THE LAKES DEVELOPMENT
STAGE 2K
BENMORE CRESCENT
PYES PA, TAURANGA

Geotechnical Completion Report

Prepared for : **The Lakes (2012) Ltd**

Ref : 20260

Date : 15 March 2013

S&L CONSULTANTS LTD - SURVEYORS - ENGINEERS - PLANNERS

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Contents

1.0 Introduction

This report refers to the site development earthworks completed for Stage 2K of The Lakes residential subdivision development at Pyes Pa.

The location of this stage of The Lakes development is shown on plans 132631-2K-RC01 and DP 462245, both prepared by Harrison Grierson Consultants (HG). Copies of these plans are included in Appendix 1 of this report. These plans show the residential development for Stage 2K to comprise

- 54 residential lots numbered 597 to 650 incl with frontage to the new road of Benmore Crescent which was constructed as part of the development of Stage 2K

- 2 residential lots numbered 694 and 698 with frontage to the existing formation of Mortlake Heights

- Lot 593 with frontage to Kennedy Road

Construction of the roading and reticulation to service these lots has been completed by the developer, The Lakes (2012) Ltd.

Approval for the Lakes Development was initially granted jointly by the Tauranga City Council and Western Bay of Plenty District Council on 24 May 2004 based on subdivision plan 16916 dated 20 April 2004 prepared by S&L Consultants Ltd (S&L). A variation was approved by the Tauranga City Council on 18 September 2007 for the proposed development on the area known as Stage 2 at The Lakes. The basis of the Stage 2 development was subdivision scheme plan 124825-2-RC04 prepared by HG.

Construction of Stage 2K has been undertaken during November 2012 to March 2013 in accordance with resource consent RC 16780 dated 7 September 2012 issued by Tauranga City Council based on HG scheme plan 132631-2K-RC01 rev 5. Conditions 7 and 8 of the approval require that

> *The Consent Holder shall provide to the Council a "Geotechnical Completion Report" compiled by a Category 1 Geo-Professional. The report shall*
> - *Comply with the Councils IDC*
> - *Display the position of all designated building platforms and building restriction lines where applicable;*
> - *Provide recommendations for the ongoing development of the lots (i.e. maximum cut/fill heights, management of steep slopes, etc.);*
> - *Confirm earthworks and/or building platforms have been constructed to comply with the New Zealand Building Code requirements;*
> - *Certify that any residential settlement of differential settlement that may still occur shall not exceed the manufacturer's recommendations with respect to the installed underground pipe networks to be vested in Council or exceed accepted design techniques with respect to road settlement or long term deflection, or exceed the settlement limitations as detailed in the New Zealand Building Code.*
> - *Comment on removal or amendment of existing land features/s displayed on Councils GIS*
>
> *Pursuant to Section 128 of the Resource Management Act 1991, the Council may review this condition, upon receipt of the "Geotechnical Completion Report", and*

require a Consent Notice to be registered on the Certificate of Title of any allotments to which the recommendations of the "Geotechnical Completion Report" relate to.

This report has been prepared for the Section 224C Certificate application for DP 462245 and describes the earthworks undertaken in the formation of Stage 2K and summarises the suitability of the prepared ground in cut and fill for future urban housing development. The report states the relevant standards adopted for the placement of filling to support residential buildings and recommendations for developing future building sites.

2.0 Original Landform and Geology

The landform prior to the commencement of the Lakes development in 2004 comprised:

- Elevated areas along the eastern side as a central plateau described locally as the Te Ranga Tablelands. These areas have been variously used for farming and horticultural cropping. The existing Pyes Pa residential area further to the east had been established on similar level areas of the same elevation.
- Lower lying areas mainly along and adjacent to the Kopurererua Stream to the west and extending eastwards.
- Transitional slopes of varying steepness between the lower lying areas and the elevated central plateau. Re entrant erosion gullies were present on some of these slopes but most were uniform in slope gradient, albeit steep in some locations.

The geological setting for the development area can be derived from the publication:
Occasional Report 22 – Department of Earth Sciences University of Waikato
"Geology of the Tauranga Area" by Briggs et al – 1996

Stage 2K is located on the elevated areas within the eastern side of The Lakes development area and the original geology can be described from preconstruction subsoil investigations to comprise

- Taupo volcanic zone tephras comprising Rotoehu ash (light grey sand) overlaid by brown or yellow post Rotoehu ash being coarse grained silts, sandy silts and sands. These are collectively referred to as "younger ashes" and overlay

- "Older" ash derivative strongly weathered clay textured tephra beds and palaesols (Hamilton ash) overlaying

- Older terrestrial and estuarine sediments deposits of the Matua subgroup of the Tauranga formation. These may comprise a wide variety of lithologies

- Te Ranga ignimbrite being white-grey pumiceous sands and coarse silts.

3.0 Presubdivision Investigations

Prior to obtaining approval for the original development on 24 May 2004, a comprehensive geotechnical assessment was undertaken by S&L. The subsequent report that accompanied the consent application was titled "Pyes Pa West Urbanisation Development, Geotechnical Assessment Report, reference 16944" and was dated October 2003.

Fifty two machine drilled boreholes and twenty six excavated pits were used to identify the subsoils that are present on the development area. Machine drilled borehole 47 was located on the former Grant plateau (now stage 2K) adjacent to Kennedy Road and showed the subsoils present. This borehole showed the presence of the "younger" and "older" ashes, the underlying Matua subgroup soils and Te Ranga Ignimbrite at a depth of 9m. The borehole was 27m deep

The presubdivision investigations concluded for Stage 2K that:

- The soils to be obtained in areas of cut on the higher ground would be suitable for placement as filling to support future houses although some conditioning may be required so that placement would be near optimum moisture contents.
- As the volcanic ash stratigraphy varies in type and relative strength foundation bearing conditions may vary across building sites formed in areas of cut.
- Similar variations in soil type may be encountered in road subgrades and insitu testing would be required to determine pavement depths applicable to the subgrade conditions present.

A summary log of the soils found in borehole 47 of 2003 is in Appendix 4.

4.0 Scope of Subdivision Earthworks

Large scale earthworks were undertaken in the Stage 2K area in the 2006-2007 earthworks season by Hick Bros Earthmoving. These earthworks comprised:

(a) The reduction of the original ground topography by excavations of up to 8 m to form uniform near flat sloping ground in a north westerly direction. The soils taken in the areas of cut were placed as the replacement filling in the areas where surface peats were removed in Stages 2D, 2F and 2G and the subgrade of Lakes Boulevard adjacent to Stages 2D, 2F, and 2G to the west.

(b) The placement of filling at the south eastern corner of Stage 2K within lots 593 and 615 to 624

The depths of cut and filling undertaken at that time are shown on drawings 18264-AB14 and AB15 in Appendix 1. This data was derived from surveyed contours of the finished surface taken on completion of the earthworks at that time compared with the original topographical surveys undertaken by S&L prior to the subdivision construction.

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These earthworks were undertaken in compliance with consent 62387 issued by Environment Bay of Plenty.

Following detailed design of the Stage 2K development by HG, additional more minor earthworks were undertaken during the construction of the Stage 2K roading and services by Higgins Contractors in the 2012-2013 earthworks season. These earthworks comprised

(a) The placement of filling up to 0.5m deep along the northern boundaries of lots 600 to 604
(b) The formation of near level building platforms on lots 605 and 606 by the placement of filling up to 0.5m deep along the western boundaries of those lots
(c) The construction of retaining walls along the western boundaries of lots 637, 639, 640, 643 and 644 and the placement of filling up to 1.25m deep behind the walls on those lots
(d) The placement of additional filling on lot 623 to increase the cover over the new services on the lot
(e) Minor cuts along the roadway in the preparation of the road subgrade levels

The extent of these earthworks is shown on HG drawing 132631-2K-AB220 contained in Appendix 1.

5.0 Earthworks Standards

The performance specification required of the contractors for the earthworks of 2006 and 2012 was based on the guidelines contained in NZS 4431:1989 "Code of Practice for Earthfill for Residential Development". Compliance with the compaction requirements listed below satisfies the standards listed in Section 7 of the NZS 4431.

Air voids percentage (as defined in NZS 4402: Part 1:1980)
- Average value less than 10% (any 10 tests)
- Maximum single value 12%

Undrained shear strength (measured by in situ vane)
- Average value not less than 150kPa (any 10 tests)
- Minimum single value 100kPa

The calculation of air voids percentages was dependant on the determination of the solid densities of the soils used in the filling. These soils mainly comprised mixed silts, clayey silts, sandy silts and sands depending on the depths below the original ground surfaces that the cuts were made for obtaining fill materials. For cohesive silt/clay soil mixtures a value of solid density of 2.65 T/m^3 was used in the calculation of air voids.

The earthworks were observed by engineering staff from S&L for the work in 2006-2007 and from HG in 2012 - 2013.

Compaction and strength control testing was undertaken by IANZ accredited Opus International Consultants Ltd both on site and in their Tauranga laboratory during both earthworks phases.

The test results are listed in Appendix 3.

Testing in the filling placed during 2012-2013 was undertaken during a period of extended hot dry weather and the ash derivative soils used in the filling had dried appreciably since they were placed. The test results show that the percentage air voids were higher than the specified 12% within some of the filling. At the same test position, the filling soils had dried to the extent where penetration with the shear vane head could not be achieved. At the test positions on lots 600 to 606, 607, 639, 640, 643 and 644 where the filling was not deeper

than 0.75 m and shear strength readings were not possible, a Scala penetrometer was driven from the ground surface and these test results are in Appendix 3.

The blow counts recorded were in excess of minimum values listed in Section3.3.7.1 of NZS 3604:2011. Therefore, in the knowledge that this filling placed had been methodically compacted and that the Scala penetrometer test results were conclusive, the filling placed on lots 600 to 606, 637, 639, 640, 643 and 644 can be considered as sufficient to provide dependable support to future buildings on these lots.

6.0 Recommendations for Development

The area within Stage, 2K originally comprised undulating farmland at the end of Kennedy Road. As shown on appended drawings 18264-AB14 and AB15 prepared after the 2006-2007 earthworks, the depths of cut undertaken over most of the areas within this stage varied from zero at the south eastern corner to 8m within lots 648 and 649. Within lots 597 to 604 and 632 to 638 the depths of cut were 5 to 6m.

Structural filling up to 2m deep was placed in lots 615 to 624 to elevate original ground levels at the south eastern corner of stage 2K.

6.1 Post Constructing Testing

Post construction machine drilled or handaugered boreholes were put down under the management of S&L on every lot that did not contain supervised filling, at locations shown on drawing 20260-01 in Appendix 1. These boreholes were generally 2.0m deep in accordance with the recommendations in NZS 3604:2011 and were intended to show soil types and continuity and to confirm the ground bearing conditions for shallow building foundations.

As the boreholes were being drilled undrained shear strengths were recorded with a hand held shear vane pushed in advance of the auger. Where sandy soils were encountered on lot 613 a Scala penetrometer was driven from the finished ground surface.

Summary logs of the soils found in the post construction boreholes are in Appendix 4. The soils found in the boreholes in areas of cut and their strengths determined in the boreholes are summarised in table 1 on pages 8 and 9. The boreholes indicated the varying soil types that may be present at building foundation levels in the areas of subdivision cut.

In each post investigation borehole the undrained shear strengths were variable but were mainly very high. For any building foundation to be detailed to NZS 3604:2011, undrained shear strengths of at least 60kPa should be present at the foundation level and extending at least two times a foundation width below any foundation level . For a "conventional" footing width 300mm wide and 300mm into the cleared ground level the required undrained shear strength of 60kPa should extend to a depth of 900mm below cleared ground level.

6.2 Subdivision Construction Filling

Supervised structural filling, as shown on S&L drawings 18264-AB11 and 20260-01 and HG drawing 132631-2K-AB220 in Appendix 1, was placed in accordance with the methods and standards quoted in NZS 4431 and discussed in Section 5.0 above under the observation of S & L and HG. Compaction testing on site confirmed that a

high and uniform degree of compaction had been achieved and is therefore suitable for the support of buildings with shallow surface foundations. Some post construction boreholes that encountered the filling also confirmed this suitability.

During the earthworks of 2012-2013, a rectangular silt runoff catchment pond was excavated on lots 598 and 599 as shown in position on 132631-2K-AB220. During the time that this pond was in place, no surface runoff occurred during the dry weather period that occurred in the first quarter of 2013. The pond was decommissioned and infilled with local ash materials and testing by Opus and S&L showed that this filling had been compacted to the specification in 5.0 above. The test results are in Appendix 3.

The backfilling to the trenches for the stormwater and wastewater pipes along the rear boundaries of 600 to 603 was tested by S&L. Adequate densities were recorded in the filling so that the presence of the pipe trenches will be unlikely to promote any instability of the batters present at or below the boundaries to those lots.

A statement in support of the suitability of the filled areas for the erection of buildings is contained in Appendix 2 of this report in the format of Form G2 of the Council Infrastructure Development Code. This statement meets the requirements of NZS 4431 and therefore the filled ground may be considered as good ground in terms of Section 3.1.3 of NZS 3604:2011.

However, within areas of structural filing on which buildings may be erected, the possibility of variations of soil type and strength may exist away from observation or compaction test locations. The normal inspection of foundation conditions during construction of buildings by competent tradesmen as described in NZS 3604 and/or by building inspectors should therefore be undertaken. If for any reason areas of low soil strength are found, professional geotechnical engineering advice should be sought.

Table 1

Summary of Subsoil Types As Determined from Post Construction Boreholes

Lot No.	Depth of Cut (m) average over lot	Soil Type	Shear Strength Range Over Borehole Depth of 2.0m (kPa)	
593	0	fill over clayey silt (younger ash)	200+	
597	6.5	clayey silt (older ash)	91-200+	
598	6.5	clayey silt (older ash)	101-200+	
599	6.5	clayey silt, sand (Matua)	189-200+	
600	6.5	sandy silt (ignimbrite)	108-152	
601	6.5	sandy silt (ignimbrite)	112-149	
602	6.5	clayey silt (Matua)	81-200+	
603	6.0	sandy silt (ignimbrite)	122-200+	
604	5.0	clayey silt (Matua)	189-200+	
605	4.0	clayey silt (Matua)	68-200+	
606	4.0	sandy silt (younger ash)	81-200+	
607	5.0	fill over clayey silt	200+	
608	5.0	clayey sandy silt (younger ash)	190-200+	#
609	4.0	sandy clayey silt (younger ash)	108-200+	#
610	4.0	fill over clayey silt	63-200+	#

		(younger ash)		
611	3.5	clayey silt (older ash)	104-200+	#
612	3.5	clayey silt (older ash)	98-200+	#
613	3.0	sand (younger ash)	Scala 2-12/100	#
614	2.0	clayey silt (younger ash)	200+	#
615	1.0	subdivision fill	150+	
616	0	subdivision fill	150+	
617	0	subdivision fill	150+	
618	0	subdivision fill	150+	
619	0	subdivision fill	150+	
620	0	subdivision fill	150+	
621	0	subdivision fill	150+	
622	0	subdivision fill	150+	
623	0	subdivision fill	150+	
624	1.0	subdivision fill over younger ash	150+	
625	2.0	clayey silt, sand (younger ash)	172-200+	
626	5.5	clayey silt, sand (Matua)	95-108	
627	6.5	clayey silt (Matua)	95-101	
628	6.0	clayey silt (Matua)	71-200+	
629	6.0	minor fill over clayey silt (Matua)	51-200+	
630	6.0	fill over clayey silt (Matua)	108-200+	
631	6.5	clayey silt (Matua)	71-200+	
632	6.0	clayey silt (older ash)	200+	
633	6.0	clayey silt (Matua)	61-159	
634	6.0	clayey silt (Matua)	78-162	
635	5.5	clayey or sandy silt (Matua)	118-200+	
636	4.8	clayey silt (older ash)	139-200+	
637	4.5	clayey silt (older ash)	57-145	
638	4.2	clayey silt (older ash)	78-200+	
639	4.0	silt, sand, clayey silt (older ash)	156-200+	
640	4.5	clayey silt (older ash)	200+	
641	5.5	clayey silt (older ash)	200+	
642	6.5	sandy, clayey silt (Matua)	57-142	
643	5.0	clayey silt (older ash)	81-125	
644	5.0	clayey silt (older ash)	57-95	
645	2.5	clayey silt (younger ash)	68-200+	
646	6.0	clayey silt (Matua)	105-152	
647	8.0	sandy clayey silt (Matua)	68-105	
648	7.5	sandy clayey silt (Matua)	78-169	
649	7.0	sandy clayey silt (Matua)	125-152	
650	6.5	clayey silt (Matua)	169-200+	
694	2.5	clayey silt (younger ash)	171-200+	
698	2.5	clayey silt (younger ash)	184-200+	

NOTE

based on boreholes 1m deep
soil types shown in brackets based on descriptions in Section 2.0 of this report

6.3 Areas of Cut

As shown on 18264-AB14 and AB15 and described on table 1 and in the borehole logs, the varying depths of cut have exposed a number of different soil types and

strengths immediately below the topsoil overlay. These soils vary from the more friable younger ashes (clayey silts and sandy silts) to the more cohesive clayey silts of the older ashes to the clayey or sandy silts and sands of the Matua subgroup soils. On lots 600, 601 and 603 the sands and silts are representative of the underlying Te Ranga ignimbrite.

