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The Lakes (2012) Limited Geotechnical Completion Report on Stage 2QRST at The Lakes Subdivision GENZTAUC13086AE-AC (Revision 1) 9 June 2014



96 Cameron Road Tauranga 3110 PO Box 13145 Tauranga 3141 New Zealand t: +64 7 571 6081 f: +64 7 571 6085 coffey.com

9 June 2014

The Lakes (2012) Limited C/- Mr Grant Rae Harrison Grierson Consultants Limited PO Box Tauranga

Email: G.Rae@HarrisonGrierson.com

Dear Grant,

RE: Geotechnical Completion Report for The Lakes (2012) Limited at Stage 2QRST, The Lakes Subdivision, Tauriko, Tauranga

This report presents all supporting geotechnical data and our Suitability Statement in relation to land development works undertaken at the above location.

It has been prepared in accordance with instructions received from The Lakes (2012) Limited and forms part of the documentation required by Tauranga City Council to achieve certification under Section 224(c) of the Resource Management Act.

If you have any queries or you require any further clarification on any aspect of this report, please do not hesitate to contact the undersigned.

For and on behalf of Coffey

Tilld

R.B. Telford

Engineering Geologist

Distribution:	The Lakes (2012) Limited	2 Copies	
	Harrison Grierson	1 Copy	
	Tauranga City Council	1 Copy	
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1 INTRODUCTION AND SCOPE

This Geotechnical Completion Report (GCR) has been prepared by Coffey Geotechnics (NZ) Ltd (Coffey) for The Lakes (2012) Limited as part of the documentation to be submitted to the Tauranga City Council following subdivision development in general accordance with the conditions of Council resource consent number RC21332. It contains a Geotechnical Suitability Statement (Appendix A), the results of site investigations and relevant quality control test data, together with as-built plans derived from Harrison Grierson Consultants Ltd (HGCL) topographical data.

This report covers bulk earthworks completed during two construction periods in 2007-2008 and 2012-2013. Minor earthworks were also undertaken in early 2014 during the civil construction period, as described herein. This report is intended to be used for certification purposes for the new lots as shown on the appended As-Built Contour Plan (Figure 05).

Lots 868 to 870 and 887 to 890 inclusive have been excluded from this GCR. Lots 868 to 870 contain a large sediment pond and topsoil stockpile which is being used for Stage 3 of the Lakes subdivision. Lots 887 to 889 received a minor amount of filling near the end of the civil construction period and are subject to on-going settlement monitoring. Lot 890 is currently being used to stockpile topsoil and is in an area that may be affected by earthworks for Stage 3. The locations of these excluded lots are shown on the attached figures.

2 DESCRIPTION OF SUBDIVISION

Stages 2Q, 2R, 2S & 2T of the Lakes subdivision (collectively referred to as 2QRST) are located to the south-east of the intersection of Takitimu Drive (State Highway 36) and Kennedy Road in Tauriko, Tauranga. These stages of the subdivision consist of a total of 90 residential lots with associated access roads and reserve areas.

The new lots are located on flat or gently sloping ground that has been formed through excavation and controlled filling at the foot of a steep natural slope that rises to the east of the site. Details of these earthworks are shown on Figures 2 and 4 which cover the 2007-2008 and 2012-2013 construction seasons respectively.

Work in 2007-2008 generally involved clearing out and filling several narrow gullies at the northern end of the site and a low-lying valley at the southern end of the development. A significant thickness of peat and organic soil was removed from the low-lying parts of this site at this time, up to the peat 'win-line' shown on Figure 2. Beyond this line the peat excavation depths became too deep to continue economically. Excavation was also undertaken to lower a prominent ridge that separated stages 2Q and 2T, forming an approximately 30m high 1V:2.5H batter. The finished ground surface at the end of this earthworks stage is shown on Figure 3.

Due to the risk of possible instability on the natural (i.e. un-modified) parts of the slope to the east of the development, two sections of debris barrier were constructed at the toe of the slope in the locations shown on Figure 3.

In 2012-2013, further excavation was undertaken to complete the 1V:2.5H batter. Material from this excavation was placed as controlled fill within the subdivision area (Figure 4), forming the finished ground surface shown on Figure 5. The debris barriers constructed in 2007-2008 were extended at this time (Figure 5).

Finally, a small amount of additional filling was placed within Lots 833 & 834 in early 2014. This work is discussed in detail in Section 6.2.3 of this report.

With the exception of drainage materials used during the civil construction stage, all bulk fill materials used during this development were obtained from excavation on site.

3 RELATED REPORTS

Stages 2QRST of the Lakes development have been subject to several stages of geotechnical investigation and assessment which are summarised in the following documents:

- 1. Shrimpton & Lipinski Ltd, "Pyes Pa West Urbanisation Development, Tauranga Geotechnical Assessment Report", ref: 16944, dated October 2003.
- 2. Coffey letter, "Re Geotechnical Design Debris Protection Bunds for Areas E, F and K, The Lakes, Pyes Pa", ref: GEOTTAUC13086, dated 11 June 2008.
- 3. Coffey letter, "Re: Review of existing debris barriers for The Lakes areas 2Q and 2T", ref: GENZTAUC13086AE-AA, dated 1 February 2013.
- Coffey letter, "Slope Stability Assessment for The Lakes Subdivision Stage 2Q", ref: GENZTAUC13086AG-AA, dated 13 March 2013.
- 5. Coffey letter, "Re: Design of Debris Protection Bunds The Lakes Stages 2QRST", ref: GENZTAUC13086AE-AB, dated 26 March 2013.

The Shrimpton & Lipinski Ltd (S&L) geotechnical assessment concluded that the subject area was generally suitable for residential development. Further investigation was recommended to assist in designing subdivision earthworks, including the removal of peat and unsuitable soils that underlay low-lying parts of the site. Additional stability assessments of the natural and engineered slopes within the development area were also recommended.

The stability analyses were undertaken by Coffey in 2007-2008 and resulted in recommendations regarding the construction of debris protection bunds at the foot of natural slopes above the subject site (see Section 8.8 for details). The construction of these bunds was subsequently reviewed by Coffey in 2013 and the length of the bunds was extended above Stage 2Q to suit a revised lot layout at this time.

The excavations to remove the peat and unsuitable soils within the site as well as the construction of the debris bunds are discussed in Sections 6.2.1 and 8.8 below.

4 INVESTIGATIONS COMPLETED

Subsurface investigations for the development were completed in several stages prior to and during the two phases of earthworks. Initial investigations on the site comprised machine boreholes and test pits as shown on Figure 1. In November 2012 a second round of investigations consisting of 12 cone penetration tests (CPTs) was undertaken (Figure 3). Pore pressure dissipation tests were completed in selected layers within these CPTs.

Additional hand auger boreholes and test pits, in conjunction with in-situ shear vane and Scala penetrometer tests, were completed during and after each earthworks phase. These test locations are presented on the appended site plans (Figures 4 & 5). The results of all in-situ soil tests, together with

detailed descriptions and depths of strata encountered during the investigations are attached to this report (Appendices B to E).

5 OVERVIEW OF GEOLOGICAL CONDITIONS

The original landform within the development area consisted of a series of deeply incised valleys and gullies on the low-lying areas of the site which were overlooked by a steep, approximately 30m-40m high escarpment to the east. The original ground contours are shown on Figure 1.

The valleys and gullies had eroded into volcanic ashes and ancient fluvially re-worked sediments of the Matua Sub-Group, comprising mixed and inter-bedded silt, sands and clays. After erosion, the valleys had been partially infilled with more recent sediments and colluvial soils derived from the eastern escarpment. The surface layers of this sedimentary sequence contained several metres of peat and highly organic soils.

The slopes to the east of the site and the large ridge that existed between stages 2Q and 2T comprised a sequence of volcanic ashes overlying Matua Sub-Group soils and pumice sands of the Te Ranga Ignimbrite with a surface veneer of colluvial soils on the slope face. The volcanic ash sequence on the ridge topography is common throughout the Tauranga area, consisting of the Hamilton Ash, Rotoehu Ash and Post-Rotoehu or 'younger' Ashes.

6 EARTHWORKS OPERATIONS

6.1 Plant

Earthworks during the 2007-2008 season were completed by Bob Hicks Earthmovers Ltd. The principal contractor for the 2012-2013 season was Higgins Group Holdings Ltd (Higgins), who sub-contracted the majority of work to Andrew Young Earthmoving Ltd. The civil construction works in 2013 and 2014 were completed by Higgins.

The main items of plant used by during each of the bulk earthworks phase comprised Terex and towed motor scrapers, hydraulic excavators, bulldozers and sheepsfoot rollers.

6.2 Construction Programme

The bulk earthworks for stages 2QRST were completed in two stages during the 2007-2008 and 2012-2013 earthworks seasons.

6.2.1 2007-2008

Works completed during 2007-2008 included excavations of up to 10m depth to lower a number of small ridges within Stage 2Q and the large ridge between 2Q and 2T. The peat and organic soils that existed within the gullies were also removed at this time. The limits of peat excavation are shown on Figure 2 and are referred to as the peat 'win-lines'. Beyond these lines the depth of peat was considered to be too great to be removed economically and the ground in these areas is therefore still underlain by peat and organic soils.

Once the peat and other unsuitable materials had been removed from the gullies, engineered fill was placed to form the generally flat or gently sloping ground surface shown on Figure 3. The maximum fill

depth was approximately 12m. Subsoil drains were installed beneath the fill to control seepage and elevated groundwater as required (Figure 2).

As shown on Figure 2, some non-structural filling was also placed within reserve areas within the subdivision. This non-engineered fill was not inspected nor is it certified by Coffey.

At the end of the work season, an approximately 3m high slope debris protection bund was constructed between Stage 2T and the steep eastern escarpment (see Figure 3). A smaller 1.5m deep slope debris channel was also formed around the south-eastern perimeter of Stage 2Q. The bund and channel were intended to protect the proposed lots from debris that may derive from instability or erosion of the steep slopes above these areas, as described in Section 8.8 below.

6.2.2 2012-2013

The works undertaken in the 2012-2013 season included further excavation to lower the ridge between stages 2Q and 2T. Materials removed from the ridge were then placed as engineered fill within the remainder of the development area to form the existing, gently sloping ground profile shown on Figure 5. The maximum depth of fill placed during this period was approximately 2m.

Following an assessment of the slopes above Stage 2Q, the debris channel constructed in 2007-2008 was extended during this work season. The finished channel now terminates in an approximately 3m high bund above proposed Lot 837 at the location shown on Figure 5 and discussed in Section 8.8.

The earthworks in 2012-2013 included construction of a 3m high 1V:2H cut and fill batter along the site's western boundary with Takitimu Drive. As this batter is located within a reserve area, its construction was not supervised or inspected by Coffey.

No specific testing of the road subgrades or service trench backfill soils was completed under the direction of Coffey. As with the previous stage of works, some non-structural filling was also placed within the reserve area between Stages 2R and 2S of the subdivision. This filling has not been certified.

6.2.3 Additional Filling

As shown on Figure 4, up to 2m of additional fill (i.e. above original ground level) was placed within Lots 833 and 834 to re-grade a shallow gully that existed in this area. While stripping the area of topsoil before filling it was found that Lot 834 was partially underlain by up to 3m of peat left over from the 2007-2008 works season. This peat was removed prior to placement of the new fill in 2014. The peat sub-excavation was extended beyond the lot's eastern boundary for a distance equal to the peat depth to avoid having to place a Building Restriction Line on these properties.

7 QUALITY CONTROL

7.1 Undercut Inspections

During the initial gully cleaning and excavation in 2007-2008, general topsoil stripping and removal of the peat layer was supervised by Coffey staff to confirm that the depth and extent of undercut was sufficient.

At the start of the 2012-2013 season, earthworks were undertaken to remove sparse vegetation and grass that had grown on the previous fill surface. Minor excavation was also undertaken to sub-excavate several erosion features that had formed on the fill surface in the time between the two work

seasons. The finished and cleared surface was inspected and approved by Coffey prior to any fill placement.

As described in Section 6.2.3, the ground beneath the additional filling placed in Lots 833 & 834 was also stripped of topsoil and unsuitable materials and inspected and approved by Coffey before filling.

7.2 Compaction Control Criteria

Due to the variability of the subsoils identified within the subdivision cut areas, compaction control criteria were specified for quality assurance purposes predominantly using the minimum allowable shear strength and maximum allowable air voids method as defined below:

- Air voids percentage (as defined in NZS 4402:1986 and as measured by Nuclear Density Meter (NDM). Targeting an average value less than 10% and maximum single value no greater than 12%.
- Undrained shear strength (measured by hand held shear vane calibrated using NZGS 2001 method. Targeting an average value greater than 150kPa and minimum single value no less than 120kPa. The average value to be determined over any ten consecutive tests in any one fill area.

All test results are IANZ (International Accreditation New Zealand) endorsed and further details are appended.

7.3 Field Control

During 2007-2008, regular in-situ density, strength and water content tests were carried out on the filling by Coffey. Testing was carried out in excess of the frequency recommended by NZS 4431 and the Tauranga City Council Code of Practice for Development 2006, this being at least 1 set of tests per 1,000 m³ of earthfill volume. The locations of all tests are shown on Figure 2.

In the 2012-2013 season, NDM and shear vane tests were carried out by Opus International Consultants Ltd (Opus). Additional check testing in the form of hand-auger boreholes, field shear vane measurements and Scala penetrometer tests were completed by Coffey during and immediately after earthworks. The locations of all NDM tests and boreholes are shown on Figure 4.

The additional fill placed on Lots 833 & 834 was tested by Coffey in 2014 using a hand-auger borehole and shear vane measurements. The location of this test (HA180) is also shown on Figure 4.

Summary tables of the test results and the certified test reports provided by Coffey and Opus are included in Appendices C and D, along with logs of the Coffey boreholes showing shear vane and Scala test results. Logs and test results for the minor additional filling completed in 2014 are appended with the results for the 2012-2013 bulk earthworks season.

8 ENGINEERING EVALUATION AND RECOMMENDATIONS

8.1 Subsoil Drainage

During civil construction in 2013, localised shallow groundwater levels were observed at some locations in pipe trenches within the subdivision. As shallow groundwater was being encountered near or above the subsoil drains installed in 2007-2008, a test pit was excavated to intercept the subsoil drain below the Lakes Boulevard to the west of Lot 814 (i.e. near settlement markers SM1 and SM9 on Figure 2). Upon encountering the drainage metal within the subsoil drain at approximately 4m depth, the test pit

flooded rapidly and water levels within the pit rose to 2m below ground level. This indicates that this part of the drainage network may not be flowing effectively.

To determine if the reduced drainage performance and shallow water table might be affecting the strength of filling within the proposed lots, a series of test pits and hand-auger boreholes were completed (HA101 to HA106 on Figure 4 and TP101 to TP104 on Figure 5). Shear vane readings and observations of groundwater conditions were recorded in these excavations.

Shear vane measurements within the test pits indicated that some layers of fill in Stage 2T that had been placed in 2007-2008 were weaker than expected, with shear strengths of between 60kPa and 120kPa being recorded even though the area had passed the fill testing when it was placed. These low shear strengths are most likely due to shallow or perched groundwater within the fill material which can result in softening, especially in cohesive soils. The hand-auger boreholes within Stage 2Q indicate that the filling in this area is less affected, although several of the boreholes drilled to assess lot-by-lot conditions also encountered relatively weak fill layers (e.g. HA109, HA113).

It is considered possible therefore that some of the fill placed during 2007-2008 may exhibit reduced strength and bearing capacity due to shallow groundwater levels. Fill placed during 2012-2013 appears to be significantly less affected although this material may experience similar softening over time.

8.2 Fill Quality

Based on the appended earth fill quality control test data (and some reliance on the diligence of the bulk earthworks contractor at times when engineering staff were not present on site) indications are that the compaction control criteria were generally met during the bulk earthworks periods in 2007-2008 and 2012-2013. However, as discussed above, post-construction testing identified some areas of filling that may be affected by shallow groundwater, resulting in reduced shear strengths.

Testing undertaken by Coffey indicates the additional fill placed within Lots 833 and 834 in 2014 also met the criteria set for engineered fill.

On the basis of the testing completed during construction, it is considered that the fill within the subdivision can be classified as engineer certified filling.

8.3 Static Settlement

8.3.1 Introduction

Static settlement occurs when soil materials compress and consolidate under static loading (e.g. filling and/or the weight of a building). For simplicity, the various stages of static settlement can be approximated by two components: 'consolidation settlement' and 'creep settlement'. Consolidation settlement is influenced by the magnitude of the static load; the greater the load, the more consolidation settlement is induced. The time for completion of consolidation settlement is dependent on the speed at which water can flow from the soil (soil permeability). It is common practice to assume consolidation is effectively complete when 90% of the total predicted settlement has occurred. The time required to reach 90% consolidation is termed ' t_{90} '.

Soils may also settle over time under their own weight, termed creep settlement. Creep settlement is essentially independent of static load meaning that the development of creep settlement is unaffected by cutting and filling. Theoretically, creep settlement can continue indefinitely as microscopic realignment and material decay take place, hence for this report the analysis of creep has been limited

to a period of 50 years to coincide with the lifespan of a typical residential dwelling. Organic and soft soils are particularly susceptible to consolidation and creep settlements. It should be noted however that organic creep settlement due to decay in organic materials is particularly difficult to predict with any accuracy due to the inherent variability of these materials.

8.3.2 Methodology

For this report, separate assessments of static settlement have been completed for the 2007-2008 and 2012-2013 earthworks seasons.

Static settlements due to 2007-2008 filling were assessed using the results of a settlement monitoring programme which began in February 2008. The locations of settlement markers used for this assessment are shown on Figure 2.

Settlements due to 2012-2013 filling were assessed by analysing the CPT and dissipation data obtained in November 2012. This information was also used to estimate settlements that may occur as a result of the future buildings.

Settlements due to the additional fill placed on Lots 833 & 834 during civil construction were monitored from January to May, 2014.

8.3.3 2007-2008 Earthworks

As depicted on Figure 2, the 2007-2008 earthworks program involved cuts and fills of up to 10m and 12m respectively throughout the development area. Typically, cuts were in the range 1m to 5m and fills were in the range 2m to 7m.

Settlement markers were installed on the surface of the subgrade at nine locations (SM1 to SM9, inclusive) prior to filling. Monitoring of settlement marker SM1 began in October 2007 until it was damaged around November 2007. SM1 was then replaced with a new marker, SM9, to allow continued monitoring at this location. The remaining settlement markers were monitored periodically from February 2008 until March 2009.

When works recommenced in 2012, the settlement monitoring programme was reinstated. Settlement markers SM2, SM3, SM4 and SM9 were destroyed during construction of Lakes Boulevard at the end of the latest earthworks season. Markers SM5, SM6 and SM8 remained operational and were monitored periodically up to April 2014. SM7 was damaged in around April 2013 and was not replaced.

Results

The results of the settlement monitoring program are summarised and appended in Appendix F. Below is a summary of the estimated consolidation settlement induced by the 2008-2009 earthworks along with an estimate of creep settlement over the next 50 years extrapolated from observed settlements.

Marker	Approximate Fill Height (m)	Interpreted Consolidation Settlement (mm)	Interpreted Creep Settlement Over Next 50 years (mm)
SM1	2	Marker damaged an	d replaced with SM9
SM2	6	120	30
SM3	6	255	30
SM4	4.5	55	20
SM5	4.5	20	20
SM6	3.5	145	10
SM7	3	60	20
SM8	3	40	20
SM9	2.5	20	20

Table 1: 2008-2009 Settlement Monitoring Results

Notes: Creep settlement to date measured from February 2008 to present Creep settlement over next 50 years extends from present date to 2064

Due to the absence of monitoring data between April 2009 and October 2012, damage or destruction of markers and a change in surveying technique (from GPS to Level apparatus), the settlement monitoring data is only capable of producing an approximate assessment of settlement performance since the earthworks of 2007-2008.

Plots of settlement against time on a logarithmic scale were used to interpret the end of consolidation settlement and the beginning of creep settlement. Based upon these plots, consolidation settlements are estimated to have reached t^{90} within approximately 90 days to 350 days of fill placement. Measured consolidation settlements range in magnitude from 20mm to 255mm. Lines of best fit applied to the settlement – log time plots were used to assess potential future creep settlements. The best-fit lines showed close agreement in predicting approximately 10mm to 30mm of creep settlement over the following 50 years.

Discussion

Based on the monitoring data and the approximate t_{90} periods discussed above, the consolidation settlements due to the 2007-2008 earthworks reached t_{90} around January 2009. The estimated magnitude of creep settlements over the next 50-year period ranges from 10mm to 30mm.

Variable ground conditions and fill heights are likely to produce differential settlements across the site. Based upon the results of the above assessment, differential settlements following the 2007/2008 earthworks were likely in the range 10mm to 170mm, which would have been sufficient to cause an uneven ground surface. However, these differential settlements would have occurred by January 2009 (i.e. at the end of primary consolidation) and before the second stage of earthworks in 2012/2013. It can therefore be assumed that any adverse effects caused by differential consolidation settlements would have been addressed during the 2012/2013 earthworks.

The differential settlements due to differences in creep are addressed in Section 8.3.6.

8.3.4 2012-2013 Earthworks

The 2012-2013 earthworks comprised a major cut and minor filling up to 2m depth across the proposed lots as shown on Figure 4.

The static settlements that may occur as a result of this filling have been calculated using proprietary software CPeT-IT¹. The software employs a method of analysis which calculates the magnitude of two settlement components; primary and secondary settlement. Primary settlement can be interpreted as an approximation of consolidation settlement. Secondary settlement can be interpreted as an approximation of creep settlement but without the component of organic decay. Outputs from the analysis have been included in Appendix F.

Using empirical relationships between cone tip resistance (q_c) and soil stiffness, CPeT-IT was able to calculate an estimate of static settlement at each of the twelve CPT locations (CPT01 to CPT12, inclusive). The output of the calculations is summarised in Table 2 below.

Fill heights at each CPT location were estimated from the cut/fill plan shown in Figure 4. The bulk unit weight (γ) of the filling was assumed to be 17kN/m³.

CPT Number	CPT Depth (m)	Cut/Fill (m)		al Static Settlement mm)
CFT Number	CP i Deptii (iii)	Cubrin (iii)	Primary (Consolidation)	Secondary (Creep)
CPT01	15.0	0	N/A	< 10
CPT02	15.0	0	N/A	10
CPT03	14.6	0	N/A	< 10
CPT04	9.8	1	100	60
CPT05	15.0	0.25	10	20
CPT06	15.0	0	N/A	30
CPT07	7.8	0.5	40	30
CPT08	15.4	0.5	30	30
CPT09	5.6	0	N/A	<10

Table 2: 2012-2013 Estimate of Static Settlement

¹ GeoLogismiki Geotechnical Software. 2007: *CPeT-IT* (Version 1.7.6.42)

CPT Number	CPT Depth (m)			tical Static Settlement (mm)	
	GPT Depth (in)		Primary (Consolidation)	Secondary (Creep)	
CPT10	15.1	0.5	20	20	
CPT11	10.7	0	N/A	<10	
CPT12	15.0	0	N/A	20	

Notes: Settlement estimates to the nearest 10mm.

CPT04 is considered to be an outlier.

Secondary (Creep) settlement does not account for decay of any organic content. Where organic content may be present, creep settlements may be underestimated by this method.

Discussion

Several of the CPT locations (CPT01 to CPT03, CPT06, CPT09, CPT11 and CPT12) were located on or near to the zero cut/fill line and were therefore modelled without fill load. Consequently, primary settlement has not been calculated at these locations as there is no load being applied to induce compression or consolidation.

The results of CPT04 show unusually high estimated magnitudes of primary and secondary settlement. As shown in the attached calculation output in Appendix F, the majority of the settlement at CPT04 is expected to occur between 6.5m and 8.5m below finished ground level. This interval coincides with a layer of possible organic soil identified by the CPT. Prior experience of conducting CPTs in the Tauranga area has found that standard CPT techniques are occasionally unable to correctly characterise layers within the volcanic and pumiceous sedimentary materials, leading to an overestimate of static settlement. The results of CPT04 are considered to be an example of such an occasion and are therefore treated with caution.

In the analysis of the remaining CPTs loading was applied proportionate to fill heights of 0.25m to 0.5m. Excluding CPT04, estimated primary settlements are in the range 10mm to 40mm which are considered to be relatively significant for such small quantities of filling.

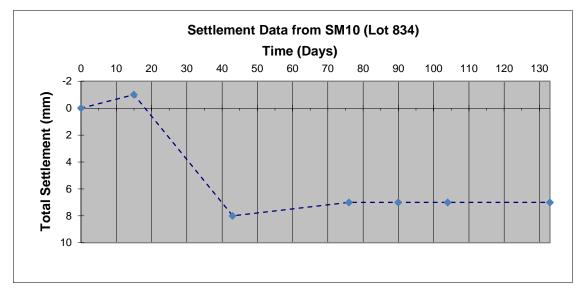
To assess the time required for primary consolidation to occur, a series of dissipation tests were conducted at CPT04, CPT06, CPT07, CPT08 and CPT12. Analysis of these test data indicates that the horizontal coefficient of consolidation (C_h) for the natural soils beneath the site is approximately 10^{-6} m²/s. This value is typical of a sandy silt material and suggests that water can flow relatively quickly from the soil. Using this value of C_h , t_{90} for the filling placed in 2012-2013 can be estimated at approximately 250 days, which is roughly equivalent to the range of 90 to 350 days estimated from the settlement monitoring data for the previous stage of filling.

Based on these calculations, and noting that the fill was placed over 12 months ago, consolidation settlements due to the 2012-2013 filling should have reached t_{90} at the time of writing. Estimates of secondary settlement are in the range of less than 10mm to approximately 30mm. These settlements are expected to occur over the next 50-year period, equating to an average annual settlement of less than 1mm per year. Comparing the results of the CPeT-IT assessment of secondary settlement with the estimates of creep settlement from the monitoring programme, both sets of results indicate that 10mm to 30mm of secondary/creep settlement can be expected over the next 50 years.

8.3.5 Lots 833 & 834

A new monitoring point was installed in early 2014 at the site of the deepest filling in Lot 834, to monitor settlements due to the fill placed (SM10 on Figure 4). Data from SM10 are presented on Chart 1 below.

Chart 1: Lot 834 Settlement Monitoring Data



The results indicate the fill placed on Lots 833 and 834 settled approximately 8mm within the first 50 to 70 days after being placed (within the limits of survey accuracy (i.e. +/- 2mm). No further settlement was measured within the period from 70 to 130 days after fill placement (i.e. 2 April to 29 May 2014).

Based on these results, it is considered that the consolidation settlement due to the additional fill placed on these lots is effectively complete at the time of writing. These sites may however be subject to future creep settlements as discussed below.

8.3.6 Future Settlements

Dwellings on the new lots will be affected by future settlement as a result of the on-going creep discussed above as well as by future building and earthworks (i.e. fill) loads. The potential for differential settlements affecting the proposed buildings largely depends on the slope of the individual site. Assuming that the individual sites are levelled before construction, steep sites will require deeper cuts and fills to form a level building platform, leading to a greater degree of differential settlement on these lots. Gently sloping sites on the other hand will require less filling beneath the building, resulting in reduced differential settlement effects

With regard to finished ground slopes, the subdivision generally consists of two zones. Lots within stages 2R, 2S and 2T are gently sloping, having less than approximately 1m of fall across a typical building platform (approx. 15m to 20m long). Lots 824 to 828 within Stage 2Q are also gently sloping. In contrast, the remaining lots within Stage 2Q have a greater site slope, with falls in excess of 1m and in some places over 3m across a typical building area.

Calculations indicate that where less than 300mm of filling is placed to form a level platform, predicted differential settlements should be within accepted limits recommended in Clause B1.0.2 of Ministry of

Business, Innovation and Employment (MBIE) compliance document B1 (i.e. max. 25mm differential settlement per 6m length). For fill depths in the 200mm to 300mm range however the settlements may lie at the upper end of the acceptable scale, depending on several factors including the true weight of fill applied.

Sites on which more than 300mm of filling is placed may experience differential settlements greater than the accepted limits recommended by MBIE.

Gently Sloping Sites (Stages 2R, 2S & 2T and Lots 824 to 828 inclusive)

Due to the gently slope of these sites, it is expected to be relatively easy to build without exceeding the max 300mm fill thickness. The recommendations given in Section 8.7 with respect to creep settlement effects still apply.

Steeply Sloping Sites

With the exception of Lots 824 to 828, the remaining lots within Stage 2Q generally comprise greater than 1.0m fall across the lot, and up to 4m in places. They are therefore likely to require greater depths of cut and fill to create level building platforms. To reduce the risk of adverse effects due to differential settlement on these sites, it is generally recommended that the building platforms be formed entirely within cut to avoid the need for complex foundation systems.

Where filling of more than 300mm depth is proposed, guidance would need to be sought from a TCC Category 1 Geo-Professional. If necessary, fill loads and resulting settlements may be reduced by using light-weight fill materials (e.g. lightweight pumice fill or specifically designed polystyrene underfill), by terracing the building into the slope or by designing elevated parts of the building as a suspended timber structure as outlined in Section 8.7.

8.4 Seismic Liquefaction

8.4.1 Background

Cyclic liquefaction is a phenomenon in which loose, saturated, cohesionless soils are subject to temporary but essentially full loss of shear strength due to pore pressure build-up as a result of earthquake loading.

While liquefied (and for a time afterwards) the soil is susceptible to vertical and lateral deformations in the form of flow slides, lateral spreading, ground settlements, ground oscillation and sand boils. The magnitude and mode of deformation is governed by landform, spatial continuity of the liquefiable material, soil density and the intensity and duration of cyclic loading.

Although not susceptible to "classic" cyclic liquefaction, under the right conditions of cyclic load intensity and duration fine-grained cohesive soils can undergo strength loss during an earthquake event. This phenomenon is referred to as cyclic softening. Although less prevalent than cyclic liquefaction, it can result in significant deformations and therefore needs to be considered in a site liquefaction analysis.

8.4.2 Methodology

For this assessment it has been assumed that any building development within Stage 2QRST will be an Importance Level 2 (IL2) structure as defined in Table 3.1 of NZS1170.0². As such, the Serviceability Limit State (SLS) seismic event has a return period of 1 in 25 years. In an SLS magnitude earthquake a building designed to current New Zealand codes may suffer minor damage but should be suitable for continued use without major structural repairs.

The Ultimate Limit State (ULS) event for an IL2 structure has a return period of 1 in 500 years. A ULS earthquake is considered to be a rare, extreme event. A building designed to current New Zealand codes may be severely damaged by such an earthquake, requiring major repairs or complete replacement. The building must however remain safe for occupants until it can be evacuated.

The peak ground accelerations for the site were derived using the criteria provided in NZS 1170.5³. The findings of the field investigation are not sufficient to clearly define the subsurface conditions beneath this site as either Class C (shallow soils) or Class D (deep soils). This report has conservatively adopted soil Class C conditions for the purposes of the liquefaction assessment. Structural engineers working on the new lots may choose to adopt Site Class D as the more conservative approach for structural design purposes.

The calculated peak ground accelerations for the site under SLS and ULS events are therefore 0.07g and 0.27g, respectively.

The assessment of liquefaction risk and estimates of liquefaction-induced ground deformation were made using a computer software package called CLiq⁴ and the analysis methods recommended by the NCEER⁵. Cyclic resistance, liquefaction triggering and liquefaction-induced vertical displacements were calculated using a modified NCEER method⁶ which captures the behaviour of fine-grained soils and their potential for cyclic softening.

8.4.3 Results

Analysis was completed using the CPT data from November 2012. The data from the CPTs were first screened using proprietary computer software CPeT-IT⁷ to identify anomalies or inconsistencies before being imported in CLiq for liquefaction assessment.

The depth to groundwater was determined from the hand-auger boreholes and test pits completed on site. The recorded elevations were used to establish a prevailing groundwater model for design, conservatively set at 5m below ground level at the western site boundary, reducing to 3m at the toe of the eastern slope.

² AS/NZS1170.0:2002 Structural Design Actions Part 0: General Principles

³ NZS1170.5:2004 Structural Design Actions Part 5: Earthquake Actions – New Zealand

⁴ GeoLogismiki Geotechnical Software. 2006: *CLiq* (Version 1.7.4.34)

⁵ Youd. T. L. and Idriss, I.M. 1998 Liquefaction Resistance of Soils: Summary Report form the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils

⁶ Robertson, P.K. 2009 *Performance Based Earthquake Design Using the CPT*, Keynote Lecture, International Conference on Performance-based Design in Earthquake Geotechnical Engineering – from Case History to Practice, IS-Tokyo

⁷ GeoLogismiki Geotechnical Software. 2007: *CPeT-IT* (Version 1.7.6.19)

Based upon cut/fill plans supplied by HGCL (Figure 4), three of the CPTs (CPT07, CPT08 and CPT10) were completed at locations which received engineered fill during the 2012-2013 earthworks season. Accordingly, layers of fill were incorporated into the liquefaction model to account for the additional loading. The remaining CPTs were carried out at locations at, or near to finished ground level and therefore did not require alteration.

CPT Number	SLS Settlement (mm)	ULS Settlement (mm)	Depth to Significant ULS Liquefaction (m)
CPT01	<10	30	12.5
CPT02	<10	200	9
CPT03	<10	150	3
CPT04	10	15	6.5
CPT05	10	15	5
CPT06	<10	15	7
CPT07	<10	20	3
CPT08	<10	15	5
CPT09	<10	<10	5
CPT10	<10	45	6
CPT11	<10	50	6
CPT12	<10	<10	5
Estimated Differential Settlements (mm)	Up to 20mm	Up to 100mm	

Table 4: Vertical Settlements Due to Liquefaction

Notes: As a general rule, differential settlements may be assumed to be in the order of one half to two thirds of the total settlements⁸.

Selected outputs from the liquefaction analyses showing the computed response to SLS and ULS events are included in Appendix G and the calculated vertical settlements predicted at ground level are summarised in Table 4.

8.4.4 Discussion – SLS Conditions

The results of the analyses indicate that at the majority of CPT locations, cyclic liquefaction and cyclic softening is unlikely to occur under SLS conditions. Liquefaction is predicted in CPT04, with potentially liquefiable material identified between 6.5m and 9m depth. Although liquefaction is not expected in the remaining CPTs, some small isolated deformations are predicted in sensitive clay-like materials.

Given the depth at which liquefaction and/or cyclic softening may occur, the deformations predicted should be contained at depth and are unlikely to become manifest at the ground surface. The

⁸ Martin, G.R. et al. (1999). *Recommended procedure for implementation of DMG Special Publication 117: Guidelines for Analysing and mitigating liquefaction in California*, SCEC, University of Southern California.

magnitudes of settlements shown on Table 4 are therefore considered to satisfy the SLS differential settlement requirements in Clause B1.0.2 of MBIE compliance document B1⁹.

8.4.5 Discussion – ULS Conditions

Under design ULS conditions, liquefaction is predicted at numerous depths in each of the CPT traces. The resulting liquefaction-induced settlements range from 10mm to 200mm, with values typically in the range of 10mm to 50mm.

In some cases (such as CPT01, CPT9 and CPT12) the thickness of liquefied material is negligible and can be discounted on the grounds that deformation of these layers would be contained by the surrounding un-liquefied material. In CPT02 and CPT03 the thickness of liquefied layers is greater and could produce more significant deformations. However, the expression of liquefaction at these locations should be much reduced at the ground surface due to the depth at which liquefaction occurs (9m and 3m respectively below finished ground level).

Provided buildings on the new lots are supported on raft type foundations or specifically designed suspended timber structures, the risk of excessive or 'life-threatening' deformations as a result of liquefaction induced settlements during a ULS event is considered to be low.

8.5 Lateral Spreading

8.5.1 Background & Methodology

Liquefaction-induced lateral spreading may occur where areas of gently sloping ground or level ground adjacent to a free face are underlain by laterally extensive liquefiable soils. As the underlying soils liquefy, surficial materials stretch and displace downslope. In many cases the free face comprises a stream bank or harbour's edge.

At the subject site, the finished ground level within Stages 2R and 2T is relatively flat. These stages are also located at least 50m from the nearest free face. The risk of lateral spreading within Stages 2R and 2T is therefore considered to be low and lateral spreading calculations were not performed for these areas.

Within Stage 2Q, the ground slopes gently westward and requires an assessment of lateral spreading for sloping ground. The batter between Stage 2S and Takitimu Drive also constitutes a possible free face that must be considered.

Site specific analyses were therefore undertaken on the CPTs within Stages 2Q and 2S (CPT01, CPT02, CPT04 to CPT07, CPT09 and CPT10) using the same earthquake parameters referenced in Section 8.4.2. The Zhang method¹⁰ for gently sloping ground was used to estimate potential lateral displacements for all of the above CPTs except CPT10. Lateral displacements for CPT10 were calculated assuming a 3m high free face located 25m west of the test location.

⁹ Ministry of Building, Innovation and Employment 2011 Compliance Document for New Zealand Building Code Clause B1 Structure
¹⁰ Zhang, C.: Bobatean, B.K.: and Brackman, D.M.L. 2004. Estimation for the task of the task of the task of the task.

¹⁰ Zhang, G.; Robertson, P.K.; and Brachman, R.W.I. 2004, *Estimating Liquefaction-Induced Lateral Displacement Using the Standard Penetration Test or Cone Penetration Test* Journal of Geotechnical and Geoenvironmental Engineering, Vol. 130, No. 8, 861-871.

The results of the calculations are given in Appendix G. It should be understood that calculation of lateral spreading potential is based on empirical models derived from past international earthquake case histories and do not account for local geological and hydrogeological conditions. The magnitudes of lateral spreading given by the calculations are therefore considered to be a guide to overall risk only, rather than a quantitative measure of actual ground displacements.

8.5.2 Discussion of Results

8.5.2.1 SLS Conditions

In Stage 2S, the results from CPT10 indicate that less than 10mm of lateral ground movement should occur near the batter between the site and Takitimu Drive under SLS conditions.

The majority of CPTs within Stage 2Q are not triggered into liquefaction and experience only minor ground deformation. The results from CPT04 indicate liquefaction may occur at between 6.5m and 9.1m depth at this location. As this liquefaction is restricted to an isolated pocket at depth and does not appear to be laterally extensive, the risk of large scale lateral spreading in Stage 2Q under SLS conditions is not considered to be significant.

Based on the above, the risk of excessive lateral ground movement within the development area as a result of a SLS earthquake is considered to be acceptably low.

8.5.2.2 ULS Conditions

As discussed above in Section 8.5.1 Stages 2R and 2T comprise relatively flat ground and are considered unlikely to undergo lateral spreading in a ULS event.

In Stage 2S, the results from CPT10 indicate that a ULS event may cause up to 40mm of lateral movement within the building sites adjacent to the Takitimu Drive batter. The magnitude of displacement is expected to diminish exponentially with increasing distance from the free face. With specifically designed foundations, deformations of this kind are considered unlikely to pose a risk to life-safety, satisfying the ULS design requirements.

The calculations for ULS earthquake conditions suggest there is a potential risk of lateral spreading within Stage 2Q during a large earthquake. The results indicate that discrete layers of liquefaction may be triggered at differing depths beneath this part of the site. However, as the indicated liquefaction occurs in discrete pockets and lenses, any significant lateral spreading observed at the ground surface would need to propagate through layers and zones of non-liquefiable ground, including up to 8m depth of engineered fill within the old gully features.

The depth to significant liquefaction and lateral spreading indicated at each CPT location within Stage 2Q is in excess of 4m to 5m and often more than 9m below finished ground level. As such the development of wide-spread lateral spreading is generally considered to be unlikely.

The risk of excessive lateral ground movement within Stage 2Q is therefore considered to be acceptably low.

8.6 Building Restriction Lines

As discussed in Section 6.2, part of the site is underlain by a significant thickness of peat which was left in place in 2007-2008 where the depth of excavation was considered to be too great to be economically

viable. To protect new dwellings on lots adjacent to the peat areas, a Building Restriction Line (BRL) has been applied, as illustrated on Figure 5. This BRL has been constructed by projecting a 45° line from the base of the 'win-line' surveyed at the time of excavation.

Construction beyond the BRL may only be undertaken with specific geotechnical input from a TCC Category 1 Geo-Professional, possibly requiring ground improvement and/or piled foundations for the parts of the building beyond the BRL.

8.7 Foundation Design & Bearing Capacity

As discussed in preceding sections, the new lots may be affected by on-going creep and minor load induced settlements. These settlements may be exacerbated by possible weak horizons within the older filling (see Sections 8.1 & 8.2) and variable ground conditions where building platforms span between cut and filled ground. The site may also experience vertical and horizontal deformations as a result of seismically induced liquefaction during a ULS earthquake (Sections 8.4 & 8.5).

It is therefore recommended that buildings within Stages 2QRST and inside (i.e. east of) the BRL discussed above be supported on raft type foundations (e.g. 'rib-raft' or similar) specifically designed for an ultimate bearing capacity of 210kPa. Alternatively, dwellings may be supported on specifically designed suspended timber foundations. In this case, the foundation bearing capacity should be confirmed by a Chartered Professional Engineer (CPEng) at the design stage.

As discussed in Section 8.6, building beyond the BRL in Stages 2R and 2S may be possible but would require specific input from a TCC Category 1 Geo-Professional.

Where soft soils are encountered during routine foundation construction or inspections, undercutting and replacement of the problem soils or simple widening of building foundations may be required, necessitating the involvement of a Chartered Professional Engineer.

Foundations within a 45 degree zone of influence from pipe inverts or service trenches will require engineering design input in accordance with the specifications in the TCC Infrastructure Development Code.

As outlined in Sections 8.3 and 8.4, dwellings on the new lots may be affected by differential ground movement as a result of variable ground conditions, and/or seismic effects. While predicted settlements and lateral displacements are within allowable limits recommended by the NZ Building Code, significant localised movement cannot be ruled out, particularly during a large earthquake. In the event of such movement, the dwellings may need to be re-levelled by either injecting grout beneath raft slabs or by re-levelling the shallow piles beneath suspended timber structures. It is noted that in this case, suspended timber floors are generally the easiest and least costly foundation type to re-level.

8.7.1 Strength Reduction Factor

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

8.8 Slope Stability Considerations

The majority of new lots within Stage 2QRST are on flat or gently sloping ground that should not be directly affected by slope instability.

8.8.1 Lots Adjacent to Takitimu Drive

As shown on Figure 5, Lots 851 to 867 are located near the 3m high batter along the site's western boundary. Development on the lots adjacent to this batter is already restricted by the BRL described in Section 8.6. Where appropriate, the BRL setback distance has been increased slightly to provide additional protection to lots from possible instability of the batter (i.e. to a line projected at 1V:3H from the toe of the batter).

While development beyond the BRL is not specifically precluded, such development would need to be subject to specific geotechnical review to consider the effects of instability as well as the presence of underlying peat.

8.8.2 Debris Bunds & Channels

The natural slopes above (i.e. east of) the new lots may be affected by future instability. The slope overlooking Stage 2T in particular shows evidence of past and on-going ground movement. Groundwater has been observed seeping from the toe of this slope throughout construction works.

In addition to this, two historic landslide scars were identified by Coffey on the slope above Stage 2Q in 2013. A large 'washout' feature had also formed on the slope above Lots 837 to 839 at this time. These features were described in the Coffey memo of 13 March 2013 (reference 4 in Section 3 above).

To reduce the risk of slope debris impacting and damaging dwellings on the lots below, debris collection bunds and channels were constructed at the toe of the natural slopes. These protection measures were constructed in two stages, with the first stage completed after the 2007-2008 earthworks (Figure 3) and the second stage completed in 2013 (Figure 5). Works were also undertaken during 2013 and 2014 to modify the previously constructed bund above Stage 2T after a review by Coffey determined that the down-slope batter on this bund was too steep with regard to long term slope stability (Coffey memo dated 1 February 2013). Collection drains were installed through this bund to pipe ponded water to the development's stormwater system.

Works were also carried out in 2013 to remediate the washout above Lots 837-839. The washout was cleared of loose material and debris before being backfilled with compacted earth fill sourced from site. A rock and geotextile-lined stormwater drain was installed up-slope of the original washout to direct stormwater from the adjacent property away from the steep slope. Although this work was inspected by Coffey, no specific testing or supervision of the filling was carried out nor was any certification warranted as the works were considered to be for landscaping and visual purposes only.

Based on the February 2013 review and observations during construction of the extended bund and channel during 2012-2013, it is considered that the debris protection measures have been constructed in general accordance with the original designs. Provided the bunds and channels are maintained in their current form, the risk of debris damaging properties within the development is considered to be low.

It is noted that access will need to be maintained behind the bunds and channels to allow debris to be cleared in the event of instability. Periodic maintenance of the drain inlets behind the bund in Stage 2T may also be required to avoid ponding of water behind the bunds.

8.9 Cut, Fill & Retaining Wall Design

The majority of the subdivision lots are situated over gently sloping land and may therefore be subject to isolated cuts and fills as part of the development of individual lots. To reduce the risk of adverse effects due to load induced settlement, it is recommended that fills of more than 300mm depth (including topsoiling) require specific geotechnical input, as discussed in Section 8.3.5. The use of lightweight fill materials (e.g. pumice sand or 'polyrock') or suspended timber foundations may be appropriate to reduce fill loads if necessary.

Any retaining walls with a total retained height of more than 1.5m (including tiered walls on subject or neighbouring properties) or those supporting a building or accessway/parking area should be designed by a Chartered Professional Engineer giving consideration to toe slope gradients and crest surcharge slopes. Consideration must also be given to existing retaining walls on the subject or neighbouring properties. Filling within the zone of influence of any existing retaining wall will need specific engineering input to ensure the stability of the existing wall is not adversely affected.

It is generally advised that unsupported cut and fill batters should be graded no steeper than 1 vertical to 2.5 horizontal. Fills above an existing retaining wall on the subject or neighbouring property should not encroach within a distance equal to the height of the wall without geotechnical review. Excavation below an existing retaining wall should not encroach within a distance equal to the height of the wall without geotechnical advice.

8.10 Re-Spread Topsoil

Topsoil was re-spread across the site at the completion of earthworks development. Topsoil depths were checked across the subdivision by the drilling of boreholes following final landscaping works. The results of this investigation, which are indicative only and subject to variation at other locations, show that topsoil depths vary from 0.05 to 0.3 metres (average 0.2 metres).

Building development or future earthworks will require over-excavation of these re-spread topsoil materials to expose the natural or engineer certified earthfill subgrade, followed by the placement and compaction of further subfloor filling as required to achieve design grades.

8.11 Service Trenches

It should be noted that the backfilling and compaction of stormwater and sewer trenches on this subdivision were not inspected or tested by Coffey and these should accordingly be classified as uncertified filling for geotechnical purposes. Trench backfilling was inspected by HGCL as part of their supervision during civil construction.

As is normal on all subdivisions, building developments involving foundations within a 45 degree zone of influence from all service pipe inverts will require specific design by a Chartered Professional Engineer with a view to piling foundation loads to below that zone (as specified in the TCC Infrastructure Development Code).

8.12 Road Subgrades

It is understood that all road subgrade preparation, inspections, testing and certification was completed under the direction of HGCL.

8.13 Contractor's Work

This report has relied on the Contractor's diligence and construction observations to ensure that the works have been carried out in accordance with:

- (i) The approved Contract drawings and design details,
- (ii) The approved Contract specifications,
- (iii) Authorised Variations to (i) and (ii) during the execution of the works,
- (iv) The conditions of Resource and Earthworks Consents where applicable,
- (v) The relevant Geotechnical Investigation reports, recommendations and site instructions,

and that all as-built information and other details provided to the Client and/or Coffey Geotechnics (NZ) Limited are accurate and correct in all respects.

8.14 Suitability Statement

A copy of our suitability statement, in the form of the Tauranga City Council forms G2 and G2a are appended.

9 SUMMARY OF RECOMMENDATIONS

Based on the information contained in this report, it is considered that the geotechnical components of Stages 2QRST of the Lakes Subdivision have been completed in general accordance with accepted engineering practice and standards. From a geotechnical perspective, development on the new lots may therefore proceed, subject to the following recommendations:

- All buildings on the new lots should be supported on either raft type foundations designed for an Ultimate Bearing Capacity of 210kPa or on suspended timber foundations specifically designed for a bearing capacity to be determined by a Chartered Professional Engineer (CPEng) at design stage.
- 2. Lots 868, 869, 870, 887, 888, 889 and 890 are excluded from this GCR as they are either being monitored for on-going settlement or are currently occupied by a stormwater pond and fill stockpiles being used for Stage 3 of the development.
- Most lots in Stages 2R and 2S are affected by a Building Restriction Line or BRL due to the presence of buried peat along the subdivision's western boundary (Lots 848, 849, 850, 851, 852, 853, 854, 855, 856, 860, 861, 864, 865 & 867). Building beyond the BRL may only be undertaken subject to specific geotechnical input by a TCC Category 1 Geo-Professional.
- 4. The placement of more than 300mm thickness of additional fill on any lot (including topsoil) should be subject to geotechnical review due to the risk of inducing further settlement on the subject or neighbouring properties as outlined in Section 8.9.

- 5. All retaining walls with a total height of more than 1.5m (including tiered walls) or those supporting slopes or building/vehicle loads must be specifically designed by a Chartered Professional Engineer giving consideration to toe slope gradients and crest surcharge slopes. The design of any retaining wall or filling on any lot should also consider possible adverse effects on pre-existing retaining walls on the subject or neighbouring properties as discussed in Section 8.9.
- 6. Building development or future earthworks on the new lots will require over-excavation of the existing topsoil materials to expose the natural or engineer certified earthfill subgrade, followed by the placement and compaction of further subfloor filling as required to achieve design grades and bearing in mind the restrictions given in (6) above.
- Building developments involving foundations within a 45 degree zone of influence from all service pipe inverts will require specific design by a Chartered Professional Engineer with a view to piling foundation loads to below that zone (as specified in the TCC 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

Prepared by:

R.B. TELFORD Project Engineering Geologist

Reviewed and Authorised by:

S.V. HARGRAVES Principal Engineering Geologist TCC Category 1 Geo-Professional



Important information about your Coffey Report

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

Your report is based on project specific criteria

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

Subsurface conditions can change

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

Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from literature and external data source review, sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, owners should retain the services of Coffey through the development stage, to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

Your report will only give

preliminary recommendations

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

Your report is prepared for specific purposes and persons

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



Important information about your Coffey Report

Interpretation by other design professionals

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

Data should not be separated from the report*

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

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

Geoenvironmental concerns are not at issue

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

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

Rely on Coffey for additional assistance

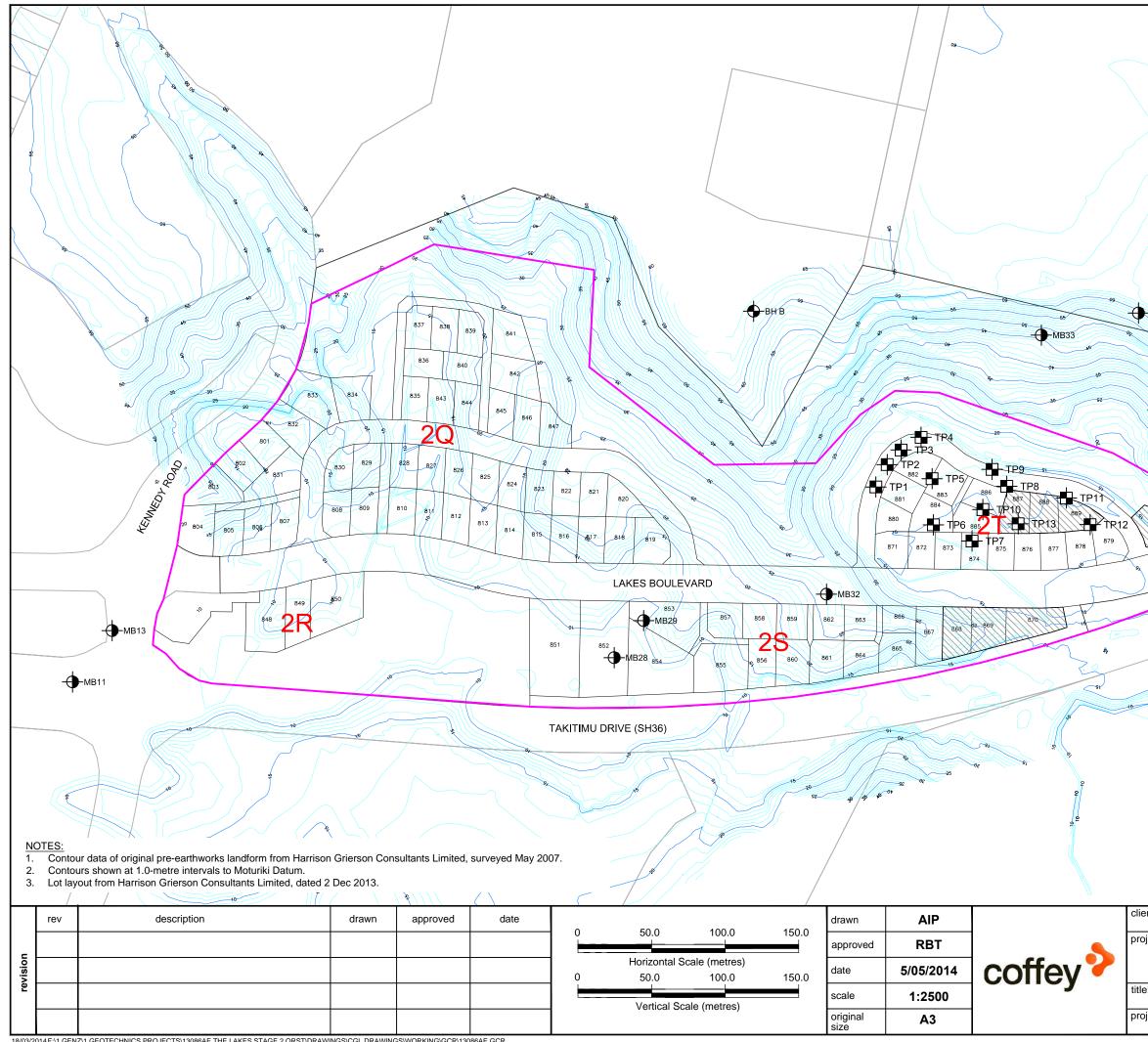
Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a project, from design to construction. It is common that not all approaches will be necessarily dealt with in your site assessment report due to concepts proposed at that time. As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

Responsibility

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

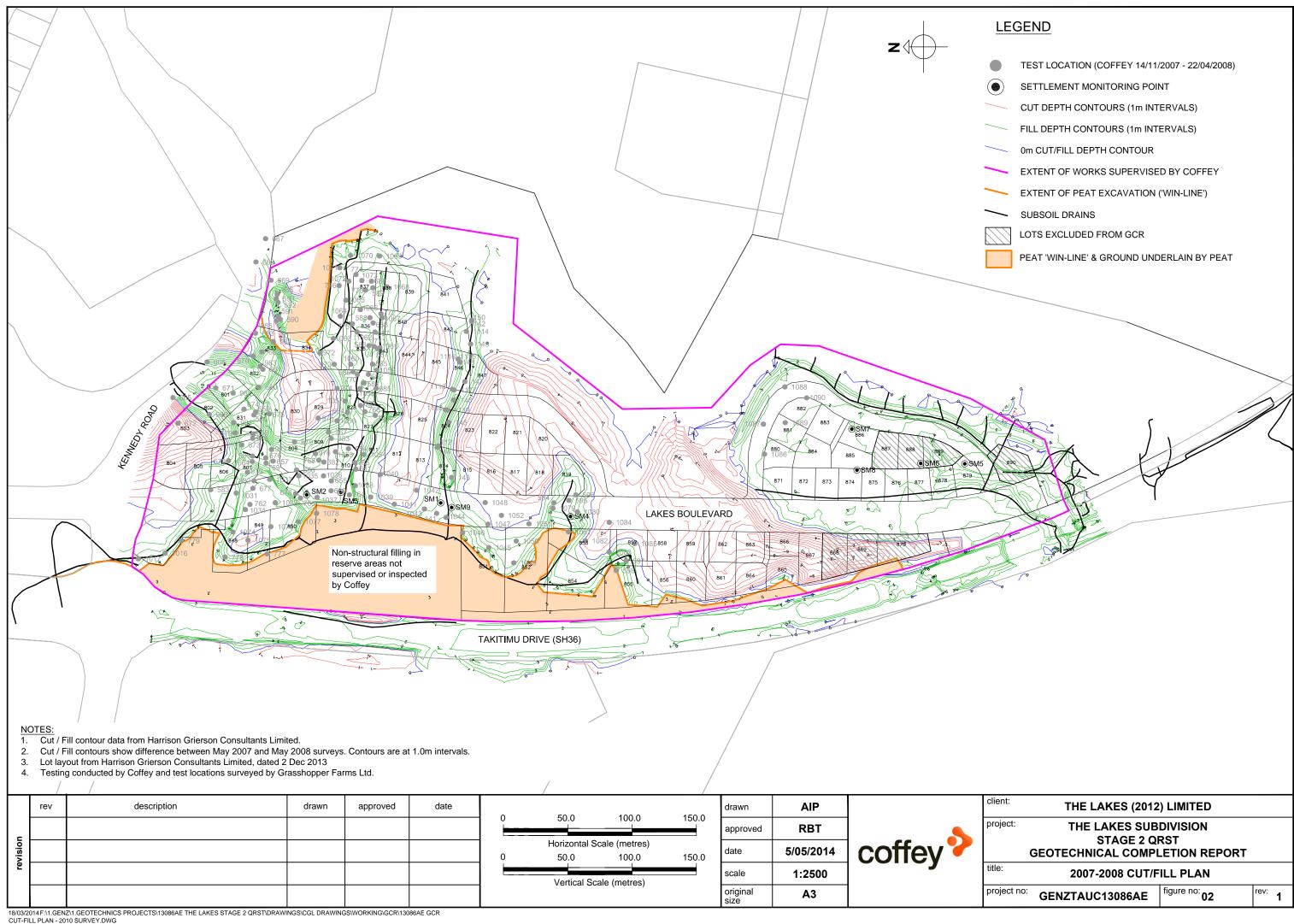
* For further information on this aspect reference should be made to "Guidelines for the Provision of Geotechnical information in Construction Contracts" published by the Institution of Engineers Australia, National headquarters, Canberra, 1987.

