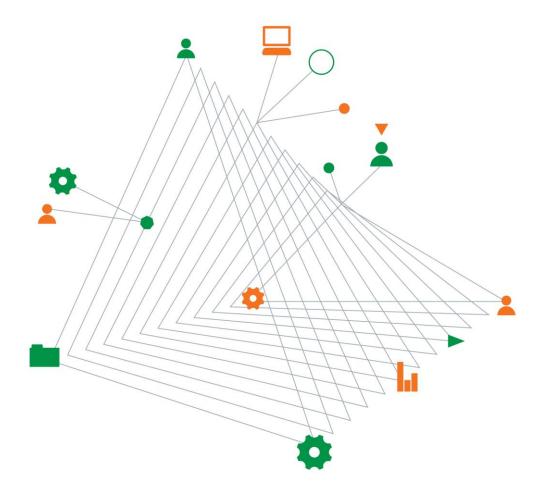


The Lakes (2012) Ltd

The Lakes - Stages 3G, 3H & Lots 236-239 (Stage D)

Geotechnical Completion Report

17 February 2017



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

The Lakes - Stages 3G, 3H & Lots 236-239 (Stage D)

Prepared for The Lakes (2012) Ltd C/- Harrison Grierson Consultants Ltd PO Box 13 025 Tauranga 3141 Tauranga

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17 February 2017

Document authorisation

Our ref: GENZTAUC13086AP-AK

For and on behalf of Coffey

David Cullen Engineering Geologist

Quality information

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Important information about your Coffey Report

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1. INTRODUCTION AND SCOPE

This Geotechnical Completion Report (GCR) has been prepared by Coffey Services (NZ) Ltd (Coffey) for the Lakes (2012) Limited following completion of earthworks for Stage 3G, Stage 3H (collectively known as 3GH) and Lots 236 to 239 within Stage D of the Lakes Subdivision and in general accordance with the conditions of Council resource consent number RC21332.

This GCR contains the results of site investigations together with as-built plans derived from Harrison Grierson Consultants Ltd (HGCL) topographical data. It describes bulk earthworks completed during the 2007-2008, 2013-2014 and 2014-2015 earthworks seasons.

The extent of earthworks observed by Coffey is shown on the appended plans (Figures 1 to 6, Appendix A). A Statement of Professional Opinion (Form G2) and Summary of Technical Data (Form G3) for the works described herein are also appended.

2. DESCRIPTION OF SUBDIVISION

Stages 3GH and Lots 236 to 239 within Stage D of the Lakes subdivision are located near the intersection of Pyes Pa Road and Takitimu Drive (State Highway SH26) in Pyes Pa, Tauranga. The site location and original ground contours are shown on Figures 1 (Stage 3GH) and 4 (Lots 236 to 239) in Appendix A. Stage 3G, Stage 3H and Lots 236 to 239 consists a total of 80, 11 and 4 lots respectively.

Before earthworks began, the majority of Stage 3G consisted of a flat or gently rolling north-south oriented plateau at approximately RL 55-65m (Moturiki Datum, 1953). During the 2013-2014 earthworks season, filling was placed over the northern portion of Stage 3G. The following 2014-2015 earthworks season, excavation of the elevated plateau was undertaken in the southeast of Stage 3G and additional filling was placed in the north and eastern extent. Combined cut/fill contours of the works completed are shown on Figure 2.

Stage H comprised a sloping terrace on the edge of the plateau before earthworks proceeded, dipping from approximately RL 59m in the western extents to approximately RL 49m in the east. During the 2014 to 2015 earthworks season, filling commenced over much of Stage 3H, with the exception of minor cut in the north-western and south-western extents.

Lots 236 to 239 within Stage 3D originally comprised of steeply sloping ground over much of the lots, dipping in a southeast and western direction where a deeply incised gully extended into the lots. Earthworks commenced in this area with the placement of fill over Lots 237 to 239 during the 2007 to 2008 earthworks season, followed by unsupervised filling thereafter, likely between 2010 and 2012 and discussed later in this report. Cut/fill contours are shown on Figure 4. The 2012 ground surface is shown on Figure 5. Further earthworks were completed during the 2014-2015 work season, with cut/fill contours for the 2014-2015 earthworks also shown on Figure 5.

Construction of a cantilever timber pole retaining wall was completed in 2017 adjacent to the northern perimeter of Stage 3G (lots numbers for which this wall spans are currently being confirmed). Additionally in 2016, a stormwater pipe was thrust beneath the slope to the east of Stage 3H to an outlet structure above the stream in the valley below. The location of the stormwater pipe and indicative location of the retaining wall is shown on Figure 3.

Civil infrastructure for these stages and lots of the subdivision was installed in 2015 and 2016. The finished ground surface is shown on Figures 3 and 6.

3. RELATED REPORTS

The following documents were prepared prior to or during the design and development of Stages 3G, 3H & Lots 236-239 (Stage D):

- 1. *'Pyes Pa West Urbanisation Development, Tauranga Geotechnical Assessment Report'*, report prepared by S&L Consultants Ltd (Ref: 16944, dated October 2003).
- 2. 'Geotechnical Investigation Report for the Lakes Subdivision Stage 3 (Phase 1) at Pyes Pa, Tauranga', report prepared by Coffey (Ref: GENZTAUC13086AF-AA, dated 29 April 2013).
- 3. 'Geotechnical Investigation Report for the Lakes Subdivision Stage 3 Zone 2 at Pyes Pa, Tauranga', report prepared by Coffey (Ref: GENZTAUC13086AK-AC, dated 7 April 2014).
- 4. 'The Lakes Subdivision Stage 3 Zone 1 Earthworks Completion Report', report prepared by Coffey (Ref: GENZTAUC13086AF-AE, dated 15 August 2014).
- 5. 'The Lakes Stage 3 Zone 3, Geotechnical Investigation Report (Addendum 1)', report prepared by Coffey (Ref: GENZTAUC13086AQ-AB, dated 10 July 2015).
- 'Building Restriction Lines above Western Slope and Collector Road, The Lakes Subdivision Stage 3 – Zone 2', memo prepared by Coffey (Ref: GENZTAUC13086AQ-AC, dated 25 August 2015).
- 7. 'Retaining Wall Design Report for Stage 3G The Lakes, The Lakes Subdivision, Tauriko', report prepared by Coffey (Ref: GENZTAUC13086AB-AB, dated 16 June 2016).

Key conclusions of the main documents are summarised below.

3.1. Geotechnical Assessments

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

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

3.2. Earthworks Completion Report

The August 2014 Earthworks Completion Report (ECR) concluded that the bulk earthworks undertaken in 2007-2008 and 2013-2014 were generally completed in accordance with the relevant standards and guidelines including NZS 4431 (Code of Practice for Earth Fill for Residential Development) and the Tauranga City Council Infrastructure Development Code (TCC IDC). The report did however identify several areas that needed to be re-visited in this GCR. These were:

- Some of the fill materials placed towards the end of the 2013-2014 season did not pass the required Nuclear Density Meter (NDM) tests. The failed tests were attributed to the highly variable source materials being used (silts, sands and clays) which resulted in fills that could not be easily assessed with a NDM. It was therefore decided that the affected fill would be retested using hand-auger boreholes with undrained shear strength measurements and/or Dynamic Cone Penetrometer (DCP) testing as appropriate for the individual soils.
- 2. The ECR also commented on the presence of undocumented filling that was encountered during excavations in 2013 within lots 238 & 239 and elsewhere within the Lakes development. This filling is understood to have been placed between 2010 and 2012, when

works on site were not closely managed by either Grasshopper Farms Ltd or The Lakes (2012) Ltd.

3. Finally, the ECR recommended that the stability of the eastern slope should be reassessed in the GCR and an appropriate Building Restriction Line (BRL) be defined for lots along the crest of this slope.

These issues are addressed in the following sections of this report.

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

4. INVESTIGATIONS COMPLETED

Geotechnical investigations have been undertaken on this and adjacent sites during each stage of the Lakes subdivision's design and construction. The investigations used for this report are listed below. Logs of each investigation are included in Appendix C.

- Three test pits excavated in 2012 within or near Stage 3G to maximum depths of up to 5m to assess shallow ground conditions before the 2013-2014 work season (Coffey, TP07–TP09 on Figure 1);
- One Cone Penetrometer Test (CPT) to a depth of approximately 13 meters below the existing ground level using a truck mounted rig supplied by Geotech Drilling Limited (Coffey, CPT314 on Figure 1);
- One machine borehole drilled to a depth of approximately 20.0m. Standard Penetration Tests (SPT) were carried out at 1.5m intervals (Coffey, MH301 on Figure 1);
- Two flight-auger machine boreholes drilled to a maximum depth of 20.0m within Stage 3H. SPT tests were conducted at specific depths within these boreholes to provide strength estimates and relatively undisturbed samples of key lithologies encountered (Coffey, CFA04 & CFA05 on Figure 1).

On completion of the bulk earthworks in 2016, Coffey drilled a total of 50 hand-auger boreholes to target depths of 2m or 2.5m (and in some cases, up to 5m depth) on approximately every second lot to confirm finished subgrade conditions. The location of each borehole is shown on Figures 3 & 6. Although labels are not shown on the plan, the boreholes are numbered according to the relevant lot number. For example, the hand auger borehole on Lot 413 in Stage 3G is referred to as HAL413. Logs of these boreholes are included in Appendix D.

5. OVERVIEW OF GEOLOGICAL CONDITIONS

The subject areas of Stage 3G and Lots 236 to 239 within Stage 3D are located on an elevated, gently sloping plateau. Below the topsoil layer, the pre-development soil profile across this plateau comprised of volcanic ashes including the Hamilton Ash and Rotoehu Ash. This ash sequence is common throughout the Tauranga area. At this location the volcanic ashes overlie ancient alluvial deposits of the Matua Sub-Group and weakly cemented pumice sands of the Te Ranga Ignimbrite.

Stage 3H is located on a gently to moderately sloping terrace formed from ancient alluvial deposits of the Matua Subgroup.

Excavations during the 2013-2015 period reduced the thickness of the volcanic ashes across the southeast of the Stage 3G plateau by up to 7m. The subsoils below many of the finished lots therefore

comprise volcanic ash silts but in some areas excavations have penetrated through the ash layers and the finished lots are underlain by variable Matua Sub-Group soils. These include silts, sands and clays which can be highly sensitive to reworking. Areas underlain by fill are discussed in Section 6.2.

6. EARTHWORKS OPERATIONS

6.1. Plant

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

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

6.2. Construction Programme

6.2.1. 2007 – 2012

Under ownership of Grasshopper Farms Ltd, earthworks during this period included excavations of up to 1m depth over Lot 237 (Stage D) as shown on Figure 4. Filling took place over Lots 237 to 239 (Stage D), however as cut & fill contours for this period are not available, fill contours were calculated by HGCL (Harrison Grierson Consultants Ltd) by subtracting the original ground surface (surveyed in 2007) from a survey completed by HGCL in 2012. This resulted in indicated fill depths of up to 11m across the lots.

Excavations in the filling in Lots 237 to 239 encountered soils that consisted of highly sensitive silts and clays with a relatively high moisture content and low undrained shear strength. Based on a series of unlogged test pits within the fill, it was considered that the non-engineered filling could remain in place provided that later fill in these areas was placed appropriately and that static settlements were monitored and reviewed prior to issue of the GCR. This later filling is discussed in more detail below.

No cut or fill took place over Stages 3GH during 2007 to 2012.

6.2.2. 2013 – 2014 & 2014 – 2015 Earthworks Seasons

In 2012 ownership of the Lakes subdivision passed from Grasshopper Farms Ltd to The Lakes (2012) Ltd. During this period the remaining earthworks were completed to form the current ground surface. Earthworks during the 2013-14 and 2014-15 summers included excavations of up to 7m depth on the main plateau of Stage 3G and 1m cuts in the north and south of Stage 3H, as shown on Figure 2.

Excavated material was used for filling up to approximately 2m deep in the northern portion of Stage 3G during both summer periods, and up to 4m deep along the eastern boundary of Stage 3G and over much of Stage 3H during the 2014-15 season.

Further cut and fill was undertaken over Lots 236 to 239 of Stage D. Lot 236 and 237 underwent cut of up to 1m and all of the lots had fill placed to varying depths, with filling of up to 8m deep in places as shown on Figure 5.

7. QUALITY CONTROL

7.1. Site Preparation Observations

During 2013-2014 and 2014-2015, Coffey undertook regular observations of fill areas to ensure topsoil, vegetation or unsuitable materials had been removed before filling.

7.2. Fill Control

As mentioned previously, filling placed over Lots 237 to 239 of Stage 3D during 2007-2012 was not tested or certified by Coffey and no other records or test results have been located.

For Stages 3GH and Lots 236 to 239 of Stage 3D in the 2013-2014 and 2014-2015 seasons, Nuclear Density Meter (NDM), laboratory moisture content and undrained shear strength tests were carried out by Geotechnics & Fulton Hogan on behalf of JMC Limited. The locations of the tests completed are shown on Figure 2 and 5.

In cases where of the above tests recorded low undrained shear strengths, retests were undertaken to assess the ground conditions and fill strength, either as additional NDM tests or subsequent hand-auger boreholes in close proximity to the original test.

7.2.1. Compaction Control Criteria

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

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

The hand-auger boreholes drilled to re-test filling used field shear vane measurements with the same target result as above.

7.2.2. Test Results

Summary tables showing the results of the laboratory fill tests for bulk earthworks at Stages 3G, 3H & Lots 236-239 (Stage D) are included in Appendix E and the locations of the tests are shown on Figures 2 and 5. The majority of tests met or exceeded the compaction control criteria given above. Failed tests are shown in red on the relevant figures.

Three tests during the 2013-2014 season did not meet the required values, with test numbers A-05, A-12, and A-41 being deemed to have failed due to low undrained shear strength readings. The fill surrounding these tests were either reworked or retested with hand-auger boreholes at a later date (passing thereafter), indicating the failed result was either due to an incorrect test value or an isolated pocket of filling.

During the 2014-2005 season, three tests being B-01, B-05 and B-13 initially failed due to low undrained shear strength readings but were retested and subsequently passed. As these tests were superseded by later testing, the tests are not showing as failed results on the site plan.

Two further tests, B-08 and B-09, failed due to low undrained shear strength readings and were retested with hand-auger boreholes at a later date, again with passing results indicating the failed tests were either due to an incorrect test value or an isolated pocket of filling.

8. ENGINEERING EVALUATION AND RECOMMENDATIONS

8.1. Fill Quality

Based on the appended earth fill quality control test data and reliance on the diligence of the bulk earthworks contractor at times when engineering staff were not present on site, results indicate that the compaction control criteria were generally met during the bulk earthworks periods in 2013-2014 and 2014-2015.

8.2. Static Settlement

The majority of the area, specifically Stage 3G, was either located in zones of cut or received evenly distributed filling over volcanic ashes with soils not expected to be subject to significant settlement. Static settlements were therefore not monitored in Stage 3G.

However, Stage 3H and Lots 236-239 (Stage D) received up to 4m and 8m of fill material respectively during the 2013-14 season. Settlement monitoring points were therefore installed in these areas. The monitoring pins consisted of steel rods attached to plates installed at the base of the filling. The data from these pins are presented graphically in Appendix F and settlement marker locations shown on Figures 2 and 6 for Stage 3H and Lots 236-239 (Stage D) respectively.

8.2.1. Stage 3H

Static settlements below the 2014 filling were monitored at two locations shown as SM26 and SM27 on Figure 2. Measured settlements were 205mm and 390mm for SM26 and SM27.

The data show the majority of consolidation settlement below the filling occurred within 2 to 3 months of earthworks being completed. Thereafter, settlement entered a long term 'creep' phase. Extrapolating the data out for a period of 50 years indicated that lots in this area may be affected by up to 100mm of future creep settlement over the assumed life of the proposed dwellings. However, differential settlements within the affected lots would be expected to be within the allowable range recommended by MBIE (i.e. 25mm/6m length), provided additional fill does not exceed 0.6m.

8.2.2. Lots 236-239 (Stage D)

Static settlements were monitored over Lots 236-239 during and after the 2013-2014 and 2014-2015 work seasons.

Three settlement markers were installed, SM15, SM28, and SM28A as shown on Figure 6, however only SM28 remained functional during the whole monitoring period as the other two markers were either damaged or moved during fill placement.

In regards to SM28, monitoring from April 2015 to August 2016 indicated the filling had induced static settlements of 68mm and that settlement was ongoing. Extrapolating the data out for 50 years indicated long-term settlement may exceed 60mm, with a high likelihood of excessive differential settlement beneath the building platforms.

The area was therefore pre-loaded with 2m of topsoil in April 2016 as shown in Figure 6. Continuing monitoring indicated this pre-load induced an additional settlement of up to 47mm. Following the completion of monitoring in August 2016, the pre-load was removed.

Following preloading we consider that the potential for future static settlements beneath these lots has been reduced, and long term differential settlements would be expected to be within accepted limits, provided additional fill does not exceed 1.0m.

8.2.3. Fill Development Restrictions

To reduce possible future settlements, any additional filling the lots listed below should not exceed the following depths without the approval of the TCC Category 1 or 2 Geo-Professional:

- 1.0m for lots 236-239
- 0.6m for lots 495-502

8.3. Slope Stability

While the majority of proposed lots within Stage 3G are located on gently sloping ground, the lots within this stage adjacent to the eastern perimeter and all lots within Stage 3H are located above a steeper slope. Lots 236-239 are also positioned above steeper slopes to the east and south of the lot boundaries.

8.3.1. Lots 413, 458, 460 and 493-503

The adjacent slope below the plateau exhibited a few areas of instability. Colluvial soils were encountered in hand auger boreholes and test pits in this area and topographic evidence also suggested that this slope has been affected by larger scale ancient instability.

Stability analyses of this slope noted that values were generally less than required by the IDC for residential development and indicated that further instability may occur on this slope in the future during extreme rainfall events or under seismic loads.

As the slope is insufficiently stable for residential development, the lots are subject to a building restriction line (BRL) as shown on Figure 3. The BRL has been defined by either projecting a 1V:2.5H line from the toe of the steepest adjacent slope, or by measuring 15m back from the slope crest, whichever is smaller. The proposed setback distance is considered adequate for the residential development in this area.

8.3.2. Lots 236-239 (Stage 3D)

Slopes adjacent to Lots 236-237 have been engineered with a gradient of 1V:2.5H for which this gradient is considered to be an adequately stable slope angle for Tauranga soils. However, this does not allow for surcharge from residential buildings or fill and therefore a BRL has been placed on these lots, setback 3-5m from the slope crest as shown on Figure 6.

The slope south of lots 237-239 have been engineered with a gradient of 1V:3H and therefore are adequate for residential development without a BRL.

8.3.3. Slope Development Restrictions

For lots 236-237, 413, 458, 460 and 493-503, it should be understood that the inclusion of a BRL on a lot does not specifically preclude development beyond the restriction line. However, any development between the BRL and slope will require specific geotechnical input and may need additional slope protection works such as retaining walls, deepened foundations, etc. The following restrictions are recommended for these lots:

 Any part of a dwelling or structure which extends beyond the BRL must be reviewed and approved by a TCC Category 1 Geo-Professional prior to the building consent application. A geotechnical report must be provided including the specific design of any mitigation works proposed.

- Any filling between the BRL and slope must be reviewed and approved by a TCC Category 1 Geo-Professional with a report to be provided to Council before work begins.
- Stormwater from any paved or impermeable surfaces including roofs and driveways on these lots must be collected and piped to the site's stormwater system. Stormwater must not be disposed via ground soakage on these lots and any concentration of runoff over the slope must be avoided.

8.4. Stage 3G Retaining Wall

The construction of the timber pole retaining wall along the northern boundary of Stage 3G was observed by Coffey. This included regular site visits to confirm borehole and post dimensions and ground conditions along the wall alignment as specified in the retaining wall design report.

Based on our observations we consider the wall has been built in accordance with the design. A separate certification letter has been provided for the wall, a copy of which is included in Appendix G.

8.4.1. Retaining Wall BRL

As the wall has not been designed for additional surcharge loads, a BRL has been defined with a setback distance equal to the height of the wall. The BRL has been assigned to lots 441, 442, 444 to 455, 457 and 458 within Stage 3G as shown on Figure 3.

8.4.2. Retaining Wall Development Restrictions

Specifically for lots 441, 442, 444 to 455, 457 and 458, in regards to the BRL adjacent to the Stage 3G retaining wall, the following restrictions are recommended:

- Any part of a dwelling or structure which extends beyond the BRL must be reviewed and approved by a TCC Category 1 or 2 Geo-Professional prior to the building consent application. A geotechnical report must be provided including the specific design of any mitigation works proposed. Specific design may include, deepened foundations past the 45° zone of influence from the toe of the retaining wall.
- No filling is to take place between the BRL and crest of wall without review and approval by a TCC Category 1 or 2 Geo-Professional. Due to the height of the existing retaining wall, any additional filling or retaining structures above the wall and within the BRL may require a Resource Consent.
- Stormwater from any paved or impermeable surfaces including roofs and driveways on these lots must be collected and piped to the site's stormwater system and not allowed to flow over the the retaining wall.

8.5. Stage 3H Stormwater Pipe Line

As mentioned in Section 2, a stormwater pipeline was horizontally drilled or 'thrust' beneath the slope to the east of Stage 3H as part of the civil infrastructure installation in 2016. The pipeline was designed by Harrison Grierson Consultants Ltd. Coffey provided advice regarding the pipeline alignment and recommended the pipe was installed at least 3.0m below existing ground level to reduce the risk of damage in the event of slope failure

A copy of Harrison Grierson's design drawings for the pipeline is included in Appendix G. Based on our observations during drilling and as-built survey information from Harrison Grierson, we consider the pipeline has been installed along an appropriate alignment. The survey data indicate the pipe is at least 3.0m deep below the existing ground surface as recommended.

8.6. Foundation Design & Bearing Capacity

The lots within Stage 3G and Lots 236-239 (Stage D) are underlain by either engineered fill or natural soils that meet or exceed the conditions for 'good ground' as defined by NZS 3604. Dwellings on these sites may therefore be supported on standard shallow foundations designed for a geotechnical ultimate bearing capacity of 300kPa.

Lots 493 to 503 within Stage 3H also meet or exceed the conditions for 'good ground' as defined by NZS 3604. However, as the lots are moderately steeply sloping, development on these lots may require deep excavation to form a level building platform. We recommend that whenever the proposed depth of excavation exceeds 1.5m, additional investigation should be undertaken by a TCC Category 1 or 2 Geo-Professional at the design/building consent stage to confirm soil conditions below the proposed foundations. A consent notice to this effect should be added to the affected lots (see Form G3, Appendix B).

It should be understood that due to the volcanic nature of the natural soils on this site, it is possible that local soil conditions may vary from those discussed above. Some soils observed onsite are also potentially prone to sub-surface erosion (e.g. 'tomos). It is therefore important that any potentially soft or unsuitable soils encountered in the foundation excavations are brought to the attention of a geotechnical professional.

8.7. Stormwater Management

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

9. CONCLUSION

Based on the observations and investigations presented in this report and with reliance on the diligence of the earthworks contractors, it is concluded that the earthworks and subdivision of Stages 3GH and Lots 236-239 of Stage 3D have been completed in general accordance with previous recommendations and current Tauranga City Council Infrastructure Development Code.

This report presents site-specific recommendations including Building Restriction Lines (BRLs) on some lots located above steeper slopes or adjacent to retaining walls. Provided these recommendations are followed and prudent development practices are adopted, it is considered that the finished lots are at low risk of erosion, falling debris, subsidence, inundation or liquefaction and these sites are therefore adequate for residential development without the need for Section 72 restrictions under the New Zealand Building Act.

Development outside the BRL (i.e. between the restriction line and the slope/retaining wall) is subject to further geotechnical input per Sections 8.3.3 and 8.4.2 of this report. The placement of additional filling is also restricted on some lots as per Section 8.2.3. The need for a Section 72 restriction on affected lots may therefore need to be re-assessed at the building consent stage.

10. LIMITATIONS

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

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

For and on behalf of Coffey

Report Prepared By:

D B CULLEN Engineering Geologist

Report Reviewed By:

D SULLIVAN Principal Geotechnical Engineer BSc, MBA, CE (Calif.), MIPENZ, CPEng, TCC Category 1 Geotechnical Engineer CPEng No. 1025183

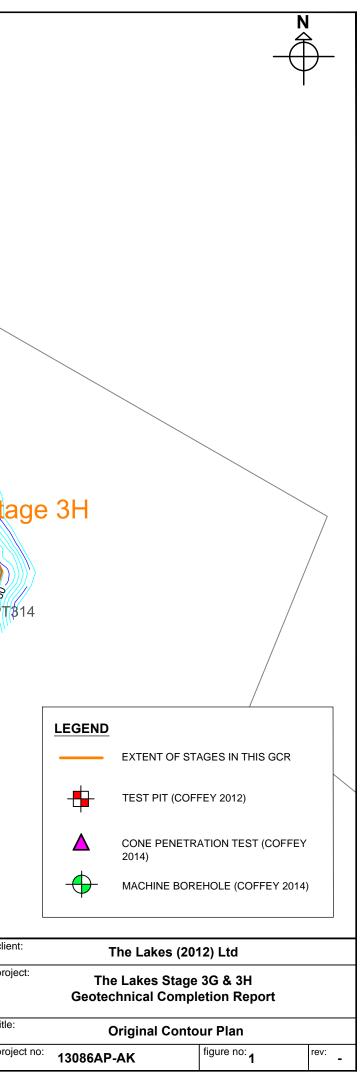
Geotechnical Suitability Statement Signed By:

R TELFORD TCC Category 2 Geotechnical Engineer

Appendix A - Figures

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NOTES: 1. Contour data of 2012 landform from Harrison Grierson Consultants Ltd. 2. Contours shown at 1.0m intervals to Moturiki Datum. 3. Lot layout and numbering from Harrison Grierson Consultants Ltd, November 2016. rev description drawn approved date u 0 30.0 60.0 90.0 120.0 Horizontal Scale (metres) 30.0 60.0 90.0 120.0 u U U U U u U U U U u U U U U						42 443 438 437 436 435 434 433 00	449 449 449 449 449 449 449 449 449 449	44 484 466 423 423 419 69 69	459 456 486 486 463 462 461 416 416 417 416 417	460 493 495 496 499 499 500 499 501 501 502 501 502 501 502 501 502 501 502 501 502 502 501 502 502 501 502	St
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LOTS 236-239 (STAGE D) GCR\13086AP STAGE 3GH & LOTS 236-239 GCR 12-01-2017.DWG

