Geotechnical Completion Report for Cabra Developments Limited

27 Lot Residential Subdivision Matua Estate Stage 4

Prepared for Cabra Developments

December 2015 Ref L18200j

Hutchinson
CONSULTING ENGINEERS

Cabra Developments Ltd

Geotechnical Completion Report

27 Lot Residential Subdivision
Matua Estate Stage 4

at

11 Gilbransen Road, Huapai

Prepared by J. Charlwood
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NZDE (Civil)

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Date 11 December 2015
Status Version 1

CONTENTS

APPENDICES

1.0 Introduction

This Geotechnical Completion Report is for a 27 Lot Residential Subdivision stage at 11 Gilbransen Road, Huapai (Stage 4). The Geotechnical Completion Report has been prepared for Cabra Developments Limited, as documentation required to be submitted to the Auckland Council following the physical construction works on the residential subdivisional development. The Auckland Council resource consent number for the subdivision is R62678.

2.0 Subdivisional Development

The residential subdivision comprised a total of 27 residential lots. All 27 lots are Huapai medium intensity lots, varying in size from 600m² to 812m².

The developed lots of Stage 4 are accessed via Matua Road on the northern boundary, Gilbransen Road on the western boundary and two new internal public roads.

Road 4 (Korako Drive) is a 6.0m wide asphaltic concrete formation extending approximately 110m east from its intersection with Gilbransen Road. Road 4 services Lots 6 to 11 and Lot 27.

Road 9 (Fred White Drive) is a 6.0m wide asphaltic concrete formation extending approximately 130m south and then 70m west from an intersection with Road 4 to an intersection with Gilbransen Road on the western boundary. Road 9 services Lots 12 to 26.

The earthworks operation completed for Stage 4 of the subdivision involved approximately 40800m³ of cut and fill earthworks and these numerical values are detailed in the table below.

Earthwork Volumes			
Stage	**Cut**	**Fill**	**Area**
4	20,900m³	19,900m³	29,600m²

As prescribed on the cut to fill as-built depth contour plan (Dwg. No. 18200AB EW-103) a total of 27 residential lots have been formed utilising a cut to fill earthworks operation within Stage 4. The maximum depth of fill in this stage was around 2.5m and the maximum depth of cut was around 2.0m.

3.0 Related Reports

Two Geotechnical Investigation Reports were prepared for Matua Residential Estate 223 Lot Residential Subdivision at Matua Road and Tapu Road, Huapai by this office, ref: LM15200 dated 19th October 2012 and Matua Residential Estate 27-Lot Residential Subdivision at 11 Gilbransen Road, Huapai ref: L16800 dated 11th July 2014. The recommendations contained in the Hutchinson Consulting Engineers (HCE) Investigation Report have been reviewed during the preparation of this document.

4.0 Earthworks Operations

4.1 Plant

The earthworks operations for this site were carried out over four months from the end of February 2015 to the end of May 2015. The plant utilised on site by the contractors, Opie Contractors (2014) Limited as the main contractor and Bob Hick Earthmovers Limited as the sub-contractor was generally as outlined below:

- 2 x CAT 23-ton Hydraulic Excavators
- 1 x CAT 22-ton long reach Hydraulic Excavator
- 1 x CAT 815 4WD Pad Foot Compactor
- 1 x CAT 615c Elevating Scraper
- 2 x Komatsu HA250 6-wheel Moxy Tip Trucks
- 2 x CAT D7 HLGP Bulldozer with scoop
- 1 x Komatsu 110R Rubber Track Tip Truck
- 1 x Hyundai 35-ton Hydraulic Excavator
- 1 x Komatsu CS360 Lime Hoe
- 1 x Rubber Track Lime Spreader Truck
- 1 x Hitachi EX200 Hydraulic Excavator
- 2 x John Deere 7700 Tractors with levelling bar and discs
- 1 x Terex Water Cart

4.2 Construction Programme

Earthwork activities commenced in late February 2015 with the construction of sediment retention pond 'A' in the north eastern corner of the original Stage 3 site site, sediment retention pond 'B' to the south of Road 4 within Stage 3 site and the formation of clean water diversion drains. At the start of March bulk earthworks commenced with topsoil stripping and the mucking out of the low gully in the northern portion of the original site. Underfill drains and settlement monitoring devices were installed at the base of this gully prior to filling. The filling of the gully also commenced in early March.

