

GREENHILL PARK RESIDENTIAL SUBDIVISION

STAGE 20 Area LUK, Greenhill Park, Hamilton

GEOTECHNICAL COMPLETION REPORT ON SUBDIVISION EARTHWORKS AND **RECOMMENDATIONS FOR BUILDING DEVELOPMENT**



Our Ref: CR171738-S20-GCR

Prepared for: Chedworth Properties Limited

Date: December 2023

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1.0 Subdivision Development Earthworks

1.1 Introduction

Stage 20 of Greenhill Park is currently accessible from Webb Drive and Watkins Street. Stage 20 comprises 36 residential lots (numbered 610-642 & 8038-8043). The locations of these lots are shown on attached subdivision plan 19-30410-20-RC1 Rev. 4 included in Appendix A.

Bulk earthworks have been completed to re-contour the previously agricultural landscape for Stage 20 of the Greenhill Park Residential Subdivision in Hamilton. Works have been carried out in accordance with Hamilton City Council's (HCC) Subdivision Resource Consent: 011.2019.7140.003. Prior to commencement of earthworks, geotechnical investigations were carried out by Beca Ltd (Beca) in 2016 [1] and summaries in DBCE Preliminary Report for L&K&Eldone (December 2019).

The Regional Infrastructure Technical Specifications (RITS) for Waikato set out the minimum standards for design and construction of public infrastructure within Hamilton City. Section 2.1.6 of the *Earthworks and Geotechnical Requirements* of the RITS states that the developer shall appoint a geo-professional to carry out functions as described in NZS 4404[5] Section 2.2.4. RITS Section 2.3.4.1 states that a geotechnical completion report shall be submitted as per NZS 4404 Section 2.6 including a statement of professional opinion on the suitability of land for building construction [4]. The developer has appointed CORE50 Ltd as the geo-professional.

To satisfy the requirements of HCC's Resource Consent, the RITS and NZS 4404, this report summarizes the observations and testing undertaken during the development of the stage, discusses the suitability of the ground for the support of the proposed residential buildings and contains recommendations for the disposal of stormwater runoff generated on individual sites.

Included in Appendix A of this report is the proposed subdivision plan comprising the proposed new lots for Area LUK Stage 20. The included earthworks plan shows the cut/fill extent of the earthworks undertaken, test positions, road and lot locations.

1.2 Earthworks in the Subdivision

The earthworks for Stage 20 of the subdivision development were undertaken between August 2023 and November 2023.

These earthworks comprised:

- 1. The stripping of surface topsoil to expose underlying natural soils.
- 2. Cut of up to 2.9m.
- 3. The placement of filling within majority of the stage.
- 4. Backfilling and raising the ground level with new fill to create uniform fill platforms.
- 5. The reinstatement of the surface topsoil cover and subsequent grassing.

The soils encountered during the formation of the site and road subgrades were a mixture of silty sands and sandy silts, typical of younger Hinuera deposits, overlying clayey silt and silty clay, typical of Walton group deposits. The Walton Subgroup rises out of the Hinuera deposits that formed a ridge line running through the greater LUK area. These soils were those that had been identified in pre-construction site investigations by the Beca Report 2016. The published geology indicates that Area LUK soils comprise Hinuera Formation alluvium at surface with Walton Subgroup overlain by Hamilton Ash in the gently sloping hill within the LUK area.

The filling work was undertaken using the Walton Subgroup soils gained from areas of cut within stages 16 to 18a and the larger Greenhill Subdivision. Filling was undertaken from August 2023 to November 2023 when drying back of the soils was possible to close to optimum moisture contents to achieve near maximum compaction densities and undrained shear strengths.

Some rockfill was placed (using AP100) at the base of the fill areas to provide an improved working surface and under drainage prior to placing the locally won fill. Depths and locals of the fill are shown in the attached cut/fill plan (Appendix A). Rockfill was proof rolled as a means or confirming suitable compaction was maintained. The target criteria was rock fill layer not prone to weaving that the building platforms could then be formed above. The rock fill was typically 1.6m or more below the surface.

Upon completion of the earthworks, approximately 100 to 200 mm of topsoil was placed across the sites and the finished surfaces were grassed in accordance with Conditions of the Resource Consent. While the target topsoil depths after the earthworks were to be around 300 mm, no guarantee is implied or given that the topsoil on any part of any lot is 300 mm or less and it is recommended that future owners or designers or builders check topsoil depths when preparing site development plans and cost schedules.

1.3 Earthworks Standards

The earthworks in filling were undertaken using in situ Silty CLAY and Clayey SILT mixtures gained from areas of cut within stages 16 to 18a and across the larger subdivision. The standards for the placement of filling, as stated in the earthworks contract documents, were to comply with NZS 4431:1989 "Code of Practice for Earth fill for Residential Development" and the Council RITS. Filling placed to these standards may be considered as good ground in terms of NZS 3604:2011 "Timber Framed Structures".

The compaction of the filling placed was monitored and tested for compaction density using a hand-held shear vane and nuclear densometer in finer grained Clayey SILT and Silty CLAY. The compaction control criteria adopted for engineered fill on site were as follows:

- Air voids percentage average value less than 10 %.
- Air voids percentage maximum single value 12 %.
- Undrained shear strength average value not less than 140 kPa.
- Undrained shear strength minimum single value 110 kPa.
- Compaction percentage average value not less than 95%.
- Compaction percentage minimum single value 90%.

1.4 Filled Ground

During the placement of filling on the road subgrades and on areas intended for residential development, the contractor, OLC, stripped and removed all topsoil and other surface organic soils. Post construction testing was carried out to confirm the interface between the cut and fill. Filling was placed in discrete layers with compaction applied through sheepsfoot drum rollers.

Subgrade inspections were carried out by the contractor and by CORE50 for verification purposes. The CORE50 subgrade and fill testing included a site walkover by the geotechnical engineer and site testing by a Geo-technician. As most of the filling placed comprised Clayey SILT and Silty CLAY identified in the pre-subdivision boreholes, testing of the compaction achieved was undertaken with a handheld shear vane and NDM testing (Nuclear Density Meter). Testing was based on the required air voids ratio (averaging 10% and no individual value of over 12%). In our experience, oven tests for air void correction can vary the air void result in this material by up to 3%. Oven tests were typically used for any on field air void result $\geq 6\%$. Solid density values were based on the same value used in the lab testing (2800kg/m³). This is a higher value that would typically be used but provides a conservative result so has been adopted without further question or testing.

1.5 Areas of Cut

Areas partly developed by cut are shown on the cut fill plan (Appendix A). In these areas, the ground at formation levels was observed to comprise of Silty and Sandy Hinuera deposits.

1.6 Test Results in Filling Placed

A summary of the tests undertaken by CORE50 is present in Appendix D.

The shear vane and nuclear densometer test results show that acceptable soil strengths had been developed in all fill areas tested. Any areas with test results that did not meet the compaction control criteria was reworked.

1.7 Land Hazards

1.7.1 Land Stability

All lots across stage 20 have been graded as flat as possible with a desirable gradient of 0.5%. Standard good practice around small slopes of the site will be required where these are presence (i.e. lots 588-562 upon modifying ground levels). Buildings should be set back from the slopes and avoid either surcharging the slopes or undermining the slopes. All foundations within this area are subject to specific engineering design, and an assessment of the building location and earthworks should be carried out as a part of the engineering design/review of any section adjacent to a slope.

1.7.2 Flooding

The final lot levels have been set based on infrastructure requirements and freeboard from flood levels developed as part of the stormwater design for the larger subdivision. The means of disposal of stormwater runoff from lots in these stages of the subdivision are described in the catchment and overland flow assessments by Beca (interpretive Report Lot Levels Area LUK). In the report for area LUK, a 1% AEP flood event is identified for each swale system. A list of Minimum Lot Levels for Stage 20 is included in Appendix E.

Site grading during house construction must not lower finished levels below the minimum finished ground levels identified by S&L without further review of the impacts on flooding. Earthworks must not direct stormwater runoff to adjacent properties, or towards buildings, or create areas of localized ponding. All overland flow is to be towards the road frontage on each section, where falls will direct surface flow towards the swale system.

It is the responsibility of the building design professional to ensure that the requirements for mitigation for the hazard of flooding are met by the design prior to submitting to Council for consent. Confirmation of the swale construction and flood levels are excluded from the scope of this report and are to be covered separately with sign-off of infrastructure works.

1.7.3 Liquefaction

The potential for the hazard of liquefaction for Area LUK of the Greenhill Park Subdivision is discussed in the DBCE Preliminary Geotechnical Report. Geologically, stage 20 is a transition zone between younger Hinuera Deposits and older Walton Subgroup. The Hinuera deposits are considered liquefaction prone is subject to a seismic event coupled with a high groundwater. Zones of the subdivision that are in the low lying area will typically be subject to liquefaction effects during the ULS earthquake. Modelling using CLiq indicates that zones with less than 2m of additional raising fill over original ground levels are considered TC2 unless further assessment is carried out.

For lots with greater than 2m of fill added or sites on cohesive (i.e. Walton Group) deposits the risk is reduced and TC1 foundations are appropriate. The foundation summary has provided a recommendation for the site class based on the net additional fill added to this area. At time of completion, all lots are deemed TC2 and have less than 2m of raised platforms. Modifications to subgrades and building levels may be carried out to reduce the liquefaction risk to a lower category as a part of building development works.

Note that updated liquefaction parameters (0.25g and M=5.9) have been used for checking the threshold as a part of the adjacent Stage 19 review, with LSN = 10 indicated for sites with 2m of fill added during subdivision earthworks. Additional fill/ground raising will reduce the risk of liquefaction triggering by increasing the non-liquefiable rafting layer.

Foundations near the top of the swales are subject to Specific Engineering Designs. The liquefaction summary plan is appended to this Completion report (Appendix A). Specifically, the requirements are:

- 0m 1.5m no habitable dwellings to be built within 1.5 m of the swale crest.
- No lots are adjacent to storm water swales in Stage 20.

1.7.4 Expansive Soils

Underlying soils within stage 20 are typically either Hinuera Formation based deposits, or Walton Subgroup (insitu or used as fill). The Hinuera Formation is predominantly sand, and silt based and considered non expansive or slightly expansive. The Walton Subgroup has a much higher clay content and is considered slightly to moderately expansive. Given the volcanic origins, the expansive nature of the soils is generally non-recoverable i.e., shrinkage only. However, the relatively high shrinkage potential of the Walton Subgroup means it would be normal to classify this as moderately expansive in its in-situ state i.e., Ys= 20-39mm.

1.7.5 Subsidence (Consolidation Settlement)

The DBCE Preliminary Geotechnical Report has identified areas within stage 20 may experience settlement of fill through consolidation of underlying Hinuera deposits. A minimum 6 month holding period between completion of bulk filling and foundation construction should be observed for Lots 610-642, and 8038-8043. This period is based on other settlement monitoring carried out on previous projects on a similar ground type. No settlement monitoring has been done for the subject site. Settlement predictions (based on CPT 308) are in the order of 70-80mm of vertical settlement under 1.1m of additional fill weight. Previously monitored fill on nearby projects (sections of the expressway) encountered 500-600mm of settlement under 4-5m of fill surcharge. The majority (over 90%) of this settlement occurred within the first 1 month of loading. Based on the similar geology, a 6 month withholding period is considered suitable with no further monitoring required.

Completion of the bulk earthworks has been completed late 2023. At time of reporting December 2023, no building works have taken place. We consider this has provided sufficient time for settlement to have occurred for the bulk earthworks carried out. Residential development can proceed without further consolidation periods required unless more fill is added. If more fill is placed to raise the ground level, a delay between filling and building works should be observed. As a rule of thumb (for and future filling), one week of additional settlement period for every 100mm of new fill placed should be observed before building works take place. This allows for at least one month of settlement period for any deeper fills (450mm of fill or more) that may result in noticeable surface settlement affecting construction. We therefore consider this additional period is appropriate to realise the majority of the predicted additional settlement.

2.0 Disposal of Stormwater

Greenhill Park has been designed with a swale network to limit peak flows from the subdivision to 80 % of the 1 % AEP pre-development rate. S&L have provided the stormwater design for the current stage of the subdivision. As a part of this design, 100% of the onsite stormwater (up to the allowable impermeable area) has been allowed for in the system design. As such, no at source on site stormwater measures are required as a part of the overall stormwater design. This allows for a centralized stormwater system which has been stated as preferred for long term maintenance by Council. The piped drainage network has been designed to convey the 10% AEP flows from roads and lots to the swale network, with each lot to be provided with a piped service connection. Flow volumes over this design event may run overland into the swale network as secondary flow.

We recommend that reduced onsite water efficiency measures such as catchpit filters and reuse tanks be encouraged to improve water efficiency and reduce the sediment load downstream. Such measures should be at the discretion of the end user on a case-by-case basis.

The above recommendations do not supersede any additional measures that Council may require of each individual lot. Any council requirements in addition to the subdivision design should be followed. Any such requirements should be confirmed from council for this area. Any lot coverage over the maximum permitted will require site specific stormwater management to offset the effects of added runoff volume.

3.0 Retaining Walls

No retaining walls have been carried out as a part of subdivision works. Small retaining walls may be required on Lots 610-642 as a part of site recontouring to modify the slopes on these lots. Such walls would be in the order of 0.5m high and would be considered a landscaping wall (alternatively small batters can be used).

4.0 Preliminary Foundation Recommendations

Based on our post-completion investigations, observations during construction and understanding of the site's geology and geotechnical hazards, we believe suitable foundations will generally be typically TC2, or modified ground subgrade allowing for a Ribraft type foundation.

The lot summary table in Appendix B provides a summary of the anticipated ground conditions and preliminary foundation recommendations for each lot. Further lot-specific testing will be required to confirm foundation requirements. This may include testing prior to consent applications or during foundation excavations. The timing of the testing will be subject to Council requirements.

5.0 Professional Opinion

It has been demonstrated in this Geotechnical Completion Report, that earthworks have been completed and building platforms have been constructed to comply with Council's RITS specifications and the New Zealand Building Code. Recommendations have been provided within the report for the disposal of stormwater from individual lots, for the ongoing development of the lots and for the mitigation of liquefaction risk where applicable.