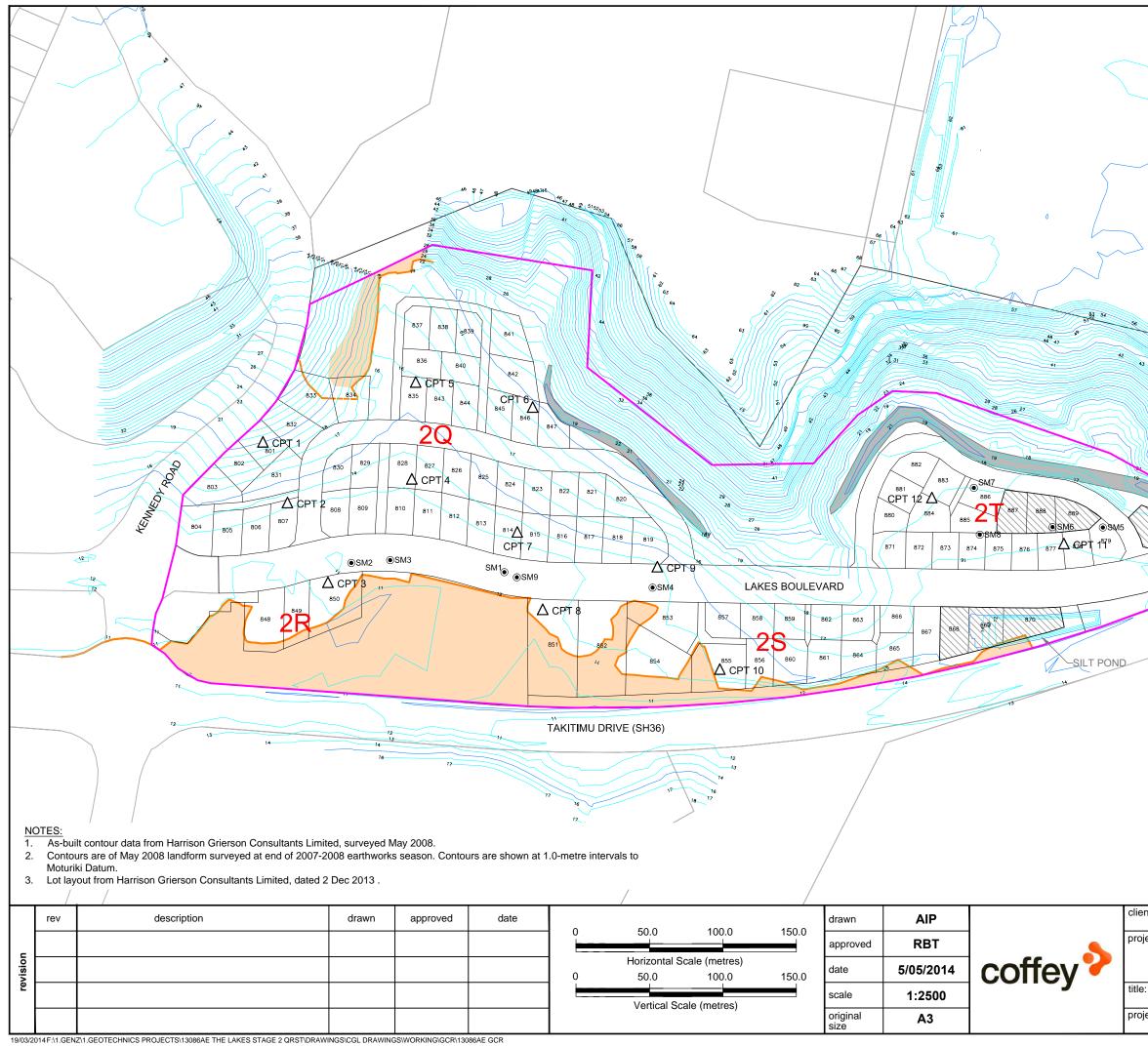
Figures



18/03/2014F:\1.GENZ\1.GENZ\1.GEOTECHNICS PROJECTS\13086AE THE LAKES STAGE 2 QRST\DRAWINGS\CGL DRAWINGS\WORKING\GCR\13086AE GCR ORIGINAL CONTOUR PLAN - 2008 SURVEY.DWG

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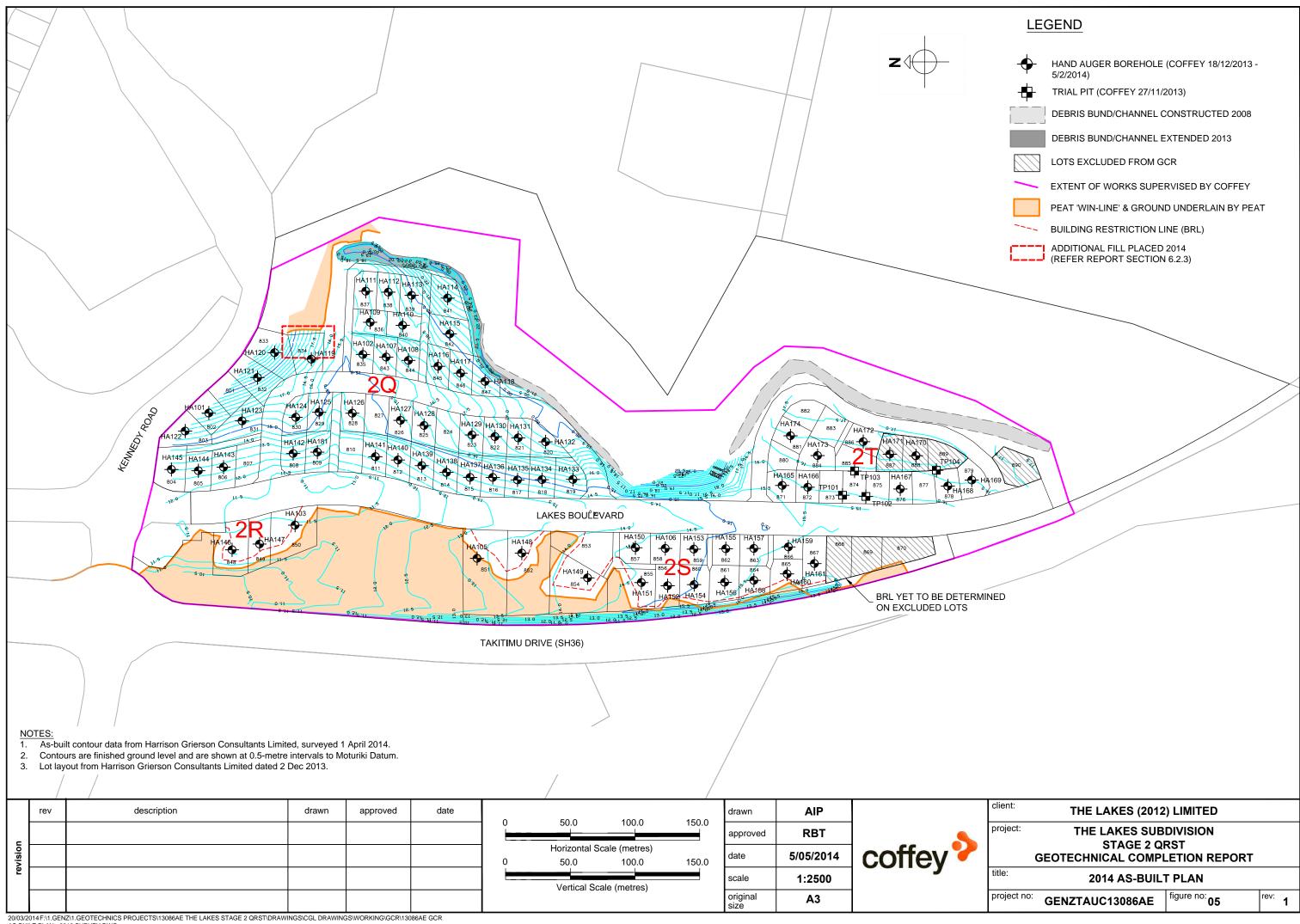


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			TAKITIMU DRIVE (SH36)				
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2. Cut	/ Fill contour data from Harrison Grierson Consultan / Fill contours show difference between May 2008 ar layout from Harrison Grierson Consultants Limited, c	nd April 2014 surveys. Contours are at 0.5m inter	rvals.				
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sion			Horizontal Scale (metres)	approved RBT date 5/05/2014	coffey	project: THE LAKES SUBDIV STAGE 2 QRS	r
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CUT-FILL PLAN - 2012 SURVEY.DWG



AS-BUILT PLAN - 2012 SURVEY.DWG

Appendix A

Geotechnical Suitability Statement

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

NAME OF SUBDIVISION	The Lakes Subdivision – Stages 2QRST
COUNCIL FILE NUMBER RC No:	RC21332
ENGINEER RESPONSIBLE FOR	Sally V. Hargraves
DEVELOPMENT	
QUALIFICATIONS:	BSc, PhD, Category 1 Geoprofessional

I, Sally Victoria Hargraves of Coffey Geotechnics Ltd, 141 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 my development evaluation report dated 5 May 2014.
- 3) In my professional opinion, not to be construed as a guarantee, I consider that;
 - a) The areas shown in my report dated 9 June 2014 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. GENZTAUC13086AE-AC (Revision 1), dated 9 June 2014.
 - b) The earth fills shown on the attached Plans ref Figure 02 & Figure 04 have been placed in accordance with the requirements of the Infrastructure Development Code.
 - c) The completed works give due regard to all land slope and foundation stability considerations.
 - d) The filled ground is suitable for the erection thereon of residential buildings requiring specific design subject to the recommendations presented in my Geotechnical Completion Report Ref. GENZTAUC13086AE-AC (Revision 1), dated 9 June 2014.
 - 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. GENZTAUC13086AE-AC (Revision 1), dated 9 June 2014.
- 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

Harg

Date: 9 June 2014



PRODUCER STATEMENT	
ITABILITY OF LAND FOR BUILDING DEVELOPM	ENT

INFRASTRUCTURE DEVELOPMENT CODE

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VERSION 1	
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DP No:	DP463737	Property Address	99 Kennedy Road, Pyes Pa	RC No:	21332
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_	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 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 Line	Design		æ	uilding Plat	lding Platfo	Soils	nt Disposa	ñ	
		at 0.5m depth	Y/N	Depth (m)	Y/N	Y/N	Depth (m)	NZS 3604:2011 Y/N/NA	Y/N/NA					form	orm		_		Comments
		1		1			1			-			1	r	1	-	1	1	
801	595	150	Y	12	Ν	N	-	Ν	Y	N	Ν	Ν	Y	N	N	N	N	Ν	
802	596	>200	Y	8	Ν	Y	3	Ν	Y	N	N	Ν	Y	N	N	N	N	N	
803	718	>200	N	-	Ν	Y	12	Ν	Y	N	N	Ν	Y	N	N	N	N	N	
804	762	>200	N	-	Ν	Y	10	Ν	Y	N	N	Ν	Y	N	N	N	N	N	Raft type foundations specifically designed for
805	617	124	Y	5	N	Y	6	Ν	Y	N	Ν	Ν	Y	N	N	N	N	Ν	Ultimate Bearing Capacity = 210kPa or suspended timber foundations specifically
806	588	200	Y	5	N	Y	3	Ν	Y	N	N	N	Y	N	N	N	N	N	designed for bearing capacity to be confirmed by CPEng at design stage.
807	591	150	Y	8	Ν	N	-	Ν	Y	N	N	Ν	Y	N	N	N	N	N	Placement of more than 300mm of additional fill on any site should be subject to specific
808	576	200	Y	10	Ν	N	-	Ν	Y	N	N	Ν	Y	N	N	N	N	N	geotechnical review.
809	585	>200	Y	9	Ν	N	-	Ν	Y	N	N	Ν	Y	N	N	N	N	N	
810	581	150	Y	11	Ν	N	-	Ν	Y	N	N	Ν	Y	N	N	N	N	N	
811	585	200	Y	8	N	N	-	Ν	Y	N	N	Ν	Y	Ν	N	N	N	N	

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DP No:	DP463737	Property Address	99 Kennedy Road, Pyes Pa	RC No:	21332
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	A		Subsurface data Shear Subdivision Natural Natural					Foundati	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 Iling	Natural Topography Unworked	Торо	tural graphy worked	Conventional Shallow Foundation to	Specific Design	iction Line	Design		æ	uilding Plat	lding Platfi	Soils	nt Disposa	ë	
		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		-		Comments
812	592	180	Y	2	Ν	Y	2	Ν	Y	N	N	Ν	Y	N	N	N	N	N	
813	597	132	Y	1	Ν	Y	2	Ν	Y	N	N	N	Y	N	N	N	N	N	
814	593	200	Y	5.5	Ν	N	-	Ν	Y	N	N	N	Y	N	N	N	N	N	
815	591	200	Y	1.5	Ν	Y	5	Ν	Y	N	N	Ν	Y	N	N	N	N	N	Defetore formulations on sifter lived size of for
816	588	200	Y	0.5	Ν	Y	6	Ν	Y	N	N	N	Y	N	N	N	N	N	Raft type foundations specifically designed for Ultimate Bearing Capacity = 210kPa or suspended timber foundations specifically
817	584	174	Y	1	Ν	Y	5	Ν	Y	N	N	Ν	Y	N	N	N	N	N	designed for bearing capacity to be confirmed by CPEng at design stage.
818	631	>200	Y	1.5	Ν	Y	5	Ν	Y	N	N	Ν	Y	N	N	N	N	N	Placement of more than 300mm of additional fill on any site should be subject to specific
819	673	200	Y	4.5	Ν	Y	2	Ν	Y	N	N	N	Y	N	N	N	N	N	geotechnical review.
820	526	200	Y	1	Ν	Y	4.5	N	Y	N	N	N	Y	N	N	N	N	N	
821	553	200	Y	1	Ν	Y	6	Ν	Y	N	N	N	Y	N	N	N	N	N	
822	553	200	Y	1.5	Ν	Y	6	Ν	Y	N	N	Ν	Y	N	N	N	N	N	

TaunanaaCity	SUMMARY OF GOTECHNICAL DATA FOR INDIVIDUAL LOTS	G3]	}
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DP No:	DP463737	Property Address	99 Kennedy Road, Pyes Pa	RC No:	21332
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	A	Subsurface data Shear Subdivision Natural Natural				Foundati	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 Iling	Natural Topography Unworked	Торо	tural graphy worked	Conventional Shallow Foundation to	Specific Design	iction Line	Design		æ	uilding Plat	lding Platfi	Soils	nt Disposa	ñ	
		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		-		Comments
823	553	200	Y	2	Ν	Y	6	Ν	Y	N	N	Ν	Y	Ν	N	N	N	N	
824	563	150	Y	5	Ν	Y	1	Ν	Y	N	N	N	Y	N	N	N	N	N	
825	570	>200	Y	1	Ν	Y	2	Ν	Y	N	N	N	Y	N	N	N	N	N	
826	564	>200	Y	5	Ν	Y	2	Ν	Y	N	N	Ν	Y	N	N	N	N	N	Defetore formulations on efficiently designed for
827	558	150	Y	6	Ν	N	-	Ν	Y	N	N	Ν	Y	N	N	N	N	N	Raft type foundations specifically designed for Ultimate Bearing Capacity = 210kPa or suspended timber foundations specifically
828	559	>200	Y	8.5	Ν	N	-	Ν	Y	N	N	Ν	Y	N	N	N	N	N	designed for bearing capacity to be confirmed by CPEng at design stage.
829	559	>200	Y	4	Ν	N	4	Ν	Y	N	N	Ν	Y	N	N	N	N	N	Placement of more than 300mm of additional fill on any site should be subject to specific
830	507	>200	Y	1	Ν	Y	4	N	Y	N	N	N	Y	N	N	N	N	N	geotechnical review.
831	811	200	Y	8	Ν	Y	4	Ν	Y	N	N	N	Y	N	N	N	N	N	
832	790	>200	Y	8	Ν	N	-	Ν	Y	N	N	Ν	Y	N	N	N	N	N	
833	992	>200	Ν	8	Ν	Y	1	Ν	Y	N	N	N	Y	N	N	N	N	N	

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DP No:	DP463737	Property Address	99 Kennedy Road, Pyes Pa	RC No:	21332
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	A	Subsurface data Shear Subdivision Natural Natura Strength Filling Topography Topogra				Foundati	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)			Natural Topography Unworked	Торо	tural graphy worked	Conventional Shallow Foundation to	Specific Design	iction Line	Design		æ	uilding Plat	lding Platfu	Soils	nt Disposa	ñ	
		at 0.5m depth	Y/N	Depth (m)	Y/N	Y/N	Depth (m)	NZS 3604:2011 Y/N/NA	Y/N/NA					form	orm		-		Comments
834	735	>200	Y	7	Ν	Y	4	Ν	Y	N	N	N	Y	N	N	N	N	N	
835	523	>200	Y	6	N	N	-	Ν	Y	N	N	N	Y	N	N	N	N	N	
836	507	109	Y	6	N	N	-	Ν	Y	N	N	N	Y	N	N	N	N	N	
837	502	200	Y	4.5	N	N	-	Ν	Y	N	N	N	Y	N	N	N	N	N	Defetore formulations on sifter lived sizes of for
838	532	192	Y	4.5	N	N	-	Ν	Y	N	N	N	Y	N	N	N	N	N	Raft type foundations specifically designed for Ultimate Bearing Capacity = 210kPa or suspended timber foundations specifically
839	511	200	Y	3.5	N	N	-	Ν	Y	N	N	N	Y	N	N	N	N	N	designed for bearing capacity to be confirmed by CPEng at design stage.
840	505	85	Y	5	N	Y	2	Ν	Y	N	N	N	Y	N	N	N	N	N	Placement of more than 300mm of additional fill on any site should be subject to specific
841	728	200	Y	1	N	N	-	N	Y	N	N	N	Y	N	N	N	N	N	geotechnical review.
842	807	200	Y	3	N	Y	3	N	Y	N	N	N	Y	N	N	N	N	N	
843	540	141	Y	6	N	N	-	N	Y	N	N	N	Y	N	N	N	N	N	
844	529	100	Y	1.5	N	Y	4	N	Y	N	N	N	Y	N	N	N	N	N	

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DP No:	DP463737	Property Address	99 Kennedy Road, Pyes Pa	RC No:	21332
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	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 Soils	On-Site Effluent Disposal	Consent Notice	
Lot No:	Area (m²)	Shear Strength (kPa)		livision Iling	Natural Topography Unworked	Торо	itural graphy worked	Conventional Shallow Foundation to	Specific Design	iction Line	Design		æ	uilding Plat	lding Platfi	Soils	nt Disposa	ë	
		at 0.5m depth	Y/N	Depth (m)	Y/N	Y/N	Depth (m)	NZS 3604:2011 Y/N/NA	Y/N/NA					form	orm		_		Comments
845	542	200	N	-	Ν	Y	4	Ν	Y	N	N	Ν	Y	Ν	N	N	N	N	
846	555	200	Y	4	Ν	у	1	Ν	Y	N	N	N	Y	N	N	N	N	N	
847	505	168	Y	7	Ν	Y	5	Ν	Y	N	N	N	Y	N	N	N	N	N	
848	1056	150	Y	10	N	Y	1	Ν	Y	Y	N	Ν	Y	N	N	N	N	N	Defetore formulations on sifter lived size of for
849	698	200	Y	5.5	N	Y	1	Ν	Y	Y	N	N	Y	N	N	N	N	N	Raft type foundations specifically designed for Ultimate Bearing Capacity = 210kPa or suspended timber foundations specifically
850	1289	150	Y	2.5	N	Y	1	Ν	Y	Y	N	Ν	Y	N	N	N	N	N	designed for bearing capacity to be confirmed by CPEng at design stage.
851	2244	150	Y	7.5	N	Ν	-	Ν	Y	Y	N	Ν	Y	N	N	N	N	N	Placement of more than 300mm of additional fill on any site should be subject to specific
852	2151	200	Y	7	Ν	N	-	Ν	Y	Y	N	N	Y	N	N	N	N	N	geotechnical review.
853	1144	>200	Y	7.5	N	Y	2.5	N	Y	Y	N	Ν	Y	N	N	N	N	N	
854	1741	200	Y	7	Ν	N	-	Ν	Y	Y	N	N	Y	N	N	N	N	N	
855	1164	200	Y	8.5	N	Y	1	N	Y	Y	N	Ν	Y	N	N	N	N	N	

TaunanaaCity	SUMMARY OF GOTECHNICAL DATA FOR INDIVIDUAL LOTS	G3		J
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DP No:	DP463737	Property Address	99 Kennedy Road, Pyes Pa	RC No:	21332
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_	Ar			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 Soils	On-Site Effluent Disposal	Consent Notice	
Lot No:	Area (m²)	Shear Strength (kPa)		livision Iling	Natural Topography Unworked	Торс	itural ography worked	Conventional Shallow Foundation to	Specific Design	iction Line	esign		U	ilding Pla	ding Platf	Soils	nt Disposi	e	
		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		al		Comments
								•											
856	619	137	Y	4.5	N	Y	3.5	Ν	Y	Y	N	N	Y	N	N	N	Ν	N	
857	563	200	Ν	-	N	Y	2	N	Y	N	N	N	Y	N	Ν	N	Ν	N	
858	552	135	Ν	-	N	Y	4.5	N	Y	N	N	N	Y	Ν	N	N	Ν	N	
859	504	131	Ν	-	N	Y	9	N	Y	N	N	N	Y	N	N	N	N	N	Raft type foundations specifically designed for
860	708	200	Y	3	N	Y	7	N	Y	Y	N	N	Y	N	N	N	Ν	N	Ultimate Bearing Capacity = 210kPa or suspended timber foundations specifically
861	640	135	Y	3	N	Y	8.5	N	Y	Y	N	N	Y	N	N	N	Ν	N	designed for bearing capacity to be confirmed by CPEng at design stage.
862	504	200	Ν	-	N	Y	7	N	Y	N	N	N	Y	N	N	N	Ν	N	Placement of more than 300mm of additional fill on any site should be subject to specific
863	525	200	Ν	-	N	Y	13	N	Y	N	N	N	Y	N	N	N	N	N	geotechnical review.
864	567	85	Y	3	N	Y	3.5	N	Y	Y	N	N	Y	N	N	N	N	N	
865	607	109	Y	5.5	N	Y	7.5	N	Y	Y	N	N	Y	N	N	N	N	N	
866	419	200	Ν	-	Ν	Y	11.5	N	Y	N	N	N	Y	N	N	N	Ν	N	

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	INFRASTRUCTURE DEVELOPMENT CODE	Julv 2011	

DP No:	DP463737	Property Address	99 Kennedy Road, Pyes Pa	RC No:	21332
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	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 Soils	On-Site Effluent Disposal	Consent Notice	
Lot No:	Area (m²)	Shear Strength (kPa)		livision Iling	Natural Topography Unworked	Торо	itural graphy worked	Conventional Shallow Foundation to	Specific Design	iction Line	Design		e	uilding Plat	lding Platfi	Soils	nt Disposa	ë	
		at 0.5m depth	Y/N	Depth (m)	Y/N	Y/N	Depth (m)	NZS 3604:2011 Y/N/NA	Y/N/NA					form	orm		_		Comments
		1		1			1							r	1	-	1	r	
867	703	>200	Y	2	Ν	Y	10	Ν	Y	Υ	Ν	Ν	Y	N	Ν	Ν	Ν	Ν	
871	543	200	Y	2	Ν	Y	2	Ν	Y	N	N	Ν	Y	N	N	N	N	N	
872	450	200	Y	2	N	Y	0.5	Ν	Y	N	N	Ν	Y	N	N	N	N	N	
873	450	150	Y	2	Ν	Ν	-	Ν	Y	N	N	Ν	Y	N	N	N	N	N	Raft type foundations specifically designed for
874	451	150	Y	2	Ν	Ν	-	Ν	Y	Ν	Ν	Ν	Y	N	N	N	N	N	Ultimate Bearing Capacity = 210kPa or suspended timber foundations specifically
875	449	150	Y	2.5	Ν	Ν	-	Ν	Y	N	N	Ν	Y	N	N	N	N	N	designed for bearing capacity to be confirmed by CPEng at design stage.
876	449	200	Y	4	Ν	Ν	-	Ν	Y	N	N	Ν	Y	N	N	N	N	N	Placement of more than 300mm of additional fill on any site should be subject to specific
877	446	150	Y	3	Ν	Ν	-	Ν	Y	Ν	Ν	Ν	Y	N	N	N	N	N	geotechnical review.
878	476	200	Y	6	Ν	Ν	-	Ν	Y	N	N	Ν	Y	N	N	N	N	N	
879	545	200	Y	6	Ν	N	-	Ν	Y	N	N	Ν	Y	N	N	N	N	N	
880	427	150	Y	2	Ν	Y	1	Ν	Y	N	N	Ν	Y	N	N	N	N	N	

TaunanaaCity	SUMMARY OF GOTECHNICAL DATA FOR INDIVIDUAL LOTS	G3		J
Tauranga City	·	VERSION 1	1	1
		Julv 2011		J

DP No:	DP463737	Property Address	99 Kennedy Road, Pyes Pa	RC No:	21332

_	Ar			Subsu	rface data			Foundati	ons	Building Restriction	S/W Specific E	S/W Soakage	S/W Reticulate	Designated Building	Minimum Buil	Compressible	On-Site Effluent	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		U		Building Platform	Soils	nt Disposal	e	
		at 0.5m depth	Y/N	Depth (m)	Y/N	Y/N	Depth (m)	NZS 3604:2011 Y/N/NA	Y/N/NA					Platform	orm		_		Comments
881	507	200	Y	2	Ν	Y	0.5	N	Y	N	N	N	Y	N	N	N	N	N	
882	478	150	Y	2	Ν	Y	0.5	Ν	Y	N	N	N	Y	N	N	N	N	N	Raft type foundations specifically designed for Ultimate Bearing Capacity = 210kPa or
883	509	150	Y	2.5	Ν	Ν	-	Ν	Y	N	N	N	Y	N	Ν	N	N	N	suspended timber foundations specifically designed for bearing capacity to be confirmed by
884	604	>200	Y	2	Ν	Y	0.5	Ν	Y	N	N	N	Y	N	Ν	N	N	N	CPEng at design stage. Placement of more than 300mm of additional fill
885	505	150	Y	3	Ν	Ν	-	Ν	Y	N	N	Ν	Y	N	Ν	N	N	Ν	on any site should be subject to specific geotechnical review.
886	492	200	Y	3	Ν	Ν	-	Ν	Y	Ν	N	N	Y	N	Ν	N	N	N	



INFRASTRUCTURE DEVELOPMENT CODE

SUMMARY OF GOTECHNICAL DATA FOR INDIVIDUAL LOTS

Appendix B

Pre-Construction Investigation Data

	SHEIMPTON & LIPIT	NSKI							Bore		No.		
Site:	Pyes Pa	a West Urbanisati	ion						Shee	et:]	0)
Job No. 16944	Date Excavated: 7	71 · 18/9/03 RL	. Gr	ound	:	r	1		Logg	jed B	sy:	M	4
	Description of Soil			Soil Symbol	Depth (m)				Undi	raine 50	d Sh (kP 10	a)	S
-SILT: Very	clayey, stightly a	chesive		x X						-			
- brown	clayey, slightly o yellow, stiff, sli	yhtly moist								1			
					0-5		-						•
				×									
			4SHES					8-0					
SAND - SH	gary pale yellar	Medjun Dense	AS	× × • •	10			100					
- sli	gary, pak yelker shtty mist.												
					1.5						$\left \right $		
- SAND : SM	gary, cream grey, ast	loose, slightly		· ·				60					
m	as 4	Dry				2	N=4	8		_			•
		Dry			2-0		M=Y			1			
				· · ·									
								00		1			
					2. 5			100					
					_								
				•••			 						
SAND: SM	gary, crean grey,	bose, Dry	へんょう					0					•
			1.	•		2	M=3	001					•
			LANIMA		3-5								
			· · ·								╞─┨		
			222										
Borcholu "	Dra		XAN										
	¥ .		V	\									
			1	. . .	4:5								
	THOD: 75mm \$			<u> , -`</u>	·								

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							Borehole	∍ No. /	MB ;	3
Site:		nisation					Sheet:	r	Of:	3
Job No. 16944	Date Excavated: アH・18/9/05	RL Grou	und:				Logged I	Ву: M4	4	
	Description of Soil		Soil Symbol Denth (m)	SPT (11)		CORE RECOVERY	Undraine	ed Shea (kPa)	ar Stre) 15(∍n
(Dry .	n Duse	·`.	1 1 3		203				
	- Dry					2001				
	-	•	く	4	N=6	6 co1				
						8001				
	Ingary, grey, Dense		· † ;	3	N=7	1008				
				5						
	Iob No. /6944	Site: Pyes Pa West Urba Nob No. /6944 Date Excavated: TH · 18/9/03 Description of Soil SAND: Sugary, (Mam grey, mediu Dry - homegenears - firm Drulling - Dry SAND: Sugary, Grey, medium De Dry homogenears grey Sand, Sand	Site: Pyes Pa West Urbanisation Job No. /6944 Date Excavated: TH · 18/9/05 RL Gro Description of Soil SAND: Sugary, crean grey, medium Dusc Dry - homogeneons - firm Drulling - Dry SAND: Sugary, grey, medium Dansc Dry - homogeneons grey Sand, Dry - homogeneons grey Sand, Dry	Site: Pyes Pa West Urbanisation Nob No. /6944 Date Excavated: TH 18/9/03 RL Ground: Description of Soil SAND: Sngary, (ream grey, medium Dase Dry - homegeneons - firm Drullung - Dry SAND: Sngary, grey, medium Dase Dry homogeneons grey Sand, Dry - Homegeneons grey Sand, Dry - Homegeneons grey Sand, Dry	Site: Pyes Pa West Urbanisation Nob No. /6944 Date Excavated: TH 18/9/05 RL Ground: Description of Soil SAND: Sugary, cream grey, medium Date Dry - homigenears - firm Drelling - Dry SAND: Sugary, grey, medium Date Dry - Songary, grey, medium Date - homigenears - firm Drelling - Dry - Homigenears - firm Drelling - Dry - Homigenears - firm Drelling - Jory - Homigenears - firm Drelling - Jory - Homigenears - firm Jeney - Jory - Homigenears - firm Jeney - Jory - Homigenears - firm Jeney - Jory - Homigenears - Jory - Jory - Homigenears - Jory - Homigenears - Jory - Homigenears - Jory - Homigenears - Jory - J	Site: Pyes Pa West Urbanisation Iob No. / (944) Date Excavated: TH 18/9/05 RL Ground: Description of Soil SAND: Sugary, cream grey, medium Date 2: 4 Dry - hemigenears - firm Drilling - Dry SAND: Sugary, grey, midium Date Dry SAND: Sugary, grey, midium Date - homigeneous grey Sand, Dry - Stand - SAND: Sugary, grey, Jenze - SAND: Sugary, grey, Jenze	Site: Pyes Pa West Urbanisation Iob No. $[l \ 9 \ 4 \ 4]$ Date Excavated: $TH \cdot 1\partial / 2/\partial S$ RL Ground: Description of Soil SAND: Sngary, cream grey, medium dust $Gry-hemigeneous$	Sheet: Pyes Pa West Urbanisation Sheet: Description of Soil Description of Soil Descript	Site: Pyes Pa West Urbanisation Sheet: U Dob No. // $\int g \psi \psi$ Date Excavated: $TH \cdot ig/g/o_S$ RL Ground: Logged By: M Description of Soil Description of Soil Dry Dry -himigeneous -himigeneous -firm Drollims Dry SAND: Singary, grey, minime David $Dryform geneous grey Sand, DryAnd: Singary, grey, grey Sand, DrySAND: Singary, grey, grey Sand, Dry$	Stee: Pyes Pa West Urbanisation Sheet: 2 Of: Logged By: M44- Description of Soil SAND: Sngary, (ream grey, medium, Jusc - hemigeneons grey San), Dry SAND: Sngary, grey Medium, Janue Dry SAND: Sngary, grey Medium, Janue SAND: Sngary Medium, Janue SAND: Sngary Medium,

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	SIRINFTON & LIFENSKI		Borehole No. MB	33
Site:	Pyes Pa West Urbanis	ation	Sheet: 3 Of:	3
10b No. 16944	Date Excavated: TH 18/9/03	RL Ground:	Logged By: M44	
	Description of Soil	Soil Symbol	Undrained Shear Str (kPa) 50 100 15	-
- sand: Sugar	ry, grey, Dase, Dry			Ĩ
), , , , , , , , , , , , , , , , , , ,	· <u>S</u>		
		45		
		<u> ~ _ </u>		
annar	19 de la desensa de la dese			
- EOB @ 10.0m	: TARPET Dyoth			
Borchole Dr	5			
	J .			
namina in the second				
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	DD: 75mm \$ MACHINE			

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Site: Pyes Pa West Urbanisation Job No. $(69(4))$ Date Excavated: TU $(3 5 03]$ RL Ground: Description of Soil Description of Soil (kPa)	Pyes Pa West Urbanisation Job No. (69(4) Date Excavated: TW 13(5)03 RL Ground: Description of Soil Image: Colspan="2">Image: Colspan="2" Image: Colspan="2		SHRIMATION & LIPINSKI						Borehole	No.	110	5
Job No. (69(4) Date Excavated: TU 13/5/03 RL Ground: Logged By: Mtt. Description of Soil	Job No. (69(4) Date Excavated: TU 13/5/03 RL Ground: Logged By: MH. Description of Soil	Site:	Pves Pa West Urbanisati	on					Sheet:	1	Of:	
TUPSOIL TUPSOIL SILT: Very clayey, moderately coheside Dark brown yellow, shiff, slightly Moist SPT 450: Very clayey, moderately Recoverer coheside Sitt Stiff, sensitive	SILT: Usy clayey, muderately cheside WW Dark bown yellow, shift, slightly X ors Muist X ors Moist X ors SPT USO: Usy clayey, muderately X ors Recovere cohesine bown yellow sult Sitt, same tive X ors Sitt, same tive X ors Sitt, same tive X ors Sitter same, staft, same tive X ors Sitter same, staft, same tive X ors Sitter same, staft, mash X ors Spr 300: Sandy pake yellow grange, Recovere Sandy pake yellow grange, sult, lase, mush	JOB NO. (6944			•				Logged E	Jy: (WH	`
TUPSOIL TUPSOIL SILT: Very clayey, moderately coheside Dark brown yellow, shiff, slightly Moist SPT 450: Very clayey, moderately RECOVERY coheside Sitt Stiff, sensitive	SILT: Using clayey, moderately cheside WW Dark brown yeldow, Shiff, Slightly X × 0.5 Muist Y Muist Y SPT USO: Usy clayey, moderately Y Recovere conversion Sum sand, Slightly cheside Some sand, Slightly cheside Y Next Y Some sand, Slightly cheside Y Next Y Next Y Next Y Novist Novist		Description of Soil	Soil Symbol	Depth (m)	SPT	GLOWNDHATER			(kPa	a)	
	Iream brown, stift (Medium. Dense, Sensitive, maist XX2-5 SPT 3JD: Sandy pale yellaw grange RECOVERT Silt, lase, maist	Mois	clayey, moderately cohesive bown yellow, shiff, slightly t very clayey, moderately cohesive brown yellow suff shiff, sensitive		1 2 1 1	1.5	SEE 83 Far	001				

SHEMPTON A LIPINSKI			•			Boreho	ole No.	M	331	Y
ite: Pyes Pa West Urba	nisation					Sheet:	l		⊃f: <u>3</u>)
	RL Ground	:.				Logged	d By:	MH	7	
Description of Soil	Soil Symbol	Depth (m)				Undrai 5((kl	hear ⊃a) 00	Strer	ngti
_ SP+ 450 Sandy Cream bown Se — RECOVERT	tt x x	\$3 — —	0							ŀ
- SAND: Vey sulty, non chesive, pa		 50		N=Z						
Cream brown, loose, sensite Dilatent	Je hit	 5-5			69					
					90					
- SPT 450 Pumice Sand, grey,, - RECOVERM	buse 1	 60 								
Fine grained pumicite (ream, firm, sensite DIdet	Je pp	— ६-५ —		NCI						
Dilatent	r P				- 90 2					
	P				80-					
- SPT USO Grey punice Sand Me. - RECOVERY Dense Crean Primicute, Den	Im PP	 - -	2							
]6	N=10						
	XX				00 %					
	BANE									
		9-0 							· 	

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	SUALMENTON & LIPINSKI						Borehol	5 110,	MC
Site:	Duce De Moet Urbenies	Han					Sheet:	3	Of
Job No. 16944	Pyes Pa West Urbanisa Date Excavated: Tu 13 5 03 RL	Ground	d:				Logged	ву: М	H
	Description of Soil	Soil Symbol	Depth (m)	SPT	GLOWNDWATER	CORE RECOVERY	Undrain 50	ed She (kPa	a)
SILT : UVY	Pumiceans clayer selt, crean Dense clayer, cream, ver E, senschire, Dulatent	× *	3 	2 4 5	SEEPACE 7 IL	1003			
	Very fire grained pumiceons self, pale grey cream, very stiff, sensitive, slightly must : fines content is low, grey, medium Dense, Very			1	S->4 N=5				
SPT 350 REGUERT	MEDIUM DEASE DEASE pumice Seni grey with yellow Gandung			ි 5 වි ව	N=16	100%			
EOB @ 12.5	m: TARGET DEPTH.								

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	SHALMPTON IS LIPPINSKI							Borehole	No.	MB	35
Site:	Pyes Pa West Urbanisati	on						Sheet:	1	Of	:3
Job No. (6944			ound	:		<u></u>		Logged E	зу: М	WA	Ballandin (1999)
	Description of Soil		Soil Symbol	Depth (m)	SPT	COMPONDINGTER	CORE RECOVERY	Undraine 50	ed Shi (kP: 10(a)	trenç 50
	TOPSOIL		W						$\prod_{i=1}^{n}$		\prod
	sulty, grey, loose	- · · · · · · · · · · · · · · · · · · ·	のでいたかでいたかい	1 S P S S S S S S		DURING HADRILLING	100 2				
	Grey pamice Sand <u>Lause</u> <u>Mediuma</u> Dense Sulty grey pumice Sand medium Dense Core in Excellent condition	ن مار مرد مرد مار	ないたいないないないないないない			N=4	1001				
SPT USO RECOVERY SAND : UU	Sulty grey pumice same medium Dense vy Sulty, Grown Grange Brey	Krrka	いるというというないのですの	<u>5</u> <u>5</u> <u>5</u> <u>5</u> <u>7</u> <u>5</u> <u>5</u> <u>7</u> <u>5</u> <u>7</u> <u>5</u> <u>7</u> <u>5</u> <u>7</u> <u>7</u> <u>5</u> <u>7</u> <u>7</u> <u>5</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u>	22	N=6	100 %				

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SPT 450 : Cream grey pumice Sand RECNERY Medium Dense pale Grown yellan 55 pale Grown yellan 55 pale Grown yellan 55 F70 50 F70 F70 F75 SPT, USO pale yellan pumice Sand F75 RECOVERY Medium, Duse				Borehole	∍ No.	MI	3 35	ŝ
Job No. 16944 Date Excavated: W. 14 5 03 RL Ground: Description of Soil SPT 450 : Cream grey partice Sand REGINERY Medium Dense Pale Grown yellow SPT. USO pare yellow punce sand SPT. USO pare yellow punce sand SAND : pumice, pale Grown yellow, medium SAND : pumice, pale Grown yellow, medium Description of Soil Description of Soil Description of Soil Set				Sheet:	U	(^{of:} 3	
SPT 450 : Cream grey pamice Sand REGUERY Medium Dense pale Grown yellow 555 pale Grown yellow 555 560 565 577, USO parte yellow pumice Sand 665 570 655 577, USO parte yellow pumice Sand 70 570 570 570 570 570 570 570		****		Logged	Ву:	W44	Land and a second s	
SPT 450 : Cream grey pumice Sand RECNERY Medium Dunse pale Grown yellow SSS SFT USO pale yellow pumice Sand RECOVERY RECOVERY RECOVERY ADD: Pumice, pale Grown yellow, medium, -	SPT		CORE RECOVERY	Undraine 50	(kF	⊃a)	Streng	3th
pale Grown yellow pale Grown yellow 55 55 55 55 55 55 55 55 55 5	333	N=6	100					
SAND: pumice, pale Grown yellaw, medium			40-503					
RECOVERY <u>Medium Duse</u> Brey Sand Dense SAND: pumice, pale Grown yellow, medium S.			308					
SPT SITS ON SAND DACKFALL DOWN TO 4.000 450 RECOVERY: Grey pamile Sand, Dense	267	N=13						

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Site: Pues Pa West Urbanisation Job No (69/44) Date Excavated: W 14/5/03 Pt. Ground: Description of Soil puestics Sand, grey, Dense SPT 450 : Grey Puent's Sard; Dense Recurrency from Seing undertaken Gree $puentice Sand, grey, densefrom Seing undertaken Gree puentice Sand, grey from Seing undertaken Gree puentice Sand, grey puentice Sand, grey from Seing undertaken Gree puentice Sand, greyfrom Seing undertaken Gree puentice Sand, greyfrom Seing undertaken Gree puentice Sand, greyfrom Seing undertaken Gree puentice Sands greyfrom Seing undertaken Gree from Seing undertak$							******		 	Boreho	le No	MB	35
Description of Soil Description of Soil pumice Sand, grey, Dense SPT 450: Grey pumice Sand; Dense Backfall primats SPT from Geing undertakin Children Dense Sands, grey Backfall primats SPT from Geing undertakin Children Dense Sands, grey Backfall primats SPT from Geing undertakin Children Dense Sands, grey Dense Sands, grey Sands San		Site:	and the film of the function of the state of		ation				 	Sheet:	3	0	f: 3
Backfall prevents SPT From being undertaken Quar Phanice Sands, grzy Junse Backfall prevents SPT From being undertaken Quar Phanice Sands, grzy Junse Backfall prevents SPT From being undertaken Quar Phanice Sands, grzy Junse Backfall prevents SPT From being undertaken Quar Backfall prevents SPT From being undertaken Quar From being u		JOB NO. (6944	Date Excavated: 😡	14/5/03	RL Gr	ound	:			Logged	By:	Mtt.	
SPT 450 : Grey pumice Sand; Dense Recovery Backfull private Sand, Dense Backfull private Sand, Dense Backfull private Sand, Dense Philos Danse Dense Backfull private Sand Dense Dense Backfull private Sand Dense De			Description of Soil			Soil Symbol	b Depth (m)	SPT			(kl	Pa)	-
			Grey pumice Grey pumice	Sand; D Sand, De	se			趨	-302 403				
	J		M: TARGET @	DEPTH		21.2	13 .2	-					

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Borehole No. MB46 Of: 4 Sheet: Site: Pyes Pa West Urbanisation Date Excavated: TH · /8/9/03 RL Ground: JOB NO. 16944 Logged By: MAA PECONEPE Undrained Shear Strength Soil Symbol Description of Soil (kPa) Depth (m) 50 100 150 TOPSOIL SILT: clayey, slightly whesive, from yellow, stiff, wast $\chi\chi$ 0-5 X ĿA Dey ŀS ROREHOLE 1003 DUNGE Х 2-0 Phoniceous sult, non chesive, cream stiff, slishtly most PP pumice Sand, pale grey, Dry 1003 SILT. Vey clayer, culisive, Duk Grown Grange, very Stiff, mast XX 3 4 1=7 રુન્ડ St.f. ×× **₩**-5 EXCAVATION METHOD: 75 MACHINE AUGER + HOLLOW 8197

Borehole No. MB 46 11111155 Of: Y Sheet: Pyes Pa West Urbanisation Site: JOB NO. 16944 Date Excavated: TH. 18/9/03 RL Ground: Logged By: MA COLE Undrained Shear Strength Soil Symbol (Depth (m) (kPa) Description of Soil 100 50 150 - SILT: Very clayey, chesine, Dark - brown ange, stiff, mast يكرير X 69 00 زيد ر 1003 3 N=5 K ЬS DQ 00 - SILT: Very clayer, slightly chesure some sand greyish cream with manyanese, stiff, most PP &-C 8 N=4 2 pp &S iii F p 40 EXCAVATION METHOD: 75mm & MACHINE AUGER + HOLLOW SPT

	SOL							Boreh	iole	No.	MB)
Site:	BUEIMPTON & LIPINSKI	- } 4!						Sheel	t:	3	Of	f: (
Job No. 16944	Pyes Pa West Urba			d:	•	,		Logge	ed B	 y:		
	Description of Soil		Soil Symbol	oDepth (m)	225		CONECUERLY	Undra	ainec	1 She (kPa 10(∋ar S a) D 1	tro 50
	very sandy, cream un Derse, slightly noist			9		N=3	00					
~~£	d cream, medium Duse Lassy Sard, cream, medium Dry	EWIMSRITE					1003					
pumice sand	n homogeneous - Irean ~ Medium Deve n Day n GLassy becoming Devel and gres	TE RANGA 16NI	·	E # #		N= 5-	803					
	grey pumice Sand Dry				2 4 4	N≊:∂	1003					
Pamice Sarr 	n han oyeneous n Gruy n Deuse n Dry N Blassy		× , , , , , , , , , , , , , , , , , , ,				60-302					

Borehole Log. MB 44 4 Of: 4 Sheet: Site: Pyes Pa West Urbanisation JOD NO. 6944 Date Excavated: TH 18 9 03 RL Ground: Logged By: m44 Undrained Shear Strength i کرن نکر کر کرد Description of Soil (kPa) E 50 100 150 - SPT: Pumice Sand, grey, Dense, Dry 12 00 ģ 5 14-9 H4-0 pumice sand; -Grey, Dense Dry 803 17 H#-S -09 pale grey |S-C SPT: Pale grey, Dense pumite Sand 4 1009 Dry 8 M=B 15-5 Homogeneas Pab grey pumier Sard, Dry Dense 00 0 3) 60 SPT: Grey Dense Pamile sind Dry 3 5 6 Mall μ**β** Pamia sand; Grey, Duse, Dry 508 Ð FOBQ 18. Om: SAND PALL BACK. EXCAVATION METHOD: 75 MMB MACHNE ANGER + HOLLOLI SPT

	U	1	7)						Tria	l Pit No.	TP01
						rial Pit			She Proi	et ect No:	1 of 1 GENZTAUC13086A
Client:	:		The	Lakes	(2012)				e started:	31.1.2008
Princip	pal:								Date	e completed:	31.1.2008
Projec			The	Lakes	Stage	e 2arst				ged by:	GW
-	oit location				-	of Lot 881			_	cked by:	RBT
-	nent type:	•	Din	onay n	or ar	Pit Orientation:	Easting: 368143	.83 m		R.L. Surface: n	
Excavat	tion dimensi	ons: m	long	m wide		Vane No: not specified	Northing: 800242	2.63 m		Datum: x/y:WB	OPC2000; RL: Məturiki
exca	vation inf	orma	tion		mate	erial substance					
stratigraphy water	notes samples tests, et		depth metres	graphic log	classification symbol	Material Descript Soil name; plasticity or grading, c components. Moisture, sensitivity, bedding, cemeritation, defects. Origin, a Rock name, grain size & type, colour minor components. Weathering, moist	olour, secondary strength. Structure, dditional observations. , fabric, inclusions &	moisture condition	consistency/ density index	25 50 vane shear 100 (remoulded 125 /peak) kPa 175	structure and additional observations
Sedimentary Deposits Colluvium 31/01/2008 ▼					SP	Sandy SILT, no plasticity, orange-brow brown,black specks; sand is fine to me SAND, fine to medium grained, cream - water seeping from side of test pit	xdium grained.	W			
			6	-		EOBH @ 5.5m, target depth Test pit TP01 terminated at 5.5 metres					-
soil d base	s, samples, t undistu undistu disturb bulk sa	ealand ests rbed sa rbed sam ed sam mple	Geotech ample 50 ample 63	nical Society mm diamete mm diamete	er	vane shear (kPa) ● remoulded × peak >>× peak greater than 200kPa UTP unable to penetrate water 10/1/98 water level on date shown → ▶→ waterinflow → wateroutflow	moisture D dry M moist W wet S saturated		cons VS S F St VSt H	istency/ density in very soft soft firm stiff very stiff hard	dex VL very loose L loose MD medium dense D dense VD very dense

C		off	E	Żγ						Trial	Pit No.	TP02
							rial Pit			Shee Proie	et ect No:	1 of 1 GENZTAUC13086AI
Clien	nt:			The	Lakes ((2012))				e started:	31.1.2008
Princ	cipa	d:			-	-				Date	e completed:	31.1.2008
Proje	ect:			The	Lakes :	Stage	2arst				ged by:	GW
-		location:				-	of Lot 881 & 882				cked by:	RBT
	_	nt type:		2	onay n		Pit Orientation:	Easting: 368163.68	3 m		R.L. Surface: m	
Excav	/atio	n dimension	s:ml	ong n	n wide		Vane No: not specified	Northing: 800235.1	13 m		Datum: x/y: WB	OPC2000; RL: Məturiki
exca	ava	ation infor	mati	on		mate	rial substance					
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	Material Descrip Soil name; plasticity or grading; components. Moisture, sensitivity bedding, cementation, defects. Origin, Rock name, grain size & type, colou minor components. Weathering, mois	colour, secondary strength. Structure, additional observations. r, fabric, inclusions &	moisture condition	consistency/ density index	25 55 vane shear 100 (remoulded 125 /peak) kPa 175	structure and additional observations
Colluvium	countered			- - 1		ML	Sandy SILT, no plasticity, creamy blac sand is fine to medium grained.		M	F	×	-
Sedimentary Deposits	groundwater not encountered			 2		SP	SAND, fine to medium grained, black SAND, fine to medium grained, crear		_	H	• × >>*	
Sedime	0,			3		SP	SAND, fine to medium grained, crear	ny speckled pale green.	-		>>×	-
				 			EOBH @ 3.0m, target depth. Test pit TP02 terminated at 3 metres.					
												- - - -
				 6								-
	etc											
soi bas	il des sed tes, s		and G ts ed san ed san sampl ole	eotechn nple 50r nple 63r e	nical Society nm diamete nm diamete	r	vane shear (kPa) ● remoulded × peak >>> peak greater than 200kPa UTP unable to penetrate water ■ 10/1/98 water level on date shown ■ waterinflow ■ wateroutflow	moisture D dry M moist W wet S saturated	Ì	consi VS F St VSt H	istency/ density in very soft soft firm stiff very stiff hard	dex VL very loose L loose MD medium dense D dense VD very dense

TRIAL PIT 13086AE GCRHAND AUGERS.GPJ COFFEY.GDT 14.4.14

C		off	E	₹	/ -					Tria	al Pit No.	
							rial Pit			She		1 of 1
	-	<u></u>		_	Lakes (ject No:	GENZTAUC13086AE 31.1.2008
Clie		_1.		me	Lanes	2012)				e started:	
	ncipa			.		0 4	0				e completed:	31.1.2008
Pro	ject:	:			Lakes S	-	-			Log	iged by:	GW
		location:		Driv	reway N	orth-	East of Lot 852			Che	ecked by:	RBT
-		nt type:					Pit Orientation:	Easting: 368170.85			R.L. Surface: n	
		on dimension ation infor		-	n wide	mate	Vane No: not specified	Northing: 800224.1	l4 m		Datum: Xy: WE	iOPC2000; RL: Moturiki
stratigraphy		notes			graphic log	classification symbol	Material Descrip Soil name; plasticity or grading, o components. Moisture, sensitivity, bedding, cementation, defects. Origin, Rock name, grain size & type, colou	colour, secondary strength. Structure, additional observations.	moisture condition	consistency/ density index	vane shear (remoulded /peak) kPa	structure and additional observations
stra	water	samples, tests, etc	RL	depth metres	grap	clas sym	minor components. Weathering, mois	ture, strength, defects.	con	con	255 50 100 175 175 175 175 175	
Colluvium	countered			- - 1_		ML	Sandy SILT, no plasticity, creamy blac sand is fine to medium grained.	k, speckled light brown;	М	F St-H	• × >>×	
ts	ot en			-		SP	SAND, fine to medium grained, black,	speckled light grey.			• ×	-
Sedimentary Deposits	groundwater not encountered			2 		ML	Sandy SILT, no plasticity, creamy stre	aked pale green.			• ×	- -
Sediı				-	$\begin{pmatrix} \times & \times & \times \\ & \times & \times & \times \\ & \times & \times & \times \\ & & \times & \times$							-
				3	(`X, X,X) X · X · X ·		EOBH @ 3.0m, target depth					
				4 			Test pit TP03 terminated at 3 metres.					- - - - - - - - - - - - - - - - - - -
				-								-
	keto			6								
s b	oil de ased otes, ⁵⁰ ⁶³ s		and G ts ed sar ed sar samp ole	Beotechr nple 50i nple 63i le	nical Society mm diameter mm diameter	r	vane shear (kPa) ● remoulded × peak >>× peak greater than 200kPa UTP unable to penetrate water	moisture D dry M moist W wet S saturated		Cons VS S F St VSt H	sistency/ density ir very soft soft firm stiff t very stiff hard	idex VL very loose L loose MD medium dense D dense VD very dense

TRIAL PIT 13086AE GCRHAND AUGERS.GPJ COFFEY.GDT 14.4.14

	ハ	off	t	ŻY	-					Tria	al Pit No.	TP04
							rial Pit			She Proj	eet ject No:	1 of 1 GENZTAUC13086AE
Clie	nt:			The	Lakes	(2012)			Date	e started:	31.1.2008
Prin	icipa	al:								Date	e completed:	31.1.2008
Proj	ject:			The	Lakes	Stage	e 2qrst			Log	iged by:	GW
Tria	ıl pit	location:		Driv	ewav E	ast o	f Lot 852			Che	ecked by:	RBT
		nt type:					Pit Orientation:	Easting: 368173.8	5 m		R.L. Surface: m	
Exca	avatio	on dimension:	s: ml	ong n	n wide		Vane No: not specified	Northing: 800224.	14 m		Datum: x/y:WB	OPC2000; RL: Moturiki
ex	cava	ation infor	mati	on			erial substance					
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	Material Descrip Soil name; plasticity or grading, components. Moisture, sensitivity, bedding, cementation, defects. Origin, Rock name, grain size & type, colou minor components. Weathering, mois	colour, secondary strength. Structure, additional observations. r, fabric, inclusions &	moisture condition	consistency/ density index	25 50 105 (remoulded 125 (peak) kPa 175	structure and additional observations
Colluvium	red			-		SP	SAND, fine to medium grained, black grey.	creamy speckled light	М			- -
ts	sncounte			<u>1</u> -		SM	Silty SAND, fine to medium grained, t with wood inclusions.	black speckled, creamy,				-
/ Deposi	groundwater not encountered			-			- becoming creamy pale green					-
Sedimentary Deposits	groundw			2 - - -		SP	SAND, fine to medium grained, crean	ny speckled green.	_			
				3			EOBH @ 3.0m, targt depth.					
				-			Test pit TP04 terminated at 3 metres.					-
				<u>4</u> -								-
				5								- - -
				-								-
				6								_
S	ketc	h										
s b	oil de ased otes, :	fication symb scription on New Zeal samples, test undisturbe undisturbe	and G	eotechr			vane shear (kPa) ● remoulded >> peak >>> peak greater than 200kPa UTP unable to penetrate	moisture D dry M moist		cons VS S	sistency/ density in very soft soft firm	dex VL very loose L loose MD medium dense

C	7	off	E	ŻY	-					Tria	al Pit No.	TP05
				-			rial Pit			She Proi	et ject No:	1 of 1 GENZTAUC13086AE
Clie	ent:			The	Lakes (2012)				e started:	31.1.2008
Prir	ncipa	al:				-				Dat	e completed:	31.1.2008
	ject:			The	Lakes :	Stage	2arst				Iged by:	GW
	-	t location:				-	882 & Lot 883			-	ecked by:	RBT
	-	nt type:		Dou			Pit Orientation:	Easting: 368154.5	51 m		R.L. Surface:	
-	-	on dimension:	s: ml	ong r	n wide		Vane No: not specified	Northing: 800205.	31 m		Datum: x/y: WI	BOPC2000; RL: Moturiki
ex	cav	ation infor	mati	on		mate	rial substance					
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	Material Descrip Soil name; plasticity or grading, o components. Moisture, sensitivity, bedding, cementation, defects. Origin, Rock name, grain size & type, colou minor components. Weathering, mois	colour, secondary strength. Structure, additional observations. r, fabric, inclusions &	moisture condition	consistency/ density index	25 50 vane shear 75 vane shear 120 (remoulded 120 /peak) kPa 175	structure and additional observations
с С	ered			-		SP	SAND, fine to medium grained, black		М			-
Deposits P	groundwater not encountered					SP	PEAT, Organic SILT, dark brown, moi SAND, fine to medium grained, black brown, with trace silt.					
Sedimentary Deposits	groundwa			2		SP	SAND, fine to medium grained, cream	y speckled pale green.	_			
				3			EOBH @ 3.0m, target depth P=Peat C=Colluvium					
					-		Test pit TP05 terminated at 3 metres.					
				5	-							- - -
				6	-							
S	keto	ch										
		fication symb	ols an	d			vane shear (kPa)		1			
b n U	otes, ⁵⁰ s		ts ed san ed san sampl ple	nple 50r nple 63r le	nical Society mm diamete mm diamete	r	 remoulded peak peak greater than 200kPa UTP unable to penetrate water 10/1/98 water level on date shown waterinflow waterinflow 	moisture D dry M moist W wet S saturated		cons VS S F St VSt H	sistency/ density in very soft soft firm stiff very stiff hard	ndex VL very loose L loose MD medium dense D dense VD very dense

C	5	of	E	ŻY	-					Tria	al Pit No.	TP 06
							rial Pit			She Pro	et ject No:	1 of 1 GENZTAUC13086AE
Clie	ent:			The	Lakes ((2012))				e started:	31.1.2008
Pri	ncipa	al:								Dat	e completed:	31.1.2008
Pro	oject:	:		The	Lakes S	Stage	2qrst			Log	iged by:	GW
Tria	al pit	t location:		Lot	884					Che	ecked by:	RBT
	-	ent type:					Pit Orientation:	Easting: 368117.9	99 m		R.L. Surface: n	
Exc	avatio	on dimension	s:ml	ong n	n wide		Vane No: not specified	Northing: 800200.	.15 m		Datum: x/y: WE	OPC2000; RL: Məturiki
ex	cav	ation info	mati	on			rial substance				L 77 -	
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	Material Descrip Soil name; plasticity or grading, c components. Moisture, sensitivity, bedding, cementation, defects. Origin, a Rock name, grain size & type, colou minor components. Weathering, mois	olour, secondary strength. Structure, additional observations. ; fabric, inclusions &	moisture condition	consistency/ density index	25 50 vane shear 75 (remoulded 125 /peak) kPa 175	structure and additional observations
υ				-		SP	SAND, fine to medium grained, black	creamy speckled grey.	М			_
Sedimentary Deposits	groundwater not encountered			1 2 3	x x x x x x x x x x x x x x x x x x x	ML SP SP	SILT, no plasticity, light grey, creamy, SAND, fine to medium grained, black green/grey, with some wood. SAND, fine to medium grained, cream EOBH @ 3.3m, target depth C=Colluvium Test pit TP06 terminated at 3.3 metree	creamy speckled pale y speckled green.	_			- - - - - - - - - - - - - - - - - - -
				4 5 								- - - - - - - - - - - - - - - - - - -
	6keta											
ייי וו נ	otes, J ₅₀ J ₅₀ J ₅₃ Ss		land G ts ed san ed san sampl ple	nple 50r nple 63r	nical Society nm diamete nm diamete	r	vane shear (kPa) • remoulded × peak >>> peak greater than 200kPa UTP unable to penetrate water ↓ 10/1/98 water level on date shown ▶ waterinflow wateroutflow	moisture D dry M moist W wet S saturated		con VS S F St VS	soft firm stiff	dex VL very loose L loose MD medium dense D dense VD very dense

(off	Ē	2	, 💙					Tria	I Pit No.	
							rial Pit			She		TP07 1 of 1
		ginice	/ .								ject No:	GENZTAUC13086AE
Cli	ent:			The	Lakes (2012				Dat	e started:	31.1.2008
Pri	ncipa	al:								Date	e completed:	31.1.2008
Pro	oject:	:		The	Lakes \$	Stage	2qrst			Log	ged by:	GW
Tri	al pit	location:		Lot	874					Che	ecked by:	RBT
Equ	ipme	nt type:					Pit Orientation:	Easting: 368118.1	6 m		R.L. Surface:	m
_		on dimension ation info		-	n wide	mato	Vane No: not specified rial substance	Northing: 800179.	32 m		Datum: x/y:W	BOPC2000; RL: Moturiki
	Lav		mau				Material Descript	ion		. ×	ਬ ਕ ਕ	
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	Soil name; plasticity or grading, c components. Moisture, sensitivity, bedding, cementation, defects. Origin, a Rock name, grain size & type, colour minor components. Weathering, moist	olour, secondary strength. Structure, dditional observations. , fabric, inclusions &	moisture condition	consistency/ density index	 25 50 50 vane shear 100 (remoulded 150 /peak) kPa 175 	structure and additional observations
υ				-		SP	SAND, fine to medium grained, black	creamy speckled grey.	М			-
posits				<u>1</u>		SM	Silty SAND, fine to medium grained, b grey/brown, with abundant wood inclu					-
Sedimentary Deposits	31/01/2008			2			- water seeping in site					
Sec	31/0			3	× × × × × × < × ×	SM	Silty SAND, fine to medium grained, c	eamy speckled green.				-
				-	-		EOBH @ 3.0m, target depth C=Colluvium Test pit TP07 terminated at 3 metres.					-
				4	-							-
				<u>5</u>	-							-
				- - 6	-							-
ę	Sketo	ch	I									
ייייייייייייייייייייייייייייייייייייי	otes, J ₅₀ J ₆₃ S		land G ts ed san ed san sampl ple	eotechr nple 50r nple 63r le	nical Society nm diamete nm diamete	r	vane shear (kPa) remoulded	moisture D dry M moist W wet S saturated		cons VS S F St VSt H	sistency/ density very soft soft firm stiff very stiff hard	index VL very loose L loose MD medium dense D dense VD very dense

U		off	E	₹y						Tria	l Pit No.	TP08
							rial Pit			She	et ect No:	1 of 1 GENZTAUC13086AE
Clien	nt:			The	Lakes (2012)				e started:	31.1.2008
Princ	cipa	d:			-	-				Date	e completed:	31.1.2008
Proje	-			The	Lakes S	Stage	2 arst				ged by:	GW
-		location:				-	East of Lot 886			-	cked by:	RBT
		nt type:					Pit Orientation:	Easting: 368147.9	94 m		R.L. Surface: m	
Excav	vatio	n dimension	s: ml	ong n	n wide		Vane No: not specified	Northing: 800157	.58 m		Datum: x/y:WB	OPC2000; RL: Moturiki
exc	ava	ation info	rmati	on		mate	rial substance					
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	Material Descript Soil name; plasticity or grading, o components. Moisture, sensitivity, bedding, cementation, defects. Origin, a Rock name, grain size & type, colou minor components. Weathering, moist	olour, secondary strength. Structure, additional observations. ; fabric, inclusions &	moisture condition	consistency/ density index	25 55 vane shear 100 (remoulded 125 /peak) kPa 175	structure and additional observations
Colluvium				- - 1_		SP	SAND, fine to medium grained, black with trace silt.	cream speckled grey,	М			-
Peat					Х Х Х Х Х Х Х Х Х Х Х Х Х Х Х Х Х Х Х	OL	PEAT, Organic SILT, no plasticity, fibrabundant organic inclusions.	ous, black, with				- - -
SD				3	<u>*</u> * *	SP	- water seeping in from the side of test SAND, fine to medium grained, black, grey/brown. EOBH @ 3.0m, target depth SD=Sedimentary Deposits Test pit TP08 terminated at 3 metres.					
				4 			rest pit in oo terminated at 5 metres.					- - - - - - - -
				- - - 6								
so i ba	il de ised tes, s		land G ts ed san ed san sampl ple	eotechn nple 50r nple 63r e	nical Society nm diamete nm diamete	r	vane shear (kPa) ● remoulded × peak >>× peak greater than 200kPa UTP unable to penetrate water ✓ ✓ 10/1/98 water level on date shown ✓ waterinflow ✓ wateroutflow	moisture D dry M moist W wet S saturated		cons VS S F St VSt H	istency/ density in very soft soft firm stiff very stiff hard	dex VL very loose L loose MD medium dense D dense VD very dense

	off	C	7 y						Tria	l Pit No.	TP09
Eng	ginee	eri	ng	Log	- T	rial Pit			She Pro	et ject No:	1 of 1 GENZTAUC13086A
Client:			The	Lakes ((2012)			Dat	e started:	31.1.2008
Princip	al:								Dat	e completed:	31.1.2008
Project	-		The	Lakes S	Stage	2qrst			Log	ged by:	GW
-	t location:				-	f Lot 886			-	ecked by:	RBT
Equipme						Pit Orientation:	Easting: 368159.	11 m	0	R.L. Surface: r	
Excavati	on dimension	s: mlo	ong n	n wide		Vane No: not specified	Northing: 800167	'.7 m		Datum: x/y: WI	90PC2000; RL: Moturiki
excav	ation info	rmati	on		mate	rial substance					
stratigraphy water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	Material Descript Soil name; plasticity or grading, c components. Moisture, sensitivity, bedding, cementation, defects. Origin, a Rock name, grain size & type, colour minor components. Weathering, moist	olour, secondary strength. Structure, dditional observations. , fabric, inclusions &	moisture condition	consistency/ density index	25 50 vane shear 76 (remoulded 125 /peak) kPa 175	structure and additional observations
Colluvium					SP	SAND, fine to medium grained, black o brown/grey, trace silt.		M			-
			<u>1</u> - - -	ж ж ж ж ж ж ж к к к к к к к к к к к к к	OL	PEAT, Organic Sandy SILT, no plastic with abundant rootlets & wood.	ty, dark brown/black				-
Peat			2 [_]	×××× ×××××× ××××××××××××××××××××××××××							-
31/01/2008 ▼			3_	<u>*</u> * * **	SP	- water seeping out of wall SAND, fine to medium grained, cream	y speckled pale green.	W			
31			 4	-		EOBH @ 3.3m, target depth SD=Sedimentary Deposits Test pit TP09 terminated at 3.3 metres					-
				-							
			- - 6	-							
Sket											
soil d based		land G ts ed sam ed sam sampl ple	eotechr nple 50r nple 63r e	nical Society nm diamete nm diamete	r	vane shear (kPa) • remoulded × peak >>> peak greater than 200kPa UTP unable to penetrate water ✓ 10/1/98 water level on date shown ▶ waterinflow ✓ wateroutflow	moisture D dry M moist W wet S saturated		cons VS S F St VSt H	sistency/ density ir very soft soft firm stiff very stiff hard	ndex VL very loose L loose MD medium dense D dense VD very dense

(2	off	Fe	21	, 🤊							
											I Pit No.	TP10
E	n	ginee	eri	ng	Log	- 1	rial Pit			She Proj	et ect No:	1 of 1 GENZTAUC13086AE
Clie	ent:			The	Lakes	(2012))			Date	e started:	31.1.2008
Pri	ncip	al:								Date	e completed:	31.1.2008
Pro	oject	:		The	Lakes	Stage	2qrst			Log	ged by:	GW
Tria	al pi	t location:		Bou	ndary o	of Lot	885 & Lot 886			Che	cked by:	RBT
Equ	iipme	ent type:					Pit Orientation:	Easting: 368140.74	4 m		R.L. Surface: m	
_		on dimension ation info			n wide	mate	Vane No: not specified rial substance	Northing: 800171.	77 m		Datum: x/y:WB	OPC2000; RL: Moturiki
	Cav						Material Descrip	tion		~ ×	ed ed	
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	Soil name; plasticity or grading, components. Moisture, sensitivity, bedding, cementation, defects. Origin, Rock name, grain size & type, colou minor components. Weathering, mois	colour, secondary strength. Structure, additional observations. r, fabric, inclusions &	moisture condition	consistency/ density index	25 50 vane shear 100 (remoulded 125 /peak) kPa 175	structure and additional observations
Colluvium				- - 1_ - -		SP	SAND, fine to medium grained, black brown/grey, with trace silt.	speckled light	M			- - - - - - -
SD	-			2 		SP	SAND, fine to medium grained, black	speckled creamy grey.				-
				3			EOBH @ 2.5m, target depth SD=Sedimentary Deposits Test pit TP10 terminated at 2.5 metres	5.				
				4 <u></u>								
				5								-
				6								-
ייייייייייייייייייייייייייייייייייייי	otes, J ₅₀ J ₆₃ Ss		iland G its ied sar ied sar samp ple	ieotechr nple 50r nple 63r le	nical Society nm diamete nm diamete	r	vane shear (kPa) remoulded × peak >>× peak greater than 200kPa UTP unable to penetrate water ↓ 10/1/98 water level on date shown waterinflow wateroutflow	moisture D dry M moist W wet S saturated		cons VS S F St VSt H	istency/ density in very soft soft firm stiff very stiff hard	dex VL very loose L loose MD medium dense D dense VD very dense

		off														
(OII	E	}	-					Tria	I Pit N	NO.		TP1	1	
E	ng	ginee	eri I	ng	Log	- T	rial Pit			She				1 CEN	of 1 ZTAUC13	
	ent:	-			Lakes						ect No			<u>31.1.</u>		JOUAL
	ncipa	al:				,						pletec	1:	31.1.		
	oject:			The	Lakes	Stage	2arst				ged b	-		GW		
	-	location:				_	ry of Lot 889				cked			RBT		
	-	nt type:					Pit Orientation:	Easting: 368139.7	76 m			Surface	∌ ; m			
		on dimension		<u> </u>	n wide		Vane No: not specified	Northing: 800117	.39 m		Datu	m:x⁄y:	WBOP	C2000; RL:	Moturiki	
ex	cav	ation infor	mati	on			rial substance				<u>⊢</u> 7	7 m				
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	Material Description Soil name; plasticity or grading, colo components. Moisture, sensitivity, stre bedding, cementation, defects. Origin, addi Rock name, grain size & type, colour, fal minor components. Weathering, moisture,	ır, secondary ngth. Structure, ional observations. oric, inclusions &	moisture condition	consistency/ density index	25 50 vane shea 400 (mmouldo	125 /peak) kPa 150 /peak) kPa			icture and al observations	
υ				-		SP	SAND, fine to medium grained, creamy sp	eckled grey.	М							_
	_					SM	Silty SAND, fine to medium grained, black light brown, with abundant wood.	k creamy speckled								
SD				2 		SP	SAND, fine to medium grained, black crea	amy speckled light								
	/2008			<u>3</u>	× ×	SM	- water seeping in Silty SAND, fine to medium grained, crea	my speckled pale	W							-
	31/01						green. EOBH @ 3.3m, target depth C=Colluvium SD=Sedimentary Deposits Test pit TP11 terminated at 3.3 metres.									-
				<u>5</u>	-											
				-	-											-
				6	-											_
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	notes, J ₅₀ J ₅₃ J ₅₃ J ₅₃ J ₅₃		land G ts ed san ed san sampl ple	nple 50 nple 63 nple 63	nical Society mm diamete mm diamete	r	vane shear (kPa) ● remoulded × peak >>× peak greater than 200kPa UTP unable to penetrate water 10/1/98 water level on date shown ▶ waterinflow ✓ wateroutflow	moisture D dry M moist W wet S saturated		cons VS S F St VSt H	s f S	/ densi very sof soft irm stiff very stif hard		VL L MD D VD	very loose loose medium dens dense very dense	se

(2	off	F)	, 🤊							
											I Pit No.	TP12
E	n	ginee	eri	ng	Log	- 1	rial Pit			She Proj	et ect No:	1 of 1 GENZTAUC13086AE
Clie	ent:			The	Lakes ((2012))			Date	e started:	31.1.2008
Pri	ncip	al:								Date	e completed:	31.1.2008
Pro	oject	:		The	Lakes	Stage	2qrst			Log	ged by:	GW
Tria	al pi	t location:		Sou	th-Wes	t Cori	ner of Lot 889			Che	cked by:	RBT
Equ	iipme	ent type:					Pit Orientation:	Easting: 368121.6	m		R.L. Surface: r	n
		on dimension		-	n wide	moto	Vane No: not specified	Northing: 800100.9	91 m		Datum: x/y: Wi	30PC2000; RL: Moturiki
	cav	ation info	mati				Material Descript	ion		. ×	ਬ ਉਹ	
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	Soil name; plasticity or grading, c components. Moisture, sensitivity, y bedding, cementation, defects. Origin, a Rock name, grain size & type, colour minor components. Weathering, moist	olour, secondary strength. Structure, dditional observations. fabric. inclusions &	moisture condition	consistency/ density index	 25 25 26 27 27 28 29 27 26 27 27 28 29 25 26 27 26 27 26 27 26 27 26 26 27 26 26 27 26 27 26 27 26 2	structure and additional observations
Colluvium				- - - 1_ -	* * * * *	SP	SAND, fine to medium grained, cream		М			- - - - -
SD				2 		ML	SILT, no plasticity, light brown. creamy trace fine sand.	, with abundant wood &		-		- - - - - - - - - - - - - -
	31/01/2008			3_		SM	- water seeping into test pit Silty SAND, fine to medium grained, cr green.	eamy speckled pale	W			-
				4 <u></u>	-		EOBH @ 3.3m, target depth. Test pit TP12 terminated at 3.3 metres					
				5 <u>-</u>	-							-
				6	-							-
ייייייייייייייייייייייייייייייייייייי	otes, J ₅₀ J ₆₃ Ss		land G ts ed sar ed sar samp ple	Beotechr nple 50i nple 63i le	nical Society nm diamete nm diamete	r	vane shear (kPa) ● remoulded × peak >>× peak greater than 200kPa UTP unable to penetrate water 10/1/98 water level on date shown ▶ waterinflow ✓ wateroutflow	moisture D dry M moist W wet S saturated		cons VS S F St VSt H	istency/ density in very soft soft firm stiff very stiff hard	ndex VL very loose L loose MD medium dense D dense VD very dense