The filling of the northern portion of the site continued from March to May 2015 with some imported fill and the lime drying of both cut material and imported fill.

The construction of the timber pole retaining wall along the eastern side of 11 Gilbransen Road (Fred White site) was completed in September 2015.

The bulk earthworks operations over the entire Stage 3 and 4 development were carried out from early March 2015 to the end of May 2015. Earthworks in the form of, berm works and backfilling sediment ponds carried on until the winter shut down at end of June 2015.

The road formation construction commenced in late May 2015 with the subgrade stabilising of Roads 4 and 9. The sealing of the road formations was undertaken in November 2015. The construction of footpaths and cycle ways commenced in late August and was completed by late October 2015.

The sediment retention control pond 'B' was decommissioned in late May 2015. At the same time sediment retention control pond 'A' was reduced in capacity to a decanting earthbund. The final topsoiling and grassing the site was completed in late October 2015.

5.0 Compaction Quality Control

5.1 Control Criteria

The Standards adopted for the earthworks were NZS4431:1989 Code of Practice for Earthfill for Residential Development. With testing in accordance with NZS4402:1986 Methods of Testing Soils for Civil Engineering Purposes. The Auckland Council Code of Practice for Land Development and Subdivision Section 2, Schedule 2E: Soil Strength Parameters recommends the following specifications in general fill; air voids: max single value 12%, average value 10%, undrained shear strength: minimum single value 110kPa, average value 140kPa. The following compaction standards were adopted for the fill:

Air Voids:

Average less than 8%
Maximum single value of 10%

Undrained Shear Strength:

Average value at least 140kPa
Minimum single value 100kPa

5.2 Field Control

Prior to the placement of fill materials, the site was inspected to ensure all topsoil and unsuitable material had been removed to our satisfaction and benches had been cut at a gentle reverse gradient back into the contour prior to placing fill.
Regular insitu strength tests were carried out on the filling utilising Shear Vane apparatus, at or in excess of the frequency recommended in NZS 4431:1989.

Control testing carried out on the compacted fill during the earthworks demonstrated that the required shear strengths and air void criteria was consistently being achieved.

5.3 Post Construction Borehole Testing

Following completion of the earthworks a total of 18 hand auger boreholes (BH1 to BH18) were drilled in selected locations over Stage 4 of the subdivision as an additional check on quality control. From these boreholes, samples were taken for expansive soils testing.

6.0 Project Evaluation

On the basis of our observations, inspections and field testing, we have formed the following conclusions:

6.1 Bearing Capacity for Building Foundations

Generally all filled and natural ground constructed to support conventional shallow residential foundations should have a geotechnical ultimate bearing capacity of 300kPa. At this bearing pressure differential settlements as a result of building loads should be within acceptable limits.

Where an ultimate bearing capacity of greater than 300kPa is required to support any dwelling constructed outside the scope of NZS 3604:2011 Timber Framed Buildings we recommend that further site specific investigation and design of the foundations be carried out prior to building consent application lodgement.

However as a result of the presence of soft natural subsoils within the likely influence of shallow foundations on Lots 18, 21 and 22 a reduced ultimate bearing capacity of 210kPa is recommended. Using stiffened waffle slab type foundation systems is the recommended option on these lots.

We note that NZS 3604:2011 limits the maximum post subdivision fill depth to 600mm over the building platform of a residential lot as there is a risk of the weight of the introduced fill causing consolidation of the underlying subsoils. Any additional filling exceeding 600mm thickness will require further geotechnical investigation and should be endorsed by an engineered design solution completed by a Chartered Professional Engineer experienced in geomechanics and familiar with the contents of this report.

