

17 August 2009

Mr R Harvey
Waitemata District Health Board Oral Health Services
Private Bag 93115
Henderson
Waitakere 0650

Dear Rodney

RE: Foundation Investigation Report on Proposed Dental Facility at Henderson Intermediate School, 70 Lincoln Road, Henderson.

1 INTRODUCTION

This report presents the results of geotechnical investigations carried out by Coffey Geotechnics (NZ) Limited (Coffey) for Waitemata District Health Board for a proposed new dental facility at Henderson Intermediate School, 70 Lincoln Road, Henderson. Coffey was commissioned for investigations which were carried out in accordance with our scope of works outlined in our proposal SILV0047 dated 16 July 2009.

The purpose of the investigation was to assess the subsurface conditions at the site of the proposed building, leading to determination of bearing capacity and AS2870 expansive soil Class, together with pertinent comments pertaining to site preparation.

Our report will be used to support an application for Building Consent with Waitakere City Council.

2 SITE DESCRIPTION AND DEVELOPMENT PROPOSALS

The proposed site for the new facility is located within the school grounds in the south-western quadrant of the property immediately south of the main playing fields, as indicated in the Woods Topographic Survey Background Report, referenced 60541 and dated 29 July 2009. The immediate vicinity is essentially level and is currently grassed.

The preliminary drawings supplied to us depict the construction of a 6 chair facility approximately 8 metres wide by 35 metres long. The floor of the majority of the building is to be supported on shallow senton piles, except the plant room that will be constructed with a slab-on-grade concrete floor. Cladding and roofing will comprise lightweight materials and the building will be constructed generally in accordance with NZS 3604: 1999.

3 FIELDWORK AND FINDINGS

Our fieldwork was undertaken on 5 August 2009 and involved the drilling of 4 hand auger boreholes to depths of up to 3.2 metres in the positions indicated on the appended site plan. A soil sample was also recovered for subsequent laboratory examination and testing.

Results of all insitu soil tests and groundwater readings, together with detailed descriptions and depths of strata encountered during the drilling of the boreholes are appended and are summarised as follows:

- Topsoil depths ranged from 0.15 to 0.3 metres.
- Filling was encountered in all boreholes and extended between 0.6 and 0.8 metres depth. It comprised very stiff deposits of clayey silts, although we have no information on its origin. Nevertheless, its quality appeared to be generally consistent with filling that could be engineer certified.
- The natural strata encountered comprised stiff to very stiff clayey silts and silty clays of an alluvial nature from Tauranga Group origin.
- Standing groundwater levels of between 1.6 metres and 2.0 metres were recorded in the boreholes at the completion of our fieldwork.

4 LABORATORY TESTING AND RESULTS

A sample was retrieved from between 0.4 and 0.6 metres depth in borehole HIHA03 and was returned to the laboratory. Water Content, Cone Penetration Limit and Linear Shrinkage tests were carried out on the sample in accordance with NZS 4402, "Methods of Testing Soils for Civil Engineering Purposes" test section 2 to assist in assessing the Expansive Class of the site materials.

Results are appended and report a water content of 68.4%, cone penetration limit of 148 and a linear shrinkage of 23%.

5 CONCLUSIONS AND RECOMMENDATIONS

The geotechnical ultimate bearing capacity for the proposed shallow foundations may be taken as 300 kPa (as required by NZS 3604), wherever competent natural or filled ground is present.

For the design of piles where the pile depth exceeds 3 times the pile diameter, a geotechnical end bearing capacity of 450 kPa may be assumed for design, provided the bases of the piles are located in competent natural or filled ground. No allowance should be made for the contribution of side adhesion.

As required by Section B1/VM4 of the New Zealand Building Code Handbook, a strength reduction factor of 0.50 or 0.80 must be applied to all recommended geotechnical ultimate soil capacities in conjunction with their use in ultimate limit state design load cases for static and earthquake overload conditions respectively.

On the basis of our experience, visual-tactile appraisal of the soils encountered and the supporting laboratory test results, our assessment is that the foundation soils on this site are not within the definition of 'good' ground as contained in NZS 3604. Expansive soils are defined in NZS 3604 as those soils having a Liquid Limit of more than 50% and a Linear Shrinkage of more than 15%. Where soils are quite silty or sandy, expansion is usually less of a problem, due to lower clay contents.

The assessed AS 2870 expansive site Class in this case is E (extreme) and the characteristic surface ground movement is up to 100mm.

