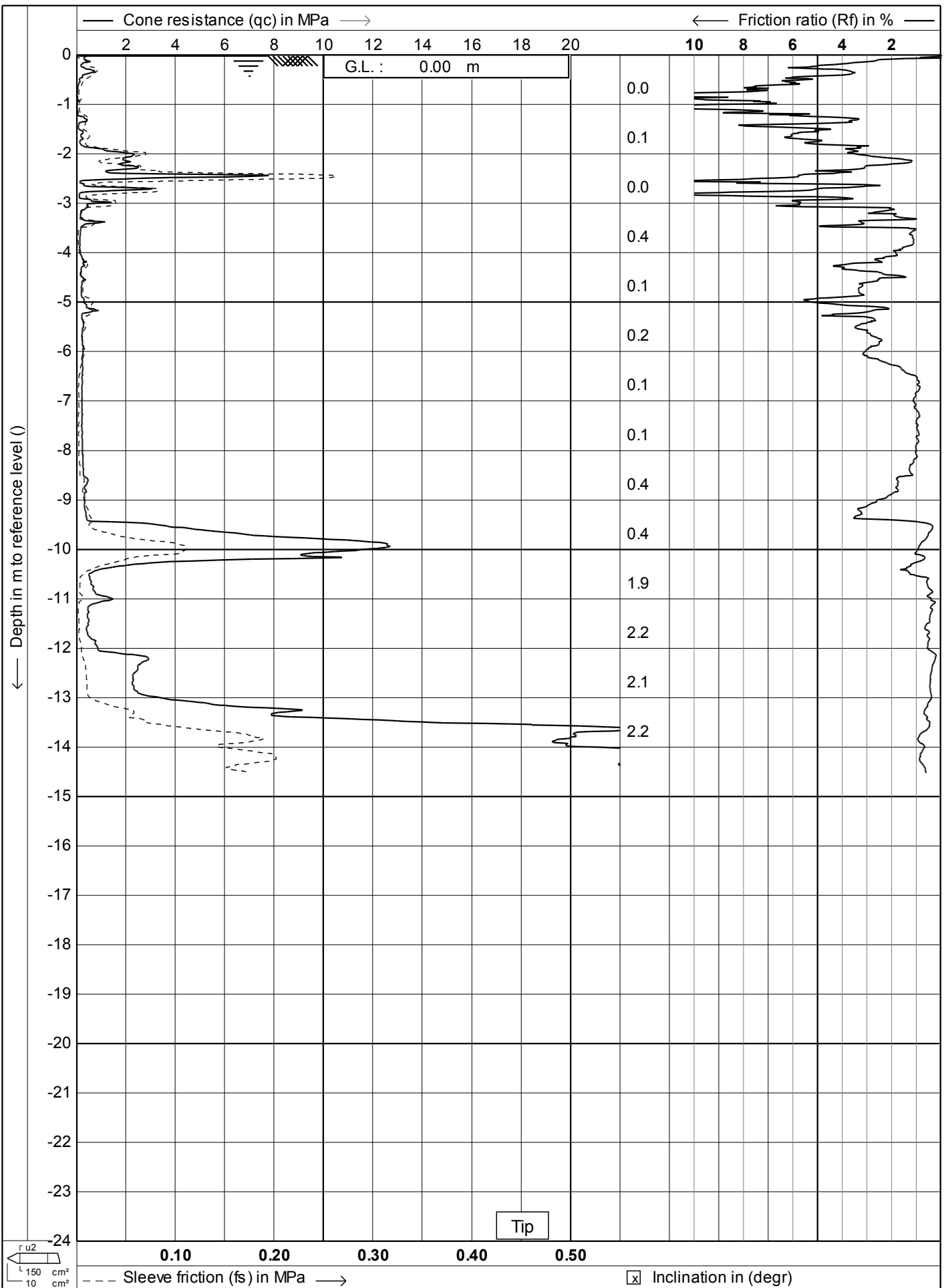
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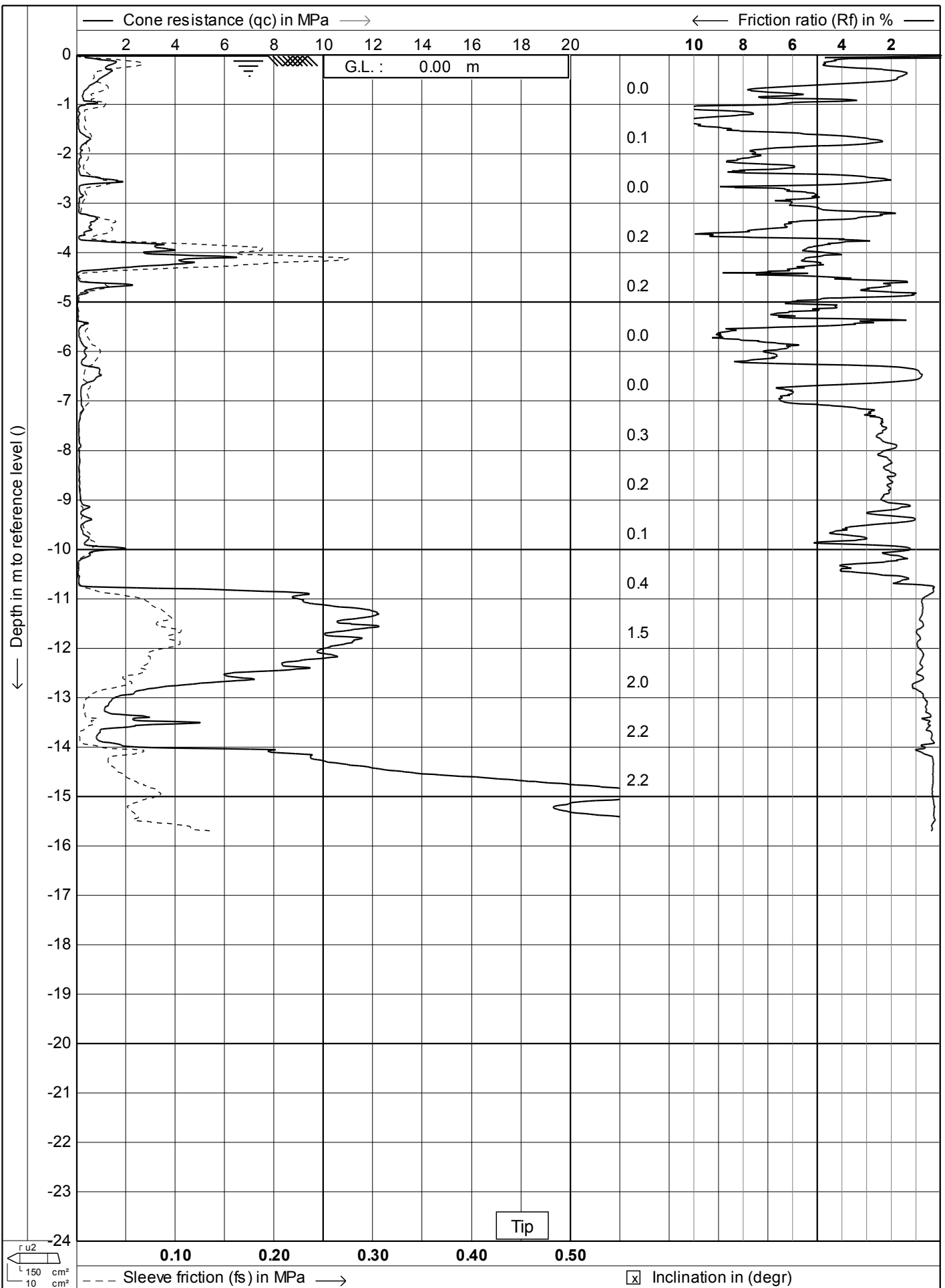
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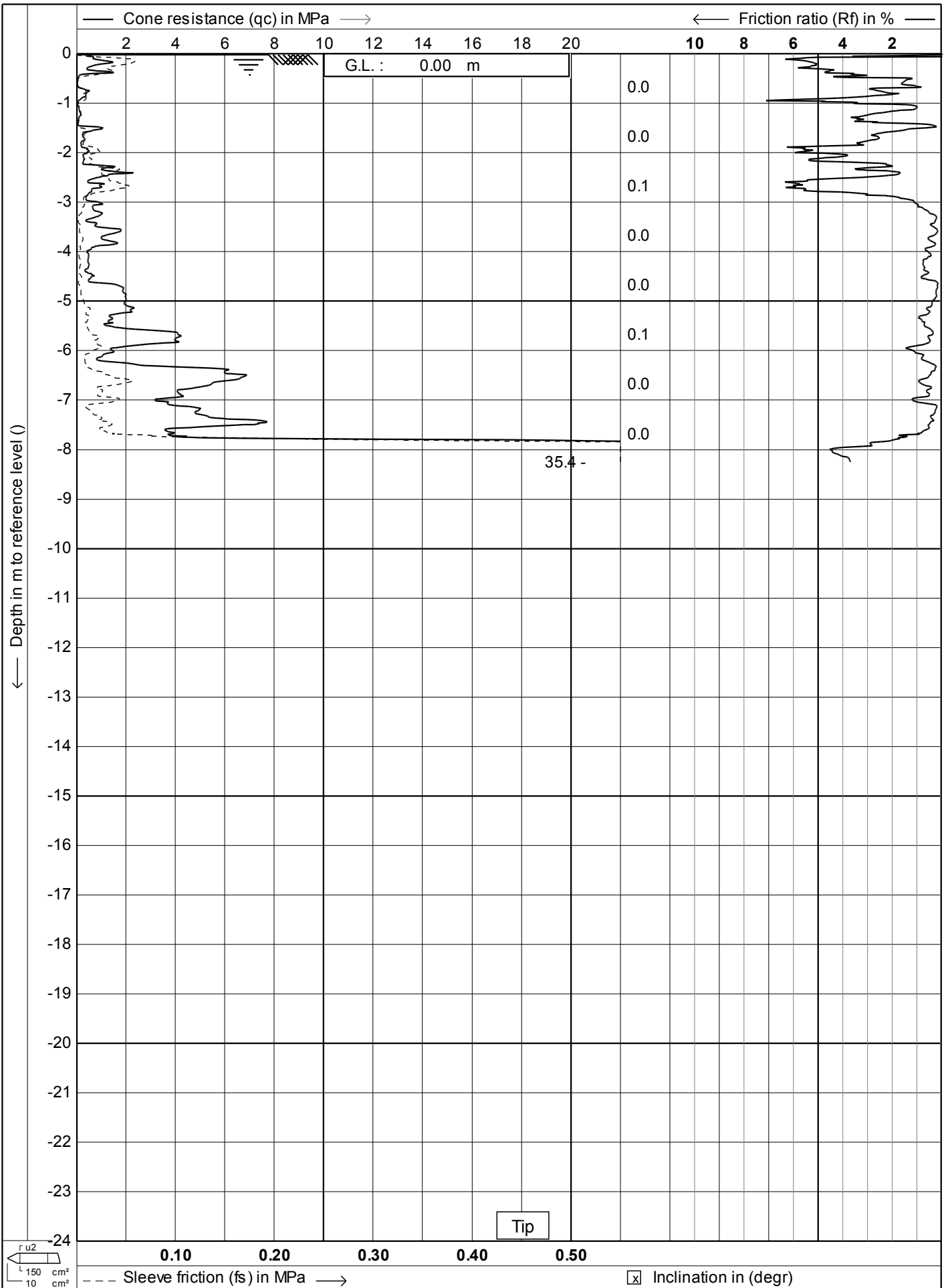
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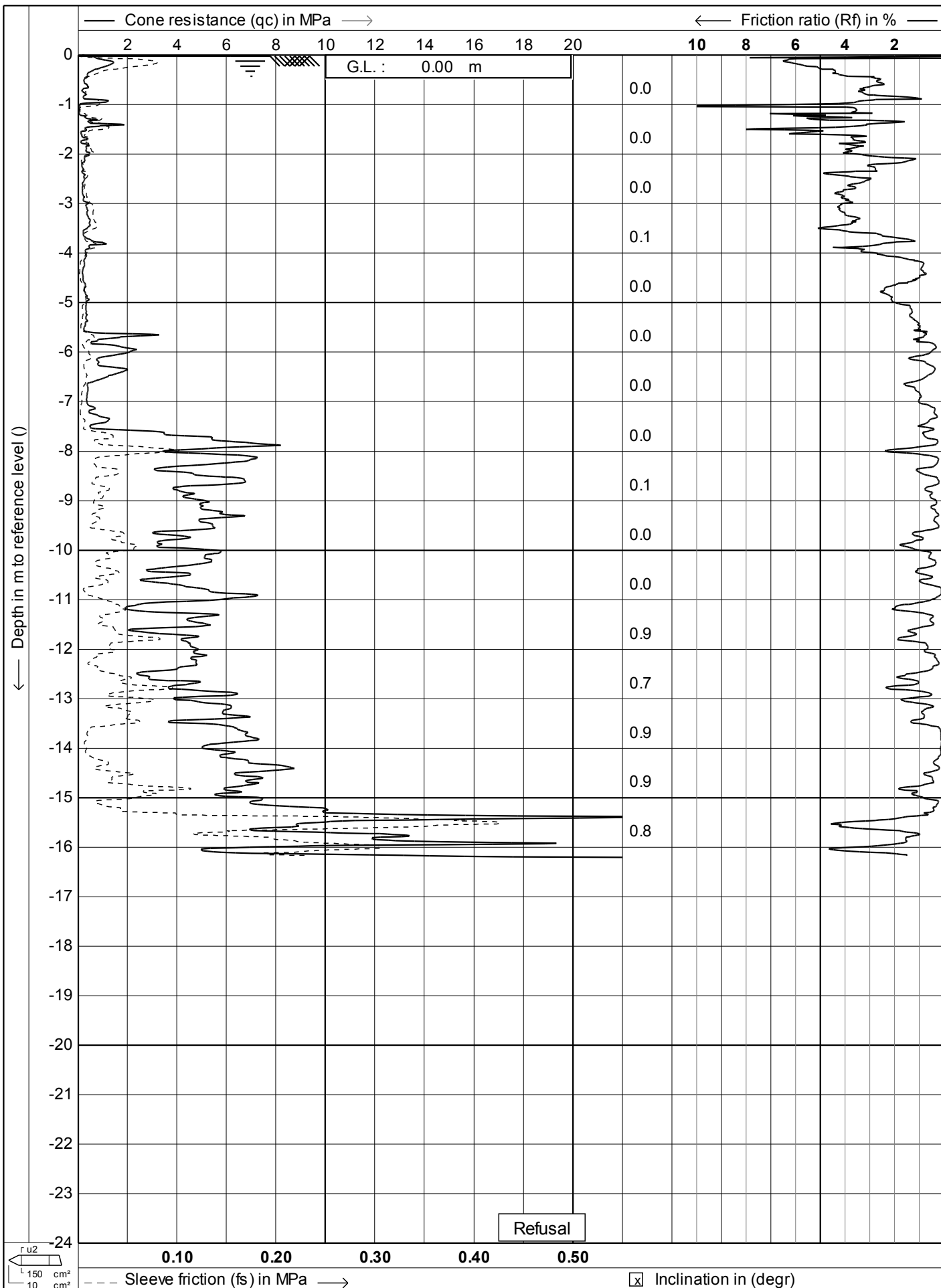
Project no. : **FE11**

CPT no. : **01** 1/14



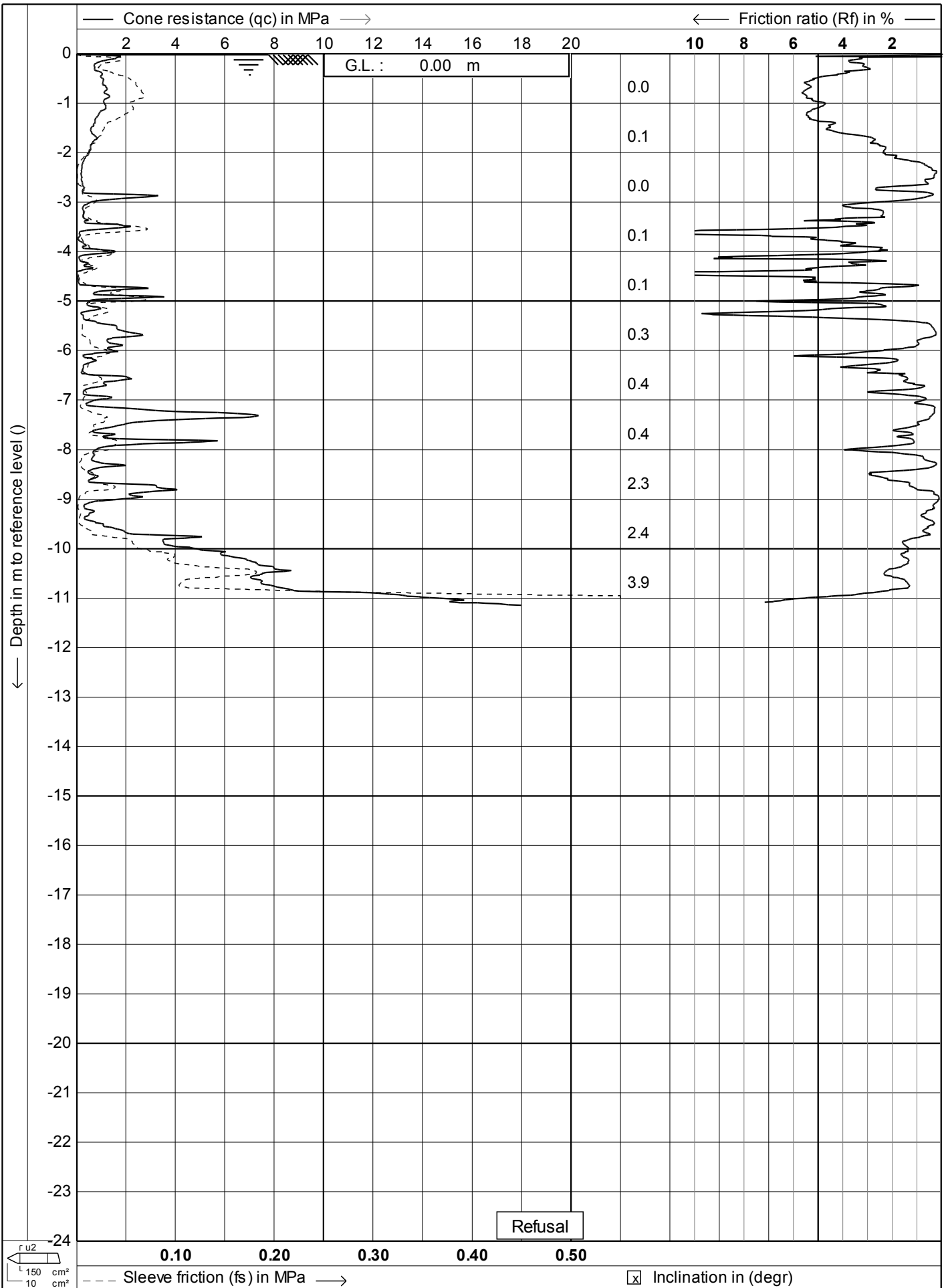




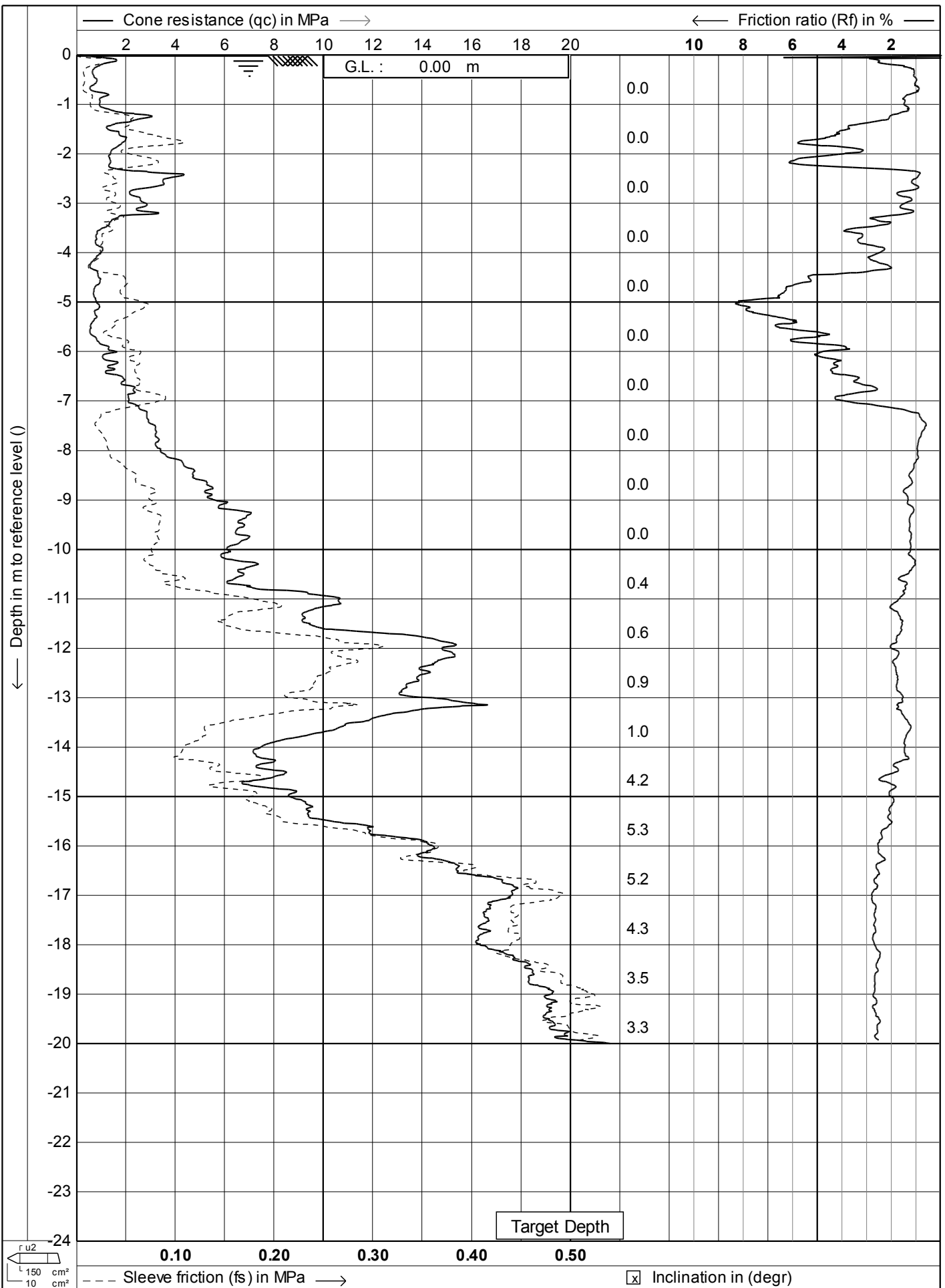


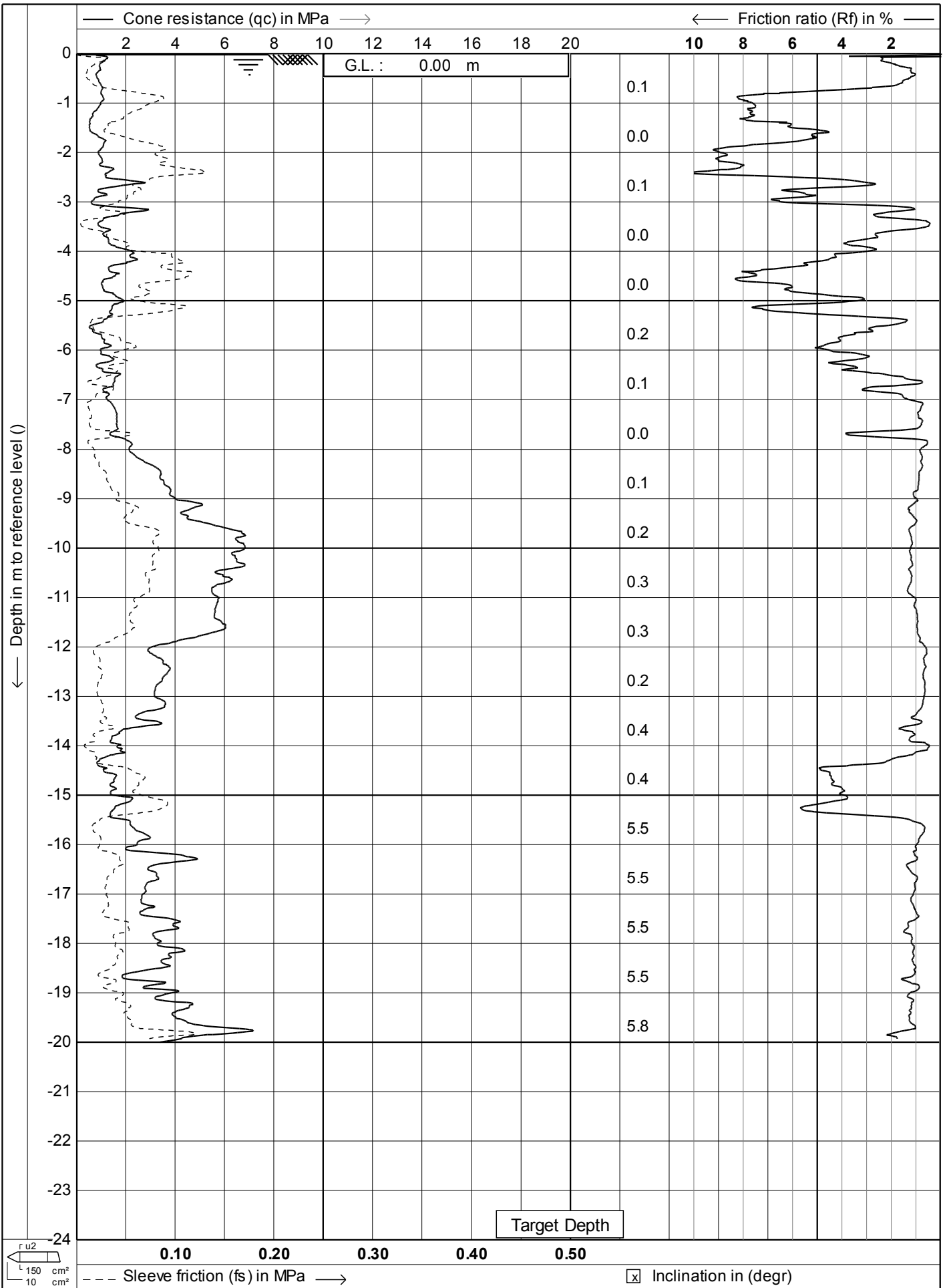
Test according A.S.T.M. Standard D 5778-95
Project : **Subdivision Investigations**
Location: **Grasshopper Properties - Tauriko**

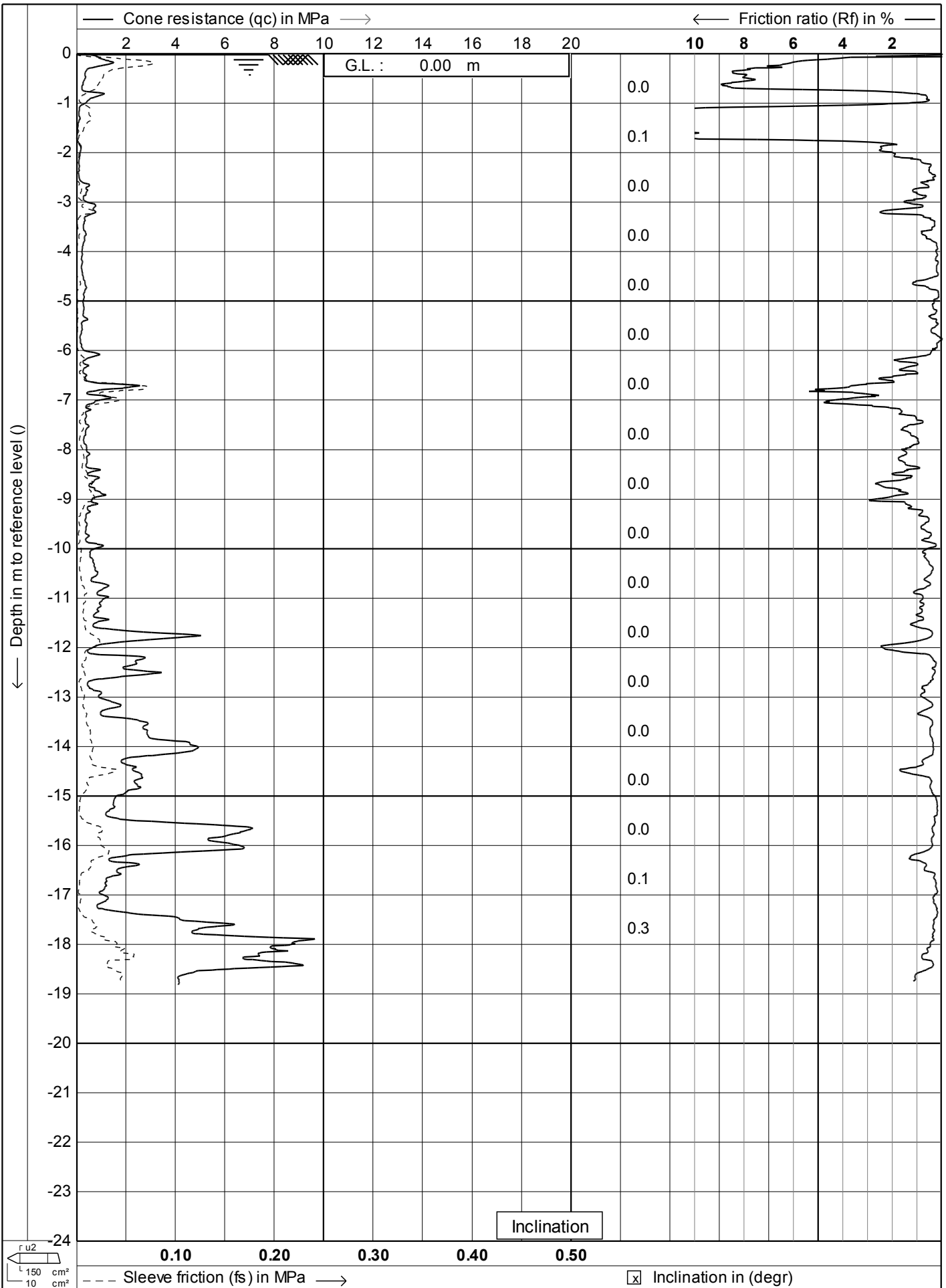
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CPT no. : **04**

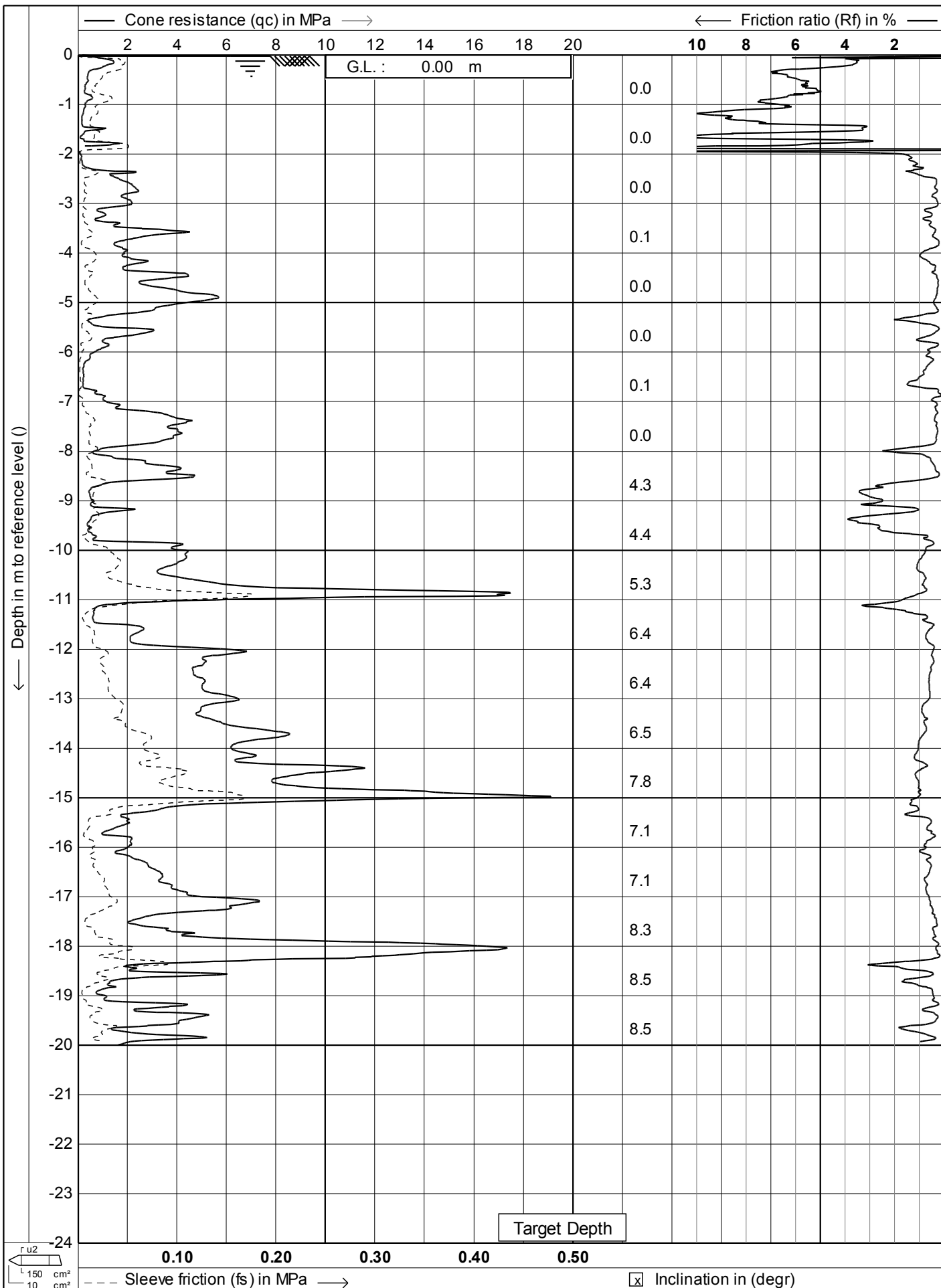


Test according A.S.T.M. Standard D 5778-95		Date : 31-5-2007	
Project : Subdivision Investigations		Cone no. : C10CFIP.C98	
Location: Grasshopper Properties - Tauriko		Project no. : FE11	
		CPT no. : 05	1/14









Test according A.S.T.M. Standard D 5778-95

Project : **Subdivision Investigations**

Location: **Grasshopper Properties - Tauriko**

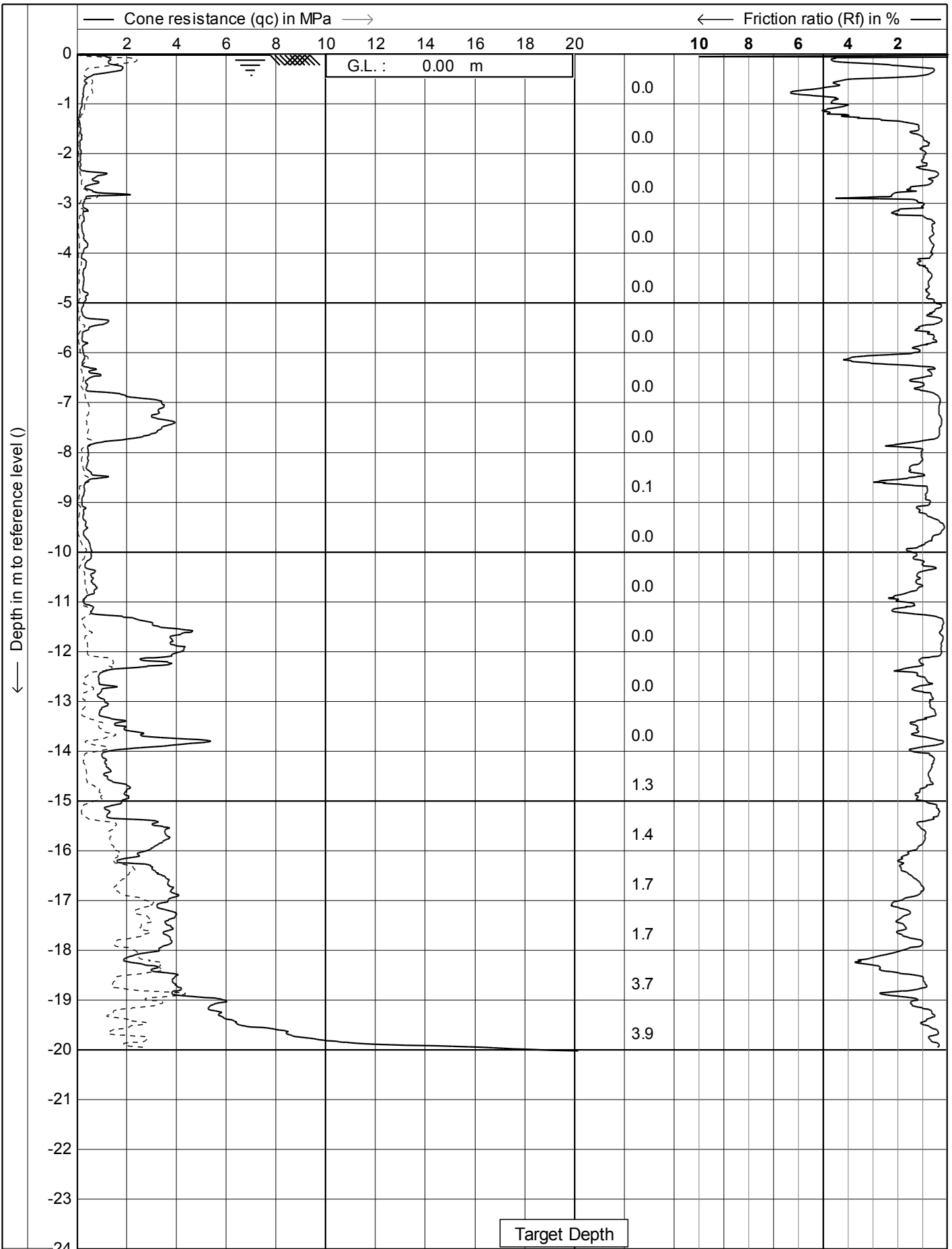
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Cone no. : **C10CFIP.C98**

Project no. : **FE11**

CPT no. : **10**

1/14



150 cm²
10 cm²

0.10 0.20 0.30 0.40 0.50

--- Sleeve friction (fs) in MPa -->

☒ Inclination in (degr)



Test according A.S.T.M. Standard D 5778-95

Project : **Subdivision Investigations**

Location: **Grasshopper Properties - Tauriko**

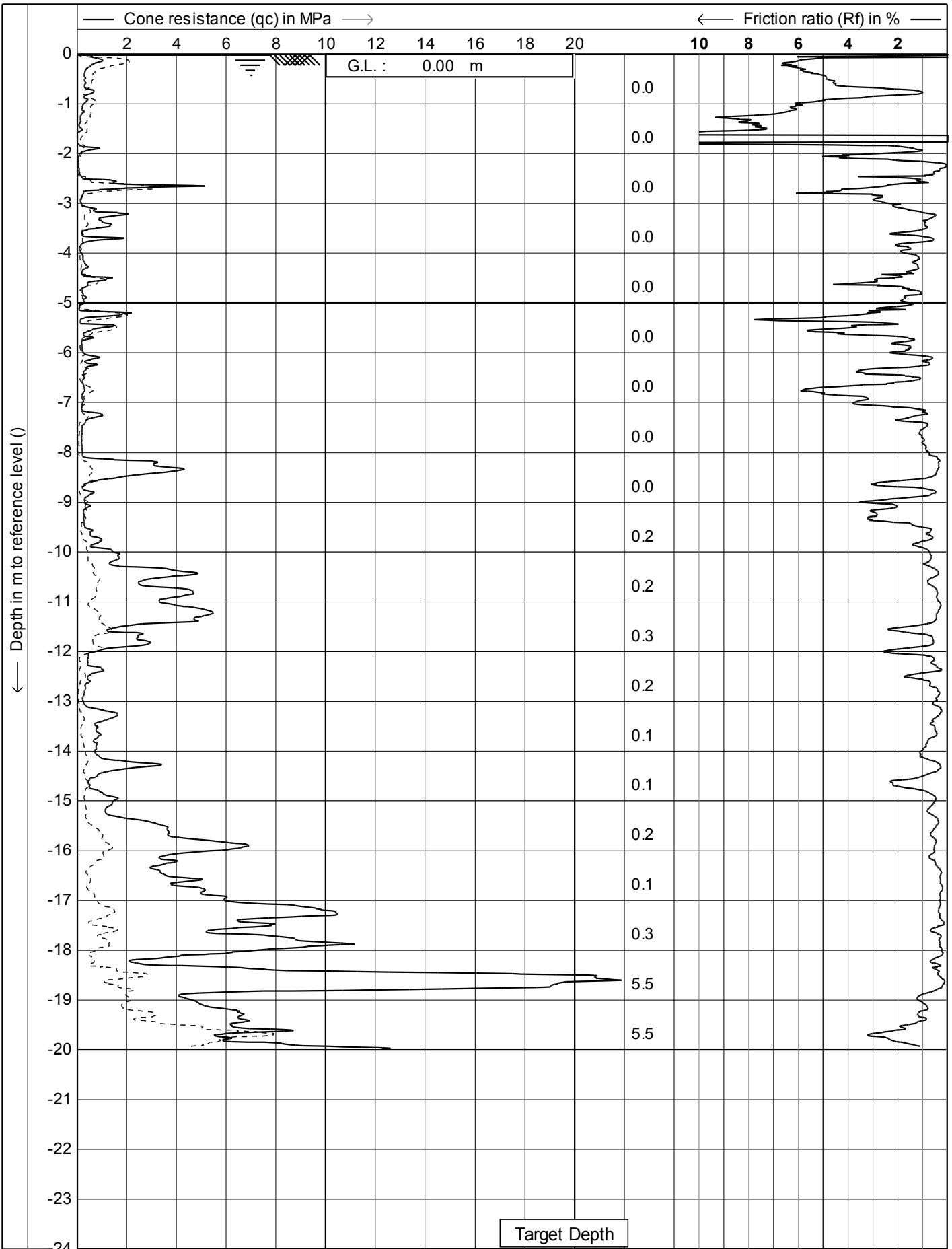
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Cone no. : **C10CFIP.C98**