The recorded undrained shear strengths indicate that the soils at likely foundation depths in the areas of cut are generally of high strength but the ranges of undrained shear strengths listed in table 1 and tabulated on the borelog sheets indicate that variations in shear strengths may be present vertically and horizontally away from the test positions. For all lots located in the areas of cut, the ultimate ground bearing capacity in the limit state may be taken at 300kPa for the detailing of surface foundations and this capacity meets the definition of "good ground' as defined in NZS 3604: 2011.

However the possibility of variations of soil type and strength may exist away from observation or post construction borehole locations. If the subsoils at foundation excavation levels are found to be of lower strength or have been disturbed by earthworks machinery during any further site development, foundations detailed in accordance with NZS 3604:2011 may have to be deepened or widened under engineering advice. This may require additional on site testing specific to the building that is to be erected and the calculation of actual ground contact pressures under foundations by a structural engineer. It may be found that the actual ground bearing capacities determined by additional testing are not exceeded for foundations detailed to NZS 3604.

6.4 Land Stability and Building Restrictions

Most of the areas on the lots on Stage 2K comprise near flat or gently sloping ground as a result of the subdivision earthworks. In these areas no global stability issues exist that may restrict or prevent buildings from being erected.

Cut batters from the 2007 earthworks are present along the north western boundaries of lots 600 to 603 and 605 and 606. These batters are in the adjoining properties and in their formed condition at the time of the completion of Stage 2K an acceptable state of stability was present. Stormwater and wastewater services are present along the boundaries of lots 600 to 603 and the easements over the services on these lots, as shown on DP 462245, will ensure that future buildings will be set back from the batters. The presence of the easements effectively imposes a building restriction line on those lots which will set back buildings from the slope crests as the close proximity rules for building foundations to these services, as described in the Infrastructure Development Code, are observed. To avoid lowering the stability of the batters no further filling, even if supported by retaining walls, should be placed in the easement areas.

A batter formed by the 2012 earthworks is present down to the northern boundaries of lots 605 and 606. A building restriction line is shown on DP 462245 to set buildings back from the boundaries by 4m or 1m from the tops of the batters. The building area may be extended to the boundary by filling out to a retaining wall on the boundaries. The walls should be specifically designed to take into account any surcharges on the ground behind the walls and any reduced resistance provided by any sloping ground in front of the walls.

On lots 598, 599 and 604, minor slopes are present beyond the rear boundaries. However, in developing those lots, account will need to be taken of any pre-existing developments on the adjoining properties to avoid surcharging or overloading any structures that may be present on those adjoining properties.

On lots 637, 639, 640, 643 and 644 where retaining walls are present along their western boundaries, buildings or any additional filling should not be located within 1.5m of the backs of those walls.

Furthermore, it is recommended that on lots 598 to 606 and 637, 639, 640, 643 and 644 the properties are developed so that no surface water flows can occur over the slope faces or retaining walls. Surface water should be collected and be piped to the stormwater outfalls on each lot that were installed as part of the subdivision development. Even though permeable soils may be present ground soakage is not to be used as a means of disposing of stormwater runoff on the lots.

7.0 Topsoil Thickness

During the subdivision earthworks areas of cut or fill were initially stripped of topsoil and this was then replaced to target depths of up to 300mm. No guarantee is implied or given that the topsoil on any part of any lot is 300mm deep or less and it is recommended that future owners or builders check topsoil depths when preparing site development plans and cost schedules.

8.0 Alterations to Council Land Information System Data

At the time of the preparation of this report, land information shown on the Council web site, webview-xtra, only referred to the need for specific stormwater design for the Stage 2K area.

From the information contained in this report the land information data should be expanded to refer to

- Building restrictions on lots 600 to 603 and 605 and 606
- Consent notices being on the certificates of titles for all 57 lots
- The disposal of stormwater from each lot to the reticulation constructed during the development of Stage 2K.

9.0 Professional Opinion

A statement in the format of Councils Infrastructure Development Code (Form G2) that all lots are suitable for building is contained in Appendix 2. This statement is accompanied by Form G3 which summarises the information and recommendations within this report.

In accordance with subdivision consent condition 8, it is recommended that the content of this report is advised to future owners of the 57 lots within the Stage 2K development at The Lakes by a consent notice on the certificates of title for all lots.

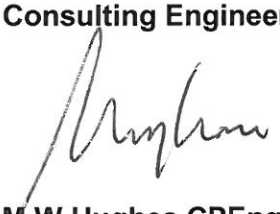
10.0 Applicability

Recommendations contained in this document are based on data from pre and post subdivision boreholes, observations of soil exposures during earthworks, and the results of tests in filling placed. 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 the proposed subdivision development on Stage 2K of The Lakes development as shown on DP 462245 and no responsibility is accepted by S & L Consultants Ltd for the use of any part of this report for other development sites without their written approval.

S & L Consultants Ltd
Consulting Engineers, Surveyors, Planners



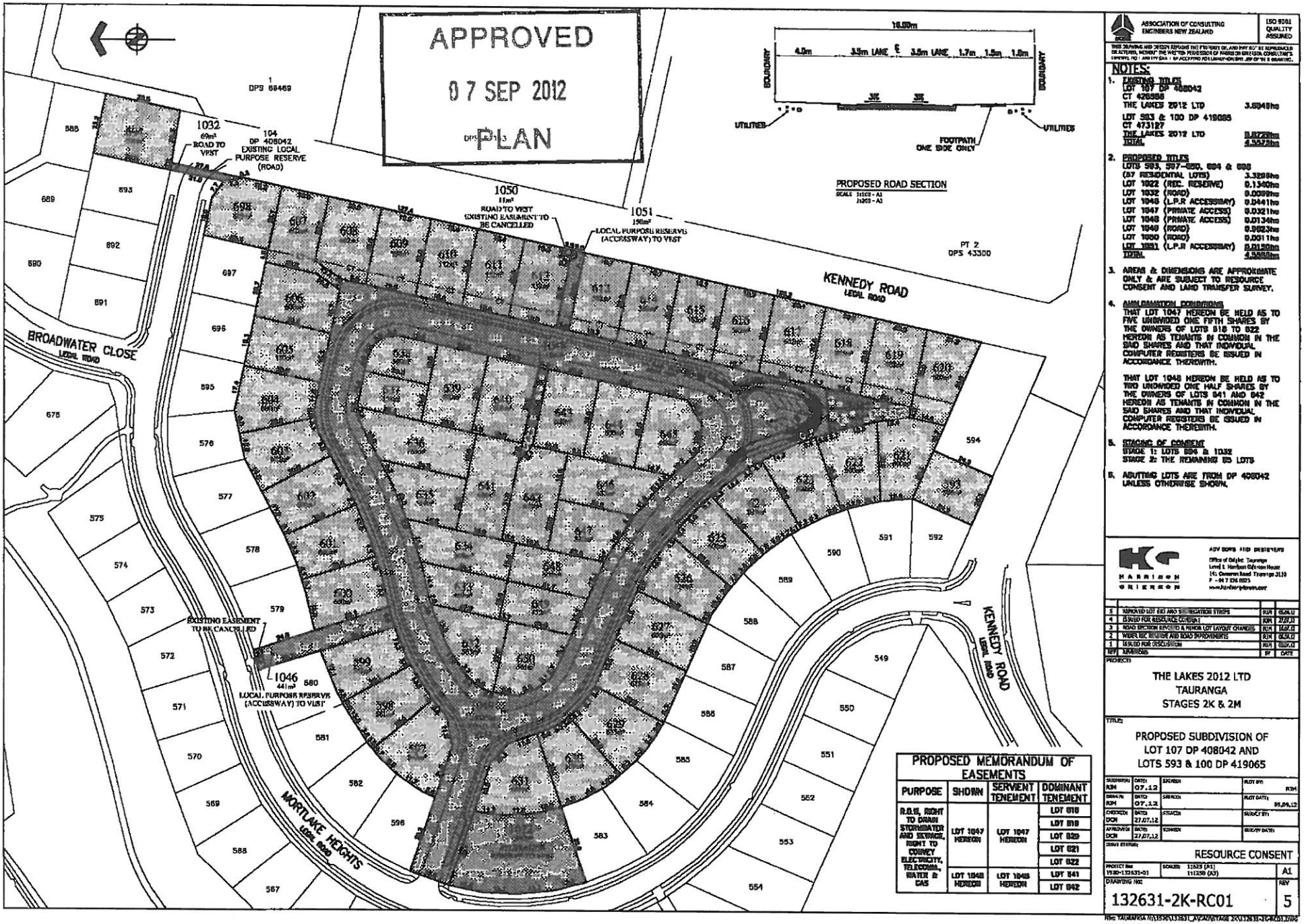
M W Hughes CPEng MIPENZ
Geotechnical Engineer

Prequalifed category one geotechnical adviser with Tauranga City Council 2008

15 March 2013

Appendix 1 Reference Drawings

Approved Subdivision Plan 132631-2K-RC01
Report Reference Plans (2008) 8264-AB11, AB12
Cut Fill Plans (2008) 18264-AB14, AB15
Reference Plan (2013) 20260-01
As Built Cut-Fill Plan (2013) 132631-2K-AB220
DP 462245 (6 sheets)



ASSOCIATION OF CONSULTING ENGINEERS NEW ZEALAND

ISO 9001 QUALITY ASSURED

NOTES:

1. EXISTING TITLES
   LOT 107 DP 408042
   CT 426568
   THE LAKES 2012 LTD 3.6848ha
   LOT 593 & 100 DP 419065
   CT 473127
   THE LAKES 2012 LTD 0.8730ha
   TOTAL 4.5578ha

2. PROPOSED TITLES
   LOTS 593, 597-650, 654 & 656
   (57 RESIDENTIAL LOTS) 3.3298ha
   LOT 1022 (REC. RESERVE) 0.1340ha
   LOT 1032 (ROAD) 0.0069ha
   LOT 1046 (L.P.R ACCESSWAY) 0.0441ha
   LOT 1047 (PRIVATE ACCESS) 0.0321ha
   LOT 1048 (PRIVATE ACCESS) 0.0134ha
   LOT 1049 (ROAD) 0.0083ha
   LOT 1050 (ROAD) 0.0011ha
   LOT 1051 (L.P.R ACCESSWAY) 0.0120ha
   TOTAL 4.5625ha

3. AREAS & DIMENSIONS ARE APPROXIMATE ONLY & ARE SUBJECT TO RESOURCE CONSENT AND LAND TRANSFER SURVEY.

4. AMALGAMATION CONDITIONS
   THAT LOT 1047 HEREON BE HELD AS TO FIVE UNDIVIDED ONE FIFTH SHARES BY THE OWNERS OF LOTS 618 TO 622 HEREON AS TENANTS IN COMMON IN THE SAID SHARES AND THAT INDIVIDUAL COMPUTER REGISTERS BE ISSUED IN ACCORDANCE THEREWITH.

   THAT LOT 1048 HEREON BE HELD AS TO TWO UNDIVIDED ONE HALF SHARES BY THE OWNERS OF LOTS 641 AND 642 HEREON AS TENANTS IN COMMON IN THE SAID SHARES AND THAT INDIVIDUAL COMPUTER REGISTERS BE ISSUED IN ACCORDANCE THEREWITH.

5. STAGING OF CONSENT
   STAGE 1: LOTS 594 & 1032
   STAGE 2: THE REMAINING 85 LOTS

6. ABUTTING LOTS ARE FROM DP 408042 UNLESS OTHERWISE SHOWN.

HARRISON GRIERSON
ADVISORS AND DESIGNERS
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REV	AMENDMENTS	BY	DATE
5	REVISED LOT 880 AND SUBDIVISION STRIPS	RJH	05.09.12
4	ISSUED FOR RESOURCE CONSENT	RJH	27.07.12
3	ROAD SECTION REVISED & MINOR LOT LAYOUT CHANGES	RJH	11.07.12
2	MINOR REC RESERVE AND ROAD IMPROVEMENTS	RJH	06.06.12
1	ISSUED FOR DISCUSSION	RJH	03.05.12

PROJECT:
THE LAKES 2012 LTD
TAURANGA
STAGES 2K & 2M

TITLE:
PROPOSED SUBDIVISION OF
LOT 107 DP 408042 AND
LOTS 593 & 100 DP 419065

DESIGNED: RJH	DATE: 07.12	SURVEYED:	PLOT BY: RJH
DRAWN: RJH	DATE: 07.12	SURVEYED:	PLOT DATE: 05.09.12
CHECKED: DCH	DATE: 27.07.12	STRUCTURES:	SURVEY BY:
APPROVED: DCH	DATE: 27.07.12	SUBMISSION:	SURVEY DATE:

ISSUE STATUS: RESOURCE CONSENT

PROJECT No: 1510-132631-01
SCALES: 1:625 (A1) 1:1250 (A3)
A1

DRAWING NO: 132631-2K-RC01
REV 5

Notes:
1) Contours are in terms of Moturiki Datum

Key

- Fill Compaction Test
- Pre-subdivision Test Site
- Settlement Control Marker
- Post Earthwork Borehole
- Subsoil Drain
- Building Restriction Line lots 560, 561 & 562 See DP 408042 other building restrictions on lots 565-568 are determined by underground services
- Analysed Cross Section

Rev. No.	Description	DATE
1	Issued with Report	08/08

	NAME	DATE	SIGNED
Surveyed			
Designed			
Drawn	GR	08/08	
Checked	CH	08/08	
Approved			

REFERENCES

S & L CONSULTANTS LTD
SURVEYORS - ENGINEERS - PLANNERS

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TITLE

Stages 2D(Part), 2G, 2J 2K, 2L & 2M

Geotechnical Report Reference Plan

(Sheet 1 of 3)