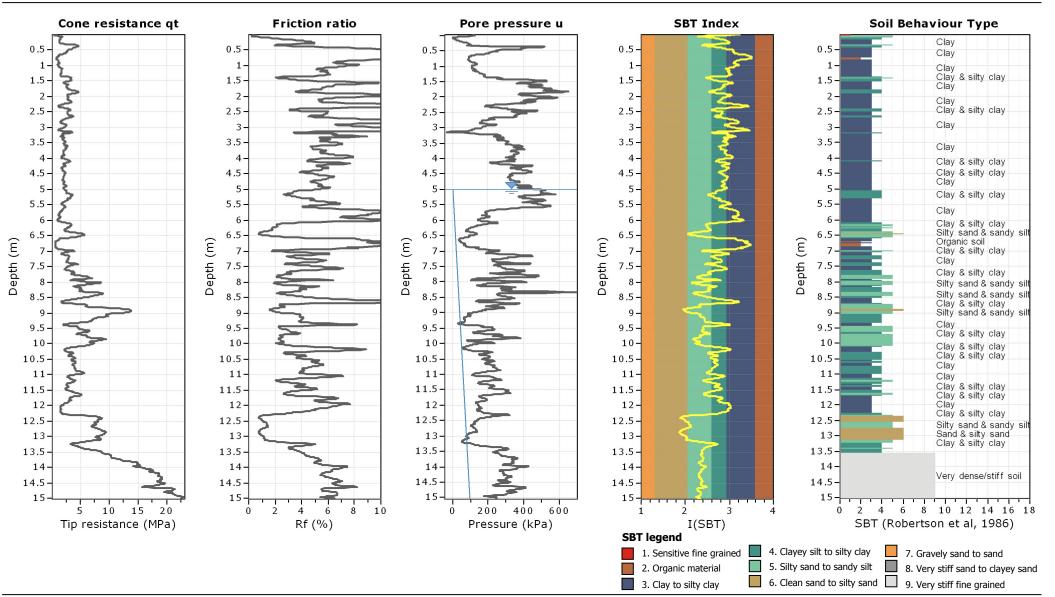
	off	C	7 y						Tria	I Pit No.	TP13
						rial Pit			She Pro	et ject No:	1 of 1 GENZTAUC13086AB
Client:			The	Lakes (2012)				e started:	31.1.2008
Princip	pal:								Date	e completed:	31.1.2008
Project			The	Lakes S	Stage	2arst				ged by:	GW
-			Lot			-4.01			-		RBT
	it location: ent type:		LOU	007		Pit Orientation:	Easting: 368136.6	30 m	Che	R.L. Surface: m	
	ion dimension	s ml	ona n	ı wide		Vane No: not specified	Northing: 800145				OPC2000; RL: Məturiki
	vation infor		-		mate	erial substance	Northing. 000110	.01111		Dutam: xy. WD	
stratigraphy water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	Material Descri Soil name; plasticity or grading, components. Moisture, sensitivity bedding, cementation, defects. Origin Rock name, grain size & type, colo minor components. Weathering, moi	, colour, secondary /, strength. Structure, , additional observations. ur, fabric, inclusions &	moisture condition	consistency/ density index	25 50 vane shear 100 (remoulded 125 (peak) kPa 175	structure and additional observations
SD Colluvium 31/01/2008 ▼					SM SP SM	Silty SAND, fine to medium grained, light brown. SAND, fine to medium grained, black - water seeping into test pit Silty SAND, fine to medium grained, green. EOBH @ 2.5m, target depth SD=Sedimentary Deposits Test pit TP13 terminated at 2.5 metro	< speckled grey. creamy speckled pale	M W			- - - - - - - - - - - - - - - - - - -
Sket	tch		6								
soil d based		and G ts ed sam ed sam sampl ole	eotechn nple 50n nple 63n e	ical Society nm diameter nm diameter	r	vane shear (kPa) ● remoulded × peak >>× peak greater than 200kPa UTP unable to penetrate water ↓ 10/1/98 water level on date shown ► waterinflow	moisture D dry M moist W wet S saturated		cons VS S F St VSt H	sistency/ density in very soft soft firm stiff very stiff hard	dex VL very loose L loose MD medium dense D dense VD very dense

Coffey Geotechnics (NZ) Ltd

141 Cameron Road, Tauranga PO Box 13145 3141

Project: The Lakes Tauranga

Location: Tauranga



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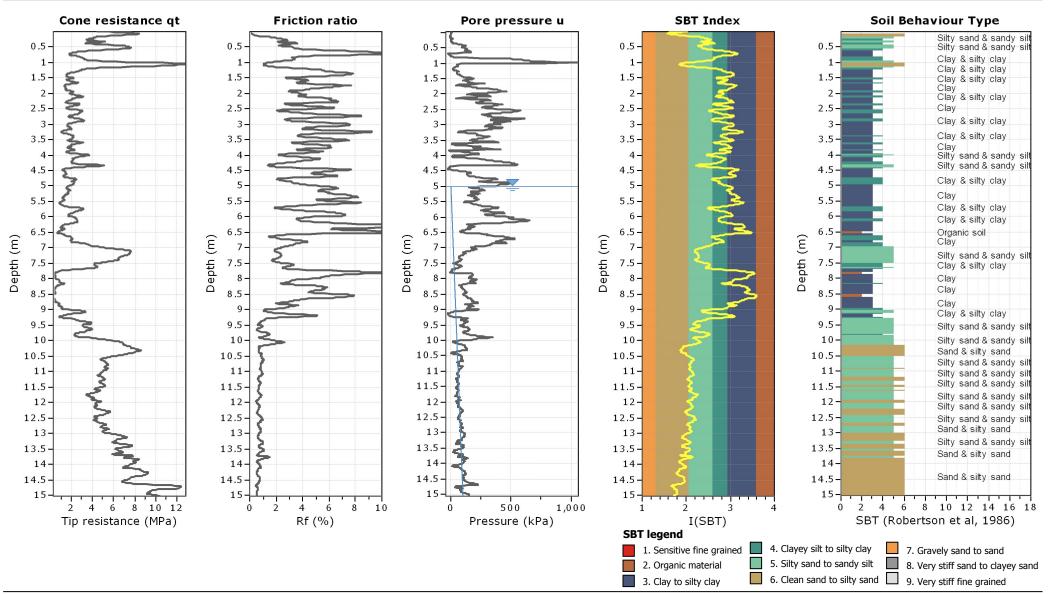
CPT: CPT-01

Total depth: 15.02 m, Date: 28/11/2012 Surface Elevation: 0.00 m Coords: X:0.00, Y:0.00 Cone Type: 50 MPa piezocone Cone Operator: TP & MU

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Project: The Lakes Tauranga

Location: Tauranga



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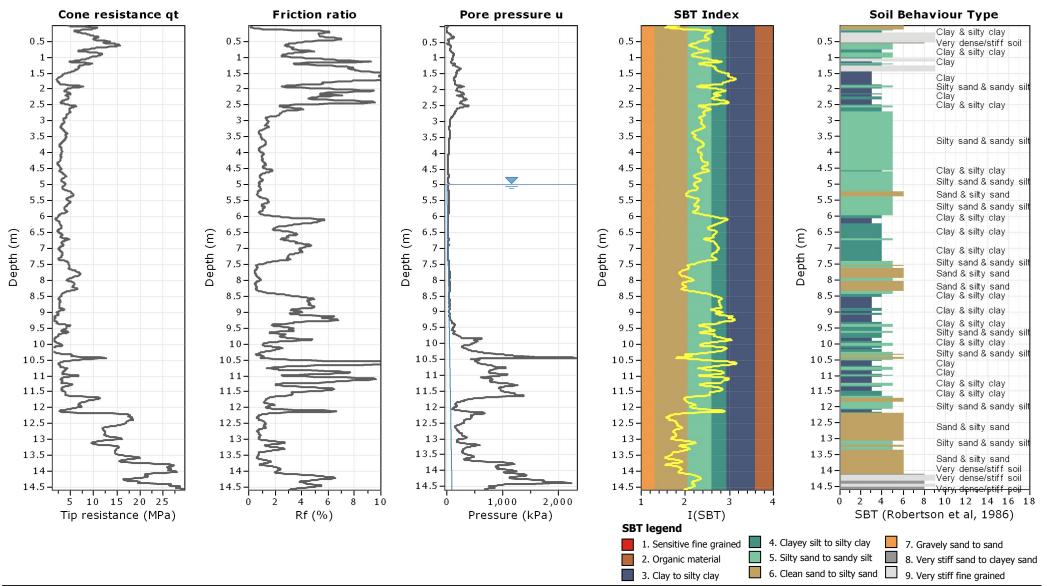
CPT: CPT-02

Total depth: 15.03 m, Date: 28/11/2012 Surface Elevation: 0.00 m Coords: X:0.00, Y:0.00 Cone Type: 50 MPa piezocone Cone Operator: TP & MU

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Project: The Lakes Tauranga

Location: Tauranga



CPT: CPT-03

Total depth: 14.59 m, Date: 28/11/2012 Surface Elevation: 0.00 m Coords: X:0.00, Y:0.00 Cone Type: 50 MPa piezocone Cone Operator: TP & MU

141 Cameron Road, Tauranga PO Box 13145 3141

Project: The Lakes Tauranga

Location: Tauranga

0.5

1

1.5

2

3

4

2.5

3.5

Depth (m) 4

5

6

6.5

7.5-

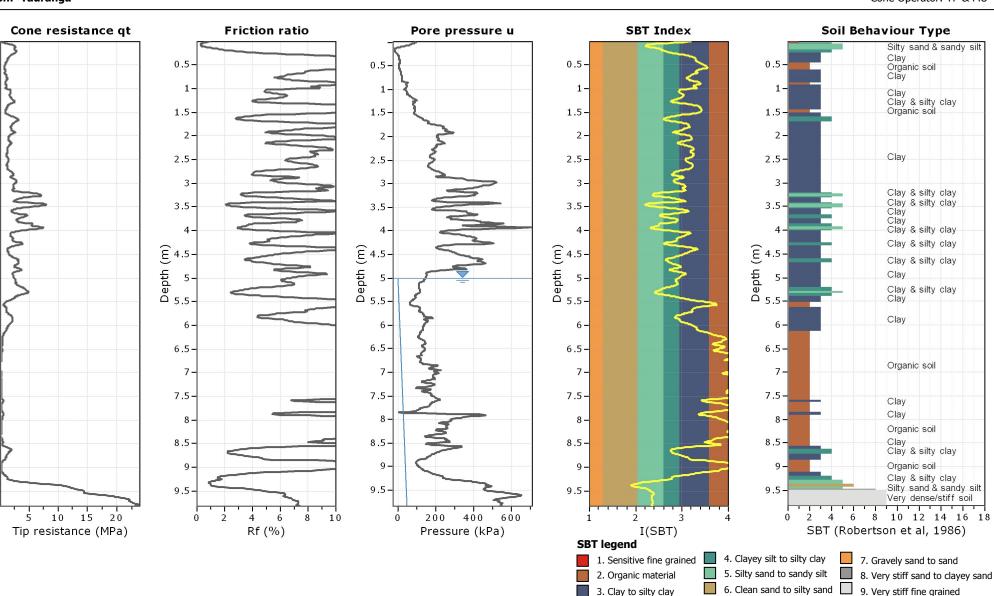
8.

8.5-

9

9.5

7 -



CPT: CPT-04

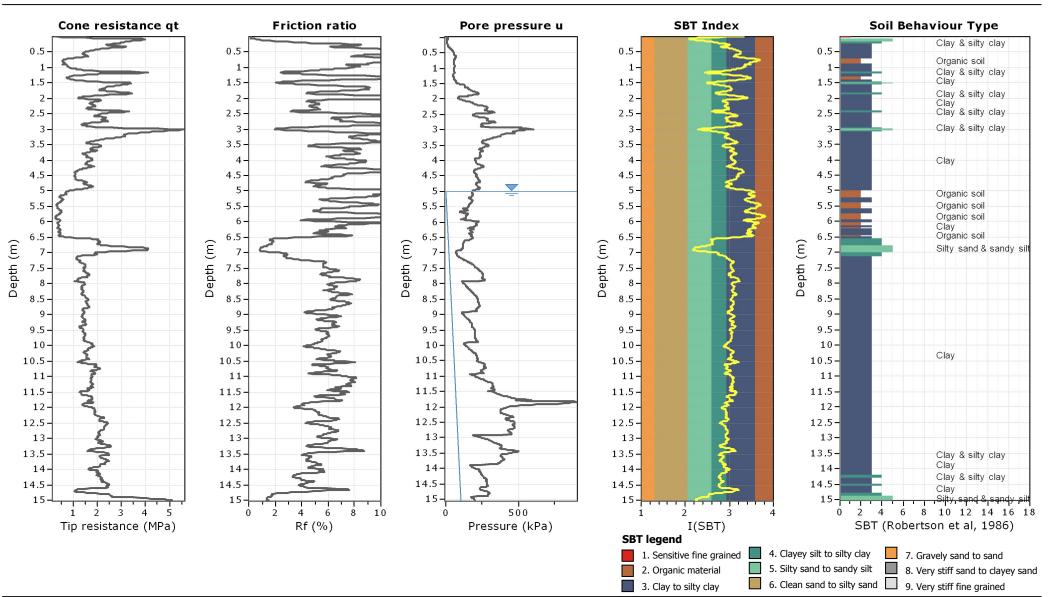
Total depth: 9.82 m, Date: 28/11/2012 Surface Elevation: 0.00 m Coords: X:0.00, Y:0.00 Cone Type: 50 MPa piezocone Cone Operator: TP & MU

3. Clay to silty clay

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Project: The Lakes Tauranga

Location: Tauranga



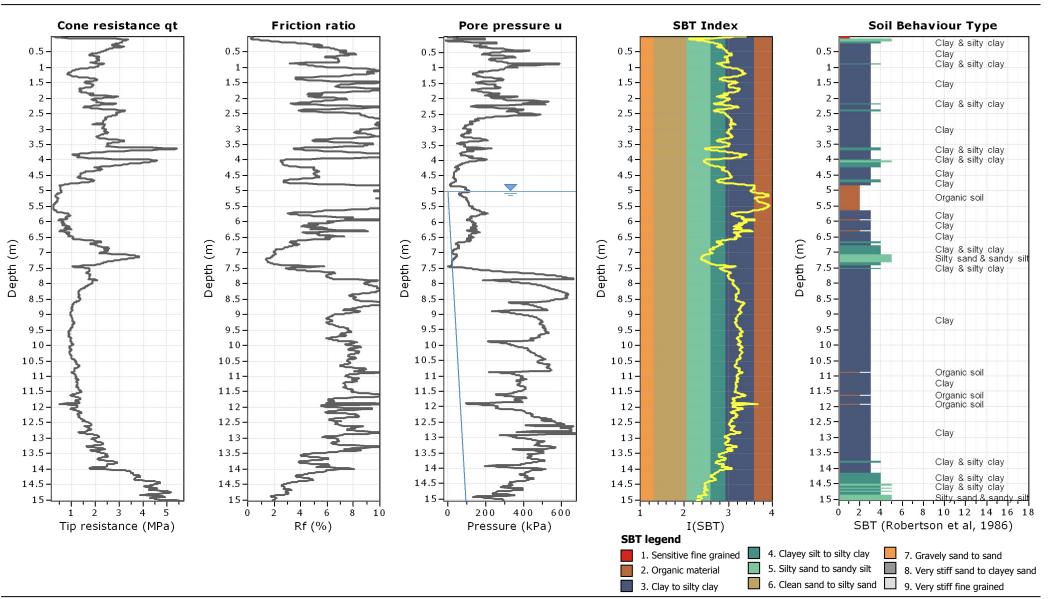
CPT: CPT-05

Total depth: 15.03 m, Date: 28/11/2012 Surface Elevation: 0.00 m Coords: X:0.00, Y:0.00 Cone Type: 50 MPa piezocone Cone Operator: TP & MU

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Project: The Lakes Tauranga

Location: Tauranga



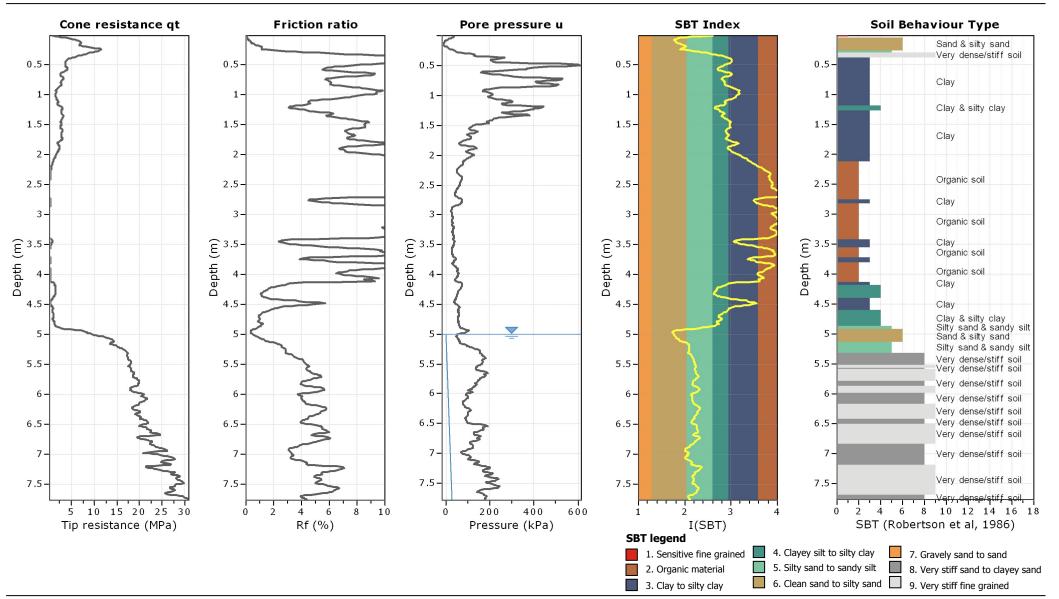
CPT: CPT-06

Total depth: 15.04 m, Date: 28/11/2012 Surface Elevation: 0.00 m Coords: X:0.00, Y:0.00 Cone Type: 50 MPa piezocone Cone Operator: TP & MU

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Project: The Lakes Tauranga

Location: Tauranga



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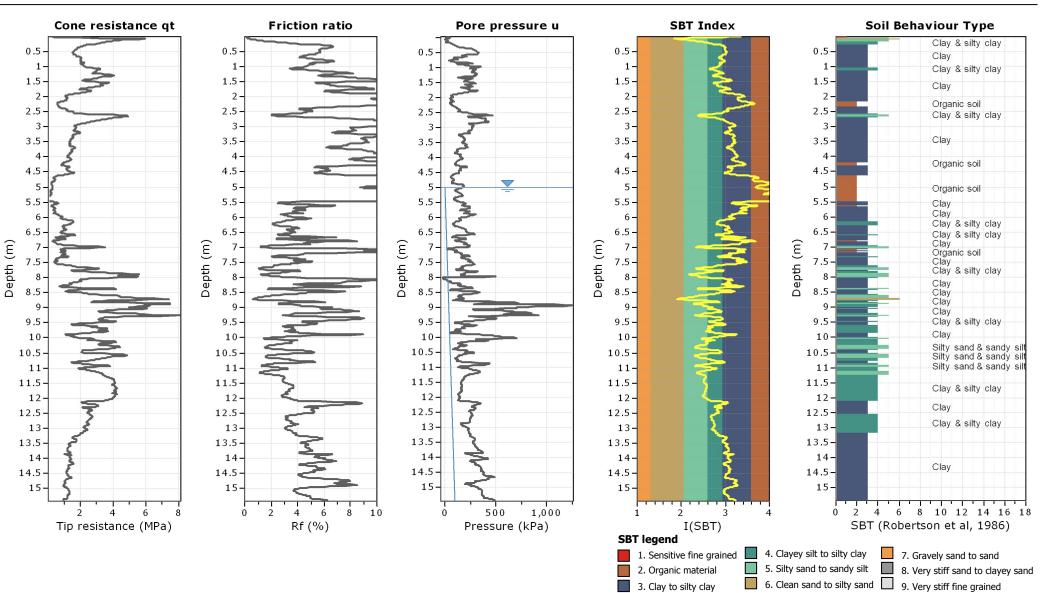
CPT: CPT-07

Total depth: 7.77 m, Date: 28/11/2012 Surface Elevation: 0.00 m Coords: X:0.00, Y:0.00 Cone Type: 50 MPa piezocone Cone Operator: TP & MU

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Project: The Lakes Tauranga

Location: Tauranga



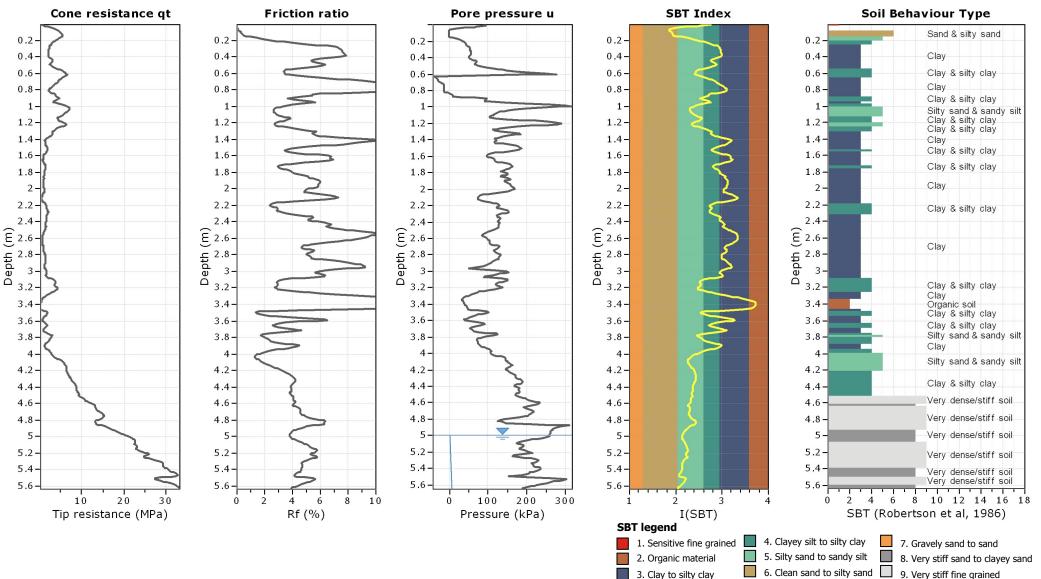
CPT: CPT-08

Total depth: 15.42 m, Date: 28/11/2012 Surface Elevation: 0.00 m Coords: X:0.00, Y:0.00 Cone Type: 50 MPa piezocone Cone Operator: TP & MU

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Project: The Lakes Tauranga

Location: Tauranga



Cone Operator: TP & MU

CPT: CPT-09 Total depth: 5.64 m, Date: 28/11/2012

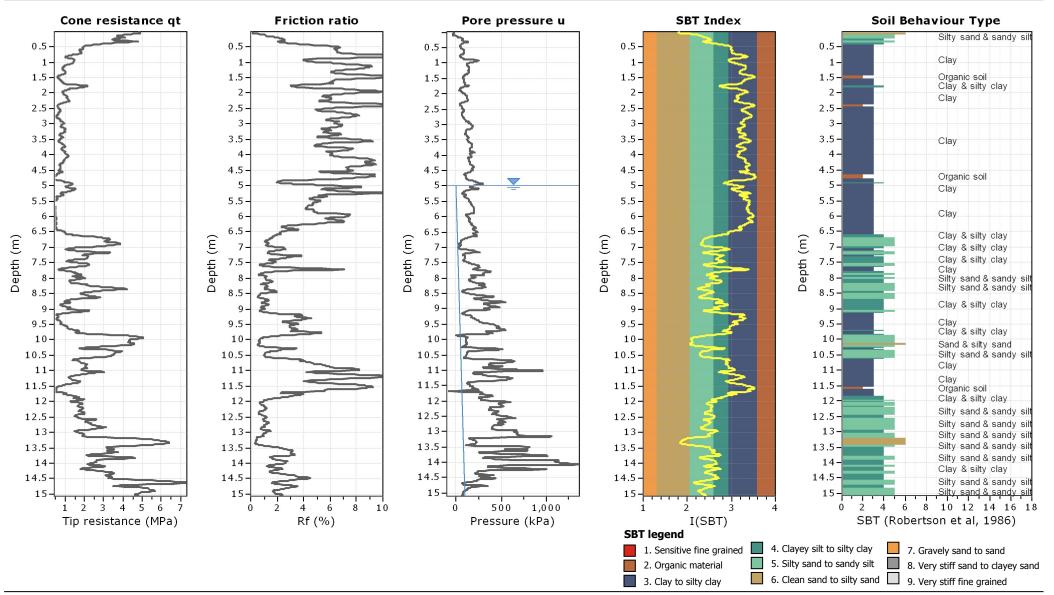
> Surface Elevation: 0.00 m Coords: X:0.00, Y:0.00

Cone Type: 50 MPa piezocone

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Project: The Lakes Tauranga

Location: Tauranga



CPT: CPT-10

Total depth: 15.07 m, Date: 28/11/2012 Surface Elevation: 0.00 m Coords: X:0.00, Y:0.00 Cone Type: 50 MPa piezocone Cone Operator: TP & MU

141 Cameron Road, Tauranga PO Box 13145 3141

Project: The Lakes Tauranga

Cone resistance gt

0.5

1

1.5

2.5

3.5

4.5

5.5

6.5

7.5

8.5

9.5

Depth (m)

4

5

6

7 -

8.

9.

2

3

Location: Tauranga

0.5

1

1.5

2.5

3.5

4.5

5.5

Depth (m)

3

4

5.

6

7.

7.5

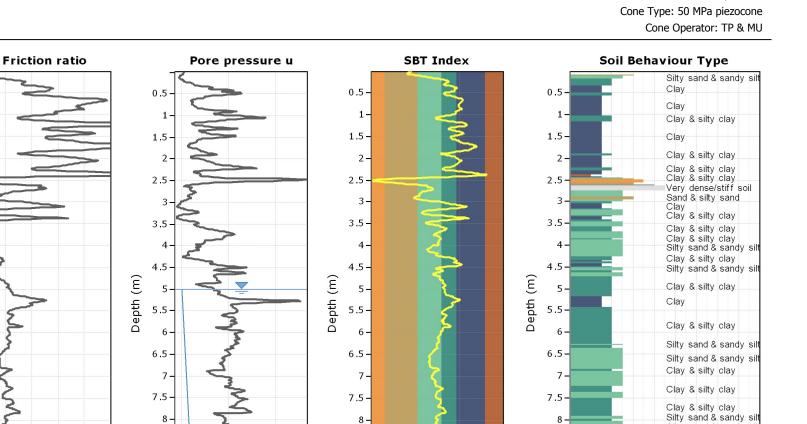
8

9

9.5

8.5

6.5



8.5-

9.5-

9 -

8.5-

9.5

9 -

10 10. 10 10 10-10.5 10.5 10.5-10.5 10.5 4 6 8 10 12 14 16 18 10 20 30 40 8 10 200 400 2 3 0 2 0 2 4 6 0 1 SBT (Robertson et al, 1986) Rf (%) I(SBT) Tip resistance (MPa) Pressure (kPa) SBT legend 4. Clayey silt to silty clay 1. Sensitive fine grained 2. Organic material 5. Silty sand to sandy silt 6. Clean sand to silty sand 9. Very stiff fine grained 3. Clay to silty clay CPeT-IT v.1.7.5.17 - CPTU data presentation & interpretation software - Report created on: 1/07/2013, 4:50:47 p.m.

8.5

9.5

9.

Project file: F:\1.GENZ\1.GEOTECHNICS PROJECTS\13086AE THE LAKES STAGE 2 QRST\LAB & FIELD TESTING\FIELD TEST RESULTS\Cpet-it file.cpt

CPT: CPT-11

Total depth: 10.67 m, Date: 28/11/2012 Surface Elevation: 0.00 m Coords: X:0.00, Y:0.00

Silty sand & sandy sil

Silty sand & sandy silf

Silty sand & sandy silt Sand & silty sand

Sand & silty sand Sand & silty sand Very dense/stiff soil

Sand & silty sand

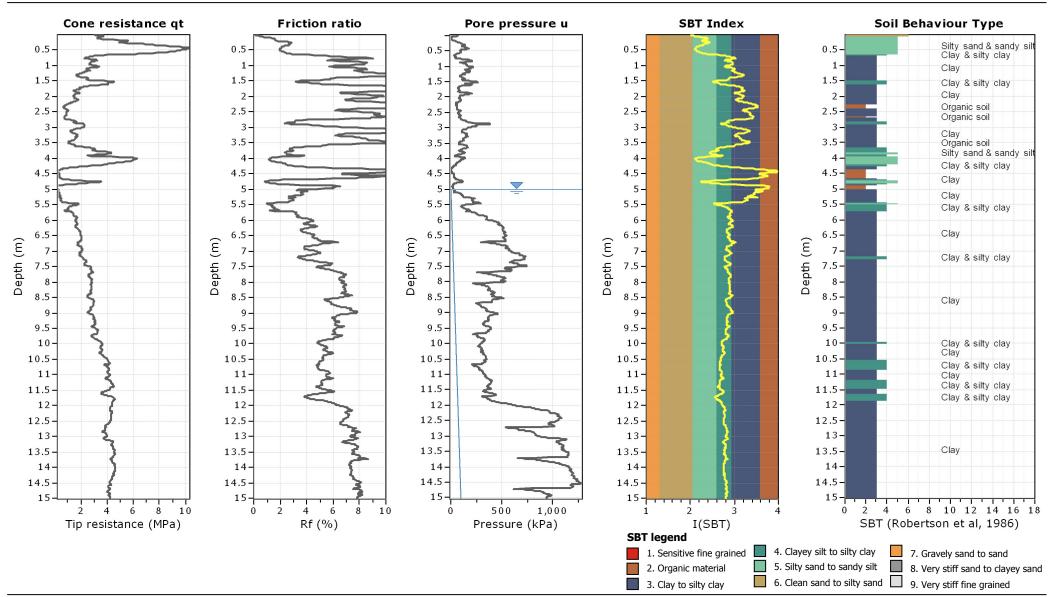
8. Very stiff sand to clayey sand

7. Gravely sand to sand

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Project: The Lakes Tauranga

Location: Tauranga



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CPT: CPT-12

Total depth: 15.02 m, Date: 28/11/2012 Surface Elevation: 0.00 m Coords: X:0.00, Y:0.00 Cone Type: 50 MPa piezocone Cone Operator: TP & MU

Appendix C

2007-2008 Earthfill Quality Control Data

GENZTAUC13086AE THE LAKES (2012) LIMITED THE LAKES SUBDIVISION STAGE 2 QRST



	FILL	TEST RESULTS I	FROM 2007 / 2008	BEARTHWORKS	PERIOD	
		Sum	mary of earthfill t	est data		
				Result		
Test Number	Date	Test RL (m)	Air Voids (%)	Shear Vane (kPa)	Scala (blows per 100mm)	Pass/Fail
141	14/11/2007	41.7	5.4	217+	-	Pass
142		10.0	1.3	217+	-	Pass
143	1	20.6	2.7	217+	-	Pass
144	1	11.8	3.5	217+	-	Pass
145	1	13.1	0.2	213+	-	Pass
146	19/11/2007	14.4	4.3	215+	-	Pass
147	1	15.4	0.0	217+	-	Pass
148	1	16.5	2.3	217+	-	Pass
149		17.3	8.6	217+	-	Pass
150		18.5	1.5	217+	-	Pass
578		10.6	2.4	205+	-	Pass
579		11.7	0.1	202+	-	Pass
580		12.4	0.3	193+	-	Pass
581		8.6	8.9	204+	-	Pass
582		9.2	1.7	204+	-	Pass
583		9.7	0.0	205+	-	Pass
584		10.5	2.9	197+	-	Pass
585	1	11.4	1.0	202+	-	Pass
586		12.6	1.1	205+	-	Pass
587		12.8	2.6	205+	-	Pass
588	29/01/2008	13.4	0.3	205+	-	Pass
589	7	14.2	2.8	205+	-	Pass
590	7	19.1	10.0	204+	-	Pass
591	7	20.7	6.8	197+	-	Pass
592	7	21.9	4.7	204+	-	Pass
593	7	23.0	2.6	176	-	Pass
594	1	11.1	2.7	205+	-	Pass
595	7	11.3	6.3	205+	-	Pass

				Result		
Test Number	Date	Test RL (m)	Air Voids (%)	Shear Vane (kPa)	Scala (blows per 100mm)	Pass/Fail
596		12.0	8.0	204+	-	Pass
597		10.8	5.5	205+	-	Pass
598		10.3	1.5	205+	-	Pass
652		12.2	0.0	260+	-	Pass
653		11.1	5.8	270	-	Pass
654	-	9.1	0.0	260+	-	Pass
655		6.8	6.0	283+	-	Pass
656		7.8	3.4	279+	-	Pass
657		10.2	6.0	286+	-	Pass
658	31/01/2008	12.5	4.7	255+	-	Pass
659	1	14.2	10.0	255+	-	Pass
660	1	17.6	3.2	291+	-	Pass
661	1	19.7	2.5	278+	-	Pass
662	1	22.2	2.6	243	-	Pass
663	-	25.0	4.0	291+	-	Pass
664	-	8.8	1.2	226	-	Pass
665		18.3	0.0	205+	-	Pass
666	1	21.5	2.3	198+	-	Pass
667	-	33.3	4.1	205+	-	Pass
668	1	31.6	3.4	205+	-	Pass
669	1	29.6	10.0	201+	-	Pass
670	-	22.5	8.4	205+	-	Pass
671	-	19.3	0.2	205+	-	Pass
672	1	16.7	3.3	205+	-	Pass
673	1	12.5	5.7	198+	-	Pass
674	1	15.4	1.7	205+	-	Pass
675	1	15.0	0.0	205+	-	Pass
676	1	10.9	0.0	205+	-	Pass
677	7/02/2008	10.1	2.8	205+	-	Pass
678	1	8.7	5.6	205+	-	Pass
679	1	11.9	0.0	205+	-	Pass
680	1	7.8	0.0	284+	-	Pass
681	1	9.2	1.8	291+	-	Pass
682	1	9.7	0.0	291+	-	Pass
683	4	10.7	0.0	286+	-	Pass

				Result		
Test Number	Date	Test RL (m)	Air Voids (%)	Shear Vane (kPa)	Scala (blows per 100mm)	Pass/Fail
684		11.6	4.5	291+	-	Pass
685	1	12.7	4.5	205+	-	Pass
686		13.7	2.5	205+	-	Pass
687		13.4	5.9	190	-	Pass
688	1	14.2	6.8	205+	-	Pass
689	1	15.1	2.5	205+	-	Pass
762		10.1	5.2	205+	-	Pass
763	1	7.9	3.7	205+	-	Pass
764	1	7.1	0	205+	-	Pass
765	1	8.7	0.6	202+	-	Pass
766	1	9.9	0	148	-	Pass
767	1	11.6	0.8	205+	-	Pass
768	1	9.1	1.9	205+	-	Pass
769	1	10.4	0	205+	-	Pass
770	-	12.2	3.4	205+	-	Pass
771	18/02/2008	12.6	7.6	205+	-	Pass
772	-	13.1	1.2	205+	-	Pass
773	-	13.1	7.5	205+	-	Pass
774	-	13.4	3.7	205+	-	Pass
775	-	12.6	3.9	205+	-	Pass
776	-	14.1	1.3	205+	-	Pass
777	-	6.4	0	205+	-	Pass
778	1	6.6	8.3	205+	-	Pass
779	-	7.8	3.5	205+	-	Pass
972		16.6	1.9	214+	-	Pass
973	1	15.7	0	214+	-	Pass
974	1	14.7	4.8	214+	-	Pass
975	1	13.8	0	214+	-	Pass
976	1	12.2	1.9	214+	-	Pass
977	1	11.8	4.5	214+	-	Pass
978	1	13.3	0	214+	-	Pass
979	7/04/2008	11.1	2.4	214+	-	Pass
980		17.2	2.9	214+	-	Pass
981	1	14.8	0	214+	-	Pass
982	1	18.8	2.1	214+	-	Pass

				Result		
Test Number	Date	Test RL (m)	Air Voids (%)	Shear Vane (kPa)	Scala (blows per 100mm)	Pass/Fail
983		21.0	0.5	214+	-	Pass
984		22.9	0	214+	-	Pass
985		24.9	3.5	214+	-	Pass
986		28.2	5.9	214+	-	Pass
1016		9.6	2.7	209+	-	Pass
1017	1	9.6	5.8	214+	-	Pass
1031		10.6	0	214+	-	Pass
1032		10.4	7.2	178+	-	Pass
1033		11.3	2.2	214+	-	Pass
1034		10.4	1.6	214+	-	Pass
1035		10.6	0.5	214+	-	Pass
1036		10.4	0	159	-	Pass
1037		10.4	2.4	214+	-	Pass
1038		10.4	1.4	214+	-	Pass
1039		10.7	4.8	214+	-	Pass
1040		11.6	1	214+	-	Pass
1041		11.1	4	214+	-	Pass
1042		11.8	4.7	214+	-	Pass
1043		11.6	3.1	214+	-	Pass
1044		11.8	2	214+	-	Pass
1045		11.8	0	214+	-	Pass
1046		11.7	0	214+	-	Pass
1047		12.2	0	214+	-	Pass
1048		12.3	4.2	214+	-	Pass
1049		11.2	0	214+	-	Pass
1050		11.9	1.5	214+	-	Pass
1051	9/04/2008	12.4	7.4	214+	-	Pass
1052	1	12.5	0	214+	-	Pass
1053	1	11.3	6.3	184	-	Pass
1054]	11.3	5.4	210+	-	Pass
1055	1	13.8	0	190+	-	Pass
1056	1	12.6	2	214+	-	Pass
1057	1	12.7	0	214+	-	Pass
1058	1	13.2	4.7	214+	-	Pass
1059	1	15.0	0.6	190+	-	Pass

				Result		
Test Number	Date	Test RL (m)	Air Voids (%)	Shear Vane (kPa)	Scala (blows per 100mm)	Pass/Fail
1060		14.4	0.6	214+	-	Pass
1061	1	14.4	0	214+	-	Pass
1062		14.6	0	214+	-	Pass
1063		15.3	3.1	214+	-	Pass
1064		15.0	0.3	214+	-	Pass
1065	1	14.8	1	173	-	Pass
1066		15.1	0	205+	-	Pass
1067		15.2	3.7	214+	-	Pass
1068	1	16.1	6.9	214+	-	Pass
1069	1	16.9	0.4	214+	-	Pass
1070	1	16.5	0	198+	-	Pass
1071	1	16.4	4.6	214+	-	Pass
1072	1	15.6	7.4	181	-	Pass
1073		16.8	0.1	184	-	Pass
1074		10.3	7	195+	-	Pass
1075		10.2	0.7	214+	-	Pass
1076	-	10.6	9.2	218+	-	Pass
1077	-	9.6	5.4	218+	-	Pass
1078		10.1	5.4	218+	-	Pass
1079		12.8	2.9	218+	-	Pass
1080		13.2	7.1	218+	-	Pass
1081	-	12.0	1.7	218+	-	Pass
1082	40/04/0000	12.3	0	218+	-	Pass
1083	10/04/2008	12.0	0	218+	-	Pass
1084	1	13.9	5.2	218+	-	Pass
1085	1	13.8	1.6	218+	-	Pass
1086	1	15.9	2.2	218+	-	Pass
1087	1	16.6	2.5	218+	-	Pass
1088	1	17.3	2.3	218+	-	Pass
1089	1	16.2	4.5	198+	-	Pass
1090	1	16.6	3.4	191+	-	Pass
1091	1	17.0	4.9	183+	-	Pass
1114		21.2	1.1	214+	-	Pass
1115	1	18.4	4.7	214+	-	Pass
1116	1	17.4	5.6	214+	-	Pass

				Result		
Test Number	Date	Test RL (m)	Air Voids (%)	Shear Vane (kPa)	Scala (blows per 100mm)	Pass/Fail
1117	22/04/2008	16.7	5	214+	-	Pass
1118	22/04/2000	15.7	3.3	196+	-	Pass
1119]	15.5	1.3	214+	-	Pass
1120]	14.5	0	214+	-	Pass
1121		13.6	5.3	189+	-	Pass

Notes

1 Shear strength for NDM tests calculated from average of 3 vane tests at each test location. UTP = unable to penetrate.

2 A target Soilds Density of 2.4 t/m³ was assumed for pumice sand fill, 2.6 t/m³ for silt/ash fill and 2.5 t/m³ for blended fills.

3 UTP = Unable to Penetrate

4 Isolated low shear strength readings in sandy soils not reported.

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coff	ey 🔊	geotech specialists M	INICS IANAGING THE E	EARTH		ТA	URANG	on Road A 3110 ffey.com	•			NZ		ELD D 1991 Test					- TS IZGS 8-2001	
		•				$\overline{\Lambda}$		1		JOB NO							13685			
	Tests	/ comments	indicated NE	are	la.		/	1		PROJEC	т				Stage 3	The Lake	s, State H	iohway 29	Tauriko	
<u>الار</u>	outsi	de the s	cope of	the	[]//R	XЛ	^	1		CLIENT					5		pper Fam	- •		
C labora	tory labor	atory's accred	Itation	M.J.	Packard	d Approv	ved Siar	natorv		MATERI	AL	Compact	ed Fill							
		TES	T LOCATION) TESTS	3		FIE				IGS	Oven Dr	ied Water	Content		
DATE	TEST				Soil		/ane Sh	ear Stre	naths k	Pa	BS or	Wet	Dry	Water	Air	Dry	Water	Air	Solid Density	COMMENTSNE
	NO	Northing	Easting	RL	Class			++'s indi	-		Depth	Density	Density	Content		Density		Voids ^{NE}	(Assumed)	COMMENTS
		m	m	m		Ind	ividual \	/alues	kPa	Average	mm	t/m ³	t/m ^a	%	%	t/m ³	%	%	(∩ssumeu) t/m³	
14.11.07	137	799223.3	369013.9	38.3	ML	206	197	225	200	207	250	1.62	1,11	45.5	6.8	1.04	55.7	2.3	2.60	
· <u></u>	138	799216.8	369056.4	39.4	SM	231+	231+	231+	231+	231+	250	1.55	1.05	48.0	6.1	1.06	46.0	7.0	2.40	
	139	799235.9	369072.8	40.3	SM	193	197	204	215	202	250	1.60	1.10	45.0	4.4		52.4			
	140	799252.3	369027.0	37.3	ML	197	215	172	167	188	250	1.62				1.05	·	1.3	2.40	
	141	799132.3	369051.1	41.7									1.10	47.0	5.9	1.09	48.4	5.2	2.60	
	141	799132.3	309051.1	41.7	ML	217+	217+	217+	217+	217+	250	1.69	1.23	37.5	6.5	1.21	39.7	5.4	2.60	
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Date	10.12.07		Checked	lon ^[]						This repo	π may onl	y pe tebto	auced in fi	ull.					Report No	7158 Sheet 1 of 1

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labora	outsic	/ comments le the so atory's accredi	ope of i	the	Packaro	Approx	h_	atony	1	JOB NO PROJEC CLIENT MATERI	СТ	Compact	ed Fill		Stage 3		13685 s, State H pper Fam			
		TEST	LOCATION					TESTS	;			LD DENSI			IGS	Oven Dr	ied Water	Content	· · · · · · · · · · · · · · · · · · ·	·
DATE	TEST				Soil	1	/ane She	ar Strei	nihe k	·Da	BS or	Wet	Dry	Water	Air	Dry	Water	Air	Solid Density	
	NO	Northing	Easting	RL	Class	•			cate UTI		Depth	Density	Density	Content		Density	Content		(Assumed)	COMMENTS
		m	m	m		Ind	ividual V	alues	kPa	Average	mm	t/m ³	t/m ³	%	%	t/m ³	%	voids %	(Assumed) t/m ³	
9.11.07	142	800497.2	368078.6	10.0	ML	217+	217+	217+	2 17+	217+	250	1.67	1.17	43.5	4.5	1.12	50.1	1.3	2.60	·
	143	800470.0	368227.8	20.6	ML	217+	217+	217+	217+	217+	250	1.64	1.18	39.0	8.3	1.09	50.7	2.7	2.60	
	144	800485.5	368106.5	11.8	SM	217+	217+	217+	217+	217+	250	1.63	1.18	38.0	5.6	1.15	42.5	3.5	2.40	
	145	800496.4	368130.1	13.1	SM	207	210	217+	217+	213+	250	1.65	1.18	40.0	3,6	1.12	47.0	0.2	2.40	
	146	800487.8	368149.4	14.4	ML	217+	217+	209	217+	215+	250	1.65	1.18	40.5	7.3	1.13	46.5	4.3	2.60	
	147	800483.9	368166.7	15.4	ML	217+	217+	217+	2 17+	217+	250	1.74	1.28	36.5	4.3	1.16	49.8	0	2.60	
	148	800475.2	368181.0	16.5	ML	217+	217+	217+	217+	217+	250	1.70	1.26	35.5	7.1	1.18	44.5	2.3	2.60	· · · · · · · · · · · · · · · · · · ·
	149	800478.8	368196.0	17.3	SM	217+	217+	217+	217+	217+	250	1.63	1.17	39.5	5.1	1.23	32.9	8,6	2.40	
	150	800470.7	368210.3	18.5	SM	217+	217+	217+	217+	217+	250	1.64	1.20	36.5	6.4	1.11	46.8	1.5	2.40	
	151	800469.9	368228.8	20.7	SM	174	207	217	217	204	250	1.55	1.17	33.0	13	1.11	40.4	9.3	2.40	
	152	799877.4	368451.2	53.0	ML	190	180	170	166	177	250	1.77	1.26	41.0	0.3	1.29	36.9	2.6	2.60	
	153	799835.1	368437.2	48.8	ML.	217+	217+	217+	217+	217+	250	1.76	1.24	42.5	0.3	1.23	42.5	0.1	2.60	
	154	799892.3	368445.2	53.8	ML	217+	217+	217+	217+	217+	250	1.68	1.24	36.0	7.8	1.19	41.8	4.8	2.60	
	155	799899.4	368425.4	53.6	ML	217+	217+	217+	217+	217+	250	1.72	1.22	42.0	2.4	1.20	43.6	1.5	2.60	
	156	799888.0	368401.7	51.6	ML	217+	217+	217+	217+	217+	250	1.73	1.23	40.5	2.8	1.22	41.9	2.1	2.60	
	157	799865.1	368378.7	48.8	ML	180	217	217	÷ 2 17	208	250	1.67	1.19	39.5	6.9	1.15	44.3	4.5	2.60	
	158	799841.4	368357.5	46.4	ML	217+	217+	217+	217+	217+	250	1.76	1.33	33.0	5.2	1.22	44.3	0	2.60	
	159	799788.6	368337.6	40.5	ML	178	190	207	214	197	250	1.71	1.19	44,5	1.8	1.13	51.9	0	2.60	
	160	799812.6	368338.8	43.2	ML	222	215	197	231	216	250	1.73	1.23	40.0	3.5	1.14	51.9	¹ 0	2.60	
	161	799814.7	368368.8	44.1	ML	217+	217+	217+	217+	217+	250	1.65	1.11	48.0	3.8	1.07	54.6	0.8	2.60	

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	outsi	/ comments de the s atory's accred	cope of	the	Packard	A Approv		2/	1	JOB NO PROJEC CLIENT MATERI	СТ	Compact	ed Fill		Stage 3		13685 s, State H pper Farm			
		TESI	LOCATION				FIELC	TESTS	5		FIE	LD DENSI	TY GAUG	E READIN	IGS	Oven Dr	ied Water	Content	· · · · · · · · · · · · · · · · · · ·	·······
DATE	TEST	Surve	eyed by clien	t	Soil	1	ane Sh	ear Strei	naths k	Pa	BS or	Wet	Dry	Water	Air	Dry	Water	Air	Solid Density	COMMENTSN
	NO	Northing	Easting	RL	Class		Note: -	+'s india	cate UT	P	Depth	Density	Density	Content	Voids ^{NE}	Density	Content		(Assumed)	COMMENTS
		m	m	m		Ind	ividual V	alues	kPa	Average	mm	t/m ³	t/m ³	%	%	t/m ³	%	%	t/m³	
9.01.08	578	800659.0	368119.5	10.6	ML	205+	205+	205+	205+	205+	250	1.75	1.35	30.0	5.9	1.29	35.5	2.4	2.50	
	579	800653.6	368141.1	11.7	ML	205+	194	205+	205+	202+	250	1.70	1.17	46.0	1.6	1.14	48.9	0.1	2.60	
	580	800639.2	368155.1	12.4	ML	174	205+	189	205+	193+	250	1.67	1.18	42.0	5.4	1.10	52.4	0.3	2.60	
	581	800640.5	368123.1	8,6	ML	205+	205+	202	205+	204+	250	1.63	1.13	43.5	5.6	1.19	36.4	8.9	2.50	
	582	800639.2	368103.9	9.2	ML	205+	205+	202	205+	204+	250	1.73	1.26	37.0	5.0	1.21	43.0	1.7	2.60	
	583	800672.9	368097.1	9.7	ML	205+	205+	205+	205+	205+	250	1.74	1.19	46.0	0	1.11	57.3	0	2.60	
	584	800553.7	368179.9	10.5	ML	202	205+	187	194	197+	250	1.78	1.27	40.0	0	1.35	32.0	2.9	2.50	
	585	800547.0	368194.6	11.4	ML	194	205+	205+	205+	202+	250	1.73	1.17	47.5	0	1.23	40.3	1.0	2.50	
	586	800549.7	368209.0	12.6	ML	205+	205+	205+	205+	205+	250	1.81	1.31	38.0	0	1.33	35.8	1.1	2.60	
	587	800545.1	368219.5	12.8	ML	205+	205+	205+	205+	205+	250	1.71	1.19	43.5	2.2	1.20	42.6	2.6	2.60	
	588	800549.0	368230.7	13.4	ML	205+	205+	205+	205+	205+	250	1.76	1.27	38.5	0	1.28	37.9	0.3	2.50	· · · · · · · · · · · · · · · · · · ·
	589	800546.7	368254.0	14.2	ML	205+	205+	205+	205+	205+	250	1.64	1.11	47.5	4.8	1.08	51.7	2.8	2.60	······
	590	800618.8	368229.4	19.1	SM	202	205+	205+	205+	204+	250	1.55	1.14	36.5	11	1.13	37.9	10	2.40	
	591	800620.6	368232.0	20.7	ML	189	192	202	205+	197+	250	1.64	1.17	40.5	3.9	1.16	42.2	6,8	2.60	
	592	800620.5	368242.6	21.9	ML	205+	205+	202	205+	204+	250	1.63	1.12	45.5	2.2	1.13	44.1	4.7	2.50	
	593	800621.9	368245.4	23.0	ML	158	154	194	198	176	250	1.67	1.09	52.5	0	1.13	47.8	2.6	2.60	·····
	594	800406.1	368086.9	11.1	ML	205+	205+	205+	205+	205+	250	1.72	1.23	39.0	0.5	1.24	38.5	2.7	2.50	·····
	595	800394.4	368088.7	11.3	ML	205+	205+	205+	205+	205+	250	1.72	1.25	37.0	1.3	1.30	31.8	6.3	2.50	**
	596	800388.9	368093.0	12.0	ML	205+	205+	202	205+	204+	250	1.66	1.23	31.5	10	1.23	35.1	8.0	2.50	
	597	800349.8	368041.6	10.8 KW /M	ML	205+	205+	205+	205+	205+	250	1.68	1.17	43.0	0.7	1.22	37.6	5.5	2.50	······

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							2		1	JOB NO)			·			13685			
• • •	Tests	s/comments ide the s	indicated ^{NE}	are			eh	1	1	PROJEC	ст				Stage 3	The Lake	es, State H	lighway 29	9. Tauriko	
	outsi	de the s 'atory's accred	cope of litation	the	10	11 Ol	M	\sim	21	CLIENT					_		opper Farm	-		
- Iabori	10079			M.J.	Packar	d Appro	ved Sigr	atory		MATER	IAL	Compact	ed Fill							
		TES	T LOCATION					TEST	3		FIE				IGS	Oven D	ried Water	Content		······
DATE	TEST	Surve	eyed by clien	t	Soil		/ane Sh	ear Stre	naths k	Pa	BS or	Wet	Dry	Water	Air	Dry	Water	Air	Solid Density	COMMENTS
	NO	Northing	Easting	RL	Class				cate UTI		Depth	Density	Density	Content		Density		Voids ^{NE}	-	COMMENTS
		m		m			lividual \			Average	mm	t/m ³	t/m ³	%	%	t/m ³	%	voias %	(Assumed)	
29.01.08	598	800357.5	368034.3	10.3	ML	205+	205+	205+	205+	205+	250	1.71	1.21	41.5	3.6				t/m³	
·····								200	2001	2001	200	1.71	1.21	41.0	3.0	1.18	45.1	1.5	2.60	
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					,	1	,	1		JOB NO							13685	•••••		
÷0	Tests	/comments le the so	indicated ^{NE}	are the	MAL	le st	1	Λ		PROJEC	т				Pyes F	^p a Bypass	, State Hig	hway 29,	Tauriko	
labora		atory's accredi		/	1011-1	Ce l		(/		CLIENT						Grassho	pper Farm	s Limited		
				M.J.	Packard	l Approv				MATERI	AL	Compact	ed Fill							
			LOCATION	-			FIELD	TESTS			FIE	LD DENSI	TY GAUG	E READIN	IGS	Oven Dr	ied Water	Content		
DATE	TEST									Pa	BS or	Wet	Dry	Water	Air	Dry	Water	Air	Solid Density	COMMENTS
	NO	Northing	Easting	RL Class Note: ++'s indicate UTI m Individual Values kPa				2	Depth	Density	Density	Content	Voids ^{NE}	Density	Content	Voids ^{NE}	(Assumed)			
		m	m						Average	mm	t/m ³	t/m³	%	%	t/m ³	%	%	t/m³		
1.01.08	652	800550,2	368186.7						241	260+	250	1.74	1.21	43.5	0.9	1.16	49,0	0	2.60	
	653								270	270	250	1.75	1.34	31.0	5.5	1.34	30.3	5.8	2.50	
	654								238	260+	250	1.65	1.12	48.0	1.8	1.08	53.5	0	2.50	
	655								291+	283+	250	1.70	1.29	31.0	7.9	1.26	34.5	6.0	2.50	
	656	800606.1	368112.3	7.8	ML	270	291+	291+	262	279+	250	1.62	1.18	37.5	8,9	1.09	48.9	3.4	2.50	
	657	800624.3	368119.2	10.2	ML	270	291+	291+	291+	286+	250	1.66	1.15	44.0	5.0	1.17	42.2	6.0	2.60	
	658	800639.9	368140.3	12.5	ML	291+	232	241	256	255+	250	1.62	1.13	42.5	8.1	1.08	50.1	4.7	2.60	
	659	800637.8	368157.4	14.2	SM	291+	232	241	256	255+	250	1.53	1.00	52.5	5.7	1.08	41.4	10	2.40	
	660	800635.5	368176.8	17.6	ML	291+	291+	291+	291+	291+	250	1.64	1.15	42.5	6.7	1.09	50.3	3.2	2.60	
	661	800632,3	368190.6	19.7	ML	29 1+	291+	256	273	278+	250	1.67	1.17	43.0	5.0	1.13	48.1	2.5	2.60	
	662	800632.9	368204.1	22.2	ML	238	244	256	232	243	250	1.68	1.18	41.5	5.2	1.14	46.8	2.6	2.60	
	663	800638.0	368218.6	25.0	ML	291+	291+	291+	291+	291+	250	1.79	1.34	32.5	5.5	1.36	32.4	4.0	2.60	
	664	800640.5	368119.0	8.8	ML	225	250	250	213	226	250	1.69	1.10	33.5	21	1.13	48.7	1.2	2.60	
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		/ comments de the so atory's accredi	ope of	the	M	a	h	Δ	/	JOB NO PROJEC CLIENT	T				Stage 3		13685 s, State H opper Farm			
					Packard	Approv		atory TESTS	•	MATERI		Compact							I	
DATE	TEST		LOCATION		Soil				-			1					ied Water			
	NO	Northing	Easting	RL	Class		ane She		ngths k cate UTI		BS or	Wet	Dry	Water	Air	Dry	Water	Air	Solid Density	COMMENTS ^N
	NO	m	m – asung	m		Ind	ividual V			Average	Depth mm	Density t/m ³	Density t/m ³	Content %	Voids ^{NE} %	Density	Content %		(Assumed)	
7.02.08	665	800702.2	368168.6	18.3	ML	205+	205+	205+	205+	205+	250	1.79	1.39	7º 29.0	4.4	t/m ³ 1.32	% 36.0	% 0.0	1/m ³	
	666	800675.7	368196.4	21.5	ML	192	189	205+	205+	198+	250	1.73	1.24	39.5	1.2	1.26	37.4	2.3	2.50	
	667	800630.2	368292.1	33.3	ML	205+	205+	205+	205+	205+	250	1.66	1.22	35.5	7.8	1.16	42.5	4.1	2.50	
	668	800637.6	368274.0	31.6	ML	205+	205+	205+	205+	205+	250	1.82	1.40	30.0	2.3	1.42	28.2	3.4	2.50	
	669	800626,0	368259.8	29.6	ML	192	205+	205+	203	201+	250	1.61	1.07	50.5	3.1	1.19	35.7	10	2.50	
	670	800639.9	368200.9	22.5	ML	205+	205+	205+	205+	205+	250	1.75	1.36	28.5	6.9	1.38	26.1	8.4	2.50	
	671	800668.8	368176.1	19.3	ML	205+	205+	205+	205+	205+	250	1.77	1.28	38.0	2.0	1.25	41.3	0.2	2.60	
	672	800698.2	368148.7	16.7	ML	205+	205+	205+	205+	205+	250	1.82	1.43	27.5	3.6	1.43	27.8	3.3	2.50	
	673	800648.7	368131.8	12.5	ML	192	189	205+	205+	198+	250	1.73	1.34	29.5	9.0	1.29	34.9	5.7	2.60	
	674	800647.0	368159.6	15.4	ML	205+	205+	205+	205+	205+	250	1.72	1.14	51.0	0	1.20	43.8	1.7	2.60	
	675	800627.3	368155.9	15.0	ML	205+	205+	205+	205+	205+	250	1.67	1.07	55.5	0	1.08	54.5	0	2.50	
	676	800630.0	368121.8	10.9	ML	205+	205+	205+	205+	205+	250	1.72	1.16	48.0	0	1.11	54.5	0	2.60	
	677	800640.0	368098.1	10.1	ML	205+	205+	205+	205+	205+	250	1.82	1.48	23.0	6.7	1,42	28.5	2.8	2.50	······
	678	800606.9	368094.0	8.7	ML	205+	205+	205+	205+	205+	250	1.84	1.51	21.5	7.1	1.49	23.4	5.6	2.50	
	679	800607.7	368134.1	11.9	ML	205+	205+	205+	205+	205+	250	1.80	1.14	48.0	0	1.11	62.5	0	2.60	
	680	800579.3	368096.2	7.8	ML	291+	291+	291+	262	284+	250	1.67	1.16	43.0	3.4	1.06	57.3	0	2.60	
	681	800560.0	368113.0	9.2	ML	291+	291+	291+	291+	291+	250	1.60	1.06	50.0	4.2	1.02	56.0	1.8	2.60	
	682	800584.9	368118.5	9.7	ML	291+	291+	291+	291+	291+	250	1.75	1.20	46.0	0	1.11	57.7	0	2.60	
	683	800579.2	368136.9	10.7	ML	291+	270	291+	291+	286+	250	1.72	1. 1 7	46.5	0	1.09	57.1	0	2.60	
	684	800566.5	368157,2	11.6	ML	291+	291+	291+	291+	291+	250	1.74	1.28	36.5	2.4	1.31	32.7	4.5	2.50	

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							1.	0		JOB NO	1						13685			
_ ₀ (Tests	s / comments	indicated NE	are		[M]	' /	/		PROJEC	ст				Stage 3	The Lake	s. State H	liqhway 29). Tauriko	
	atory labor	de the s atory's accred	cope of litation	the	- /L	1Pd	m_	al l		CLIENT					-		pper Farm			
	,	-		M.J.	Packar	d Appro	ved Siar	atory		MATERI	AL	Compact	ed Fill							
		TEST						TESTS	3	·	FIE	LD DENSI		E READIN	IGS	Oven Dr	ied Water	Content	·····	
DATE	TEST	Surve	eyed by clien	ıt	Soil		/ane Sh	ear Stre	nathe k	·Da	BS or	Wet	Dry	Water	Air	Dry	Water	Air	Solid Density	COMMENTSNE
	NO	Northing	Easting	RL	Class			++'s indi	-		Depth	Density	Density	Content		Density		Voids ^{NE}	•	COMMENTS
			m	m		Ind		/alues		Average	mm	t/m ³	t/m ³	%	%	t/m ³	%		(Assumed)	
07.02.08	685	800544.2	368175.7	12.7	ML	205+	205+	205+	205+	205+	250	1.62	1.09	48.5			<u> </u>	%	t/m³	
	686	800562.2	368188.8	13.7	ML	205+									3.6	1.10	46.5	4.5	2.50	
	687			·			205+	205+	205+	205+	250	1.62	1.16	44.0	2.7	1.07	51.2	2.5	2.50	
		800543.0	368206.5	13.4	ML	187	194	174	203	190	250	1.48	0.98	51.5	12	0.88	68.2	5.9	2.60	
	688	800546.6	368226.6	14.2	ML	205+	205+	205+	205+	205+	250	1.65	1.21	36.0	7.9	1,19	38.1	6.8	2.50	
	689	800547.8	368259,1	15.1	ML	205+	205+	205+	205+	205+	250	1.47	0.99	48.5	12	0.83	77.2	2.5	2.50	
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Date	04.03.08		Checked //	15718			·			This repor	rt may oni	y be repro	duced in fi	<u></u> ۱۱.		·	<u>. </u>	<u> </u>	Report No	7623 Sheet 1 of 1