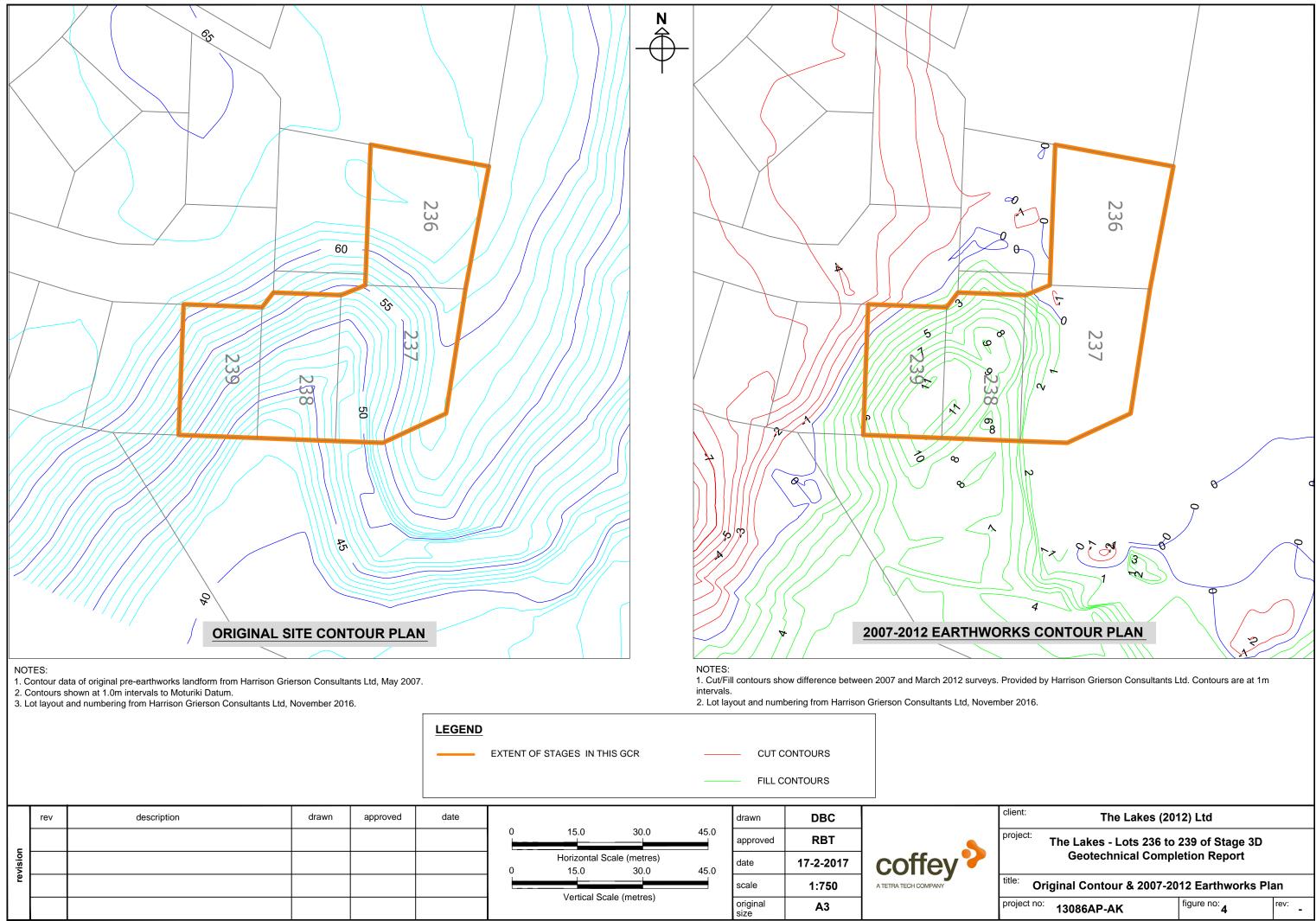


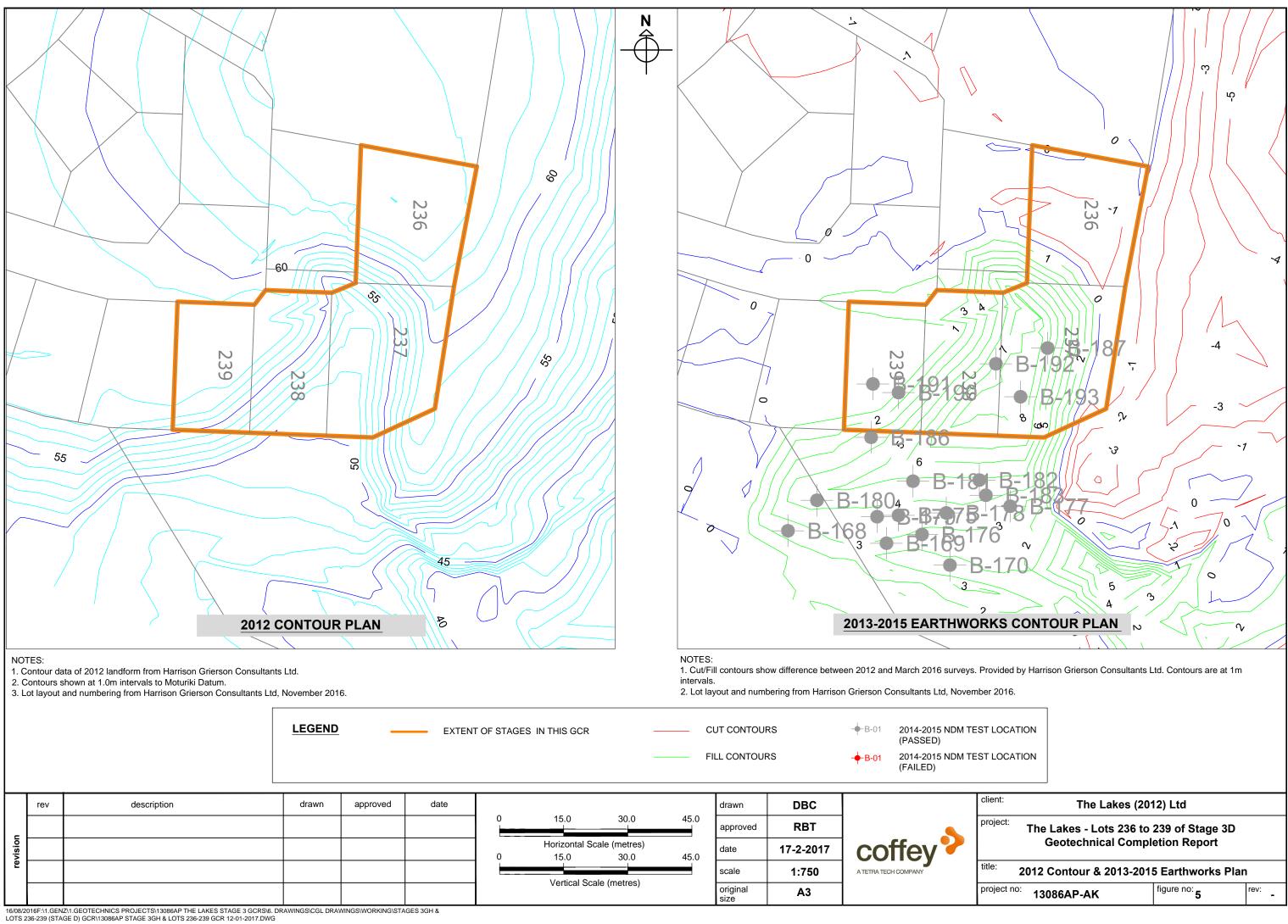
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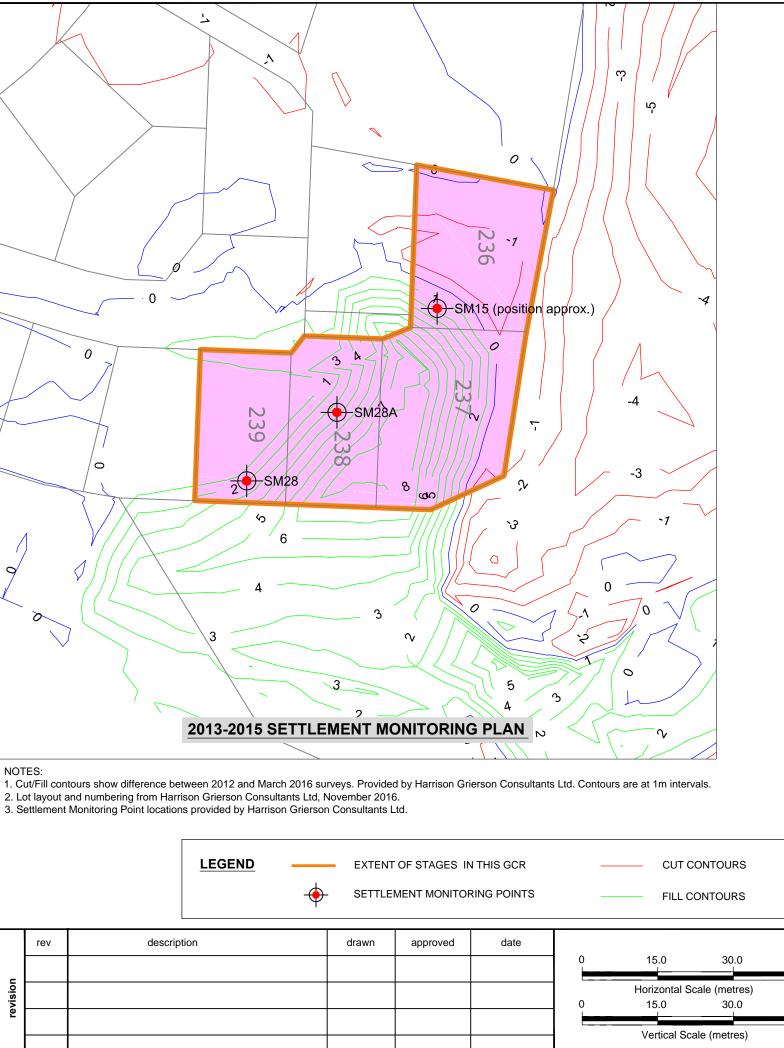
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	- - A-01	2013-2014 NDM TEST LOCATION (FAILED)
	- + -B-01	2014-2015 NDM TEST LOCATION (PASSED)
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1. Contour data of March 2016 landform from Harrison Grierson Consultants Ltd.

2. Contours shown at 1.0m intervals to Moturiki Datum.

EXTENT OF 2m TOPSOIL PRELOAD

3. Lot layout and numbering from Harrison Grierson Consultants Ltd, November

4. Hand auger boreholes are numbered according to the relevant lot number.

clie DBC drawn 45.0 pro RBT approved coffey 17-2-2017 date 45.0 title scale 1:750 A TETRA TECH COMPANY pro original size A3

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	client: The Lakes (20'		
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	title: Settlement Monitoring & 2	2016 Contour Plan	rev:
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Appendix B - Geotechnical Suitability Statement & Geotechnical Data Summary Table

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

NAME OF SUBDIVISION	The Lakes Subdivision – Stages 3G, 3H & Lots 236- 239 (Stage D)
COUNCIL FILE NUMBER RC No:	RC21332
ENGINEER RESPONSIBLE FOR	Robert Telford
DEVELOPMENT	
QUALIFICATIONS:	TCC Category 2 Geotechnical Engineer

I, Robert Telford of Coffey Services (NZ) Ltd, 96 Cameron Road, Tauranga, hereby confirm that:

- I am a professional person, appropriately qualified with experience in geomechanics to ascertain the suitability of the land for building development and was retained as the Soils Engineer to the above development.
- An appropriate level of site investigation and construction supervision has been carried out under my direction and is described in our development evaluation reports dated 29 April 2013, 7 April 2014 and 10 July 2015.
- 3) In my professional opinion, not to be construed as a guarantee, I consider that;
 - a) The areas shown in my report dated 17 February 2017 of each new allotment are suitable for the erection thereon of the building types appropriate to the zoning of the land, provided that reference is made to my Geotechnical Completion Report Ref. GENZTAUC13086AP-AK, dated 17 February 2017.
 - b) The earth fills shown on the attached Plans ref Figure 2, Figure 5 and Figure 6 have been placed in general accordance with the requirements of the Infrastructure Development Code.
 - c) The completed works give due regard to all land slope and foundation stability considerations.
 - d) The filled ground is suitable for the erection thereon of residential buildings not requiring specific design subject to the recommendations presented in my Geotechnical Completion Report Ref. GENZTAUC13086AP-AK, dated 17 February 2017.
 - e) The original ground not affected by filling is suitable for the erection thereon of residential buildings not requiring specific design subject to the recommendations presented in my Geotechnical Completion Report Ref. GENZTAUC13086AP-AK, dated 17 February 2017.
- 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.

Talh Signed

Date: 17 February 2017



SUITABILITY OF LAND FOR BUILDING DEVELOPMENT

PRODUCER STATEMENT



INFRASTRUCTURE DEVELOPMENT CODE

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																	ac	Suitable for standard foundations designed in accordance with NZS 3604, as per Section 8.6 of Coffey GCR ref: GENZTAUC13086AP-AK.
458	586	N/T	≻	.	z	≻	V	۲	z	- >	z z	≻ 	Z	z	z	z	×	Development subject to Slope BRL restrictions per Section 8.3.3 of Coffey GCR ref:GENZTAUC13086AP-AK.
																	De	Development subject to Retaining Wall BRL restrictions per Section 8.4.2 of Coffey GCR ref:GENZTAUC13086AP-AK.
459	353	>202	Y	L	z	z	ı	Y	z	Z	z z	× ۲	z	z	z	z	N acc	Suitable for standard foundations designed in accordance with NZS 3604, as per Section 8.6 of Coffey GCR ref: GENZTAUC13086AP-AK.
460	913	177	≻	v	z	≻	V	≻	z	- 	z	≻ 	Z	Z	Z	z	acc	Suitable for standard foundations designed in accordance with NZS 3604, as per Section 8.6 of Coffey GCR ref: GENZTAUC13086AP-AK.
																	Sec	Development subject to Slope BRL restrictions per Section 8.3.3 of Coffey GCR ref:GENZTAUC13086AP-AK.
		L		j		SU	IMMAR	SUMMARY OF GOTECH	HNICAL DATA FOR INDIVIDUAL LOTS	ATA F	OR IF	IDIVI	DUA	Г ГО.	lS			63
		1auranga Uiy	ngu	- City														VERSION 1
								INERACTRIC	CTURE DEVELOPMENT CODE		VIENT		, .					4

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			Comments						Suitable for standard foundations designed in accordance with NZS 3604, as per Section 8.6 of Coffey GCR ref: GEN7TALIC13086AP-AK						C3	VERSION 1 1 July 2011 1
21332	Consent Not	ice		z	z	z	z	z	z	z	z	z	z	z		
	On-Site Efflu	ient Disposa	al	z	z	z	z	z	z	z	Ν	z	z	z		
RC No:	Compressibl	e Soils		z	z	z	z	z	z	z	z	z	z	z	2	
RC	Minimum Bu	uilding Platf	form	z	z	z	z	z	z	z	Z	z	z	z	FOR INDIVIDUAL LOTS	
	Designated I	Building Pla	tform	z	z	z	z	z	z	z	Z	z	z	z		
	S/W Reticula	ate		≻	≻	≻	≻	≻	≻	≻	۲	≻	≻	\succ		ODE
	S/W Soakage	e		z	z	z	z	z	z	z	z	z	z	z		NTC
s Pa	S/W Specific	Design		z	z	z	z	z	z	z	Ζ	z	z	z	FOF	PME
, Pye	Building Res	triction Line	e	z	z	z	z	z	z	z	Z	z	z	z	ATA	VELO
Boulevard, Pyes	suo	Specific Design	Y/N/NA	z	z	z	z	z	z	z	z	z	z	z	HNICAL D	TURE DEV
310 Lakes E	Foundations	Conventional Shallow Foundation to	NZS 3604:2011 Y/N/NA	≻	≻	≻	۲	۲	≻	≻	٢	≻	≻	≻	SUMMARY OF GOTECHNICAL DATA	INFRASTRUCTURE DEVELOPMENT CODE
Property Address		Natural Topography Earthworked	Depth (m)	4	5	~	~	$\overline{\mathbf{v}}$		v	-			,	JMMAR	
berty /		Topo Earth	N/Y	≻	~	≻	≻	≻	z	≻	z	z	z	z	SL	
Prop	Subsurface data	Natural Topography Unworked	Y/N	z	z	z	z	z	z	z	z	z	z	z		
6181	Subsur	Subdivision Filling	Depth (m)				v	v	~	~	L	~	v	~		
DP48		Sub	N/Y	z	z	z	≻	≻	≻	≻	≻	≻	≻	~		nça
Lot 1001 DP486181		Shear Strength (kPa)	at 0.5m depth	>202	N/T	184	N/T	>202	N/T	>202	N/T	>202	N/T	>202	F	Tauranga Uiy
		Area (m²)		580	599	581	548	545	509	469	449	450	450	450		
DP No:		Lot No:		461	462	463	464	465	466	467	468	469	470	471		

			Comments						Suitable for standard foundations designed in accordance with NZS 3604, as per Section 8.6 of Coffey GCR ref: GFNZTALIC13086AP-AK.						ES	VERSION 1 1 July 2011 1
21332	Consent Noti	се		z	z	z	z	z	z	z	z	z	z	z		
	On-Site Efflue	ent Disposal	l	z	z	z	z	Ν	z	Ζ	Ζ	z	z	z		
RC No:	Compressible	e Soils		z	z	z	z	z	z	z	z	z	z	z	TS	
RC	Minimum Bu	ilding Platfo	orm	z	z	z	z	z	z	z	z	z	z	z		
	Designated B	uilding Platf	form	z	z	z	z	z	z	z	z	z	z	z		
	S/W Reticula	te		~	~	≻	≻	\succ	≻	\succ	\mathbf{F}	≻	~	≻		ODE
	S/W Soakage	!		z	z	z	z	z	z	z	z	z	z	z		NTC
s Pa	S/W Specific	Design		z	z	z	z	z	z	z	z	z	z	z	P01	PME
, Pye	Building Rest	riction Line		z	z	z	z	z	z	z	Z	z	z	z	ATA	VELO
s Boulevard, Pyes	suo	Specific Design	A/N/NA	z	z	z	z	z	z	z	z	z	z	z	HNICAL D	UCTURE DEVELOPMENT CODE
310 Lakes F	Foundations	Conventional Shallow Foundation to	3604:2011 Y/N/NA	~	≻	≻	۶	٨	۲	Y	۲	≻	≻	≻	SUMMARY OF GOTECHNICAL DATA FOR INDIVIDUAL LOTS	INFRASTRUC
Property Address		Natural Topography Earthworked	Depth (m)			$\overline{\mathbf{v}}$	v	-		1	I	ı	ı	ı	JMMAR	
berty /		Na Topo Earth	N/Y	z	z	≻	≻	Ζ	z	Z	Z	z	z	z	SL	
Prop	Subsurface data	Natural Topography Unworked	N/Y	z	z	z	z	z	z	z	z	z	z	z		
6181	Subsur	Subdivision Filling	Depth (m)	~	~	v	~	L	~	1	1	v	~	-	Ĩ	
DP48		Sub	Y/N	>	≻	≻	≻	≻	≻	۲	≻	≻	≻	≻	000	124
Lot 1001 DP486181		Shear Strength (kPa)	at 0.5m depth	>202	N/T	N/T	N/T	>182	N/T	>202	L/Ν	>202	N/T	>202	Ton work	ho nSun mut
	ļ.	Area (m²)		450	450	407	447	508	450	450	450	450	450	450		
DP No:		Lot No:		472	473	474	475	476	477	478	479	480	481	482		

]									fav						\square	
										s designed in +ion a 6 of Cof	AP-AK.						
					Comments					Suitable for standard foundations designed in secondance with NTS 3604 as ner Section 8.6 of Crefton	GCR ref: GENZTAUC13086AP-AK					G3	VERSION 1
Q										Suitable f	eccol dance w GC						
21332		Consent Noti	ce			z	z	z	z	z	z	z	z	z	z		
		On-Site Efflue	ent Dispos	al		z	z	z	z	z	z	z	z	z	z		
RC No:		Compressible	e Soils			z	z	z	z	z	z	z	z	z	z	2	
RC		Minimum Bu	ilding Platf	form		z	z	z	z	z	z	z	z	z	z	FOR INDIVIDUAL LOTS	
		Designated B	uilding Pla	tform		z	z	z	z	z	z	z	z	z	z		
		S/W Reticular	te			≻	≻	≻	≻	≻	≻	≻	≻	≻	\succ		
		S/W Soakage				z	z	z	z	z	z	z	z	z	z		
s Pa		S/W Specific	Design			z	z	z	z	z	z	z	z	z	z	- E	
, Pye		Building Rest	riction Line	е		z	z	z	z	z	z	z	z	z	z	ATA	
Boulevard, Pyes		suo	Specific Design		Y/N/NA	z	z	z	z	z	z	z	z	z	Z	CHNICAL DATA	
310 Lakes B		Foundations	Conventional Shallow Foundation to	NZS 3604:2011	Y/N/NA	7	Y	×	×	×	Y	Y	Y	Y	Y	SUMMARY OF GOTECH	
Property Address			Natural Topography Earthworked	Depth (m)						$\overline{\mathbf{v}}$	-	5	ю	5	3	JMMAR	
erty /			Topo Earth	N/Y		z	z	z	z	≻	≻	≻	≻	≻	≻	ุ รา	
Prop		Subsurface data	Natural Topography Unworked		N/N	z	z	z	z	z	z	z	z	z	z		
5181		Subsur	Subdivision Filling	Depth (m)		~	~	v	v	v	ı	ı	v	v	-		Ś
DP48(Subc Fi	N/A		~	Y	Υ	Y	Y	z	z	Y	Y	Ν		nga
Lot 1001 DP486181			Shear Strength (kPa)	at 0.5m depth		N/T	>202	N/T	>202	N/T	190	N/T	173	N/T	N/T	F	1auranga Ury
:0	1	Δ	area (m²)			554	480	489	553	567	596	601	638	383	350		
DP No:			Lot No:			483	484	485	486	487	488	489	490	491	492		

INFRASTRUCTURE DEVELOPMENT CODE

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					ions designed in Section 8.6 of Coffey)86AP-AK.	IRL restrictions per	igation required if ection 8.6 of Coffey 186AP-AK.		ions designed in Section 8.6 of Coffey 186AP-AK	th restrictions per	NZTAUC13086AP-AK.	NZTAUC13086AP-AK.	igation required if ection 8.6 of Coffey)86AP-AK.		63	1
				Comments	Suitable for standard foundations designed in accordance with NZS 3604, as per Section 8.6 of Coffey GCR ref: GENZTAUC13086AP-AK.	Development subject to Slope BRL restrictions per Sertion 8.3.3.of Coffeed CCP ref.GENTTALICT3086AD-AK	Additional geotechnical investigation required if excavation depth >1.5m, as per Section 8.6 of Coffey GCR ref: GENZTAUC13086AP-AK.		Suitable for standard foundations designed in accordance with NZS 3604, as per Section 8.6 of Coffey GCR ref: GFN7TAILCI 30SGAP-AK	Development subject to fill depth restrictions per	Section 8.2.3 of Coffey GCR ref:GENZTAUC13086AP-AK.	Section 8.3.3 of Coffey GCR ref:GENZTAUC13086AP-AK.	Additional geotechnical investigation required if excavation depth >1.5m, as per Section 8.6 of Coffey GCR ref: GENZTAUC13086AP-AK.		9	VERSION 1 July 2011
21332	-	Consent Notic	ce		~		≻	≻	≻	≻	≻	≻	~	Y		
2		On-Site Efflue	nt Disposa	al	z		z	z	z	z	z	z	z	z		
RC No:		Compressible	Soils		z		z	z	z	z	Ζ	z	z	z	s S	
RCI		Minimum Bui	lding Platf	orm	z		z	z	z	z	Ζ	z	z	Z	- LO	
		Designated Bu	uilding Pla	tform	z		z	z	z	z	z	z	z	z		
	-	S/W Reticulat	e		~		≻	\succ	≻	\succ	۲	≻	\succ	\succ		ODE
	-	S/W Soakage			z		z	z	z	z	z	z	z	z	R IN	
is Pa		S/W Specific I	Design		z		z	z	z	z	z	z	z	z	A FOI	PME
l, Pye	-	Building Restr	iction Line	2	≻		≻	\succ	≻	≻	\succ	≻	≻	≻	DAT	VELC
Boulevarc		lations	Specific Design	Y/N/NA	z		z	z	z	z	z	z	z	z	CHNICAL DATA FOR INDIVIDUAL LOTS	UCTURE DEVELOPMENT CODE
310 Lakes Boulevard, Pyes		Foundat	Conventional Shallow Foundation to	NZS 3604:2011 Y/N/NA	~		~	≻	٨	≻	٨	≻	7	У	SUMMARY OF GOTEC	INFRASTRUG
Property Address			Natural Topography Earthworked	Depth (m)	۲		7			I	ı		ı	I	JMMAR	
erty /			Na Topo Earth	N/Y	≻		≻	z	z	z	z	z	z	z	SL	
Prop		Subsurface data	Natural Topography Unworked	N/X	z		z	z	z	z	Z	z	z	z		
6181		Subsu	Subdivision Filling	Depth (m)	V		~	7	4	4	4	4	4	2	ł	
DP48			Sub	N/Y	~		≻	≻	Х	≻	≻	≻	≻	Х		194
Lot 1001 DP486181			Shear Strength (kPa)	at 0.5m depth	130		>202	>202	N/T	N/T	N/T	>202	N/T	>202	E	1auranga Uiy
		A	rea (m²)		824		813	840	753	625	718	931	975	827		
DP No:		l	Lot No:		493		494	495	496	497	498	499	500	501		

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					ey	JK.	JK.	~	ey	JK.	>	
5				Comments	Suitable for standard foundations designed in accordance with NZS 3604, as per Section 8.6 of Coffey GCR ref: GENZTAUC13086AP-AK.	Development subject to fill depth restrictions per Section 8.2.3 of Coffey GCR ref:GENZTAUC13086AP-AK.	Development subject to Slope BRL restrictions per Section 8.3.3 of Coffey GCR ref:GENZTAUC13086AP-AK.	Additional geotechnical investigation required if excavation depth >1.5m, as per Section 8.6 of Coffey GCR ref: GENZTAUC13086AP-AK.	Suitable for standard foundations designed in accordance with NZS 3604, as per Section 8.6 of Coffey GCR ref: GENZTAUC13086AP-AK.	Development subject to Slope BRL restrictions per Section 8.3.3 of Coffey GCR ref:GENZTAUC13086AP-AK.	Additional geotechnical investigation required if excavation depth >1.5m, as per Section 8.6 of Coffey GCR ref: GENZTAUC13086AP-AK.	
21332	Consent Not	ice				>	-			≻		
	On-Site Efflue		al			Z				z		
RC No:	Compressible					2				Z		
х Х	Minimum Bu					2				Z		
	Designated B S/W Reticula		tiorm			2				z ≻		
	S/W Soakage									z		ate
ьч	S/W Specific					Z				z		enetra
Pyes	Building Rest	-	e			>	-			≻		To Pé
soulevard,	suo	Specific Design		Y/N/NA		Z	2			z		P = Unable
310 Lakes Boulevard, Pyes	Foundati	Conventional Shallow Foundation to	NZS 3604:2011	Y/N/NA		>	-			≻		Key: DCP = Tested with Dynamic Cone Penetration (Scala);
Property Address		Natural Topography Earthworked	Depth (m)				I			~		N/T = No
erty /		Nê Topc Earth	N/Y			Z	2			≻		l ;(ele
Prop	Subsurface data	Natural Topography Unworked		N/Y		Z	2			z		netration (Sc
181	Subsur	Subdivision Filling	Depth (m)			7	_			v		one Per
DP486		Subdi Fill	N/Y			>	_			≻		amic C
Lot 1001 DP486181		Shear Strength (kPa)	at 0.5m depth				7074			>202		with Dyn
	ŀ	Area (m²)				100	+			719		Tested
DP No:		Lot No:				500	202			503		Key: DCP =

INFRASTRUCTURE DEVELOPMENT CODE

SUMMARY OF GOTECHNICAL DATA FOR INDIVIDUAL LOTS

夫 Tauranga City

Version 1 1 July 2011 Appendix C - Pre Development Investigation Data

•		ht				aec	otechnics									
•				y		,				Tria	I Pit I	No.	7	P06		
E	n	ginee	eri	ng	Log	- T	rial Pit			She Proj	et ject N	lo:	1 (f 1 AUC130 8	86AF
Cli	ent:			THE	LAKE	S 201	2 LTD			Dat	e stai	ted:	1	4.3.201	3	
Pri	ncip	al:								Dat	e con	npleted	l: 1	4.3.201	3	
Pro	oject	:		THE		S STA	AGE 3 CONSTRUCTION			Log	ged b	by:	ŀ	B		
Tria	al pi	t location:		Refe	er to sit	te pla	n			Che	ecked	by:	F	RBT		
Equ	iipme	ent type:				-	Pit Orientation:	Easting: 368704.4	m		R.L.	Surface	:			
		ion dimensic		-	m wide		Vane No: DR2244	Northing: 799943.	7 m		Datu	ım:				
ex	cav	ation infor	mati	on			rial substance				5	5 m (
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material Soil - Soil type; colour, structure. plasticity, sensitivity. Secondary and Rock - Colour, fabric, rock type; disc information.	d minor components.	moisture condition	consistency/ density index	50 75 75 75 75 75 75 75 75 75	125 /peak) KPa 175 /peak) KPa	ado	structure litional obs	and servations	
		Sample 17		-	× × × × × × × × × × × × × × × × × × ×	OL ML	TOPSOIL SILT; light brown. Friable and dry.		D		•	×				-
Younger Ash		Sample 18		<u> 1</u>		ML	- becoming orange brown and moist		М							
Youn	Groundwater not encountered	Sample 19		2	× × × × × × × × × × × ×		when reworked.									_
	ot enc			-	× × × × × × × × × × × × × × ×		SILT with minor sand and trace clay; plasticity.									_
	ater n			-		SP	Fine to coarse SAND with trace silt; Occasional silty lenses. Sand is well									_
RA	ewpu			3			- becoming white/light brown below	3.2m.								
	Grou	Sample 20		-	x^ x_ x_	ML	Clayey SILT; brown. Medium plastici					UTP				_
sh							when reworked.	ly, very early groupy								_
Hamilton Ash				- <u>-</u>			- becoming orange brown and less s	stiff.								
lami		Sample 21		-												_
-				5	+ x- x-x x_ x_ x_ (<u>x_ x_</u> x											_
				-	-		(Target depth) RA = Rotoehu Ash Test pit TP06 terminated at 5 metres	s.								-
				6	-											-
5	Sketo	ch			1											
5	soil d	fication symb					vane shear (kPa) ● remoulded		T							
		on New Zeala		otechnic	cal Society In	c 2005	 × peak ≫× peak greater than 200kPa 	moisture D dry		VS		/ density	V		ry loose	
ι	50		ed sam		m diameter m diameter		UTP unable to penetrate water	M moist W wet		S F	1	soft firm	L	ID me	ose edium dense	
E	s	disturbed bulk samp	sample le	9	in uaneler		 ✓ 10/1/98 water level on date shown ✓ water inflow 	S saturated		St VSt H		stiff very stiff hard	D V		nse ry dense	
F		environme refusal	ental sa	ample			water outflow									

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C	;(offe	E١		γ	jec	otechnics			Tria	I Pit N			700	7	
							rial Pit			She				1 GEN	of 1	13086AF
Clie Prir	ent: ncip	al:		THE	LAKE	S 201	2 LTD			Date Date	e star e con	ted: npleted	d:	14.3. 14.3.	2013	
Pro Tria	-	: t location:			E LAKES er to sit		AGE 3 CONSTRUCTION			-	ged b cked	-		KB RBT		
Exc	avati	ent type: on dimensic ation infor		-	m wide	mato	Pit Orientation: Vane No: DR2244 rial substance	Easting: 368767.5 Northing: 799923.			R.L. Datu	Surface	9:			
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material Soil - Soil type; colour, structure. plasticity, sensitivity. Secondary and Rock - Colour, fabric, rock type; disc information.	d minor components.	moisture condition	consistency/ density index	25 50 vane shear	125 /peak) KPa 150 /peak) KPa			cture and I observation	ons
HA RA Younger Ash	Groundwater not encountered	Sample 22 Sample 23 Sample 24 Sample 25 Sample 26				OL ML ML SP	TOPSOIL SILT; light brown. Friable and dry. - becoming orange brown with trace below 1.0m. SILT with trace sand and clay; orang when reworked. SILT with minor sand; bright orange. Fine to coarse SAND with trace silt; Pumiceous, well graded. - becoming light brown/white below S Clayey SILT; brown. Medium plastic reworked. - becoming orange brown below 4.0 (Target depth) RA = Rotoehu Ash HA = Hamilton Ash Test pit TP07 terminated at 5 metres	ge brown. Greasy orange brown. 3.1m. ity and greasy when m.	M		• *	×				
c s b	oil de ased otes, 33	fication symb sscription on New Zeala samples, tes undisturbe	and Ge t s ed sam ed sam sample le	otechnic ple 50m ple 63m	cal Society In m diameter m diameter	c 2005	vane shear (kPa) ● remoulded × peak >×× peak greater than 200kPa UTP unable to penetrate water ✓ 10/1/98 water level on date shown ▶ water inflow water outflow	moisture D dry M moist W wet S saturated		consi VS S S St VSt H	r f s	// densit very soft soft irm stiff very stiff hard	-	VL L MD D VD	very loose loose medium d dense very dense	ense