In accordance with RITS Section 2.3.4.1, a statement of professional opinion is enclosed in Appendix II of this document. This statement is presented in the form of Checklist 2.2 of Council's Development Manual, Volume 4: Quality Systems for Land Development, and is accompanied by a *Summary of Geotechnical Data for Individual Lots* which summarises the information and recommendations contained in this report.

6.0 Applicability

Recommendations contained in this document are based on data from observations of site earthworks, boreholes, and test results. Inferences about the nature and continuity of subsoils away from these locations are made but cannot be guaranteed.

In all circumstances, if variations in the subsoils occur which differ from those described or are assumed to exist, the site should be inspected by an engineer suitably qualified to make an informed judgement and provide advice on appropriate improvement measures.

This report has been prepared specifically for Stage 20 as shown for Lots: Lots 610-642, and 8038-8043 of Area LUK, Stage 20 within the Greenhill Park Residential Subdivision. No responsibility is accepted by CORE50 Ltd for the use of any part of this report for other development sites without their written approval.

Report Prepared By:	June	Date: 19 th December 2023
	Thomiya Dandara	
	Themiya Bandara	
	Civil Site Engineer	
Report Reviewed By:	Milhard	Date: 21st December 2023
	Michael Richardson	
	Geotechnical Engineer CPE	ng

References

- [1] Ruakura Land Development LDP Geotechnical Factual Report by Beca, 15 April 2016.
- [2] C. Hughes and K. Read, "Ruakura Development Stage 1 Geotechnical Investigation Liquefaction Potential Detailed Assessment," Opus International Consultants, Ltd., Hamilton, New Zealand, 2014.
- [3] M. Hughes and L. Shuler, "Report on Preliminary Geotechnical Investigation, Ruakura Development, Hamilton," S&L Consultants, Ltd., Tauranga, New Zealand, 2015.
- [4] "Section 2 Earthworks and Geotechnical Requirements," in *Regional Infrastructure Technical Specifications*, Waikato Local Authority Shared Services, May 2018.
- [5] "NZS 4404 Land Development and Subdivision Infrastructure," in *New Zealand Standards*, Wellington, New Zealand, Standards New Zealand, 2010.
- [6] "Greenhill Park Geotechnical Interpretation and Design-Area 1" by Beca 28 October 2016.
- [7] "Part 5: Earthquake Actions New Zealand," in *NZS 1170.5:2004 Structural Design Actions*, Standards New Zealand, 2004.
- [8] "Greenhill Park Design Report Area I (Stage 5, 6, 7 & 8) by Beca 20 December 2016
- [9] "Clause B1: Structure," in Acceptable Solutions and Verification Methods For New Zealand Building Code, Wellington, Ministry of Business, Innovation and Employment, 2014.
- [10] "Part A: Technical Guidance," in *Repairing and rebuilding houses affected by the Canterbury earthquakes*, Wellington, Ministry of Business, Innovation and Employment, 2012.
- [11] "Clause E1: Surface Water," in Acceptable Solutions and Verification Methods For New Zealand Building Code, Wellington, Ministry of Business, Innovation and Employment, 2014.
- [12] *Regional Infrastructure Technical Specifications*, Waikato Local Authority Shared Services, May 2018.
- [13] "Preliminary Geotechnical Report Area K, L & Eldone," DB Consulting Engineers, December 2019.

Appendix A <u>Reference Drawings</u> Subdivision Plan: 19-30410-20-RC1 Rev. 4 Cut/Fill Plan: 30410-01-S20-EW1 Rev. AB2 Preliminary Subdivision Foundation Plan: DB 171738-AREA-K&L&Eldone-01 Road Names Plan



R:Project Files30410-01-1901 Drawing Presentation Files30410-01-S20 - Stage 20 Asbuilt EW and Geotech Plan.dwg - Plottect: 28/



ÂN	A	S & L Land Specialists Ph. 07 577 6069 Emcil: info@silp.co.nz P.O. Box 231, Tauranga 3140 www.silp.co.nz
	в	Legend: Major Contour Minor Contour Cut Area Fill Area
	С	Contour Interval 0.25m
	D	
	E	
	F	Rev DESCRIPTION DRN CKD APP DATE 0 PRELIMINARY NP BP 13/11/23 AB1 AS-BUILT NP BP 13/11/23 AB2 Lot Level Update NP BP 27/11/23 AB2 Lot Level Update NP BP 27/11/23 AB2 NAME DATE NAME DATE SURVEYED DESIGNED DESIGNED DESIGNED COORDINATE SYSTEM: ORIGIN OF COORDINATES: HEIGHT DATUM: - -ORIGIN OF HEIGHT: TITLE TITLE -
	G	STAGE 20 CUT FILL PLAN ORIGINAL TO AS-BUILT
	H	PREPARED FOR







k)0000 - H Drivelnparkinson/Autocadi21338-ADD - LUK - Road Names Plan - Autocadi21338-ADD - LUK - Road Names Plan.dwg - Plotted: 26/





Appendix BGeotechnical Completion FormsChecklist 2.2 - Statement of Professional OpinionSummary of Geotechnical Data for Individual Lots

NZS 4404: 2010 SCHEDULE2A (Checklist 2.2)

STATEMENT OF PROFESSIONAL OPINION AS TO SUITABILITY OF LAND FOR BUILDING CONSTRUCTION

Development: Greenhill Park LUK Stage 20 Developer: Chedworth Properties Limited

At Pardoa Boulevard, Chartwell, Hamilton (Chilman Terrace, Halley Drive and Bannerman Crescent)

I, Michael Richardson of CORE50 Ltd, PO Box 1123, Taupo

Hereby confirm that:

- **1.0** I am a geo-professional as defined in clause **1.2.2** of NZS 4404:2010 and was retained by the developer as the geo- professional on the above development.
- 2.0 The extent of my inspections during construction, and the results of all tests carried out are described in my geotechnical completion report for Greenhill Park Area LUK Stage 20 dated December 2023 (reference 171738-S20-GCR)
- 3.0 In my professional opinion, not to be construed as a guarantee, I consider that:
 - a. The completed works give due regard to land slope and foundation stability considerations.
 - b. The site ground affected by engineered certified filling is suitable for the erection thereon of buildings designed according to the report recommendations provided that:
 - i. Lots 610-642, and 8038-8043 are subject to specific engineering review of foundations addressing TC2 liquefaction ground damage for the ULS design case.
 - ii. Lots may be modified for subgrade improvement to reduce the TC2 requirement down to TC1 under supervision on an engineer.
 - iii. All lots are subject to an engineering inspection during foundation excavations in lieu of further soils testing. Construction supervision from an engineer shall be carried out to confirm the shallow ground conditions are in accordance with this report and suitable for NZS3604 foundations for bearing strength.
 - iv. All lots need to observe minimum floor levels and require surface falls from the rear of the lot to the front.
- 4.0 This professional opinion is furnished to Hamilton City Council and the developer 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 of any dwelling.
- 5.0 This certificate shall be read in conjunction with my geotechnical completion report referred to in clause 2 above and shall not be copied or reproduced except in conjunction with the full geotechnical completion report.

Mohihand

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Date: 21 December 2023

Michael Richardson Chartered Professional Engineer (Geotechnical) CPEng 1005467

Stage 20, Greenhill Park, Hamilton

Signed

Geotechnical Completion Report

Job No: CR171738-S20-GCR

Site Specific Geotechnical Summary and Foundation Recommendations Table

C	SIR	RE 50													
		GINEERED	Job Ref RC No:			.738-S20-GCR 19/7140/003		Date DP No:	18/12/2023 TB210C400	Client	©hedworth Properties Lir	nited		Project Address	Stage 19, Greenhill Park, Hamilton
			Site Soils Characteristics			Foundation Recommendations									
Lot #	Area (m²)	Topsoil Depth Encountered (mm) _{Note 1}	Encountered Soils	GWT (mm)		t/Fill Depths	Expansivity Class (AS2870)	Conventional Shallow Foundation to NZS3604:2011	Building Setback Zones (Y/N) _{Note 3}	Storm Water Specific Design (Y/N) _{Note 4}	Codemark Ribraft (Y/N) _{Note 5 & 6}	Liquefaction Technical Category	Minimum Building Platform (Y/N) _{Note 8}	Consent Notice (Y/N) _{Note 7}	Notes
610	360m²	200	Engineered Fill, Silts and Sands (Hinuera Formation).	NE	0.3	1.9-2.4	s	N	Ν	N ⁴	N ⁵	TC2 - Like	Υ ⁸	Y ⁷	
611	360m²	200	Engineered Fill, Silts and Sands (Hinuera Formation).	NE	0.3	1.9-2.4	S	N	Ν	N ⁴	N ⁵	TC2 - Like	Y ⁸	Y ⁷	
612	360m²	200	Engineered Fill, Silts and Sands (Hinuera Formation).	NE	0.3	1.9-2.4	S	N	N	N ⁴	N ⁵	TC2 - Like	γ ⁸	Y ⁷	-
613	363m²	200	Engineered Fill, Silts and Sands (Hinuera Formation).	NE	0.3	1.9-2.4	s	Ν	Ν	N ⁴	N ⁵	TC2 - Like	Y ⁸	Y ⁷	
614	299m²	200	Engineered Fill, Silts and Sands (Hinuera Formation).	NE	0.8-2.0	2.4-2.9	S	N	Ν	N ⁴	N ⁵	TC2 - Like	Y ⁸	Y ⁷	
615	300m²	200	Engineered Fill, Silts and Sands (Hinuera Formation).	NE	0.3	2.4-2.9	S	N	Ν	N ⁴	N ⁵	TC2 - Like	Y ⁸	Y ⁷	
616	300m²	300	Engineered Fill, Silts and Sands (Hinuera Formation).	NE	0.3	2.4-2.9	s	Ν	Ν	N ⁴	N ⁵	TC2 - Like	Y ⁸	Y ⁷	-
617	368m²	300	Engineered Fill, Silts and Sands (Hinuera Formation).	NE	0.3	2.4-2.9	s	Ν	Ν	N ⁴	N ^S	TC2 - Like	Y ⁸	Y ⁷	
618	368m²	200	Engineered Fill, Silts and Sands (Hinuera Formation).	NE	0.3	2.4-2.9	s	Ν	Ν	N ⁴	N ⁵	TC2 - Like	γ ⁸	Y ⁷	
619	368m²	200	Engineered Fill, Silts and Sands (Hinuera Formation).	NE	0.3-1.2	2.4-2.9	S	N	Ν	N ⁴	N ⁵	TC2 - Like	Y ⁸	Y ⁷	
620	300m²	200	Engineered Fill, Silts and Sands (Hinuera Formation).	NE	0.3-1.2	1.9-2.4	s	N	N	N ⁴	N ⁵	TC2 - Like	Y ⁸	Y ⁷	
621	300m²	200	Engineered Fill, Silts and Sands (Hinuera Formation).	NE	0.3-1.2	1.4-1.9	s	N	Ν	N ⁴	N ⁵	TC2 - Like	Y ⁸	γ ⁷	
622	300m²	200	Engineered Fill, Silts and Sands (Hinuera Formation).	NE	0.3	1.4-1.9	s	N	N	N ⁴	N ⁵	TC2 - Like	Y ⁸	Y ⁷	
623	300m²	200	Engineered Fill, Silts and Sands (Hinuera Formation).	NE	0.3	1.4-1.9	s	N	Ν	N ⁴	N ⁵	TC2 - Like	γ ⁸	Υ ⁷	
624	220m ²	200	Engineered Fill, Silts and Sands (Hinuera Formation).	NE	0.3	0.9-1.9	S	N	N	N ⁴	N ⁵	TC2 - Like	γ ⁸	Y ⁷	
625	210m ²	200	Engineered Fill, Silts and Sands (Hinuera	NE	0.3	0.9-1.9	s	N	N	N ⁴	N ⁵	TC2 - Like	γ ⁸	Y ⁷	
626	210m ²	200	Formation). Engineered Fill, Silts and Sands (Hinuera	NE	0.3	0.9-1.9	s	N	N	N ⁴	N ⁵	TC2 - Like	γ ⁸	Y ⁷	
627	300m²	200	Formation). Engineered Fill, Silts and Sands (Hinuera	NE	0.3	0.9-1.9	s	N	N	N ⁴	N ⁵	TC2 - Like	γ ⁸	Y ⁷	
628	210m²	200	Formation). Engineered Fill, Silts and Sands (Hinuera	NE	0.3	0.9-1.9	s	N	N	N ⁴	N ⁵	TC2 - Like	γ ⁸	Y ⁷	
629	210m ²	200	Formation). Engineered Fill, Silts and Sands (Hinuera	NE	0.3	0.9-2.4	s	N	N	N ⁴	N ⁵	TC2 - Like	У ⁸	Y ⁷	
630	280m ²	200	Formation). Engineered Fill, Silts and Sands (Hinuera	NE	0.3	0.4-2.9	s	N	N	N ⁴	N ⁵	TC2 - Like	У ⁸	Y ⁷	
631	210m ²	200	Formation). Engineered Fill, Silts and Sands (Hinuera	NE	0.3	0.4-2.9	s	N	N	N ⁴	N ⁵	TC2 - Like	т У ⁸	Y ⁷	
632	210m ²	200	Formation). Engineered Fill, Silts and Sands (Hinuera	NE	0.3	0.4-2.9	s	N	N	N ⁴	N ⁵	TC2 - Like	T Y ⁸	γ ⁷	
			Formation). Engineered Fill, Silts and Sands (Hinuera					N		N N ⁴	N ⁵		Y Y ⁸	Y Y ⁷	
633	300m ²	200	Formation). Engineered Fill, Silts and Sands (Hinuera	NE	0.3	0.4-2.9	S		N			TC2 - Like		Y ⁷	
634	228m ²	200	Formation). Engineered Fill, Silts and Sands (Hinuera	NE	0.3	0.4-2.9	S	N	N	N ⁴	N ⁵	TC2 - Like	Y ⁸		
635	210m ²	200	Formation). Engineered Fill, Silts and Sands (Hinuera	NE	0.3	0.4-2.9	S	N	N	N ⁴	N ⁵	TC2 - Like	Y ⁸	Y ⁷	
636	280m ²	200	Formation).	NE	0.3	0.9-2.9	S	N	N	N ⁴	N ⁵	TC2 - Like	Y ⁸	Y ⁷	-
637	210m²	200	Formation).	NE	0.3	0.9-2.9	s s	N	N	N ⁴	N ⁵	TC2 - Like TC2 - Like	Y ⁸ Y ⁸	Y ⁷ Y ⁷	•
638	210m²	200	Formation).	NE	0.3	0.9-2.9	s	N	N N	N N ⁴	N N ⁵	TC2 - Like	Y Y ⁸	Y Y ⁷	
639	230m²	200	Engineered Fill, Silts and Sands (Hinuera Formation).	NE		0.9-2.4									
640	350m²	200m²	Engineered Fill, Silts and Sands (Hinuera Formation).	NE		0.9-2.4	S	N	N	N ⁴	N ⁵	TC2 - Like	٧ ⁸	Y ⁷	
641	300m²	200	Engineered Fill, Silts and Sands (Hinuera	NF		0 9-1 4	S	N	Ν	N ⁴	N ⁵	TC2 - Like	Y ⁸	Y ⁷	