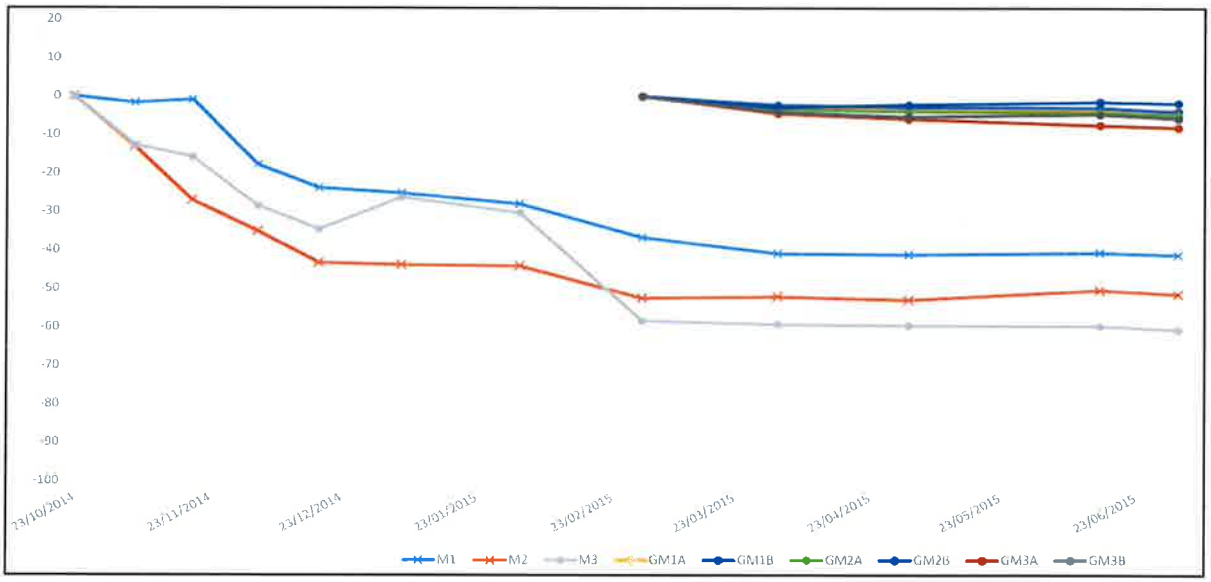
Post subdivisional construction filling is particularly relevant to the northern Lots 1 to 10 and if ground levels are to be raised more than 200mm above the finished ground levels at the time of subdivision completion, these lots will be subject to the recommendations included within section 6.2 below.

6.2 Fill Induced Settlement

In the northern portion of the subdivision engineered earthfill typically extending up to 2.5m in depth was placed and compacted over a layer of weaker alluvial soils below. The consolidation of the underlying soils has been monitored since October 2014 and up to 60mm of post construction settlement has occurred (refer to figure 1 below). As expected the majority of this settlement occurred almost immediately after fill placement. The results of quality control testing, monitoring and the time elapsed since the placement of the majority of the fill indicates that induced settlements beneath the certified filling as a result of the imposed soil loads would now be within building code limits.

Given that Lots 1 to 10 have been subject to settlement monitoring, if finished building platform levels are raised more than 200mm above finished ground levels following subdivision completion, these lots would be subject to specific design with particular attention to potential post construction settlements. If ground levels are raised above the surrounding existing finished ground levels by more than 200mm, these sites will be subject to the potential settlement requirements of Class H1 soils and/or above. Raising ground levels by 200mm above the original finished ground levels would allow concrete "slab-on-grade" construction to be completed no more than 500mm above the original ground levels.

Table 6.2 – Settlement Monitoring Graph (Height Deformation mm)



6.3 Expansive Soils

Two sets of Expansive soil tests were completed on samples selected from different locations throughout the subdivision and within the likely zone of influence of shallow building foundations.