TRIAL PIT TEST PITS 150313.GPJ COFFEY.GDT 29.4.13

C)(offe	Э١) c	jec	technics			Tria	l Pit No.	TP08	
							rial Pit			She		1 c	of 1 AUC13086AF
Clie	ent:			THE		S 201	2 LTD				e started:	15.3.201	3
Pri	ncip	al:								Date	e completed:	15.3.201	13
	ject			THE		S STA	GE 3 CONSTRUCTION				ged by:	RBT	-
	-									-			
		t location: ent type:		Rere	er to sit	e pia	Pit Orientation:	Easting: 368724 n	0	Che	cked by: R.L. Surface:	RBT	
	-	ion dimensio	ns. n	1 lona	m wide		Vane No: DR2244	Northing: 799993			Datum:		
_		ation infor				mate	rial substance	Noraling. Pooooo			Dulum.		
stratigraphy	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material Soil - Soil type; colour, structure. plasticity, sensitivity. Secondary an Rock - Colour, fabric, rock type; disc information.	Grading; bedding; d minor components. continuities, additional	moisture condition	consistency/ density index	25 25 75 100 (remoulded 125 /peak) kPa 155	structure additional ob:	
		Sample 27		-	$\overline{)}$	OL	Organic SILT with numerous fine roo	otlets; greyish brown.	D				-
Younger Ash	untered	Sample 28		<u>1</u> <u>-</u> <u>-</u> <u>2</u>		ML	 SILT with trace to minor clay, some to brown. Stiff, dry, friable. becoming moist, minor clay, occas 1.0m. becoming mottled yellow/orange brown and the source of the sourc	ional rootlets below rown below 1.3m.	M				
RA	not enco			-		SP	Fine to coarse SAND with trace silt; black flecks.	yellow/brown with					-
Ľ	Groundwater not encountered	Sample 30		3_		SP	Fine to medium SAND with minor sil Pockets rework to soft sandy silt with plastic. Silty CLAY; chocolate brown with wh	n some clay, slightly	M- W				
НА	G	Sample 31		4 <u></u>		ML	stiff in-situ, soft and with medium to I reworked. SILT with trace clay and trace fine so Very stiff to hard, non plastic and mo	and; yellowish brown.					- - - - -
		Sample 32		5 6		ML	SILT with minor clay; orangish brown clay, moderately plastic, soft to firm. (Target depth) RA = Rotoehu Ash HA = Hamilton Ash Test pit TP08 terminated at 5.2 metr						
(5	oil d	fication symb					vane shear (kPa) ● remoulded						
t n U	otes, ⁵⁰ S	on New Zeala samples, test undisturbe	t s ed sam ed sam sample le	ple 50m ple 63m	cal Society In m diameter m diameter	c 2005	× peak peak yeak greater than 200kPa UTP unable to penetrate water 10/1/98 water level on date shown water inflow water outflow	moisture D dry M moist W wet S saturated		consi VS S F St VSt H	istency/ density in very soft soft firm stiff very stiff hard	VL ve L lo MD m D de	ery loose ose edium dense ense ery dense

TRIAL PIT TEST PITS 150313.GPJ COFFEY.GDT 29.4.13



					y										N	lachir	ne Bo	oreh	ole	No.	CFA04	
Ε	n	gi	neer	'n	g	Lo	g -	Machine E	Bore	eho	ble	;				heet rojec	t No:				1 of 4 GENZTAUC	C13086A
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Prir	ncip	al:													D	ate c	omp	leteo	d:		7.3.2014	
Pro	jec	t:		S	TA	GE 3	- Z(ONE 2							L	ogge	d by:				SLC	
Ma Loc			orehole	С	res	t of v	ves	tern slope							С	heck	ed b	y:			RBT	
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Machine Borehole No. CFA05 **Engineering Log - Machine Borehole** Sheet 1 of 4 Project No: GENZTAUC13086AK THE LAKES LTD (2012) 7.3.2014 Client: Date started: Principal: 7.3.2014 Date completed: STAGE 3 - ZONE 2 SLC Project: Logged by: Machine Borehole Crest of western slope RBT Checked by: Location: Drill model & mounting: Flight auger JD2 Easting: 368826.5 m Slope: -90° R.L. Surface: 51 m Vane No: Hole diameter: 100 mm Drilling fluid: Northing: 800012.1 m Bearing: Datum: x/y = BOPC2000, z = Moturiki drilling information material substance rock mass defects Material Description defect description vane shear (remoulded /peak) kPa Material Description Soil name: plasticity or grading, colour, secondary components, Moisture, sensitivity, strength, Structure, bedding, comentation, defects. Origin, additional observations. Rock name; grain size & type, colour, fabric, inclusions & minor components. Weathering, moisture, strength, defects. recovery classification symbol consistency/ density index estimated defect number, type, orientation, shape g weathering spacing mm stratigrap moisture condition roughness, aperture, infill description (refer to defect graphic lo core recc recovery method % depth metres notes support water RQD samples description explanation sheet) 300 300 300 RL tests, etc general particular SILT, low plasticity, brown; trace fine D AD Ν sand 1 _50 **VOLCANIC ASHES** 2 _49 groundwater not encountered 3 48 Silty SAND, fine to coarse, pale М × brown × × × X × × Sandy SILT, non plastic, pale brown with orange brown mottles, sand is × 4 _47 fine to medium. Reworks to low plasticity. Silty SAND, fine to medium, dark × brown. Sandy SILT, low plasticity, dark brown (non organic), some clay, sand is fine to coarse (possible remnants of lower Hamilton Ash). MATUA SUB-GROUP -4.5m, becoming pale brown. X 5 _46 × Silty SAND, fine to medium, pale brown, pumiceous. × W Sandy SILT, low plasticity, pale grey brown, wet, sand is fine to coarse. -5.3m, dark brown and orange brown mottles and streaks М Clayey SILT, low to medium plasticity, pale grey. 6 classification symbols and weathering method water consistency/ density index auger drilling AD soil description UW unweathered 10/1/98 water level vs very soft based on Field Description of Soil and Rock, V slightly weathered moderately weathered highly weathered SW OB open barrel on date shown S soft MW π triple tube New Zealand Geotechnical Society Inc 2005 water inflow F firm HW w washbore partial drill fluid loss CW RS completely weathered residual soil 1 notes, samples, tests SI stiff support U₅₀ undisturbed sample 50mm diameter complete drill fluid loss VSt very stiff Ν nil rock ss strength С U₆₃ undisturbed sample 63mm diameter н hard casing EW extremely weak D disturbed sample moisture VL very loose VW W MS very weak weak moderately strong vane shear (kPa) N* SPT - sample recovered dry loose D . remoulded Nc SPT with solid cone Μ moist MD medium dense × peak w bulk sample wet D s vs strong very strong extremely stror Bs dense peak greater than 200kPa saturated VD Е environmental sample s very dense unable to penetrate UTP



Machine Borehole No. CFA05 **Engineering Log - Machine Borehole** Sheet 2 of 4 Project No: GENZTAUC13086AK THE LAKES LTD (2012) 7.3.2014 Client: Date started: Principal: 7.3.2014 Date completed: STAGE 3 - ZONE 2 SLC Project: Logged by: Machine Borehole Crest of western slope RBT Checked by: Location: Drill model & mounting: Flight auger JD2 Easting: 368826.5 m Slope: -90° R.L. Surface: 51 m Vane No: Hole diameter: 100 mm Drilling fluid: Northing: 800012.1 m Bearing: Datum: x/y = BOPC2000, z = Moturiki drilling information material substance rock mass defects Material Description defect description vane shear (remoulded /peak) kPa Material Description Soil name: plasticity or grading, colour, secondary components. Moisture, sensitivity, strength. Structure, bedding, comentation, defects. Origin, additional observations. Rock name; grain size & type, colour, fabric, inclusions & minor components. Weathering, moisture, strength, defects. recovery classification symbol consistency/ density index estimated defect number, type, orientation, shape weathering g spacing mm stratigrap moisture condition roughness, aperture, infill description (refer to defect graphic lo core recc recovery method % notes depth metres support water RQD samples description explanation sheet) 300 300 300 300 RL tests, etc general particular Clayey SILT, low to medium AD Μ Ν plasticity, pale grey. (continued) -6.0m, becoming medium plasticity 7 44 -7.5m, some manganese inclusions -7.8m, becoming brown orange with 8 _43 pale grey and dark brown manganese inclusions. groundwater not encountered MATUA SUB-GROU 9 42 -9.4m, becoming very dark brown with brown, pale brown, orange brown and pale grey mottles. Manganese rich lense @ <80%. 10 _41 ********************* ****** SILT, medium plasticity, orange, some clay and medium to coarse sand 11 _40 -11.6m, becoming brown with dark brown manganese deposits 12 30 weathering classification symbols and method water consistency/ density index auger drilling soil description AD UW unweathered 10/1/98 water level vs very soft V slightly weathered moderately weathered highly weathered based on Field Description of Soil and Rock, SW OB open barrel on date shown S soft MW π triple tube New Zealand Geotechnical Society Inc 2005 water inflow F firm HW w washbore partial drill fluid loss CW RS completely weathered residual soil _ notes, samples, tests SI stiff support U₅₀ undisturbed sample 50mm diameter complete drill fluid loss VSt very stiff Ν nil rock s strength С U₆₃ undisturbed sample 63mm diameter н hard casing EW extremely weak D disturbed sample moisture VL very loose VW W MS very weak weak moderately strong vane shear (kPa) N* SPT - sample recovered dry loose D . remoulded Nc SPT with solid cone Μ moist MD medium dense × peak w bulk sample wet D s vs strong very strong extremely stror Bs dense peak greater than 200kPa saturated VD Е environmental sample s very dense unable to penetrate UTP



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GROUP		ater not encountered			-	$\langle \times, \times \rangle$																
Ч Ч		enco			15	× × ×																
SUB-0		er not	SPT	<u>36</u>	15	<	× ×	-15.0m, becoming brown wi	ith dark													-
MATUA			0,1,2 N*=3		-	$\langle \times \rangle$	×	brown manganese mottles.									95					
Ξ		groundw			-	$\begin{pmatrix} \times & \times \\ \times & \times \end{pmatrix}$																
					-	$(\times \times)$	×															
				_35	16		× •															
						× × × × ×	*															-
			SPT		_	(* X *) (X * X (* X *)	<	-16.5m, poor recovery.														
			0,2,5 N*=7		_	$\langle \cdot \times \rangle$	*										80					
				_34	17	(\times,\times)												$\left \right $				
					_																	
					-	(× ^) (× × ×	×															
					-	× × × × ×	×															
					-		-															
	thod			33		lassific	ation s	ymbols and	water						COP	sistency/ o	lensit	v inde			thering	
AD OB	ор	iger d en ba	rrel		b		n Field	Description of Soil and Rock,			/1/98 w date s		vel		VS S		ery sof			UW SW MW	slightly weath	
Π W	wa	ple tul ashbo			_	lew Zea notes, s		eotechnical Society Inc 2005	$\blacktriangleright \triangleleft$		ter inflo rtial dri		oss		F St	fir	m			HW CW	/ highly weather / completely we	ered
sup N C	oport nil ca	ising			L	J ₅₀	undistu	urbed sample 50mm diameter urbed sample 63mm diameter	-		mplete				VSt H	ve	ery stiff ard	f		RS rock	residual soil k mass strength	
	ne she	ear (kl)	disturb	ed sample sample recovered	moist D	Jre di	ry				VL L	ve	ery loo ose	se		EW VW W		ak
×	pea			10ru-	В	NC Bs		th solid cone	M W	m w	noist ret				MD D	m	edium ense	dens	e	MS S	moderately st strong	rong
>>>> UTP			ater than 20 penetrate	JUNPA	E		enviro	nmental sample	S	Sa	aturate	d			VD	V6	ery der	nse		VS ES	very strong extremely stro	ong



	,		J	Π		У										M	achine	e Borel	nole N	o. C	FA05	
E	n	g	in	ieer					Machine E	Bore	h	ole)				neet oject l	No:		G	of 4 ENZTAUC	13086AF
Clie	ent	t:			7	ΉE	LAK	ES	LTD (2012)							Da	ate sta	rted:		7.	.3.2014	
Prir	nci	ipa	l:													Da	ate co	mplete	d:	7.	.3.2014	
Pro Ma			Bo	rehole	S	TAC	GE 3	- Z(ONE 2							Lc	gged	by:		S	LC	
Loc				renoie	C	cres	t of v	ves	tern slope							Cł	necke	d by:		R	BT	
				nounting:	Ŭ	0				isting: 36					e: -90°			. Surfac			Vane No:	
				100 mm		D	rilling fl mate		substance	orthing: 80	00012	.1 m		Bear	ring:		Dat	·	(= BOP		00, z = Moturiki ects	
aphy	1	Ť		notes		s	graphic log core recovery	classification symbol	Material Descriptio Soil name; plasticity or grading secondary components. Moisture, strength. Structure, bedding, cer defects. Origin, additional obse	, colour, sensitivity, nentation,	ture tion	consistency/ density index	hering ation	estii stre	mated ength	ne shear	(remoulded /peak) kPa		defe	ect ing	defect desc number, type, orient roughness, aper description (refe	tation, shape, rture, infill
strati	method	support		samples, tests, etc	RL	depth metres	grapl core	class symb	Rock name; grain size & type, col inclusions & minor components. V moisture, strength, defec	our, fabric, Veathering,	moisture condition	consi dens	weat	M S S S S S S	S S S S S S S S S S S S S S S S S S S	2 V SI SI SI SI SI SI SI SI SI SI SI SI SI	28 28 (Te	recovery RQD %	30 300 300	1000 3000	description explan particular	
	٩D		ountered	SPT 0,2,3 N*=5		-			Sandy Clayey SILT, mediun plasticity, brown and grey w brown manganese deposits medium to coarse. (continu	n ⁄ith dark s, sand is	W				mated ength	2		95	-		-	-
MATUA SUB-GROUP			groundwater not encountered		_32	19			Silty CLAY, medium to high	1	-											
M			ground	SPT 1,1,2 N*=3		-			plasticity, pale grey. - no recovery below 19.4m. CLAY continuation inferred 19.									20	-			-
					_31	<u>20</u>			EOBH, target depth. CFA05 terminated at 19.95	metres.												
																						-
					<u>_</u> 30	21																
						-																-
					_29	22																
					_28																	-
																						-
Merica AD AD OB TT W sup N C var ● × ≫	ppo ne s	aug ope tripl was ort nil cas shea	ar (kP oulded	rrel e e a)	27	s b N U U U U N N B	oil desc ased or lew Zea otes, sa 50 63 50 63 50 63 50 63 50 63 50 63 50 63 50 63 50 63 50 63 50 63 50 50 63 50 50 50 50 50 50 50 50 50 50 50 50 50	ription Field land G amples undistu undistu disturb SPT - s	Description of Soil and Rock, eotechnical Society Inc 2005 , tests Irbed sample 50mm diameter ribed sample 63mm diameter ed sample asample recovered th solid cone	water V M moistu D M W S	on wa pai cor ire di m w	date s ter inflo tial dri mplete y oist	ow I fluid I drill flu	oss	\ 5 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	/S 5 = 5t /St H /L	ver soft firm stiff ver har ver	y stiff d y loose se dium der	dex	weath UW SW MW HW CW RS rock I EW VW W MS S VS	unweathered slightly weather moderately we completely weather completely weather completely weather mass strength extremely weather we	athered ed athered k



C		U	Π	e	У										Machi	ne Bo	oreh	ole No). //	ИНЗ01
							g ·	- Machine	Bore	eho	ole	;			Sheet Projec					of 4 SENZTAUC13086AK
Clie	ent:			T	ΉE	LAK	ES	LTD (2012)							Date s	tarte	d:		1	5.1.2014
Pri	ncip	al:													Date o	compl	etec	ł:	1	5.1.2014
Pro	oject	:		S	TAC	GE 3	- Z	ONE 2							Logge	d by:			ĸ	(MJ
Ма	-	e Bo	orehole	С	res	t of	Sec	tion A-A							Check	-			R	BT
			mounting:						asting: 36	8841.	822 m	1	Slope	: -90°				: 53 m		Vane No:
Hol	e dia	meter	r: mm		D	rilling f	iuid:	Ν	Northing: 7	99939).797 r	n	Bearin	ng:	D	atum:	x/y	= BOP(C200	00, z = Moturiki
dr	illing	g inf	ormatio	n			1	substance			1	i			i	_	ock	mass	def	
stratigraphy	support	water	notes samples, tests, etc	RL	depth metres	graphic log core recovery	classification symbol	Material Descript Soil name; plasticity or gradin secondary components. Moistur strength. Structure, bedding, c defects. Origin, additional obs Rock name; grain size & type, c inclusions & minor components. moisture, strength, def	ng, colour, e, sensitivity, ementation, servations. colour, fabric, Weathering,	moisture condition	consistency/ density index	weathering alteration	estim stren	ated ngth	25 50 vane shear 100 (remoulded 125 /peak) kPa	175 recovery %	% Q	defe spaci mm	ng 1	defect description number, type, orientation, shape, roughness, aperture, infill description (refer to defect description explanation sheet) particular general
₽	ГТ С				-	\bigcirc	OL	Organic SILT, no plasticity odor, rootlets (TOPSOIL).	/, organic	М	F									_
				_52.5 _52.0		/x x x x x x x x x x x x x x x x x x x	ML	SILT, no plasticity, yellow- trace fine sand, minor roo - becoming orange-brown plasticity	brown, tlets.							67				- - - - - - - - - - - - - - - - - - -
				<u>5</u> 1.5	1.5	× × × × × × × × ×														-
			SPT		_	~ ~ ~ ~ × × × × × ×		- becoming pale brown & rootlets		M-W										_
			1,0,1 N*=1		_	× × × × × × × × ×		- increasing plasticity from 2.6m	1.5 to											-
				_51.0	2 <u>.0</u>															
VIC ASHES				_50.5	2 <u>.5</u>	*****		- becoming brown to oran black specks	ge-brown,							100				
				<u>5</u> 0.0	3 <u>.0</u>	× × × × × × × × ×														-
VOLCA			SPT		-	$X \times X$														-
			1,1,0 N*=1		-	× × × × × × × × ×														-
				_49.5	3 <u>.5</u>	× × × × × × × × ×														
						× × × × × × × × ×										100				
				10.0	4.0	× × × × × × × × × × × ×														-
				_49.0	- <u></u>	× × × × × × × × ×														
						<u>* * *</u>	SP	- increasing sand content SAND, fine to medium gra		1										-
				48.5	4 <u>.5</u>			grey, black & white specks silt.	s, some											-
			SPT		-		ML	Sandy SILT, no plasticity, yellow-brown, white & black	ck specks,	W	F-St									-
			9,11,8 N*=19		-		× ×	sand is fine grained.	. ,											-
				_48.0	5 <u>.0</u>		×									93				
					_		ML	SILT, pink-grey, low plasti	oity minor	_										-
				47.5	5.5	× × × × × ×	SP	orange streaks.			VL	-								-
me AD	thod	l Jger d	rilling	47.5	С	lassific oil des	ation	symbols and	water	<u> </u>		1			consistency/	densit	y inde		weath	hering unweathered
	pport ri pport ni ca ne she ren pea × pea	pen ba ple tul ashbo I asing ear (kl noulde ak ak gre	arrel be re Pa)	00kPa	b N U U U U N N	ased o lew Zea otes, s J ₅₀ J ₆₃) l ⁶³) t c s	n Field aland C ample undist disturt SPT - SPT w bulk s	Description of Soil and Rock, Geotechnical Society Inc 2005 s, tests urbed sample 50mm diameter urbed sample 63mm diameter bed sample sample recovered <i>i</i> th solid cone	Meta S	on wa pa coi ure di m w	/1/98 w date si ter inflo rtial dril mplete ry noist et aturate	hown ow I fluid I drill flu	oss	S F S V H V L L I	6 s = fi St s /St v H h /L v _ k MD n O c	rery soft oft irm atiff rery stiff aard rery loo bose nedium lense rery der	f se dens	e	SW MW HW CW RS	watered slightly weathered moderately weathered highly weathered completely weathered residual soil extremely weak very weak weak moderately strong strong very strong extremely strong



C		O	Π	e	У										Machine	e Bore	nole I	No. 🖊	ИН301
Ε	n	gir	neer	in	g I	Lo	g.	Machine E	Bore	eho	ole)			Sheet Project	No:			of 4 GENZTAUC13086AK
Clie	ent:			Т	HE	LAK	ES	LTD (2012)							Date sta	arted:		1	5.1.2014
Prir	ncip	al:													Date co	mplete	d:	1	5.1.2014
Pro	ject	:		S	ТАС	GE 3	- Z(ONE 2							Logged	by:		ĸ	(MJ
	chin atic		orehole	С	rest	tof	Sec	ion A-A							Checke	d by:		F	RBT
Drill	moc	lel & r	mounting:	T2 T	ractor	r Moun	nt	Ea	asting: 36	8841.8	822 m	1	Slope:	-90°		Surfac	æ: 53	m	Vane No:
_			r: mm		Di	rilling f			orthing: 7	99939	.797 r	n	Bearing	g:	Dat	-			00, z = Moturiki
dri	Illin	ginf	ormatio				i	substance Material Descriptic	on		. ×				۲D a		1	s def	ects defect description
stratigraphy	support	water	notes samples, tests, etc	RL	depth metres	graphic log core recovery	classification symbol	Soil name; plasticity or grading secondary components. Moisture strength. Structure, bedding, cer defects. Origin, additional obse Rock name; grain size & type, co inclusions & minor components. L moisture, strength, defect	, sensitivity, mentation, ervations. lour, fabric, Weathering,	moisture condition	consistency/ density index	weathering alteration	estima streng	ted gth ∞SS	25 50 vane shear 75 vane shear 100 (remoulded 125 /peak) kPa	recovery % RQD %	spa m	fect acing nm	number, type, orientation, shape, roughness, aperture, infill description (refer to defect description explanation sheet) particular general
VOLCANIC ASHES ⊣	ТС			_47.0	6.0		SP (cont)	SAND, fine to medium grai brown, mottled orange/blac (continued)		W	VL					93			
VOLCAN			SPT 1,1,0 N*=1	_46.5	6.5														
				_46.0	7.0		CH	Clayey SILT/Silty CLAY, mi high plasticity, trace fine sa - sand pockets, fine grained 6.6 to 6.7m	nd.		F					100			
				45.5	7.5		- - - - -												
			SPT 0,1,1 N*=2	45.0	8.0	<pre>< -X -X- -X- -X- </pre>													-
Ч				44.5	8.5	<pre> </pre>		- increasing sand content fi 8.5m	rom 8 to							100			
JA SUBGROU					9.0	<x -<u>×</u> (× </x 		 becoming pale grey, mind yellow-green mottles from 8 8.7m becoming dry to moist, no plasticity from 8.7m 	3.5 to	D-M	-								
MATUA			SPT 2,3,4 N*=7	_44.0	-	~_X ~_X ~_X ~_X													
				43.5	9 <u>.5</u>	- × - - × - - × - - × - - × -										73			
				_43.0	10 <u>.0</u> 	×- ×- ×-	· · · · · · · · · · · · · · · · · · ·	nale erange steining from	10 3 to										
			SPT 1,1,1 N*=2	_42.5	10 <u>.5</u> 		ML	- pale orange staining from 10.5m SILT, low plasticity, pink-gr mottled orange-brown, blac specks.	ey,	M-W	-					100			
AD OB TT W sup N C var ● × ≫>	oj tr w oport ni ca ne sh rer pe < pe	il asing ear (kl noulde ak ak gre	arrel be re Pa)	42.0	ci se bi N N U	assific oil des ased or ew Zea otes, s otes, s 50 63 * c s	cription n Field aland G amples undistu undistu disturb SPT - s SPT w bulk sa	Description of Soil and Rock, eotechnical Society Inc 2005 , tests Irbed sample 50mm diameter ribed sample 63mm diameter ed sample sample recovered th solid cone	water V M moister D M W S	on wat par cor u re dr m ww	date si ter inflo tial dril mplete y oist	ow I fluid le drill flu	oss	CCC VS F St VS H VL L MI D VI	sof firm St ver - ver loo D me der	y soft t f y stiff d y loose se dium der		UW SW MW HW CW RS	hering unweathered slightly weathered moderately weathered highly weathered completely weathered residual soil mass strength extremely weak wery weak weak weak woderately strong strong very strong extremely strong



)	U		Π(e	y										Machine	e Bo	reh	ole N	lo. /	MH301	
Ε	in	gi	n	eer	'n	g I	Lo	g ·	Machine I	Bore	eho	ole)			Sheet Project	No:				of 4 GENZTA	UC13086AK
Cli	ent:				Т	HE	LAK	ES	LTD (2012)							Date sta	rted	:		1	5.1.2014	!
Pri	incip	oal:														Date co	mple	eted	:	1	5.1.2014	!
Pr	ojec	t:			S	ΤΑ	GE 3	- Z(ONE 2							Logged	by:			K	(MJ	
	achir catio		Sore	hole	С	resi	tof	Sec	tion A-A							Checke	d by			R	RBT	
Dri	ll mo	del 8	k mo	unting:	T2 T	racto	Mour	nt	E	asting: 36	8841.	822 m	1	Slope:	-90°	R.L	. Sur	face	: 53 ı	n	Vane	No:
	le dia					D	rilling f			orthing: 7	99939	.797 r	n	Bearing	g:	Dat	+				00, z = Motur	iki
	riiin	ig ir	itor	matior	1			1	substance Material Description		1	. ×				a م ط	+	CK	mass			description
	method		sa	n otes amples, sts, etc	RL	depth metres	graphic log core recovery	classification symbol	Soil name; plasticity or grading secondary components. Moisture strength. Structure, bedding, ce defects. Origin, additional obse Rock name; grain size & type, cc inclusions & minor components. moisture, strength, defer	e, sensitivity, mentation, ervations. blour, fabric, Weathering,	moisture condition	consistency/ density index	weathering alteration	estima strenç ≧≷≥≊	ated gth ∽∑≌	25 50 vane shear 100 (remoulded 125 /peak) kPa	recovery %	RQD %	def spac mi	cing m	roughness description	orientation, shape, s, aperture, infill n (refer to defect explanation sheet) general
	TT C				_41.5	_	*****	ML (cont)	SILT, low plasticity, pink-gr mottled orange-brown, blac specks. <i>(continued)</i> - orange staining - becoming pale grey with o staining	ck	M-W	F					100					
				SPT 0,0,0 N*=0	_41.0		*****	ML	SILT, non to low plasticity, pink-orange with black & o staining, mottled grey & bla								0					
đ		15/1/2014			_40.0		*****		- grey silt mottles from 12.8 13.0m - trace fine sand	3 to							100					
TUA SUBGROUP		15		SPT 0,0,0 N*=0	_39.5 _39.0			SM	SILT, no plasticity, dark orange-brown with significa limonite staining, trace to n sand, very stiff to hard. San fragmented to angular, har pieces in silt/sand matrix.	ninor mple has rd & soft		S										
MATU					_38.5	 14 <u>.5</u>		×	Mixed silts & sands with sc seams, brown, dark orang soft, wet to saturated. Sam probably disturbed by SPT Sandy Clayey SILT, low pla pink-orange, dark orange	e & black; ple asticity,							27					
				SPT	_38.0	 15 <u>.0</u>		× × MH	sand is fine grained, dark orange-brown. - increasing clay content, h plasticity; minor sand - increasing dark orange si content, low to medium plas SILT, medium to high plast	and asticity												
				1,0,1 N*=1	_37.5	15 <u>.5</u>	* * * * * * * * * * * *		orange-grey, trace fine sar - some dark orange sand p	nd. bockets,							0					-
					_37.0		× × × × × × × × × × × × × × × × × × ×	SM MH	with some dark orange sta - becoming low to medium Silty SAND, fine to medium black, trace silt. - becoming orange-brown, black & orange	plasticity n grained, mottled	W	F					100					- - - -
	-				36.5		× × × × × × × × ×		SILT, medium to high plast pink-orange grey.	i											havin	-
AL OF TI W SU SU N C Va S X × ×	3 c tu v v pport n c n ne sh re pe × pe	auger open l riple t washt t nil casing mear (emoul eak eak g	barre tube bore kPa) ded reate	4)0kPa	s b N n U	oil des ased o ew Zea otes, s 50 63 * c s	criptio n Field aland G amples undistr disturb SPT - SPT w bulk sa	Description of Soil and Rock, eetechnical Society Inc 2005 s, tests urbed sample 50mm diameter urbed sample 63mm diameter ed sample sample recovered ith solid cone	water W M moistu D M W S	on wa par cor u re dr m w	/1/98 w date si ter inflo rtial dril mplete ry ioist et aturate	nown w I fluid Ia drill flu	oss	С	sof firm t stiff St ver har L ver loo: D me der	y soft y stiff d y loos se dium o	e dens		UW SW MW HW CW RS	highly we	eathered ely weathered y weathered soil n y weak k ely strong ng

coffey

	,					y										Machin	e Bo	oreho	ole No.	M	H301	
Ε	n	Q	gir	neer	'n	g	Lo	g ·	Machine	Bore	ehe	ole)			Sheet Project	No:			4 o GE	of 4 ENZTAUC1	3086AK
Clie	ent	t:			T	ΉE	LAK	ES	LTD (2012)							Date st	arteo	d:		15.	.1.2014	
Pri	nci	ipa	al:													Date co	ompl	eted	:	15.	.1.2014	
Pro					S	TAC	GE 3	- Z	ONE 2							Logged	l by:			KN	ſJ	
Ma				rehole	С	res	t of :	Sec	tion A-A							Checke	ed by	/:		RB	вт	
Drill	lmo	ode	el & r	nounting:	T2 T	racto	r Mour	nt	E	asting: 36	8841.	822 m	1	Slope:	-90°	R.	L. Su	rface	: 53 m		Vane No:	
		-		: mm		D	rilling f			lorthing: 7	99939).797 r	n	Bearin	ıg:	Da					, z = Moturiki	
dr	1111	ng	inte	ormation	1			i	substance Material Descripti	ion	1	<u> </u>				-D -	r	OCK	mass o	detec	cts defect descr	iption
stratigraphy	method	support	water	notes samples, tests, etc	RL	depth metres	graphic log core recovery	classification symbol	Soil name; plasticity or gradin secondary components. Moistur strength. Structure, bedding, cr defects. Origin, additional obs Rock name; grain size & type, c inclusions & minor components. moisture, strength, defe	ng, colour, e, sensitivity, ementation, servations. olour, fabric, Weathering,	moisture condition	consistency/ density index	weathering alteration	estima stren	ated igth ∽∑≌	25 50 vane shear 75 vane shear 125 /peak) kPa	recovery %	% Q	defect spacin mm	ng ''	umber, type, orienta roughness, aper description (refer description explana particular	ture, infill to defect
	Т	С		SPT 1,0,1 N*=1		1 1 1		МН	- increasing sand content - 50mm fine brown sand lenses/layers		W	F										-
				IN = I	_36.0	17 <u>.0</u>		<	- black specks, heavy oran staining Sandy SILT, medium to hi plasticity, dark pink-brown	igh												-
								<	orange staining, abundant specks; sand is fine to me grained, orange-brown.	t black							100					-
					_35.5	17 <u>.5</u>	$\langle \times \rangle$		- decreasing sand content - becoming low plasticity, of	dark												
						-			brown, black specks and o mottles	orange												-
ЧО					_35.0	18 <u>.0</u>		< <														-
MATUA SUBGROUP				SPT		_	× × × × × ×	MH	SILT, medium to high plas pink-orange, some black r													_
A SU				0,0,0 N*=0		_	(-
ATU					_34.5	18 <u>.5</u>	* * * * * * * *															
Z							××××× ×××××										100					-
					<u>34.0</u>	19 <u>.0</u>		ML	 increasing sand content Sandy SILT/ Silty SAND, I 	ow												
						-			plasticity, pink-orange brow & black specks, sand is fir													_
						_	$\langle \times \rangle$	<	medium grained. - increasing sand content,	orange &												-
					<u>3</u> 3.5	19 <u>.5</u>	(\hat{x})	< <	black staining	-							┢					
				SPT 1,1,3		_	× × × × > × ×										87					-
				N*=4	33.0	20.0		<														_
					_00.0				EOBH @ 19.95m, target of TS = TOPSOIL	-												
						_			MH301 terminated at 19.9	5 metres.												-
					<u>32.5</u>	20 <u>.5</u>																
						-																-
						01 0																-
					_32.0	21 <u>.0</u>																
						-																_
					<u>3</u> 1.5	21 <u>.5</u>																-
						-																-
						-																-
me	tho	d			31.0	22.0 c	lassific	ation	symbols and								lanalt	, in ala	.	/eather	ring	
N C	ppo nes r P × P	ope trip wa ort nil cas shea ceal	k grea	rrel pe re Pa)	00kPa	b N U U N	otes, s otes, s 50 63 (* Ic s	n Field aland G ample undist disturk SPT - SPT w bulk s	Description of Soil and Rock, seotechnical Society Inc 2005 s, tests urbed sample 50mm diameter urbed sample 63mm diameter sed sample sample recovered ith solid cone	water	on wa pa co ure d n w	/1/98 w date sl ter inflo rtial dril mplete ry noist ret aturated	nown w I fluid Ia drill flu	oss	V S S V H V L D	i sc fin St sti St ve I ha 12 ve Io 10 m	ry sof ft m	t se dens	USS≥HCR CR EVS≥S S≥S S≥S S≥S S	EW /W V //S	unweathered slightly weather moderately wea highly weathere completely wea residual soil ass strength extremely weak very weak weak moderately stro strong very strong extremely stron	athered ed thered

