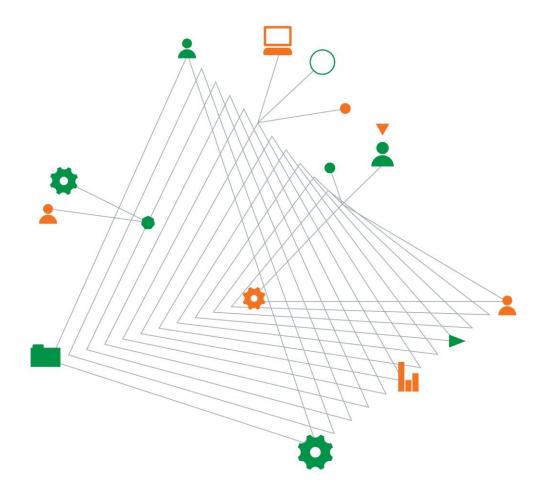


#### The Lakes (2012) Ltd

#### The Lakes - Stage 3E

#### **Geotechnical Completion Report**

24 June 2016



Experience comes to life when it is powered by expertise This page has been left intentionally blank

#### The Lakes - Stage 3E

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

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24 June 2016

#### **Document authorisation**

Our ref: GENZTAUC13086AP-AI

For and on behalf of Coffey

David Cullen Engineering Geologist

#### **Quality information**

#### **Revision history**

Revision	Description	Date	Author	Reviewer	Signatory
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## **Table of contents**

1.	INTR	ODUCTION AND SCOPE1
2.	DESC	CRIPTION OF SUBDIVISION1
3.	RELA	TED REPORTS1
	3.1.	Geotechnical Assessments2
	3.2.	Contaminated Soils Report2
	3.3.	Earthworks Completion Report2
4.	INVE	STIGATIONS COMPLETED
5.	OVEF	RVIEW OF GEOLOGICAL CONDITIONS
6.	EART	THWORKS OPERATIONS
	6.1.	Plant
	6.2.	Construction Programme
7.	QUAL	LITY CONTROL
	7.1	Fill Control
8.	ENGI	NEERING EVALUATION AND RECOMMENDATIONS4
	8.1	Fill Quality4
	8.2	Static Settlement
	8.3	Slope Stability4
	8.4	Foundation Design & Bearing Capacity4
	8.5	Stormwater Management5
9.	CON	CLUSION
10.	LIMIT	ATIONS

#### Important information about your Coffey Report

#### Appendices

- Appendix A Figures
- Appendix B Geotechnical Suitability Statement & Geotechnical Data Summary Table
- Appendix C Pre Development Investigation Data
- Appendix D Post Development Investigation Data

## 1. INTRODUCTION AND SCOPE

This Geotechnical Completion Report (GCR) has been prepared by Coffey Geotechnics (NZ) Ltd (Coffey) for the Lakes (2012) Limited following completion of earthworks for Stage 3E of the Lakes Subdivision and in general accordance with the conditions of Council resource consent number RC21332.

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 the 2007-2008, 2013-2014 and 2014-2015 earthworks seasons.

The extent of earthworks observed by Coffey is shown on the appended plans (Figures 1 to 6, 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

Stage 3E of the Lakes subdivision is located near the southern end of Lakes Boulevard in Pyes Pa, Tauranga. The site location and original ground contours are shown on Figure 1.

Before work began, the majority of the site consisted of flat or gently rolling north-south oriented plateau at approximately RL 60m (Moturiki Datum, 1953).

During the 2007 to 2008 earthworks season, excavation of the elevated plateau was undertaken in the southern extent of Stage 3E and also within lots 352 to 355 to the west. Contours of the works completed are shown on Figure 2. The finished ground surface (surveyed in 2012) is shown on Figure 3.

In 2012 ownership of the Lakes subdivision passed from Grasshopper Farms Ltd to The Lakes (2012) Ltd. Further earthworks were completed for which additional excavation was undertaken on the plateau in the northern and eastern regions of Stage 3E. Combined cut/fill contours for the 2013-2014 and 2014-2015 earthworks are shown on Figure 4 Appendix A.

Civil infrastructure for these stages of the subdivision was installed in 2015 and 2016. The finished (March 2016) ground surface is shown on Figure 5 at approximately RL 58m in the southern/ eastern region of Stage 3E and increasing gently to approximately RL 60m in the northern/western region.

### 3. RELATED REPORTS

The following documents were prepared prior to or during the design and development of Stages 3E:

- 1. *'Pyes Pa West Urbanisation Development, Tauranga Geotechnical Assessment Report'*, report prepared by S&L Consultants Ltd (Ref: 16944, dated October 2003).
- 2. 'Detailed Site Investigation for the Lakes Subdivision Stage 3, Takitimu Drive, Tauranga', report prepared by Coffey Environments (Ref: ENNZAUCK51132AA, dated 21 March 2013).
- 3. 'Geotechnical Investigation Report for the Lakes Subdivision Stage 3 (Phase 1) at Pyes Pa, Tauranga', report prepared by Coffey (Ref: GENZTAUC13086AF-AA, dated 29 April 2013).

- 4. *'Summary of Works Report, The Lakes, Stage 3, Tauranga'* report prepared by Coffey Environments (Ref: ENNZAUCK51132AB, dated 7 April 2014).
- 5. 'Geotechnical Investigation Report for the Lakes Subdivision Stage 3 Zone 2 at Pyes Pa, Tauranga', report prepared by Coffey (Ref: GENZTAUC13086AK-AC, dated 7 April 2014).
- 6. 'The Lakes Subdivision Stage 3 Zone 1 Earthworks Completion Report', report prepared by Coffey (Ref: GENZTAUC13086AF-AE, dated 15 August 2014).

Key conclusions of the main documents are summarised below.

#### 3.1. Geotechnical Assessments

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.

Subsequent geotechnical investigation reports by Coffey in April 2013 and April 2014 summarised additional investigations that were completed to specifically assess the Stage 3 area. These investigations generally confirmed the S&L conclusion that the site was adequate for subdivision.

#### 3.2. Contaminated Soils Report

Due to the presence of farm buildings and facilities on the original site, Coffey was also engaged to conduct an environmental assessment of the proposed development area. The results of this assessment were described in the Coffey Environments report of March 2013 (Section 4, reference 2). This report identified isolated areas of possibly contaminated soil at the sites of a (suspected) pre-existing sheep dip, an above-ground fuel storage tank and a diary effluent pond.

Further investigation at the suspected sheep dip site did not find evidence of significant soil contamination in this area. Soils beneath the fuel storage tank and the effluent pond were sub-excavated during the early stage of earthworks in 2013 and were buried beneath road areas within the development area as required by the Environmental Management Plan. This work was observed and results presented by Coffey Environments in the Summary of Works Report of April 2014 (Section 4, reference 4).

#### 3.3. Earthworks Completion Report

The August 2014 Earthworks Completion Report (ECR) concluded that the bulk earthworks undertaken in 2007-2008 and 2013-2014 were generally completed in accordance with the relevant standards and guidelines including NZS 4431 (Code of Practice for Earth Fill for Residential Development) and the Tauranga City Council Infrastructure Development Code (TCC IDC).

The ECR also referred to the presence of subsurface erosion features ('tomos') found in other Stages of the Lakes Subdivision, indicating soils below the plateau may be subject to erosion and scouring. While 'tomos' have not been observed within Stage 3E, it is possible erosional features may be encountered during construction on these lots.

## 4. INVESTIGATIONS COMPLETED

Geotechnical investigations have been undertaken on this and adjacent sites during each stage of the Lakes subdivision's design and construction, including five test pits that were excavated in 2012 within or near Stage 3E to depths of up to 6m to assess shallow ground conditions before the 2013-2014 work season (Coffey, TP04 – TP08 on Figure 3). Logs are included in Appendix C.

On completion of the bulk earthworks in 2016, Coffey drilled a total of 38 hand-auger boreholes to a target depth of 2m on approximately every second lot to confirm finished subgrade conditions. The location of each borehole is shown on Figure 5. Although not shown on the plan, the boreholes are numbered according to the relevant lot number. For example, the hand auger borehole on Lot 352 in Stage 3E is referred to as HAL352. Where two hand auger boreholes occur on the same lot, they are appended with the letter A and B. Logs of these boreholes are included in Appendix D.

## 5. OVERVIEW OF GEOLOGICAL CONDITIONS

The subject area is located on an elevated, gently sloping plateau. Below the topsoil layer, the predevelopment soil profile across this plateau comprised of volcanic ashes including the Hamilton Ash and Rotoehu Ash. This ash sequence is common throughout the Tauranga area. At this location the volcanic ashes overlie ancient alluvial deposits of the Matua Sub-Group and weakly cemented pumice sands of the Te Ranga Ignimbrite.

Excavations in 2007-2008 and 2013-2014 reduced the thickness of the volcanic ashes across most of the plateau by up to 7m. The subsoils below many of the finished lots therefore comprise volcanic ash silts but in some areas excavations have penetrated through the ash layers and the finished lots are underlain by variable Matua Sub-Group soils. These include silts, sands and clays which can be highly sensitive to reworking.

## 6. EARTHWORKS OPERATIONS

#### 6.1. Plant

Earthworks during the 2007-2008 season were completed by Bob Hicks Earthmovers Ltd. The contractor for the 2013-2014 and 2014-2015 seasons was JMC Civil Construction Ltd.

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

#### 6.2. Construction Programme

Earthworks in 2007 and 2008 summer included excavations of up to 4m depth on the main plateau as shown on Figure 2.

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 2012.

During the 2013-2014 and 2014-2015 earthworks seasons, the remaining earthworks were completed to form the current ground surface, including excavation of up to 6m depth within Stage 3E. Cut contours for this period are shown on Figure 4 and the finished ground surface is shown on Figure 5.

We note the cut/fill contours are shown at 1m vertical intervals. As such, fill depths of less than 1m will not appear on this plan. It is understood minor filling was completed to 'fine-tune' the finished landform and fill materials were observed in the post-development boreholes on Lots 390, 392 and 404. Fill depths shown in the *G3* – *Summary of Geotechnical Data For Individual Lots* table, allow for minor earthworks shown in these areas.

Several pre-existing farm buildings and facilities were removed from site at this time. This included the sub-excavation and disposal of contaminated soils from areas around the buildings in accordance with the 2014 Summary of Works Report.

## 7. QUALITY CONTROL

#### 7.1 Fill Control

As this area is within bulk cut with finish earthworks, there has not been laboratory fill testing conducted in Stage 3E. The minor fill materials observed onsite have been assessed using undrained shear strength measurements in the post-development hand auger boreholes.

# 8. ENGINEERING EVALUATION AND RECOMMENDATIONS

#### 8.1 Fill Quality

Based on hand auger investigations, results indicate that the minor fill observed on parts of the site has been compacted to adequate standard (greater than 150kPa).

#### 8.2 Static Settlement

As the entire site is now between 1m and 6m below original ground level, static settlement is not considered to be of concern within Stage 3E of the Lakes Subdivision.

#### 8.3 Slope Stability

Similarly, it is considered that Stage 3E is not situated in proximity to a slope that may have an adverse effect on the site.

#### 8.4 Foundation Design & Bearing Capacity

Most of the lots discussed in this GCR are underlain by natural volcanic soils which have been exposed by excavation. While the large majority of tests and investigations in these soils indicate they are adequate for standard shallow foundations, areas of relatively weak or sensitive materials have also been encountered in the post-development hand-auger boreholes.

It is therefore recommended that dwellings on the new lots be supported on pod-raft type foundations (e.g. 'rib-raft') which have been specifically designed for a geotechnical ultimate bearing capacity of 200kPa. The ground conditions under many of these lots should also be adequate for standard foundations designed in accordance with NZS 3604, however this would need to be confirmed by specific site investigation at the building consent stage.

It should be understood that due to the volcanic nature of the natural soils on this site, it is possible that local soil conditions may vary from those discussed above. Some soils observed onsite are also potentially prone to sub-surface erosion (e.g. 'tomos). 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.

#### 8.5 Stormwater Management

To further reduce the potential for surface and sub-surface erosion, all stormwater from impervious areas within the development will need to be carefully collected and piped to a safe disposal point or to the reticulated network. Particular care should be taken to avoid areas of ponded stormwater or concentrated flows around and under buildings or structures.

## 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 Stage 3E have been completed in general accordance with our previous recommendations and current Tauranga City Council Infrastructure Development Code.

### **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:

D B CULLEN Engineering Geologist

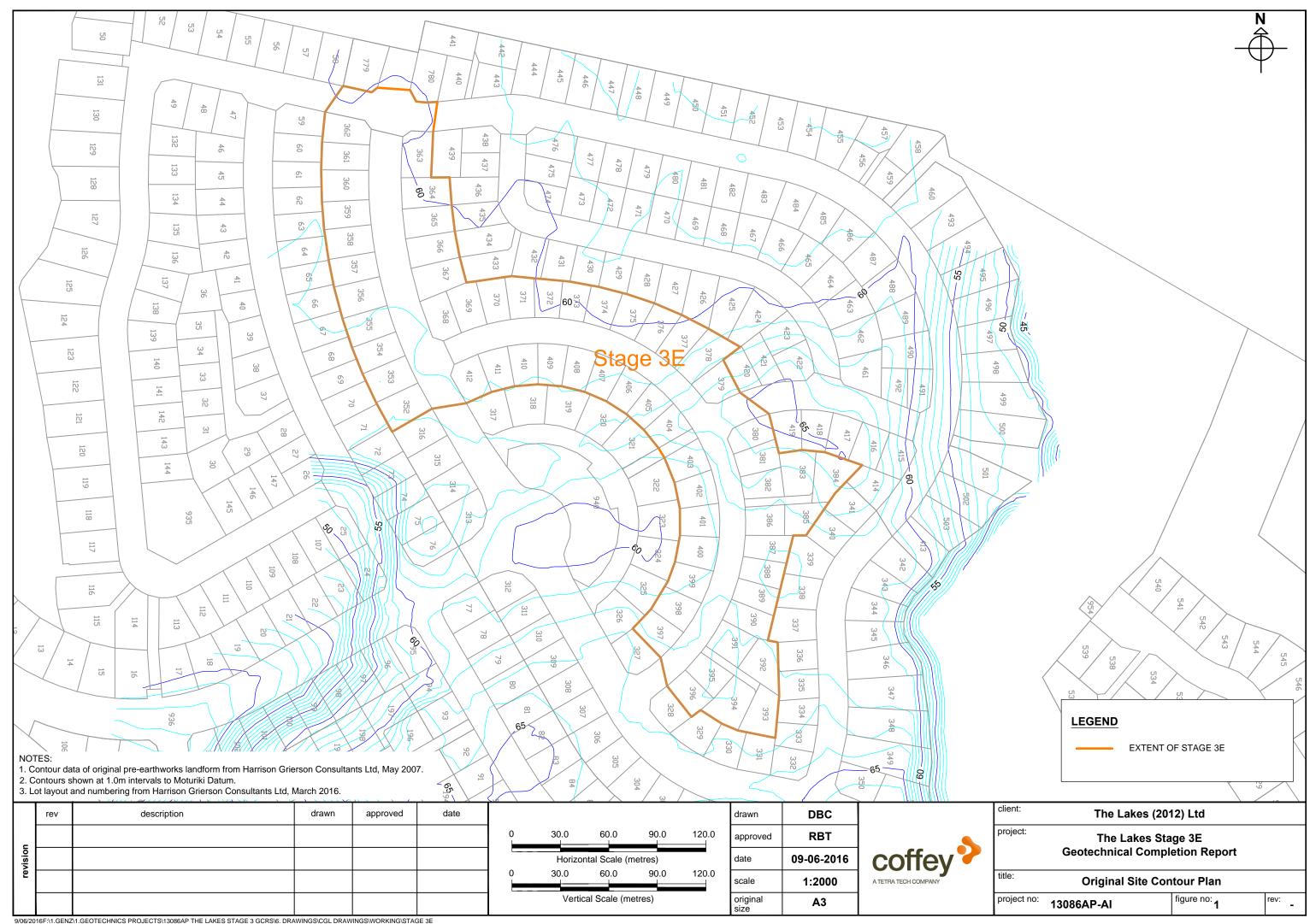
Report Reviewed By:

**D SULLIVAN** Principal Geotechnical Engineer

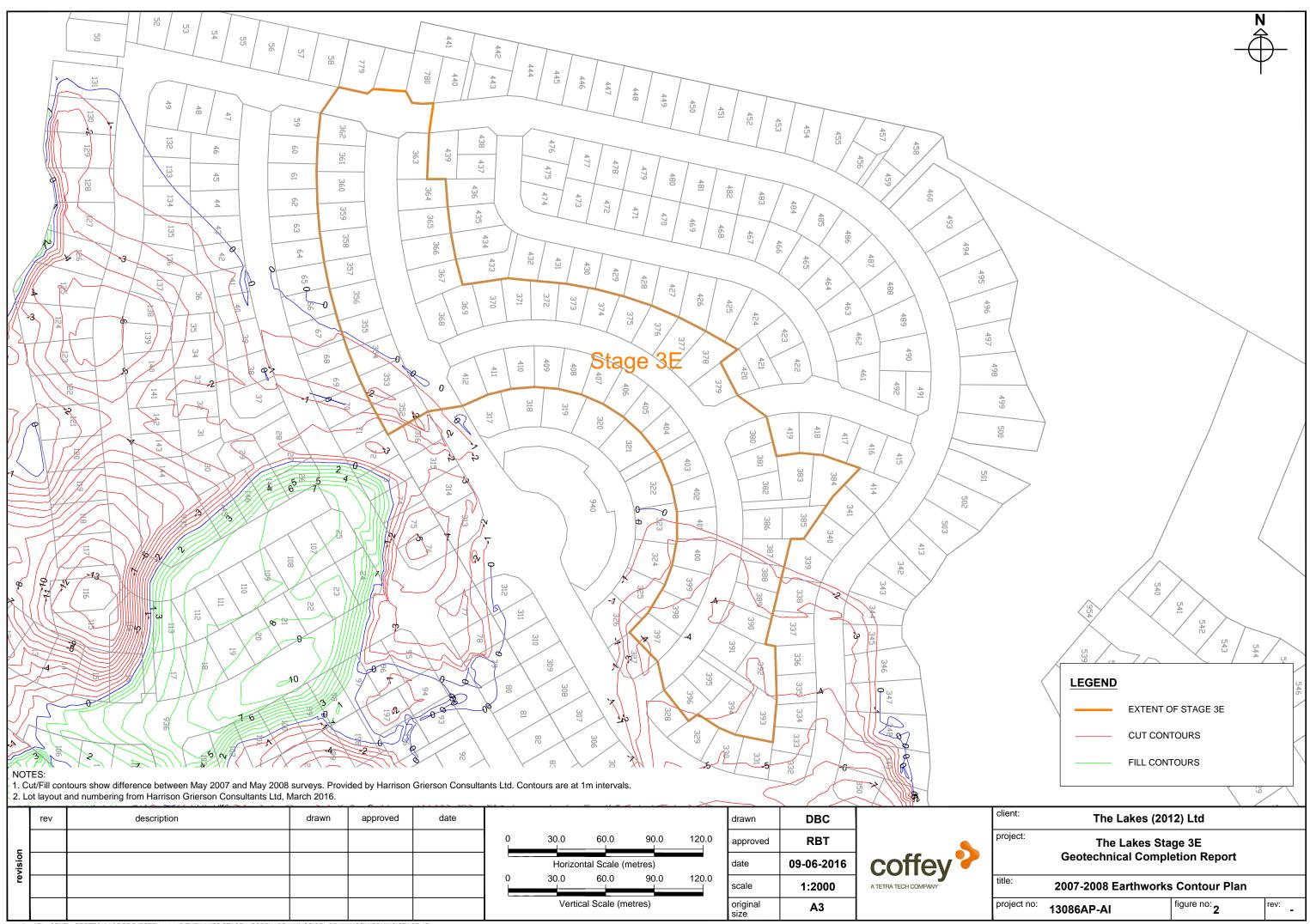
Geotechnical Suitability Statement Signed By:

R TELFORD TCC Category 2 Geotechnical Engineer

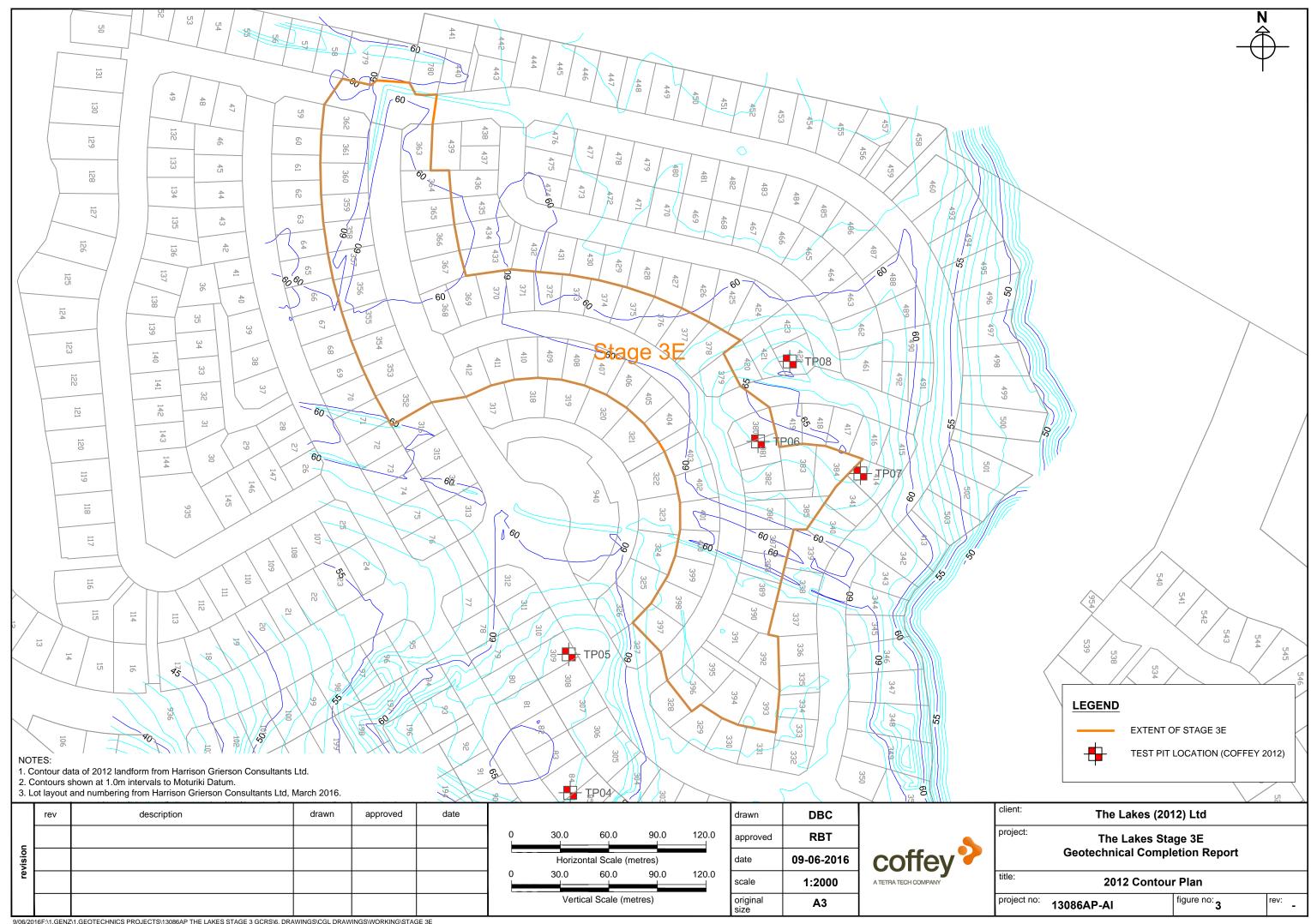
Appendix A - Figures



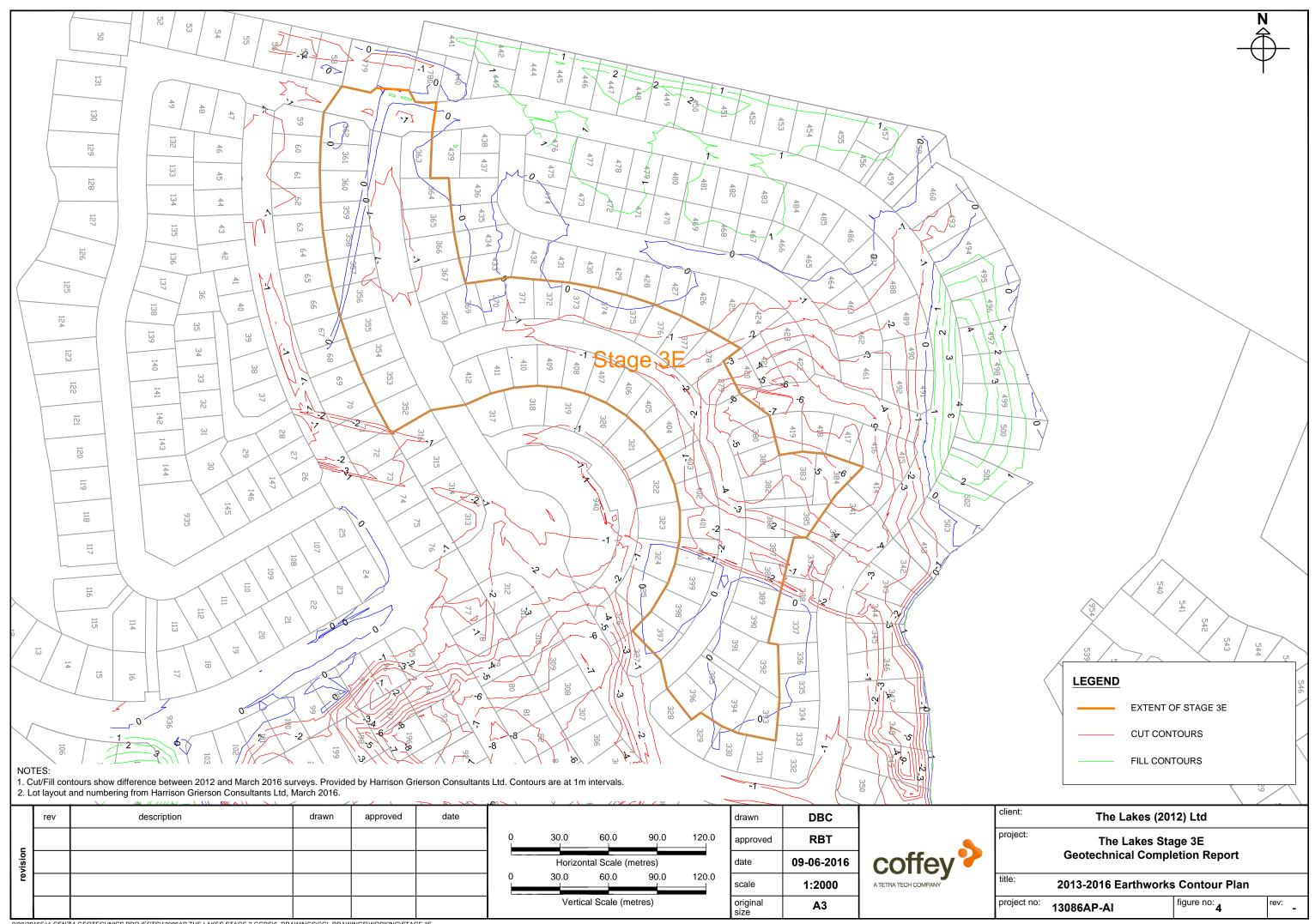
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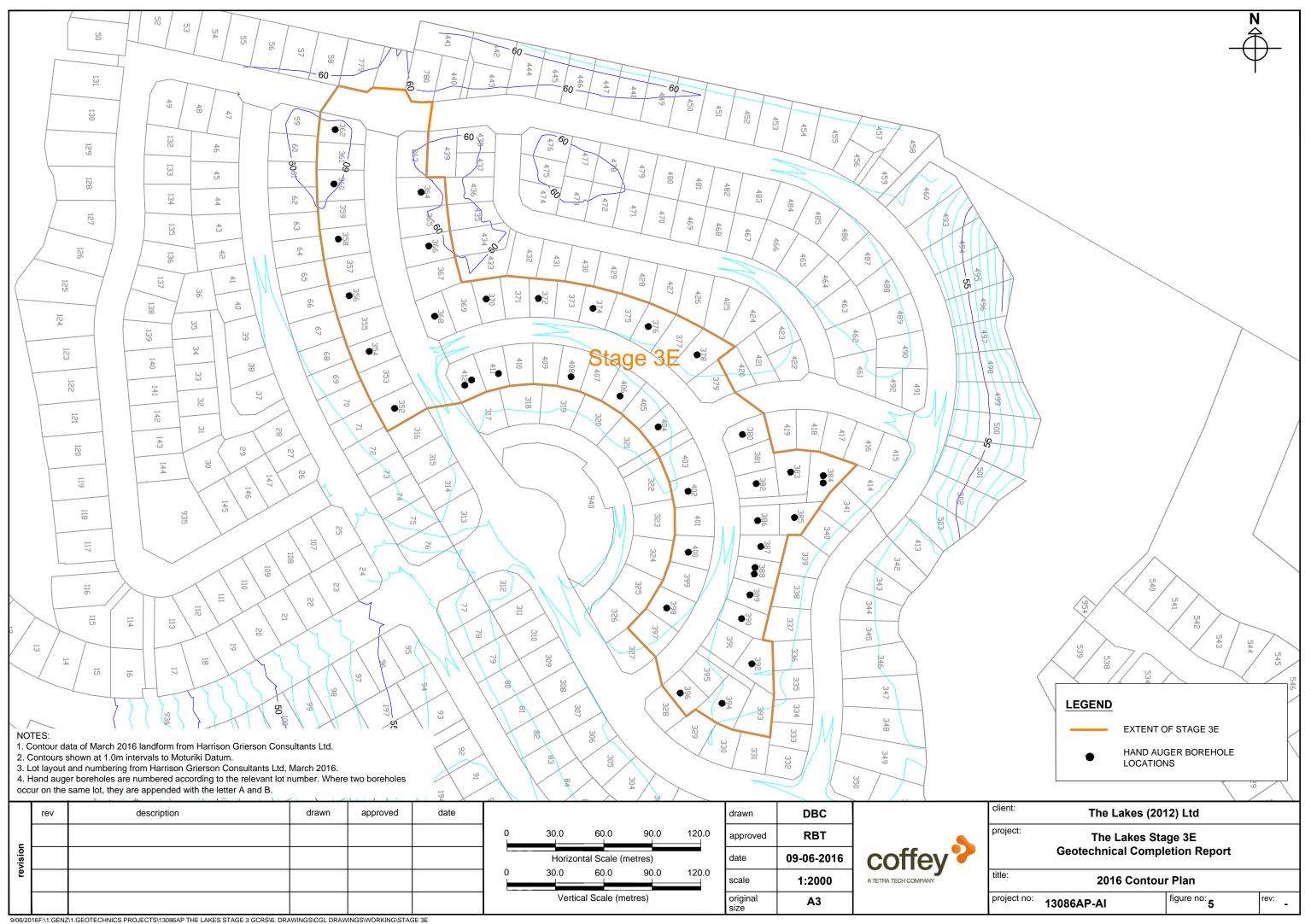
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Appendix B - Geotechnical Suitability Statement & Geotechnical Data Summary Table

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

NAME OF SUBDIVISION	The Lakes Subdivision – Stage 3E
COUNCIL FILE NUMBER RC No:	RC21332
ENGINEER RESPONSIBLE FOR	Robert Telford
DEVELOPMENT	
QUALIFICATIONS:	TCC Category 2 Geotechnical Engineer

I, Robert Telford of Coffey Geotechnics Ltd, 96 Cameron Road, Tauranga, hereby confirm that:

- 1) I am a professional person, appropriately qualified with experience in geomechanics to ascertain the suitability of the land for building development and was retained as the Soils Engineer to the above development.
- An appropriate level of site investigation and construction supervision has been carried out under my direction and is described in our development evaluation reports dated 29 April 2013 and 7 April 2014.
- 3) In my professional opinion, not to be construed as a guarantee, I consider that;
  - a) The areas shown in my report dated 24 June 2016 of each new allotment are suitable for the erection thereon of the building types appropriate to the zoning of the land, provided that reference is made to my Geotechnical Completion Report Ref. GENZTAUC13086AP-AI, dated 24 June 2016.
  - b) The earth fills shown on the attached Plans ref Figure 02 & Figure 04 have been placed in general 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 requiring specific design subject to the recommendations presented in my Geotechnical Completion Report Ref. GENZTAUC13086AP-AI, dated 24 June 2016.
  - e) The original ground not affected by filling is suitable for the erection thereon of residential buildings requiring specific design subject to the recommendations presented in my Geotechnical Completion Report Ref. GENZTAUC13086AP-AI, dated 24 June 2016.
- 4) This professional opinion is furnished to the Council and the owner for their purposes 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

(L Tellod

Date: 24 June 2016



PRODUCER STATEMENT SUITABILITY OF LAND FOR BUILDING DEVELOPMENT



DP No:	Lot 1001 DP486181	Property Address	310 Lakes Boulevard, Pyes Pa	RC No:	21332

-	Ar			Subsu	rface data	Topography	Foundatio	ons	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		
Lot No:	Area (m²)	Shear Strength (kPa)		livision lling	Natural Topography Unworked	Торо		Conventional Shallow Foundation to	Specific Design	iction Line	Design		ſĎ	iilding Pla	ding Platf	Soils	nt Dispos	ē	
		at 0.5m depth	Y/N	Depth (m)	Y/N	Y/N	Depth (m)	NZS 3604:2011 Y/N/NA	Y/N/NA	ίυ Ι				tform	orm		al		Comments
352	552	>183	Ν	-	Ν	Y	3	N	Y	Ν	Ν	Ν	Y	N	Ν	Ν	Ν	Y	
353	550	N/T	Ν	-	Ν	Y	2	N	Y	Ν	Ν	Ν	Y	Ν	Ν	Ν	Ν	Y	
354	481	>202	Ν	-	Ν	Y	2	N	Y	Ν	Ν	Ν	Y	Ν	Ν	Ν	Ν	Y	
355	520	N/T	Ν	-	Ν	Υ	2	Ν	Y	Ν	Ν	Ν	Y	Ν	Ν	Ν	Ν	Y	
356	560	>202	Ν	-	Ν	Υ	1	Ν	Y	Ν	Ν	Ν	Y	Ν	Ν	Ν	Ν	Y	Pod-raft type foundations specifically designed for geotechnical ultimate bearing capacity
357	480	N/T	Ν	-	Ν	Υ	1	Ν	Y	Ν	Ν	Ν	Y	Ν	Ν	Ν	Ν	Y	200kPa, subject to Section 8 of Coffey GCR ref: GENZTAUC13086AP-AI.
358	520	>183	Ν	-	Ν	Υ	1	Ν	Y	Ν	Ν	Ν	Υ	Ν	Ν	Ν	Ν	Y	N/T = Not Tested.
359	480	N/T	Ν	-	Ν	Υ	1	Ν	Y	Ν	Ν	Ν	Y	Ν	Ν	Ν	Ν	Y	
360	560	180	Ν	-	Ν	Y	1	Ν	Y	Ν	Ν	Ν	Y	Ν	Ν	Ν	Ν	Y	
361	487	N/T	Ν	-	Ν	Υ	1	Ν	Y	Ν	Ν	Ν	Υ	Ν	Ν	Ν	Ν	Y	
362	476	183	Ν	-	Ν	Υ	0	Ν	Y	Ν	Ν	Ν	Υ	Ν	Ν	Ν	Ν	Y	



INFRASTRUCTURE DEVELOPMENT CODE

SUMMARY OF GOTECHNICAL DATA FOR INDIVIDUAL LOTS

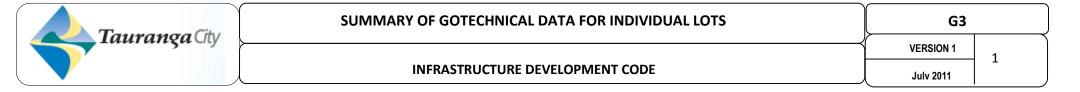
DP No:	Lot 1001 DP486181	Property Address	310 Lakes Boulevard, Pyes Pa	RC No:	21332

	A	Subsurface data Shear Subdivision Natural Natural			Foundatio	Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building	Minimum Building Platform	Compressible Soils	On-Site Effluent Disposal	Consent Notice					
Lot No:	Area (m²)	Shear Strength (kPa)		livision Iling	Natural Topography Unworked	Торо	tural graphy worked	Conventional Shallow Foundation to	Specific Design	iction Lin	Design		D	uilding Pla	ding Plati	Soils	nt Dispos	ë	
		at 0.5m depth	Y/N	Depth (m)	Y/N	Y/N	Depth (m)	NZS 3604:2011 Y/N/NA	Y/N/NA	rb				Platform	form		a		Comments
000	526	NUT	N		N	V	_	N	X				V					V	
363	526	N/T	Ν	-	N	Y	0	N	Y	N	N	N	Y	N	N	N	N	Y	
364	553	158	Ν	-	Ν	Y	0	Ν	Y	Ν	Ν	Ν	Υ	Ν	Ν	Ν	Ν	Y	
365	537	N/T	Ν	-	Ν	Y	1	Ν	Y	N	N	N	Y	N	N	Ν	N	Y	
366	540	169	Ν	-	Ν	Y	1	Ν	Y	N	Ν	N	Y	Ν	Ν	Ν	N	Y	
367	580	N/T	Ν	-	Ν	Y	1	Ν	Y	Ν	Ν	Ν	Υ	Ν	Ν	Ν	Ν	Y	Pod-raft type foundations specifically designed for geotechnical ultimate bearing capacity 200kPa, subject to Section 8 of Coffey GCR ref:
368	475	>183	Ν	-	Ν	Y	1	Ν	Y	N	Ν	Ν	Υ	Ν	Ν	Ν	Ν	Y	GENZTAUC13086AP-AI.
369	499	N/T	Ν	-	Ν	Y	1	Ν	Y	N	Ν	Ν	Y	Ν	N	Ν	N	Y	N/T = Not Tested.
370	439	>202	Ν	-	Ν	Y	1	Ν	Y	Ν	Ν	Ν	Υ	Ν	Ν	Ν	Ν	Y	
371	422	N/T	Ν	-	Ν	Y	1	Ν	Y	N	Ν	N	Y	Ν	Ν	Ν	Ν	Y	
372	387	>183	Ν	-	Ν	Y	1	Ν	Y	Ν	Ν	Ν	Υ	Ν	Ν	Ν	Ν	Y	



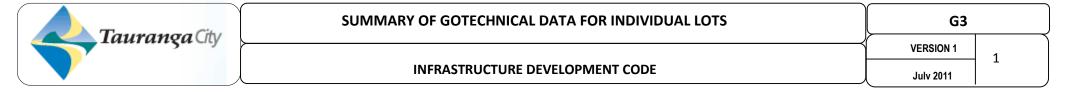
DP No:	Lot 1001 DP486181	Property Address	310 Lakes Boulevard, Pyes Pa	RC No:	21332

	A	Subsurface data			Foundati	ons	Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Building Platform	Compressible	On-Site Efflue	Consent Notice				
Lot No:	Area (m²)	Shear Strength (kPa)		division Iling	Natural Topography Unworked	Торо	tural graphy worked	Conventional Shallow Foundation to	Specific Design	iction Lin	Design		e	uilding Pla	lding Platf	Soils	Effluent Disposal	ë	
		at 0.5m depth	Y/N	Depth (m)	Y/N	Y/N	Depth (m)	NZS 3604:2011 Y/N/NA	Y/N/NA	τD.				tform	orm		a		Comments
070	200	N/7																	
373	388	N/T	N	-	N	Y	1	N	Y	N	N	Ν	Y	N	N	Ν	N	Y	
374	436	173	Ν	-	N	Y	1	N	Y	N	Ν	Ν	Y	Ν	Ν	Ν	Ν	Y	
375	468	N/T	Ν	-	N	Y	1	N	Y	N	N	Ν	Y	Ν	N	Ν	Ν	Y	
376	455	>202	Ν	-	N	Y	1	N	Y	N	N	Ν	Y	Ν	Ν	Ν	N	Y	Ded with two foundations are difically designed
377	508	N/T	Ν	-	N	Y	1	N	Y	N	N	Ν	Y	Ν	Ν	Ν	N	Y	Pod-raft type foundations specifically designed for geotechnical ultimate bearing capacity 200kPa, subject to Section 8 of Coffey GCR ref:
378	628	156	Ν	-	N	Y	2	N	Y	N	N	Ν	Y	Ν	Ν	Ν	Ν	Y	GENZTAUC13086AP-AI.
379	461	N/T	Ν	-	N	Y	4	N	Y	N	N	N	Y	Ν	Ν	Ν	Ν	Y	N/T = Not Tested.
380	449	108	Ν	-	N	Y	6	N	Y	N	Ν	Ν	Y	Ν	Ν	Ν	Ν	Y	
381	435	N/T	Ν	-	N	Y	5	N	Y	N	Ν	Ν	Υ	Ν	Ν	Ν	Ν	Υ	
382	408	>183	Ν	-	Ν	Y	4	Ν	Y	N	Ν	Ν	Υ	Ν	Ν	Ν	Ν	Y	



DP No:	Lot 1001 DP486181	Property Address	310 Lakes Boulevard, Pyes Pa	RC No:	21332