Project no. : **FE11**

CPT no. : **11**

1/14



150 cm²
10 cm²

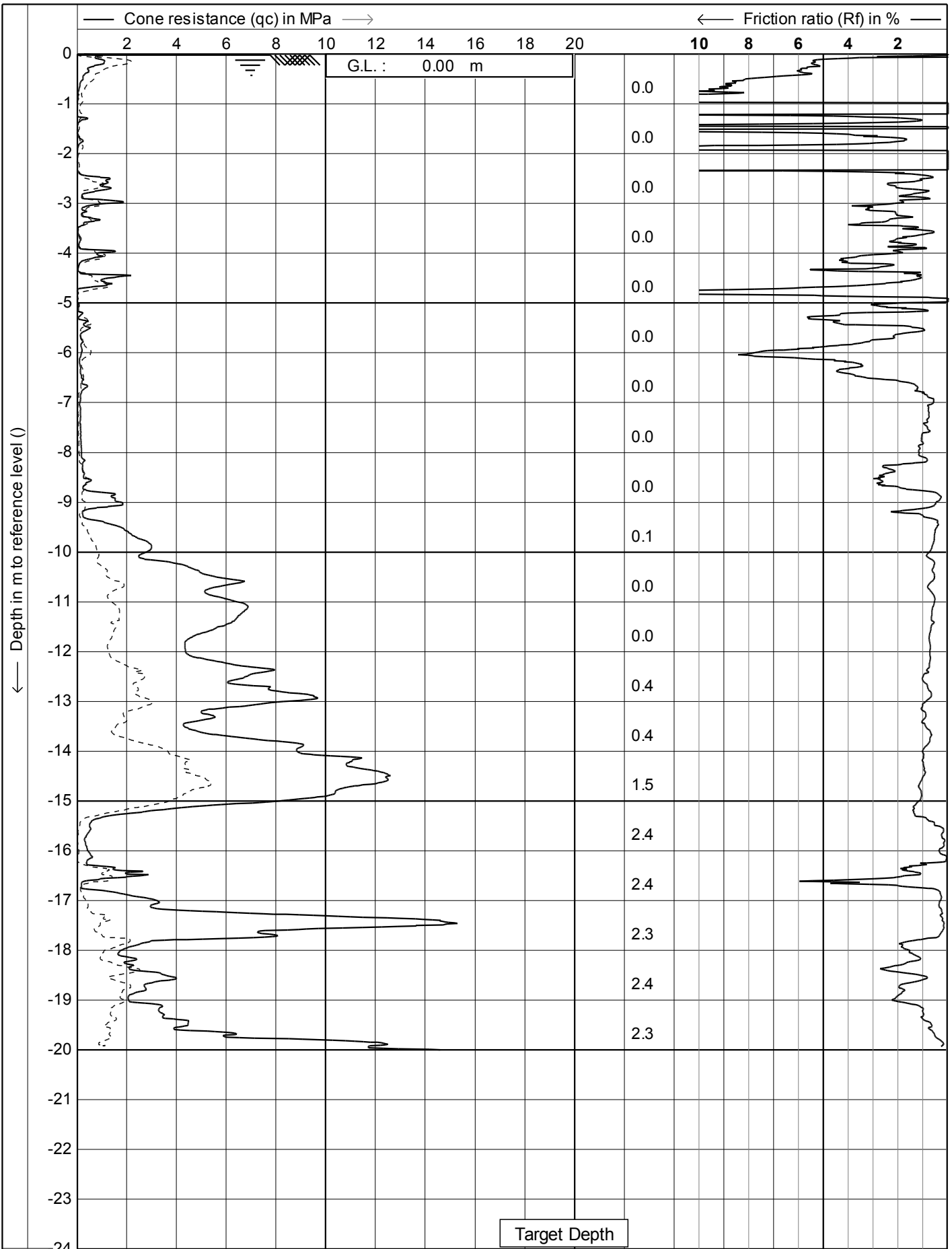
--- Sleeve friction (fs) in MPa -->

☒ Inclination in (degr)



Test according A.S.T.M. Standard D 5778-95
Project : **Subdivision Investigations**
Location: **Grasshopper Properties - Tauriko**

Date : **31-5-2007**
Cone no. : **C10CFIP.C98**
Project no. : **FE11**
CPT no. : **12**



Test according A.S.T.M. Standard D 5778-95

Project : **Subdivision Investigations**

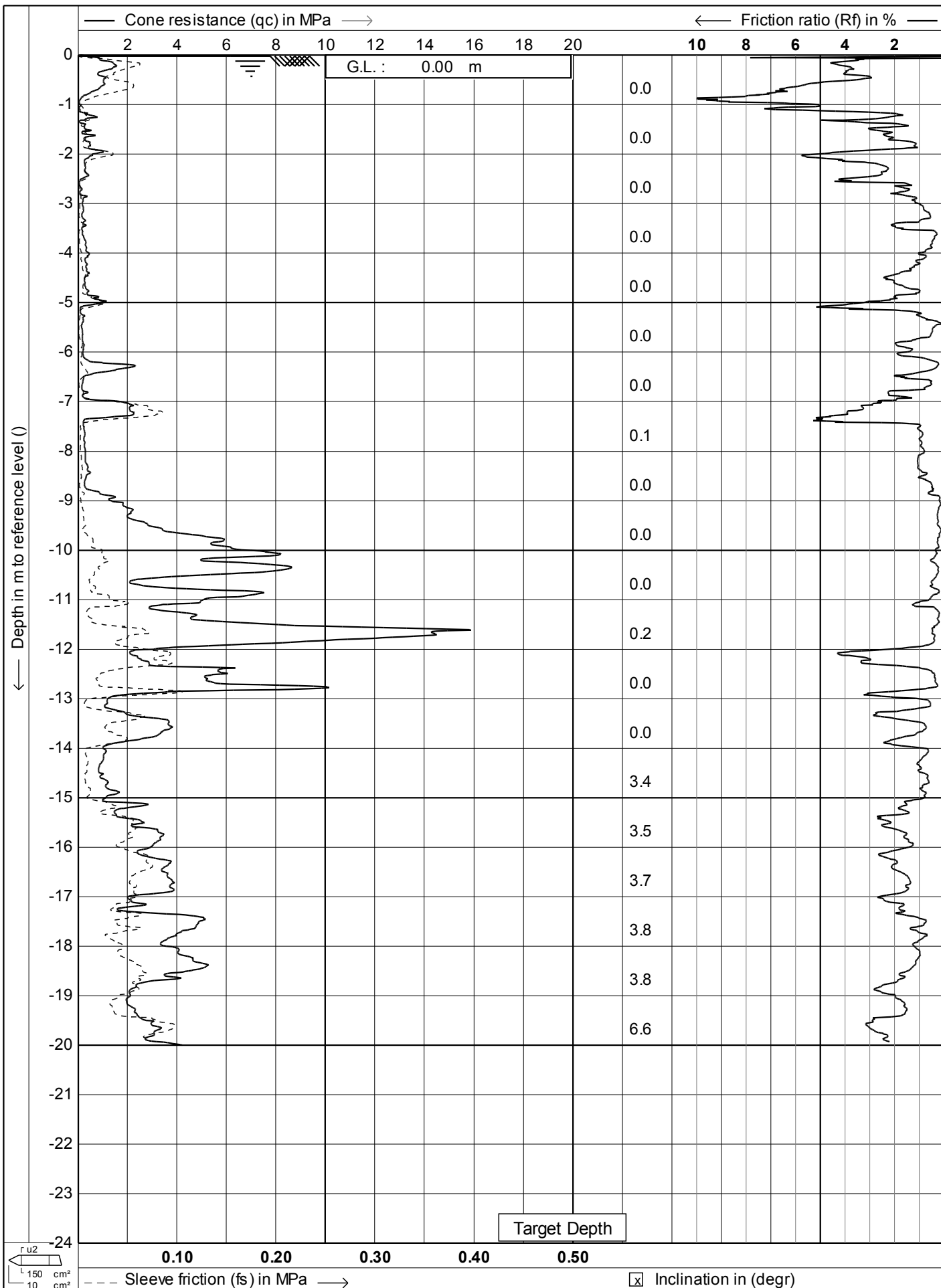
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Date : **31-5-2007**

Cone no. : **C10CFIP.C98**


Project no. : **FE11**


CPT no. : **13**





Test according A.S.T.M. Standard D 5778-95
Project : **Subdivision Investigations**
Location: **Grasshopper Properties - Tauriko**


Date : **31-5-2007**
Cone no. : **C10CFIP.C98**
Project no. : **FE11**
CPT no. : **14**


Client : FIVE STAR ESTATE LIMITED					Machine Borehole No. MH 1						
Project Location : Grasshopper Farms Tauriko					Sheet 1 of 6						
Job Number: 13447					Vane Head:	Logged By: MJP	Processor : MAP	Start Date: 01.06.07	Finish Date: 01.06.07		
Stratigraphy	Borehole Location:	mN	mE	Ground R.L.		Groundwater/ Piezometer	Drilling Method & Casing	Recovery (%)	RQD (%)	Sample and Laboratory Test Details	Vane Dial / Vane Shear Strength (kPa) & SPT
	Description: Refer to site plan			Orientation: vertical							
	CORE DESCRIPTION		Legend	Depth (m)	DEFECTS						
Younger Ash	TOPSOIL										
	SILT, yellow-light brown, non-plastic, moist										
	at 2.2m with minor sand										
Rotoehu Ash	Silty SAND, black flecked light grey										
Hamilton Ash	Silty CLAY, brown, very plastic										
	at 3.7m becoming very sticky, moist at 3.9m becoming orange										
Alluvial Silts	SILT, with trace clay, slightly sticky, moderately plastic, damp										
	at 4.5m becoming very greasy when reworked, moist										
	Sandy SILT, black flecked light grey and orange, with common moderate to highly weathered angular pumice inclusions (1mm to 5mm)										
	at 7.8m with increasing pumice sand (becoming less weathered)										
Continued											
 FOUNDATION ENGINEERING		Comments: Adjacent to CPT 6		Drilling Fluid:	Topsoil	Sand	Sandstone	Plutonic			
				water	Fill	Gravel	Siltstone	No Core			
		Checked:	Clay	Organic	Limestone						
			Silt	Pumice	Volcanic						

Client : FIVE STAR ESTATE LIMITED					Machine Borehole No. MH 1											
Project Location : Grasshopper Farms Tauriko					Sheet 2 of 6											
Job Number: 13447					Vane Head:	Logged By: MJP	Processor : MAP	Start Date: 01.06.07 Finish Date: 01.06.07								
Stratigraphy	Borehole Location:	mN	mE		Ground R.L.		Groundwater/ Piezometer	Drilling Method & Casing	Recovery (%)	RQD (%)	Sample and Laboratory Test Details	Vane Dial / Vane Shear Strength (kPa) & SPT				
	Description: Refer to site plan				Orientation: vertical											
	CORE DESCRIPTION				Legend	Depth (m)	DEFECTS									
Alluvial Silts	Sandy SILT, black flecked light grey and orange, with common moderate to weathered angular pumice sand inclusions (1mm to 5mm)					8.5										
						9.0										
Alluvial Pumice	Pumiceous SAND, fine, clean with rare pumice inclusions up to 8mm diameter, black flecked orange and light grey, dry at 12.0m hole continually caving in, difficult to extract auger due to hole collapse at 13.5m becoming light grey Continued					9.5										
						10.0										
						10.5										
						11.0										
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 FOUNDATION ENGINEERING					Comments: Adjacent to CPT 6		Drilling Fluid:		Topsoil		Sand		Sandstone		Plutonic	
							water		Fill		Gravel		Siltstone		No Core	
							Checked:		Clay		Organic		Limestone			
							Driller: Perry Drilling		Rig: Tractor	Silt		Pumice		Volcanic		
















Client : FIVE STAR ESTATE LIMITED					Machine Borehole No. MH 1								
Project Location : Grasshopper Farms Tauriko					Sheet 3 of 6								
Job Number: 13447					Vane Head:	Logged By: MJP	Processor : MAP	Start Date: 01.06.07	Finish Date: 01.06.07				
Stratigraphy	Borehole Location:	mN	mE		Ground R.L.		Groundwater/ Piezometer	Drilling Method & Casing	Recovery (%)	RQD (%)	Sample and Laboratory Test Details	Vane Dial / Vane Shear Strength (kPa) & SPT	
	Description: Refer to site plan				Orientation: vertical								
	CORE DESCRIPTION		Legend	Depth (m)	DEFECTS								
Alluvial Pumice	Pumiceous SAND, fine, clean with rare pumice inclusions up to 8mm diameter, balck flecked orange and light grey, dry			16.5									
	at 18.0m with rare lithic inclusions up to 2mm and rare angular pumice (fine gravel sized)			17.0									
				17.5									
				18.0									
				18.5									
				19.0									
				19.5									
				20.0									
	E.O.B at 20 metres			20.5									
				21.0									
				21.5									
				22.0									
				22.5									
				23.0									
				23.5									
				24.0									
 FOUNDATION ENGINEERING		Comments: Adjacent to CPT 6		Drilling Fluid: water		Topsoi		Sand		Sandstor		Plutonic	
				Fill			Gravel		Siltstone		No Core		
		Driller: Perry Drilling Rig: Tractor		Checked:		Clay		Organic		Limestor			
				Silt			Pumice		Volcanic				


Client : FIVE STAR ESTATE LIMITED					Machine Borehole No. MH 2										
Project Location : Grasshopper Farms Tauriko					Sheet 4 of 6										
Job Number: 13447					Vane Head:	Logged By: MJP	Processor : MAP	Start Date: 01.06.07	Finish Date: 01.06.07						
Stratigraphy	Borehole Location:	mN	mE	Ground R.L.		Groundwater/ Piezometer	Drilling Method & Casing	Recovery (%)	RQD (%)	Sample and Laboratory Test Details	Vane Dial / Vane Shear Strength (kPa) & SPT				
	Description: Refer to site plan			Orientation: vertical											
	CORE DESCRIPTION			Legend	Depth (m)							DEFECTS			
Younger Ash	TOPSOIL														
	SILT, light brown-yellow, sticky, with no apparent fabric, non-plastic, moist to wet				0.5										
					1.0										
R.A	Sandy SILT, black flecked light grey, slightly sticky, non-plastic				1.5										
					2.0										
					2.5										
Hamilton Ash	Silty CLAY, dark brown, very plastic, sticky, wet				3.0										
					3.5										
					4.0										
Alluvial Silts	Clayey SILT, with trace sand, orange, moderately plastic, greasy when reworked				4.5										
					5.0										
	Sandy SILT, with abundant lithic inclusions, black flecked orange, wet				5.5										
					6.0										
					6.5										
	at 6.5m becoming orange and light grey with black flecked lithic inclusions				7.0										
	at 6.8m with highly weathered to completely weathered pumice inclusions (fine gravel sized), moist to wet				7.5										
					8.0										
	Continued														
 FOUNDATION ENGINEERING				Comments: Adjacent to CPT 7 R.A = Rotoehu Ash		Drilling Fluid: water		Topsoil		Sand		Sandstone		Plutonic	
						Checked:		Fill		Gravel		Siltstone		No Core	
								Clay		Organic		Limestone			
				Driller: Perry Drilling		Rig: Tractor		Silt		Pumice		Volcanic			


Client : FIVE STAR ESTATE LIMITED					Machine Borehole No. MH2											
Project Location : Grasshopper Farms Tauriko					Sheet 5 of 6											
Job Number: 13447					Vane Head:	Logged By: MJP	Processor : MAP	Start Date: 01.06.07 Finish Date: 01.06.07								
Stratigraphy	Borehole	mN	mE		Ground R.L.		Groundwater/ Piezometer	Drilling Method & Casing	Recovery (%)	RQD (%)	Sample and Laboratory Test Details	Vane Dial / Vane Shear Strength (kPa) & SPT				
	Location:	Description: Refer to site plan			Orientation: vertical											
	CORE DESCRIPTION			Legend	Depth (m)	DEFECTS										
Alluvial Silts	Sandy SILT, orange and light grey with black flecked lithic inclusions, contains highly weathered to completely weathered pumice inclusions, moist to wet at 9.5m becoming wet at 11.0m becoming black flecked light grey with abundant lithic inclusions, very wet to saturated				8.5											
					9.0											
					9.5											
					10.0											
					10.5											
					11.0											
					11.5											
					12.0											
					12.5											
					Alluvial Sands								Silty SAND, black flecked light grey, with rare highly weathered pumice inclusions (fine gravel sized), wet at 13.5m with 3 bands of orange silt every 0.5 metres, non-plastic at 14.0m with decreasing silt			
13.5																
14.0																
14.5																
15.0																
Alluvial Silts	Sandy SILT, light grey-light brown, with abundant fine grained lithics, non-plastic, saturated				15.5											
					16.0											
Continued																
 FOUNDATION ENGINEERING					Comments: Adjacent to CPT 7		Drilling Fluid: water		Topsoil		Sand		Sandstone		Plutonic	
					Driller: Perry DrillingRig: Tractor		Checked:		Fill		Gravel		Siltstone		No Core	
							Clay			Organic		Limestone				
							Silt			Pumice		Volcanic				

Client : FIVE STAR ESTATE LIMITED						Machine Borehole No. MH 2						
Project Location : Grasshopper Farms Tauriko						Sheet 6 of 6						
Job Number: 13447						Vane Head:	Logged By: MJP	Processor :	Start Date: 01.06.07 Finish Date: 01.06.07			
Stratigraphy	Borehole Location:	mN	mE	Ground R.L.		Groundwater/ Piezometer	Drilling Method & Casing	Recovery (%)	RQD (%)	Sample and Laboratory Test Details	Vane Dial / Vane Shear Strength (kPa) & SPT	
	Description:	Refer to site plan		Orientation: vertical								
	CORE DESCRIPTION			Legend	Depth (m)	DEFECTS						
Alluvial Silts	Sandy SILT, light grey-light brown, with abundant fine grained lithics, non-plastic, saturated				16.5							
Alluvial Pumice	at 16.2m becoming light grey, less weathered with a band of saturated silt at 16.5m											
	Pumiceous SAND, black flecked light grey, (fine to medium sand sized), with trace silt, moist				17.0							
					17.5							
					18.0							
					18.5							
	at 19.0m abundant pumice (fine to medium gravel sized) grading with depth (becoming coarser)				19.0							
					19.5							
					20.0							
					20.5							
					21.0							
	E.O.B at 21 metres				21.5							
					22.0							
					22.5							
					23.0							
					23.5							
					24.0							
 FOUNDATION ENGINEERING		Comments:		Drilling Fluid:	Topsoil	Sand	Sandstone	Plutonic				
				water	Fill	Gravel	Siltstone	No Core				
				Checked:	Clay	Organic	Limestone					
				Silt	Pumice	Volcanic						
Driller: Perry Drilling		Rig: Tractor										

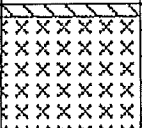
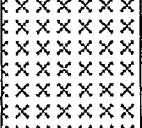
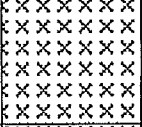

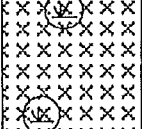

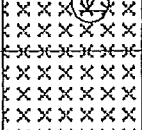
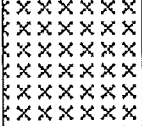
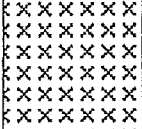
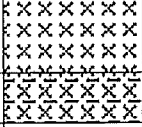
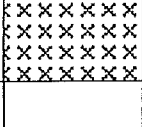

Client : FIVE STAR ESTATE LIMITED Project Location : Grasshopper Farms Tauriko Job Number: 13447					Trial Pit No. TP 1 Sheet 1 of 17							
					Vane Head:	Logged By:	Processor :		Date:			
					4612	MJP	MAP		07.06.07			
Stratigraphy	Pit Location:	mN	mE	Ground R.L.	Legend	Depth (m)	Groundwater	Vane Shear Strength (kPa)	Soil Sensitivity	Sample and Laboratory Test Details		
	Description: Refer to site plan											
	SOIL DESCRIPTION											
Younger Ash	TOPSOIL											
	SILT, yellow-light brown, very stiff, non-plastic, friable					0.5		157	3.1			
	at 0.8m becoming stiff					1.0		87	2.5			
	at 2.0m becoming slightly sandy, moist					1.5		87	2.7			
	at 2.4m becoming very stiff					2.0		98	2.2			
						2.5		105	2.6			
						3.0		115	2.6			
						3.5		192	3.3			
	Sandy SILT, dark orange, very stiff, non-plastic, moist					4.0		157	4.5			
	Silty SAND, dark orange and light grey, moist					4.5		150	5.0			
R. ASH						5.0		50	2.6			
						5.5		68	2.5			
						6.0		62	2.3			
Alluvial Silts	Pumiceous SILT, intermixed with light grey medium sands and completely weathered pumiceous sands, horizontally bedded, pumiceous, non-plastic, moist											
	at 4.7m becoming firm to stiff											
	at 5.2m becoming stiff											
	E.O.B at 6.0 metres. Maximum Reach of Excavator											
FOUNDATION ENGINEERING		Comments: Groundwater not encountered. R.ASH = Rotoehu Ash		Excavator Used:	Topsoil		Sand		Sandstone		Plutonic	
				Hiltachi EX 200	Fill		Gravel		Siltstone		No Core	
				Checked:	Clay		Organic		Limestone			
					Silt		Pumice		Volcanic			


Client : FIVE STAR ESTATE LIMITED Project Location : Grasshopper Farms Tauriko Job Number: 13447				Trial Pit No. TP 2 Sheet 2 of 17 Vane Head: 4612 Logged By: MJP Processor : MAP Date: 07.06.07								
Stratigraphy	Plt Location:	mN	mE	Ground R.L.	Legend	Depth (m)	Groundwater	Vane Shear Strength (kPa)	Soil Sensitivity	Sample and Laboratory Test Details		
	Description: Refer to site plan											
	SOIL DESCRIPTION											
Younger Ash	TOPSOIL											
	SILT, with trace sand, very stiff, yellow-light brown, friable, non-plastic, moist											
	at 1.3m becoming very hard											
	at 1.7m becoming very stiff											
	Sandy SILT, dark orange, very stiff, with abundant highly weathered to completely weathered pumice inclusions (fine to medium sand sized)											
Rotorua Ash	SAND, medium, with trace silt, black flecked orange, loose to medium dense (strength inferred)											
Alluvial Silts	SILT, light grey, greasy when reworked with rare bands of light grey silty sand, pumiceous, stiff, non-plastic											
	E.O.B at 5.0 metres. Maximum Reach of Excavator											
 FOUNDATION ENGINEERING		Comments: Groundwater not encountered.		Excavator Used: Hitachi EX 200 Checked:	Topsoil Fill Clay Silt	   	Sand Gravel Organic Pumice	   	Sandstone Siltstone Limestone Volcanic	   	Plutonic No Core	 

Client : FIVE STAR ESTATE LIMITED Project Location : Grasshopper Farms Tauriko Job Number: 13447					Trial Pit No. TP 3 Sheet 3 of 17					
					Vane Head: 4612	Logged By: MJP	Processor : MAP	Date: 07.06.07		
Stratigraphy	Pit Location:	mN	mE	Ground R.L.	Legend	Depth (m)	Groundwater	Vane Shear Strength (kPa)	Soil Sensitivity	Sample and Laboratory Test Details
	Description: Refer to site plan									
	SOIL DESCRIPTION									
Younger Ash	TOPSOIL									
	SILT, yellow-light brown, very stiff, non-plastic, friable									
	at 1.0m with a band of orange silts to 1.5 metres					0.5		150	3.0	
	at 1.7m becoming very stiff					1.0		108	3.4	
	at 2.0m becoming orange, sandy silt, moist					1.5		112	2.7	
						2.0		90	2.2	
						2.5		98	2.0	
						3.0		206+		
	Silty SAND, orange, with abundant lithic inclusions					3.5		93	2.0	
	at 3.3m with trace silt					4.0		115	3.3	
Rotoehu Ash	Sandy SILT, orange and light grey, stiff, pumiceous, non-plastic, moist					4.5		105	4.4	
						5.0		62	2.1	
Alluvial Silts	Pumiceous SILT, black flecked light grey, with common highly weathered to completely weathered pumice inclusions (fine sand to coarse sand sized) and horizontally bedded bands of clean light grey medium sand, very stiff, pumiceous, non-plastic, moist					5.5				
	at 4.7m becoming stiff					6.0				
	E.O.B at 5.0 metres. Maximum Reach of Excavator									
 FOUNDATION ENGINEERING		Comments: Groundwater not encountered.	Excavator Used:	Topsoil	Sand	Sandstone	Plutonic	++++		
			Hitachi EX 200	Fill	Gravel	Siltstone	No Core			
			Checked:	Clay	Organic	Limestone				
				Silt	Pumice	Volcanic				

Client : FIVE STAR ESTATE LIMITED Project Location : Grasshopper Farms Tauriko Job Number: 13447					Trial Pit No. TP 4 Sheet 4 of 17 Vane Head: 4612 Logged By: MJP Processor : MAP Date: 07.06.07						
Stratigraphy	Pit Location:	mN	mE	Ground R.L.	Legend	Depth (m)	Groundwater	Vane Shear Strength (kPa)	Soil Sensitivity	Sample and Laboratory Test Details	
	Description: Refer to site plan										
SOIL DESCRIPTION											
Younger Ash	TOPSOIL										
	SILT, yellow-light brown, very stiff, friable, non-plastic, coarse texture that becomes silty when reworked, moist										
						0.5		196	4.2		
						1.0		122	3.2		
						1.5		108	3.6		
	at 2.0m becoming sandy silt, moist					2.0		112	4.1		
						2.5		108	3.4		
						3.0		132	3.8		
						3.5		115	3.3		
	Rotoehu Ash	Silty SAND, orange, with trace lithic inclusions									
at 4.0m becoming clean sand with trace lithic inclusions					4.0		62	3.3			
Silt	SILT, orange and light grey, intermixed with bands of orange sandy silt and light grey sands horizontally bedded, with rare highly weathered to completely weathered pumice inclusions, (fine sand to coarse sand sized) and manganese streaking, becomes greasy when reworked, very stiff, pumiceous silt, moist					4.5		122	3.5		
	E.O.B at 4.8 metres. Maximum Reach of Excavator							62	3.0		
						5.0					
						5.5					
						6.0					
 FOUNDATION ENGINEERING		Comments: Groundwater not encountered.	Excavator Used:	Topsoil		Sand		Sandstone		Plutonic	++++
				Fill		Gravel		Siltstone		No Core	
			Checked:	Clay		Organic		Limestone			
				Silt		Pumice		Volcanic			

Client : FIVE STAR ESTATE LIMITED						Trial Pit No. TP 5							
Project Location : Grasshopper Farms Tauriko						Sheet 5 of 17							
Job Number: 13447						Vane Head: 4612	Logged By: MJP		Processor : MAP		Date: 07.06.07		
Stratigraphy	Pit Location:	mN	mE	Ground R.L.		Legend	Depth (m)	Groundwater	Vane Shear Strength (kPa)	Soil Sensitivity	Sample and Laboratory Test Details		
	Description:	Refer to site plan											
	SOIL DESCRIPTION												
Alluvial Silts	TOPSOIL SILT, with trace clay, cream and light grey mottled orange, stiff, with rare horizontal bands of non-plastic, light grey silt, pronounced bedding, slightly plastic					[Pattern]	0.5		62	3.3			
	TOPSOIL SILT, with trace clay, firm, black mottled brown, with major organic inclusions (25-30% by volume) abundant rootlets and wood inclusions (including logs up to 250mm diameter) slightly to moderately decomposed with strong amporic odour, saturated, water table perched above 2.4m, moderately plastic					[Pattern]	1.0		44	2.3			
	SILT, firm, with trace clay and sand, light grey, slightly plastic, pumiceous with rare slightly decomposed to highly decomposed organic inclusions, saturated					[Pattern]	1.5		10	1.3			
						[Pattern]	2.0	▽	68	2.5			
	at 3.5m becoming black manganese flecked light grey with no visable bedding (appears massive)					[Pattern]	2.5		24	3.0			
						[Pattern]	3.0		19	1.9			
						[Pattern]	3.5		35	2.2			
						[Pattern]	4.0		32	1.7			
E.O.B at 5.0 metres. Major Pit collapse from 2.4 to 5.0 metres					[Pattern]	5.0		50	3.1				
					[Pattern]	5.5							
					[Pattern]	6.0							
FOUNDATION ENGINEERING		Comments: Groundwater encountered at 2.0 metres.		Excavator Used:		Topsoil	[Pattern]	Sand	[Pattern]	Sandstone	[Pattern]	Plutonic	[Pattern]
				Hitachi EX 200		Fill	[Pattern]	Gravel	[Pattern]	Siltstone	[Pattern]	No Core	
				Checked:		Clay	[Pattern]	Organic	[Pattern]	Limestone	[Pattern]		
						Silt	[Pattern]	Pumice	[Pattern]	Volcanic	[Pattern]		

Client : FIVE STAR ESTATE LIMITED Project Location : Grasshopper Farms Tauriko Job Number: 13447				Trial Pit No. TP 6 Sheet 6 of 17							
				Vane Head: 4612		Logged By: MJP		Processor : MAP		Date: 07.06.07	
Stratigraphy	Pit Location: mN mE Ground R.L.		Legend	Depth (m)	Groundwater	Vane Shear Strength (kPa)	Soil Sensitivity	Sample and Laboratory Test Details			
	Description: Refer to site plan										
	SOIL DESCRIPTION										
Alluvial Silts	TOPSOIL										
	SILT, stiff, light grey and cream mottled orange, with trace sand, non-plastic, wet					0.5		62		4.8	
	at 1.0m becoming firm					1.0		38		2.4	
	SILT, firm, with trace clay, black flecked light grey, with abundant slightly decomposed organic inclusions to 2.5m, saturated					1.5		47		3.6	
	at 2.5m becoming soft					2.0		24		2.4	
	at 2.5m becoming soft					2.5		16		1.2	
	SILT, with trace sand, firm, light grey, non-plastic					3.0		27		1.7	
	at 2.5m becoming soft					3.5		35		1.8	
	Clayey SILT, stiff, with trace sand, dark orange banding, slightly plastic					4.0		44		1.6	
	at 2.5m becoming soft					4.5		62		3.0	
Y. A	SILT, yellow-light brown, stiff, non-plastic, spongy texture, saturated					5.0		79		2.5	
	E.O.B at 5.0 metres. Major Pit Collapse from 2.5 to 5.0 metres					5.5					
				6.0							
















**FOUNDATION
ENGINEERING**


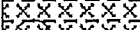
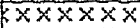




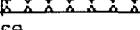


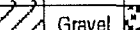

Comments:
Groundwater encountered at 1.4 metres.
Y.A = Younger Ash















Excavator Used:
Hitachi EX 200


Checked:

Topsoil		Sand		Sandstone		Plutonic	
Fill		Gravel		Siltstone		No Core	
Clay		Organic		Limestone			
Silt		Pumice		Volcanic			


Client : FIVE STAR ESTATE LIMITED					Trial Pit No. TP 7								
Project Location : Grasshopper Farms Tauriko					Sheet 7 of 17								
Job Number: 13447					Vane Head: 4612	Logged By: MJP	Processor : MAP	Date: 07.06.07					
Stratigraphy	Pit Location:	mN	mE	Ground R.L.	Legend	Depth (m)	Groundwater	Vane Shear Strength (kPa)	Soil Sensitivity	Sample and Laboratory Test Details			
	Description: Refer to site plan												
	SOIL DESCRIPTION												
Alluvial Silts	TOPSOIL					0.5		47	2.0				
	SILT, light grey and white banded orange, firm, with sub-horizontal bands of orange sand, non-plastic, moist					1.0		19	1.5				
	Clayey SILT, light grey-light brown, firm, with rare organic inclusions (up to 300mm diameter to 1.7m depth), moderately plastic, saturated					1.5	▽	27	1.7				
	at 1.5m becoming light grey, saturated					2.0		13	1.3				
	at 2.0m becoming soft					2.5		16	1.6				
						3.0		21	1.6				
						3.5							
						4.0							
						4.5							
						5.0							
E.O.B at 4.0 metres. Unable to Excavate Further Due to Continued Pit Collapse					5.5								
					6.0								
FOUNDATION ENGINEERING		Comments: Groundwater encountered at 1.5 metres.		Excavator Used: Hitachi EX 200		Topsoil		Sand		Sandstone		Plutonic	
				Checked:		Fill		Gravel		Siltstone		No Core	
						Clay		Organic		Limestone			
						Silt		Pumice		Volcanic			

Client : FIVE STAR ESTATE LIMITED					Trial Pit No. TP 8							
Project Location : Grasshopper Farms Tauriko					Sheet 8 of 17							
Job Number: 13447					Vane Head: 4612		Logged By: MJP		Processor : MAP		Date: 07.06.07	
Stratigraphy	Pit Location:	mN	mE	Ground R.L.	Legend	Depth (m)	Groundwater	Vane Shear Strength (kPa)	Soil Sensitivity	Sample and Laboratory Test Details		
		Description: Refer to site plan										
	SOIL DESCRIPTION											
Alluvia / Silts	TOPSOIL					0.5		62	2.1			
	Clayey SILT, stiff, light brown, with rare organic inclusions, moderately plastic											
Pumice	Clayey SILT, firm, dark brown, with major organic inclusions (highly decomposed inclusions to 500mm diameter), moderately plastic, wet					1.0		41	2.0			
Pumice	SILT, firm, with trace clay, light grey, slightly sticky, slightly plastic, saturated					2.0		27	2.1			
Pumice	Pumiceous GRAVELS, firm, fine to coarse, gravel sized, poorly graded, angular, slightly weathered and appears massive (no bedding)					2.5		27	1.7			
Pumice	at 3.5m becoming stiff					3.0		35	2.2			
Pumice	at 4.0m becoming very stiff, pumice is difficult to excavate					3.5		71	2.6			
Pumice	E.O.B at 4.5 metres. Unable to Excavate Further Due to Continued Pit Collapse					4.0		171	3.9			
Pumice						4.5		122	3.5			
Pumice						5.0						
Pumice						5.5						
Pumice						6.0						

 FOUNDATION ENGINEERING	Comments: Groundwater encountered at 2.6 metres. Adjacent to CPT 10	Excavator Used:	Topsoil		Sand		Sandstone		Plutonic	
			Fill		Gravel		Siltstone		No Core	
		Checked:	Clay		Organic		Limestone			
			Silt		Pumice		Volcanic			

Client : FIVE STAR ESTATE LIMITED Project Location : Grasshopper Farms Tauriko Job Number: 13447					Trial Pit No. TP 9 Sheet 9 of 17					
					Vane Head:	Logged By:	Processor :		Date:	
					4612	MJP	MAP		07.06.07	
Stratigraphy	Pit Location:	mN	mE	Ground R.L.	Legend	Depth (m)	Groundwater	Vane Shear Strength (kPa)	Soil Sensitivity	Sample and Laboratory Test Details
	Description: Refer to site plan									
	SOIL DESCRIPTION									
Alluvial Silts	TOPSOIL									
	SILT, very stiff, light grey banded light brown-grey, non-plastic, moist				XXXXXX	0.5		108	2.8	
	SILT, firm, with trace clay, grey-brown, with rare slightly decomposed organic inclusions (roots), slightly plastic				XXXXXX	1.0		32	2.0	
	at 2.0m ground water encountered				XXXXXX	1.5		47	1.7	
Pumice	Pumiceous GRAVELS, very stiff, light grey, fine sand to coarse gravel sized, poorly sorted, clean, angular, no bedding, appears massive				XXXXXX	2.0	▽	27	2.7	
					XXXXXX	2.5		108	5.1	
					XXXXXX	3.0		122	3.8	
					XXXXXX	3.5		101	3.4	
					XXXXXX	4.0		90	1.9	
E.O.B at 4.0 metres. Unable to Excavate Further Due to Continued Pit collapse						4.5				
						5.0				
						5.5				
						6.0				
 FOUNDATION ENGINEERING		Comments: Groundwater encountered at 2.0 metres.	Excavator Used:	Topsoil	Sand	Sandstone	Plutonic	++++		
			Checked:	Fill	Gravel	Siltstone	No Core			
				Clay	Organic	Limestone				
				Silt	Pumice	Volcanic				

Client : FIVE STAR ESTATE LIMITED Project Location : Grasshopper Farms Tauriko Job Number: 13447					Trial Pit No. TP 10 Sheet 10 of 17						
					Vane Head:	Logged By:	Processor :	Date:			
					4612	MJP	MAP	07.06.07			
Stratigraphy	Pit Location:	mN	mE	Ground R.L.	Legend	Depth (m)	Groundwater	Vane Shear Strength (kPa)	Soil Sensitivity	Sample and Laboratory Test Details	
	Description: Refer to site plan										
	SOIL DESCRIPTION										
Alluvial Silts	SILT, firm, light grey banded light brown, non-plastic, moist					0.5		32	1.2		
						1.0		62	3.9		
Peat	PEAT, stiff, juvenile, fresh, fibrous, with abundant slightly decomposed organic inclusions to 350mm diameter within a silty matrix, saturated					1.5	19	1.9			
						2.0	47	2.5			
Alluvial Silts	Clayey SILT, firm, grey, fine pumiceous silt when dried, soapy when remoulded					2.5	62	3.9			
						3.0	44	2.1			
						3.5	68	3.6			
						4.0	50	3.9			
						4.5	56	2.9			
						5.0	98	3.6			
E.O.B at 5.0 metres. Major pit collapse from 1.0 to 5.0 metres					5.5						
					6.0						
FOUNDATION ENGINEERING		Comments: Groundwater encountered at 1.5 metres.	Excavator Used:	Topsoil		Sand		Sandstone		Plutonic	
				Fill		Gravel		Siltstone		No Core	
			Checked:	Clay		Organic		Limestone			
				Silt		Pumice		Volcanic			