Site Specific Geotechnical Summary and Foundation Recommendations Table

071	50011	200	Formation).			0.5-1.7									
642	350m²	200	Engineered Fill, Silts and Sands (Hinuera Formation).	NE	0.3	1.9-2.4	S	Ν	Ν	N^4	N ⁵	TC2 - Like	Y ⁸	Y ⁷	-
			Site	Soils Characte	ristics					Fe	oundation Recommendation	5			
Lot #	Area (m²)	Topsoil Depth Encountered (mm) _{Note 1}		GWT (mm)		t/Fill Depths	Expansivity Class (AS2870)	Conventional Shallow Foundation to NZS3604:2011	Building Setback Zones (Y/N) _{Note 3}	Storm Water Specific Design (Y/N) _{Note 4}	Codemark Ribraft (Y/N) _{Note 5 & 6}	Liquefaction Technical Category	Minimum Building Platform (Y/N) _{Note 8}	Consent Notice (Y/N) _{Note 7}	Notes
					Cut	Fill									
8038	231m²	200	Engineered Fill, Silts and Sands (Hinuera Formation).	NE	0	0.3-0.9	S	Ν	Ν	N^4	N ⁵	TC2 - Like	Y ⁸	Y ⁷	-
8039	225m²	200	Engineered Fill, Silts and Sands (Hinuera Formation).	NE	0	0.3-0.9	s	Ν	Ν	N^4	N ⁵	TC2 - Like	Y ⁸	Y ⁷	
8040	220m²	200	Engineered Fill, Silts and Sands (Hinuera Formation).	NE	0	0.3-1.4	S	Ν	Ν	N^4	N ⁵	TC2 - Like	γ ⁸	Y ⁷	-
8041	214m²	200	Engineered Fill, Silts and Sands (Hinuera Formation).	NE	0	0.3-1.4	S	Ν	Ν	N^4	N ⁵	TC2 - Like	γ ⁸	Y ⁷	-
8042	208m²	200	Engineered Fill, Silts and Sands (Hinuera Formation).	NE	0	0.3-1.4	s	Ν	Ν	N^4	N ⁵	TC2 - Like	γ ⁸	Y ⁷	-
8043	203m²	200	Engineered Fill, Silts and Sands (Hinuera Formation).	NE	0	0.3-1.4	S	Ν	Ν	N^4	N ⁵	TC2 - Like	Y ⁸	Y ⁷	
Notes:			•								·	·		•	

Notes:

1) Respread Topsoil depths approximate only as Topsoiling works were still in progress at time of Post Construction Soil Testing.

2) Depths are taken from Asbuilt Cut/Fill Plans supplied by S&L. This considers approximately 200mm of topsoil removal across all lots prior to subdivision filling.

3) Setback required for properties adjacent swales. SED type foundation to be adopted for all lots adjacent to swales. No foundations to be constructed <1.5m from top of slope. No specific engineer design required >3m from top of slope.

4) Soakage Testing is not required on individual lots. On site stormwater runoff reduction measures encouraged, i.e.; Re-use tanks, filters and catchpits.

5) TC2 Foundations Recommended. Ministry of Business, Innovation and Employment (MBIE) and New Zealand Geotechnical Society (NZGS) Repairing and rebuilding houses affected by the Canterbury earthquakes, Part A: Technical Guidance – Section 5.

6) M Class Foundations Recommended.

7) Consent Notice relation to Stormwater Controls required on all lots.

8) Refer appendix E for minimum Finished Floor levels per Lot.

NE = Not Encountered, GWT = Ground Water Table, SRP = Sediment Retention Pond, e.g.l. = existing ground level.

Appendix C <u>Laboratory Testing</u> Fill Material Lab Testing.

PARTICLE SIZE ANALYSIS (HYDROMETER METHOD) TEST REPORT

Project :	Greenhill Park Area LUK
Location :	Greenhill Park Area LUK EW.S2
Client :	Chedworth Properties c/o CORE50 Ltd
Contractor :	ONLINE Contractors
Sample Ref No:	#1
Sampled by :	Client (Aaron Kennedy)
Date sampled :	11/03/22
Sampling method :	Bulk Sample
Sample condition :	As received
Sample description :	CLAY, some silt, trace sand
Solid Particle Density (t/r	n ³): 2.66 Tested
Water Content (as receiv	ved): 55.7 %

Project No:	2-68311.00	Î
succes and	HA8743/1 HYD	
Lab Ref No:		
Client Ref:	171738-LUK-SI	



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PARTICLE SIZE ANALYSIS (HYDROMETER METHOD) TEST REPORT

Project :	Greenhill Par	rk Area Ll	JK		
Location :	Greenhill Park Area LUK EW.S2				
Client :	Chedworth F	Properties	s c/o CORE50 Ltd		
Contractor :	ONLINE Con	tractors			
Sample Ref No:	#2				
Sampled by :	Client (Aaron Kennedy)				
Date sampled :	11/03/22				
Sampling method :	Bulk Sample				
Sample condition :	As received				
Sample description :	Silty CLAY, tr	ace sand			
Solid Particle Density (t/m	n ³):	2.74	Tested		
Water Content (as receiv	ed):	62.0	96		

Project No:	2-68311.00
Lab Ref No:	HA8743/2_HYD
Client Ref:	171738-LUK-SI



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Date Reported:

Date Tested:

29/03/22

IANZ Approved Signatory

Designation : Date : Senior Civil Engineering Technician 29/03/22



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PF-LAB-100 (11/07/2020)

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DRY DENSITY / WATER CONTENT RELATIONSHIP STANDARD COMPACTION

Project :	Greenhill Park A	rea LUK	
Location :	Greenhill Park Area LUK EW.S2		
Client:	Chedworth Prop	perties c/o COR	E50 Ltd
Contractor :	ONLINE Contractors		
Sampled by :	Client (Aaron Ke	ennedy)	
Date sampled :	11/03/22		
Sampling method :	Bulk Sample		
Sample description :	CLAY, some silt,	trace sand	
Sample condition :	As received		Project
Solid density :	2.66 t/m ³	(Tested)	Lab Re
Source:	#2		Client I

Project No :	2-68311.00
Lab Ref No :	HA8743/1_MDD
Client Ref No :	171738-LUK-SI

				Test Results	5		1.2	
Maximum dry de	nsity	1.03	t/m³		Natural wat	ter content	55.4	%
Optimum water o	content	56	%		Fraction tes	sted 100	% Passing 1	9mm
Sample ID		-240	-180	-120	-60	Nat	60	
Bulk density	t/m³	1.228	1.261	1.294	1.405	1.601	1.606	
Water content	%	38.5	43.3	47.1	50.8	55.4	60.2	
	1 1	0.000	0000		0.070	1.070	7.0.07	

Tracer correction	1.0	0010	10110		~ ~ ~ ~			
Dry density	t/m³	0.887	0.880	0.880	0.932	1.030	1.003	
Sample conditior	ו	Hard Moist	Hard Moist	Hard Moist	Hard Moist-Wet	V. Stiff Wet	Stiff Wet	
Peak stress	kPa	UTP	UTP	UTP	>209	92	48	
Remoulded stres	s kPa	20	<u> 1</u>	2		44	28	



Test Methods

NZS 4402 : 1986 Test 4.1.1 (Standard) All information supplied by Client Compaction Shear Strength using a Hand Held Shear Vane, NZ Geotechnical Soc Inc 8/2001

Date tested : 22/03/22 Date reported : 29/03/22

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IANZ Approved Signatory

Senior Civil Engineering Technician Designation : Date : 29/03/22



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DRY DENSITY / WATER CONTENT RELATIONSHIP STANDARD COMPACTION

Project :	Greenh	nill Park Area LUK	
Location :	Greenh	nill Park Area LUK EW.	S2
Client :	Chedworth Properties c/o CORE50 Ltd		
Contractor :	ONLIN	E Contractors	
Sampled by :	Client	(Aaron Kennedy)	
Date sampled :	11/03/2	2	
Sampling method :	Bulk Sa	ample	
Sample description :	Silty Cl	AY, trace sand	
Sample condition :	As rece	ived	Project
Solid density :	2.74	t/m ³ (Tested)	Lab Ref
Source:	#2	ATLA SAME ATLA	Client F

Project No :	2-68311.00
Lab Ref No :	HA8743/2_MDD
Client Ref No :	171738-LUK-SI

		Tes	t Results			
Maximum dry density	1.01	t/m³	Natural water conte	nt	59.1	%
Optimum water content	59	%	Fraction tested	100%	Passing 1	9mm

Sample ID		-240	-180	-120	-60	Nat	60	
Bulk density	t/m³	1.242	1.280	1.353	1.511	1.606	1.573	
Water content	%	44.2	48.8	52.8	57.1	59.1	65.2	
Dry density	t/m³	0.861	0.861	0.886	0.962	1.009	0.952	
Sample condition	1	Hard	Hard	Hard	Hard	V. Stiff	Firm	
		Moist	Moist	Moist	Moist-Wet	Wet	Wet	
Peak stress	kPa	UTP	UTP	UTP	>209	88	44	
Remoulded stress	s kPa	200		-	-	40	16	





Test Methods

Notes NZS 4402 : 1986 Test 4.1.1 (Standard) All information supplied by Client Compaction Shear Strength using a Hand Held Shear Vane, NZ Geotechnical Soc Inc 8/2001



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PLASTICITY INDEX FOR SOILS TEST REPORT

Project :	Greenhill Park Area LUK
Location :	Greenhill Park Area LUK EW.S2
Client :	Chedworth Properties c/o CORE50 Ltd
Contractor :	ONLINE Contractors
Sampled by :	Client (Aaron Kennedy)
Date sampled :	11/03/2022
Date received :	14/03/2022
Sampling method :	Bulk Sample
Sample condition :	As received

Project No :	2-68311.00
Lab Ref No :	HA8743_PI
Client Ref No :	171738-LUK_SI

		Test Results	
	Sample Lab Ref No :	HA8743/1_PI	HA8743/2_PI
	Sample Location ID :	#1	#2
	Sample Depth (m) :		
	Soil Fraction Tested :	-425µm	-425µm
	Natural Water Content (%) :	55.7	62.0
	Liquid Limit :	120	101
	Plastic Limit :	47	50
	Plasticity Index :	73	51
	Sample Description :	HA8743/1_PI HA8743/2_PI	CLAY, some silt, trace sand Silty CLAY, trace sand
Fest Methods		Notes	
Water Content Liquid Limit Plastic Limit	NZS 4402 : 1986, Test 2.1 NZS 4402 : 1986, Test 2.2 NZS 4402 : 1986, Test 2.3	Soil fraction tested as	s shown.
Plasticity Index	NZS 4402 : 1986, Test 2.4		

Date tested : 28/03/22 Date reported : 04/04/22 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested. This report may only be reproduced in full All information supplied by Client

IANZ Approved Signatory

Designation : Date :

LHF 2402 (08/20)

Senior Civil Engineering Technician 04/04/22



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LINEAR SHRINKAGE FOR SOILS TEST REPORT

Project :	Greenhill Park Area LUK
Location :	Greenhill Park Area LUK I
Client :	Chedworth Properties c/o
Contractor :	ONLINE Contractors
Sampled by :	Client
Date sampled :	11/03/22
Date received :	14/03/22
Sampling method :	Bulk Sample
Sample condition :	As received

enhill Park Area LUK EW.S2 edworth Properties c/o CORE50 Ltd LINE Contractors nt 3/22 03/22 k Sample eceived

Project No :	2-68311.00
Lab Ref No :	HA8743_LS
Client Ref No :	171738-LUK-SI

		Test Results	
	Sample Lab Ref No :	HA8743/1_LS	HA8743/2_LS
	Location ID :	#1	#2
	Sample Depth (m) :	•	1.7
	Soil Fraction Tested :	-425µm	-425µm
	Sample History :	Natural	Natural
	Water Content as Rec'd (%) :	55.7	62,0
	Water Content at LS test (%) :	120.7	100.6
	Linear Shrinkage (%) :	22	19
	Sample Description : HA8743/1_LS HA8743/2_LS		e silt, trace sand trace sand
Fest Methods	5	Notes	
Water Content		Sample de	escription is not IANZ endorsed.