Appendix D - Post Development Investigation Data



THE LAKES client:

principal:

project: THE LAKES STAGE 3GH

Contro of lot 112

Borehole ID.	HAL413
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	17 Aug 2016
date completed:	17 Aug 2016
logged by:	ODS
checked by:	RBT

locati		<u></u>	ntre of l	ot A	112					obor		-	RBT
locatio				014	13						cked		
positio		t Spe	cified					surface elevation: Not Specified		gle from I			
drill mo								drilling fluid:	hol	e diamet	er : 5() mm	vane id.: SL588
drillin	-	ormati	on			mate		ostance			_		1
method & support	 penetration 3 	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture	consistency / relative density	v ⊕re €	ane near ^{moulded} peak (Pa)	structure and additional observations
1					_	$\left \right\rangle$		ORGANIC SILT: non plastic, black.	D to		5		TOPSOIL
			VS >202 kPa VS 190/ 41 kPa		0.5-			SILT: non plastic to low plasticity, orange brown with mottled grey and brown, with trace fine to coarse grained sand. SILT: non plastic to low plasticity, pale brown, with	/ м	_		 @ @	FILL MATUA SUBGROUP
			VS 160/ 18 kPa		-			trace fine to coarse grained sand and with trace clay. 0.6 m: with minor to some fine to coarse grained sand				 	
			VS >202 kPa VS >202 kPa		1.0— - -			0.8 m: with minor to some fine grained sand SAND: fine to coarse grained, pale brown, with trace silt. Clayey SILT: low to medium plasticity, brown, with			I.	 @ 	
z		Not Encountered	VS >202 kPa VS >202 kPa		- 1.5 -			\trace fine grained sand. SILT: low plasticity, orange brown, with trace clay and with trace fine grained sand.	/			• •	
z		Not E	VS >202 kPa		- - 2.0			1.8 m: with some clay 2.0 m: sand becomes absent				 🏵	
			VS 163/ 46 kPa								 ⊕ 	 @ 	
			VS >202 kPa VS 122/		-			2.5 m: low to medium plasticity				() 	
			32 kPa VS >202 kPa		3.0-							© ⊕	
			VS 178/ 46 kPa					Hand Auger HAL413 terminated at 3.5 m Target depth			 ⊕ 	 	
					4.0								
					- - 4.5						I.		
					- - 5.0								
AS HA V	d auger auger hand a washb hand a	screwi uger ore		M r C c pen	port mud casing etration		nil istance g to	B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) D	soi bas Class oisture dry	cation syn descripti ed on Unit fication Sy	on fied	ž.	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable
e.g. 3	bit shơ AD/T blank t TC bit V bit		suffix	wate	■ 10-0 leve	Oct-12 wa el on date er inflow er outflow	ater shown	N standard penetration test (SPT) M N* SPT - sample recovered W Nc SPT with solid cone S VS vane shear; peak/remouded (kPa) W R refusal W HB hammer bouncing	satur p plast	ated c limit			Fb friable VL very loose L loose MD medium dense D dense VD very dense



THE LAKES client:

principal:

project: THE LAKES STAGE 3GH

Centre of lot 415 location:

location:	Ce	ntre of	lot 4	15					check	ed by	: RBT
position: N	-	cified					surface elevation: Not Specified	•	e from ho		
Irill model:		-					drilling fluid:	hole	diameter	: 50 m	m vane id.: SL588
support support 2 penetration	vater	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	vane shea ⊕remoule ⊚peak (kPa) ਨੂੰ 02	additional observations
	Î Î			-	Γ, Ι , Ι , Ι , Ι , Ι , Ι , Ι , Ι		ORGANIC SILT: non plastic, black.	D	VSt to H		TOPSOIL
	 	VS >202 kPa VS >202 kPa		- - 0.5			SILT: non plastic to low plasticity, orange brown, with trace fine grained sand. Clayey SILT: low to medium plasticity, brown.	D to M	1		
 z	Encountered	VS >202 kPa VS >202 kPa		- - 1.0			1.0 m: becoming orange brown, low plasticity				
	 	VS >202 kPa	a	- 1.5— - -			1.8 m: becoming medium plasticity				1 1 1
	i I	VS 122/ 29 kPa		2.0-						 ⊕ © 	
- V		VS 102/ 42 kPa					Hand Auger HAL415 terminated at 2.5 m			 ⊕ ∳ ∳	
							Target depth				
				4.0							
method AD auge AS auge HA hanc W wast	er drilling er screwi d auger nbore d auger		M i C d	port mud casing etration	I	l nil sistance og to al	HP hand penetrometer (kPa) N standard penetration test (SPT)	soil c based Classifie moisture D dry M moist	ation syml lescription d on Unifie cation Syst	bol & n d	Consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable
* bit sl e.g. AD/1 B blan T TC b V V bit	k bit bit	suffix		■ 10-0 leve	Oct-12 w el on date er inflow er outflow	e shown	Nc SPT with solid cone VS vane shear: peak/remouded (kPa)	W wet S saturat Wp plastic WI liquid li	limit		VL very loose L loose MD medium dense D dense VD very dense

Borehole ID.

sheet:

project no.

date started:

logged by:

date completed:

HAL415 1 of 1

17 Aug 2016

17 Aug 2016

ODS

GENZTAUC13086AP



client: THE LAKES

principal:

project: THE LAKES STAGE 3GH

location: Centre of lot 417

Borehole ID.	HAL417
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	17 Aug 2016
date completed:	17 Aug 2016
logged by:	ODS
checked by:	RBT

positio	on: I	Not	Spec	ified					surface elevation: Not Specified	angle	from h	orizontal	l: 90°
drill m								<u></u>	drilling fluid:	hole of	diamete	er : 50 mi	m vane id.: SL588
drilli			matio	on			mate	erial sub				-	
method & support	1 2 penetration		water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	vane shear ⊕remould ⊚peak (kPa)	additional observations
						-	$\left \right\rangle$		ORGANIC SILT: non plastic, black.	D	St to VSt		TOPSOIL
				√S >202 kPa VS 165/ 25 kPa		- 0.5 — - -			SILT: low plasticity, orange brown, with minor clay and with trace manganese. 0.5 m: with some clay. Becomes greasy when reworked	y D to M			MATUA SUBGROUP
			Not Encountered	VS 125/ 15 kPa		- 1.0			0.9 m: with trace fine to coarse sand 1.0 to 1.6 m: sensitive when disturbed			⊕ ⊕ ●	İ.
– HA – – – – – – – – – – – – – – – – – –			Not Enco	VS 85/ 15 kPa		-			1.2 m: sand becomes absent			⊕ @ 	
				VS 173/ 58 kPa		1.5						 ⊕ ©	
				VS 122/ 32 kPa		2.0-			1.8 m: becoming pinky brown and sensitive when disturbed	1		 ⊕ ⊙	
				VS 79/ 24 kPa VS 98/		-			2.1 m: becoming pink			⊕ <mark>`</mark> ⊙	
						3.0 -			Hand Auger HAL417 terminated at 2.5 m Target depth			Of O I	
						3.5 - - 4.0 -							
						- 4.5 — - -							
meth	 				sup	5.0 — - port			samples & field tests	classificat			
AD AS HA W HA	aug aug han was		e		M i C d	mud casing etration		I nil sistance ng to al	B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT)	based Classifica moisture D dry M moist	escriptic on Unific ation Sys	ed	VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable
* B T V	AD/	/T nk bit bit	n by s	suffix		✓ 10-0 leve wate	Oct-12 w el on date er inflow er outflov	e shown	N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	W wet S saturate Wp plastic li WI liquid lin	mit		VL very loose L loose MD medium dense D dense VD very dense



THE LAKES client:

principal:

project: THE LAKES STAGE 3GH

Contro of lot 110

Borehole ID.	HAL419
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	17 Aug 2016
date completed:	17 Aug 2016
logged by:	ODS
checked by:	RBT

o o - 1	0.0-	<u>^</u>	ntro of		110						a by.	
ocat			ntre of l	οτ 4	•19						ked by	
	on: No	t Spe	cified					surface elevation: Not Specified	Ũ	from ho		
irill m	odel:							drilling fluid:	hole of	diameter	r : 50 m	m vane id.: SL588
drilli	ng info	ormat	on			mate		ostance	_			
support	¹ 2 penetration 3	water	samples & field tests	RL (m)	depth (m)	graphic log	class ification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	vane shear ⊕ remould ⊚ peak (kPa)	additional observations
1					_	$\left \right\rangle$		ORGANIC SILT: non plastic, black.	M	St to VSt		TOPSOIL
			VS >202 kPa	l	-	$\stackrel{ }{\longrightarrow}$		SILT: non plastic to low plasticity, orange brown	-	vor		
			VS 112/ 19 kPa		- 0.5			with mottled brown and grey, with trace fine grained sand. SILT: low plasticity, orange brown, with some clay and with trace fine to coarse grained sand.	/		 ⊕ ©	MATUA SUBGROUP
		ba	VS 85/ 15 kPa					0.8 m: with trace manganese 0.9 m: becomes sticky/greasy when reworked			+ ⊕ •	
- N		Not Encountered	VS 83/ 19 kPa		-						 ⊕ •	
		N N	VS 117/ 35 kPa		1.5						 ⊕	
			VS 124/ 29 kPa								⊕ ⊚	
			VS 112/ 18 kPa		2.0			Clayey SILT : low plasticity, pink orange-brown, with trace fine grained sand. Sticky.			 ⊕ © 	
			VS 102/ 26 kPa		- - -2.5			Hand Auger HAL419 terminated at 2.5 m			 	
					-			Target depth				
					3.0 — -							
					-							
					- 4.0							
					- - 4.5							
					-							
					- 5.0							
meth AD AS HA M HA	od auger auger hand a washb hand a	screwi luger ore		M r C c	port mud casing etration		nil istance g to	HP hand penetrometer (kPa) D	based Classifica oisture dry	tion sym escription on Unifie ation Sys	n d	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Eb finition
e.g. 3 7	bit sho AD/T blank I TC bit V bit		suffix	wate	Land terms to the second seco	Oct-12 wa el on date er inflow er outflow	ater shown	N standard penetration test (SPT) M N* SPT - sample recovered W Nc SPT with solid cone S VS vane shear; peak/remouded (kPa) W R refusal W HB hammer bouncing W	/ wet saturate /p plastic li	imit		Fb friable VL very loose L loose MD medium dense D dense VD very dense



client: THE LAKES

principal:

project: THE LAKES STAGE 3GH

location: Centre of lot 420

Borehole ID.	HAL420
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	17 Aug 2016
date completed:	17 Aug 2016
logged by:	ODS
checked by:	RBT

ocation:	Ce	ntre of l	ot 4	20					chec	ked I	oy:	RBT
position: N	ot Spe	cified					surface elevation: Not Specified	angle	e from h	orizor	ntal:	90°
drill model:							drilling fluid:	hole	diamete	r : 50	mm	vane id.: SL588
drilling inf	ormat	ion			mate	erial sub	ostance					
support support penetration	, water	samples & field tests	RL (m)	depth (m)	graphic log	class ification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	sh ⊕rem ⊚p	ne ear ^{oulded} eak Pa) 05	structure and additional observations
				-			ORGANIC SILT: non plastic, black.	D to N				TOPSOIL
		VS >202 kPa VS >202 kPa		- - 0.5 - -			SILT: non plastic to low plasticity, orange brown, with trace fine grained sand. 0.5 m: with trace clay	M	_		• - •	YOUNGER ASH DEPOSIT
		VS >202 kPa		-						11		
 z	Encount	VS 177/ 29 kPa		1.0— - -			SILT: non plastic to low plasticity, orange brown, with trace fine to coarse grained sand, with trace clay and with trace manganese. Greasy when reworked.			 ⊕ 	0	MATUA SUBGROUP
		VS 98/ 26 kPa		1.5-			Sandy SILT: non plastic, orange brown, sand is fine to coarse grained.		St	 ⊕ ©		
		VS 78/ 26 kPa		-			SILT: low plasticity, orange brown, with minor cla and with trace fine to coarse grained sand.	ay		 ⊕ ⊙ 		
		VS 71/ 24 kPa		2.0						 ⊕(●) 		
		VS 71/ 25 kPa		2.5								
				3.0			Hand Auger HAL420 terminated at 2.5 m Target depth					
				- 3.5— - -								
				4.0								
				4.5 — - -								
				- 5.0— -							Ϊİ.	
AS auger HA hand V wash	r drilling r screwi auger bore auger		pen	port mud casing etration		I nil sistance ng to al	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT)	based Classific moisture D dry M moist	tion sym lescriptic d on Unifie cation Sys	o n ed		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable
bit sh e.g. AD/T blank T TC bi V bit		suffix	wat	■ 10-0 leve	Oct-12 w el on date er inflow er outflow	e shown	N* Standard policitation (science) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	W wet S saturat Wp plastic WI liquid lii	limit			VL very loose L loose MD medium dense D dense VD very dense



THE LAKES client:

principal:

project: THE LAKES STAGE 3GH

Centre of lot 424 location:

Borehole ID.	HAL424
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	17 Aug 2016
date completed:	17 Aug 2016
logged by:	ODS
checked by:	RBT

location:	: L	en	ntre of l	OT 4			checked by: RBT											
position: I	ition: Not Specified surface elevation: Not Specified angle from										ngle from horizontal: 90°							
drill mode	el:							drilling fluid:	hole	diamete	er : 5	50 r	mm	vane id.: SL588				
drilling i	inform	atic	on			mate	erial sub	stance						1				
	support of tiepport br>tiepport t				depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	Ð	van she remoi © pei (kPa Q	ar ulded ak	structure and additional observations				
			/S >202 kPa		-	$\left \right\rangle$		ORGANIC SILT: non plastic, black.	М	VSt to H)			TOPSOIL				
			VS 148/		- 0.5			SILT : low plasticity, orange brown, with trace fine grained sand and trace clay.					¶ 	YOUNGER ASH DEPOSIT				
		nan	41 kPa VS 139/ 19 kPa					0.7 m: with minor clay. Low to medium plasticity										
2 2			/S >202 kPa		-													
			/S >202 kPa		- 1.5 -			1.5 m: with trace clay and with trace fine grained sand. Non to low plasticity						 @ 	 @	 •		
				- 2.0			SILT: non plastic, orange brown, with some fine to coarse grained sand. SAND: fine to coarse grained, yellow brown, with trace silt.				 		MATUA SUBGROUP					
			VS 173/ 46 kPa VS 146/ 29 kPa		-		1.9 m: with some silt SILT : non plastic to low plasticity, brown, with trace fine to coarse grained sand and with trace clay. Sticky.	e		 ⊕ 		 0 						
			20 11 0		2.5 - - - 3.0			Hand Auger HAL424 terminated at 2.5 m Target depth				+@ 						
					-													
					3.5							 	 					
					4.0													
	4.		- 4.5															
					5.0-													
AS aug HA han W was	uger drilling* uger screwing* and auger ashbore and auger		mud casing		l nil sistance ng to	HP hand penetrometer (kPa)	base Classifi moisture D dry	ation syn descripti d on Unif cation Sy	nbol on ied	&	<u> </u>	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Check first test test						
e.g. AD/ B blar T TC	bit shown by suffix g. AD/T blank bit		Oct-12 w	efusal N standard penetration test (SPT) M 12 water N* SPT - sample recovered W 12 water Nc SPT with solid cone S date shown VS vane shear; peak/remouded (kPa) Wp flow R refusal With solid cone With solid cone		W wet	limit				Fb friable VL very loose L loose MD medium dense D dense VD very dense							



client: THE LAKES

principal:

project: THE LAKES STAGE 3GH

location: Centre of lot 426

Borehole ID.	HAL426
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	17 Aug 2016
date completed:	17 Aug 2016
logged by:	ODS
checked by:	RBT

positi	ioi	n: Not Specified surface elevation: Not Specified									angle from horizontal: 90°				
drill n				opo	, nou					drilling fluid:	hole diameter : 50 mm vane id.: SL588				
drill	lin	ng ir	nfor	mati	on			mate	erial sub	stance					
method & support	support a support a support a vater depth (m) graphic log graphic log				graphic log	class ification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	sh ⊕rem ⊚p	ane ear ^{noulded} peak Pa) 00	structure and additional observations			
	'				VS >202 kPa		_	$\left \right\rangle$		ORGANIC SILT: non plastic, black.	D to N				TOPSOIL
			 		VS >202 kPa		- 0.5			SILT : non plastic to low plasticity, orange brown with trace fine grained sand.	n, M	_		۱Ŷ	YOUNGER ASH DEPOSIT
				untered	VS 156/ 35 kPa		- - 1.0			0.9 m: with trace clay. Low plasticity			 	 	-
HA H	:			Not Encountered	VS >202 kPa		- - 1.5			1.2 m: sand becomes absent1.4 m: with minor to some clay. Low to medium plasticity					-
			 		VS 197/ 58 kPa		- - - 2.0-			,			 ⊕ 		
			 		VS >202 kPa		2.0						1	 @	
							- <u>2.5</u> - - - 3.0 -			Hand Auger HAL426 terminated at 2.5 m Target depth					
							- - 3.5 - -								-
							4.0								-
										-					
			Ì				- 5.0								-
meth AD AS HA W HA	AS auger screwing* C casing HA hand auger W washbore penetration			l nil sistance ng to	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT)	based	tion sym lescriptic d on Unific cation Sys	o n ed		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable					
* e.g. B T V		AD/	T 1k bit bit		suffix	wate	✓ 10-0 leve wate	Oct-12 w	ater e shown	N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	W wet S saturat Wp plastic Wl liquid li	limit			VL very loose L loose MD medium dense D dense VD very dense



client: THE LAKES

principal:

project: THE LAKES STAGE 3GH

location: Centre of lot 428

Borehole ID.	HAL428
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	17 Aug 2016
date completed:	17 Aug 2016
logged by:	ODS
checked by:	RBT

positi	ior	n· N	lot 9	Snor	ified			surface elevation: Not Specified	angle from horizontal: 90°							
drill n				spec	lineu					drilling fluid:		-	diamete			
drill	lin	ig in	for	nati	on			mate	erial sub	-				-	-	
method & support	:	¹ 2 penetration		water	samples & field tests	RL (m)	depth (m)	graphic log classification symbol		material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture	moisture condition		⊕ re €	vane hear moulde peak kPa)	
1			T				_	$\left \right\rangle$		ORGANIC SILT: non plastic, black.		o M	H SA consistency / of relative density			TOPSOIL
			 		VS >202 kPa	a	- - 0.5			SILT: non plastic to low plasticity, orange brown with trace fine grained sand.	n, I	М			 ¶ 	YOUNGER ASH DEPOSIT
				Not Encountered	VS >202 kPa	a	- - 1.0			0.8 m: with fine grained sand					 ¶ 	
- HA -			 	Not End	VS 156/ 44 kPa		- - 1.5			1.4 m: with minor clay. Low plasticity				⊕ 	 • 	
	I I VS >202 kPa - I I VS >202 kPa - I I 2.0 - I I VS 166/ I I 44 kPa I I VS 182/ - I 109 kPa 2.5				- - 2.0											
					-			2.2 m: becomes low to medium plasticity				1				
										Hand Auger HAL428 terminated at 2.5 m Target depth	class	ificat	tion sym			
meth AD AS HA W HA * e.g. B T V	NS auger screwing* AA hand auger V washbore HA hand auger bit shown by suffix B blank bit T C bit			ater e shown	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	si Das moistur D dry M mo W wei S sat Wp pla	oil de ased ssifica e ist	escriptio on Unific ation Sys	n ed	-	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense					



THE LAKES client:

principal:

CDF_0_9_06_LIBRARY.GLB rev:AT_L0g_COF_BOREHOLE: NON CORED_13086AP - STAGE 3GH - ODS.GPJ_<<Pre>CDF_00912017 09:48

project: THE LAKES STAGE 3GH

locati	ion:	Ce	ntre of l	ot 4	30					checl	ked	by:	RBT
positic	on: No	Spe	cified					surface elevation: Not Specified	angle from horizontal:			90°	
drill m							drilling fluid: hole diameter : 50 mm				vane id.: DR2244		
drilli	ng info	rmati	on			mate		ostance					
method & support	1 2 penetration 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	⊕ rei ⊛	ane near ^{moulded} peak (Pa)	
					-	$ \rangle$		ORGANIC SILT: non plastic, black.	D to M	VSt			TOPSOIL
			VS >182 kPa VS >182 kPa		- - 0.5			SILT: non plastic, orange brown, with minor fine grained sand.					FILL -
			VS >182 kPa VS >182 kPa		- - 1.0-			0.6 m: becoming fine to medium grained sand SILT: non plastic, black, with minor fine to medium			1		-
– HA – – – – – – – – – – – – – – – – – –		Not Encountered	VS >182 kPa VS 164/ 29 kPa		- - - 1.5-			\grained sand. SILT: non plastic, orange brown with mottled brown, with minor fine to medium grained sand. becoming grey brown with minor fine grained sand	M		 ₽		YOUNGER ASH DEPOSIT
5 5 5			VS 148/ 36 kPa VS 158/ 30 kPa VS 166/ 30 kPa		 2.0 				M to W		⊕ ⊕ ⊕	 • • • • •	-
			VS 91/ 24 kPa		-2.5 			Hand Auger HAL430 terminated at 2.5 m Target depth					
metho AD AS HA W HA * e.g. B T V	AS auger screwing* HA hand auger W washbore HA hand auger * bit shown by suffix e.g. AD/T B blank bit T TC bit			ater shown	HP hand penetrometer (kPa) D N standard penetration test (SPT) M N* SPT - sample recovered W Nc SPT with solid cone S	based Classifica o dry 1 moist V wet s saturate Vp plastic li	d mit	n ed	*	consistency / relative densityVSvery softSsoftFfirmStstiffVStvery stiffHhardFbfriableVLvery looseLlooseMDmedium denseDdenseVDvery dense			

Borehole ID.	HAL430
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	17 Aug 2016
date completed:	17 Aug 2016
logged by:	NM
checked by:	RBT



THE LAKES client:

principal:

THE LAKES STAGE 3GH project:

location:	Cer	ntre of l	lot 4	32						checl	ked	by:	RBT	
position: No	t Spec	ified					surface elevation: Not Specified	angle from horizontal: 90°						
drill model:							drilling fluid:	hole diameter : 50 mm vane id.: SL588						
method & support 2 penetration 3	a E samples & C				graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components		moisture condition	consistency / relative density	⊕re ⊛	rane hear moulde peak kPa)		
↑ ↑	-			-	$ \rangle$	0.0	ORGANIC SILT: non plastic, black.		D	VSt	П		TOPSOIL	
		VS 187/ 46 kPa VS 156/ 38 kPa		- - 0.5			SILT: low plasticity, orange brown, with trace fine grained sand and with trace clay.	C	D to M		- - - - - - - - - - - - - -	 [©] 		
	tered	VS 122/ 26 kPa VS 134/		- - 1.0							- Φ 	 © 		
 4 z 	Not Encountered	29 kPa VS 156/					1.2 m: with some clay and with trace fine to coarse grained sand	•			⊕ 	9 		
	44 kPa 1.5-			- 1.5 - -					⊕ 			(P) (C)		
		VS 187/ 44 kPa		- - 2.0							 	 ©	 	
		VS 156/ 58 kPa					SAND: fine to coarse grained, orange, with trace silt. SILT: non plastic to low plasticity, pale brown with		М		 ₽	 	ROTOEHU ASH	
				2.5 - - - - - - - - - - - - - - - - - - -			mottled orange brown, with minor clay and with trace fine to coarse grained sand. Hand Auger HAL432 terminated at 2.5 m Target depth	Class	ssificat	ion sym				
AS auger HA hand a W washb HA hand a * bit sho e.g. AD/T B blank I T TC bit	D auger drilling* S auger scrivening* A hand auger / washbore A hand auger / washbore A hand auger / washbore bit shown by suffix g. AD/T bit hat			ater e shown	HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear: peak/remouded (kPa)	Cl moist D d M n W w S s Wp p	soil de based d lassifica	scriptio on Unifie tion Sys	n ed	×	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense			

Borehole ID. HAL432 1 of 1 sheet: GENZTAUC13086AP project no. date started: 17 Aug 2016 date completed: 17 Aug 2016 logged by: ODS



THE LAKES client:

principal:

project: THE L

Centre location:

project:	TH	IE LAKE	LAKES STAGE 3GH						logge	ed by:	ODS
location:	Ce	ntre of l	lot 4	134					chec	ked by:	RBT
position: No drill model:	ot Spe	cified				•				orizontal: r : 50 mm	
drilling info	ormat	ion			mate	erial sub					
method & support ¹ ² penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	Vane shear ⊕ remoulded ⊚ peak (kPa) 00 00 000 00 000 000	structure and additional observations
HA HI H HI H H HI	Not Encountered	VS >202 kPa VS >202 kPa VS >202 kPa VS 166/ 32 kPa VS 148/ 29 kPa VS 187/ 44 kPa VS 122/ 38 kPa VS 96/ 24 kPa					SILT: non plastic, brown with mottled orange brown, with trace fine grained sand. SILT: non plastic, orange brown, with trace fine to medium grained sand. 0.9 m: with minor clay, low plasticity 1.5 m: with trace fine grained sand 2.4 m: with trace fine to coarse grained sand Hand Auger HAL434 terminated at 2.5 m Target depth	D to M	VSt	$\begin{array}{c} & & & \\ & & & & \\ & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & &$	YOUNGER ASH DEPOSIT

Borehole ID.

sheet:

project no.

date started:

date completed:

HAL434 1 of 1

18 Aug 2016 18 Aug 2016

GENZTAUC13086AP

₹ 10/01/2017 09:48 CDF_0_9_06_LIBRARY.GLB rev:AT Log_COF BOREHOLE: NON CORED_13086AP - STAGE 3GH - ODS.GPJ

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



client: THE LAKES

principal:

project: THE LAKES STAGE 3GH

location: Centre of lot 436

Borehole ID.	HAL436
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	18 Aug 2016
date completed:	18 Aug 2016
logged by:	ODS
checked by:	RBT

locatio	on:	Ce	ntre of l	lot 4	36					check	ed	by:	RBT
position	n: No	Spec	cified					surface elevation: Not Specified	angle	from ho	orizo	ntal:	90°
drill mo	del:							drilling fluid:	hole	diameter	r: 50) mm	vane id.: SL588
drilling	g info	rmati	on			mate	rial sub	stance					
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	⊕rer ⊛	ane lear noulded peak Pa)	structure and additional observations
	 				-	$\left \right\rangle$		ORGANIC SAND: non plastic, black.	D to M				TOPSOIL
			VS >202 kPa	a	- 0.5			SILT : non plastic to low plasticity, orange brown with mottled grey and brown, with trace to minor fine to coarse grained sand.				 •	FILL
			VS >202 kPa		- - 1.0			SILT : non plastic to low plasticity, orange brown, with trace fine grained sand.	М	-		 •	YOUNGER ASH DEPOSIT
z		Not Encountered	VS >202 kPa VS 192/ 49 kPa	3	- - 1.5-							• 	
			VS 161/ 36 kPa		-			1.5 m: with trace clay. Low plasticity1.8 m: with minor clay.			 		
			VS 185/ 39 kPa		2.0						 ⊕ 	 @ 	
	 		VS 146/ 31 kPa		- 2.5			Hand Auger HAL436 terminated at 2.5 m Target depth			⊕ - -		
					- - 3.0-								
					- - 3.5—								
					4.0-								
					- - 4.5								
					- - 5.0						i i		
AS a HA h W v	nod auger drilling* auger screwing* hand auger			ling* M mud N nil rewing* C casing ler e penetration			istance	B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) D	classification symbol & soil description based on Unified Classification System moisture				consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Eb fible
e.g. AD/T B blank bit T To hit			Oct-12 wa el on date er inflow er outflov	ater shown	N standard penetration test (SPT) M N* SPT - sample recovered W Nc SPT with solid cone S VS vane shear; peak/remouded (kPa) W R refusal W HB hammer bouncing		imit			Fb friable VL very loose L loose MD medium dense D dense VD very dense			



THE LAKES client:

principal:

project: THE LAKES STAGE 3GH

Centre of lot 438 location.