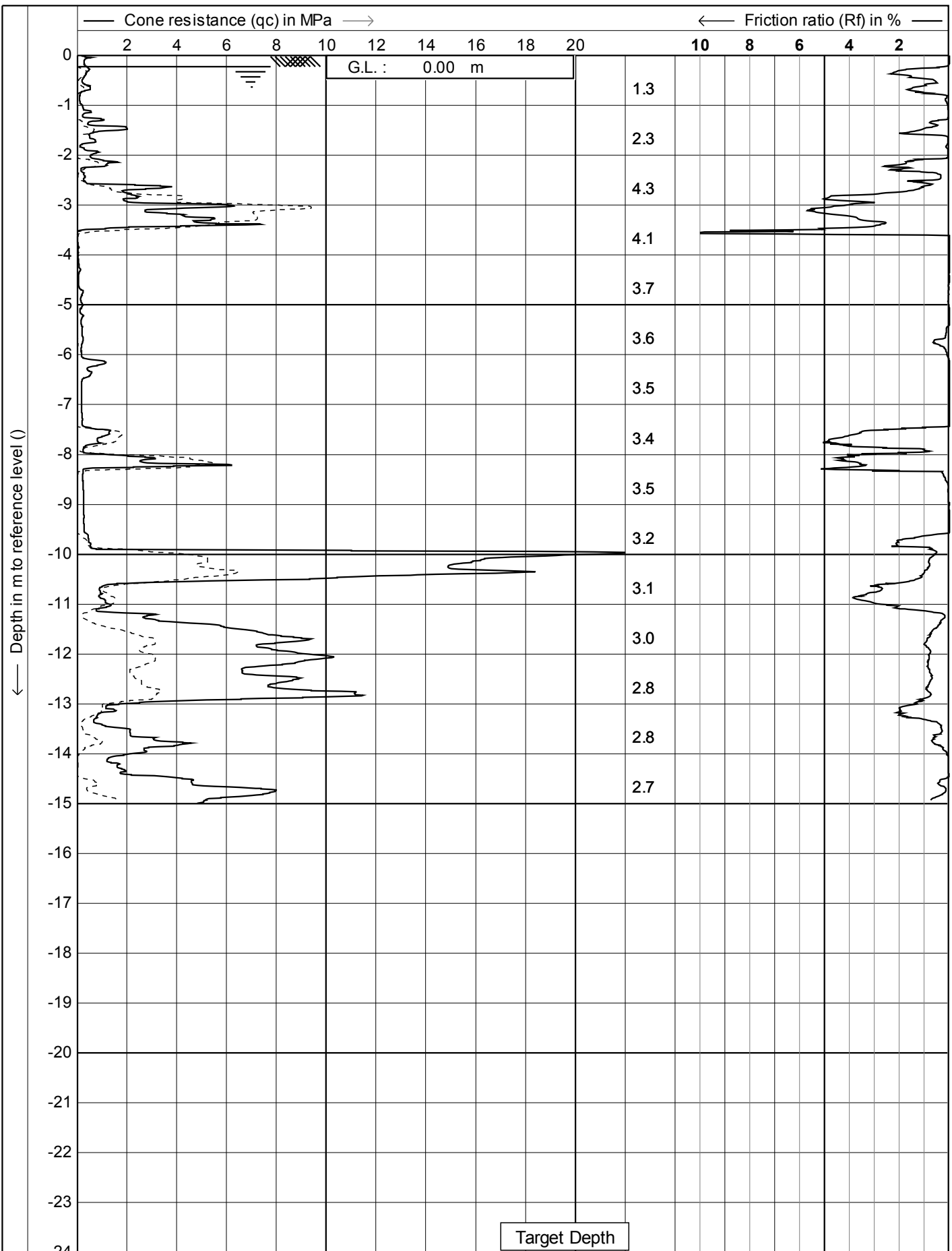
Client : FIVE STAR ESTATE LIMITED Project Location : Grasshopper Farms Tauriko Job Number: 13447					Trial Pit No. TP 11 Sheet 11 of 17						
					Vane Head:	Logged By:	Processor :	Date:			
					4612	MJP	MAP	07.06.07			
Stratigraphy	Pit Location:	mN	mE	Ground R.L.	Legend	Depth (m)	Groundwater	Vane Shear Strength (kPa)	Soil Sensitivity	Sample and Laboratory Test Details	
	Description: Refer to site plan										
	SOIL DESCRIPTION										
Alluvial Silts	TOPSOIL										
	SILT, stiff, light brown streaked black, with common rootlet inclusions, sub-horizontal banded with light grey sandy silt, non-plastic, wet							62	2.6		
						0.5					
						1.0		76	4.0		
	Clayey SILT, firm, light brown, sticky, with abundant highly decomposed organic inclusions to 4.5m, organic odour, moderately plastic, saturated					1.5		35	2.2		
						2.0		32	2.0		
						2.5		27	2.1		
	SILT, stiff, black flecked light grey, greasy when reworked, non-plastic					3.0		65	2.4		
						3.5		90	4.3		
						4.0		59	3.7		
					4.5		79	2.6			
					5.0		62	3.0			
E.O.B at 5.0 metres.					5.5						
					6.0						
 FOUNDATION ENGINEERING		Comments: Groundwater encountered at 1.2 metres.	Excavator Used:	Topsoil		Sand		Sandstone	***	Plutonic	++++
			Checked:	Fill		Gravel		Siltstone	2222	No Core	
				Clay		Organic		Limestone			
				Silt		Pumice		Volcanic			

[illegible]

Client : FIVE STAR ESTATE LIMITED					Face Log No. 2					
Project Location : Grasshopper Farms Tauriko					Sheet 2 of 2					
Job Number: 13447					Vane Head:	Logged By: MJP	Processor : MAP	Date: 07.06.07		
Geology	Borehole Location:	mN	mE	Ground R.L.	Legend	Depth (m)	Standing Water Level	Vane Shear Strength (kPa)	Soil Sensitivity	Scala Penetrometer (blows/100mm)
	Description: Refer to site plan									
SOIL DESCRIPTION										
Colluvium	SILT, sandy, dark orange, easily disturbed, friable, dry				UPPER BENCH	0.5 1.0				
	SILT, sandy, dark orange, easily disturbed, friable at 2.0m with a horizontal band of light grey sand				LOWER BENCH	1.5 2.0 2.5				
Pumice Alluvium	Pumiceous SILT, with some sand, light grey with horizontal bedding (some beds are dark orange stained), moist to dry					3.0 3.5 4.0 4.5 5.0 5.5 6.0				
Comments: Groundwater not encountered. Face log in shed. Fifth elevation					Borehole Diameter: 50mm	Topsoil	Sand	Sandstone	Plutonic	+ + + +
					Checked:	Fill	Gravel	Siltstone	No Core	+ + + +
					Clay	Organic	Limestone	+ + + +		
					Silt	Pumice	Volcanic	+ + + +		



**FOUNDATION
ENGINEERING**



Test according A.S.T.M. Standard D 5778-95

Project : **Five Star Estate Limited**

Location: **Kennedy Road - Pyes Pa - Tauranga**

Date : **7-12-2007**

Cone no. : **C10CFIP.E59**

Project no. : **02FE04**

CPT no. : **01**

← Depth in m to reference level ()

— Cone resistance (qc) in MPa —→

← Friction ratio (Rf) in % —

2 4 6 8 10 12 14 16 18 20

10 8 6 4 2

G.L. : 0.00 m

1.6

0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14
-15
-16
-17
-18
-19
-20
-21
-22
-23
-24

Tip

0.10

0.20

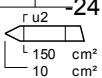
0.30

0.40

0.50

--- Sleeve friction (fs) in MPa —→

☒ Inclination in (degr)



Test according A.S.T.M. Standard D 5778-95

Project : **Five Star Estate Limited**

Location: **Kennedy Road - Pyes Pa - Tauranga**

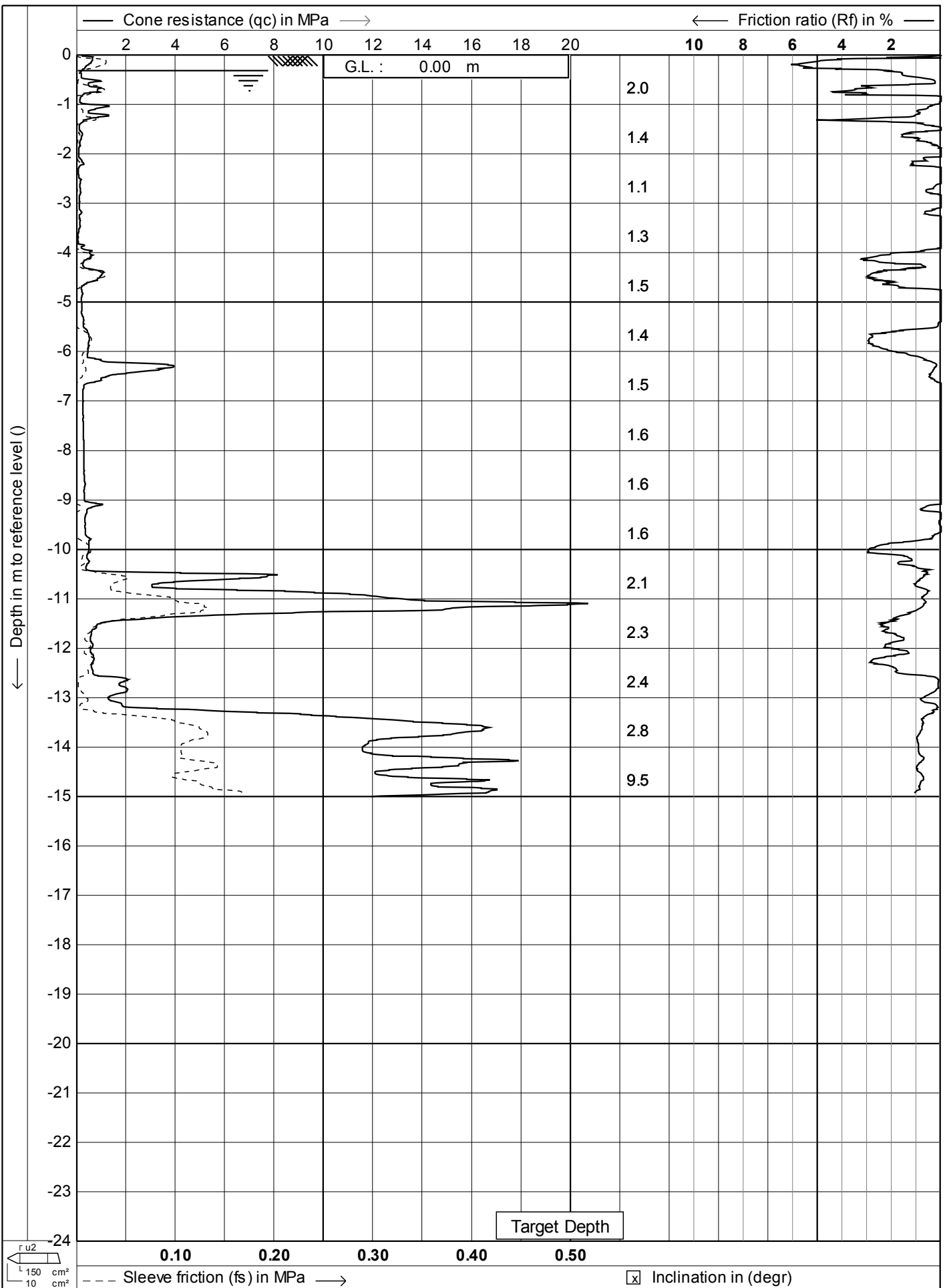
Date : **7-12-2007**

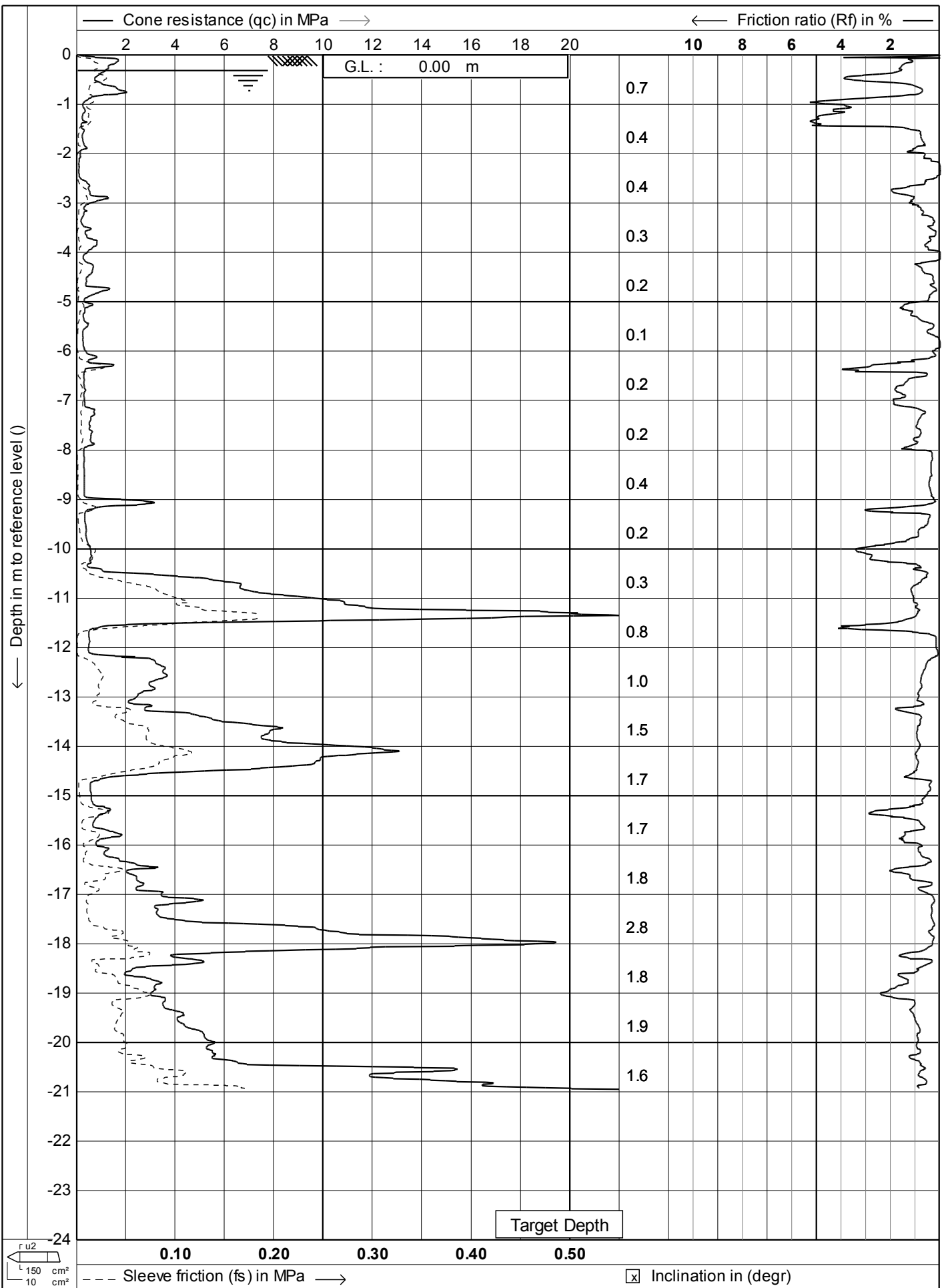
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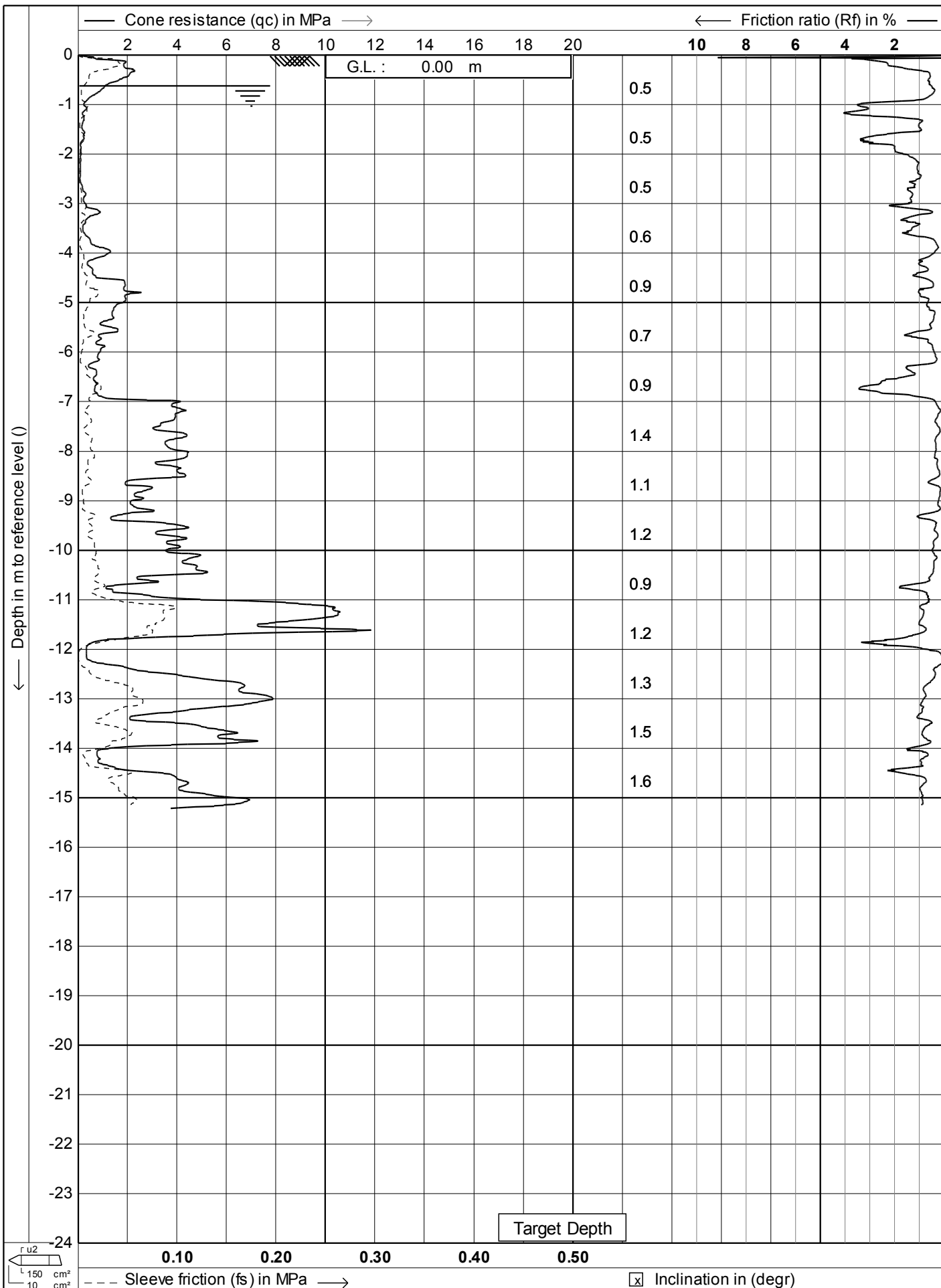
Project no. : **02FE04**

CPT no. : **02**

1/14







Test according A.S.T.M. Standard D 5778-95

Project : **Five Star Estate Limited**

Location: **Kennedy Road - Pyes Pa - Tauranga**

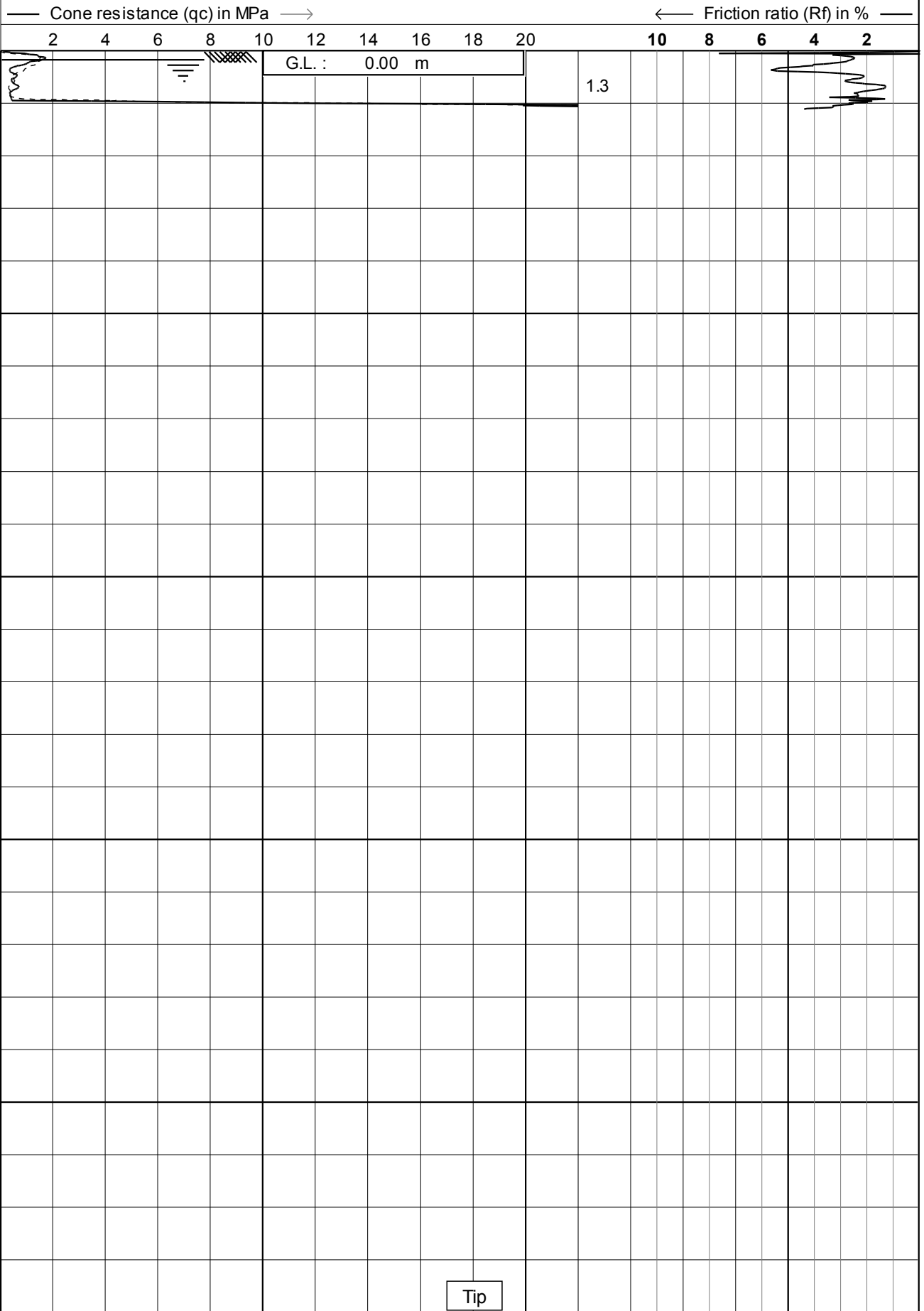
Date : **7-12-2007**

Cone no. : **C10CFIP.E59**

Project no. : **02FE04**

CPT no. : **04**

← Depth in m to reference level ()



--- Sleeve friction (fs) in MPa ---→

☒ Inclination in (degr)



Test according A.S.T.M. Standard D 5778-95

Project : **Five Star Estate Limited**

Location: **Kennedy Road - Pyes Pa - Tauranga**

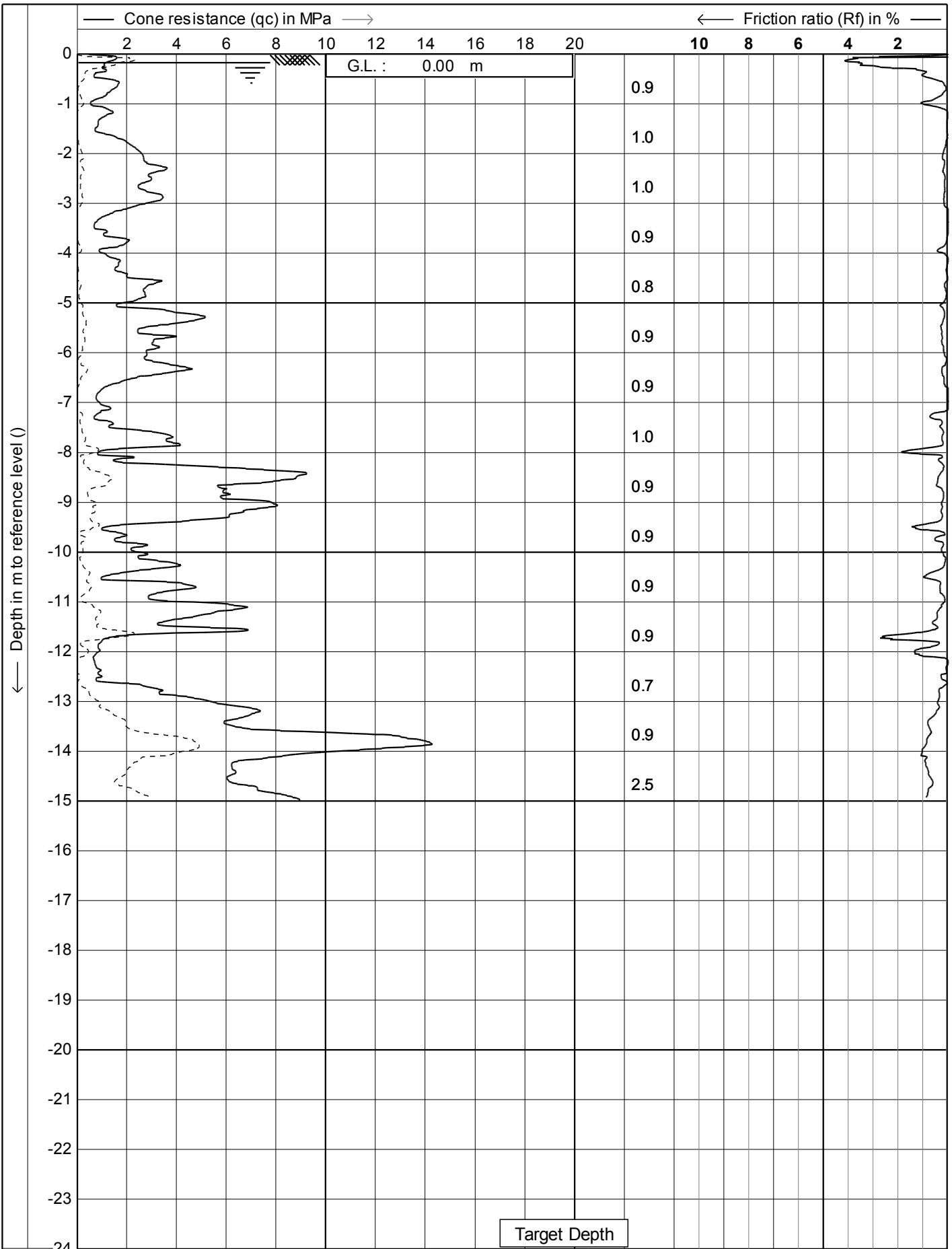
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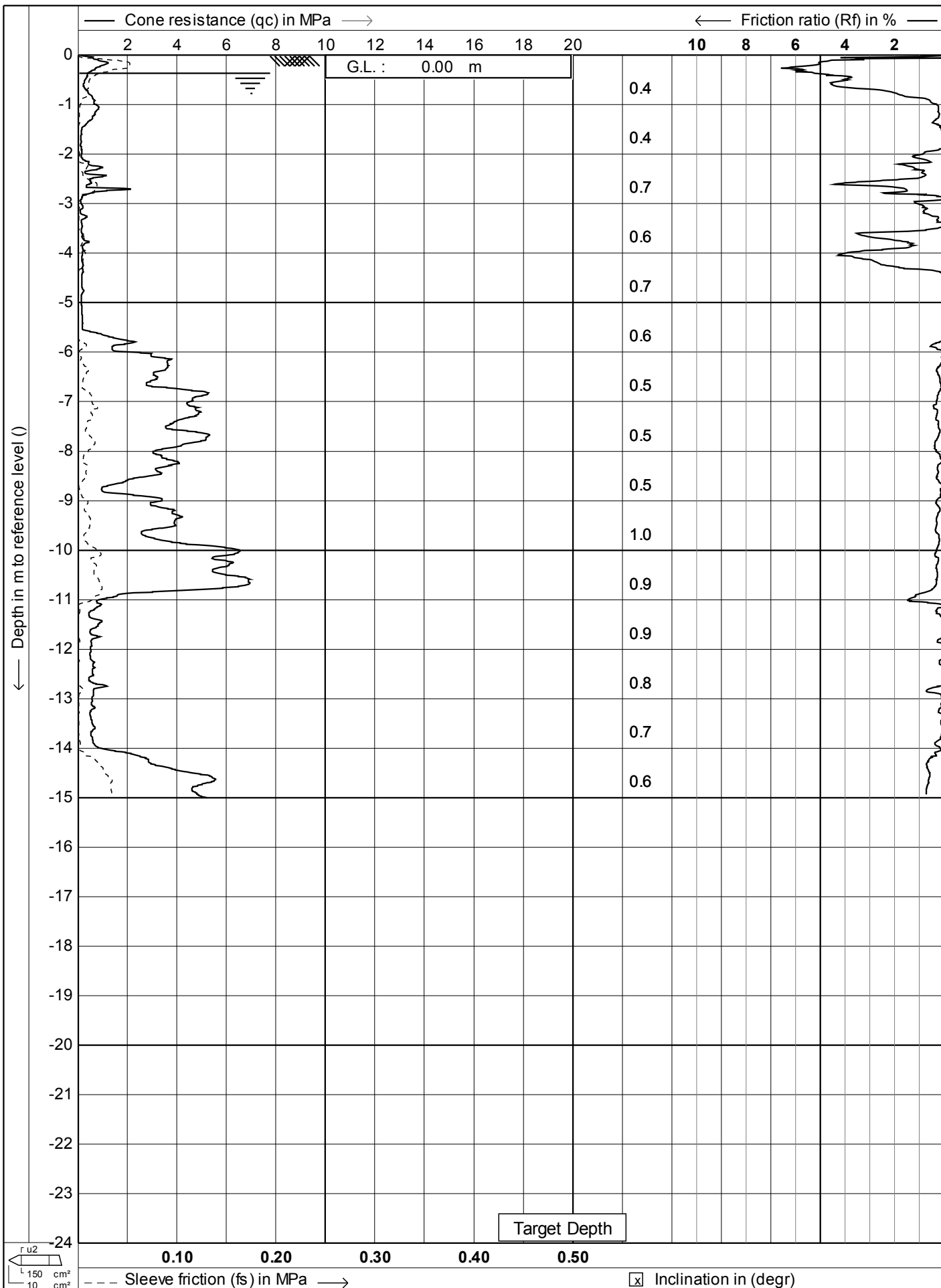
Cone no. : **C10CFIP.E59**

Project no. : **02FE04**

CPT no. : **05**

1/14





Test according A.S.T.M. Standard D 5778-95

Project : **Five Star Estate Limited**

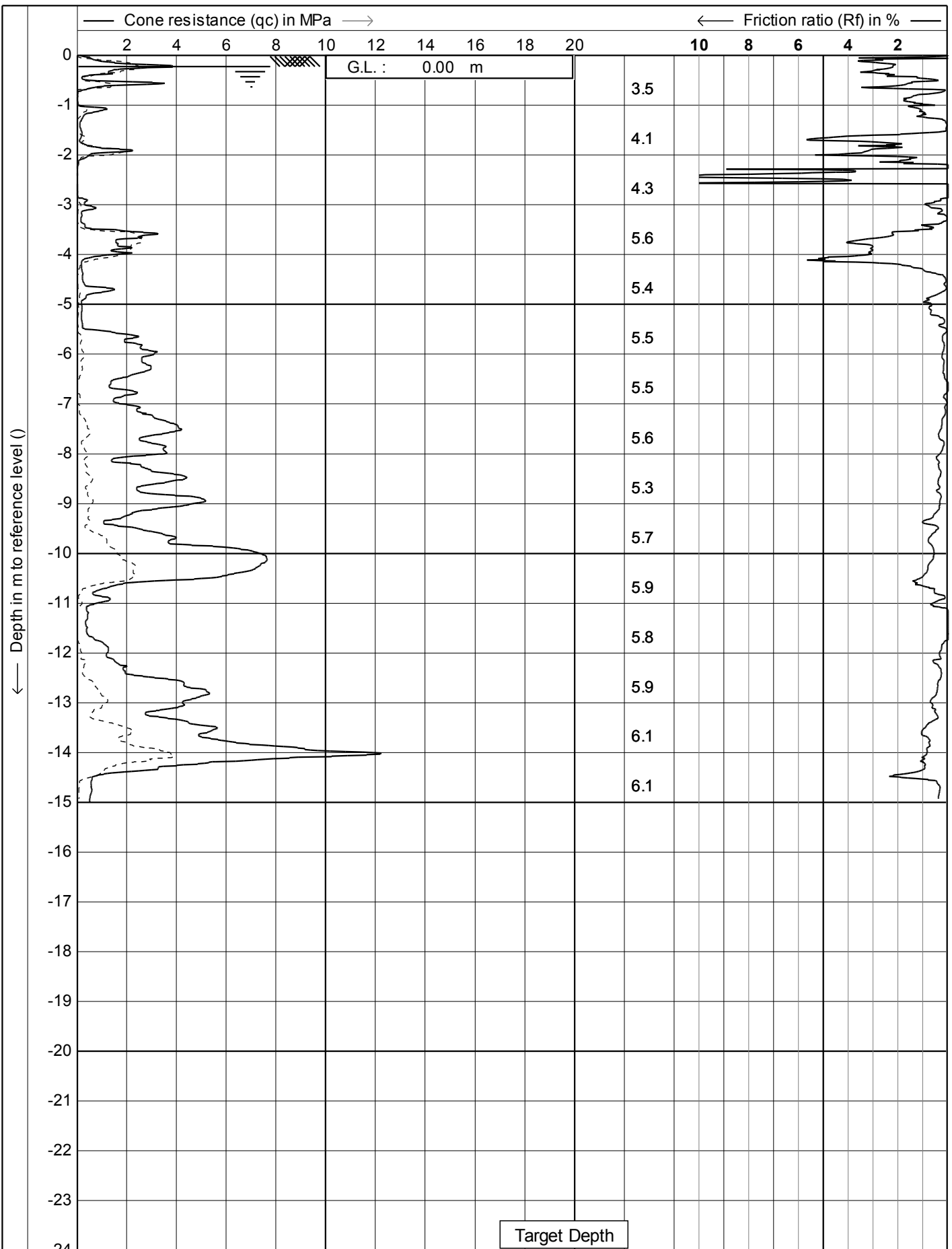
Location: **Kennedy Road - Pyes Pa - Tauranga**

Date : **7-12-2007**

Cone no. : **C10CFIP.E59**

Project no. : **02FE04**

CPT no. : **06**



150 cm²
10 cm²

0.10 0.20 0.30 0.40 0.50

--- Sleeve friction (fs) in MPa -->

☒ Inclination in (degr)



Test according A.S.T.M. Standard D 5778-95

Project : **Five Star Estate Limited**

Location: **Kennedy Road - Pyes Pa - Tauranga**

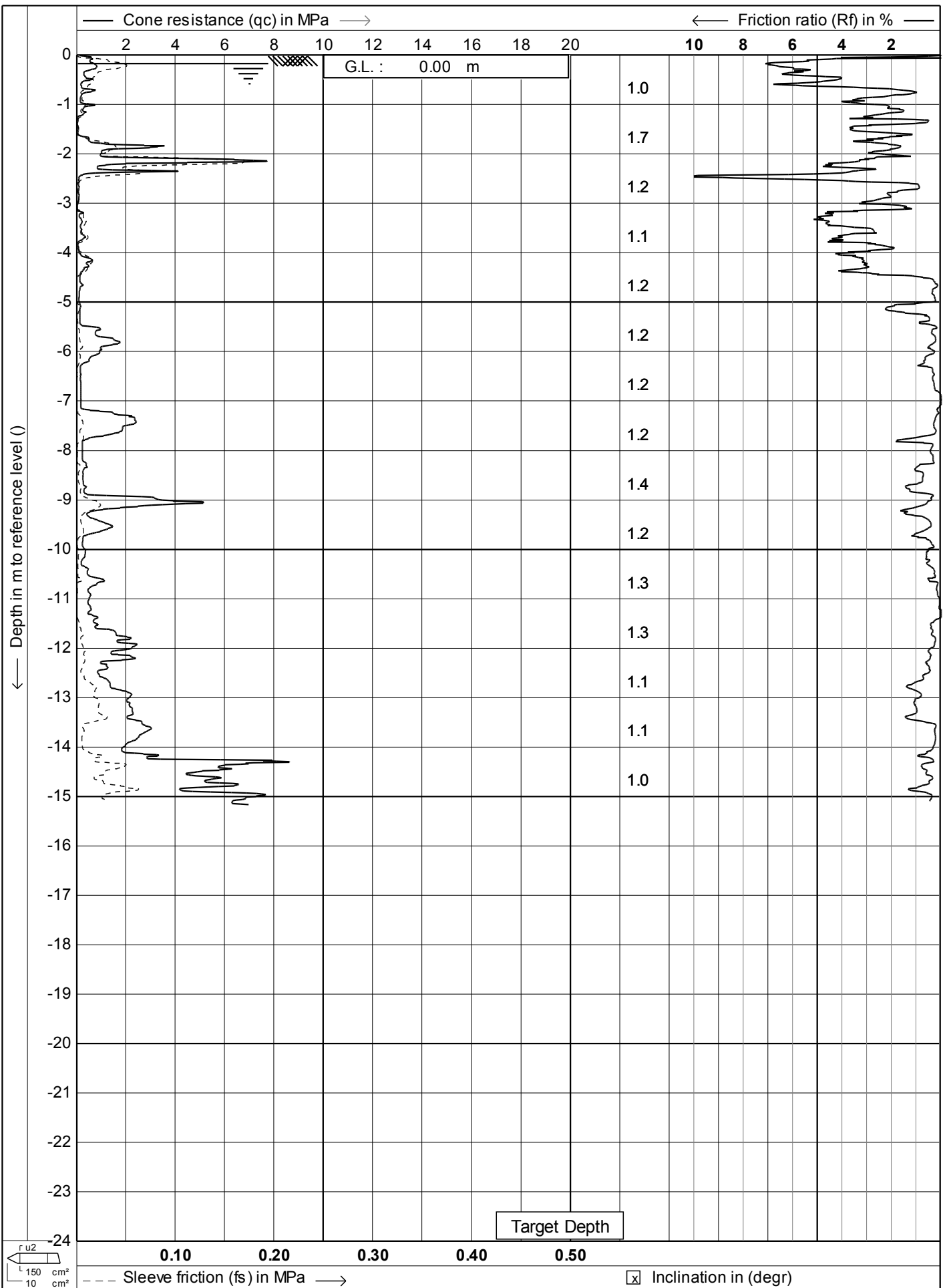
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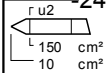
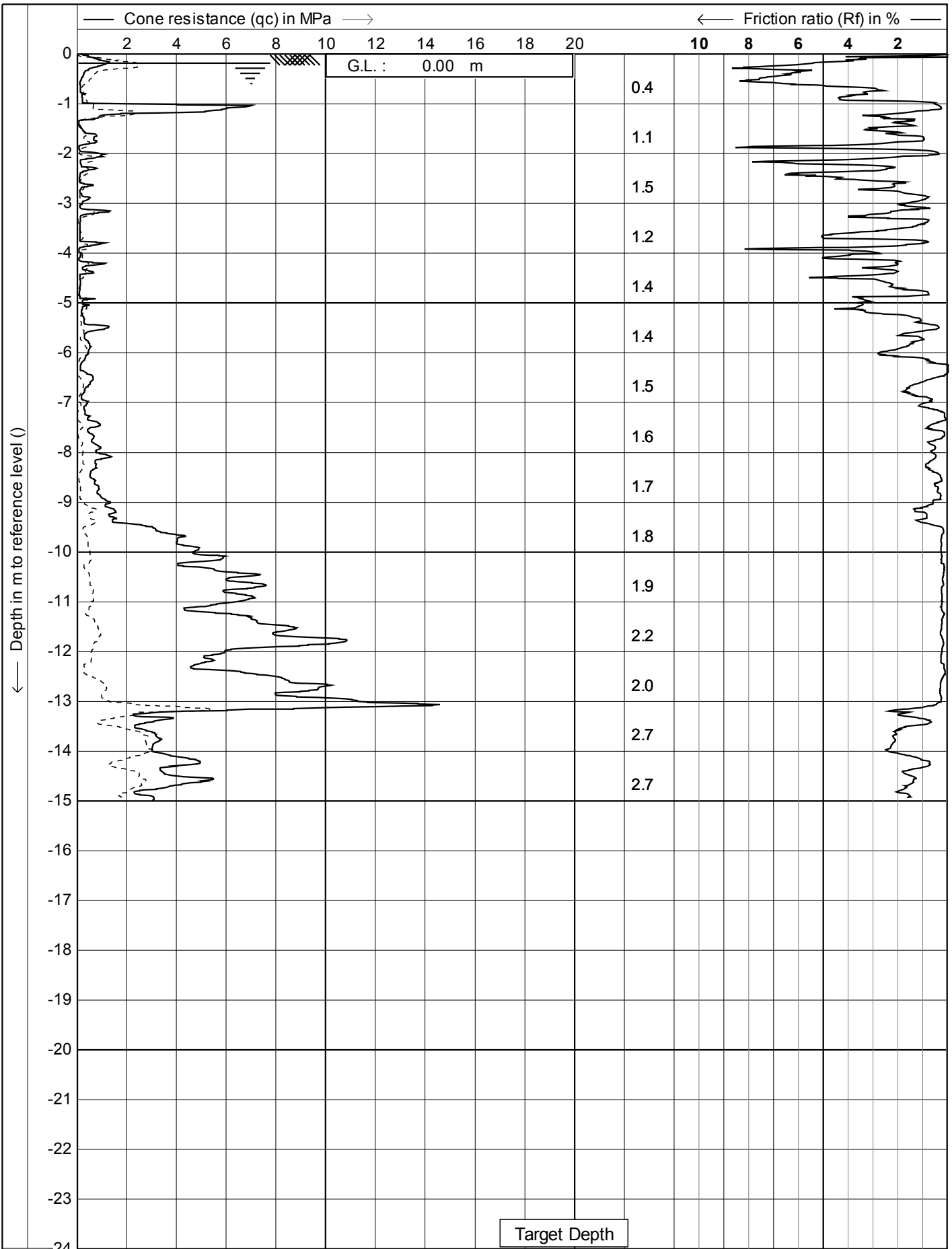
Cone no. : **C10CFIP.E59**

Project no. : **02FE04**

CPT no. : **07**

1/14





0.10 0.20 0.30 0.40 0.50

--- Sleeve friction (fs) in MPa —> ☒ Inclination in (degr)