Date tested : 01/04/22 Date reported : 04/04/22 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested. This report may only be reproduced in full All information supplied by Client

IANZ Approved Signatory

Designation : Date :

LHF 2403 (08/20)

Senior Civil Engineering Technician 04/04/22



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SOLID DENSITY OF SOIL PARTICLES TEST REPORT

Project :
Location :
Client :
Contractor :
Sampled by :
Date sampled :
Date received :
Sampling method :
Sample condition :

Greenhill Park Area LUK Greenhill Park Area LUK EW.S2 Chedworth Properties c/o CORE50 Ltd ONLINE Contractors Client (Aaron Kennedy) 11/03/2022 14/03/2022 Bulk sample As received

Project No :	2-68311.00
Lab Ref No :	HA8743_SD
Client Ref No :	171738-LUK_SI

HA8743/I_SD #1 - Whole Natural 2,66	HA8743/2_SD #2 - Whole Natural 2.74
- Whole Natural	- Whole Natural
Whole Natural	Whole Natural
Natural	Natural
2.66	2.74
9743/1_SD 9743/2_SD	CLAY, some silt, trace sand Silty CLAY, trace sand
Notes	
	743/2_SD

Date tested : 22/03/22 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested. Date reported : 29/03/22 This report may only be reproduced in full All Information supplied by Client CCREDITES IANZ Approved Signatory Test results indicated as not accredited are outside the Senior Civil Engineering Technician Designation : scope of the laboratory's Date : 29/03/22 ASTING LABORATO accreditation

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Project :	Greenhill Park Area LUK
Location :	Greenhill Park Area LUK
Client :	Chedworth Properties/Core50 Ltd
Contractor :	ONLINE
Sampled by :	Client (AK)
Date sampled :	21/03/23
Date received :	21/03/23
Sampling method :	As Received
Sample condition :	Bagged

Project No :	2-68311.00	_
Lab Ref No :	HA10626_wc	
Client Ref No :	171738-LUK-SI	

Sample Lab Ref No : 1 2 3 Location ID : 1 2 3 Sample Depth (m) : - - - Water Content (%) : 46.1 49.9 45.9 Sample Lab Ref No : 5 6 7 Location ID : 5 6 7 Sample Depth (m) : - - -	4
Sample Depth (m): - - - Water Content (%): 46.1 49.9 45.9 Sample Lab Ref No: 5 6 7 Location ID: 5 6 7	*
Water Content (%) : 46.1 49.9 45.9 Sample Lab Ref No : 5 6 7 Location ID : 5 6 7	51.9
Sample Lab Ref No : 5 6 7 Location ID : 5 6 7	51.5
Location ID: 5 6 7	
Sample Depth (m) :	
Water Content (%): 49.1 56.9 49.8	
Water Content (%) : 49.1 56.9 49.8	
Test Methods Notes NZS 4402 : 1986 Test 21	

Date tested : 21/03/23 Date reported : 23/03/23 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested. This report may only be reproduced in full All information supplied by Client

IANZ Approved Signatory

Designation : Senior Civil Engineering Technician

23/03/23

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Project :	Greenhill Park Area LUK
Location :	Greenhill Park Area LUK
Client :	Chedworth Properties/CORE50 Ltd
Contractor :	
Sampled by :	Aaron Kennedy (Client)
Date sampled :	26/04/23
Date received :	26/04/23
Sampling method :	NDM Pad
Sample condition :	As received

Project No : 2-68311.00 Lab Ref No: HA10846 WC Client Ref No: 171738-LUK-SI

	Test Res	ults			
Sample Lab Ref No :	HA10846/1	HA10846/2	HA10846/3	HA10846/4	
Location ID :	GHP #1	GHP #2	GHP #3	GHP #4	
Sample Depth (m) :	¥		÷	1	
Water Content (%) :	50.8	42.1	49.5	43.4	
Sample Lab Ref No :	HA10846/5				
Location ID :	GHP #5				
Sample Depth (m) :	-	ĺ			
Water Content (%) :	47.3				
Test Methods		Notes			
Water Content : NZS 4402 : 1986 Test 2.1					

Sampling is not covered by IANZ Accreditation. Results apply only to sample tested. Date tested : 26/04/23 Date reported : 28/04/23 This report may only be reproduced in full All information supplied by Client COREDITED Approved Signatory Test results indicated as not accredited are outside the Designation : Senior Civil Engineering Technician scope of the laboratory's 28/04/23 Date : NG LABORA accreditation

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Project :	Greenhill Park Area LUK		
Location :	Greenhill Park Area LUK		
Client:	Core50 Limited/Chedworth Properties		
Contractor :	ONLINE		
Sampled by :	Client		
Date sampled :	21/09/23		
Date received :	21/09/23		
Sampling method :	Bagged		
Sample condition :	As received		

Project No :	2-68311.00	
Lab Ref No :	HA11683_wc	
Client Ref No :	171738-LUK-SI	

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		Test Res	ults	its', and		
	Sample Lab Ref No :	1	2	3	4	
	Location ID :	#1	#2	#3	#4	
	Sample Depth (m) :	-	-		-	
	Water Content (%) :	49.6	36.7	35.9	45.8	
	Sample Lab Ref No :	5	6	7	8	
	Location ID :	#5	#6	#7	#8	
	Sample Depth (m) :	-	-	1	-	
	Water Content (%) :	43.2	45.2	52.6	48.4	
	Sample Lab Ref No :	9				
	Location ID :	#9]			
	Sample Depth (m) :	-]			
	Water Content (%) :	50.3]			
Test Methods			Notes			
Water Content :	NZS 4402 : 1986 Test 2.1					

Sampling is not covered by IANZ Accreditation. Results apply only to sample tested. Date tested : 21/09/23 Date reported : 25/09/23 This report may only be reproduced in full All information supplied by Client CCREDITED Approved Signatory Test results indicated as not accredited are outside the Designation : Senior Civil Engineering Technician scope of the laboratory's accreditation 25/09/23 TSANG LABORATO Date : LHF 2400 (04/23)

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Project :	Greenhill Park Area LUK
Location :	Greenhill Park LUK
Client :	Chedworth Properties/Core50
Contractor :	(H) (H)
Sampled by :	As received
Date sampled :	17/10/23
Date received :	17/10/23
Sampling method :	Bagged
Sample condition :	As received



Test Results						
San	nple Lab Ref No : [ן ר	2	3		
Loc	ation ID : [GHP01	GHP02	GHP03		
San	nple Depth (m) : [2	2	2		
Wat	ter Content (%) : [40.5	44.0	57.6		
Test Methods			Notes			
Water Content : NZS 4402 : 1986 Te	est 2.1					

Date tested : 17/10/23 Sampling is not covered by IANZ Accreditation. Results apply only to sample tested. Date reported : 20/10/23 This report may only be reproduced in full All information supplied by Client CCREDITED Approved Signatory Test results indicated as not accredited are outside the Designation : Senior Civil Engineering Technician scope of the laboratory's 20/10/23 Date : ANG LABORATO accreditation

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Appendix D <u>Post Construction Test Results</u> Soil Tests by CORE50 NDM Testing




(mm)

	_		Project Name		Job Ref.	
CÇ	۶R	E 50	Stage 20, Greenhill Par	k, Hamilton	171738-S	20-GCR
SOLUTI	ONS E	NGINEERED	Tested by	Date	Sheet No.	Test Site
			ТВ	30/11/2023	17	MA610
Undrained Shear (kPa)	No of blows /100mm	Scala Penetrometer (Blows/100mm) 0 2 4 6 8 10 12 14 16	Soil De	escription		Water Table
		Good Ground Result	TOPSOIL: SILT, some organic minor fine sand; dark brown to b FILL: CLAY GRAVEL; dark b	olack; moist; low p	plasticity.	
200/			low plasticity; moderately se	nsitve.		
	7 6 5 6		FILL: SAND SILT; light brow dense to dense; dry; poorly o		grey; medium	
	7 8 9 8		-			
	8 8 7 9		FILL: CLAY SILT; dark brow	n mottled brown	n hard dry:	
200/	7 9		high plasticity; moderately se		i, nara, ary,	
		Image: Sector set of the sector set	EOB at 2.0m, Target Boreho	ole Depth.		
			-			
	ng up to te	OB = End Of Borehole UTP : sting was: Fine for the previous 3		JTE = Unable T	o Extract	

Ground water was not encountered during testing

Notes:

> Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

	_		Project Name		Job Ref.	
C	۶R	E 50	Stage 20, Greenhill Par	k, Hamilton	171738-S	20-GCR
		NGINEERED	Tested by	Date	Sheet No.	Test Site
			ТВ	30/11/2023	16	MA611
Undrained Shear (kPa)	No of blows /100mm	Scala Penetrometer (Blows/100mm) 0 2 4 6 8 10 12 14 1		escription		Water Table
Silear (Kra)	/100mm	0 2 4 6 8 10 12 14 1 Result Result Result R	TOPSOIL: SILT, some organic minor fine sand; dark brown to	black; moist; low p n mottled brown oderately sensitive mottled light bro- graded.	plasticity. n; very stiff to ve. own; medium	
				UTE = Unable 1	o Extract	
Weather leadi	ng up to te	esting was: Fine for the previous	s 3 days.			

Ground water was not encountered during testing

Notes:

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

	_		Project Name		Job Ref.	
C	۶R	E 50	Stage 20, Greenhill Par	k, Hamilton	171738-S	20-GCR
SOLUTI	ONS E	NGINEERED	Tested by	Date	Sheet No.	Test Site
			ТВ	30/11/2023	15	MA612
Undrained Shear (kPa)	No of blows /100mm	Scala Penetrometer (Blows/100mm) 0 2 4 6 8 10 12 14 16	Soil De	escription		Water Table
		Good Ground Result	TOPSOIL: SILT, some organic minor fine sand; dark brown to b FILL; CLAY SILT; dark brow	olack; moist; low p	plasticity.	
200/			high plasticity; moderately se FILL: SAND SILT; light grey	ensitve. mottled light bro	-	
	7 7		dense to dense; dry; poorly (-	graded.		
	8 8 10		-			
	6 7			(I). 1		
200/	8 8 7		FILL: CLAY SILT; brown mo dry; high plasticity; moderate	-	rown; nard;	
	14 17					
UTP	UTP		FILL: CLAY GRAVEL; light g low plasticity; moderately se		y; hard; dry;	
			EOB at 2.0m, Target Boreho	ble Depth.		
			-			
			-			
			-			
			-			
Weather leading		DB = End Of Borehole UTP		JTE = Unable T	o Extract	

Weather leading up to testing was: Fine for the previous 3 days. Ground water was not encountered during testing

Notes:

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



			Project Name		Job Ref.		
C	٥R	E 50	Stage 20, Greenhill Par	k, Hamilton	171738-S	20-GCR	
		NGINEERED	Tested by	Date	Sheet No.	Test Site	
			ТВ	30/11/2023	14	MA613	
Undrained Shear (kPa)	No of blows /100mm	Scala Penetrometer (Blows/100mm) 0 2 4 6 8 10 12 14 16	Soil De	escription		Water Table	
		Good Ground Result	TOPSOIL: SILT, some organic minor fine sand; dark brown to b				
			FILL: SAND SILT; light brow	n mottled light o	grey; dense;		
			dry; poorly graded.				
	9						
	9						
	9		-				
200/	10 11		-				
	10						
	7		FILL: CLAY SILT; brown mo				
	8		hard; dry; high plasticity; mo	derately sensitiv	/e.		
200/	9 6		-				
200/	0 8						
	11						
	12		.FILL: CLAY GRAVEL; brow		hard; dry; low		
	11		plasticity; moderately sensiti	ve.			
UTP			EOB at 2.0m, Target Boreho	le Depth.			
			-				
			-				
			-				
			-				
			1				
			1				
]				
	EC	DB = End Of Borehole UTP	= Unable To Penetrate	JTE = Unable 1	o Extract		

Notes:

Depth

(mm)

Weather leading up to testing was: Fine for the previous 3 days.

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

Notes:

	_		_			Project Name			Job Ref.	
C	シR	E	:5	0		Stage 20, Green	hill Par	k, Hamilton	171738-S	20-GCR
SOLUT						Tested by		Date	Sheet No.	Test Site
						ТВ		30/11/2023	13	MA614
Undrained Shear (kPa)	No of blows /100mm	0 2		Penetr ows/100			Soil De	escription		Water Table
				_	Result	TOPSOIL: SILT, some minor fine sand; dark b				
				_	Good Ground	FILL: CLAY SILT; br	own mo	ottled dark brown	-	
474/00						high plasticity; mode	erately s	ensitive.		
174/62	8					FILL: SAND SILT; liq	ght brow	/n mottled light (grey; medium	
	8					dense to dense; dry	; poorly	graded.		
	12					-				
	9					-				
	7 5					-				
	4	_				-				
	6					FILL: CLAY SILT; br			•	
	6					stiff to hard; dry; hig	h plastic	tity; moderately	sensitive.	
200/	7									
	8					-				
	8 8					-				
	7					-				
180/53						-				
						EOB at 2.0m, Targe	t Boreho	ole Depth.		
						_				
						-				
						-				
		_				-				
						-				
						-				
						-				
		+				-				
						1				
						1				
	FC)B = F	nd Of	Boreho	le LITP	= Unable To Penetra	te I	UTE = Unable 1	o Extract	
Weather leadir										

Weather leading up to testing was: Fine for the previous 3 days.

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

Notes:

	Project Name		Job Ref.	
CØRE 50	Stage 20, Greenhill F	Park, Hamilton	171738-S	20-GCR
SOLUTIONS ENGINEERED	Tested by	Date	Sheet No.	Test Site
	ТВ	30/11/2023	12	MA615
No of blows ar (kPa) No of blows /100mm Scala Penetrometer (Blows/100mm) 0 2 4 6 8 10 12 14 14		Description		Water Table
Groun	minor fine sand; dark brown			
Resul	FILL: SAND SILT; light buddense to dense; dry; poo		grey; medium	
7				
9 11				
9 7	FILL: CLAY SILT; brown	-	n; very stiff to	
77/29 7	hard; dry; high plasticity;	sensitive.		
8				
11				
200/ 12				
200/				
	EOB at 2.0m, Target Bor	ehole Depth.		

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

Notes:

				Project Name		Job Ref.					
C	シR	E 50		Stage 20, Greenhill Par	k, Hamilton	171738-S	20-GCR				
		NGINEERED		Tested by	Date	Sheet No.	Test Site				
				ТВ	30/11/2023	11	HA616				
Undrained Shear (kPa)	No of blows /100mm	Scala Penetror (Blows/100m 0 2 4 6 8 10		Soil De		Water Table					
			- Result	TOPSOIL: SILT, some organic minor fine sand; dark brown to b							
			Good Ground	FILL: SAND SILT; light grey dense; dry; poorly graded.	mottled light bro	own; medium					
				donoo, ary, poorry gradou.							
	4										
	4										
	6 6			FILL: CLAY SILT; light brown high plasticity; insensitive.	n mottled browr	i; very stiff; dry;					
	6 7										
-	7										
	7 8										
	10 9			-							
	8										
159/88	9										
				EOB at 2.0m, Target Boreho	ble Depth.						
				-							
				-							
		B = End Of Borehole			JTE = Unable T	o Extract					
Weather lead	Veather leading up to testing was: Fine for the previous 3 days.										