Borehole ID.	HAL438
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	18 Aug 2016
date completed:	18 Aug 2016
logged by:	ODS
checked by:	RBT

location:	Ce	ntre of l	O [4	38					check	ked b	by:	RBT
position: No	ot Spe	cified					surface elevation: Not Specified	angle	from ho	orizon	tal:	90°
drill model:							drilling fluid:	hole o	diameter	r : 50	mm	vane id.: SL588
drilling inf	ormat	ion			mate	rial sub	stance					I
method & support	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	vai she ⊕remo ⊛pi (kP 02 00	ear oulded eak	structure and additional observations
				-	$\left \right\rangle$		ORGANIC SILT: non plastic, black.	D to M				TOPSOIL
		VS >202 kPa		0.5-			SILT: non plastic to low plasticity, orange brown with mottled grey and brown, with trace to minor fine to coarse grained sand.					FILL -
		VS >202 kPa		-			Sandy SILT: non plastic, grey brown, sand is fine to coarse. With trace fine to coarse grained gravel. SILT: non plastic to low plasticity, orange brown, with trace fine grained sand.	M	_		 ¶	YOUNGER ASH DEPOSIT
 ≰ z	Encountere	VS >202 kPa		1.0 — -							 @	-
		VS >202 kPa		- 1.5			1.4 m: becomes brown. With trace clay. Low plasticity				ίİ.	-
		VS >202 kPa		-			1.7 m: with minor clay					
		VS 173/ 41 kPa		2.0						 ⊕ 	0	
		VS 125/ 29 kPa		2.5			Hand Auger HAL438 terminated at 2.5 m			⊕ @ ++) 	
				- - 3.0 —			Target depth					-
				- 3.5— -								
				- 4.0 -								
				- 4.5 -								
				- - 5.0								
AS auger HA hand W washi	drilling screwi auger bore auger		pen			nil istance g to	B bulk disturbed sample D disturbed sample E environmental sample SS spilt spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) D	based	tion syml escription on Unifie ation Syst	n d		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable
e.g. AD/T B blank	e.g. AD/T B blank bit T TC bit				Oct-12 wa	effusal N standard penetration test (SPT) M 12 water N* SPT - sample recovered W 12 date shown Nc SPT with solid cone S offlow VS vane shear; peak/remouded (kPa) Wp			ed imit nit			VL very loose L loose MD medium dense D dense VD very dense



client: THE LAKES

principal:

project: THE LAKES STAGE 3GH

ation: Centre of lot 441

Borehole ID.	HAL441
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	18 Aug 2016
date completed:	18 Aug 2016
logged by:	NM
checked by:	RBT

location:	Centre of	lot 44	11					check	ed by:	RBT
position: No	ot Specified					surface elevation: Not Specified	angle	from ho	orizontal: 9	90°
drill model:						drilling fluid:	hole o	diameter	r : 50 mm	vane id.: DR2244
drilling inf	ormation			mate	rial sub			>		
method & support	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	vane shear ⊕remoulded ⊚peak (kPa) 02 00 02 00	structure and additional observations
A	VS >182 kP VS >182 kP VS >182 kP VS >182 kP VS >182 kP VS >182 kP VS >182 kP VS >182 kP VS >182 kP VS >182 kP VS >182 kP VS >182 kP VS >182 kP VS >182 kP VS >182 kP VS >182 kP VS >182 kP VS >182 kP VS >182 kP					ORGANIC SILT: non plastic, black. SILT: non plastic, orange brown, with some fine grained sand. 0.4 m: with trace clay 0.8 m: becoming mottled dark brown and with some fine to medium grained sand 1.0 m: becoming mottled dark brown and white SILT: non plastic, dark brown, with some organic silt and with minor fine grained sand. SILT: non plastic, yellow brown, with some organic silt and with minor fine grained sand. SILT: non plastic, yellow brown, with some fine grained sand. Hand Auger HAL441 terminated at 2.5 m Target depth	D to M D to M M M to W	VSt	$\begin{array}{c} 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 $	TOPSOIL FILL YOUNGER ASH DEPOSIT
method AD auger AS auger HA hand W washt HA hand	odrilling* screwing* auger pore auger pown by suffix bit				l ater shown	B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample	based Classifica bisture dry moist wet saturate plastic li	escription on Unifie ation System ed mit	n :d	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense



THE LAKES client:

principal:

0/01/2017 09:49

ODS.GPJ

STAGE 3GH

_0_9_06_LIBRARY.GLB rev:AT Log_COF BOREHOLE: NON CORED_13086AP -

CDF

TC bit V bit

R HB

hammer bouncing

project: THE LAKES STAGE 3GH

Centre of lot 442 In a stimul

location	1: C	entre of	lot 4	42					check	ked by:		RBT
position:	Not S	ecified					surface elevation: Not Specified	angle	from ho	orizontal:	90°	
drill mode	el:						drilling fluid:	hole of	diamete	r : 50 mm		vane id.: SL588
drilling	inform	ation			mate	erial sub	ostance					
	2 penetration	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	vane shear ⊕ remoulded ⊚ peak (kPa) 03 00 000		structure and additional observations
HA		VS >202 kPa VS >202 kPa VS >202 kPa	2	0.5- 0.5- 1.0- 1.5- 2.0-			 SILT: non plastic to low plasticity, orange brown with mottled brown, with trace fine to coarse grained sand. 1.1 to 1.2 m: with mottled black 1.2 to 1.3 m: with trace rootlets SILT: non plastic to low plasticity, orange brown, with trace fine grained sand. 1.8 m: with trace fine grained sand and with trace clay 	D to M	VSt		FILL	GER ASH DEPOSIT
		VS 112/ 22 kPa		- - - - 2.5-						 ⊕		
				3.0- 			Hand Auger HAL442 terminated at 2.5 m Target depth	classificat				-
AS au HA hai W wa HA hai * bit e.g. AD B bla		wing* r	pen wate	∎lev wat	ı	ater shown	B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample	soil de based Classifica bisture dry moist wet saturate p plastic li	escriptio on Unifie ation Sys	n ed	Con VS S F VSt H Fb VL L MD D VD	sistency / relative density very soft soft firm stiff very stiff hard friable very loose loose medium dense dense very dense

Borehole ID. HAL442 1 of 1 sheet: GENZTAUC13086AP project no. date started: 18 Aug 2016 18 Aug 2016 date completed: logged by: ODS checked by: прт

D VD

dense very dense



THE LAKES client:

principal:

project: THE LAKES STAGE 3GH

Contro of lot 115 le settere.

Borehole ID.	HAL445
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	18 Aug 2016
date completed:	18 Aug 2016
logged by:	NM
checked by:	RBT

loca	tior	n:	Ce	ntre of l	ot 4	45					check	ked by	c RBT
posit	tion:	Not	Spec	cified					surface elevation: Not Specified	angle	from ho	orizonta	ıl: 90°
drill n	nod	el:							drilling fluid:	hole o	liamete	r : 50 m	m vane id.: DR2244
drill	ling	infor	mati	on			mate	rial sub	stance				
method & support		² penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	vane shea ⊕ remoul ⊚ peal (kPa) ß 00 00	r additional observations
				VS >182 kPa		-			ORGANIC SILT: non plastic, black. SILT: non plastic, orange brown, with minor fine	M	VSt		TOPSOIL
	1			VS >182 kPa		- - 0.5			grained sand.	D			
				VS >182 kPa		-			Sandy SILT: fine to coarse grained, non plastic, grey with mottled white, with fine to coarse grained sand and with trace angular gravel. SILT: low to medium plasticity, orange brown, with				
			ountered	VS >182 kPa VS 173/		- 1.0 <i>-</i> -			minor clay and with trace fine grained sand.				4
- H - N			Not Encountered	36 kPa		-			1.2 m: becoming mottled red brown	M			
				VS >182 kPa		1.5			1.4 m: red brown mottling becomes absent. Becoming flecked white				9 –
				VS >182 kPa VS >182 kPa		- - 2.0						i i i	9 - 9 -
2	İ			VS >182 kPa VS >182 kPa		-			 2.1 m: becoming brown 2.2 m: becoming black with mottled orange brown, non plastic, with minor fine to medium grained sand and with faint organic odour 	D		i i i	ା - ସ୍ - ା -
						2.5 - - - - - - - - - - - - - - - - - - -			Hand Auger HAL445 terminated at 2.5 m Target depth				
meti AD AS HA W HA * e.g. B T V	au au ha wa ha bit AI bla	uger dr uger so and au ashboi and au t show D/T ank bit C bit bit	rewir ger ger ger	ng*	pene wate	mud casing etration c c c c c c c c c c c c c c c c c c c	I	ater shown	HP hand penetrometer (kPa) D N standard penetration test (SPT) M N* SPT - sample recovered W Nc SPT with solid cone S	based Classifica o dry d moist V wet s saturate Vp plastic li	escriptio on Unifie ation Sys	n ed	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense



THE LAKES client:

principal:

project: THE LAKES STAGE 3GH

Centre of lot 447 location:

Borehole ID.	HAL447
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	18 Aug 2016
date completed:	18 Aug 2016
logged by:	ODS
checked by:	RBT

locatio			ntre of l	01 4	47						check	(ed b	oy:	RBT
position:		Spe	cified					surface elevation: Not Specified		•	from ho			
drill mod								drilling fluid:	ł	nole d	liameter	r:50	mm	n vane id.: SL588
drilling	g info	rmati	on		1	mate	erial sub	stance						
method & support	² penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moioturo	condition	consistency / relative density	she ⊕rem ⊚p	ne ear oulded beak Pa) 02 02	
HA		Not Encountered	VS >202 kPa VS 166/ 54 kPa VS >202 kPa VS 160/ 54 kPa VS >202 kPa VS >202 kPa VS >202 kPa					SILT: non plastic, orange brown with mottled brown and black, with trace fine to coarse grained sand. SILT: non plastic, black, with trace fine grained sand and with faint organic odour. SILT: non plastic to low plasticity, orange brown with mottled brown and black, with trace fine to medium grained sand and with trace clay. 1.2 m: orange brown with mottled brown and with trace to minor clay	_	to M	VSt	$\begin{array}{c} & & \\$		FILL > > >
					2.5 - - - - - - - - - - - - - - - - - - -			Hand Auger HAL447 terminated at 2.5 m Target depth						
AS au HA ha W w HA ha * bi e.g. A B bl T T	inger d auger s and au vashbo and au vit shov AD/T blank bi C bit / bit	crewii uger re uger vn by	ıg*	pen	■ 10- leve	no res rangin refusa	al ater e shown	HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shar: peak/remouded (kPa)	t Cla moistu D dr M mo W we S sa Wp pla	soil de based d issifica re y bist et turate	mit	n :d		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense



THE LAKES client:

position: Not Specified

principal:

project: THE LAKES STAGE 3GH

Centre of lot 449 location:

sheet:	1 of 1
project no	GENZTAUC13086AP
date start	ed: 18 Aug 2016
date com	oleted: 18 Aug 2016
logged by	: NM
checked b	by: RBT
angle from horizor	tal: 90°
hole diameter : 50	mm vane id.: DR2244

HAL449

Borehole ID.

	nodel:	Ji Ope	ecified					surface elevation: Not Specified			orizontai: 9	
						<u> </u>	· · · ·	drilling fluid:	noie c	liamete	er : 50 mm	vane id.: DR2244
arill	ing inf	orma	lion			mate	erial sub	stance				
method & support	1 2 penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	vane shear ⊕remoulded ⊚peak (kPa) g 00 0 00	structure and additional observations
			VS >182 kF	'a	-			SILT : non plastic, orange brown with mottled brown, with minor fine grained sand.	D to M	VSt	 	FILL
			VS UTP		0.5-			SAND: fine to medium grained, purple grey.	_		- VS UTP	
			VS >182 kF	a	-			SILT: non plastic to low plasticity, orange brown, with minor clay.		VSt		
		untered	VS >182 kF		1.0-						 	
 ¥ z 		Not Enco	VS >182 kF	'a	-			1.1 m: becoming mottled purple grey, white and red brown	M to W			
			VS >182 kF	'a	1.5-			1.4 m: becoming brown with mottled orange brown	D to M		 © 	
			VS >182 kF									
			VS >182 kF VS >182 kF		2.0-			SILT: non plastic, yellow brown, with some fine	D			YOUNGER ASH DEPOSIT
					-			grained sand.				
<u>* *</u>			VS >182 kF	°a	2.5			Hand Auger HAL449 terminated at 2.5 m Target depth			<u> </u> 	
					- - 3.0-							
					-							
					3.5							
					4.0-							
					-	-						
					4.5-	-						
					- - 5.0-							
meth AD AS HA W HA	auger auger hand washt hand	screw auger oore		M C	pport mud casing netration	ı	nil istance g to	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT)	based Classifica noisture dry	escription on Unifie	o n ed	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable
* e.g. B T V	bit she AD/T blank TC bit V bit	bit	r suffix	wat	■ 10- lev	Oct-12 wa el on date ter inflow ter outflow	shown	N* SPT - sample recovered W Nc SPT with solid cone S VS vane shear: peak/remouded (kPa) W	/ wet	mit		VL very loose L loose MD medium dense D dense VD very dense

surface elevation: Not Specified



THE LAKES client:

principal:

0/01/2017 09:49

project: THE LAKES STAGE 3GH

loca

,			-	-					55			
							chec	ked by	:	RBT		
						surface elevation: Not Specified	angle from horizontal: 90°					
							drilling fluid:	hole o	diamete	r : 50 m	ım	vane id.: SL588
rilling in	forma	tion			mate	rial sub	stance	_		_		
support 1 2 penetration		samples & field tests	RL (m)	depth (m)	graphic log	class ification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	vane shea ⊕ remoul ⊚ peal (kPa) 8 0 0	r ded	structure and additional observations
A	T			_	\Box		ORGANIC SILT: non plastic, black.	D	VSt		1	TOPSOIL
		VS >202 kPa VS >202 kPa VS >202 kPa	l	0.5-			SILT : non plastic to low plasticity, orange brown with mottled brown, with trace fine to coarse grained sand and with trace clay.				-• -•	FILL
 	Encountered	VS >202 kPa		- 1.0							•	
		VS >202 kPa VS >202 kPa		- 1.5—							• 	
		VS >202 kPa	u	- - 2.0-			SILT : non plastic to low plasticity, orange brown, with trace fine grained sand and with trace clay.	D to M	-		 	OUNGER ASH DEPOSIT
		VS 101/ 29 kPa		- - - 2.5-						 ⊕ ⊕ 		
				2.0	-		Hand Auger HAL452 terminated at 2.5 m Target depth				1	
				- - - 3.5-								
				-							i	
	 			4.0								
	 			4.5								
				50-	4							

Borehole ID.

sheet:

project no.

logged by:

date started:

date completed:

HAL452

18 Aug 2016 18 Aug 2016

GENZTAUC13086AP

1 of 1

ODS

- ODS.GPJ	VS 101/ 29 kPa			 ⊕ ∳ 	-
- STAGE 3GH			Hand Auger HAL452 terminated at 2.5 m Target depth		-
L CORED 13086AI		3.0-			
F BOREHOLE: NON		3.5			
3LB rev:AT Log CO		4.0			- - - - - -
CDF_0_9_06_LIBRARY.GLB.rev.AT_Log_COF_BOREHOLE: NON CORED_13086AP - STAGE_3GH - ODS.GFU		4.5 - - - 5.0 -			
meti AD AS HA W HA		support M mud N nil C casing penetration registrance ranging to refusal	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa)	classification symbol & soil description based on Unified Classification System moisture D dry	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Th firm
* e.g. B T V	bit shown by suffix AD/T blank bit TC bit V bit	Vater 10-Oct-12 water level on date shown water inflow water outflow	N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	M moist W wet S saturated Wp plastic limit WI liquid limit	Fb friable VL very loose L loose MD medium dense D dense VD very dense



client: THE LAKES

principal:

project: THE LAKES STAGE 3GH

location: Centre of lot 453

Borehole ID.	HAL453
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	18 Aug 2016
date completed:	18 Aug 2016
logged by:	ODS
checked by:	RBT

locutio	cation: Centre of lot 453 checked by:							RBI						
position: Not Specified surface elevation: Not Specified angle from horized														
drill model: drilling fluid:						drilling fluid:	hole diameter : 50 mm vane id.: SL588							
drilling	g inform	ation				mate	rial sub	stance						
method & support	² penetration	samples field test		depth (m)		graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	:	moisture condition	consistency / relative density	sh ⊕ren ⊛	ane lear noulded peak Pa)	
A A	Image: 1 Image: 1	VS >202 VS >202	Pa Pa Pa	0.5 1.0 1.5 2.0			<u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u></u>	ORGANIC SILT: non plastic, black. SILT: non plastic to low plasticity, orange brown with mottled brown and grey, with trace fine to coarse grained sand. SILT: non plastic, black. SILT: non plastic, black. SILT: non plastic to low plasticity, orange brown with trace fine grained sand.	D	to M	ν VSt to H			TOPSOIL FILL
		VS 194 46 kPa		2.5 3.0 3.5 4.0				Hand Auger HAL453 terminated at 2.5 m Target depth						
method a AD a AD a HA h W w HA h * b e.g. A B	I I I <td>wing* r</td> <td></td> <td>le w</td> <td></td> <td>no resi rangin refusa t-12 wa</td> <td>iter shown</td> <td>samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS spit spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing</td> <td>Ci moistu D di M m W w S si Wp p</td> <td>soil de based o assifica</td> <td>nit</td> <td>bol &</td> <td></td> <td>consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense</td>	wing* r		le w		no resi rangin refusa t-12 wa	iter shown	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS spit spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	Ci moistu D di M m W w S si Wp p	soil de based o assifica	nit	bol &		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense



client: THE LAKES

principal:

project: THE LAKES STAGE 3GH

Borehole ID.	HAL455
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	18 Aug 2016
date completed:	18 Aug 2016
logged by:	ODS
checked by:	RBT

agaition: Not Specific		1455			autace elevation: Not Specified	onglo	from he			
oosition: Not Specifie drill model:	eu				surface elevation: Not Specified drilling fluid:	•	from ho diameter			vane id.: SL588
drilling information			mate	rial sub	5					
ss ation &	amples & eld tests	RL (m) depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	var she ⊕remo ⊛pe (kP g	ear oulded eak	structure and additional observations
Image: Second second	 Z02 kPa >202 kPa >202 kPa >202 kPa >202 kPa >202 kPa >202 kPa >51 kPa /S 190/ 51 kPa /S 173/ 86 kPa 	<u></u>		syn	ORGANIC SILT: non plastic, black. SILT: non plastic to low plasticity, orange brown with mottled brown and grey, with trace fine to coarse grained sand. SILT: non plastic to low plasticity, orange brown with trace fine grained sand. Hand Auger HAL455 terminated at 2.5 m Target depth	D to M		$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$\begin{array}{c} - & - & - \\ - & - & - \\ - & - & - \\ - & - &$	TOPSOIL FILL YOUNGER ASH DEPOSIT
I I I I I I	4 7 7	lev wa	n	f ater shown	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	based	escription on Unifie ation System ed imit	 		consistency / relative densityVSvery softSsoftFfirmStstiffVStvery stiffHhardFbfriableVLvery looseLlooseMDmedium denseDdenseVDvery dense



client: THE LAKES

principal:

project: THE LAKES STAGE 3GH

Borehole ID.	HAL457
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	18 Aug 2016
date completed:	18 Aug 2016
logged by:	ODS
checked by:	RBT

location:	Ce	ntre of l	ot 4	57						checł	ked b	y:	RBT
position: N	lot Spe	cified					surface elevation: Not Specified		angle	from ho	orizont	al: 9	90°
drill model:							drilling fluid:		hole d	iamete	r : 50 r	nm	vane id.: SL588
drilling in	format	ion			mate	erial sub	stance						
method & support 1 2 penetration		samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic colour, secondary and minor components	;,	moisture condition	consistency / relative density	van shea ⊕ remou ⊚ pea (kPa 00 00	ar Jided ak	structure and additional observations
2 2 - 1		VS >202 kPa VS >202 kPa VS >202 kPa VS >202 kPa VS >202 kPa					ORGANIC SILT: non plastic, black. SILT: non plastic to low plasticity, orange brow with mottled brown and grey, with trace fine to coarse grained sand.	Vn ,	D to M	H			TOPSOIL
		VS >202 kPa		2.0			SILT: non plastic to low plasticity, orange brow with trace fine to coarse grained sand.	/n,					YOUNGER ASH DEPOSIT
							Hand Auger HAL457 terminated at 2.5 m Target depth						
AS auge HA hand W wash HA hand	k bit bit	ng*	pen wat	■ 10-0 leve	I	ater e shown	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetrometer (kPa) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing			scriptio on Unifie tion Sys	n ed		consistency / relative densityVSvery softSsoftFfirmStstiffVStvery stiffHhardFbfriableVLvery looseLlooseMDmedium denseDdenseVDvery dense



THE LAKES client:

principal:

project: THE LAKES STAGE 3GH

Centre of lot 459 location:

Borehole ID.	HAL459
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	18 Aug 2016
date completed:	18 Aug 2016
logged by:	ODS
checked by:	RBT

locati	on.	Ce	ntre of	101 4	109					checl	kea	by:	RBT
positio	n: No	ot Spe	cified					surface elevation: Not Specified	angl	e from ho	orizo	ntal:	90°
drill ma								drilling fluid:	hole	diamete	r : 50) mm	vane id.: SL588
drillir	ng info	ormat	ion		1	mate	rial sub	stance					
method & support	1 2 penetration 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	⊕ re ⊛	ane near moulded peak (Pa)	
					-			ORGANIC SILT: non plastic, black.	D to N				TOPSOIL
			VS >202 kPa VS >202 kPa		- 0.5— -			SILT: low plasticity, orange brown with mottled brown, with trace fine to coarse grained sand.				 ¶ ¶	
		Not Encountered	VS >202 kPa	a	- 1.0							 ¶ ¶	
z		Not E	VS >202 kPa	a	- - 1.5			SILT: low plasticity, brown, with trace fine graine	ed M			 @ 	MATUA SUBGROUP
			VS >202 kPa	a	2.0-			sand.				 @	
			VS 153/ 29 kPa		2.0			Clayey SILT : low to medium plasticity, orange brown, with fine grained sand.			 	 •	
					2.5 - - 3.0 - - -			Hand Auger HAL459 terminated at 2.5 m Target depth					
					3.5								
					- - - 4.5—								
					- - 5.0-								
AS HA W HA	auger auger hand a washt hand a	screwi auger oore auger	ng*	M C pen	port mud casing etration	 no res rangin refusa 	ſ	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N SPT_cample requested	soil o based	ation sym descriptio d on Unifie cation Sys	n ed	£	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VU very lease
e.g. B T	bit sho AD/T blank TC bit V bit	bit	suffix		Level wat	Oct-12 wa el on date er inflow er outflow	SHOWH	N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	W wet S satural Wp plastic WI liquid li	limit			VL very loose L loose MD medium dense D dense VD very dense



THE LAKES client:

principal:

project: THE LAKES STAGE 3GH

Borehole ID.	HAL460
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	22 Aug 2016
date completed:	22 Aug 2016
logged by:	ODS
checked by:	RBT

location:	Ce	ntre of	lot 4	60					chec	ked	by:	RBT
position: N	ot Spe	cified					surface elevation: Not Specified	angle	from h	orizoi	ntal:	90°
drill model:							drilling fluid:	hole o	liamete	r : 50	mm	vane id.: SL588
drilling in	format	ion			mate	erial sub	ostance					I
method & support 2 penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	sh ⊕ren ⊚	ear noulded peak Pa)	structure and additional observations
				_	$\left \right\rangle$		ORGANIC SILT: non plastic, black.	D to M	VSt			TOPSOIL
		VS >202 kPa VS 177/ 44 kPa	3	0.5			SILT: non plastic to low plasticity, orange brown, with trace fine grained sand. 0.6 m: with trace clay					YOUNGER ASH DEPOSIT
	 	VS 117/ 38 kPa		- - 1.0 -			SILT : low plasticity, orange brown, with trace clay and with trace fine to coarse grained sand. Greasy when reworked.	M		 		MATUA SUBGROUP
 	Encountered	VS 113/ 52 kPa		- - 1.5 - -			SILT : non plastic, pale brown, with some fine to coarse grained sand.			 ⊕ ¢	 	
	Not	VS 109/ 32 kPa		- 2.0 -						⊕ ¢ 	 	
	I I I	VS 121/ 31 kPa VS >202 kPa		- 2.5 -			2.3 m: with trace fine to coarse grained sand. Is sensitive in hand sample			 ⊕ ₽ 	 	
		VS >202 kPa VS >202 kPa VS >202 kPa	a	- 3.0 — - - -			Clayey SILT : low to medium plasticity, brown, with trace fine grained sand.					
				- 3.5 - -	CXXXX		Hand Auger HAL460 terminated at 3.5 m Target depth					
	 			4.0								
				4.5								
				- 5.0								
AS auge HA hand W wash	r drilling r screwi auger bore auger		pen	mud casing etration		nil sistance ig to	HP hand penetrometer (kPa) D N standard penetration test (SPT) M	based Classifica oisture dry moist	escription on Unifie	o n ed		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable
* bit sh e.g. AD/T B blank T TC bi V V bit	bit	suffix	wate	✓ 10-0 leve wate	Oct-12 w el on date er inflow er outflow	e shown	N* SPT - sample recovered W Nc SPT with solid cone S VS vane shear; peak/remouded (kPa) W R refusal W HB hammer bouncing	/ wet saturate /p plastic li	mit			VL very loose L loose MD medium dense D dense VD very dense



THE LAKES client:

principal:

project: THE LAKES STAGE 3GH

Centre of lot 461 location.

sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	22 Aug 2016
date completed:	22 Aug 2016
logged by:	ODS
checked by:	RBT
angle from barizontaly 00°	

HAL461

Borehole ID.

location:	Ce	ntre of l	01 4	101						chec	ked I	by:	RBT
position: N	lot Spe	cified					surface elevation: Not Specified		angle	from he	orizor	ntal:	90°
drill model:							drilling fluid:		hole d	liamete	r : 50	mm	vane id.: SL588
drilling in	format	ion	1		mate	erial sub	ostance						
method & support 1 2 penetration		samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components		moisture condition	consistency / relative density	sh ⊕rem ⊚r	ear poulded peak Pa)	structure and additional observations
				-	$\left \right\rangle$		ORGANIC SILT: non plastic, black.		D	VSt			TOPSOIL
	i	VS >202 kPa		-			SILT: low plasticity, brown, with minor clay.		М		11	 ¶ 	MATUA SUBGROUP
	1	VS >202 kPa		0.5			0.5 m: becoming orange brown					 •	
	!	VS 184/ 34 kPa		- 1.0							11	9	
		VS >202 kPa	l	-								 @	
		VS 156/ 41 kPa		1.5-							 ⊕	 @	
		VS 71/ 22 kPa		-			1.8 m: becomes sticky/greasy when reworked			St	 ⊕@		
		VS 71/ 21 kPa		2.0-			2.0 m: with trace fine grained sand				 ⊕@ 		
	ļ –	VS 75/ 18 kPa		- 2.5								11	
				3.0			Hand Auger HAL461 terminated at 2.5 m Target depth						
	 			- 3.5— - -									
				4.0							1 1		
				- 4.5									
				5.0 —									
AS auge HA hand W wash	r drilling r screwi auger bore auger		M C pen	port mud casing etration		istance	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT)	Cli moistu D di M m	soil de based assifica ure Iry noist	ion sym escriptio on Unifie ation Sys	n ed	<u> </u>	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable
* bit sh e.g. AD/T B blank T TC b V V bit	k bit it	suffix		■ 10-0 leve	Oct-12 w el on date er inflow er outflov	e shown	N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	S sa Wp p	vet aturate lastic li quid lim	mit			VL very loose L loose MD medium dense D dense VD very dense



THE LAKES client:

principal:

project: THE LAKES STAGE 3GH

Borehole ID.	HAL463
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	22 Aug 2016
date completed:	22 Aug 2016
logged by:	ODS
checked by:	RBT

location:	Ce	ntre of	lot 4	63						chec	ked l	oy:	RBT
position: No	ot Spec	cified					surface elevation: Not Specified	а	ingle	from ho	orizor	ntal:	90°
drill model:							drilling fluid:	h	ole d	iamete	r : 50	mm	vane id.: SL588
drilling inf	ormati	on		1	mate	erial sub				~			
method & support 1 2 penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	class ification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture	condition	consistency / relative density	sh ⊕rem ⊚p	ne ear oulded peak Pa) 002 002	structure and additional observations
^ ^				-	$ \rangle$		ORGANIC SILT: non plastic, black.		D	VSt to H			TOPSOIL
		VS >202 kPa VS 184/ 39 kPa	a	- - 0.5 - -			SILT: low plasticity, orange brown, with trace figrained sand with trace clay.	ne I	М	п	111	• • - •	YOUNGER ASH DEPOSIT
	ntered	VS 166/ 29 kPa		1.0-								● 	
 ⊈ z 		VS 158/ 29 kPa		-							⊕ 		
		VS >202 kPa		1.5			1.6 m: with trace fine to coarse grained sand					🌳 	
		VS >202 kPa VS 187/	a	2.0-								🏵 	
		65 kPa		-								11	
				2.5			SAND: fine to coarse grained, orange brown, v minor silt. Hand Auger HAL463 terminated at 2.5 m	vith					MATUA SUBGROUP
				3.0			Target depth						
													•
AS auger HA hand W washt HA hand * bit sho e.g. AD/T	oore auger own by s	ıg⁺	pen wat	▼ 10-0	no res rangin refusa Oct-12 wa	ater e shown	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vanse kinemended (kPa)	so ba Clas moistur D dry M mo W we' S sat	re bist turated		n ed		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense
* bit sho	own by s	suffix		■ 10-0 leve	rangin refusa	ng to al ater e shown	HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered	D dry M mo W wei S sat Wp pla	/ bist et	nit			H hard Fb friable VL very loos L loose



THE LAKES client:

principal:

project: THE LAKES STAGE 3GH

Contro of lot 165

Borehole ID.	HAL465
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	22 Aug 2016
date completed:	22 Aug 2016
logged by:	ODS
checked by:	RBT

location:	Cent	tre of I	ot 4	65					check	ked by:	RBT
position: No	ot Specifie	ed					surface elevation: Not Specified			orizontal:	
drill model:							drilling fluid:	hole o	diamete	r : 50 mm	vane id.: SL588
method & support penetration	/ater ij so	amples & ield tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	vane shear ⊕remoulded ⊚ peak (kPa) S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	structure and additional observations
	Not Encountered SA	; >202 kPa ; >202 kPa ; >202 kPa ; >202 kPa VS 194/ 44 kPa VS 122/ 24 kPa VS 151/ 39 kPa					ORGANIC SILT: non plastic, black. SILT: non plastic to low plasticity, orange brown with mottled brown, with trace fine to coarse grained sand. 1.3 m: with trace clay. Low plasticity Hand Auger HAL465 terminated at 2.5 m Target depth	D to M		$\begin{array}{c} 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 $	TOPSOIL FILL YOUNGER ASH DEPOSIT
AS auger HA hand W washt HA hand	oore auger own by suff bit		M r C c pen	etration	I	ater shown	B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample	based Classifica bisture dry moist wet saturate plastic li	escriptio on Unifie ation Sys	n ed	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense



THE LAKES client:

principal:

project: THE LAKES STAGE 3GH

Contro of lot 167 le settere.