Test according A.S.T.M. Standard D 5778-95

Project : **Five Star Estate Limited**

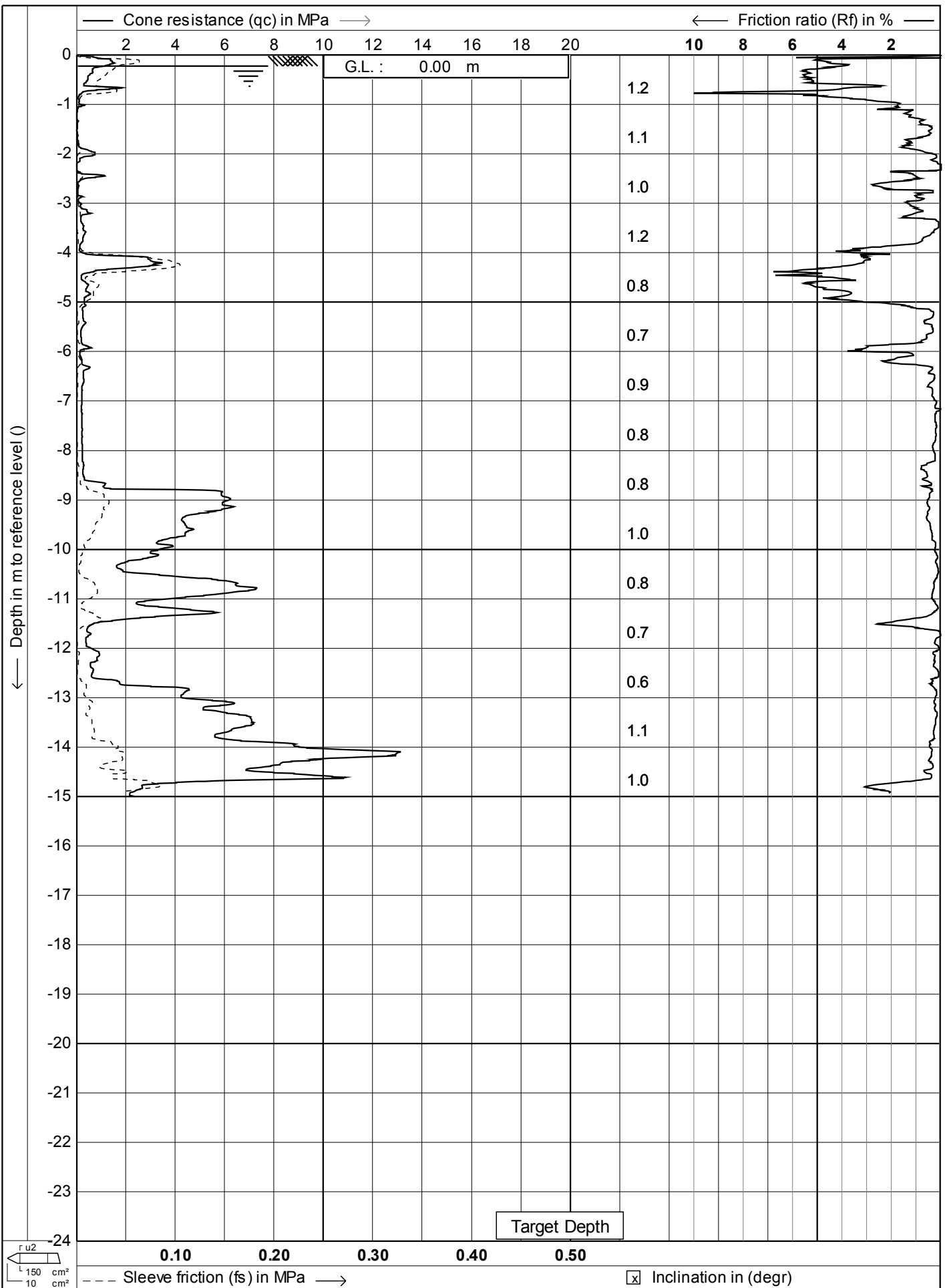
Location: **Kennedy Road - Pyes Pa - Tauranga**

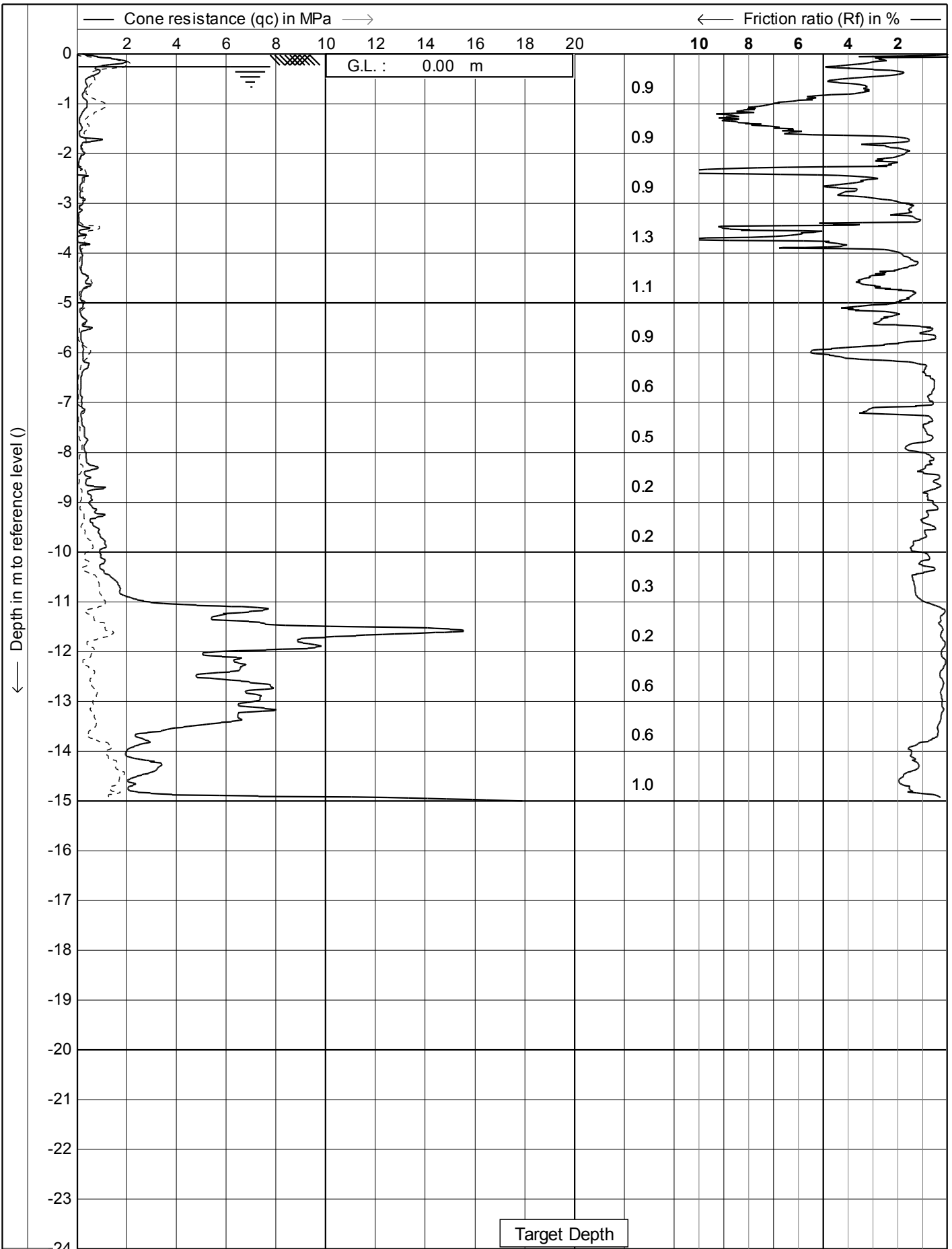
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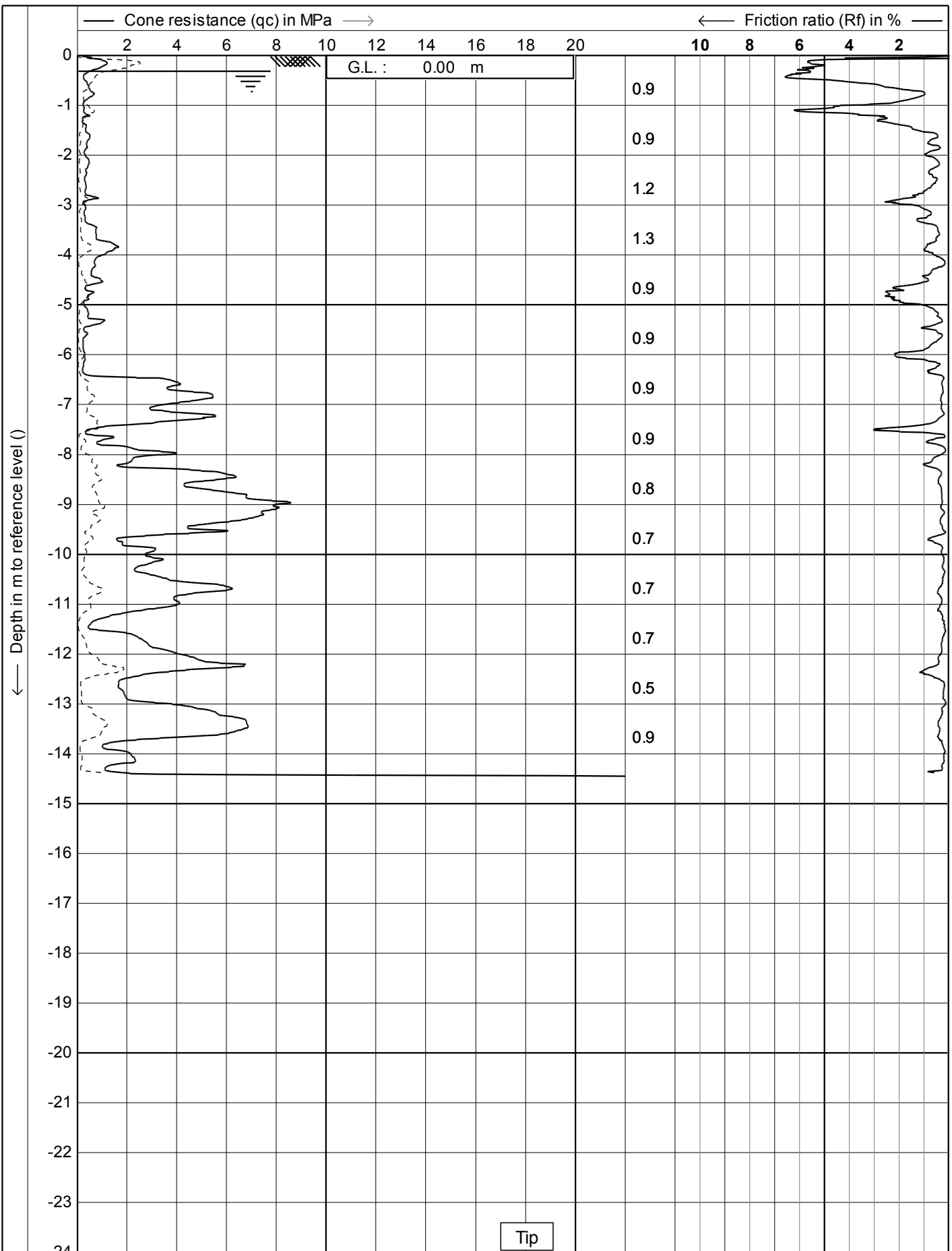
Cone no. : **C10CFIP.E59**

Project no. : **02FE04**

CPT no. : **09** 1/14

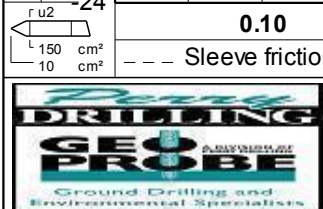
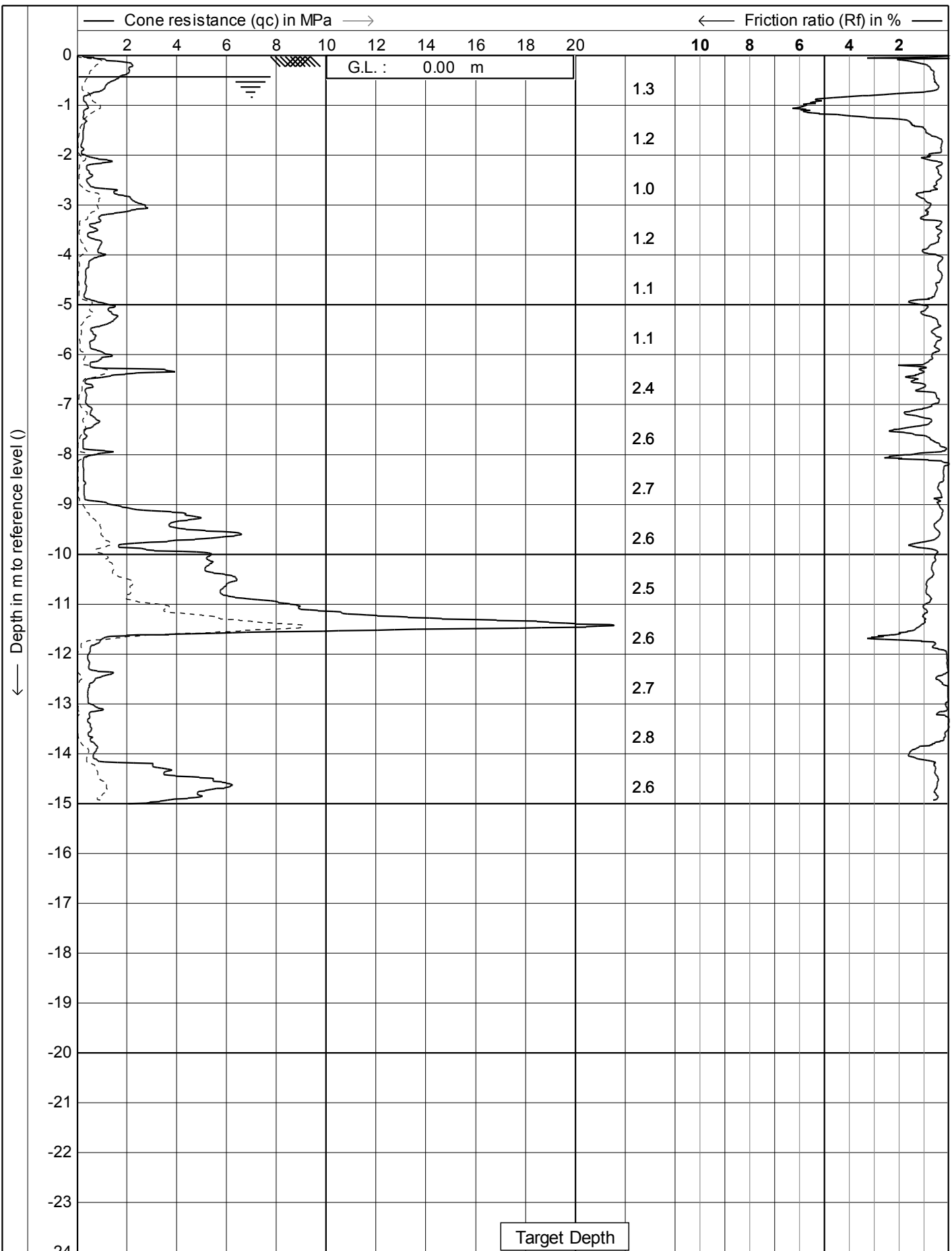






Test according A.S.T.M. Standard D 5778-95
 Project : **Five Star Estate Limited**
 Location: **Kennedy Road - Pyes Pa - Tauranga**

Date : **7-12-2007**
 Cone no. : **C10CFIIP.E59**
 Project no. : **02FE04**
 CPT no. : **12**



Test according A.S.T.M. Standard D 5778-95

Project : **Five Star Estate Limited**

Location: **Kennedy Road - Pyes Pa - Tauranga**

Date : **7-12-2007**

Cone no. : **C10CFIP.E59**

Project no. : **02FE04**

CPT no. : **13**

Engineering Log - Trial Pit

Trial Pit No. **TP 01**

Sheet 1 of 1
Project No: **GEOTTAUC13717**

Client: **FIVESTAR ESTATE LIMITED**

Date started: 5.2.2008

Principal:

Date completed: **5.2.2008**

Project: **KENNEDY ROAD, PYES PA**

Logged by: **MJP**

Trial pit location: ***Adjacent to CPT 07***

Checked by: **MJP**

Equipment type: HITACHI EX200					Pit Orientation:		Easting: m		R.L. Surface: m		
Excavation dimensions: m long m wide					Vane No: 017		Northing: m		Datum:		
excavation information					material substance						
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material Soil - Soil type; colour, structure. Grading; bedding; plasticity, sensitivity. Secondary and minor components. Rock - Colour, fabric, rock type; discontinuities, additional information.	moisture condition	consistency/ density index	vane shear 25 50 100 125 150 175 (remoulded kPa)	structure and additional observations
				1		ML	TOPSOIL	D			Alluvium
						SW	TOPSOIL	M-W			
				2		PT	SAND, fine to medium, pumiceous, light grey with topsoil inclusions, moist to wet PEAT, abundant 5 to 300mm diameter slightly decomposed, fibrous organic inclusions (wood) in a black silty matrix, saturated At 1.0m with some organic inclusions up to 700mm diameter	S			
				3							
				4							
				5							
				6			Test pit TP 01 terminated at 5 metres.				




Sketch

classification symbols and
soil description
based on New Zealand Geotechnical Society Inc 2005

notes, samples, tests	
U _{6.0}	undisturbed sample 50mm diameter
U _{6.3}	undisturbed sample 63mm diameter
D	disturbed sample
Bs	bulk sample
E	environmental sample
R	refusal

vane shear (kPa)

- remoulded
- X peak
- >>X peak greater than 200kPa

water
 10/1/98 water level
on date shown
 water inflow
 water outflow

moisture	
D	dry
M	moist
W	wet
S	saturated

consistency/ density index			
VS	Very soft	VL	very loose
S	soft	L	loose
F	firm	MD	medium dense
St	stiff	D	dense
VSt	very stiff	VD	very dense
H	hard		

Engineering Log - Trial Pit

Client: **FIVESTAR ESTATE LIMITED**

Principal:

Project: **KENNEDY ROAD, PYES PA**

Trial pit location: **Adjacent to CPT 01**

Trial Pit No. **TP 02**

Sheet 1 of 1

Project No: **GEOTTAUC13717**

Date started: **5.2.2008**

Date completed: **5.2.2008**

Logged by: **MJP**

Checked by: **MJP**

Equipment type: HITACHI EX200		Pit Orientation:		Easting: m	R.L. Surface: m
Excavation dimensions: m long m wide		Vane No: 017		Northing: m	Datum:
excavation information			material substance		
stratigraphy	water	notes samples, tests, etc	depth metres	classification symbol	material
					Soil - Soil type; colour, structure, Grading; bedding; plasticity, sensibility. Secondary and minor components. Rock - Colour, fabric, rock type; discontinuities, additional information.
					moisture condition
					consistency/ density index
					vane shear (remoulded / peak) kPa
					structure and additional observations
			1	SW	TOPSOIL
					SAND, fine, yellow-orange
					TOPSOIL
				ML	SILT, light brown, no plasticity
				Pt	PEAT, abundant 5 to 400mm diameter slightly decomposed, fibrous organic inclusions (wood) in a black silty matrix, saturated
			2		
			3		
			4		
			5		Test pit TP 02 terminated at 4.5 metres.
			6		

Sketch

classification symbols and soil description based on New Zealand Geotechnical Society Inc 2005

notes, samples, tests

U₅₀ undisturbed sample 50mm diameter
U₆₃ undisturbed sample 63mm diameter
D disturbed sample
Bs bulk sample
E environmental sample
R refusal

vane shear (kPa)

● remoulded
x peak
>>x peak greater than 200kPa

water

10/1/98 water level on date shown
water inflow
water outflow

moisture

D dry
M moist
W wet
S saturated

consistency/ density index

VS very soft VL very loose
S soft L loose
F firm MD medium dense
St stiff D dense
VSt very stiff VD very dense
H hard

Engineering Log - Trial Pit

Client: **FIVESTAR ESTATE LIMITED**

Principal:

Project: **KENNEDY ROAD, PYES PA**

Trial pit location:

Trial Pit No. **TP 03**

Sheet 1 of 1

Project No: **GEOTTAUC13717**

Date started: **5.2.2008**

Date completed: **5.2.2008**

Logged by: **MJP**

Checked by: **MJP**

Equipment type: HITACHI EX200				Pit Orientation:				Easting: m				R.L. Surface: m			
Excavation dimensions: m long m wide				Vane No: 017				Northing: m				Datum:			
excavation information					material substance										
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material Soil - Soil type; colour, structure. Grading; bedding; plasticity, sensilivity. Secondary and minor components. Rock - Colour, fabric, rock type; discontinuities, additional information.	moisture condition	consistency/ density index	vane shear (remoulded) (kPa)	structure and additional observations				
				1	XXXXXXXXXXXXXXXXXXXX	ML	SILT, yellow-light brown, friable, no plasticity	M	St	100	100	100	100	Younger Ash	
				2	XXXXXXXXXXXXXXXXXXXX	MH	SILT with trace clay; low plasticity, dark orange streaked with slightly sandy texture, moist, fissured appearance, easily broken by hand, uniform appearance	M	VSt	100	100	100	100	Matua Subgroup	
				3	XXXXXXXXXXXXXXXXXXXX				H	100	100	100	100		
				4	XXXXXXXXXXXXXXXXXXXX				St	100	100	100	100		
				5	XXXXXXXXXXXXXXXXXXXX				St	100	100	100	100		
				6	XXXXXXXXXXXXXXXXXXXX		at 3.0m becoming moist to wet, orange streaked light grey, fine silt	M-W	F	100	100	100	100		
				6			Test pit TP 03 terminated at 5.5 metres.								

Sketch

classification symbols and soil description based on New Zealand Geotechnical Society Inc 2005

notes, samples, tests

U₅₀ undisturbed sample 50mm diameter
U₆₃ undisturbed sample 63mm diameter
D disturbed sample
Bs bulk sample
E environmental sample
R refusal

vane shear (kPa)
● remoulded
× peak
>>X peak greater than 200kPa

water
10/1/98 water level on date shown
water inflow
water outflow

moisture
D dry
M moist
W wet
S saturated

consistency/ density index
VS very soft VL very loose
S soft L loose
F firm MD medium dense
St stiff D dense
VSt very stiff VD very dense
H hard

Engineering Log - Trial Pit

Client: **FIVESTAR ESTATE LIMITED**

Principal:

Project: **KENNEDY ROAD, PYES PA**

Trial pit location: **Adjacent to CPT 06**

Trial Pit No. **TP 04**

Sheet 1 of 1
Project No: **GEOTTAUC13717**

Date started: **5.2.2008**

Date completed: **5.2.2008**

Logged by: **MJP**

Checked by: **MJP**

Equipment type: HITACHI EX200				Pit Orientation :		Easting: m		R.L. Surface: m			
Excavation dimensions: m long m wide				Vane No: 017		Northing: m		Datum:			
excavation information					material substance						
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material Soil - Soil type; colour, structure. Grading; bedding; plasticity, sensitivity. Secondary and minor components. Rock - Colour, fabric, rock type; discontinuities, additional information.	moisture condition	consistency/ density index	vane shear (remoulded /peak) kPa	structure and additional observations
	▼			1	XXXXXXXXXXXXXXXXXXXX	ML	TOPSOIL SILT with some sand; occasional white streaking light grey with common bands of topsoil, moist to wet	M		25 75 100 125 150 175	Alluvium
				2	XXXXXXXXXXXXXXXXXXXX	CL	TOPSOIL SILT, with some clay, slightly plastic, light grey streaked brown with common slightly decomposed, fibrous 5 to 300mm diameter organic inclusions (wood)	M- W			
				3	XXXXXXXXXXXXXXXXXXXX			S			
				4	XXXXXXXXXXXXXXXXXXXX		at 3.5m becoming dark brown				
				5	XXXXXXXXXXXXXXXXXXXX		at 4.3m becoming brown and light grey				
				6	XXXXXXXXXXXXXXXXXXXX		Test pit TP 04 terminated at 5.5 metres.				

Sketch

classification symbols and
soil description
based on New Zealand Geotechnical Society Inc 2005

notes, samples, tests
U₅₀ undisturbed sample 50mm diameter
U₆₃ undisturbed sample 63mm diameter
D₅ disturbed sample
Bs bulk sample
E environmental sample
R refusal

vane shear (kPa)
● remoulded
x peak
>>x peak greater than 200kPa

water
10/1/98 water level
on date shown
water inflow
water outflow

moisture
D dry
M moist
W wet
S saturated

consistency/ density Index
VS very soft VL very loose
S soft L loose
F firm MD medium dense
St stiff D dense
VS_t very stiff VD very dense
H hard

Engineering Log - Trial Pit

Client: **FIVESTAR ESTATE LIMITED**
Principal:
Project: **KENNEDY ROAD, PYES PA**
Trial pit location: **Adjacent to CPT 05**

Trial Pit No. **TP 05**
Sheet 1 of 1
Project No: **GEOTTAUC13717**
Date started: **5.2.2008**
Date completed: **5.2.2008**
Logged by: **MJP**
Checked by: **MJP**

Equipment type: HITACHI EX200				Pit Orientation:		Easting: m		R.L. Surface: m			
Excavation dimensions: m long m wide				Vane No: 017		Northing: m		Datum:			
excavation information				material substance							
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material Soil - Soil type; colour, structure. Grading; bedding; plasticity, sensitivity. Secondary and minor components. Rock - Colour, fabric, rock type; discontinuities, additional information.	moisture condition	consistency/ density index	vane shear (remoulded /peak) kPa	structure and additional observations
	▼			1	XXXXXX	ML	TOPSOIL	M		25	Alluvium
					XXXXXX	Pt	SILT with trace sand; no plasticity, light brown and light grey streaked brown with common bands of topsoil up to 10mm thick, moist	S		50	
					XXXXXX	SM	PEAT, abundant 5 to 200mm diameter slightly decomposed to moderately decomposed organic inclusions (wood) in a dark brown silty matrix, saturated (perched watertable)	M-W		75	
					XXXXXX		Silty SAND, light brown streaked light grey, moist to wet			100	
					XXXXXX					150	
	▼			2	XXXXXX					175	
				3	XXXXXX						
				4	XXXXXX	Pt	PEAT, abundant 5 to 150mm diameter slightly decomposed to moderately decomposed organic inclusions (wood) in a dark brown-black silty matrix, moist to wet				
					XXXXXX	CL	Clayey SILT, light grey, slightly sticky, low plasticity, wet	W			
	▼			5	XXXXXX						
				6			Test pit TP 05 terminated at 5.5 metres.				

Sketch

classification symbols and soil description based on New Zealand Geotechnical Society Inc 2005

notes, samples, tests
U₂₀ undisturbed sample 50mm diameter
U₆₃ undisturbed sample 63mm diameter
D disturbed sample
Bs bulk sample
E environmental sample
R refusal

vane shear (kPa)
● remoulded
x peak
>>x peak greater than 200kPa

water
10/1/98 water level on date shown
water inflow
water outflow

moisture
D dry
M moist
W wet
S saturated

consistency/ density index
VS very soft VL very loose
S soft L loose
F firm MD medium dense
St stiff D dense
VSt very stiff VD very dense
H hard

Engineering Log - Trial Pit

Client: **FIVESTAR ESTATE LIMITED**

Principal:

Project: **KENNEDY ROAD, PYES PA**

Trial pit location: **Adjacent to CPT 13**

Trial Pit No. **TP 06**

Sheet **1 of 1**

Project No: **GEOTTAUC13717**

Date started: **5.2.2008**

Date completed: **5.2.2008**

Logged by: **MJP**

Checked by: **MJP**

Equipment type: HITACHI EX200				Pit Orientation:				Easting: m				R.L. Surface: m					
Excavation dimensions: m long m wide				Vane No: 017				Northing: m				Datum:					
excavation information					material substance												
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material Soil - Soil type; colour, structure. Grading; bedding; plasticity, sensitivity. Secondary and minor components. Rock - Colour, fabric, rock type; discontinuities, additional information.	moisture condition	consistency/ density index	vane shear (remoulded /peak) kPa				structure and additional observations			
										25	50	75	100	125	150	175	
						SW	TOPSOIL SAND and gravels; fine to medium (pumiceous), orange streaked yellow and light grey, grading to fine silty sands, dry	D									Alluvium
				1		ML	SILT, low plasticity, dark brown and black streaked light brown with common topsoil bands up to 15mm at 1.3m becoming light brown with rare to common slightly decomposed to moderately decomposed organic inclusions (wood) up to 100mm diameter, wet	W									
				2													
				3		ML	Sandy SILT, fine, light grey, wet, sensitive, no plasticity										
				4													
				5			at 3.8m with a large tree stump included, slightly decomposed										
				6			Test pit TP 06 terminated at 5.5 metres.										

Sketch

classification symbols and
soil description
based on New Zealand Geotechnical Society Inc 2005

notes, samples, tests
U₅₀ undisturbed sample 50mm diameter
U₆₃ undisturbed sample 63mm diameter
D disturbed sample
Bs bulk sample
E environmental sample
R refusal

vane shear (kPa)
● remoulded
X peak
>>X peak greater than 200kPa

water
10/1/98 water level
on date shown
water inflow
water outflow

moisture
D dry
M moist
W wet
S saturated

consistency/ density index
VS very soft VL very loose
S soft L loose
F firm MD medium dense
St stiff D dense
VSt very stiff VD very dense
H hard

Engineering Log - Excavation

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location: **Northern end of proposed access road**

Excavation ID. **TP18**

sheet: 1 of 1

project no. **GENZTAUC13086AL**


date excavated: **22 May 2014**

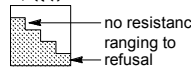
date completed: **22 May 2014**

logged by: **G. Nijhuis**

checked by: **R. Telford**

position: E: 367,842; N: 800,766 (WGS84) surface elevation: 10.00 m (Moturiki) pit orientation: E-W
equipment type: 10t Excavator Excavator excavation method: Excavator excavation dimensions: 3.5 m long 0.6 m wide vane id.: 4523

excavation information					material substance											
method	support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	shear vane @ remoulded @ peak (kPa)	structure and additional observations			
E	N	1			10.0				Sandy SILT to Silty SAND: non-plastic, orange brown with white lenses.	M	H	50 100 150 200	FILL			
		</														

method	penetration	samples & field tests	classification symbol & soil description based on Unified Classification System	consistency / relative density
N natural exposure X existing excavation BH backhoe bucket B bulldozer blade R ripper E excavator	 no resistance ranging to refusal water 10-Oct-12 water level on date shown water inflow water outflow	U## undisturbed sample ##mm diameter D disturbed sample B bulk disturbed sample E environmental sample HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shearpeak/remoulded (uncorrected kPa) R refusal	moisture D dry M moist W wet W _P plastic limit W _L liquid limit	VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
support N none S shoring				

Engineering Log - Excavation

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location: **Middle of proposed access road**

Excavation ID. **TP19**

sheet: 1 of 1

project no. **GENZTAUC13086AL**

date excavated: **22 May 2014**


date completed: **22 May 2014**

logged by: **G. Nijhuis**

checked by: **R. Telford**

position: E: 367,844; N: 800,748 (WGS84) surface elevation: 8.50 m (Moturiki) pit orientation: E-W
equipment type: 10t Excavator Excavator excavation method: Excavator excavation dimensions: 3.5 m long 0.6 m wide vane id.:

excavation information					material substance				
method	support	penetration	water	samples & field tests	depth (m)	graphic log	classification symbol	material description	moisture condition
N		1			8.0			SAND: fine to coarse grained, white. TOPSOIL	D
		2			7.5			Sandy GRAVEL: fine to coarse grained. ORGANIC SILT: non plastic, grey brown.	W
		3			7.0			PEAT: dark brown, fibrous, ~50% organics, slightly to highly decomposed.	
					6.5				
					6.0				
					5.5				
					5.0				
					4.5			Test pit TP19 terminated at 3.8 m Machine limit	
					4.0				
					3.5				
					3.0				
					2.5				
					2.0				
					1.5				
					1.0				
					0.5				
					0.0				

method	penetration	samples & field tests	classification symbol & soil description based on Unified Classification System	consistency / relative density
N natural exposure X existing excavation BH backhoe bucket B bulldozer blade R ripper E excavator	 <p>no resistance ranging to refusal</p> <p>water</p> <p>10-Oct-12 water level on date shown</p> <p>water inflow</p> <p>water outflow</p>	U## undisturbed sample ##mm diameter D disturbed sample B bulk disturbed sample E environmental sample HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane sheapeak/remoulded (uncorrected kPa) R refusal	moisture D dry M moist W wet W _p plastic limit W _L liquid limit	VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
support N none S shoring				

Engineering Log - Excavation

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location: **Southern end of proposed access road**

Excavation ID: **TP20**

sheet: 1 of 1

project no. **GENZTAUC13086AL**






date excavated: **22 May 2014**

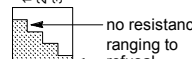
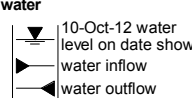
date completed: **22 May 2014**

logged by: **G. Nijhuis**

checked by: **R. Telford**

position: E: 367,853; N: 800,725 (WGS84) surface elevation: 8.00 m (Moturiki) pit orientation: E-W
equipment type: 10t Excavator Excavator excavation method: Excavator excavation dimensions: 3.5 m long 0.6 m wide vane id.:

excavation information					material substance								structure and additional observations		
method	support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	shear vane @ remoulded @ peak (kPa)			
↑ ↓ E	N	1			8.0				ORGANIC SILT: non plastic, dark brown.	M					
		2				Sandy SILT: non plastic, sand is medium to coarse.									
		3				ORGANIC SILT: low liquid limit, dark brown.									
						7.5	0.5			ORGANIC SILT: low liquid limit, dark brown.	W	F	Ⓟ		
						7.0	1.0			SAND: coarse grained, pale grey.					
										PEAT: dark brown, slightly to highly decomposed, 50% organic material.					
						6.5	1.5			SILT: non plastic, blue grey, minor sand.					
						6.0	2.0								
						5.5	2.5								
						5.0	3.0								
		4.5	3.5						becoming pale brown streaked orange						
									difficult to excavate due to water inflow						
					4.0	4.0			Test pit TP20 terminated at 3.7 m Machine limit						
					3.5	4.5									

method	penetration	samples & field tests	classification symbol & soil description	consistency / relative density
N natural exposure X existing excavation BH backhoe bucket B bulldozer blade R ripper E excavator	 water 	U## undisturbed sample ##mm diameter D disturbed sample B bulk disturbed sample E environmental sample HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane sheapeak/remoulded (uncorrected kPa) R refusal	based on Unified Classification System moisture D dry M moist W wet W _p plastic limit W _L liquid limit	VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
support N none S shoring				

Engineering Log - Excavation

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location:

Excavation ID: **TP21**

sheet: 1 of 1

project no. **GENZTAUC13086AL**

date excavated: **22 May 2014**

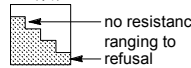
date completed: **22 May 2014**

logged by: **G. Nijhuis**

checked by: **R. Telford**

position: E: 367,874; N: 800,634 (WGS84) surface elevation: 7.50 m (Moturiki) pit orientation: E-W
equipment type: 10t Excavator Excavator excavation method: Excavator excavation dimensions: 3.5 m long 0.6 m wide vane id.:

excavation information					material substance				
method	support	penetration	water	samples & field tests	depth (m)	graphic log	classification symbol	material description	structure and additional observations
N		1			7.5			ORGANIC SILT: non plastic, dark brown.	TOPSOIL
		2						ORGANIC SILT: non plastic, black and white.	ALLUVIAL DEPOSITS
		3			7.0			SAND: coarse grained.	
								ORGANIC SILT	
					6.5			PEAT	
								SAND	
					6.0			ORGANIC SILT	Minor Inflow from sand layers
					5.5			CLAY/SILT : pale grey, medium to high plasticity.	
					5.0				
								Slightly Sandy SILT : yellow-orange, non-plastic.	Moderate Inflow
					4.5				
					4.0				
					3.5				
					3.0				
								Test pit TP21 terminated at 3.8 m Machine limit	

method	penetration	samples & field tests	classification symbol & soil description based on Unified Classification System	consistency / relative density
N natural exposure X existing excavation BH backhoe bucket B bulldozer blade R ripper E excavator	 <p>no resistance ranging to refusal</p> <p>water</p> <p>10-Oct-12 water level on date shown</p> <p>water inflow</p> <p>water outflow</p>	<p>U## undisturbed sample ##mm diameter</p> <p>D disturbed sample</p> <p>B bulk disturbed sample</p> <p>E environmental sample</p> <p>HP hand penetrometer (kPa)</p> <p>N standard penetration test (SPT)</p> <p>N* SPT - sample recovered</p> <p>Nc SPT with solid cone</p> <p>VS vane sheapeak/remoulded (uncorrected kPa)</p> <p>R refusal</p>	<p>moisture</p> <p>D dry</p> <p>M moist</p> <p>W wet</p> <p>W_P plastic limit</p> <p>W_L liquid limit</p>	<p>VS very soft</p> <p>S soft</p> <p>F firm</p> <p>St stiff</p> <p>VSt very stiff</p> <p>H hard</p> <p>Fb friable</p> <p>VL very loose</p> <p>L loose</p> <p>MD medium dense</p> <p>D dense</p> <p>VD very dense</p>

Engineering Log - Excavation

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location:

Excavation ID. **TP22**

sheet: 1 of 1

project no. **GENZTAUC13086AL**

date excavated: **22 May 2014**


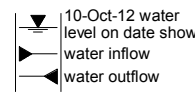
date completed: **22 May 2014**

logged by: **G. Nijhuis**

checked by: **R. Telford**

position: E: 367,831; N: 800,585 (WGS84) surface elevation: 8.00 m (Moturiki) pit orientation: E-W
equipment type: 10t Excavator Excavator excavation method: Excavator excavation dimensions: 3.5 m long 0.6 m wide vane id.:

excavation information					material substance				
method	support	penetration	water	samples & field tests	depth (m)	graphic log	classification symbol	material description	structure and additional observations
N		1			8.0			PEAT: dark brown, fibrous, large trees and branches, slightly to heavily decomposed.	ALLUVIAL DEPOSITS
		2			7.5				
		3			7.0				
					6.5			Sandy SILT	Minor water inflow at 1.0m
					6.0			ORGANIC SILT	
					5.5			Clayey SILT: medium to high liquid limit, grey.	
					5.0				
					4.5			Test pit TP22 terminated at 3.5 m Machine limit	
					4.0				
					3.5				

method	penetration	samples & field tests	classification symbol & soil description based on Unified Classification System	consistency / relative density
N natural exposure X existing excavation BH backhoe bucket B bulldozer blade R ripper E excavator	 water 	U## undisturbed sample ##mm diameter D disturbed sample B bulk disturbed sample E environmental sample HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear peak/remoulded (uncorrected kPa) R refusal	 <	

Engineering Log - Excavation

client: **The Lakes (2012) Ltd**

principal:

project: ***The Lakes Stages 2U & 2V***

location:

Excavation ID. **TP23**

sheet: 1 of 1

project no. **GENZTAUC13086AL**

date excavated: **22 May 2014**

date completed: **22 May 2014**

logged by: **G. Nijhuis**

checked by: **R.Telford**

position: E: 367,750; N: 800,501 (WGS84)

surface elevation: 8.50 m (Moturiki)






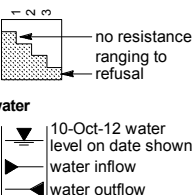
pit orientation: E-W

equipment type: 10t Excavator Excavator

excavation method: Excavator

excavation dimensions: 3.5 m long 0.6 m wide

vane id.:

excavation information						material substance							
method	support	penetration	water	samples & field tests	depth (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	shear vane ⊗ remoulded ⊙ peak (kPa)	structure and additional observations
↑ E ↓	N	1 2 3			0.0	0.0			Silty SAND: non plastic, dark brown, iron staining.	D to M		80 100 120 140 160 180 200	ALLUVIAL DEPOSITS
					-8.0	0.5			ORGANIC SILT: non plastic, dark brown black.				
					-7.5	1.0			Clayey SILT: medium to high liquid limit, grey blue.	W			Moderate inflow at 1.0m depth
					-7.0	1.5			becoming organic rich				
					-6.5	2.0			two large branches/logs up to 300mm diameter				
					-6.0	2.5							
					-5.5	3.0							
					-5.0	3.5							
					-4.5	4.0			Test pit TP23 terminated at 3.8 m Machine limit				
					-4.0	4.5							
method N natural exposure X existing excavation BH backhoe bucket B bulldozer blade R ripper E excavator support N none S shoring				penetration  water 10-Oct-12 water level on date shown water inflow water outflow		samples & field tests U## undisturbed sample ##mm diameter D disturbed sample B bulk disturbed sample E environmental sample HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane sheapeak/remoulded (uncorrected kPa) R refusal			classification symbol & soil description based on Unified Classification System moisture D dry M moist W wet W _p plastic limit W _L liquid limit		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense		

Engineering Log - Excavation

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location:

Excavation ID. **TP24**

sheet: 1 of 1

project no. **GENZTAUC13086AL**

date excavated: **22 May 2014**

date completed: **22 May 2014**

logged by: **G. Nijhuis**

checked by: **R. Telford**

position: E: 367,756; N: 800,451 (WGS84)

surface elevation: 7.50 m (Moturiki)

pit orientation: E-W

equipment type: 10t Excavator Excavator

excavation method: Excavator

excavation dimensions: 3.5 m long 0.6 m wide

vane id.:

excavation information					material substance							
method	support	penetration	water	samples & field tests	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	shear vane ⊕ remoulded ⊙ peak (kPa)	structure and additional observations
↑ ↓ E	N	1 2 3			6.0			ORGANIC SILT: dark brown.				ALLUVIAL DEPOSITS
					7.0			0.5				
					6.5			SAND: fine to coarse grained, grey-brown.				Unable to excavate below 2.0m due to water inflow and pit wall collapse
					6.0			PEAT: dark brown, ~ 25% wood fibres, some branches.				
					5.5			Test pit TP24 terminated at 2.0 m Flooding				
					5.0							
					4.5							
					4.0							
					3.5							
					3.0							
					2.5							
					2.0							
					1.5							
					1.0							
					0.5							
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					-71.5							
					-72.0							
					-72.5							
					-73.0							
					-73.5							
					-74.0							
					-74.5							
					-75.0							
					-75.5							
					-76.0							
					-76.5							
					-77.0							
					-77.5							
					-78.0							
					-78.5							
					-79.0							
					-79.5							
					-80.0							

Engineering Log - Excavation

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location:

Excavation ID. **TP25**

sheet: 1 of 1

project no. **GENZTAUC13086AL**

date excavated: **22 May 2014**

date completed: **22 May 2014**

logged by: **G. Nijhuis**



checked by: **R. Telford**

position: E: 367,848; N: 800,685 (WGS84) surface elevation: 7.50 m (Moturiki) pit orientation: E-W
equipment type: 10t Excavator Excavator excavation method: Excavator excavation dimensions: 3.5 m long 0.6 m wide vane id.:

excavation information					material substance				
method	support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description
N		1			7.5				SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components
E		2			-7.0	0.5			PEAT: dark brown.
		3			-6.5	1.0			Test pit TP25 terminated at 1.0 m Flooding
					-6.0	1.5			
					-5.5	2.0			
					-5.0	2.5			
					-4.5	3.0			
					-4.0	3.5			
					-3.5	4.0			
					-3.0	4.5			

ALLUVIAL DEPOSITS

Inflow from 0.1m depth. Excavation unable to continue due to high water inflows and pit wall collapse.

method	penetration	samples & field tests	classification symbol & soil description	consistency / relative density
N natural exposure X existing excavation BH backhoe bucket B bulldozer blade R ripper E excavator	 <p>no resistance ranging to refusal</p> <p>water</p>  <p>10-Oct-12 water level on date shown water inflow water outflow</p>	U## undisturbed sample ##mm diameter D disturbed sample B bulk disturbed sample E environmental sample HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane sheapeak/remoulded (uncorrected kPa) R refusal	based on Unified Classification System	VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
support N none S shoring			moisture D dry M moist W wet W _p plastic limit W _L liquid limit	

Engineering Log - Excavation

Excavation ID. **TP26**

sheet: 1 of 1

project no. **GENZTAUC13086AL**

date excavated: **22 May 2014**


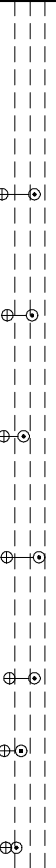
date completed: **22 May 2014**



logged by: **G. Nijhuis**

checked by: **R. Telford**

client: ***The Lakes (2012) Ltd***
principal:
project: ***The Lakes Stages 2U & 2V***
location:

position: E: 367,908; N: 800,689 (WGS84)	surface elevation: 12.50 m (Moturiki)	pit orientation: N-S	
equipment type: 10t Excavator Excavator	excavation method: Excavator	excavation dimensions: 3.5 m long 0.6 m wide	vane id.:

excavation information						material substance								
method	support	penetration			water	samples & field tests	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	shear vane ⊕ remoulded ⊙ peak (kPa) 50 100 150 200	structure and additional observations
↑ N ↓ E	N	1 2 3				0.0			Sandy SILT: non plastic, dark brown, friable.	M	VSt		TOPSOIL	
						SILT: low liquid limit, orange brown, some fine to coarse sand, black specks.			YOUNGER ASH					
						SAND: fine to coarse grained, yellow-orange.			ROTOEHU ASH					
						CLAY / SILT : pale brown, medium plasticity.			MATUA SUBGROUP?					
						Clayey SILT: medium to high liquid limit, white.								
						-12.0								
						-11.5								
						-11.0								
						-10.5					S			
						-10.0					VSt			
						-9.5					St			
						-9.0			becoming orange-brown					
						-9.0			becoming wet	W				
									Test pit TP26 terminated at 3.6 m Machine limit					
						-8.5								
						-8.0								

method N natural exposure X existing excavation BH backhoe bucket B bulldozer blade R ripper E excavator support N none S shoring	penetration  no resistance refusal water  10-Oct-12 water level on date shown water inflow water outflow	samples & field tests U## undisturbed sample ##mm diameter D disturbed sample B bulk disturbed sample E environmental sample HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear peak/remoulded (uncorrected kPa) R refusal	classification symbol & soil description based on Unified Classification System moisture D dry M moist W wet W _P plastic limit W _L liquid limit	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Engineering Log - Excavation

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location:

Excavation ID. **TP27**

sheet: 1 of 1

project no. **GENZTAUC13086AL**

date excavated: **22 May 2014**

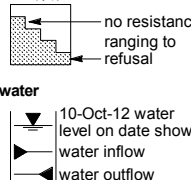
date completed: **22 May 2014**

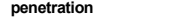
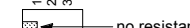
logged by: **G. Nijhuis**

checked by: **R. Telford**

position: E: 367,938; N: 800,573 (WGS84) surface elevation: 17.50 m (Moturiki) pit orientation: N-S
equipment type: 10t Excavator Excavator excavation method: Excavator excavation dimensions: 3.5 m long 0.6 m wide vane id.:

excavation information					material substance				
method	support	penetration	water	samples & field tests	depth (m)	graphic log	classification symbol	material description	structure and additional observations
N		1			17.5			SILT: non plastic, minor fine to coarse sand.	TOPSOIL
		2			17.0			Sandy SILT: non plastic, orange-brown.	YOUNGER ASH
		3			16.5				
					16.0				
					15.5				
					15.0			Sandy SILT: non plastic, orange.	VOLCANIC ASH
					14.5			Silty SAND: coarse grained, orange, pumiceous.	
					14.0			Test pit TP27 terminated at 3.5 m Machine limit	
					13.5				
					13.0				

method	penetration	samples & field tests	classification symbol & soil description	consistency / relative density
N natural exposure X existing excavation BH backhoe bucket B bulldozer blade R ripper E excavator	 <p>no resistance ranging to refusal</p> <p>water</p> <p>10-Oct-12 water level on date shown</p> <p>water inflow</p> <p>water outflow</p>	U## undisturbed sample ##mm diameter D disturbed sample B bulk disturbed sample E environmental sample HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane sheapeak/remoulded (uncorrected kPa) R refusal	based on Unified Classification System moisture D dry M moist W wet W _P plastic limit W _L liquid limit	VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense

method	penetration	samples & field tests	classification symbol & soil description based on Unified Classification System	consistency / relative density
N natural exposure		U## undisturbed sample ##mm diameter	moisture D dry M moist W wet W _p plastic limit W _L liquid limit	VS very soft
X existing excavation		D disturbed sample		S soft
BH backhoe bucket		B bulk disturbed sample	F firm	
B bulldozer blade		E environmental sample	St stiff	
R ripper		HP hand penetrometer (kPa)	VS _t very stiff	
E excavator		N standard penetration test (SPT)	H hard	
		N* SPT - sample recovered	Fb friable	
		Nc SPT with solid cone	VL very loose	
		VS vane shear peak/remoulded (uncorrected kPa)	L loose	
			MD medium dense	
			D dense	
			VD very dense	
support	water 	R refusal		
N none	10-Oct-12 water level on date shown			
S shoring	water inflow			
	water outflow			

Engineering Log - Excavation

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location:

Excavation ID. **TP29**

sheet: 1 of 1

project no. **GENZTAUC13086AL**

date excavated: **22 May 2014**

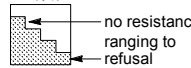
date completed: **22 May 2014**

logged by: **G. Nijhuis**

checked by: **R. Telford**

position: E: 367,868; N: 800,443 (WGS84) surface elevation: 19.50 m (Moturiki) pit orientation: N-S
equipment type: 10t Excavator Excavator excavation method: Excavator excavation dimensions: 3.5 m long 0.6 m wide vane id.:

excavation information					material substance								
method	support	penetration	water	samples & field tests	SRL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	shear vane ⊕ remoulded ⊙ peak (kPa)	structure and additional observations
↑ 													

method	penetration	samples & field tests	classification symbol & soil description based on Unified Classification System	consistency / relative density
N natural exposure X existing excavation BH backhoe bucket B bulldozer blade R ripper E excavator	 <p>no resistance ranging to refusal</p> <p>water</p> <p>10-Oct-12 water level on date shown</p> <p>water inflow</p> <p>water outflow</p>	U## undisturbed sample ##mm diameter D disturbed sample B bulk disturbed sample E environmental sample HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane sheapeak/remoulded (uncorrected kPa) R refusal	moisture D dry M moist W wet W _P plastic limit W _L liquid limit	VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
support N none S shoring				

Engineering Log - Cored Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location: **Near culvert crossing**

Borehole ID. **MH28**

sheet: 1 of 4

project no. **GENZTAUC13086AL**

date started: **25 Jul 2014**

date completed: **25 Jul 2014**

logged by: **S.Campbell**

checked by: **R.Telford**

position: E: 367,817; N: 800,752 (BOPC2000) surface elevation: 8.00 m (Moturiki) angle from horizontal: 90°
drill model: Morooka, Track mounted drilling fluid: casing diameter : NW vane id.:

drilling information			material substance			rock mass defects		
method & support	water	depth (m)	graphic log	material description	weathering & alteration	estimated strength & Is(50)	samples, field tests & Is(50) (MPa)	defect spacing (mm)
				start coring at 0.00m				
				TOPSOIL: Sandy ORGANIC SILT: low to medium plasticity, dark brown mottled brown grey, m, some clay, moist; TOPSOIL.				
		0.5		SILT: non plastic, grey brown with dark orange brown specks, some very fine grained sand, some completely weathered pumice inclusions (pale grey sandy silt), moist.				
		0.75		0.75 m: 20mm coarse grained sand lense				
		1.0		ORGANIC SILT: low plasticity, dark brown, amorphous. Minor highly decomposed plant fibers, moist to wet, soft; PEAT.				
		1.5		0.90 m: wood fragments from 0.9m to 3m with occasional interbedded silt lenses <200mm				
		2.0						
		2.5						
		3.0		3.00 m: clayey silt lense (medium plasticity, grey becoming dark brown)				
		3.5		3.05 m: becoming low plasticity, dark brown, <60% fibrous wood inclusions (PEAT)				
		4.0						
		4.5		4.50 m: 15% wood inclusions				
		5.0						
		5.30		5.30 m: becoming dark grey brown				

method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore NMLCNMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) SPT standard penetration test	water 10/10/12, water level on date shown water inflow complete drilling fluid loss partial drilling fluid loss water pressure test result (lugeons) for depth interval shown	graphic log / core recovery core recovered (graphic symbols indicate material) no core recovered core run details barrel withdrawn TCR = Total Core Recovery (%) SCR = Solid Core Recovery (%) RQD = Rock Quality Designation (%)	weathering & alteration* RS residual soil CW completely weathered HW highly weathered MW moderately weathered SW slightly weathered UW unweathered *W replaced with A for alteration strength VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong	defect type BS bedding shear PT parting JT joint SZ shear zone SS shear surface CO contact CS crushed seam SM seam roughness SL slickensided POL polished SO smooth RO rough VR very rough	planarity PL planar CU curved UN undulating ST stepped IR irregular coating CN clean SN stain VN veneer CO coating
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Engineering Log - Cored Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location: **Near culvert crossing**

Borehole ID. **MH28**

sheet: 2 of 4

project no. **GENZTAUC13086AL**

date started: **25 Jul 2014**









date completed: **25 Jul 2014**

logged by: **S.Campbell**

checked by: **R.Telford**

position: E: 367,817; N: 800,752 (BOPC2000) surface elevation: 8.00 m (Moturiki) angle from horizontal: 90°
drill model: Morooka, Track mounted drilling fluid: casing diameter : NW vane id.:

drilling information				material substance				rock mass defects			
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 X = axial O = diametral a = axial d = diametral	samples, field tests & Is(50) (MPa)	core run details	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)
			6.0		Clayey SILT: medium plasticity, pale brown, minor 30x10mm wood inclusions, moist, soft.				TCR= 95%		ALLUVIAL DEPOSITS (PEAT+ ORGANIC SILT AND CLAYS)
			6.5		SILT: low plasticity, pale grey, minor fine grained sand, moist, soft.			VS 16 /5 kPa SPT 1, 0, 0, 0, 0, 0 N*=0	TCR= 100%		
			7.0		Silty CLAY: medium to high plasticity, pale brown grey, wet.				TCR= 100%		ALLUVIAL DEPOSITS (NON ORGANIC SILTS + SANDS)
			7.5		SILT: low to medium plasticity, pale brown grey, some clay, some fine to medium grained sand, moist to wet. 7.00 m: becoming pale brown grey, sand is absent						
			8.0		Sandy SILT: non plastic, pale grey, sand is very fine grained, moist.			SPT 1, 0, 0, 0, 0, 0 N*=0	TCR= 20%		
			8.5		Silty SAND: very fine grained, pale grey, dilative, dry, very loose.				TCR= 71%		
			9.0		SAND: fine to coarse grained, well graded, pale grey, trace to minor coarse grained rounded pumice gravels, moist to wet, very loose to loose.			SPT 1, 0, 0, 0, 0, 0 N*=0	TCR= 15%		
			9.5								
			10.0						TCR= 100%		
			10.5		10.05 m: orange brown lense <50mm, sand becoming fine to coarse grained with trace pink grey inclusions <5mm below 10.1m 10.30 m: becoming orange brown below 10.3m 10.45 m: sand becoming dark brown			SPT 3, 3, 4, 5, 6, 5 N*=20	TCR= 80%		

method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore NMLCNMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) SPT standard penetration test	water  10/10/12, water level on date shown  water inflow  complete drilling fluid loss  partial drilling fluid loss  water pressure test result (lugeons) for depth interval shown	graphic log / core recovery  core recovered (graphic symbols indicate material)  no core recovered core run details  barrel withdrawn TCR = Total Core Recovery (%) SCR = Solid Core Recovery (%) RQD = Rock Quality Designation (%)	weathering & alteration* RS residual soil CW completely weathered HW highly weathered MW moderately weathered SW slightly weathered UW unweathered *W replaced with A for alteration strength VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong	defect type BS bedding shear PT parting JT joint SZ shear zone SS shear surface CO contact CS crushed seam SM seam roughness SL slickensided POL polished SO smooth RO rough VR very rough	planarity PL planar CU curved UN undulating ST stepped IR irregular coating CN clean SN stain VN veneer CO coating
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Engineering Log - Cored Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location: **Near culvert crossing**

Borehole ID. **MH28**

sheet: 3 of 4

project no. **GENZTAUC13086AL**

date started: **25 Jul 2014**









date completed: **25 Jul 2014**

logged by: **S.Campbell**

checked by: **R.Telford**

position: E: 367,817; N: 800,752 (BOPC2000) surface elevation: 8.00 m (Moturiki) angle from horizontal: 90°
drill model: Morooka, Track mounted drilling fluid: casing diameter : NW vane id.:

drilling information				material substance				rock mass defects			
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 X = axial O = diametral a = axial d = diametral	samples, field tests & Is(50) (MPa) a = axial d = diametral	core run details	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)
					SAND: fine to coarse grained, well graded, pale grey, trace to minor coarse grained rounded pumice gravels, moist to wet, very loose to loose. (continued)				TCR= 95%		ALLUVIAL DEPOSITS (NON ORGANIC SILTS + SANDS)
			11.5								
			12.0								
			12.5		12.45 m: some fine to coarse rounded reddish brown gravels (possible weathered rhyolite)						
			13.0								
			13.5		Gravelly SILT: non plastic, cream grey, gravels are fine to coarse grained, rounded and comprise pumice and rhyolite, moist to wet. SILT: non plastic, pale grey, dilative, moist to wet.						SPT sank 450mm under hammer weight
			14.0								
			14.5								
			15.0								
			15.5								
			16.0		Sandy SILT: non plastic, pale grey, sand is very fine grained, moist to wet.						

method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore NMLCNMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) SPT standard penetration test	water  10/10/12, water level on date shown  water inflow  complete drilling fluid loss  partial drilling fluid loss  water pressure test result (lugeons) for depth interval shown	graphic log / core recovery  core recovered (graphic symbols indicate material)  no core recovered core run details  barrel withdrawn TCR = Total Core Recovery (%) SCR = Solid Core Recovery (%) RQD = Rock Quality Designation (%)	weathering & alteration* RS residual soil CW completely weathered HW highly weathered MW moderately weathered SW slightly weathered UW unweathered *W replaced with A for alteration strength VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong	defect type BS bedding shear PT parting JT joint SZ shear zone SS shear surface CO contact CS crushed seam SM seam roughness SL slickensided POL polished SO smooth RO rough VR very rough	planarity PL planar CU curved UN undulating ST stepped IR irregular coating CN clean SN stain VN veneer CO coating
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Engineering Log - Cored Borehole

Borehole ID.	MH28
sheet:	4 of 4
project no.	GENZTAUC13086AL
date started:	25 Jul 2014
date completed:	25 Jul 2014
logged by:	S. Campbell
checked by:	R. Telford

client: **The Lakes (2012) Ltd**

principal:

project: ***The Lakes Stages 2U & 2V***

location: **Near culvert crossing**

position: E: 367,817; N: 800,752 (BOPC2000)

surface elevation: 8.00 m (Moturiki)

angle from horizontal: 90°

drill model: Morooka, Track mounted

drilling fluid:

casing diameter : NW

vane id.:

drilling information				material substance		rock mass defects													
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is(50)					samples, field tests & Is(50) (MPa)	core run details	defect spacing (mm)				additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)	
							WV	W	MS	VS	ES			a = axial; d = diametral	20	60	200	600	2000
HQ		-9	17.0		Sandy SILT: non plastic, pale grey, sand is very fine grained, moist to wet. (continued)						SPT 1, 1, 1, 1, 0, 1 N*=3	TCR= 100%					ALLUVIAL DEPOSITS (NON ORGANIC SILTS + SANDS)		
			17.5									TCR= 100%							
		-10	18.0								SPT 1, 0, 0, 0, 0, 0 N*=0	TCR= 100%							
			18.5																
		-11	19.0									TCR= 100%							
			19.5									SPT 1, 0, 0, 0, 0, 1 N*=1	TCR= 100%						
		-12	20.0		Borehole MH28 terminated at 19.95 m Target depth														
			20.5																
		-13	21.0																
			21.5																
method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore NMLCNMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) SPT standard penetration test				water <div><div></div>10/10/12, water level on date shown <div></div>water inflow <div></div>complete drilling fluid loss <div></div>partial drilling fluid loss <div>25uL</div>water pressure test result (lugeons) for depth interval shown</div> <td colspan="4">graphic log / core recovery <div><div></div>core recovered (graphic symbols indicate material) <div></div>no core recovered core run details <div></div>barrel withdrawn TCR = Total Core Recovery (%) SCR = Solid Core Recovery (%) ROD = Rock Quality Designation (%)</div><td colspan="4">weathering & alteration* RS residual soil CW completely weathered HW highly weathered MW moderately weathered SW slightly weathered UW unweathered *W replaced with A for alteration strength VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong</td><td colspan="4">defect type BS bedding shear PT parting JT joint SZ shear zone SS shear surface CO contact CS crushed seam SM seam roughness SL slickensided POL polished SO smooth RO rough VR very rough</td><td colspan="2">planarity PL planar CU curved UN undulating ST stepped IR Irregular coating CN clean SN stain VN veneer CO coating</td></td>		graphic log / core recovery <div><div></div>core recovered (graphic symbols indicate material) <div></div>no core recovered core run details <div></div>barrel withdrawn TCR = Total Core Recovery (%) SCR = Solid Core Recovery (%) ROD = Rock Quality Designation (%)</div> <td colspan="4">weathering & alteration* RS residual soil CW completely weathered HW highly weathered MW moderately weathered SW slightly weathered UW unweathered *W replaced with A for alteration strength VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong</td> <td colspan="4">defect type BS bedding shear PT parting JT joint SZ shear zone SS shear surface CO contact CS crushed seam SM seam roughness SL slickensided POL polished SO smooth RO rough VR very rough</td> <td colspan="2">planarity PL planar CU curved UN undulating ST stepped IR Irregular coating CN clean SN stain VN veneer CO coating</td>				weathering & alteration* RS residual soil CW completely weathered HW highly weathered MW moderately weathered SW slightly weathered UW unweathered *W replaced with A for alteration strength VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong				defect type BS bedding shear PT parting JT joint SZ shear zone SS shear surface CO contact CS crushed seam SM seam roughness SL slickensided POL polished SO smooth RO rough VR very rough				planarity PL planar CU curved UN undulating ST stepped IR Irregular coating CN clean SN stain VN veneer CO coating	

Engineering Log - Cored Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location: **Just off vehicle access way**

Borehole ID. **MH29**

sheet: 1 of 4

project no. **GENZTAUC13086AL**

date started: **25 Jul 2014**









date completed: **25 Jul 2014**

logged by: **S.Campbell**

checked by: **R.Telford**

position: E: 367,860; N: 800,743 (BOPC2000) surface elevation: 9.00 m (Moturiki) angle from horizontal: 90°
drill model: Morooka, Track mounted drilling fluid: casing diameter : NW vane id.:

drilling information				material substance				rock mass defects			
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 X = axial O = diametral a = axial d = diametral	samples, field tests & Is(50) (MPa)	core run details	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)
					start coring at 0.00m						
			0.5		SANDY SILT: non plastic, brown, trace medium rounded gravels, dry.						
			1.0		SAND: fine to medium grained, poorly graded, pale grey, some silt, moist.						
			1.5		Silty SAND: fine to medium grained, poorly graded, pale grey, moist.						
			2.0		Sandy SILT: non plastic to low plasticity, pale brown, sand is fine to medium grained, moist.						
			2.5		Clayey SILT: medium plasticity, brown, moist.						
			3.0		ORGANIC SILT: non plastic, dark brown, various sized wood inclusions throughout, dry to moist.						
			3.5								
			4.0								
			4.5								
			5.0								
			5.5								
			6.0								
			6.5								
			7.0								
			7.5								
			8.0								
			8.5								
			9.0								

method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore NMLCNMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) SPT standard penetration test	water  10/10/12, water level on date shown  water inflow  complete drilling fluid loss  partial drilling fluid loss  water pressure test result (lugeons) for depth interval shown	graphic log / core recovery  core recovered (graphic symbols indicate material)  no core recovered core run details  barrel withdrawn TCR = Total Core Recovery (%) SCR = Solid Core Recovery (%) RQD = Rock Quality Designation (%)	weathering & alteration* RS residual soil CW completely weathered HW highly weathered MW moderately weathered SW slightly weathered UW unweathered *W replaced with A for alteration strength VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong	defect type BS bedding shear PT parting JT joint SZ shear zone SS shear surface CO contact CS crushed seam SM seam roughness SL slickensided POL polished SO smooth RO rough VR very rough	planarity PL planar CU curved UN undulating ST stepped IR irregular coating CN clean SN stain VN veneer CO coating
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Engineering Log - Cored Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location: **Just off vehicle access way**

Borehole ID. **MH29**

sheet: 2 of 4

project no. **GENZTAUC13086AL**

date started: **25 Jul 2014**









date completed: **25 Jul 2014**

logged by: **S.Campbell**

checked by: **R.Telford**

position: E: 367,860; N: 800,743 (BOPC2000) surface elevation: 9.00 m (Moturiki) angle from horizontal: 90°
drill model: Morooka, Track mounted drilling fluid: casing diameter : NW vane id.:

drilling information				material substance				rock mass defects			
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 X = axial O = diametral a = axial d = diametral	samples, field tests & Is(50) (MPa) a = axial d = diametral	core run details	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)
					ORGANIC SILT: non plastic, dark brown, various sized wood inclusions throughout, dry to moist. <i>(continued)</i>				TCR= 100%		ALLUVIAL DEPOSITS (PEAT+ ORGANIC SILT AND CLAYS) SPT sank 450mm under hammer weight
					SILT: low plasticity, pale grey, some wood inclusions from 6.2m to 6.75, wet to saturated.				SPT 0, 0, 0, 0, 0, 0 N*=0	TCR= 84%	
					6.75 m: - becoming pale grey stained orange brown					TCR= 100%	
					8.00 m: - becoming saturated in core box				SPT 0, 0, 0, 0, 0, 0 N*=0	TCR= 96%	
					Sandy SILT: low plasticity, pale brown grey, sand is very fine grained, moist to wet.					TCR= 86%	ALLUVIAL DEPOSITS (NON ORGANIC SILTS + SANDS)
									SPT 0, 0, 0, 1, 1, 0 N*=2	TCR= 0%	
										TCR= 100%	
									SPT 1, 0, 0, 0, 1, 2 N=3	TCR= 100%	

method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore NMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) SPT standard penetration test	water  10/10/12, water level on date shown  water inflow  complete drilling fluid loss  partial drilling fluid loss  water pressure test result (lugeons) for depth interval shown	graphic log / core recovery  core recovered (graphic symbols indicate material)  no core recovered core run details  barrel withdrawn TCR = Total Core Recovery (%) SCR = Solid Core Recovery (%) RQD = Rock Quality Designation (%)	weathering & alteration* RS residual soil CW completely weathered HW highly weathered MW moderately weathered SW slightly weathered UW unweathered *W replaced with A for alteration strength VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong	defect type BS bedding shear PT parting JT joint SZ shear zone SS shear surface CO contact CS crushed seam SM seam roughness SL slickensided POL polished SO smooth RO rough VR very rough	planarity PL planar CU curved UN undulating ST stepped IR irregular coating CN clean SN stain VN veneer CO coating
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Engineering Log - Cored Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location: **Just off vehicle access way**

Borehole ID. **MH29**

sheet: 3 of 4

project no. **GENZTAUC13086AL**

date started: **25 Jul 2014**









date completed: **25 Jul 2014**

logged by: **S.Campbell**

checked by: **R.Telford**

position: E: 367,860; N: 800,743 (BOPC2000) surface elevation: 9.00 m (Moturiki) angle from horizontal: 90°
drill model: Morooka, Track mounted drilling fluid: casing diameter : NW vane id.:

drilling information				material substance				rock mass defects			
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 X = axial O = diametral a = axial d = diametral	samples, field tests & Is(50) (MPa) a = axial d = diametral	core run details	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)
					Sandy SILT: low plasticity, pale brown grey, sand is very fine grained, moist to wet. (continued)				TCR= 95%		ALLUVIAL DEPOSITS (NON ORGANIC SILTS + SANDS)
			11.5								
			12.0						SPT 1, 0, 0, 0, 0, 0 N*=0	TCR= 100%	
			12.5								
			13.0						TCR= 100%		
			13.5								
			14.0						SPT 1, 0, 0, 0, 0, 0 N*=0	TCR= 100%	
			14.5		Silty SAND: fine to coarse grained, well graded, grey mottled orange brown, some medium grained gravels, wet. SILT: non plastic, pale grey, dry.				TCR= 100%		
			15.0								
			15.5		Silty SAND: fine to coarse grained, well graded, grey, minor fine grained gravels, dry, loose.				SPT 1, 2, 1, 2, 1, 1 N*=5	TCR= 100%	
			16.0		SILT: non plastic, pale grey, some very fine grained sand, moist.				TCR= 86%		

method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore NMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) SPT standard penetration test	water  10/10/12, water level on date shown  water inflow  complete drilling fluid loss  partial drilling fluid loss  water pressure test result (lugeons) for depth interval shown	graphic log / core recovery  core recovered (graphic symbols indicate material)  no core recovered core run details  barrel withdrawn TCR = Total Core Recovery (%) SCR = Solid Core Recovery (%) RQD = Rock Quality Designation (%)	weathering & alteration* RS residual soil CW completely weathered HW highly weathered MW moderately weathered SW slightly weathered UW unweathered *W replaced with A for alteration strength VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong	defect type BS bedding shear PT parting JT joint SZ shear zone SS shear surface CO contact CS crushed seam SM seam roughness SL slickensided POL polished SO smooth RO rough VR very rough	planarity PL planar CU curved UN undulating ST stepped IR irregular coating CN clean SN stain VN veneer CO coating
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Engineering Log - Cored Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location: **Just off vehicle access way**

Borehole ID: **MH29**

sheet: 4 of 4

project no: **GENZTAUC13086AL**

date started: **25 Jul 2014**









date completed: **25 Jul 2014**

logged by: **S.Campbell**

checked by: **R.Telford**

position: E: 367,860; N: 800,743 (BOPC2000) surface elevation: 9.00 m (Moturiki) angle from horizontal: 90°
drill model: Morooka, Track mounted drilling fluid: casing diameter : NW vane id.:

drilling information				material substance				rock mass defects			
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 X = axial O = diametral a = axial d = diametral	samples, field tests & Is(50) (MPa)	core run details	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)
					SILT: non plastic, pale grey, some very fine grained sand, moist. <i>(continued)</i> 16.50 m: - some clay below 16.5m			SPT 1, 0, 0, 0, 0, 0 N*=0	TCR= 100%		ALLUVIAL DEPOSITS (NON ORGANIC SILTS + SANDS)
					17.50 m: - clay absent below 17.5m, becoming pale grey with some dark brown specks 17.70 m: - becoming hard below 17.7m				TCR= 100%		
								SPT 2, 2, 3, 2, 3, 3 N*=11	TCR= 100%		
					Silty SAND: very fine grained, pale grey, moist, medium dense.				TCR= 100%		
					19.20 m: - becoming orange brown, sand becoming fine to coarse grained 19.40 m: - becoming dark orange brown			SPT 6, 9, 9, 6, 7, 6 N*=28	TCR= 100%		
					Borehole MH29 terminated at 19.95 m Target depth						

method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore NMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) SPT standard penetration test	water  10/10/12, water level on date shown  water inflow  complete drilling fluid loss  partial drilling fluid loss  water pressure test result (lugeons) for depth interval shown	graphic log / core recovery  core recovered (graphic symbols indicate material)  no core recovered core run details  barrel withdrawn TCR = Total Core Recovery (%) SCR = Solid Core Recovery (%) RQD = Rock Quality Designation (%)	weathering & alteration* RS residual soil CW completely weathered HW highly weathered MW moderately weathered SW slightly weathered UW unweathered *W replaced with A for alteration strength VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong	defect type BS bedding shear PT parting JT joint SZ shear zone SS shear surface CO contact CS crushed seam SM seam roughness SL slickensided POL polished SO smooth RO rough VR very rough	planarity PL planar CU curved UN undulating ST stepped IR irregular coating CN clean SN stain VN veneer CO coating
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Engineering Log - Cored Borehole

client: **The Lakes (2012) Ltd**

principal:

project: ***The Lakes Stages 2U & 2V***

location: ***Edge of low lying flooded ground in valley***

Borehole ID. **MH30**

sheet: 1 of 4

project no. **GENZTAUC13086AL**

date started: **25 Jul 2014**

date completed: **25 Jul 2014**

logged by: **S.Campbell**

checked by: ***R. Telford***

position: E: 367,816; N: 800,675 (BOPC2000)

surface elevation: 7.50 m (Moturiki)

angle from horizontal: 90°

drill model: Morooka. Track mounted

drilling fluid:

casing diameter : NW

vane id.:

[illegible]

Engineering Log - Cored Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location: **Edge of low lying flooded ground in valley**

Borehole ID. **MH30**

sheet: 2 of 4

project no. **GENZTAUC13086AL**

date started: **25 Jul 2014**









date completed: **25 Jul 2014**

logged by: **S.Campbell**

checked by: **R.Telford**

position: E: 367,816; N: 800,675 (BOPC2000) surface elevation: 7.50 m (Moturiki) angle from horizontal: 90°
drill model: Morooka, Track mounted drilling fluid: casing diameter : NW vane id.:

drilling information				material substance				rock mass defects			
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 X = axial O = diametral a = axial d = diametral	samples, field tests & Is(50) (MPa) a = axial d = diametral	core run details	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)
					SILT: low plasticity, dark brown grey, 10-15% wood inclusions, wet. <i>(continued)</i>				TCR= 29%		ALLUVIAL DEPOSITS
			6.0								
			6.5					SPT 0, 0, 0, 0, 0, 0 N*=0	TCR= 50%		
			7.0		7.00 m: - wood inclusions increasing to 20%				TCR= 95%		
			7.20		7.20 m: - solid wood block <50mm at 7.2m						
			7.5								
					SAND: fine to medium grained, poorly graded, grey, clean sand, wet. 7.70 m: - sand becoming fine to coarse grained, well graded				SPT 0, 0, 0, 0, 0, 0 N=0	TCR= 0%	
			8.0								
			8.5		8.50 m: - 100mm dark brown grey silt lense below 8.5m				TCR= 79%		
			9.0								
			9.5					SPT 2, 2, 2, 3, 3, 3 N=11	TCR= 0%		
			10.0						TCR= 100%		
			10.30		10.30 m: - gravels absent below 10.3m						
			10.45		10.45 m: - large black wood inclusions at 10.45m						
			10.50		10.50 m: - some fine to medium grained rounded pumice gravels			SPT 2, 1, 2, 4, 5, 6 N*=17	TCR= 51%		

method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore NMLCNMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) SPT standard penetration test	water  10/10/12, water level on date shown  water inflow  complete drilling fluid loss  partial drilling fluid loss  water pressure test result (lugeons) for depth interval shown	graphic log / core recovery  core recovered (graphic symbols indicate material)  no core recovered core run details  barrel withdrawn TCR = Total Core Recovery (%) SCR = Solid Core Recovery (%) RQD = Rock Quality Designation (%)	weathering & alteration* RS residual soil CW completely weathered HW highly weathered MW moderately weathered SW slightly weathered UW unweathered *W replaced with A for alteration strength VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong	defect type BS bedding shear PT parting JT joint SZ shear zone SS shear surface CO contact CS crushed seam SM seam roughness SL slickensided POL polished SO smooth RO rough VR very rough	planarity PL planar CU curved UN undulating ST stepped IR irregular coating CN clean SN stain VN veneer CO coating
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Engineering Log - Cored Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location: **Edge of low lying flooded ground in valley**

Borehole ID. **MH30**

sheet: 3 of 4

project no. **GENZTAUC13086AL**

date started: **25 Jul 2014**









date completed: **25 Jul 2014**

logged by: **S.Campbell**

checked by: **R.Telford**

position: E: 367,816; N: 800,675 (BOPC2000) surface elevation: 7.50 m (Moturiki) angle from horizontal: 90°
drill model: Morooka, Track mounted drilling fluid: casing diameter : NW vane id.:

drilling information				material substance				rock mass defects			
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 X = axial O = diametral a = axial d = diametral	samples, field tests & Is(50) (MPa) a = axial d = diametral	core run details	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)
					SAND: fine to medium grained, poorly graded, grey, clean sand, wet. <i>(continued)</i> 11.00 m: - some fine rounded pumice gravels				TCR= 76%		ALLUVIAL DEPOSITS
					Silty SAND: fine grained, uniform, brown grey, moist.						
					SAND: uniform, very fine grained, pale grey, moist. 12.20 m: - sand becoming fine to coarse grained, minor fine grained pumice gravels			SPT 2, 2, 3, 4, 4, 5 N*=16	TCR= 93%		
					12.80 m: - sand becoming fine grained				TCR= 124%		
					13.45 m: - minor silt below 13.45m			SPT 5, 6, 7, 6, 8, 9 N*=30	TCR= 93%		
					14.40 m: - dark brown organic silt lense <50mm below 14.4m Sandy SILT: non plastic to low plasticity, grey brown, sand is very fine to fine grained, moist.				TCR= 95%		
								SPT 1, 2, 2, 2, 2, 3 N*=9	TCR= 100%		
					SAND: fine to medium grained, poorly graded, grey, moist to wet.				TCR= 52%		
					Sandy SILT: non plastic, brown grey, sand is very fine grained, moist to wet.						
					SAND: fine to medium grained, poorly graded, pale grey, minor silt, moist to wet.						

method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore NMLCNMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) SPT standard penetration test	water  10/10/12, water level on date shown  water inflow  complete drilling fluid loss  partial drilling fluid loss  water pressure test result (lugeons) for depth interval shown	graphic log / core recovery  core recovered (graphic symbols indicate material)  no core recovered core run details  barrel withdrawn TCR = Total Core Recovery (%) SCR = Solid Core Recovery (%) RQD = Rock Quality Designation (%)	weathering & alteration* RS residual soil CW completely weathered HW highly weathered MW moderately weathered SW slightly weathered UW unweathered *W replaced with A for alteration strength VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong	defect type BS bedding shear PT parting JT joint SZ shear zone SS shear surface CO contact CS crushed seam SM seam roughness SL slickensided POL polished SO smooth RO rough VR very rough	planarity PL planar CU curved UN undulating ST stepped IR irregular coating CN clean SN stain VN veneer CO coating
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Engineering Log - Cored Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location: **Edge of low lying flooded ground in valley**

Borehole ID. **MH30**

sheet: 4 of 4

project no. **GENZTAUC13086AL**

date started: **25 Jul 2014**









date completed: **25 Jul 2014**

logged by: **S.Campbell**

checked by: **R.Telford**

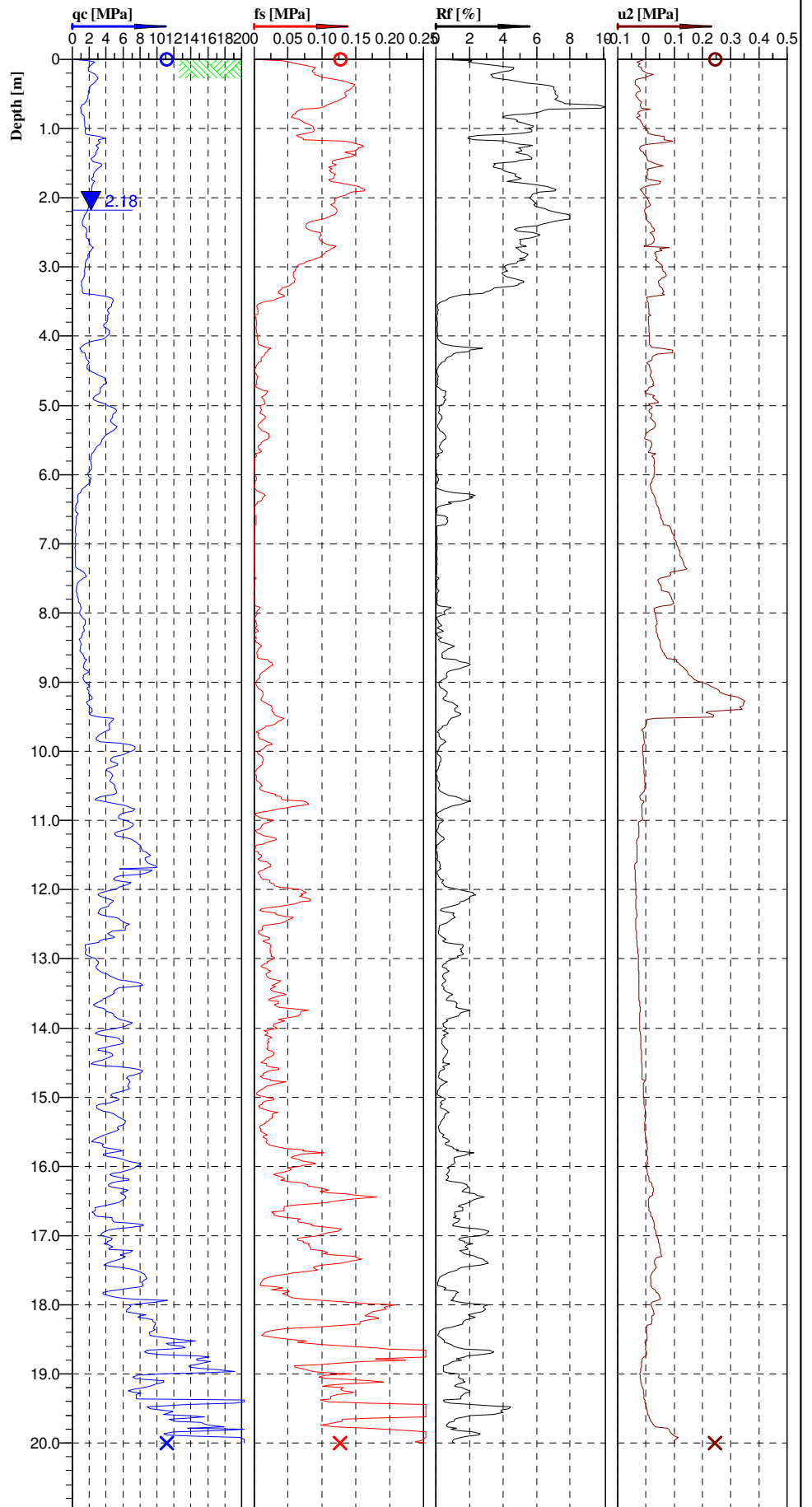
position: E: 367,816; N: 800,675 (BOPC2000) surface elevation: 7.50 m (Moturiki) angle from horizontal: 90°
drill model: Morooka, Track mounted drilling fluid: casing diameter : NW vane id.:

drilling information				material substance				rock mass defects			
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is(50) X = axial O = diametral a = axial d = diametral	samples, field tests & Is(50) (MPa) a = axial d = diametral	core run details	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)
					SAND: fine to medium grained, poorly graded, pale grey, minor silt, moist to wet. <i>(continued)</i> 16.50 m: - wood inclusions from 16.5m to 16.95m 16.70 m: - sand becoming fine to coarse grained			SPT 0, 0, 0, 0, 0, 3 N*=3	TCR= 89%		ALLUVIAL DEPOSITS
			17.0								
			17.5						TCR= 105%		
			18.0		17.80 m: - sand becoming coarse grained, some fine to medium gravels						
			18.5		Sandy SILT: non plastic, pale brown grey, moist to wet.			SPT 2, 3, 3, 3, 3, 3 N*=12	TCR= 96%		
			19.0		Silty SAND: fine to coarse grained, well graded, dark orange brown, moist to wet.						
			19.5		SAND: fine to coarse grained, well graded, grey, minor fine to medium grained gravels, moist to wet.				TCR= 143%		
			20.0		PUMICE: pale pink grey, dense compressed pumice cobble, moist to wet.						
			20.5		SAND: fine grained, grey, moist to wet. 19.20 m: - sand becoming coarse grained			SPT 3, 4, 5, 6, 8, 11 N*=30	TCR= 91%		
			21.0		Borehole MH30 terminated at 19.95 m Target depth						
			21.5								

method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore NMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) SPT standard penetration test	water  10/10/12, water level on date shown  water inflow  complete drilling fluid loss  partial drilling fluid loss  water pressure test result (lugeons) for depth interval shown	graphic log / core recovery  core recovered (graphic symbols indicate material)  no core recovered core run details  barrel withdrawn TCR = Total Core Recovery (%) SCR = Solid Core Recovery (%) RQD = Rock Quality Designation (%)	weathering & alteration* RS residual soil CW completely weathered HW highly weathered MW moderately weathered SW slightly weathered UW unweathered *W replaced with A for alteration strength VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong	defect type BS bedding shear PT parting JT joint SZ shear zone SS shear surface CO contact CS crushed seam SM seam roughness SL slickensided POL polished SO smooth RO rough VR very rough	planarity PL planar CU curved UN undulating ST stepped IR irregular coating CN clean SN stain VN veneer CO coating
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Classification by
Robertson 1986