	A	Subsurface data			Foundati	ons	Building Restriction	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Building Platform	Compressible	On-Site Efflue	Consent Notice				
Lot No:	Area (m²)	Shear Strength (kPa)		livision Iling	Natural Topography Unworked	Торо	tural graphy worked	Conventional Shallow Foundation to	Specific Design	iction Line	Design		e	uilding Pla	lding Platf	Soils	Effluent Disposal	ĕ	
		at 0.5m depth	Y/N	Depth (m)	Y/N	Y/N	Depth (m)	NZS 3604:2011 Y/N/NA	Y/N/NA					tform	orm		<u>a</u>		Comments
000		000	N			V	_		X				V					V	
383	555	>202	Ν	-	N	Y	5	N	Y	N	N	N	Y	N	N	N	N	Y	
384	588	74	Ν	-	N	Y	6	N	Y	N	Ν	Ν	Y	Ν	Ν	Ν	Ν	Y	
385	400	>202	Ν	-	N	Y	4	N	Y	N	N	Ν	Y	N	N	N	Ν	Y	
386	445	>202	Ν	-	N	Y	3	N	Y	N	N	N	Y	Ν	Ν	N	Ν	Y	Pod-raft type foundations specifically designed
387	434	133	Ν	-	N	Y	3	N	Y	N	Ν	Ν	Y	Ν	Ν	Ν	Ν	Y	for geotechnical ultimate bearing capacity 200kPa, subject to Section 8 of Coffey GCR ref:
388	409	>202	Ν	-	Ν	Y	3	N	Y	N	Ν	Ν	Υ	Ν	Ν	Ν	Ν	Υ	GENZTAUC13086AP-AI. N/T = Not Tested.
389	417	>202	Y	< 1	Ν	Y	3	N	Y	N	Ν	Ν	Υ	Ν	Ν	Ν	Ν	Y	N/T = NOT Tested.
390	452	>202	Y	< 1	Ν	Y	3	N	Y	N	Ν	Ν	Υ	Ν	Ν	Ν	Ν	Y	
391	506	N/T	Y	< 1	Ν	Y	4	N	Y	N	N	Ν	Υ	Ν	Ν	Ν	Ν	Y	
392	546	>202	Y	< 1	Ν	Y	4	Ν	Y	N	Ν	Ν	Y	Ν	Ν	Ν	Ν	Y	



DP No:	Lot 1001 DP486181	Property Address	310 Lakes Boulevard, Pyes Pa	RC No:	21332

	A			Subsu	rface data			Foundati	ons	Building Restr	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Buil	Compressible	On-Site Efflue	Consent Notice	
Lot No:	Area (m²)	Shear Strength (kPa)		livision Iling	Natural Topography Unworked	Торо	tural graphy worked	Conventional Shallow Foundation to	Specific Design	Restriction Line	Design		e	uilding Pla	<b>Building Platform</b>	Soils	Effluent Disposal	ë	
		at 0.5m depth	Y/N	Depth (m)	Y/N	Y/N	Depth (m)	NZS 3604:2011 Y/N/NA	Y/N/NA	τD.				tform	orm		a		Comments
									1	r –	r –							[	
393	536	N/T	Y	< 1	Ν	Y	5	Ν	Y	Ν	Ν	Ν	Υ	Ν	Ν	Ν	Ν	Y	
394	606	>183	Y	< 1	N	Y	4	N	Y	N	N	Ν	Y	N	Ν	Ν	Ν	Y	
395	420	N/T	Y	< 1	N	Y	4	N	Y	N	N	Ν	Y	Ν	Ν	Ν	Ν	Y	
396	408	>183	Ν	-	N	Y	5	Ν	Y	N	Ν	Ν	Υ	Ν	Ν	Ν	Ν	Y	Pod-raft type foundations specifically designed
397	468	N/T	Y	< 1	N	Y	4	Ν	Y	N	Ν	Ν	Υ	Ν	Ν	Ζ	Ν	Y	for geotechnical ultimate bearing capacity 200kPa, subject to Section 8 of Coffey GCR ref:
398	467	>183	Y	< 1	Ν	Y	3	Ν	Y	N	Ν	Ν	Υ	Ν	Ν	Ν	Ν	Y	GENZTAUC13086AP-AI. N/T = Not Tested.
399	461	N/T	Y	< 1	N	Y	3	N	Y	N	N	Ν	Y	N	Ν	Ν	Ν	Y	N/T - NOL TESTEU.
400	459	>202	Y	< 1	Ν	Y	2	Ν	Y	N	N	Ν	Υ	Ν	Ν	Ν	Ν	Y	
401	459	N/T	Ν	-	Ν	Y	2	Ν	Y	N	N	Ν	Υ	Ν	Ν	Ν	Ν	Y	
402	455	>183	Ν	-	Ν	Y	2	Ν	Y	N	Ν	Ν	Y	Ν	Ν	Ν	Ν	Y	



DP No:	Lot 1001 DP486181	Property Address	310 Lakes Boulevard, Pyes Pa	RC No:	21332

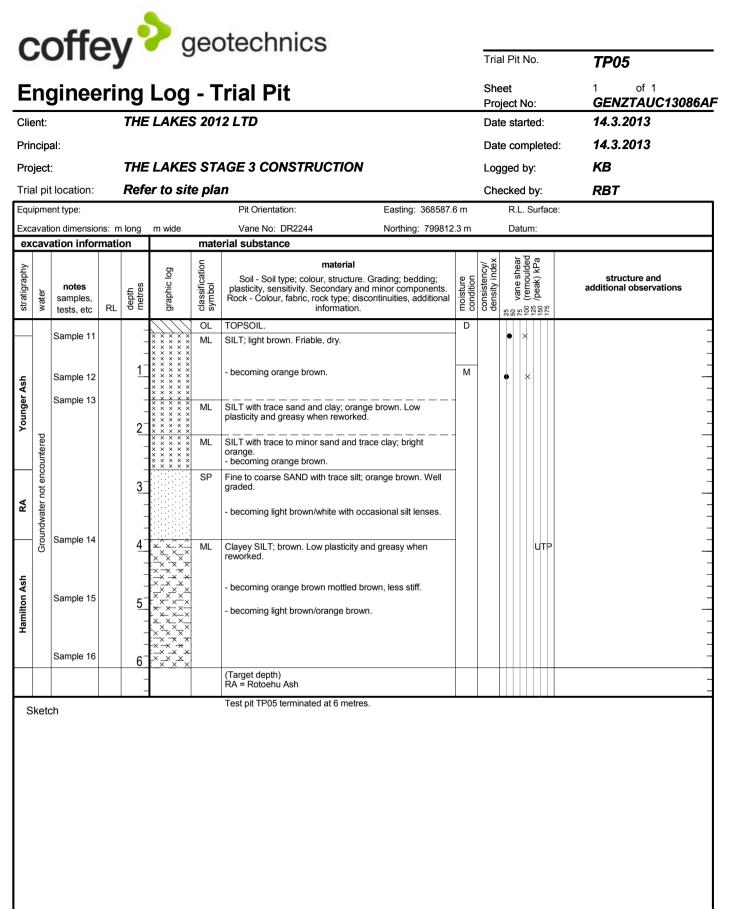
	A			Subsu	rface data			Foundati	ons	Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Building Platform	Compressible	On-Site Efflue	Consent Notice	
Lot No:	Area (m²)	Shear Strength (kPa)		livision Iling	Natural Topography Unworked	Торо	tural graphy worked	Conventional Shallow Foundation to	Specific Design	iction Line	Design		æ	uilding Pla	ding Platf	Soils	Effluent Disposal	ñ	
		at 0.5m depth	Y/N	Depth (m)	Y/N	Y/N	Depth (m)	NZS 3604:2011 Y/N/NA	Y/N/NA	(D				tform	orm		<u>a</u> _		Comments
403	458	N/T	N	_	N	Y	2	N	Y	N	N	N	Y	N	N	N	N	Y	
403	458	IN/ I	IN	-	IN	ř	2	IN	ř	IN		IN	Ť	IN	IN	IN	IN	r	
404	416	>202	Ν	-	N	Y	4	N	Y	Ν	Ν	Ν	Y	Ν	Ν	Ν	Ν	Y	
405	419	N/T	Ν	-	N	Y	3	N	Y	N	Ν	Ν	Y	Ν	Ν	Ν	Ν	Y	
406	425	>183	Ν	-	N	Y	2	N	Y	N	Ν	Ν	Y	Ν	Ν	Ν	Ν	Y	Pod-raft type foundations specifically designed
407	429	N/T	Ν	-	N	Y	2	N	Y	N	N	N	Y	Ν	N	Ν	Ν	Y	for geotechnical ultimate bearing capacity 200kPa, subject to Section 8 of Coffey GCR ref:
408	431	>202	Ν	-	N	Y	2	N	Y	N	N	Ν	Y	Ν	Ν	Ν	Ν	Y	GENZTAUC13086AP-AI.
409	430	N/T	Ν	-	N	Y	1	N	Y	N	N	N	Y	Ν	Ν	Ν	Ν	Y	N/T = Not Tested.
410	428	N/T	Ν	-	N	Y	1	N	Y	N	Ν	Ν	Y	Ν	Ν	Ν	Ν	Y	
411	424	>202	Ν	-	N	Y	1	N	Y	N	Ν	Ν	Y	Ν	Ν	Ν	Ν	Y	
412	472	55	Ν	-	Ν	Y	1	Ν	Y	N	Ν	Ν	Υ	Ν	Ν	Ν	Ν	Y	



Appendix C - Pre Development Investigation Data

_		-ff	~				otechnics									
C	7		=)	y		jec				Tria	al Pit	No.		TP0	4	
Ε	ng	ginee	eri	ng	Log	- T	rial Pit			She	eet ject l	No		1 GEN	of 1 <b>ZTAUC13(</b>	)86 <b>A</b> F
Cli	ent:			THE		S 201	2 LTD					rted:			2013	
Pri	ncip	al:								Dat	e co	mplet	ed:	14.3.	2013	
Pro	oject	:		THE		S STA	AGE 3 CONSTRUCTION	,		Log	ged	by:		RBT		
Tria	al pi	t location:		Refe	er to sit	te pla	n			Che	ecked	d by:		RBT		
Equ	iipme	ent type:					Pit Orientation:	Easting: 368588.	5 m		R.L	Surfa	ce:			
		ion dimensio		-	m wide		Vane No: DR2244	Northing: 799726	.9 m		Dat	um:				
ex	cav	ation infor	mati	on			rial substance			. ×	F	a Ç				
stratigraphy	water	<b>notes</b> samples, tests, etc	RL	depth metres	graphic log	classification symbol	material Soil - Soil type; colour, structure plasticity, sensitivity. Secondary ar Rock - Colour, fabric, rock type; dis information.	nd minor components	moisture condition	consistency/ density index		100 (remoulded 125 /peak) kPa	2		icture and al observations	
TS		Sample 1		-		OL	Organic SILT with trace clay, dark g wood fragments and building debris		D							_
	1			-		ML	SILT with minor very fine sand, light friable, very stiff.		1			UT	P			-
_		Sample 2		<u>  1</u>			- occasional tree roots (2-5mm).									
Younger Ash	σ			-	× × × × × × × × × × × × × × × × × × × ×											_
nnge	Intere	Sample 3		-	× × × × × × × × × × × ×	ML	SILT with minor clay; orange/brown		M							_
۶	encountered			2		ML	Very slight plasticity, moist.	'								
				-	X X	ML	SILT with trace to minor fine sand a orange. Stiff, friable to very slightly of our Torrest the second se	cohesive, moist.	M- W							_
	Groundwater not			3	<u>× × × × ×</u>	SP	SILT with trace sand and minor clay	worked, moist to wet.	M							_
RA	round			-			SAND with trace to minor silt; light of Pumiceous, friable, moist.									
	G	Sample 4		-			- becomes pale orange/white and n below 3.4m.	ninor to some silt	-							-
		- cumpic r		4	× × × × × × × ×	ML	Clayey SILT; chocolate brown, very when reworked. Non plastic, moist.	stiff in-situ, friable				UT	P			-
₽				-	$\begin{array}{c} \times \times \times \times \\ \times - \times - \times - \times \\ \times - \times - \times - \times$											-
		Sample 5		-	×××× ××××	-	- becoming mottled chocolate brow	n/orange brown.								-
				5			(max. reach of excavator)									_
				-	-		RA = Rotoehu Ash HA = Hamilton Ash									-
				6	-		Test pit TP04 terminated at 4.8 met	res.								_
				-												
_	Sketo			-												
	Keu	511														
		fication symb	ools an	nd			vane shear (kPa)									
		escription on New Zeala	and Ge	eotechnic	al Society In	c 2005	remoulded     x peak     x peak     x peak	moisture			sistend	cy/ den	-		vor 1	
	otes, I <sub>50</sub>	samples, tes undisturbe		ple 50m	m diameter		>>>> peak greater than 200kPa UTP unable to penetrate	D dry M moist W wet		VS S F		very so soft firm	ш	VL L MD	very loose loose medium dense	_
	63		ed sam	nple 63m	m diameter		water ▼ 10/1/98 water level	S saturated		F St VSt		stiff very st	iff	MD D VD	dense very dense	-
	s	bulk samp environme	le				<ul> <li>on date shown</li> <li>water inflow</li> </ul>			H		hard		vU	very delibe	
F	2	refusal					water outflow									

TRIAL PIT TEST PITS 150313.GPJ COFFEY.GDT 28.3.13



v.6	soil desc based on notes, sa	New Zealand Geotechnical Society Inc 2005 mples, tests undisturbed sample 50mm diameter	vane ● × >>× UTP wate	shear (kPa) remoulded peak peak greater than 200kPa unable to penetrate	<b>moi</b> D M W	sture dry moist wet	<b>consis</b> VS S F	<b>tency/ density ind</b> very soft soft firm
ں I	U <sub>63</sub> D	undisturbed sample 63mm diameter disturbed sample		10/1/98 water level on date shown	S	saturated	St VSt	stiff very stiff
OH E	Bs E R	bulk sample environmental sample refusal		water inflow water outflow			н	hard

VL

MD

VD

D

very loose loose

dense

medium dense

very dense

•	~	htt				aec	otechnics							
•	~		-)		2	,				Tria	I Pit N	lo.	<b>TP06</b>	
E	n	ginee	eri	ng	Log	- T	rial Pit			She Proj	et ect N	0:	1 of 1 <b>GENZTAUC1</b>	3086AF
Cli	ent:			THE		S 201	2 LTD			Dat	e star	ted:	14.3.2013	
Pri	ncip	al:								Date	e com	pleted	d: <b>14.3.2013</b>	
Pro	ject	t:		THE		S STA	AGE 3 CONSTRUCTION			Log	ged b	y:	KB	
Tria	al pi	t location:		Refe	er to sit	te pla	n			Che	cked	by:	RBT	
		ent type:				-	Pit Orientation:	Easting: 368704.4	4 m			Surface	e:	
Exc	avat	ion dimensio	ons: m	n long	m wide		Vane No: DR2244	Northing: 799943	.7 m		Datu	m:		
ex	cav	ation infor	mati	on			rial substance				L 7	3 _		
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material Soil - Soil type; colour, structure. plasticity, sensitivity. Secondary an Rock - Colour, fabric, rock type; disc information.	d minor components.	moisture condition	consistency/ density index	25 50 vane shear 100 (remounded	125 /peak) kPa 175	structure and additional observatio	ons
		Sample 17		-	× × × × × × × × × × × × × × × × × × ×	OL ML	TOPSOIL SILT; light brown, friable and dry.		D		•	×		-
Younger Ash	_	Sample 18		<u>1</u>   -	· · · · · · · · · · · · · · · · · · ·	ML	- becoming orange brown and moist		м					
You	Groundwater not encountered	Sample 19		2	<pre>(</pre>	ML	when reworked.							-
RA	vater not ei			3	* * * * * *	SP	plasticity. Fine to coarse SAND with trace silt; occasional silty lenses. Well graded.							-
	Ground	Sample 20		-	× × × ×	ML	- becoming white/light brown. Clayey SILT; brown. Medium plastic when reworked.	ity, very stiff, greasy				UTP		-
Hamilton Ash		Sample 21		4 - - 5			- becoming orange brown and less	stiff.						
							(Target depth) RA = Rotoehu Ash Test pit TP06 terminated at 5 metres	5.						
S	<u>i</u> ket				<u> </u>									
1 1 1 1	otes,		and Ge ts ed sam ed sam sample	otechnic ple 50m ple 63m	al Society In m diameter m diameter	c 2005	vane shear (kPa)         ●       remoulded         ×       peak         >×       peak greater than 200kPa         UTP       unable to penetrate         water       10/1/98 water level on date shown         ▶       water inflow         water outflow       water outflow	moisture D dry M moist W wet S saturated		cons VS S F St VSt H	v s fi s v	/ density ery soft oft rm tiff ery stiff ard	L loose MD medium de D dense	

-

C	;(	offe	Ð١		<b>?</b> g	jec	otechnics			Tris	al Pit	Nc			TDO	7	
			_				rial Pit			She					1 GEN	of 1 Z <b>TAUC1</b> 3	3086AF
Clie Prir	ent:				LAKES					Dat	e sta	arte		1:	14.3. 14.3.	2013	
Pro Tria	-	: t location:			ELAKES er to sit		AGE 3 CONSTRUCTION			-	iged ecke	-			KB RBT		
Equ	ipme	ent type: ion dimensio	ns: m		m wide		Pit Orientation: Vane No: DR2244	Easting: 368767. Northing: 799923			R.I		urface	):			
ex	cav	ation infor	mati	on		mate	rial substance										
stratigraphy	water	<b>notes</b> samples, tests, etc	RL	depth metres	graphic log	classification symbol	material Soil - Soil type; colour, structure. plasticity, sensitivity. Secondary an Rock - Colour, fabric, rock type; dis information.	d minor components.	moisture condition	consistency/ density index	25 50 vane shear	100 (remoulded	175 /peak) KPa			cture and I observation	ns
		Sample 22		-	× × × × × × × × × × × × × × × × × × ×	OL ML	TOPSOIL SILT; light brown. Friable and dry.		D		•	×					-
Younger Ash	pa	Sample 23 Sample 24		<u>1</u>   -   -	× × × × × × × × × × × × × × × × × × ×	ML	- becoming orange brown with trace		M		• >	×					
Yc	t encountered			2	× × × × × × × × × × × × × × × × × × ×	ML	when reworked										
RA	Groundwater not			<u>3</u>		SP	SAND with trace silt; orange brown, grained, pumiceous. Well graded.	line to coarse									-
	Gro	Sample 25			× × × × × × × × ×	ML	Clayey SILT; brown. Medium plastic reworked.	ity and greasy when	-								-
НА		Sample 26					- becoming orange brown.										-
				6			(Target depth) RA = Rotoehu Ash HA = Hamilton Ash Test pit TP07 terminated at 5 metre:	5.									
S	keta	l		1 -	1	1			1	1							
s b	oil de ased otes, 50 63 53		ind Ge s d sam d sam sample le	otechnic ple 50m ple 63m	cal Society In m diameter m diameter	c 2005	vane shear (kPa)	<b>moisture</b> D dry M moist W wet S saturated		Cons VS S F St VSt H		ver sof firn stif	ry soft ft n f ry stiff	y index	VL L MD D VD	very loose loose medium der dense very dense	nse

C	1	offe	21		<b>&gt;</b> c	lec	otechnics				
-										Trial Pit No.	<b>TP08</b>
Ε	n	ginee	eri	ng	Log	- T	rial Pit			Sheet Project No:	1 of 1 <b>GENZTAUC13086AF</b>
Clie	ent:			THE		S 201	2 LTD			Date started:	15.3.2013
Pri	ncip	al:								Date completed:	15.3.2013
Pro	ject	:		THE		S STA	GE 3 CONSTRUCTION			Logged by:	RBT
Tria	al pi	t location:		Refe	er to sit	e pla	n			Checked by:	RBT
Equ	ipme	ent type:					Pit Orientation:	Easting: 368724 r	n	R.L. Surface:	
Exc	avat	ion dimensio	ons: n	n long	m wide		Vane No: DR2244	Northing: 799993	m	Datum:	
ex	cav	ation infor	mati	on			rial substance				
stratigraphy	water	<b>notes</b> samples, tests, etc	RL	depth metres	graphic log	classification symbol	material Soil - Soil type; colour, structure. plasticity, sensitivity. Secondary and Rock - Colour, fabric, rock type; disc information.	d minor components.	moisture condition	consistency/ density index 25 50 750 vane shear 176 (remoulded 126 /peak) kPa	structure and additional observations
		Sample 27		-		OL	Organic SILT with numerous fine roo	otlets; greyish brown.	D		-
Younger Ash	ntered	Sample 28		1		ML	SILT with trace to minor clay, some to brown. Stiff, dry, friable. - becoming moist, minor clay, occasi - becoming mottled yellow/orange br - trace very fine sand, moist.	ional rootlets.	M		- - - - - - - - -
A	Groundwater not encountered	Sample 29		-	× × × × × ×	SP	Fine to coarse SAND with trace silt; black flecks.	yellow/brown with	_		-
RA	undwater	Sample 30		3		SP	Fine to medium SAND with minor sil Pockets rework to soft sandy silt with plastic.	n some clay, slightly	M- W		
ЧЧ	Gro	Sample 31		4 - - -		ML	Silty CLAY; chocolate brown with wh stiff in-situ, soft and with medium to I reworked. SILT with trace clay and trace fine sa Very stiff to hard, non plastic and mo	nigh plasticity when and; yellowish brown.	-		- - - - - - -
		Sample 32		<u>5</u>  6_ 		ML	SILT with minor clay; orangish brown clay, moderately plastic, soft to firm. (Target depth) RA = Rotoehu Ash HA = Hamilton Ash Test pit TP08 terminated at 5.2 metr	/			- - - - - - - -
S	iket	ch									
s t n U	oil de ased otes, 50 63 S		and Ge ts ed sam ed sam sample	otechnic ple 50m ple 63m	cal Society In m diameter m diameter	c 2005	vane shear (kPa)         • remoulded         × peak         >>× peak greater than 200kPa         UTP unable to penetrate         water         ✓       10/1/98 water level on date shown         ▶       water inflow         ✓       water outflow	moisture D dry M moist W wet S saturated		consistency/ density in       VS     very soft       S     soft       F     firm       St     stiff       VSt     very stiff       H     hard	dex VL very loose L loose MD medium dense D dense VD very dense