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labora	🔨 outsid	s / comments i ide the so ratory's accredi	scope of t	are the	N	'Na	ette		/	JOB NO PROJEC CLIENT	CT F				Stage 3		13685 es, State H opper Farm	Highway 29		
	,	γ	<u> </u>		. Packard	J Approv	-		<u> </u>	MATERI	T	Compacte						<u></u>		
; 	1			. 1		<u> </u>	FIELD) TESTS	<u>;</u>	'	•	ELD DENSI	1	1	1	Oven Dr	ried Water	Content	1 1	1
DATE	TEST		eyed by client		Soil		Vane She		-		BS or	Wet	Dry	Water	Air	Dry	Water		Solid Density	COMMENTS
ļ	NO	Northing	Easting	RL	Class			++'s indic		- <u>j</u>	Depth	Density			Voids ^{NE}				E (Assumed)	Ĺ
	·	m	m	<u></u> т	<u> </u> '	1	dividual V	1 1	1	Average		t/m³	t/m ³	%	%	t/m ^a	%	%	t/m³	<u> </u>
18.02.08	762	800642.3	368085.6	10.1	ML	205+	205+	205+	205+		250	1.77	1.39	27.0	7.0	1.37	29.3	5.2	2.50	<u> </u>
	763	800603.1	368090.5	7.9	ML	205+	205+	205+	205+		250	1.72	1.30	32.5	6.0	1.26	36.5	3.7	2.50	1
	764	800565.0	368093.0	7.1	ML	205+	205+	205+	205+		250	1.75	1.25	40.0	1.9	1.14	53.9	0	2.60	
Į	765	800560.8	368118.0	8.7	ML	205+	194	205+	205+	202+	250	1.76	1.28	38.5	2.0	1.25	41.0	0.6	2.60	I
]	766	766 800553.0 368157.6 9.9 ML 139 140 153 158				148	250	1.68	1.15	46.5	2.7	1.10	53.1	0	2.60					
	767	800581.2	368141.9	11.6	ML	205+	205+	205+	205+	205+	250	1.61	1.09	47.0	5.0	1.02	57.1	0.8	2,50	I
]	768	800588.8	368120.1	9.1	ML	205+	205+	205+	205+		250	1.69	1.18	42.5	2.4	1.17	43.6	1.9	2.50	I
	769	800629.7	368117.7	10.4	ML	205+	205+	205+	205+	205+	250	1.65	1.13	45.0	5.2	0.96	71.0	0	2.60	
)	770	800558.8	368186.6	12.2	ML	205+	205+	205+	205+	205+	250	1.69	1.16	45.5	2.5	1.18	43.6	3.4	2.60	
]	771	800545.6	368208.2	12.6	ML	205+	205+	205+	205+	205+	250	1.67	1.24	34.0	8.2	1.23	34.9	7.6	2.50	1
)	772	800540.5	368233.8	13.1	ML	205+	205+	205+	205+	205+	250	1.67	1.18	41.5	5.6	1.11	50.6	1.2	2.60	
)	773	800552.5	368252.1	13.1	ML	205+	205+	205+	205+	205+	250	1.73	1.33	30.0	7.0	1.34	29.2	7.5	2.50	1
	774	800559.9	368264.2	13.4	ML	205+	205+	205+	205+	205+	250	1.72	1.26	37.5	4.8	1.23	39.9	3.7	2.60	1
)	775	800562.7	368225.9	12.6	ML	205+	205+	205+	205+	205+	250	1.67	1.19	40.5	6.5	1.14	45.6	3.9	2.60	1
							205+	205+	250	1.67	1.20	39.5	7.1	1.10	51.2	1.3	2.60	1		
							205+	205+	250	1.77	1.31	34.5	4.3	1.22	44.9	0	2.60	1		
	778							205+	205+	250	1.70	1.34	26.5	13	1.30	30.7	8.3	2.50	I	
	779							205+	205+	250	1.81	1.35	34.0	2.2	1.37	32.0	3.5	2.60	í	
	1			1	[]		ſ	1	1,	, ,	1	()				[]	<u> </u>	++	[]	1
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	outsic	/ comments ie the so atory's accredi	ope of		M	1 Pa) ch		J	JOB NO PROJEC CLIENT					Stage 3		13685 s, State H			
C labora	tory abon	story a accredi	Lauon	M.J.	Packard	Approv	/ed Sian	atorv	.1	MATERI	AL	Compact	ed Fill			0100110	pper i uni			
		TEST	LOCATION					TESTS	;		FIE	LD DENSI	TY GAUG	E READIN	IGS	Oven Dr	ied Water	Content		
DATE	TEST	Surve	yed by clien	t	Soil	v	ane She	ear Strei	ngths k	Pa	BS or	Wet	Dry	Water	Air	Dry	Water	Air	Solid Density	COMMENTS
	NO	Northing	Easting	RL	Class		Note: +	+'s india	cate UTI	•	Depth	Density	Density	Content	Voids ^{NE}	Density	Content	Voids ^{NE}	(Assumed)	
		m	m	m		Ind	ividual V	alues	kPa	Average	mm	t/m ³	t/m ^a	%	%	t/m ³	%	%	t/m ³	
7.04.08	972	800587.9	368203.4	16.6	ML	214+	214+	214+	214+	214+	250	1.86	1.44	29.5	2.3	1.43	30.0	1.9	2.60	
	973	800576.8	368194.5	15.7	ML	214+	214+	214+	214+	214+	250	1.83	1.36	35.0	0.2	1.32	38.6	0	2.60	
	974	800574.6	368175.6	14.7	ML	214+	214+	214+	214+	214+	250	1.79	1.34	33.0	3.8	1.36	31.6	4.8	2.60	
	975	800589,3	368152.6	13.8	ML	214+	214+	214+	214+	214+	250	1.71	1.23	39.5	4.3	1. 12	52.7	0	2.60	· · · · · · · · · · · · · · · · · · ·
	976	800591.5	368125.1	12.2	ML	214+	214+	214+	214+	214+	250	1.74	1.25	39.0	3.1	1.23	41.5	1.9	2.60	
	977	800625.6	368128.3	11.8	ML	214+	214+	214+	214+	214+	250	1.82	1.35	34.5	0.9	1.41	29.3	4.5	2.60	*** <u>++++++++++++++++++++++++++++++++++</u>
	978	800640.2	368136.9	13.3	ML	214+	214+	214+	214+	214+	250	1.84	1.40	31.5	2.1	1.28	43.7	0	2.60	
	979	800644.4	368110.6	11.1	ML	214+	214+	214+	214+	214+	250	1.81	1.38	31.5	3.4	1.36	33.2	2.4	2.60	
	980	800674.0	368155.5	17.2	ML	214+	214+	214+	214+	214+	250	1.82	1.38	31.5	3.2	1.38	31.9	2.9	2.60	
	981	800654.9	368149.2	14.8	ML	214+	214+	214+	214+	214+	250	1.84	1.35	36.5	D	1.27	45.3	0	2.60	
	982	800655.4	368172.1	18.8	ML	214+	214+	214+	214+	214+	250	1.77	1.31	35.5	3.2	1.28	37.8	2.1	2.60	
	983	800634.4	368192.8	21.0	ML	214+	214+	214+	214+	214+	250	1.76	1.29	36.5	3.2	1.25	41.2	0.5	2.60	
	984	800624.3	368212.1	22.9	ML	214+	214+	214+	214+	214+	250	1.78	1.32	34.5	3.3	1.26	41.9	0	2.60	hannan an a
	985	800621.7	368228.4	24.9	ML	214+	214+	214+	214+	214+	250	1.72	1.28	34.5	6.8	1.22	40.3	3.5	2.60	
	986	800621.1	368249.0	28.2	ML	214+	214+	214+	214+	214+	250	1.69	1.24	36.5	7.0	1.22	38.7	5,9	2.60	
	987	800644.4	368238.0	27.5	ML	214+	214+	214+	214+	214+	250	1.76	1.33	32.0	6.4	1.32	32.7	5.9	2.60	
	988	800657.4	368213.1	24.7	ML	214+	214+	214+	214+	214+	250	1.87	1.42	31.5	0.9	1.43	30.8	1.2	2.60	
	989	800670.3	368196.7	22.3	ML	214+	214+	214+	214+	214+	250	1.85	1.37	35.0	0	1.35	37.3	0	2.60	**************************************
	990	800692.1	368175.5	19.3	ML	214+	214+	214+	214+	214+	250	1.75	1.38	27.0	10	1.32	32.9	5.9	2.60	
ate	23.04.08		Checked (_1~~/~						This repo	t may on	y be repro	duced in fi						Report No.	8092 Sheet

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labora	outsid	/ comments ie the so story's accredi	ope of	the /	Packard			atory	1	JOB NO PROJEC CLIENT MATERI	т	Compacte	ed Fill	an.	Stage 3		13685 s, State Hi pper Farm			
		TEST	LOCATION				FIELD	TESTS	;		FIE	LD DENSI	TY GAUG	E READIN	IGS	Oven Dr	ied Water	Content		
DATE	TEST	Surve	yed by client	t	Soil	V	ane She	ear Strei	ngths k	Pa	BS or	Wet	Dry	Water	Аіг	Dry	Water	Air	Solid Density	COMMENTSNE
	NO	Northing	Easting	RL	Class		Note: +	+'s india	cate UTI	2	Depth	Density	Density	Content	Voids ^{NE}	Density	Content	Voids ^{NE}	(Assumed)	
		m	m	m		Ind	ividual V	alues	кРа	Average	mm	t/m ³	t/m ³	%	%	t/m ³	%	%	t/m³	
09.04.08	1016	800708,3	368047.7	9.6	ML	214+	214+	192	214+	209+	250	1.86	1.45	28.0	1.2	1.47	26.1	2.7	2.50	
	1017	800729.0	368043.4	9.6	ML	214+	214+	214+	214+	214+	250	1.75	1.31	33.0	4.0	1.34	30.1	5.8	2.50	
	1018	800757.4	368060.2	10.8	ML	214+	214+	214+	214+	214+	250	1.88	1.48	27.0	3.0	1.49	26.2	3.6	2.60	
	1019	800781.4	368051.1	10.1	ML	214+	214+	214+	214+	214+	250	1.87	1.44	30.0	1.6	1.43	30.3	1.5	2.60	
	1020	798978.7	369081.5	53.5	ML	214+	214+	214+	180	206+	250	1.56	0.94	66.0	2.1	0.95	63.2	3.0	2.60	
	1021	798988.1	369063.9	49.9	ML	162	161	153	182	165	250	1.57	1.16	35.0	13	1.10	42.4	9.1	2.50	
	1022	799007.7	369072.1	52.2	ML	187	176	189	182	184	250	1.41	0.82	72.0	9.2	0.57	146,2	0	2.60	
	1023	799019.5	369060.0	49.3	ML	180	189	159	182	178	250	1.60	1.02	56.5	2.7	0.98	63.1	0.3	2.60	
	1024	799005.0	369091.9	55.1	ML	203	189	200	184	194	250	1.66	1. 16	43.0	3.6	1.23	34.9	7.7	2.50	
	1025	799018.7	369083.5	54.0	ML	134	162	184	214+	174+	250	1.52	0.91	66.5	3.9	0.80	91.0	0	2.60	
	1026	799036.6	369092.3	54.9	ML	214+	214+	192	201	205+	250	1.53	0.97	62.0	2.5	0.90	68.9	2.9	2.60	
	1027	799075.9	369020.1	46.0	ML	214+	187	214+	214+	207+	250	1.70	1.12	51.5	0	0.96	76.6	0	2.60	
	1028	799050.2	369026,6	46.6	ML	214+	214+	214+	214+	214+	250	1.70	1.21	40.5	4.6	1.02	65.6	0	2.60	
	1029	799036.1	369045.5	49.0	ML	214+	214+	214+	214+	214+	250	1.66	1.12	48.0	2.9	1.09	51.9	1.3	2.60	
	1030	799027.4	369032.6	47.4	ML	214+	214+	214+	214+	214+	250	1.77	1.25	41.5	0	1.16	53.1	0	2.60	
	1031	800653.0	368094.4	10.6	ML	153	214+	162	182	178+	250	1.87	1.39	34.5	0	1.35	38.6	C	2.60	
	1032	800622.6	368086.9	10.4	ML	214+	214+	214+	214+	214+	250	1.82	1.46	24.0	8.3	1.48	22.7	7.2	2.50	
	1033	800627.0	368105.1	11.3	ML	214+	214+	214+	214+	214+	250	1.85	1.46	27.0	4.5	1.42	30.5	2.2	2.60	
	1034	800645.9	368081.6	10.4	ML	214+	214+	214+	214+	214+	250	1.83	1.42	28.5	4.5	1.38	33.0	1.6	2.60	
	1035	800604.4	368107.9	10.6	ML	214+	214+	214+	214+	214+	250	1.83	1.38	33.0	1.5	1.36	34.5	0.5	2.60	
Date	23.04.08		Checked G	.kw/M	P					This repo	rt may onl	y be repro	duced in fi	ull.					Report No	8095 Sheet 1 of

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o iabora	outsic	/ comments de the su atory's accred	cope of	the /	Packard	and an		- atory	/	JOB NO PROJEC CLIENT MATERI	CT	Compact	ad Fill		Stage 3		13685 s, State H pper Farm			
		TEST						TESTS	<u></u> ;		r			E READIN	IGS	Oven Dr	ied Water	Content		· · · · · · · · · · · · · · · · · · ·
DATE	TEST		eyed by clien		Soil	l ,	/ane Sh	ar Stre	ngths k	Da	BS or	Wet	Dry	Water	Air	Dry	Water	Air	Solid Density	COMMENTSNE
	NO	Northing	Easting	RL	Class				cate UTI		Depth	Density	Density	Content	Voids ^{NE}	Density	Content		(Assumed)	COMMENTS
		m	m	m		Ind	ividual V	alues	kPa	Average	mm	t/m ³	t/m ³	%	%	t/m ³	%	voids %	t/m ³	
09.04.08	1036	800585.1	368107.7	10.4	ML	140	171	175	148	159	250	1.70	1.17	45.5	1.9	1.10	54.4	0	2.60	
	1037	800590.1	368091.1	10.4	ML	214+	214+	214+	214+	214+	250	1.81	1.41	28.5	3,4	1.39	30.0	2.4	2.50	
	1038	800560.4	368100.1	10.4	ML	214+	214+	214+	214+	214+	250	1.75	1.28	37.0	3.5	1.24	40.8	1.4	2.60	
	1039	800548.5	368091.3	10.7	ML	214+	214+	214+	214+	214+	250	1.76	1.34	31.5	4.5	1.34	31.0	4.8	2.50	
	1040	800540.9	368108.9	11.6	ML	214+	214+	214+	214+	214+	250	1.63	1.10	48.0	4.9	1.03	57.4	1.0	2.60	
	1041	800530.1	368085.7	11.1	ML	214+	214+	214+	214+	214+	250	1.80	1.41	27.5	4.8	1.40	28.8	4.0	2.50	
	1042	800512.8	368096.6	11.8	ML	214+	214+	214+	214+	214+	250	1.78	1.38	29.5	4.5	1.38	29.1	4.7	2,50	
	1043	800506.6	368082.1	11.6	ML	214+	214+	214+	214+	214+	250	1.92	1.51	27.5	0.7	1.55	24.3	3.1	2.60	
	1044	800489.8	368075.4	11.8	ML	214+	214+	214+	214+	214+	250	1.85	1.37	35.0	0	1.42	30.5	2.0	2.60	······································
	1045	800456.6	368052.0	11.8	ML	214+	214+	214+	214+	214+	250	1.71	1.23	40.0	4.0	1.15	49.3	0	2.60	
	1046	800477.0	368063.7	11.7	ML	214+	214+	214+	214+	214+	250	1.70	1.20	42.0	3.4	1.13	51.3	0	2.60	
	1047	800457.2	368070.2	12.2	ML	214+	214+	214+	214+	214+	250	1.63	1.11	47.0	5.0	1.01	61.2	0	2.60	
	1048	800459.4	368087.0	12.3	ML	214+	214+	214+	214+	214+	250	1.67	1.26	33.0	8.1	1.19	40.5	4.2	2.50	
	1049	800437.2	368040.2	11.2	ML	214+	214+	214+	214+	214+	250	1.87	1.42	31.5	0	1.40	33.5	0	2.60	
	1050	800435.3	368057.1	11.9	ML	214+	214+	214+	214+	214+	250	1.73	1.27	36.5	3.0	1.21	42.9	1.5	2.60	
	1051	800425.3	368070.5	12.4	ML	214+	214+	214+	214+	214+	250	1.60	1.15	39.0	9.4	1.12	42.9	7.4	2.50	
	1052	800446.8	368077.1	12.5	ML	214+	214+	214+	214+	214+	250	1.79	1.29	38.5	0	1.22	46.4	ο	2.60	
	1053	800575.8	368126.6	11.3	ML	184	182	168	200	184	250	1.75	1.35	30.0	5.6	1.33	32.2	6.3	2.60	
	1054	800553.8	368124.4	11.3	ML	198	214+	214+	214+	210+	250	1.73	1.27	36.5	2.8	1.28	35.5	5.4	2.60	
	1055	800544.9	368154.8	13.8	ML	214+	192	176	178	190+	250	1.60	1.04	54.5	2,2	0.94	70.7	0	2.60	
Date	23.04.08		Checked (itw/,	мјр					This repo	rt may onl	y be repro	duced in fu	J II .					Report No	8096 Sheet 1 of

		geotech SPECIALISTS M					www.cof													
						1	1	1		JOB NO							13685			
? (0)		/comments le the so			M		1			PROJEC	CT .				Stage 3		s, State H	-		
labora		atory's accred		1		a		_/		CLIENT						Grassho	pper Farm	is Limited		
		тгот			Packaro		<u>v</u>	atory		MATERI		Compact				0			r	
DATE	TEST		LOCATION		Soil						BS or	Wet		1	1		ied Water		• • • • •	
<i>"</i> ,,,	NO	Northing	Easting	RL	Class	V			ngths k cate UTF				Dry	Water	Air	Dry	Water	Air	Solid Density	COMMENTS
	no	m	m	m	Gidss	Ind	ividual V				Depth	Density	Density	Content	Voids ^{NE}	Density	Content		(Assumed)	
.04.08	1056	800574.6	368150.6	12.6	ML	214+	214+	214+	214+	Average 214+	mm 250	t/m ³	t/m ³	8.0 38.0	% 4.9	t/m ³	%	%	t/m³	···
	1057	800568.4	368165.9	12.7	ML	214+	214+	214+	214+	214+	250	1.73	1.22	43.0	4.9	1.17	43.5 47.7	2,0 0	2.50	
	1058	800556.6	368175.8	13.2	ML	214+	214+	214+	214+	214+	250	1.73	1.21	37.5	3.9	1.17	36.4	4,7	2.60	
	1059	800543.7	368189.9	15.0	ML	162	207	214+	178	190+	250	1.74	1.20	43.5	2.4	1.27			2.60	
	1060	800563.9	368194.6	14.4	ML	214+	214+	214+	214+	214+	250	1.75	1.19	43.5	0.6	1.18	47.2 42.2	0.6 0.6	2.60	• • • • • • • • • • • • • • • • • • • •
	1061	800541.3	368207.3	14.4	ML	214+	214+	214+	214+	214+	250	1.73	1.23	43.0	0.0	1.23	46.9	0.8	2.60	
	1062	800559.0	368219.6	14.6	ML	214+	214+	214+	214+	214+	250	1.74	1.22	41.0	0.9	1.18	40.9	0	2.60	
	1063	800577.4	368214.6	15.3	ML	214+	214+	214+	214+	214+	250	1.75	1.27	32.5	6.0	1.20	42.2 37.6	3.1	2.60	
	1064	800572.0	368231.8	15.0	ML	214+	214+	214+	214+	214+	250	1.69	1.12	50.5	0.0	1.13	50.1	0.3	2.60	
	1065	800567.7	368244.3	14.8	ML	171	184	162	176	173	250	1.65	1.12	48.5	3.4	1.13	53.8	1.0	2.60	
	1066	800556.5	368236.9	15.1	ML	214+	214+	192	200	205+	250	1.76	1.24	42.0	0.5	1.19	47.8	0		
	1067	800539.3	368230.7	15.2	ML	214+	214+	214+	214+	214+	250	1.81	1.24	37.5	0.3	1.15			2.60	
	1068	800535.9	368254.7	16.1	ML	214+	214+	214+	214+	214+	250	1.01	1.31	35.0	3.2	1.37	31.9 29.2	3.7 6.9	2.60	
	1069	800541.6	368278.7	16.9	ML	214+	214+	214+	214+	214+	250	1.76	1.30	35.0	3.2 4.4	1.36	42.0	0.9	2.60	
	1070	800564.1	368279.1	16.5	ML	214+	192	200	184	198+	250	1.70	1.13	50.0	4.4 0	1.13	42.0 50.3	0.4		
	1071	800572.5	368269.5	16.4	ML	214+	214+	214+	214+	214+	250	1.70	1.13	38.5	1.9	1.13			2.60	
	1072	800565.4	368259.1	15.6	ML	192	168	182	180	181	250	1.77	1.20	36.5	6.6	1.32	33.8 30.4	4.6 7.4	2.60	
	1073	800555.3	368259.6	16.8	ML	201	182	161	192	184	250	1.75	1.25	39.5	2.7	1.34	44.3	0.1	2.60	
									132	10 ⁴		1.74	1.20	03.0	4.1	1.21	44.0	0.1	2.60	

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.₂ Ô		/ comments		are			. /	م م	1	PROJEC	ст				Stage 3	The Lake	s, State H	ighway 29), Tauriko	
		de the so atory's accred		the /	1014	ae	/	\sim /		CLIENT						Grassho	pper Farm	is Limited		
S labora	tory abor			M.J.	Packard	Approv	ed Sign	atory		MATERI	AL	Compact	ed Fill							
		TEST					FIELD	TESTS	3		FIE	LD DENSI	TY GAUG	E READIN	IGS	Oven Dr	ied Water	Content		<u> </u>
DATE	TEST	Surve	yed by client	t	Soil	<u>۱</u>	ane She	ear Stre	ngths k	Pa	BS or	Wet	Dry	Water	Air	Dry	Water	Air	Solid Density	COMMENTS
	NO	Northing	Easting	RL	Class		Note: +	+'s indi	cate UTI	-	Depth	Density	Density	Content	Voids ^{NE}	Density	Content	Voids ^{NE}	(Assumed)	
		m	m	m		Ind	ividual V	alues	kPa	Average	mm	t/m ³	t/m³	%	%	t/m³	%	%	t/m³	
0.04.08	1074	800655.6	368064.1	10.3	ML	218+	194	181	186	195+	250	1.73	1.28	34.5	6.5	1.29	33.5	7.0	2.60	
	1075	800643.8	368057.8	10.2	ML	218+	218+	218+	201	214+	250	1.80	1.34	34.0	2.4	1.32	37.0	0.7	2.60	
	1076	800626.0	368068.2	10.6	ML	218+	218+	218+	218+	218+	250	1.71	1.32	29.5	8.4	1.34	28.0	9.2	2.50	
	1077	800604.6	368072.1	9.6	ML	218+	218+	218+	218+	218+	250	1.73	1.34	29.0	7.5	1.31	32.5	5.4	2.50	
	1078	800590.5	368078.7	10.1	ML	218+	218+	218+	218+	218+	250	1.76	1.32	33.5	3.1	1.36	29.5	5.4	2.50	
	1079	800406.8	368082.7	12.8	ML	218+	218+	218+	218+	218+	250	1.70	1.23	38.0	6.0	1.18	43.9	2.9	2.60	
	1080	800387.8	368079.9	13.2	ML	218+	218+	218+	218+	218+	250	1.72	1.24	39.5	3.9	1.29	33.7	7.1	2.60	
	1081	800394.6	368064.3	12.0	ML	218+	218+	218+	218+	218+	250	1.69	1.18	43.0	3.9	1.15	47.3	1.7	2.60	
	1082	800381.5	368057.4	12.3	ML	218+	218+	218+	218+	218+	250	1.77	1.29	37.5	2.6	1.23	43.4	0	2.60	
	1083	800363.1	368048.6	12.0	ML	218+	218+	218+	218+	218+	250	1.74	1.25	39.5	2.6	1.19	45.8	0	2.60	
	1084	800362.9	368071.7	13.9	ML	218+	218+	218+	218+	218+	250	1.59	1.15	38.0	10	1.06	49.1	5.2	2.50	
	1085	800343,3	368055.1	13.8	ML	218+	218+	218+	218+	218+	250	1.66	1.11	50.0	2.0	1.10	50.9	1.6	2.60	
	1086	800242.3	368124.7	15.9	ML	218+	218+	218+	218+	218+	250	1.76	1.32	33.0	5.5	1.27	38.6	2.2	2.60	uuuuuu
	1087	800243.1	368147.9	16.6	ML	218+	218+	218+	218+	218+	250	1.81	1.34	34.5	1.8	1.35	33.6	2.5	2.60	
	1088	800226.4	368176.9	17.3	ML	218+	218+	218+	218+	218+	250	1.77	1.32	34.0	4.1	1.29	37.1	2.3	2.60	
	1089	800226.1	368149.2	16.2	ML	218+	184	186	205	198+	250	1.76	1.31	34.5	4.3	1.31	34.3	4.5	2.60	
	1090	800209.5	368168.4	16.6	ML	218+	167	184	194	191+	250	1.76	1.28	37.0	3.1	1.29	36.5	3.4	2.60	**************************************
	1091	800216.8	368188.1	17.0	ML	169	161	184	218+	183+	250	1.74	1.22	42.0	1.3	1.28	35.6	4.9	2.60	
	1092	800068.7	368067.8	13.7	ML	184	181	187	201	188	250	1.60	1.11	44.0	8.5	1.07	50.0	4.1	2.50	
	1093	800068.4	368090.9	13.8	ML	184	181	164	186	179	250	1.87	1,35	38.0	0	1.45	29.1	2.3	2.60	

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Clabor	🖌 outsi	s / comments ide the se ratory's accred	cope of	the A			ved Sigr	hatory	•	JOB NO PROJEC CLIENT MATERI	СТ	Compact	ed Fill		Stage 3		13685 es, State H opper Farm			
DATE	TEOT					T		TESTS				LD DENSI			1		ied Water	Content		· · · · · · · · · · · · · · · · · · ·
DATE	TEST NO	Northing	eyed by client Easting	RL	Soil Class	\ \		ear Strei ++'s india	-		BS or	Wet	Dry	Water	Air	Dry	Water	Air	Solid Density	COMMENTS ^{NE}
	NO	m	r ⊂asung m	m	Class	Ind		/alues		Average	Depth mm	Density t/m ³	Density t/m ³	Content %	Voids ^{NE} %	Density t/m ³	Content		(Assumed)	
22.04.08	1114	800474.0	368220.0	21.2	ML	214+	214+	214+	214+	214+	250	1.71	1.23	39.5	4.2	1.18	45.5	% 1.1	t/m ³	
	1115	800480,3	368198.6	18.4	ML	214+	214+	214+	214+	214+	250	1.76	1.33	32.5	5.6	1.31	34.2	4.7	2.60	
	1116	800480.3	368198.6	17.4	ML	214+	214+	214+	214+	214+	250	1.73	1.25	37.0	5,1	1.27	35.7	5.6	2.60	
	1117	800483.7	368174.6	16.7	ML	214+	214+	214+	214+	214+	250	1.71	1.24	38.0	5.5	1.23	38.8	5.0	2.60	
	1118	800484.9	368175.1	15.7	ML	140	214+	214+	214+	196+	250	1.70	1.19	42.0	3.9	1.19	43.1	3.3	2.60	
	1119	800488.8	368159.0	15.5	ML	214+	214+	214+	214+	214+	250	1,74	1.27	37.0	4.1	1.22	42.2	1.3	2.60	
	1120	800490.3	368159.1	14.5	ML	214+	214+	214+	214+	214+	250	1.81	1.33	36.0	1.2	1.30	39.4	0	2.60	
	1121	800496.0	368131.1	13.6	ML	214+	214+	162	166	189+	250	1.76	1.31	34.0	4.8	1.32	33.1	5.3	2.60	
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Appendix D

2012-2013 Earthfill Quality Control Data

GENZTAUC13086AE THE LAKES (2012) LIMITED THE LAKES SUBDIVISION STAGE 2 QRST



FILL IE	STRESULTSFR				G ADDITIONAL FILL A	REAS)
		Sum	mary of earthfill t			
				Result		
Test Number	Date	Test RL (m)	Air Voids (%)	Shear Vane (kPa)	Scala (blows per 100mm)	Pass/Fail
NDM 1			6.0	UTP	-	Pass
NDM 2	04/01/2012		7.7	250+	-	Pass
NDM 3	24/01/2013		8.7	160	-	Pass
NDM 4	_		11.4	UTP	-	Marginal Pas
NDM 5			6.1	190	-	Pass
NDM 6	8/04/2013		8.2	UTP	-	Pass
NDM 7			7.3	223	-	Pass
HA1				UTP		Pass
HA2				UTP		Pass
HA3			Bore	ehole encountered	d natural soils	-
HA4	8/03/2013		Borehole loc	ated in non-struct	ural fill in reserve area	
HA5				200+		Pass
HA6			Boreh	ole located outsic	le peat win-line	
HA7				200+ ⁽⁴⁾		Pass
HA101				200+		Pass
HA102				180		Pass
HA103	13/11/2013			190 ⁽⁴⁾		Pass
HA104	13/11/2013			190		Pass
HA105				150		Pass
HA106			Bore	ehole encountered	d natural soils	· · · · · · · · · · · · · · · · · · ·
HA180	31/01/2014			150 - 200+		Pass
HA182				157		Fail
HA183	13/04/2014			59		Fail
HA184				75		Fail

Notes

Shear strength for NDM tests calculated from average of 3 vane tests at each test location. UTP = unable to penetrate.
 A target Soilds Density of 2.65 t/m³ was used throughout testing.

3 UTP = Unable to Penetrate

4 Isolated low shear strength readings in sandy soils not reported.



Opus International Consultants Ltd Tauranga Laboratory 278 Chadwick Road, Greerton PO Box 9057, Tauranga 3142 New Zealand

t: +64 7 578 5425 f: +64 7 578 3382 w: www.opus.co.nz

21 April 2013

Mr M Haden Higgins Contractors BOP Ltd PO Box 4473 Mt Maunganui 3149

13/275

Dear Mike

The Lakes Subdivision Stages 2QRST: Bulk Fill

Attached are the results of in-situ nuclear density, water content & shear stress tests carried out on the compacted bulk fill materials at The Lakes subdivision – Stages 2QRST, Tauranga.

Regards

qu

Bruce Hudson Laboratory Manager



EARTHWORKS COMPACTION CONTROL **TEST RESULTS**



255568.05/0TL

13/034

106386

Project : The Lakes Stages 2QRST	
Location : The Lakes Subdivision	
Client : Higgins Contractors BOP Ltd	
Contractor : Higgins Contractors BOP Ltd	
Tested by : Greg Cleaver (Opus Laboratory)	
Date tested : 24 January 2013	
Nuclear densometer no : 3440-64130	
Solid density (assumed): 2.65 t/m ³	
Maximum dry density : Unknown t/m ³	
Optimum water content : Unknown %	
Shear vane no : DR2410 Project No):
Shear vane correction : 1.759 Lab Ref N	10:
Material description: Bulk Fill Client Ord	ler No :

		Nuclear	Densometer	r Test Resul	ts		
Test Number	1	2	3	4			
Northing	5816656	5816611	5816676	5816740			
Easting	1873397	1873386	1873502	1873527			
Estimated Fill Depth			C	.75 Metres a	pproximate	ly	
Test Probe Depth (mm)	300	300	300	300			
Wet Density (t/m3)	1.69	1.68	1.75	1.66			1
Dry Density (t/m ³)	1.17	1.20	1.30	1.18			1
Water Content (%)	44.0	40.5	34.5	40.5			
Air Voids (%)*	4.2	6.3	6.0	7.5			
% of MDD							

		Oven	Corrected '	Fest Results		
Dry Density (t/m ³)	1.20	1.22	1.35	1.25		
Water Content (%)	40.6	38.0	30.1	33.3		
Air Voids (%)*	6.0	7.7	8.7	11.4		
% of MDD						

Shear Vane Test Results							
Shear Vane Reading	UTP	UTP	84	UTP			
Shear Strength (kPa)	UTP	UTP	148	UTP			
Shear Vane Reading	UTP	142	84	UTP			
Shear Strength (kPa)	UTP	250	148	UTP			
Shear Vane Reading	UTP	UTP	106	UTP			
Shear Strength (kPa)	UTP	UTP	186	UTP			

Test Method	Notes		
In-situ Density & Water Content : NZS 4407 : 1991, Test 4.2.1	The test positions were selected by Higgins Contractors staff &		
Shear Strength using a Hand Held Shear Vane, NZ Geotechnical Soc Inc 8/2001	Greg Cleaver of Opus Laboratory and are approximate only.		
Water Content : NZS 4402 : 1986, Test 2.1	Fill depth supplied by Higgins Contractors staff.		

GPS coordinate datum = NZTM.

UTP = unable to penetrate.

This report may only be reproduced in full.

Preliminary report ONLY - subject to checking.

Date reported : 30 January 2013

Approved

Date :



Designation : Sector Civil Engineering Technician 30 January 2013

PF-LAB-030 (1/09/12)

Opus International Consultants Ltd Tauranga Laboratory Quality Management Systems Certified to ISO 9001 278 Chadwick Road, Greerton PO Box 9057, Tauranga 3142, New Zealand Page 1 of 2

Telephone +64 7 578 5425 Facsimile +64 7 578 3382 Website www.opus.co.nz

EARTHWORKS COMPACTION CONTROL **TEST RESULTS**



255568.05/0TL 13/275

106386

Project :	The Lakes Subdivision - Stages 20	QRST
Location :	Tauranga	-
Client :	Higgins Contractors BOP Ltd	
Contractor :	Higgins Contractors BOP Ltd	
Tested by :	Greg Cleaver (Opus Laboratory)	
Date tested :	8 April 2013	
Nuclear densometer no :	3440-64130	
Solid density (assumed) :	2.65 t/m ³	
Maximum dry density :	Unknown	
Optimum water content :	Unknown	
Shear vane no :	DR2410	Project No :
Shear vane correction :	1.759	Lab Ref No :
Material description:	Bulk Fill	Client Order No :

		Nuclear	Densometer	Test Re	sults	a second de la constance de la	
Test Number	5	6	7				
Centre of Lot	836	842	850				
Northing	5816750	5816731	5816873				
Easting	1873594	1873604	1873432				
Estimated Fill Depth			0	.75 metre	s approxim	ately	
Test Probe Depth (mm)	300	300	300				
Wet Density (t/m ³)	1.78	1.68	1.69				
Dry Density (t/m ³)	1.35	1.21	1.24				
Water Content (%)	31.5	39.0	36.0				
Air Voids (%)*	6.4	7.3	8.5				
% of MDD							

		Oven	Corrected Test	Results		
Dry Density (t/m ³)	1.35	1.22	1.22			
Water Content (%)	32.0	37.3	38.3			
Air Voids (%)*	6.1	8.2	7.3			-
% of MDD						

		She	ar Vane Test F	lesults		
Shear Vane Reading	86	UTP	132			
Shear Strength (kPa)	151	UTP	232			-
Shear Vane Reading	130	UTP	126			
Shear Strength (kPa)	229	UTP	222			
Shear Vane Reading	122	UTP	122			
Shear Strength (kPa)	215	UTP	215			

Test Method	Notes
Insitu Density & Water Content : NZS 4407 : 1991, Test 4.2.1	The test positions were selected by Higgins Contractors staff &
Shear Strength using a Hand Held Shear Vane, NZ Geotechnical Soc Inc 8/2001	are approximate only.
Water Content : NZS 4402 : 1986, Test 2.1	Fill depth approximate only.
	*Excluded from IANZ accreditation.

GPS co-ordinate datum = NZTM projection.

UTP = unable to penetrate.

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Date reported : 21 April 2013

IANZ Approved Signatory

que Designation : Laboratory Manager Date :

21 April 2013

PF-LAB-030 (1/09/12)

Opus International Consultants Ltd Tauranga Laboratory Quality Management Systems Certified to ISO 9001

278 Chadwick Road, Greerton PO Box 9057, Tauranga 3142, New Zealand Page 1 of 1

Telephone +64 7 578 5425 Facsimile +64 7 578 3382 Website www.opus.co.nz

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C	7	JIE	=)	y `	5	jec		1105			Hand	Auge	r No.	H	A1	
							land A				Shee Proie	t ct No:			of 1 ENZTAUC1:	3086AE
Cli	ent:			The	Lakes	(2012	2)					starte			3.2013	
Pri	ncip	al:									Date	compl	eted:	8.	3.2013	
Pro	oject	:		The	Lakes	Stag	e 2qrst				Logg	ed by:		SL	LC	
На	nd A	Auger loca	tion:	Refe	r to sit	te pla	n				Chec	ked by	/:	RI	BT	
Dyr	namio	c penetrome	ter typ	e:		-	Eastin	g: 368147 m		Slope: -90°	I	R.L. Su	rface: m		Vane No: DI	R4523
		meter: 50 m						ng: 800602 m		Bearing:		Datum:	x/y=EBOP	C2000	0, RL=Moturiki	
dr	illin	g informat	lon		materia		stance					×	50 m	ne	enetration resista	nce test
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	Soi pl	mat il type; colour, struc lasticity, sensitivity. components, add	Second	ary and minor	moisture	consistency/ density index	 vane shear vane shear (remoulded peak) kPa 	Ė	blows per 100r	nm
EILL EILE	None Observed wate	SILT; light brown. Dry, friable, low cohesion w Becoming more cohesive w							iitional ir plasticity v plastic					ط ط ط ط ا		
		fication symb	pols an			hear (kP		water ▼ 10/1/98 wate	er level	moisture D dry		-	ensity index			
	based and R	l on Field Desc ock, New Zea cchnical Societ	land			eak eak grea	ter than 200kPa penetrate	on Habe Water on date sho water inflow water outflow	wn	M moist W wet S saturated	VS S F St VSt H	soft firm stiff	/ stiff	VL MD D VD	dense	se

		-tt	~				otech	nice										
C	3	JIE	=)		e e	jec	lech	11105			Hand	Auge	r No.		HA2			
							land A				Shee Proje				1 of 1 GEN		C130)86AE
Cli	ent:			The	Lakes	(2012	2)					starte			8.3.2			
Pri	ncip	al:									Date	comp	leted:		8.3.2	013		
Pro	oject	:		The	Lakes	Stag	e 2qrst				Logg	ed by:			SLC			
На	nd A	Auger locat	tion:	Refe	r to sit	te pla	n				Chec	ked by	y:		RBT			
_		penetrome						ıg: 368137 m	:	Slope: -90°		R.L. Su		m		Vane N	lo: DR4	523
		meter: 50 m						ing: 800508 m		Bearing:		Datum:	x/y=E	BOPC	2000, RL	.=Moturi	ki	
dı	illin	g informat	ion		materia		stance						<u> </u>	Ū "	popetr	ation re	eietan	to tost
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	So	mat il type; colour, struc lasticity, sensitivity. components, add	Second	ary and minor	moisture	consistency/ density index	ts vane shea	100 (remoulded 125 /peak) kPa 175	bl	ows pe	r 100mi	n
	None Observed			0.5			Sandy SILT; b Low cohesion Silty SAND; lig Easily friable (r EOBH, target	wn. with some cohesion prown. with no plastic limit,	friable.		M		22 C				,	
	soil de based and R	fication symb escription on Field Desc ock, New Zeal chnical Societ	ription and	of Soil	● re × po ≫× po			water ↓ 10/1/98 wate on date show ↓ water inflow water outflow	vn	moisture D dry M moist W wet S saturated	consis VS S F St VSt H	soff firm stiff	y soft	index	VL L MD D VD	very la loose mediu dense very d	m dense)

(offe	Ð	y T	g	geo	otech	nics			Han	d Aug	er N	0.	НА	3			
E	'n	ginee	eri	ng	Log	- -	land A	luger			Shee Proje	et ect No):		1 of GE		AUC1	308	86AE
Cli	ent:			The	Lakes	(201)	2)					starte			8.3	2013	3		
Pri	ncip	al:					-				Date	com	olete	d:	8.3	2013	3		
	oject			Tho	Lakes	Stan	o 2arst					jed by			SL				
	-					-	-					-							
		Auger loca			er to sit	e pia		a: 269201 m		Slopo: 00°	Che	R.L. S	-	o: m	RB		ne No: [D45	22
		meter: 50 m		e.				ng: 368201 m ing: 800502 m		Slope: -90° Bearing:				E III	22000			511452	-5
		g informat			materia	al subs		ing. 000302 m		Dealing.		Datan	1. <i>N</i> y	-LDOI	52000,				_
Ž					_	no						×,	5	ear ded Pa	pen	etratio	n resist	ance	test
stratigraphy		notes			graphic log	classification symbol	So	mate bil type; colour, structe		rading: hadding:	lie	condition consistency/ density index		vane shear (remoulded /peak) kPa					
stratiç	water	samples,	ы	depth metres	jraph	symb	p	plasticity, sensitivity. Source and the components, additional components additi	Second	lary and minor	moisture	condit consis		van /pe		blows	per 10	Omm	
°.	>	tests, etc	RL	σĽ	5	00		orange- brown.	uonai ir	niormation.	-		222	125 125 150	2 2	4 6	3 10 12	14 16	5 18
Alluvial Deposits	None Observed			- - - - - - - - - - - - - - - - - - -			Becoming ora moist. Sandy SILT; il Sand is mediu friable in hand EOBH, target	ecs, moist.	derate p e grave to inicia	ge brown with black and plasticity and cohesion, l <5mm, cohesive but al cohesion, moist.			•	× × × × × × × т	P	\langle			
				- 1. <u>5</u> - -															
				2.0															
	soil d based and R	fication symt escription on Field Dess ock, New Zea chnical Societ	cription land	d of Soil	● re × pe ≫× pe		•	water ↓ 10/1/98 water on date show → water inflow water outflow	'n	moisture D dry M moist W wet S saturated	consi VS S F St VSt H	ve so fin sti	ery sof oft m ff ery stif		VL L MD D VD	lo m de	ery loose ose edium de ense ery dense		

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C	X	DIIE	Ð	y	<u> </u>	jec	otechnics		Har	nd A	uge	r No).		H	44				
Ε	'n	ginee	eri	ng	Log	- H	land Auger		She Pro	et ject	No:				1 c GE		TA	UC1	308	86AL
Clie	ent:			The	Lakes	(201)	2)			e sta							013			-
Pri	ncip	al:							Dat	e co	mp	leted	d:		13	6.2	013	}		
Pro	oject			The	Lakes	Staa	e 2arst		Loa	iged	bv:				GJ	N				
		uger loca	tion [.]			-	-		-	ecke	-				RE	BT				
		penetrome					Easting: 368265 m	Slope: -90°				,. Irface	e: n	n			Vane	No: E	R452	23
Hol	e dia	meter: 50 m	nm				Northing: 800576 m	Bearing:		Da	tum:	x/y=	=EB	OPC	2000	, RL=	=Moti	ıriki		
dr	illing	g informat	tion		materia		stance					1			-					
phy					бо	classification symbol	mat	erial		,	consistency/ density index	- Loop	(remoulded	кРа	pe	netra	tion	esista	ance	test
stratigraphy	er	notes		th res	graphic log	ssifica		ture. Grading; bedding;	sture	condition	sistei isity ii			oeak)		blo	wsp	er 100	mm	
stra	water	samples, tests, etc	RL	depth metres	gra	syn		Secondary and minor itional information.	moi		den	50 50	75 100 1	150 A	2		-	10 12		5 18
TS	-				////	OL	Sandy SILT, dark brown. Moist, r			М	Н									
				-		ML	Sandy SILT, mottled brown and w	hite orange. Moist, sensitive	-											
				-										>>	*					
				-		SP	Gravelly SAND, fine to coarse, da	rk grey. Moist, subangular,												
				1		ML	\dense. Sandy SILT, mottled brown and w	hite orange. Moist, sensitive						UTF						
-				<u>-</u>																
ΕĽ											01									
				-							St- VSt									
				-								•×								
				2																
				<u> </u>			- Becoming grey, wet below 2.0m	l.				•		×						
	Бu			-		PT	Sandy SILT, dark brown with orar			M-		•	×							
TS	drilli			-			Moist to wet, sensitive, rootlets ar 50% organic. Organic odor.	d wood inclusions. Approxim	nately	w										
MEN	uring			-	** * **	-														
SEDIMENTS	ured during drilling			3	** * ** **							•	×							
C				<u> </u>	** * * * **		- Decaying log, approximately 30	0mm thick.												
ORGANI	▲ Meas			-	** * ** **															
0				-	** * * * ** * * *															
	1			-		SM	Silty SAND, fine to medium, whitis		to	S										
MS				-		ML	surrounded. Saturated, medium Sandy SILT, brown orange with b		tive											
				4	(. × . × . × . ×		becomes greasy when reworked.													
				-			TS = Topsoil MS = Matua Subgroup Borehole HA4 terminated at 4 me	tres												
				-																
				-																
				5_																
				-																
				-																
				-																
				-																
	<u> </u>			6			1		1											
		fication symb	ools an	d		hear (kP emoulde	■ 10/1/98 wate		cons VS	sisten	-	ensit y soft		lex	VL		verv	loose		
		on Field Deso ock, New Zea		of Soil	× pe	eak	ter than 200kPa on date show water inflow	W wet	S F		soft firm				L MD		loos		nse	
(Geote	chnical Societ	ty Inc 2	005			penetrate — water outflow	, S saturated	St VSt		stiff				D VD		den			
									Н		har						,	_ 5.100		

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0	20	offe	91	V	? g	geo	otechnics				A	- 11-							
			_								•	r No.			45				
E	n	ginee	eri	ng	Log	- H	land Auger			heet rojec	t No:				of 1 ENZ	ΤΑ	JC1	308	6AE
Cli	ent:			The	Lakes	(201)	2)				tarte			13	.6.2	013			_
Pri	ncip	al:							D	ate c	ompl	eted:		13	.6.2	013			
Pro	oject	:		The	Lakes	Stag	e 2qrst		L	ogge	d by:			GJ	IN				
На	nd A	uger loca	tion:	Refe	er to sit	e pla	n		С	heck	ed by	/:		RE	BT				
-		: penetrome		be:			Easting: 368212 m		Slope: -90°			rface:					No: D	R452	3
		meter: 50 m g informat			materia	al sub	Northing: 800594 m		Bearing:	D	atum:	x/y=E	BOPC	2000), RL=	Motu	iki		
								-4			ex /	ear	Pa	pe	netrat	ion re	esista	nce t	est
stratigraphy	_	notes		s	graphic log	classification symbol	m Soil type; colour, stru	a terial ucture. Gr	ading; bedding;	ture	consistency/ density index	ne she	(remoulded /peak) kPa				- 400		
strati	water	samples, tests, etc	RL	depth metres	grap	class symt	plasticity, sensitivity components, ad	y. Second	lary and minor	moisture condition	consi dens	, ca v ca	100 (re 125 /pe	2	4 6		er 100		18
n ⊢		,			////	OL	Sandy SILT, dark brown. Moist			м	н								
				-		ML	Slightly sandy SILT, orange bro hard.												
							Sandy SILT, orange. Moist, se fine to medium, pumiceous.	nsitive, ve	ery stiff to hard. Sand is										
FILL				_		SM	Silty SAND with trace gravel, fin	e to medi	um, orange brown,	-									
ш				1_			subangular to subrounded, den	se, pumic	eous.										
				-			becomes graviab brown below	v 1 0m					UTF						_
				-			- becomes grayish brown below	V 1.2111.											
				-		SM	Organic fine sandy SILT, white sensitive, organic inclusions and			M- W	St- VSt			×					_
S				_	$(\times) \times) \times (\times) \times) \times (\times) \times) \times (\times) \times)$														-
ENT				2			- becomes dark brown with org	anic stain	ing, rootlets and wood										
EDIM							inclusions below 2.0m.												-
AIC S				-															
ORGANIC SEDIMENTS				-															
ō				3	$\begin{pmatrix} \times & \times & \times \\ & \times & \times & \times \\ & \times & \times & \times \end{pmatrix}$														
					$\begin{array}{c} \times \times$														
						SM	Sandy SILT, orange and brown wet, sensitive, stiff to very stiff.	mottles w	vith black specs. Moist to										
MS				_															
					$\begin{array}{cccc} \times & \times & \times \\ & \times & \times & \times \\ \times & \times & \times \end{array}$														
				4			TS = Topsoil MS = Matua Subgroup Borehole HA5 terminated at 3.8	metres											
				-				meues.											
				-															
				-															
				5_															
				-															
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				-															
				6					·										
		fication symb	ols ar	nd		hear (kP		ater lovel	D dou		-	ensity i	ndex	\ <i>#</i>					
I	based	on Field Des ock, New Zea		n of Soil	× pe	emoulde eak eak grea	ter than 200kPa	nown	M moist S W wet F		very soft firm			VL L MD		very l loose		150	
		chnical Societ		005			penetrate water outfl		S saturated S		stiff			D VD		dens	um der e dense	130	
									F		hard			10		very	201130		

HAND AUGER SCALA FIELD_LOG&SHEAR_VEIN_RECORDS.GPJ COFFEY.GDT 7.5.14

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-		-tt	~				otechnics							
C	7	JIE	=)		5	jec	lechines		Hand	Auge	er No.		HA6	
Ε	ną	ginee	eri	ng	Log	- H	land Auger		Shee Proie	t ct No	:		1 of 1 GENZTAUC	:13086AE
Clie	ent:			The	Lakes	(2012	?)		,	starte			13.6.2013	
Pri	ncip	al:							Date	comp	leted:		13.6.2013	
Pro	oject	:		The	Lakes	Stag	e 2qrst		Logg	ed by	:	(GJN	
На	nd A	Auger locat	tion:	Refe	er to sit	e pla	n		Chec	ked b	y:	1	RBT	
		penetrome					Easting: 368022 m	Slope: -90°			urface: m		Vane No	: DR4523
		meter: 50 m					Northing: 800357 m	Bearing:		Datum	: x/y=EBOF	PC2	000, RL=Moturiki	
dr	illing	g informat	ion		materia		tance				L 73	-	non of votion vooi	
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	mate Soil type; colour, struct plasticity, sensitivity. S components, addi	ure. Grading; bedding; Secondary and minor	moisture	consistency/ density index	25 55 75 76 75 75 76 70 70 70 70 70 70 70 70 70 70 70 70 70	175	blows per 1	00mm
<u>51</u>	-			- - - 1		ML	Sandy SILT, dark brown. Moist, ro Sandy SILT, trace clay, orange. M liquid limit, sensitive. - Becoming more sandy below 0.9	loist, very stiff to hard, medium	M	H H	-	TP		
FILL				 		ML	Silty SAND, well graded, white with Moist, subangular, dense, pumice SILT with trace sand, medium liqu sensitive, very stiff to hard.	ous.			:	>>x		
							- Becoming wet below 2.6m.					>>x		-
				 4			- Thin silt layer (approximately 50			St- VSt				-
SO SW				5		ML	Fine sandy SILT, white with green organic inclusions and odor. Sandy SILT, orange and brown m wet, sensitive, stiff to very stiff. TS = Topsoil OS = Organic Sediments MS = Matua Subgroup Borehole HA6 terminated at 5 met	ottles with black specs. Moist t	w					
				6										
s t a	oased and R	fication symb escription on Field Desc ock, New Zeal chnical Societ	cription land	of Soil	● re × p ≫× p			n M moist W wet	consis VS S F St VSt H	ver sof firr stif	n ff ry stiff	\ L N	VL very loo L loose MD medium D dense VD very der	dense

-		ht.				nec	otech	nics												
C	~		-)		5	,		moo			Han	d Aug	er No).		HA	7			
Ε	'n	ginee	eri	ng	Log	- ŀ	land A	Auger			She Proj	et ect No	:			1 of GEI		AUC1	308	36AE
Clie	ent:			The	Lakes	(201)	2)					e starte					6.201			
Pri	ncip	al:									Date	e comp	lete	d:		13.6	6.201	3		
Pro	oject	:		The	Lakes	Stag	e 2qrst				Log	ged by	:			GJN	1			
На	nd A	uger loca	tion:			-	-				-	cked b				RB1	-			
		penetrome						ıg: 368024 m		Slope: -90°		R.L. S	urfac	e: m	ı		Var	e No: I	DR452	23
Hol	e dia	meter: 50 m	nm				Northi	ng: 800430 m	I	Bearing:		Datum	i: x/y	=EBC	OPC	2000, F	RL=Mo	turiki		
dr	illing	g informat	ion		materia		stance									i —				
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol		mat il type; colour, struc lasticity, sensitivity. components, add	Second	ary and minor	moisture	condition consistency/ density index	20	75 Vane snear 100 (remoulded	150 /peak) kPa		blows	per 10	Omm	
TS	-	,			////	OL	Sandy SILT, d			1- VSt	210				+ 0 0					
						ML OL ML	ery stiff to hard, medium , stiff. f to very stiff.		V H	•		ŬTP UTP								
				_		subangular. Moist,					>>:	×								
				2		SW		orange. Moist, sens aded, white, subrou		f to very stiff. subangular. Moist,					>>:	×				
FILL						ML	Sandy SILT, o	range. Moist to we	t, sensiti	ve, stiff to very stiff.					UTP					
	g drilling ▲			3		SW	- Thin silt layer Gravelly SANE	r (approximately 50) r (approximately 50) O with trace silt, coa eous. Gravel is fine	mm thick arse, gre			3			UTP					
	Measured during			4																
				5																
				6	l,			.												
s t	soil de based and R	fication symb ascription on Field Dess ock, New Zea chnical Societ	cription land	of Soil	● re × p ≫× p			water ↓ 10/1/98 water on date shor ↓ water inflow ↓ water outflow	wn	moisture D dry M moist W wet S saturated	consi VS S F St VSt H	so fin sti	ry soft ft n ff ry stiff		ex	VL L MD D VD	loo me de	ry loose ose edium d nse ry dense	ense	

C	20	offe	<u>ا</u> ۹		20	geo	otech	nics			lland	<u> </u>	m NL							
											Hand	-	er ing	Ο.		A1(01			
E	n	ginee	eri	ng	Log	- H	land A	Auger			Sheet Projec					of 1 E NZ	TA	JC1	308	6AE
Cli	ent:			The	Lakes	(201)	2)				Date s	starte	d:		13	8.11.	201	3		_
Pri	ncip	al:									Date o	comp	lete	d:	13	8.11.	201	3		
Pro	oject	:		The	Lakes	Stag	e 2qrst				Logge	d by:			G.	JN				
На	nd A	uger loca	tion:	Lot	802						Check	ed b	y:		RI	3 <i>T</i>				
Dyr	namio	penetrome	ter typ	be:			Eastin	ng: 368158.4 m	ç	Slope: -90°	F	R.L. Su	urfac	e: m			Vane	No: 2	244	
		meter: 50 m			motoria			ing: 800674.7 m		Bearing:	۵)atum	: x/y	=EBOP(C200	0, RL=	=Motu	riki		
		y morma			materia		stance					- ×		a da	ре	enetra	tion r	esista	ince t	est
stratigraphy					c log	icatio					on le	consistency/ density index	.	vane snear (remoulded /peak) kPa	ŀ					
stratig	water	samples,		epth netres	Jraphi	symbo	So p	lasticity, sensitivity. S	econda	ary and minor	moisture condition	consis		vane (rem /pea		blo	ws p	er 100	mm	
<i>w</i>	>	tests, etc	RL	δE			Sandy SILT, n				D-M		25 50	75 125 150	2	2 4 0	68	10 12	14 16	18
						ML	rootlets (TOPS	SOIL).		-	_/ M	1								
							Sanuy Sie I, II	io plasticity, orange-b	TOWIT	with white motiles.				>	>*					
				0.5										>	>*					
				_																
				10										>	>*					
				-										>	>*					
				-																
ц.				1.5			- 50mm Silty S pumiceous	SAND lense, fine to m	ledium	ı grained, white-grey,				>	>X					
FIL				_										>	>*					
	013			-]	- 100mm Silty	SAND lense, fine to r	mediur	m grained, grey-brown										
	13/11/2013		necessing Log - Hand Auger Jackas (2012) The Lakes Stage 2qrst Stag			rown; with minor to some		-	•	>	>X									
	13		The Lakes Stage 2qrst refronter type: Easting: 38155.4 m Slope: -90* formation material substance Material Sold yes: color, structure. Grading: bedd Sandy SILT, no plasticity, frable, dark brown, dry to n optimize the substance 1.0 - 50rm Sity SAND lense, fine to medium grained, grey-white, pumi SILT, no plasticity, dark orange-brown, with m Sity SAND lense, fine to medium grained, grey-white, pumi Sity SAND lense, fine to medium grained, grey-white, pumi Sity SAND, fine to medium grained, grey-white, pumi <td>-white, pumiceous.</td> <td>-/ W</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>			-white, pumiceous.	-/ W													
			The Lakes Stage 2qrst: Protection: Lot 802 Strometer type: Easting: Stage 300574.7 m Bear Demonstrom material substance Image 300574.7 m Bear Owners Organization material substance Image 300574.7 m Bear Owners Organization material substance Image 300574.7 m Bear Owners Organization Solid type; colour, structure, Grading plasticity, secondary components, additional scondary components, additional scondary scond			sand.			•	>	>x									
				2.5		1	-		od frag	gments				>	>*					
				-										>	>*					
				-			- sample is po	orly recovered from 2	2.7 to 3	3.0m										
				3.0		1	FOBH @ 3.0n	n target depth			_	<u> </u>		>	>*					
									etres.											
				3.5																
				_																
				10																
				4.0																
				-																
				4.5																
				-																
				5.0	l				4											
			ools ar	ıd			•		loval		consiste	-		-						
	based			of Soil	×р	eak		on date shown		M moist	VS S	sof			VL L		loos			
				005							F St	firm stift	f		MD D		dens			
											VSt H	ver har	y stiff d		VD		very	dense		

HAND AUGER SCALA FIELD_LOG&SHEAR_VEIN_RECORDS.GPJ COFFEY.GDT 7.5.14

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C	3	JIE	=)		5	jet		1105			На	ind A	Auge	r No.		HA	A10	2			—
Ε	'n	ginee	eri	ng	Log	- H	land A	Auger				ieet	t No:			1 o GE		ΤΔΙ	JC13	2086	AF
Cli	ent:			The	Lakes	(201)	2)						tarteo	d:			11.				
Pri	ncip	al:				•	,				Da	ite c	ompl	eted	:	13.	11.	201	3		
	oject			Tho	l akos	net2	e 2qrst						d by:	0100	•	GJ			-		
	-	Nuger loca	tion			olag	c 29/31						ed by			RB					
		penetrome			555		Eastin	ıg: 368203.6 m	S	Slope: -90°	CI		L. Su		m			/ane	No: 22	44	
		meter: 50 m						ing: 800555.6 m		Bearing:					EBOPC	2000,	, RL=	Motu	iki		
dr	illin	g informat	tion		materia	al subs	stance														
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol		mate il type; colour, structi lasticity, sensitivity. S components, addil	ure. Gra Seconda	ary and minor		moisture condition	consistency/ density index	o vane shear	 (remoulded 125 /peak) kPa 175 		blov	ws pe	esista er 100r	nm	
		10313, 010		_	[[[]	ML	Sandy SILT, n	o plasticity, friable, d	lark bro	wn, rootlets, organic od		М	Н	325			4 6		0 12	4 16	18
				0.5		ML	Sandy SILT, n sand is fine gr		orange-k	prown with pink streaks	;			•	>>	*					
FILL	Groundwater not encountered			1.0											>>	*					
	Groundwate			1.5 ⁻ - 2.0 ⁻										•	>>	*					
				2.0				k brown Sandy SILT		rganic) poor sample recovery.					>>	* * *					
				3.0				02 terminated at 2.5													
				3.5																	
				4.0																	
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				5.0																	
: ;	soil de based and R	fication symb ascription on Field Dess ock, New Zea chnical Societ	cription land	id of Soil	● re × pe ≫× pe		•	water ↓ 10/1/98 water → on date show → water inflow → water outflow	'n	moisture D dry M moist W wet S saturated	Cor VS S F St VS H	3	very soft firm stiff	v soft	index	VL L MD D VD		dens	um den	se	

-		ht.				ner	otech	nics												
C	7		-)	y	5	,		1100		Hand	Auge	er No			HA	10:	3			
E	in	ginee	eri	ng	Log	- H	land A	Auger		Sheet Projec					1 of GE	i 1 NZT	AU	C1:	808	6AE
Cli	ent:			The	Lakes	(201)	2)			Date s	tarte	d:				11.2				_
Pri	ncip	al:								Date o	omp	letec	l:		13.'	11.2	2013	3		
Pro	oject	t:		The	Lakes	Staa	e 2qrst			Logge	d by:				GJI	v				
		Auger loca	tion.			5				Check	-				RB					
		c penetrome					Eastin	ıg: 368071.85 m	Slope: -90°		L.L. St	, 	: m				ane N	lo: 22	44	
Hol	le dia	meter: 50 m	nm				Northi	ing: 800608 m	Bearing:	D	atum	x/y=	EBOP	PC2	000,	RL=N	loturi	ki		
dr	rillin	g informat	ion		materia		stance				1			_						
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol		material il type; colour, structure. Gr lasticity, sensitivity. Secono components, additional ii	lary and minor	moisture condition	consistency/ density index		 (i) (remoulded (i) (remoulded<td></td><td><u> </u></td><td>etratio blow 4 6</td><td>s per</td><td>· 100ı</td><td>nm</td><td></td>		<u> </u>	etratio blow 4 6	s per	· 100ı	nm	
				-	////	МН	SILT, medium	plasticity, mottled brown &	orange.	D-M		210							+ 10	
				-										>>x						
				0.5		SP	Gravelly SANE	D, fine to coarse grained, g	ap graded, angular,	м	1									
				-		ML	\grey-white, tra Sandy SILT, n	io plasticity, orange-brown.							,					
				-																
	p			1.0	///	SP	<u></u>	ne grained, uniformly grade			VSt- H			>>>						
	ntere			-		ML		o plasticity, friable, white, p	ossibly organic.	D-M										
	Groundwater not encountered			-			- becoming ora	ange-brown												
FIL	not e			1.5										×						
"	vater																			
	wpung			-																
	Gro			2.0								•		>>x						
				_			- becoming mo	oist to wet												
				-		SP	Silty SAND, fin	ne grained, uniform grain si	ze, grey-brown,	M-	-									
				2.5						Ŵ										
				-		SP	silt.	medium grained, grey-brow	vn, pumiceous, with some	•										
				3.0	////		- becoming dif													
							Note: Hole is e	n, target depth. essentially dry, with minor s 03 terminated at 3 metres.	eepage											
				-			Dorenole Hiven													
				3.5																
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				-																
				4.0																
				4.5																
				-																
┣—				5.0	L			i												
:	soil d based and R	ification symb escription I on Field Desc lock, New Zea schnical Societ	cription land	of Soil	● re × pi ≫× pi			water ↓ 10/1/98 water level on date shown ↓ water inflow water outflow	moisture D dry M moist W wet S saturated	consiste VS S F St VSt H	ver sof firm stiff	y soft t n y stiff	/ index		VL L MD D VD		very lo loose mediu dense very d	m der	se	

		. ff	~				otechn	lice														
C	7	JIE	=)		9	jec		105			Han	d Au	ger	No			HA	10	4			
							land A				She	et ect N	<u>.</u>				1 of GE			101	208	6AE
	ent:				Lakes							e star		1:				11.2				
Pri	ncip	al:				•	,				Date	e com	ple	eted	:		13.	11.2	201	3		
Pro	oject	:		The	Lakes	Stad	e 2qrst				Load	ged b	v:				GJI	N				
	-	uger loca	tion:			J					-	cked	-	:			RB					
_		: penetrome					Easting:	m		Slope: -90°		R.L.			: m				ane l	No: 22	244	
		meter: 50 n					Northing	: m		Bearing:		Datu	m:	x/y=	EBO	PC2	2000,	RL=N	/lotur	iki		
dr	illing	g informat	ion		materia		stance						×		. D	,	nen	etrati	on re	sista	nce t	est
aphy					bol o	classification symbol			terial		e	condition consistency/	Inde	shea	(remoulded /neak) kPa		pen	cuau		51510		631
stratigraphy	water	notes samples,		depth metres	graphic log	lassifi ymbol	plas	ype; colour, stru ticity, sensitivity	Second	ary and minor	moisture	onditio onsist	ensity	vane	(rem /peal	502		blow	s pe	r 100	nm	
<u>در</u>	3	tests, etc	RL	đΕ	б ////	ML		components, ad		ntormation.		_	-	22	122	150	2	4 6	8 1	0 12	14 16	18
						ML	Sandy SILT, no p					// VC				>>>	<					
							- bright orange-re	ed streaks														
E				0.5																		
																	,					
				1.0																		
	ered			-	× × × × × × × × × × × × × × ×	ML	SILT, no plasticit	y, light brown, m	inor fine	sand.		VS	St									
	count				* * * * * *											>>>						
	not en			1.5	× ×																	
S	ater r			-	× × × × × × × × × × × × × × ×		- sample becomi	ng moist to wet														
ALLUVIAL DEPOSITS	Groundwater not encountered			-	<u> </u>	SP	SAND, fine grain streaks, trace silt		aded, lig	ht brown with orange												
LDE	Q			2.0			Streaks, trace sit	L.								×						
NAN.																						
ALL				25											×							
				2.5																		
				-																		
				3.0																		
				-			EOBH @ 3.0m, t Borehole HA104		metres.													
				3.5																		
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				-																		
				5.0	_																	
		fication symb	ools an	d		hear (kP	·	water 10/1/98 was	ter level	moisture D dry		stency			inde		14					
	based	on Field Des ock, New Zea		of Soil	× pe	emoulded eak eak grea	ter than 200kPa	 In the second sec	own	M moist W wet	VS S F	s	ery oft irm	soft			VL L MD		very l loose medii		190	
		chnical Societ		005			penetrate	- water outflo		S saturated	F St VSt	s	tiff	stiff			D VD		dense		130	
					1						H		ard						5.90	2.150		

(offe	The Lakes (2012) The Lakes Stage 2qrst tition: Lot 853 eter type: Easting: 368046 m Slope: -90° nm Northing: 800467.4 m Bearing:				Har	nd A	uge	r Nc			HA	10	5						
E	'n	ginee	eri	ng	Log	- H	land A	Auger		She		No:				1 0	f 1		IC1	308	6AE
Cli	ent:			The	Lakes	(201)	2)				, 	arte					11.2				
Pri	ncip	al:								Dat	e co	omp	letec	1:		13.	11.2	201	3		
Pro	oject			The	Lakes	Stag	e 2arst			Loo	iaed	l by:				GJ	N				
	-		tion.			j	9 1			-	-	ed by				RB					
		-			000		Eastin	iq: 368046 m	Slope: -90°	One			y. Irface	: m				ane l	No: 22	244	
-							Northi	o ng: 800467.4 m			Da	atum:	x/y=	EBOF	PC2	2000,	RL=ľ	Motur	iki		
dı	illin	g informa	tion	-	materia	-	stance								_						
yhc					bo	ation		mate	rial		_	consistency/ density index	hoor	(remoulded /peak) kPa		pen	etrati	on re	esista	nce t	est
stratigraphy	Ŀ	notes		es es	ohic lo	sifice				stire	condition	sister sity ir	000	emol eak)			blov	vs pe	r 100	nm	
stra	water	samples, tests, etc	RL	dept meti	grap	clas	p			iou	con	den	25	。 125 125 125 125 125 125 125 125	175	2		-	0 12		18
_				_	////	ML	Sandy SILT, n	o plasticity, friable, d	ark brown, rootlets, organic o	dor.	M	VSt- H			Ì						
				-		ML	· · · ·														
				0.5				icity, light drown with	orange mottles; with minor fil	ne											-
						1									>>>	<					
				-		1							•		<						
				10		1	- 50mm laver	of fine arained cand	uniform arain size, arev, ora:	anic											
	-			<u>.</u>		ML	odor.	_		/											
	Groundwater not encountered			-		ML	-		vn-grey; sand is fine grained.						>>>	<					
	lcour			15										•	×						
FL	not er			1. <u>0</u>																	
Ē	ater r		information material substance notes samples, tests, etc g set set set set set set set set set set				nae				•	>	<								
	mpur		The Lakes Stage Squares The Intervention in the stage of the stage o		5																
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				25		1								• >	<						
				2.5]															
				-											>>>	<					
				30-																	
				3.0																	
					////		FOBH @ 3.2n	n target depth													
				25			Borehole HA1	05 terminated at 3.2	metres.												
				3.5																	
				-																	
				4.0																	
				4.5																	
				E 0-																	
				J 0.0	l			i	1												
:	soil d	escription			• r	emoulde		 10/1/98 water 		cons VS	sister	ver	y soft	/ index		VL		very l	oose		
i	and R	ock, New Zea	land		≫× p	eak grea	ter than 200kPa	water inflow	W wet	S F		soff firm	1			L MD		loose		ise	
	Geote	chnical Socie	ty Inc 2	005	UTP u	inable to	penetrate	- water outflow	S saturated	St VSt			y stiff			D VD		dense very o			
										н		har	d								