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

Notes:

							Project Name		Job Ref.	
C	ふ R	F	5(\mathbf{C}			Stage 20, Greenhill I	Park, Hamilton	171738-S	20-GCR
SOLUTI							Tested by	Date	Sheet No.	Test Site
							ТВ	30/11/2023	10	MA617
Undrained Shear (kPa)	No of blows /100mm	0	(Blov	Penetro vs/100 8 10	mm)		Soil	Description		Water Table
				_	F	Result	TOPSOIL: SILT, some orga minor fine sand; dark brown			
						Good Ground	FILL: CLAY SILT; light br			
200/							stiff to hard; dry; high pla sensitive.	sticity; insensitive	o moderately	
180/83							-			
159/103							-			
							-			
200/							EOB at 2.0m, Target Bor	abala Danth		
								enole Depth.		
							-			
							-			
							l			
Weather leadi				oreho			= Unable To Penetrate	UTE = Unable	To Extract	

Weather leading up to testing was: Fine for the previous 3 days.

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

Notes:

					Project Name		Job Ref.	
	C	۶R	E 5	0	Stage 20, Greenhill Pa	rk, Hamilton	171738-S2	20-GCR
			NGINEER		Tested by	Date	Sheet No.	Test Site
					ТВ	30/11/2023	9	MA618
	Undrained Shear (kPa)	No of blows /100mm		Penetrometer ws/100mm) 8 10 12 14 16		escription		Water Table
				Good Ground	TOPSOIL: SILT, some organic minor fine sand; dark brown to			
				Result	FILL: CLAY SILT; brown mo		ght brown; very	
	200/					,		
					-			
	165/97				-			
					-			
	200/				-			
_					-			
	177/103				-			
					EOB at 2.0m, Target Boreh	ole Depth.		
					-			
					-			
					-			
					-			
	Weather leadii)B = End Of B sting was: Fine	orehole UTP		UTE = Unable 1	o Extract	

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

Notes:

			•	Project Name		Job Ref.	
C	۶R	E 5	0	Stage 20, Greenhill Pa	ark, Hamilton	171738-S	20-GCR
SOLUTI	ONS E	NGINEER	ED	Tested by	Date	Sheet No.	Test Site
				ТВ	30/11/2023	8	MA619
Undrained Shear (kPa)	No of blows /100mm		Penetrometer ws/100mm) 8 10 12 14 16	Soil [Description		Water Table
_			Good Ground	TOPSOIL: SILT, some organi minor fine sand; dark brown to			
			Result	FILL: CLAY SILT; dark bro hard; dry; high plasticity; m			
168/62				-			
				-			
200/							
				-			
				_			
200/							
				-			
200/				EOB at 2.0m, Target Boreł	oole Denth		-
					lolo Bopuli.		
				-			
				-			
				-			
				1			
				1			
				1			
	FC)B = End Of B	Borehole LITP	= Unable To Penetrate	UTE = Unable 1	o Extract	
Weather leadir			e for the previous 3				

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

						Project Name		Job Ref.	
C	ふR	F	5	\mathbf{C}		Stage 20, Greenhill Par	k, Hamilton	171738-S	20-GCR
SOLUT	Contract A	-Ca (10 M 10 M 10 M			Tested by	Date	Sheet No.	Test Site
						ТВ	30/11/2023	7	MA620
Undrained Shear (kPa)	No of blows /100mm		(Blow	enetrome vs/100mm 8 10 12)		escription		Water Table
					Result	TOPSOIL: SILT, some organic minor fine sand; dark brown to			
					Good Ground	FILL: CLAY SILT; light brow stiff to hard; dry; high plastic			
195/85						sensitive.			
200/									
189/115									
200/						FILL; SILT SAND minor clay hard; dry; low plasticity; mod			
2007						EOB at 2.0m, Target Boreho	ble Depth.		
	EC	DB = Ei	nd Of B	orehole	UTP :	Unable To Penetrate	UTE = Unable 1	o Extract	

Notes:

Weather leading up to testing was: Fine for the previous 3 days.

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

Notes:

								Project Name		Job Ref.	
C	3)R			5	0			Stage 20, Greenhill Pa	rk, Hamilton	171738-S	20-GCR
SOLUT								Tested by	Date	Sheet No.	Test Site
								ТВ	30/11/2023	6	MA621
Undrained Shear (kPa)	No of blows /100mm	0		(Blo	ws/100	ometer 9 mm) 12 14	16	Soil D	escription		Water Table
						Good Grou		TOPSOIL: SILT, some orga trace to minor fine sand; da			
					1 —	Resu	ult	FILL: CLAY SILT; light brow		ish brown; very	
200/			_					stiff to hard; dry; moderately	/ sensitive.		
200/											
			_								
200/											
						_					
192/71							-				
								HINUERA FORMATION: SI	LT SAND; light	grey; hard;	
								moist; low plasticity; modera	ately sensitive.		
UTP								EOB at 2.0m, Target Boreh	ole Depth.		
		╟									
		╟									
	EC	0B =	= Enc	d Of E	Boreho	le U	TP :	= Unable To Penetrate	UTE = Unable 1	To Extract	

Weather leading up to testing was: Fine for the previous 3 days.

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

Notes:

							Project Name		Job Ref.	
C	ふR	F	5	O)		Stage 20, Greenhill Par	k, Hamilton	171738-S	20-GCR
SOLUTI							Tested by	Date	Sheet No.	Test Site
							ТВ	30/11/2023	5	MA622
Undrained Shear (kPa)	No of blows /100mm	0 2	(BI	ows/1	trometer 00mm) 10 12 14		Soil D		Water Table	
				-	Gro		TOPSOIL: SILT, some orga trace to minor fine sand; dat	rk brown to blac	k; moist; low	
195/41							FILL: CLAY SILT; light brow stiff to hard; dry; sensitive.	n mottled orang	ish brown; very	
200/										
							FILL: SILT SAND minor gra hard; dry; low plasticity; mod			
200/										
							HINUERA FORMATION: SI moist; low plasticity; modera		brown; hard;	
200/										
							EOB at 2.0m, Target Boreh	die Depth.		
	EC)B = I	End Of	Boreh	nole l	JTP =	= Unable To Penetrate	UTE = Unable 1	o Extract	

Weather leading up to testing was: Fine for the previous 3 days.

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



Soil De	Water Table				
ТВ	30/11/2023	4	MA623		
Tested by	Date	Sheet No.	Test Site		
Stage 20, Greenhill Parl	171738-S20-GCR				
Project Name		Job Ref.B153:L201			

Depth (mm)	Undrained Shear (kPa)	No of blows	Scala Penetrometer (Blows/100mm)	Soil Description	Water Table
()		/100mm	0 2 4 6 8 10 12 14 16		
100			Result	TOPSOIL: SILT, some organic material, some rootlets,	
200			Good	trace to minor fine sand; dark brown to black; moist; low	
300			Ground	FILL: CLAY SILT; brown mottled light brown; dry; high	
400				plasticity; moderately sensitive	
500	177/71				
600					
700					
800					
900					
1000	UTP		<u>,</u>		
1100					
1200					
1300					
1400				FILL: SILT SAND; brown; very stiff; moist; low plasticity;	
1500	139/29			sensitive.	
1600				FILL: CLAY SILT; brown; very stiff; moist; high plasticity;	
1700				sensitive.	
1800					
1900					
2000	200/			FILL: SILT SAND; light grey; hard; moist; low plasticity; moderately sensitive.	
2100				EOB at 2.0m, Target Borehole Depth.	
2200					
2300					
2400					
2500	195/71				
2600					
2700					
2800					
2900					
3000	200/				
3100					
3200					
3300					
3400					
3500					
Notes:		EC	DB = End Of Borehole UTP	= Unable To Penetrate UTE = Unable To Extract	
1	Weather leading	ng up to te	esting was: Fine for the previous 3	days.	
2	Ground water	was not er	ncountered during testing		
3		-		ration Certificate. (Values are undrained shear strength)	
4			ude Re-moulded values where po		
5	Shear Vane S	erial No.:	3102 Exp. Date: 08/03/2	024	Rev3.7



(mm)

Notes:

		Project Name		Job Ref.	
C [©] RE 50		Stage 20, Greenhill Par	k, Hamilton	171738-S	20-GCR
SOLUTIONS ENGINEERED		Tested by	Date	Sheet No.	Test Site
		ТВ	30/11/2023	16	MA624
Undrained Shear (kPa)No of blows /100mmScala Penetro (Blows/100 0 2 4 6 8 10		Soil De		Water Table	
	Result	TOPSOIL: SILT, some organic minor fine sand; dark brown to l			
	Good Ground	FILL: CLAY SILT; dark brow hard; dry; high plasticity; mo	n mottled brown	n; very stiff to	
200/		-			
180/53					
		-			
200/		FILL: SILT SAND; grey mott dry; low plasticity; moderate		stiff to hard;	
		HINUERA FORMATION: SII moist; low plasticity; modera		grey; hard;	
200/			la Danth		
		EOB at 2.0m, Target Boreho	bie Depth.		
		-			
		-			
		-			
		-			
				_	
EOB = End Of Borehol Weather leading up to testing was: Fine for the			JTE = Unable T	o Extract	

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

		_	_					Project Name		Job Ref.	
C	۶R			5	0			Stage 20, Greenhill Par	rk, Hamilton	171738-S2	20-GCR
SOLUTI								Tested by	Date	Sheet No.	Test Site
								ТВ	30/11/2023	15	MA625
Undrained Shear (kPa)	No of blows /100mm	0	2 -	(Blo	ws/10	rometer 0mm) 0 12 14		Soil D		Water Table	
							ood ound sult	TOPSOIL: SILT, some organic minor fine sand; dark brown to			
								FILL; CLAY SILT; dark brow high plasticity; moderately s		n; hard; dry;	
200/											
								-			
200/				, /							
								-			
200/											
								FILL: SILT SAND; light grey low plasticity; moderately se	-	own; nard; dry;	
200/								EOB at 2.0m, Target Boreh	ole Depth		
					_						
Weather leadir					Boreho le for t				UTE = Unable 1	o Extract	

Weather leading up to testing was: Fine for the previous 3 days.

Notes:

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



								Project Name			Job Ref.	
C	3)R			5	\mathbf{O}			Stage 20, Greenhi	ll Par	k, Hamilton	171738-S	20-GCR
SOLUT								Tested by		Date	Sheet No.	Test Site
								ТВ		30/11/2023	14	MA626
Undrained Shear (kPa)	No of blows /100mm	0	S 2	(Blov	vs/100	romete Dmm)) 12 14		Soil Description				Water Table
						Gr	ood ound esult	TOPSOIL: SILT, some or minor fine sand; dark bro				
200/								FILL: CLAY SILT; brov dry; high plasticity; mo		-	rown; hard;	
								-				
200/												
200/								FILL: SILT SAND; light hard; dry; low plasticity				
195/85								HINUERA FORMATIO moist; low plasticity; m			grey; very stiff;	
								EOB at 2.0m, Target E	Boreho	ble Depth.		
								-				
	EC)))))))))	End	I Of B	oreho	ole	UTP =	= Unable To Penetrate	l	UTE = Unable ⊺	o Extract	

Notes:

Depth

(mm)

Weather leading up to testing was: Fine for the previous 3 days.

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

Notes:

					_		Project Na	me		Job Ref.		
C	シR	R	Ξļ	5(C		Stage	20, Greenhill Par	k, Hamilton	171738-S	20-GCR	
SOLUT							Tested by		Date	Sheet No.	Test Site	
								ТВ	30/11/2023	13	MA627	
Undrained Shear (kPa)	No of blows /100mm	0		(Blow	enetro /s/100n 8 10		6	Soil Description				
						- Result	101 0012.0	SILT, some organic and; dark brown to				
						Good Ground	FILL: CLA	Y SILT; brown mo	ttled dark brow	-		
200/							nign plastic	city; moderately s	ensitive.			
174/53							-					
							_					
177/62							_					
142/41							low plastic	GRAVEL; light gi ity; moderately se	nsitive.	; very stiff; dry;		
							EOB at 2.0)m, Target Boreho	ble Depth.			
							-					
	EC)B =	End	Of Bo	orehole	e UTI	P = Unable To	o Penetrate	UTE = Unable 1	o Extract		

Weather leading up to testing was: Fine for the previous 3 days.

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

Notes:

					******			Project Name		Job Ref.	
C	٥R			5	0			Stage 20, Greenhill Pa	rk, Hamilton	171738-5	20-GCR
SOLUT								Tested by	Date	Sheet No.	Test Site
								ТВ	30/11/2023	12	MA628
Undrained Shear (kPa)	No of blows /100mm	0	S 2	(Blov	ws/100	omete mm) 12 14		Soil I		Water Table	
200/						Gr	ood ound esult	TOPSOIL: SILT, some organi minor fine sand; dark brown to FILL: CLAY SILT; brown m hard; dry; high plasticity; m	black; moist; low ottled light brown	plasticity. n; very stiff to	
200/											
192/83								FILL: SILT SAND; light bro very stiff; dry; low plasticity			
133/59								EOB at 2.0m, Target Borel	nole Depth.		
Weather leadir					oreho			= Unable To Penetrate	UTE = Unable	Fo Extract	

Weather leading up to testing was: Fine for the previous 3 days. Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



Depth (mm)

Notes:

								Project Name		Job Ref.	
C	۶R	E		5	O			Stage 20, Greenhill Par	k, Hamilton	171738-S	20-GCR
SOLUTI								Tested by	Date	Sheet No.	Test Site
								ТВ	30/11/2023	11	MA629
Undrained Shear (kPa)	No of blows /100mm	0	2	(Blo	Penetr ws/100 8 10)mm)		Soil De		Water Table	
						_	Result	TOPSOIL: SILT, some organic minor fine sand; dark brown to l			
							Good Ground	FILL: CLAY SILT; light brow hard; dry; high plasticity; mo	n mottled browr	n; very stiff to	
200/		+						naid, dry, nigh plasticity, nio		ve.	
195/85								-			
				, 							
		-									
200/											
200/								FILL: SILT GRAVEL; light gr		; hard; dry; low	
		╟						plasticity; moderately sensiti	ve.		
UTP								EOB at 2.0m, Target Boreho	ole Depth.		
		+				_					
		-									
		$\left \right $				_		-			
Weather leadir					oreho				JTE = Unable ⊺	o Extract	

Weather leading up to testing was: Fine for the previous 3 days. Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

Notes:

								Project Name			Job Ref.	
C	٥R	F	2	5()			Stage 20, Greenhill	Park	, Hamilton	171738-8	S20-GCR
SOLUTI								Tested by		Date	Sheet No.	Test Site
								ТВ		30/11/2023	10	MA630
Undrained Shear (kPa)	No of blows /100mm	0 :						So		Water Table		
					_		Result	TOPSOIL: SILT, some org minor fine sand; dark brow				
200/							Good Ground	FILL: CLAY SILT; light t hard; dry; high plasticity sensitive.				
200/												
200/												
200/								-				
								EOB at 2.0m, Target Bo	orehol	le Depth.		
		OB = 1	End	Of P-	broke			= = Unable To Penetrate		TE = Unable 1	Co Evtract	

Weather leading up to testing was: Fine for the previous 3 days.