On this basis, foundation design may be carried out in accordance with AS 2870 or in accordance with NZS 3604 provided that in this latter case the minimum foundation depth below cleared ground level following topsoil removal and benching of building platform areas is 1200mm. Alternatively, a specific foundation and structural design may be undertaken by a suitably experienced Chartered Professional Engineer.

The structural designer should attend to all details of pile type, spacing, diameter and load capacity and must also ensure that the design allows for any differential movement that may occur between the piled and unpiled portions of the building.

On some expansive clay sites if on-grade floor slab construction takes place during a long dry summer, exposed building platform soils may dry out and become highly desiccated. For foundation slab areas, thorough soaking of the exposed building platform area a few days before hardfill placement can help to limit the problem. Careful detailing of construction joints in brittle building elements can also be of benefit.

It is important that any tree stumps and large roots are completely removed from the building platform and the immediate surroundings and that the holes created are filled with compacted hardfill to certifiable standards. Tree removal will cause fluctuations in groundwater contents across the building platform for some period of time and therefore it is important that the structural designer allows for appropriate control joints in the walls and floors of the structure.

Under the circumstances we would like to be given the opportunity of reviewing the final working drawings for this development to ensure that our recommendations have been interpreted as intended.

The opinions, recommendations and comments given in this report result from the application of normal methods of site investigation. As factual evidence has been obtained solely from boreholes 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.

Therefore, it is important that we are given the opportunity to examine the site during foundation construction, so that the nature and quality of the exposed subsoils can be related to the report assumptions. In all circumstances however, if variations in the subsoils occur from those described or assumed to exist then the matter should be referred back to us immediately.

Upon satisfactory completion of these aspects of the works, we would then be in a position to issue the appropriate Producer Statement Construction Review to Council.

We require at least 24 hours notice for site inspections.

6 LIMITATION

This report has been prepared solely for the use of our client, Waitemata District Health Board, 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.