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C	~		7)		5		otechnics		Hand	Auge	r No.		H	A1	06			_
F	n	ninoc	ri	na	ا مم	_ F	land Auger		Sheet				1	of 1				
_		JIIICC	/				_		Projec	t No:						JC1:	3086	<u>5AE</u>
Clie	ent:			The	Lakes	(2012	2)		Date s	starte	d:				.201			
Prir	ncipa	al:							Date o	comp	leted	:	13	8.11	.201	3		
Pro	ject	:		The	Lakes	Stag	e 2qrst		Logge	d by:			G.	JN				
Ha	nd A	uger locat	tion:	Lot	858				Check				R	BT				
-		penetrome		e:			Easting: 368053.7 m	Slope: -90°			irface:		2000			No: 22	244	
		neter: 50 m g informat			materia	al subs	Northing: 800321.8 m	Bearing:	L	Jatum	x/y=i	EBOP	5200	0, RL	=Motu	riki		_
ž		-			5	ч				iv∕ ×a	ear	ded Pa	pe	enetra	ation r	esista	nce te	est
stratigraphy	L	notes		s	graphic log	classification symbol	material Soil type; colour, structure.	Grading: bedding:	tion	consistency/ density index	le she	(remoulded /peak) kPa						
strati	water	samples, tests, etc	RL	depth metres	grapl	class symb	plasticity, sensitivity. Seco components, additiona	ondary and minor	moisture condition	consi	vane	125 150 (re	0			er 1001		10
		16313, 610			<i>7777</i>	ML	Sandy SILT, no plasticity, friable, dark	brown, rootlets.		VSt-	26		2	2 4	68	10 12 '	14 16	18
				_	* * * * * * * * * * * *	ML	SILT, no plasticity, orange with black s	pecks, with some sand.		Н								
				0.5	× × × × × × × × × × × × × × × × × × × ×								Î					
				-	× × × × × × × × × × × × × × ×		comple becoming moint											
				-	× × × × × × × × × × × × × × ×		 sample becoming moist increasing sand content 				•	×						
				1.0	× × × × × × × × × ×													
Ņ	tered			_	* * * * * *	SP	 sample becoming pale orange with find sample becoming pale orange with find sample becoming pale or sample becoming particular sample becoming particular sample becoming particular sample becoming particular sample becoming pale or s		_	St-		>	>X					
OSIT	unoou			_		-	sub-rounded to sub-angular, pumiceou			Vst								
DEF	not er			1.5	$\begin{pmatrix} \times & \times & \times \\ & \times & \times & \times \\ & & \times & \times & \times$	ML	SILT, low plasticity, light brown, with so sand.	ome clay & minor fine graine	d		• ×							
ALLUVIAL DEPOSITS	vater			-	$\times \times $	ML	- sample becoming white/light brown Silty SAND/Sandy SILT, no plasticity, v	white		1								
ALLL	Groundwater not encountered			_	$\begin{pmatrix} \times & \times \\ \times & \times \end{pmatrix}$		- increasing sand content	vince.	W									
	Gre			2.0		SP ML	Silty SAND, fine to medium grained, w				•	×						
				-	× × ×	SP	Sandy SILT, non to low plasticity, white SAND, fine to medium grained, grey-w											
				_ م د	(ML	Sandy SILT, non to pow plasticity, whit	e.										
				2.5							• ×							
				-	$\begin{pmatrix} & & & \\ & & & \\ & & & \\ & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & $		- sample becoming wet		W									
				3.0	$\begin{pmatrix} & & \times & \times & \times \\ & & \times & \times & \times \\ & & & \times & \times$		- sample becoming saturated											
				0.0	<u> </u>		EOBH @ 3.0m, target depth		-									
				-			Note: Shear Vane sinks below 2.6m Borehole HA106 terminated at 3 metre	es.										
				3.5														
				_														
				-														
				4.0														
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s	oil de	fication symb			• re	hear (kP moulded		moisture D dry M moist	consiste VS	ver	y soft	index	VL			loose		
a	ind Ro	on Field Desc ock, New Zeal	and		≫× pe		ter than 200kPa water inflow	W wet S saturated	S F	sof firm	1		L MD			um der	ise	
	seote	chnical Societ	y inc 20	00	UTP u	nable to	penetrate — water outflow		St VSt	stiff ver	y stiff		D VD		dens	e dense		

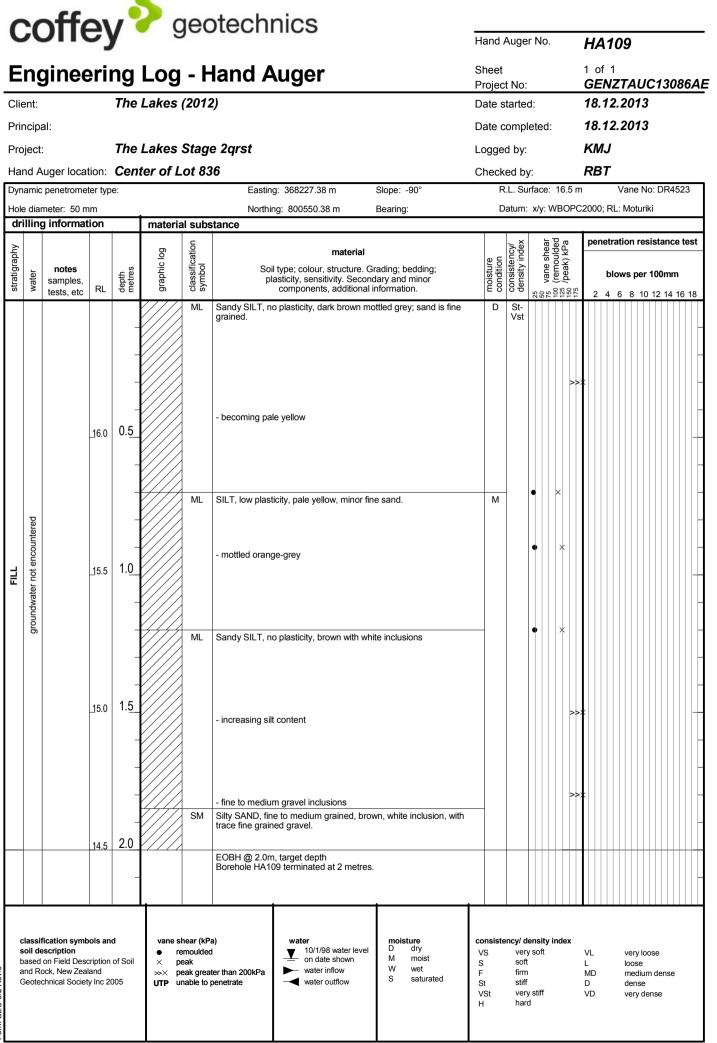
HAND AUGER SCALA FIELD_LOG&SHEAR_VEIN_RECORDS.GPJ COFFEY.GDT 7.5.14

Appendix E

Post-Construction Investigation Data

C		offe	ey	y	g	geo	otech	nics		H	land <i>i</i>	Auge	r Nc		Н	A1	07			
Ε	ng	ginee	əri	ng	Log	- H	land A	Auger			heet rojec					of 1 EN 2		UC1	308	36A)
Clie	ent:			The	Lakes	(201)	2)				ate s						.201			
	ncip	al·				(,				ate c			ł.			2.201			
				Tho	Lakos	net2	e 2qrst									мJ				
	ject					-	-				ogge	-								
		uger loca			ter of L	.01 84		a: 268200.8 m	Slope: -90°	C	heck			: 16 m		BT	Vanc	No: E		23
-		penetrome meter: 50 n		Je.				ig: 368200.8 m ng: 800538.67 m	Bearing:					WBOF		00. BI			/140	23
		g informa			materia	al subs		ng. 000000.07 m	Doarnig.			ataini	<i>,</i> ,,,,,			0,112				
hy					D	ion		mate	rial			cy/ dex	aar	ded	pe	enetra	ation	resist	ance	test
stratigraphy	L	notes		s	graphic log	classification symbol	So	il type: colour. structu	re. Gradina: beddina:		ture	consistency/ density index	49	(remoulded /peak) kPa						
strati	water	samples, tests, etc	RL	depth metres	grap	class	р	lasticity, sensitivity. S components, additi	econdary and minor		moisture condition	consi	5	65555 7 7 7 7 7 7 9	e ,		•	oer 100		0.40
_		16313, 610			////	OL	Sandy SILT, n	o plasticity, brown, tra	ace gravel, rootlets (TOP	SOIL).	D-M	St-	26		- 2	2 4	68	10 12	14 1	6 18
				-			Sondy SILT n	o plasticity brown m	inor modium grained gra		-	Vst								
						ML	rootlets; sand	is fine grained.	inor medium grained gra	ivei &										
							- pale brown w	vith white inclusions												
							- increasing pl	asticity, becoming bro	own					>	>X					
				-																
FILL			15.5	0.5																
							- some blue-bl	lack gravel, medium g	arained											-
				_		1		-						×						
						ML	Sandy SILT, n gravel & fine g	o plasticity, grey-whit rained sand.	e, with some medium gra	ained										
	ered						- brown mottle	d grey												
	dwater not encountered				× × × × × × × ×	ML		ticity, brown (Hamilto	Ash)		-		•	×						
	ot en		15.0	1.0			OILT, IOW Plas	licity, brown (namito	ranj.											
	ater n				× × × × × × × × × × × × × × × × × ×															
	empu				× × × × × × × × × × × ×															
	ground				× × × × × × × × × × × × × × × × × ×								•	×						
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HES				-	\times \times \times \times \times															
S ASI				-	× × × × × × × × × × × × × × × × × × ×		- mottled oran	ge												
ANIC			14.5	1.5_	× × × × × × × × × × × × × × × × × ×			-						>	>x					
VOLCANIC ASHES																				
				-																
					X X X X X X X X X X X X X X X X X X X		- sand pocket.	fine grained, pale gr	ev											
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			14.0	2.0	* * * * * *		FORH @ 2 On	n, target depth.			-			>	+	+++				
				_			Borehole HA1	07 terminated at 2 m	etres.											
	<u> </u>	1	1	1	'	I	1		1		1	I								
~	120-'	fication	holo	d		hoor (1-7	2)	water	mointur		neist	nev/ -	oncit	index						
s	oil de	fication syml			● re	hear (kP emoulde	•	water 10/1/98 water → on date showr		\ \	/S	ver	y soft	/ index	VL			y loose		
а	ind R	on Field Des ock, New Zea	land		≫× p		ter than 200kPa	water inflow	W wet S saturated	F	-	soft firm	1		L MD	1		dium de	ense	
(beote	chnical Socie	ty INC 2	CUUD	UTP u	nable to	penetrate	- water outflow	e suuruou	\ \	St /St		y stiff		D VD		den very	ise y dense		
										ŀ	1	har	u							

-		http://www.com	21	y geotechnics ring Log - Hand Auger The Lakes (2012)																
C	~		-)	y	5	,		1100		Hand	Aug	er No	0.		HA	10	8			
E	'n	ginee	ri	ng	Log	- H	land A	Auger		Sheet Projec		:			1 of GE		ΓΑι	JC13	808	6Al
Cli	ent:			The	Lakes	(2012	2)			Date	starte	ed:				12.2				
Pri	ncip	al:								Date	comp	olete	d:		18.	12.2	201	3		
Pro	oject	:		The	Lakes	Stag	e 2qrst			Logge	ed by	:			KM	IJ				
На	nd A	Auger loca	tion:	Cen	ter of L	.ot 84	14			Checl	ked b	oy:			RB	т				
Dyr	namic	penetrome	ter typ	e:			Eastin	ng: 368197.23 m	Slope: -90°	F	R.L. S	urface	e: 1	6 m		V	ane l	No: DF	R452	3
		meter: 50 m			•			ing: 800520.49 m	Bearing:	[Datum	n: x/y	: WB	BOPC	2000	; RL:	Motu	riki		
dr	illin	g informat	ion		materia		stance							_	1	otroti	00.00	esista		
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	So	material il type; colour, structure. lasticity, sensitivity. Seco components, addition	Grading; bedding; ondary and minor	moisture condition	consistency/ density index		75 vane shear 100 (remoulded	¹²⁵ /peak) kPa ¹⁷⁵		blov	vs pe	r 100r 0 12 1	nm	
			samples, tests, etc RL a a b a b b a b b a b c a b c a b c a b c a b c a b c a b c a b c a b c a b c a b c a b c a b c a b c a b c a b c a b								St- Vst									
VOLCANIC ASHES			_15.5			ML	Sandy SILT, n	no plasticity, dark brown, ine to medium grained g	mottled orange-brown, ravel & white inclusions; sa	ind				>>	*					
	not encountered			-	X X X X X X X X X X X X X X X X X X X	ML	fine sand & bla	ack inclusions.	n, black & white specks, mi	nor		•	* *							
ALLUVIAL DEPOSITS	groundwater not								olack specks; sand is fine	M- W		•		*						
ALL			_14.5	- 1. <u>5</u> - - -			- increasing sa	and content, sand is fine	grained			•		×						
L			14.0	2.0																
							EOBH @ 2.0 r Borehole HA1	m, target depth 08 terminated at 2 metro	es.											
				-	1															
: 	soil de based and R	fication symb escription on Field Deso ock, New Zea chnical Societ	ription and	of Soil	● re × po ≫× po			water ↓ 10/1/98 water lev on date shown ↓ water inflow ↓ water outflow	moisture D dry M moist W wet S saturated	consist VS S F St VSt H	ve so firr sti	ry soft ft m ff ry stiff	t	lex	VL L MD D VD		dense	um den	se	



(20	offe	2 \	/		geo	otechr	nics		-											
										ŀ	Hand J	Auge	er No).		HA	11	0			
E	İnq	ginee	eri I	ng	Log	- H	land A	uger			Sheet ² rojec					1 of GE		- 41	IC13	2086	64
	ent:				Lakes						Date s					18.					<u></u>
Pri	incip	al:				•				[Date c	omp	lete	d:		18.	12.2	201:	3		
Pr	oject			The	Lakes	Stag	e 2qrst			L	_ogge	d by:				KM	J				
	-	Auger locat	tion:			-	-				Check	-				RB	т				
Dy	namio	c penetrome	ter typ	e:			Easting	g: 368222.95 m	Slope:			.L. Sı	-	e: 1	9 m		Va	ane N	No: DF	R4523	3
		meter: 50 m						ıg: 800526.9 m	Bearin	g:	D	atum	: x/y:	WE	SOPC	;2000;	RL: N	Motu	riki		
d	rillin	g informat	ion		materia		stance					- v	<u> </u>	- 7	-	non	otrati	on re	sista	nco to	net
stratigraphy	water							mate type; colour, structu asticity, sensitivity. S components, addit	ure. Grading; Secondary an	d minor	moisture condition	consistency/ density index	25 50	75 varie sriear 100 (remoulded	¹²⁵ /peak) kPa 175		blow	's pe	r 100 r 0 12 1	nm	
				_		ML	gravel, rootlets	,		ne grained, trace sand is fine grained.	D	St- Vst									_
			<u>1</u> 8.5	0.5		ML		e-brown & pale yelle w plasticity, mottled		prown; minor fine	M	-			>>						
FILL	untered			_			- minor organic	silt, dark blue-grey					•	×							_
	groundwater not encountered		_18.0	1. <u>0</u>		ML	Silty SAND, fine	e to medium grained	d, brown.												
	10			-	*****	ML	- becoming pale	e grey city, orange-brown	with black sp	ecks					>>	*					_
ALLUVIAL DEPOSITS			_17.5	1. <u>5</u> _ _	x x x x x x x x x x x x x x x x x x x		- increasing cla	y content, medium	plasticity; bec	oming clayey SILT.		F-St	•	<	×						-
			17.0	2.0	× × × × × × × × × × × × × × × × × × ×		EOBH @ 2.0m Borehole HA11	, target depth 0 terminated at 2 m	netres.												
	soil d based and R	fication symb escription I on Field Deso ock, New Zeal ochnical Societ	ription and	of Soil	● re × p ≫× p			water ↓ 10/1/98 water on date shown ▶ water inflow water outflow	r level D m M W	dry moist wet saturated	consiste VS S F St VSt H	ver sof firm stiff	y soft t n f y stiff		lex	VL L MD D VD	1	very k loose mediu dense very c	ım den	se	

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C			=)			300	10011	1105			Hand	Auge	r No).		HA	411	11			
Е	ng	ginee	eri	ng	Log	- 	land A	Auger			Sheet					1 o		ידאו	101	208	6AE
	ent:			-	Lakes						Projec Date s							201		500	
	ncip	al:		-			,				Date of			d:		19.	12.	201	3		
	oject			The	l akes	Stag	e 2qrst				Logge	•				RB			-		
	-	Auger loca	tion [.]			-	-				Check					RB					
		penetrome						ng: 368222.95 m	Ś	Slope: -90°		R.L. Su		e: 17	'n			Vane	No: S	_588	
		meter: 50 n					Northi	ing: 800526.9 m	E	Bearing:	0	Datum:	x/y:	WB	OPC	2000); RL	: Moti	ıriki		
dr	illing	g informat	ion		materia	1	stance							- 73				tion .	!-+-		
stratigraphy	water	OL Sandy SILT, no plasticity, dark brown, organic; sand is fir (TOPSOIL).							ary and minor	moisture condition	consistency/ density index	25 50 vano choo	75 valie silear 100 (remoulded 125 /2004/1400	150 /peak) KPa 175	-	blo	ws p	esist a er 100 10 12	mm		
TS					$\langle \rangle \rangle \rangle$	OL		no plasticity, dark bro	own, org	anic; sand is fine grained	I D	н									
FILL	groundwater not encountered	Desits, etc A. C. Z. OL Sandy SILT, no plasticity, dark brown, organic; sand is fine (TOPSOIL). ML SILT, minor fine to coarse sand; orange-brown, mottled br plasticity, trace clay. 16.5 0.5 16.0 1.0 SM Silty SAND, coarse to medium, brown-grey.		ey. Irown, mottled brown, lov Town-grey.		VSt	•	×		*											
	soil de	fication syml			• re	hear (kP	TS = TOPSOI Borehole HA1	11 terminated at 2 m water ▼ 10/1/98 wate	er level	moisture D dry M moist	consist VS	ver	y soft			VL		very	loose		
ł	based and R	on Field Des ock, New Zea chnical Socie	land		× p ≫× p	eak eak grea	ter than 200kPa penetrate	 on date show water inflow water outflow 	vn	M moist W wet S saturated	S F St VSt H	soff firm stiff	y stiff			L MD D VD		loos med dens	e ium de	ise	

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al:	erii	-		- -					5					112			
:		The	1			Auger		Shee Proje					1 of GE	1 NZTA	AUC	C13(086 <i>4</i>
:			Lakes	(2012	2)			Date						12.20			
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		The	Lakes	Stag	e 2qrst			Logge	ed by:				RB				
uger loca	tion:		ter of L	-	-			Chec	-				RB	т			
penetrome						ng: 368248.16 m	Slope: -90°		R.L. Sı		: 17	.5 m		Var	ne No	: SL5	588
meter: 50 m					Northi	ing: 800534.76 m	Bearing:		Datum	x/y:	WBC	OPC	2000;	RL: M	oturik	i	
g informat	tion		materia		stance						73			etratio			
notes samples, tests, etc	RL	depth metres	graphic log	classification symbol		material aviil type; colour, structure. lasticity, sensitivity. Seco components, addition	Grading; bedding; ondary and minor	moisture	consistency/ density index	vane shea	125 (neak) kPa	50 / podiny in d		blows	per '	100m	m
			////	OL	Sandy SILT, n (TOPSOIL).	no plasticity, dark brown,	organic, sand is fine graine	d D	VSt								
	ML SILT, low plasticity, orange-brown, mottled brown, mino coarse sand; trace clay.							M	-								
	ML Clayey SILT, medium plasticity, orange-brown. ML SILT, low plasticity, minor fine to coarse sand; orange-br mottled brown, trace clay.						e-brown.	_									
							e sand: orange-brown.	_									
		_								•		×					
	17.0	0.5															
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	16.0	1.5															
		-		ML	Sandy SILT; b	prown, no plasticity; sand	l is coarse grained.			•	×						
		_															
		_		MI		trace fine to coarse sand		_									
		_		IVIL	Clayey SILT, ti												
	15.5	2.0															
	10.0				EOBH @ 2.0m Borehole HA1	n, target depth 12 terminated at 2 metre	es.				-×						
		_															
				1		i	-ii										
				1		1											
		_16.5 _16.0				16.0 1.5 ML Sandy SILT; t ML Clayey SILT, t	16.0 1.5 ML Sandy SILT; brown, no plasticity; sand ML Clayey SILT, trace fine to coarse sand	16.0 1.5 ML Sandy SILT; brown, no plasticity; sand is coarse grained. ML Clayey SILT, trace fine to coarse sand.	16.0 1.5 ML Sandy SILT; brown, no plasticity; sand is coarse grained. ML Clayey SILT, trace fine to coarse sand.	16.0 1.5 16.0 1.5 ML Sandy SILT; brown, no plasticity; sand is coarse grained. ML Clayey SILT, trace fine to coarse sand. 15.5 2.0	16.0 1.5 ML Sandy SILT; brown, no plasticity; sand is coarse grained. ML Clayey SILT, trace fine to coarse sand.	16.0 1.5 ML Sandy SILT; brown, no plasticity; sand is coarse grained. ML Clayey SILT, trace fine to coarse sand.	16.0 1.5 ML Sandy SILT; brown, no plasticity; sand is coarse grained. ML Clayey SILT, trace fine to coarse sand.	16.0 1.5 ML Sandy SILT; brown, no plasticity; sand is coarse grained.	16.0 1.5 ML Sandy SILT; brown, no plasticity; sand is coarse grained. ML Clayey SILT, trace fine to coarse sand.	16.0 1.5 ML Sandy SILT; brown, no plasticity; sand is coarse grained. ML Clayey SILT, trace fine to coarse sand.	16.0 1.5 ML Sandy SILT; brown, no plasticity; sand is coarse grained.

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c	'n	ninor		na	امم	L	land Auger	Shee	t					1 (of 1	-				
	, I I	Jinee	711					Proje	ct No	:									308	86AE
Cli	ent:			The	Lakes	(2012	?)	Date	starte	ed:							013			
Pri	ncip	al:						Date	comp	lete	d:			19	.12	2.20	013	8		
Pro	oject	:		The	Lakes	Stag	e 2qrst	ogg	ed by	:				R	3					
		uger loca			ter of L	ot 83			ked b	-				RI	3 <i>T</i>					
-		penetrome		e:			Easting: 368246.07 m Slope: -90°		R.L. S					200	<u>о.</u> п			lo: S	L588	i
		meter: 50 m g informat			materia	al subs	Northing: 800518.66 m Bearing: tance		Datum	i. x/y		вО		200	0, R		otur	IKI		
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	material Soil type; colour, structure. Grading; bedding; plasticity, sensitivity. Secondary and minor components, additional information.	moisture	consistency/ density index	25 50	75 vane shear	125 /peak) kPa	175		bl	ows	per	100	mm	test 6 18	
TS				_	Sandy SILT, no plasticity, dark brown, organic, sand is fine grained (TOPSOIL).	D	H											_		
			18.5	0.5		ML	Clayey SILT, medium plasticity, orange-brown, mottled brown and pale brown, minor coarse sand.	M						¢						
FILL	groundwater not encountered		<u>18.0</u>	_ _ 1. <u>0</u>		ML	Sandy SILT, no plasticity, grey-brown, sand is fine to coarse grained.		VSI					¢						
	ß		_17.5	- - 1. <u>5</u> -		ML	SILT, low plasticity, pale orange, trace clay.			•		×	×							
			17.0	2.0		· · ·	EOBH @ 2.0m, target depth TS = TOPSOIL Borehole HA113 terminated at 2 metres.		St	-										
s 1	soil de based and R	on Field Des ock, New Zea	cation symbols and vane shear (kPa) water moisture											VL L MD VD		lo m d	ense	m de	nse	

-		_ff				ner	otechnics											
C	ノ		=)		5	juu	leon nes	Hand	Aug	er No).		H/	11	14			
Ε	ną	ginee	eri	ng	Log	- H	land Auger	Shee Proje):			1 0 GE		TA	UC1	308	B6AE
Clie	ent:			The	Lakes	(2012	2)	Date							201			
Pri	ncip	al:						Date	com	olete	d:		19.	12.	201	13		
Pro	ject	:		The	Lakes	Stag	e 2qrst	Logg	ed by	r:			RB	;				
На	nd A	Auger loca	tion:	Cen	ter of L	.ot 84	11	Chec	ked b	by:			RB	T				
Dyn	amic	c penetrome	ter typ	e:			Easting: 368243.48 m Slope: -90°		R.L. S	urface	e: 22 i	m			Vane	No: S	SL588	3
		meter: 50 n			<u> </u>	<u> </u>	Northing: 800493.21 m Bearing:		Datun	n: x/y	WBO	PC	2000); RL	: Mot	uriki		
dr	Illin	g informat	tion		materia		stance				- 7 -		ner	otra	tion	resist	anco	tast
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	consistency/ density index	25 50	75 Varie Sriear 100 (remoulded 125 /peak) kPa	175	•	blo	ws p	er 100)mm	
TS						OL	Sandy SILT, no plasticity, dark brown, organic; sand is fine graine (TOPSOIL).	d D	Н									
FILL	ntered		_21.5	0.5		ML	Sandy SILT, no plasticity, orange; sand is fine to coarse grained. SILT, low plasticity, brown, minor clay, trace medium sand.	M				:						
POSITS	groundwater not encountered		_21.0	1. <u>0</u> -		ML	SILT, low plasticity, pale orange, trace clay, trace fine to medium sand.		F	•								
ALLUVIAL DEPOSITS			_20.5	1. <u>5</u> 		ML	Sandy SILT, no plasticity, pale orange, mottled dark brown; sand medium grained.	s	St	-• >								
						ML	Clayey SILT, medium plasticity, orange-brown, trace medium san	d.	VS	ŧ								
			20.0	2.0	<u>;^x^x</u> x		EOBH @ 2.0m, target depth TS = TOPSOIL Borehole HA114 terminated at 2 metres.			+•								
s t	oil de based and R	fication symf escription on Field Des ock, New Zea chnical Socie	cription land	of Soil	● re × p ≫× p			consis VS F St VSt H	ve sc fin sti	ry soft ft m		ĸ	VL L MD D VD		loos mec den	lium de		

		-ff	~				otech	nice												
C)(JIE	=)	y	e e	jet		1105			Han	d Auge	er No).		HA1	115			
F	'n	ainee	ri	na	Loa	- F	land A	luger			She					of				
_		9										ect No							130	86AE
	ent:	-l.		me	Lakes	(2012	2)					starte		ı.			2.20 2.20			
	ncip			The	Lakaa	C4	- D awa4					comp		1:			2.20	13		
	oject					-	e 2qrst					ged by				RB	,			
_		Auger locat			ler of L	01 04		ng: 368218.9 m		Slope: -90°	Cne	R.L. S	-	e: 20 m		RBT		e No:	SL58	8
· ·		, meter: 50 m						ing: 800491.03 m		Bearing:		Datum	: x/y:	WBOP	C2	000; F	RL: Mo	turiki		
dı	rillin	g informat	ion		materia		stance						Ι.	-	Ť					
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	So	n il type; colour, str lasticity, sensitivit components, a	y. Second	ary and minor	moisture	condition consistency/ densitv index	25 50 yoon ohoo	 75 valic silicati 100 (remoulded 125 /peak) kPa 150 /peak) kPa 	c/ ا	b	lows	oer 1	00mm	1
₹S						OL	Sandy SILT; n (TOPSOIL).	o plasticity, dark	brown, org	anic; sand is fine grain	ed [н								
	-			-		ML	· ,		ge, mottlec	brown; sand is fine to	N	1			*					
FILL	not encountered		_19.5	0.5											×					-
	groundwater not		_19.0	1. <u>0</u> –		ML	grained.	io plasticity, dark no plasticity, orang		nd is fine to coarse fine grained.		VSt	- •	×						
ALLUVIAL DEPOSITS			_18.5	1.5									•	×						-
			18.0	2.0	<u>() X (X) X</u>		EOBH @ 2.0n TS = TOPSOII Borehole HA1	n, target depth L 15 terminated at	2 metres.		•		•	*						
	soil d based and R	fication symb escription I on Field Desc ock, New Zeal cchnical Societ	cription land	of Soil	● re × po ≫× po			water ↓ 10/1/98 w on date sl water inflc water outf	hown ow	moisture D dry M moist W wet S saturated	consi VS S F St VSt H	so firr stit	ry soft ft n ff ry stiff	y index		ИD	loo me der	dium	lense	

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C	7		=)	y	5	jet		1103			Hand	Aug	er N	0.		HA	11	6			-
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	ent:	<u> </u>		_	Lakes			0			Proje Date					GE 19.				0864	<u>.</u>
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	oject			The	Lakes	Staa	e 2qrst				Logg					RB					
	-	Auger loca	tion:			-	-				Chec	-				RB	т				
_		c penetrome						ıg: 368191.28 ı	m	Slope: -90°		R.L. S		e: 1	7 m		V	ane N	No: SL	588	٦
		meter: 50 m g informat			materia			ng: 800499.87	'm I	Bearing:		Datun	n: x/y	: WE	OPC	2000	; RL:	Motu	riki		
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	So	il type; colour, s lasticity, sensiti components,	vity. Second	ading; bedding; ary and minor ıformation.	moisture	consistency/ density index		75 vane shear 100 (remoulded	50 /peak) kPa		blov	vs pe	r 100m	ce test m 16 18	
TS				_		OL	Sandy SILT, n (TOPSOIL).	o plasticity, dar	k brown, org	ganic; sand is fine grain		_	0.0			2	4 0	0 1		+ 10 10	_
FILL				-		ML	Sandy SILT, n grained.	o plasticity, ora	nge-brown;	sand is fine to medium	N					*					
	ered		_16.5	0.5		SM	Silty SAND, fir	ie to medium g	rained, oran	ge-brown.		VS	t	>	<						
EPOSITS	groundwater not encountered		<u>1</u> 6.0	1.0										×						_	
ALLUVIAL DEPOSITS			<u>1</u> 5.5	1.5		ML		icity, orange, tr		nedium sand. sand is coarse grained		St	•	×						_	
			15.0	2.0			EOBH @ 2.0n TS = TOPSOII Borehole HA1	n, target depth L 16 terminated a	at 2 metres.					-×							
	soil d based and R	fication symt escription Ion Field Dess ock, New Zea cchnical Societ	cription land	of Soil	● re × pe ≫× pe			water ↓ 10/1/98 → on date → water in → water of	nflow	moisture D dry M moist W wet S saturated	consis VS S F St VSt H	ve so fir st	ery sof oft m	t	lex	VL L MD D VD		very k loose mediu dense very c	ım dens	e	

		-ff	~				otech	nice														
C	7	JIE	=)	y	5	jet	lecin	1105			Har	nd A	uge	r No			HA	117	,			_
Ε	'n	ginee	eri	ng	Log	- H	land A	uger			She Pro	eet ject	No:				of GEN		٩U	C13	086	6AE
Cli	ent:			The	Lakes	(2012	2)					e sta		d:				2.20				
Pri	ncip	al:									Dat	e co	mpl	etec	l:		19.1	2.20	013	}		
Pro	oject	t:		The	Lakes	Stag	e 2qrst				Log	ged	by:			I	RB					
На	nd A	Auger loca	tion:	Cent	ter of L	.ot 84	16				Che	ecke	d by	/:			RB1	-				
Dyr	namio	c penetrome	ter typ	e:			Eastin	g: 368187.37 m	:	Slope: -90°		R.L	Su	rface	:18 n	n		Va	ne N	lo: SL	588	
		meter: 50 m						ng: 800479.44 m	n l	Bearing:		Da	tum:	x/y:	WBO	PC2	000;	RL: M	oturi	iki		
		g informat	lon		materia		stance						×	F	,	1	pene	tratio	n re	sistar	ce te	est
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	Soi	m il type; colour, stri lasticity, sensitivit components, a	y. Second	ary and minor	moisture	condition	density index	25 50 vane she:	 (i) (remoulded (i) (remoulded<th>175</th><th></th><th>blows</th><th>per</th><th>100n</th><th>m</th><th></th>	175		blows	per	100n	m	
TS	-			_		OL	Sandy SILT, d (TOPSOIL).	ark brown, no pla	isticity, org	anic; sand is fine grain	ed	D	Η									_
	tered		_17.5	0.5		ML	Sandy SILT, Ic fine to coarse		ge, mottle	d brown and grey; sand	1 is	M				*						
FILL	groundwater not encountered		_17.0	1. <u>0</u> -												×						
			_16.5	1.5 2.0												*						
							EOBH @ 2.0n TS = TOPSOII Borehole HA1	n, target depth 17 terminated at :	2 metres.													
s t a	soil de based and R	ification symb escription I on Field Deso tock, New Zea schnical Societ	cription land	of Soil	● re × p ≫× p			water ↓ 10/1/98 w on date st water inflo water outf	nown w	moisture D dry M moist W wet S saturated	cons VS S F St VSt H		very soft firm stiff	/ soft	/ index	\ L N	/L /D /D	lo m de	ense	m den	se	

C		ОПС	ey		g	jec	otechnics	- +	land	Auge	r No			HA	11	8			
E	ng	ginee	eri	ng	Log	- ŀ	land Auger		Sheet Projec					1 of GE	f 1 NZ 7	ΓΑΙ	JC1	30	86A
Clie	ent:			The	Lakes	(201)	2))ate s						12.2				
⊃rir	ncipa	al:						C	ate c	omp	etec	l:		19.	12.2	201	3		
Pro	ject	:		The	Lakes	Stag	e 2grst	L	ogge	d by:				RB					
	-	uger loca	tion:			-	-		heck	-				RB	т				
		penetrome					Easting: 368180.97 m	Slope: -90°		.L. Su		: 19				ane	No: S	SL58	8
		meter: 50 n			•		Northing: 800462.96 m	Bearing:	D	atum:	x/y:	WBC	PC	2000	; RL:	Motu	riki		
dri	illing	g informa	tion		materia		stance					. 77 -	-1	non	etrati	00.0			toot
stratigraphy	water	notes samples,	RL	depth metres	graphic log	classification symbol	material Soil type; colour, structure. G plasticity, sensitivity. Secon components, additional i	dary and minor	moisture condition	consistency/ density index	vane shea	(remoulded /peak) kPa		•	blov	vs pe	er 100)mm	
		tests, etc				OL	Sandy SILT, no plasticity, dark brown, o		D	VSt	222	125	17	2	4 6	8 1	10 12	14 1	6 18
s				-	>>>>	ML	(TOPSOIL). Sandy SILT; no plasticity, orange, mottle	d nale orange and grev:	M	-									
FILL				-			sand is fine to coarse grained.	u pale orange and grey,			•		×						-
			<u>1</u> 8.5	0.5_		ML	Sandy SILT; no plasticity, pale orange; s	and is medium to coarse	-										_
				_	* * * * * * * * * * * *	IVIL	grained.												
					$\begin{array}{c} \times & \times & \times \\ & \times & \times & \times \\ \times & \times & \times & \times$														
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	dwater not encountered			-															
	ot enc		18.0	1.0	$\begin{array}{ccc} \times & \times & \times \\ \times & \times & \times \\ \times & \times & \times \end{array}$														
	ter no																		
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			17.0	2.0	× × × × × × × × ×														
							EOBH @ 2.0m, target depth TS = TOPSOIL												
				-			Borehole HA118 terminated at 2 metres.												
s b a	oil de based and Re	fication syml sscription on Field Des pock, New Zea chnical Socie	cription Iland	of Soil	● re × pe ≫× pe			D dry M moist W wet S saturated	onsiste /S S St /St H	ver soft firm stiff	y soft	/ index		VL L MD D VD		loose medi dens	um de		

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C			=)	y	5	juu		1105			Hand	l Aug	er N	lo.		Η	A1	19)			_
F	'n	nine	ri	na	l ou	- F	land A	liner			Shee	t				1	of	1				
		gine	/ 1					luger			Proje									C13	080	<u>SAE</u>
	ent:			The	Lakes	(2012	2)				Date							201				
	ncip										Date			ed:				201	14			
	oject					-	e 2qrst				Logg	ed by	<i>r</i> :			S						
		uger loca			ter of L	.ot 83		000100.0		21 222	Cheo		-			R	BT	1/-			4500	
		penetrome meter: 50 m		e:				ig: 368199.9 m ng: 800595.4 m		Slope: -90° Bearing:		R.L. S Datun			m /BOPC	:200	00. E			lo: DF	452.	\$
		g informat			materia	al subs		ng. 000000.1111		Boarnig.		Batan		<i></i>					otai			
stratigraphy	water	notes samples,	RL	depth metres	graphic log	classification symbol		mat il type; colour, struc lasticity, sensitivity. components, add	Second	ary and minor	moisture	consistency/ density index		vane shear	100 (remoulded 125 /peak) kPa 175	ŀ	b	lows	per	sistar 100n	ım	
		tests, etc		02				iable, brown with or	casion	al pale grey and orange		_	25	22	1122		24	6	8 10) 12 1	4 16	18
EILL	groundwater not encountered			0.5 1.0 1.5 2.0			- mottled pale - becoming pir Silty SAND, fin mottles. Some	a sandy SILT inclusi	n. /et.	ale grey and dark grey					UTF							
s t	soil de based and R	fication symt sscription on Field Dess ock, New Zea chnical Sociel	cription land	of Soil	● re × p ≫× p			water 10/1/98 wate on date show water inflow water outflow	vn	moisture D dry M moist W wet S saturated	consis VS S F St		ry so ft m		ndex	VL L D		lo m	ery lo iose nediu ense	ose m den:	e	
				005	≫× p	eak grea			1		F	fir st ve	m	ff		ME		m de	nediu		e	

C)(offe	Ð		g	jec	otech	nics			Ha	and A	Auge	r No.		Н	A1.	20			
E	'n	ginee	eri	ng	Log	- F	land A	Auger				neet	t No:			1	of 1		UC1	308	86AE
Cli	ent:			The	Lakes	(2012	2)						tarte	d:				2014			
	ncipa	al:				•	,				Da	ate c	ompl	eted				2014			
	oject			The	Lakes	Stad	e 2qrst						d by:			S					
	-	luger loca	tion [.]			-	-						ed by	ŗ			BT				
		penetrome						g: 368204.9 m	S	Blope: -90°	01		.L. Su		m	/ \		Vane	e No: [)R45	23
Hol	e dia	meter: 50 n	۱m				Northi	ng: 800623.85 m	E	Bearing:		D	atum:	x/y: \	WBOP	C200	00; RI	.: Mot	uriki		
dr	illing	g informa	tion		materia		tance								-	<u> </u>					
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	So	mate il type; colour, struct lasticity, sensitivity. S components, addi	ure. Gra Seconda	ary and minor		moisture condition	consistency/ density index	25 50 75 vane shear	100 (remoulded 125 /peak) kPa	Ē	ble	ows p	resist per 10 10 12)mm	
FILL	groundwater not encountered			0.5 1.0 1.5 2.0			Sandy SILT, d is fine to media - some grey bi EOBH, target	depth.	v brown v specks	with brown mottles.	Sand	D	H		UT	× × ×					
s t a	based and Re	fication symi scription on Field Des cck, New Zea chnical Socie	cription land	of Soil	● re × po ≫× po		a)	20 terminated at 2 n water ↓ 10/1/98 wate on date show water inflow water outflow	r level /n	moisture D dry M moist W wet S saturated	Col VS S F St VS H	S St	very soft firm stiff	v soft	index	VL L MD VD		loos mea den	dium de		

		-ff					otech	nice														
C)(JIE	=)		e e	jet		1105			Ha	nd A	Auge	r No.		ŀ	IA1	21	1			_
Ε	'n	ginee	eri	ng	Log	- H	land A	Auger			She Pro		t No:				of GEN		AU(C13	086	AE
Cli	ent:			The	Lakes	(2012	2)						tarteo	d:			0.1.					_
Pri	ncip	al:									Dat	te c	ompl	eted:		3	0.1.	20	14			
Pro	oject			The	Lakes	Stag	e 2qrst				Log	ggeo	d by:			S	SC					
На	nd A	Auger locat	tion:	Cen	ter of L	ot 83	32				Ch	eck	ed by	/:		F	RBT					
Dyr	namio	c penetrome	ter typ	e:			Eastin	g: 368186.66 m		Slope: -90°		R	.L. Su	rface:	m			Va	ne N	: DR	1523	
		meter: 50 m g informat			materia			ng: 800638.7 m		Bearing:		D	atum:	x/y: V	VBOF	C20	000; F	RL: M	oturi	ci		
					materia		stance						<u> </u>	a.	σg	1,	oenet	ratio	n res	istan	ce te	st
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	Soi	ma il type; colour, stru lasticity, sensitivity components, ad	. Second	ary and minor	moietura	condition	consistency/ density index	25 50 75 vane shea	100 (remoulded 125 /peak) kPa	ľ	b	lows	per	100m 12 14	m	
FILL	groundwater not encountered			- 0. <u>5</u> - 1. <u>0</u> - 1. <u>5</u>			Sandy SILT, d is fine to media - becoming bro Silty SAND/Sa grey. Sandy SILT, d streaks (non o specks. Organic SILT I Sandy SILT, fr	um. Some pale gro own with trace pale andy SILT pocket, iny and friable, brov irganic). Sand is fir	y, black, (with brown mottles. Sa s. ecks. ed, low plasticity, pale ccasional dark brown fium. Some pale grey		D D-М	H	756.2		* * * * * *	2 4					
	soil d based and R	fication symb escription I on Field Desc ock, New Zeal ochnical Societ	ription and	of Soil	● re × po ≫× po		a)		ter level own v	moisture D dry M moist W wet S saturated	conn: VS S F St VSI H		very soft firm stiff	/ stiff	index	X V L M D V	ID	lc m d	ery loo ose rediur ense ery de	n dens	9	

-		\ff		,		ner	otech	nics											
C	~		-)		5			1100			Ha	and	Auge	r No.		HA	122	2	
Ε	'n	ginee	eri	ng	Log	- H	land A	luge	r			neet roiec	t No:			1 o GE		AUC13	086AE
Cli	ent:			The	Lakes	(2012	2)					-	tarte				1.20		
Pri	ncip	al:									Da	ate c	omp	leted	:	30.	1.20	14	
Pro	oject			The	Lakes	Stag	e 2qrst				Lo	ogge	d by:			sc	;		
	-	uger locat	tion:			-	•						ed by			RB			
_		penetrome						g: 368144.3	3 m	Slope: -90°				, face:	m			ane No: DF	4523
		meter: 50 m					Northi	ng: 800693	.17 m	Bearing:		D	atum:	x/y:	WBOPC	2000); RL: N	/loturiki	
dr	illing	g informat	ion		materia		stance									i –			
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	Soi	asticity, sen	material Ir, structure. Gr sitivity. Second nts, additional ir			moisture condition	consistency/ density index	25 50 vane shear	 (remoulded 125 /peak) kPa 175 		blow	on resistar s per 100n 8 10 12 1	ım
					////	OL	Sandy SILT, n	o plasticity,	brown, organic	, rootlets.		D	н						
VOLCANIC ASHES	groundwater not encountered					ML	- becoming pa organic) sandy	SILT inclus	sions.	rey. and dark brown (non					UTF				
	ĝro					SM	Silty SAND, fin	, medium gr	ravels encounte	ered									
				- 1. <u>0</u> -					etration Test fro ed at 0.7 metres	om 0.7 to 1.8m. s.									
				- 1. <u>5</u> -														<	
: 	soil de based and Re	fication symb scription on Field Desc ck, New Zeal chnical Societ	cription land	of Soil	● re × pe ≫× pe			→ on c	I/98 water level late shown er inflow er outflow	moisture D dry M moist W wet S saturated	8 ∧ 8 ± 8 ∧ H	S t St	ver soft firm stiff	y soft	index	VL L MD D VD	l r c	very loose oose medium dens dense very dense	9e

C	ノ		7)		5		otechnic	5		Hand	Auge	er No).		HA	123				_
F	'n	ninoc	ri	na		_ F	land Aug	or		Sheet	t				1 of	1				
		JIIICO	711					CI		Proje	ct No					IZT/		C13	086	AE
	ent:			The	Lakes	(2012	2)			Date						.201				
Pri	ncip	al:				_				Date	comp	leteo	1:			.201	4			
	oject					-	e 2qrst			Logge	ed by:				SC					
		uger loca			ter of L	.ot 83		150.4		Chec	ked b R.L. Si	-			RB1			: DR	4500	
		penetrome meter: 50 m		e:			Easting: 3681 Northing: 800		Slope: -90° Bearing:		atum			PC	2000:				4020	
		g informat			materia	al subs	-					,		_	,					_
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	plasticity,	material olour, structure. G sensitivity. Secono onents, additional i	lary and minor	moisture condition	consistency/ density index	50 Viano choor	75 valie slical 100 (remoulded 125 /neak) kPa	150 'r',		tration blows	per '	100m	m	
					[[]]		Organic SILT, dry and		PSOIL). n with brown mottles. San	D	н									
EILL	groundwater not encountered			- 0.5 - 1.0 -			 - pale grey silty SAND - becoming moist. 	ne pale grey speck	S.	M				*						
				1. <u>5</u> - - 2.0			to medium. Some pale	e grey specks.	rown mottles. Sand is fine		VSt	•	*	×						
							EOBH, target depth Borehole HA123 termi	inated at 2 metres.												
s t a	based and Re	fication symb scription on Field Desc ock, New Zeal chnical Societ	cription and	of Soil	● re × p ≫× p		ter than 200kPa	er 10/1/98 water level on date shown water inflow water outflow	moisture D dry M moist W wet S saturated	consist VS S F St VSt H	ver sof firn stif	y soft t n f y stiff			VL L MD D VD	lo m de	ery loo ose edium ense ery de	n dens	e	

_		sff.					otechnics											
C	7	JIE	=)	y	5	ju		H	and /	Auge	r No.		HA	12	4			_
Ε	ng	ginee	eri	ng	Log	- -	land Auger		heet rojec	t No:			1 of		ΓΔΙΙ	C13	086	6AE
Clie	ent:	_		The	Lakes	(201)	2)		ate s		d:			1.20		010		<u></u>
Pri	ncip	al:				•	, ,	D	ate c	ompl	eted:		24.	1.20)14			
Pro	oject	:		The	Lakes	Staa	e 2qrst	L	ogge	d bv:			KM	J				
		uger locat	tion:			•	•		heck	-	<i>.</i> :		RB					
_		penetrome					Easting: 368155.1 m Slope: -				rface:	m			ane N	lo: DF	2244	ŧ I
Hol	e dia	meter: 50 m	ım				Northing: 800607.5 m Bearing:		D	atum:	x/y: W	/BOPC	2000	; RL:	Motur	iki		
dr	illing	g informat	ion		materia	-	tance				L 7	7		o front i				
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material Soil type; colour, structure. Grading; be plasticity, sensitivity. Secondary and components, additional informatic	minor	moisture condition	consistency/ density index	25 50 75 vane shea	25 /peak) kPa		blow	/s per	sistar 100n	m	
		10313, 010			////	SP	Silty SAND, fine grained, black, organic odor, root	ilets (TOPSOIL)	D	VSt-	325			4 6	8 10) 12 1	4 16	18
				-		SP	Silty SAND, fine grained, dark brown, orange spec	cks.	_	H								
				-		ML	SILT, non to low plasticity, orange-brown, yellow n sand.	nottling, some fine	_									_
				0.5			Sallu.					>>	*					
				-														_
	q			-														
	not encountered			-									Î					_
FILL	<u> </u>			1.0			- grey mottles											
	groundwate			-		ML	Sandy SILT, no plasticity, orange-brown, sand is f friable.	ïne grained,				>>	×					_
				_ 1. <u>5_</u>			- decreasing sand content											
				-		ML	- brown & white specks SILT, low plasticity, brown, minor white mottles, m	inor fine sand.	_		•	×						_
				-		SP	- becoming pale orange-brown; increasing sand c Silty SAND, fine grained, pale brown, orange mott		M									_
				2.0			blue-grey fine gravel.	ung, udoc										_
					_ / / / /		EOBH @ 2.0m, target depth Borehole HA124 terminated at 2 metres.											
s ti a	soil de based and R	fication symb sscription on Field Desc ock, New Zeal chnical Societ	cription land	of Soil	● re × p ≫× p		ter than 200kPa ↓ 10/1/98 water level D on date shown M water inflow W	dry W moist S wet F saturated S	/S St /St	very soft firm stiff	v stiff	ndex	VL L MD D VD		very lo loose mediu dense very d	m den:	se	

-		ht.		,	> <	nec	otech	nics												
C	ハ	אור	-)		5	,00		moo			Hand	Auge	er No.		HA	12	5			_
Ε	'n	ginee	eri	ng	Log	- ŀ	land A	Auger			Shee Proje	t ct No	:		1 of GE	f 1 NZ1	TAU	C13	086	AE
Cli	ent:			The	Lakes	(2012	2)					starte				1.20				_
Pri	ncip	al:									Date	comp	leted:		24.	1.20)14			
Pro	oject	:		The	Lakes	Stag	e 2qrst				Logg	ed by	:		KM	IJ				
На	nd A	uger loca	tion:	Cent	ter of L	.ot 82	29				Chec	ked b	y:		RB	Т				
Dyr	namic	penetrome	ter typ	e:			Eastin	ng: 368159 m	:	Slope: -90°		R.L. S	urface:	m		Va	ane N	o: DR	2244	
		meter: 50 m						ing: 800588 m		Bearing:		Datum	: x/y: V	VBOPC	2000	; RL: I	Moturi	ki		
	illing	g informat	lon		materia		tance					_ ×	<u>ہ</u>	n g	pen	etrati	on re	sistan	ce te	st
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol		m il type; colour, stru lasticity, sensitivity components, ad	y. Second	ary and minor	moisture	consistency/ density index	5 vane she	100 (remoulded 125 /peak) kPa 175			s per	100m	m	
FILL	groundwater not encountered			0.5		OL ML ML	grained (TOPS Sandy SILT, n brown mottling SILT, low plas	SOIL). to plasticity, orang g; sand is fine grai	je-brown; ined. nge-browr	pale yellow, grey, dark n, with orange mottling. friable; sand is fine	D-1	М		>>	× ×					
				1.5 2.0		ML	medium grave	el; sand is fine gra -white & orange n	nottling	blue-grey, trace fine to le mottling, some mediu	IM D-I	и	-	>>	*					_
				_	/ /		EOBH, target Borehole HA1	depth 25 terminated at 2	2 metres.											
s t	soil de based and Re	fication symb sscription on Field Deso ock, New Zea chnical Societ	cription land	of Soil	● re × p ≫× p		•	water ↓ 10/1/98 w on date sh water inflo water outfl	nown ww	moisture D dry M moist W wet S saturated	consis VS S F St VSt H	ver sof firr stif	n f ry stiff	index	VL L MD D VD		very lo loose mediui dense very de	m dens	e	

Coffey geotechnics Engineering Log - Hand Auger									Hand Auger No.						HA126									
									Sheet						1 of 1 GENZTAUC13086AE									
Client: The Lakes (2012)										Project No:														
										Date started:						24.1.2014								
Pri	ncip	al:			Da							Date completed:					24.1.2014							
Pro	oject	:		The	e Lakes Stage 2qrst Lo							Logged by:						КМЈ						
		uger loca			ter of L	.ot 82			Che						RB									
		penetrome meter: 50 m		e:			Easting: 368158.4 m	Slope: -90°				rface			2000;			o: DR	2244					
		g informat			materia	al subs	Northing: 800563.5 m	Bearing:		Dai	um.	λ/у.	VVD.	OF C.	2000,	INL. IV	lotun	NI		-				
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.			condition	density index	25 20 vane chear	 vane shear vane shear remoulded peak) kPa rea 		penetration resistance t blows per 100mm				m					
	groundwater not encountered					ML	SILT, low plasticity, brown, mottl	ng orange-brown; minor fine sa	nd.		/St- H													
EILL				_		ML	Sandy SILT, no plasticity, pale y is fine grained.	ellow-brown, orange staining; sa	nd															
				0. <u>5</u>									>>>	¢										
				_		ML	SILT, low plasticity, orange-brow	n, some fine sand.	D	-M										-				
				- 1. <u>0</u>			- brown, grey & yellow mottling						•	>>>	<									
				-		SP	SAND, fine grained, grey, black SILT, low plasticity, orange-brow	-		И				>>>	<									
				- - 1.5			- grey mottles, organic odor @ 1	.3m																
				-			- some fine sand, trace medium	grained gravel & white mottles						>>>	<					_				
				- 2.0			- grey silt inclusion (non organic				St	•		×										
							EOBH @ 2.0m, target depth Borehole HA126 terminated at 2	metres.																
	soil de based and R	fication symb escription on Field Desc ock, New Zea ochnical Societ	cription and	of Soil	≫× peak greater than 200kPa ► water inflow W wet					VSvery softVLvery letSsoftLlooseFfirmMDmediuStstiffDdenseVStvery stiffVDvery ofHhardVStvery of						oose nediur lense	n dens	e						

coffey				g	geotechnics							Hand Auger No.					HA127							
F	'n	ninod	ari	na	Log - Hand Auger								Sheet					1 of 1						
							- 1					Project No:					GENZTAUC13086AE							
	ent:			The	Lakes	(2012						Date started:					24.1.2014							
Pri	ncip	al:									Date o	comp	leted	:			.201	14						
	oject					-	e 2qrst				Logge	d by:				KM.								
		uger loca			ter of L	ot 82.					Check				F	RB1					_			
		penetrome meter: 50 n		be:				ng: 368152.8 m ng: 800526.7 m		Slope: -90° Bearing:		R.L. Su Datum:			20.20	000.			o: DR ki	2244	ł			
		g informat			materia	al subs		ng. 000020.7 m	-	Joannig.	-	- actainin	<i>,</i> ,,,,					otani						
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FILL	groundwater not encountered					ML				olack specks, nd is fine grained; trace		Н	-											
	round			-							M	-			>>X						-			
				0.5			farm track).	, medium to coarse g		encountered (possible o	id .										-			
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classification symbols and soil description based on Field Description of Soil and Rock, New Zealand Geotechnical Society Inc 2005					≫× peak greater than 200kPa water inflow					moisture D dry M moist W wet S saturated	consistency/ density index VS very soft VL very loose S soft L loose F firm MD medium dense St stiff D dense VSt very stiff VD very dense H hard H hard						se							

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FILL				-								>>	×					-
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HES				 1.5		-	Sandy SILT; brown, no plasticity, sa	nd is fine to medium grained.			Ð	×						
VOLCANIC ASHES				2.0		SW	SAND, trace silt; brown, sand is fine	to medium grained.										
s	soil d	fication syml escription			● re	hear (kP emoulded	a) water	moisture	consist VS	ver	y soft	index	VL			loose		
a	and R	on Field Des ock, New Zea chnical Socie	land		»× p		ter than 200kPa penetrate → water inflow water outflow	W wet S saturated	S F St VSt H	soff firm stiff ver har	y stiff		L MD D VD		den	lium de	nse	

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5	soil d	escription			● re	near (KP emoulde eak	· · · · · · · · · · · · · · · · · · ·	level D dry	VS	-	y soft	muex	VL		very lo	ose	
á	and R	ock, New Zea chnical Societ	land		≫× p	eak grea	ter than 200kPa penetrate water outflow	W wet S saturated	S F St	sof firn stif	ı		L MD D		loose mediur dense	n dense	
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⊢					////	OL	Sandy SILT; n	o plasticity, dark bro	own, org	anic; sand is fine grain	ed	D	Н	100			2 4			12 14	10 18
EILL FILL	groundwater not encountered			- - - 0.5 - - - 1.0 -		ML	(TOPSOIL). Sandy SILT; of fine to coarse Sandy SILT; of	prange-brown mottl grained.	ed brow	anic; sand is fine grain n, low plasticity, sand is ck flecks, low plasticity	5	M	T			* * *					
ALLUVIAL DEPOSITS				1. <u>5</u> - - 2.0		SM	- becoming ora		brown, t	race black flecks, no						×					-
							EOBH, target Borehole HA1	depth 30 terminated at 2 i	metres.												
	soil de based and R	fication symb escription on Field Desc ock, New Zeal chnical Societ	cription land	of Soil	● re × po ≫× po			water ↓ 10/1/98 wate on date sho ↓ water inflow ↓ water outflow	wn	moisture D dry M moist W wet S saturated	cons VS F St VSI H		very soft firm stiff	/ stiff	index	VI L M VI	D	loo me de	ry loo ose edium nse ry der	dense	<u> </u>

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		,			////	OL	Sandy SILT; no plasticity, dark brown, organic; sand is fine gra	ined	D	н	100							
	0.5					ML	(TOPSOIL). Sandy SILT; orange-brown mottled brown and white, low plas sand is fine to coarse grained. - becoming non plastic.	icity,	M				*					
	ed	0.5 - becoming low plasticity. 1.0 - with trace black flecks - with trace black flecks											*					
	groundwater not encountered												*					
ALLUVIAL DEPOSITS		sand is fine to coarse grained.							w	Vst			*					
				2.0			EOBH, target depth Borehole HA131 terminated at 2 metres.				•	×						
s b a	oil de based and Re	fication symb sscription on Field Deso ock, New Zea chnical Societ	cription land	of Soil	● re × p ≫× p			V S F S	S t St	soft firm stiff	/ soft	index	VL L D VC)	loo me der	dium c	lense	

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stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	Soil pla	mat l type; colour, struct asticity, sensitivity. components, add	Seconda	ary and minor	moisture	condition	consistency/ density index	5 vane shea	100 (remoulded 125 /peak) kPa		ŀ	olow	s pei	• 100n	ım	
					())()	OL	Sandy SILT; no (TOPSOIL).	o plasticity, dark bro	own, org	anic; sand is fine grain	ed	D	Н									
						ML	, ,		mottled	brown, low plasticity, s	and	М				*						
FILL				0.5			- becoming sar	ndy SILT.								*						
	groundwater not encountered			1.0												*						
ALLUVIAL DEPOSITS	Bro			- - 1.5		ML	plasticity, sand	nd; orange-brown is fine to coarse gr ange-brown with wh	ained.	e black flecks, low	5.		Vst			*						
				2.0			EOBH, target d Borehole HA13	depth 32 terminated at 2 r	netres.						×	*						
	soil d based and R	fication symb escription on Field Deso ock, New Zea chnical Societ	cription land	of Soil	● re × po ≫× po			water ↓ 10/1/98 wate on date show water inflow water outflow	vn	moisture D dry M moist W wet S saturated	cons VS S F St VSt H		very soft firm stiff	/ stiff	index	L N	ΛD	l r	very lo oose mediu dense very d	m den:	se	

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FILL	g			0.5		ML	SILT, minor sa is fine to coars		d white, no plasticity, sanc	М				* *					
OSITS	groundwater not encountered			- 1. <u>0</u> -		SW		rown, sand is fine to medi			Vst	-		×					
ALLUVIAL DEPOSITS				- 1. <u>5</u> - - 2.0					I, orange, white and black.		н	•	×	×					
⊢				2.0	× / / / /	1	EOBH, target	depth 33 terminated at 2 metres						*					
				-				55 terminated at 2 metres											
	soil de based and R	fication symb escription on Field Deso ock, New Zea chnical Societ	cription land	of Soil	● re × p ≫× p		•	water ↓ 10/1/98 water level on date shown → water inflow → water outflow	moisture D dry M moist W wet S saturated	consist VS S F St VSt H	ver soft firm stiff	y soft t y stiff	index	VL L MD D VD		loose medi dens	ium den	se	

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		,			////	OL		o plasticity, dark bro	wn, orga	nic; sand is fine grained		VSt	(10)							
		(TOPSOIL). ML SILT, minor sand; orange mottled white, no plasticity, s grained. - becoming pale brown						p plasticity, sand is fine	M	H			>>>	¢				-		
													>>>	<						
	roundwater not encountered			_ 1.0		ML				ed orange, medium					>>>	<				-
	Deserved of the second						sticity.			•		×	¢				-			
				2.0	× × × × × × × × × × × × × × × × × × ×		Borehole HA1	34 terminated at 2 n	netres.											
s k a	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 mois D M W									M moist W wet	consist VS S F St VSt H	ver sof firr stif	ry soft ft n f ry stiff	y inde		VL L MD D VD	loo me dei	ry loose se edium d nse ry dens	ense	

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Е	n	ginee	eri	nq	Loq	- H	land A	Auger			Shee					of 1				~ ^ -
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Hol	e dia	meter: 50 m	nm				Northi	ng: 800436 m	I	Bearing:		Datum	: x/y: \	VBOP	C200	00; RI	_: Mot	uriki		
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stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	Soi pl	mat il type; colour, struc lasticity, sensitivity. components, add	Second	ary and minor	moisture	consistency/ density index	25 00 vane shea	100 (remoulded 125 /peak) kPa		bl	ows p	er 100	mm	
						OL	Sandy SILT; n (TOPSOIL).	o plasticity, dark bro	own, org	janic; sand is fine graine	d D	н								
FILL				-		ML	Sandy SILT; c	orange-brown mottl coarse grained.	ed brow	n and white, no plasticity	, М				*					
	_			0.5		ML	SILT; white, lov	w plasticity.				Vst	•	>						
ALLUVIAL DEPOSITS				1. <u>0</u> -		ML				w plasticity, sand is fine sand (<1mm thick).	io W	St- VSt	• • ×	×						
ALI	V			1. <u>5</u> -									• ×							
	15/01/2014			2.0		SW		own-orange mottle	d black.		S		•		<					
				_			EOBH, target of Borehole HA13	depth 35 terminated at 2 i	metres.											
	soil de based and R	ification symb escription I on Field Deso tock, New Zea cchnical Societ	cription land	of Soil	● re × p ≫× p			water ↓ 10/1/98 wate on date show water inflow water outflow	wn	moisture D dry M moist W wet S saturated	consis VS S F St VSt H	sof firn stif	y soft t n f y stiff	index	VL L D VD		loos mec den	ium de	nse	

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t	based	on Field Desc ock, New Zeal		of Soil	× p	eak	ter than 200kPa	 on date show water inflow 		M moist W wet	vs S F	sof	t			L MD		loose		se	
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stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	Soil pla	mate I type; colour, structr asticity, sensitivity. S components, addii	ure. Grading; bedding; econdary and minor	moisture	condition consistency/	density index	o vane shear	100 (remoulded 125 /peak) kPa	75		lows	per 1	00mr		
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stratigraphy	water	notes samples,		depth metres	graphic log	assific mbol	Soil pla	type; colour, structi sticity, sensitivity. S	ure. Gradin Secondary a	g; bedding; and minor	moisture condition	nsiste	vane	(remo /peak		blo	ows p	er 100	mm	
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á	and R	ock, New Zea chnical Societ	land		≫× p	eak grea	ter than 200kPa penetrate	 water inflow water outflow 	s s		F St	firm stiff	ı		MD D			ium de	nse	
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		,			////	OL	Sandy SILT; n (TOPSOIL).	o plasticity, dar	k brown, org	anic; sand is fine graine	d D	н								
FILL				-		ML	, ,	orange-brown, I	low plasticity	, sand is fine to coarse	M				×					
	Intered			0. <u>5</u> -		ML	Sandy SILT; c grained.	orange-brown, I	low plasticity	, sand is fine to coarse		Vst	•	×						
ALLUVIAL DEPOSITS	groundwater not encountered											St	•	×						
				- 1. <u>5</u> - - -			- becoming pa layers of silty S		ked orange,	interbedded with 50mm		Vst	•	×						
⊢			-	2.0		1	EOBH, target of	depth					•	*	╉				++	
				-			Borehole HA1	39 terminated a	at 2 metres.											
s t	oil de based and Re	fication symb ascription on Field Desc ock, New Zeal chnical Societ	cription land	of Soil	● re × po ≫× po		•	water ↓ 10/1/98 on date → water in → water of	flow	moisture D dry M moist W wet S saturated	Consist VS S F St VSt H	ver soft firm stiff	/ soft / stiff	index	VI L M D VI	D	loos me der	dium d	ense	

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	ent:	_			Lakes			Date								201		//0		
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Dyr	namic	: penetrome	ter typ	e:			Easting: 368122.2 m Slope: -90°		R.	L. Si	irfac	e: n	n			Van	e No	: SL	588	
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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		75 vane shear 100 (remoulded	50 /peak) kP				-	1 00m 12 14		
		,				OL	Sandy SILT; no plasticity, dark brown, organic; sand is fine graine (TOPSOIL).	d	D	Н										Ī
EILL	ered			- - 0.5_ -		ML	Sandy SILT; brown, low plasticity, sand is fine to coarse grained. Sandy SILT; brown, low plasticity, sand is fine to coarse grained becoming pale orange-brown mottled brown.		M	Vst	- •		×	*						
ALLUVIAL DEPOSITS	groundwater not encountered			- 1. <u>0</u> - - -			- <100mm layer of silty SAND; pale brown-orange, sand is fie to coarse grained.		W	Н	•	×								
				1. <u>5</u> - - 2.0							•	×								
							EOBH, target depth Borehole HA140 terminated at 2 metres.													
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	soil de based and Re	fication symb escription on Field Deso ock, New Zea chnical Societ	cription land	of Soil	● re × p ≫× p			cons VS S F St VSt H	ister	ver sof firn stif	y sofi t i y stiff	t	lex	VL L MD D VD		loc me de	ry loo ose edium nse ry dei	dens	e	

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	pe	0.5				Sandy SILT; orange-brown mottled sand is fine to coarse grained.		M				*						
FILL	groundwater not encountered						pumiceous fine gravel, sand is fine	to coarse grained.		Н	-		*					
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s t	soil de based and Ro	fication symt sscription on Field Dess Jock, New Zea chnical Sociel	cription land	of Soil	● re × pe ≫× pe		a) water	level D dry n M moist W wet S saturated	onsiste VS S F St VSt H	ver sof firm stiff	y soft t n y stiff	/ index	VI L MI D VI	D	loo: me der	dium de	ense	

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				SW SAND: pale brown, trace fine sub-rounded pumiceous grating fine to medium grained. 1.0 SW ML SILT, minor sand; orange-brown, low plasticity, sand is fine ML SILT, minor sand; orange-brown mottled pale brown and orange plasticity, sand is fine to coarse grained. 1.5 ML Sandy SILT; orange-brown mottled pale brown and orange plasticity, sand is fine to coarse grained. - - <														
⊢	I		ation symbols and			1	<u> </u>		İ		1							
s b a	oil de based and R	on Field Desc ock, New Zeal	cription land	of Soil	● m × p ≫× p	emoulded eak eak grea	ter than 200kPa	0/1/98 water level n date shown ater inflow	D dry M moist W wet	consiste VS S F St VSt	ver soff firm stiff ver	y soft	index	VL L MD D VD		loose medi dens	um den	se
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	-	Juger loca	tion			•	•	Checl					RB						
		penetrome				.01 01	Easting: 368113.8 m Slope: -90°		R.L. S	•	e: m				Van	e No	SL5	88	٦
-		neter: 50 n					Northing: 800682.7 m Bearing:	ſ	Datum	: x/y:	WBOF	PC	2000	; RL	.: Mo	turiki			
dı	illin	g informat	tion	i	materia		tance					_							7
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	consistency/ density index	25 50 Young phone	75 Valle sileal 100 (remoulded 125 /peak) kPa	175	-	blo	ows	per 1	00m	m 16 18	
						OL	Sandy SILT; no plasticity, dark brown, organic; sand is fine grained (TOPSOIL).	D											Π
				-		ML	Sandy SILT; orange-brown, no plasticity, trace fine angular gravel, sand is fine to coarse.	M											
FILL				0.5		SM	Silty SAND; orange-brown, trace fine angular gravel.											-	
	not encountered			-		ML	Sandy SILT; white mottled orage-brown, low plasticity, sand is fine grained.		VSt- H		×								
	groundwater not enco			1. <u>0</u>		ML	SILT; orange-brown, low plasticity. Sandy SILT; orange-brown mottled orange and brown, low plasticity, sand is fine to medium grained.	_										-	
VOLCANIC ASHES	ß			- - 1. <u>5</u>			- becoming grey-brown mottled dark brown organic staining.			•	×		< compared by the second second second second second second second second second second second second second se					-	
				2.0			- interbedded with organic silt.			•	×								
				_			EOBH, target depth Borehole HA144 terminated at 2 metres.												_
	soil de based and R	fication symbols secription on Field Deso ock, New Zea chnical Societ	cription land	of Soil	● re × pe ≫× pe			consist VS S F St VSt H	ver sof firr stif	ry soft ft n ff ry stiff	y index		VL L MD D VD		loo me der		dense	3	

0	-ff		,		ner	otechnics				
		-)		5	juu		Hand	Auge	er No.	HA145
Eng	ginee	eri	ng	Log	- -	land Auger	Sheet Projec			1 of 1 GENZTAUC13086AE
Client:				Lakes			Date			15.1.2014
Princip	al:				•	-	Date	comp	leted:	15.1.2014
Project			The	Lakes	Staa		Logge	•		RB
	 Auger locat	tion.			-	•	Check	-		RBT
	penetrome					Easting: 368114.8 m Slope: -90°			urface: m	Vane No: SL588
Hole dia	meter: 50 m	ım				Northing: 800703.5 m Bearing:	[Datum	: x/y: WBOP0	C2000; RL: Moturiki
drillin	g informat	ion		materia	i	tance				
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	²⁵ ²⁵ ⁷⁵ vane shear ¹⁰⁰ (remoulded ¹²⁵ /peak) kPa ¹⁷⁵	blows per 100mm
VOLCANIC ASHES VOLCANIC ASHES groundwater not encountered groundwater not encountered	fication symb escription on Field Desc ock, New Zeal	ols an aritition	- - - - - - - - - - - - - - - - - - -	$\begin{array}{c} & & & & \\ & & & & & \\ &$	SM ML ML	Sandy SILT; no plasticity, dark brown, organic; sand is fine grained (TOPSOIL). Sandy SILT; orange-brown, no plasticity, trace fine angular gravel, sand is fine to coarse. Silty SAND; brown mottled dark brown, sand is fine to coarse grained. - becoming wet. - becoming wet. - becoming saturated Sandy SILT; pale brown streaked orange-yellow, no plasticity, san is fine to coarse grained. AD=Aluvial Deposits EOBH, target depth F= FILL Borehole HA145 terminated at 2 metres.	i D M W W	H D D H H	tensity index	-



Engineering Log - Hand Auger

The Lakes (2012)

Client:

Principal: Project:

The Lakes Stage 2qrst

Date completed: Logged by:

Sheet

Project No:

Date started:

Checked by:

R.L. Surface: m

Hand Auger No.