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

	_			Project Name		Job Ref.	
C	۶R	E 5	0	Stage 20, Greenhill Pa	rk, Hamilton	171738-9	620-GCR
		NGINEER		Tested by	Date	Sheet No.	Test Site
				ТВ	30/11/2023	9	MA631
Undrained Shear (kPa)	No of blows /100mm		Penetrometer ws/100mm) 8 10 12 14 16	Soil D		Water Table	
			Good Ground	TOPSOIL: SILT, some organic minor fine sand; dark brown to			
			Result	FILL: CLAY SILT; brown m hard; dry; high plasticity; in		ght brown;	
200/							
				-			
				-			
200/				-			
				-			
				-			
200/				-			
				-			
				-			
200/							_
				EOB at 2.0m, Target Boreh	ole Depth.		
				-			
				-			
				-			
				-			
				-			
M)B = End Of B		= Unable To Penetrate	UTE = Unable 1	o Extract	
vveather leading	ng up to te	sting was: Fine	e for the previous	days.			

Ground water was not encountered during testing

Notes:

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

SOLUTIONS ENGINEERED	Stage 20, Greenhill Park, Hamilton Tested by Date S TB 30/11/2023	171738-S20-GCR Sheet No. Test Site 8 MA632
Problem, Line Schwerzscher Köllschull – Minischerfölde Anderson Schulze und	,	
No of Scolo Departmentar	TB 30/11/2023	8 MA632
No of Scala Depotrometer		
Undrained Shear (kPa) No of blows /100mm Stala Penetrometer (Blows/100mm) 0 2 4 6 8 10 12 14 16	Soil Description	Water Table
Ground Ground	TOPSOIL: SILT, some organic material, some root minor fine sand; dark brown to black; moist; low pla	
Result	FILL: CLAY SILT; dark brown mottled brown; hard; dry; high plasticity; moderately sensitive	
200/		
	_	
180/71	-	
	_	
	-	
200/	-	
	1600mm: Brown mottled dark brown	
	-	
200/	_	
	EOB at 2.0m, Target Borehole Depth.	
	-	
	-	
	1	
	-	
	_	
EOB = End Of Borehole UTF Weather leading up to testing was: Fine for the previous	P = Unable To Penetrate UTE = Unable To 3 days.	Extract

Ground water was not encountered during testing

Notes:

> Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

Notes:

				Project Name		Job Ref.	
C	3)R	E 5	0	Stage 20, Greenhill P	ark, Hamilton	171738-S	20-GCR
		NGINEE		Tested by	Date	Sheet No.	Test Site
				ТВ	30/11/2023	7	MA633
Undrained Shear (kPa)	No of blows /100mm	(Blo	Penetrometer ows/100mm) 8 10 12 14 16		Description		Water Table
			Result	TOPSOIL: SILT, some organ minor fine sand; dark brown			
			Good Ground	FILL: CLAY SILT; light bro			
200/					<i>.</i> , <i>.</i> , <i>.</i> ,		
				-			
				-			
200/				-			
				_			
				_			
192/62				-			
				-			
195/74				EOB at 2.0m, Target Bore	hole Depth.		
				_			
				-			
				-			
				-			
				-			
				-			
				-			
J	FC	DB = End Of	Borehole LITE	P = Unable To Penetrate	UTE = Unable 1	To Extract	
	ing up to te		ne for the previous				

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

Notes:

						Project Name		Job Ref.	
C	3)R	F	5	0		Stage 20, Greenhill F	ark, Hamilton	171738-S	20-GCR
SOLUT						Tested by	Date	Sheet No.	Test Site
						ТВ	30/11/2023	6	MA634
Undrained Shear (kPa)	No of blows /100mm	0 2		Penetron ows/100m 8 10 1	m)	Soil	Description		Water Table
					- Good Ground	TOPSOIL: SILT, some or trace to minor fine sand; or			
					- Result	FILL: CLAY SILT; light br		jish brown; very	•
200/						stiff to hard; dry; moderat	ely sensitive.		
200/									
200/68			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,						
200/									
200/						HINUERA FORMATION: moist; low plasticity; mode		grey; hard;	
						EOB at 2.0m, Target Bore	hole Depth.		
						1			
	EC)B = I	End Of I	Borehole	UTP	= Unable To Penetrate	UTE = Unable	To Extract	-

Weather leading up to testing was: Fine for the previous 3 days.

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

Notes:

				Project Name		Job Ref.	
C	S R	E 5	0	Stage 20, Greenhill Par	k, Hamilton	171738-S2	20-GCR
		INGINEER		Tested by	Date	Sheet No.	Test Site
				ТВ	30/11/2023	5	MA635
Undrained Shear (kPa	blowe	(Blo	Penetrometer ws/100mm) 8 10 12 14 16	Soil De	escription		Water Table
			Ground	TOPSOIL: SILT, some orga trace to minor fine sand; dar			
			Result	FILL: CLAY SILT; light brow stiff to hard; dry; sensitive.	n mottled orang	ish brown; very	
200/				-			
-							
				-			
200/							
_				-			
200/83				-			
				-			
				-			
180/71				-			
				EOB at 2.0m, Target Boreho	ole Depth.		
-				-			
				1			
				1			
				-			
	EC	OB = End Of E	Borehole UTP	= Unable To Penetrate	UTE = Unable 1	o Extract	
Weather lea	ding up to te	esting was: Fin	ne for the previous 3	3 days.			

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

Notes:

				Project Name		Job Ref.B153	:L201
Ce	3P	E 5	\cap	Stage 20, Greenhill P	ark, Hamilton	171738-	S20-GCR
				Tested by	Date	Sheet No.	Test Site
001011				ТВ	30/11/2023	4	MA636
Undrained Shear (kPa)	No of blows /100mm	(Bloy	Penetrometer ws/100mm) 8 10 12 14 16		Description		Water Table
			Result	TOPSOIL: SILT, some org trace to minor fine sand; d			
			Ground	FILL: CLAY SILT; brown r hard; dry; high plasticity; r			
200/							
				-			
				-			
UTP				-			
				-			
				-			
200/				-			
				-			
				-			
195/85				-			
				EOB at 2.0m, Target Bore	hole Depth.		
				-			
				-			
				-			
				-			
				-			
				-			
4	EC)B = End Of B	orehole UTP	= Unable To Penetrate	UTE = Unable	Fo Extract	
Weather leadi	ng up to te	sting was: Fin	e for the previous 3	3 days.			

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

Notes:

	Project Name		Job Ref.	
CØRE 50	Stage 20, Greenhill	Park, Hamilton	171738-	S20-GCR
SOLUTIONS ENGINEERED	Tested by	Date	Sheet No.	Test Site
	ТВ	30/11/2023	3	MA637
Undrained Shear (kPa) No of blows /100mm Scala Penetrometer (Blows/100mm) 0 2 4 6 8 10 12 14 16		il Description		Water Table
Good ground	TOPSOIL: SILT, some c trace to minor fine sand			
	FILL: CLAY SILT; browr hard; dry; high plasticity		n; very stiff to	
174/65	_			
	_			
200/	-			
	-			
192/71	-			
	-			
	_			
200	EOB at 2.0m, Target Bo	rehole Depth.		
	_			
	_			
	_			
	-			
	-1			
	-			
──── ┟ ─── ┟ ┟╷╎╷╷╷╷	-1			

Weather leading up to testing was: Fine for the previous 3 days.

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

							Project Name		Job Ref.	
C	٥R	E	Ξ5	50			Stage 20, Greenhill Par	k, Hamilton	171738-S	20-GCR
SOLUTI							Tested by	Date	Sheet No.	Test Site
							ТВ	30/11/2023	2	MA638
Undrained Shear (kPa)	No of blows /100mm	0	(B	lows/10	trometer 00mm) 10 12 14	16		escription		Water Table
					Grou Grou Resu	ind	TOPSOIL: SILT, some organic minor fine sand; dark brown to	black; moist; low	plasticity.	
		-					FILL: CLAY SILT; brown mottle plasticity; insensitive	d orangish brown	; hard; dry; high	
200/						_				
200/							FILL: CLAY GRAVEL; brown m	ottled grey; hard;	dry; low	
							plasticity; insensitive			
UTP										
UTP										
							EOB at 2.0m, Target Boreho	ole Depth.		
						-				
	EC)B =	End Of	f Boreh	iole U	ITP :	= Unable To Penetrate	UTE = Unable 1	o Extract	

Notes:

Weather leading up to testing was: Fine for the previous 3 days.

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

Notes:

	_	_								Project Name		Job Ref.	
C	۶R	E		5	6)				Stage 20, Greenhill Par	k, Hamilton	171738-S	20-GCR
SOLUT										Tested by	Date	Sheet No.	Test Site
										ТВ	30/11/2023	1	MA639
Undrained Shear (kPa)	No of blows /100mm	0		(B	lows	/100	omet 9 mm) 12		6		escription		Water Table
							Good	Grour	nd	TOPSOIL: SILT, some organic minor fine sand; dark brown to l			
					_	_	Resu	lt	-	FILL: CLAY SILT; brown mottle high plasticity; insensitive	d light brown; ver	y stiff to hard dry;	
 200/										nigh plasticity, insensitive			
2007													
						_							
				ļ									
195/50		╟	+			+	_						
						_							
200/													
						_							
 186/62		+											
										EOB at 2.0m, Target Boreho	ole Depth.		
			_										
		╟				+							
						+							
				-	\square	+	-						
	EC)B =	En	d Of	Bor	eho	le	UTF	P =	Unable To Penetrate	JTE = Unable T	o Extract	_
Weather leadin			-					vious	3	days.			

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

Notes:

	_						Project Name		Job Ref.	
C	۶R	E	5	O			Stage 20, Greenhill Par	k, Hamilton	171738-S	20-GCR
SOLUT							Tested by	Date	Sheet No.	Test Site
							ТВ	30/11/2023	20	MA640
Undrained Shear (kPa)	No of blows /100mm	0 2		ws/10	rometer 0mm) 0 12 14			escription		Water Table
					Gro Gro	und	trace to minor fine sand; dar nasticity FILL: CLAY SILT; brown mo	k brown to blac	k; moist; low	
		_		-			stiff to hard; dry; high plastic		•	
200/										
						_				
400/74										
183/71										
200/										
		_								
							FILL: CLAY GRAVEL: brown	n mottled grey;	nard; dry; low	•
							plasticity; modertaely sensiti	ve.		
UTP							EOB at 2.0m, Target Boreho	ole Depth.		
						_				
		_								
						_				
	EC)B = E	nd Of B	oreho	le U	ITP =	= Unable To Penetrate	UTE = Unable 1	o Extract	
Weather leading	na un to te	stina w	vas: Find	e for th	e nrevio	us 3	davs			

Weather leading up to testing was: Fine for the previous 3 days.

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

Notes:

	_			Project Name		Job Ref.	
C	۶R	E 5	0	Stage 20, Greenhil	ll Park, Hamilton	171738-S2	20-GCR
		NGINEEF		Tested by	Date	Sheet No.	Test Site
				ТВ	30/11/2023	19	MA641
Undrained Shear (kPa)	No of blows /100mm		Penetrometer ws/100mm) 8 10 12 14 16		oil Description		Water Table
			Result	trace to minor fine sand			
			Ground	plasticity FILL: CLAY SILT; brow stiff; dry; high plasticity			
192/71				-			
UTP				FILL: CLAY GRAVEL; (low plasticity; moderate		ırey; hard; dry;	
200/				FILL: CLAY SILT; oran dry; high plasticity; mod	•	rown; hard;	
				-			
200/				EOB at 2.0m, Target B	archala Danth		
				-			
				-			
				-			
Moothor les-		DB = End Of E		= Unable To Penetrate	UTE = Unable 1	To Extract	
		sting was: Fin	e for the previous 3	uays.			

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

-		_	_	-		Project Name		Job Ref.	
C	۶R	E	5	0		Stage 20, Greenhill	Park, Hamilton	171738-S	20-GCR
SOLUTI	IONS E	NGIN	EER	ED		Tested by	Date	Sheet No.	Test Site
						ТВ	30/11/2023	18	MA642
Undrained Shear (kPa)	No of blows /100mm		(Blov	Penetrom ws/100mi 8 10 11	m)		I Description		Water Table
					- Result	trace to minor fine sand;			
					- Good Ground	nlasticity FILL: CLAY GRAVEL; da low plasticity; moderately	-	grey; hard; dry;	
200/									
						FILL: CLAY SILT; dark b hard; dry; high plasticity;			
200/			, ^						
200/						-			
200/						-			
UTP						FILL: CLAY GRAVEL; or hard; dry; low plasticity; i	-		
						EOB at 2.0m, Target Bor	ehole Depth.		
						-			
						-			
Veather leadir)B = Enc				= Unable To Penetrate	UTE = Unable	To Extract	

Weather leading up to testing was: Fine for the previous 3 days.

Notes:

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible



(mm)

Notes:

		_									Pro	oject Name			Job Ref.	
	C	シR			Č	5	O					Stage 20, 0	Greenhill Par	k, Hamilton	171738-S	20-GCR
	SOLUT										Te	sted by		Date	Sheet No.	Test Site
												TI	3	30/11/2023	1	MA8038
	Undrained Shear (kPa)	No of blows /100mm	0	2	(E	Blov	vs/10)0m	mete 1 m) 12 14					escription		Water Table
				_		-		- (Good G	Ground				material, some ro black; moist; low		
							1	- F	Result			L: CLAY SIL ⁻ ensitive	Γ; brown mottle	ed light brown; dry	; high plasticity;	
	195/133		-		_		_	-		_	_					
							_				_					
											FIL	L: SILT SAN	D; brown; dry; l	nigh plasticity; ins	ensitive.	
	162/142		_				_				_					
							_				HIN		ATION: SILT	SAND; light grey;	moist: low	
	156/68												ately sensitive		moist, iow	
	0.114.4															
	91/44										EC	B at 2.0m,	Target Boreh	ole Depth.		
													-			
											-					
			_			_	-			_						
_			\parallel		-		_									
			╞													
			H													
			╟		+		-									
	Moothan las-						oreh					hable To Pe	netrate	UTE = Unable 1	o Extract	
	Weather leading	ng up to te	รแก	iy Wa	as:			u10	previ	ious d	o aay	5.				