FOUNDATION INVESTIGATION

For and on behalf of Coffey Geotechnics (NZ) Limited



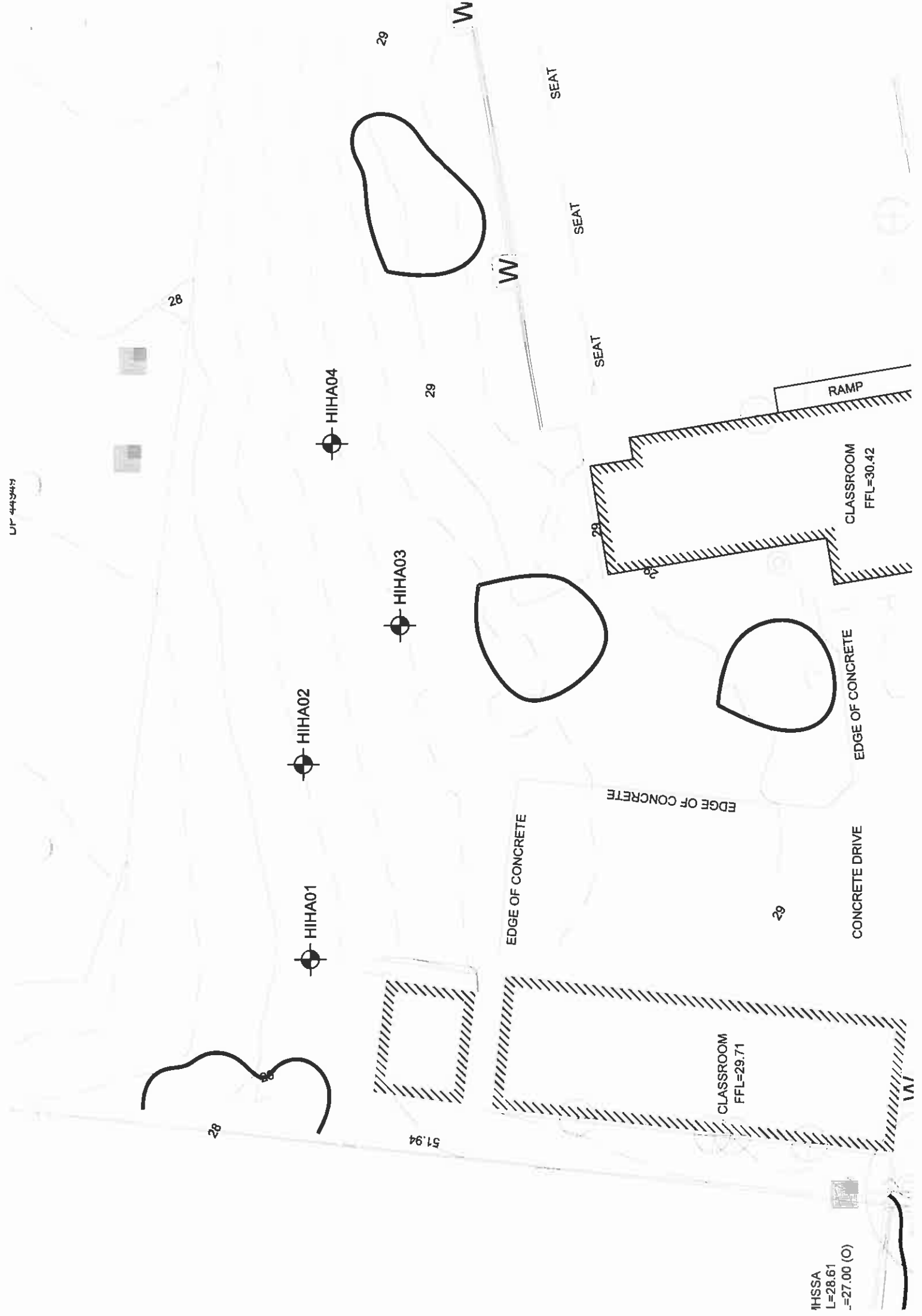
RJ Knowles

Associate Geotechnical Engineer

Distribution:	WDHB	2 copies
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Figures

UP 443443



11HSSA
L=28.61
J=27.00 (O)

Appendix 1

Laboratory Test Results

CLASSIFICATION TEST RESULTS

Test Methods: NZS 4402:1986 Tests 2.1, 2.5 & 2.6



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

B.E. Coker
B.E. Coker Approved Signatory

JOB NO

INNZNWP80327

PROJECT

Dental Facility Roll-out
Henderson Intermediate School

CLIENT

Lincoln Rd, Henderson
Coffey Geotechnics (NZ) Ltd
(Ref 14388AA-HI)

Borehole No

HIHA03

Sample No

S1 6.08.09

Depth

0.4 - 0.6 m

Water Content

%

68.4

Samples prepared from 'As Received' Natural Water Content

Soil fraction used

Whole soil

Cone Penetration Limit

148

Linear Shrinkage

%

23



information
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DATE

12.8.09

CHECKED

Appendix 2

Field Investigation Data

Engineering Log - Hand Auger

Client: **WAITEMATA DISTRICT HEALTH BOARD**

Principal:

Project: **DENTAL FACILITY - HENDERSON INTERMEDIATE**

Hand Auger Location: **Refer to site plan**

Hand Auger No. **HIHA01**

Sheet 1 of 1

Project No: **GENZSILV14388AA-1**

Date started: **5.8.2009**

Date completed: **5.8.2009**

Logged by: **LS**

Checked by: **LS**

drilling information		material substance		structure and additional observations					
stratigraphy	water	notes samples, tests, etc	RL	depth metres	material	moisture condition	consistency/density index	vane shear (remoulded / peak) kPa	structure and additional observations
Fill			28.0		TOPSOIL		VS		
			27.5	0.5	MH Clayey SILT; light brown/light grey, streaked orange, medium plasticity with minor rootlets	M			
Tauranga Group Alluvium			27.0	1.0	CL Silty CLAY; grey, streaked orange, medium plasticity	W	St		
			26.5	1.5					
			26.0	2.0	MH Clayey SILT; grey/light brown, medium plasticity with wood inclusions	S			
			25.0	3.0	becoming orange with limonite staining				
			24.5	3.5	Borehole HIHA01 terminated at 3.2 metres				
			24.0	4.0					

classification symbols and soil description
based on Field Description of Soil and Rock, New Zealand Geotechnical Society Inc 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 index

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

Engineering Log - Hand Auger

Client: **WAITEMATA DISTRICT HEALTH BOARD**
 Principal:
 Project: **DENTAL FACILITY - HENDERSON INTERMEDIATE**
 Hand Auger Location: **Refer to site plan**

Hand Auger No. **HIHA02**
 Sheet 1 of 1
 Project No: **GENZSILV14388AA-I**
 Date started: **5.8.2009**
 Date completed: **5.8.2009**
 Logged by: **LS**
 Checked by: **LS**