HA146

GENZTAUC13086AE

Vane No:

1 of 1

Hand Auger location: Center of Lot 848 Dynamic penetrometer type:

Easting: 368053 m Slope: -90°

		meter: 50 m						ing: 800656.65 m	E	Bearing:	D	atum:	x/y:	WBOP	C2000	0; RL:	Motu	riki	
d	rilling	g informat	ion		materia		stance												
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	So	ma il type; colour, stru lasticity, sensitivity components, ad	aterial Icture. Gra V. Seconda Iditional in	ading; bedding; ary and minor formation.	moisture condition	consistency/ density index	25 50 vane shear	75 vance ancar 100 (remoulded 125 /peak) kPa		blo	ws pe	r 100n	nce test
F	nterec	,																	
	groundwater not encountered			0.5 1.0 1.5 2.0			Scala.	etrate surface (gra		uctions). Contiued to									
2	soil de based and R	fication symb ascription on Field Desc ock, New Zeal chnical Societ	ription and	of Soil	● re × p ≫× p	hear (kPa emouldec eak eak grea nable to p		water ¥ 10/1/98 wai on date she water inflow √ water outflo	own v	moisture D dry M moist W wet S saturated	consiste VS S F St VSt H	ver soft firm stiff	y soft		VL L MD D VD		dens	um den	se



Engineering Log - Hand Auger

The Lakes (2012)

Client:

Principal: Project:

The Lakes Stage 2qrst

Date completed:

Project No:

Date started:

Sheet

Hand Auger No.

HA147

GENZTAUC13086AE

1 of 1

Logged by: Checked by:

lan	d A	uger locat	tion:	Cent	ter of L	ot 84	9			Che	cked	by:								
yna	amic	penetrome	ter typ	e:			Eastin	g: 368057.1 m	Slope: -90°		R.L.	Surfa	ace:	m		١	/ane	No:		
		meter: 50 m					Northi	ng: 800635.3 m	Bearing:		Datu	m: x	/y: W	BOPC	2000	; RL:	Motu	ıriki		
dril	lling	g informat	ion		materia	al subs	tance													
suaugrapriy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	So	mater il type; colour, structu lasticity, sensitivity. Se components, additio	e. Grading; bedding; econdary and minor	moisture	condition consistency/	density index	vane shear	125 /peak) kPa 150 /peak) kPa	-	blov	ws pe	esist a er 100 10 12	mm	
	groundwater not encountered			0.5 1.0 2.0		ML	 becoming da Refusal at 1. 	nd; brown-orange, m I is fine to coarse grai I is fine to coarse grai rk grey-brown (organ Om (gravel obstructio 47 terminated at 1 me	c staining).						*					
so ba an	bil de ased nd Ro	fication symb sscription on Field Desc ock, New Zeal chnical Societ	ription and	of Soil	● re × po ≫× po			water ↓ 10/1/98 water I on date shown ↓ water inflow → water outflow		consi VS S F St VSt H	s f s	/ den very s soft irm stiff very s nard	oft	ndex	VL L MD D VD		loose medi dens	ium de	nse	

()(offe	2)	/	/ g	jec	otechnics													_
								land	Aug	ler	No.		l	HA	14	48				
Ε	ng	ginee	eri I	ng	Log	- H		Shee Proje		. .				l of		ΤΔ	uc	121)86,	ΔF
Clie	ent:			The	Lakes	(2012)ate								201		750	/00/	
Priı	ncip	al:						Date	com	ple	ted:			31.	1.2	201	3			
Prc	ject	:		The	Lakes	Stag	e 2qrst	.ogg	ed b	y:				sc						
На	nd A	uger locat	tion:	Cen	ter of L	.ot 85	2	Chec	ked	by:				RB	т					
Dyn	amic	penetrome	ter typ	e:			Easting: 368034.1 m Slope: -90°		R.L. \$	Surfa	ace:	m				Vane	e No:			٦
		meter: 50 m g informat			mataria		Northing: 800428.6 m Bearing:		Datur	n: x	/y: V	VBOF	°C2	000	; RL	: Mo	turiki			┛
		ginionnai			materia					š	ar	a g	T	pen	etra	tion	resi	stand	e tes	t
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	consistency/	nelisity litue	vane she	100 (remoulded 125 /peak) kPa	175	2			Der 1		n 16 18	8
						OL	Organic SILT, dry and friable, brown with pale brown mottles. Some fine grained sand (TOPSOIL FILL).	D	н	_										T
				_		ML	Sandy SILT, dry and friable, brown with pale grey mottles. Sand is fine to coarse grained becoming pale grey and brown with some pale yellow streaks becoming brown with various brown mottles.						*							
	q			0. <u>5</u>			- becoming moist.	M					×						-	
FILL	groundwater not encountered			 1.0		SW ML	Silty SAND, fine to coarse, pale grey. Sandy SILT, low plasticity, brown with various brown mottles. Sand is fine to medium grained.						*							
				 1. <u>5</u>			- becoming low to medium plasticity.		Vs	st	•	*								-
				2.0			EOBH, target depth. Borehole HA148 terminated at 2 metres.		S		• ×									
				_	ļ															-
s t a	oil de based and R	fication symb sscription on Field Desc ock, New Zeal chnical Societ	cription and	of Soil	● re × po ≫× po		ter than 200kPa penetrate ↓ 10/1/98 water level ↓ D dry M moist W wet ↓ water inflow ↓ W wet S saturated	onsis VS S F St VSt H	v Si fii Si	den oft m iff ery s ard	oft	ndex		VL - VID O VD		loo: me der	dium	dense	9	

C	OII	ey		e c	jec	otech	nics		Hai	nd /	Auge	r No.		н	A14	19			
									She	eet	-				of 1				
En	ginee	eri	ng	Log	- 1	land A	Auger				t No:					TA	UC1	308	36A
Client:			The	Lakes	(2012	2)			Dat	te s	tarteo	d:		31	.1.2	2013	3		
Princip	bal:								Dat	te c	ompl	eted:		31	.1.2	2013	3		
Projec	:t:		The	Lakes	Stage	e 2qrst			Log	ggeo	d by:			S	2				
Hand	Auger loca	ition:	East	tern ex	tent o	of Lot 854			Ch	eck	ed by	r:		R	BT				
	ic penetrome		e:				ng: 368035.5 m	Slope: -90°			.L. Su					Vane			
	ameter: 50 n ng informa			materia	al subs		ing: 800390.1 m	Bearing:		D	atum:	x/y: \	VBOP	C200	0; RL	: Mot	uriki		
stratigraphy water			depth metres	graphic log	classification symbol	Soi	material il type; colour, structure. lasticity, sensitivity. Secc	ondary and minor	oistura	condition	consistency/ density index	vane shear	(remoulded /peak) kPa	pe			resista er 100		
š st	tests, etc	RL	đđ	5		Organia SII T	components, additiona				88	25 50 75	122	2 2	2 4	68	10 12	14 1	6 18
			-		OL	fine grained sa Sandy SILT, d Sand is fine to	and (TOPSOIL FILL). Iry and friable, brown with coarse grained.		ome	D									
						Silty SAND, fin	ne to medium, pale brow	n, dry.											
			0.5				Iry and friable, brown wit aks. Sand is fine to coars	n various brown mottles a se grained.	nd		VSt- H								
			-		•	- becoming mo	oist.			М				×					
r not encountered						Sandy SILT, Ic	ne to medium, pale brow ow plasticity, brown with aks. Sand is fine to coars	various brown mottles and	t					*					
groundwater r			-											*					
			1. <u>5</u>									•	×						
			2.0			EOBH, target (denth					•	*						
			_			Borehole HA1	49 terminated at 2 metre	?S.											
soil c base and F	ification syml lescription d on Field Des Rock, New Zea echnical Socie	cription	of Soil	● re × p ≫× p		•	water ↓ 10/1/98 water leve on date shown water inflow √ water outflow	moisture D dry M moist W wet S saturated	con: VS S F St VSt H		soft firm stiff	soft	index	VL L MD D VD		loos mec den	lium de		

-		-ff					otechnics												
C	7	JIE	=)		5	jec			Har	nd A	Auge	r No		HA	150)			-
Ε	ng	ginee	eri	ng	Log	- H	land Auger		She Pro		t No:			1 of GE	1 NZT	AU	C13	086	AE
Clie	ent:			The	Lakes	(2012)				tarte			4.2	.201	4			_
Pri	ncip	al:							Dat	e c	omp	leted	:	4.2	.201	4			
Pro	oject	:		The	Lakes	Stage	e 2qrst		Log	geo	d by:			sc					
На	nd A	Auger locat	tion:	Cen	ter of L	.ot 85	7		Che	eck	ed b	y:		RB	т				
Dyr	namic	penetrome	ter typ	e:			Easting: 368054.3 m	Slope: -90°		R	.L. Sı	irface	m		Va	ine N	o: DR	4523	٦
_		meter: 50 m			i	<u> </u>	Northing: 800345.2 m	Bearing:		D	atum	x/y:	WBOP	2000	; RL: N	loturi	ki		
	iiiin	g informat	ion		materia		tance				. ×	-	n ç	pen	etratio	on res	sistan	ce tes	st
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material Soil type; colour, structure. plasticity, sensitivity. Seco components, addition:	Grading; bedding; ondary and minor	moisture	condition	consistency/ density index	25 50 75 vane shea	100 (remoulded 125 /peak) kPa 175	Ė		s per	100m	m	
FILL	-					OL	Organic SILT, dry and friable, brown w fine grained sand (TOPSOIL FILL). Sandy SILT, dry and friable, brown wit minor black specks. Sand is fine to me	h pale brown mottles and		D	H			×					
ALLUVIAL DEPOSITS	groundwater not encountered			0. <u>5</u> - - 1. <u>0</u> -			- some pale grey silty SAND inclusions moist.	s <30mm @1.0m, dry to	Ē	D-M				*					
				- 1. <u>5</u> - -			-				VSt		×	×					
				20			- pale grey with brown mottles. Becom is fine to coarse.	ing moist, low plasticity. S	Sand	М									
\vdash				_ <u>2.U</u>	x^x^x^		EOBH, target depth.												+
				-			Borehole HA150 terminated at 2 metre)S.											
		1.0 - some pale grey silty SAND inclusions <30r	_ 																
s t	soil de based and R	escription on Field Desc ock, New Zea	cription land	of Soil	● re × p ≫× p	emoulded eak eak grea	er than 200kPa	el moisture D dry M moist W wet S saturated	Cons VS S F St VSt H		ver sof firm stiff	y soft	index	VL L MD D VD	k n c	rery lo pose nediur lense rery de	m dens	e	

		=)		5	jec	otechnics		Hand	Auge	er No.		HA	151	1		
En	ainee	eri	na	Loa	- H	land Auger		Shee				1 of			400	
Client:	-		_	Lakes				Proje Date					<u>NZT.</u> 1.20	AUC 13	130	86A
Princip			me	Lanes	(2012	-)		Date					1.20 1.20			
			Tho	Lakos	Stan	e 2qrst						SC		15		
Projec		4:			-	-		Logge	-							
	Auger loca			ler of L	01 03	Easting: 368022.3 m	Slope: -90°	Chec		y: urface:	m	RB		ne No:	DR4	523
	ameter: 50 n		-			Northing: 800347.5 m	Bearing:			: x/y: W		2000	; RL: N	loturiki		
drillin	ng informa	tion		materia		stance					_	i				
stratigraphy water	notes		h es	graphic log	classification symbol	materi Soil type; colour, structur	e. Grading; bedding;	moisture	consistency/ density index	ane shear	/peak) kPa	pen		on resis		
stratig water	samples, tests, etc	RL	depth metres	grap	clas sym	plasticity, sensitivity. Se components, additio	condary and minor nal information.	moi	den	25 25 75 75 75 75	150 150 175 175	2		8 10 1		
FILL groundwater not encountered			- - - - - - - - - - - - - - - - - - -		<u>OL</u> ML	Organic SILT, dry and friable, brown (fine grained sand (TOPSOIL FILL). Sandy SILT, non plastic, brown with mottles. Sand is fine to medium.		1	St- VSt	• ×	``	× ×				
soil d based and F	sification syml description d on Field Des Rock, New Zea echnical Socie	cription land	of Soil	● re × po ≫× po			moisture	consist VS F St	-	ı	ndex	VL L MD D	lc n	ery loos pose nedium a		

-		-ff	~				otech	nice											
C	7	JIE	=)		e e	jec		1105			Hand	Auge	er No.		HA	152	?		
Ε	ng	ginee	eri	ng	Log	- H	land A	Auger			Sheet				1 of		лис	120	86AE
—	ent:			_	Lakes						Proje Date					.201		130	
	ncip	al.				(-				Date					.2014			
	oject			Tho	l akos	Stan	e 2qrst				Logge	•			sc				
	-	luger locat	tion			-	-				Checl				RB				
		penetrome				01 00		g: 368025 m		Slope: -90°			y. Irface:	m			ne No	DR4	523
		meter: 50 m						ng: 800319.7 m		Bearing:			: x/y: V		2000	; RL: M	loturiki		
dr	illin	g informat	ion		materia	al subs	tance								i				
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol		m il type; colour, stri lasticity, sensitivit components, a	y. Second	lary and minor	moisture condition	consistency/ density index		100 (remoulded 125 /peak) kPa 175	<u> </u>	etratio blows 4 6	s per 1	00mm	1
						OL		dry and friable, b and (TOPSOIL FI		pale brown mottles. Sor	ne D	Н							
FILL							with pale grey	mottles.		ry and friable, pale brow		VSt-	-	UTF	5				
				-	$\begin{pmatrix} & & & \\ & & & \\ & & & \\ & & & & \\ & & & & & \\ & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & \\ & & & & & & \\ & & & & & $		is fine to medi			ome black specks. Sand	, м	Η H							_
				0.5_															
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	ered			-	× × × × × × × ×						M-	-							_
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	ot enc			1.0	$(\times \times \times \times \times \times \times \times \times \times \times \times \times \times \times \times \times \times \times$														
SITS					$(\times \times \times)$		Silty SAND, fir	ne to medium, poo	orly sorted	l, dark reddy brown. Moi	st.								
EPO	groundwater			-	$\begin{pmatrix} \times & \times \\ & \times & \times \end{pmatrix}$														_
ALLUVIAL DEPOSI	Buor			-	x x x x x x x x x x x x x x x x x x x		SILT, low plas 1.2m.	ticity, brown with s	some dark	< reddy brown staining 🤅	0	St- VSt	●×						-
				1.5_			Sandy SILT, Ic	ow plastcity, pale	grey. San	d is fine to medium.			• ×						
				_	$\begin{pmatrix} \times & \times & \times \\ \times & \times & \times \\ \times & \times & \times \end{pmatrix}$														_
							- 100mm silty	SAND lense, med	dium grain	ned, pale grey.									
					(^`x^`x^`x (`x`x`x (`x`x`x						W								
				_			- some clay.						• ×						
				-															_
				2.0			FORU to mat	-1 41-				_							
							EOBH, target Borehole HA1	depth 52 terminated at 3	2 metres.										
s t	oased and R	fication symb ascription on Field Deso ock, New Zeal chnical Societ	cription land	of Soil	● re × po ≫× po		•	water ↓ 10/1/98 w → on date st → water inflo → water outf	nown w	moisture D dry M moist W wet S saturated	consist VS S F St VSt H	ver sof firm stiff	y soft t y stiff	ndex	VL L MD D VD	lc m d	ery loos pose nedium ense ery den	dense	

C	ノ	אוונ	The Lakes (2012)	leen nes	Hand	d Au	ger	No	-		НА	15	3						
		gineering Log - Hand Auger The Lakes (2012) The Lakes Stage 2qrst uger location: Center of Lot 859 penetrometer type: Easting: 368053.4 m Slope: -90° neter: 50 mm Northing: 800300.4 m Bearing: information material substance		Shee	et					1 of	1								
	<u> </u>		_	Proje	ect N	0:							JC	30	86A				
Cli	ent:		2)	Date	star	tec	1:			4.2.	201	14							
Pri	ncipa	al:						Date	com	nple	eted	:		4.2.	201	14			
Pro	oject			The	Lakes	Stag	e 2qrst	Logo	ed b	y:			,	SC					
		-			ter of L	ot 85.		Cheo		-				RB					
-		-	Information Material substance notes amples, manuels, Bearing: material substance					R.L.					0000		ane		DR4	523	
		notes samples, to the terminal substance of the terminal substance of the terminal substance of the terminal substance of the terminal substance of the terminal substance of the terminal substance of the terminal substance of the terminal substance of the terminal substance of terminal							Datu	m:	x/y:	WBOF	-U2	2000;	RL:	IVIOTU	IFIKI		
stratigraphy	water	samples,	RL	depth metres	graphic log	classification symbol	Soil type; colour, structure. Grading; bedding; plasticity, sensitivity. Secondary and minor	moisture	condition consistency/	density index	25 50 75 vane shear	100 (remoulded 125 /peak) kPa	175		blow	/s pe	er 10	0mm	e test n 16 18
VOLCANIC ASHES	groundwater not encountered			0. <u>5</u> 		OL	Organic SILT, dry and friable, brown with pale brown mottles. Som fine grained sand (TOPSOIL FILL). Sandy SILT, dry and friable, pale yellow brown with occasional orange brown mottles and black specks. Sand is fine to coarse becoming pale brown with brown orange staining (possible limonite staining). Moist, low plasticity becoming moist to wet, soft becoming quick, pale brown with some black specks becoming wet.	_		St		× × ×	21					. 14	
				2.0			EOBH, target depth. Borehole HA153 terminated at 2 metres.												
: ;	soil de based and Ro	ication symb scription on Field Desc ock, New Zeal chnical Societ	cription and	of Soil	● re × po ≫× po			consis VS S F St VSt H	v s f s v	ery oft irm	soft	' index		VL L MD D VD		very loose medi dens very	e um d e	ense	

C)(offe	Ð		g	geo	otechnics	- H	land	Auge	r No.		HA	154	!		
									Sheet Projec				1 of	F 1	AUC	1308	86AF
Cli	ent:		The Lakes Stage 2qrst ger location: Center of Lot 860 enetrometer type: Easting: 368025.5 m eter: 50 mm Northing: 800299.8 m information material substance)ate s		d:			.2014			<u> </u>				
	ncip	al:	The Lakes Stage location: Center of Lot 86 trometer type: 50 mm 50 mm material subs	,	C)ate c	lamo:	eted:		4.2	.2014	4					
	oject	The	The	Lakes	Staa	e 2arst		ogge	•			sc					
	-		tion [.]			-	-		heck		<i>.</i> .		RB				
			Someter type: Easting: 368025.5 m Slope: -90° 50 mm Northing: 800299.8 m Bearing: mation material substance material s 0 0 0 g 0			L. Su		m			ne No: I	DR45	23				
Hol	e dia	meter: 50 n	50 mm No rmation material substance es hes, etc RL geb bles, otc RL geb	Northing: 800299.8 m	Bearing:	D	atum:	x/y: V	VBOPC	2000	; RL: M	oturiki					
dr	illing	g informat	ion	_	materia		tance						i –				
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	Soil type; colour, structu plasticity, sensitivity. S	ure. Grading; bedding; secondary and minor	moisture condition	consistency/ density index	25 50 vane shear	100 (remoulded 125 /peak) kPa 175		blows	n resist	0mm	
FILL	-					OL MH		. ·	D	VSt- H							_
	ncountered			0.5		SW	Silty SAND, fine to coarse, Loose t grey with occasional pale orange b Silty CLAY, medium plasticity, pale - some fine to medium sands. Mois	rown staining. grey with. Dry to moist.	D-M M	-	•	UTF	*				
VOLCANIC ASHES	groundwater not encountered			1. <u>0</u> _ _ 1.5_		CL	Sandy Silty CLAY, medium plasticit coarse. Silty CLAY, medium to high plastici sand.			St	•	<					
				2.0		ML	Sandy SILT, low plasticity, pale yell orange staining. Moist. EOBH, target depth. Borehole HA154 terminated at 2 m			VSt	•	×					
s t a	soil de based and R	fication symbol ascription on Field Des- ock, New Zea chnical Societ	cription land	of Soil	● re × pe ≫× pe			level D dry h M moist W wet S saturated	onsiste /S S St /St H	very soft firm stiff	v soft	index	VL L MD D VD	la m de	ery loose ose nedium d ense ery dens	ense	

C		offe	Ð	y	g	jec	otechnics		Hand	l Aug	er No	D.	Н	IA1	55			
Ε	no	ainee	eri	na	Loa	- H	land Auger		Shee					of				
	ent:	<u> </u>			Lakes					ct No starte					ZTA 014		308	36AI
	ncip	al·		me	Lanes	(2012	-)			comp		d.			014 014			
				Tho	Lakos	Stan	e 2qrst			ed by		u.	J. R		014			
	oject	Juger loca	tion			-	-							ь вт				
		penetrome				01 01	Easting: 368052.6 m	Slope: -90°	Chec	ked b R.L. S	-	e: m		ы	Van	e No: I)R45	23
		meter: 50 m					Northing: 800274.8 m	Bearing:		Datum	ı: x/y	WBOF	PC200	00; R	L: Mo	turiki		
dr	illing	g informat	tion		materia		tance						+					
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	mater Soil type; colour, structur plasticity, sensitivity. Se components, additio	e. Grading; bedding; condary and minor	moisture	consistency/ density index	25	75 vane snear 100 (remoulded 125 /peak) kPa 150 /peak) kPa		b	lows	resist	Dmm	
TS						OL	Organic SILT; no plasticity, dark bro grained (TOPSOIL).	wn, organic; sand is fine	N	Н								
VOLCANIC ASHES	groundwater not encountered					ML	Sandy SILT; pale yellow-brown, stre no plasticity, sand is fine to coarse.	aked orange, trace black fler	xs, M	Vst ,	•	× × ×	*					
-				_			EOBH @ 2.0m, target depth TS = TOPSOIL Borehole HA155 terminated at 2 me	tres.										
s t a	oased and R	fication symbols escription on Field Deso ock, New Zea chnical Societ	cription land	of Soil	● re × pe ≫× pe			moisture D dry M moist W wet S saturated	consis VS F St VSt H	ve so firr sti	ry soft ft n ff ry stiff		VL L D VD)	loo me der	dium d	ense	

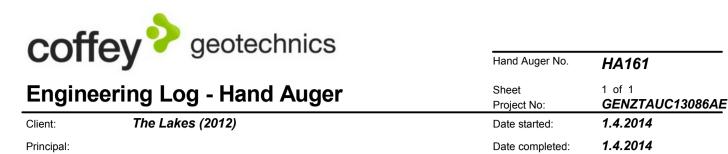
-		http://www.com				nec	otech	nics												
C	~	offey geotechnics gineering Log - Hand Auger						Hand	Auge	er No		Η	A1	56						
Ε	'n	ginee	eri	ng	Log	- -	land A	Auger			Sheet Projec					of 1 EN 2		UC1	308	6AE
Cli	ent:			The	Lakes	(201	2)				Date s					2.2				
Pri	ncip	al:									Date of	comp	letec	1:	5.	2.2	014			
Pro	oject	:		The	Lakes	Stag	e 2qrst				Logge	d by:			R	В				
На	nd A	Auger loca	tion:	Cen	ter of L	.ot 86	51				Check	ed b	y:		R	BT				
Dyr	namio	; penetrome	ter typ	e:			Eastin	ng: 368026.2 m	:	Slope: -90°	F	R.L. Su	urface	: m			Vane	No: D	R452	3
		meter: 50 m			.			ing: 800276 m		Bearing:	[Datum	: x/y:	WBOP	C200	00; RI	_: Mot	uriki		
		g informat	ion		materia	1	stance					_ ×		, D (G)	Пре	enetra	ation	resista	nce t	est
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol		ma il type; colour, strue lasticity, sensitivity. components, add	Second	ary and minor	moisture condition	consistency/ density index	25 50 vane ches	(cremoulded (cremoulded) (cremo		ble	ows p	er 100 10 12	nm	
FILL				-		OL	(TOPSOIL).			ganic; sand is fine grained o plasticity, sand is fine to	_/ м	Н								_
						. ML	Sandy SILT; p grained.	pale yellow-brown, i	no plastic	city, sand is fine to coarse	2				*					
ASHES	er not encountered			- - - 1.0_								Vst	•	×						
VOLCANIC	groundwate			- - 1.5_			- becoming we	et			W	St	- •	×						
				2.0								St	- •	×						
				-			EOBH @ 2.0n TS = TOPSOI Borehole HA1	n, target depth L 56 terminated at 2	metres.											
	soil de based and R	fication symb escription on Field Dess ock, New Zea chnical Societ	cription land	of Soil	● re × p ≫× p			water ↓ 10/1/98 wat → on date sho → water inflow → water outflo	wn ′	moisture D dry M moist W wet S saturated	consist VS S F St VSt H	ver sof firm stiff	y soft t n f y stiff	/ index	VL L D VD)	loos mea den	lium der	ise	

U	~	offey geotechnics gineering Log - Hand Auger			Hand	d Aug	jer	No.			HA1	57							
							land Auger	Shee Proie	et ect No	o.				1 of 1 GEN2	ΖΤΑ	UC	:13	08(6A
Clie	ent:			The	Lakes	(2012			start		:			5.2.20					
Prin	ncipa	al:						Date	com	ple	eted:			5.2.20)14				
ro	ject	:		The	Lakes	Stag	e 2qrst	Logg	ed b	y:				RB					
	-	uger loca	tion:	Cen	ter of L	.ot 86	3	Cheo	ked	by:				RBT					
yna	amic	penetrome	ter typ	e:			Easting: 368053 m Slope: -90°		R.L. 8	-		m			Van	e No	: DR	4523	3
		meter: 50 n			1		Northing: 800253.6 m Bearing:		Datur	n:	x/y: \	VBOF	PC:	2000; RL	.: Mo	oturik	i		
dri	Illing	g informat	ion		materia		tance			-	L	7	-1	penetra	otion	roci	etan		net
stratigrapny	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	consistency/		25 50 75 vane shea	100 (remoulded 125 /peak) kPa	175	•	ows	per 1	00m	m	
VOLCANIC ASHES	palatinous of the set		OL ML	Sandy SILT; no plasticity, dark brown, organic; sand is fine grained (TOPSOIL). Sandy SILT; pale grey, trace black flecks, no plasticity, sand is fine to coarse.	_/	Vs	t t t t t t t t t t t t t t t t t t t	•	××××		x					· · · · · · · · · · · · · · · · · · ·			
				_			EOBH @ 2.0m, target depth TS = TOPSOIL Borehole HA157 terminated at 2 metres.												
s bi ai	oil de ased nd R	escription	cription land	of Soil	● re × po ≫× po		a) water moisture	Consis VS S F St VSt H	so fii st ve		soft	index		VL L MD D VD	loo me dei		dens	e	

C	χ	DILE	offey geotechnics ineering Log - Hand Auger		Diechinics	Ha	and	Auge	r No.		н	41:	58			—		
								Sł	neet	-			1 0	of 1				C A 1
	ent:	<u> </u>			Lakes					t No:				<u>=NZ</u> 2.20		JC1	308	<u>6AE</u>
		al·		me	Lanes	(2012	-7			ompl				2.20 2.20				
	ncip			The	Lakaa	Stor	e 2qrst			•			RE		/4			
	oject		4: ·			-	•			d by:								
		uger loca			ler of L	.01 00	Easting: 368028.6 m Slope: -90°	CI		ed by		m	RE		Vane	No: D	R452	3
		meter: 50 m					Northing: 800253.9 m Bearing:					NBOP	C200					Ŭ
dr	illin	g informat	ion		materia	al subs	tance						-					
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	25 50 vane shear	100 (remoulded 125 /peak) kPa	Ė	blo	ws pe	esista er 100 10 12	nm	
VOLCANIC ASHES TS str	Dual OL Sandy SILT: no plastic (TOPSOIL). Sandy SILT: pale grey- ine to coarse. SILT: pale grey- cemented. 0.5 X X X X ML SILT: pale grey- cemented. 0.5 X X X X ML SILT: pale grey- cemented. 1.0 X X X X ML SILT: trace sand; pale sand is fine to coarse. 1.0 X X X X X X X X X 1.5 X X X X X X X X X - X X X <th>Sandy SILT; no plasticity, dark brown, organic; sand is fine gra (TOPSOIL). Sandy SILT; pale grey streaked light orange, low plasticity, san fine to coarse. Silty SAND; pale grey-brown, sand is fine to coarse grained, sli</th> <th>ined d is ghtly</th> <th></th> <th>8 8 H D VSt</th> <th>•</th> <th>× × ×</th> <th>22 2</th> <th>4</th> <th>58</th> <th>10 12</th> <th>14 16</th> <th></th>		Sandy SILT; no plasticity, dark brown, organic; sand is fine gra (TOPSOIL). Sandy SILT; pale grey streaked light orange, low plasticity, san fine to coarse. Silty SAND; pale grey-brown, sand is fine to coarse grained, sli	ined d is ghtly		8 8 H D VSt	•	× × ×	22 2	4	58	10 12	14 16					
				2.0			EOBH @ 2.0m, target depth TS = TOPSOIL Borehole HA158 terminated at 2 metres.				•	> ×						
s t a	oil de based and R	fication symb ascription on Field Deso ock, New Zea chnical Societ	cription land	of Soil	● re × po ≫× po			CO V: S F SI V: H	S t St	soft firm stiff	/ soft	index	VL L D VD		loose med dens	ium der	ise	

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	ent:	-		-	Lakes			•				tarteo	1:			.201		013	000	
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	oject			The	Lakes	Stad	e 2qrst					d by:			RB		•			
	-	uger loca	tion [.]			•	•			-	-	ed by	<i>,</i> .		RB					
		penetrome				.01 00		g: 368055.3 m	Slope: -90°	One		L. Su		m			ane N	o: DR	4523	3
Hol	e diar	neter: 50 m	ım				Northi	ng: 800227 m	Bearing:		Da	atum:	x/y: \	NBOP	C2000	; RL: N	/loturi	ki		
dr	illing	g informat	ion		materia		tance								1					
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol		material il type; colour, structure. lasticity, sensitivity. Seco components, addition	Grading; bedding; ondary and minor	moisture	condition	consistency/ density index	25 50 vane shear	100 (remoulded 125 /peak) kPa		blow:	s per	100m	m	
ΤS		,				OL	Sandy SILT; n (TOPSOIL).	o plasticity, dark brown,	organic; sand is fine grai	ned	М	н	1010							
VOLCANIC ASHES	groundwater not encountered			- 0.5 - 1.0 - 1.5 - - - - - - - - - - - - - - - - - - -		ML	Sandy SILT; p	and is fine to coarse.	ack flecks, streaked orang		w				* * * * * * *					
s t	soil de based and Ro	fication symb scription on Field Deso ck, New Zeal chnical Societ	cription land	of Soil	● re × po ≫× po		a)	U 59 terminated at 2 metro 59 terminated at 2 metro water 10/1/98 water levo on date shown water inflow ↓ water outflow	moisture	Cons VS S F St VSt H		ncy/ de very soft firm stiff very harc	soft	index	VL L MD D VD	li r c	very lo oose mediu dense very de	m dens	se	

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	ent:										t No: tarte					<u>21A</u> 014	UCI	30	86AE		
	ncip	al·		me	Lanes	(2011	-)							u. eted)14			
	oject			Tho	l akos	net?	o 2arst						d by:		•	RE		,,,			
	-	Nuger loca	tion [.]			-	-						ed by			RE					
_		penetrome						ng: 368033.5 r	n	Slope: -90°	on			rface:	m	7.1		Vane	No: I	DR45	23
		meter: 50 n						ing: 800228.5	m	Bearing:		D	atum:	x/y:	WBOF	C200	0; RI	.: Mot	uriki		
dr	illin	g informat	tion		materia		stance						×		م ر	Ine	notr	ation	rociet	ance	test
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol		lasticity, sensit				condition	consistency/ density index	25 50 75 vane shea	 (remoulded (remoulded (remoulded) (remoulded		ble	owsp 6 8	er 10	Omm	
TS				-		OL	Sandy SILT; n (TOPSOIL).	no plasticity, da	rk brown, org	janic; sand is fine graii	ned	М	Η								_
VOLCANIC ASHES	groundwater not encountered					ML		ce fine sub-ang		, no plasticity, sand is gravel.	fine	w	Vst St St	•	× × ×	×					
				2.0	• X • X • X		TS = TOPSOI	n, target depth L 60 terminated						•	*						
t a	soil de based and R	fication symbols secription on Field Desi ock, New Zea chnical Societ	cription land	of Soil	● re × po ≫× po					moisture D dry M moist W wet S saturated	con VS S F St VS H		ver soft firm stiff	/ soft	index	VL L MD D VD		loos mea den	lium d		



The Lakes Stage 2qrst Project:

Hand Auger location: Center of Lot 867

Logged by: Checked by:

SC

Dynamic penetrometer type: Easting: 368044.8 m Slope: -90° R.L. Surface: m Vane No: DR2244 Hole diameter: 50 mm Northing: 800206.4 m Datum: x/y: WBOPC2000; RL: Moturiki Bearing: drilling information material substance vane shear (remoulded /peak) kPa penetration resistance test classification symbol consistency/ density index stratigraphy g material moisture condition graphic lo notes Soil type; colour, structure. Grading; bedding; depth metres blows per 100mm water plasticity, sensitivity. Secondary and minor components, additional information. samples, RL 25 50 75 1125 175 tests, etc 2 4 6 8 10 12 14 16 18 Organic SILT, low plasticity, dark brown, fine to coarse gravels \throughout (TOPSOIL FILL) D Μ Н Sandy SILT, low plasticity, brown with various brown and grey mottles, sand is fine to coarse. -0.3m, becoming pale brown grey with orange flecks. E 0.5 -0.5m, becoming brown with various brown and grey mottles. groundwater not encountered Clayey SILT, medium palsticity, orange brown. Occasional dark orange brown staining with minor dark brown (non organic) streaks VSt-H 1.0 VOLCANIC ASH [?] 1.5 -1.6m, some pale grey mottles. -1.8m, some pink brown gravel inclusions. 2.0 EOBH, target depth. Borehole HA161 terminated at 2 metres. classification symbols and vane shear (kPa) water moisture D drv consistency/ density index 10/1/98 water level soil description remoulded VS very soft VL very loose . Μ moist based on Field Description of Soil on date shown soft peak × S F loose I. W wet and Rock, New Zealand peak greater than 200kPa water inflow firm MD medium dense s saturated Geotechnical Society Inc 2005 UTP unable to penetrate water outflow St stiff D dense VSt verv stiff VD very dense hard н

GEO 5.2 Rev orm

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Clie					Lakes					tarte				.201		010	<u> </u>
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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	5 0 5 vane shear	100 (remoulded 125 /peak) kPa 175		blov	/s per	100m	n 16 18
₽		,				OL	Sandy SILT; no plasticity, dark brown, organic; sand is fine g	rained	D	н	100						
FILL	groundwater not encountered		_15.0			ML	(TOPŠOIL). Sandy SILT, no plasticity, orange-brown, friable; sand is fine coarse grained.	to	M			UTF	× ×				
			_14.0	_ 1.5 		OL	- 20mm lens of organic silt SILT (ORGANIC); low plasticity, dark brown, fibrous organic inclusions, organic odor		_	VSt		V					
A				_		ML	Silty SAND, fine to medium grained, pale brown.		w	1							
⊢			13.5	2.0	< X X		EOBH @ 2.0m, target depth										
				_			AD = ALLUVIAL DEPOSIT Borehole HA165 terminated at 2 metres.										
s ti a	oil de based and Re	fication symb ascription on Field Desc ock, New Zeal chnical Societ	cription land	of Soil	● re × pe ≫× pe			V S F	/S St /St	very soft firm stiff	/ stiff	ndex	VL L MD D VD		very lo loose mediu dense very d	m dense	2

C	2	offey geotechnics gineering Log - Hand Auger				Hand	Auge	r No			HA1	66				—				
		ngineering Log - Hand Auger					Shee	t				of								
	ΠĆ	Jinee	ern	ng	LOG	- Г		Auger			ct No				GEN		AUC	:13	086	<u>AE</u>
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Pro	ject	:		The	Lakes	Stag	e 2qrst			Logg	ed by			I	RB					
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		meter: 50 m g informat			materia	al subs		ng: 800212.23 m	Bearing:		Datum	x/y:	WBOF	<i>'</i> C2	000; R	L: MC	DTULLIK			-
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol		material il type; colour, structure. G lasticity, sensitivity. Secon components, additional	dary and minor	moisture	consistency/ density index	25 00 vane shear	100 (remoulded 125 /peak) kPa		penet	lows	per 1	00m	m	
TS						OL	(TOPSOIL). Sandy SILT; n	o plasticity, dark brown, o o plasticity, orange-brown fine to medium grained.		_/	Н			×						-
			<u>1</u> 5.0	0. <u>5</u> 										*						
FILL	groundwater not encountered		_14.5	 1.0		ML	SILT, no plasti mottled dark o	icity, minor fine to medium brange.	sand; orange-brown,					* *						
			_14.0	 1.5										*						
			13.5	2.0			- becoming gre				VSt	•	×							-
							EOBH @ 2.0n TS = TOPSOII Borehole HA10	n, target depth L 66 terminated at 2 metres												
s t	oil de based and Re	fication symb sscription on Field Deso ock, New Zea chnical Societ	cription land	of Soil	● re × p ≫× p			water ↓ 10/1/98 water level on date shown ► water inflow ↓ water outflow	moisture D dry M moist W wet S saturated	consis VS S F St VSt H	sof firn stif	y soft	index	L N C	/L - /D /D	loc me de	ry loo: ose edium nse ry der	dense	e	

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	ncipa	al.			Lunco	(2077	7		e com						1.2					
	ject			The	Lakes	Stan	o 2arst		ged by		icu	•		RE						
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		meter: 50 m					Northing: 800140.08 m Bearing:		Datun	n: >	٧y: ۱	WB	OPC	200	0; RI	_: M	oturi	ki		
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aphy					bol	classification symbol	material	e.	condition consistency/ density index		shear	(remoulded	с) кга	pe	netra	atioi	n res	sista	nce	est
stratigraphy	water	notes samples,		depth metres	graphic log	assifi /mbol	Soil type; colour, structure. Grading; bedding; plasticity, sensitivity. Secondary and minor	moisture	onditic onsiste		vane	(remo	/pear		bl	ows	per	100	nm	
	×	tests, etc	RL	μ	Б \ \ \ \ \	ບ ແ OL	components, additional information. Sandy SILT, no plasticity, dark brown, organic, sand is fine graine	_	_		2025	100	150	2	4	6 8	3 10	12	4 16	18
TS				_		UL	(TOPSOIL).													
					$\begin{pmatrix} \times & \times & \times \\ \times & \times & \times \\ \times & \times & \times \end{pmatrix}$	ML	SILT, low plasticity, orange-brown, mottled brown, white and orange, minor fine to coarse sand.	1	Л											
				_	$(\times \times \times \times \times \times \times \times \times \times \times \times \times \times \times \times \times \times \times$															
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						ML	Sandy SILT, no plasticity, pale orange-brown; sand is fine to coar grained.	se	VS	t										
			14.0	2.0		ML	SILT, low plasticity, orange-brown, mottled brown, white and orange; minor fine to coarse sand.													
							EOBH @ 2.0m, target depth TS = TOPSOIL			T			×				\parallel			
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s t a	oil de ased ind Ro	fication symb ascription on Field Deso ock, New Zeal ochnical Societ	cription and	of Soil	● re × pe ≫× pe		, D day	cons VS S F St VSt H	so fir st ve	ery s oft m	oft	ind	ex	VL L MD D VD		lo m de	ery lo ose ediur ense ery de	n der	se	

HAND AUGER SCALA 13086AE GCRHAND AUGERS.GPJ COFFEY.GDT 7.5.14

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	ground			_			orange, minor	fine to medium sand.								× I						
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		fication syml	ools ar	d		hear (kP emoulde		water 10/1/98 water I	level	D dry	consist VS	-	lensit y soft		lex	VL		VA	ry loos	se		
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stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol		mate il type; colour, structu lasticity, sensitivity. S components, additi	ure. Gra Seconda	ary and minor	moisture	consistency/ density index	vane shear	100 (remoulded 125 /neak) kPa	50 / poany ni a 5		blow	s pei	sistar r 100r	nm	
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s b a	oil de based and Re	fication symb scription on Field Deso pock, New Zea chnical Societ	cription land	of Soil	● re × po ≫× po		•	water ↓ 10/1/98 water on date showr water inflow water outflow	level n	moisture D dry M moist W wet S saturated	consist VS S F St VSt H	ver soft firm stiff	y soft	inde		VL L MD D VD	lı r c	lense	ım den	se	

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	-	luger locat	tion [.]			-	-				Chec	-				BT				
_		penetrome				.01 00		ng: 368125.5 m		Slope: -90°		R.L. Si		m			Vane	e No:	DR4	523
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stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol		mat bil type; colour, struc lasticity, sensitivity. components, add	Second	ary and minor	moisture	consistency/ density index	25 20 25 vane shea	100 (remoulded 125 /peak) kPa	İ	b	lows 6 8	per 1	00mm	1
τs						OL		no plasticity, dark bro	own, org	anic; sand is fine graine	d M	_	150						2 14	
	itered			0.5				bale grey, no plastici							×					
FILL	groundwater not encountered			- 1. <u>0</u> - - -											×					-
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s t a	soil de based and Re	fication symbols sscription on Field Desc ock, New Zeal chnical Societ	cription land	of Soil	● re × p ≫× p		•	water ↓ 10/1/98 wate on date show ► water inflow water outflow	wn	moisture D dry M moist W wet S saturated	consis VS S F St VSt H	sof firn stif	y soft t y stiff	index	VL L MI VC	D	loo: me der	dium	dense	

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Dyr	namic	penetrome	ter typ	e:			Eastin	ng: 368126.5 m		Slope: -90°		R.L. Si	irface	: m			Va	ne N	o: DR	4523	
		meter: 50 m			<u> </u>	<u> </u>		ng: 800148.1 m		Bearing:	I	Datum	: x/y:	WBO	PC2	2000;	RL: M	loturi	ki		
	iiiin	g informat	ion		materia	1	tance					×			1	nene	tratio	n res	istan	ce te	st
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol		n il type; colour, str lasticity, sensitivi components, a	ty. Second	ary and minor	moisture	consistency/ density index	25 20 vane shea	100 (remoulded 125 /peak) kPa	175		blows	s per	100m	m	
TS	-			-		OL ML	(TOPŠOIL).			anic; sand is fine graine	ed M	H			*						-
				0. <u>5</u> 			- becoming ora	ange-brown, mot	tled white a	and orange	M				*						
FILL	groundwater not encountered														*						
	0			1.5											*						
				2.0			EOBH @ 2.0n TS = TOPSOII								*						
				-				71 terminated at	2 metres.												
s t	soil de based and Re	fication symb sscription on Field Desc ock, New Zeal chnical Societ	cription land	of Soil	● re × p ≫× p			water ↓ 10/1/98 w on date s ► water inflo water out	ow	moisture D dry M moist W wet S saturated	consist VS S F St VSt H	ver sof firm stiff	y soft t n y stiff	/ index	\ L N	/L - MD 	lc m d	ery loo oose nediur ense ery de	n dens	e	

HAND AUGER SCALA 13086AE GCRHAND AUGERS.GPJ COFFEY.GDT 7.5.14

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Е	n	ainee	eri	na	Loa	- H	land A	Auger			Shee					of				~~~=
	ent:	<u></u>			Lakes							ect No					2014		130	86AE
		ali		me	Lakes	(2012	2)					start		4.			2014 2014			
	ncip			The	l akaa	Stor	o Jarot					com		1:		7.2.2 RB	2014			
	oject	Nuger locat	lion			-	e 2qrst					ed by				ς RBT				
		penetrome				.01 00		g: 368136.4 m		Slope: -90°	Che	R.L. S	-	e: m	-			e No:	DR4	523
		meter: 50 m						ng: 800168.7 m		Bearing:		Datun	n: x/y:	WBOF	PC2	000; F	RL: Mo	turiki		
dr	illin	g informat	ion		materia		tance							_	Ť					
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol		mat il type; colour, struct lasticity, sensitivity. components, add	ture. Gra Second	ary and minor	moisture	condition consistency/ density index	25 50 yoon ohoo	75 valie silear 100 (remoulded 125 /peak) kPa		Ŀ	blows	per 1	00mm	1
τs		,			$\langle \rangle \rangle \rangle$	OL	Sandy SILT; n (TOPSOIL).	o plasticity, dark bro	own, org	anic; sand is fine graine	ed N	_	210		-					
				0.5		ML	Sandy SILT; p	ale grey, no plastici							* *					-
FILL	groundwater not encountered			 1.0											* *					
				- 1. <u>5</u> -											*					-
				2.0			EOBH @ 2.0n TS = TOPSOII Borehole HA1	n, target depth L 72 terminated at 2 r	netres.						* -*					
: 	soil de based and R	fication symb sscription on Field Desc ock, New Zeal chnical Societ	cription and	of Soil	● re × p ≫× p			water 10/1/98 water on date show water inflow water outflow	vn	moisture D dry M moist W wet S saturated	consis VS S F St VSt H	ve so fir st	ry soft ft m ff ry stiff	y index	L N C	1D	loo me dei		dense	

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	ent:	_			Lakes					Date s					1.20		<u>, , , , , , , , , , , , , , , , , , , </u>		
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Pro	oject			The	Lakes	Staa	e 2qrst			Logge				SC	2				
	-	uger locat	tion:			•	•			Check				R					
_		penetrome						g: 368122.35 m	Slope: -90°				: 16.5 ı			/ane	No: DI	R4523	3
		meter: 50 m					Northi	ng: 800206.59 m	Bearing:	C	atum	: x/y:	WBOP	C200	0; RL:	Motu	uriki		
dr	illin	g informat	ion		materia	·	stance						- TI -	1	notro	lon	esista		ant.
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	Soi pl	material il type; colour, structure. C lasticity, sensitivity. Secor components, additional	idary and minor	moisture condition	consistency/ density index	25 50 vane shea	100 (remoulded 125 /peak) kPa	Ė	blo	ws p	er 100	nm	
TS					$\langle \rangle \rangle \rangle$	OL	Sandy SILT, n (TOPSOIL).	o plasticity, organic,dark l	prown; sand is fine grained	d b	н								
	-			_		ML	. ,	o plasticity, orange-browr d.	ı, friable; sand is fine to										-
			10.0	0.5			- becoming mo	ottled pale grey						×					
			<u>1</u> 6.0	0.5															
				-									UT	Þ					
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	not encountered									M									
	t enco		15.5	1.0										Î					
FILL	ter no		_10.0																
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			_15.0	1.5			- 100mm dark	grey lens						*					
				=										*					
			14.5	2.0		1													
				_			EOBH @ 2.0m TS = TOPSOII Borehole HA1	n, target depth L 73 terminated at 2 metres											
s ti a	soil de based and R	fication symb sscription on Field Desc ock, New Zeal chnical Societ	cription land	of Soil	● re × p ≫× p		•	water ↓ 10/1/98 water level on date shown ↓ water inflow ↓ water outflow	moisture D dry M moist W wet S saturated	consiste VS S F St VSt H	ver sof firm stiff	y soft t n y stiff	rindex	VL L D VD		loose med dens	ium der	ise	

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	oject			The	Lakes	Staa	e 2qrst				Logge				S	с				
		Auger loca	tion:			-	-				Check	-				BT				
_		penetrome						ıg: 368139.57 m	Slope: -90°					17 m			Vane	No: E)R45	23
		meter: 50 n					Northi	ng: 800225.35 m	Bearing:		0	atum:	x/y: \	WBOP	C200	00; RI	L: Mot	uriki		
dr	illin	g informat	tion	1	materia	1	stance							-	i -					
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	Soi	mate il type; colour, structu lasticity, sensitivity. S components, addit	ire. Grading; bedding; econdary and minor		moisture condition	consistency/ density index	25 50 vane shear	100 (remoulded 125 /peak) kPa		bl	owsp	er 10()mm	
EILL	groundwater not encountered		_16.5	- - - - - - - - - - - - - - - - - - -		ML	- becoming pa	d. Ile brown, mottled pa	rown, friable; sand is i	fine to	M	H			* *					
			15.0	-			EOBH @ 2.0n	ey, moist to wet, sand n, target depth 74 terminated at 2 m							*					
: ;	soil d based and R	fication syml escription on Field Des ock, New Zea chnical Socie	cription land	of Soil	● r × p ≫× p			water ↓ 10/1/98 water on date shown water inflow water outflow	level D dry D M moist W wet S saturate	ed	Consiste VS S F St VSt H	ver soft firm stiff	y soft y stiff	index	VL L D VD	C	loos mec den	lium de		

_		-ff					otechnics				
C	3	JIE	=)		5	jet	lechines	Han	d Aug	er No.	HA180
Ε	'n	ginee	eri	ng	Log	- H	land Auger	She Proj	et ect No):	1 of 1 GENZTAUC13086AE
Cli	ent:			The	Lakes	(201)	2)		starte		31.1.2014
Pri	ncip	al:						Date	com	oleted:	31.1.2014
Pro	oject	:		The	Lakes	Stag	e 2qrst	Log	ged by	<i>r</i> :	SC
На	nd A	Auger loca	tion:	Nort	h west	corr	er of Lot 834	Che	cked b	by:	RBT
Dyr	namic	penetrome	ter typ	e:			Easting: 368221.6 m Slope: -90°		R.L. S	urface: m	Vane No: DR4523
		meter: 50 m					Northing: 800604.2 m Bearing:		Datun	n: x/y: WBOP	PC2000; RL: Moturiki
	mmų	g informat	lon		materia		tance		_ ×	교 및 과	penetration resistance test
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	225 225 255 100 100 100 125 126 125 126 126 126 126 126 126 126 126 126 126	blows per 100mm
						ML	Sandy SILT, dry and friable, brow with various brown mottles and specks. Sand is fine to coarse. Minor fine to medium road gravely		_	00000000	
				0. <u>5</u>			throughout.				× -
				-			- becoming moist.		1		-
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				 1. <u>5</u>					VSt H	- • •	×
				-							
	σ			2.0			- refusal due to gravels, position moved 0.8m west. Augered dow	'n			
	encountered			-			to 1.8m and continued logging.			•	× -
	encol			2.5						•	<
	er not			2.5							
	groundwate			-					н		* –
	grou			3.0_							*
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										т	P
				4. <u>5</u>							
-	1				//// × × × × < × × ×	ML	Sandy SILT, non plastic, pale green grey. Sand is fine to medium	ı.			*
AD				5.0							*
				-	V V V		EOBH, target depth. AD = ALLUVIAL DEPOSITS				
				_			Borehole HA180 terminated at 5 metres.				
				5.5	L		· · · · · · · · · · · · · · · · · · ·				
t a	soil de based and Re	fication symb escription on Field Dess ock, New Zea chnical Societ	cription land	of Soil	● re × p ≫× p			consi VS S F St VSt H	ve so fin sti	m ff ery stiff	VL very loose L loose MD medium dense D dense VD very dense

		_ff	~				otech	nice										
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E	'n	ginee	eri	ng	Log	- -	land A	Auger		Shee Proje		:			of 1 ENZ 7	TAU	C13	086AE
Cli	ent:			The	Lakes	(2012	2)			Date					.1.20			
Pri	ncip	al:								Date	comp	letec	1:	28	.1.20	014		
Pro	oject	:		The	Lakes	Stag	e 2qrst			Logg	ed by	:		KI	ΛJ			
На	nd A	uger locat	tion:	Cent	ter of L	.ot 80	9			Chec	ked b	y:		RE	3T			
Dyr	namic	penetrome	ter typ	e:			Eastin	ng: 368128.2 m	Slope: -90°		R.L. S	urface	e: m		V	'ane N	lo: DR2	2244
		meter: 50 m			<u> </u>			ing: 800590.78 m	Bearing:		Datum	1: x/y:	WBOP	C200	0; RL:	Motur	iki	
	illing	g informat	lon		materia		tance						<u>م</u> ت	ne	netrati	ion re	sistan	e test
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	So p	mater il type; colour, structu lasticity, sensitivity. Se components, additio	re. Grading; bedding; econdary and minor	moisture	consistency/ density index	25 50 Vana shas	75 varie sirear 100 (remoulded 125 /peak) kPa 150	ŀ	blov	vs per	100m) 12 14	m
TOPSOIL				_		SM	Silty SAND, fir	ne grained, black, root	lets, organic odor (TOPSOIL). D	VSt H	_						_
				_		SM	Silty SAND, S	andy SILT, pale orang	ge-brown, some fine sand.									
				0.5			- white inclusio	ons @ 0.4m					>:	>*				
				_			- increasing sil	lt content		D-I	Λ							
	not encountered			_								•	×					_
FILL	groundwater not e			1.0				avel & fine sand with w	vhite mottles	M								
	grour			-									>	>x				_
				1. <u>5</u>			- becoming on	ange-brown ne sand inclusion, fine	orained				>:	>×				
									-									
							EOBH @ 2.0n Borehole HA1	n, target depth 81 terminated at 2 me	stres.				•					
	soil de based and Re	fication symb sscription on Field Desc ock, New Zeal chnical Societ	cription land	of Soil	● re × po ≫× po		•	water ↓ 10/1/98 water I → on date shown → water inflow → water outflow		consis VS S F St VSt H	ve so firr stit	ry soft ft n ff ry stiff	y index	VL L MD D VD		very lo loose mediu dense very d	m dense	9

coffey	geotechnics
Engineering L	og - Trial Pit

E	n	ginee	eri	ng	Log	- T	rial Pit			She Pro	et ject l	No:		1 of 1 GENZTAUC130)86A		
Clie	ent:			The	Lakes ((2012)			Date started:				27.11.2013			
Priı	ncipa	al:								Dat	e cor	mpleted	d:	27.11.2013			
Prc	ject:			The	Lakes S	Stage	e 2qrst			Log	ged	by:		KMJ			
Tria	al pit	location:		Bou	ndary o	of Lot	s 874 & 875			Che	ecked	d by:		RBT			
Equ	ipme	nt type:					Pit Orientation:	Easting: 368092.6	7 m		R.L	Surface	e: 16				
		on dimension		0	1m wide		Vane No: DR4523	Northing: 800166.	76 m		Dat	tum: x/y=	EBOPC	2000, RL=Moturiki			
ex	cav	ation infor	mati	ion			erial substance						1				
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	Material Des Soil name; plasticity or gra components. Moisture, sensi bedding, cementation, defects. O Rock name, grain size & type, minor components. Weathering,	ding, colour, secondary tivity, strength. Structure, rigin, additional observations.	moisture condition	consistency/ density index	25 50 75 vane shear	100 (remoulded 150 (peak) kPa 175		structure and additional observations			
-			15	- - - 1		OL ML	SILT, no plasticity, black, rootlets SILT, low plasticity, brown, with v fine sand.		M	St	•	×					
One Observed	erved		14				 white pumiceous silt pockets becoming orange-brown occasional pockets/layers of org increasing plasticity 	ganic silts with organic odor			•	×			-		
	None Obse			<u>1</u> 4	<u>1</u> 4	<u>1</u> 4	<u>1</u> 4	-	× ×	ML	SILT, medium plasticity, interbed brown.	ded brown, grey & light			•	×	*
ALLUVIAL DEPOSITS		_13 _12	<u>1</u> 3	3		SP	Silty SAND, fine grained, grey.					UPT	*		-		
ALLUV			<u>1</u> 2	<u>4</u>		ML	Clayey SILT/Clayey SAND, medii sensitive, organic odor, sand is fi								-		
				- -			EOBH @ 4.2m, target depth. Test pit TP102 terminated at 4.2	metres.									
			11	5											-		
			10	6													
S	Sketo	ch	<u>1 IU</u>				1		1								

	classification symbols and soil description based on New Zealand Geotechnical Society Inc 2005	vane shear (kPa) ● remoulded × peak ≫× peak greater than 200kPa	moisture D dry
Form GEO 5.5 Rev.6	notes, samples, tests U ₅₀ undisturbed sample 50mm diameter U ₆₃ undisturbed sample 63mm diameter D disturbed sample Bs bulk sample E environmental sample R refusal	Joak greater than 200kr a UTP unable to penetrate water ↓ 10/1/98 water level on date shown ▶ waterinflow ↓ wateroutflow	M moist W wet S saturated

Trial Pit No.