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Rev3.7

Shear Vane records include Re-moulded values where possible Shear Vane Serial No.: 3102 Exp. Date: 08/03/2024



								Project Name		Job Ref.	
C	٥R	E	Ξļ	50	С			Stage 20, Greenhill Par	k, Hamilton	171738-S	20-GCR
SOLUTI								Tested by	Date	Sheet No.	Test Site
								ТВ	30/11/2023	2	MA8040
Undrained Shear (kPa)	No of blows /100mm	0	S 2 4	(Blov	vs/100	12 14	16		escription		Water Table
						Goo Gro Res	und	TOPSOIL: SILT, some organic minor fine sand; dark brown to			
								FILL: CLAY SILT; brown mottle insensitive	d light brown; dry	; high plasticity;	
200/											
200/								FILL: CLAY SILT minor gravel; high plasticity; insensitive	brown mottled da	rk brown; dry;	
200/								FILL: CLAY SILT; brown mottle	d dorl brown dr	, high placticity	
								insensitive	a daik biowii, diy	, nigh plasticity,	
136/77								HINUERA FORMATION: SILT plasticity; sensitive.	SAND; light grey;	moist; low	
142/29								EOB at 2.0m, Target Boreh	ole Depth.		
	EC)B =	End	Of B	oreho	le l	JTP :	= Unable To Penetrate	UTE = Unable 1	o Extract	

Notes:

Depth

(mm)

Weather leading up to testing was: Fine for the previous 3 days.

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible


Depth

(mm)

			Project Name		Job Ref.	
CC	3P	E 50	Stage 20, Greenhill Par	k, Hamilton	171738-S	20-GCR
			Tested by	Date	Sheet No.	Test Site
301011		NOMEEKED	ТВ	30/11/2023	3	MA8042
Undrained Shear (kPa)	No of blows /100mm	Scala Penetrometer (Blows/100mm) 0 2 4 6 8 10 12 14 16	Soil De	Water Table		
		Good ground Result	TOPSOIL: SILT, some organ trace to minor fine sand; dar	k brown to blac	k; moist; low	
200/			FILL: CLAY SILT; brown mo plasticity; insensitive	ttled light browr	n; dry; high	
200/			-			
162/44	2		HINUERA FORMATION: SII moist; low plasticity; modera		n; very stiff;	
	3 7 7		HINUERA FORMATION: SA dense; poorly graded.	ND SILT; light (grey; moist;	
183/65	6 9 7 5		HINUERA FORMATION: SII hard; moist; low plasticity; m	-		
200	6					
		Image: Section of the section of t	EOB at 2.0m, Target Boreho	io Dopui.		
	EC	DB = End Of Borehole UTP	= Unable To Penetrate	JTE = Unable 1	o Extract	

Notes: Weather leading up to testing was: Fine for the previous 3 days.

Ground water was not encountered during testing

Shear Vane readings are converted readings, as per calibration Certificate. (Values are undrained shear strength)

Shear Vane records include Re-moulded values where possible Shear Vane Serial No.: 3102 Exp. Date: 08/03/2024



171738-LUK-SI

1/10/2020

Chedworth Properties Limited

ONLINE Contractors Limited

Project Address:

Job Ref:

Contractor:

Date Started:

Last Updated:

Last Updated By:

Client:

Stage 19 Area LUK of Greenhill Park, Hamilton

Subdivision Earth Fill Compaction and Quality Assurance

CORES Hamilⁱ Taupo Phone Web: <u>Test I</u>

NZS 4 NZS 4 NZS 4 NZS 4 CETA ASTN



E50 Ltd	
nilton Office:	62 Church Road, Pukete, Hamilton, 3200
po Office:	89 Tahara Road, Taupo, 3330
ne:	0800 CORE50
) :	Core50.nz
t Methods:	Notes:
6 4402 1986 Test 2.1	Water Content done by External Laboratory
6 4407 2015 Test 4.2	NDM Direct Transmission
6 4407 2015 Test 4.3	NDM Back Scatter
ANZ TG1 2011	Scala Dynamic Cone Penetrometer
M D5874 - 16 2007	Clegg Hammer
GS: August 2001	Hand Held Shear Vane

Approximate Locations:
Δ 24/11/202: Schick Testing
■ 15/12/2020: Coffey Testing
⊗ CORE50 Testing.





Subdivision Earth Fill Compaction and Quality Assurance

Project Address:Area LUK of Greenhill Park, HamiltonJob Ref:171738-LUK-SIClient:Chedworth Properties LimitedContractor:ONLINE Contractors LimitedDate Started:1/10/2020Last Updated:31/03/2023Last Updated By:AK

			te Location: site location plar	n)				Undrain	Soil Strenged Shear St Unable to	rength (kP	'a)	Lab Mater	rial Testing D	Data				sity NDM Test Gauge Test Re				Ove	n Correcte	d Test Resı	ılts		Result
Test Date	Test No. N: (NDM) D: (DCP) S: (Shear Vane) C: (Clegg)	RL (Ref Datum: Moturiki 1953)	Ref Datum:	(Mt Eden 2000) Eastings	Compacted Lift Thickness (mm)	Soil Description	Test 1 (kPa)			at 500mm BGL	Average (kPa)	Solid M Density I	Max Dry (Density (kg/m ³)	Content.	Gauge NDM Serial No.	Gauge Probe Depth (mm)	Gauge Wet Density (kg/m ³)		Gauge Dry Density (kg/m ³)	Gauge Proctor Ratio (PR%)	Air Voids		Density	Proctor Ratio (PR%)	Voids	PASS/FAIL	Comments
20/01/2023	N: 1	39.400	Stage 19	Lot 8036	500	CLAY SILT	UTP	209+	209+	209+	209	2700	1020	57.5	79159	300	1684	54.1	1093	107	0	50.1	1122	110	2	PASS	
20/01/2023	N: 2	40.110	Stage 19	Lot 594	500	CLAY SILT	UTP	209+	209+	209+	209	2700	1020	57.5	79159	300	1656	39.8	1185	116	9	56.8	1056	104	1	PASS	
20/01/2023	N: 3	39.570	Stage 19	Lot 586	500	CLAY SILT	UTP	209+	209+	209+	209	2700	1020	57.5	79159	300	1626	45.9	1114	109	8	48.5	1095	107	6	PASS	
20/01/2023	N: 4	39.150	Stage 19	Lot 601	500	Sandy CLAY SILT	UTP	UTP	UTP	UTP	209	2480	1250	32.0	79159	300	1663	35.8	1225	98	7	40.7	1182	95	4	PASS	Solid density assumed as per Lab report HA5441/1_MDD
20/01/2023	N: 5	38.800	Stage 19	Lot 581	500	CLAY SILT	UTP	209+	209+	161	197	2700	1020	57.5	79159	300	1669	36.9	1219	120	10	40.5	1188	116	8	PASS	
3/03/2023	N: 6	38.900	Stage 19	Lot 606	500	CLAY SILT	164	161	164	176	166	2700	1020	57.5	79159	250	1673	59.4	1050	103	-1	52.8	1095	107	2	PASS	
3/03/2023	N: 7	38.910	Stage 19	Lot 609	500	CLAY SILT	146	209	152	179	171	2700	1020	57.5	79159	300	1674	58.5	1056	104	-1	55.7	1075	105	0	PASS	

CORE50 Ltd Hamilton Office: Taupo Office:	62 Church Road, Pukete, Hamilton, 3200 89 Tahara Road, Taupo, 3330
Phone:	0800 CORE50
Web:	Core50.nz
Test Methods: NZS 4402 1986 Test 2.1 NZS 4407 2015 Test 4.2 NZS 4407 2015 Test 4.3 CETANZ TG1 2011 ASTM D5874 - 16 2007 NZGS: August 2001	<u>Notes:</u> Water Content done by External Laboratory NDM Direct Transmission NDM Back Scatter Scala Dynamic Cone Penetrometer Clegg Hammer Hand Held Shear Vane





Field Density Report - NDM

Contract:	DB Con	Report No:	SH20112410
Address:	Greenhill Park	Job No:	8926
Site:	Greenhill Park area: LUK	Lot No.:	-
Material Type:	Subgrade	Date Placed:	24-Nov-2020
Limits:	-	Date Tested:	24-Nov-2020
Comments:	As per clients locations. Jn: 171738-Area LUK/SI. Unable to prob deeper than 150mm.	Tested by:	EA
R/L:	-	Reported by:	Euan Acket

Test Procedures:

()NZS4407:2015 Test 4.2 Field W/C and Dry Density of Compacted Materials D/T.

(X)NZS4407:2015 Test 4.3 Field W/C and Dry Density of Compacted Materials B/S.

()NZS4402:1986 Test 4.1.1 Standard Compaction.

(X)NZS4402:1986 Test 4.1.3 Vibratory Compaction.

()NZS4407:2015 Test 3.7.1 Solid Density of Aggregate Particles.

()NZS4402:1986 Test 2.7.2 Solid Density of Soil Particles.

()NZS4407:2015 Test 4.3.6 Moisture Correction.

- ()NZS4402:1986 Test 2.1 Water Content.
- ()NZS4407:2015 Test 3.1 Water content

()NZS4407:2015 Test 4.3.7 (e) Degree of Saturation.

Test Site Location	CHN	Nominal Layer Thickness mm	Probe Depth mm	Bulk Density Kg/m³	Dry Density Kg/m³	Reported W/C %	Field W/C %	Degree of Saturation %	Air Voids %	Compaction %
1		1.0m	150	1709	1131.04	51.1	51.1	97	2	107
2		1.0m	150	1689	1147.42	47.2	47.2	92	5	108
3	А	0.5m	150	1585	941.21	68.4	68.4	97	2	90
3	В	0.65m	150	1541	954.77	61.4	61.4	89	7	90
3	С	1.0m	150	1602	1060.23	51.1	51.1	87	8	100
4		1.0m	150	1493	924.46	61.5	61.5	85	10	87
5		1.0m	150	1681	1078.95	55.8	55.8	98	1	102
6		1.0m	150	1690	1061.56	59.2	59.2	101	-1	100
						-				
						-				
							Average Air \			

Humboldt: HS-5001EZ ()

Humboldt: HS-5001SD (X)

S/N:5586 S/N:8894

Note 1: Maximum Dry Density determined in accordance with NZS4402:1986 Test 4.1.1(Standard)

Note 2: Maximum Dry Density determined in accordance with NZS4402:1986 Test 4.1.3(Vibe)

Note 3: Water content determined with accordance with NZS4402:1986 Test 2.1

Note 5: Solid Density of soil tested in accordance with NZS4407:2015 Test 2.7.2

Note 4: Solid Density of aggregate tested in accordance with NZS4407:2015 Test 3.7.1

Calibration Expiry Date - 02/03/2022 Calibration Expiry date -10/07/2022

MDD kg/M³: 1060 OMC %: 54 Average Reported W/C %: 57 Average Field W/C %: 57 Average DOS%: 93 Refer Lab Report No: Refer Lab Report No: Refer Lab Report No: Refer Lab Report No:

Average Compaction %:

Refer Lab Report No:

Assumed

Measured or Assumed:

98

Euan Acket-QA Technician

Note 6: Solid Density used: 2800

Note 7: Offsets Measured From: -

Signatory: FA



Date: 16-Jan-2023



Figure 1.



Figure 2.

Coffey Testing NZ 3 Titoki Piace Mount Moungarui



					RTHWOR	201 1000		100					-	and the second second	ct No:		77	3-TAUR00030		
	Test Metro	icali , simear sig acci	engin (using n ontiance with f	23 4402:1985	Tell 2.1) Density C	accutations (In 2	accontance with I	er 1-song (n a NGS 4402 1986	Tests 4.1.1	1.51비니	4401,1991	1161421): Water Corbert Testing (m		Page:	-		1 of 1		
Client:	D B Consulting 42 Tawn Place Pukete, Hamilto		i i											IANA	Tests indicate accredited are the scope of t	e outside	tory's accreditation			
Principal:	Jamie Masters													N# VISHE						
0.0. to:	4													Approved Signato	ny:		Etic Paton			
Project:	Green Hill Park													Approved Signato	ny Signature:		21.6			
														Date of same:			16/12/2020			
Project Locatio	n: Cans Road													Phile of wanter			10122000			
Project Locatio	n: Cans Road			-									_	Date of ender		i.	NZ Accredited Laboratory	y Number: 1352		
Project Locatio Date	Work Order :	Tested By	Test No.	Wet Density (t/m ³)	Oven Water Content (%)	Dry Density (Um ²)	Solid Density (t/m²)	Air Voids		in i	itrength		Test Location	Easting	Northing	RL (m)	and the second se	y Number: 1352 Comments		
			Test No.	Density	Water	Density	Density			Shear S in I	itrength Pa		Test Location Ref to Plan		Northing	RL	and the second se			
Date	Work Order :	Ву	Test No.	Density (t/m²)	Water Content (%)	Density (Um ³)	Density (t/m ⁴)	Voids %	(UTP =	Shear S in I = Unable	itrength tPa e to pens	etrate)		Easting		RL (m)	NZ Accredited Laborator			
Date 15/12/2020	Work Order :	By EP	1	Density (t/m ²) 1.72	Water Content (%) 42.5	Density (Um ²)	Density (t/m ³) 2.8	Voids	(UTP = NT	Shear S in I Unable NT	itrength tPa e to pens NT	etrate) NT	Ref to Plan	Easting		RL (m)	Accredited Laboratory			
Date 15/12/2020 15/12/2020	Work Order : TAUR20W00531 TAUR20W00531	By EP EP	1 2	Density (t/m ³) 1.72 1.69	Water Content (%) 42.5 48.3	Density (Um ²) 1.21 1.15	Density (t/m ³) 2.8 2.8	Voids % 5.4 5.5	(UTP = NT NT	Shear S in I Unable NT NT	itrength tPa e to pens NT NT	etrate) NT NT	Refto Plan Refto Plan	Easting		RL (m)	Accredited Laboratory	Comments		
Date 15/12/2020 15/12/2020 15/12/2020	Work Order : TAUR20W00531 TAUR20W00531 TAUR20W00531 TAUR20W00531	By EP EP EP	1 2 3	Density (t/m ³) 1.72 1.69 1.65	Water Content (%) 42.5 48.3 54.3	Density (Um ²) 1.21 1.15 1.07	Density (t/m ⁹) 2.8 2.8 2.8 2.8	Voids N 5.4 5.5 3.0	(UTP = NT NT NT	Shear S in I Unable NT NT NT	itrength tPa e to pens NT NT NT	etrate) NT NT NT	Ref to Plan Ref to Plan Ref to Plan	Easting		RL (m)	Accredited Laboratory Sitty CLAY Sitty CLAY Sitty CLAY	Comments		