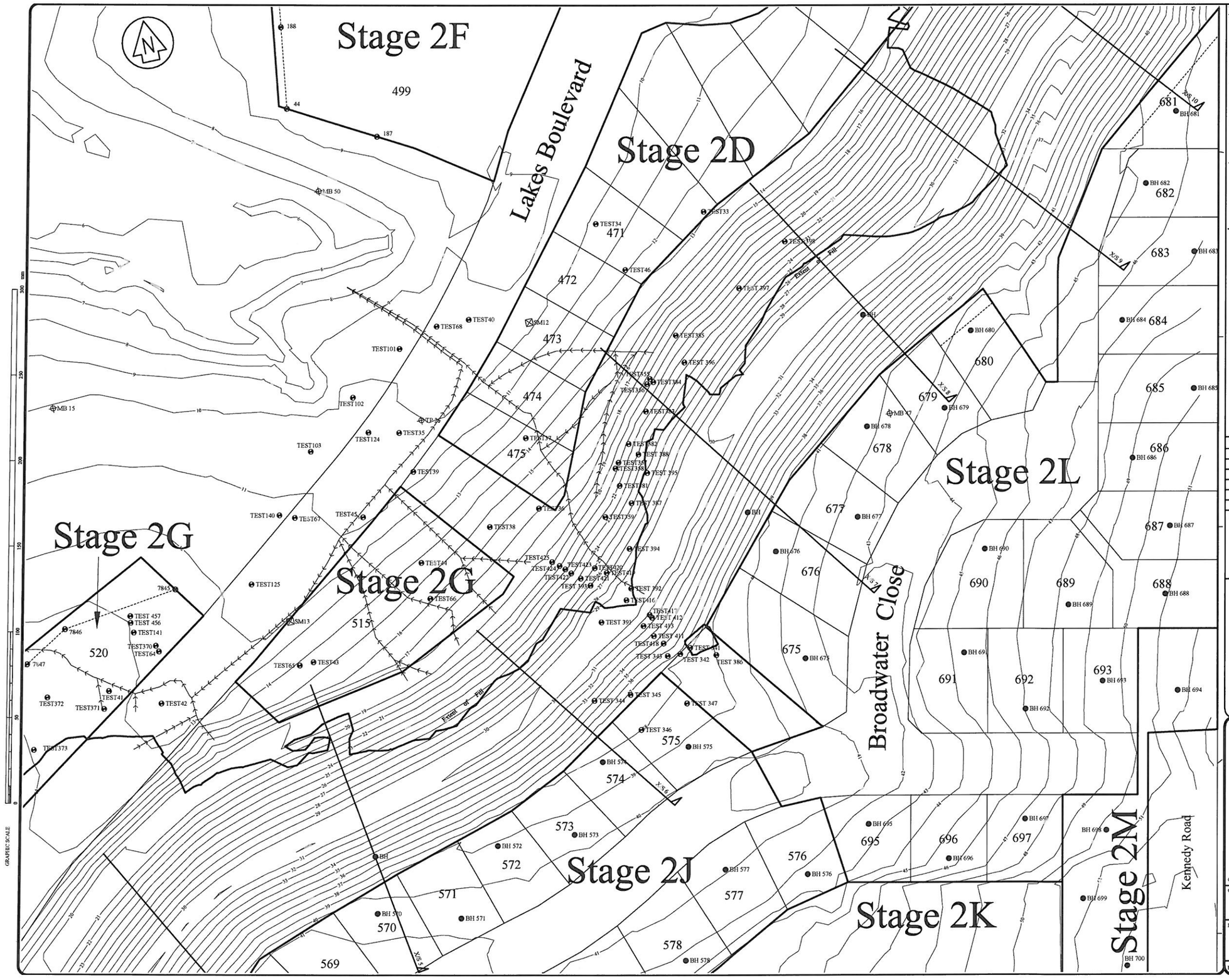
ORIGINAL SCALES	DATE
1:500 @ A1 1:1000 @ A3	08/08

DRAWING No 18264 - AB11

Revision 1

METRIC DESIGN

GRAPHIC SCALE



Notes:
1) Contours are in terms of Moturiki Datum

Key

- Fill Compaction Test
- Pre-subdivision Test Site
- Settlement Control Marker
- Post Earthwork Borehole
- Subsoil Drain
- Building Restriction Line lots 520, 680 & 681 See DP 408042 other building restrictions on lots 569-575 & 675-679 are determined by underground services
- Analysed Cross Section

checked by.	Rev. No.	Description	DATE
	1	Issued with Report	08/08

	NAME	DATE	SIGNED
Surveyed			
Designed			
Drawn	GR	08/08	
Checked	CH	08/08	
Approved			

REFERENCES

S & L CONSULTANTS LTD
SURVEYORS - ENGINEERS - PLANNERS

111 Cameron Road, Tauranga, New Zealand
P.O. Box 231 Ph (07)577-6069
Fax(07)577-6065
Email: slconsultants@sltga.co.nz

TITLE

Stages 2D(Part), 2G, 2J
2K, 2L & 2M

Geotechnical Report
Reference Plan

(Sheet 2 of 3)

ORIGINAL SCALES	DATE
1:500 @ A1 1:1000 @ A3	08/08

DRAWING No
18264 - AB12

Revision: 1

METRIC DESIGN

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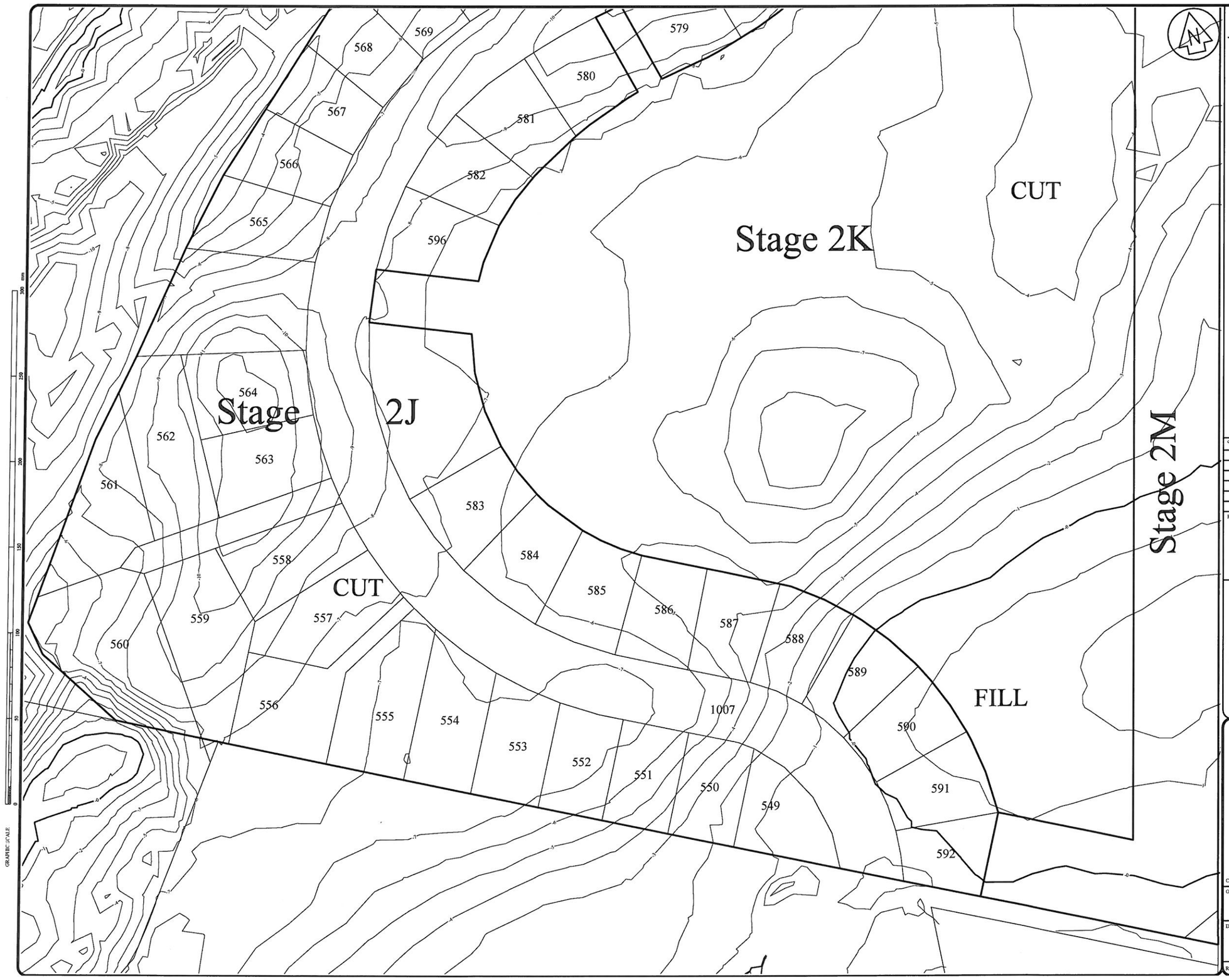

Rev. No.	Description	DATE
1	Issued with Report	08/08

checked by:

	NAME	DATE	SIGNED
Surveyed			
Designed			
Drawn	GR	08/08	
Checked	CH	08/08	
Approved			

REFERENCES

S & L CONSULTANTS LTD
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Fax(07)577-6065
Email: slconsultants@sltga.co.nz

TITLE

Stages 2D(Part), 2G, 2J
2K, 2L & 2M

Cut Fill Plan

(Sheet 1 of 3)

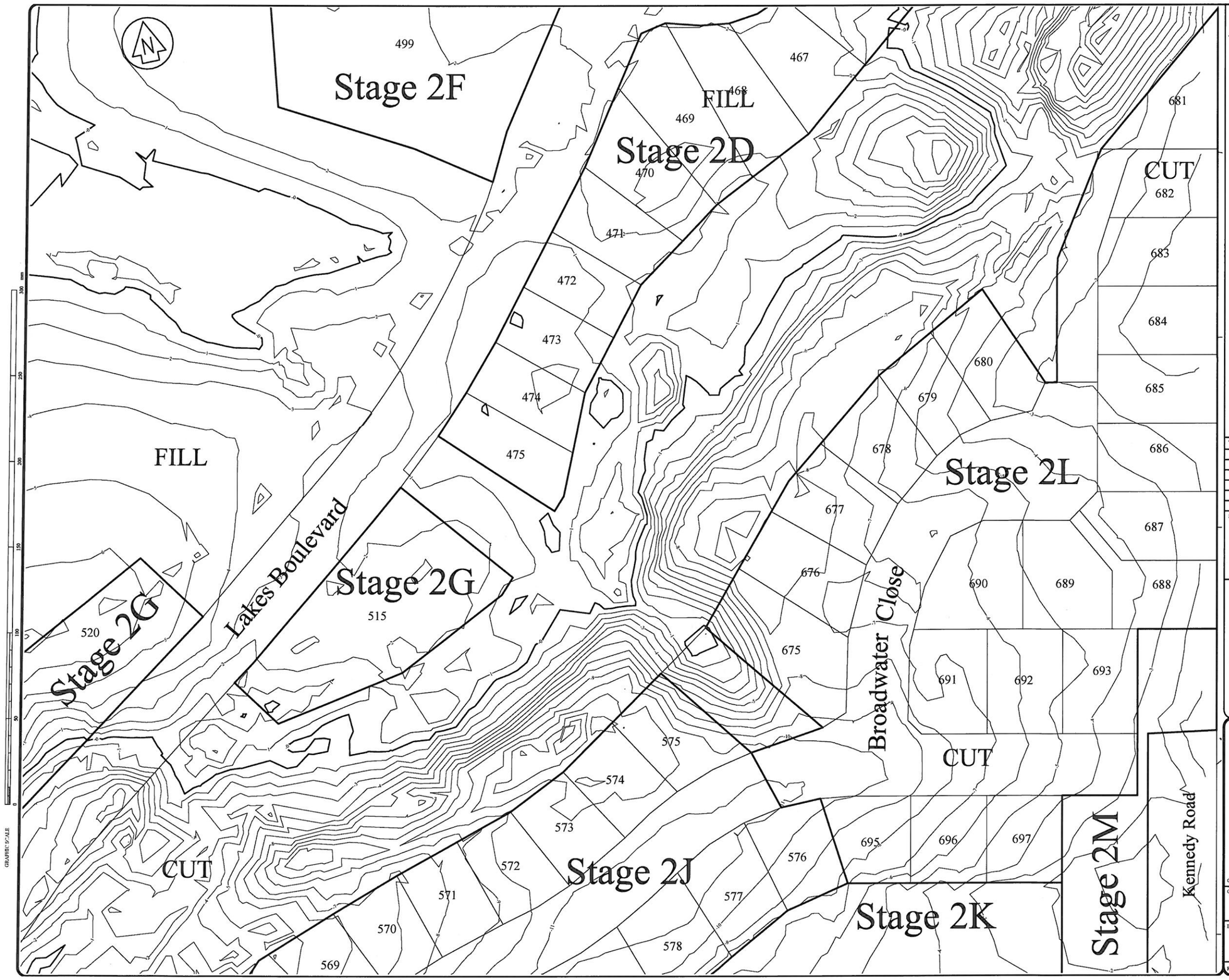
ORIGINAL SCALES
1:500 @ A1
1:1000 @ A3

DATE
08/08

DRAWING No
18264 - AB14

Revision: 1

METRIC DESIGN



FILL / CUT Subdivision Cut and Fill Areas

1 —— Fill Contour

-1 —— Cut Contour

checked. by.	Rev. No.	Description	DATE
	1	Issued with Report	08/08

	NAME	DATE	SIGNED
Surveyed			
Designed			
Drawn	GR	08/08	
Checked	CH	08/08	
Approved			

REFERENCES

S&L
SIRIMPTON & LIPINSKI

S & L CONSULTANTS LTD
SURVEYORS - ENGINEERS - PLANNERS

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Fax(07)577-6065
Email: slconsultants@sltga.co.nz

TITLE

Stages 2D(Part), 2G, 2J
2K, 2L & 2M

Cut Fill Plan

(Sheet 2 of 3)