Clayey silt to silty clay (5)
Clay (3)
Sand to silty sand (8)
Sandy silt to clayey silt (6)
Silty sand to sandy silt (7)
Sand to silty sand (8)
Silty sand to sandy silt (7)
Sensitive fine grained (1)
Sandy silt to clayey silt (6)
Silty sand to sandy silt (7)
Sandy silt to clayey silt (6)
Silty sand to sandy silt (7)
Sand to silty sand (8)
Sand (9)
Sand to silty sand (8)
Silty sand to sandy silt (7)
Sand to silty sand (8)
Sandy silt to clayey silt (6)
Silty sand to sandy silt (7)
Sand to silty sand (8)
Silty sand to sandy silt (7)
Sand to silty sand (8)
Silty sand to sandy silt (7)
Sand (9)
Silty sand to sandy silt (7)
Very stiff fine grained (11)
Silty sand to sandy silt (7)



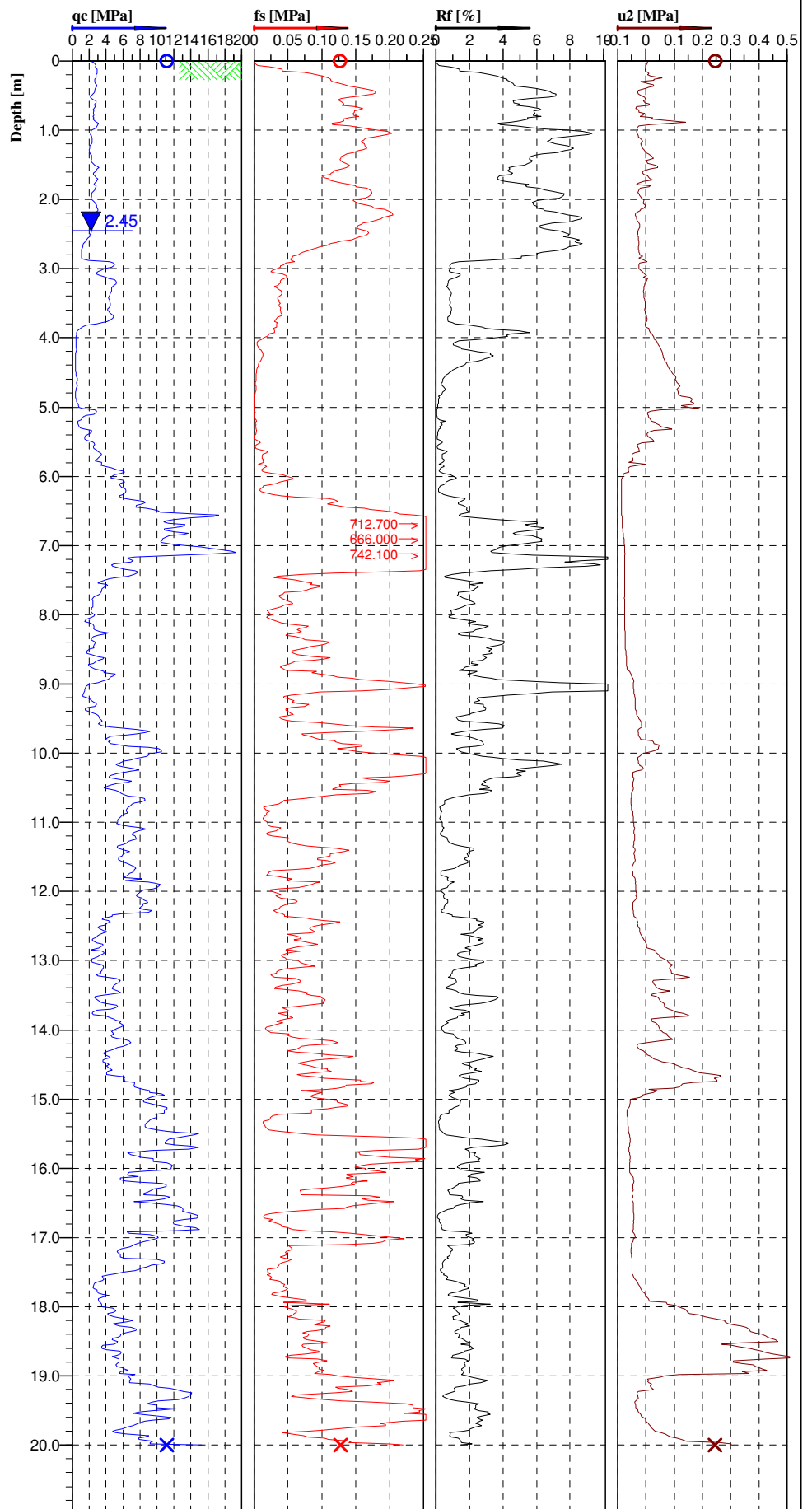
Cone No: 4341
Tip area [cm²]: 10
Sleeve area [cm²]: 150



Location: TAURANGA	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test no: CPT01
Project ID:	Client: COFFEYS	Date: 12/06/2015	Scale: 1 : 90
Project: TAKIMU DRIVE SITE		Page: 1/1	Fig:
S 37°45.406 E 176°06.153		File: CPT01.CPT	

**Classification by
Robertson 1986**

Silty sand to sandy silt (7)
Clay (3)
Clayey silt to silty clay (5)
Clay (3)
Silty sand to sandy silt (7)
Clay (3)
Sensitive fine grained (1)
Silty sand to sandy silt (7)
Sand to silty sand (8)
Silty sand to sandy silt (7)
Very stiff fine grained (11)
Sandy silt to clayey silt (6)
Clayey silt to silty clay (5)
Clay (3)
Clayey silt to silty clay (5)
Silty sand to sandy silt (7)
Sand to silty sand (8)
Very stiff fine grained (11)
Sandy silt to clayey silt (6)
Sand to silty sand (8)
Silty sand to sandy silt (7)
Sand to silty sand (8)
Sandy silt to clayey silt (6)
Silty sand to sandy silt (7)
Clayey silt to silty clay (5)
Sand to silty sand (8)
Silty sand to sandy silt (7)
Sandy silt to clayey silt (6)
Silty sand to sandy silt (7)
Sand to silty sand (8)
Sand (9)
Very stiff fine grained (11)
Sand to silty sand (8)
Sand (9)
Silty sand to sandy silt (7)
Sand (9)
Sandy silt to clayey silt (6)
Silty sand to sandy silt (7)
Sand (9)
Sandy silt to clayey silt (6)



Cone No: 4341
Tip area [cm2]: 10
Sleeve area [cm2]: 150



Location: TAURANGA	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test no: CPT02
Project ID:	Client: COFFEYS	Date: 12/06/2015	Scale: 1 : 90
Project: TAKIMU DRIVE SITE	Page: 1/1	Fig:	
S 37°45.389 E 176°06.153	File: CPT02.CPT		

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location: **East of old farm shed proximal to SH36**

Hole ID. **MH31**

sheet: 1 of 3

project no. **GENZTAUC13086AL**

date started: **15 Jun 2015**

date completed: **15 Jun 2015**

logged by: **S.Campbell**

checked by: **R.Telford**

position: E: 367961; N: 800438 (BOPC2000) surface elevation: 15.45 m (Moturiki) angle from horizontal: 90°
equipment type: Morooka, Track mounted hole diameter : 100 mm vane id.:

drilling information				material substance									
method & support	water	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE:plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE:grain characteristics, colour, structure, minor components	moisture condition	consistency / relative density	samples & field tests	vane shear remoulded peak (kPa) 150g 150g 200g	core run details TCR ROD	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)	
						ORGANIC SILT: non plastic, black with orange brown specks, some fine grained sand.						TOPSOIL FILL	
						SILT: non plastic to low plasticity, orange brown mottled pale orange brown, some fine to medium grained sand, minor inclusions of pale grey.						FILL	
			15	0.5							100%		
			14	1.0									
			13	1.5									
			12	2.0					SPT 3, 3, 3, 3, 4 N*=13		89%		
			11	2.5									
			10	3.0		2.60 m: 100mm of alternating 10mm bands of organic silt and brown silt.					100%		
			9	3.5		3.00 m: becoming dark orange brown, trace fine to medium sand.			SPT 3, 1, 2, 1, 2 N*=6		100%		
			8	4.0		SILT: low plasticity, brown with grey streaks, minor clay.							
			7	4.5		Silty SAND: fine to coarse grained, well graded, dark grey, trace fine grained gravels.	MD		SPT 4, 2, 4, 3, 3 N*=12		84%		
			6	5.0		5.20 m: with grey-black staining between 5.2 and 5.3 metres. 5.30 m: sand becoming fine to coarse grained.					94%		
			5										
			4										
			3										
			2										
			1										
			0										

method AD auger drilling* AS auger screwing* CT cable tool DT diatube HA hand auger RR roller/tricone W washbore B blank bit V V bit T TC bit * bit shown by suffix e.g. AD/T NMLC NMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm)	water 10 Oct., 73 Water Level on Date shown water inflow complete drilling fluid loss partial drilling fluid loss USCS Unified Soil Classification System	weathering & alteration* RS residual soil CW completely weathered HW highly weathered MW moderately weathered SW slightly weathered UW unweathered *W replaced with A for alteration moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense	strength VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong core run details TCR Total Core Recovery SCR Solid Core Recovery ROD Rock Quality Designation	samples & field tests U## undisturbed sample ##mm diameter D disturbed sample B bulk disturbed sample E environmental sample HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear (kPa); peak/remoulded R refusal	defect type BS bedding shear PT parting JT joint SZ shear zone SS shear surface CO contact CS crushed seam SM seam roughness SL slickensided POL polished SO smooth RO rough VR very rough planarity PL planar CU curved UN undulating ST stepped IR irregular coating CN clean SN stain VN veneer CO coating
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Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location: **East of old farm shed proximal to SH36**

Hole ID. **MH31**

sheet: 2 of 3

project no. **GENZTAUC13086AL**

date started: **15 Jun 2015**

date completed: **15 Jun 2015**

logged by: **S.Campbell**

checked by: **R.Telford**

position: E: 367961; N: 800438 (BOPC2000) surface elevation: 15.45 m (Moturiki) angle from horizontal: 90°
equipment type: Morooka, Track mounted hole diameter : 100 mm vane id.:

drilling information				material substance									
method & support	water	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE:plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE:grain characteristics, colour, structure, minor components	moisture condition	consistency / relative density	samples & field tests	vane shear remoulded peak (kPa) 100 150 200	core run details TCR RQD	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)	
			6.0			Sandy SILT: non plastic, grey, sand is fine to medium grained.					94%	ALLUVIAL DEPOSITS	
			6.5			SAND: fine to coarse grained, well graded, grey, trace fine grained gravels.		VL	SPT 1, 0, 0, 0, 0 N*=0		60%		
			7.0								0%		
			7.5			Silty SAND: fine to coarse grained, well graded, grey with black specks, some fine grained gravels.					80%		
			8.0			Sandy SILT: non plastic, grey, sand is fine grained, some fine grained gravels.					100%		
			8.5			Silty SAND: fine to coarse grained, well graded, grey with black specks, some fine grained gravels.							
			9.0			Sandy SILT: non plastic, pale grey, sand is fine to medium grained.							
			9.5			Silty SAND: fine to coarse grained, well graded, grey with black specks, sand is fine to medium grained.	MD		SPT 1, 0, 1, 6, 4 N*=11		73%		
			10.0								0%		
			10.5						SPT 4, 2, 2, 4, 4 N*=12		84%		

method AD auger drilling* AS auger screwing* CT cable tool DT diatube HA hand auger RR roller/tricone W washbore B blank bit V V bit T TC bit * bit shown by suffix e.g. AD/T NMLC NMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm)	water 10 Oct., 73 Water Level on Date shown water inflow complete drilling fluid loss partial drilling fluid loss USCS Unified Soil Classification System	weathering & alteration* RS residual soil CW completely weathered HW highly weathered MW moderately weathered SW slightly weathered UW unweathered *W replaced with A for alteration moisture D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense	strength VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong core run details TCR Total Core Recovery SCR Solid Core Recovery RQD Rock Quality Designation	samples & field tests U## undisturbed sample ##mm diameter D disturbed sample B bulk disturbed sample E environmental sample HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear (kPa); peak/remoulded R refusal	defect type BS bedding shear PT parting JT joint SZ shear zone SS shear surface CO contact CS crushed seam SM seam roughness SL slickensided POL polished SO smooth RO rough VR very rough planarity PL planar CU curved UN undulating ST stepped IR irregular coating CN clean SN stain VN veneer CO coating
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Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location: **East of old farm shed proximal to SH36**

Hole ID. **MH31**

sheet: 3 of 3

project no. **GENZTAUC13086AL**

date started: **15 Jun 2015**

date completed: **15 Jun 2015**

logged by: **S.Campbell**

checked by: **R.Telford**

position: E: 367961; N: 800438 (BOPC2000) surface elevation: 15.45 m (Moturiki) angle from horizontal: 90°
equipment type: Morooka, Track mounted hole diameter: 100 mm vane id.:

drilling information				material substance									
method & support	water	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE:plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE:grain characteristics, colour, structure, minor components	moisture condition	consistency / relative density	samples & field tests	vane shear remoulded peak (kPa) 100 150 200	core run details TCR RQD	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)	
						Silty SAND: fine to coarse grained, well graded, grey with black specks, sand is fine to medium grained. <i>(continued)</i>		MD			0%	ALLUVIAL DEPOSITS	
						SAND: fine to coarse grained, well graded, grey.		L to MD	SPT 5, 3, 3, 3, 5 N*=14		80%		
						13.50 m: becoming dark grey, trace silt, trace pale grey and black inclusions, fine gravel. 13.90 m: becoming pale grey, some silt.			SPT 4, 0, 2, 3, 4 N*=9		73%		
						Silty SAND: fine to coarse grained, well graded, pale grey with black specks, trace fine grained gravels. 14.60 m: sand becoming fine to medium grained, becoming grey to pale brown.		MD			100%		
									SPT 3, 5, 4, 5, 7 N*=21		60%		
						Borehole MH31 terminated at 15.45 m Target depth							

method	water	weathering & alteration*	consistency / relative density	strength	samples & field tests	defect type	planarity
AD auger drilling* AS auger screwing* CT cable tool DT diatube HA hand auger RR roller/tricone WB washbore B blank bit V V bit T TC bit * bit shown by suffix e.g. AD/T NMLC NMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm)	10 Oct., 73 Water Level on Date shown water inflow complete drilling fluid loss partial drilling fluid loss USCS Unified Soil Classification System	RS residual soil CW completely weathered HW highly weathered MW moderately weathered SW slightly weathered UW unweathered *W replaced with A for alteration moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit	VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense	VW very weak W weak MS moderately strong S strong VS very strong ES extremely strong core run details TCR Total Core Recovery SCR Solid Core Recovery RQD Rock Quality Designation	U## undisturbed sample ##mm diameter D disturbed sample B bulk disturbed sample E environmental sample HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear (kPa); peak/remoulded R refusal	BS bedding shear PT parting JT joint SZ shear zone SS shear surface CO contact CS crushed seam SM seam roughness SL slickensided POL polished SO smooth RO rough VR very rough	PL planar CU curved UN undulating ST stepped IR irregular coating CN clean SN stain VN veneer CO coating

Engineering Log - Hand Auger

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location: **Toe of southern slope**

Borehole ID. **HA01**

sheet: 1 of 1

project no. **GENZTAUC13086AL**

date started: **15 Jun 2015**

date completed: **15 Jun 2015**

logged by: **S.Campbell**

checked by: **R.Telford**

position: E: 367,885; N: 800,371 (BOPC2000)

surface elevation: 24.00 m (Moturiki)

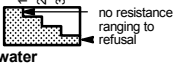
angle from horizontal: 90°

DCP id.:

drill model: Hand Auger

hole diameter : 50 mm

drilling information				material substance									
method & support	1 penetration	2 water	3 samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
HA	N			24				SILT: non plastic to low plasticity, brown, trace clay and some fine grained sand.	M	St to VSt	50		RE-WORKED VOLCANIC ASHES
					0.5								VS 108/ 17 kPa
								0.8 m: some clay, becoming low plasticity.					VS 61/ 17 kPa
				-23	1.0			Clayey SILT: medium plasticity, brown.	VSt				VS 105/ 19 kPa
					1.5			SILT: low plasticity, brown, some clay, trace fine grained sand.	VSt				VS >180 kPa
								1.5 m: rare to trace manganese specks <3mm.					VS >180 kPa
				-22	2.0			1.9 m: clay becoming minor.					VS >180 kPa
					2.5			2.5 m: trace to minor fine grained pumice sand.					VS 147/ 19 kPa
				-21	3.0			INTERBEDDED SILTS, SANDY SILTS AND SILTY SANDS: Silts, low plasticity, pale brown grey. Sandy Silts, non plastic, pale brown grey. Silty Sands, fine to coarse grained, well graded, pale brown grey..	D to M				ROTOEHU ASH
									M	St			VS 63/ 9 kPa
HA	N				3.5			SAND: fine grained, uniform, grey.		St			VS 64/ 22 kPa
					4.0			Clayey SILT: medium to high plasticity, pale grey.	VSt				HAMILTON ASH
				-20				3.8 m: becoming dark grey brown.					VS 125/ 17 kPa
					4.5			4.2 m: becoming brown.					MATUA SUB-GROUP
								CLAY: medium to high plasticity, orange brown.	VSt				VS 139/ 26 kPa
HA	N				5.0			Hand Auger HA01 terminated at 5.0 m					VS 132/ 22 kPa
				19									

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger HQ3 HQ3 core barrel (61.1mm)	support M mud C casing N nil	penetration  water 10-Oct-12 water level on date shown water inflow water outflow	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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* bit shown by suffix
e.g.
AD/T
B blank bit
T TC bit
V V bit

Engineering Log - Hand Auger

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location: **Middle of southern slope**

Borehole ID. **HA02**

sheet: 1 of 1

project no. **GENZTAUC13086AL**

date started: **15 Jun 2015**

date completed: **15 Jun 2015**

logged by: **S.Campbell**

checked by: **R.Telford**

position: E: 367,874; N: 800,351 (BOPC2000)






























surface elevation: 34.00 m (Moturiki)

angle from horizontal: 90°

DCP id.:

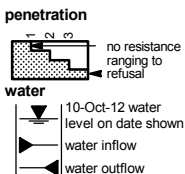
drill model: Hand Auger

hole diameter : 50 mm

drilling information						material substance									
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear remoulded peak (kPa)	DCP (blows/ 100 mm)	structure and additional observations
	1	2	3												
HA	N					34				ORGANIC SILT: non plastic, black.	M	VSt becoming S	  	    	TOPSOIL
										SILT: low plasticity, brown, minor clay.					RE-WORKED VOLCANIC ASHES
															VS 99/ 19 kPa
										0.9 m: minor pale brown and pale grey mottles (possible colluvium ?).					VS 132/ 15 kPa
										1.4 m: minor to some medium grained sand.					VS 122/ 15 kPa
															VS 153/ 15 kPa
						32				1.9 m: becoming moist to wet, drilling becoming easy.	M to W			VS 22/ 10 kPa	
						31				SANDY SILT/SILTY SAND: fine to coarse grained, well graded, non plastic, orange brown, [Completely Weathered Pumice Sands].	W	F			MATUA SUB-GROUP
										SILT: low plasticity, brown, trace to minor clay, minor fine grained sand.	M	VSt	  		VS 28/ 12 kPa
												  		VS 149/ 12 kPa	
												  		VS 162/ 26 kPa	
														VS >180 kPa	
						30				3.2 m: with trace fine grained, sub-rounded and moderately weathered rhyolite/andesite gravels.	VSt to St	  		VS >180 kPa	
									Sandy SILT: low plasticity, brown mottled pale brown, minor sand pockets <10mm dia. from 3.4m to 3.6m.					VS >180 kPa	
									3.7 m: with minor 10-50mm sand pockets becoming orange brown, sand becoming fine grained.						
						45				4.2 m: with <40mm pockets/inclusions of silt (low to medium plasticity, pale brown , some clay).	D to M	  		VS 90/ 24 kPa	
									4.4 m: becoming pale yellow brown, sand becoming fine grained, dry to moist.						
						29				Clayey SILT: low to medium plasticity, pale brown.	M	St	  		VS 80/ 9 kPa
										Hand Auger HA02 terminated at 5.0 m					

method	support	penetration	water	samples & field tests	classification symbol & soil description	consistency / relative density
AD auger drilling*	M mud			B bulk disturbed sample		VS very soft
AS auger screwing*	C casing			D disturbed sample		S soft
HA hand auger				E environmental sample		F firm
W washbore				SS split spoon sample		St stiff
HA hand auger				U## undisturbed sample ##mm diameter		VSt very stiff
HQ3 core barrel (61.1mm)				HP hand penetrometer (kPa)		H hard
				N standard penetration test (SPT)		Fb friable
				N* SPT - sample recovered		VL very loose
				Nc SPT with solid cone		L loose
				VS vane shear; peak/remoulded (kPa)		MD medium dense
				R refusal		D dense
				HB hammer bouncing		VD very dense
					moisture	
					D dry	
					M moist	
					W wet	
					S saturated	
					Wp plastic limit	
					WL liquid limit	

* bit shown by suffix
e.g. AD/T
B blank bit
T TC bit
V V bit



Engineering Log - Hand Auger

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stages 2U & 2V**

location: **Top of southern slopw**

Borehole ID. **HA03**

sheet: 1 of 1

project no. **GENZTAUC13086AL**

date started: **15 Jun 2015**

date completed: **15 Jun 2015**

logged by: **S.Campbell**

checked by: **R.Telford**

position: E: 367,862; N: 800,331 (BOPC2000)

surface elevation: 46.00 m (Moturiki)

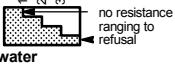
angle from horizontal: 90°

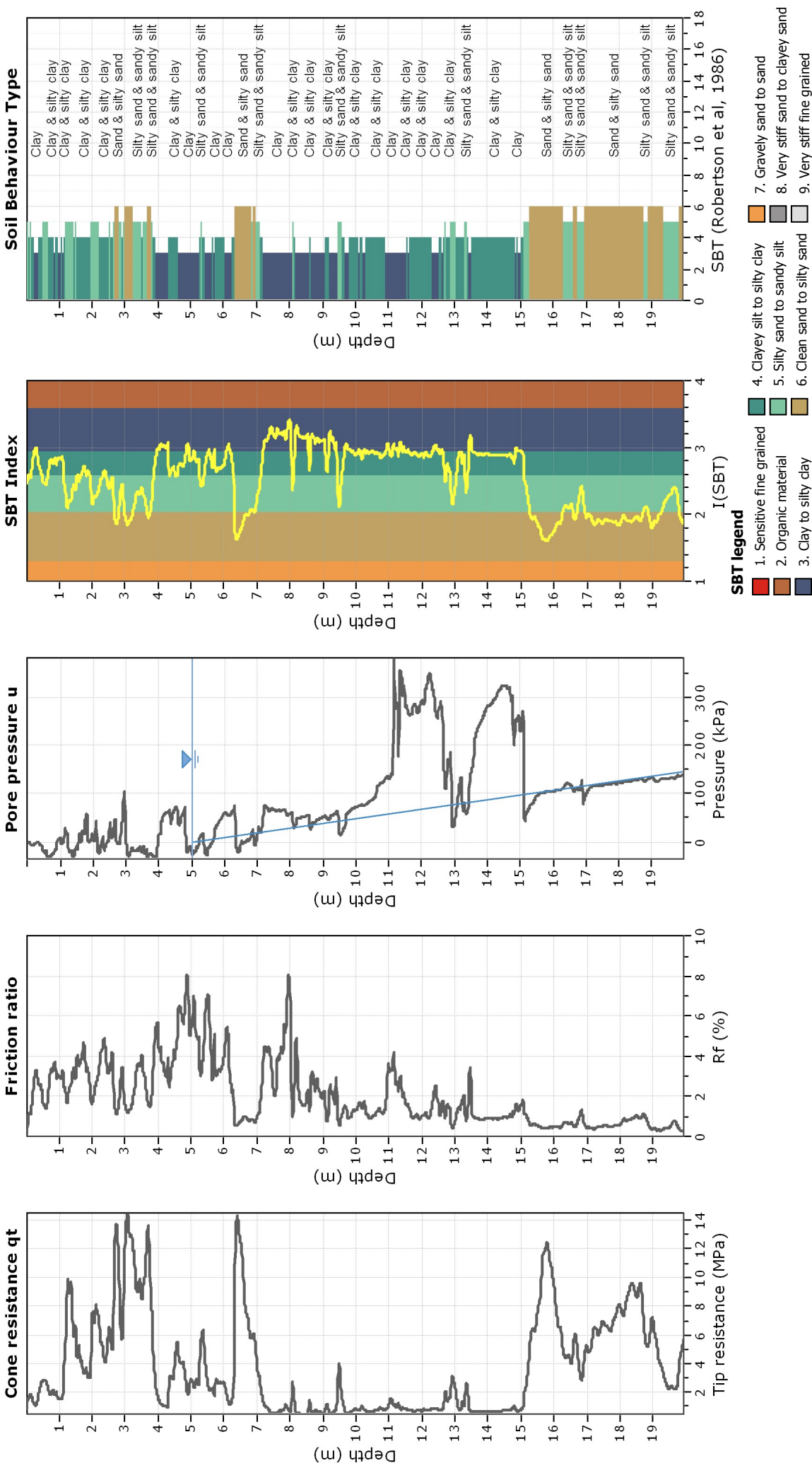
DCP id.:

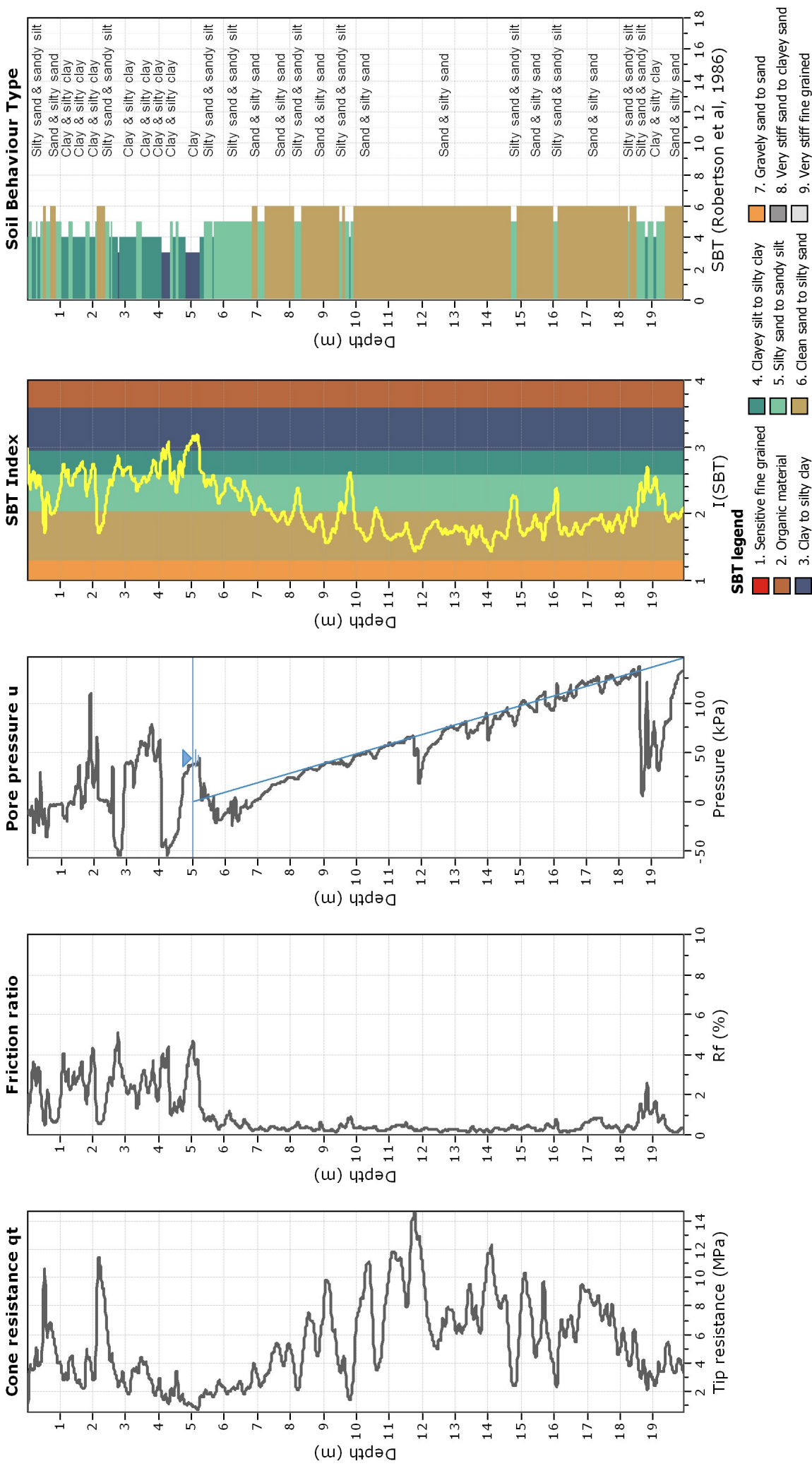
drill model: Hand Auger

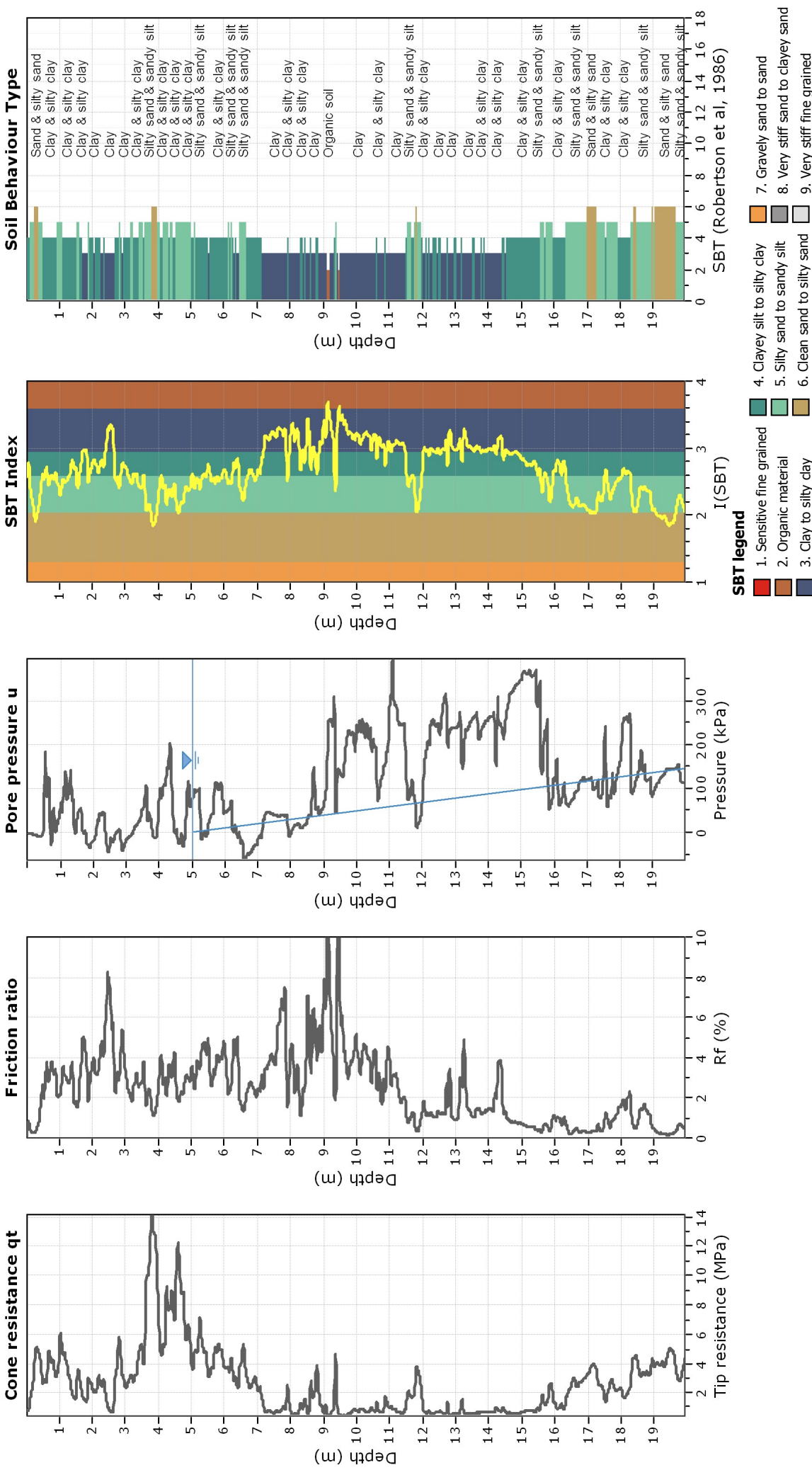
hole diameter : 50 mm

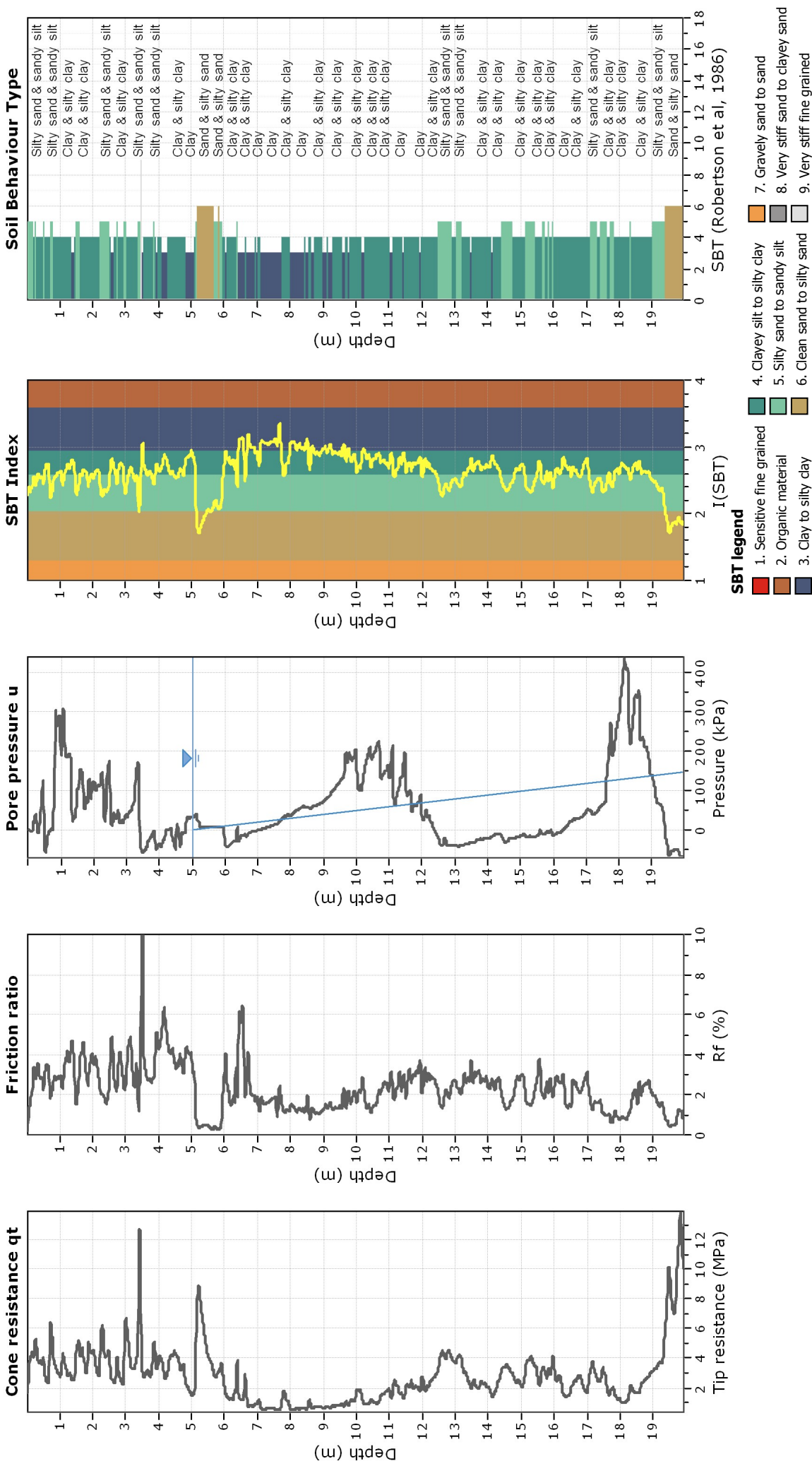
drilling information						material substance									
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear remoulded peak (kPa)	DCP (blows/ 100 mm)	structure and additional observations
	1	2	3												
HA	N					-45	0.5			ORGANIC SILT: non plastic, black.	M	St becoming F	50 100 150 200	2 4 6 8 10	TOPSOIL
										SILT: non plastic, orange brown mottled dark brown, trace fine grained sand.	D to M				YOUNGER ASHES
															VS 95/ 17 kPa
															VS 100/ 20 kPa
															VS 80/ 15 kPa
															VS 28/ 17 kPa
															ROTOEHU ASH
															HAMILTON ASH [?]
															MATUA SUB-GROUP
															VS 180 kPa
					-43	3.0			Sandy SILT: non plastic, orange brown, sand is fine grained.	D	F becoming VSt	50 100 150 200	2 4 6 8 10	VS 38/ 12 kPa	
											VS 120/ 20 kPa				
											VS 85/ 15 kPa				
											VS 73/ 19 kPa				
					-42	4.0			Sandy SILT: non plastic, orange brown, sand is fine grained, minor black specks.	D to M		50 100 150 200	2 4 6 8 10	VS 112/ 20 kPa	
														VS 144/ 34 kPa	
					-41	5.0			Hand Auger HA03 terminated at 5.0 m						

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger HQ3 HQ3 core barrel (61.1mm)	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B T V	penetration  no resistance ranging to refusal water 10-Oct-12 water level on date shown water inflow water outflow		moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit	