TP102

consistency/ density index									
VS	very soft								
S	soft								
F	firm								
St	stiff								
VSt	very stiff								
Н	hard								

VL L MD D VD very loose loose medium dense dense very dense

coney	• gee	Trial Pit No.			TP103		
Engineerin	na Loa - T	rial Pit			Sheet		1 of 1
	The Lakes (2012)				Project		GENZTAUC13086AE 27.11.2013
Principal:	The Lakes (2012)				Date co		
	The Lakes Stage	2arst				-	KMJ
-	Boundary of Lot	-			Logged by: Checked by:		RBT
Equipment type:	Doundary of Lot	Pit Orientation:	Easting: 368113.82			Surface	
Excavation dimensions: 4m lo		Vane No: DR4523	Northing: 800175.79	9 m	Da	tum: x/y=	=EBOPC2000, RL=Moturiki
excavation informatio		rial substance	ion.			. T	
notes samples, tests, etc RL	depth metres graphic log classification symbol	Material Descript Soil name; plasticity or grading, or components. Moisture, sensitivity, s bedding, cementation, defects. Origin, a Rock name, grain size & type, colour minor components. Weathering, moist	olour secondary	moisture condition	density index density index 25 vane shear	100 (remoulded 125 /peak) kPa 175	structure and additional observations
Image: Part of the second	2 0 ML 1 2 ML 3 2 ML 4 5 5 - - - - - - - - - - - - -	SILT, no plasticity, black, rootlets, orga Sandy SILT, low plasticity, brown, with gravel & fine to medium grained sand. - silt pockets, white, with black specks. - becoming orange-brown with black s - grey inclusion - grey silt lenses & occasional organic - decreasing sand content SILT, low plasticity, orange-brown - tree trunks Sandy SILT, low plasticity, grey, trace of - abundant tree trunks from 2.9 to 3.5m (Clayey SILT, medium plasticity, blue-g odor. EOBH @ 3.5m, target depth AD = ALLUVIAL DEPOSITS Test pit TP103 terminated at 3.5 metre	white specks, with fine pecks pockets te inclusion & black clay & fine sand.		St- Vst	×	× · · · · · · · · · · · · · · · · · · ·
	otechnical Society Inc 2005 ple 50mm diameter ple 63mm diameter	vane shear (kPa) ● remoulded × peak >× peak greater than 200kPa UTP unable to penetrate water ↓ 10/1/98 water level on date shown ▶ waterinflow wateroutflow	moisture D dry M moist W wet S saturated		consisten VS S F St VSt H	cy/ densi very soft firm stiff very stiff hard	t VL very loose L loose MD medium dense D dense

coffey	geotechnics

coney geoteenmee						Trial Pit No.			TP104
Engineer	ing	Log	- T	rial Pit			She	et ject No:	1 of 1 GENZTAUC13086AE
Client:	The Lakes (2012) Date started:							27.11.2013	
Principal:			•				Dat	e completed:	27.11.2013
Project:	The	Lakes	Stage	e 2qrst				ged by:	KMJ
Trial pit location:			-	ts878 & 889				ecked by:	RBT
Equipment type:				Pit Orientation:	Easting: 368114.25	m		R.L. Surface:	
Excavation dimensions:		1m wide		Vane No: DR4523	Northing: 800111.6	3 m		Datum: x/y=l	EBOPC2000, RL=Moturiki
excavation inform	ation			erial substance Material Descript	ion		- ×	ਕ ਉਂ ਜ	
notes samples, tests, etc	r depth metres	graphic log	classification symbol	Soil name; plasticity or grading, c components. Moisture, sensitivity, y bedding, cementation, defects. Origin, a Rock name, grain size & type, colour minor components. Weathering, moist	olour, secondary strength. Structure, dditional observations. , fabric, inclusions &	moisture condition	consistency/ density index	 25 50 70 71 71 72 73 74 74 75 70 75 70 75 70 75 70 7	structure and additional observations
LIF		X X X X X X X X X X X X X X X X X X X		SILT, no plasticity, black, rootlets, orga SILT, no plasticity, brown, black speck - organic inclusion - dark brown inclusion - increasing sand content - becoming pale yellow-brown, black s sand - pale grey silt pockets SILT, low plasticity, grey-white, with bla EOBH @ 3.5m target depth. Test pit TP104 terminated at 3.5 metre	s & rootlets. pecks, with fine grained ack specks, pumiceous.	M	St- Vst	 × × × × × 	
Sketch classification symbols soil description based on New Zealan notes, samples, tests U _{s0} undisturbed a U _{s3} undisturbed a D disturbed sample	d Geotechr sample 50r sample 63r	mm diamete	er	vane shear (kPa) ● remoulded × peak >>× peak greater than 200kPa UTP unable to penetrate water ✓ 10/1/98 water level on date shown >> waterinflow	moisture D dry M moist W wet S saturated		conns VS S F Str VSR H	sistency/ densit very soft soft firm stiff very stiff hard	y index VL very loose L loose MD medium dense D dense VD very dense

Appendix F

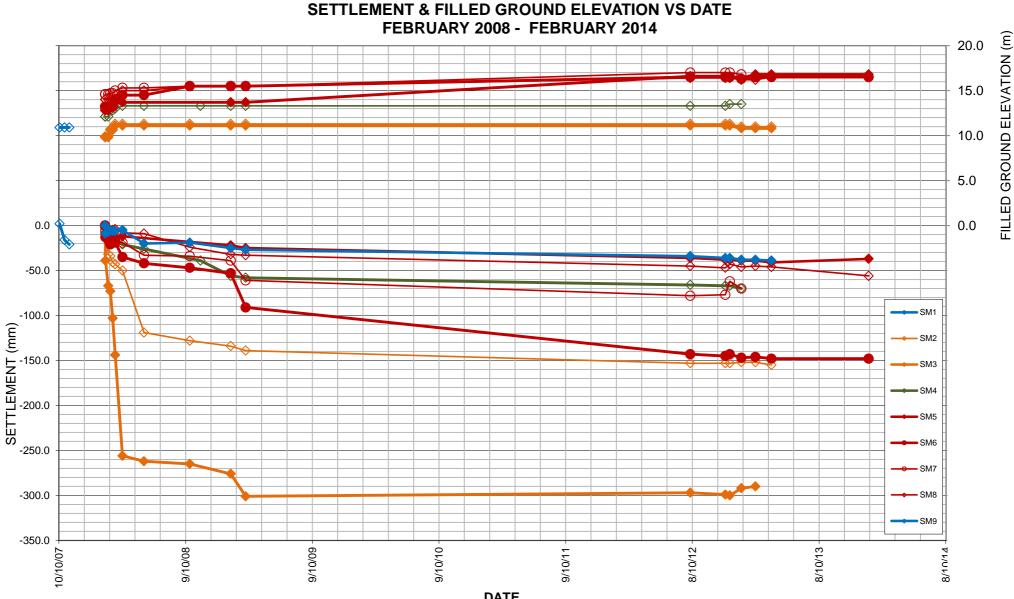
Static Settlement Analyses

Marker	Approximate Fill Height (m)	Interpreted Consolidation Settlement (mm)	Interpreted Creep Settlement Over Next 50 years (mm)					
SM1	2	Marker dama	Marker damaged and replaced wi					
SM2	6	120	35	30				
SM3	6	255	40	30				
SM4	4.5	55	15	20				
SM5	4.5	20	20	20				
SM6	3.5	145	10	10				
SM7	3	60	25	20				
SM8	3	40	10	20				
SM9	2.5	20	15	20				

Table F1: 2008-2009 Settlement Monitoring Results

THE LAKES (2012) LTD THE LAKES STAGE 2 QRST, TAURANGA **GEOTECHNICAL COMPLETION REPORT**



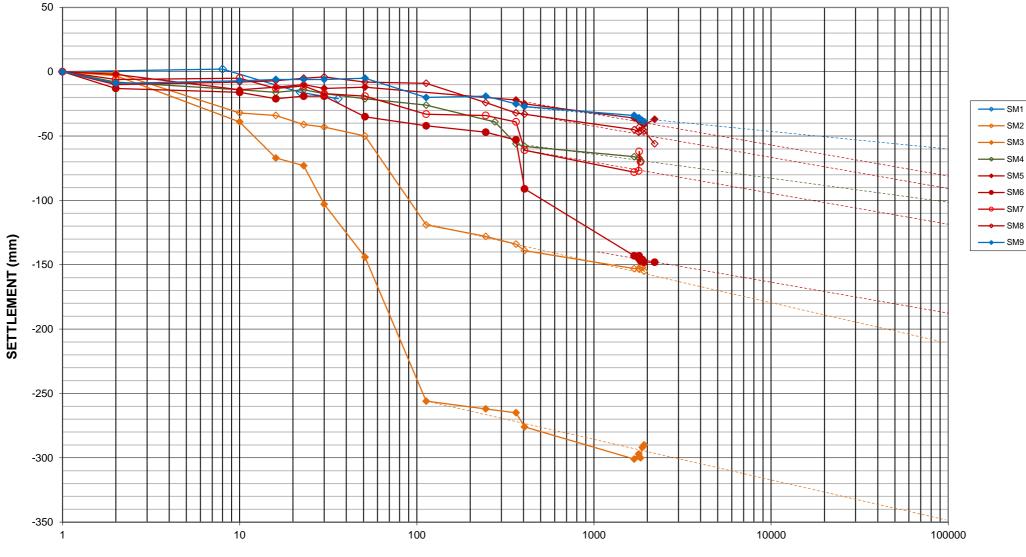


DATE



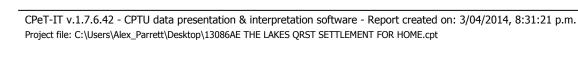
THE LAKES (2012) LTD THE LAKES STAGE 2 QRST, TAURANGA GEOTECHNICAL COMPLETION REPORT SETTLEMENT VS LOG TIME FEBRUARY 2008 - FEBRUARY 2014

GENZTAUC13086AE SETTLEMENT MONITORING DATA



LOG TIME (days)

CPT: CPT-01 Total depth: 15.02 m, Date: 28/11/2012 Surface Elevation: 20.00 m Coords: lat 0° lon 0° Cone Type: 50 MPa Piezocone Cone Operator: Ground Investigation





coffey

Footing type: Rectangular

Footing width: 200.00 (m)

Footing pressure: 0.00 (kPa) Embedment depth: 0.00 (m)

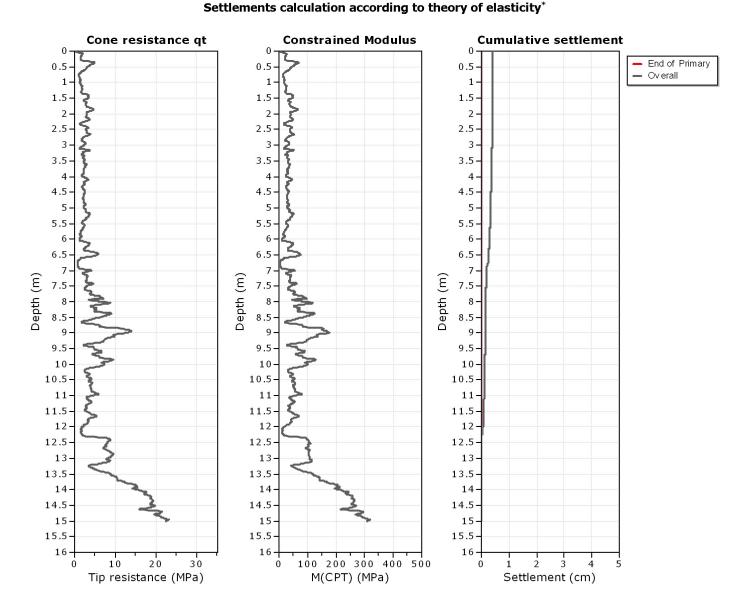
Remove excavation load: No Apply 20% rule: No

Calculate secondary settlements: Yes

Time period for primary consolidation: 1 months Time period for second. settlements: 12 months

Footing is rigid: No

L/B: 10.0



Caclulation properties

* Primary settlements calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$\mathbf{S} = C_a \cdot \Delta z \cdot \log(t)$$

Total depth: 14.59 m, Date: 28/11/2012 Surface Elevation: 12.00 m Coords: lat 0° lon 0° Cone Type: 50 MPa Piezocone Cone Operator: Ground Investigation

Cumulative settlement



0 End of Primary 0.5 0.5 0.5 - Overall 1 1 1 1.5 1.5 1.5 2 2 2 2.5 2.5 2.5 3 3 3 3.5 3.5 3.5 4 4 4 4.5 4.5 4.5 5. 5 5 5.5 5.5 5.5 6 6 6 6.5 6.5 6.5 7. 7 7 Depth (m) Depth (m 7.5-7.5 7.5 8 -8 8 8.5 8.5 8.5 9 9 9 9.5 9.5 9.5 10 10 10 10.5 10.5 10.5 11 11 11

Caclulation properties

M(CPT) (MPa)

* Primary settlements calculation is performed according to the following formula:

2

Settlement (cm)

ż

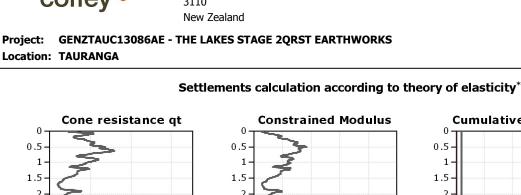
4

5

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$\mathbf{S} = C_a \cdot \Delta z \cdot \log(t)$$





Depth (m)

11.5

12.5

13.5

14.5

15.5

12

13

14

15

16

CPT: CPT-03

100 200 300 400 500

11.5

12.5

12

13 13.5-

14

15

16-

0

1

14.5

15.5

11.5

12.5

13.5

14.5

15.5

12

13

14

15

16

0

L/B: 10.0 Footing pressure: 0.00 (kPa) Embedment depth: 0.00 (m) Footing is rigid: No Remove excavation load: No Apply 20% rule: No Calculate secondary settlements: Yes

10

Footing type: Rectangular

Footing width: 200.00 (m)

20

Tip resistance (MPa)

30

Time period for primary consolidation: 1 months Time period for second. settlements: 12 months

CPT: CPT-03 Total depth: 14.59 m, Date: 28/11/2012 Surface Elevation: 12.00 m Coords: lat 0° lon 0° Cone Type: 50 MPa Piezocone Cone Operator: Ground Investigation



Footing type: Rectangular

Footing width: 200.00 (m)

Footing is rigid: No

Footing pressure: 34.00 (kPa) Embedment depth: 0.00 (m)

Remove excavation load: No Apply 20% rule: No

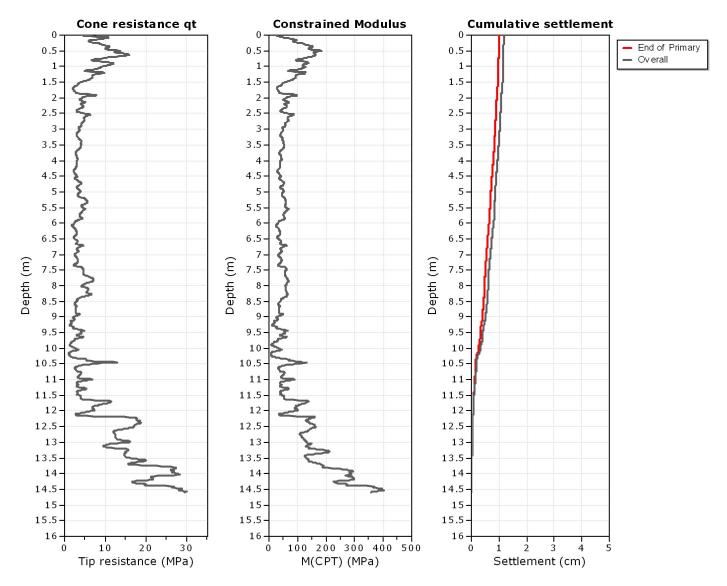
Calculate secondary settlements: Yes

Time period for primary consolidation: 1 months Time period for second. settlements: 12 months

L/B: 10.0

Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST EARTHWORKS Location: TAURANGA

Settlements calculation according to theory of elasticity*



Caclulation properties

* Primary settlements calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$\mathbf{S} = C_a \cdot \Delta z \cdot \log(t)$$

CPeT-IT v.1.7.6.42 - CPTU data presentation & interpretation software - Report created on: 7/03/2014, 11:37:33 a.m. 1 Project file: F:\1.GENZ\1.GEOTECHNICS PROJECTS\13086AE THE LAKES STAGE 2 QRST\ANALYSES & DESIGN\SETTLEMENT\GENZTAUC13086AE THE LAKES STAGE QRST.cpt

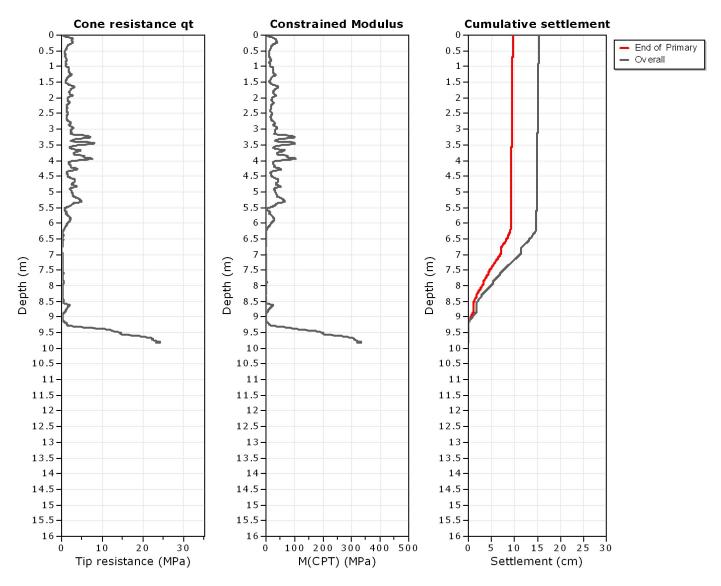
CPT: CPT-04 Total depth: 9.82 m, Date: 28/11/2012 Surface Elevation: 13.25 m Coords: lat 0° lon 0° Cone Type: 50 MPa Piezocone Cone Operator: Ground Investigation



Location: TAURANGA

coffey

Settlements calculation according to theory of elasticity*



Caclulation properties

* Primary settlements calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$\mathbf{S} = C_a \cdot \Delta z \cdot \log(t)$$

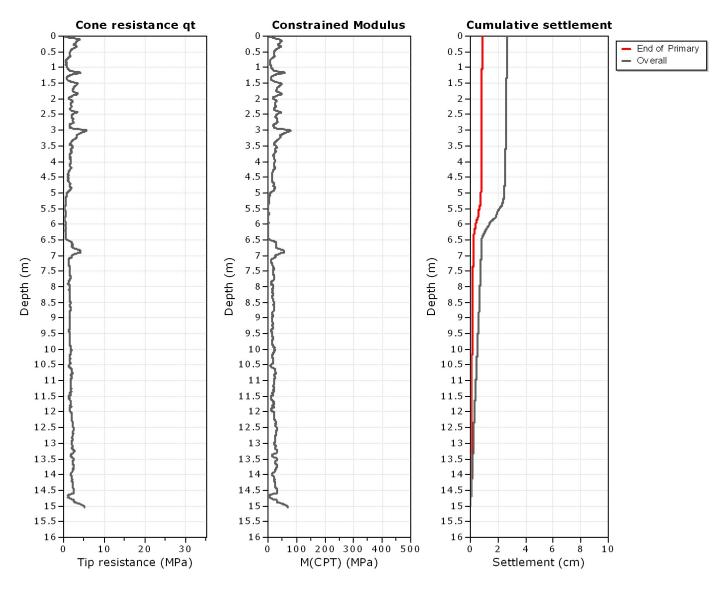
Footing type: Rectangular Footing width: 200.00 (m) L/B: 10.0 Footing pressure: 17.00 (kPa) Embedment depth: 0.00 (m) Footing is rigid: No Remove excavation load: No Apply 20% rule: No Calculate secondary settlements: Yes Time period for primary consolidation: 1 months Time period for second. settlements: 12 months

CPT: CPT-05 Total depth: 15.03 m, Date: 28/11/2012 Surface Elevation: 15.75 m Coords: lat 0° lon 0° Cone Type: 50 MPa Piezocone Cone Operator: Ground Investigation



Location: TAURANGA

Settlements calculation according to theory of elasticity*



Caclulation properties

* Primary settlements calculation is performed according to the following formula:

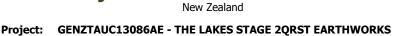
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$\mathbf{S} = C_a \cdot \Delta z \cdot \log(t)$$

Footing type: Rectangular Footing width: 200.00 (m) L/B: 10.0 Footing pressure: 4.25 (kPa) Embedment depth: 0.00 (m) Footing is rigid: No Remove excavation load: No Apply 20% rule: No Calculate secondary settlements: Yes Time period for primary consolidation: 1 months Time period for second. settlements: 12 months

CPT: CPT-06 Total depth: 15.04 m, Date: 28/11/2012 Surface Elevation: 19.50 m Coords: lat 0° lon 0° Cone Type: 50 MPa Piezocone Cone Operator: Ground Investigation



Location: TAURANGA

Footing type: Rectangular

Footing width: 200.00 (m)

Footing pressure: 0.00 (kPa) Embedment depth: 0.00 (m)

Remove excavation load: No

Calculate secondary settlements: Yes

Time period for primary consolidation: 1 months Time period for second. settlements: 12 months

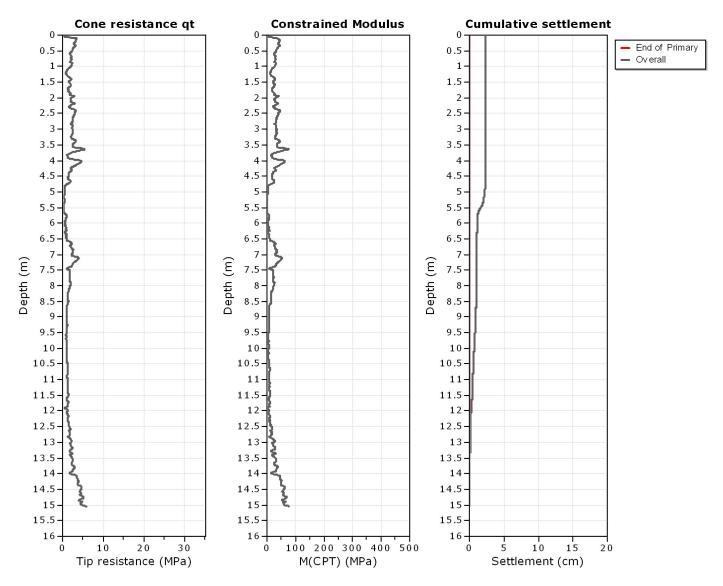
Footing is rigid: No

Apply 20% rule: No

L/B: 10.0

coffey

Settlements calculation according to theory of elasticity*



Caclulation properties

* Primary settlements calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$\mathbf{S} = C_a \cdot \Delta z \cdot \log(t)$$

Project file: C:\Users\Alex_Parrett\Desktop\13086AE THE LAKES QRST SETTLEMENT FOR HOME.cpt

8.5

9.5

10

11-

12-

13-

14

15

16

0

12.5-

13.5-

14.5

15.5

10.5

11.5

9

CPT: CPT-07 Total depth: 7.77 m, Date: 28/11/2012 Surface Elevation: 13.50 m Coords: lat 0° lon 0° Cone Type: 50 MPa Piezocone Cone Operator: Ground Investigation



Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST EARTHWORKS

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0.5

1.5

2.5

3.5

4.5

8.5-

10

11-

12-

13-

14

15

16-

11.5-

12.5-

13.5-

14.5

15.5

10.5

9 9.5

Depth (m)

1

2

3

4

Cone resistance qt **Constrained Modulus Cumulative settlement** 0 0 0 End of Primary 0.5 0.5 - Overall 1 1 1.5 1.5 2 2 2.5 2.5 3 3 3.5 3.5 4 4 4.5 4.5 5 5 5 5.5 5.5 5.5 6 6 6 6.5-6.5-6.5 7. 7 7 Depth (m) Depth (m) 7.5 7.5 7.5 8 8 8

8.5

9

9.5

10

11-

12-

10.5

11.5

12.5-

13

14-

13.5-

14.5-

15.5

15

16-

0

5

10

Settlement (cm)

Caclulation properties

100 200 300 400 500

M(CPT) (MPa)

Footing type: Rectangular Footing width: 200.00 (m) L/B: 10.0 Footing pressure: 8.50 (kPa) Embedment depth: 0.00 (m) Footing is rigid: No Remove excavation load: No Apply 20% rule: No Calculate secondary settlements: Yes Time period for primary consolidation: 1 months

10

Time period for second. settlements: 12 months

20

Tip resistance (MPa)

30

* Primary settlements calculation is performed according to the following formula:

15

20

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$\mathbf{S} = C_a \cdot \Delta z \cdot \log(t)$$

CPT: CPT-08 Total depth: 15.42 m, Date: 28/11/2012 Surface Elevation: 12.00 m Coords: lat 0° lon 0° Cone Type: 50 MPa Piezocone Cone Operator: Ground Investigation



coffey

Cone resistance qt **Constrained Modulus Cumulative settlement** 0 0 0 End of Primary 0.5 0.5 0.5 - Overall 1 1 1 1.5 1.5 1.5 2 2 2 2.5 2.5-2.5 3 3 3 3.5-3.5 3.5 4 4 4 4.5 4.5 4.5 5 5 5 5.5 5.5 5.5 6 6 6 6.5 6.5 6.5 7 7 Depth (m) Depth (m) Depth (m 7.5 7.5 8 8 8.5 8.5 8.5 9 9 9.5 9 9.5 1010 10 10.5 10.5 10.5 11-11 11 11.5 11.5 11.5 12-12 12 12.5 12.5 12.5 13 13 13 13.5 13.5 13.5 14 14 14 14.5 14.5 14.5 15 15 15 15.5 15.5 15.5 16 16-16 10 20 100 200 300 400 500 5 10 30 15 20 Ò 0 Tip resistance (MPa) M(CPT) (MPa) Settlement (cm)

Settlements calculation according to theory of elasticity*

Caclulation properties

* Primary settlements calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$\mathbf{S} = C_a \cdot \Delta z \cdot \log(t)$$

Footing type: Rectangular Footing width: 200.00 (m) L/B: 10.0 Footing pressure: 8.50 (kPa) Embedment depth: 0.00 (m) Footing is rigid: No Remove excavation load: No Apply 20% rule: No Calculate secondary settlements: Yes Time period for primary consolidation: 1 months

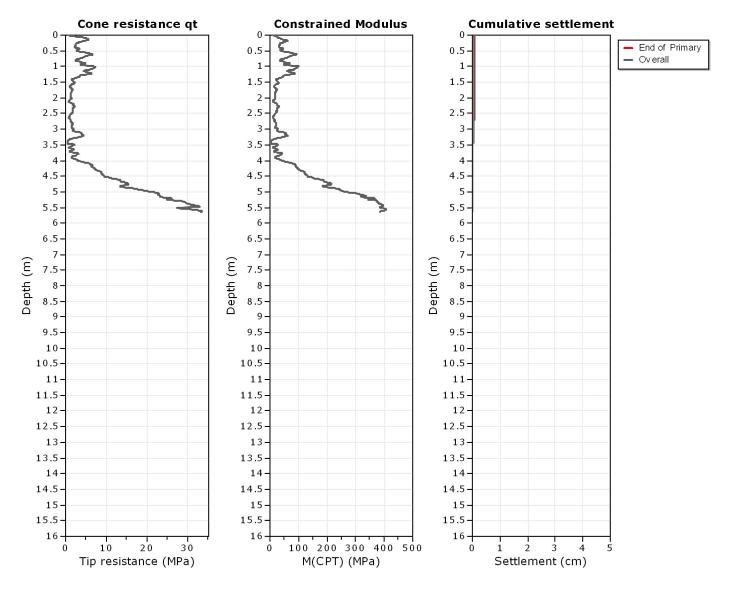
Time period for second. settlements: 12 months

CPT: CPT-09 Total depth: 5.64 m, Date: 28/11/2012 Surface Elevation: 14.00 m Coords: lat 0° lon 0° Cone Type: 50 MPa Piezocone Cone Operator: Ground Investigation



coffey

Settlements calculation according to theory of elasticity*



Caclulation properties

* Primary settlements calculation is performed according to the following formula:

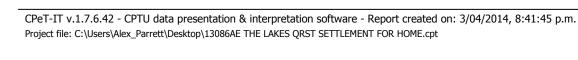
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$\mathbf{S} = C_a \cdot \Delta z \cdot \log(t)$$

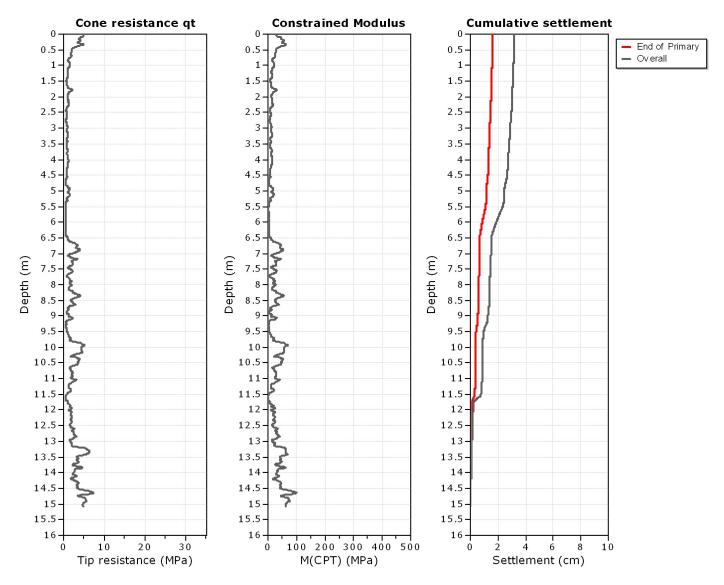
Footing type: Rectangular Footing width: 200.00 (m) L/B: 10.0 Footing pressure: 0.00 (kPa) Embedment depth: 0.00 (m) Footing is rigid: No Remove excavation load: No Apply 20% rule: No Calculate secondary settlements: Yes Time period for primary consolidation: 1 months Time period for second. settlements: 12 months

Total depth: 15.07 m, Date: 28/11/2012 Surface Elevation: 14.00 m Coords: lat 0° lon 0° Cone Type: 50 MPa Piezocone Cone Operator: Ground Investigation



Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST EARTHWORKS

Settlements calculation according to theory of elasticity*



Caclulation properties

* Primary settlements calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$\mathbf{S} = C_a \cdot \Delta z \cdot \log(t)$$

coffey

Footing type: Rectangular

Footing width: 200.00 (m)

Footing pressure: 8.50 (kPa) Embedment depth: 0.00 (m)

Remove excavation load: No Apply 20% rule: No

Calculate secondary settlements: Yes

Time period for primary consolidation: 1 months Time period for second. settlements: 12 months

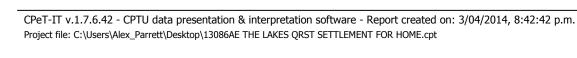
Footing is rigid: No

L/B: 10.0

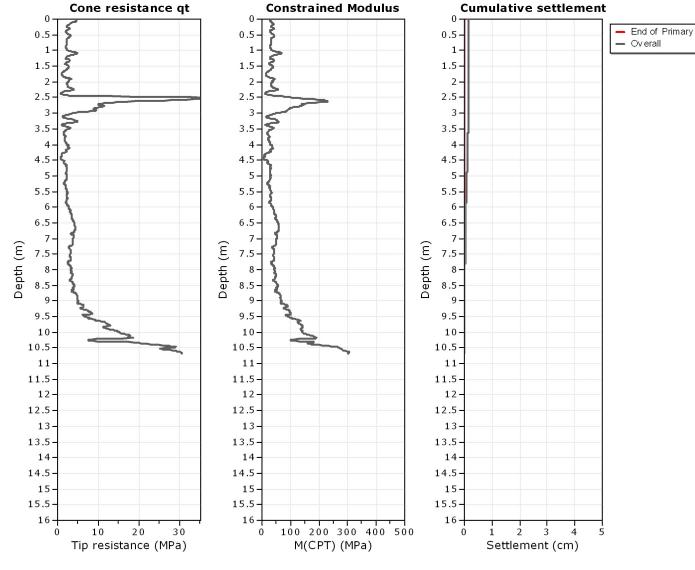
CPT: CPT-10

Location: TAURANGA

CPT: CPT-11 Total depth: 10.67 m, Date: 28/11/2012 Surface Elevation: 16.00 m Coords: lat 0° lon 0° Cone Type: 50 MPa Piezocone Cone Operator: Ground Investigation







Settlements calculation according to theory of elasticity*

Constrained Modulus

Caclulation properties

* Primary settlements calculation is performed according to the following formula:

$$\mathbf{S} = \sum \frac{\Delta \sigma_{v}}{\mathbf{M}_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$\mathbf{S} = C_a \cdot \Delta z \cdot \log(t)$$

Footing type: Rectangular Footing width: 200.00 (m) L/B: 10.0 Footing pressure: 0.00 (kPa) Embedment depth: 0.00 (m) Footing is rigid: No Remove excavation load: No Apply 20% rule: No Calculate secondary settlements: Yes Time period for primary consolidation: 1 months

Time period for second. settlements: 12 months

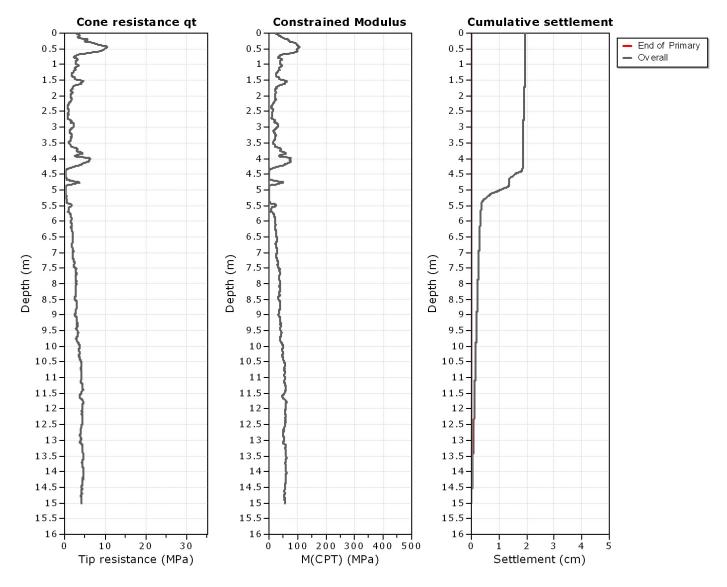


CPT: CPT-12 Total depth: 15.02 m, Date: 28/11/2012 Surface Elevation: 17.00 m Coords: lat 0° lon 0° Cone Type: 50 MPa Piezocone Cone Operator: Ground Investigation



Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST EARTHWORKS Location: TAURANGA





Caclulation properties

* Primary settlements calculation is performed according to the following formula:

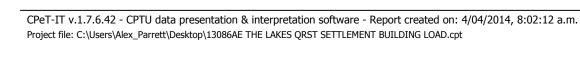
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$\mathbf{S} = C_a \cdot \Delta z \cdot \log(t)$$

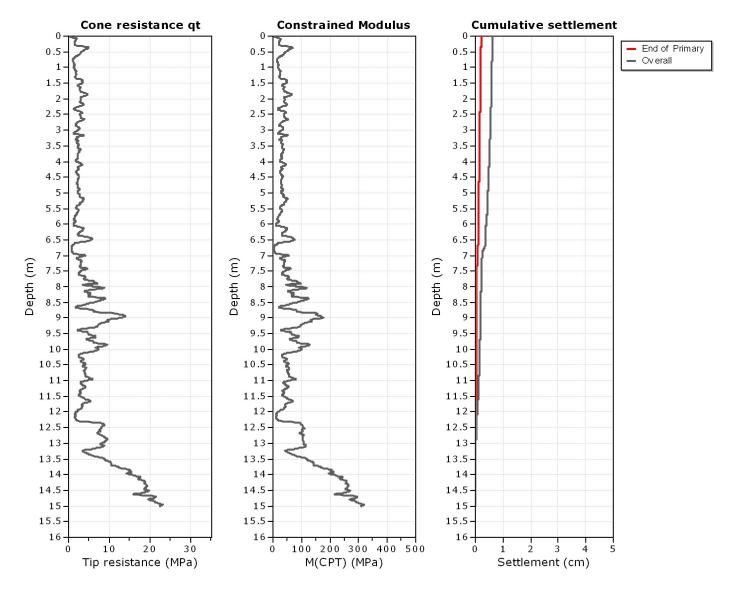
Footing type: Rectangular Footing width: 200.00 (m) L/B: 10.0 Footing pressure: 0.00 (kPa) Embedment depth: 0.00 (m) Footing is rigid: No Remove excavation load: No Apply 20% rule: No Calculate secondary settlements: Yes Time period for primary consolidation: 1 months Time period for second. settlements: 12 months

С Total depth: 15.02 m, Date: 28/11/2012 Surface Elevation: 20.00 m Coords: lat 0° lon 0° Cone Type: 50 MPa Piezocone Cone Operator: Ground Investigation





Settlements calculation according to theory of elasticity*



Caclulation properties

* Primary settlements calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$\mathbf{S} = C_a \cdot \Delta z \cdot \log(t)$$

1

Footing type: Rectangular

Footing width: 30.00 (m)

Footing pressure: 5.00 (kPa)

Embedment depth: 0.00 (m)

Remove excavation load: No

Calculate secondary settlements: Yes

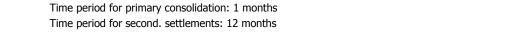
Time period for primary consolidation: 1 months Time period for second. settlements: 12 months

Footing is rigid: No

Apply 20% rule: No

L/B: 1.0

Total depth: 15.03 m, Date: 28/11/2012 Surface Elevation: 13.25 m Coords: lat 0° lon 0° Cone Type: 50 MPa Piezocone Cone Operator: Ground Investigation



Caclulation properties

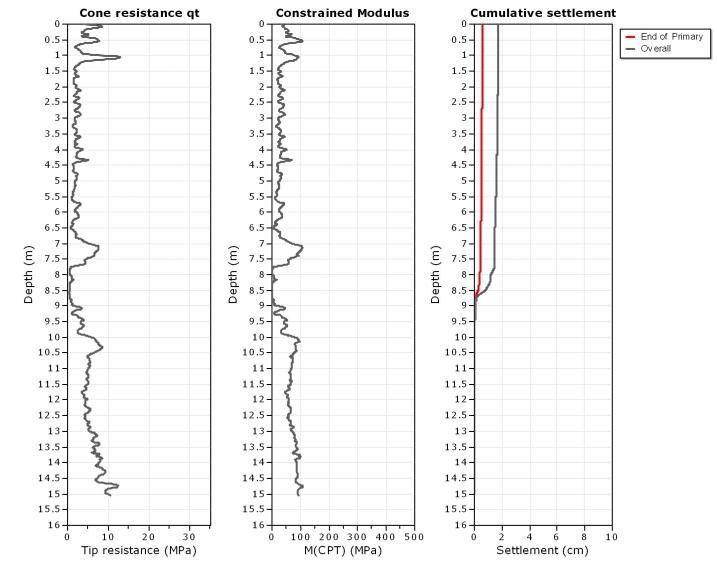
* Primary settlements calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$\mathbf{S} = C_a \cdot \Delta z \cdot \log(t)$$

Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST EARTHWORKS Location: TAURANGA



Settlements calculation according to theory of elasticity*



Footing type: Rectangular

Footing width: 30.00 (m)

Footing pressure: 5.00 (kPa)

Embedment depth: 0.00 (m)

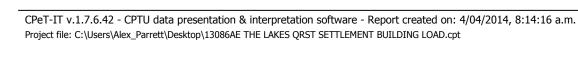
Remove excavation load: No Apply 20% rule: No

Calculate secondary settlements: Yes

Footing is rigid: No

L/B: 1.0

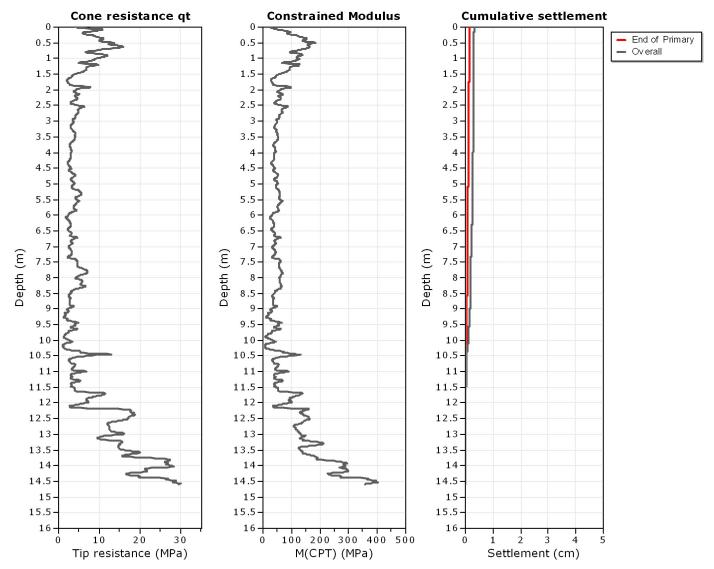
CPT: CPT-03 Total depth: 14.59 m, Date: 28/11/2012 Surface Elevation: 12.00 m Coords: lat 0° lon 0° Cone Type: 50 MPa Piezocone Cone Operator: Ground Investigation





coffey

Settlements calculation according to theory of elasticity*



Caclulation properties

* Primary settlements calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$\mathbf{S} = C_a \cdot \Delta z \cdot \log(t)$$

Footing is rigid: No

L/B: 1.0

Remove excavation load: No

Footing pressure: 5.00 (kPa) Embedment depth: 0.00 (m)

Apply 20% rule: No

Footing type: Rectangular

Footing width: 30.00 (m)

Calculate secondary settlements: Yes

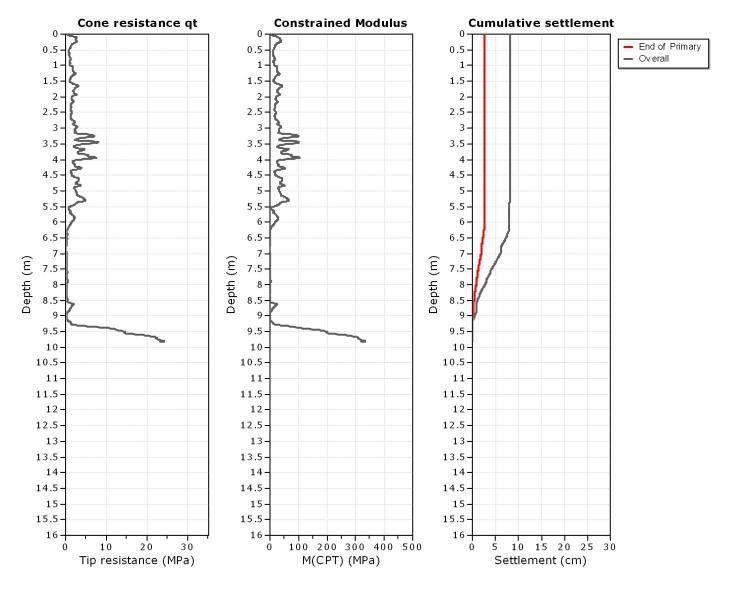
- Time period for primary consolidation: 1 months
- Time period for second. settlements: 12 months

CPT: CPT-04 Total depth: 9.82 m, Date: 28/11/2012 Surface Elevation: 13.25 m Coords: lat 0° lon 0° Cone Type: 50 MPa Piezocone Cone Operator: Ground Investigation



coffey

Settlements calculation according to theory of elasticity*



Caclulation properties

* Primary settlements calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$\mathbf{S} = C_a \cdot \Delta z \cdot \log(t)$$

Footing type: Rectangular Footing width: 30.00 (m) L/B: 1.0 Footing pressure: 5.00 (kPa) Embedment depth: 0.00 (m) Footing is rigid: No Remove excavation load: No Apply 20% rule: No Calculate secondary settlements: Yes Time period for primary consolidation: 1 months Time period for second. settlements: 12 months

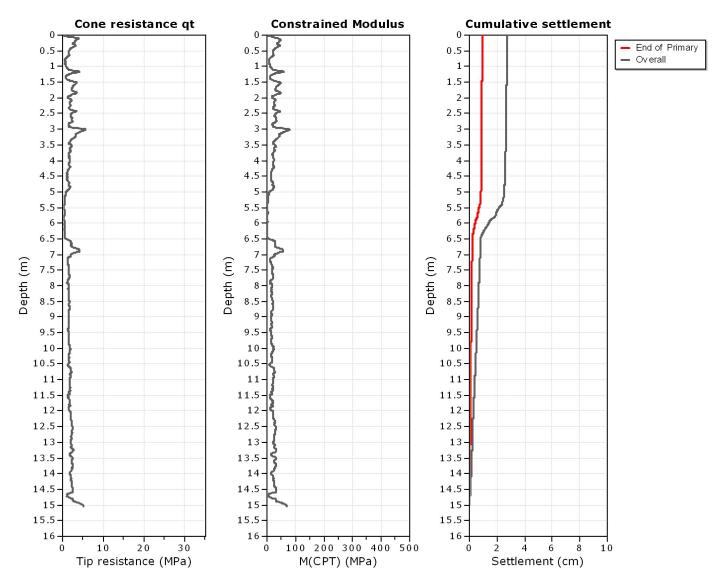
CPT: CPT-05 Total depth: 15.03 m, Date: 28/11/2012 Surface Elevation: 15.75 m Coords: lat 0° lon 0° Cone Type: 50 MPa Piezocone Cone Operator: Ground Investigation



Location: TAURANGA

coffey

Settlements calculation according to theory of elasticity*



Caclulation properties

* Primary settlements calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$\mathbf{S} = C_a \cdot \Delta z \cdot \log(t)$$

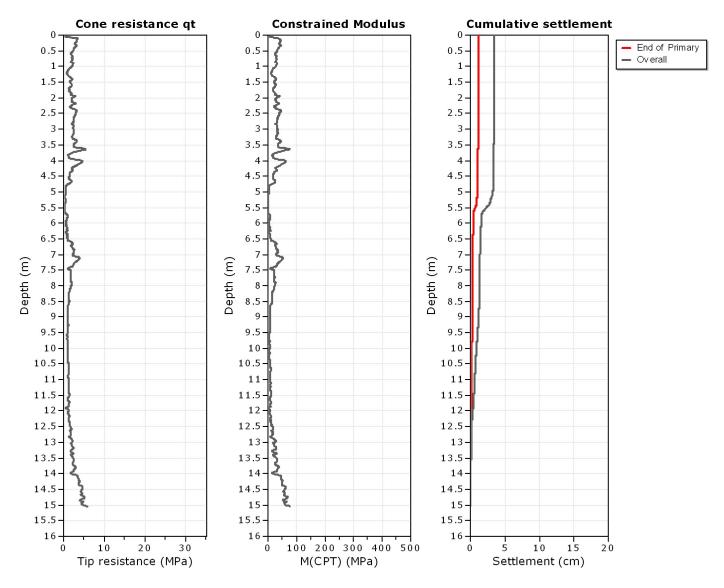
Footing type: Rectangular Footing width: 30.00 (m) L/B: 1.0 Footing pressure: 5.00 (kPa) Embedment depth: 0.00 (m) Footing is rigid: No Remove excavation load: No Apply 20% rule: No Calculate secondary settlements: Yes Time period for primary consolidation: 1 months Time period for second. settlements: 12 months

CPT: CPT-06 Total depth: 15.04 m, Date: 28/11/2012 Surface Elevation: 19.50 m Coords: lat 0° lon 0° Cone Type: 50 MPa Piezocone Cone Operator: Ground Investigation



coffey

Settlements calculation according to theory of elasticity*



Caclulation properties

* Primary settlements calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$\mathbf{S} = C_a \cdot \Delta z \cdot \log(t)$$

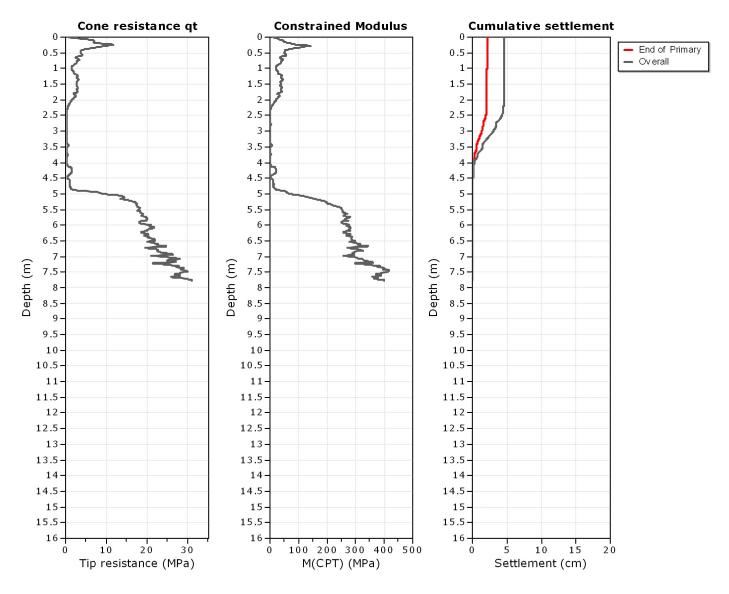
Footing type: Rectangular Footing width: 30.00 (m) L/B: 1.0 Footing pressure: 5.00 (kPa) Embedment depth: 0.00 (m) Footing is rigid: No Remove excavation load: No Apply 20% rule: No Calculate secondary settlements: Yes Time period for primary consolidation: 1 months Time period for second. settlements: 12 months

CPT: CPT-07 Total depth: 7.77 m, Date: 28/11/2012 Surface Elevation: 13.50 m Coords: lat 0° lon 0° Cone Type: 50 MPa Piezocone Cone Operator: Ground Investigation



coffey

Settlements calculation according to theory of elasticity*



Caclulation properties

* Primary settlements calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$\mathbf{S} = C_a \cdot \Delta z \cdot \log(t)$$

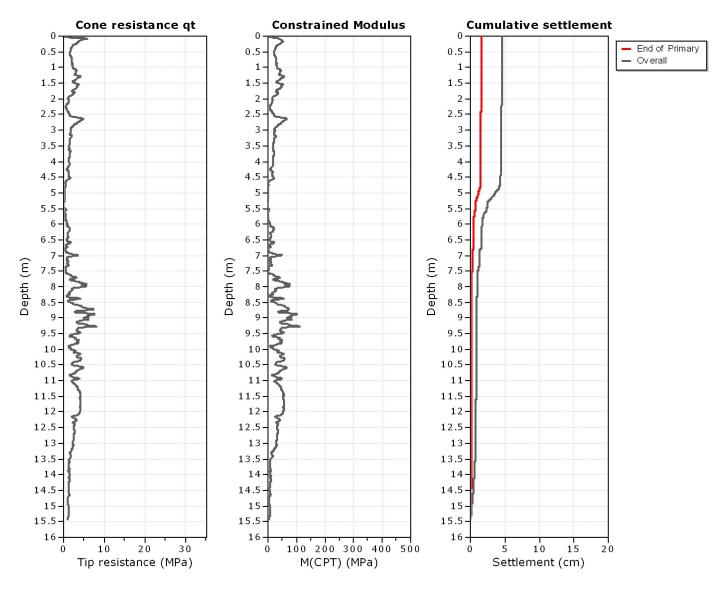
Footing type: Rectangular Footing width: 30.00 (m) L/B: 1.0 Footing pressure: 5.00 (kPa) Embedment depth: 0.00 (m) Footing is rigid: No Remove excavation load: No Apply 20% rule: No Calculate secondary settlements: Yes Time period for primary consolidation: 1 months Time period for second. settlements: 12 months Coffey 96 Cameron Road, Tauranga 3110

CPT: CPT-08 Total depth: 15.42 m, Date: 28/11/2012 Surface Elevation: 12.00 m Coords: lat 0° lon 0° Cone Type: 50 MPa Piezocone Cone Operator: Ground Investigation



Location: TAURANGA

Settlements calculation according to theory of elasticity*



Caclulation properties

* Primary settlements calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$\mathbf{S} = C_a \cdot \Delta z \cdot \log(t)$$

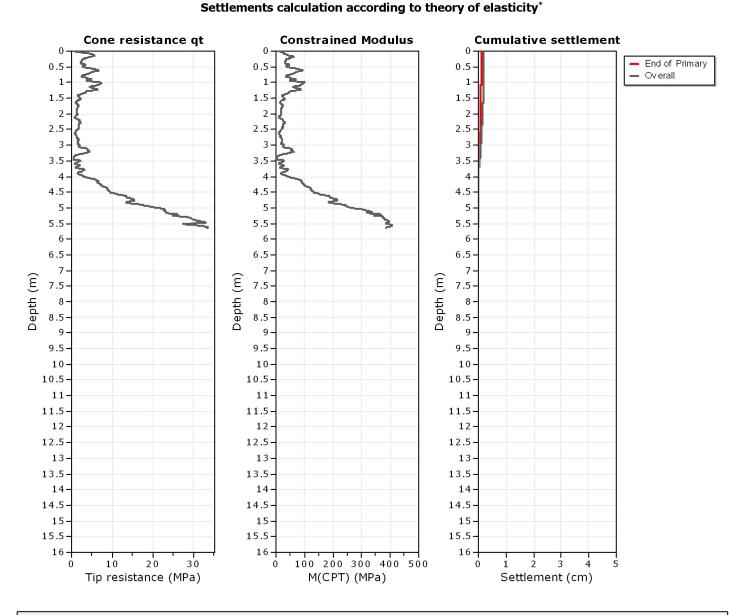
Footing width: 30.00 (m) L/B: 1.0 Footing pressure: 5.00 (kPa) Embedment depth: 0.00 (m) Footing is rigid: No Remove excavation load: No Apply 20% rule: No Calculate secondary settlements: Yes Time period for primary consolidation: 1 months Time period for second. settlements: 12 months

Footing type: Rectangular

CPT: CPT-09 Total depth: 5.64 m, Date: 28/11/2012 Surface Elevation: 14.00 m Coords: lat 0° lon 0° Cone Type: 50 MPa Piezocone Cone Operator: Ground Investigation



coffey



Caclulation properties

* Primary settlements calculation is performed according to the following formula:

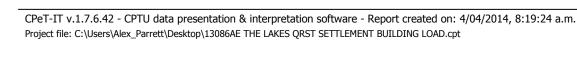
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$\mathbf{S} = C_a \cdot \Delta z \cdot \log(t)$$

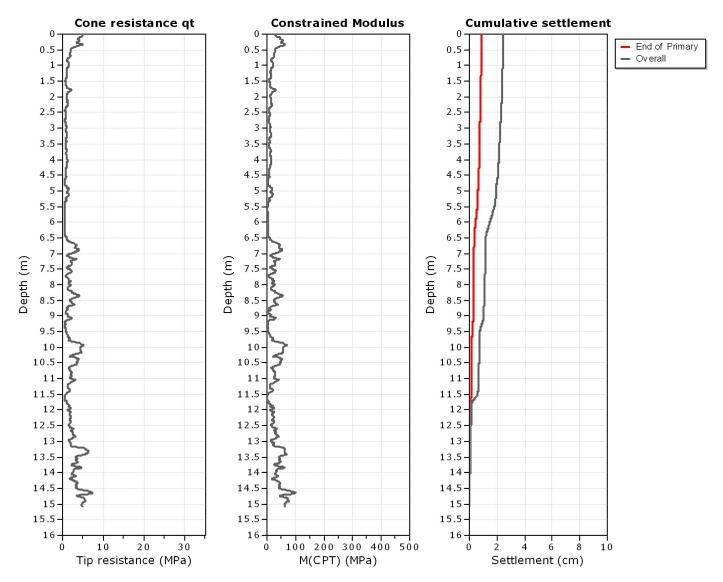
Footing type: Rectangular Footing width: 30.00 (m) L/B: 1.0 Footing pressure: 5.00 (kPa) Embedment depth: 0.00 (m) Footing is rigid: No Remove excavation load: No Apply 20% rule: No Calculate secondary settlements: Yes Time period for primary consolidation: 1 months Time period for second. settlements: 12 months

Total depth: 15.07 m, Date: 28/11/2012 Surface Elevation: 14.00 m Coords: lat 0° lon 0° Cone Type: 50 MPa Piezocone Cone Operator: Ground Investigation



Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST EARTHWORKS Location: TAURANGA

Settlements calculation according to theory of elasticity*



Caclulation properties

* Primary settlements calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$\mathbf{S} = C_a \cdot \Delta z \cdot \log(t)$$



Footing type: Rectangular

Footing width: 30.00 (m)

Footing is rigid: No

Footing pressure: 5.00 (kPa) Embedment depth: 0.00 (m)

Remove excavation load: No Apply 20% rule: No

Calculate secondary settlements: Yes

Time period for primary consolidation: 1 months Time period for second. settlements: 12 months

L/B: 1.0

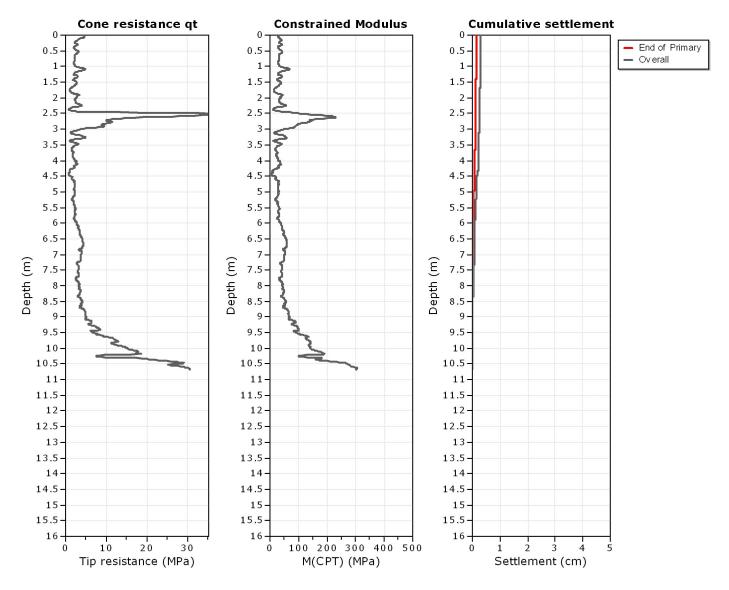
CPT: CPT-10

Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST EARTHWORKS

CPT: CPT-11 Total depth: 10.67 m, Date: 28/11/2012 Surface Elevation: 16.00 m Coords: lat 0° lon 0° Cone Type: 50 MPa Piezocone Cone Operator: Ground Investigation







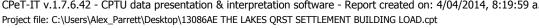
Caclulation properties

* Primary settlements calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$\mathbf{S} = C_a \cdot \Delta z \cdot \log(t)$$



coffey

Location: TAURANGA

Footing type: Rectangular

Footing width: 30.00 (m)

Footing pressure: 5.00 (kPa)

Embedment depth: 0.00 (m)

Remove excavation load: No Apply 20% rule: No

Calculate secondary settlements: Yes

Time period for primary consolidation: 1 months Time period for second. settlements: 12 months

Footing is rigid: No

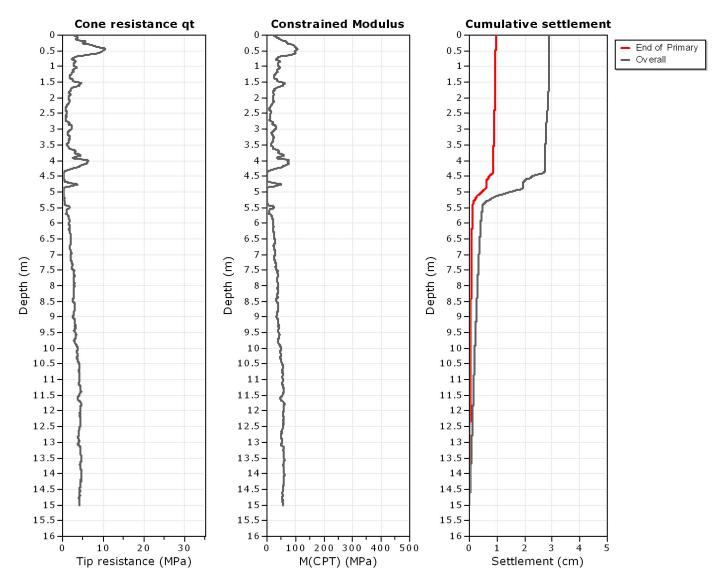
L/B: 1.0

CPT: CPT-12 Total depth: 15.02 m, Date: 28/11/2012 Surface Elevation: 17.00 m Coords: lat 0° lon 0° Cone Type: 50 MPa Piezocone Cone Operator: Ground Investigation



Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST EARTHWORKS Location: TAURANGA

Settlements calculation according to theory of elasticity*



Caclulation properties

* Primary settlements calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$\mathbf{S} = C_a \cdot \Delta z \cdot \log(t)$$

Footing type: Rectangular Footing width: 30.00 (m) L/B: 1.0 Footing pressure: 5.00 (kPa) Embedment depth: 0.00 (m) Footing is rigid: No Remove excavation load: No Apply 20% rule: No Calculate secondary settlements: Yes Time period for primary consolidation: 1 months Time period for second. settlements: 12 months



Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST EARTHWORKS Location: TAURANGA

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50} , which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position r: piezocone radius

 I_r : stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).

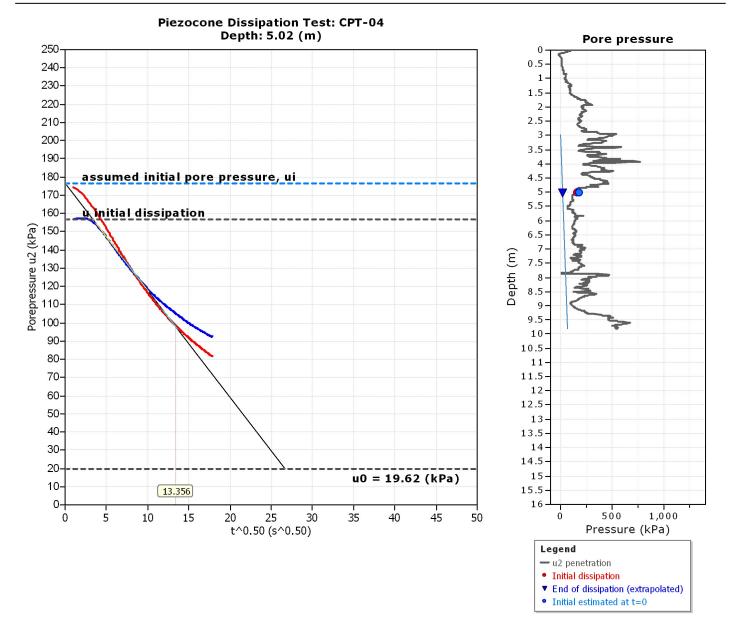
 t_{50} : time corresponding to 50% consolidation

Permeability estimates based on dissipation test

The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

$$k_h = c_h \times \gamma_w / M$$

	Tabular results										
CPTU Borehole	Depth (m)	(t ₅₀) ^{0.50}	t₅₀ (s)	t₅₀ (years)	G/Su	с _h (m²/s)	_{Ch} (m²/year)	M (MPa)	k _h (m/s)		
CPT-04	5.02	13.4	178	5.66E-006	512.97	9.86E-006	311	32.34	2.99E-009		





Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST EARTHWORKS Location: TAURANGA

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50} , which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position r: piezocone radius

 I_r : stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).

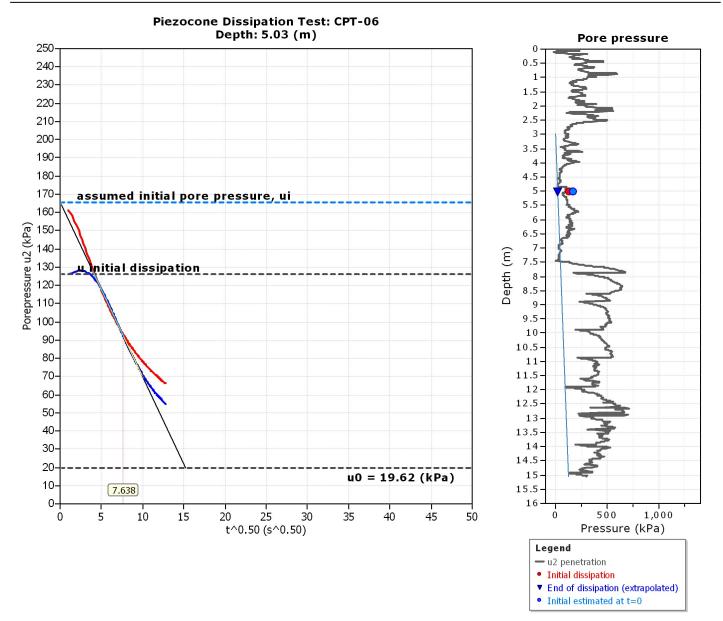
 t_{50} : time corresponding to 50% consolidation

Permeability estimates based on dissipation test

The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

$$k_h = c_h \times \gamma_w / M$$

	Tabular results										
CPTU Borehole	Depth (m)	(t ₅₀) ^{0.50}	t₅₀ (s)	t₅₀ (years)	G/Su	c _h (m²/s)	_{Ch} (m²/year)	M (MPa)	k _h (m/s)		
CPT-06	5.03	7.6	58	1.85E-006	1227.24	4.66E-005	1470	2.31	1.98E-007		





Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST EARTHWORKS Location: TAURANGA

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50} , which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position r: piezocone radius

 I_r : stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).

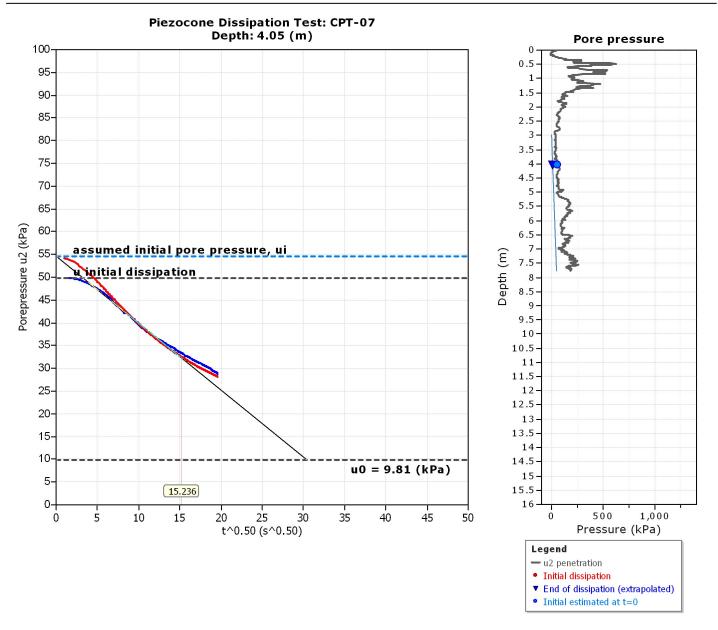
 t_{50} : time corresponding to 50% consolidation

Permeability estimates based on dissipation test

The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

$$k_h = c_h \times \gamma_w / M$$

	Tabular results										
CPTU Borehole	Depth (m)	(t ₅₀) ^{0.50}	t₅₀ (s)	t₅₀ (years)	G/Su	c _h (m²/s)	c _h (m²/year)	M (MPa)	k _h (m/s)		
CPT-07	4.05	15.2	232	7.36E-006	1413.20	1.26E-005	396	0.84	1.47E-007		





Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST EARTHWORKS Location: TAURANGA

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50} , which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position r: piezocone radius

 I_r : stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).

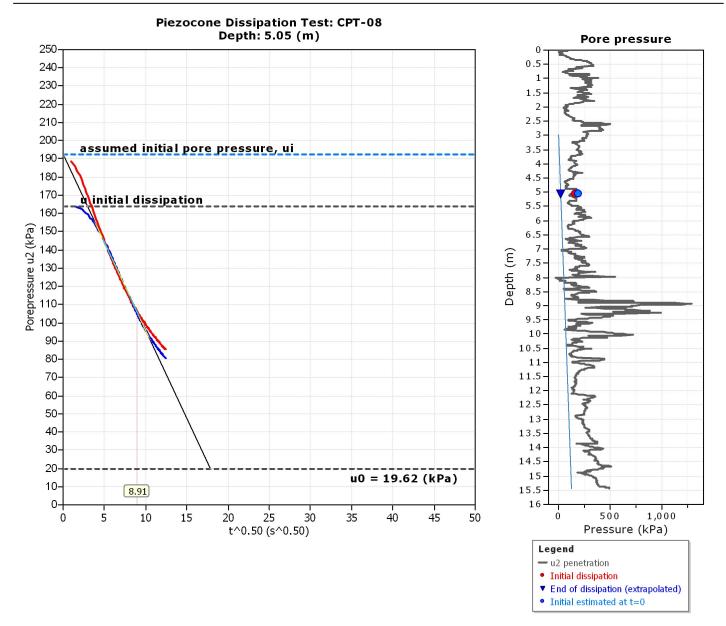
 t_{50} : time corresponding to 50% consolidation

Permeability estimates based on dissipation test

The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

$$k_h = c_h \times \gamma_w / M$$

	Tabular results										
CPTU Borehole	Depth (m)	(t ₅₀) ^{0.50}	t₅₀ (s)	t₅₀ (years)	G/Su	c _h (m²/s)	c _h (m²/year)	M (MPa)	k _h (m/s)		
CPT-08	5.05	8.9	79	2.52E-006	2059.14	4.44E-005	1399	0.37	1.17E-006		





Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST EARTHWORKS Location: TAURANGA

Dissipation tests

Dissipation tests consists of stopping the piezocone penetration and observing porepressures (u) with elapsed time (t). The data are automatic recorded by the field computer and should take place until a minimum of 50% dissipation.