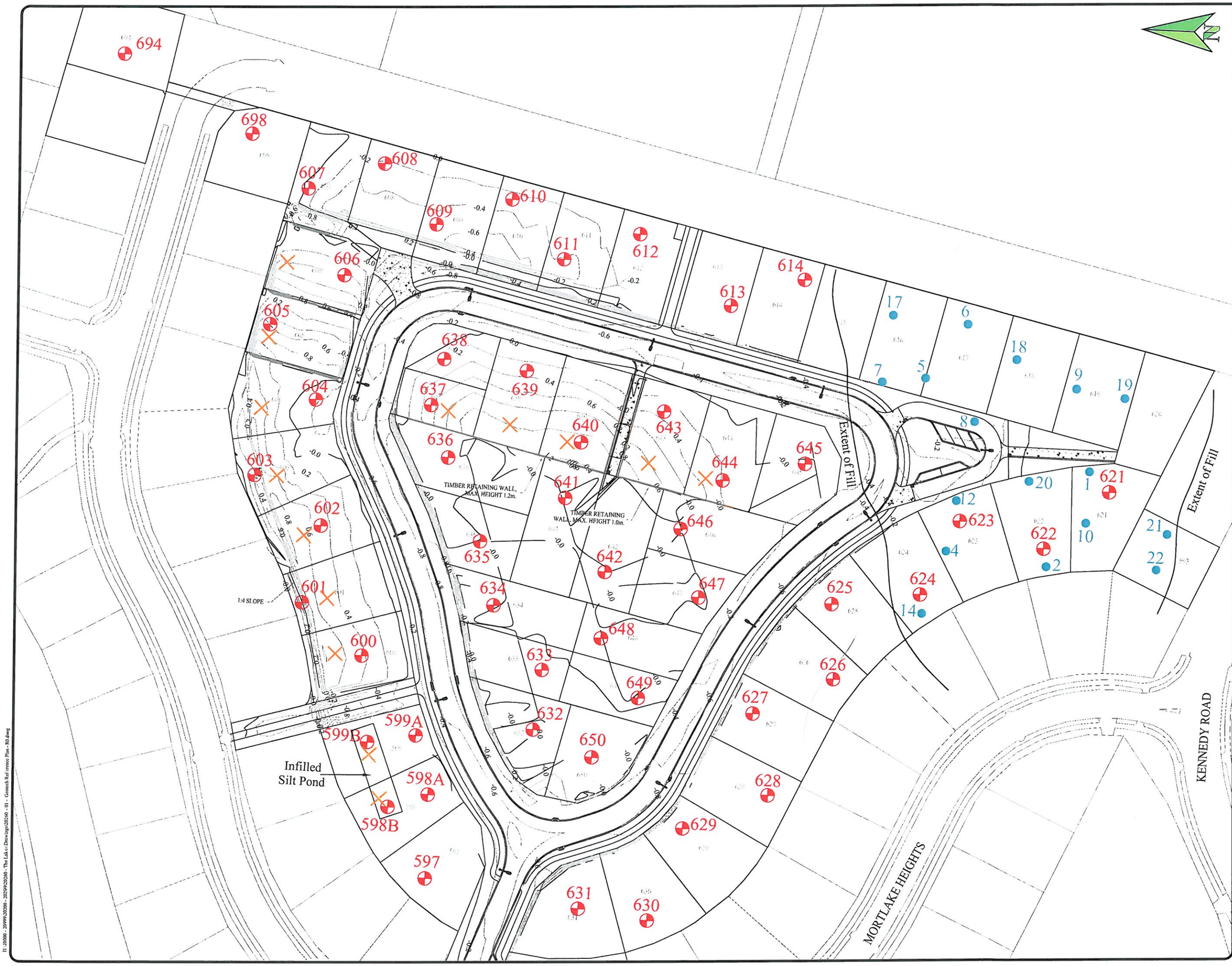
ORIGINAL SCALES	DATE
1:500 @ A1 1:1000 @ A3	08/08

DRAWING No

18264 - AB15

Revision: 1

METRIC DESIGN



Borehole by S&L Consultants

21 Compaction Tests by Opus 2008

Compaction Tests by Opus 2013

Extent of Fill (2008)

CKD BY	REV No	DESCRIPTION	DATE
	0	With Report	04/13

	NAME	DATE	SIGNED
Surveyed			
Designed			
Drawn	NP	2/13	
Checked			
Approved			

REFERENCES
Harrison & Grierson
Drawing 132631-2K-AB220

S & L CONSULTANTS LTD
SURVEYORS - ENGINEERS
PLANNERS
102 Hamilton Street, Tauranga
New Zealand
P.O. Box 231 Ph.(07)577-6069
Fax(07)577-6065
Email: slconsultants@sltga.co.nz
Web Site: www.sltga.co.nz

TITLE
The Lakes (2012) Ltd
Stage 2K
The Lakes, Tauriko

Reference Plan for Geotechnical Report

ORIGINAL SCALES	DATE
1:1000 @ A3	2/13

DRAWING No
20260 - 01

REVISION: 0

METRIC DESIGN

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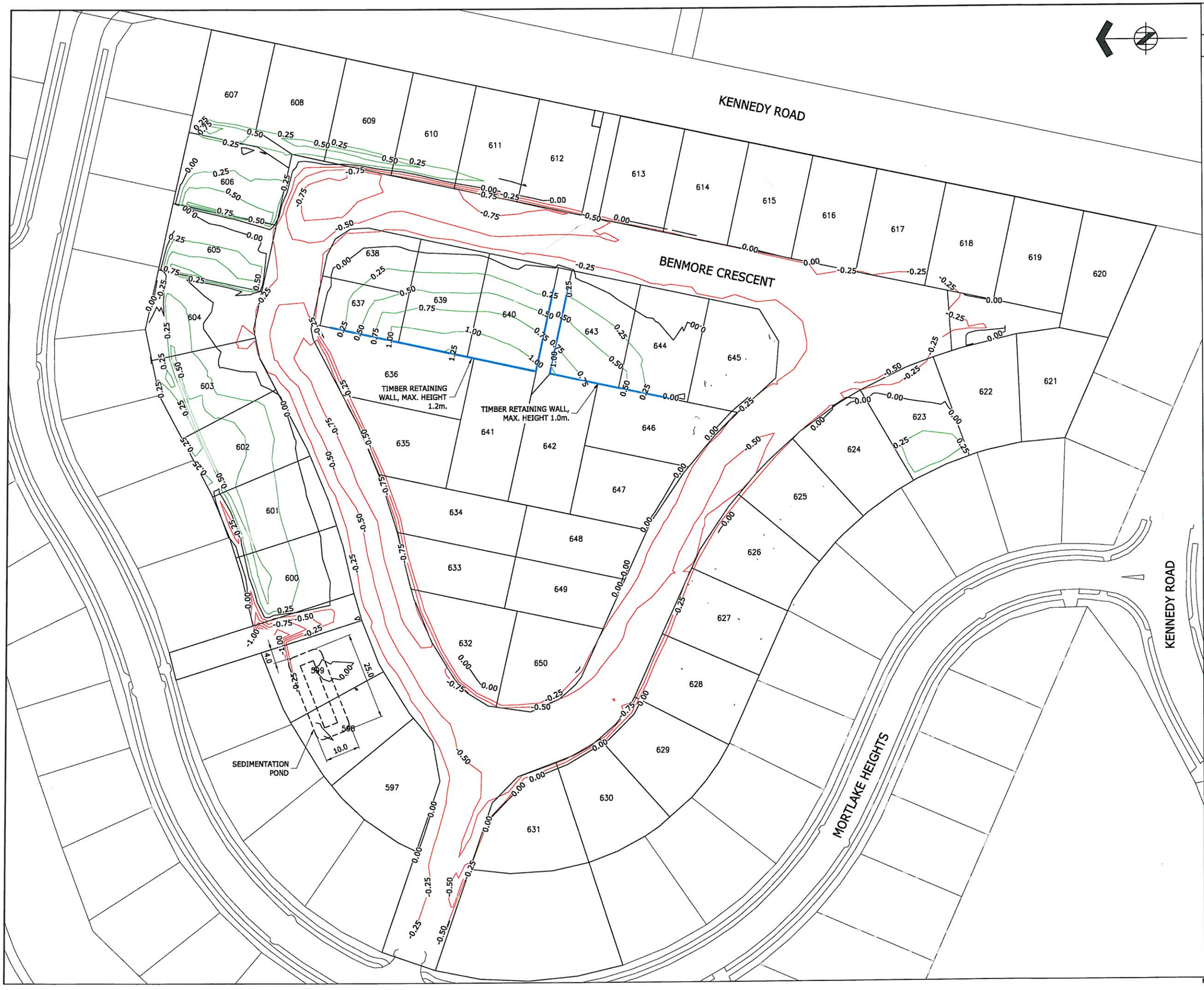


ASSOCIATION OF CONSULTING ENGINEERS NEW ZEALAND

ACENZ

ISO 9001 QUALITY ASSURED

NOTES:

1. CUT / FILL CONTOURS ARE SHOWN AT 0.25m INTERVALS.
2. CUT FILL CONTOURS ARE THE DIFFERENCE BETWEEN THE STRIPPED EXISTING SURFACE AND THE FINISHED SUBGRADE SURFACE.

LEGEND:

- CUT CONTOURS
- FILL CONTOURS
- ZERO CUT FILL CONTOURS
- TIMBER RETAINING WALL

HARRISON GRIERSON

Tauranga Office
Level 1 Harrison Grierson House
141 Cameron Road Tauranga 3110
P +64 7 578 0023
www.harrisongrierson.com

REF	REVISIONS	BY	DATE
B	SEDIMENT POND ADDED, AS BUILT	GPR	25.03.13
A	AS BUILT	DJH	07.03.13

PROJECT:

THE LAKES (2012) LTD
TAURANGA

TITLE:

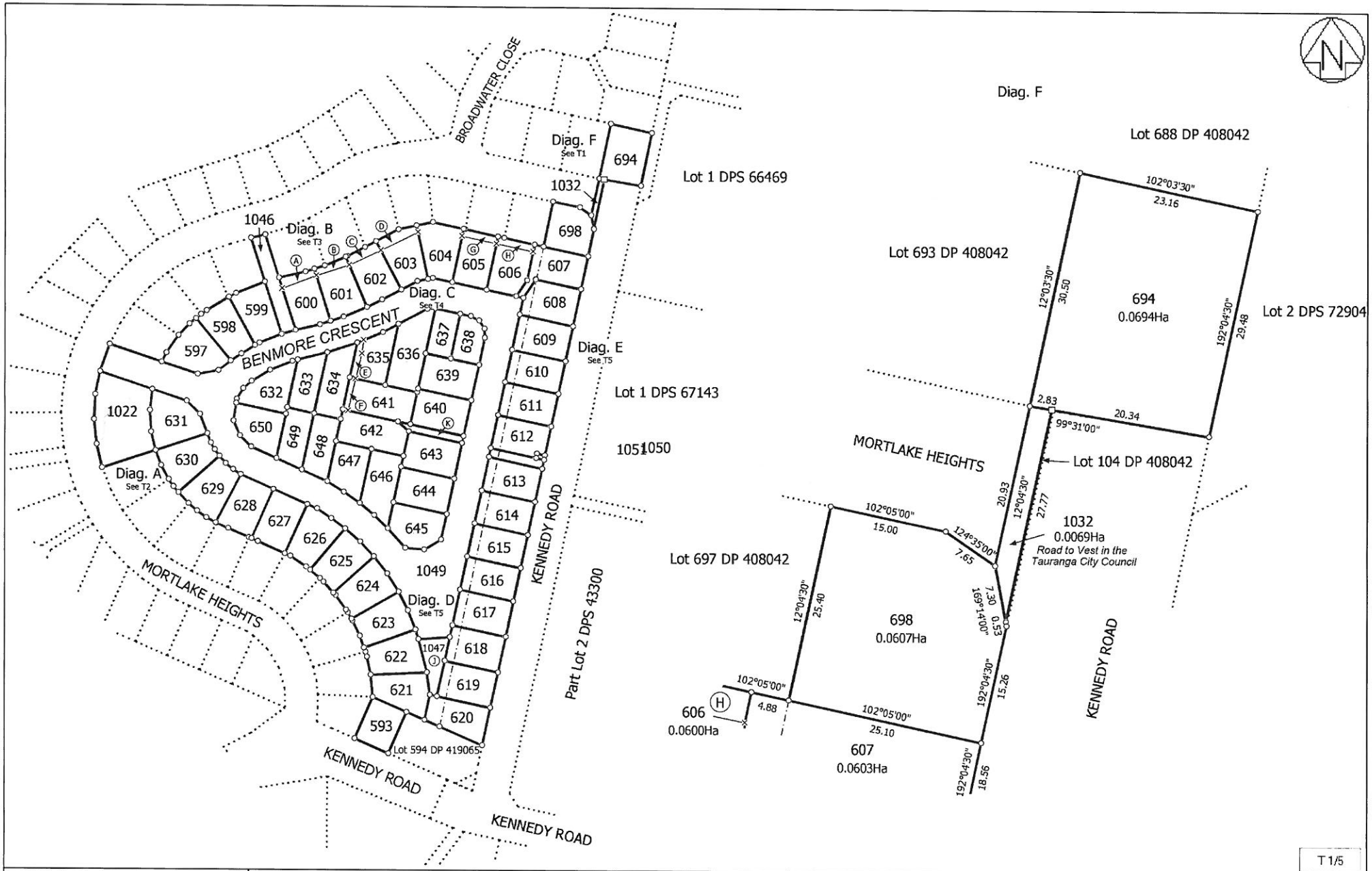
STAGE 2K
AS BUILT CUT FILL CONTOUR PLAN

ORIGINATOR: RCH	DATE: 07.03.12	SIGNED:	PLOT BY: HJD
DRAWN: DJH	DATE: 07.03.12	SIGNED:	PLOT DATE: 26.03.13
CHECKED: RCH	DATE: 07.03.12	SIGNED:	SURVEY BY:
APPROVED: GPR	DATE: 07.03.12	SIGNED:	SURVEY DATE:

ISSUE STATUS: AS BUILT

PROJECT No: 1520-132631-01	SCALES: 1:500 - A1 1:1000 - A3	A1
DRAWING No: 132631-2K-AB220		REV B

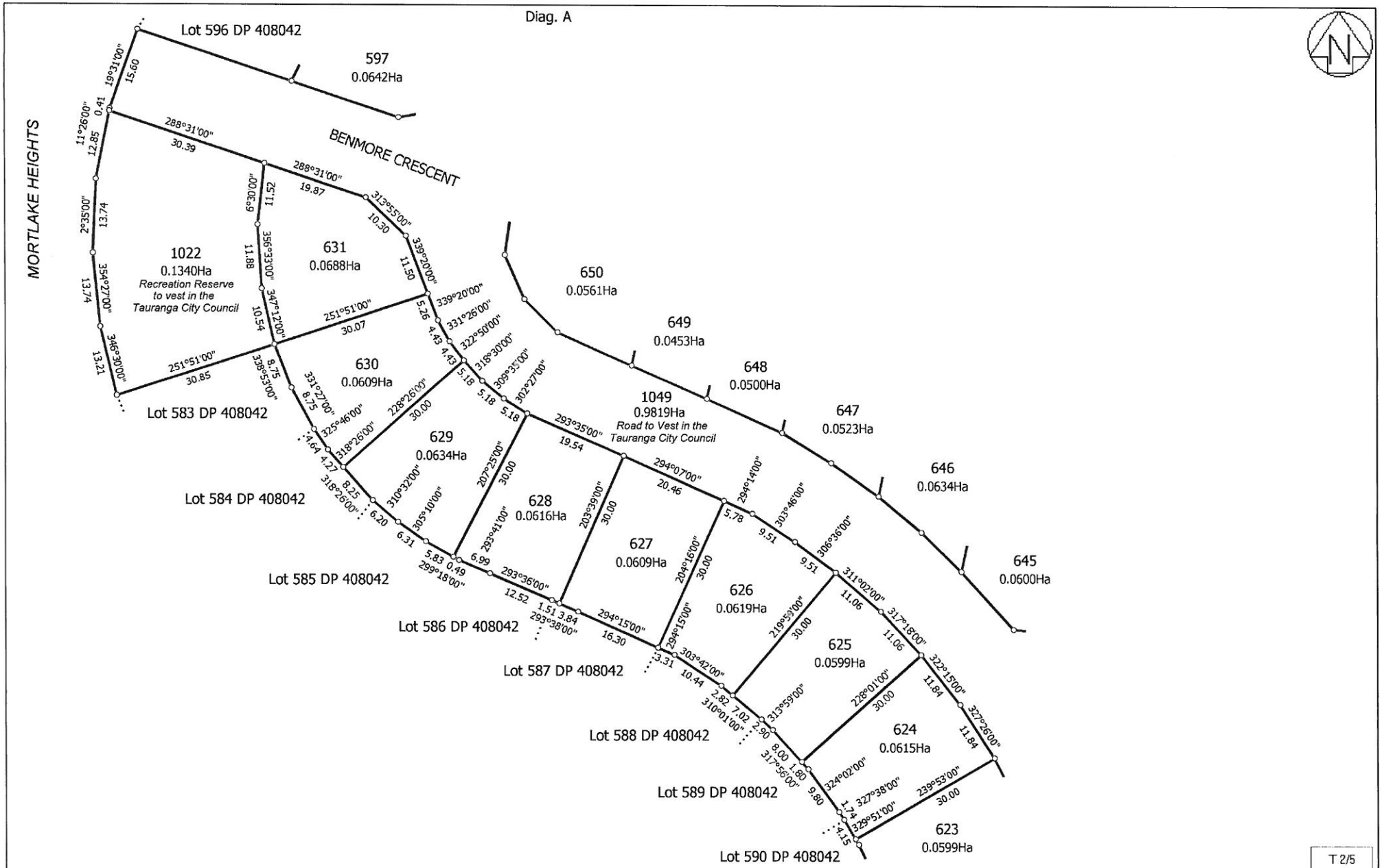
File: TAURANGA N:\1520\132631_A\CAD\STAGE 2K\132631-2K-AB220.DWG