Borehole ID.	HAL467
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	22 Aug 2016
date completed:	22 Aug 2016
logged by:	ODS
checked by:	RBT

location:	Ce	ntre of	lot 4	!67					check	ked by	/:	RBT
position: N	ot Spe	cified					surface elevation: Not Specified	angle	from ho	orizonta	al: 9	0°
drill model:							drilling fluid:	hole of	diameter	r : 50 m	۱m	vane id.: SL588
drilling inf	ormat	ion		1	mate		stance					
method & support 2 penetration	, water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	vane shea ⊕ remoul ⊚ peal (kPa 36 00 000	a r Ided k	structure and additional observations
		VS >202 kPa	3	- - - 0.5 -			ORGANIC SILT: non plastic, black. SILT: non plastic to low plasticity, orange brown with mottled brown, with trace fine to coarse grained sand.	D to M			• • •	Topsoil Fill
	Encountered	VS >202 kPa VS >202 kPa		- - 1.0 - -			Sano.				-••	
		VS >202 kPa	a	- 1.5— -			1.5 m: becomes dark brown with mottled orange brown	M	-			YOUNGER ASH DEPOSIT
		VS >202 kPa	a	2.0			with trace fine sand. 2.0 m: with trace clay				• •	
, , y , y		VS 112/ 35 kPa		2.5						 ⊕ ©		
				3.0			Hand Auger HAL467 terminated at 2.5 m Target depth	classifica	tion sym			
AS auget HA hand W wash HA hand	auger own by bit	ng*	pen	■ 10-0 leve	− no res rangin refusa	ater shown	B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample	soil de based Classific bisture dry moist wet saturate plastic li	escriptio on Unifie ation Sys	n :d		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense



THE LAKES client:

principal:

THE LAKES STAGE 3GH project:

ntro of lot 160

Borehole ID.	HAL469
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	22 Aug 2016
date completed:	22 Aug 2016
logged by:	ODS
checked by:	RBT

location:	location: Centre of lot 469 checke								ked b	oy:	RBT	
position: No	ot Spe	cified					surface elevation: Not Specified	· ·	e from h			
drill model:						wiel eur	drilling fluid:	hole	diamete	r : 50	mm	vane id.: SL588
drilling info	Jinau					erial sub	material description		sity	va	ne	structure and
method & support 1 2 penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	⊕rema ● rema ● p (kF 25 00	ear bulded eak	additional observations
				-	$ \rangle$		ORGANIC SILT: non plastic, black.	D to N				TOPSOIL
		VS >202 kPa VS >202 kPa		- 0.5— -			SILT: non plastic to low plasticity, orange brown with mottled grey and brown, with trace fine to coarse grained sand.				 • 	FILL
HA 	pe	VS 197/ 58 kPa		- - 1.0 - -			SILT : non plastic to low plasticity, orange brown, with trace fine sand. 1.0 m: with trace clay	М	_		 •	YOUNGER ASH DEPOSIT
, , , , , , , , , , , , , , , , , , ,	SZ	VS >202 kPa		- 1.5— - -					St		 •	-
		VS 71/ 38 kPa		- 2.0 - -						 		-
		VS 96/ 29 kPa		-2.5-			Hand Auger HAL469 terminated at 2.5 m Target depth				+ +	
				- 3.0								-
				- 3.5— -								
				- 4.0								
				4.5						11		
				- 5.0								
	ore		M I C d	port mud casing etration		nil sistance ig to	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT)	based	tion sym lescriptio d on Unifie cation Sys	n ed		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable
* bit sho e.g. AD/T B blank T TC bit V V bit		suffix	wat	■ 10- leve	Oct-12 wa el on date er inflow er outflov	ater e shown	N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	W wet S saturat Wp plastic WI liquid li	limit			VL very loose L loose MD medium dense D dense VD very dense



THE LAKES client:

principal:

project: THE LAKES STAGE 3GH

Borehole ID.	HAL471
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	22 Aug 2016
date completed:	22 Aug 2016
logged by:	ODS
checked by:	RBT

t Specified	(E) 12 (a) 0.5- (a) 1.0- (a) 1.5-	-	classification symbol	surface elevation: Not Specified drilling fluid: stance material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components ORGANIC SILT: non plastic, black. SILT: non plastic to low plasticity, orange brown with mottled grey and brown, with trace fine to coarse grained sand.	•	e from h diameter / Kouester / Ko	r:50 va she ⊕rem @ P (kF : : : : : : : : : : : : : : : : : : :	mm ne aar oulded oulded a0051 	vane id.: SL588 structure and additional observations TOPSOIL
samples & field tests VS >202 kP VS >202 kP VS >202 kP VS >202 kP VS >202 kP VS >202 kP VS >202 kP	(E) 12 (a) 0.5- (a) 1.0- (a) 1.5-	-		material description material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components ORGANIC SILT: non plastic, black. SILT: non plastic to low plasticity, orange brown with mottled grey and brown, with trace fine to	moisture condition	ot tSA 1	va she ⊕ e k (k001 03 04 03 04 05 04 05 04 05 04 05 04 05 04 05 04 05 04 05 04 05 04 05 04 05 05 05 05 05 05 05 05 05 05 05 05 05	ne aar oulded jeak 200 1200 1100 1100 1100 1100 1100 1100	structure and additional observations
samples & field tests VS >202 kP VS >202 kP VS >202 kP VS >202 kP VS >202 kP VS >202 kP VS >202 kP	(E) 12 (a) 0.5- (a) 1.0- (a) 1.5-	-		material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components ORGANIC SILT: non plastic, black. SILT: non plastic to low plasticity, orange brown with mottled grey and brown, with trace fine to		1 VSt to	she ⊕ rem @ p (K001 	ear 120 (a) 120 (a) 120 (a) 120 (b) 120 (b)	additional observations TOPSOIL
field tests vs >202 kP VS 12 (a) 0.5- (a) 1.0- (a) 1.5-	graphic log	classification symbol	SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components ORGANIC SILT: non plastic, black. SILT: non plastic to low plasticity, orange brown with mottled grey and brown, with trace fine to		1 VSt to	she ⊕ rem @ p (K001 	ear 120 (a) 120 (a) 120 (a) 120 (b) 120 (b)	additional observations TOPSOIL	
VS >202 kP	ia 1.0-			SILT: non plastic to low plasticity, orange brown with mottled grey and brown, with trace fine to		1 VSt to		 	
VS >202 kP	ia 1.0-			with mottled grey and brown, with trace fine to				• 	FILL
VS >202 kP	1.5-					1			
	a	1		SILT: non plastic to low plasticity, orange brown with trace fine to coarse grained sand.	, M	_	11	🌳 	YOUNGER ASH DEPOSIT
VS >202 kP	2.0-			2.0 m: with trace clay				🏵 	
VS 187/ 52 kPa	2.5-			Hand Auger HAL471 terminated at 2.5 m			 	19	
	3.0- 3.5- 4.0- 4.5- 5.0-			Target depth					
drilling* screwing* luger ore luger	water	n no resis ranging refusal -Oct-12 wate rel on date s	stance to er	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear: peak/remouded (kPa)	soil d base Classifi moisture D dry M moist W wet S satura	description d on Unifi- cation System red	bol & n ed	1 I	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense
sc iug ori	rewing* ger e	lling* rewing* ger ger n by suffix by suffix	lling* rewing* ger ger b by suffix by suffix	lling* support M mud N nil C casing penetration ger n by suffix n by suffix	lling* rewing* ger support 5.0– samples & field tests bulk disturbed sample c environmental sample E environmental sample E environmental sample E environmental sample S sight spon sample U## undisturbed sample E environmental sample S sight spon sample U## undisturbed sample ##mm diameter HP hand penetrometer (KPa) N* standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R	lling* rewing* ger e support M mud c casing samples & field tests B classifica soil c base D ger ger e mud c casing N nil C casing Samples & field tests B classifica bulk disturbed sample E ger ger penetration motisture maging to ger no resistance ranging to water no resistance ranging to motisture level on date shown water inflow N nil C casing classifica base Classifica N N N N N N SS split spoon sample U## motisture U## motisture N N SS split spoon sample U## D dry N N SS split spoon sample U## N M N SS split spoon sample U## D dry N N SS Split spoon sample U## D dry N N SS Split spoon sample N Standard penetration test (SPT) N* M N SS SPT - sample recovered NC S Saturation W N S VS vane shear; peak/remouded (kPa) W W	lling* support samples & field tests classification sym lling* M mud N nil B bulk disturbed sample classification sym ger penetration B bulk disturbed sample classification sym ger penetration no resistance split spoon sample U## undisturbed sample ger into-ct-12 water Into-ct-12 water N* SPT - sample recovered D disturbed N standard penetration N* SPT - sample recovered D dy M Moist VS vater inflow vater refusal R refusal N* SPT with solid cone Wp plastic limit	lling* a.by suffix support 4.5- - 5.0- b samples & field tests b sample & sample b sample & sample b sample & sample & sample b sample & sa	lling* rewing* ger support 4.5 - 5.0 - samples & field tests 5.0 - samples & field tests B classification symbol & 1.1 lling* rewing* ger mud c casing N nil C casing samples & field tests B bulk disturbed sample D classification symbol & soil description based on Unified Classification System penetration ger moresistance ranging to water no resistance ranging to lo-Oc-12 water level on date shown water inflow samples & field tests B bulk disturbed sample D classification symbol & soil description based on Unified Classification System n by suffix no resistance ranging to Vester inflow N nil C casing D dry N standard penetration test (SPT) N' SPT - sample recovered Nc moist Vester Nc D dry N''''''''''''''''''''''''''''''''''''



client: THE LAKES

principal:

project: THE LAKES STAGE 3GH

Borehole ID.	HAL472
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	30 Aug 2016
date completed:	30 Aug 2016
logged by:	ODS
checked by:	RBT

location:	location: Centre of lot 472 checked								ked by	:	RBT		
position: No	ot Spec	ified					surface elevation: Not Specified	angle	from he	orizonta	l: 90°		
drill model:							drilling fluid:	hole of	diamete	r : 50 m	m	vane id.: SL588	
drilling inf	ormatio	on			mate	rial sub	stance						
method & support	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	vane shea ⊕ remoul ⊚ peak (kPa) B 0 0	r ded	structure and additional observations	
HA HA H H H H H H H H H H H H H H H H H	Not Encountered	/S >202 kPa /S >202 kPa /S >202 kPa /S >202 kPa /S >202 kPa /S >202 kPa	Ľ	0.5	3		ORGANIC SILT: non plastic, black. SILT: non plastic to low plasticity, orange brown with mottled brown, with trace fine to coarse grained sand. 0.7 to 0.8 m: with trace fine to coarse angular gravel 1.25 to 1.35 m: dark brown with mottled grey and brown with trace organic odour SILT: non plastic to low plasticity, orange brown, with trace fine to coarse grained sand.				TO ● FIL ● - ● - ● - ● - ● - ● - ● - ● - ● - ● - ● - ● - ● - ● - ● - ● -	DPSOIL _L DUNGER ASH DEPOSIT	
				2.5 - - - - - - - - - - - - - - - - - - -			Hand Auger HAL472 terminated at 2.0 m Target depth						
AS auger HA hand W washl HA hand	r drilling* r screwin auger bore auger own by s bit	g*	pen wat	etration		ater shown	B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample	based Classifica oisture dry moist wet saturate p plastic li	escriptio on Unifie ation Sys	n ed		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense	



THE LAKES client:

principal:

project: THE LAKES STAGE 3GH

Contro of lot 176

Borehole ID.	HAL476
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	22 Aug 2016
date completed:	22 Aug 2016
logged by:	NM
checked by:	RBT

locat	location: Centre of lot 476 checked						ked b	y:	RBT				
positi	on: No	ot Spe	cified			surface elevation: Not Specified an			angle	from ho	90°		
drill m								drilling fluid:	hole o	diamete	r : 50 r	mm	vane id.: DR2244
drilli	ng inf	ormat	ion			mate	rial sub			>			
method & support	1 2 penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	van she ⊕remoi ⊚pe (kPa 02 00	ar ulded ak	structure and additional observations
						$\left \right\rangle$		ORGANIC SILT: non plastic, black.	D	VSt			
			VS >182 kPa VS >182 kPa					SILT: non plastic, orange brown, with minor fine grained sand.0.6 m: becoming flecked white and purple					FILL
4 z		Not Encountered	VS >182 kPa VS >182 kPa		- 1.0 -			0.9 m: becoming mottled brown with white and purple flecks absent, with trace clay	М			ÌÌ.	-
- N		NotE	VS >182 kPa		- 1.5			1.3 m: with minor clay and with trace fine to medium grained angular gravel	M to W			 @	- - - -
			VS >182 kPa		-								
GPJ < <drawn< td=""><td></td><td></td><td>VS >182 kPa VS 127/ 42 kPa</td><td></td><td>2.0</td><td></td><td></td><td>SILT: non plastic, yellow brown, with minor fine grained sand.</td><td></td><td></td><td></td><td> @ </td><td>YOUNGER ASH DEPOSIT</td></drawn<>			VS >182 kPa VS 127/ 42 kPa		2.0			SILT : non plastic, yellow brown, with minor fine grained sand.				@ 	YOUNGER ASH DEPOSIT
			VS 116/ 21 kPa		-2.5			Hand Auger HAL476 terminated at 2.5 m					-
					- - 3.0 - -			Target depth				İ İ	
					- 3.5 — - -								
					4.0								
					4.5								- - - - - - -
5					5.0 —								
meth AD AS HA W HA	od auger auger hand a washt hand a	screwi auger oore		pene	nud asing etration		nil istance g to	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT)	based Classifica oisture dry	escriptio on Unifie	ed		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable
* e.g. B T V	bit sho AD/T blank TC bit V bit	bit	suffix	wate	leve	Dct-12 wa I on date er inflow er outflow	ater shown	N* Standard perietation rest (SF1) W N* SPT - sample recovered W Nc SPT with solid cone S VS vane shear, peak/remouded (kPa) W R refusal W HB hammer bouncing	/ wet saturate /p plastic li	mit			VL very loose L loose MD medium dense D dense VD very dense



client: THE LAKES

principal:

project: THE LAKES STAGE 3GH

Borehole ID.	HAL478
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	22 Aug 2016
date completed:	22 Aug 2016
logged by:	ODS
checked by:	RBT

ocation:	Ce	ntre of l	OT 4	478					chec	ked by	y:	RBT
position: No	ot Spe	cified					surface elevation: Not Specified	angle	e from h	orizonta	al: 9	90°
drill model:							drilling fluid:	hole	diamete	r : 50 n	nm	vane id.: SL588
drilling inf	ormati	ion			mate	rial sub	stance		1			
method & support 1 2 penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	class ification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	van shea ⊕ remou ⊚ pea (kPa 33 € €	ar Jided ak	structure and additional observations
				-			ORGANIC SILT: non plastic, black.	D to N				TOPSOIL
		VS >202 kPa VS >202 kPa		0.5			SILT: non plastic to low plasticity, orange brown with mottled brown and grey, with trace fine grain sand.	ned			• •	FILL
z z	Encountere	VS >202 kPa		1.0 - -								
		VS >202 kPa VS >202 kPa		- 1.5 - - -			1.8 to 1.9 m: becomes brown with mottled black				●	
		VS >202 kPa		2.0			1.95 m: with trace coarse grained gravel SILT: non plastic, black, with trace fine grained sand. Trace organic odour. SILT: non plastic to low plasticity, orange brown,				•	YOUNGER ASH DEPOSIT
		VS >202 kPa		2.5			with trace fine grained sand. Hand Auger HAL478 terminated at 2.5 m					
				3.0			Target depth					
method AD auger AS auger HA hand W washt HA hand	drilling screwi auger oore auger	ng*	pen wat	▼ 10-0	I	ater	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remouded (kPa)	based	escriptic I on Unifie ation Sys ed limit	bol & n ed		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense



client: THE LAKES

principal:

project: THE LAKES STAGE 3GH

Borehole ID.	HAL480
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	22 Aug 2016
date completed:	22 Aug 2016
logged by:	ODS
checked by:	RBT

location:	Ce	ntre of l	OT 4	80					check	ked	by:	RBT
position: No	ot Spe	cified					surface elevation: Not Specified	angle	from ho	orizoi	ntal:	90°
drill model:							drilling fluid:	hole o	diamete	r : 50	mm	vane id.: SL588
drilling inf	ormat	ion			mate	erial sub	stance					1
method & support	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	⊕ren ⊛	ne noulded peak Pa)	structure and additional observations
				-			ORGANIC SILT: non plastic, black.	D to M				TOPSOIL
		VS >202 kPa VS >202 kPa VS >202 kPa					SILT: non plastic to low plasticity, orange brown with mottled brown and grey, with trace fine grained sand.	d			$\begin{array}{c} - 0 \\ - 0$	FILL
⊈ z	Not Encoun	VS >202 kPa		1.0— - - -							 • •	
		VS >202 kPa		1.5			SILT: non plastic to low plasticity, orange brown, with trace fine grained sand.	M			• •	YOUNGER ASH DEPOSIT
		VS >202 kPa VS 175/ 44 kPa VS 173/		- 2.0— - -			1.9 m: with trace to minor clay. Low to medium plasticity.			 		
		44 kPa		- 2.5			Hand Auger HAL480 terminated at 2.5 m			₽ 	() 	
				- - 3.0- - - -			Target depth					
				3.5— - - 4.0—								
				- - 4.5 - - -								
				- 5.0						11		
AS auger HA hand W washl	r drilling r screwi auger bore auger		pen	port mud casing etration	I	nil sistance ig to	HP hand penetrometer (kPa) [] N standard penetration test (SPT) []	based Classifica moisture D dry M moist	escriptio on Unifie	n ed		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable
* bit sh e.g. AD/T B blank T TC bit V V bit		suffix	wat	■ 10- leve	Oct-12 wa el on date er inflow er outflov	e shown	N* SPT - sample recovered Nc SPT with solid cone VS vane shear: peak/remouded (kPa)	W wet S saturate Wp plastic li WI liquid lin	mit			VL very loose L loose MD medium dense D dense VD very dense



client: THE LAKES

principal:

project: THE LAKES STAGE 3GH

Borehole ID.	HAL482
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	22 Aug 2016
date completed:	22 Aug 2016
logged by:	ODS
checked by:	RBT

location:	Cen	tre of l	0 [4	82					check	ked b	y:	RBT
position: No	ot Specif	ied					surface elevation: Not Specified	angle	e from ho	orizon	tal:	90°
drill model:							drilling fluid:	hole	diamete	: 50	mm	vane id.: SL588
drilling info	ormatio	n			mate	rial sub	stance					
method & support 1 2 penetration	/ater	samples & field tests	RL (m)	depth (m)	graphic log	class ification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture	consistency / relative density	var she ⊕remc ⊚pe (kP	ear oulded eak	structure and additional observations
		S >202 kPa		-			ORGANIC SILT: non plastic, black.	D to N				TOPSOIL
		S >202 kPa		0.5			SILT: non plastic to low plasticity, orange brow with mottled brown and grey, with trace fine to coarse grained sand.				 •	FILL
z	e	S >202 kPa		1.0			SILT: non plastic to low plasticity, orange brow with trace fine to coarse grained sand.	'n,			 @	YOUNGER ASH DEPOSIT
		S >202 kPa		- 1.5			1.5 m: with trace fine grained sand				 � 	
		S >202 kPa		- - 2.0							 🏵	
		VS 185/ 39 kPa VS 185/		-						 ⊕ 	0 	
		39 kPa					Hand Auger HAL482 terminated at 2.5 m Target depth					
AS auger HA hand a W washb HA hand a	oore auger own by su		pene	nud casing etration c m er		ater	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample S split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetrometer (kPa) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal	based	ed limit	n d		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense



THE LAKES client:

principal:

project: THE LAKES STAGE 3GH

Contro of lot 181 le settere.

Borehole ID.	HAL484
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	23 Aug 2016
date completed:	23 Aug 2016
logged by:	ODS
checked by:	RBT

location:	Ce	ntre of l	ot 4	84					checke	ed by:	RBT
position: No	ot Spe	cified					surface elevation: Not Specified	· ·	e from hor		90°
drill model:							drilling fluid:	hole	diameter :	50 mm	vane id.: SL588
drilling info	ormati	on			mate	rial sub					
method & support 1 2 penetration 3	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition		vane shear ⊕remoulded ⊚ peak (kPa) B 0 0 0 0	structure and additional observations
HA HA HA HA HA HA HA HA HA HA HA HA HA H	Not Encountered	VS >202 kPa VS >202 kPa VS >202 kPa VS >202 kPa VS 201/ 58 kPa VS 139/ 38 kPa VS 173/ 58 kPa				32 CI	ORGANIC SILT: non plastic, black. SILT: non plastic to low plasticity, orange brown with mottled brown and grey, with trace fine to coarse grained sand. SILT: non plastic to low plasticity, orange brown, with trace fine to coarse grained sand. SILT: non plastic to low plasticity, orange brown, with trace fine to coarse grained sand. 1.7 m: with trace fine grained sand, and with minor clay. Low to medium plasticity Hand Auger HAL484 terminated at 2.5 m Target depth	D to M	VSt to H	$ \begin{array}{c} \bullet \\ \bullet \\ \bullet \\ \bullet \\ \bullet \\ \bullet \\ \bullet \\ \bullet \\ \bullet \\ \bullet $	TOPSOIL FILL YOUNGER ASH DEPOSIT
AS auger HA hand a W washb HA hand a	oore auger own by bit	ng*	pen wat	mud casing etration er er		l ater shown	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample S spilt spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetrometer (kPa) N standard penetrometer (kPa) N SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	soil d based	limit	ol &	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense



client: THE LAKES

principal:

project: THE LAKES STAGE 3GH

Borehole ID.	HAL486
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	23 Aug 2016
date completed:	23 Aug 2016
logged by:	ODS
checked by:	RBT

nositi		: C		ified					surface elevation: Not Specified	21	nalo	from h			
drill m			pec	aneu					drilling fluid:		0	diamete			vane id.: SL588
drilli	ing i	inforn	natio	on			mate	rial sub	stance						
method & support	1 2 nenetration	2 penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	class ification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture	condition	consistency / relative density	⊕ rer ●	ane near moulded peak (Pa)	structure and additional observations
			Intered	VS >202 kPa VS >202 kPa VS >202 kPa VS 177/					ORGANIC SILT: non plastic, black. SILT: non plastic to low plasticity, orange brown with mottled brown, with trace fine grained sand. SILT: low plasticity, orange brown, with trace fine to coarse grained sand.		N	VSt to H			TOPSOIL FILL YOUNGER ASH DEPOSIT
				VS 172/ VS 172/ 32 kPa VS >202 kPa		2.0 — - - - - - - - - - - - - - - - - - - -			1.5 m: with trace clay						
						3.0			Hand Auger HAL486 terminated at 2.5 m Target depth						
meth AD AS HA W HA HA e.g. B T V	aug han was han bit s AD/	nk bit bit	ewin er er	g*	pen wat	■ 10-0 leve		ater shown	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	ba Clas moisture D dry M moi W wet S satu Wp plas	oil de ased sifica e ist	imit	on ed		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense



THE LAKES client:

principal:

project: THE LAKES STAGE 3GH

Contro of lot 188 Innetion

Borehole ID.	HAL488
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	23 Aug 2016
date completed:	23 Aug 2016
logged by:	ODS
checked by:	RBT

location:	Cei	ntre of l	lot 4	88					chec	ked by:	RBT
position: No	ot Spec	cified					surface elevation: Not Specified	angle	from h	orizontal:	90°
drill model:							drilling fluid:	hole d	iamete	r : 50 mm	vane id.: SL588
drilling inf	ormati	on			mate	rial sub	stance				1
method & support 1 2 penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	vane shear ⊕ remoulded ⊚ peak (kPa) B 0 00 00	structure and additional observations
				-	$\left \right\rangle$		ORGANIC SILT: non plastic, black.	D to M	VSt		TOPSOIL
		VS >202 kPa VS 190/ 61 kPa	3	- 0.5 - -			SILT: low plasticity, orange brown, with minor clay and with trace fine grained sand. 0.4 m: with trace fine to coarse grained sand. Greasy when reworked			♥ ♥ ♥ 	YOUNGER ASH DEPOSIT
	untered	VS 89/ 22 kPa		- 1.0						⊕ @ 	
H H 		VS 92/ 51 kPa		-			Sandy SILT: non plastic, orange brown, sand is fine to coarse grained.		St	 	MATUA SUBGROUP
		VS 156/ 67 kPa		1.5			1.6 m: becomes pale brown			 ⊕ @ -	
		VS 114/ 29 kPa		- 2.0			SILT: low plasticity, pale brown, with trace clay and with trace fine to coarse grained sand.	M to W	VSt	 ⊕ ©	
		VS >202 kPa	1	- - 			Silty CLAY: medium plasticity, brown, with trace fine grained sand.	М		 	
							Target depth				
AS auger HA hand W washt HA hand	oore auger own by s	ng*	pen wat	■ 10-0 leve wate		l ater shown	HP hand penetrometer (kPa) D N standard penetration test (SPT) M N* SPT - sample recovered W Nc SPT with solid cone S VS vane shear: peak/remouded (kPa) W	based Classifica noisture dry moist wet	d nt d nit	n ed	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense



THE LAKES client:

principal:

project: THE LAKES STAGE 3GH

Centre of lot 490 location:

Borehole ID.	HAL490
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	23 Aug 2016
date completed:	23 Aug 2016
logged by:	ODS
checked by:	RBT

positio	non.			ified					surface elevation: Not Specified		andle	from h			90°
drill m			spec	aneu					drilling fluid:		U	liamete			
drilli	ng i	infor	nati	on			mate	rial sub	stance						
method & support		² penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components		moisture condition	consistency / relative density	⊕ n	/ane hear emoulder peak (kPa)	
						-	$\left \right\rangle$		ORGANIC SILT: non plastic, black.	[D to M	St to VSt			TOPSOIL
			,	VS >202 kPa VS 173/ 29 kPa	3	0.5			SILT: non plastic to low plasticity, orange brown with mottled grey and brown, with trace fine to coarse grained sand. SILT: low plasticity, brown orange, with minor clay		М				FILL MATUA SUBGROUP
			ntered	VS 128/ 24 kPa		- - 1.0			and with trace fine to coarse grained sand. Greas when reworked. 1.0 m: becomes orange brown. With trace silt	sy			 	 • •	
 			Not Encountered	VS 85/ 18 kPa VS 114/		-			1.3 m: with minor fine grained sand and with trace clay	e			⊕ 0 	 	
				36 kPa VS 112/ 24 kPa		1.5									
				24 kPa √S >202 kPa	3	- 2.0			SAND: fine to coarse grained, orange brown, with trace silt. SILT: low plasticity, brown, with some clay and with the president of the second state of the second stat					●	
		 		√S >202 kPa	3				trace fine grained sand.					 @)
						- - - 3.0 - - - - - - - - - - - - - - - - - - -			Hand Auger HAL490 terminated at 2.5 m Target depth						
						- 4.0 - -									
						4.5 — - - 5.0 —									
meth AD AS HA W HA	A hand auger washbore penetratic		mud casing etration		N nil Samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa)				escriptic on Unifie	ibol on ed		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable			
* e.g. B T V	bit shown by suffix g. AD/T blank bit To bit			Dct-12 wa I on date er inflow er outflow	shown	N* SPT - sample recovered			d mit iit			VL very loose L loose MD medium dense D dense VD very dense			



client: THE LAKES

principal:

project: THE LAKES STAGE 3GH

Borehole ID.	HAL493
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	23 Aug 2016
date completed:	23 Aug 2016
logged by:	ODS
checked by:	RBT

location:	location: Centre of lot 493							checked by: RBT
position: Not Specified surface elevation: Not Specified								angle from horizontal: 90°
drill model:							drilling fluid:	hole diameter : 50 mm vane id.: SL588
drilling information r					mate	erial sub	stance	
method & support 1 2 penetration		samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	Unition uniti
				-	$\left \right\rangle$		ORGANIC SILT: non plastic, black.	M VSt to 1 1 1 1 H 1 1 1 H 1 1 1
		VS 130/ 19 kPa VS 136/ 22 kPa		0.5-			SILT: low plasticity, orange brown, with minor clay and with trace fine to coarse grained sand.	MATUA SUBGROUP
				1.0		•	SILTY SAND: fine to coarse grained, orange brown.	
		VS 89/ 44 kPa VS 165/		- 1.5			SILT: non plastic to low plasticity, pale orange brown, with trace to minor fine to coarse grained sand. 1.4 m: with some fine grained sand. Becoming pale	
		41 kPa		-			brown	
		VS >202 kF	a	2.0-			SAND: fine to coarse grained, grey brown, with trace silt. Clayey SILT: low to medium plasticity, brown, with trace fine grained sand.	
H H H H H H H H H H H H H H H H H H H	of Encounter	VS >202 kF	a	2.5-			SILT: non plastic to low plasticity, brown, with trace	
		- VS >202 kP VS >202 kP		-			fine grained sand and with trace clay. 2.8 m: becoming orange brown 2.9 m: sand becomes absent	
		V3 -202 KF	a	3.0			3.1 m: with trace fine grained sand and with minor clay	
		VS >202 kł	a	- 3.5— -			3.4 m: with trace manganese and becoming orange	
»		VS >202 kF	a	4.0-			4.0 m: greasy when reworked	
		VS 104/ 38 kPa		- - 4.5				 ⊕ ∳ ∳
		VS 128/ 71 kPa		5.0			4.8 m: with minor to some manganese Hand Auger HAL493 terminated at 5.0 m	
method AD aug AS aug HA han W was HA han * bits e.g. AD/ B blan T T C t	AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger * bit shown by suffix e.g. AD/T B blank bit T T C bit M mud C casing penetration water u u u u u u u u		N nil		B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample	classification symbol & soil description consistency / relative density VS very soft based on Unified S Classification System F firm St oisture VSt dry H moist Fb wet VL very loose saturated L p plastic limit MD		



THE LAKES client:

principal:

project: THE LAKES STAGE 3GH

Centre of lot 494 location:

Borehole ID.	HAL494
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	23 Aug 2016
date completed:	23 Aug 2016
logged by:	ODS
checked by:	RBT

		ntre of l	014	57					chec	Neu	Uy.	RBT
position: N	ot Spe	cified					surface elevation: Not Specified	0	e from he			
drill model:	-						drilling fluid:	hole	diamete	r : 50	mm	vane id.: SL588
drilling inf	format	ion			mate	material substance			1			1
method & support 1 2 penetration	s water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	⊕ rer ⊛	ne noulded peak Pa)	structure and additional observations
				-	$\left \right\rangle$		ORGANIC SILT: non plastic, black.	D to M				TOPSOIL
		VS >202 kPa VS >202 kPa		- - 0.5 - -			SILT: low plasticity, orange brown with mottled grey and brown, with trace fine to coarse grained sand and with trace clay.				• • - • •	FILL
		VS >202 kPa		- - 1.0	XXXX		SILT : non plastic to low plasticity, orange brown, with trace fine sand.	М			 •	YOUNGER ASH DEPOSIT
		VS 166/ 41 kPa		-			1.1 m: with trace clay			lii	 0 	
		VS >202/ 58 kPa		- 1.5			16 m with minor day. Low plasticity			 ⊕ 	 •	
	i	VS 160/ 36 kPa		-			1.6 m: with minor clay. Low plasticity			ΦI	 	
		VS 96 kPa	2.0-			SILT : low plasticity, orange brown, with minor clay and with trace fine to coarse grained sand.			19	 (MATUA SUBGROUP	
 z 	·	VS >202/ 69 kPa				Sandy SILT: non plastic to low plasticity, orange brown, sand is fine to coarse grained.			 ⊕ 	 		
		VS 182 kPa		-			SAND: fine to coarse grained, orange brown, with trace to minor silt.	_		11	 ©	
	i I	VS >202 kPa	3.0-				with trace fine to coarse grained sand and with trace (clay. SILT: non plastic, brown, with trace to minor fine mained a grad	• _/	i	i i	 (\$)	
		VS >202 kPa				grained sand. SAND: fine to coarse grained, grey brown, with trace silt.						
				-			Clayey SILT: low to medium plasticity, brown, with trace fine grained sand.				U	
	i	VS >202 kPa		4.0			SILT: low plasticity, orange brown, with minor clay and with trace fine grained sand and with trace	_			⊕ 	
		VS 160/ 75 kPa	4.5-				manganese.			l⊕ ∣	€ 	
	i	VS 106/ 52 kPa		-			4.6 m: with trace to minor manganese			•	11	
	i			5.0 -			Hand Auger HAL494 terminated at 5.0 m Target depth					
method AD support AD auger drilling* M AS auger screwing* M HA hand auger C W washbore penetr HA hand auger water * bit shown by suffix e.g. B blank bit t T T C bit t		etration		í ater	B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) D N standard penetration test (SPT) M N* SPT - sample recovered W Nc SPT with solid cone S		escription lon Unifie ation Sys	n ed		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense		



client: THE LAKES

principal:

project: THE LAKES STAGE 3GH

Borehole ID.	HAL495
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	23 Aug 2016
date completed:	23 Aug 2016
logged by:	ODS
checked by:	RBT

location: Centre of lot 495									checked by: RBT				
position: Not Specified							surface elevation: Not Specified	angle	from horizontal:	90°			
drill model:					drilling fluid:			hole	diameter : 50 mm	vane id.: SL588			
drilling information					mate	rial sub	stance						
method & support	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	anav shear tago (bd) tago	structure and additional observations			
		VS >202 kPa VS >202 kPa		- - - 0.5 -			ORGANIC SILT: non plastic, black. SILT: low plasticity, orange brown with mottled grey and brown, with trace fine to coarse grained sand and with trace clay.	M	VSt to H 	TOPSOIL FILL			
		VS >202 kPa VS >202 kPa							 				
		√S >202 kPa		1.5 — - -									
		VS >202 kPa VS >202 kPa		2.0									
 ∀H	Z	VS >202 kPa		2.5			SILT : non plastic to low plasticity, orange brown, with trace fine grained sand and trace clay.			YOUNGER ASH DEPOSIT			
		VS >202 kPa VS >202 kPa		3.0-									
		VS >202 kPa					3.7 m: with minor clay						
		VS 173/ 52 kPa VS 194/		4.0			4.0 m: becoming brown. Sand becomes absent.						
		VS 194/ 46 kPa VS >202 kPa		- 4.5— -			4.5 m: with trace fine sand						
method 5.0 AD auger drilling* AAD auger screwing* C casing HA hand auger W washbore HA hand auger W washbore HA hand auger		√S >202 kPa		- - - 5.0 -			Hand Auger HAL495 terminated at 5.0 m Target depth						
		mud casing etration			samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered	soil d based Classific D dry M moist W wet	tion symbol & escription on Unified ation System	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose					
e.g. AD/T B blank	e.g. AD/T B blank bit T TC bit			leve wat	er outflow	shown	Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	S saturate Wp plastic WI liquid lin	imit	L loose MD medium dense D dense VD very dense			



client: THE LAKES

principal:

project: THE LAKES STAGE 3GH

Borehole ID.	HAL499
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	23 Aug 2016
date completed:	23 Aug 2016
logged by:	ODS
checked by:	RBT

potentice: surface elevation: Not Specified angle from horoznat: OP dmim rode: material substance on:	ntre of l	ot 4	99				checked by: RBT			
defiling information material substance material description material description grags <td colspan="7">position: Not Specified</td> <td>surface elevation: Not Specified</td> <td>angle from horizontal: 90°</td> <td></td>	position: Not Specified							surface elevation: Not Specified	angle from horizontal: 90°	
State State <th< td=""><td colspan="5">drill model:</td><td></td><td></td><td>drilling fluid:</td><td>hole diameter : 50 mm vane id.: SL5</td><td>88</td></th<>	drill model:							drilling fluid:	hole diameter : 50 mm vane id.: SL5	88
NS -202 kPa 0.5 SILT: non plastic, biadk. M VS to H H						mate		stance		
NS -202 kPa 0.5 SILT: non plastic, biadk. M VS to H H	method & support	water		RL (m)	depth (m)	graphic log	classification symbol	SOIL TYPE: plasticity or particle characteristic,	Line construction	5
i i i i i i i i i i i i i i i i i i i		Not Encountered	VS >202 kPa VS >202 kPa VS >202 kPa VS >202 kPa VS >202 kPa VS >202 kPa VS >202 kPa VS 156/ 49 kPa VS 190/ 54 kPa VS >202 kPa VS >202 kPa VS >202 kPa VS >202 kPa VS >202 kPa VS >202 kPa VS >202 kPa VS >202 kPa					SILT: non plastic to low plasticity, orange brown with mottled brown and grey, with trace fine to coarse grained sand.	H I I I I <	
Www.washbore Perturbation SS split spoon sample HA hand auger Image: Transing to registance no resistance U## undisturbed sample ##mm diameter * bit shown by suffix Image: Transing to registance N standard penetrometer (kPa) D dry * bit shown by suffix Image: Transing to registance N standard penetrometer (kPa) M moist * bit shown by suffix Image: Transing to registance N SPT - sample recovered W Wet VL very loose B black bit Image: Transing to registance VS vane shear; peak/remouded (kPa) Wp plastic limit MD medium densee	method AD auger AA auger HA hand W washt HA hand * bit shot	I III method AD auger drilling* AA auger screwing* HA hand auger W washbore HA hand auger support M mud C casing penetration W washbore HA hand auger metration * bit shown by suffix water V 10-		oport nud asing etration on on on on on on on on on on on on o	 no resi rangin refusal Cott-12 wa 	stance g to	Squeezing samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone	classification system consistency / relative densit densite densitive densitive densitive densite densitive densite	-	



client: THE LAKES

principal:

project: THE LAKES STAGE 3GH

Borehole ID.	HAL501
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	23 Aug 2016
date completed:	23 Aug 2016
logged by:	ODS
checked by:	RBT

	tion:		entre of							chec			RBI
											orizoi		
drilling information material substa								-	101	e diamete	. 50	11111	vane id.: SL588
unn						mat		material description		. <u>}</u>	V	ane	structure and
method & support	1 2 penetration	3 water	samples & field tests	RL (m)	depth (m)	graphic log	class ification symbol	SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture	condition consistency / relative density	⊕ ren ⊛	noulded peak Pa)	additional observations
		i			-			ORGANIC SILT: non plastic, black.	D to	M VSt to H	' 		TOPSOIL
		 	VS >202 kPa VS >202 kPa		0.5			SILT: non plastic to low plasticity, orange brown with mottled brown and grey, with trace fine to coarse grained sand.					FILL
			VS >202 kPa	a	1.0-							 	
		 	VS >202 kPa	a	-							 @ 	
			VS >202 kPa		1.5							 @ 	
		 	VS >202 kPa	a	2.0-							🏵 	
HA -		ncounter	VS 156/ 62 kPa VS 190/		2.5-						₽ 	 ● 	
Ī		i i	62 kPa		-			SILT: low plasticity, orange brown, with trace to	M		⊕ 	@ 	YOUNGER ASH DEPOSIT
			VS >202 kPa		3.0			minor clay and with trace fine grained sand.				() ()	
			VS >202 kPa	a	- - 3.5							 ⊕	
			VS >202 kPa	a	-			3.6 m: with trace clay. Non to low plasticity				 (\$)	
			VS 194/ 52 kPa		4.0			4.2 m: becoming brown orange with minor clay.	Low		 ⊕	 ©	
		 	VS >202 kPa	a	- 4.5			plasticity				 ⊕ 	
		 	VS 166/ 66 kPa		- - 5.0			Hand Auger HAL501 terminated at 5.0 m Target depth			 ⊕	 0 + 1	
meth AD AS HA W HA	AS auger screwing* C casing AA hand auger V washbore penetration		mud casing etration	– no re	N nil sistance ng to al	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT)	soi bas	cation syn I descriptio ed on Unifi fication Sys	on ed		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable		
e.g. AD/T B blank bit		Oct-12 w el on dat er inflow	ranging to refusal HP hand penetrometer (kPa) N standard penetration test (SPT) tct-12 water N* SPT - sample recovered on date shown VS vare shoar penetrativended (kPa)			t ated ic limit I limit		Fb friable VL very loose L loose MD medium dense D dense VD very dense					



client: THE LAKES

principal:

project: THE LAKES STAGE 3GH

Borehole ID.	HAL502
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	23 Aug 2016
date completed:	23 Aug 2016
logged by:	ODS
checked by:	RBT

location		Jei	ntre of l	01 5	02					cheo	скес	1 Dy	y:	RBT
position:		Spec	ified					surface elevation: Not Specified		e from h				
drill mode								drilling fluid:	hole	diamet	er : 5	50 n	nm	vane id.: SL588
drilling i		nati	on			mat	erial sub	stance						
	2 penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	⊕r	van shea emou ⊚ pea (kPa 00	ar ilded ak	structure and additional observations
			VS >202 kPa		-			ORGANIC SILT: non plastic, black.	D to N		5			TOPSOIL
		,	VS >202 kPa		- 0.5 - -			SILT: non plastic to low plasticity, orange brown with mottled brown and grey, with trace fine to coarse grained sand.						FILL
			VS >202 kPa		1.0-		8	SILT: non plastic, orange brown, with trace fine					• -	YOUNGER ASH DEPOSIT
			VS >202 kPa		-			sand.					• -	
			VS >202 kPa		1.5			1.4 m: with trace clay. Non to low plasticity					•	
ii			VS >202 kPa		-								•	
		Encountered	VS >202 kPa		2.0-								•	
1 1 1 1 1 1		Not	VS >202 kPa		2.5			2.3 m: becoming mottled brown						
			VS >202 kPa		3.0-			2.6 m: becoming brown2.9 m: becoming orange brown						
			VS 178/ 39 kPa					3.3 m: with minor clay. Low plasticity			0		• •	
			VS 184/ 46 kPa		-						 ⊕		0	
			VS 148/ 35 kPa		- 4.0 — -			Clayey SILT : low to medium plasticity, orange brown, with trace fine grained sand.	M		1	@) 	MATUA SUBGROUP
ii			VS 190/ 52 kPa		-						⊕		•	
* *			VS >202 kPa		4.5			Hand Auger HAL502 terminated at 4.6 m Squeezing				 	•	
					- - 5.0			Oqueezing						
method AD aug AS aug HA har W was	ger dri ger sci nd aug shbore nd aug	rewin Jer		pene	nud casing etration	− no re rang ▼ refus		samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetration test (SPT) N standard penetration test (SPT)	base Classifi moisture D dry M moist	ation syr descripti d on Unif cation Sy	nbol on ied	&		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable V(t) travelopee
e.g. AD	nk bit bit	ı by s	suffix		✓ 10-0 leve wate	Oct-12 v el on dat er inflov er outflo	e snown /	N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	W wet S satura Wp plastic WI liquid I	limit				VL very loose L loose MD medium dense D dense VD very dense



THE LAKES client:

principal:

project: THE LAKES STAGE 3GH

Centre of lot 503 location:

Borehole ID.	HAL503
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	23 Aug 2016
date completed:	23 Aug 2016
logged by:	ODS
checked by:	RBT
date completed: logged by:	23 Aug 2016 ODS

location:	Ce	ntre of l	01 5	03					chec	ked	by		RBT
position: I	Not Spe	cified					surface elevation: Not Specified	angle	e from h	orizo	onta	l: 90°	
drill mode	el:						drilling fluid:	hole	diamete	er : 5	0 m	m	vane id.: SL588
drilling i	informat	ion	1		mate		1	-					
	2 penetration 3 water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	⊕re	/ane hear emould peak (kPa)	led	structure and additional observations
		VS >202 kPa		-			ORGANIC SILT: non plastic, black. SILT: non plastic to low plasticity, orange brown with mottled grey, with trace fine to coarse grained	D to M				FILL	SOIL
		VS >202 kPa		0.5			sand. SILT: non plastic to low plasticity, orange brown, with trace fine sand.					YOL	INGER ASH DEPOSIT
		VS >202 kPa VS 156/ 38 kPa		- 1.0 -			0.8 m: with trace fine to coarse grained sand 0.9 m: with trace clay. Low plasticity.					• 	
		VS 156/ 38 kPa		- - 1.5							 @	i i	
	Not En	VS 194/ 49 kPa		- - 2.0			SILT: low plasticity, brown orange, with minor clay and with trace fine to coarse grained sand. Greasy when reworked.					9 	UA SUBGROUP
		38 kPa VS >202 kPa	l	- - 2.5						₽ 		• 	
		VS >202 kPa VS >202 kPa		3.0-			SILT: non plastic to low plasticity, brown, with trace clay and with trace fine grained sand. 2.9 m: with some clay. Low plasticity			1 i		 ⊕ ⊕	
		VS >202 kPa		- 3.5			3.3 m: becoming orange brown					- ⊕ 	
		VS 190/ 54 kPa		- - 4.0			Hand Auger HAL503 terminated at 4.0 m				 	9 	
				- - - 4.5 -			Squeezing				İ İ		
				- - 5.0 —									
AS aug HA han W was	ger drilling ger screw nd auger shbore nd auger		pen	etration		nil iistance ig to	HP hand penetrometer (kPa)	based	tion sym escriptic I on Unific ation Sys	on ed		V S F S	soft firm t stiff St very stiff hard
e.g. AD/	nk bit bit	suffix	wat	■ 10-0 leve	Oct-12 wa el on date er inflow er outflov	shown	N* SPT - sample recovered V Nc SPT with solid cone S VS vane shear: peak/remouded (kPa) V	W wet S saturate Wp plastic I WI liquid lir	limit			V L N D V	L very loose loose ID medium dense dense



client: The Lakes 2012 LTD

principal: -

project: The Lakes Stage 3 GCR

Borehole ID.	HAL236
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	16 Mar 2016
date completed:	16 Mar 2016
logged by:	NM
checked by:	RBT

	ion:			eor						checked by: RBI
		lot Sp							surface elevation: Not Specified	angle from horizontal: 90° DCP id.:
		Hand	-	er					drilling fluid:	hole diameter : 50 mm vane id.:
drilli	<u> </u>	forma	tion				mate	erial sub	stance	
metnoa & support	1 2 penetration	3 water	fie	mples & Id tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	unit provided the second seco
Î				>240 kPa		_		ML	TOPSOIL: SILT: low plasticity, brown, with minor fine grained sand, trace fine grained	D H
			V: 4	'S 147/ 0 kPa		- - 0.5 -		ML	∖angular gravel. SILT: non plastic to low plasticity, orange brown, with some fine grained sand.	D to M I
 		Not Encountered	V	'S 111/ 25 kPa 25 l03/ 25 kPa /S 78/		- - 1.0		ML SP ML	Sandy SILT: non plastic, orange brown, with fine to medium grained sand. SILTY SAND: fine to medium grained, orange brown.	$ \begin{array}{c} \hline \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline $
			1	8 kPa		- - 1.5		SP	Sandy SILT: low plasticity, pale pink, with lenses of fine to medium gained pale pink sand. SAND: fine to medium grained, orange brown.	
Ţ				'S 206/ I0 kPa		- - - <u>2.0</u>		ML	At 1.6m: becoming white. SILT: low plasticity, orange brown, with trace ∖fine grained sand.	
									Hand Auger HA3D-236 terminated at 2.0 m Target depth	
metho AD AS HA W HA * e.g. B T	auge auge hand wash hand	l auger nown by c bit it	ving*	×	pene	nud casing etration c c c c c c c c c c c c c c c c c c c		ater e shown	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U### undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	classification symbol & soil description consistency / relative density based on Unified VS very soft Classification System F firm moisture VSt very stiff D dry H hard M moist Fb friable VV vert VL very loose S saturated L loose Wp plastic limit MD medium dense VI very dense VD very dense



client: The Lakes 2012 LTD

principal: -

project: The Lakes Stage 3 GCR

Borehole ID.	HAL237
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	16 Mar 2016
date completed:	16 Mar 2016
logged by:	ODS
checked by:	RBT

			LOT							checked by	•	RBT
position: N							surface elevation: Not Specified		U	om horizonta		DCP id.:
drill model:		0					drilling fluid:	ŕ	nole dia	meter : 50 m	Im	vane id.: 2244-02
drilling in	nformat	ion			mate	rial sub	stance					
method & support 1 2 penetration		samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	⊕ remoulded ● peak 1 (kPa)	DCP (blows/ 00 mm)	structure and additional observations
				-			SILT: low plasticity, brown mottled pink, white and orange, with minor fine grained sand, trace fine to medium grained angular gravel.	D	MD			TOPSOIL
				- - 0.5 - -			SILTY SAND: fine to coarse grained, brown with mottled pink brown, with trace fine to medium gravel. 0.7 m: becoming mottled dark brown					FILL
z	Not Encou	VS >183 kPa VS >183 kPa		- 1.0 -			SILT: non plastic, orange brown, with some fine to medium sand. 1.0 m: sand becomes trace and plasticity becomes low	D to M	VSt			
		VS >183 kPa VS >183 kPa		- 1.5 -			1.25 m: becoming mottled pink SILT: low plasticity, orange brown, with trace	_				
		VS >183 kPa		- - 2.0			fine sand. 1.85 m: becoming mottled pale pink and dark					
							Hand Auger HA3D-237 terminated at 2.0 m Target depth			n symbol &		consistency / relative density
AS auge HA hand W wash HA hand * bit s e.g. AD/	ger drilling ger screwi ad auger shbore ad auger shown by /T nk bit	ng*	C of pen	support M mud N nil C casing penetration penetration ranging to refusal water level on date shown water inflow			B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetroin test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal		soil description v based on Unified S Classification System S moisture V D dry H M moist F W wet V S saturated L			F firm St stiff /St very stiff H hard /b friable /L very loose



The Lakes 2012 LTD client:

principal: -

The Lakes Stage 3 GCR project:

Borehole ID.	HAL238
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	16 Mar 2016
date completed:	16 Mar 2016
logged by:	NM
checked by:	RBT

location:	Cel	ntre of	LOI	238					С	hecked b	y:	RBT
position: No	ot Spec	cified					surface elevation: Not Specified	a	angle fro	om horizont	al: 90°	DCP id.:
drill model: I	Hand A	uger					drilling fluid:	ł	nole dia	meter : 50 r	nm	vane id.:
drilling inf	ormati	on			mate	erial sub	stance					
method & support	water	samples & field tests	RL (m)	depth (m)	graphic log	classification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	(kPa)	DCP (blows/ 100 mm)	
	Not Encountered	VS 176/ 33 kPa VS >240 kPa VS >240 kPa VS >240 kPa VS >240 kPa VS >240 kPa				ML ML ML	SILT: low plasticity, brown mottled pink, white and orange, with minor fine grained sand, trace fine to medium grained angular gravel. SILT: low plasticity, orange brown mottled brown, with trace fine grained sand, trace pockets of sandy silt. SILT: non plastic, pale orange, with some fine to medium grained sand. Sandy SILT: non plastic, pale brown mottled white and orange, streaked black, with fine to medium grained sand. SILT: low plasticity, orange brown, with trace fine grained sand, trace clay. Hand Auger HA3D-238 terminated at 2.0 m Target depth		H			FILL -
AS auger HA hand W washt HA hand	auger own by s bit	ng*	pen wat	etration etration		ater e shown	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetroin test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear, peak/remouded (kPa) R refusal HB hammer bouncing	b Cla moistur D dr M mo W we S sa Wp pla	soil desc based on ussification re y bist	n symbol & ription Unified In System		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense



client: The Lakes 2012 LTD

principal: -

project: The Lakes Stage 3 GCR

Borehole ID.	HAL239
sheet:	1 of 1
project no.	GENZTAUC13086AP
date started:	16 Mar 2016
date completed:	16 Mar 2016
logged by:	ODS
checked by:	RBT

	ion:	00	entre of	-01	200					C	hecked l	oy.	RBT
positic		·						surface elevation: Not Specified		•	om horizor		DCP id.:
drill m			0					drilling fluid:	h	ole dia	meter : 50	mm	vane id.: 2244-02
drilli	ng inf	ormat	ion			mate		ostance				1	
method & support	2 2 penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	class ification symbol	material description SOIL TYPE: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	vane shear ⊕remoulded ⊚peak (kPa) B 0 0 00	DCP (blows/ 100 mm	
			VS >183 kPa		-	$\left \right\rangle$		SILT : low plasticity, brown mottled pink, white and orange, with minor fine grained sand, trace fine to medium grained angular gravel.	D	VSt			TOPSOIL
			VS >183 kPa VS >183 kPa		- 0.5			SILT: non plastic to low plasticity, orange brown with mottled pale pink, with trace clay and trace fine sand. 0.5 m: trace gravel becoming present- are grey, medium to coarse and angular	D to M				
< z		Not En	VS >183 kPa		- 1.0			SILT: low plasticity, pink with mottled dark brown, with trace clay and trace to minor manganese. SAND: fine to coarse grained, pale brown, with some silt.	-	MD	 0 		
			VS >183 kPa VS >183 kPa		- - 1.5			1.0 m: silt becomes trace 1.1 m: becomes brown 1.2 m: silt becomes minor SILT: non plastic to low plasticity, orange brown, with some sand.	-				
, ,			VS >183 kPa		- - -			SILTY SAND: fine to coarse grained, orange brown with mottled pale brown.			 �		
					2.5 - - - - - - - - - - - - - - - - - - -			Target depth					
metho AD AS HA W HA * e.g. B T V	auger auger hand wash hand	auger own by bit	ing*	M C pen wat	Leve		iter shown	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	b Cla moistur D dry M mc W we S sai Wp pla	oil desc ased on ssificatio	Unified on System		consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense

Appendix E – Fill Test Summary Tables



GENZTAUC13086AP-AK THE LAKES (2012) LIMITED THE LAKES SUBDIVISION STAGES 3G, 3H & LOTS 236-239 (STAGE D)

			ummary of earthfi	015 EARTHWORI						
Result										
Test Number	Date	Test RL (m)	Air Voids (%)	Shear Vane (kPa)	Scala (blows per 100mm)	Pass/Fail				
A-5		58.44	0.8	127	-	Fail - area reworked				
A-6	18/10/2013	58.83	2.2	209	-	Pass				
A-7		58.91	0.4	UTP	-	Pass				
A-8		58.38	2.7	236+	-	Pass				
A-9		59.09	1.9	UTP	-	Pass				
A-10		58.77	3.8	236+	-	Pass				
A-11		58.51	4.3	176	-	Pass				
A-12		58.71	3.5	86	-	Fail - Retested HAL4				
A-13		58.08	3.7	UTP	-	Pass				
A-29		28.83	1.6	UTP	-	Pass				
A-30		59.33	2.6	236+	-	Pass				
A-31		58.46	1.6	149	-	Pass				
A-32		59.00	0.0	180	-	Pass				
A-33		58.32	4.4	171	-	Pass				
A-34		58.81	0.0	220	-	Pass				
A-35		58.22	0.8	138	-	Marginal Pass				
A-36	_	58.67	0.3	UTP	-	Pass				
A-37	-	58.01	0.0	236+	-	Pass				
A-38 A-39	30/10/2013	58.50 57.76	0.0	236+	-	Pass				
A-39 A-40		57.76	0.0	195 UTP	-	Pass Pass				
A-40 A-41		58.18	0.0	97	-	Fail - Retested HAL4				
A-41 A-42		58.24	4.9	UTP	-	Pass				
A-43		58.24	0.5	205	-	Pass				
A-44		58.53	0.0	197	-	Pass				
A-45		58.86	6.3	236+	-	Pass				
A-46		59.58	3.0	138	-	Marginal Pass				
A-47		59.43	1.3	9999	-	Pass				
A-48		59.23	5.8	236+	-	Pass				
B-01	15/10/2014	52.59	1.5	112	-	Pass - Retest done, see B				
B-02		52.13	2.8	200	-	Pass				
B-03		52.06	-0.3	187	-	Pass				
B-04		51.71	-0.4	154 84	-	Pass				
B-05 B-06		52.2 58.72	0.2 2.6	226		Pass - Retest done, see B Pass				
B-00 B-07		58.51	1.5	170		Pass				
B-08		58.77	-0.3	119	-	Fail - Retested HAL469-HAL4				
B-09		59.11	0.5	112	-	Fail - Retested HAL4				
B-10		59.09	1.8	167	-	Pass				
B-11		52.8	3.6	187	-	Pass				
B-12		52.59	2.5	140	-	Pass				
B-13		52.08	0.5	109	-	Pass - Retest done, see B				
B-14	5/11/2014	53.62	4.1	204	-	Pass				
B-15		53.19	9.4	179	-	Pass				
B-16		53.58	2.4	158	-	Pass				
B-17 B-18	-	53.4	-0.1	171 166	-	Pass Pass				
B-18 B-19	-	53.05 53.06	4.5	189	-	Pass				
B-19 B-20	-	53.53	0.4	169	-	Pass				
B-20 B-21		53.06	1	164	-	Pass				
B-22		52.68	2.4	157	-	Pass				
B-26	14/11/2014	51.85	5.5	227	-	Pass				
B-27		53.12	6.2	184	-	Pass				
B-28		52.07	4	148	-	Pass				
B-29	4	55.4	2.4	179	-	Pass				
B-30	27/11/2014	54.9	1.3	231	-	Pass				
B-31		55.1	3.9	176	-	Pass				
B-32 B-33		54.76 54.26	1.6 6.4	198 187	-	Pass Pass				
B-48	+	55.55	4.5	166	-	Pass				
B-40 B-49	1	55.44	7.6	209	-	Pass				
B-50	1/12/2014	55.22	4.8	150	-	Pass				
B-51	1	54.95	6	174	-	Pass				
B-52	1	54.68	6.3	193	-	Pass				
B-53		56.26	3.2	219	-	Pass				
B-54	-	55.97	2	193	-	Pass				
B-55		55.98	1.2	231	-	Pass				
B-56	5/12/2014	56.35	-0.2	213	-	Pass				
B-57	4	55.95	2.8	222	-	Pass				
B-58 B-59	-	56.06	11.3	220	-	Pass				
	<u> </u>	56.47	4.5	231	-	Pass				

Test Number	Date	Test RL (m)	Result			
			Air Voids (%)	Shear Vane (kPa)	Scala (blows per 100mm)	Pass/Fail
B-61	9/12/2014	57.06	1.9	159	-	Pass
B-62		56.9	-1.9	222	-	Pass
B-63		56.81	1.2	163	-	Pass
B-64		56.65	3.1	204	-	Pass
B-65		56.06	4.5	221	-	Pass
B-168	16/02/2015	46.99	5	232	-	Pass
B-169		45.83	1.5	231	-	Pass
B-170		45.35	3.8	230	-	Pass
B-175	20/02/2015	49.28	-2.9	224	-	Pass
B-176		48.50	1.5	210	-	Pass
B-177	24/02/2015	48.99	1.8	220	-	Pass
B-178		48.76	7.7	225	-	Pass
B-179		49.55	0.8	203	-	Pass
B-180		50.17	1.3	232	-	Pass
B-181	26/02/2015	47.50	1.4	232	-	Pass
B-182		47.00	4.4	195	-	Pass
B-183		34.00	4.4	219	-	Pass
B-186	3/03/2015	53.69	2.5	232	-	Pass
B-187		53.67	2.1	230	-	Pass
B-190	9/03/2015	56.91	-1.6	232	-	Pass
B-191		57.67	4.3	195	-	Pass
B-192		57.37	11.9	210	-	Pass
B-193		58.66	4.7	226	-	Pass

Notes

Shear strength for NDM tests calculated from average of 4 vane tests at each test location. 1

A target Soilds Density of 2.44 t/m³ to 2.60 t/m³ was assumed for silt/ash fill.
UTP = Unable to Penetrate

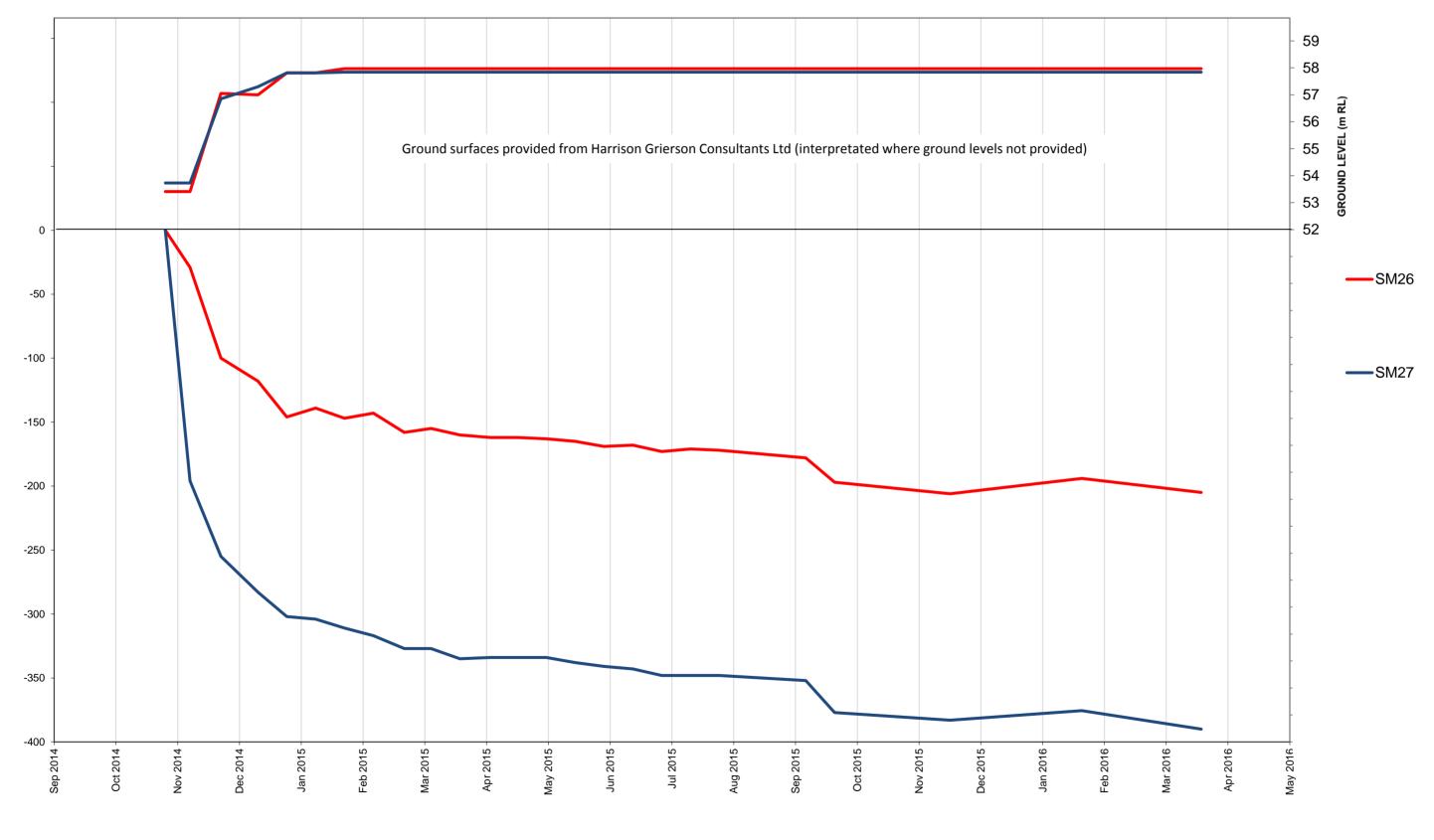
Failed test areas were observed by Coffey and retested with shearvane and/or scala penetrometer.
All test locations and elevations surveyed by JMC Ltd.