TRIAL PIT TEST PITS 150313.GPJ COFFEY.GDT 28.3.13

Appendix D - Post Development Investigation Data



TETRA	A TECH		PANY								orehole ID.		HAL352
En	ngi	ne	ering	g l	_00	] -	Ha	nd Auger			heet:		<sup>1 of 1</sup> GENZTAUC13086AI
client	-			_		<u> </u>		5			roject no. ate started:		30 May 2016
princi				U							ate complete	od.	30 May 2016
		тн	E LAKE		TAG	E 36		)				eu.	NM
proje			NTRE C				. GCr				ogged by:		DBC
locati			35; N: 79997				cified)	surface elevation: Not Specified			hecked by:	۹Us	DCP id.:
drill m		500-0	55, N. 75557	0 (D8		or ope	cilied)	drilling fluid:		•	meter : 50 mm	30	vane id.: DR2244
drilli	ng info	rmati	ion			mate	erial sub	stance					
method & support	1 2 penetration 3	water	samples & field tests	RL (m)	depth (m)	graphic log	class ification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	shear (ble ⊕ remoulded ⊚ peak 100 (kPa)	CP ows/ mm) ∞∞₽	structure and additional observations
		-			-			ORGANIC SILT: low plasticity, dark brown.	M	VSt to H			TOPSOIL
			VS >183 kPa		_		ML	SILT: low plasticity, orange brown, with fine to medium grained sand.	-		<b>9</b>       		MATUA SUB-GROUP
					-		SP	SAND: fine to medium grained, white, with minor silt.			i i i i   <b>i i</b>		
			VS >183 kPa		0.5-		ML	Sandy SILT: non plastic, white, with fine	_			Ϊİ.	
			VS >183 kPa		-		· · ·	grained sand.				<u>iii</u>	
		Encountered			-		ML	<b>SILT</b> : low plasticity, orange brown, with minor fine grained sand, trace clay.	D to M				
- HA - N - N		Not Enco	VS >183 kPa		1.0-			1.0 m: soil is friable.	D				
			VS UTP		-						Vs Uтр                         		
			VS UTP		- 1.5 —								
			VS UTP		-			1.7 m: with some silt.	M				
			VS >183 kPa		<del>-2.0 -</del>			Hand Auger HAL352 terminated at 2.0 m Target depth					
metho AD AS HA W HA * e.g. B	bit shown by suffix							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/remouded (kPa)         R       refusal	b Cla moistur D dr M mo W we Wp pla	soil desc ased on ssificatio re y bist	Unified n System	F F F F	consistency / relative density           /S         very soft           S         soft           =         firm           St         stiff           /St         very stiff           H         hard           Fb         friable           //L         very loose



		COMPANY							B	orehole ID.		HAL354
E~	~:	noorlin	<b>.</b>		~	Lla	nd Augar		s	heet:		1 of 1
EN	gı	neerin	g	ΓΟĆ	] -	на	nd Auger		р	roject no.		GENZTAUC13086AP
client	:	THE LAK	ES						d	ate started:		30 May 2016
princi	pal:								d	ate complete	ed:	30 May 2016
projec	ct:	THE LAK	ES S	STAG	E 3E	E GCF	?		lo	ogged by:		ODS
locati	on:	CENTRE	OF L	.OT 3	854				с	hecked by:		DBC
		368468; N: 800	003 (D	atum N	ot Spe	cified)	surface elevation: Not Specified			om horizontal:	90°	DCP id.:
drill mo drillin		ormation			mate	erial sub	drilling fluid: stance	r	nole diai	meter : 50 mm		vane id.: SL588
~*	tion	samples 8			DC	ttion	material description		cy / ensity		CP	structure and additional observations
method & support	1 2 penetration	field tests	RL (m)	depth (m)	graphic log	class ification symbol	SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	⊕remoulded ତpeak (kPa) ନ୍ତିହିନ୍ଦିର୍ଦ୍ଦ	mm) ∞∞♀	
HA +		VS >202 kF VS >202 kF VS 153/ 32 kPa	'a				ORGANIC SILT: low plasticity, dark brown. SILT: non plastic to low plasticity, orange brown, with trace fine grained sand. 0.35 m: with minor clay SAND: fine to medium grained, brown, with some silt. 1.1 m: with trace silt	M	USt to H			TOPSOIL VOLCANIC ASHES
	auger		M			, , , , , , , , , , , , , , , , , , ,	SILT: non plastic, pale brown, with minor fine grained sand. Hand Auger HAL354 terminated at 2.0 m Target depth samples & field tests B bulk disturbed sample D disturbed sample	5	VSt sification soil desc ased on	I       I       I         I       I       I	                               	
HA W HA * e.g. B T	AD auger drilling* AS auger screwing* AA hand auger W washbore HA hand auger bit shown by suffix B blank bit T C bit W mud C casing penetration water 10-C leve water water					e shown	D disturbed sample E environmental sample S 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	Cla moistu D dr M ma W we Wp pla	re y oist	n System	F S H F V L M	firm St stiff /St very stiff hard b friable /L very loose loose /D medium dense



TETR	A TECH	COMP		-							orehole ID. heet:		HAL356
Ēr	ngi			_	-0(	) -	Ha	nd Auger			roject no.		GENZTAUC13086AF
clien	t:	TH	E LAKE	S						d	ate started:		30 May 2016
princ	cipal:									d	ate complete	ed:	30 May 2016
proje	ect:	TH	ELAKE	s s	TAG	E 3E	GCF			lo	gged by:		ODS
locat	tion:	CEI	NTRE C	DF L	ОТ 3	856				С	hecked by:		DBC
positi drill m		36845	6; N: 80003	38 (Da	atum No	ot Spe	cified)	surface elevation: Not Specified drilling fluid:		-	m horizontal: 9 meter : 50 mm	90°	DCP id.: vane id.: SL588
	ing info	ormatio	on			mat	erial sub	•					Valie Id., OESSO
method & support	penetration	ter	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 DC shear ⊕remoulded ⊚peak (blo 100	ws/	structure and additional observations
ang ∎ ag	۵ ۳ ۲ – ۱	water		RL	dep	gra	cla	ORGANIC SILT: low plasticity, dark brown.	е ъ М	ତି 😇 VSt to	(kPa) 02 02 02 02 02 02 02 02 02 02 02 02 02 0		TOPSOIL
- N		Not Encountered	/S >202 kPa /S >202 kPa /S >202 kPa /S >202 kPa		- - - - - - - - - - - - - - - - - - -			SILT: non plastic to low plasticity, orange brown, with trace fine grained sand.		Н	$\begin{array}{c} \begin{array}{c} \\ \\ \\ \\ \end{array}\end{array}$		VOLCANIC ASHES
• •			√S >202 kPa √S >202 kPa		- 1.5 — - - - -			Hand Auger HAL356 terminated at 2.0 m			$\begin{array}{c} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$		
					_			Target depth					
AD AS HA W HA * e.g. B	AS auger screwing* HA hand auger W washbore HA hand auger * bit shown by suffix e.g. AD/T						sistance ng to al rater e shown	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/remouded (kPa)         R       refusal	t Cla moistu D dr M mo W we Wp pla	soil desc based on assificatio re y oist	Unified n System	F F F F L M	St stiff /St very stiff H hard "5 friable /L very loose



#### Borehole ID. HAL358 1 of 1 sheet: **Engineering Log - Hand Auger** GENZTAUC13086AP project no. THE LAKES client: 30 May 2016 date started: principal: 30 May 2016 date completed: THE LAKES STAGE 3E GCR logged by: NM project: **CENTRE OF LOT 358** DBC location. checked by: position: E: 368449; N: 800072 (Datum Not Specified) surface elevation: Not Specified angle from horizontal: 90° DCP id.: drill model: drilling fluid: hole diameter : 50 mm vane id.: DR2244 drilling information material substance DCP material description vane structure and consistency / relative density class ification g (blows/ 100 mm) samples & shear ⊕ remould ⊚ peak additional obs /ations Ē method & support moisture condition penetra SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components field tests graphic I symbol Ē depth ( water (kPa) 8 8 8 R ORGANIC SILT: low plasticity, dark brown. Μ VSt TOPSOIL 11111 |||||||11111 11 ||||||11111 1 + 1||||||11111 **SILT**: low plasticity, orange brown, with trace fine grained sand, trace clay. ML D to M | | | | |11111 MATUA SUB-GROUP 11 11111 ||||||VS >183 kPa | | |9 11 11111 1111 |||||| | | | |111 111 11111 111 11111 111 11111 VS >183 kPa 0.5 1111 111 ||11 |||||||11111 М |||||111 11111 11 ||||||11111 ||||0.7 m: minor fine grained sand with clay | | | |11111 VS 107/ 19 kPa absent 11111 1 111 φij Ðı ||||11111 11 1 11 11111 Encountered 1111 ||||111 0.9 m: some fine grained sand. St 11111 ||||||||||VS 81/ 1111 11 1 ⊕¦⊙ 19 kPa 1.0 ₹ ż 11111 Not 111 11111 |||||||1 | | 11111 1.1 m: minor fine grained sand. 111 |||||||11111 VS 94/ 19 kPa ||||11111 ⊕|•|| 11111 ||||||||||11111 11111 ||||||1.3 m: minor clay, trace fine grained sand. 11 ||||||11111 11 ||||||11111 11111 111 | | | | |VS 81/ 19 kPa 11111 111 ⊕¦⊙ 15 11111 11111 111 1 1 1 1 11111 1 | | | 11111 111 |||||11111 g Clayey SILT: low plasticity, orange, with trace VSt CL-ML |||||11111 VS 120/ 25 kPa fine to medium grained sand, greasy. |||||11111 ⊕¦ ||||11111 1.8 m: minor fine to medium grained sand. ||11111 11111 11 ||1 + 111111 VS >183 kPa 11111 2.0 Hand Auger HAL358 terminated at 2.0 m 11111 Target depth iiiii 111 |||||||11111 ||||||11111 | | | | |11 classification symbol & method AD auger drilling\* support consistency / relative density samples & field tests soil description N nil bulk disturbed sample mud VS Μ В very soft AS auger screwing' based on Unified soft firm C casing D disturbed sample S F hand auger HA Classification System Е environmental sample W penetration washbore SS split spoon sample St stiff HA hand auge no resistance ranging to refusal very stiff undisturbed sample ##mm diameter VSt U## moisture HP hand penetrometer (kPa) hard н dry moist wet D M W standard penetration test (SPT) Fb Ν friable wate N\* SPT - sample recovered VL very loose bit shown by suffix 10-Oct-12 water Wp WI plastic limit T SPT with solid cone Nc loose L e.g. B evel on date shown AD/T İiguid limit VS vane shear; peak/remouded (kPa) MD medium dense blank bit vater inflow R refusal D dense TC bit water outflow very dense

HB

hammer bouncing

VD

HAS.GPJ STAGE 3E NON CORED + DCP COF BOREHOLE: 20 ž ٤ Ę

V bi



#### Borehole ID. HAL360 1 of 1 sheet: **Engineering Log - Hand Auger** GENZTAUC13086AP project no. THE LAKES client: 30 May 2016 date started: 30 May 2016 principal: date completed: THE LAKES STAGE 3E GCR logged by: ODS/NM project: **CENTRE OF LOT 360** DBC location. checked by: position: E: 368445; N: 800106 (Datum Not Specified) surface elevation: Not Specified angle from horizontal: 90° DCP id.: drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588 drilling information material substance DCP material description vane structure and consistency / relative density class ification g (blows/ 100 mm) samples & shear ⊕ remould ⊚ peak additional obs /ations Ē method & support moisture condition penetra SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components field tests graphic l symbol Ē depth ( water (kPa) 8 8 8 R ORGANIC SILT: low plasticity, dark brown. Μ VSt to TOPSOIL IIII Η |||||||11111 1.1.1 ||||||11111 ||||| | | |11111 | | | |11111 111 VS >202 kPa 11111 VOI CANIC ASHES **SILT**: non plastic to low plasticity, orange brown, with trace fine grained sand. 11 | | | | |1111 1111 |||||| | | | ||||||11111 111 111 1111 111 VS 180/ 41 kPa 11111 + | || 0.5 liiiii 111 ||||||11 |||||||11111 0.6 m: with trace clav 111 1 1 1 1 111 ||||||11111 |||||||||11111 | | || | | | |11111 | | |11111 ||||||11 1 11111 Encountered 1111 ||||| | | |11111 |||||||||VS 190/ $\left| \cdot \right|$ 1111 1 ф ¥ ż 39 kPa 1.0 iiiii Not HAS.GPJ 111 111 11111 11111 STAGE 3E 111 1111 11111 ||||||||||11111 VS 163/ 34 kPa 11111 ∉ þ NON CORED + DCP ||||11111 1 | |11111 |||11111 ||||||||||11111 11111 ||||| | | | |VS 175/ 74 kPa 11111 $\mathbf{O}$ ₽ COF BOREHOLE: 15 11111 MATUA SUB-GROUP SILT: non plastic to low plasticity, orange, with trace clay and trace fine to coarse grained 11111 ||||||sand 111 1 1 1 1 11111 1 | | | 11111 111 1 1 1 1 11111 Log VS >202 kPa ||||11111 ||||11111 ||||11111 |||||20 | | |11111 ž 111 1111 ||||111 11111 VS >202 kPa 2.0 ٤ Hand Auger HAL360 terminated at 2.0 m 11111 Target depth 11111 111 |||||||Ę 11111 ||||||11111 | | | | |11 classification symbol & method AD auger drilling\* consistency / relative density support samples & field tests soil description N nil bulk disturbed sample mud VS Μ В very soft AS auger screwing' based on Unified soft firm C casing D disturbed sample S F hand auger HA Classification System Е environmental sample W penetration washbore SS split spoon sample St stiff hand auger no resistance ranging to refusal HA very stiff undisturbed sample ##mm diameter VSt U## moisture HP hand penetrometer (kPa) hard н dry moist wet D M W standard penetration test (SPT) Fb Ν friable wate N\* SPT - sample recovered VL very loose bit shown by suffix 10-Oct-12 water Wp WI plastic limit T SPT with solid cone Nc loose L e.g. B evel on date shown AD/T İiguid limit VS vane shear; peak/remouded (kPa) MD medium dense blank bit vater inflow R refusal D dense TC bit

water outflow

V bi

HB

hammer bouncing

VD

very dense



## Borehole ID. HAL362 1 of 1 sheet: **Engineering Log - Hand Auger** GENZTAUC13086AP project no. THE LAKES client: 30 May 2016 date started: principal: 30 May 2016 date completed: THE LAKES STAGE 3E GCR logged by: NM project: **CENTRE OF LOT 362** DBC location. checked by: position: E: 368446; N: 800140 (Datum Not Specified) surface elevation: Not Specified angle from horizontal: 90° DCP id.: drill model: drilling fluid: hole diameter : 50 mm vane id.: DR2244 drilling information material substance DCP material description vane structure and consistency / relative density class ification g shear ⊕ remould ● peak (blows/ 100 mm) samples & additional obs /ations Ē method & support penetra SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components field tests graphic l moisture conditior symbol Ē depth ( water (kPa) 8 8 8 R ORGANIC SILT: low plasticity, dark brown. Μ VSt to TOPSOIL 11111 Η |||||||11111 11 ||||||11111 ||||||||||11111 | | | | |11111 11 11111 ||||||VS >183 kPa | | |9 11 11111 ML SILT: low plasticity, yellow brown, with minor D MATUA SUB-GROUP 1111 ||||| | | | |fine grained sand, trace clay ||||11111 1111 111 ||||||11111 VS >183 kPa 0.5 111 ||||||11 |||||||11111 111 1 1 1 1 11111 111 ||||||11111 D to M ||||++++11111 VS 169/ 31 kPa | | |11111 ||||| | |11111 ||||11 11111 Encountered 1111 1 + 1111 11111 |||||VS 133/ 33 kPa | | |1111 0 ż 1.0 € ₹ D 11111 Not HAS.GPJ 111 11111 11111 STAGE 3E 111 |||||||11111 VS >183 kPa ||||11111 | | | 111 11111 NON CORED + DCP ||||11111 11111 ||||||1.3 m: Some sand. Greasy 11111 111 ||||||||||111 11111 11111 | | |111 VS 151/ 25 kPa 11111 | **(** COF BOREHOLE: 15 θ 11111 11111 111 11111 1 1 1 1 11111 111 ||||||11111 Log ||||||||||11111 |||||11111 VS >183 kPa ||||||||20 ||||11111 ž ||||1111 ||||11111 VS >183 kPa 11111 2.0 ٤ Hand Auger HAL362 terminated at 2.0 m 11111 Target depth iiiii 111 |||||||Ę 11111 ||||||iiiii | | | | |11 method AD auger drilling\* classification symbol & consistency / relative density support samples & field tests soil description N nil bulk disturbed sample mud VS Μ В very soft AS auger screwing' based on Unified soft firm C casing D disturbed sample S F HA W hand auger Classification System Е environmental sample penetration washbore SS split spoon sample St stiff hand auger no resistance ranging to refusal HA very stiff undisturbed sample ##mm diameter VSt U## moisture HP hand penetrometer (kPa) hard н dry moist wet D M W standard penetration test (SPT) Fb Ν friable wate N\* SPT - sample recovered VL very loose bit shown by suffix 10-Oct-12 water Wp WI plastic limit T SPT with solid cone Nc loose L e.g. B evel on date shown AD/T İiguid limit VS vane shear; peak/remouded (kPa) MD medium dense blank bit vater inflow R refusal D dense TC bit water outflow

HB

V bi

hammer bouncing

VD

very dense



			- y							_			
ATETF	A TECH	COMF	PANY							В	orehole ID.		HAL364
Fr	nai	no	orin	n I	0	- r	Ha	nd Auger		S	heet:		1 of 1
	igi				-0(	1 -	i ia	na Augei		р	roject no.		GENZTAUC13086AF
clier	it:	тн	E LAKE	S						d	ate started:		31 May 2016
prino	cipal:									d	ate complete	ed:	31 May 2016
proje	ect:	ΤН	E LAKE	s s	TAG	E 3E	E GCF	2		lc	gged by:		ODS
loca	tion:	CE	NTRE C	)F L	от з	864				С	hecked by:		DBC
positi	on: E:	36849	99; N: 80010	)1 (Da	atum No	ot Spe	cified)	surface elevation: Not Specified		-	m horizontal:	90°	DCP id.:
	nodel: ing info	ormati	ion			mat	erial sub	drilling fluid:	ł	nole diar	meter : 50 mm		vane id.: SL588
	Lo Lo							material description		sity	vane D0		structure and
method & support	1 2 penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	class ification symbol	SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	shear ⊕ remoulded ⊚ peak (kPa) B 2 2 2 3 3 3 4 9	mm)	additional observations
			V0 - 000 1-D-		-			ORGANIC SILT: low plasticity, dark brown.	M	VSt to H			TOPSOIL VOLCANIC ASHES
			VS >202 kPa					SILT: non plastic to low plasticity, orange brown, with trace fine grained sand.					VOLCANIC ASHES
			VS 158/ 32 kPa		-								
z		Not Encountered	VS 98/ 34 kPa		- 1.0—			SILT: low plasticity, orange brown, with minor clay.		St VSt to			MATUA SUB-GROUP
			VS 117/ 22 kPa		-					н	⊕		
			VS 156/ 44 kPa		1.5 —								
			VS >202 kPa		-			1.7 m: becoming non to slightly plastic, becoming orange, with trace fine to medium grained sand, greasy					
					-2.0			Hand Auger HAL364 terminated at 2.0 m Target depth					
<b>meth</b> AD AS HA W HA	auger auger hand a washb hand a	screwi auger ore auger	ng*		mud casing etration	− no re rangi ▼ refus	al	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	t Cla moistu D dr	soil desc pased on assificatio re y poist		V F S V F F	F firm St stiff /St very stiff H hard Fb friable
* B T V	bit sho AD/T blank TC bit V bit	bit	suffix		✓ 10-0 leve wate	Oct-12 v el on dat er inflow er outflo	e shown /	NC SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	Wp pla	astic limit uid limit			Loose MD medium dense