Engineering Log - Hand Auger

client: **THE LAKES 2012 LTD**

principal:

project: **THE LAKES STAGE 2UV**

location: **Approx 50m north of Roundabout**

Borehole ID. **HA04**

sheet: 1 of 1

project no. **GENZTAUC13086AR**


date started: **10 Nov 2015**


date completed: **10 Nov 2015**

logged by: **SWH**

checked by: **RBT**

position: E: 367,978; N: 800,804 (BOPC2000) surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger hole diameter : 50 mm

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
HA N Not Encountered	1				0.5		OL	BARK AND VEGETATION.	D				GARDEN BED
	2						ML	ORGANIC SILT: non plastic, black, some roots.					TOPSOIL FILL
	3						ML	SILT: non plastic, pale brown-grey, some fine to coarse grained sand.	VSt				FILL
													VS 146/ 43 kPa
													VS 119/ 38 kPa
					1.0		ML	SILT: low liquid limit, brown-orange.					YOUNGER ASHES
													VS >181 kPa
					1.5			1.5 m: trace of fine to coarse grained, black and grey sand; trace of fine grained, grey pumice gravel					VS 177/ 52 kPa
					2.0								VS 170/ 47 kPa
					2.5		ML	Sandy SILT: non plastic to low liquid limit, brown-grey.					VS >181 kPa
					2.5		SM	Silty SAND: fine to coarse grained, grey, sand is fine to coarse grained.					ROTOEHU ASH
													VS UTP
					3.0		ML	SILT: low liquid limit, brown-grey, some fine to coarse grained sand.	VSt				VS >181 kPa
					3.0			Hand Auger HA04 terminated at 3.0 m Target depth					
					3.5								
					4.0								
					4.5								
					5.0								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration  no resistance ranging to refusal water 10-Oct-12 water level on date shown water inflow water outflow		moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit	

Engineering Log - Hand Auger

client: **THE LAKES 2012 LTD**

principal:

project: **THE LAKES STAGE 2UV**

location: **Northern edge of Roundabout**

Borehole ID. **HA05**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **10 Nov 2015**

date completed: **10 Nov 2015**

logged by: **SWH**

checked by: **RBT**

position: E: 367,954; N: 800,766 (BOPC2000)

surface elevation: Not Specified


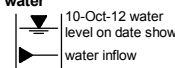
angle from horizontal: 90°

DCP id.:

drill model: Hand Auger

hole diameter : 50 mm

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
HA	1						SW	SAND: fine to coarse grained, grey.	D				FILL
	2		B		0.5		ML	Sandy SILT: non plastic to low liquid limit, grey, stained black, brown and orange, sand is fine to coarse grained.		VSt	⊙		VS >181 kPa
	3						ML	SILT: low liquid limit, brown.			⊙		VS >181 kPa
			B		1.0			0.8 m: becoming brown-orange, with some black staining; trace of fine grained, black gravel					VS UTP
					1.5		ML	Sandy SILT: non plastic to low liquid limit, grey, sand is fine to coarse grained; trace of fine grained, grey pumice gravel.					VS UTP
					2.0		ML	Sandy SILT: non plastic to low liquid limit, grey, Varies between grey Sandy SILT and brown SILT. Appears to be unsorted mixture.			⊙		VS >181 kPa
					2.5		SM	Silty SAND: fine to coarse grained, non plastic, grey, trace of fine grained, black and grey gravel.			⊙		VS >181 kPa
			B		3.0		ML	Sandy SILT: low liquid limit, pale brown-grey, sand is fine to coarse grained; trace of fine grained, black gravel.		VSt	⊙		VS >181 kPa
					3.5			Hand Auger HA05 terminated at 3.0 m Target depth					
					4.0								
					4.5								
					5.0								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration  water 10-Oct-12 water level on date shown 		moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit	

Engineering Log - Hand Auger

client: **THE LAKES 2012 LTD**

principal:

project: **THE LAKES STAGE 2UV**

location: **Southern edge of Roundabout**

Borehole ID. **HA06**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **10 Nov 2015**


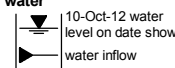
date completed: **10 Nov 2015**

logged by: **SWH**

checked by: **RB**

position: E: 367,954; N: 800,740 (BOPC2000) surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger hole diameter : 50 mm

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
AD	1				0.5		ML	SILT: non plastic, brown-grey, some fine to coarse grained grey angular gravel in the upper 0.2m. Very difficult to penetrate.	D	H			FILL
AS	2				1.0		SW	SAND: fine to coarse grained, grey, some fine grained, black and grey (pumice) subangular gravel.					VS UTP
HA	3				1.5		ML	SILT: low liquid limit, dark brown-orange, some black and orange staining, trace of fine grained, black gravel.		VSt to H	100		VS >181 kPa
W					2.0			1.9 m: some fine to coarse grained, grey sand			150		VS >181 kPa
HA					2.5			2.4 m: becoming brown, grey and orange. Colours are highly variable			200		VS >181 kPa
					2.7			2.7 m: thin layer of pale orange, Sandy SILT					VS >181 kPa
					3.0			Hand Auger HA06 terminated at 3.0 m Target depth					VS >181 kPa
					3.5								
					4.0								
					4.5								
					5.0								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration  water 10-Oct-12 water level on date shown 		moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit	

Engineering Log - Hand Auger

client: **THE LAKES 2012 LTD**

principal:

project: **THE LAKES STAGE 2UV**

location: **Approx 120m south of Roundabout**

Borehole ID. **HA07**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **10 Nov 2015**


date completed: **10 Nov 2015**

logged by: **SWH**

checked by: **RBT**

position: E: 367,976; N: 800,616 (BOPC2000) surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger hole diameter : 50 mm

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
HA	1				0.5		ML	SILT: low liquid limit, dark brown-black. 0.3 m: becoming brown-grey	D	VSt	⊕ ⊙		FILL VS 129/ 38 kPa
	2				0.7		ML	SILT: low liquid limit, brown. 0.7 m: some fine to coarse grained, grey sand; trace of fine grained, grey gravel			⊕ ⊙		VS >181 kPa
	3				1.0		ML	SILT: low liquid limit, brown-orange.			⊕ ⊙		VS 150/ 70 kPa
					1.5		ML	1.45 m: stained black SILT: low liquid limit, brown-orange.	M	St	⊕ ⊙		VS 124/ 50 kPa
					2.0						⊕ ⊙		YOUNGER ASHES VS 70/ 38 kPa
					2.5		ML	SILT: low liquid limit, pale orange, trace of fine grained sand.	M to W	F to St	⊕ ⊙		VS 80/ 40 kPa
					3.0			Hand Auger HA07 terminated at 3.0 m Target depth			⊕ ⊙		VS 91/ 40 kPa
					3.5						⊕ ⊙		ROTOEHU ASH VS 43/ 21 kPa
					4.0						⊕ ⊙		VS 86/ 28 kPa
					4.5						⊕ ⊙		
					5.0						⊕ ⊙		

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	penetration  no resistance ranging to refusal water 10-Oct-12 water level on date shown water inflow water outflow	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System moisture D dry M moist W wet S saturated Wp plastic limit WI liquid limit	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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* bit shown by suffix
e.g. AD/T
B blank bit
T TC bit
V V bit

Engineering Log - Hand Auger

client: **THE LAKES 2012 LTD**

principal:

project: **THE LAKES STAGE 2UV**

location: **Approx 220m south of Roundabout**

Borehole ID. **HA08**

sheet: 1 of 1

project no. **GENZTAUC13086AR**







date started: **10 Nov 2015**



date completed: **10 Nov 2015**

logged by: **SWH**

checked by: **RBT**

position: E: 367,969; N: 800,496 (BOPC2000) surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger hole diameter : 50 mm

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
HA	1				0.5		ML	Sandy SILT: non plastic, pale grey, sand is fine to coarse grained; some fine to medium gravel in the upper 0.2m.	D	VSt			EMBANKMENT FILL
	2				1.0		ML	SILT: non plastic, black.					VS UTP
	3				1.5		ML	SILT: non plastic to low liquid limit, brown-grey, stained black, orange and grey, trace of fine to medium grained sand.		St			BURIED TOPSOIL VS 104/ 50 kPa
					2.0		ML	SILT: low liquid limit, pale brown.	M	St to VSt			COLLUVIUM VS 70/ 28 kPa
					2.5		ML	SILT: low liquid limit, pale brown.					YOUNGER ASHES VS 119/ 45 kPa
					3.0		ML	Sandy SILT: low liquid limit, pale brown-grey, sand is fine to coarse grained.	M to W	St			VS 94/ 40 kPa
					3.5			Hand Auger HA08 terminated at 3.0 m Target depth					ROTOEHU ASH VS 60/ 21 kPa
					4.0								VS 62/ 26 kPa
					4.5								VS 78/ 33 kPa
					5.0								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit	penetration  no resistance ranging to refusal	water  10-Oct-12 water level on date shown water inflow water outflow		

* bit shown by suffix
e.g. AD/T
B blank bit
T TC bit
V V bit

Appendix D - Completion Test Data

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: ***The Lakes Stage 2UV***

location: **Center of Lot 3**

Borehole ID. **HAL3**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **10 Oct 2016**

date completed: **10 Oct 2016**

logged by: **DBC**

checked by: ***RBT***

position: Not Specified

surface elevation: Not Specified

angle from horizontal: 90°

DCP id.:

drill model: Hand Auger

drilling fluid:

hole diameter : 50 mm

vane id.: 4523 / New Blade

drilling information						material substance											
method & support	1 penetration	2 water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	vane shear ● remoulded ○ peak (kPa) 50 100 150 200	DCP (blows/ 100 mm) 2 4 6 8 10	structure and additional observations				
<div>↑ HA ↓ N</div>	<div>1 2 3</div>	Not Encountered	VS >215 kPa		0.5			ORGANIC SILT: non plastic, black.	M				TOPSOIL FILL				
			SILT: non plastic to low plasticity, orange brown, with minor clay and minor sand.					M	H		FILL						
			Sandy SILT: non plastic, grey mottled orange brown.					M	H								
			VS >215 kPa		1.0												
			VS >215 kPa					1.5									
			SILTY SAND: fine to medium grained, grey mottled orange brown.						M								
			VS >215 kPa		2.0												
Sandy SILT: non plastic, grey mottled orange brown.	M	H															
VS >215 kPa	2.5																
								HAL3 terminated at 2.5 m Target depth									
<div><div>method</div><div>AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger</div><div>* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit</div></div>			<div><div>support</div><div>M mud N nil C casing</div><div>penetration</div><div><div>no resistance ranging to refusal</div></div><div>water</div><div><div>10-Oct-12 water level on date shown</div><div>water inflow</div><div>water outflow</div></div></div>			<div><div>samples & field tests</div><div>B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing</div></div>			<div><div>classification symbol & soil description</div><div>based on Unified Classification System</div><div>moisture</div><div>D dry M moist W wet S saturated Wp plastic limit Wi liquid limit</div></div>			<div><div>consistency / relative density</div><div>VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense</div></div>					

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 6**

Borehole ID. **HAL6**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **10 Oct 2016**

date completed: **10 Oct 2016**

logged by: **DBC**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: 4523 / New Blade

drilling information				material substance									
method & support	1 penetration	2 water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear remoulded peak (kPa)	DCP (blows/100 mm)	structure and additional observations
HA			VS >215 kPa					ORGANIC SILT: non plastic, black.	M				TOPSOIL FILL
			VS UTP		0.5			Sandy SILT: non plastic, orange brown.	M	H			FILL
			VS >215 kPa					SILTY SAND: fine to medium grained, pale grey.	M		VS UTP		
								0.8 m: slight groundwater seepage encountered.	W				
			VS UTP		1.0			SILT: non plastic to low plasticity, orange brown, with minor clay and some sand.	M to W	H			
			VS UTP					Sandy SILT: non plastic, grey.	M	H	VS UTP		
			VS UTP		1.5			SILT: non plastic, orange brown streaked pale grey, with some sand.	M	H	VS UTP		
			VS UTP		2.0			SAND: fine to medium grained, pale grey, with some silt.	M		VS UTP		
			VS UTP					SILTY SAND: fine to medium grained, pale grey.	M				
			VS >215 kPa		2.5			HAL6 terminated at 2.5 m Target depth					

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	penetration 	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit					

* bit shown by suffix
e.g.
AD/T
B blank bit
T TC bit
V V bit

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 8**

Borehole ID. **HAL8**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **10 Oct 2016**

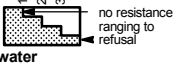
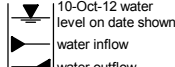
date completed: **10 Oct 2016**

logged by: **DBC**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: 4523 / New Blade

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
HA	1 2 3							ORGANIC SILT: non plastic, black.	M				TOPSOIL FILL
			VS UTP					SILT: non plastic, orange brown, with minor sand.	M	H	VS UTP		FILL
			VS UTP		0.5			SILTY SAND: fine to coarse grained, pale grey streaked orange brown, pumicious.	M		VS UTP		
			VS UTP		1.0			gravels encountered between 0.6m and 1.2m.			VS UTP		
								HAL8 terminated at 1.2 m Obstruction in the hole					Gravels impeding progress, 3 separate boreholes attempted.
					1.5								
					2.0								
					2.5								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	penetration  water 	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit				moisture D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 9**

Borehole ID. **HAL9**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **10 Oct 2016**

date completed: **10 Oct 2016**

logged by: **DBC**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: 4523 / New Blade

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
	1 2 3							SILT: non plastic, black.	M				TOPSOIL FILL
			VS UTP					SILT: non plastic, orange brown, with minor sand.	M	H	VS UTP		FILL
			VS UTP		0.5			SILTY SAND: fine to medium grained, pale grey, pumicious.	M		VS UTP		
			VS UTP						W		VS UTP		
			VS UTP		1.0			Sandy SILT: non plastic, orange brown streaked pale grey.	M	H	VS UTP		
			VS UTP					SILTY SAND: fine to medium grained, pale grey streaked orange brown, pumicious.	M to W		VS UTP		
			VS >215 kPa		1.5			SILT: non plastic, orange brown streaked pale grey, with some sand.	M	VSt to H			
			VS 176/47 kPa		2.0								
			VS 165/41 kPa		2.5								
								HAL9 terminated at 2.5 m Target depth					

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	penetration 	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit					

* bit shown by suffix
e.g.
AD/T
B blank bit
T TC bit
V V bit

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 11**

Borehole ID. **HAL11**

sheet: 1 of 1

project no. **GENZTAUC13086AR**


date started: **10 Oct 2016**

date completed: **10 Oct 2016**

logged by: **DBC**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: 4523 / New Blade

drilling information							material substance									
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	vane shear ⊕ remoulded ⊙ peak (kPa)	DCP (blows/ 100 mm)	structure and additional observations	
	1	2	3													
HA	N			Not Encountered	VS UTP		0.5			ORGANIC SILT: non plastic, black.	M				TOPSOIL FILL	
										Sandy SILT: non plastic, orange brown.	M	H	VS UTP	FILL		
										SILTY SAND: fine to medium grained, pale grey streaked orange brown.	M		VS UTP			
										SILT: non plastic, orange brown, with some sand.	M	H	VS UTP			
										1.0 m: becoming pale grey streaked orange brown.						
					VS UTP		1.5					VS UTP				
					VS 138/ 19 kPa						VSt	⊕	⊙			
					VS 76/ 25 kPa		2.0				M to W	St	⊕	⊙		
					VS UTP							H				
							2.5			HAL11 terminated at 2.5 m Target depth						

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration 		moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 13**

Borehole ID. **HAL13**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **10 Oct 2016**

date completed: **10 Oct 2016**

logged by: **DBC**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: 4523 / New Blade

drilling information							material substance																
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	vane shear			DCP (blows/ 100 mm)	structure and additional observations						
	1	2	3										remoulded	peak	(kPa)								
													50	100	150	200	2	4	6	8	10		
<div>HA</div> <div>N</div>				Not Encountered	VS UTP					SILT: non plastic, orange brown, with some sand.	M												FILL
					VS UTP					Sandy SILT: non plastic, orange brown streaked pale grey.	M	H											
					VS UTP					SILT: non plastic, orange brown, with some sand.	M	H											
					VS 215 kPa																		
					VS 215 kPa																		
					VS 215 kPa																		
					VS UTP																		
										SAND: fine to medium grained, grey, with some silt.	M to W												
										SILT: non plastic, orange brown, with minor sand.	M	H											
										HAL13 terminated at 2.5 m Target depth													

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	penetration 	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit					

* bit shown by suffix
e.g.
AD/T
B blank bit
T TC bit
V V bit

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 14**

Borehole ID. **HAL14**

sheet: 1 of 1

project no. **GENZTAUC13086AR**


date started: **10 Oct 2016**

date completed: **10 Oct 2016**

logged by: **DBC**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: 4523 / New Blade

drilling information							material substance										
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear ⊕ remoulded ⊙ peak (kPa)	DCP (blows/ 100 mm)	structure and additional observations		
<div><div></div><div></div><div></div></div> <div>HA</div> <div>N</div>	1	2	3							SILT: non plastic, orange brown, with minor sand and common gravels.	M	St	⊕	2	FILL		
					VS 50/ 15 kPa						0.4 m: becoming orange brown streaked pale grey with some sand. Gravels absent.		H	⊕		4	
					VS UTP		0.5						VS UTP			4	
					VS >215 kPa						0.9 m: becoming orange brown with minor sand.			⊙		6	
					VS UTP		1.0						VS UTP			6	
					VS >215 kPa		1.5						⊙	8			
					VS >215 kPa		2.0						⊙	10			
					VS UTP		2.5				HAL14 terminated at 2.5 m Target depth			VS UTP			10

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
penetration water * bit shown by suffix e.g. AD/T B blank bit T TC bit V v hit	moisture D dry M moist W wet S saturated Wp plastic limit Wl liquid limit			

* bit shown by suffix
e.g.
AD/T
B blank bit
T TC bit
V V bit

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 22**

Borehole ID: **HAL22**

sheet: 1 of 1

project no: **GENZTAUC13086AR**

date started: **23 Jan 2017**

date completed: **23 Jan 2017**

logged by: **ODS**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear remoulded peak (kPa)	DCP (blows/100 mm)	structure and additional observations
HA	1							ORGANIC SILT: non plastic, black, with trace fine to coarse grained sand.	D to M				TOPSOIL
	2		VS UTP					SILT: non plastic, brown with mottled orange brown, with trace fine to coarse grained gravel and with minor fine to coarse grained sand.	VSt		VS UTP		FILL
	3		VS 194/29 kPa		0.5			0.5 m: becoming grey					
			VS >202 kPa		1.0			0.6 m: becoming orange brown with mottled brown					
			VS 173/31 kPa		1.5			1.3 m: becoming orange brown with mottled grey					
			VS >202 kPa		2.0			1.4 m: with trace fine to coarse grained angular gravel					
			VS >202 kPa		2.5			HAL22 terminated at 2.0 m Target depth					

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	penetration 	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit					

* bit shown by suffix
e.g.
AD/T
B blank bit
T TC bit
V V bit

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 24**

Borehole ID. **HAL24**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **23 Jan 2017**

date completed: **23 Jan 2017**

logged by: **NM**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information					material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations	
HA	1							SILT: non plastic, black/brown with mottled orange brown and grey, with minor fine grained sand and with trace sub-rounded to angular fine to medium gravel.	D				FILL	
	2				0.5			SAND: fine to medium grained, orange.	MD				MATUA SUBGROUP	
	3							0.6 m: becoming grey						
			VS 76/ 27 kPa		1.0			SILT: non plastic, orange brown, with minor clay and with trace fine grained sand.	M	St to VSt				
			VS 128/ 21 kPa					1.0 m: becoming pale grey						
			VS 81/ 24 kPa		1.5									
			VS 97/ 29 kPa											
			VS 103/ 29 kPa		2.0			HAL24 terminated at 2.0 m Target depth						
					2.5									

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration 		moisture D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 26**

Borehole ID. **HAL26**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **23 Jan 2017**

date completed: **23 Jan 2017**

logged by: **ODS**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear remoulded peak (kPa)	DCP (blows/100 mm)	structure and additional observations
HA	1		VS 175/26 kPa					ORGANIC SILT: non plastic, black, with trace fine to coarse grained sand.	D to M				TOPSOIL
	2		VS 153/29 kPa		0.5			SILT: non plastic to low plasticity, orange brown, with minor fine to coarse grained sand.	M	VSt			FILL
	3		VS >202 kPa		1.0			0.7 m: becomes orange brown with mottled pale grey					
			VS 125/29 kPa		1.5			SILT: non plastic, orange brown, with trace fine grained sand.	St to VSt				MATUA SUBGROUP
			VS 134/39 kPa		2.0			SAND: fine to coarse grained, grey.					
			VS 93/38 kPa		2.5			Silty CLAY: non plastic to low plasticity, orange brown, with trace fine grained sand. Is sticky and sensitive in hand sample.					
					2.0			HAL26 terminated at 2.0 m Target depth					

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration 		moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 28**

Borehole ID. **HAL28**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **23 Jan 2017**

date completed: **23 Jan 2017**

logged by: **NM**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
HA	1							SILT: non plastic, brown/black with mottled grey, with trace gravel and trace fine grained sand.	D				FILL
	2		VS 91/ 18 kPa		0.5			SILT: non plastic, yellow brown, with minor clay.	W to S	St			MATUA SUBGROUP
	3		VS 52/ 10 kPa										
			VS 57/ 15 kPa		1.0			1.0 m: becoming pale grey with minor fine grained sand and with trace clay	W				
			VS 88/ 18 kPa		1.5			SAND: fine to medium grained, orange.	L				
					2.0			HAL28 terminated at 2.0 m Target depth					
					2.5								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	penetration 	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit					

* bit shown by suffix
e.g.
AD/T
B blank bit
T TC bit
V V bit

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 30**

Borehole ID. **HAL30**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **23 Jan 2017**

date completed: **23 Jan 2017**

logged by: **ODS**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
HA	1	Not Encountered	VS UTP		0.5			ORGANIC SILT: non plastic, black, with trace fine to coarse grained sand.	D to M	VSt to H	VS UTP		TOPSOIL
								Sandy SILT: fine grained, non plastic, yellow brown.					
			VS 79/ 29 kPa		1.0			SAND: fine to coarse grained, grey.	M	St			MATUA SUBGROUP
								Silty CLAY: low plasticity, orange brown, with trace fine grained sand. Is sticky in hand sample.					
			VS 86/ 26 kPa										
			VS 158/ 25 kPa		1.5			Silty CLAY: low plasticity, pale grey, Is sensitive in hand sample.		VSt			
			VS 114/ 46 kPa										
					2.0			HAL30 terminated at 2.0 m Target depth					
					2.5								

method
AD auger drilling*
AS auger screwing*
HA hand auger
W washbore
HA hand auger

* bit shown by suffix
e.g.
AD/T
B blank bit
T TC bit
V V bit

support
M mud
C casing
N nil

penetration
no resistance ranging to refusal

water
10-Oct-12 water level on date shown
water inflow
water outflow

samples & field tests
B bulk disturbed sample
D disturbed sample
E environmental sample
SS split spoon sample
U## undisturbed sample ##mm diameter
HP hand penetrometer (kPa)
N standard penetration test (SPT)
N* SPT - sample recovered
Nc SPT with solid cone
VS vane shear; peak/remoulded (kPa)
R refusal
HB hammer bouncing

classification symbol & soil description
based on Unified Classification System

moisture
D dry
M moist
W wet
S saturated
Wp plastic limit
WL liquid limit

consistency / relative density
VS very soft
S soft
F firm
St stiff
VSt very stiff
H hard
Fb friable
VL very loose
L loose
MD medium dense
D dense
VD very dense

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 32**

Borehole ID. **HAL32**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **23 Jan 2017**

date completed: **23 Jan 2017**

logged by: **NM**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear remoulded peak (kPa)	DCP (blows/100 mm)	structure and additional observations
HA	1		VS >182 kPa					ORGANIC SILT: non plastic, black, with trace fine to coarse grained sand and with trace fine to coarse gravel.	D	VSt			TOPSOIL
	2		VS 91/18 kPa		0.5			SILT: non plastic, grey with mottled dark brown, with minor fine grained sand.		St			FILL
	3		VS 79/18 kPa										
		Not Encountered	VS 93/18 kPa		1.0			SILT: non plastic, white with mottled orange brown, with trace clay. 0.8 to 1.3 m: poor recovery	W to S	St to VSt			MATUA SUBGROUP
			VS 91/24 kPa		1.5			1.3 m: becoming pale grey with minor fine grained sand and with trace clay. Chalky in hand sample	D to M				
			VS 114/29 kPa										
			VS 103/24 kPa		2.0			1.9 m: becoming grey and with some fine to coarse grained sand					
								HAL32 terminated at 2.0 m Target depth					
					2.5								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration 		moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 34**

Borehole ID. **HAL34**

sheet: 1 of 1

project no. **GENZTAUC13086AR**



date started: **23 Jan 2017**

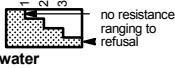
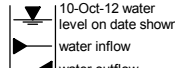
date completed: **23 Jan 2017**

logged by: **ODS**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information					material substance									
method & support	1 penetration	2 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear ⊕ remoulded ⊙ peak (kPa)	DCP (blows/ 100 mm)	structure and additional observations
HA N			Not Encountered	VS 190/ 51 kPa					ORGANIC SILT: non plastic, black, with trace fine to coarse grained sand.	D to M	VSt			TOPSOIL
					SILT: non plastic to low plasticity, brown with mottled orange brown and grey, with trace fine to coarse grained sand.			⊕	⊙			FILL		
				VS 96/ 25 kPa	0.5			Silty CLAY: low plasticity, pale grey, is sensitive in hand sample.	M	St	⊕	⊙	MATUA SUBGROUP	
				VS 63/ 28 kPa	1.0		0.8 m: becomes pale grey to white	⊕			⊙			
		VS 71/ 25 kPa	1.5	1.7 m: 150mm layer of silty SAND, orange brown, fine to coarse grained	⊕		⊙							
				VS 66/ 32 kPa		2.0			HAL34 terminated at 2.0 m Target depth					
				VS 70/ 29 kPa		2.5								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger		support M mud N nil C casing		samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing		classification symbol & soil description based on Unified Classification System		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense	
penetration 		water 				moisture D dry M moist W wet S saturated Wp plastic limit Wl liquid limit			
* bit shown by suffix e.g. AD/T B blank bit T TC bit V v hit									

* bit shown by suffix
e.g.
AD/T
B blank bit
T TC bit
V V bit

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 36**

Borehole ID. **HAL36**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **23 Jan 2017**

date completed: **23 Jan 2017**

logged by: **NM**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
HA	1							ORGANIC SILT: non plastic, black, with trace fine to coarse grained sand and with trace fine to coarse gravel.	D				TOPSOIL
	2		VS >182 kPa					SILT: non plastic, orange brown, with minor fine grained sand.	M to W	St to VSt			MATUA SUBGROUP
	3		VS 79/ 18 kPa		0.5			0.4 m: becoming orange brown with mottled pale grey					
			VS 91/ 30 kPa					0.7 m: becoming grey with some fine grained sand 0.8 m: becoming pale grey with mottled orange brown. With minor fine to medium grained sand					
			VS 88/ 15 kPa		1.0			SAND: fine to medium grained, pale orange.	D				
			VS 77/ 10 kPa		1.5			SILT: non plastic, brown, with trace clay.	W to M	St			
			VS 110/ 24 kPa		2.0			SILT: non plastic, pale grey to white, with trace clay. Poor recovery.	W to S				
					2.5			HAL36 terminated at 2.0 m Target depth					

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration 		moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 38**

Borehole ID: **HAL38**

sheet: 1 of 1

project no: **GENZTAUC13086AR**

date started: **23 Jan 2017**

date completed: **23 Jan 2017**

logged by: **ODS**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information					material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear ⊕ remoulded ⊙ peak (kPa) 0 50 100 150 200	DCP (blows/ 100 mm) 2 4 6 8 10	structure and additional observations
<div><div>HA</div><div>N</div></div>	1 2 3							ORGANIC SILT: non plastic, black, with trace fine to coarse grained sand.	D to M				TOPSOIL
			VS >202 kPa		0.5			SILT: non plastic to low plasticity, orange brown with mottled brown, with trace fine to medium grained sand.		VSt to H		⊕	
		Not Encountered	VS 195/ 58 kPa		1.0			0.8 m: with trace fine grained sand			⊕	⊙	
			VS >202 kPa					1.1 m: with trace clay				⊕	
			VS >202 kPa		1.5							⊕	
			VS >202 kPa		2.0							⊕	
					2.5			HAL38 terminated at 2.0 m Target depth					

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	penetration 	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit					

* bit shown by suffix
e.g.
AD/T
B blank bit
T TC bit
V V bit

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 40**

Borehole ID: **HAL40**

sheet: 1 of 1

project no: **GENZTAUC13086AR**

date started: **23 Jan 2017**

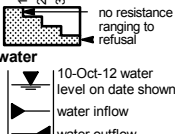
date completed: **23 Jan 2017**

logged by: **NM**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information					material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear remoulded peak (kPa)	DCP (blows/ 100 mm)	structure and additional observations	
HA	1		VS >182 kPa					ORGANIC SILT: non plastic, black, with trace fine to coarse grained sand.	D				TOPSOIL	
	2		VS >182 kPa		0.5			SILT: non plastic, yellow brown, with trace fine grained sand.	VSt				FILL	
	3		VS >182 kPa					0.8 m: with minor fine grained sand	M					
		Not Encountered	VS >182 kPa		1.0			1.2 m: becoming orange brown with trace clay	M to W					
			VS >182 kPa		1.5									
			VS 148/33 kPa											
			VS >182 kPa											
			VS >182 kPa		2.0			HAL40 terminated at 2.0 m Target depth						
					2.5									

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration 		moisture D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 43**

Borehole ID. **HAL43**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **20 May 2016**

date completed: **20 May 2016**

logged by: **ODS**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear remoulded peak (kPa)	DCP (blows/100 mm)	structure and additional observations
HA	1	Not Encountered	VS 146/ 34 kPa					Silty SILT: low plasticity, dark brown.	M				TOPSOIL
	2		VS 98/ 55 kPa		0.5			SILT: non plastic, orange brown, with trace to minor clay and with trace fine to coarse grained sand.		St to VSt	⊕ ⊙		MATUA SUBGROUP
	3		VS 122/ 24 kPa					0.6 m: becomes "greasy" in hand sample			⊕ ⊙		
			VS 92/ 21 kPa		1.0						⊕ ⊙		
			VS 112/ 49 kPa								⊕ ⊙		
			VS 106/ 26 kPa		1.5						⊕ ⊙		
			VS 74/ 34 kPa								⊕ ⊙		
			VS 173/ 29 kPa		2.0			HAL43 terminated at 2.0 m Target depth			⊕ ⊙		
					2.5								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud N nil C casing	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration water 		moisture D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 45**

Borehole ID. **HAL45**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **20 May 2016**

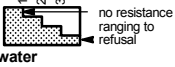
date completed: **20 May 2016**

logged by: **ODS**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
1 2 3	1 2 3							Silty SILT: low plasticity, dark brown.	M				TOPSOIL
			VS 154/ 25 kPa					Sandy SILT: non plastic, orange brown, fine to coarse grained sand.		VSt			MATUA SUBGROUP
			VS >202 kPa		0.5								
			VS >202 kPa										
			VS >202 kPa		1.0			1.0 m: trace fine to coarse grained sand					
			VS >202 kPa					1.15 to 1.25 m: 10cm layer of fine to coarse grained sand					
			VS 59/ 29 kPa		1.5			SILTY SAND: non plastic, brown, fine grained sand.		VL			
								SAND: fine to coarse grained, grey brown.		VL			
			VS 49/ 29 kPa		2.0			Clayey SILT: non plastic, pale grey.		F			
								HAL45 terminated at 2.0 m Target depth					
					2.5								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration  10-Oct-12 water level on date shown water inflow water outflow		moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 47**

Borehole ID. **HAL47**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **20 May 2016**

date completed: **20 May 2016**

logged by: **ODS**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance									
method & support	1 penetration	2 water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear remoulded peak (kPa)	DCP (blows/100 mm)	structure and additional observations
HA N	1 2 3	Not Encountered	VS >202 kPa					Silty SILT: low plasticity, dark brown.	M	VSt to H			TOPSOIL
			VS >202 kPa		0.5			SILT: non plastic to low plasticity, orange brown, with minor fine to coarse grained sand.					MATUA SUBGROUP
			VS >202 kPa					Sandy SILT: non plastic, pale brown, fine to coarse grained sand.					
					1.0			SAND: fine to coarse grained, grey brown.		VSt			
								Silty CLAY: low plasticity, brown, with trace fine to coarse grained sand.					
			VS 109/32 kPa		1.5			Silty CLAY: low plasticity, white.					
			VS 112/32 kPa										
			VS 173/29 kPa		2.0			HAL47 terminated at 2.0 m Target depth					
					2.5								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	penetration 	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit				moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 49**

Borehole ID: **HAL49**

sheet: 1 of 1

project no: **GENZTAUC13086AR**

date started: **20 May 2016**

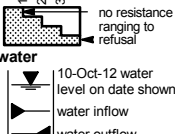
date completed: **20 May 2016**

logged by: **ODS**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
HA	1							Silty SILT: low plasticity, dark brown.	M				TOPSOIL
	2		VS 173/ 29 kPa					Clayey SILT: low plasticity, pale grey.		VSt	⊕ ⊙		MATUA SUBGROUP
	3		VS 153/ 29 kPa		0.5						⊕ ⊙		
			VS 129/ 29 kPa								⊕ ⊙		
			VS 98/ 25 kPa		1.0						⊕ ⊙		
			VS 106/ 25 kPa								⊕ ⊙		
			VS 180/ 63 kPa		1.5						⊕ ⊙		
			VS 156/ 41 kPa								⊕ ⊙		
			VS 114/ 29 kPa		2.0			HAL49 terminated at 2.0 m Target depth			⊕ ⊙		
					2.5								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration 		moisture D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 51**

Borehole ID: **HAL51**

sheet: 1 of 1

project no: **GENZTAUC13086AR**

date started: **20 May 2016**

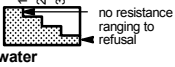
date completed: **20 May 2016**

logged by: **ODS**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
HA	1							Silty SILT: low plasticity, dark brown.	M				TOPSOIL
	2				0.5			SAND: fine to coarse grained, grey brown.	VL to L				MATUA SUBGROUP
	3				1.0			Clayey SILT: low plasticity, pale grey.	St to VSt				
			VS 75/ 18 kPa										
			VS 82/ 21 kPa										
			VS 117/ 29 kPa										
			VS >202 kPa		1.5								
			VS >202 kPa										
			VS 182/ 32 kPa		2.0			HAL51 terminated at 2.0 m Target depth					
					2.5								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration  10-Oct-12 water level on date shown water inflow water outflow		moisture D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 52**

Borehole ID: **HAL52**

sheet: 1 of 1

project no: **GENZTAUC13086AR**

date started: **20 May 2016**

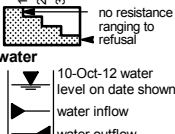
date completed: **20 May 2016**

logged by: **ODS**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
HA	1							Silty SILT: low plasticity, dark brown.	M				TOPSOIL
	2		VS 104/ 29 kPa					Clayey SILT: low plasticity, pale grey.		St to VSt	⊕ ⊙		MATUA SUBGROUP
	3		VS 93/ 24 kPa		0.5						⊕ ⊙		
			VS 177/ 26 kPa								⊕ ⊙		
			VS 156/ 24 kPa		1.0						⊕ ⊙		
			VS 185/ 62 kPa								⊕ ⊙		
			VS >202 kPa		1.5						⊕ ⊙		
			VS 104/ 26 kPa								⊕ ⊙		
			VS 173/ 29 kPa		2.0			HAL52 terminated at 2.0 m Target depth			⊕ ⊙		
					2.5								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration 		moisture D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 55**

Borehole ID. **HAL55**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **24 May 2016**

date completed: **24 May 2016**

logged by: **NM**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information							material substance										
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear			DCP (blows/ 100 mm)	structure and additional observations
	1	2	3										⊕ remoulded	⊙ peak	(kPa)		
<div><div>HA</div><div>N</div></div>				Not Encountered					ML	SILT: non plastic, dark brown.	D to M	VSt to H					TOPSOIL
										ML			SILT: low plasticity, orange brown, with minor clay, minor fine to medium grained sand. Occasional pockets of low plasticity, white, silt with some clay (4cm).				
									ML	SILT: low plasticity, orange brown, with minor clay, trace fine grained sand.	D						
									ML	SILT: low plasticity, orange brown streaked black, with minor clay, trace fine grained sand, trace rootlets.	M	St					VOLCANIC ASHES
										HAL55 terminated at 2.0 m Target depth							

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
penetration no resistance ranging to refusal	water 10-Oct-12 water level on date shown water inflow water outflow	moisture D dry M moist W wet S saturated Wp plastic limit Wl liquid limit		

* bit shown by suffix
e.g.
AD/T
B blank bit
T TC bit
V V bit

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 56**

Borehole ID. **HAL56**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **24 May 2016**

date completed: **24 May 2016**

logged by: **NM**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information					material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations	
HA	1	Not Encountered	VS >183 kPa				ML	SILT: low plasticity, orange brown, with minor clay, trace fine grained sand.	D	VSt to H			FILL	
	2		VS >183 kPa		0.5			0.4 m: becoming white with trace clay.						
	3		VS >183 kPa					0.6 m: becoming orange brown with some fine to medium grained sand.						
			VS >183 kPa					0.8 m: becoming white with trace fine grained sand.	M to W					
			VS >183 kPa		1.0			1.0 m: becoming orange brown.						
			VS 151 kPa						D					
			VS >183 kPa		1.5			1.4 m: becoming grey with minor fine grained sand.					VOLCANIC ASHES	
			VS UTP					1.6 m: becoming orange brown with some fine to medium grained sand.						
			VS 142/18 kPa		2.0		ML	Clayey SILT: low plasticity, orange brown, with minor clay, trace fine grained sand, trace rootlets. HAL56 terminated at 2.0 m Target depth	M	VSt				
					2.5									

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	penetration 	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit					

* bit shown by suffix
e.g.
AD/T
B blank bit
T TC bit
V V bit

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 58**

Borehole ID: **HAL58**

sheet: 1 of 1

project no: **GENZTAUC13086AR**

date started: **24 May 2016**

date completed: **24 May 2016**

logged by: **NM**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information					material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations	
HA	1	Not Encountered	VS >183 kPa				ML	SILT: low plasticity, pale orange brown, with some fine to medium grained sand, minor clay.	D to M	VSt to H			FILL	
	2		VS >183 kPa		0.5			0.4 m: becoming orange brown with trace fine to medium grained sand.						
	3		VS >183 kPa											
			VS 183/ 31 kPa		1.0			0.9 m: becoming mottled pale orange with minor fine to medium grained sand.						
			VS >183 kPa											
			VS 183/ 78 kPa		1.5		ML	SILT: low plasticity, white mottled orange brown, with some clay.	D					
			VS >183 kPa											
			VS >183 kPa				ML	Clayey SILT: low plasticity, orange brown flecked white.						
			VS >183 kPa		2.0			HAL58 terminated at 2.0 m Target depth						
					2.5									

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	penetration 	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit					

* bit shown by suffix
e.g.
AD/T
B blank bit
T TC bit
V V bit

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 60**

Borehole ID: **HAL60**

sheet: 1 of 1

project no: **GENZTAUC13086AR**

date started: **24 May 2016**

date completed: **24 May 2016**

logged by: **NM**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information					material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear remoulded peak (kPa)	DCP (blows/100 mm)	structure and additional observations	
HA	1	Not Encountered	VS >183 kPa				ML	SILT: non plastic to low plasticity, pale orange brown mottled grey, with some fine to medium grained sand, minor clay.	M	VSt to H			FILL	
	2		VS >183 kPa		0.5			0.4 m: becoming pale orange brown with minor fine to medium grained sand.						
	3		VS >183 kPa					0.9 m: becoming grey mottled orange brown with trace fine grained sand.						
			VS 151/43 kPa	1.0				1.1 m: minor fine to medium grained sand.	D to M					
			VS UTP					1.4 m: becoming brown with trace fine grained sand.						
			VS >183 kPa	1.5				1.6 m: becoming streaked black with trace medium grained rounded gravel.					YOUNGER ASH	
			VS >183 kPa				ML	SILT: low plasticity, orange brown, with minor fine grained sand, trace clay.						
			VS >120/31 kPa	2.0				HAL60 terminated at 2.0 m Target depth						
					2.5									

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	penetration 	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit					