Appendix F – Static Settlement Results



SETTLEMENT (mm)

SETTLEMENT VS TIME

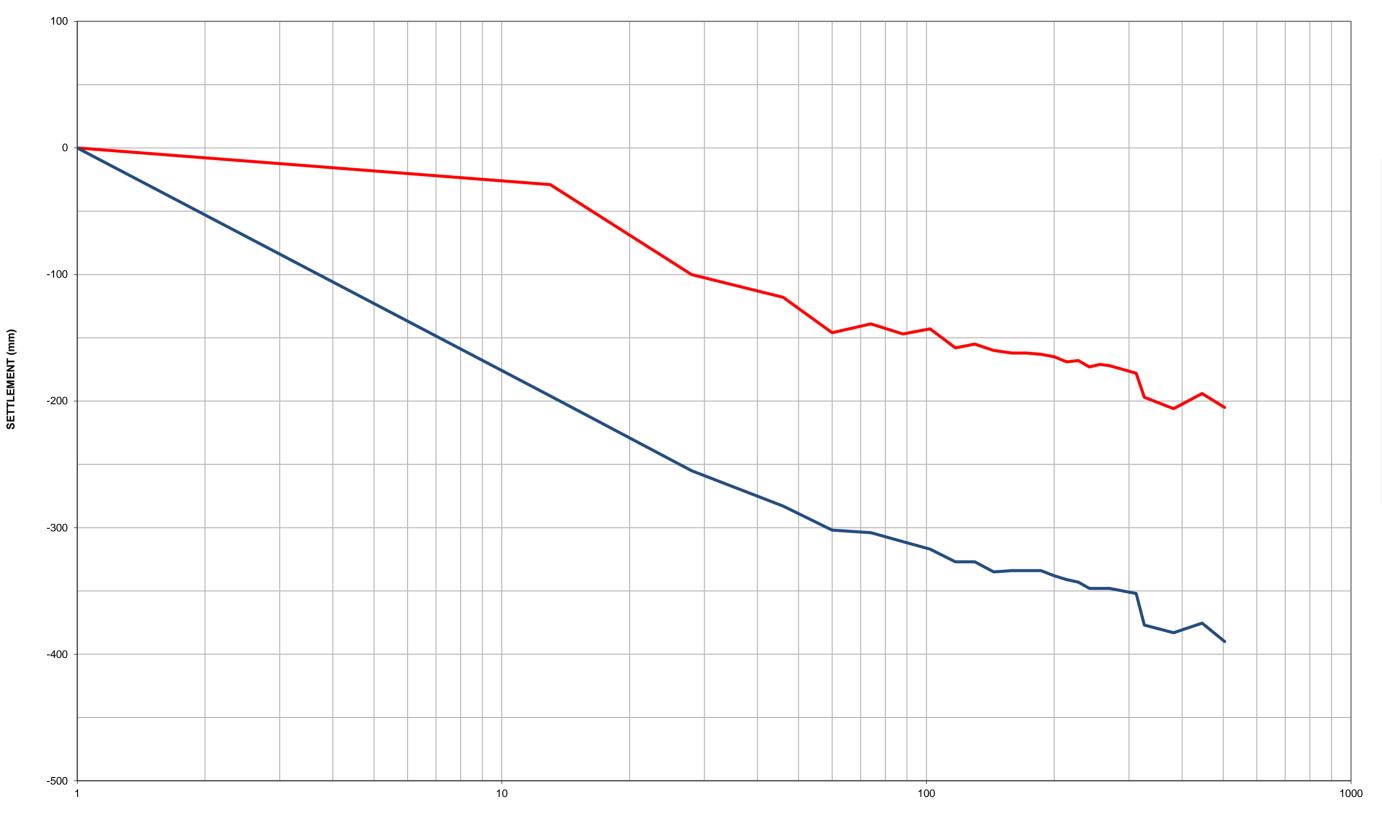


DATE



GENZTAUC13086AP-AK THE LAKES STAGE 3H GEOTECHNICAL COMPLETION REPORT SETTLEMENT MONITORING

SETTLEMENT VS TIME (LOG SCALE)

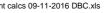


TIME (days, log scale)

F:\1.GENZ\1.GEOTECHNICS PROJECTS\13086AP THE LAKES STAGE 3 GCRs\8. REPORTS & CORRESPONDENCE\13086AP-AK Stage 3GH & Stage 3D Lots 236-239 GCR\Stage 3D Lots 236 to 239 & Stage H Settlement\The Lakes Stg3H settlement calcs 09-11-2016 DBC.xls

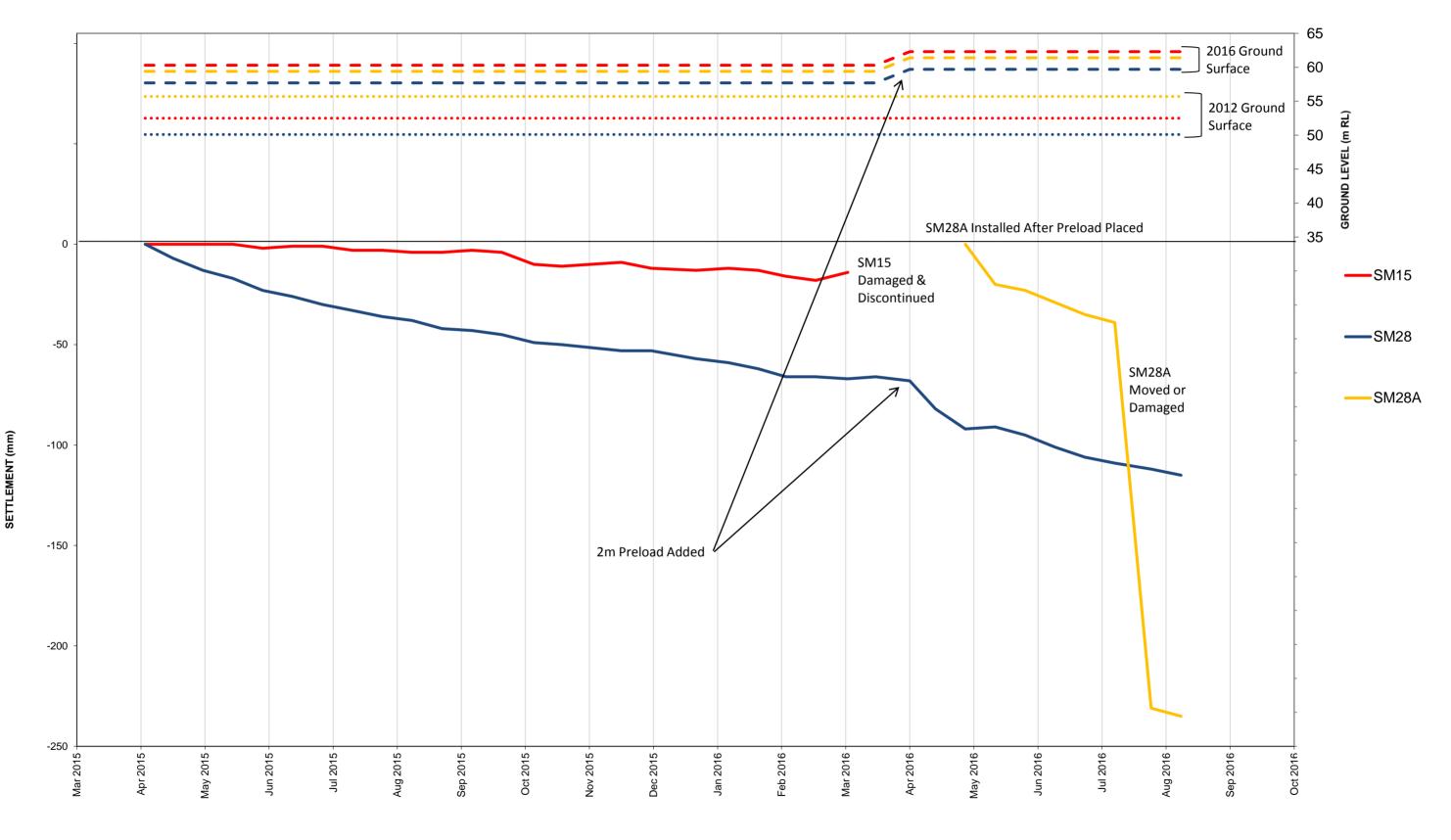
—SM26

—SM27





SETTLEMENT VS TIME



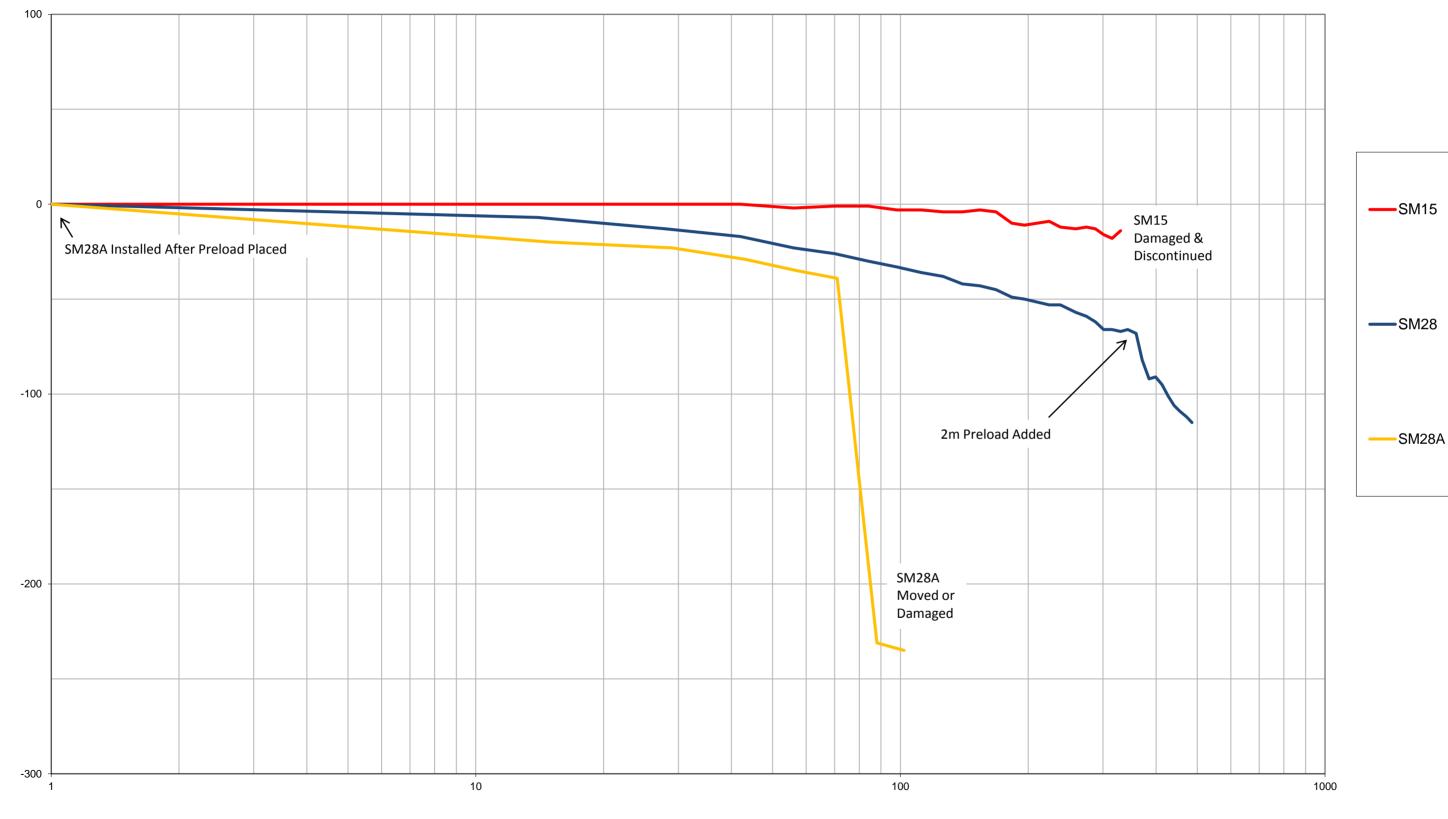
DATE



SETTLEMENT (mm)

GENZTAUC13086AP-AK THE LAKES STAGE 3D LOTS 236-239 GEOTECHNICAL COMPLETION REPORT SETTLEMENT MONITORING

SETTLEMENT VS TIME (LOG SCALE)



TIME (days, log scale)

F:\1.GENZ\1.GEOTECHNICS PROJECTS\13086AP THE LAKES STAGE 3 GCRs\8. REPORTS & CORRESPONDENCE\13086AP-AK Stage 3GH & Stage 3D Lots 236-239 GCR\Stage 3D Lots 236 to 239 & Stage H Settlement\The Lakes Stg3D settlement calcs 01-09-2016 DBC.xls

Appendix G – Stage 3G Retaining Wall Certification



96 Cameron Road, Tauranga Tauranga Central 3110 New Zealand

t: +647 577 4288

coffey.com

2 February 2017

Our ref: GENZTAUC13086AB-AF

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

Attention: Tony Mills

Dear Tony

The Lakes Stage 3G – Northern Boundary Retaining Wall Observation and Certification

This letter confirms that Coffey Services (NZ) Ltd (Coffey) visited the above site on numerous occasions to observe works associated with the construction of the timber pole retaining wall which runs along the northern boundary of Stage 3G. The observations were completed in general accordance Coffey's design report¹ dated 16 June 2016 and the Tauranga City Council building consent number 55971.

The following items were checked or carried out on site:

- Verification of pre-drilled pile hole diameters depths and spacing's;
- Confirmation of soil conditions encountered within the boreholes;
- Verification of timber pole upright heights and diameters;
- Verification of timber lagging, dimensions and placement;
- Confirmation of safety fence installation.

As a result of our observations and site measurements, Coffey are satisfied that the subject retaining wall has been built in general accordance with the requirements of the design report and building consent.

A producer statement (PS4 – Construction Review) is attached to this letter.

¹ Coffey (2016) Retaining Wall Design Report for Stage 3G The Lakes, The Lakes Subdivision, Tauriko. Dated: 16 June 2016, Ref: GENZTAUC13086AB-AB

Limitations

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

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

For and on behalf of Coffey

Tellor

Rob Telford Senior Engineering Geologist

Letter reviewed by:

David Sullivan, BSc, MBA, CE (Calif.), MIPENZ, CPEng, TCC Category 1 Geotechnical Engineer Principal Geotechnical Engineer CPEng No. 1025183

Attachments

Site photographs

Producer Statement - PS4 - Construction Review

Photograph 1: Photo taken on the 10/11/16 of predrilled Pile holes 47 to 126.



Photograph 2: Photo taken on the 22/11/16 of the placement of piles.



CLIENT: The Lake	es (2012) Ltd	PROJECT:	13086AB	DESIGNED:	N.M	SITE PHOTOGRAPHS
		DWG #:	А	DRAWN:	N.M	
		REVISION:				
PROJECT TITLE:	Stage 3G -Retaining Wall	SCALE:	NA	STATUS:	FINAL	coffey
	Observations and Certification	DATE:	23.01.17			Page 1 A TETRA TECH COMPANY

Photograph 3: Photo taken on the 22/11/16 of the final placement and alignment of retaining wall piles.



CLIENT: The Lake	es (2012) Ltd	PROJECT:	13086AB	DESIGNED:	N.M	SITE PHOTOGRAPHS	
		DWG #:	Α	DRAWN:	N.M		
		REVISION:					coffev ?
PROJECT TITLE:	Stage 3G -Retaining Wall	SCALE:	NA	STATUS:	FINAL		coney •
	Observations and Certification	DATE:	23.01.17			Page 2	A TETRA TECH COMPANY



PRODUCER STATEMENT – PS4 – CONS (Guidance notes on the use of this form are printed of	
ISSUED BY: COFFEY SERVICES (NZ) LIMITED	
TO: THE LAKES (2012) LIMITED	
TO BE SUPPLIED TO: TAURANGA CITY COUNCIL	
IN RESPECT OF: TIMBER POLE RETAINING WALL DESIGN	
AT: THE LAKES STAGE 3G	
COFFEY SERVICES (NZ) LTD has been engaged by THE LAKES (2012) LT (Construction Review Firm) To provide CM1 CM2 CM3 CM4 CM5(Engineering Categories) or conservation	
or Sother PERIODIC INSPECTIONS DURING RETAINING WALL CONSTR	RUCTIONservices
(Extent of Engagement) in respect of clause(s) B1/VM4 & F4 of the described in	Building Code for the building work
documents relating to Building Consent No.55971	and those relating to
Building Consent Amendment(s) Nos. N/A	issued during the
course of the works. We have sighted these Building Consents and the cond	litions of attached to them.
Authorised instructions / variations(s) No. N/A	(copies attached)
or by the attached Schedule \square have been issued during the course of the w	orks.
On by the basis of ⊠this ⊡these review(s) and information supplied by the and on behalf of the firm undertaking this Construction Review, I believed only of the building works have been completed in accordance with the real and Building Consent Amendments identified above, with respect to Clause Code. I also believe on reasonable grounds that the persons who have undertaken	e on reasonable grounds that □All ⊠Part levant requirements of the Building Consent se(s) B1/VM4 & F4of the Building
competency to do so.	
I,David Sullivanam:	⊠CPEng No1025183
(Name of Construction Review Professional)	Reg Arch No.
I am a Member of : IPENZ INZIA and hold the following qualifications:	
The Construction Review Firm issuing this statement holds a current policy of than \$200,000*. The Construction Review Firm is a member of ACENZ :	of Professional Indemnity Insurance no less
SIGNED BY David Sullivan ON BEHALF OF COFFEX SERVIC	CES (NZ) LTD
Date: 3-2-17 Signature:	VC
Note: This statement shall only be relied upon by the Building Consent Authority named ab	

Design Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of \$200,000*.

This form is to accompany Forms 6 or 8 of the Building (Form) Regulations 2004 for the issue of a Code Compliance Certificate.

FORM OF PRODUCER STATEMENT PS3 - CONSTRUCTION

1

At project completion, this form shall be completed by the building contractor and supplied to the Engineer. 11

ISSUED BY: HIGGINS CONTRACTORS CTD (Building Contractor)
TO: THE LAKES 2012 : (Owner/Principal)
IN RESPECT OF: RETAINING WALL LAKES 3G (Description of Contract Works)
AT: 3110L PYES PARD (Address)
T/A: DUILDING CONSENT No: 55577 (Territorial Authority / Building Consent Authority)
The above Building Contractor has contracted to the above Owner/Principal to carry out and complete certain building works in accordance with the contract, titled
(Title of building contract)
Builder's Authorised Agent)
above building contractor, believe on reasonable grounds that the above building contractor has carried out and completed
□All □Part only as specified in the attached particulars
of the building works in accordance with the contract.

· · · · · · · · · (Signature of Authorised Agent on behalf of the Building Contractor)

13/2/2017 (Date)

92 HEC

MAUNGANU MT (Address)

ETTS

This producer statement is confirmation by the builder(s) that they have carried out the building work in accordance with the drawings, specifications (and site amendments) that are part of the contract / building consent documents.

.....

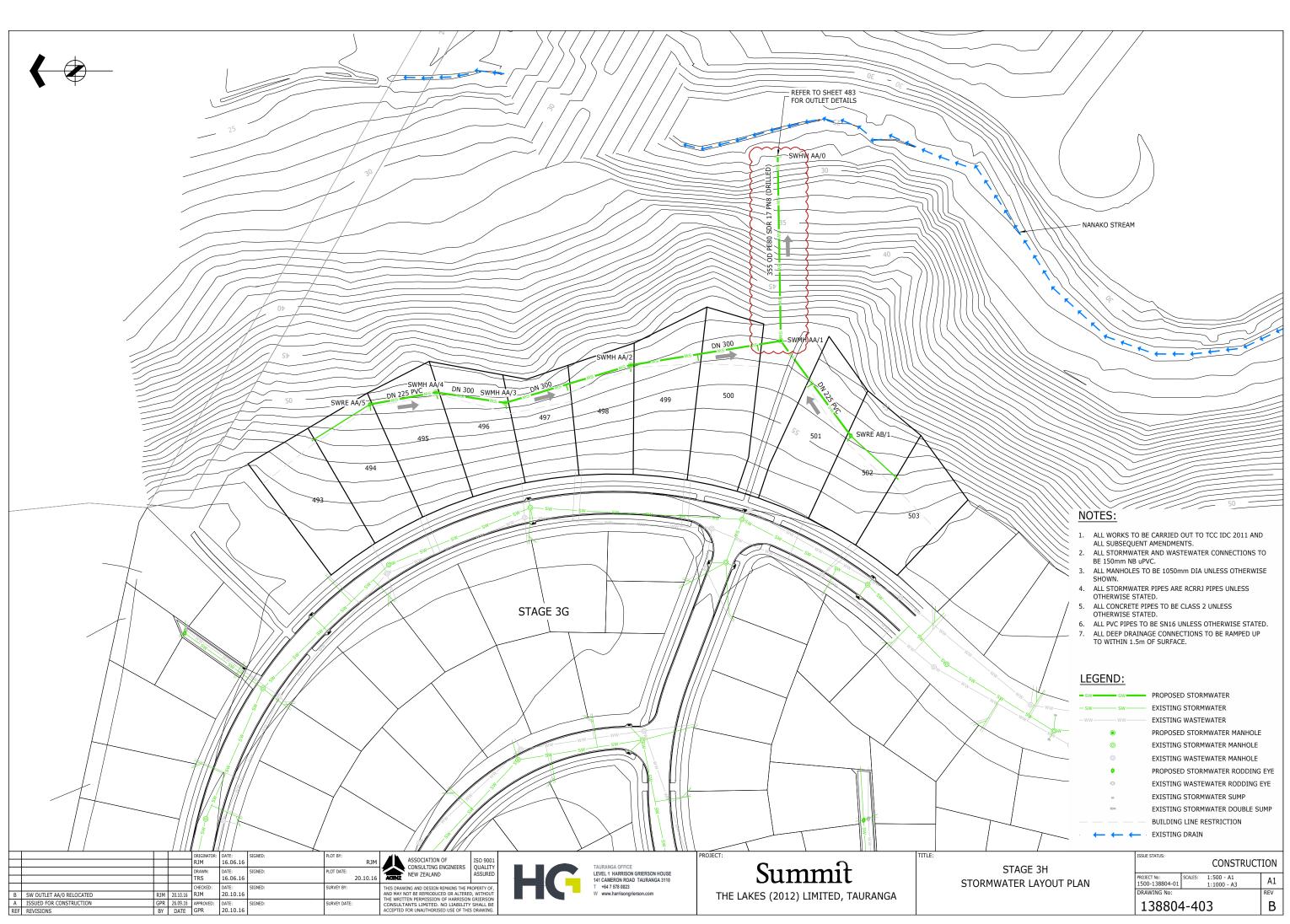
RD

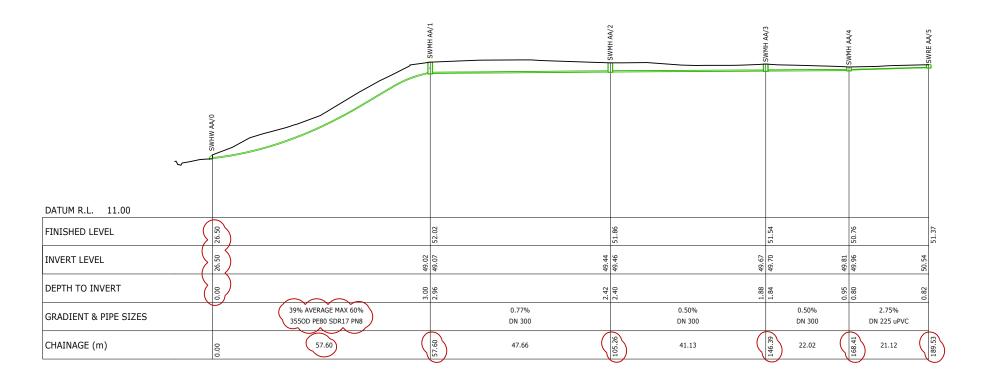
Work covered by this statement should have been supervised and checked by suitably qualified tradespersons.

The Engineer requires this producer statement and a copy of the T/A's building consent conditions, to confirm that items of the contract that he has not personally examined, have in fact been built according to the documents, so that the Engineer may issue appropriate documents to the T/A for it to release the Code Compliance Certificate.

20393-1

Appendix H – Stage 3H Stormwater Pipeline Drawings





STORMWATER LINE AA LONGITUDINAL SECTION

SCALE HOR 1:500 - A1, 1:1000 - A3 VER 1:100 - A1, 1:200 - A3

		T /WY HIMMS		CWDE AD /1	JWNE AB/ I
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DATUM R.L. 23.00					
FINISHED LEVEL		52.02			53.81
INVERT LEVEL	49.02	50.32		52.54	
DEPTH TO INVERT	3.00	1.70		1.27	
GRADIENT & PIPE SIZES			5.99% DN 225 uPVC		
CHAINAGE (m)		0.00	37.03		37.03

STORMWATER LINE AB LONGITUDINAL SECTION

SCALE HOR 1:500 - A1, 1:1000 - A3 VER 1:100 - A1, 1:200 - A3

				DATE:	SIGNED:	PLOT BY:		ASSOCIATION OF	ISO 9001		
			RJM	16.06.16		к	М		QUALITY		TAURANGA OFFICE
			DRAWN:	DATE:	SIGNED:	PLOT DATE:		NEW ZEALAND			LEVEL 1 HARRISON GRIERSON HOUSE
			TRS	16.06.16		20.10	16	ACENZ	ASSURED		141 CAMERON ROAD TAURANGA 3110
			CHECKED:	DATE:	SIGNED:	SURVEY BY:	Th	HIS DRAWING AND DESIGN REMAINS THE PF	ROPERTY OF,		T +64 7 578 0023
OULET AA/0 RELOCATED, PIPE LENGTH REDUCED	RJM	20.10.16	RJM	20.10.16							W www.harrisongrierson.com
SUED FOR CONSTRUCTION	GPR	26.09.16	APPROVED:	DATE:	SIGNED:	SURVEY DATE:					
/ISIONS	BY	DATE	GPR	20.10.16			A	CCEPTED FOR UNAUTHORISED USE OF THIS	S DRAWING.		
U	ED FOR CONSTRUCTION	ED FOR CONSTRUCTION GPR	ED FOR CONSTRUCTION GPR 26.09.16	ULET AA/0 RELOCATED, PIPE LENGTH REDUCED RIM CHECKED: DFOR CONSTRUCTION GPR 26.09.16 APPROVED:	TRS 16.06.16 CIECKED: DATE: ULLET AA/0 RELOCATED, PIPE LENGTH REDUCED RIM 20.10.16 ED FOR CONSTRUCTION GPR 26.09.16 APROVED:	TRS 16.06.16 CHECKED: DATE: SIGNED: ULET AA/0 RELOCATED, PIPE LENGTH REDUCED RJM 20.10.16 RJM 20.10.16 ED FOR CONSTRUCTION GPR 26.09.16 APPROVED: DATE: SIGNED:	TRS 16.06.16 20.10. CHCKED: DATE: SIGNED: SURVEY BY: ULET AA/0 RELOCATED, PIPE LENGTH REDUCED RIM 20.10.16 SURVEY BY: ED FOR CONSTRUCTION GPR 26.09.16 APPROVED: DATE: SIGNED: SURVEY DY:	TRS 16.06.16 20.10.16 C CHECKED DATE: SIGNED: SURVEY BY: T ULLET AA/0 RELOCATED, PIPE LENGTH REDUCED RIM 20.10.16 SURVEY BY: T A ED FOR CONSTRUCTION GPR 26.09.16 APROVED: DATE: SIGNED: SURVEY DATE: T	DATE: SIGNED: PLOT DATE: TRS 16.06.16 20.10.16 20.10.16 ULET AA/0 RELOCATED, PIPE LENGTH REDUCED RIM 20.10.16 SIGNED: SURVEY BY: This DRAWING AND DESIGN REMAINS THE PLAND MAD MAD MAD DESIGN REMAINS THE PLAND MAD MAD MAD MAD MAD DESIGN REMAINS THE PLAND MAD MAD MAD MAD MAD MAD DESIGN REMAINS THE PLAND MAD MAD MAD MAD MAD MAD MAD MAD MAD MA	DRAWN: DATE: SIGNED: PLOT DATE: 20.10.16 TRS ASSURED TRS 16.06.16 SIGNED: 20.10.16 TRS ASSURED ASSURED ULET AA/0 RELOCATED, PIPE LENGTH REDUCED RJM 20.10.16 RJM 20.10.16 SIGNED: SURVEY BY: THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF, AND MAY NOT BE REPRODUCED OR ALTERED, WITHOUT ED FOR CONSTRUCTION GPR 26.09.16 APPROVED: DATE: SIGNED: SURVEY DATE: CHEVISION OF HAREISON GEREASON	Date: Date: SIGNED: PLOT Date: TRS 16.06.16 CHECKD: Date: CHECKD: Date: CHECKD: Date: CHECKD: Date: CHECKD: Date: CHECKD: Date: CHECKD: Date: CHECKD: Date: SURVEY BY: This Dawling And Design Remains The ROPERTY OF, AND MAY NOT BE REPROJUCED OR ALTERED, WITHOUT THE WRITEW PERMISSION OF HARRISON GENERSON CONSTRUCTION GPR 26.09.16 APROVED: Date: SIGNED: SURVEY DATE:



STORMWA

STAGE 3H	ISSUE STATUS:		CONSTRUCT	ION
ATER LONGITUDINAL SECTION	PROJECT No: 1500-138804-01	SCALES:	AS SHOWN	A1
	DRAWING No:			REV
	138804-435			В