Land District: South Auckland Digitally Generated Plan Generated on: 27/02/2013 2:15pm Page 5 of 9	Lots 593, 597-650, 694, 698, 1022, 1032, 1046-1051 being a subdivision of Lot 107 DP 408042 and Lots 100 & 593 DP 419065	Surveyor: Michael Peter Dewhirst Firm: Harrison Grierson Consultants Ltd	Title Plan LT 462245 DRAFT

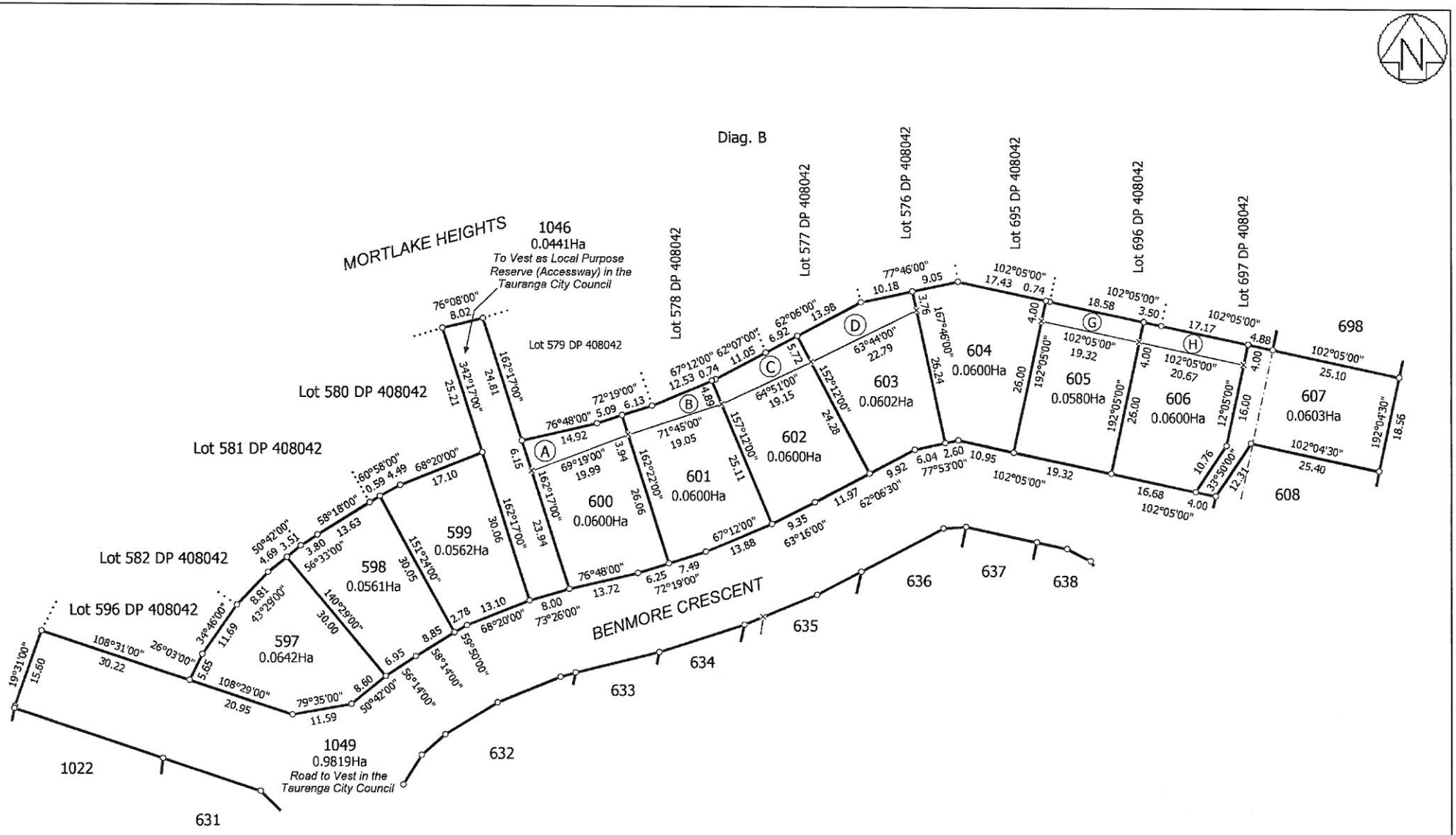
T 1/5

Diag. A



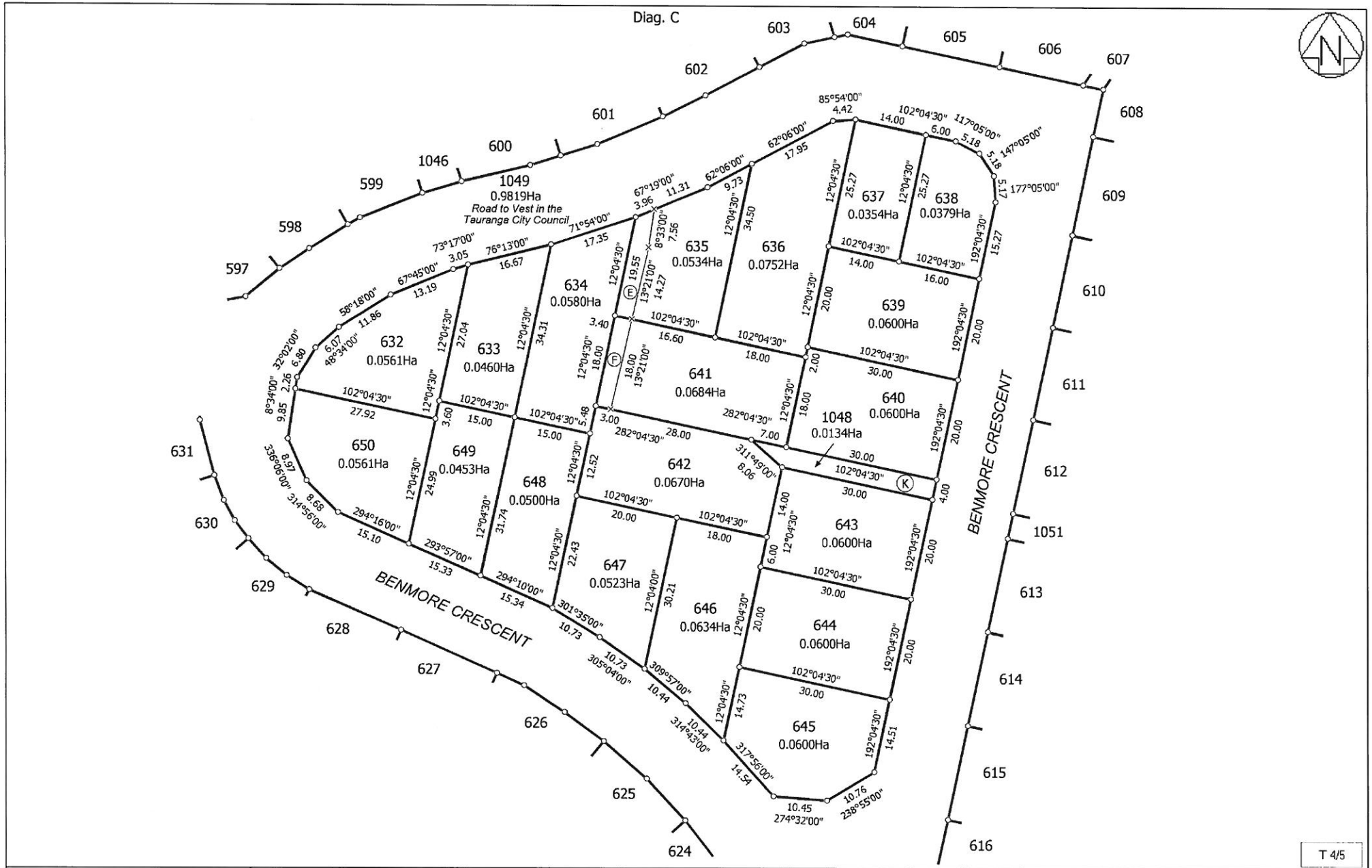
T 2/5

Land District: South Auckland Digitally Generated Plan Generated on: 27/02/2013 2:15pm Page 6 of 9	Lots 593, 597-650, 694, 698, 1022, 1032, 1046-1051 being a subdivision of Lot 107 DP 408042 and Lots 100 & 593 DP 419065	Surveyor: Michael Peter Dewhirst Firm: Harrison Grierson Consultants Ltd	Title Plan LT 462245 DRAFT



T 3/5

Land District: South Auckland Digitally Generated Plan Generated on: 27/02/2013 2:15pm Page 7 of 9	Lots 593, 597-650, 694, 698, 1022, 1032, 1046-1051 being a subdivision of Lot 107 DP 408042 and Lots 100 & 593 DP 419065	Surveyor: Michael Peter Dewhirst Firm: Harrison Grierson Consultants Ltd	Title Plan LT 462245 DRAFT



Land District: South Auckland Digitally Generated Plan Generated on: 27/02/2013 2:15pm Page 8 of 9	Lots 593, 597-650, 694, 698, 1022, 1032, 1046-1051 being a subdivision of Lot 107 DP 408042 and Lots 100 & 593 DP 419065	Surveyor: Michael Peter Dewhirst Firm: Harrison Grierson Consultants Ltd	Title Plan LT 462245 DRAFT

Land District: South Auckland Digitally Generated Plan Generated on: 27/02/2013 2:15pm Page 9 of 9	Lots 593, 597-650, 694, 698, 1022, 1032, 1046-1051 being a subdivision of Lot 107 DP 408042 and Lots 100 & 593 DP 419065	Surveyor: Michael Peter Dewhirst Firm: Harrison Grierson Consultants Ltd	Title Plan LT 462245 DRAFT

Land Registration District	Plan Number
SOUTH AUCKLAND	DP 462245

TCC Ref: RC16780
Harrison Grierson Ref: 1520-132631-01

Memorandum of Easements (Pursuant to s243 Resource Management Act 1991)			
Purpose	**Shown**	**Servient Tenement**	**Dominant Tenement**
Right of Way Right to drain Water and Sewage Right to convey Electricity, Water & Gas Right to convey Telecommunications and Computer Media	J	Lot 1047 hereon	Lots 619-622 hereon
	K	Lot 1048 hereon	Lots 641-642 hereon

Memorandum of Easements in Gross Pursuant to s243 Resource Management Act 1991)			
Purpose	**Shown**	**Servient Tenement**	**Grantee**
Right to drain Water and Sewage	A	Lot 600 hereon	Tauranga City Council
	B	Lot 601 hereon	
	C	Lot 602 hereon	
	D	Lot 603 hereon	
	E	Lot 635 hereon	
	F	Lot 641 hereon	

Areas shown G and H are subject to building restrictions.

Amalgamation Conditions:

That Lot 1047 hereon (legal access) be held in five undivided one-fifth shares by the owners of Lots 618 to 622 hereon as tenants in common in the said shares and that individual computer registers be issued in accordance therewith.

That Lot 1048 hereon (legal access) be held in two undivided one-half shares by the owners of Lots 641 & 642 hereon as tenants in common in the said shares and that individual computer registers be issued in accordance therewith.

See Request 1093778

N:\1520\132631_01\400 Tech\440 Landonline\2K\DP 462245 Schd.doc

Appendix 2 Certificates

Infrastructure Development Code Form G2

Infrastructure Development Code Form G3

CERTIFICATION **G2**

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

NAME OF SUBDIVISION	The Lakes Stage 2K
COUNCIL FILE NUMBER RC No:	16780
ENGR RESPONSIBLE FOR INVESTIGATION:	M W Hughes
QUALIFICATIONS:	BE CPEng MIPENZ

I Michael William Hughes of S & L Consultants Ltd

Hereby confirm that;

I am a professional person, appropriately qualified with experience in geotechnical engineering to ascertain the suitability of the land for building development and was retained as the Soils Engineer to the above development.

1. An appropriate level of site investigation and construction supervision has been carried out under my direction and is described in my development evaluation report dated 15 March 2013.
2. In my professional opinion, not to be construed as a guarantee, I consider that;
   a) The areas shown in my report dated 15 March 2013 of each new allotment are suitable for the erection thereon of the building types appropriate to the zoning of the land, provided that, buildings are set back from easements, slopes or retaining walls as described in my report.
   b) The earth fills shown on the attached Plans No. 18264-AB11 and 132631-2K-AB220 have been placed in accordance with the requirements of the Infrastructure Development Code.
   c) The completed works give due regard to all land slope and foundation stability considerations.
   d) The filled ground is suitable for the erection thereon of residential buildings not requiring specific design in terms of NZS 3604:2011 and related documents based on data from specific test sites.
   e) The original ground not affected by filling is suitable for the erection of residential buildings not requiring specific design in terms of NZS 3604:2011 and related documents based on data from specific test sites but ground conditions may vary away from these test sites.
3. This professional opinion is furnished to the Council and the owner for their purposes alone, on the express condition that it will not be relieved upon by any other person and does not remove the necessity for normal inspections of foundation conditions at the time of erection for any dwelling.

Signed: ..... Date: 15 March 2013

SUMMARY OF GEOTECHNICAL DATA/RECOMMENDATIONS FOR INDIVIDUAL LOTS
FROM IDC _ G3

Subdivision: The Lakes Stage 2K
Location: Benmore Crescent, Pyes Pa

TCC Ref: RC 16780
S&L Ref: 20260

The comments and notations included on this summary sheet are outlined in the support documents.
These shall be read in conjunction with this summary.