Laboratory testing was undertaken by Opus International Consultants Limited in accordance with Tests 2.1, 2.2, 2.3, 2.4 and 2.6 of NZS 4402:1986 Method of Testing Soils for Civil Engineering Purposes. Full test results are contained in Appendix B.

Based on the observed earthworks and these results all lots are classified in accordance with AS 2870 as Site Classification M (moderately expansive).

In terms of AS 2870:2011 Residential Slabs and Footings Site Class M soils have characteristic surface movement limits of 20mm to 40mm. Specific foundation design parameters are detailed in the Suitability Statement.

All shallow perimeter foundations should extend a minimum of 750mm below finished ground level once the future building platform is prepared.

As a result of the potential shrink/swell nature of the expansive soils when slab-on-grade construction is carried out during periods of extended dry weather (ie: a hot dry summer season) excavated floor slab areas should be thoroughly wetted and soaked for a minimum of 48 hours prior to final preparation of the impermeable damp proof course and concrete pouring. This can be achieved with extended fine spraying of the prepared sub-grade with a garden hose sprinkler and/or the like. Alternatively extended heavy wetting of the compacted hardfill under the slab.
Rapid construction following excavation and benching is also considered a suitable option provided the insitu material is sufficiently moist. Careful detailing of control joints in brittle cladding elements is also recommended.

Expansive soils are typically clay soils that undergo volumetric change due to seasonal fluctuations in moisture content. Other factors that can affect moisture content are outlined below:

- garden watering, site drainage and tank overflows.
- the location of large trees near buildings, especially high transpiration species (i.e. willows, eucalyptus and/or the like).
- the moisture content of the platform at construction stage. Many platforms have dried out after initial excavation. Designers should consider moisture content of the building platform and consider thoroughly wetting the platform before pouring the floor slab in dry conditions.

6.4 Topsoil

Topsoil depths on each lot were checked by excavating a borehole in the approximate central area of each residential lot. Our findings are indicative only and may vary. The topsoil depths over the subdivision lots typically range from 100mm to 300mm in depth.

6.5 Stormwater Disposal

All stormwater runoff from future roofs, decks, hardstand areas, surface and subsoil drainage should be collected into a sealed stormwater system and discharged into the public piped stormwater system provided.

Concentrated stormwater flows should not be allowed to discharge close to any future building(s) and/or onto sloping ground within the vicinity of the future building site. This would be detrimental to foundation conditions and site stability.

6.6 Service Trenches

Wherever possible trench backfill has generally been compacted to minimise potential for future settlements. As is normal practice on all subdivisions building development involving foundations within the 45 degree zone of influence from pipe inverts will require specific Engineering input and design.

6.7 Contractor's Work

We have relied on the Contractor's work practices and assume that the works have been carried in accordance with:

(a) The approved Contract drawings and design details.
(b) The approved Contract specifications.
(c) Authorised variations to (a) and (b) during the execution of the works.
(d) The conditions of Resource and Earthworks consents and Building consents where applicable.
(e) The relevant IHCL geotechnical reports and site instructions.

and that all as-built data and other information provide to the client and/or IHCL are accurate and correct in all respects

Yours faithfully,
IAN HUTCHINSON CONSULTANTS LTD

Prepared by: Neil Douglas
ENGINEER

Reviewed by: Paige Farley
CIVIL MANAGER

Reviewed by : Ian Hutchinson
MANAGING DIRECTOR

7.0 Statement of Professional Opinion as to Suitability of Land for Building Development

Scheme Plan No: R62678 **Owner: Cabra Developments Limited**

Address: Matua Road **Locality: Huapai**

I, Ian Thomas Hutchinson of IAN HUTCHINSON CONSULTANTS LIMITED 154 Centreway Road, P O Box 150, OREWA

Hereby confirm that:

1. I am a Chartered Professional Engineer experienced in the field of geotechnical engineering and was retained by the Owner/Developer as the Geotechnical Engineer on Stage 4 of the Matua Estate Subdivision at 11 Gilbransen Road, Huapai.