Vane No: 486/iii		Easting: m		Slope: -90°		R.L. Surface 28.21 m					
Hole diameter: 50 mm		Northing: m		Bearing:		Datum:					
drilling information				material substance							
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material Soil type, colour, structure, Grading, bedding; plasticity, sensitivity. Secondary and minor components, additional information.	moisture condition	consistency/ density index	vane shear (remoulded peak) kPa	structure and additional observations
Fill			28.0				TOPSOIL	M	VSt		
			27.5			MH	Clayey SILT; light brown/light grey streaked orange, high plasticity with minor rootlets				
Tauranga Group Alluvium			27.0				CH		St		
			26.5								
			26.0								
			25.5								
			25.0				MH	Clayey SILT, light grey, streaked orange			
			24.5				becoming orange, streaked light brown	W/S	VSl		
			4.0				Borehole HIHA02 terminated at 3.2 metres.				
classification symbols and soil description based on Field Description of Soil and Rock, New Zealand Geotechnical Society Inc 2005				vane shear (kPa) ● remoulded peak >>>X 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 Index VS very soft VL very loose S soft L loose F firm MD medium dense St stiff D dense VSl very stiff VD very dense H hard	

Engineering Log - Hand Auger

Client: **WAITEMATA DISTRICT HEALTH BOARD**
 Principal:
 Project: **DENTAL FACILITY - HENDERSON INTERMEDIATE**
 Hand Auger Location: **Refer to site plan**

Hand Auger No. **HIHA03**
 Sheet 1 of 1
 Project No: **GENZSILV14388AA-1**
 Date started: **5.8.2009**
 Date completed: **5.8.2009**
 Logged by: **GS**
 Checked by: **LS**

Vane No: 486/iii		Easting: m		Slope: -90°		R.L. Surface: 28.61 m	
Hole diameter: 50 mm		Northing: m		Bearing:		Datum:	
drilling information				material substance			
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material Soil type: colour, structure, Grading; bedding, plasticity, sensitivity. Secondary and minor components, additional information
FI			28.5				TOPSOIL
			28.0			MH	Clayey SILT; light brown/light grey, streaked orange, medium plasticity with minor rootlets in top 200mm
Tauranga Group Alluvium			27.5				CH
			27.0				Silty CLAY, light brown/light grey, streaked orange, high plasticity
			26.5			ML	clayey SILT; light grey, streaked light brown/orange, medium plasticity
			26.0				becoming light brown/orange
			25.5				Borehole HIHA03 terminated at 3.2 metres
			25.0				
			4.0				

classification symbols and soil description based on Field Description of Soil and Rock New Zealand Geotechnical Society Inc 2005	vane shear (kPa) ● remoulded X peak >>>X 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 index VS very soft S soft F firm St stiff VSst very stiff H hard	VL very loose L loose MD medium dense D dense VD very dense
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Engineering Log - Hand Auger

Client: **WAITEMATA DISTRICT HEALTH BOARD**

Principal:

Project: **DENTAL FACILITY - HENDERSON INTERMEDIATE**

Hand Auger Location: **Refer to site plan**

Hand Auger No. **HIHA04**

Sheet 1 of 1

Project No: **GENZSILV14388AA-I**

Date started: **5.8.2009**

Date completed: **5.8.2009**

Logged by: **LS**

Checked by: **LS**

drilling information		material substance		moisture condition		consistency/density index		structure and additional observations	
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material	moisture condition	consistency/density index
Fill			28.5				TOPSOIL	M	Vst
			28.0	0.5		ML	Clayey SILT; light brown/light grey, streaked orange, medium plasticity, with minor rootlets		
Tauranga Group Alluvium			27.5	1.0		ML	Clayey SILT; light grey, streaked orange, medium plasticity		
			27.0	1.5		CH	Silty CLAY; light grey, streaked orange, medium to high plasticity		
			26.5	2.0				W	St
			26.0	2.5		ML	Clayey SILT; light brown/light grey, streaked orange and pink, medium plasticity		
			25.5	3.0			becoming light brown/orange		
			25.0	3.5			Borehole HIHA04 terminated at 3.2 metres.		
				4.0					

classification symbols and soil description
based on Field Description of Soil and Rock, New Zealand
Geotechnical Society Inc 2005

vane shear (kPa)
● remoulded
x peak
>>x peak greater than 200kPa
UTP unable to penetrate

water
10/198 water level on data shown
water inflow
water outflow

moisture
D dry
M moist
W wet
S saturated

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