The porepressures are plotted as a function of square root of (t). The graphical technique suggested by Robertson and Campanella (1989), yields a value for t_{50} , which corresponds to the time for 50% consolidation.

The value of the coefficient of consolidation in the radial or horizontal direction c_h was then calculated by Houlsby and Teh's (1988) theory using the following equation:

$$c_h = \frac{T \times r^2 \times I_r^{0.5}}{t_{50}}$$

where:

T: time factor given by Houlsby and Teh's (1988) theory corresponding to the porepressure position r: piezocone radius

 I_r : stiffness index, equal to shear modulus G divided by the undrained strength of clay (S_u).

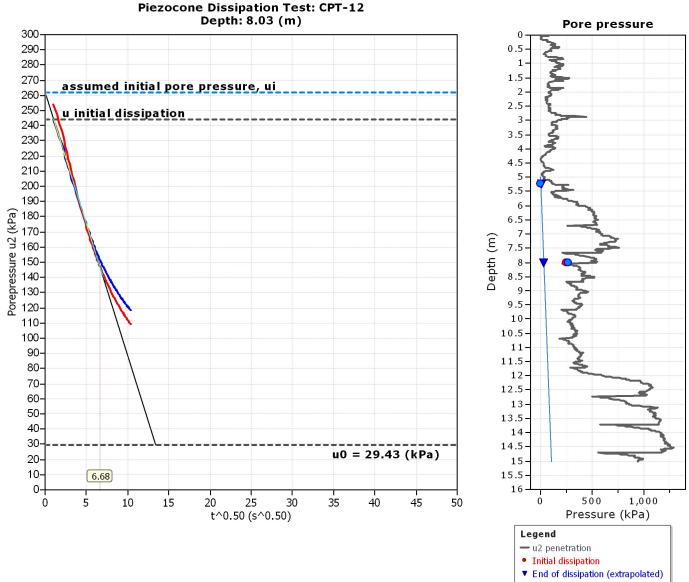
 t_{50} : time corresponding to 50% consolidation

Permeability estimates based on dissipation test

The dissipation of pore pressures during a CPTu dissipation test is controlled by the coefficient of consolidation in the horizontal direction (c_h) which is influenced by a combination of the soil permeability (k_h) and compressibility (M), as defined by the following:

$$k_h = c_h \times \gamma_w / M$$

	Tabular results										
CPTU Borehole	Depth (m)	(t ₅₀) ^{0.50}	t₅₀ (s)	t₅₀ (years)	G/Su	c _h (m²/s)	c _h (m²/year)	M (MPa)	k _h (m/s)		
CPT-12	8.03	6.7	45	1.42E-006	526.76	3.99E-005	1259	37.70	1.04E-008		



• Initial estimated at t=0

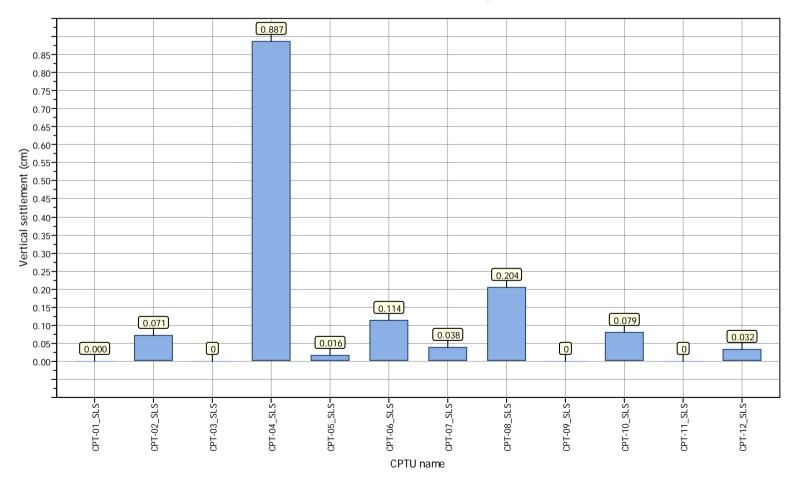
Appendix G

Liquefaction and Lateral Spread Analyses



Project title : GENZTAUC13086AE - THE LAKES STAGE 2QRST SLS EARTHQUAKE

Location : TAURANGA



Overall vertical settlements report



Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST SLS EARTHQUAKE

Location: TAURANGA

1

Depth (m)

Peak ground acceleration:

0.07

Unit weight calculation:

Cone resistance **Friction Ratio** CRR plot Vertical settlements Lateral displacements SBTn Plot 0-0· 0 0-0. 0.5-0.5-0.5-0.5 0.5^{-1} 0.5-1-1-1-1-1-1.5-1.5 1.5-1.5-1.5-1.5-2-2-2-2-2-2-2.5-2.5-2.5-2.5-2.5-2.5 3-3-3-3-3-3-3.5-3.5-3.5-3.5-3.5-3.5 4-4-4-4-4 4 4.5 4.5 4.5-4.5-4.5-4.5- \bigtriangledown 5-5-5-5-5-5-During eart 5.5 5.5 5.5-5.5-5.5-5.5-6-6-6-6-6-6-6.5 6.5-6.5 6.5-6.5-6.5-7-7-7-7-Depth (m) Depth (m) Depth (m) Depth (m) Depth (m) 7.5 7.5-7.5-7.5-7.5-8-8-8-8-8-8-8.5-8.5 8.5-8.5-8.5 8.5-9-9-9-9q 9 9.5-9.5-9.5-9.5-9.5 9.5 10 10° 10-10-10-10-10.5 10.5-10.5-10.5-10.5-10.5 11-11-11-11-11-11-11.5 11.5 11.5 11.5-11.5-11.5-12 12-12-12-12-12-12.5-12.5-12.5 12.5-12.5-12.5-13-13-13-13-13-13-13.5-13.5 13.5 13.5 13.5-13.5-14-14-14-14-14-14-14.5 14.5 14.5 14.5 14.5 14.5-15-15 15-15-15-15-15.5-15.5 15.5-15.5-15.5-15.5-16-16-16-16-16-16 10 20 30 2 8 10 0.2 0.4 0.6 0 6 8 10 6 8 10 0 0 4 6 0 2 4 0 2 4 2 3 qt (MPa) Rf (%) CRR & CSR Settlement (cm) Displacement (cm) Ic (Robertson 1990) Analysis method: Robertson (2009) G.W.T. (in-situ): 5.00 m Use fill: No Clay like behavior Robertson (2009) G.W.T. (earthq.): 5.00 m Fill height: applied: All soils Fines correction method: N/A Based on Ic value Average results interval: Fill weight: N/A Limit depth applied: No Points to test: 3 Earthquake magnitude M_w: 7.50 Ic cut-off value: 2.60 Trans. detect. applied: Yes Limit depth: N/A

Yes

MSF method:

Method based

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 K_{α} applied:

Based on SBT

CPT: CPT-01_SLS

Total depth: 15.02 m

4



Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST SLS EARTHQUAKE

Location: TAURANGA

Cone resistance **Friction Ratio** CRR plot Vertical settlements Lateral displacements SBTn Plot n 0-0 0-0. 0.5-0.5-0.5 0.5 0.5-0.5 1 1-1-1-1 1.5-1.5-1.5-1.5-1.5 1.5 2-2-2-2-2-2-2.5-2.5-2.5-2.5-2.5-2.5- \bigtriangledown 3-3-3-3-3-3-During earthq. 3.5 3.5-3.5-3.5-3.5-3.5 4-4-4-4-4 4.5 4.5 4.5-4.5-4.5-4.5-5-5-5-5-5-5-5.5 5.5-5.5-5.5-5.5-5.5 6-6-6-6-6-6-6.5-6.5-6.5 6.5 6.5-6.5-7-7-7-7-Depth (m) Depth (m) Depth (m) Depth (m) Depth (m) Depth (m) 7.5 7.5-7.5-7.5-7.5-7.5 8-8-8-8-8-8 8.5 8.5-8.5-8.5-8.5 8.5-9-9-9-9-9-9.5-9.5 9.5-9.5-9.5-9.5 10 10-10-10-10-10-10.5 10.5 10.5-10.5-10.5-10.5 11-11-11-11-11-11-11.5-11.5 11.5 11.5-11.5-11.5-12-12-12-12-12-12-12.5-12.5-12.5-12.5-12.5-12.5-13-13-13-13-13-13-13.5-13.5 13.5-13.5 13.5-13.5-14-14-14-14-14-14-14.5 14.5 14.5 14.5 14.5 14.5-15- 15° 15-15-15-15-15.5-15.5 15.5-15.5-15.5-15.5-16-16+ 16-16-16-16 10 20 30 2 8 10 0.2 0.4 0.6 0 4 6 8 10 6 8 10 0 0 4 6 0 2 0 2 4 2 3 4 qt (MPa) Rf (%) CRR & CSR Settlement (cm) Displacement (cm) Ic (Robertson 1990) Analysis method: Robertson (2009) G.W.T. (in-situ): 3.00 m Use fill: No Clay like behavior Robertson (2009) G.W.T. (earthq.): 3.00 m Fill height: applied: All soils Fines correction method: N/A Based on Ic value Average results interval: Fill weight: N/A Limit depth applied: No Points to test: 3 Earthquake magnitude M_w: 7.50 Ic cut-off value: 2.60 Trans. detect. applied: Yes Limit depth: N/A Peak ground acceleration: 0.07 Unit weight calculation: Based on SBT K_{α} applied: MSF method: Method based Yes

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CPT: CPT-02_SLS

Total depth: 15.03 m



Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST SLS EARTHQUAKE

Location: TAURANGA

Cone resistance Friction Ratio CRR plot Vertical settlements Lateral displacements SBTn Plot 0 0 0-0. 0.5-0.5-0.5-0.5- 0.5^{-1} 0.5^{-1} 1-1-1-1-1 1 1.5 1.5 1.5-1.5-1.5-1.5-2-2-2-2-2-2-2.5-2.5-2.5-2.5-2.5-2.5- $\overline{}$ 3-3-3-3-3-3-During earthq. 3.5-3.5-3.5-3.5-3.5-3.5-4 4-4-4-4 4 4.5-4.5 4.5-4.5-4.5-4.5-5-5-5-5-5-5-5.5-5.5-5.5 5.5-5.5-5.5-6-6-6-6-6-6-6.5-6.5 6.5 6.5-6.5-6.5-7-7-7 7-Depth (m) Depth (m) Depth (m) Depth (m) Depth (m) Depth (m) 7.5 7.5-7.5-7.5-7.5-7.5 8-8-8-8-8-8-8.5 8.5-8.5-8.5-8.5 8.5-9-9-9-9 9-9.5-9.5-9.5-9.5-9.5 9.5 10 10 10-10-10-10-10.5 10.5 10.5-10.5-10.5-10.5 11- 11° 11-11-11-11-11.5 11.5 11.5 11.5-11.5-11.5-12-12 12-12-12-12-12.5 12.5-12.5-12.5 12.5-12.5-13-13-13-13-13-13-13.5 13.5-13.5 13.5 13.5-13.5-14-14 14-14-14-14-14.5-14.5 14.5 14.5 14.5 14.5-15-15-15-15-15-15-15.5-15.5 15.5-15.5-15.5-15.5-16-16-16-16-16-16 10 20 30 2 8 10 0.2 0.4 0.6 0 6 8 10 6 8 10 0 0 4 6 0 2 4 0 2 4 2 3 4 qt (MPa) Rf (%) CRR & CSR Settlement (cm) Displacement (cm) Ic (Robertson 1990) Analysis method: Robertson (2009) G.W.T. (in-situ): 3.00 m Use fill: No Clay like behavior Robertson (2009) G.W.T. (earthq.): 3.00 m Fill height: applied: All soils Fines correction method: N/A Based on Ic value Average results interval: 3 Fill weight: N/A Limit depth applied: No Points to test: Earthquake magnitude M_w: 7.50 Ic cut-off value: 2.60 Trans. detect. applied: Yes Limit depth: N/A Peak ground acceleration: 0.07 Unit weight calculation: Based on SBT K_{α} applied: MSF method: Method based Yes

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CPT: CPT-03_SLS

Total depth: 14.59 m



Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST SLS EARTHQUAKE

Location: TAURANGA

Cone resistance **Friction Ratio** CRR plot Vertical settlements Lateral displacements SBTn Plot 0-0-0· 0 0-0. 0.5-0.5-0.5- 0.5^{-1} 0.5^{-1} 0.5^{-1} 1-1-1-1-1 1 1.5 1.5 1.5-1.5-1.5-1.5-2-2-2-2-2-2-2.5-2.5-2.5-2.5-2.5-2.5 \bigtriangledown 3-3-3-3-3-3-During earthq. Ę 3.5-3.5-3.5-3.5-3.5-3.5-4 4-4-4-4 4 4.5 4.5 4.5-4.5-4.5-4.5-5-5-5-5-5-5-5.5-5.5-5.5-5.5-5.5-5.5 6-6-6-6-6-6-6.5-6.5-6.5-6.5-6.5-6.5-7 7-7-7-Depth (m) Depth (m) Depth (m) Depth (m) Depth (m) Depth (m) 7.5 7.5-7.5-7.5-7.5-7.5 8-8-8-8-8-8 8.5 8.5-8.5-8.5-8.5 8.5-9-9 9 С 9-9.5-9.5-9.5 9.5 9.5-9.5 10-10 10-10 10-10-10.5 10.5 10.5-10.5-10.5-10.5-11-11-11-11-11-11-11.5 11.5 11.5 11.5 11.5-11.5-12-12-12-12-12-12-12.5-12.5-12.5-12.5-12.5-12.5-13-13-13-13-13-13-13.5 13.5-13.5 13.5 13.5-13.5-14-14-14-14-14-14-14.5 14.5 14.5 14.5 14.5 14.5-15 15 15-15-15-15-15.5-15.5 15.5-15.5-15.5-15.5-16-16-16-16-16-16-10 20 30 2 8 10 0.2 0.4 0.6 0 6 8 10 6 8 10 0 0 4 6 0 2 4 0 2 4 2 3 4 qt (MPa) Rf (%) CRR & CSR Settlement (cm) Displacement (cm) Ic (Robertson 1990) Analysis method: Robertson (2009) G.W.T. (in-situ): 3.00 m Use fill: No Clay like behavior Robertson (2009) G.W.T. (earthq.): 3.00 m Fill height: N/A applied: All soils Fines correction method: Based on Ic value Average results interval: 3 Fill weight: N/A Limit depth applied: No Points to test: Earthquake magnitude M_w: 7.50 Ic cut-off value: 2.60 Trans. detect. applied: Yes Limit depth: N/A Peak ground acceleration: 0.07 Unit weight calculation: Based on SBT K_{α} applied: MSF method: Method based Yes

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CPT: CPT-04_SLS

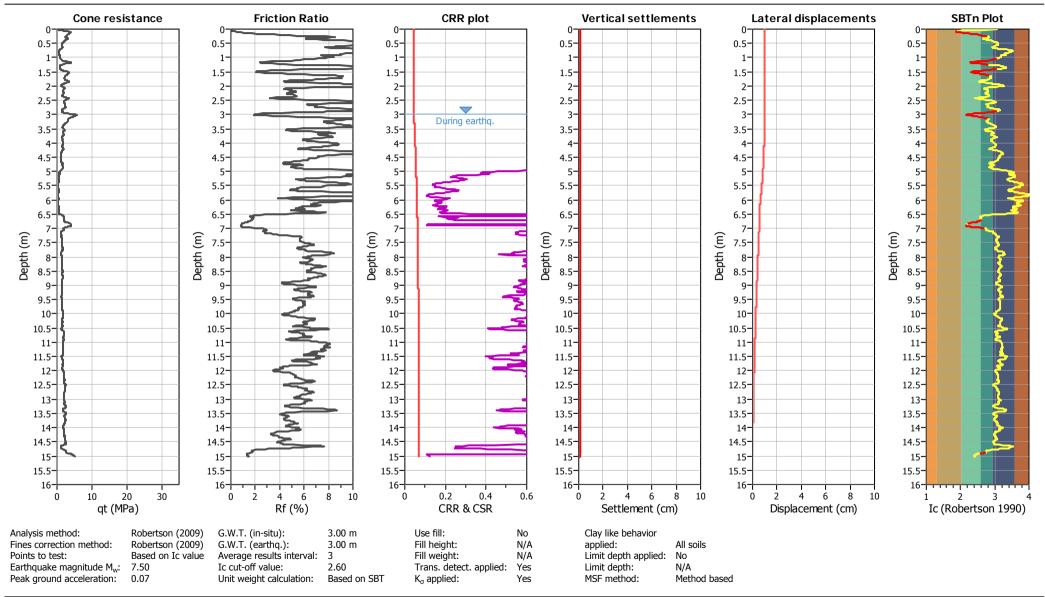
Total depth: 9.82 m



Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST SLS EARTHQUAKE Location: TAURANGA

CPT: CPT-05_SLS

Total depth: 15.03 m



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Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST SLS EARTHQUAKE

Location: TAURANGA

Cone resistance **Friction Ratio** CRR plot Vertical settlements Lateral displacements SBTn Plot 0-0· 0 0-0. 0.5-0.5-0.5-0.5 0.5-0.5 1 1-1-1-1-1 1.5 1.5 1.5-1.5-1.5-1.5-2-2-2-2-2-2-2.5-2.5-2.5-2.5-2.5-2.5- \bigtriangledown 3-3-3-3-3-3-During earthq. 3.5-3.5-3.5-3.5-3.5-3.5-4 4-4-4-4-4.5 4.5 4.5 4.5-4.5-4.5-5-5-5-5-5-5-5.5-5.5-5.5-5.5-5.5-5.5-6-6-6-6-6-6-6.5-6.5-6.5-6.5 6.5-6.5-7-7-7-7-7 Depth (m) Depth (m) Depth (m) Depth (m) Depth (m) Depth (m) 7.5 7.5-7.5-7.5-7.5-7.5 8-8-8-8-8-8-8.5 8.5-8.5-8.5-8.5 8.5-9-9-9 9-9-9-9.5-9.5-9.5-9.5-9.5-9.5-10-10-10-10-10-10-10.5-10.5 10.5-10.5-10.5-10.5-11-11-11-11-11-11-11.5-11.5 11.5 11.5-11.5-11.5-12-12-12-12-12-12-12.5-12.5-12.5-12.5-12.5-12.5-13-13-13-13-13-13-13.5-13.5 13.5 13.5 13.5-13.5-14-14-14-14-14-14-14.514.5 14.5 14.5 14.5 14.5-15 15 15-15-15-15-15.5-15.5 15.5-15.5-15.5-15.5-16-16-16-16-16-16 10 20 30 2 8 10 0.2 0.4 0.6 0 6 8 10 6 8 10 0 0 4 6 0 2 4 0 2 4 2 3 4 qt (MPa) Rf (%) CRR & CSR Settlement (cm) Displacement (cm) Ic (Robertson 1990) Analysis method: Robertson (2009) G.W.T. (in-situ): 3.00 m Use fill: No Clay like behavior Robertson (2009) G.W.T. (earthq.): 3.00 m Fill height: N/A applied: All soils Fines correction method: Based on Ic value Average results interval: 3 Fill weight: N/A Limit depth applied: No Points to test: Ic cut-off value: Earthquake magnitude M_w: 7.50 2.60 Trans. detect. applied: Yes Limit depth: N/A Peak ground acceleration: 0.07 Unit weight calculation: Based on SBT K_{α} applied: MSF method: Method based Yes

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CPT: CPT-06_SLS

Total depth: 15.04 m

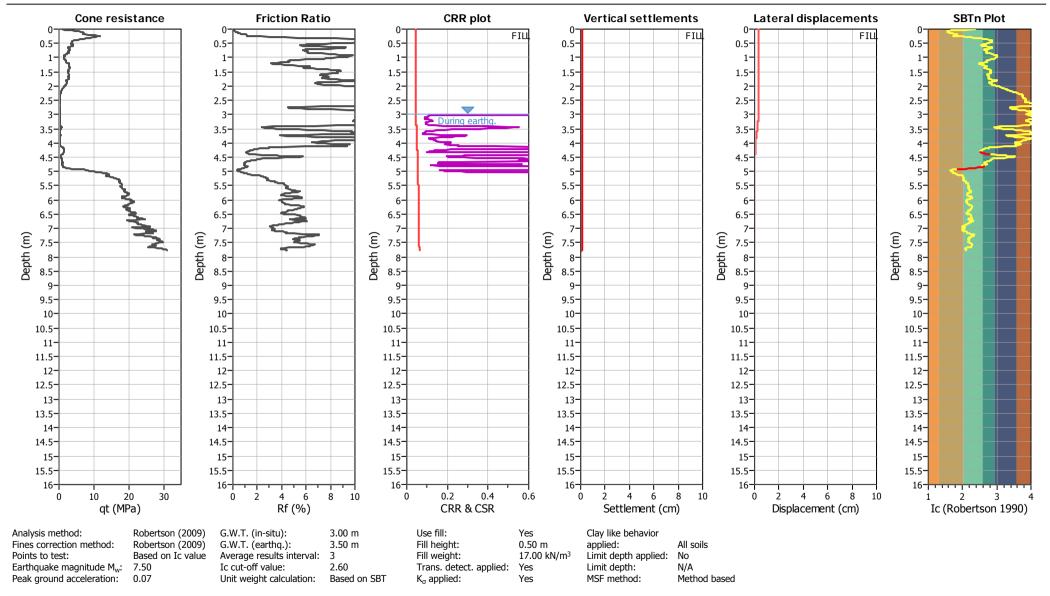


Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST SLS EARTHQUAKE

Location: TAURANGA

CPT: CPT-07_SLS

Total depth: 7.77 m



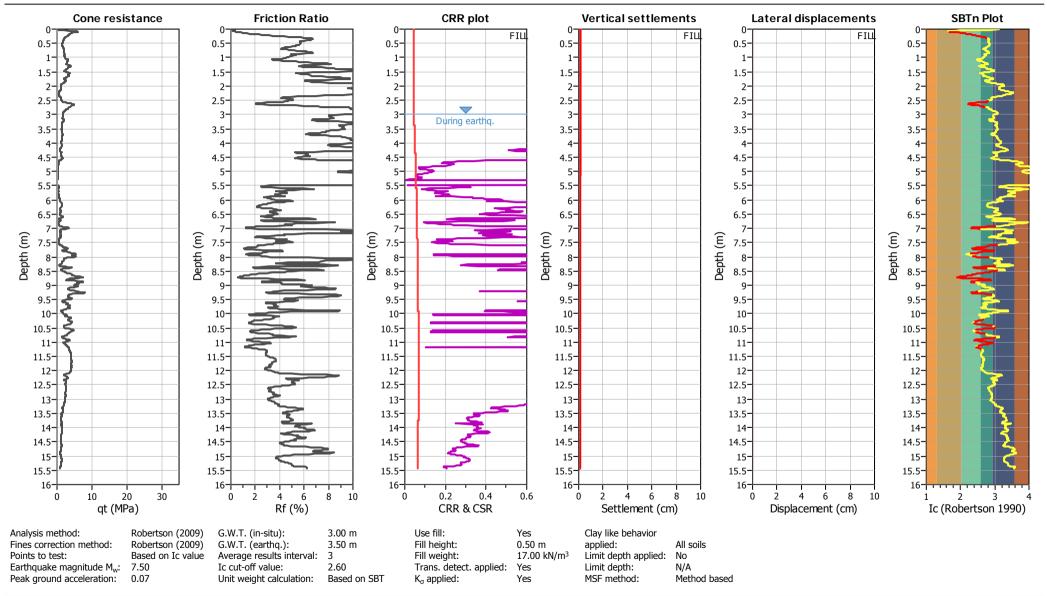
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Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST SLS EARTHQUAKE Location: TAURANGA

CPT: CPT-08_SLS

Total depth: 15.42 m



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Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST SLS EARTHQUAKE

Location: TAURANGA

Cone resistance **Friction Ratio** CRR plot Vertical settlements Lateral displacements SBTn Plot 0 0 0-0 0-0. 0.5-0.5-0.5- 0.5^{-1} 0.5- 0.5^{-1} 1 1-1-1-1-1-1.5 1.5-1.5-1.5-1.5-1.5 2-2-2-2-2-2-2.5-2.5 2.5-2.5-2.5-2.5 $\overline{}$ 3-3-3-3-3-3 During ear 3.5-3.5-3.5-3.5-3.5-3.5 4 4-4-4-4-4 4.5 4.5 4.5-4.5-4.5-4.5-5-5-5-5-5-5-5.5-5.5 5.5-5.5-5.5-5.5-6-6-6-6-6-6-6.5-6.5-6.5-6.5-6.5-6.5-7 7-7-7-Depth (m) Depth (m) Depth (m) Depth (m) Depth (m) Depth (m) 7.5 7.5-7.5-7.5-7.5-7.5 8-8-8-8-8-8-8.5 8.5-8.5-8.5-8.5 8.5 9 9 9-9 9-9-9.5-9.5-9.5-9.5-9.5-9.5-10-10-10-10 10-10 -10.5 10.5-10.5-10.5-10.5-10.5 11-11-11-11-11-11-11.5 11.5 11.5 11.5 11.5-11.5-12-12-12-12-12-12-12.5-12.5-12.5-12.5-12.5-12.5-13-13-13-13-13-13-13.5 13.5 13.5 13.5-13.5-13.5-14-14-14-14-14-14-14.5 14.5 14.5 14.5 14.5 14.5-15 15 15-15-15-15-15.5-15.5 15.5-15.5-15.5-15.5-16-16-16-16-16-16-10 20 30 2 8 10 0.2 0.4 0.6 0 6 8 10 6 8 10 0 0 4 6 0 2 4 0 2 4 2 3 4 qt (MPa) Rf (%) CRR & CSR Settlement (cm) Displacement (cm) Ic (Robertson 1990) Analysis method: Robertson (2009) G.W.T. (in-situ): 3.00 m Use fill: No Clay like behavior Robertson (2009) G.W.T. (earthq.): 3.00 m Fill height: All soils Fines correction method: N/A applied: Based on Ic value Average results interval: 3 Fill weight: N/A Limit depth applied: No Points to test: Earthquake magnitude M_w: 7.50 Ic cut-off value: 2.60 Trans. detect. applied: Yes Limit depth: N/A Peak ground acceleration: 0.07 Unit weight calculation: Based on SBT K_{α} applied: MSF method: Method based Yes

CPeT-IT v.1.7.5.27 - CPTU data presentation & interpretation software - Report created on: 8/04/2014, 3:26:07 p.m. Project file: F:\1.GENZ\1.GEOTECHNICS PROJECTS\13086AE THE LAKES STAGE 2 QRST\ANALYSES & DESIGN\Liquefaction\Analysis for GCR\GENZTAUC13086AE_THE LAKES STAGE QRST_SLS.clq

CPT: CPT-09_SLS

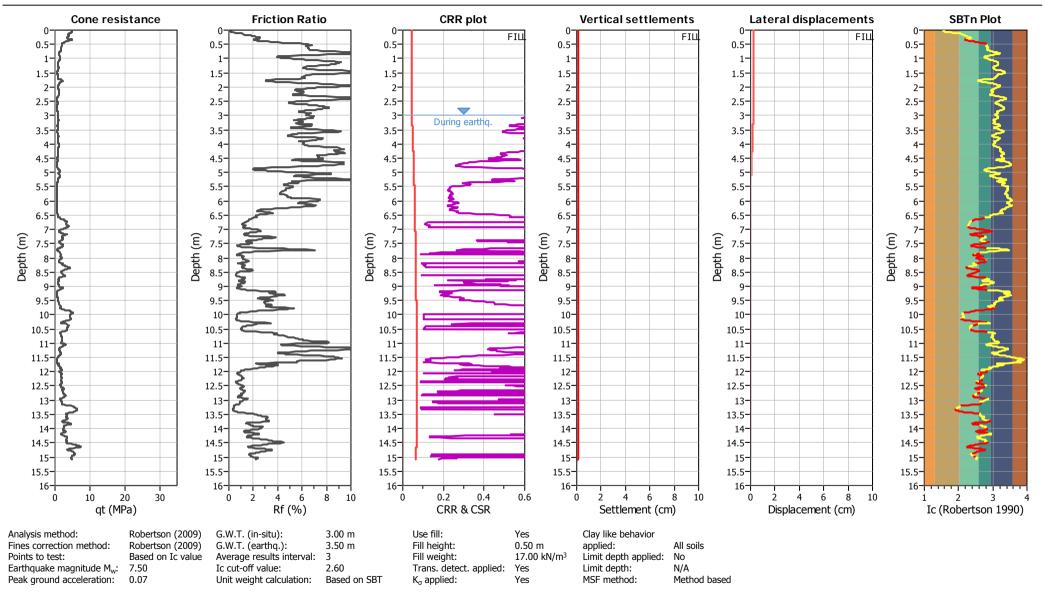
Total depth: 5.64 m



Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST SLS EARTHQUAKE Location: TAURANGA

CPT: CPT-10_SLS

Total depth: 15.07 m



CPeT-IT v.1.7.5.27 - CPTU data presentation & interpretation software - Report created on: 8/04/2014, 3:26:10 p.m. Project file: F:\1.GENZ\1.GEOTECHNICS PROJECTS\13086AE THE LAKES STAGE 2 QRST\ANALYSES & DESIGN\Liquefaction\Analysis for GCR\GENZTAUC13086AE_THE LAKES STAGE QRST_SLS.clq



Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST SLS EARTHQUAKE

Location: TAURANGA

Cone resistance **Friction Ratio** CRR plot Vertical settlements Lateral displacements SBTn Plot 0 0 0· 0 0-0. 0.5-0.5-0.5- 0.5^{-1} 0.5- 0.5^{-1} 1-1-1-1-1-1 1.5 1.5 1.5-1.5-1.5-1.5-2-2-2-2-2-2-2.5-2.5-2.5-2.5-2.5-2.5 3- 3.5-3-3-3-3-3-3.5-3.5-3.5-3.5-3.5-4-4-4-4-4 4.5-4.5-4.5-4.5-4.5-4.5 \bigtriangledown 5-5-5-5-5-5-During earthq. 5.5-5.5-5.5-5.5-5.5-5.5-6-6-6-6-6-6-6.5-6.5-6.5-6.5 6.5 6.5-7 7-7-7-7-7 Depth (m) Depth (m) Depth (m) Depth (m) Depth (m) Depth (m) 7.5 7.5 7.5-7.5-7.5-7.5 8-8-8-8-8-8-8.5-8.5 8.5-8.5-8.5 8.5-9-9-9 9-9-9 9.5-9.5-9.5-9.5-9.5 9.5 10-10 10-10-10-10-10.5 10.5 10.5 10.5-10.5-10.5-11-11-11-11-11-11-11.5 11.5 11.5 11.5 11.5-11.5-12-12-12-12-12-12-12.5-12.5-12.5-12.5-12.5-12.5-13-13-13-13-13-13-13.5 13.5 13.5 13.5-13.5-13.5-14-14-14-14-14-14-14.5 14.5 14.5 14.5 14.5 14.5-15 15 15-15-15-15-15.5-15.5 15.5-15.5-15.5-15.5-16-16-16-16-16-16-10 20 30 2 8 10 0.2 0.4 0.6 0 6 8 10 6 8 10 0 0 4 6 0 2 4 0 2 4 2 3 4 qt (MPa) Rf (%) CRR & CSR Settlement (cm) Displacement (cm) Ic (Robertson 1990) Analysis method: Robertson (2009) G.W.T. (in-situ): 5.00 m Use fill: No Clay like behavior Robertson (2009) G.W.T. (earthq.): 5.00 m Fill height: applied: All soils Fines correction method: N/A Based on Ic value Average results interval: Fill weight: N/A Limit depth applied: No Points to test: 3 Earthquake magnitude M_w: 7.50 Ic cut-off value: 2.60 Trans. detect. applied: Yes Limit depth: N/A Peak ground acceleration: 0.07 Unit weight calculation: Based on SBT K_{α} applied: MSF method: Method based Yes

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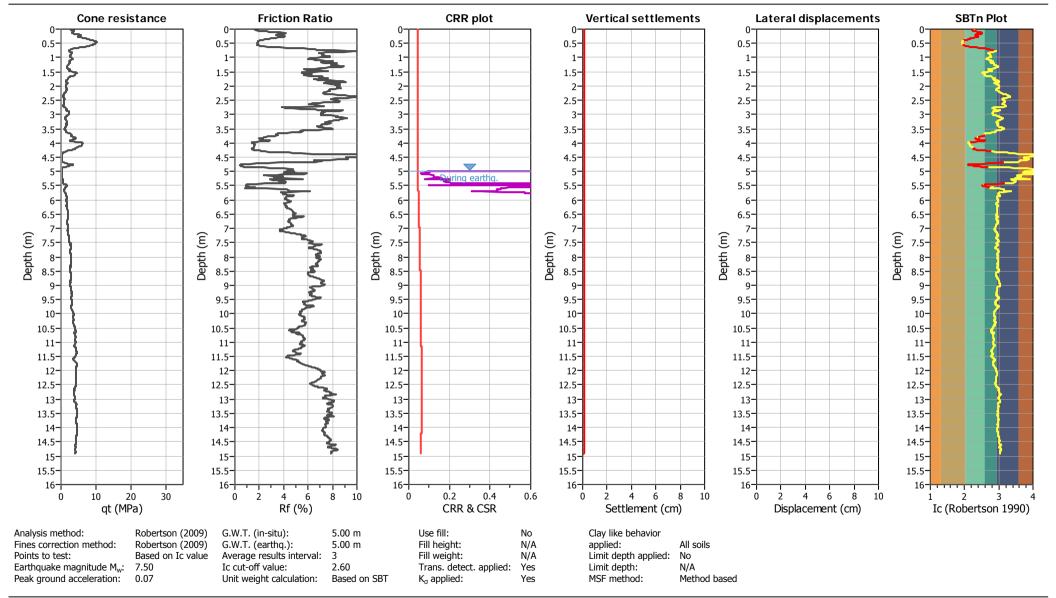
CPT: CPT-11_SLS

Total depth: 10.58 m



Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST SLS EARTHQUAKE

Location: TAURANGA



CPeT-IT v.1.7.5.27 - CPTU data presentation & interpretation software - Report created on: 8/04/2014, 3:26:14 p.m. Project file: F:\1.GENZ\1.GEOTECHNICS PROJECTS\13086AE THE LAKES STAGE 2 QRST\ANALYSES & DESIGN\Liquefaction\Analysis for GCR\GENZTAUC13086AE_THE LAKES STAGE QRST_SLS.clq

CPT: CPT-12_SLS

Total depth: 14.90 m



Project title : GENZTAUC13086AE - THE LAKES STAGE 2QRST ULS EARTHQUAKE Location : TAURANGA

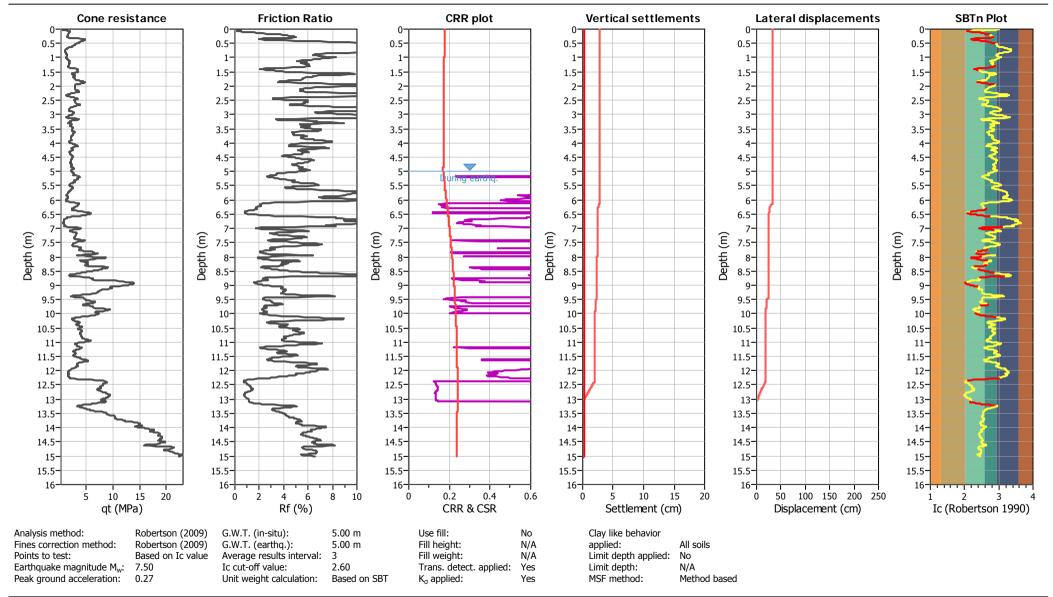
222.958 220.00 210.00-200.00-190.00-180.00-170.00-E 160.00 Lateral displacement 140.00-130.00-120.00-110.00-100.00-90.00-80.00-70.00-60.00-50.00-32.46 40.00-24.241 22.491 30.00-21.216 13.461 20.00-2.58 10.00-0.426 0 0 [0] 0.00 CPT-01_ULS-CPT-04_ULS-CPT-05_ULS-CPT-02_ULS-CPT-03_ULS-CPT-06_ULS-CPT-07_ULS-CPT-09_ULS-CPT-08_ULS-CPT-10_ULS-CPT-11_ULS-CPT-12_ULS-CPTU name

Overall lateral displacements report



Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST ULS EARTHQUAKE

Location: TAURANGA



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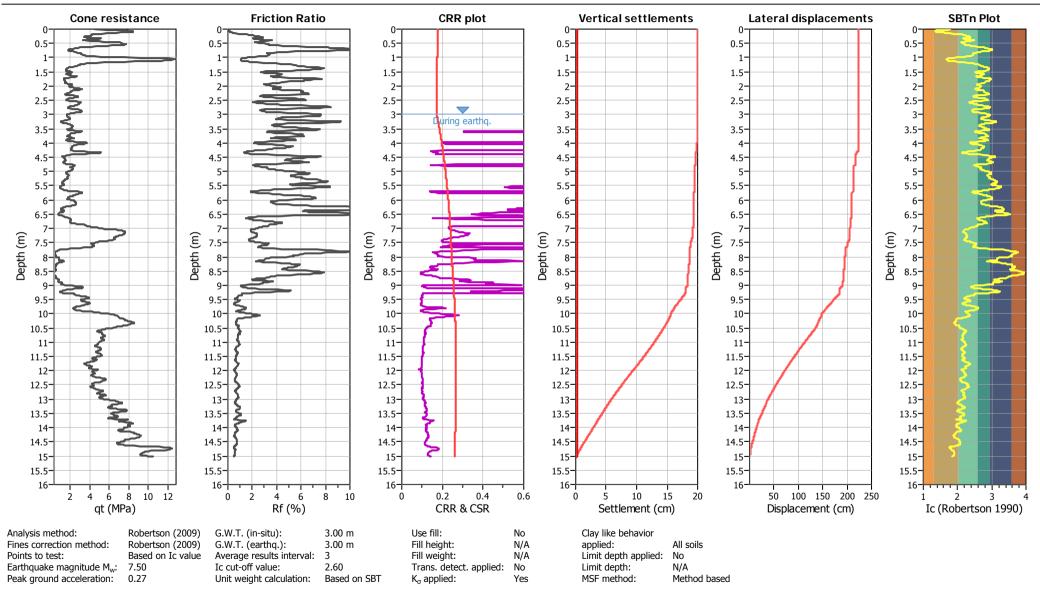
CPT: CPT-01_ULS

Total depth: 15.02 m



Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST ULS EARTHQUAKE

Location: TAURANGA



CPeT-IT v.1.7.5.27 - CPTU data presentation & interpretation software - Report created on: 8/04/2014, 3:38:23 p.m. Project file: F:\1.GENZ\1.GEOTECHNICS PROJECTS\13086AE THE LAKES STAGE 2 QRST\ANALYSES & DESIGN\Liquefaction\Analysis for GCR\GENZTAUC13086AE_THE LAKES STAGE QRST_ULS.clq

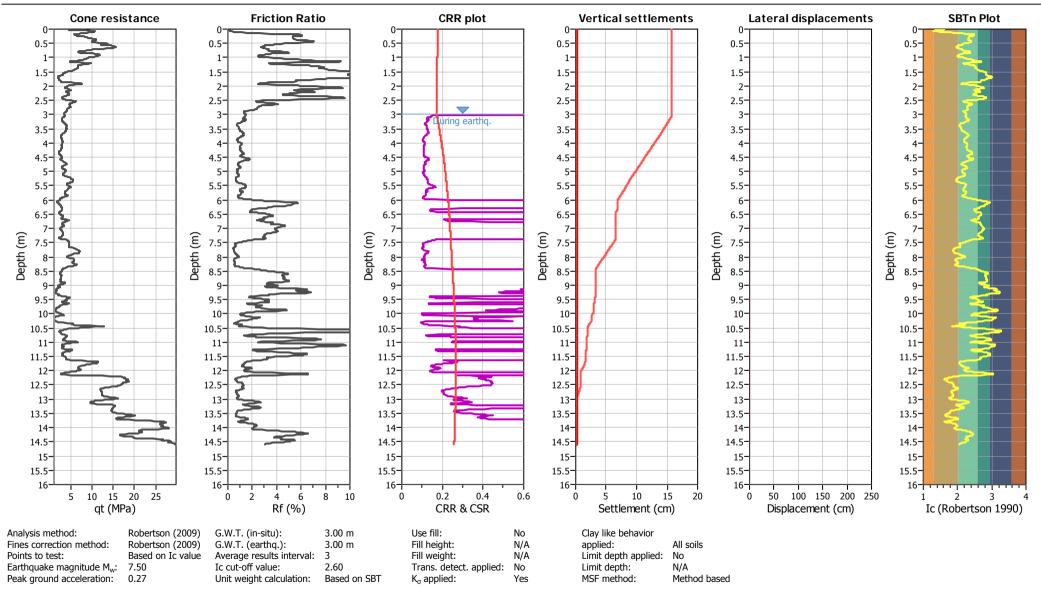
CPT: CPT-02_ULS

Total depth: 15.03 m



Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST ULS EARTHQUAKE

Location: TAURANGA



CPeT-IT v.1.7.5.27 - CPTU data presentation & interpretation software - Report created on: 8/04/2014, 3:38:24 p.m. Project file: F:\1.GENZ\1.GEOTECHNICS PROJECTS\13086AE THE LAKES STAGE 2 QRST\ANALYSES & DESIGN\Liquefaction\Analysis for GCR\GENZTAUC13086AE_THE LAKES STAGE QRST_ULS.clq

CPT: CPT-03_ULS

Total depth: 14.59 m



Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST ULS EARTHQUAKE

Location: TAURANGA

Cone resistance **Friction Ratio** CRR plot Vertical settlements Lateral displacements SBTn Plot 0-0-0 Ô٠ 0-0. 0.5 0.5-0.5-0.5 0.5- 0.5^{-1} 1-1-1-1-1-1 1.5 1.5 1.5-1.5-1.5-1.5-2-2-2-2-2-2-2.5-2.5-2.5-2.5-2.5-2.5 \bigtriangledown 3-3-3-3-3-3uring earthg. Ś 3.5-3.5-3.5-3.5-3.5-3.5-4 4-4-4-4-4.5 4.5 4.5-4.5-4.5-4.5-5-5-5-5-5-5-5.5-5.5-5.5-5.5-5.5-5.5 6-6-6-6-6-6-6.5-6.5-6.5-6.5-6.5 6.5-7 7-7-7-Depth (m) Depth (m) Depth (m) Depth (m) Depth (m) Depth (m) 7.5-7.5 7.5-7.5-7.5-8-8-8-8-8-8.5 8.5-8.5-8.5-8 4 8.5-9-9 9-9-9.5-9.5-9.5 9.5-9.5-9.5 10-10 10-10 10-10-10.5 10.5 10.5-10.5-10.5-10.5-11-11-11-11-11-11-11.5 11.5 11.5 11.5 11.5-11.5-12-12-12-12-12-12-12.5-12.5-12.5-12.5-12.5-12.5-13-13-13-13-13-13-13.5 13.5 13.5 13.5-13.5-13.5-14-14-14-14-14-14-14.5 14.5 14.5 14.5 14.5 14.5-15-15 15-15-15-15-15.5-15.5 15.5-15.5-15.5-15.5-16 16-16-16-16-16-10 15 20 50 100 150 200 250 5 2 8 10 0.2 0.4 0.6 5 10 15 20 0 4 6 0 0 0 2 3 qt (MPa) Rf (%) CRR & CSR Settlement (cm) Displacement (cm) Ic (Robertson 1990) Analysis method: Robertson (2009) G.W.T. (in-situ): 3.00 m Use fill: No Clay like behavior Robertson (2009) G.W.T. (earthq.): 3.00 m Fill height: applied: All soils Fines correction method: N/A Based on Ic value Average results interval: Fill weight: N/A Limit depth applied: No Points to test: 3 Earthquake magnitude M_w: 7.50 Ic cut-off value: 2.60 Trans. detect. applied: Yes Limit depth: N/A Peak ground acceleration: 0.27 Unit weight calculation: Based on SBT K_{α} applied: MSF method: Method based

Yes

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CPT: CPT-04_ULS

Total depth: 9.82 m

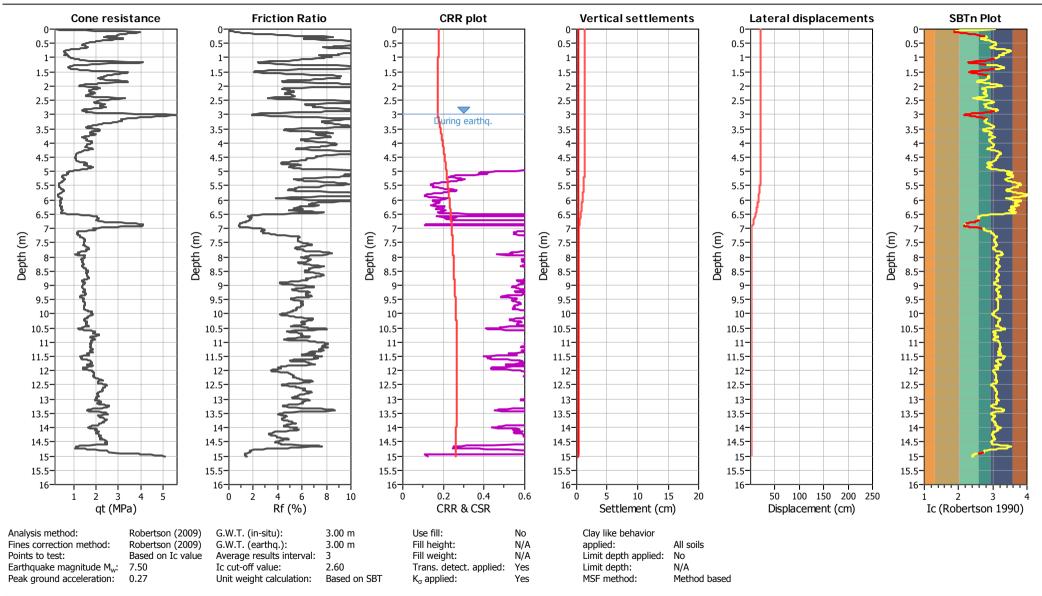
4



Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST ULS EARTHQUAKE Location: TAURANGA

CPT: CPT-05_ULS

Total depth: 15.03 m

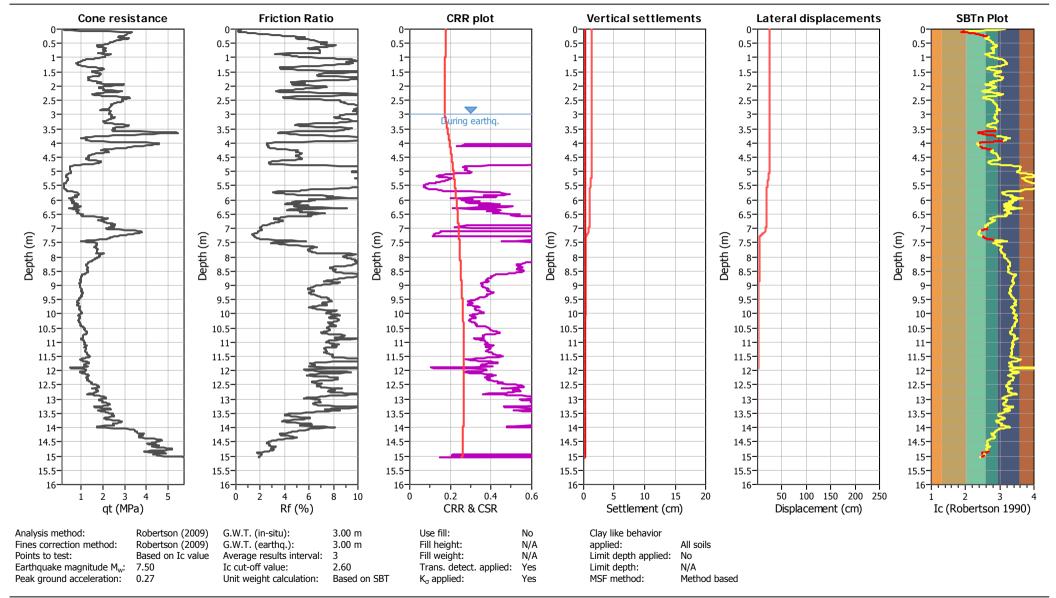


CPeT-IT v.1.7.5.27 - CPTU data presentation & interpretation software - Report created on: 8/04/2014, 3:38:27 p.m. Project file: F:\1.GENZ\1.GEOTECHNICS PROJECTS\13086AE THE LAKES STAGE 2 QRST\ANALYSES & DESIGN\Liquefaction\Analysis for GCR\GENZTAUC13086AE_THE LAKES STAGE QRST_ULS.clq



Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST ULS EARTHQUAKE

Location: TAURANGA



CPeT-IT v.1.7.5.27 - CPTU data presentation & interpretation software - Report created on: 8/04/2014, 3:38:28 p.m. Project file: F:\1.GENZ\1.GEOTECHNICS PROJECTS\13086AE THE LAKES STAGE 2 QRST\ANALYSES & DESIGN\Liquefaction\Analysis for GCR\GENZTAUC13086AE_THE LAKES STAGE QRST_ULS.clq

CPT: CPT-06_ULS

Total depth: 15.04 m

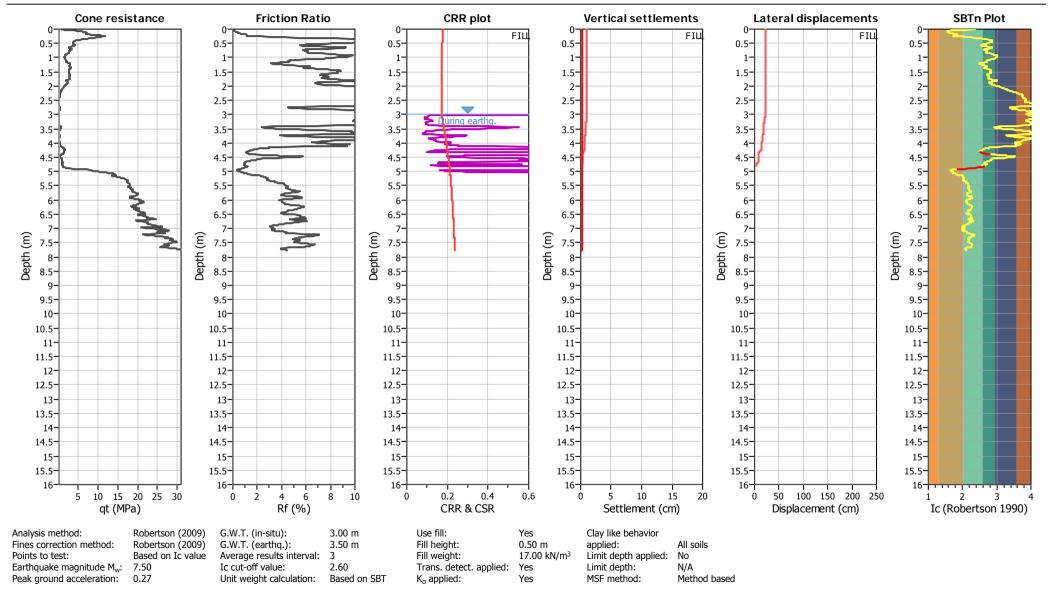


Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST ULS EARTHQUAKE

Location: TAURANGA

CPT: CPT-07_ULS

Total depth: 7.77 m



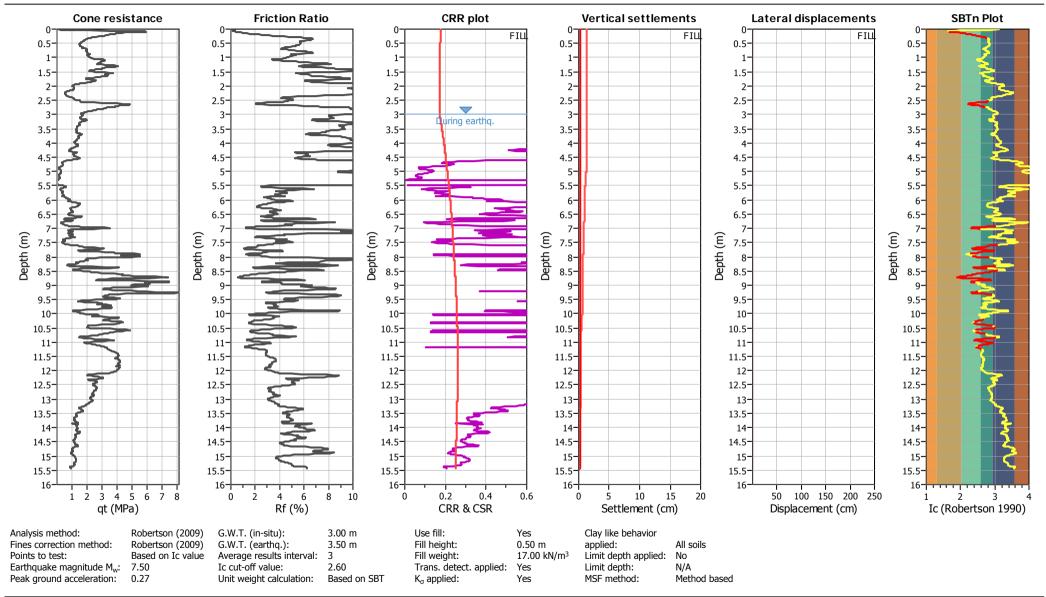
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Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST ULS EARTHQUAKE Location: TAURANGA

CPT: CPT-08_ULS

Total depth: 15.42 m



CPeT-IT v.1.7.5.27 - CPTU data presentation & interpretation software - Report created on: 8/04/2014, 3:38:31 p.m. Project file: F:\1.GENZ\1.GEOTECHNICS PROJECTS\13086AE THE LAKES STAGE 2 QRST\ANALYSES & DESIGN\Liquefaction\Analysis for GCR\GENZTAUC13086AE_THE LAKES STAGE QRST_ULS.clq

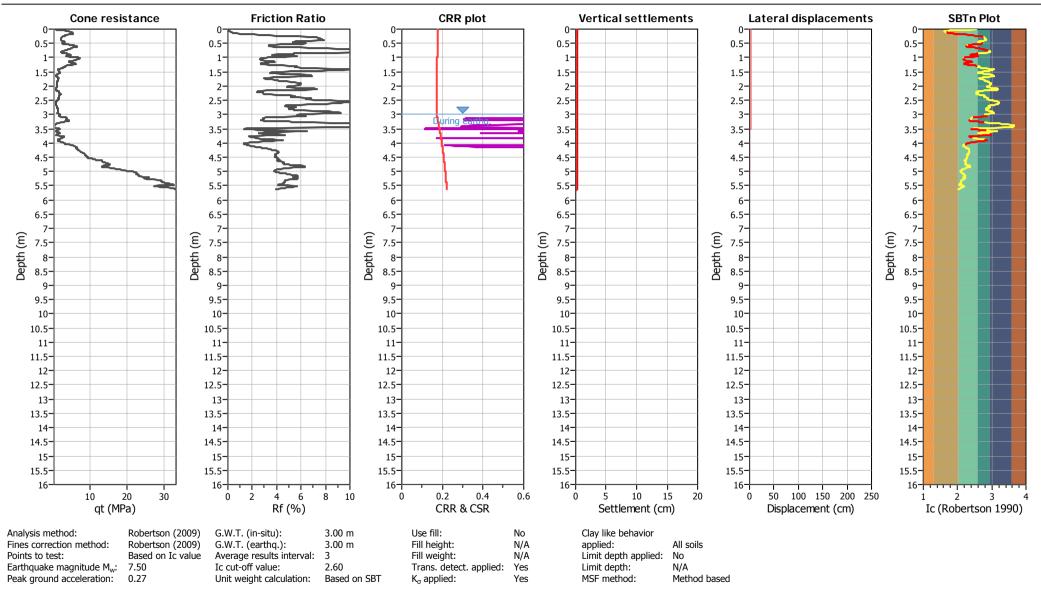


Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST ULS EARTHQUAKE Location: TAURANGA

HQUAKE

CPT: CPT-09_ULS

Total depth: 5.64 m



CPeT-IT v.1.7.5.27 - CPTU data presentation & interpretation software - Report created on: 8/04/2014, 3:38:34 p.m. Project file: F:\1.GENZ\1.GEOTECHNICS PROJECTS\13086AE THE LAKES STAGE 2 QRST\ANALYSES & DESIGN\Liquefaction\Analysis for GCR\GENZTAUC13086AE_THE LAKES STAGE QRST_ULS.clq

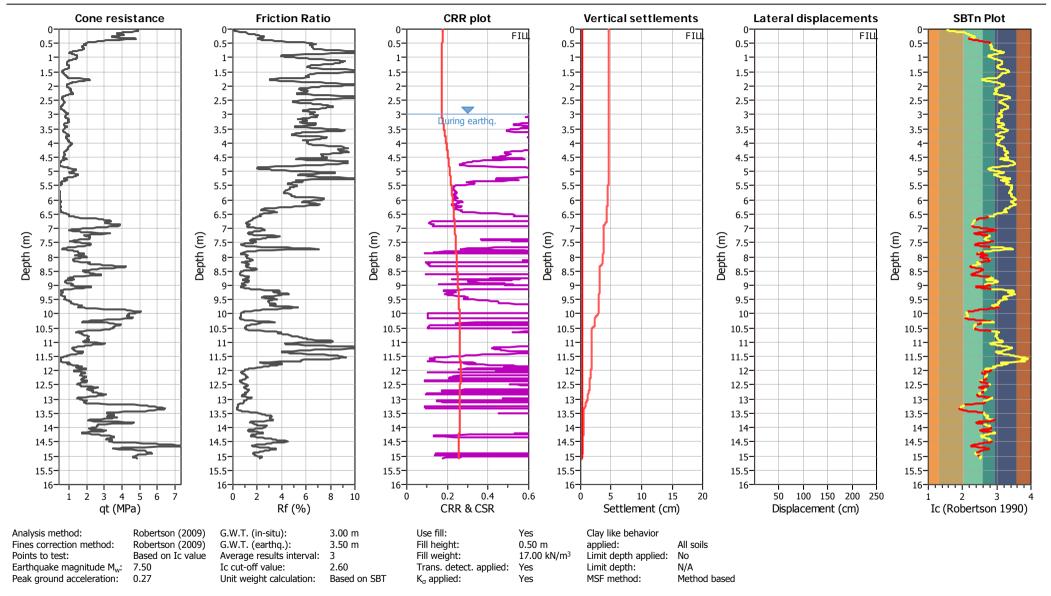


Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST ULS EARTHQUAKE

Location: TAURANGA

CPT: CPT-10_ULS

Total depth: 15.07 m

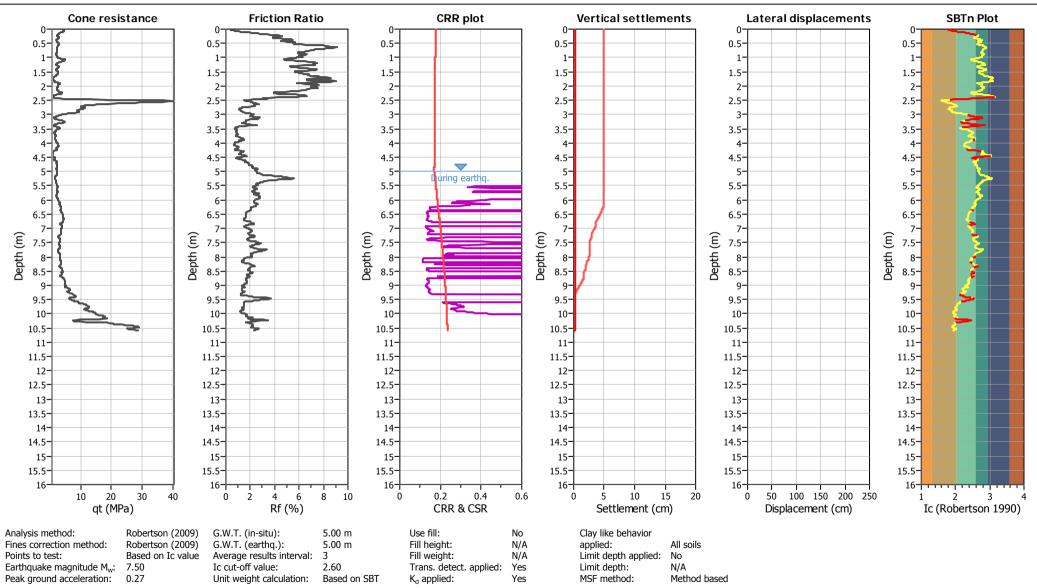


CPeT-IT v.1.7.5.27 - CPTU data presentation & interpretation software - Report created on: 8/04/2014, 3:38:36 p.m. Project file: F:\1.GENZ\1.GEOTECHNICS PROJECTS\13086AE THE LAKES STAGE 2 QRST\ANALYSES & DESIGN\Liquefaction\Analysis for GCR\GENZTAUC13086AE_THE LAKES STAGE QRST_ULS.clq



Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST ULS EARTHQUAKE

Location: TAURANGA



CPeT-IT v.1.7.5.27 - CPTU data presentation & interpretation software - Report created on: 8/04/2014, 3:38:39 p.m. Project file: F:\1.GENZ\1.GEOTECHNICS PROJECTS\13086AE THE LAKES STAGE 2 QRST\ANALYSES & DESIGN\Liquefaction\Analysis for GCR\GENZTAUC13086AE_THE LAKES STAGE QRST_ULS.clq

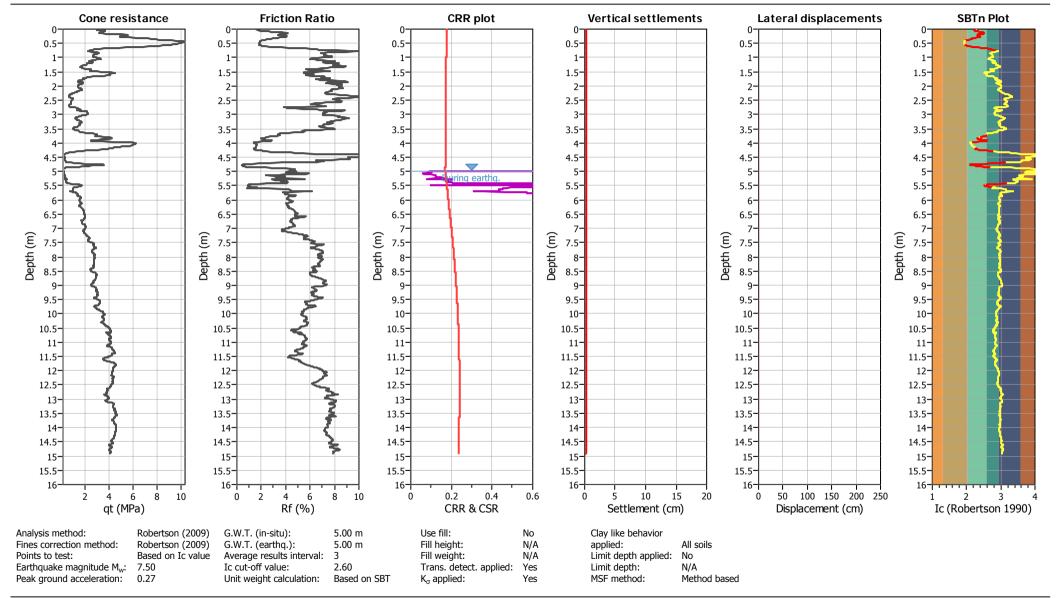
CPT: CPT-11_ULS

Total depth: 10.58 m



Project: GENZTAUC13086AE - THE LAKES STAGE 2QRST ULS EARTHQUAKE

Location: TAURANGA



CPeT-IT v.1.7.5.27 - CPTU data presentation & interpretation software - Report created on: 8/04/2014, 3:38:41 p.m. Project file: F:\1.GENZ\1.GEOTECHNICS PROJECTS\13086AE THE LAKES STAGE 2 QRST\ANALYSES & DESIGN\Liquefaction\Analysis for GCR\GENZTAUC13086AE_THE LAKES STAGE QRST_ULS.clq

CPT: CPT-12_ULS

Total depth: 14.90 m