		Subsurface Data						Foundations		Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Building Platform	Compressible Soils	on-site effluent disposal	consent notice	Recommendations /Restrictions
		Shear Strength	Subdivision Filling		Natural Topography Unworked	Natural Topography earthworked		Conventional shallow	Specific Design										
Lot No.	Area (m2)	(kPa)	Y/N	Depth (m)	Y/N	Y/N	Depth (m)	Y/N/NA	Y/N										
623	599	150	y	0-0.5	Y	N		Y	N	N	N	N	Y	N	N	N	N	Y	
624	615	150	Y	0-0.5	N	Y	1.0	Y	N	N	N	N	Y	N	N	N	N	Y	
625	599	172	N		N	Y	1.0	Y	N	N	N	N	Y	N	N	N	N	Y	
626	619	95-108	N		N	Y	5.5	Y	N	N	N	N	Y	N	N	N	N	Y	
627	609	95-101	N		N	Y	6.5	Y	N	N	N	N	Y	N	N	N	N	Y	
628	616	71-200	N		N	Y	6.0	Y	N	N	N	N	Y	N	N	N	N	Y	
629	634	51-200	N		N	Y	6.0	Y	N	N	N	N	Y	N	N	N	N	Y	
630	609	108-200	N		N	Y	6.0	Y	N	N	N	N	Y	N	N	N	N	Y	
631	688	71-200	N		N	Y	6.5	Y	N	N	N	N	Y	N	N	N	N	Y	
632	561	200	N		N	Y	6.0	Y	N	N	N	N	Y	N	N	N	N	Y	
633	460	61-159	N		N	Y	6.0	Y	N	N	N	N	Y	N	N	N	N	Y	
634	580	78-102	N		N	Y	6.0	Y	N	N	N	N	Y	N	N	N	N	Y	
635	534	118-200	N		N	Y	5.5	Y	N	N	N	N	Y	N	N	N	N	Y	
636	752	139-200	N		N	Y	4.8	Y	N	N	N	N	Y	N	N	N	N	Y	
637	354	57-145	Y	0-1.25	N	Y	4.5	Y	N	N	N	N	Y	N	N	N	N	Y	
638	379	78-200	N		N	Y	4.2	Y	N	N	N	N	Y	N	N	N	N	Y	
639	600	156	Y	0-1.25	N	Y	4.0	Y	N	N	N	N	Y	N	N	N	N	Y	
640	600	200	Y	0-1.25	N	Y	4.5	Y	N	N	N	N	Y	N	N	N	N	Y	
641	684	200	N		N	Y	5.5	Y	N	N	N	N	Y	N	N	N	N	Y	
642	670	57-142	N		N	Y	6.5	Y	N	N	N	N	Y	N	N	N	N	Y	
643	600	81-125	Y	0-0.75	N	Y	5.0	Y	N	N	N	N	Y	N	N	N	N	Y	
644	600	57-125	Y	0-0.5	N	Y	5.0	Y	N	N	N	N	Y	N	N	N	N	Y	
645	600	68-200	N		N	Y	2.5	Y	N	N	N	N	Y	N	N	N	N	Y	
646	634	105-152	N		N	Y	6.0	Y	N	N	N	N	Y	N	N	N	N	Y	
647	523	68-105	N		N	Y	8.0	Y	N	N	N	N	Y	N	N	N	N	Y	
648	500	778-169	N		N	Y	7.5	Y	N	N	N	N	Y	N	N	N	N	Y	
649	453	125-152	N		N	Y	7.0	Y	N	N	N	N	Y	N	N	N	N	Y	
650	561	169	N		N	Y	6.5	Y	N	N	N	N	Y	N	N	N	N	Y	
694	694	171	N		N	Y	2.5	Y	N	N	N	N	Y	N	N	N	N	Y	
698	607	184	N		N	Y	2.5	Y	N	N	N	N	Y	N	N	N	N	Y	

Tauranga City

SUMMARY OF GEOTECHNICAL DATA FOR INDIVIDUAL LOTS

INFRASTRUCTURE DEVELOPMENT CODE

G3
VERSION 1/1

SUMMARY OF GEOTECHNICAL DATA/RECOMMENDATIONS FOR INDIVIDUAL LOTS
FROM IDC _ G3

Subdivision: The Lakes Stage 2K
Location: Benmore Crescent, Pyes Pa

TCC Ref: RC 16780
S&L Ref: 20260

The comments and notations included on this summary sheet are outlined in the support documents.
These shall be read in conjunction with this summary.

		Subsurface Data						Foundations		Building Restriction Line	S/W Specific Design	S/W Soakage	S/W Reticulate	Designated Building Platform	Minimum Building Platform	Compressible Soils	on-site effluent disposal	consent notice	Recommendations /Restrictions
		Shear Strength *	Subdivision Filling		Natural Topography Unworked	Natural Topography earthworked		Conventional shallow	Specific Design										
Lot No.	Area (m2)	(kPa)	Y/N	Depth (m)	Y/N	Y/N	Depth (m)	Y/N/NA	Y/N										
593	505	200+	Y	0-1.0	Y	N		Y	N	N	N	N	Y	N	N	N	N	Y	
597	642	91-200	N		N	Y	6.5	Y	N	N	N	N	Y	N	N	N	N	Y	
598	561	101-200	N		N	Y	6.5	Y	N	N	N	N	Y	N	N	N	N	Y	
299	562	189	N		N	Y	6.5	Y	N	N	N	N	Y	N	N	N	N	Y	
600	600	108-152	Y	0-0.5	N	Y	6.5	Y	N	N	N	N	Y	N	N	N	N	Y	
601	600	112-149	Y	0-0.5	N	Y	6.5	Y	N	N	N	N	Y	N	N	N	N	Y	
602	600	81-200	Y	0-0.5	N	Y	6.5	Y	N	N	N	N	Y	N	N	N	N	Y	
603	602	122-200	Y	0-0.5	N	Y	6.0	Y	N	N	N	N	Y	N	N	N	N	Y	
604	600	189	Y	0-0.5	N	Y	5.0	Y	N	N	N	N	Y	N	N	N	N	Y	
605	580	68-200	Y	0-0.5	N	Y	4.0	Y	N	N	N	N	Y	N	N	N	N	Y	
606	600	81-200	Y	0-0.5	Y	Y	4.0	Y	N	N	N	N	Y	N	N	N	N	Y	
607	603	150	Y	0-0.8	Y	Y	5.0	Y	N	N	N	N	Y	N	N	N	N	Y	
608	599	190	N		N	Y	5.0	Y	N	N	N	N	Y	N	N	N	N	Y	
609	590	108-200	N		N	Y	4.0	Y	N	N	N	N	Y	N	N	N	N	Y	
610	551	63-200	N		N	Y	4.0	Y	N	N	N	N	Y	N	N	N	N	Y	
611	551	104-200	N		N	Y	3.5	Y	N	N	N	N	Y	N	N	N	N	Y	
612	550	98-200	N		N	Y	3.5	Y	N	N	N	N	Y	N	N	N	N	Y	
613	561	NA	N		N	y	3.0	Y	N	N	N	N	Y	N	N	N	N	Y	
614	561	200	N		N	y	2.0	Y	N	N	N	N	Y	N	N	N	N	Y	
615	561	150	Y	0-1.0	N	y	1.0	Y	N	N	N	N	Y	N	N	N	N	Y	
616	561	150	Y	0.5-2.0	Y	N		Y	N	N	N	N	Y	N	N	N	N	Y	
617	601	150	Y	2.0	Y	N		Y	N	N	N	N	Y	N	N	N	N	Y	
618	601	150	Y	2.0	Y	N		Y	N	N	N	N	Y	N	N	N	N	Y	
619	601	150	Y	1.0-2.0	Y	N		Y	N	N	N	N	Y	N	N	N	N	Y	
620	600	150	Y	0-1.0	Y	N		Y	N	N	N	N	Y	N	N	N	N	Y	
621	601	150	Y	1.0-1.5	Y	N		Y	N	N	N	N	Y	N	N	N	N	Y	
622	599	150	Y	1.5	Y	N		Y	N	N	N	N	Y	N	N	N	N	Y	

Comments : Building restriction line defined on Lots 600 -603 by services easement

Tauranga City

SUMMARY OF GEOTECHNICAL DATA FOR INDIVIDUAL LOTS

INFRASTRUCTURE DEVELOPMENT CODE

G3
VERSION 1/1

Appendix 3 Test Results

The Lakes Subdivision

Stage 2K - Summary of Results of Compaction Tests by Opus (2006) and Coffey (2008)

Test No.	Date	Soil Type	Percentage Air Voids	Undrained Shear Strength (kPa)
1	25/09/2006	Ash	9.8	166+
2	25/09/2006	Ash	5.8	168+
4	25/09/2006	Ash	7.0	168+
5	25/09/2006	Ash	3.2	142
6	25/09/2006	Ash	4.5	143
7	28/09/2006	Ash	5.2	191+
8	28/09/2006	Ash	5.3	183+
9	28/09/2006	Ash	5.9	179+
10	28/09/2006	Ash	5.3	153
12	28/09/2006	Ash	5.5	160
13	28/09/2006	Ash	10.3	UTP
14	28/09/2006	Ash	4.3	195+
17	18/10/2006	Ash	4.9	UTP
18	19/10/2006	Ash	6.6	179+
19	20/10/2006	Ash	3.6	179+
20	18/10/2006	Ash	6.4	179+
21	22/05/2008	Ash	1.1	208+
22	22/05/2008	Ash	8.2	223+

The Lakes Stage 2K
Compaction Test Results
Undertaken by Opus 2013

Position Lot No	Date	Soil Type	Percentage Air Voids	Undrained Shear Strength (kPa)	Scala penetrometer blows/100m
600	24/02/2013	Ash	14	UTP	6-10
601	24/02/2013	Ash			8-12
602	24/02/2013	Ash	18	UTP	5-14
603	24/02/2013	Ash			4-26
604	24/02/2013	Ash			3-11
605	24/02/2013	Ash			5-15
606	24/02/2013	Ash			4-13
637	24/02/2013	Ash	16.5	UTP	4-10
639	24/02/2013	Ash			4-13
640	28/02/2013	Ash			3-8
604	1/03/2013	Ash	6.0	UTP	
639	2/03/2013	Ash	8.1	UTP	
640	3/03/2013	Ash	7.4	UTP	
643	4/03/2013	Ash	14.7	UTP	
644	5/03/2013	Ash	13.9	UTP	
598(pond)	11/03/2013	Ash	19.3	UTP	4-7
599(pond)	12/03/2013	Ash	27.1	UTP	4-9

Appendix 4 Borehole Logs

SHRIMPTON & LIPINSKI

BH 597&598A

Site: The Lakes (2012) Ltd; Stage 2K, The Lakes Subdivision, Tauriko

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: 19/11/12 | RL m Moturiki Datum | Logged By: N.I

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa) 50 100 150
BH 597						
TOPSOIL 100 mm						
SILT; clayey; very stiff; moist; mod. plastic; orange brown		0.5		not found	139	
becomes hard; black speckles		1.0			utp	>
becomes stiff; wet; low plasticity; yellow orange brown black speckles		1.5			91	
SILT; slightly sandy; very stiff; very moist; sl.cohesive; yellow orange; black specles		2.0			159	
End of borehole 2.0 m						
BH 598 A						
TOPSOIL 80 mm						
SILT; clayey; hard; moist; slightly cohesive; orange brown		0.5		not found	utp	>
becomes very stiff; moderately plastic yellow orange brown		1.0			169	
abundant black mottles (Biotite)		1.5			101	
		2.0			108	
End of borehole 2.0 m						

EXCAVATION METHOD: 150 mm diameter machine auger

SHRIMPTON & LIPINSKI

BH 598B&599B

Site: The Lakes (2012) Ltd; Stage 2K, The Lakes Subdivision, Tauriko

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: 22/3/2013 | RL m Moturiki Datum | Logged By: N.I

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)
BH 598B					
TOPSOIL 150 mm			1		
SILT; clayey; slightly sandy; hard; slightly moist; slightly cohesive; orange brown dark brown and light grey mottles FILL	Fill		1		118
			2		
			6		utp
		0.5	9		
			8		utp
			6	not found	
			5		utp
		1.0			utp
End of borehole 1.0 m					
		1.5			
		2.0			
BH 599B					
TOPSOIL 150 mm			1		
SILT; clayey; slightly sandy; hard; slightly moist; slightly cohesive; orange brown dark brown and light grey mottles FILL	Fill		2		utp
			4		
			8		utp
		0.5	7		
			11		utp
			10	not found	
			10		utp
		1.0			utp
End of borehole 1.0 m					
		1.5			
		2.0			

Undrained Shear Strength (kPa): 50 100 150

EXCAVATION METHOD: 50 mm diameter hand auger

SHRIMPTON & LIPINSKI

BH 599A&600

Site: The Lakes (2012) Ltd; Stage 2K, The Lakes Subdivision, Tauriko

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: 13/11/12&??? | RL m Moturiki Datum | Logged By: N.I

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa) 50 100 150
BH 599A						
TOPSOIL 80 mm						
SILT; clayey; hard; moist; slightly cohesive; orange brown		0.5		not found	utp	>
SAND (f-m); medium dense; moist; light grey		1.0				
SILT; clayey; very stiff; moist; moderately plastic; orange brown; red mottles		1.5			189	
becomes yellow orange brown					189	
becomes hard		2.0			utp	>
End of borehole 2.0 m						
BH 600						
SILT; sandy; very stiff; very moist; friable; yellow black mottles		0.5		not found	108	
becomes light pink grey; black mottles		1.0			108	
		1.5			152	
End of borehole 2.0 m		2.0			142	

EXCAVATION METHOD: 150 mm diameter machine auger

SHRIMPTON & LIPINSKI

BH 601&602

Site: The Lakes (2012) Ltd; Stage 2K, The Lakes Subdivision, Tauriko

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: 13/11/12 | RL m Moturiki Datum | Logged By: N.I

Description of Soil	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)
BH 601				
SILT; slightly sandy; very stiff; moist; slightly cohesive; light pink grey brown; black speckles	0.5		not found	149
becomes very moist; light grey brown; black speckles	1.0			145
SILT; sandy; very stiff; very moist; slightly cohesive; light brown grey				
SAND (f-m); medium dense; very moist; pumiceous; grey	1.5			112
	2.0			
End of borehole 2.0 m				
BH 602				
SILT; clayey; hard; moist; moderately plastic; orange brown	0.5		not found	utp
becomes very moist; yellow orange brown; black speckles	1.0			utp
contains large black mottles				
becomes stiff; wet; low plasticity	1.5			81
SILT; very slightly sandy; very stiff; very moist; slightly cohesive; yellow orange; black specles	2.0			118
End of borehole 2.0 m				

Undrained Shear Strength (kPa): 50 100 150

EXCAVATION METHOD: 150 mm diameter machine auger

SHRIMPTON & LIPINSKI

BH 603&604

Site: The Lakes (2012) Ltd; Stage 2K, The Lakes Subdivision, Tauriko

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: 13/11/12 | RL m Moturiki Datum | Logged By: N.I

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)
BH 603					
SILT; sandy; hard; moist; friable; yellow brown light grey and black speckles				not found	utp
SILT; slightly sandy; very moist; very stiff; slightly cohesive; light grey brown; black mottles		0.5			156
		1.0			132
becomes wet; light brown grey; black mottles					122
		1.5			122
SAND (f-m) silty; medium dense; very moist; grey; black speckles		2.0			
End of borehole 2.0 m					
BH 604					
SILT; clayey; hard; moist; moderately plastic; orange brown		0.5		not found	utp
becomes yellow orange brown					
becomes very stiff		1.0			196
SILT; very slightly sandy; very stiff; very moist; slightly cohesive; yellow brown; black specles					176
SILT; clayey; very stiff; wet; low plasticity; yellow brown black speckles		1.5			189
becomes stiff		2.0			61
End of borehole 2.0 m					

Undrained Shear Strength (kPa): 50 100 150

EXCAVATION METHOD: 150 mm diameter machine auger

SHRIMPTON & LIPINSKI

BH 605&606

Site: The Lakes (2012) Ltd; Stage 2K, The Lakes Subdivision, Tauriko

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: 13/11/12 | RL m Moturiki Datum | Logged By: N.I