	RA TECH	COMF		al		<b>1</b> - Ľ	На	nd Auger		s	orehole ID	).	HAL366
clier	<u> </u>			_		1					roject no. ate started		<u>GENZTAUC13086AF</u> 31 May 2016
	cipal:			.0							ate comple		31 May 2016
proje		тн	E LAKE	2.2	TΔG	F 3F	GCE	)			aged by:	sieu.	NM
loca											hecked by:		DBC
			04; N: 8000				cified)	surface elevation: Not Specified	á		m horizonta		DCP id.:
drill n	nodel:							drilling fluid:	ł	nole dia	meter : 50 m	m	vane id.: DR2244
drill	ing infe	ormat	ion			mate	erial sub	stance material description		_≩	vane	DCP	structure and
method & support	1 2 penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	shear ( ⊕remoulded ⊚peak 11 (kPa) B 0 0 0 0 0 0 0 0 0 0	blows/ 00 mm)	additional observations
			VS >183 kPa		=		ML	ORGANIC SILT: low plasticity, dark brown.	D	VSt			TOPSOIL -
			VS 169/ 26 kPa		0.5 —			fine grained sand, trace clay.					-
		ntered	VS 169/ 31 kPa		-								
   z 		Not Encountered	VS 183/ 32 kPa		1.0-						⊕		-
			VS 151/ 31 kPa		-					St			
			VS 94/ 21 kPa		1.5—		ML	<b>SILT</b> : low plasticity, orange, with minor to trace clay, trace fine to coarse grained sand. Greasy.		VSt to H	 ⊕  ⊕           		MATUA SUB-GROUP
			VS 151/ 31 kPa		-						<pre>              </pre>		
* *			VS >183 kPa		-2.0			Hand Auger HAL366 terminated at 2.0 m Target depth					
meti AD AS HA W HA * e.g. B	hod auger auger hand a washt hand a	oore auger own by	ng*	pen wate	etration		ater e shown	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/remouded (kPa)	t Cla moistu D dr M m W we Wp pla	soil desc based on ussificatio re y bist	a symbol & ription Unified n System	F S	F firm St stiff /St very stiff H hard Pb friable /L very loose



A TETR	A TECH	COMP		n I	0	Y	На	nd Auger			Borehole heet:	ID.	HAL368
	<u> </u>				-0(	1 -	Па	nd Auger			roject no		GENZTAUC13086A
clien	it:	TH	E LAKE	S						d	ate start	ed:	31 May 2016
princ	cipal:										ate com		31 May 2016
proje	ect:		E LAKE				GCF	2		lo	ogged by		NM
locat			NTRE C							С	hecked b	oy:	DBC
positi drill m		36850	08; N: 80002	25 (Da	itum No	ot Spe	cified)	surface elevation: Not Specified drilling fluid:		-	om horizor meter : 50		DCP id.: vane id.: DR2244
	ing info	ormati	ion			mate	erial sub	-					Valie Id.: Divezerr
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	class ification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	vane shear ⊕remoulded ⊚peak (kPa) 000000000000000000000000000000000000	DCP (blows/ 100 mm	
		-			-			ORGANIC SILT: low plasticity, dark brown.	D	VSt			TOPSOIL
			VS >183 kPa		- 0.5 —		ML	SILT: low plasticity, orange brown, with minor fine grained sand, trace clay.	M				MATUA SUB-GROUP
		pa	VS 169/ 31 kPa		-			0.6 m: becoming minor clay, trace fine to medium grained sand.					
HA		Not Encountered	VS 169/ 31 kPa		- 1.0			1.1 m: becoming orange with minor clay, trace					-
			VS 169/ 31 kPa		-			fine to medium grained sand, greasy.					
			VS 169/ 31 kPa		- 1.5— -			1.6 m: minor fine to medium grained sand. Compressible	w	St			
			VS 61/ 21 kPa		-						                     ⊕@        		
			VS >183 kPa		2.0-			1.9 m: some fine to medium grained sand.		VSt to H			
					_			Hand Auger HAL368 terminated at 2.0 m Target depth					
meth AD AS HA W HA	auger auger hand a washb hand a	screwii iuger ore iuger	ng*	pene wate	nud casing etration		al	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	t Cla moistu D dr M mo W we	soil desc pased on issificatio re y poist et	Unified on System		consistency / relative density         VS       very soft         S       soft         F       firm         St       stiff         VSt       very stiff         H       hard         Fb       friable         VL       very loose
e.g. B T V	AD/T blank t TC bit V bit	pit			leve		e shown	Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing		astic limit uid limit			L loose MD medium dense D dense VD very dense



A TETRA T			ANY								Borehole ID	).	HAL370
Eng	gi	ne	erin	g l	_00	<b>)</b> -	Ha	nd Auger			heet: roject no.		1 of 1 GENZTAUC13086AF
client:	<u> </u>		E LAKE					-			late started	1:	31 May 2016
princip	al:									d	late comple	eted:	- 31 May 2016
project	t:	ΤН	E LAKE	s s	TAG	E 38	E GCF	2		lo	ogged by:		ODS
locatio	n:	CE	NTRE C	)F L	от з	70				с	hecked by	:	DBC
position: drill mod		36854	0; N: 8000	36 (Da	itum No	ot Spe	cified)	surface elevation: Not Specified drilling fluid:		-	om horizonta meter : 50 m		DCP id.: vane id.: SL588
drilling		ormati	on			mat	erial sub	stance					
method & support	2 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	⊕ remoulded ⊚ peak     1     (kPa)	DCP (blows/ 00 mm)	structure and additional observations
			VS >202 kP <i>a</i>		-			ORGANIC SILT: low plasticity, dark brown. SILT: non plastic to low plasticity, orange brown, with trace fine grained sand.	M	VSt			TOPSOIL
			VS >202 kPa		- 0.5								
		Not Encountered	VS >202 kPa		- - 1.0-								-
			VS 153/ 44 kPa		-								
			VS >202 kPa		1.5 —			SILT: non plastic, pale orange brown, with minor fine to coarse grained sand. Greasy.	_		                                       		-
			VS >202 kPa		-						                                       		
					-2.0			Hand Auger HAL370 terminated at 2.0 m Target depth			                 		
AS a HA h W w HA h	uger of uger s and a vashbo and a bit sho	ore	ng*	pen wate	nud casing etration	- no re rangi ◄ refus Oct-12 v	ater	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 pedid components	b Cla moistur D dry M mo W we	soil desc pased on issificatio re y pist et	n symbol & rription Unified on System	F F F	St stiff /St very stiff H hard -b friable /L very loose
e.g. A B b T T	oit shơ AD/T olank t C bit / bit		suffix		Leve	Oct-12 v	ater e shown		W we Wp pla		t		/L very loose



			<u> </u>							_			
A TETR	A TECH	COMF	ANY							В	orehole ID.		HAL372
E۲	nai	no	orin	a I		N	Ha	nd Auger		S	heet:		1 of 1
	iyi			_	LOÍ	<u>J</u> -	Па	nu Auger		р	roject no.		GENZTAUC13086A
clien	t:	ΤН	E LAKE	S						d	ate started:		31 May 2016
princ	ipal:									d	ate comple	ted:	31 May 2016
proje	ect:	ΤН	E LAKE	s s	TAG	E 31	E GCI	?		lc	ogged by:		NM
locat	ion:	CE	NTRE C	)F L	.от з	872				С	hecked by:		DBC
positio	on: E:	36857	2; N: 8000	36 (D	atum No	ot Spe	cified)	surface elevation: Not Specified	а	angle fro	om horizontal:	90°	DCP id.:
drill m	odel: ng info	rmoti	on			mat	erial sul	drilling fluid:	h	nole diar	meter : 50 mn	n	vane id.: DR2244
ariii		Jinau						material description		, sity	vane [	DCP	structure and
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	● remoulded ● peak 10 (kPa)	lows/ 0 mm)	additional observations
	о ю <del>–</del> И б	>		œ	σ		0 0	ORGANIC SILT: low plasticity, dark brown.	M	VSt to		9009	TOPSOIL
					-	$ \rangle$				H			
			VS >183 kPa				ML	SILT: low plasticity, orange brown, with minor fine to medium grained sand.	D				VOLCANIC ASHES
			V3 - 103 KF2		-								
					-								
			VS >183 kPa		0.5								
					-								
					-						<b> </b>             <b> </b>		
			VS >183 kPa		-								
		red											
		Not Encountered	VS 169/				ML	SILT: low plasticity, yellow brown, with minor clay, trace fine grained sand.	М	VSt			MATUA SUB-GROUP
ż		Not En	31 kPa		1.0-								
					-								
			VS 151/ 25 kPa		_						⊕   ⊕		
					-								
					-								
			VS 169/ 25 kPa		1.5-								
			10 4001								i i i i <b>  i</b> i		
			VS 133/ 31 kPa		-								
					-								
			VS 151/ 19 kPa										
			- to KFd		2.0-			Hand Auger HAL372 terminated at 2.0 m Target depth					
			<b>[</b>						class	ification			
neth AD AS	od auger auger			M	<b>port</b> mud casing	I	N nil	samples & field tests       B     bulk disturbed sample       D     disturbed sample	s	oil desc ased on	ription	۱ I	consistency / relative density       VS     very soft       S     soft
HA N	hand a washb	auger ore	-		etration			E environmental sample SS split spoon sample			n System	1	firm St stiff
HA	hand a	auger				no re rang	esistance ing to sal	U## undisturbed sample ##mm diameter HP hand penetrometer (kPa)	<b>moistu</b> D dry	y		Ì	/St very stiff H hard
		wn by	suffix	wat	<b>V</b>  10-0	Oct-12 v	vater	N         standard penetration test (SPT)           N*         SPT - sample recovered           Nc         SPT with solid cone	M mo W we	oist			Fb friable /L very loose _ loose
e.g. B	AD/T blank				leve	el on dat er inflov	te shown v	Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal		uid limit		1	MD medium dense
T V	TC bit V bit			-	- wat	er outflo	w	HB hammer bouncing					VD very dense



ATETRA			PANY							В	orehole ID.		HAL374
E۳	ina	no	orina	n I	~	N .	ปว	nd Augor		s	heet:		1 of 1
	ıyı				-0(	<u>J</u> -	Па	nd Auger		р	roject no.		GENZTAUC13086AF
client		ΤН	E LAKE	S						d	ate started:		31 May 2016
princi	ipal:									d	ate complete	ed:	31 May 2016
proje	ct:		E LAKE				GCF	2		lc	gged by:		ODS
locati	-		NTRE C								hecked by:		DBC
positio drill mo		36860	05; N: 80002	29 (Da	tum No	ot Spe	cified)	surface elevation: Not Specified drilling fluid:			m horizontal: meter : 50 mm	90°	DCP id.: vane id.: SL588
	ng info	ormati	on			mate	erial sub						
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	class ification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	shear ⊕remoulded ⊚peak 100	CP ws/ mm)	structure and additional observations
ĕ ₪ A A	- N m	Ň		RL	de		sy	ORGANIC SILT: low plasticity, dark brown.	Ĕ 8 M	रु <u>चे</u> VSt to			TOPSOIL
- HA		Not Encountered	VS >202 kPa VS 173/ 52 kPa VS 165/ 46 kPa VS 102/ 29 kPa VS 165/ 39 kPa					SILT: non plastic to low plasticity, orange brown, with trace fine grained sand.			$\begin{array}{c} \begin{tabular}{cccccccccccccccccccccccccccccccccccc$		VOLCANIC ASHES
					-2.0			Hand Auger HAL374 terminated at 2.0 m Target depth					
AS HA W HA * e.g. B	bd auger hand a washb hand a bit sho AD/T blank t TC bit	screwi auger ore auger wn by	ng*	pene	nud easing etration er er leve wate		ater e shown	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/remouded (kPa)       R     refusal       HB     hammer bouncing	b Cla moistur D dr M mo W we Wp pla	soil desc ased on ssificatio re y bist		F F L L	F firm St stiff /St very stiff H hard Fb friable /L very loose Joose MD medium dense



A TETR/		COMPANY							В	orehole ID		HAL376
Er	ngi	neerir	g	Loc	<b>)</b> - (	Ha	nd Auger			heet:		1 of 1 GENZTAUC13086AF
client		THE LAK			<u> </u>		5			roject no. ate started	:	31 May 2016
princ			-							ate comple		31 May 2016
proje	•	THE LAK	ES S	STAG	E 3E	E GCR				ogged by:		ODS
locat		CENTRE								hecked by:		DBC
positio	on: E:	368640; N: 800	018 (D	atum No	ot Spe	cified)	surface elevation: Not Specified	a		om horizontal		DCP id.:
drill m							drilling fluid:	ł	nole dia	meter : 50 mr	n	vane id.: SL588
drilli		ormation				erial sub	stance material description		, ity	vane	DCP	structure and
method & support	1 2 penetration	samples a field tests	RL (m)	depth (m)	graphic log	class ification symbol	SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	● remoulded ● peak (kPa)	olows/ 10 mm) ₄ ∞ ∞ ₽	additional observations
- HA		VS >202 kl VS >202 kl VS 177/ 34 kPa VS 156/ 35 kPa VS 133/ 32 kPa	Pa				ORGANIC SILT: low plasticity, dark brown. SILT: non plastic to low plasticity, orange brown, with trace fine grained sand.	M	VSt to H	$\begin{array}{c} \begin{array}{c} \begin{array}{c} \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \begin{array}{c} \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \end{array} \\ \end{array} $		TOPSOIL
		VS 102/ 46 kPa	Pa				SILT: non plastic to low plasticity, pale orange brown, with trace to minor fine to coarse grained sand and with trace clay.					MATUA SUB-GROUP
<u>↓</u> ↓				-2.0			Hand Auger HAL376 terminated at 2.0 m Target depth					
metho AD AS HA W HA * e.g. B	auger auger hand a washb hand a	ore auger wn by suffix	M C			al /ater e shown	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/remouded (kPa)       R     refusal	b Cla moistur D dr M mo W we Wp pla	soil desc ased on ssificatio re y bist	Unified n 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



A TETR	A TECH	COMP		g l	-0(	<b>)</b> -	Ha	nd Auger		sl	orehole neet: roject no		HAL378 1 of 1 GENZTAUC13086A
clien	t:	TH	E LAKE	S						da	ate starte	ed:	31 May 2016
princ	ipal:									da	ate comp	oleted:	31 May 2016
proje	ect:	ТН	E LAKE	s s	TAG	E 3E	GCF	2		lo	gged by	:	ODS
locat	ion:	CE	NTRE C	)F L	от з	78				cl	necked b	by:	DBC
positio	on: E:	36867	0; N: 80000	)1 (Da	itum No	ot Spec	cified)	surface elevation: Not Specified	a	angle fro	m horizon	tal: 90°	DCP id.:
drill m								drilling fluid:	ł	nole diar	neter : 50	mm	vane id.: SL588
arilli	ng info	rmati	on				erial sub	stance material description		ity _	vane	DCP	structure and
method & support	1 2 penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	shear ⊕remoulded ⊚peak (kPa) 0500000000000000000000000000000000000	(blows/ 100 mm)	additional observations
					-			ORGANIC SILT: low plasticity, dark brown.	M	VSt to H			TOPSOIL
			VS >202 kPa		-			<b>SILT</b> : non plastic, pale orange brown, with minor fine to coarse grained sand.	-		     <b>⊕</b>       <b>⊕</b>		MATUA SUB-GROUP
			VS 156/ 24 kPa		0.5 —			0.6 m: with some fine to coarse grained sand			$\begin{array}{c} & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\$		
		Not Encountered	VS 98/ 21 kPa		- - 1.0-					St	⊕		
		Ž	VS 96/ 18 kPa		-			1.1 m: becoming pale brown, with trace fine to coarse grained sand and with trace clay. Sticky			$\begin{array}{c} \cdot \cdot \cdot \cdot \\ - \cdot \cdot \cdot \\ - \cdot \cdot \\ -$		
			VS 79/ 21 kPa		- 1.5—						$\begin{array}{c} \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$		
			VS >202 kPa		-					Н	· · · · · · · · · · · · · · · · · · ·		
<u></u>					-2.0			Hand Auger HAL378 terminated at 2.0 m Target depth					
meth AD AS HA W HA		screwir luger ore luger	ıg*	pen wate	nud casing etration	no res rangir ◄ refusa		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	moistur D dr M mo W we	soil desci ased on ssification re y bist et	symbol &		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose
e.g. B T V	AD/T blank t TC bit V bit		Julia		leve	Oct-12 w I on date er inflow er outflov	e shown	Nc     SPT with solid cone       VS     vane shear, peak/remouded (kPa)       R     refusal       HB     hammer bouncing		astic limit uid limit			L loose MD medium dense D dense VD very dense



		_	-y							-			
TETR	RA TECH	COMF	PANY							В	orehole ID.		HAL380
Er	nai	no	orin	a I	0	N _	На	nd Augor		S	heet:		1 of 1
	iyi		enni	<u>y 1</u>	-06	<u>J -</u>	па	nd Auger		р	roject no.		GENZTAUC13086A
clien	nt:	ΤH	E LAKE	S						d	ate started:		31 May 2016
princ	cipal:									d	ate complete	ed:	31 May 2016
proje	ect:	ΤН	E LAKE	s s	TAG	E 3E	E GCF	2		lc	ogged by:		ODS
loca	tion:	CE	NTRE C	)F L	от з	80				с	hecked by:		DBC
positi	ion: E:	36869	99; N: 79995	51 (Da	tum No	ot Spe	cified)	surface elevation: Not Specified	a		om horizontal:	90°	DCP id.:
drill n	nodel:					•	,	drilling fluid:		-	meter : 50 mm		vane id.: SL588
drill	ing info	ormati	ion			mate	erial sub	stance			· · ·		1
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	shear ⊕ remoulded ⊚ peak (blo 100	CP ows/ mm)	structure and additional observations
E ⊼ A A	- 0 0	Š		Ľ	ð	5	ିରଟ	ORGANIC SILT: low plasticity, dark brown.	E 8 M	8 ≞ VSt to	1 1 1 20 00 00 00 00 00 00 00 00 00 00 00 00	<sup>ء ∞ 2</sup>	TOPSOIL
			VS 173/ 38 kPa		-			SILT: non plastic, brown, with minor fine to coarse grained sand.	-	Н			MATUA SUB-GROUP
			VS 108/ 26 kPa		0.5			0.6 m: becoming orange brown, with trace clay. Greasy					-
z		Not Encountered	VS 189/ 19 kPa		- 1.0			0.9 m: clay absent					
			VS 106/ 19 kPa		-								
			VS >202 kPa		1.5 — - -								
			VS >202 kPa		- - <del>2.0</del>			Hand Auger HAL380 terminated at 2.0 m Target depth					
meth AD AS HA W HA * e.g. B T	bit sho AD/T blank I TC bit	screwi iuger ore iuger wn by	ng*	pen wate	etration etration		al ater e shown	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/remouded (kPa)         R       refusal	b Cla moistur D dr M mo W we Wp pla	soil desc ased on ssificatio re y bist	Unified n System	                             	Consistency / relative density           /S         very soft           S         soft           E         firm           St         stiff           /St         very stiff           H         hard           Fb         friable           /L         very loose



A TETR/	A TECH	COMP		-							orehole I	ID.	HAL382
Ēr	Ŋ				-0(	<b>J</b> -	На	nd Auger		р	roject no		GENZTAUC13086AF
client	t:	ΤH	E LAKE	S	_	_	_			d	ate starte	ed:	31 May 2016
princ	ipal:									d	ate comp	leted:	31 May 2016
proje	ct:	ΤH	E LAKE	s s	TAG	E 3E	GCF	2		lo	ogged by:	:	NM
locati	ion:	CE	NTRE C	DF L	OT 3	882				С	hecked b	y:	DBC
		36870	06; N: 79992	21 (Da	atum No	ot Spee	cified)	surface elevation: Not Specified			om horizon		DCP id.:
drill m drilli	ng info	ormati	on			mate	erial sub	drilling fluid: stance	I		meter : 50 i	mm	vane id.: DR2244
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	class ification 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
	3 7 - 3	- Me		RI	de	B	3 C	ORGANIC SILT: low plasticity, dark brown.	<u>ё</u> 8 М	<u>७ च</u> VSt	200 		TOPSOIL -
			VS >183 kPa		-			<b>SILT</b> : low plasticity, yellow brown, with minor fine to medium grained sand, trace clay.			       <b>0</b>         <b>0</b> 		MATUA SUB-GROUP
			VS >183 kPa		0.5				M to W	-			-
		ered	VS 151/ 37 kPa		-			Sandy SILT: non plastic, orange brown, with fine to medium grained sand.			                     		· · · · · · · · · · · · · · · · · · ·
HA		Not Encountered	VS 126/ 31 kPa		1.0-			SILT: low plasticity, yellow brown, with minor		St			-
			VS 94/ 31 kPa		-			fine to medium grained sand, trace clay.			⊕ ⊕                     		
			VS 94/ 31 kPa		1.5—								-
			VS 120/ 31 kPa		-			1.7 m: becoming red brown.		VSt	-                               ⊕   ●     		
			VS 81/					1.9 m: becoming yellow brown with minor clay, trace fine grained sand.		St			
F			<u>31 kPa</u>		- 2.0			Hand Auger HAL382 terminated at 2.0 m Target depth					
metho AD AS HA W HA	od auger s hand a washbo hand a	screwii uger ore		M i C o pen	etration		l nil sistance ng to al	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)	t Cla moistu D dr M mo	soil desc based on ussificatio re y bist	n symbol &		F firm St stiff /St verystiff H hard Fb friable
* B T V	bit show AD/T blank b TC bit V bit		suffix		■  10-  leve	Oct-12 w el on date er inflow er outflow	e shown	N*     SPT - sample recovered       Nc     SPT with solid cone       VS     vane shear; peak/remouded (kPa)       R     refusal       HB     hammer bouncing		et astic limit uid limit		L N	MD medium dense