2. The extent of my inspections during construction and the results of all tests carried out are described our report ref: L18200j dated 27th November 2015.

3. In my professional opinion, not to be construed as a guarantee I consider that:

   (a) The earthfills identified on the attached as-built cut/fill depth contour plan No: 18200AB/EW-103 have been completed in compliance with NZS 4431:1989 and the Legacy Rodney District Council Standards for Engineering Design and Construction.

   (b) The completed works give due regard to land slope and foundation stability considerations.

   (c) Landscape retaining wall design parameters are given below:

   - c' = 0kPa
   - S_u' (to calculate pole embedment) = 100kPa
   - $\phi' = 30^o$
   - $\gamma' = 18kN/m^3$
   - Timber pole wall active (K_a) horizontal soil loads.

   (c) A geotechnical ultimate bearing capacity of 300kPa may be used for foundation design on Lots 1 to 17, 19, 20 and 23 to 27.

   (d) Due to the presence of soft natural subsoils within the likely influence of shallow foundations on Lots 18, 21 and 22 an ultimate bearing capacity of 210kPa should be adopted. Using stiffened waffle slab type foundation systems is a preferred option on these lots.

(e) As is normal practice within subdivisional building development involving foundations within the 45 degree zone of influence from pipe inverts will require Engineering input.

(f) The assessed AS 2870 expansive Site Classification for all lots (excluding lot 18) is M (moderately expansive).

(i) All shallow foundations should extend a minimum of 750mm below finished ground level.

(ii) Alternatively foundation design may be undertaken in accordance with AS 2870:2011 sections 3 and 4 for Site Class M.

(g) Subject to the geotechnical limitations, expansive soil assessments, restrictions and recommendations contained in clauses 3.(a), 3.(b), 3.(c), 3.(d), 3.(e), 3.(f), 3.(g) and 3.(h) above: The filled and natural ground within the residential lot boundaries is generally suitable for residential buildings constructed in accordance with NZS 3604:2011 Timber Framed Buildings and related documents.

4. Road subgrades have been modified to accommodate the pavement design requirements.

The professional opinion contained in this report is furnished to the Auckland Council and Cabra Developments Limited for their purposes alone on the express condition that it will not be relied upon by any other person. Prospective purchasers should still satisfy themselves as to any specific conditions pertaining to their particular land interest.

Signed:_____ **Date:** 11 December 2015

I.T. Hutchinson
MANAGING DIRECTOR
BE (Civil) ME MIPENZ
CPEng Civil Structural IntPE (NZ)

CPEng Reg No: 63973
Member: ACENZ and IPENZ

Table 7.1 – Suitability Statement Summary

Lot No.	Requirements	Ultimate Bearing Capacity (kPa)	AS2870 -2011 Class	Indicative Topsoil Depth (mm)
1	AS 2870 raft foundation or NZS 3604 with minimum foundation depth of 750mm.	300	M*	100
2	AS 2870 raft foundation or NZS 3604 with minimum foundation depth of 750mm.	300	M*	150
3	AS 2870 raft foundation or NZS 3604 with minimum foundation depth of 750mm.	300	M*	100
4	AS 2870 raft foundation or NZS 3604 with minimum foundation depth of 750mm.	300	M*	100
5	AS 2870 raft foundation or NZS 3604 with minimum foundation depth of 750mm.	300	M*	100
6	AS 2870 raft foundation or NZS 3604 with minimum foundation depth of 750mm.	300	M*	100
7	AS 2870 raft foundation or NZS 3604 with minimum foundation depth of 750mm.	300	M*	150
8	AS 2870 raft foundation or NZS 3604 with minimum foundation depth of 750mm.	300	M*	150
9	AS 2870 raft foundation or NZS 3604 with minimum foundation depth of 750mm.	300	M*	200
10	AS 2870 raft foundation or NZS 3604 with minimum foundation depth of 750mm.	300	M*	100
11	AS 2870 raft foundation or NZS 3604 with minimum foundation depth of 750mm.	300	M	150
12	Retaining wall setback zone restrictions. Elsewhere AS 2870 foundation design or NZS 3604 with minimum footing depth of 900mm.	300	M	200
13	Retaining wall setback zone restrictions. Elsewhere AS 2870 foundation design or NZS 3604 with minimum footing depth of 900mm.	300	M	300
14	Retaining wall setback zone restrictions. Specific design within 45 degree zone of influence of Stormwater line. Elsewhere AS 2870 foundation design or NZS 3604 with minimum footing depth of 900mm.	300	M	300
15	Retaining wall setback zone restrictions. Specific design within 45 degree zone of influence of Stormwater line. Elsewhere AS 2870 foundation design or NZS 3604 with minimum footing depth of 900mm.	300	M	300
16	AS 2870 raft foundation or NZS 3604 with minimum foundation depth of 750mm.	300	M	300
17	AS 2870 raft foundation or NZS 3604 with minimum foundation depth of 750mm.	300	M	300