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa) 50 100 150
BH 605						
SILT; clayey; hard; moist; slightly cohesive; orange brown		0.5		not found	utp	>
becomes moderately plastic; yellow orange brown		1.0			132	
becomes very stiff; very moist		1.5			68	
becomes wet; low plasticity becomes stiff		2.0			101	
SAND (f-m) silty; gravelly; medium dense; moist; yellow grey						
End of borehole 2.0 m						
BH 606						
SAND (f-m); medium dense; moist; yellow		0.5		not found	81	
SILT; v. stiff; moist; sl. cohesive; lt. brown grey		1.0			utp	>
SAND (f-m); medium dense; moist; light grey		1.5			utp	>
SILT; stiff; moist; sl. cohesive; light yellow		2.0			utp	>
SAND (f-m); loose; slightly moist; light grey (Rotoehu Ash)						
SILT; clayey; hard; moist; high plasticity; darkish brown (Hamilton Ash) becomes orange brown becomes moderately plastic						
End of borehole 2.0 m						

EXCAVATION METHOD: 150 mm diameter machine auger

SHRIMPTON & LIPINSKI

BH 614&607

Site: The Lakes Subdivision, Stage 2K

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: 18/04/08 | Logged By: N.I

Description of Soil		Soil Symbol	Depth (m)	Scala blows/100mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa) 50 100 150
BH 614							
TOPSOIL	Fill				not found	utp	>
SILT; clayey; sandy; moist; hard; friable; brown dark brown mottles; gravels to 20mm dia. FILL						utp	>
SILT; clayey; moist; hard; friable; brown			0.5			200+	>
very stiff; moderately plastic			1.0			174	●
						161	●
End of borehole 1.0 m			1.5				
			2.0				
BH 607							
TOPSOIL 50 mm	Fill						
SILT; sandy; hard; dry; friable; mixed orange brown FILL						utp	>
SILT; clayey; hard; slightly moist; friable; orange brown dark brown and light grey mottles FILL			0.5			200+	>
						200+	>
SILT; sandy; hard; slightly moist; friable; light grey brown yellow, orange and dark brown mottles FILL						200+	>
SILT; clayey; slightly sandy; hard; dry; friable; yellow orange brown			1.0			utp	>
End of borehole 2.0 m			1.5				
			2.0				

EXCAVATION METHOD: 50mm Diameter Hand Auger

SHRIMPTON & LIPINSKI

BH 608&609

Site: The Lakes Subdivision, Stage 2K

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: 18/04/08 | Logged By: N.I

Description of Soil		Soil Symbol	Depth (m)	Scala blows/100mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa) 50 100 150
BH 608							
TOPSOIL	Fill				not found	200+	>
SILT; clayey; slightly sandy; moist; hard; friable; brown; dark brown and orange mottles FILL			0.5			200+	>
						200+	>
SILT; sandy; clayey; moist; very stiff; friable; brown			1.0			190	
						190	
End of borehole 1.0 m			1.5				
			2.0				
BH 609							
TOPSOIL					not found		
SILT; clayey; moist; hard; moderately plastic; brown						200+	>
slightly sandy			0.5			180	
sandy; friable						120	
						108	
			1.0			130	
End of borehole 1.0 m			1.5				
			2.0				

EXCAVATION METHOD: 50mm Diameter Hand Auger

SHRIMPTON & LIPINSKI

BH 610&611

Site: The Lakes Subdivision, Stage 2K

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: 18/04/08 | Logged By: N.I

Description of Soil		Soil Symbol	Depth (m)	Scala blows/100mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa) 50 100 150
BH 610							
TOPSOIL	Fill				not found	184	
SILT; clayey; moist; hard; moderately plastic; brown dark brown mottles FILL						190	
SILT; clayey; slightly sandy; moist; very stiff; moderately plastic; brown			0.5			200+	>
sandy; friable						92	
wet; stiff			1.0			63	
End of borehole 1.0 m			1.5				
			2.0				
BH 611							
TOPSOIL					not found	utp	>
SILT; clayey; moist; hard; friable; brown			0.5			utp	>
						utp	>
very stiff; moderately plastic			1.0			142	
						104	
End of borehole 1.0 m			1.5				
			2.0				

EXCAVATION METHOD: 50mm Diameter Hand Auger

SHRIMPTON & LIPINSKI

BH 612&613

Site: The Lakes Subdivision, Stage 2K

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: 18/04/08 | Logged By: N.I

Description of Soil	Depth (m)	Scala blows/100mm	Groundwater	Undrained Shear Strength (kPa)
BH 612				
TOPSOIL			not found	utp
SILT; clayey; moist; hard; friable; brown very stiff; moderately plastic	0.5			196
orangey brown				155
wet; stiff	1.0			117
End of borehole 1.0 m	1.5			98
	2.0			
BH 613				
TOPSOIL		2	not found	
SAND; silty; moist; fine to medium grained; medium dense; brown	0.5	6 6 8 12		
loose light brown	1.0	7 8 3 1 1		
End of borehole 1.0 m	1.5			
	2.0			

Undrained Shear Strength (kPa): 50 100 150

EXCAVATION METHOD: 50mm Diameter Hand Auger

SHRIMPTON & LIPINSKI

BH 621&622

Site: The Lakes (2012) Ltd; Stage 2K, The Lakes Subdivision, Tauriko

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: 19/11/12 | RL m Moturiki Datum | Logged By: N.I

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa) 50 100 150
BH 621						
TOPSOIL 250 mm	Fill			not found		
SILT; clayey; slightly sandy; hard; moist; friable; orange brown; dark brown and light grey mottles FILL	Fill	0.5		not found	utp	>
	Fill	1.0		not found	utp	>
	Fill	1.5		not found	utp	>
SILT; clayey; slightly sandy; very stiff; moist; friable; orange brown	Fill	2.0		not found	193	•
End of borehole 2.0 m				not found		
BH 622						
TOPSOIL 300 mm	Fill			not found		
SILT; clayey; slightly sandy; hard; moist; friable; orange brown; dark brown and light grey mottles FILL	Fill	0.5		not found	utp	>
	Fill	1.0		not found	utp	>
	Fill	1.5		not found	utp	>
becomes dark grey brown; light grey and orange brown mottles	Fill	2.0		not found	utp	>
End of borehole 2.0 m				not found		

EXCAVATION METHOD: 150 mm diameter machine auger

SHRIMPTON & LIPINSKI

BH 623&624

Site: The Lakes (2012) Ltd; Stage 2K, The Lakes Subdivision, Tauriko

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: | RL m Moturiki Datum | Logged By: N.I

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa) 50 100 150
BH 623						
TOPSOIL 250 mm	Fill			not found		
SILT; clayey; slightly sandy; hard; moist; friable; orange brown; dark brown and light grey mottles FILL		0.5			utp	>
		1.0			utp	>
		1.5			utp	>
		2.0			utp	>
End of borehole 2.0 m						
BH 624						
TOPSOIL 100 mm	Fill			not found		
SILT; clayey; slightly sandy; hard; moist; friable; orange brown; dark brown and light grey mottles FILL		0.5			utp	>
		1.0			utp	>
SILT; clayey; slightly sandy; very stiff; moist; slightly cohesive; orange brown		1.5			129	•
end of slightly sandy; becomes moderately plastic		2.0			129	•
End of borehole 2.0 m						

EXCAVATION METHOD: 150 mm diameter machine auger

SHRIMPTON & LIPINSKI

BH 625&626

Site: The Lakes (2012) Ltd; Stage 2K, The Lakes Subdivision, Tauriko

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: 19/11/12 | RL m Moturiki Datum | Logged By: N.I

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa) 50 100 150
BH 625						
TOPSOIL 100 mm						
SILT; clayey; slightly sandy; very stiff; moist; sl. cohesive; orange brown		0.5		not found	172	
SAND (f-m) silty; medium dense; moist; yellow orange brown		1.0			utp	>
SILT; sandy (f); hard; moist; friable; light yellow						
SAND (f-m); loose; moist; light grey (Rotoehu Ash)		1.5			200+	>
SILT; clayey; hard; moist; high plasticity; darkish brown (Hamilton Ash)		2.0			utp	>
End of borehole 2.0 m						
BH 626						
TOPSOIL 100 mm						
SILT; clayey; slightly sandy; very stiff; moist; sl. cohesive; orange brown		0.5		not found	108	
SILT; sandy (f); hard; moist; friable; orange brown		1.0			98	
SILT; clayey; stiff; very moist; moderately plastic; yellow orange brown; black speckles becomes wet; low plasticity		1.5			95	
End of borehole 2.0 m		2.0			101	

EXCAVATION METHOD: 150 mm diameter machine auger

SHRIMPTON & LIPINSKI

BH 627&628

Site: The Lakes (2012) Ltd; Stage 2K, The Lakes Subdivision, Tauriko

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: 19/11/12 | RL m Moturiki Datum | Logged By: N.I

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)
BH 627					
TOPSOIL 100 mm					
SILT; clayey; slightly sandy; very stiff; moist; sl. cohesive; orange brown		0.5		not found	101
end of slightly sandy; moderately plastic					
becomes stiff		1.0			95
becomes wet; low plasticity					
becomes slightly sandy		1.5			101
SILT; sandy; very stiff; very moist; slightly cohesive; yellow grey brown; black mottles		2.0			112
End of borehole 2.0 m					
BH 628					
TOPSOIL 200 mm					
SILT; clayey; hard; moist; slightly cohesive; orange brown		0.5		not found	utp
becomes moderately plastic					
becomes very stiff		1.0			145
SILT; v. sl. sandy; very stiff; moist; slightly cohesive; orange					
SILT; clayey; stiff; very moist; low plasticity; yellow orange brown; black speckles		1.5			71
becomes wet					
becomes firm		2.0			47
End of borehole 2.0 m					

Undrained Shear Strength (kPa): 50 100 150

EXCAVATION METHOD: 150 mm diameter machine auger

SHRIMPTON & LIPINSKI

BH 629&630

Site: The Lakes (2012) Ltd; Stage 2K, The Lakes Subdivision, Tauriko

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: 19/11/12 | RL m Moturiki Datum | Logged By: N.I

Description of Soil		Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa) 50 100 150
BH 629							
TOPSOIL 100 mm							
SILT; clayey; slightly sandy; hard; moist; friable; orange brown; dark brown and light grey mottles FILL	Fill		0.5		not found	utp	>
SILT; slightly sandy; stiff; moist; slightly cohesive; yellow orange; black speckles							
SILT; clayey; stiff; wet; low plasticity; yellow orange brown black speckles			1.0			61	
			1.5			51	
SILT; slightly clayey; stiff; saturated; sensetive; dilatent; slightly cohesive; light yellow; black speckles							
SILT; sandy; very stiff; moist; slighly cohesive; light grey brown; black speckles			2.0			125	
End of borehole 2.0 m							
BH 630							
TOPSOIL 100 mm							
SILT; clayey; slightly sandy; hard; moist; friable; orange brown; dark brown and light grey mottles FILL	Fill		0.5		not found	utp	>
SILT; clayey; very stiff; moist; moderately plastic; orange brown			1.0			159	
becomes wet; low plasticity; yellow orange brown			1.5			108	
SILT; very slightly sandy; very stiff; very moist; slightly cohesive; orange; black speckles			2.0			186	
End of borehole 2.0 m							

EXCAVATION METHOD: 150 mm diameter machine auger

SHRIMPTON & LIPINSKI

BH 631&632

Site: The Lakes (2012) Ltd; Stage 2K, The Lakes Subdivision, Tauriko

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: 19/11/12 | RL m Moturiki Datum | Logged By: N.I

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)
BH 631					
SILT; clayey; stiff; moist; moderately plastic; yellow orange brown; black speckles		0.5		not found	98
SILT; slightly sandy; hard; very moist; sl.cohesive; orange; black speckles		1.0			utp
SILT; clayey; stiff; wet; low plasticity; yellow orange brown black speckles		1.5			71
becomes saturated; sensitive					
becomes firm		2.0			44
End of borehole 2.0 m					
BH 632					
TOPSOIL 50 mm				not found	
SILT; clayey' hard; moist; slightly cohesive; orange brown		0.5			utp utp
		1.0			utp utp
becomes very stiff becomes moderately plastic; yellow orange brown		1.5			179
becomes hard		2.0			utp
End of borehole 2.0 m					

Undrained Shear Strength (kPa): 50 100 150

EXCAVATION METHOD: 150 mm diameter machine auger

SHRIMPTON & LIPINSKI

BH 633&634

Site: The Lakes (2012) Ltd; Stage 2K, The Lakes Subdivision, Tauriko

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: 13/11/12and 19/11/12 | RL m Moturiki Datum | Logged By: N.I

Description of Soil	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)
BH 633 19/11/12				
TOPSOIL 100 mm			not found	
SILT; clayey; very stiff; moist; moderately plastic; orange brown	0.5			159
SILT; very stiff; moist; slightly cohesive; orange black speckles	1.0			142
becomes slightly sandy				135
SILT; clayey; stiff; wet; low plasticity; yellow orange brown; black speckles	1.5			64
	2.0			61
End of borehole 2.0 m				
BH 634 13/11/12				
TOPSOIL 80 mm			not found	
SILT; clayey; very stiff; moist; slightly cohesive; orange brown	0.5			152
becomes moderately plastic	1.0			162
SILT; very slightly sandy; very stiff; very moist; slightly cohesive; orange	1.5			108
SILT; clayey; stiff; very moist; low plasticity; yellow brown; black speckles				
becomes stiff	2.0			78
End of borehole 2.0 m				

Undrained Shear Strength (kPa)

50 100 150

EXCAVATION METHOD: 150 mm diameter machine auger

SHRIMPTON & LIPINSKI

BH 635&636

Site: The Lakes (2012) Ltd; Stage 2K, The Lakes Subdivision, Tauriko

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: 13/11/12 | RL m Moturiki Datum | Logged By: N.I

Description of Soil		Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa) 50 100 150
BH 635							
TOPSOIL 200 mm	Fill				not found		
SILT; clayey; hard; slightly moist; friable; brown dark brown mottles FILL							
SILT; very slightly sandy; very stiff; moist; sl. cohesive; orange ; black speckles			0.5			166	●
SILT; clayey; very stiff; moist; moderately plastic; orange brown			1.0			142	●
SILT; slightly sandy; very stiff; very moist; slightly cohesive; yellow orange; black speckles			1.5			118	●
SILT; sandy; hard; moist; friable; orange brown black mottles			2.0			200+	>
End of borehole 2.0 m							
BH 636							
TOPSOIL 100 mm					not found		
SILT; clayey; hard; dry; friable; darkish brown (Hamilton Ash)			0.5			utp	>
becomes moist			1.0			utp	>
becomes moderately plastic							
becomes yellow orange brown							
becomes very stiff			1.5			169	●
End of borehole 2.0 m			2.0			139	●

EXCAVATION METHOD: 150 mm diameter machine auger

SHRIMPTON & LIPINSKI

BH **637&638**

Site: The Lakes (2012) Ltd; Stage 2K, The Lakes Subdivision, Tauriko

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: | RL m Moturiki Datum | Logged By: N.I