V bi

# Borehole ID. HAL383 sheet: 1 of 1 **Engineering Log - Hand Auger** GENZTAUC13086AP project no. THE LAKES client: 09 Jun 2016 date started: principal: 09 Jun 2016 date completed: THE LAKES STAGE 3E GCR logged by: ODS project: **CENTRE OF LOT 383** DBC location. checked by: position: E: 368728; N: 799928 (Datum Not Specified) surface elevation: Not Specified angle from horizontal: 90° DCP id.: drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588 drilling information material substance DCP structure and material description vane consistency / relative density classification g shear ⊕ remould ● peak (blows/ 100 mm) samples & additional obs /ations Ē method & support penetra moisture condition SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components field tests graphic l symbol Ē depth ( water (kPa) 8 8 8 R ORGANIC SILT: low plasticity, dark brown. D to M TOPSOIL Шİ |||||||11111 11 ||||||11111 1 + 1| | | |11111 | | | | |11111 11 11111 |||||||||MATUA SUB-GROUP SAND: fine to coarse grained, yellow-brown. | | | | |1111 1111 ||| | | | ||||||11111 11 ||||||SILT: non plastic to low plasticity, brown, with Н 11111 0.5 trace fine grained sand. ||||||111 1111 VS >202 kPa 111 |||• 11111 111 1111 11 ||||||11111 ||||||||||11111 | | |11111 | | | | |||||11111 | | | | |11 | | | | |11111 VS >202 kPa Encountered 1111 |||||||• 11111 | | | | || | |11111 ||||||¥ ż 1.0 11111 Not HAS.GPJ 11111 111 |||||||STAGE 3E 11111 11 | | | | |VS UTP ||||VS UTP 11111 NON CORED + DCP ||||| | | | |11111 11111 111 11111 ||||111 11111 1.4 m: becoming orange brown 11111 ||||| | | | |VS >202 kPa COF BOREHOLE: 15 iiiii Μ 111 1.5 m: becoming slightly plastic. Sand becomes absent 11111 111 ||||||11111 1 1 1 1 11111 111 11111 Log ||||11111 |||||11111 VS >202 kPa | | | |||||11111 20 11111 11 111 ž 11 1111 11111 11 2.0 Hand Auger HAL383 terminated at 2.0 m Target depth ٤ iiiii 111 |||||||Ę 11111 ||||||iiiii | | | | |111 consistency / relative density VS Verv soft method AD auger drilling\* classification symbol & support samples & field tests soil description N nil bulk disturbed sample mud Μ В AS auger screwing' disturbed sample environmental sample based on Unified soft firm C casing D S F HA W hand auger Classification System Е penetration split spoon sample undisturbed sample ##mm diameter washbore SS St stiff hand auger no resistance ranging to refusal HA very stiff VSt U## moisture HP hand penetrometer (kPa) hard н dry moist wet D M W standard penetration test (SPT) Fb Ν friable wate N\* SPT - sample recovered VL very loose bit shown by suffix 10-Oct-12 water Wp WI plastic limit T SPT with solid cone Nc loose L e.g. B evel on date shown AD/T İiguid limit VS vane shear; peak/remouded (kPa) MD medium dense blank bit vater inflow R refusal D dense TC bit water outflow HB hammer bouncing VD very dense



A TET	RA '	TECH (	COMP		n I	0	ч – г	Нэ	nd Auger			Borehole II heet:	D.	HAL384A 1 of 1
					-	-0(	J -	110	nu Augel			roject no.	.l.	GENZTAUC13086AF
clie			ιH	E LAKE	3							ate starte		31 May 2016
prir			<b>T</b> 11		· ~ ~	<b>T</b> 40		- 001				ate comp	leted:	31 May 2016
pro								GCF	ſ			bgged by:		NM
loca								oified)	surface elevation: Not Specified			hecked by	,	DCP id.:
drill			00074	18; N: 79992	20 (Da		or she	cilieu)	drilling fluid:		U	meter : 50 n		vane id.: DR2244
dri	llin	g info	rmati	on			mate	erial sub						1
method &	lindque	<sup>1</sup> 2 penetration 3	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	(kPa)	DCP (blows/ 100 mm)	
1							$\left \right\rangle$		ORGANIC SILT: low plasticity, dark brown.	D	VSt			TOPSOIL
				VS >183 kPa		-		ML	<b>SILT</b> : low plasticity, orange brown, with minor clay, trace fine grained sand.					MATUA SUB-GROUP
				VS 74/ 19 kPa		- 0.5			0.4 m: becoming orange with some clay, trace fine grained silt, sticky and greasy.	W	St			-
			intered	VS 68/ 19 kPa		-			0.8 m: occasional pockets of manganese.					
HA ⊓			Not Encountered	VS 74/ 19 kPa		1.0-						⊕ ©        		-
				VS 55/ 19 kPa		-						 ⊕●                 		
				VS 74/ 19 kPa		- 1.5								-
				VS 68/ 19 kPa		-						           ⊕@ <sub>   </sub>     		
<u>,</u>	¥			VS 68/ <del>19 kPa</del>		- 2.0			Hand Auger HAL384A terminated at 2.0 m Target depth			⊕ <mark>      </mark>                 		
Me AD AS HA W HA * e.g	t L L	I auger c auger s hand au vashbc hand an bit show AD/T blank b TC bit	orewin uger ore uger vn by	ng*	M r C c pen	etration	- no re rangii ◄ refus Oct-12 w	ater e shown	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/remouded (kPa)       R     refusal       HB     hammer bouncing	t Cla moistu D dr M ma W we Wp pla	soil desc based on ussification re y bist	n symbol & rription Unified nn 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



A TETRA 1			PANY								orehole IE	D.	HAL384B
En	gi	ne	ering	gl	_00	] -	Ha	nd Auger			heet:		<sup>1 of 1</sup> GENZTAUC13086AF
client:	<u> </u>		E LAKE								roject no. ate starteo	d:	09 Jun 2016
princip	al:			-							ate comple		09 Jun 2016
project		тн	E LAKE	's s	TAG	E 3E	E GCF	2			ogged by:		ODS
locatio											hecked by	r:	DBC
			18; N: 79992				cified)	surface elevation: Not Specified	á		om horizonta		DCP id.:
drill moo								drilling fluid:	ł	nole dia	meter : 50 m	ım	vane id.: SL588
drilling	-	rmati	on				erial sub	stance material description		, it	vane	DCP	structure and
method & support	<sup>1</sup> 2 penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	class ification symbol	SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	shear ⊕remoulded ⊚peak (kPa) S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S <sup>00</sup> S 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					-			ORGANIC SILT: low plasticity, dark brown.	M	VSt to H			TOPSOIL
			VS >202 kPa		-			<b>SILT</b> : non plastic to low plasticity, orange, with trace fine to coarse grained sand. Greasy.	_				MATUA SUB-GROUP
			VS 139/ 24 kPa		0.5			0.5 m: with trace clay			□             □               ⊕    @                     		-
		Not Encountered	VS 156/ 29 kPa		- - 1.0-						i i i i   <b>i</b>		-
		Z	VS 74/ 28 kPa		-					St			
			VS 62/ 25 kPa		- 1.5—			1.4 m: becomes sticky					-
			VS 61/ 29 kPa								               		
					-			Hand Auger HAL384B terminated at 2.0 m Target depth			                 		
AS a HA h W w HA h	auger o auger s nand a vashbo nand a	ore uger	ng*		nud casing etration		I nil sistance ng to al	samples & field tests       B     bulk disturbed sample       D     disturbed sample       E     environmental sample       SS     split spoon sample       U##     undisturbed sample ##mm diameter       HP     hand penetration test (SPT)       N     standard penetration test (SPT)	t Cla moistu D dr M mo	soil desc based on ussificatio re y bist			Consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable
e.g. A B b T T	oit shơ AD/T blank t IC bit / bit	wn by bit	suffix		✓ 10-0 leve wate	Oct-12 w el on dat er inflow er outflo	e shown	N*     SPT - sample recovered       Nc     SPT with solid cone       VS     vane shear; peak/remouded (kPa)       R     refusal       HB     hammer bouncing	Wp pla	astic limit uid limit		ן ז נ	VL very loose L loose MD medium dense D dense VD very dense



# Borehole ID. HAL385 sheet: 1 of 1 **Engineering Log - Hand Auger** GENZTAUC13086AP project no. THE LAKES client: 09 Jun 2016 date started: principal: 09 Jun 2016 date completed: THE LAKES STAGE 3E GCR logged by: ODS project: **CENTRE OF LOT 385** DBC location. checked by: position: E: 368731; N: 799900 (Datum Not Specified) surface elevation: Not Specified angle from horizontal: 90° DCP id.: drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588 drilling information material substance structure and DCP material description vane consistency / relative density class ification g shear ⊕ remould ● peak (blows/ 100 mm) samples & additional obs ations Ē method & support moisture condition penetra SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components field tests graphic I symbol Ē depth ( water (kPa) 8 8 8 R ORGANIC SILT: low plasticity, dark brown. Μ Н TOPSOIL 11111 | | | | |11111 11111 11 | | | | |||||| | | |11111 **SILT**: non plastic to low plasticity, dark orange brown, with trace fine grained sand. | | | | |VOLCANIC ASHES 11 11111 ||||||VS >202 kPa iiiii 11 |||@ 1111 |||||| | | |11111 | | | | |111 ||||||11111 0.5 ||||||111 1111 VS >202 kPa 111 |||• 11111 111 1111 11111 11 ||||||11111 ||||||||||11111 | | |11111 | | | | |||||11111 | | | | |11 11111 VS >202 kPa Encountered 1111 |||||||• 11111 | | | | || | |1111 ||||||¥ ż 1.0 Not 11111 1.0 m: becoming orange brown 111 11111 |||11111 111 |||||||11111 VS >202 kPa ||||11111 | | | IIIĨ 11111 ||||11111 11111 111 11111 ||||111 11111 11111 ||||| | | | |VS >202 kPa 11111 111 15 iiiii 111 1.5 m: with trace clay, becoming slightly plastic 11111 111 ||||||11111 1 1 1 1 11111 111 ||||||11111 11111 |||||11111 VS >202 kPa |||| ||||11111 | |11111 111 11 1111 ||11111 11111 11 2.0 Hand Auger HAL385 terminated at 2.0 m Target depth iiiii 111 |||||||11111 ||||||iiiii | | | | |11 consistency / relative density VS very co<sup>4</sup> method AD auger drilling\* classification symbol & support samples & field tests soil description N nil bulk disturbed sample very soft soft firm mud Μ В AS auger screwing' disturbed sample environmental sample based on Unified C casing D S F HA W hand auger Classification System Е penetration washbore SS split spoon sample St stiff hand auger no resistance ranging to refusal HA very stiff undisturbed sample ##mm diameter VSt U## moisture HP hand penetrometer (kPa) hard н dry moist wet D M W standard penetration test (SPT) Fb Ν friable wate N\* SPT - sample recovered VL very loose bit shown by suffix 10-Oct-12 water Wp WI plastic limit T SPT with solid cone Nc loose L e.g. B evel on date shown AD/T İiguid limit VS vane shear; peak/remouded (kPa) MD medium dense blank bit vater inflow R refusal D dense TC bit water outflow HB hammer bouncing VD very dense

HAS.GPJ STAGE 3E NON CORED + DCP COF BOREHOLE: Log 20 ž ٤ Ę

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		COMPANY								orehole ID.		HAL386
En	qi	neerin	a l	Loc	<b>)</b> - (	Ha	nd Auger			heet:		
client:	<u> </u>	THE LAK			<u> </u>		<u> </u>			roject no. ate started:		<u>GENZTAUC13086AF</u> 31 May 2016
											l.	-
princip				-		- 001				ate complete	ea:	31 May 2016
project		THE LAK				: GCF	{			ogged by:		ODS
locatio		CENTRE							С	hecked by:		DBC
position drill mod		368708; N: 7998	398 (Da	atum No	ot Spe	cified)	surface elevation: Not Specified drilling fluid:		-	om horizontal: meter : 50 mm	90°	DCP id.: vane id.: SL588
		rmation			mat	erial sub		1				Vane Id., SL300
	tion	samples 8			b	tion	material description		ty / nsity		CP ws/	structure and additional observations
method & support	<sup>2</sup> penetration	field tests	RL (m)	depth (m)	graphic log	class ification symbol	SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	Premoulded Premoulded (kPa) B 2 2 3 N + 5	mm) ∞∞₽	
		VS >202 kF VS >202 kF VS >202 kF	'a 'a				ORGANIC SILT: low plasticity, dark brown. SILT: non plastic to low plasticity, orange brown, with trace to minor clay and trace fine grained sand. 0.4 m: becoming greasy	M	VSt to H			TOPSOIL
method AD a AS a HA h W w HA h		bre	sup M C pen				SILTY SAND: fine to coarse grained, pale brown.         Siltry SAND: fine to coarse grained, pale brown.         Clayey SILT: low plasticity, pale brown, with trace fine grained sand.         Hand Auger HAL386 terminated at 2.0 m Target depth         samples & field tests         B       bulk disturbed sample         D       disturbed sample         E       environmental sample         S       split spoon sample         U##       undisturbed sample ##mm diameter         HP       hand penetrometer (kPa)         N       standard penetroin test (SPT)         N*       SPT - sample recovered         N       approximation test (SPT)	t Cla moistu D dr M mo W we	soil desc ased on ssificatio re y bist et			firm tt stiff /St very stiff h hard b friable /L very loose
e.g. A B b T T	it shov D/T lank b C bit / bit			■  10-i leve	Oct-12 w el on date er inflow er outflo	e shown	N*         SPT - sample recovered           Nc         SPT with solid cone           VS         vane shear; peak/remouded (kPa)           R         refusal           HB         hammer bouncing	Wp pla	et astic limit uid limit		L	Ioose MD medium dense



blank bit

TC bit

V bi

vater inflow

water outflow

R

HB

refusal

hammer bouncing

D

VD

dense

very dense

# Borehole ID. HAL387 sheet: 1 of 1 **Engineering Log - Hand Auger** GENZTAUC13086AP project no. THE LAKES client: 09 Jun 2016 date started: principal: 09 Jun 2016 date completed: THE LAKES STAGE 3E GCR logged by: ODS project: **CENTRE OF LOT 387** DBC location. checked by: position: E: 368709; N: 799882 (Datum Not Specified) surface elevation: Not Specified angle from horizontal: 90° DCP id.: drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588 drilling information material substance DCP material description vane structure and consistency / relative density class ification g shear ⊕ remould ● peak (blows/ 100 mm) samples & additional obs ations Ē method & support penetra moisture condition SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components field tests graphic l symbol Ē depth ( water (kPa) 8 8 8 R ORGANIC SILT: low plasticity, dark brown. Μ TOPSOIL 11 ||1 + 1||||||1111 11 VS 185/ 19 kPa 11 SILT: low plasticity, orange brown, with trace fine to medium grained sand and with trace VSt to 1111 MATUA SUB-GROUP ⊕ijo 11 Ĥ 1111 clay. Greasy. ||| | |1111 11 1111 11 Tiiii ||0.5 ||||||111 VS 133/ 24 kPa e lo l 11 4 | | | | 111 111 1111 11 111 1111 ||||| | |111 | | |111 11 111 VS >202 kPa Encountered |||||||• 0.9 m: with some fine to coarse grained sand ΠĪ | | |111 ¥ 1.0 ż 1 Not HAS.GPJ 111 111 ||||||1 | | 9111 STAGE 3E 11 | | | | |VS UTP ||||388 I I I VS UTP 1.2 m: becoming grey brown 11111 + DCP ||||| | | | |11111 ||NON CORED 1111 11 |||||11 1.4 m: with some fine grained sand 111 1 VS 182/ 52 kPa 111 111 ¢ 0 COF BOREHOLE: 1.5 11 SILTY SAND: fine to coarse grained, grey MD 1 1 1 1 brown 111 g SILT: non plastic to low plasticity, grey brown, Н 1 111 with trace to minor fine to coarse grained sand. |||||111 VS >202 kPa ø ||||1.8 m: becoming brown and non plastic 7 11 11 ž 11 |||||11111 VS >202 kPa 11 2.0 ٤ Hand Auger HAL387 terminated at 2.0 m 11111 Target depth 11111 111 Ę 11111 ||||||11111 11 111 method AD auger drilling\* classification symbol & consistency / relative density support samples & field tests soil description N nil bulk disturbed sample mud VS Μ В very soft AS auger screwing' based on Unified soft firm C casing D disturbed sample S F HA W hand auger Classification System Е environmental sample penetration washbore SS split spoon sample St stiff hand auger HA no resistance ranging to refusal very stiff undisturbed sample ##mm diameter VSt U## moisture HP hand penetrometer (kPa) hard н dry moist wet D M W standard penetration test (SPT) Fb Ν friable wate N\* SPT - sample recovered VL very loose bit shown by suffix 10-Oct-12 water Wp WI plastic limit T SPT with solid cone Nc loose L e.g. B evel on date shown AD/T İiguid limit VS vane shear; peak/remouded (kPa) MD medium dense



A TETR/	A TECH	COMP		~ I	~	N	ᆸ	nd Augor			orehole I heet:	D.	HAL388A
٢	iyi			-	-0(	J -	пa	nd Auger		р	roject no.		GENZTAUC13086A
client	t:	TH	E LAKE	S						d	ate starte	ed:	31 May 2016
princ	ipal:									d	ate comp	leted:	31 May 2016
proje	ct:	TH	E LAKE	s s	TAG	E 31	E GCF	2		lo	ogged by:		ODS
locati	ion:	CE	NTRE C	)F L	от з	88				С	hecked b	y:	DBC
-		36870	06; N: 79986	69 (Da	atum No	ot Spe	cified)	surface elevation: Not Specified		-	om horizont		DCP id.:
drill m	odel: ng info	rmati	on			mat	erial sub	drilling fluid:	ł	nole dia	meter : 50 r	nm	vane id.: SL588
ø	penetration		samples & field tests	(L	(m) (	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic,	ture	consistency / relative density	vane shear ⊕remoulded ⊛peak	DCP (blows/ 100 mm)	structure and additional observations
method & support	1 2 pen 3	water		RL (m)	depth (m)	graph	class symb	colour, secondary and minor components	moisture condition	consis	(kPa)	9 8 9 7 7	
					-			ORGANIC SILT: low plasticity, dark brown.	M	VSt to H			TOPSOIL
			VS 144/ 24 kPa		-			SILT: non plastic to low plasticity, orange brown, with trace to minor clay and trace fine to coarse grained sand.			 ⊕  @   		MATUA SUB-GROUP
			VS >202 kPa		0.5—								
					-			0.7 m: pale brown, with trace clay and with minor fine to coarse grained sand					
N –		ot Encountered	VS 71/ 21 kPa		-			0.85 m: becoming sticky		St			
		Not	VS 49/ 34 kPa		-								
					-			1.3 m: with some fine to coarse grained sand		St			
			VS 63/ 29 kPa		1.5—								
			VS >202 kPa		-			1.8 m: becoming brown, with trace fine grained sand, clay absent		H			
<u>v v</u>					2.0			Hand Auger HAL388A terminated at 2.0 m Target depth					
metho AD AS HA W HA	AS auger screwing* C casir HA hand auger W washbore <b>penetra</b>						N nil sistance ng to al	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)	t Cla <b>moistu</b> D dr	soil desc based on assificatio	symbol &		Consistency / relative density       VS     very soft       S     soft       =     firm       St     stiff       VSt     very stiff       H     hard       -b     friable
* e.g. B T V	B blank bit T TC bit					Oct-12 v el on dat er inflow er outflo	e shown	N*     SPT - sample recovered       Nc     SPT with solid cone       VS     vane shear; peak/remouded (kPa)       R     refusal       HB     hammer bouncing	W we Wp pla				/L very losse - losse MD medium dense D dense /D very dense



# Borehole ID. HAL388B 1 of 1 sheet: **Engineering Log - Hand Auger** GENZTAUC13086AP project no. THE LAKES client: 09 Jun 2016 date started: 09 Jun 2016 principal: date completed: THE LAKES STAGE 3E GCR ODS project: logged by: **CENTRE OF LOT 388** DBC location: checked by: position: E: 368706; N: 799865 (Datum Not Specified) surface elevation: Not Specified angle from horizontal: 90° DCP id.: drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588 drilling information material substance DCP (blows/ 100 mm) classification symbol consistency / relative density structure and additional observat material description vane penetration samples & field tests shear ⊕ remould ● peak graphic log rvations method & support Ē moisture condition SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components Ê depth ( water (kPa) RL ORGANIC SILT: low plasticity, dark brown. М TOPSOIL 1.1.1 |||||||||++++|||||||||||1111 111 VS 184/ 46 kPa | | | | ⊕ | |● **SILT**: non plastic to low plasticity, orange brown with mottled brown, with trace fine to VSt to H MATUA SUB-GROUP 11 medium grained sand. TTT ||||||1111 1111 111 1111 0.5 111 111 VS >202 kPa 111 |||• 111 |||||||**SAND**: fine to coarse grained, orange brown, with trace silt. MD ||||||||||| | || | | | |||||| | |Not Encountered ||||**SILT**: non plastic, orange brown, with trace fine to coarse grained sand. ||||||VS 180/ 44 kPa | | |1.0 ф $\mathbf{O}$ ₹ **SAND**: fine to coarse grained, yellow brown, with trace silt. MD to