M* denotes the sites may be classified as Class M (moderately expansive) provided no more than 200mm of fill is placed above the finished site level (existing grass level). Any additional filling of the site may lead to consolidation of the soft natural subsoils and the effects of this need to be considered. If these sites are filled more than 200mm above existing finished site level, the AS2870 classification shall be Class H1 and specific design will be required with due consideration given to potential post construction settlement.

Lot No.	Requirements	Ultimate Bearing Capacity (kPa)	AS2870 -2011 Class	Indicative Topsoil Depth (mm)
18	AS 2870 raft foundation	210	M	150
19	AS 2870 raft foundation or NZS 3604 with minimum foundation depth of 750mm.	300	M	100
20	AS 2870 raft foundation or NZS 3604 with minimum foundation depth of 750mm.	300	M	100
21	AS 2870 raft foundation	210	M	100
22	AS 2870 raft foundation	210	M	200
23	AS 2870 raft foundation or NZS 3604 with minimum foundation depth of 750mm.	300	M	200
24	AS 2870 raft foundation or NZS 3604 with minimum foundation depth of 750mm.	300	M	200
25	AS 2870 raft foundation or NZS 3604 with minimum foundation depth of 750mm.	300	M	150
26	AS 2870 raft foundation or NZS 3604 with minimum foundation depth of 750mm.	300	M	150
27	AS 2870 raft foundation or NZS 3604 with minimum foundation depth of 750mm.	300	M	150

M* denotes the sites may be classified as Class M (moderately expansive) provided no more than 200mm of fill is placed above the finished site level (existing grass level). Any additional filling of the site may lead to consolidation of the soft natural subsoils and the effects of this need to be considered. If these sites are filled more than 200mm above existing finished site level, the AS2870 classification shall be Class H1 and specific design will be required with due consideration given to potential post construction settlement.