Description of Soil	Depth (m)	Undrained Shear Strength (kPa)
BH 637		
SILT; clayey; hard; moist; moderately plastic; orange brown		
becomes very stiff; yellow orange brown	0.5	145
SILT; very slightly sandy; very stiff; moist; sl. cohesive; orange		139
SILT; clayey; very stiff; wet; low plasticity; yellow orange brown; black speckles	1.0	142
becomes stiff	1.5	57
becomes saturated; sensitive		
becomes slightly sandy; very stiff	2.0	105
End of borehole 2.0 m		
BH 638		
SILT; clayey; hard; moist; slightly cohesive; orange brown		
becomes moderately plastic	0.5	utp >
becomes yellow orange brown	1.0	utp >
SILT; very sl. sandy; very stiff; very moist; slightly cohesive; orange	1.5	156
SILT; clayey; stiff; wet; low plasticity; yellow orange brown	2.0	78
End of borehole 2.0 m		

Soil Symbol | Scala blows/100 mm | Groundwater: not found | Undrained Shear Strength (kPa) | Undrained Shear Strength (kPa) 50 100 150

EXCAVATION METHOD: 150 mm diameter machine auger

SHRIMPTON & LIPINSKI

BH **639&640**

Site: The Lakes (2012) Ltd; Stage 2K, The Lakes Subdivision, Tauriko

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: 13/11/12 | RL m Moturiki Datum | Logged By: N.I

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa) 50 100 150
BH 639						
SILT; very stiff; moist; slightly cohesive; yellow orange brown; black speckles				not found		
SAND (f-m); loose; moist; light grey (Rotoehu Ash)		0.5			utp	>
SILT; clayey; hard; moist; high plasticity; darkish brown (Hamilton Ash)		1.0			utp	>
becomes moderately plastic; orange brown		1.5			utp	>
becomes very stiff		2.0			156	
End of borehole 2.0 m						
BH 640						
SILT; clayey; hard; moist; slightly cohesive; orange brown		0.5		not found	utp	>
becomes moderately plastic		1.0			utp	>
becomes yellow orange brown		1.5			200+	>
becomes yellow orange brown; black speckles						
SILT; very slightly sandy; very stiff; moist; slightly cohesive; orange		2.0			135	
End of borehole 2.0 m						

EXCAVATION METHOD: 150 mm diameter machine auger

SHRIMPTON & LIPINSKI

BH 641&642

Site: The Lakes (2012) Ltd; Stage 2K, The Lakes Subdivision, Tauriko

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: 13/11/12 | RL m Moturiki Datum | Logged By: N.I

Description of Soil	Depth (m)	Undrained Shear Strength (kPa)
BH 641		
TOPSOIL 100 mm		
SILT; clayey; hard; dry; friable; darkish brown (Hamilton Ash)	0.5	utp
becomes moist; moderately plastic	1.0	utp
	1.5	utp
becomes very stiff; yellow orange brown	2.0	162
End of borehole 2.0 m		
BH 642		
TOPSOIL 100 mm		
SILT; very slightly sandy; very stiff; moist; slightly cohesive; yellow orange; black speckles	0.5	152
SILT; clayey; stiff; very moist; low plasticity; yellow orange brown	1.0	57
	1.5	95
SILT; sandy; very stiff; moist; friable; yellow orange black speckles	2.0	125
End of borehole 2.0 m		

Groundwater: not found (BH 641); not found (BH 642)

Scala blows/100 mm

Undrained Shear Strength (kPa): 50 100 150

EXCAVATION METHOD: 150 mm diameter machine auger

SHRIMPTON & LIPINSKI

BH 643&644

Site: The Lakes (2012) Ltd; Stage 2K, The Lakes Subdivision, Tauriko

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: 13/11/12 | RL m Moturiki Datum | Logged By: N.I

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)
BH 643					
SILT; clayey; very stiff; moist; moderately plastic; orange brown		0.5		not found	125
SILT; very slightly sandy; very stiff; moist; slightly cohesive; orange brown		1.0			105
SILT; clayey; wet' stiff; low plasticity; yellow orange brown black speckles		1.5			91
		2.0			81
End of borehole 2.0 m					
BH 644					
SILT; clayey; stiff; moist; moderately plastic; orange brown		0.5		not found	95
SILT; slightly clayey; stiff; very moist; moderately plastic; yellow orange brown becomes clayey; black speckles		1.0			68
becomes wet; low plasticity		1.5			57
		2.0			57
End of borehole 2.0 m					

Undrained Shear Strength (kPa)

50 100 150

EXCAVATION METHOD: 150 mm diameter machine auger

SHRIMPTON & LIPINSKI

BH 645&646

Site: The Lakes (2012) Ltd; Stage 2K, The Lakes Subdivision, Tauriko

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: 13/11/12and 19/11/12 | RL m Moturiki Datum | Logged By: N.I

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa) 50 100 150
BH 645 19/11 /12						
TOPSOIL 50 mm						
SILT; clayey; hard; moist; mod. plastic; orange brown		0.5		not found	utp	>
SILT; very slightly sandy; very stiff; moist; sl. cohesive; orange		1.0			186	
SILT; clayey; stiff; very moist; low plasticity; yellow orange brown; black speckles becomes slightly sandy		1.5			68	
SAND (f-m) silty; medium dense; moist; yellow orange brown		2.0			101	
End of borehole 2.0 m						
BH 646 13/11/12						
TOPSOIL 100 mm						
SILT; clayey; very stiff; moist; friable; brown black speckles becomes moderately plastic		0.5		not found	152	
becomes low plasticity; yellow orange brown; black speckles		1.0			108	
SILT; slightly sandy; very stiff; very moist; sl. cohesive; yellow orange; black speckles		1.5			105	
SILT; clayey; very stiff; very moist; moderately plastic; orange brown		2.0			112	
End of borehole 2.0 m						

EXCAVATION METHOD: 150 mm diameter machine auger

SHRIMPTON & LIPINSKI

BH **647&648**

Site: The Lakes (2012) Ltd; Stage 2K, The Lakes Subdivision, Tauriko

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: 19/11/12 | RL m Moturiki Datum | Logged By: N.I

Description of Soil		Soil Symbol	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa) 50 100 150
BH 647							
TOPSOIL 100 mm					not found		
SILT; very slightly sandy; stiff; moist; slightly cohesive; yellow orange; black speckles			0.5			68	
SILT; clayey; stiff; wet; low plasticity; yellow orange brown black speckles			1.0			81	
SILT; sandy; very stiff; very moist; slightly cohesive; light yellow grey brown; black mottles			1.5			105	
			2.0			101	
End of borehole 2.0 m							
BH 648							
TOPSOIL 100 mm					not found		
SILT; clayey; hard; moist; friable; orange brown dark brown mottles FILL	Fill						
SILT; clayey; very stiff; moist; moderately plastic; orange brown			0.5			101	
becomes wet; low plasticity; yellow orange brown							
becomes stiff			1.0			78	
SILT; slightly sandy; stiff; wet; slightly cohesive; yellow orange; black speckles							
SAND (f-m) silty; medium dense; moist; yellow orange brown; black speckles			1.5			169	
			2.0			145	
End of borehole 2.0 m							

EXCAVATION METHOD: 150 mm diameter machine auger

SHRIMPTON & LIPINSKI

BH 649&650

Site: The Lakes (2012) Ltd; Stage 2K, The Lakes Subdivision, Tauriko

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: 19/11/12 & | RL m Moturiki Datum | Logged By: N.I

Description of Soil	Depth (m)	Scala blows/100 mm	Groundwater	Undrained Shear Strength (kPa)
BH 649 19/11/12				
TOPSOIL 150 mm			not found	
SILT; clayey; very stiff; very moist; low plasicity; yellow orange brown; black speckles	0.5			142
SILT; sandy; very stiff; moist; friable; light yellow brown black and red orange mottles				
becomes slightly cohesive	1.0			142
	1.5			125
becomes pink yellow brown; black and orange mottles	2.0			152
End of borehole 2.0 m				
BH 650 19/11/12				
TOPSOIL 50 mm			not found	
SILT; clayey; hard; moist; slightly cohesive; orange brown	0.5			utp
becomes moderately plastic; yellow orange brown				
becomes very stiff	1.0			183
SILT; slightly sandy; hard; moist; slightly cohesive; yellow orange; black speckles	1.5			200+
becomes very stiff	2.0			169
End of borehole 2.0 m				

Undrained Shear Strength (kPa): 50 100 150

EXCAVATION METHOD: 150 mm diameter machine auger

SHRIMPTON & LIPINSKI

BH 694&698

Site: The Lakes Subdivision, Stage 2K

Sheet: 1 Of: 1

Job No. 20260 | Date Excavated: 18/04/08 | Logged By: N.I

Description of Soil	Soil Symbol	Depth (m)	Scala blows/100mm	Groundwater	Undrained Shear Strength (kPa)	Undrained Shear Strength (kPa) 50 100 150
BH 694						
TOPSOIL						
SILT; clayey; moist; very stiff; moderately plastic; orangey brown					171	
hard; brown		0.5			200+	>
					200+	>
SAND; silty; moist; fine to medium grained; medium dense; brown		1.0		not found	utp	>
					utp	>
End of borehole 1.0 m		1.5				
		2.0				
BH 698						
SILT; clayey; moist; very stiff; moderately plastic; brown		0.5			184	
					190	
					190	
		1.0		not found	utp	>
					utp	>
End of borehole 1.0 m		1.5				
		2.0				

EXCAVATION METHOD: 50mm Diameter Hand Auger

SHRIMPTON & LIPINSKI

Borehole No. MB 47

Site: Pyes Pa West Urbanisation

Sheet: 1 Of: 6

Job No. 16944 | Date Excavated: F. 19/9/03. | RL Ground: | Logged By: MBA

Description of Soil	Soil Symbol	Depth (m)	SPT	GROUNDWATER	CORE RECOVERY	Undrained Shear Strength (kPa) 50 100 150
SILT: Very clayey, moderately cohesive pale brown yellow, slightly moist.	YOUNGER ASHES	0.5		BORE HOLE DRY	100%	
Very sandy, coarse grained pale yellow, stiff, moist		1.0				
Very moist		1.5			100%	
Sand: grey, loose, moist		2.0				
SILT: Very clayey, cohesive, brown stiff, moist	OLDER ASHES	3.5				
Brown orange		4.0			100%	
		5.0				

EXCAVATION METHOD: 75mm Ø MACHINE AUGER + HOLLOW SPT.

SHRIMPTON & LIPINSKI

Borehole No. MB 47

Sheet: 2 Of: 6

Site: Pyes Pa West Urbanisation

Job No. 16944 | Date Excavated: f. 19/9/03 | RL Ground: | Logged By: MH

Description of Soil	Soil Symbol	Depth (m)	SPT		Core Recovery	Undrained Shear Strength (kPa) 50 100 150
SILT: Very clayey, cohesive, brown orange, very stiff, moist	OLDER ASHES	50	2 2 3	N=5	100%	
		55			100%	
SPT: Very clayey, cohesive, brown orange silt, very stiff, moist		60	1 2 2	N=4	100%	
becoming pale brown orange		65				
pale yellow, coarse grained slightly cohesive Transition Zone between older Ashes & Matua.	TRANSITION ZONE	70			100%	
SPT: Pumiceous fine grained silt slightly cohesive, cream, stiff sensitive, very moist		75	1 2 2	N=4	100%	
cream pumiceous silt, slightly cohesive, stiff, very moist.	MATUA	80				
		85			100%	
		90				

EXCAVATION METHOD: 75mm ϕ MACHINE AUGER + Hollow SPT.

SHRIMPTON & LIPINSKI

Borehole No. MB 47

Sheet: 3 Of: 6

Site: Pyes Pa West Urbanisation

Job No. 16944 | Date Excavated: F. 19/9/03 | RL Ground: | Logged By: MAA.

Description of Soil	Soil Symbol	Depth (m)	SPT		Undrained Shear Strength (kPa) 50 100 150
SPT: Coarse grained gritty sand with some glassy pumice shards Tc Rangi IGNIMBRITE	g.	9.5	1 2 2 N=4	100% CORE RECOVERY	
slightly moist moist		10.0		100%	
SPT: Coarse grained sand, grey. Medium Dense, slightly moist		10.5	1 1 2 N=3	100%	
as per SPT		11.0		100%	
		11.5			
SPT: Sugary sand, grey, medium Dense slightly moist		12.0	1 2 2 N=4	100%	
Sugary Sands, grey ~ medium Dense ~ homogeneous ~ Dry.		12.5			
		13.0		100%	
		13.5			

EXCAVATION METHOD: 75mm ϕ MACHINE AUGER + HOLLOW SPT

SHRIMPTON & LIPINSKI

Borehole No. MB47

Sheet: 4 Of: 6

Site: Pyes Pa West Urbanisation

Job No. 16944 | Date Excavated: f. 19/3/03 | RL Ground:

Logged By: MH

Description of Soil	Soil Symbol	Depth (m)	SPT	Core Recovery	Undrained Shear Strength (kPa) 50 100 150
SPT: Sand: Sugary, grey, medium Dense Dry		13	2 2 3 N=5	100%	
Sugary pumice sand ~ homogeneous ~ medium Dense ~ Dry		14.0 14.5		100%	
SPT: Sand: Sugary, grey, Dense, Dry		15.0	2 4 6 N=10	100%	
Pumice sands. coarse grained, some pumice gravels and glassy shards Grey, Dense. Dry. homogeneous pumice sand		15.5 16.0 16.5 17.0 17.5 18.0		100%	

EXCAVATION METHOD: 75mm ϕ MACHINE AUGER + HOLLOW SPT

SHRIMPTON & LIPINSKI

Borehole No. MB 47

Sheet: 5 Of: 6

Site: Pyes Pa West Urbanisation

Job No. 16944 | Date Excavated: F-15/5/03 | RL Ground: | Logged By: MH

Description of Soil	Soil Symbol	Depth (m)	SPT	CORE RECOVERY	Undrained Shear Strength (kPa) 50 100 150
SPT: Pumice sand, coarse grained with glassy pumice shards, Grey Dense Dry		0	2 4 5 N=9	100%	
Glassy pumice sand ~ homogeneous ~ Dense ~ grey ~ Dry ~ rods hot from friction		12.5 19.0 19.5 20.0 20.5 21.0		100%	
SPT: coarse grained grey pumice sand, Dense, Dry			3 5 8 N=13	80 - 90% 100%	
Pumice sand, coarse grained, grey Dense, Dry		21.5 22.0 22.5		100%	

EXCAVATION METHOD: 75mm ϕ MACHINE AUGER + HOLLOW SPT

SHRIMPTON & LIPINSKI

Borehole No. MB 47

Sheet: 6 Of: 6

Site: Pyes Pa West Urbanisation

Job No. 16944 | Date Excavated: F. 19/9/05 | RL Ground: | Logged By: MH

Description of Soil	Soil Symbol	Depth (m)			Undrained Shear Strength (kPa) 50 100 150
SPT: Pumice Sand, coarse, grey, Dense Dry		22.5	1 9 10 N=19	100%	
Pumice Sand: Coarse, grey, Dense Dry ~rods hot from friction		23.0		80-90%	
SPT: Pumice Sand coarse grey, Dense Dry		23.5 24.0	4 10 12	100%	
Pumice Sand: Coarse, grey, Dense, Dry homogeneous ~rods too hot to handle from friction.		24.5 25.0 25.5		60-80%	
SPT: Sugary pumice Sand, grey, Dense Dry		26.0	5 10 14	100%	
Homogeneous Sugary grey dense pumice Sand Dry		26.5		50%	
EOR @ 27.0m: AUGER GETTING STUCK		27.0			

EXCAVATION METHOD: 75 mm ϕ MACHINE AUGER + HOLLOW SPT