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               VS >202 kPa		SILTY SAND: fine grained, yellow brown.		
		SAND: fine to coarse grained, brown grey, with lenses of grey clayey silt.		11 11 11 11 11 11 11 11 11
VS >202 kPa		SILT: non plastic, brown, with trace fine grained sand.		
	2.0	Hand Auger HAL388B 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 N nil C casing penetration	samples & field tests       B     bulk disturbed sample       D     disturbed sample       E     environmental sample       SS     split spoon sample       U##     undisturbed sample ##mm diameter	classification symbol & soil description based on Unified Classification System	consistency / relative density           VS         very soft           S         soft           F         firm           St         stiff
<ul> <li>bit shown by suffix</li> <li>e.g. AD/T</li> <li>B blank bit</li> <li>T C bit</li> <li>V bit</li> </ul>	water 10-Oct-12 water level on date shown water outflow	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	D dry M moist W wet Wp plastic limit WI liquid limit	VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense



# Borehole ID. HAL389 sheet: 1 of 1 **Engineering Log - Hand Auger** GENZTAUC13086AP project no. THE LAKES client: 09 Jun 2016 date started: principal: 09 Jun 2016 date completed: THE LAKES STAGE 3E GCR logged by: ODS project: **CENTRE OF LOT 389** DBC location. checked by: position: E: 368704; N: 799852 (Datum Not Specified) surface elevation: Not Specified angle from horizontal: 90° DCP id.: drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588 drilling information material substance structure and DCP material description vane consistency / relative density class ification g shear ⊕ remould ● peak (blows/ 100 mm) samples & additional obs ations Ē method & support penetra moisture condition SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components field tests graphic l symbol Ē depth ( water (kPa) 8 8 8 R ORGANIC SILT: low plasticity, dark brown. М Н TOPSOIL Шİ ||||||11111 11 ||||||11111 ||||| | | || | | | | | | | | | |11111 11 11111 **SILT**: non plastic to low plasticity, brown, with trace fine grained sand and with trace clay. ||||||VOLCANIC ASHES VS >202 kPa || 🏟 11 11111 1111 |||||| | | | || | | | |11111 111 1111 111 11111 0.5 | | | | |111 1111 VS >202 kPa 111 |||• 11111 0.6 m: clay becomes absent 111 11111 11 ||||||11111 ||||| | | |11111 | | |11111 | | |11111 11 11111 VS >202 kPa Encountered 1111 |||||||• 0.9 m: becoming orange brown 11111 | | | | || | |1111 ||||||¥ ż 1.0 Not 11111 1.0 m: with trace clay, sand becomes absent HAS.GPJ 111 11111 |||||||11111 STAGE 3E 111 |||||||11111 VS >202 kPa ||||11111 | | | IIIĬ 11111 NON CORED + DCP ||||11111 11111 111 11111 ||||111 11111 11111 ||||| | | | || | | **|** VS >202 kPa 11111 COF BOREHOLE: 15 iiiii 111 11111 111 ||||||11111 1 1 1 1 11111 111 ||||||11111 Log ||||11111 |||||11111 VS >202 kPa ||||11111 20 11111 11 111 ž 11 1111 11111 11111 11 2.0 ٤ Hand Auger HAL389 terminated at 2.0 m Target depth iiiii 111 |||||||Ę 11111 ||||||iiiii | | | | |11 consistency / relative density VS Verv 20<sup>4</sup> method AD auger drilling\* classification symbol & support samples & field tests soil description N nil bulk disturbed sample very soft soft firm mud Μ В AS auger screwing' based on Unified C casing D disturbed sample S F HA W hand auger Classification System Е environmental sample penetration washbore SS split spoon sample St stiff hand auger no resistance ranging to refusal HA very stiff undisturbed sample ##mm diameter VSt U## moisture HP hand penetrometer (kPa) hard н dry moist wet D M W standard penetration test (SPT) Fb Ν friable wate N\* SPT - sample recovered VL very loose bit shown by suffix 10-Oct-12 water Wp WI plastic limit T SPT with solid cone Nc loose L e.g. B evel on date shown AD/T İiguid limit VS vane shear; peak/remouded (kPa) MD medium dense blank bit vater inflow R refusal D dense TC bit water outflow

HB

V bi

hammer bouncing

VD

very dense



			-y							_				
A TETRA	TECH	COMP	ANY							E	Borehole	ID.		HAL390
En	ai	<b>n</b> 0	orin	~	~	•	ปล	nd Augor		s	heet:			1 of 1
	<b>y</b>	ne	enni	y ı	-0(	<u>J</u> -	па	nd Auger		р	project no	).		GENZTAUC13086A
client	:	TH	E LAKE	S						d	late start	ed:		31 May 2016
princi	pal:									d	late com	plete	d:	31 May 2016
projec	ct:	ΤΗ	E LAKE	s s	TAG	E 3E	GCF	2		lo	ogged by	/:		ODS
locatio	on:	CE	NTRE C	)F L	от з	890				С	hecked l	by:		DBC
positio	n: E::	36869	98; N: 79983	38 (Da	atum No	ot Spec	cified)	surface elevation: Not Specified	á	angle fro	om horizor	ntal: 9	0°	DCP id.:
drill mo	odel:					_		drilling fluid:	ł	nole dia	meter : 50	mm		vane id.: SL588
drillin	ng info	rmati	on			mate	erial sub	stance				-		
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)	DC (blov 100 n	vs/ nm)	structure and additional observations
	<u>9 6 7</u>	3		~	Ū	5	0.0	ORGANIC SILT: low plasticity, dark brown.	M E B	H	8 <sup>20</sup> 20 8	0 4 0	Π	TOPSOIL
			VS >202 kPa					Clayey SILT: low plasticity, pink brown with mottled grey and mottled dark brown, with trace fine to coarse grained sand. SILT: low plasticity, orange brown, with minot clay and with trace fine to coarse grained sand.	-					FILL MATUA SUB-GROUP
			VS UTP		-			Sandy SILT: non plastic, brown to pale brown, sand is fine to coarse grained.	_		   V\$ UTP                     			
		ountered	VS >202 kPa VS >202 kPa					<b>SILT</b> : non plastic to low plasticity, orange brown, with trace fine grained sand and with trace clay.	_					
			VS >202 kPa		-									
			VS >202 kPa		1.5									
v			VS >202 kPa		- - 			Hand Auger HAL390 terminated at 2.0 m Target depth						
AS HA W	d auger auger hand a washb	screwii uger ore		M i C o pen	port mud casing etration		nil	samples & field tests         B       bulk disturbed sample         D       disturbed sample         E       environmental sample         SS       split spoon sample         U##       undisturbed sample ##mm diameter	s b	soil desc based on assificatio			II II V S F S	St stiff /St very stiff
ů l					er Intervention	Oct-12 w el on date er inflow	ig to al ater e shown	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	D dr M m W we Wp pla	y oist	t			H hard b friable /L very loose Loose MD medium dense D dense /D very dense



## Borehole ID. HAL392 sheet: 1 of 1 **Engineering Log - Hand Auger** GENZTAUC13086AP project no. THE LAKES client: 31 May 2016 date started: principal: 31 May 2016 date completed: THE LAKES STAGE 3E GCR logged by: ODS project: **CENTRE OF LOT 392** DBC location. checked by: position: E: 368704; N: 799808 (Datum Not Specified) surface elevation: Not Specified angle from horizontal: 90° DCP id.: drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588 drilling information material substance structure and DCP material description vane consistency / relative density class ification g (blows/ 100 mm) samples & shear ⊕ remould ⊚ peak additional obs ations Ē method & support moisture condition penetra SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components field tests graphic I symbol Ē depth ( water (kPa) 8 8 8 R ORGANIC SILT: low plasticity, dark brown. Μ VSt to TOPSOIL 11111 Η ||||||11111 11 ||||||11111 ||||| | | || | | | | | | | | | |11111 11 11111 | | | | |FILL SILT: non plastic to low plasticity, brown with mottled pale brown and grey, with trace to VS >202 kPa 11 11111 minor fine to medium grained sand and with 1111 |||||| | | |trace clay. | | | | |11111 111 |||||||11111 0.5 ||||||111 1111 VS >202 kPa 111 |||• 11111 111 1111 11111 11 ||||||11111 |||||||||11111 | | || | | | |11111 | | || | | |11111 11 1 ||||||11111 VS 158/ 49 kPa Encountered 11111 1 + 1⊕ | • | 11111 | | |1111 111 ¥ ż 1.0 MATUA SUB-GROUP Not 11111 SILT: low plasticity, orange brown, with minor clay and trace fine grained sand. 111 11111 |||||||11111 111 |||||||11111 VS >202 kPa ||||11111 | | | IIIĨ 11111 ||||11111 11111 111 1.3 m: becoming greasy 11111 ||||111 11111 11111 ||||| | | | |VS >202 kPa 11111 15 iiiii 111 11111 111 ||||||11111 1 1 1 1 11111 111 ||||||11111 g ||||11111 |||||11111 VS >202 kPa ||||11111 ||||111 11111 11 1111 1 + 1111 11111 VS >202 kPa 2.0 Hand Auger HAL392 terminated at 2.0 m 11111 Target depth iiiii 111 |||||||11111 ||||||11111 | | | | |11 method AD auger drilling\* classification symbol & support consistency / relative density samples & field tests soil description N nil bulk disturbed sample mud VS Μ В very soft AS auger screwing' based on Unified soft firm C casing D disturbed sample S F HA W hand auger Classification System Е environmental sample penetration washbore SS split spoon sample St stiff hand auger no resistance ranging to refusal HA very stiff undisturbed sample ##mm diameter VSt U## moisture HP hand penetrometer (kPa) hard н dry moist wet D M W standard penetration test (SPT) Fb Ν friable wate N\* SPT - sample recovered VL very loose bit shown by suffix 10-Oct-12 water Wp WI plastic limit T SPT with solid cone Nc loose L e.g. B evel on date shown AD/T İiguid limit VS vane shear; peak/remouded (kPa) MD medium dense blank bit vater inflow R refusal D dense TC bit water outflow HB hammer bouncing VD very dense

HAS.GPJ STAGE 3E NON CORED + DCP COF BOREHOLE: 20 ž ٤ Ę

V bi



	TECH									B	orehole ID.		HAL394
											heet:		1 of 1
En	Igi	ne	erin	gι	-0(	<b>J</b> -	Ha	nd Auger		р	roject no.		GENZTAUC13086A
client	:	ΤH	E LAKE	S							ate started:		31 May 2016
princi	ipal:									d	ate complete	ed:	31 May 2016
proje	ct:	тн	E LAKE	s s	TAG	E 3E	E GCF	2		lo	ogged by:		NM
locati								-			hecked by:		DBC
			36; N: 79978				cified)	surface elevation: Not Specified	2		om horizontal:	90°	DCP id.:
drill me				(			,	drilling fluid:		U	meter : 50 mm		vane id.: DR2244
drillir	ng info	ormat	ion			mate	erial sub	stance	1				
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	class ification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	⊕ remoulded ⊚ peak     100     (kPa)	ows/ mm)	structure and additional observations
	3 0	3			-			ORGANIC SILT: low plasticity, dark brown.	D	VSt to H			TOPSOIL
			VS >183 kPa		-		ML	<b>SILT</b> : low plasticity, orange brown mottled with, with some clay, trace fine grained sand.					MATUA SUB-GROUP
			VS >183 kPa		0.5-								
		itered	VS UTP		-		ML	Sandy SILT: non plastic, white, with fine grained sand.	_		                   YS UTP       	iii.	
z		Not Encountered	VS >183 kPa		1.0-		ML	SILT: low to medium plasticity, orange brown,	_				
			VS >183 kPa		-			with some clay, trace fine grained sand. 1.2 m: soil is friable.					
			VS UTP		- 1.5						VSUTP		
			VS UTP		-								
<b>_</b>			VS UTP		- 2.0			Hand Auger HAL394 terminated at 2.0 m Target depth			                       <del>        </del>		
			 		-								
AD auger drilling* M AS auger screwing* C HA hand auger W washbore Pe HA hand auger					port nud casing etration	I	I nil sistance ng to al	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)	b Cla moistur D dru M mo	soil desc based on ussificatio re y bist		V F V F	F firm St stiff /St very stiff H hard Fb friable
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit					■  10-  leve	Oct-12 w el on dat er inflow er outflo	e shown	N*         SPT - sample recovered           Nc         SPT with solid cone           VS         vane shear, peak/remouded (kPa)           R         refusal           HB         hammer bouncing		et astic limit uid limit		L	MD medium dense



	A TECH		PANY							В	orehole	ID.	HAL396
Er	nai	ne	erin	a I		<b>-</b> 1	Ha	nd Auger		S	heet:		1 of 1
clier			E LAKE		;	)					roject no		GENZTAUC13086AF
		11		.5							ate starte		31 May 2016
	cipal:	τu			TA0	E 21					ate com		31 May 2016
proje							GCF	ſ			ogged by		NM
loca							-:6:1)	surface claustices. Not One sife d			hecked b	,	DBC
	nodel:	3000	60; N: 7997	90 (Da		n ope	cineu)	surface elevation: Not Specified drilling fluid:			om horizon meter : 50		DCP id.: vane id.: DR2244
drill	ing inf	ormat	ion	1		mat	erial sub	stance					1
method & support	1 2 penetration 3	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) 03 00 000	DCP (blows/ 100 mm)	structure and additional observations
			VS >183 kPa	1	-			SILT: low to medium plasticity, red brown, with trace fine to medium grained sand.	D	VSt to H			MATUA SUB-GROUP
			VS UTP		0.5-			0.3 m: soil is friable.			       		-
		sred	VS UTP		-						           γς μτρ 		-
HA		Not Encountered	VS >183 kPa	3	1.0-								-
			VS >183 kPa	a	-		ML	SILT: low plasticity, yellow orange, with some clay, trace fine grained sand.	M		· · · · · · · · · · · · · · · · · · ·		-
			VS >183 kPa	a	- 1.5						· · · · · · · · · · · · · · · · · · ·		-
			VS >183 kPa	a	-								
₩ ₩			VS >183 kPa	1	2.0			Hand Auger HAL396 terminated at 2.0 m Target depth					
meth AD AS HA W HA	auger auger hand a washt hand a	screwi auger ore		M C pen	port mud casing etration	– no re	N nil esistance ing to sal	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)	b Cla moistur D dru M mo	soil desc ased on ssificatio			consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable
* B T V	bit sho AD/T blank TC bit V bit	bit	suffix	wat	■  10-0 leve	Oct-12 v I on dat er inflow er outflo	e shown /	N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	W we Wp pla				VL very loose L loose MD medium dense D dense VD very dense



V bi

### Borehole ID. HAL398 sheet: 1 of 1 **Engineering Log - Hand Auger** GENZTAUC13086AP project no. THE LAKES client: 30 May 2016 date started: 30 May 2016 principal: date completed: THE LAKES STAGE 3E GCR logged by: NM project: **CENTRE OF LOT 398** DBC location. checked by: position: E: 368652; N: 799844 (Datum Not Specified) surface elevation: Not Specified angle from horizontal: 90° DCP id.: drill model: drilling fluid: hole diameter : 50 mm vane id.: DR2244 drilling information material substance DCP material description vane structure and consistency / relative density class ification g (blows/ 100 mm) samples & shear ⊕ remould ⊚ peak additional obs /ations Ē moisture condition method 8 support SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components penetra field tests graphic I symbol Ē depth ( water (kPa) 8 8 8 R ORGANIC SILT: low plasticity, dark brown. D VSt to TOPSOIL 11111 Η |||||||11111 11111 11 ||||||1 + 1| | | |11111 ML SILT: low plasticity, orange brown, with trace | | | | |11111 MATUA SUB-GROUP 11 fine to medium grained sand, trace clay. 11111 ||||||VS >183 kPa | | |9 11 11111 1111 |||||| | | | |111 111 11111 1111 ||||||111 11111 VS >183 kPa 0.5 ||||||||11 |||||||11111 0.6 m: some clay. | | | |111 11111 111 ||||||11111 ||||| | | |11111 | | |11111 VS >183 kPa | | | | | 11111 ||||11 1 11 11111 Encountered 1111 1 + 1111 11111 |||||||||||||VS >183 kPa 11111 . ż 1.0 ₹ 11111 Not 1.0 m: a 100mm lense of pale yellow fine to HAS.GPJ 111 medium grained sand with minor silt is present. 11111 ||||||1 | | 11111 1.1 m: with minor fine grained sand, trace clay. STAGE 3E 111 |||||||11111 VS >183 kPa ||||11111 | | | | | | |11111 NON CORED + DCP ||||11111 11111 111 11 11111 ||||111 11111 11111 ||||| | | | |VS >183 kPa 11111 . . COF BOREHOLE: 15 11111 111 1.5 m: with minor clay, trace fine grained sand 11111 111 1 1 1 1 11111 1 1 1 1 11111 111 ||||||11111 Log 11111 |||||11111 VS >183 kPa ||||||||20 ||||11111 ž 11 1111 1 + 111111 VS >183 kPa 11111 2.0 ٤ Hand Auger HAL398 terminated at 2.0 m 11111 Target depth iiiii 111 |||||||Ę 11111 ||||||iiiii | | | | |11 classification symbol & method AD auger drilling\* support consistency / relative density samples & field tests soil description N nil bulk disturbed sample mud VS Μ В very soft AS auger screwing' based on Unified soft firm C casing D disturbed sample S F hand auger HA Classification System Е environmental sample penetration W washbore SS split spoon sample St stiff hand auger no resistance ranging to refusal HA very stiff undisturbed sample ##mm diameter VSt U## moisture HP hand penetrometer (kPa) hard н dry moist wet D M W standard penetration test (SPT) Fb Ν friable wate N\* SPT - sample recovered VL very loose bit shown by suffix 10-Oct-12 water Wp WI plastic limit T SPT with solid cone Nc loose L e.g. B evel on date shown AD/T İiguid limit VS vane shear; peak/remouded (kPa) MD medium dense blank bit vater inflow R refusal D dense TC bit water outflow HB hammer bouncing VD very dense



Er	ngi	ne	ering	_	-0(	<b>J</b> -	Ha	nd Auger		sl p	orehole IE heet: roject no.		HAL400 1 of 1 GENZTAUC13086AI
clien <sup>.</sup>		1 H	E LAKE	3							ate started		30 May 2016
princ											ate compl	eted:	30 May 2016
proje			E LAKE				GCF	2		lc	ogged by:		ODS
locat			NTRE C								hecked by		DBC
positio drill m		36866	5; N: 79987	'7 (Da	atum No	ot Spe	cified)	surface elevation: Not Specified drilling fluid:		•	m horizonta neter : 50 m		DCP id.: vane id.: SL588
	ng info	rmati	on			mate	erial sub						Valle Id., SESSO
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	class ification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density		DCP (blows/ 100 mm)	structure and additional observations
	3 2 1	wa		RL	de	dıc dıc	sy	ORGANIC SILT: low plasticity, dark brown.	D to M	VSt to H	50 <sup>220</sup>		TOPSOIL
			VS >202 kPa		-			<b>SILT</b> : non plastic, orange brown, with trace fine to coarse grained sand.	_		       🏵		VOLCANIC ASHES
			VS >202 kPa		0.5 —			0.6 m: becoming slightly plastic	M		       •       •             		-
			VS >202 kPa		-			0.75 m: becoming mottled pale brown					
		Not Encountered	VS 165/ 38 kPa		1.0 —			1.0 m: with minor clay					
			VS >202 kPa		-			SILT: non plastic to low plasticity, brown with mottled pale brown and orange brown, with trace to minor fine to coarse grained sand.	_				MATUA SUB-GROUP
			VS >202 kPa		1.5 —								
			VS 158/ 41 kPa		-			1.7 m: with trace clay 1.75 m: becoming brown					
			VS 104/ — 45 kPa		-2.0 -			Hand Auger HAL400 terminated at 2.0 m Target depth					
meth AD AS HA W HA	auger of auger s hand a washbo hand a	uger drilling* uger drilling* uger screwing* and auger ashbore and auger t shown by suffix t shown by suffix t shown by suffix t shown by suffix					sistance ng to al ater	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/remouded (kPa)	b Cla moistur D dr M mo W we Wp pla	re bist	symbol & ription Unified n System		consistency / relative density       /S     very soft       S     soft       =     firm       St     stiff       /St     very soft       /St     stiff       /St     very soft       +     hard       >b     friable       /L     very loose       -     loose       MD     medium dense