APPENDIX A
As-Built Drawings

Hutchinson
CONSULTING ENGINEERS

CABRA DEVELOPMENTS LTD.
MATUA RESIDENTIAL ESTATE
11 GILBRANSEN ROAD, HUAPAI
STAGE 4 AS BUILT PLANS

Matua Residential Estate
HUAPAI

Hutchinson
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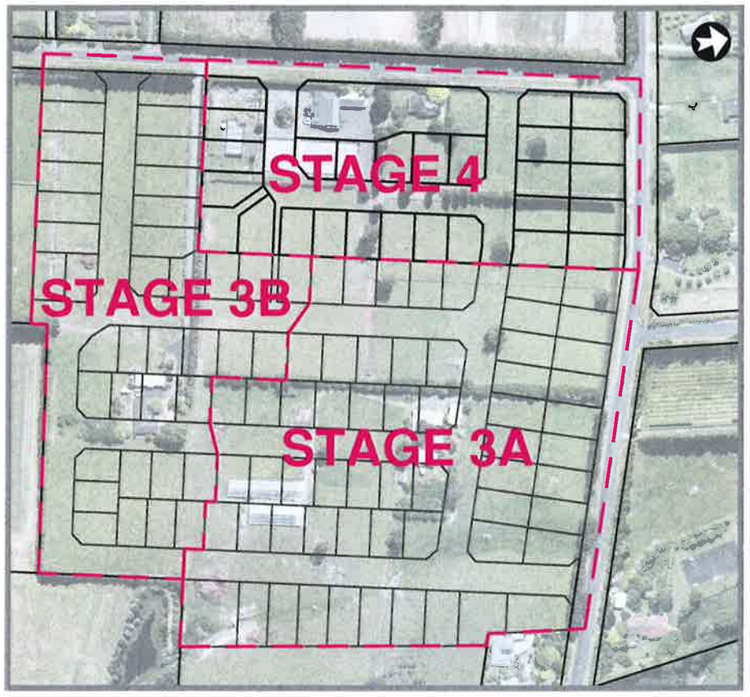

LOCALITY PLAN

DRAWINGS - 18200AB STAGE 4

GENERAL (GE)
GE-001 COVER
GE-002 AS BUILT LOT LAYOUT PLAN

EARTHWORKS (EW)
EW-101 ORIGINAL SITE PLAN
EW-102 AS BUILT CONTOUR PLAN
EW-103 AS BUILT DEPTH CONTOUR PLAN
EW-104 AS BUILT RETAINING WALL RESTRICTION ZONE PLAN

ROADING (RD)
RD-201 AS BUILT ROADING PLAN
RD-202 AS BUILT TYPICAL ROAD CROSS SECTIONS - COLLECTOR ROAD
RD-203 AS BUILT TYPICAL ROAD CROSS SECTIONS - LOCAL ROAD

STORMWATER (SW)
SW-301 AS BUILT STORMWATER MANHOLE DEATILS
SW-302 AS BUILT STORMWATER PIPE PIPE AND CESSPIT DETAILS

WASTEWATER (WW)
WW-401 AS BUILT WASTEWATER PLAN

WATER SUPPLY (WS)
WS-501 AS BUILT WATERMAIN PLAN

18200AB GE-001
DECEMBER 2015

I certify that these As-built plans are an accurate record of the works undertaken and that:

- *The **Coordinates** (X, Y) are in terms of NZTM on NZGD(2000).*
- *The **Levels** (Z) are in terms of the Auckland 1946 (MSL) LINZ datum (DOSLI datum).*

Signed: _____ :

Chartered Professional Engineer

Date: 11 December 2015 :

Name: Ian T. Hutchinson :

MATUA ROAD

ROBERT MIGHT ROAD

MATUA ROAD

ROAD FOUR

ROAD NINE

ROAD SIX

ROAD FIVE

ROAD THREE

ROAD SEVEN

ROAD SEVEN

ROAD EIGHT

GILBRANSEN ROAD

STAGE 4

STAGE 3A

STAGE 3B

-	-	-	-	-	-	Design	L. SOVUS	25/11/2015
No.	Revision	Drawn	Chk.	Appd.	Date	Drawn	S. MARSHALL	25/11/2015
						Checked	N. DOUGLAS	04/12/2015
						Approved	I. T. HUTCHINSON	11/12/2015
						Scale	1:2000 @ A3	
						Scale vert. exag.		

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Matua Residential Estate
HUAPAI

Project
CABRA DEVELOPMENTS LTD
MATUA RESIDENTIAL ESTATE
STAGE 4
11 GILBRANSEN ROAD, HUAPAI

Title
AS-BUILT LOT LAYOUT PLAN

Job No.
A3-18200AB

Sheet No.
GE-002

I certify that these As-built plans are an accurate record of the works undertaken and that:

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Signed: _____ Chartered Professional Engineer