Greenhill Park		
Carrs Road Hamilton	Tested by: Date tested:	EP 15.12.20
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		Restormer and
		Contraction of the second second
		-
		arrs Road Hamilton Tested by:



Project Address:Stage 20 Area LUK of Greenhill Park,Job Ref:Hamilton 171738-LUK-SIClient:Chedworth Properties LimitedContractor:ONLINE Contractors LimitedDate Started:1/10/2020Last Updated:20/12/2023Last Updated By:AK

Test Site (Refer to test site (Refer to test site N: (NDM) D: (DCP) S: (Shear Var C: (Clegg) 21/02/2023 N: 8 21/02/2023 N: 9 21/02/2023 N: 10 21/02/2023 N: 10 21/02/2023 N: 11 21/02/2023 N: 12 21/02/2023 N: 13 21/02/2023 N: 13 21/02/2023 N: 14 21/03/2023 N: 15 21/03/2023 N: 16 21/03/2023 N: 16	RL (Ref Datum: Moturiki 1953) 38.550 38.495 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400 38.400	Soil Description CLAY SILT	Test 1 (kPa) UTP 209+ 209+ 209+ UTP		d Shear St Unable to Test 3 (kPa) 209+ 209+ 209+ 209+	trength (kP Penetrate Test 4 at 500mm BGL (kPa) 209+ 179 209+	Average (kPa) 209 201	Lab Mi SD: Solid Density (kg/m ³) (Measured) 2700 2700	aterial Testing MDD: Max Dry Density (kg/m ³) (Measured) 1020	g Data OMC: Optimum Water Content. (%) 57.5	Gauge NDM Serial No.	Gauge Probe Depth (mm)	Field G Gauge Wet Density (kg/m ³)	Gauge Test Re Gauge Moisture Content (%)	sults Gauge Dry Density (kg/m ³)	Gauge Proctor Ratio (PR%)	Gauge Air Voids (%)	Moisture	Corrected 1 Dry Density (kg/m ³)	Fest Resu Proctor Ratio (PR%)	lts Air Voids (%)	PASS/FAIL	Result Comments
N: (NDM) D: (DCP) D: (DCP) S: (Shear Var C: (Clegg) C: (Clegg) 21/02/2023 N: 8 21/02/2023 N: 9 21/02/2023 N: 10 21/02/2023 N: 11 21/02/2023 N: 11 21/02/2023 N: 12 21/02/2023 N: 13 21/02/2023 N: 13 21/03/2023 N: 14 21/03/2023 N: 15 21/03/2023 N: 16	(Ref Datum: Moturiki 1953) 38.550 38.495 38.400 38.473 38.620 37.980 37.980 39.240 39.246	CLAY SILT CLAY SILT CLAY SILT CLAY SILT CLAY SILT CLAY SILT	(kPa) UTP 209+ 209+ 209+ UTP	(kPa) 209+ 209+ 209+ 209+ 209+	(kPa) 209+ 209+ 209+	at 500mm BGL (kPa) 209+ 179	(kPa) 209 201	Solid Density (kg/m ³) (Measured) 2700	Max Dry Density (kg/m ³) (Measured) 1020	Optimum Water Content. (%)	NDM Serial No.	Probe Depth	Wet Density	Moisture Content	Dry Density	Proctor Ratio	Air Voids	Content	Density	Ratio	Voids	PASS/FAIL	Comments
21/02/2023 N: 9 21/02/2023 N: 10 21/02/2023 N: 11 21/02/2023 N: 11 21/02/2023 N: 12 21/02/2023 N: 13 21/03/2023 N: 14 21/03/2023 N: 15 21/03/2023 N: 16	38.495 38.400 38.473 38.620 37.980 39.240 39.246	CLAY SILT CLAY SILT CLAY SILT CLAY SILT CLAY SILT	209+ 209+ 209+ UTP	209+ 209+ 209+	209+ 209+	179	201			57.5													
21/02/2023 N: 10 21/02/2023 N: 11 21/02/2023 N: 11 21/02/2023 N: 12 21/02/2023 N: 13 21/03/2023 N: 14 21/03/2023 N: 15 21/03/2023 N: 16	38.400 38.473 38.620 37.980 39.240 39.246	CLAY SILT CLAY SILT CLAY SILT CLAY SILT	209+ 209+ UTP	209+ 209+	209+			2700			79159	300	1727	51.0	1144	112	-1	44.3	1197	117	3	PASS	
21/02/2023 N: 11 21/02/2023 N: 12 21/02/2023 N: 13 21/02/2023 N: 13 21/03/2023 N: 14 21/03/2023 N: 15 21/03/2023 N: 16	38.473 38.620 37.980 39.240 39.246	CLAY SILT CLAY SILT CLAY SILT	209+ UTP	209+		209+	a.c	2700	1020	57.5	79159	300	1711	49.7	1143	112	1	57.1	1089	107	-3	PASS	
21/02/2023 N: 12 21/02/2023 N: 13 21/03/2023 N: 14 21/03/2023 N: 15 21/03/2023 N: 16	38.620 37.980 39.240 39.246	CLAY SILT CLAY SILT	UTP		209+		209	2700	1020	57.5	79159	300	1689	59.0	1062	104	-2	54.1	1096	107	0	PASS	
21/02/2023 N: 13 21/03/2023 N: 14 21/03/2023 N: 15 21/03/2023 N: 16	37.980 39.240 39.246	CLAY SILT	-	209+		209+	209	2700	1020	57.5	79159	300	1784	30.1	1371	134	8	36.1	1311	129	4	PASS	Minor gravels observed on NDM test pad
21/03/2023 N: 14 21/03/2023 N: 15 21/03/2023 N: 16	39.240 39.246		1170	2051	209+	209+	209	2700	1020	57.5	79159	300	1715	43.3	1197	117	4	44.7	1185	116	3	PASS	Traces of gravels observed on NDM test pad
21/03/2023 N: 15 21/03/2023 N: 16	39.246		UTP	209+	209+	209+	209	2700	1020	57.5	79159	300	1710	49.5	1144	112	1	50.1	1139	112	1	PASS	Traces of gravels observed on NDM test pad
21/03/2023 N: 16		CLAT JILI	209+	209+	137	209+	191	2700	1020	57.5	79159	300	1703	46.9	1159	114	3	46.1	1166	114	3	PASS	Test at 100mm Below indicated RL.
		CLAY SILT	182	209+	209+	209+	202	2700	1020	57.5	79159	300	1720	51.1	1138	112	0	49.9	1147	112	0	PASS	Test at 100mm Below indicated RL.
21 /02 /2222	39.197	CLAY SILT	206	209+	209+	203	206	2700	1020	57.5	79159	300	1723	54.4	1116	109	-2	45.9	1181	116	2	PASS	Test at 100mm Below indicated RL.
21/03/2023 N: 17	39.227	CLAY SILT	176	209+	206	161	188	2700	1020	57.5	79159	300	1703	52.6	1116	109	0	51.9	1121	110	0	PASS	Test at 100mm Below indicated RL.
21/03/2023 N: 18	39.310	CLAY SILT	179	209+	209+	134	183	2700	1020	57.5	79159	300	1694	47.6	1148	113	3	49.1	1136	111	2	PASS	Test at 100mm Below indicated RL.
21/03/2023 N: 19	39.240	CLAY SILT	164	206	179	137	171	2700	1020	57.5	79159	300	1666	55.2	1073	105	1	56.9	1062	104	0	PASS	Test at 100mm Below indicated RL.
21/03/2023 N: 20	39.230	CLAY SILT	209+	209+	209+	209+	209	2700	1020	57.5	79159	300	1674	56.1	1072	105	0	49.8	1117	110	3	PASS	Test at 100mm Below indicated RL.
26/04/2023 N: 21	39.685	CLAY SILT	182	140	197	149	167	2700	1020	57.5	79159	300	1780	42.5	1249	122	1	50.8	1180	116	-4	PASS	
26/04/2023 N: 22	39.720	CLAY SILT	209+	209+	209+	209+	209	2700	1020	57.5	79159	300	1767	40.8	1255	123	2	42.1	1243	122	2	PASS	
26/04/2023 N: 23	39.980	CLAY SILT	179	182	164	209+	183	2700	1020	57.5	79159	300	1719	62.0	1061	104	-5	49.5	1150	113	0	PASS	
26/04/2023 N: 24	39.970	CLAY SILT	206	209+	164	149	182	2700	1020	57.5	79159	300	1685	55.0	1087	107	0	43.4	1175	115	5	PASS	
26/04/2023 N: 25	40.040	CLAY SILT	209+	209+	209+	149	194	2700	1020	57.5	79159	300	1699	53.7	1105	108	0	47.3	1153	113	3	PASS	
26/04/2023 N: 26a	39.990	CLAY SILT	134	134	146	149	141															FAIL	Low Shear Vane Results
26/04/2023 N: 26b	39.390	CLAY SILT	54	48	80	209	98															FAIL	Low Shear Vane Results
26/04/2023 N: 27a	39.990	CLAY SILT	149	134	179	119	145															FAIL	Low Shear Vane Results
26/04/2023 N: 27b	39.390	CLAY SILT	75	95	101	194	116															FAIL	Low Shear Vane Results
26/04/2023 N: 28a	40.230	CLAY SILT	104	122	149	122	124															FAIL	Low Shear Vane Results
26/04/2023 N: 28b	39.630	CLAY SILT	110	92	89	134	107															FAIL	Low Shear Vane Results
21/09/2023 N: 29	39.200	CLAY SILT	209	209	209	209	209	2700	1020	57.5	79159	300	1628	43.2	1137	111	9	49.6	1088	107	6	PASS	
21/09/2023 N: 30	39.300	CLAY SILT	209	209	209	209	209	2700	1020	57.5	79159	300	1705	45.0	1176	115	4	36.7	1247	122	8	PASS	
21/09/2023 N: 31	39.300	CLAY SILT	209	176	179	209	193	2700	1020	57.5	79159	300	1722	43.8	1197	117	3	35.9	1267	124	8	PASS	
21/09/2023 N: 32a	40.200	CLAY SILT	209	UTP	164	209	197	2700	1020	57.5	79159	300	1663	38.3	1202	118	9	45.8	1141	112	6	PASS	Retest of #28a
21/09/2023 N: 32b	39.600	CLAY SILT	209	164	209	209	197	2700	1020	57.5	79159	300	1823	35.6	1344	132	2	43.2	1273	125	-2	PASS	Retest of #28b
21/09/2023 N: 33a	40.000	CLAY SILT	UTP	UTP	UTP	209	209	2700	1020	57.5	79159	300	1758	45.1	1212	119	0	45.2	1211	119	0	PASS	Retest of #27a
21/09/2023 N: 33b	39.300	CLAY SILT	149	164	137	209	165	2700	1020	57.5	79159	300	1726	46.9	1175	115	1	52.6	1131	111	-1	PASS	Retest of #27b
21/09/2023 N: 34a	40.000	CLAY SILT	UTP	UTP	UTP	209	209	2700	1020	57.5	79159	300	1694	40.6	1205	118	6	48.4	1142	112	2	PASS	Retest of #26a
21/09/2023 N: 34b	39.200	CLAY SILT	149	209	164	209	183	2700	1020	57.5	79159	300	1623	58.6	1023	100	2	50.3	1080	106	6	PASS	Retest of #26b
17/10/2023 N: 35	40.050	CLAY SILT	131	179	191	209	177	2700	1020	57.5	79159	300	1670	56.9	1064	104	0	40.5	1189	117	8	PASS	
17/10/2023 N: 36	40.000	CLAY SILT	149	164	194	209	179	2700	1020	57.5	79159	300	1693	51.1	1120	110	1	44.0	1176	115	5	PASS	
17/10/2023 N: 37	40.000	CLAY SILT	209	209	149	140	177	2700	1020	57.5	79159	300	1696	53.4	1106	108	0	57.6	1076	106	-2	PASS	

CORE50 Ltd	
Hamilton Office:	62 Church Road, Pukete, Hamilton, 3200
Taupo Office:	89 Tahara Road, Taupo, 3330
Phone:	0800 CORE50
Web:	Core50.nz
Test Methods:	Notes:
NZS 4402 1986 Test 2.1	Water Content done by External Laboratory
NZS 4407 2015 Test 4.2	NDM Direct Transmission
NZS 4407 2015 Test 4.3	NDM Back Scatter
CETANZ TG1 2011	Scala Dynamic Cone Penetrometer
ASTM D5874 - 16 2007	Clegg Hammer
NZGS: August 2001	Hand Held Shear Vane







Appendix E <u>Stormwater Management</u> Minimum Lot Levels: 30410-01-S20-G1 Rev. AB2



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MINIMUM INISHED FLOOR	в		-	-	vei ope Ari	row		
LEVEL (FFL)								
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39.95		AB1 AB2	Lot Level		NP	BP		27/11/23
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EST LEVEL	MINIMUM FINISHED FLOOR LEVEL (FFL)
39.56	39.71
39.69	39.84
39.80	39.95
39.91	40.06
40.06	40.21
40.16	40.31
40.24	40.39
40.32	40.47
40.46	40.61
40.45	40.60
40.31	40.46
40.23	40.38
40.12	40.27
39.94	40.09
40.13	40.35
40.29	40.44
40.36	40.51
40.40	40.55
40.61	40.76
40.61	40.76
40.56	40.71
40.49	40.64
40.42	40.57
40.29	40.44
40.20	40.35
40.13	40.28
40.00	40.15
39.94	40.09
39.83	39.98
39.80	39.95
39.76	39.91
40.03	40.18
39.98	40.13
39.89	40.04
40.08	40.23
40.03	40.18
39.99	40.14
39.90	40.05
39.72	39.87