* bit shown by suffix
e.g.
AD/T
B blank bit
T TC bit
V V bit

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 62**

Borehole ID. **HAL62**

sheet: 1 of 1

project no. **GENZTAUC13086AR**


date started: **24 May 2016**

date completed: **24 May 2016**

logged by: **NM**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information								material substance										
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear ⊕ remoulded ⊙ peak (kPa) 50 100 150 200	DCP (blows/ 100 mm) 2 4 6 8 10	structure and additional observations			
<div>HA</div> <div>N</div>	1	2	3	Not Encountered	VS >183 kPa				ML	SILT: low plasticity, orange brown mottled white, with minor clay, trace fine grained sand.	M	VSt to H			FILL			
					VS >183 kPa		0.5			0.5 m: becoming orange brown with some fine to medium grained sand.								
					VS >183 kPa					0.8 m: minor clay with occasional pockets of white silt.								
					VS >183 kPa		1.0			1.1 m: becoming white mottled orange brown with sand absent.	D							
					VS >183 kPa		1.5											
					VS >183 kPa				ML	SILT: low plasticity, orange brown, with some clay, trace fine to medium grained sand.								
					VS >183 kPa													
					VS >183 kPa		2.0											
									2.5									

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration 		moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit	

client: **The Lakes (2012) Ltd**

principal:

project: ***The Lakes Stage 2UV***

location: **Center of Lot 68**

Borehole ID. **HAL68**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **20 May 2016**

date completed: **20 May 2016**

logged by: **NM**

checked by: **RBT**

position: Not Specified

surface elevation: Not Specified

angle from horizontal: 90°

DCP id.:

drill model: Hand Auger

drilling fluid:

hole diameter : 50 mm

vane id.: DR2244

drilling information						material substance														
method & support		penetration		samples & field tests		RL (m)	depth (m)	graphic log	classification symbol	material description		moisture condition	consistency / relative density		vane shear		DCP (blows/ 100 mm)		structure and additional observations	
AD AS HA W HA	1 2 3	water	VS > 183 kPa	VS 94/ 19 kPa	VS UTP	VS > 183 kPa	VS > 183 kPa	VS > 183 kPa	VS > 183 kPa	VS > 183 kPa	VS > 183 kPa	D	VSt	St	VSt	50 100 150 200	2 4 6 8 10	FILL		
										SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components										
										ML	SILT: low plasticity, dark brown.									
										ML	SILT: low plasticity, orange brown, with minor fine to medium grained sand, trace clay, trace fine grained rounded gravel.									
										ML	SILT: low plasticity, grey mottled orange, with some clay.									
										0.7 m: becoming orange brown with minor fine to medium grained sand, trace fine to medium grained rounded to subangular gravel. Clay absent.										
										HAL68 terminated at 2.0 m Target depth										

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 70**

Borehole ID. **HAL70**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **20 May 2016**

date completed: **20 May 2016**

logged by: **NM**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
HA	1						ML	SILT: low plasticity, dark brown.	D				TOPSOIL
	2		VS 183 kPa				ML	SILT: low plasticity, grey mottled orange, with minor clay.	VSt				MATUA SUBGROUP
	3				0.5				M				
			VS 81/19 kPa										
			VS 94/25 kPa					0.8 m: minor fine grained sand.	W to S				
			VS 55/19 kPa		1.0								
			VS 74/19 kPa					1.2 m: becoming dilatant.					
			VS 107/31 kPa		1.5				VSt				
			VS 107/21 kPa										
			VS 81/31 kPa		2.0			HAL70 terminated at 2.0 m Target depth	St				
					2.5								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration 		moisture D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 72**

Borehole ID. **HAL72**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **01 Feb 2017**

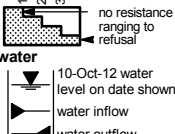
date completed: **01 Feb 2017**

logged by: **ODS**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information					material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear remoulded peak (kPa)	DCP (blows/100 mm)	structure and additional observations	
HA	1							SILT: non plastic to low plasticity, orange brown, with trace fine grained sand.	M	VSt			VOLCANIC ASHES	
	2		VS >202 kPa		0.5									
	3		VS >202 kPa											
			VS 112/ 24 kPa		1.0			0.7 m: with trace to minor clay, low plasticity						
			VS 106/ 18 kPa											
			VS 125/ 58 kPa		1.5									
			VS 120/ 34 kPa		2.0									
					2.0			HAL72 terminated at 2.0 m Target depth						
					2.5									

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration 		moisture D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 74**

Borehole ID: **HAL74**

sheet: 1 of 1

project no: **GENZTAUC13086AR**

date started: **01 Feb 2017**

date completed: **01 Feb 2017**

logged by: **ODS**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
HA	1		VS >202 kPa					ORGANIC SILT: non plastic, black.	D to M	VSt			TOPSOIL
	2				0.5			SILTY SAND: fine to coarse grained, yellow brown, with trace fine pumiceous gravel.	M				POST ROTOEHU ASH
	3		VS UTP		1.0			Sandy SILT: fine grained, non plastic, yellow brown.			VS UTP		ROTOEHU ASH
			VS 98/34 kPa		1.5			SAND: fine to coarse grained, grey brown.		St			MATUA SUBGROUP
			VS 97/29 kPa		2.0			Silty CLAY: low plasticity, brown, sticky in hand sample.					
								CLAY: medium plasticity, white to pale grey.					
					2.0			HAL74 terminated at 2.0 m Target depth					
					2.5								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	penetration 	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit				moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 76**

Borehole ID. **HAL76**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **01 Feb 2017**


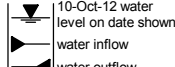
date completed: **01 Feb 2017**

logged by: **ODS**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
HA	1							SILT: non plastic to low plasticity, orange brown, with trace fine grained sand.	D				TOPSOIL
	2		VS >202 kPa					SILT: non plastic to low plasticity, orange brown with mottled grey, with trace fine to coarse grained sand and trace clay.	D to M	VSt to H			FILL
	3		VS >202 kPa		0.5			Sandy SILT: fine grained, non plastic, yellow brown.					POST ROTOEHU ASH
								SAND: fine to coarse grained, grey.					ROTOEHU ASH
			VS 93/ 21 kPa		1.0			Silty CLAY: non plastic to low plasticity, brown, with trace fine grained sand. Sticky in hand sample.	M	St to VSt			HAMILTON ASH
			VS 112/ 41 kPa					CLAY: medium plasticity, white to pale grey.		St to VSt			MATUA SUBGROUP
			VS 96/ 24 kPa		1.5								
			VS 105/ 32 kPa		2.0			HAL76 terminated at 2.0 m Target depth					
					2.5								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration  water 		moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 78**

Borehole ID. **HAL78**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **01 Feb 2017**

date completed: **01 Feb 2017**

logged by: **ODS**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information					material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear remoulded peak (kPa)	DCP (blows/ 100 mm)	structure and additional observations	
HA	1		VS >202 kPa		0.5			ORGANIC SILT: non plastic to low plasticity, dark brown with mottled grey and orange brown, with trace fine to coarse grained sand. Faint organic odour.	D to M	VSt			FILL	
	2		VS >202 kPa											
	3				1.0			CLAY: medium plasticity, white to pale grey. 1.0 m: with streaked orange brown	M	St to VSt			MATUA SUBGROUP	
		Not Encountered	VS 112/ 22 kPa											
			VS 125/ 24 kPa		1.5									
			VS 151/ 62 kPa											
			VS 71/ 34 kPa		2.0			HAL78 terminated at 2.0 m Target depth						
					2.5									

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration 		moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 80**

Borehole ID. **HAL80**

sheet: 1 of 1

project no. **GENZTAUC13086AR**


date started: **20 May 2016**

date completed: **20 May 2016**

logged by: **NM**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information								material substance									
method & support	penetration		water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	vane shear		DCP (blows/ 100 mm)	structure and additional observations		
	1	2										remoulded	peak				
<div>HA</div> <div>N</div>	1	2	Not Encountered	VS 114/ 28 kPa				ML	SILT: low plasticity, dark brown.	D		⊕	⊙	<div>2</div> <div>4</div> <div>6</div> <div>8</div> <div>10</div>	TOPSOIL		
	3							ML	SILT: low plasticity, pale yellow, with trace clay.	M	VSt	⊕	⊙		MATUA SUBGROUP		
									VS 142/ 25 kPa	0.5			⊕			⊙	
									VS 126/ 19 kPa			⊕	⊙				
									VS 68/ 19 kPa	1.0		⊕	⊙				
									VS 107/ 19 kPa			⊕	⊙				
									VS 126/ 25 kPa	1.5		⊕	⊙				
									VS 107/ 19 kPa			⊕	⊙				
									VS 120/ 31 kPa	2.0		M				⊕	⊙
					2.5												

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration 		moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 82**

Borehole ID. **HAL82**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **20 May 2016**

date completed: **20 May 2016**

logged by: **NM**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear remoulded peak (kPa)	DCP (blows/100 mm)	structure and additional observations
HA	1		VS 133/ 33 kPa				ML	Silty SILT: low plasticity, dark brown.	D	VSt			TOPSOIL
	2		VS 120/ 19 kPa		0.5		ML	SILT: low plasticity, grey, with trace clay, trace fine grained sand.	M				MATUA SUBGROUP
	3		VS 88/ 19 kPa					0.5 to 1.0 m: Soil becomes sensitive in hand sample	W to S				From 0.5 to 1.0: low recovery.
			VS 133/ 25 kPa		1.0			1.1 m: becoming pale orange with some fine to medium grained sand.					
			VS 133/ 25 kPa					1.3 m: becoming grey with sand absent.					
			VS 68/ 31 kPa		1.5					St			
			VS UTP				ML	Sandy SILT: non plastic, grey, with fine to medium grained sand.					
							SP	SAND: fine to medium grained, pale orange, with trace silt.		MD			
					2.0			HAL82 terminated at 2.0 m Target depth					
					2.5								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration water 		moisture D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 83**

Borehole ID. **HAL83**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **20 May 2016**


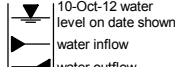
date completed: **20 May 2016**

logged by: **ODS**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
1 2 3	1 2 3							Silty SILT: low plasticity, dark brown.	M				TOPSOIL
			VS 158/ 12 kPa					Clayey SILT: non plastic to low plasticity, pale grey, "sticky".		VSt			MATUA SUBGROUP
			VS 58/ 15 kPa		0.5					St to VSt			
			VS 122/ 29 kPa					0.8 m: becomes white					
			VS 67/ 21 kPa		1.0								
			VS 134/ 29 kPa					1.2 to 1.5 m: with trace limonite staining					
			VS 93/ 26 kPa		1.5								
			VS 166/ 36 kPa										
			VS 133/ 49 kPa		2.0			SILT: non plastic, orange brown, with minor fine to coarse grained sand and with trace fine grained pumiceous gravel. HAL83 terminated at 2.0 m Target depth					
					2.5								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration  water 		moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 85**

Borehole ID. **HAL85**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **20 May 2016**

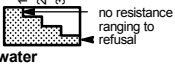
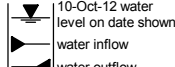
date completed: **20 May 2016**

logged by: **ODS**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
1 2 3	1 2 3							Silty SILT: low plasticity, dark brown.	M				TOPSOIL
			VS 173/ 21 kPa					Sandy SILT: non plastic, orange brown, fine to coarse grained sand.		St to VSt	⊕	⊙	MATUA SUBGROUP
					0.5			SAND: fine to coarse grained, orange brown, with trace fine gravel and trace silt.					
			VS 153/ 18 kPa					Clayey SILT: non plastic to low plasticity, brown, with trace fine to coarse grained sand.		St to VSt	⊕	⊙	
			VS 105/ 34 kPa		1.0						⊕	⊙	
			VS 65/ 21 kPa					Silty CLAY: low plasticity, white, with trace limonite staining.			⊕	⊙	
			VS 156/ 32 kPa		1.5						⊕	⊙	
			VS 98/ 18 kPa								⊕	⊙	
			VS 78/ 28 kPa		2.0			HAL85 terminated at 2.0 m Target depth			⊕	⊙	
					2.5								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration  water 		moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 87**

Borehole ID. **HAL87**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **20 May 2016**

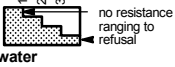
date completed: **20 May 2016**

logged by: **ODS**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: casing diameter : 50 mm vane id.: SL588

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear remoulded peak (kPa)	DCP (blows/100 mm)	structure and additional observations
HA	1	Not Encountered	VS 142/ 29 kPa		0.5			Silty SILT: low plasticity, dark brown.	M	St to VSt			TOPSOIL
	2		VS 85/ 21 kPa					SILT: non plastic to low plasticity, orange brown, with trace fine to coarse grained sand.					MATUA SUBGROUP
	3		VS 88/ 25 kPa					Clayey SILT: low plasticity, pale grey.					
			VS 133/ 29 kPa		1.0			0.7 m: with trace limonite staining 0.75 m: becoming white					
			VS 161/ 34 kPa										
			VS 160/ 51 kPa		1.5								
			VS 173/ 48 kPa										
			VS 121/ 32 kPa		2.0			HAL87 terminated at 2.0 m Target depth					
					2.5								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration  10-Oct-12 water level on date shown water inflow water outflow		moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 89**

Borehole ID. **HAL89**

sheet: 1 of 1

project no. **GENZTAUC13086AR**


date started: **20 May 2016**

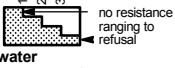
date completed: **20 May 2016**

logged by: **NM**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information								material substance														
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	vane shear (kPa)			DCP (blows/ 100 mm)	structure and additional observations					
	1	2	3										remoulded peak	remoulded	peak							
HA	1	2	3	Not Encountered	VS >183 kPa		0.5		ML	SILT: low plasticity, dark brown.	D	VSt	50	100	150	200	2	4	6	8	10	TOPSOIL
									ML	SILT: non plastic to low plasticity, orange brown, with minor clay, trace fine to coarse grained sand.			150	200	VOLCANIC ASHES							
									VS >183 kPa	0.5		ML	SILT: low to medium plasticity, grey, with minor clay, trace black coarse grained sand.	M to W	VSt	50	100	150	200	2	4	6
					VS 135/ 19 kPa	1.0		0.8 m: From 0.8 to 2.0m: Soil is sensitive in hand sample	50	100	150	200	2			4	6	8	10			
N	1	2	3		VS 107/ 18 kPa		1.0						50	100	150	200	2	4	6	8	10	
					VS 120/ 19 kPa		1.5			1.4 m: trace fine grained sand, dilatant with clay absent.	W to S		50	100	150	200	2	4	6	8	10	
					VS 120/ 19 kPa								50	100	150	200	2	4	6	8	10	
					VS 151/ 19 kPa								50	100	150	200	2	4	6	8	10	
					VS 133/ 19 kPa		2.0			HAL89 terminated at 2.0 m Target depth			50	100	150	200	2	4	6	8	10	
							2.5															

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
penetration  no resistance ranging to refusal 10-Oct-12 water level on date shown water inflow water outflow	moisture D dry M moist W wet S saturated Wp plastic limit Wl liquid limit			

* bit shown by suffix
e.g.
AD/T
B blank bit
T TC bit
V V bit

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 91**

Borehole ID. **HAL91**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **24 May 2016**

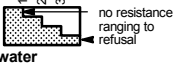
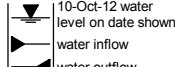
date completed: **24 May 2016**

logged by: **NM**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : vane id.: DR2244

drilling information				material substance									
method & support	1 penetration	2 water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear remoulded peak (kPa)	DCP (blows/100 mm)	structure and additional observations
			VS >183 kPa				ML	SILT: low plasticity, dark brown.	D				TOPSOIL
			VS >183 kPa		0.5		ML	SILT: low plasticity, white mottled orange, with some clay.		H to VSt			MATUA SUBGROUP
			VS 120/19 kPa					0.6 m: becoming white with minor clay.	M to W	VSt			
			VS 151/21 kPa		1.0			1.0 m: becoming dilatant.					
			VS 126/31 kPa						W				
			VS 126/31 kPa		1.5								
			VS 126/31 kPa					1.8 m: becoming mottled orange.					
			VS 151/31 kPa		2.0			HAL91 terminated at 2.0 m Target depth					
					2.5								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	support M mud C casing penetration  water 	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System moisture D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 94**

Borehole ID. **HAL94**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **20 May 2016**

date completed: **20 May 2016**

logged by: **NM**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information							material substance											
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear		DCP (blows/ 100 mm)	structure and additional observations		
	1	2	3										remoulded	peak				
<div>HA</div> <div>N</div>				Not Encountered	VS 133/ 31 kPa				ML	SILT: low plasticity, dark brown.	D					TOPSOIL		
					VS 120/ 19 kPa		0.5			ML	SILT: non plastic to low plasticity, grey, with coarse silt.	M	VSt				MATUA SUBGROUP	
					VS 68/ 9 kPa						0.6 m: becoming sensitive and dilatant.		F to St				From 0.6 to 1.2: poor recovery	
					VS 43/ 9 kPa		1.0					W						
					VS 101/ 19 kPa					S			VSt					
					VS 126/ 19 kPa													
							1.5			SP	SAND: fine to coarse grained, orange red, with trace silt.		MD					
					VS 126/ 31 kPa									VSt				
					VS 126/ 30 kPa			2.0			ML	SILT: low plasticity, orange red mottled grey, with some fine to coarse grained sand.	M					
												HAL94 terminated at 2.0 m Target depth						
						2.5												

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration 		moisture D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 95**

Borehole ID. **HAL95**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **20 May 2016**

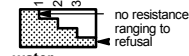
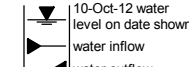
date completed: **20 May 2016**

logged by: **NM**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information					material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear remoulded peak (kPa)	DCP (blows/100 mm)	structure and additional observations	
HA N	1	Not Encountered	VS 172/ 25 kPa				ML	SILT: non plastic, dark brown.	D				TOPSOIL	
	2						ML	SILT: non plastic to low plasticity, pale yellow, with minor fine grained sand, trace clay (Chalky).	VSt				MATUA SUBGROUP	
	3		VS 151/ 19 kPa		0.5			0.4 m: becoming white with trace to minor fine grained sand.	M					
			VS 120/ 19 kPa						W					
			VS 151/ 19 kPa		1.0			1.0 m: becoming sensitive and dilatant in hand sample.	S					
			VS 133/ 19 kPa											
			VS 117/ 37 kPa		1.5			1.6 m: becoming some fine grained sand.	M to W				From 1.0 to 1.2: poor recovery	
			VS 142/ 43 kPa											
			VS >183 kPa		2.0			HAL95 terminated at 2.0 m Target depth						
					2.5									

method		support		samples & field tests		classification symbol & soil description		consistency / relative density	
AD	auger drilling*	M	mud	B	bulk disturbed sample	based on Unified Classification System		VS	very soft
AS	auger screwing*	C	casing	D	disturbed sample			S	soft
HA	hand auger			E	environmental sample		F	firm	
W	washbore			SS	split spoon sample		St	stiff	
HA	hand auger			U##	undisturbed sample ##mm diameter		VSt	very stiff	
				HP	hand penetrometer (kPa)	moisture		H	hard
				N	standard penetration test (SPT)	D	dry	Fb	friable
				N*	SPT - sample recovered	M	moist	VL	very loose
				Nc	SPT with solid cone	W	wet	L	loose
				VS	vane shear; peak/remoulded (kPa)	S	saturated	MD	medium dense
				R	refusal	Wp	plastic limit	D	dense
				HB	hammer bouncing	Wl	liquid limit	VD	very dense
		penetration							
									
		water							
									
* bit shown by suffix									
e.g. AD/T									
B blank bit									
T TC bit									
V V bit									

* bit shown by suffix
e.g.
AD/T
B blank bit
T TC bit
V V bit

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 96**

Borehole ID. **HAL96**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **20 May 2016**

date completed: **20 May 2016**

logged by: **NM**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information								material substance									
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	vane shear			DCP (blows/ 100 mm)	structure and additional observations
	1	2	3										remoulded (kPa)	peak			
<div>HA</div> <div>N</div>				Not Encountered	VS 172/ 25 kPa			ML	SILT: non plastic, dark brown, with trace fine grained sand, trace rootlets.	D	VSt					TOPSOIL	
					VS 151/ 19 kPa				ML	SILT: non plastic to low plasticity, pale yellow, with minor fine sand, trace clay (Chalky).			⊕	⊙		MATUA SUBGROUP	
					VS 120/ 19 kPa	0.5				0.6 m: minor fine grained sand.		M	⊕	⊙			
					VS 151/ 19 kPa				1.0 m: trace fine grained sand. Dilatant.	W		⊕	⊙				
					VS 133/ 19 kPa	1.0				S		⊕	⊙		From 1.0 to 1.2: poor recovery		
					VS 117/ 37 kPa							⊕	⊙				
					VS 142/ 43 kPa	1.5			1.8 m: minor to trace fine grained sand.	M to W		⊕	⊙				
					VS >183 kPa	2.0				HAL96 terminated at 2.0 m Target depth					⊙		
						2.5											

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud N nil C casing	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration 		moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 98**

Borehole ID. **HAL98**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **01 Feb 2017**

date completed: **01 Feb 2017**

logged by: **ODS**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear remoulded peak (kPa)	DCP (blows/100 mm)	structure and additional observations
HA	1		VS 189/39 kPa					ORGANIC SILT: non plastic to low plasticity, black.	D				TOPSOIL
	2		VS 161/49 kPa		0.5			SILT: low plasticity, orange brown, with trace fine to coarse grained sand and with trace clay.	M	St to VSt			POST ROTOEHU ASH
	3		VS 202 kPa		1.0			0.9 m: with minor fine to coarse grained sand					
			VS 190/35 kPa		1.1			1.1 m: with some fine to coarse grained sand					
			VS 90/39 kPa		1.5								
			VS 139/29 kPa		2.0			SAND: fine to coarse grained, grey brown.					ROTOEHU ASH
								CLAY: low plasticity, pale grey to white with streaked orange brown.	VSt				MATUA SUBGROUP
					2.0			HAL98 terminated at 2.0 m Target depth					
					2.5								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration water 		moisture D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 102**

Borehole ID. **HAL102**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **24 May 2016**


date completed: **24 May 2016**

logged by: **NM**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
HA	1						ML	SILT: low plasticity, dark brown.	D	VSt			TOPSOIL
	2		VS 183/ 25 kPa				CL-ML	Clayey SILT: low plasticity, pale orange brown.					VOLCANIC ASHES
	3				0.5								
			VS 183/ 25 kPa										
			VS 133/ 31 kPa				ML	SILT: low plasticity, grey, with minor fine grained sand, minor clay.	M to W	St to VSt			MATUA SUBGROUP
			VS 120/ 25 kPa		1.0								
			VS 114/ 21 kPa										
			VS 94/ 37 kPa		1.5								
			VS 81/ 19 kPa										
			VS 94/ 37 kPa		2.0								
								HAL102 terminated at 2.0 m Target depth					
					2.5								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration  no resistance ranging to refusal water 10-Oct-12 water level on date shown water inflow water outflow		moisture D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 103**

Borehole ID. **HAL103**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **20 May 2016**

date completed: **20 May 2016**

logged by: **ODS**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: SL588

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear remoulded peak (kPa)	DCP (blows/100 mm)	structure and additional observations
HA	1	Not Encountered	VS 74/ 15 kPa					Silty SILT: low plasticity, dark brown.	M				TOPSOIL
	2		VS 89/ 21 kPa		0.5			Clayey SILT: low plasticity, pale grey, "sticky".		St to VSt			MATUA SUBGROUP
	3		VS 109/ 25 kPa					0.7 m: with trace limonite staining 0.75 m: becoming white					
			VS 148/ 46 kPa		1.0								
			VS 156/ 26 kPa										
			VS 136/ 22 kPa		1.5								
			VS 75/ 38 kPa										
			VS 98/ 38 kPa		2.0			HAL103 terminated at 2.0 m Target depth					
					2.5								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration 		moisture D dry M moist W wet S saturated Wp plastic limit WL liquid limit	

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 105**

Borehole ID. **HAL105**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **20 May 2016**

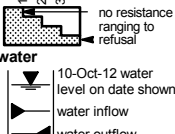
date completed: **20 May 2016**

logged by: **NM**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information				material substance									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	DCP (blows/100 mm)	structure and additional observations
HA	1						ML	SILT: non plastic, dark brown.	D	VSt			TOPSOIL
	2		VS >183 kPa				ML	SILT: low plasticity, orange brown, with minor clay, trace fine to coarse grained sand.					VOLCANIC ASHES
	3				0.5		ML	SILT: non plastic to low plasticity, grey, with minor fine grained sand, trace clay.	M	St to VSt			MATUA SUBGROUP
			VS 133/ 19 kPa					0.6 m: becoming sensitive in hand sample	W to S				
			VS 88/ 21 kPa										
			VS 133/ 24 kPa		1.0								
			VS 120/ 31 kPa										
			VS 123/ 30 kPa		1.5								
			VS 126/ 19 kPa					1.6 m: becoming dilatant.					
			VS 126/ 31 kPa		2.0								
								HAL105 terminated at 2.0 m Target depth					
					2.5								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration 	moisture D dry M moist W wet S saturated Wp plastic limit Wl liquid limit		

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 107**

Borehole ID. **HAL107**

sheet: 1 of 1

project no. **GENZTAUC13086AR**

date started: **20 May 2016**

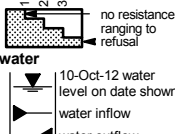
date completed: **20 May 2016**

logged by: **NM**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information						material substance												
method & support	penetration		water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear ⊕ remoulded ⊙ peak (kPa) 100 150 200	DCP (blows/ 100 mm) 2 4 6 8 10	structure and additional observations				
	1	2													3			
<div>HA</div> <div>N</div>	1	2	3	Not Encountered		0.5		ML	SILT: low plasticity, dark brown.	D	VSt	<div>⊕</div> <div>⊙</div>	<div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div>	TOPSOIL				
								ML	SILT: low plasticity, orange brown, with minor fine to coarse grained sand, minor clay.	M to W				<div>⊕</div> <div>⊙</div>	VOLCANIC ASHES			
								ML	SILT: low plasticity, grey, with minor clay, trace fine grained sand.						W to S	<div>⊕</div> <div>⊙</div>	MATUA SUBGROUP	
								VS 107/ 21 kPa	0.8 m: becoming sensitive in hand sample									<div>⊕</div> <div>⊙</div>
								VS 110/ 21 kPa										
								VS 120/ 21 kPa										
								VS 123/ 21 kPa										
								VS 107/ 21 kPa										
								VS 126/ 25 kPa										
								VS 151/ 19 kPa										
				HAL107 terminated at 2.0 m Target depth		<div>⊕</div> <div>⊙</div>												
				2.5														

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	penetration 	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
water 10-Oct-12 water level on date shown water inflow water outflow	moisture D dry M moist W wet S saturated Wp plastic limit Wl liquid limit				
* bit shown by suffix e.g. AD/T B blank bit T TC bit V v hit					

* bit shown by suffix
e.g.
AD/T
B blank bit
T TC bit
V V bit

Engineering Log - Borehole

client: **The Lakes (2012) Ltd**

principal:

project: **The Lakes Stage 2UV**

location: **Center of Lot 109**

Borehole ID: **HAL109**

sheet: 1 of 1

project no: **GENZTAUC13086AR**

date started: **20 May 2016**

date completed: **20 May 2016**

logged by: **NM**

checked by: **RBT**

position: Not Specified surface elevation: Not Specified angle from horizontal: 90° DCP id.:
drill model: Hand Auger drilling fluid: hole diameter : 50 mm vane id.: DR2244

drilling information							material substance												
method & support	penetration		water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description	moisture condition	consistency / relative density	vane shear ⊕ remoulded ⊙ peak (kPa)	DCP (blows/ 100 mm)	structure and additional observations					
<div><div>HA</div><div>N</div></div>	1	2	Not Encountered	VS >183 kPa				ML	SILT: non plastic, dark brown.	D	VSt			TOPSOIL					
								ML	SILT: low plasticity, grey, with minor fine grained sand.	M					MATUA SUBGROUP				
				VS 94/ 19 kPa	0.5				ML	SAND: fine to medium grained, orange brown. 0.8 m: Occasional pockets of grey fine to medium grained sand.	D	L to MD	⊕	⊙					
				VS UTP															
				VS >183 kPa	1.0													⊙	
				VS >183 kPa														⊙	
				VS >183 kPa														⊙	
				VS >183 kPa	1.5													⊙	
				VS >183 kPa														⊙	
				VS >183 kPa													⊙		
		VS 183 kPa	2.0						HAL109 terminated at 2.0 m Target depth			⊙							
						2.5													

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger	support M mud C casing N nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remoulded (kPa) R refusal HB hammer bouncing	classification symbol & soil description based on Unified Classification System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	penetration 		moisture D dry M moist W wet S saturated Wp plastic limit Wl liquid limit	

Appendix E – Fill Test Results

Report No: ND:BOP15W0024
Issue No: 1

Nuclear Density Report

Client: Paul Francis
JMC Limited
PO Box 16070
Bethlehem

Tauranga 3147

Project: The Lakes - Stage 3, Zone 2

The test results reported herein are not accredited.
Contact the laboratory for further information. Samples
are tested as received unless stated otherwise. This
report may only be reproduced in full.



Approved Signatory: Rob Ermens
(Lab Manager)

Date of Issue: 12/01/15

Testing Details

Site Tested: 2UV
Tested By: Barrack Carle
Date Tested: 05/01/15
Time Tested: 14:30
Material: Pumice/Sand
Specification: Contract Specification
Field Methods: NZS 4407:1991 Test 4.2.1
Lab Methods: NZS 4402:1986 Test 4.1.1, NZS 4402:1986 Test 2.1

Compaction Target Details

Material Sample ID: External
MDD Method: NZS 4402:1986 Test 4.1.1*
Max. Dry Density: 1.31 t/m³ @ 29.0 %
Min. Dry Density (t/m³):
Solid Density Type:

Test Results

Site No	Moisture (%)	Wet Density (t/m ³)	Dry Density (t/m ³)	Relative Compaction (%)
1	13.0	1.47	1.30	99.2
2	13.0	1.44	1.27	96.9

Comments

* Test was conducted externally and is not accredited by this laboratory.
MDD target from report reference BOP14S-04474.
Density measurements are not accredited due to being outside of NDM range of calibration.
Tested at same location as Scalas on report BOP15S-00054.

Report No: ND:BOP15W0262

Issue No: 1

Nuclear Density Report

Client: Paul Francis
JMC Limited
PO Box 16070
Bethlehem

Tauranga 3147

Project: The Lakes - Stage 3, Zone 2

The test (s) reported herein (unless otherwise indicated) have been performed in accordance with the laboratory's scope of accreditation. This report may only be reproduced in full.




Approved Signatory: Rob Ermens
(Lab Manager)
IANZ Accreditation No:749
Date of Issue: 02/03/15

Testing Details

Site Tested: 2UV
Tested By: Barrack Carle
Date Tested: 18/02/15
Time Tested: 09:30
Material: Ash
Specification: Contract Specification
Field Methods: NZS 4407:1991 Test 4.2.1
Lab Methods: NZS 4402:1986 Test 2.1

Compaction Target Details

Material Sample ID:
MDD Method:
Max. Dry Density:
Min. Dry Density (t/m³):
Solid Density Type:

Test Results

Site No	Moisture (%)	Wet Density (t/m³)	Dry Density (t/m³)	Air Voids (%)
3	24.5	1.81	1.46	7.2
4	32.5	1.81	1.37	1.7
5	26.0	1.74	1.38	10.3

Comments

Density measurements are not accredited due to being outside of NDM range of calibration. Site 5 was noted as having pumice sand present. Shear strength values determined by Shear Vane (NZGS guidelines - 2001) and are accredited. Results located on page 2. Solid Density target of 2.60t/m3 from report reference BOP14S 04495. GPS locations taken by client on site.

JMC, The Lakes 2UV 18-02-15 - Shear Vane Shear Strength Results

	1	2	3	4	Shear Strength Ave
Test Location	kPa	kPa	kPa	kPa	kPa
3	232.0	232.0	232.0	232.0	232.0
4	232.0	205.5	222.0	232.0	222.9
5	159.1	232.0	232.0	112.7	183.9

Report No: ND:BOP15W1316
Issue No: 1

Nuclear Density Report

Client: Paul Francis
JMC Limited
PO Box 16070
Bethlehem

Tauranga 3147
NZ

Project: The Lakes - Stage 3, Zone 2

The test (s) reported herein (unless otherwise indicated) have been performed in accordance with the laboratory's scope of accreditation. This report may only be reproduced in full.




Approved Signatory: Rob Ermens
(Lab Manager)
IANZ Accreditation No:749
Date of Issue: 22/12/2015

Testing Details

Site Tested: 2UV
Tested By: Rob Ermens
Date Tested: 18/12/2015
Time Tested: 10:30
Material: Ash
Specification: Contract Specification
Field Methods: NZS 4407:1991 Test 4.2.1
Lab Methods: NZS 4402:1986 Test 2.1

Compaction Target Details

Material Sample ID: External
MDD Method: *
Max. Dry Density:
Min. Dry Density (t/m³):
Solid Density Type:

Test Results

Site No	Moisture (%)	Wet Density (t/m ³)	Dry Density (t/m ³)	Air Voids (%)
252	53.0	1.62	1.06	2.9
253	46.5	1.67	1.14	2.7
254	54.5	1.68	1.09	-1.7

Comments

* Test was conducted externally and is not accredited by this laboratory.
Density measurements are not endorsed due to being outside of NDM range of calibration.
Solid Density of 2.58t/m³ from report reference 15S-02607. GPS locations taken by client on site.
Shear strength values determined by Shear Vane (NSGS guidelines - 2001) and are accredited. Results located on page 2.

JMC, The Lakes 18-12-15 - Shear Vane Shear Strength Results

	Shear Strength Ave
Test Location	kPa
252	172.5
253	206.4
254	174.7

Nuclear Density Report

Report No: ND:BOP16W0825

Issue No: 2

This report replaces all previous issues of report no 'ND:BOP16W0825'.

Client: Paul Francis
JMC Limited
PO Box 16070
Bethlehem

Tauranga 3147
NZ

Project: The Lakes - Stage 3, Zone 2

The tests reported herein (unless otherwise indicated) have been performed in accordance with the laboratory's scope of accreditation. Samples are tested as received, in natural condition, unless stated otherwise in the comments. This report may only be reproduced in full.




Approved Signatory: Barrack Carle

IANZ Accreditation No: 749
Date of Issue: 1/09/2016

Testing Details

Site Tested: 2UV
Tested By: Barrack Carle
Date Tested: 24/08/2016
Time Tested: 11:00
Material: Ash
Specification: Contract Specification
Field Methods: NZS 4407:2015 Test 4.2
Lab Methods: NZS 4402:1986 Test 2.1

Compaction Target Details

Material Sample ID: External
MDD Method: *
Max. Dry Density:
Min. Dry Density (t/m³):
Solid Density Type:

Test Results

Site No	Moisture (%)	Wet Density (t/m³)	Dry Density (t/m³)
320	56.5	1.61	1.03

Comments

* Test was conducted externally and is not accredited by this laboratory.
Report not IANZ endorsed due to density measurements being outside of NDM range of calibration. GPS locations recorded by client. Solid density target 2.58t/m³ from report reference BOP15S-02607. Shear strength values determined by Shear Vane (NZGS guidelines - 2001) and are accredited. Results located on page 2. Issue 2 with correct site Shear vanes.

JMC The Lakes, 2UV 24-08-16 - Shear Vane Shear Strength Results

	Shear Strength Ave
Test Location	<i>kPa</i>
320	194.7

Report No: ND:BOP17W0454
Issue No: 1

Nuclear Density Report

Client: Jason Mather
JMC Limited
PO Box 16070
Bethlehem

Tauranga 3147
NZ

Project: The Lakes - Stage 3, Zone 2

The tests reported herein (unless otherwise indicated) have been performed in accordance with the laboratory's scope of accreditation. Samples are tested as received, in natural condition, unless stated otherwise in the comments. This report may only be reproduced in full.




Approved Signatory: Rob Ermens
(Lab Manager)
IANZ Accreditation No: 749
Date of Issue: 18/05/2017

Testing Details

Site Tested: 2UV
Tested By: Barrack Carle
Date Tested: 27/04/2017
Time Tested: 08:00
Material: Ash
Specification: No Specification
Field Methods: NZS 4407:2015 Test 4.2
Lab Methods: NZS 4402:1986 Test 2.1

Compaction Target Details

Material Sample ID:
MDD Method:
Max. Dry Density:
Min. Dry Density (t/m³):
Solid Density Type:

Test Results

Site No	Moisture (%)	Wet Density (t/m³)	Dry Density (t/m³)	Air Voids (%)
373	60.6	1.66	1.04	-3
374	45.8	1.77	1.22	-3
375	26.9	1.83	1.45	5
376	27.5	1.83	1.44	5
377	34.0	1.77	1.32	4
378	39.0	1.88	1.35	-5
379	35.2	1.79	1.33	2
380	34.7	1.87	1.38	-1
381	63.7	1.69	1.03	-5
382	30.0	1.81	1.39	4

Comments

Wet density measurements that fall below 1.72t/m³ are not accredited due to being outside the NDM range of calibration.
Shear strength values determined by Shear Vane (NZGS guidelines - 2001) and are accredited. Results located on page 2.
Solid Density of 2.58t/m³ from FH report reference BOP15S-02607.

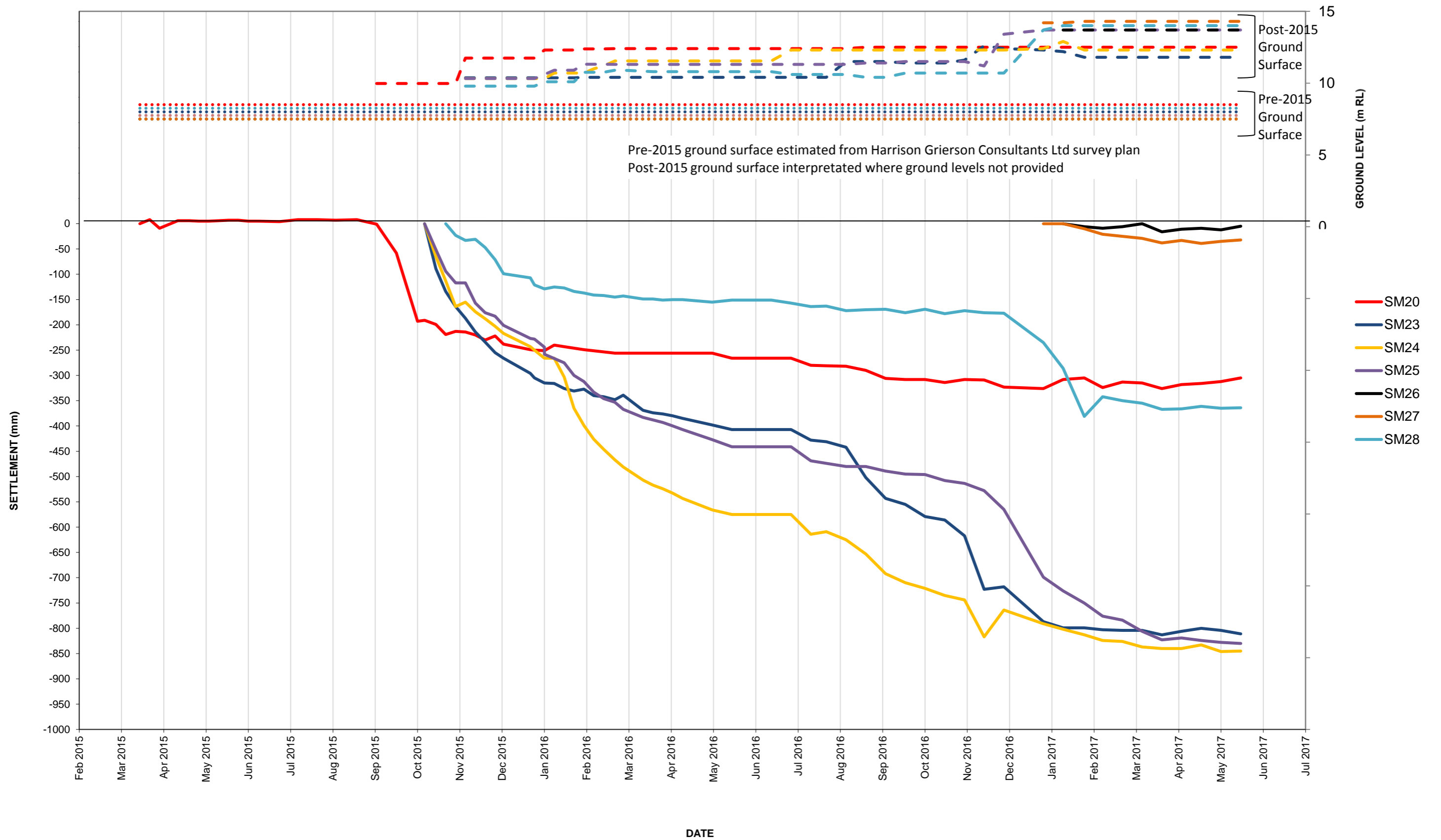
JMC, 2UV 27-04-17 - Shear Vane Shear Strength Results

	Shear Strength Ave
Test Location	kPa
373	176.5
374	224.5
375	210.7
376	211.5
377	219.6
378	UTP
379	227.8
380	227.8
381	199.3
382	UTP

UTP = Unable To Penetrate

Appendix F – Static Settlement Results

SETTLEMENT VS TIME



SETTLEMENT VS TIME (LOG SCALE)