A TETR/	A TECH	COMP		g L	-0(	<b>)</b> -	Ha	nd Auger		sł	orehole neet: roject no		HAL402 1 of 1 GENZTAUC13086AI
clien	t:	TH	E LAKE	S							ate starte		30 May 2016
princ	ipal:									da	ate com	pleted:	30 May 2016
proje	ect:	тн	E LAKE	s s	TAG	E 3E	E GCF	2			gged by		NM
locat			NTRE C								necked b		DBC
			65; N: 79991				cified)	surface elevation: Not Specified			m horizon		DCP id.:
drill m		00000	, 11. 7000	0 (20		or op o	Since)	drilling fluid:		-	neter : 50		vane id.: DR2244
drilli	ng info	ormati	on			mate	erial sub	stance					
method & support	<sup>1</sup> 2 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) 00 00 000	DCP (blows/ 100 mm	
	3				-			ORGANIC SILT: low plasticity, dark brown.	D	VSt to H			TOPSOIL
			VS >183 kPa VS >183 kPa		- 0.5 —		ML	<b>SILT</b> : low plasticity, orange brown, with minor fine grained sand, trace clay.			$\begin{array}{c} \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot $		VOLCANIC ASHES
		Not Encountered	VS >183 kPa VS 151/ 25 kPa		- - - 1.0-			0.7 m: with minor clay. 0.9 m: becoming orange with some clay, trace fine grained sand.	M		$\begin{array}{c} \ldots \\ \ldots \\ \ldots \\ \ldots \\ \ldots \\ \ldots \\ \ldots \\ \ldots \\ \ldots \\ \ldots $		
			VS >183 kPa VS >183 kPa		- - 1.5-		ML	SILT: low plasticity, orange brown, with some	M to W				
			VS >183 kPa		-			clay, minor fine to medium grained sand.			$\begin{array}{c} & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & \cdots & $		
<u>* *</u>					-2.0			Hand Auger HAL402 terminated at 2.0 m Target depth					
AD auger drilling* M m AS auger screwing* C ca HA hand auger Penet HA hand auger C HA hand auger Penet					drilling*     support     samples & field tests       drilling*     M mud     N nil     B bulk disturbed sample       auger     C casing     D disturbed sample       penetration     E environmental sample       auger     no resistance       auger     Image: Nore transition       auger     Image: Nore transition       water     no resistance       water     N standard penetration       water     N*       SPT - sample recovered						symbol & ription Unified n 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
e.g. B T V	blank t TC bit V bit	oit				el on date er inflow er outflow		VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	WI liq	uid limit			MD medium dense D dense VD very dense



			<u>y</u>							_				
TETR	A TECH	COMF	PANY							В	Borehole	e ID	).	HAL404
Fr	nai	nc	orin	a I		- r	Ha	nd Auger		S	heet:			1 of 1
	iyi			_	-0(	J -	i ia	na Augei		р	roject r	10.		GENZTAUC13086A
clien	t:	ТН	E LAKE	S						d	ate sta	rtec	1:	30 May 2016
princ	ipal:									d	ate con	nple	eted:	30 May 2016
proje	ect:	ТН	IE LAKE	s s	TAG	E 31	E GCF	8		lo	bgged b	by:		ODS
locat	ion:	CE	INTRE C	)F L	.OT 4	404				С	hecked	by	:	DBC
positi	on: E:	3686	48; N: 79995	55 (Da	atum No	ot Spe	cified)	surface elevation: Not Specified	â	angle fro	om horizo	onta	l: 90°	DCP id.:
	odel:					<u> </u>		drilling fluid:	ł	nole dia	meter : 5	0 m	m	vane id.: SL588
ariii	ng info	ormat					erial sub	stance material description		ĹŢ,	vane	Т	DCP	structure and
od & ort	penetration		samples & field tests	Ê	depth (m)	graphic log	classification symbol	SOIL TYPE: plasticity or particle characteristic,	tion	consistency / relative density	shear ⊕ remoulder ⊚ peak	d (	(blows/ 00 mm	additional observations
method 8 support	1 2 pen	water		RL (m)	depth	grapt	class symb	colour, secondary and minor components	moisture condition	consis relativ	(kPa)	5	4005	2
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			VS >202 kPa					SILT: non plastic to low plasticity, pale brown,	-					
			V3 -202 KFa		-			with trace to minor fine to coarse grained sand and with trace clay.			@	)     		
	111				-		×	-	M	-		li		VOLCANIC ASHES
			VS >202 kPa		0.5			<b>SILT</b> : non plastic to low plasticity, orange brown, with trace fine grained sand.				li		
					0.5-							"		
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			VS >202 kPa											
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			VS >202 kPa		-	1		SILT: non plastic, brown, with trace to minor fine to coarse grained sand.	1			, i	111	MATUA SUB-GROUP
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		+	VS >202 kPa		2.0-			Hand Auger HAL404 terminated at 2.0 m				1	111	
					-			Target depth						
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meth AD		drilling			port			samples & field tests		sificatior soil desc	n symbol a		Ť	consistency / relative density
AD AS HA	auger auger hand a	screw			mud casing	1	N nil	B bulk disturbed sample D disturbed sample	b	ased on				VS very soft S soft
HA W HA	washt hand a	ore			etration			E environmental sample SS split spoon sample			Joystern		_	F firm St stiff
	nailui	augei				<ul> <li>no re rangi</li> <li>refus</li> </ul>	sistance ng to al	U## undisturbed sample ##mm diameter HP hand penetrometer (kPa)	D dr	y				VSt very stiff H hard
*	bit sho	wn by	suffix	wat	<b>T</b>  10-	- Oct-12 v	/ater	N standard penetration test (SPT) N* SPT - sample recovered	W we	oist et astic limit				Fb friable VL very loose
e.g. B	AD/T blank				- leve		e shown	Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal		uid limit				L loose MD medium dense D dense
T V	TC bit V bit			-	- d wat	er outflo	w	R refusal HB hammer bouncing						D dense VD very dense



#### Borehole ID. HAL406 sheet: 1 of 1 **Engineering Log - Hand Auger** GENZTAUC13086AP project no. THE LAKES client: 30 May 2016 date started: 30 May 2016 principal: date completed: THE LAKES STAGE 3E GCR NM logged by: project: **CENTRE OF LOT 406** DBC location. checked by: position: E: 368624; N: 799974 (Datum Not Specified) surface elevation: Not Specified angle from horizontal: 90° DCP id.: drill model: drilling fluid: hole diameter : 50 mm vane id.: DR2244 drilling information material substance DCP material description vane structure and consistency / relative density class ification g (blows/ 100 mm) samples & shear ⊕ remould ⊚ peak additional obs /ations Ē method & support penetra SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components field tests graphic I moisture conditior symbol Ē depth ( water (kPa) 8 8 8 R ORGANIC SILT: low plasticity, dark brown. Μ VSt to TOPSOIL 11111 Η |||||||11111 11 ||||||11111 ||||||||||11111 | | | | |11111 11 11111 ||||||VS >183 kPa | | |9 11 11111 ML SILT: low plasticity, orange brown, with minor D MATUA SUB-GROUP 1111 |||||| | | | |clay, trace fine grained sand 111 111 11111 111 111 11111 VS >183 kPa 0.5 111 ||||||11 |||||||11111 | | | |111 11111 111 ||||||11111 ||||| | | |11111 | | ||||||11111 VS >183 kPa | | | | | | | |11111 ||||||||||11111 Encountered 1111 1 + 1| | | || | | | |11111 ||||11 1 VS UTP V\$ UTP ₹ ż 1.0 SAND: fine to medium grained, pale yellow Not SP 111 brown, with some silt. |||||||11111 1 | | |||||||11111 111 | | | | |11111 VS 151/ 21 kPa ||||۱Ŷ 11111 æ١ Sandy SILT: non plastic to low plasticity, pale yellow brown, with fine to medium grained MI ΙĨ 11111 ||||11111 sand ||||11111 |||||11111 ||||111 SILT: low plasticity, pale yellow brown, with minor fine to medium grained sand, trace clay. MI M to W 11111 ||||| | | | |VS >183 kPa 111 . . 15 11111 111 11111 ||||||111 1 1 1 1 11111 1 1 1 1 11111 111 1 1 1 1 11111 Log ||||11111 |||||11111 VS >183 kPa ||||||||ML Sandy SILT: non plastic to low plasticity, pale | | |yellow brown, with fine to medium grained 11111 sand 11 11111 ||||11111 VS >183 kPa 2.0 Hand Auger HAL406 terminated at 2.0 m 11111 Target depth iiiii | | | |111 Ę 11111 ||||||11111 | | | | |11 classification symbol & Method AD auger drilling\* support consistency / relative density samples & field tests soil description mud N nil bulk disturbed sample VS Μ В verv soft AS auger screwing' based on Unified soft firm C casing D disturbed sample S F hand auger НА Classification System Е environmental sample penetration W washbore SS split spoon sample St stiff no resistance ranging to refusal HA hand auger very stiff undisturbed sample ##mm diameter VSt U## moisture HP hand penetrometer (kPa) hard н dry moist wet D M W standard penetration test (SPT) Fb Ν friable wate N\* SPT - sample recovered VL very loose bit shown by suffix 10-Oct-12 water Wp WI plastic limit T SPT with solid cone Nc loose L e.g. B evel on date shown AD/T İiguid limit VS vane shear; peak/remouded (kPa) MD medium dense blank bit vater inflow R refusal D dense TC bit water outflow HB hammer bouncing VD very dense

HAS.GPJ STAGE 3E NON CORED + DCP COF BOREHOLE: 20 ž ٤

V bi



## Borehole ID. HAL408 sheet: 1 of 1 **Engineering Log - Hand Auger** GENZTAUC13086AP project no. THE LAKES client: 30 May 2016 date started: 30 May 2016 principal: date completed: THE LAKES STAGE 3E GCR logged by: ODS project: **CENTRE OF LOT 408** DBC location. checked by: position: E: 368594; N: 799986 (Datum Not Specified) surface elevation: Not Specified angle from horizontal: 90° DCP id.: drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588 drilling information material substance DCP material description vane structure and consistency / relative density class ification g (blows/ 100 mm) samples & shear ⊕ remould ⊚ peak additional obs /ations Ē method & support penetra SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components field tests graphic I moisture conditior symbol Ē depth ( water (kPa) 8 8 8 R ORGANIC SILT: low plasticity, dark brown. D to M VSt to TOPSOIL IIII Η |||||||11111 11 ||||||11111 |||||||||||11111 ||||11111 111 VS >202 kPa 11111 VOLCANIC ASHES **SILT**: non plastic to low plasticity, orange brown, with trace fine grained sand. М 11 1111 1111 |||||111 1 |||||11111 ||111 111 11111 VS >202 kPa 0.5 iiiii 111 11 |||||||11111 111 11111 111 ||||||11111 VS 173/ 44 kPa ||||11111 ф | | |11111 | | |SILT: low plasticity, brown to orange brown, MATUA SUB-GROUP 11 1 11 11111 with trace clay and with trace fine to coarse grained sand. Greasy. Encountered 1111 1 + 1||||||11111 ||||||||||VS 185/ 1111 11 I | |o ф ż 44 kPa 1.0 ₹ iiiii 1.0 m: becoming orange brown Not 111 11111 1 | | 11111 111 1111 11111 ||||||||||11111 VS 166/ 36 kPa 1.2 m: with minor clay 11111 ∉ þ ||||11111 11111 11 11111 ||||111 11111 11111 | | | | |VS 190/ 44 kPa ¢ 15 iiiii 11111 111 11111 1 1 1 1 11111 111 ||||||11111 g VS >202 kPa ||||11111 |||||1.75 m: with minor to some fine to coarse 11111 ||||grained sand 11111 Sandy SILT: non plastic, orange brown, 111 1111 greasy ||||11111 VS UTP 11111 2.0 Hand Auger HAL408 terminated at 2.0 m Target depth iiiii |||||111 11111 ||||||iiiii | | | | |11 method AD auger drilling\* classification symbol & support consistency / relative density samples & field tests soil description N nil bulk disturbed sample mud VS Μ В very soft AS auger screwing' based on Unified soft firm C casing D disturbed sample S F HA W hand auger Classification System Е environmental sample penetration washbore SS split spoon sample St stiff no resistance ranging to refusal HA hand auge very stiff undisturbed sample ##mm diameter VSt U## moisture HP hand penetrometer (kPa) hard н dry moist wet D M W standard penetration test (SPT) Fb Ν friable wate N\* SPT - sample recovered VL very loose bit shown by suffix 10-Oct-12 water Wp WI plastic limit T SPT with solid cone Nc loose L e.g. B evel on date shown AD/T İiguid limit VS vane shear; peak/remouded (kPa) MD medium dense blank bit vater inflow R refusal D dense

very dense

VD

HAS.GPJ STAGE 3E NON CORED + DCP COF BOREHOLE: 20 ž ٤ Ę

TC bit

V bi

water outflow

HB

hammer bouncing



V bi

## Borehole ID. HAL411 sheet: 1 of 1 **Engineering Log - Hand Auger** GENZTAUC13086AP project no. THE LAKES client: 30 May 2016 date started: principal: 30 May 2016 date completed: THE LAKES STAGE 3E GCR logged by: ODS project: **CENTRE OF LOT 411** DBC location. checked by: position: E: 368547; N: 799989 (Datum Not Specified) surface elevation: Not Specified angle from horizontal: 90° DCP id.: drill model: drilling fluid: hole diameter : 50 mm vane id.: SL588 drilling information material substance structure and DCP material description vane consistency / relative density class ification g (blows/ 100 mm) samples & shear ⊕ remould ⊚ peak additional obs ations Ē method & support moisture condition penetra SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components field tests graphic I symbol Ē depth ( water (kPa) 8 8 8 R ORGANIC SILT: low plasticity, dark brown. Μ VSt to TOPSOIL 11111 Η ||||||11111 11111 11 ||||||||||| | | |11111 SILT: non plastic to low plasticity, orange brown, with trace fine grained sand and with trace clay. Greasy. VOLCANIC ASHES 111 VS >202 kPa 11111 11 11111 1111 |||||111 1 |||||||||||11111 111 111 VS >202 kPa 0.5 iiiii 111 11 |||||||11111 111 11111 111 ||||||11111 | | | | | | | • ||||11111 VS >202 kPa | | |11111 | | |11111 11 1 ||11111 Encountered 1111 1 + 1111 11111 |||||||||||1111 ||||VS 172 kPa ż 1.0 ø ₹ 11111 Not 1.0 m: with trace fine to coarse grained sand HAS.GPJ 111 11111 11111 STAGE 3E 111 |||||||11111 ||||||||||11111 . . . . . VS 190 kPa 11111 NON CORED + DCP ||||11111 11111 111 11111 11 ||||111 11111 11111 ||||| | | | |VS >202 kPa COF BOREHOLE: 15 iiiii 111 11111 111 ||||||11111 1 1 1 1 11111 111 1 1 1 1 11111 g VS >202 kPa ||||11111 |||||11111 ||||11111 20 | | |11111 ž 1111 111 ||||111 11111 VS >202 kPa 11111 2.0 ٤ Hand Auger HAL411 terminated at 2.0 m 11111 Target depth iiiii 111 |||||||Ę 11111 ||||||iiiii | | | | |11 method AD auger drilling\* classification symbol & consistency / relative density support samples & field tests soil description N nil bulk disturbed sample mud VS Μ В very soft AS auger screwing' based on Unified soft firm C casing D disturbed sample S F HA W hand auger Classification System Е environmental sample penetration washbore SS split spoon sample St stiff hand auger HA no resistance ranging to refusal very stiff undisturbed sample ##mm diameter VSt U## moisture HP hand penetrometer (kPa) hard н dry moist wet D M W standard penetration test (SPT) Fb Ν friable wate N\* SPT - sample recovered VL very loose bit shown by suffix 10-Oct-12 water Wp WI plastic limit ⊻ SPT with solid cone Nc loose L e.g. B evel on date shown AD/T İiguid limit VS vane shear; peak/remouded (kPa) MD medium dense blank bit vater inflow R refusal D dense TC bit water outflow HB hammer bouncing VD very dense



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TETR/	A TECH	COMP	ANY							В	orehole ID.		HAL412A
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	iyi			_	-06	<u> </u>	Па	nd Auger		р	roject no.		GENZTAUC13086A
lient	t:	ΤΗ	E LAKE	S						d	ate started:		30 May 2016
orinc	ipal:									d	ate complete	d:	30 May 2016
oroje	ct:	TH	E LAKE	s s	TAG	E 3E	E GCF	2		lo	ogged by:		NM
ocati	ion:	CE	NTRE C	FL	OT 4	12				с	hecked by:		DBC
ositic	on: E:	36853	81; N: 79998	35 (Da	atum No	ot Spe	cified)	surface elevation: Not Specified	a	angle fro	om horizontal: 9	90°	DCP id.:
Irill m								drilling fluid:	ł	nole dia	meter : 50 mm		vane id.: DR2244
drilli	ng info	ormati	on			mate	erial sub			≥	vane DC	'n	atministration and
8 D T	penetration		samples & field tests	(	Ê	ic log	class ification symbol	material description SOIL TYPE: plasticity or particle characteristic,	tion	consistency / relative density	vane DC shear (blo ⊕remoulded ⊚peak 100 r	ws/	structure and additional observations
metnod & support	1 2 pene	water		RL (m)	depth (m)	graphic log	classi symbo	colour, secondary and minor components	moisture condition	consis	(kPa) (kPa) (kPa)		
								SILT: low plasticity, orange brown, with minor clay, trace fine to medium grained sand	D	VSt			VOLCANIC ASHES
			VS >183 kPa		-								
			VS 55/ 19 kPa		0.5-		ML	SILT: low plasticity, orange brown, with some clay, trace fine grained sand, greasy.	M	St			MATUA SUB-GROUP
		ntered	VS >183 kPa		-			0.7 m: becoming yellow brown with trace fine to medium grained sand.		VSt to H			
		Not Encountered	VS >183 kPa VS >183 kPa		1.0						1 <b>193</b> 99 .		
			VS 151/		- - 1.5— -		SP	SAND: fine to medium grained, yellow, with minor silt.	D	L to MD			
			43 kPa VS >183 kPa			· · · · ·	ML	some fine to medium grained sand.	M to W	VSt to H			
			<b>r</b>		_			Hand Auger HAL412A terminated at 2.0 m Target depth					
metho AD AS HA W HA HA	od auger hand a washb hand a bit sho AD/T	screwin nuger ore nuger	ng*	pen wate	etration	− no re rangii < refusi Oct-12 w	aĺ	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/remouded (kPa)	moistur D dr M mo W we Wp pla	soil desc ased on ssificatio re y bist		V S F S V F F V F V L	firm t stiff /St very stiff h hard b friable /L very loose



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client	t:	TH	E LAKE	S						d	ate start	ed:	09 Jun 2016
princi	ipal:									d	ate com	pleted:	09 Jun 2016
proje	ct:	TH	E LAKE	s s	TAG	E 31	E GCF	2		lo	ogged by	<u>-</u>	ODS
locati	ion:	CE	NTRE C	)F L	ОТ 4	12				с	hecked b	oy:	DBC
positio	on: E:	36852	7; N: 79998	32 (Da	itum No	ot Spe	cified)	surface elevation: Not Specified	а	ingle fro	m horizor	ital: 90°	DCP id.:
drill mo	odel: ng info	rmati	on			mat	erial sub	drilling fluid:	h	ole dia	meter : 50	mm	vane id.: SL588
	-							material description		' / isity	vane	DCP	structure and
method & support	<ol> <li>penetration</li> </ol>	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	shear ⊕ remoulded ⊚ peak (kPa) 02 00 00 00	(blows/ 100 mm) ∾ + ∞ ∞ ₽	
- HA		Not Encountered	VS 156/ 44 kPa VS >202 kPa		- - - - - - - - - - - - - - -			<ul> <li>SILT: non plastic to low plasticity, orange brown, with trace fine to medium grained sand. Greasy.</li> <li>0.5 m: with trace clay</li> </ul>	Μ	VSt to H	$\begin{array}{c} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 &$		MATUA SUB-GROUP
	×     · </td <td></td> <td>VS 156/ 29 kPa VS 118/ 38 kPa VS 122/ 69 kPa</td> <td></td> <td>- - - 1.5- - - - - - - - - - - - </td> <td></td> <td></td> <td>1.5 m: becoming grey-brown and non-plastic, with some fine to coarse grained sand</td> <td></td> <td></td> <td></td> <td></td> <td></td>		VS 156/ 29 kPa VS 118/ 38 kPa VS 122/ 69 kPa		- - - 1.5- - - - - - - - - - - - 			1.5 m: becoming grey-brown and non-plastic, with some fine to coarse grained sand					
					-			Hand Auger HAL412B terminated at 2.0 m Target depth					-
AS HA W HA	auger auger hand a washb hand a	screwir auger ore	ng*	pene wate	nud casing etration	− no re rangi ⊲ refus		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/remouded (kPa)	s b Cla moistur D dry M mo W we Wp pla	oil desc ased on ssificatio re / bist			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