Date: 11 December 2015

Name: Ian T. Hutchinson

GILBRANSEN ROAD

MATUA ROAD

16 735m²
17 739m²
18 739m²
19 718m²
20 812m²
21 689m²
22 605m²
23 611m²
24 632m²
25 622m²
26 619m²
27 624m²
15 606m²
14 600m²
13 662m²
12 715m²
11 696m²
10 721m²
9 730m²
8 737m²
7 742m²
6 758m²
1 733m²
2 735m²
3 744m²
4 756m²
5 782m²

STAGE 4

STAGE 3B

STAGE 3A

SUBDIVISION STAGE BOUNDARY

NOTE:
ALL LEVELS RELATE TO L & S DATUM.
ALL AREAS SUBJECT TO FINAL SURVEY.

No.	Revision	Drawn	Chk.	Appd.	Date
-	-	-	-	-	-

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Design	L. SOVUS	25/11/2015
Drawn	S. MARSHALL	25/11/2015
Checked	N. DOUGLAS	4/12/2015
Approved	I. T. HUTCHINSON	11/12/2015
Scale	1:1000 @ A3	
Scale vert. exag.		

Matua Residential Estate HUAPAI

Project
CABRA DEVELOPMENTS LTD
MATUA RESIDENTIAL ESTATE
STAGE 4
11 GILBRANSEN ROAD, HUAPAI

Title
ORIGINAL SITE PLAN

Job No.
A3-18200AB

Sheet No.
EW-101

I certify that these As-built plans are an accurate record of the works undertaken and that:

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- *The **Levels** (Z) are in terms of the Auckland 1946 (MSL) LINZ datum (DOSLI datum).*

Signed: _____ Chartered Professional Engineer

Date: 1 December 2015

Name: Ian T. Hutchinson

GILBRANSEN ROAD

MATUA ROAD

16 735m² 25.5
17 739m²
18 739m² 25.0
19 718m²
20 812m²
21 689m²
22 605m² 24.5
23 611m²
24 632m² 24.0
25 622m²
26 619m²
27 624m² 23.5

15 606m² 25.0
14 600m²
13 662m² 24.5
12 715m² 24.0
11 696m² 23.5

10 721m²
9 730m²
8 737m² 23.0
7 742m²
6 758m²

1 733m²
2 735m² 22.5
3 744m² 22.0
4 756m² 21.5
5 782m² 21.0

STAGE 4

STAGE 3B

STAGE 3A

SUBDIVISION STAGE BOUNDARY

NOTE:
ALL LEVELS RELATE TO L & S DATUM.
ALL AREAS SUBJECT TO FINAL SURVEY.

No.	Revision	Drawn	Chk.	Appd.	Date
-	-	-	-	-	-

Hutchinson CONSULTING ENGINEERS
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Design	L. SOVUS	25/11/2015
Drawn	S. MARSHALL	25/11/2015
Checked	N. DOUGLAS	4/12/2015
Approved	I. T. HUTCHINSON	11/12/2015
Scale	1:1000 @ A3	
Scale vert. exag.		

Matua Residential Estate HUAPAI

Project
CABRA DEVELOPMENTS LTD
MATUA RESIDENTIAL ESTATE
STAGE 4
11 GILBRANSEN ROAD, HUAPAI

Title
AS-BUILT CONTOUR PLAN

Job No.
A3-18200AB

Sheet No.
EW-102

I certify that these As-built plans are an accurate record of the works undertaken and that:

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Signed: _____ Chartered Professional Engineer

Date: 11 December 2015

Name: Ian T. Hutchinson

GILBRANSEN ROAD

MATUA ROAD

16 735m²
17 739m²
18 739m²
19 718m²
20 812m²
21 689m²
22 605m²
23 611m²
24 632m²
25 622m²
26 619m²
27 624m²
15 606m²
14 600m²
13 662m²
12 715m²
11 696m²
10 721m²
9 730m²
8 737m²
7 742m²
6 758m²
1 733m²
2 735m²
3 744m²
4 756m²
5 782m²

CUT

FILL

STAGE 4

STAGE 3B

STAGE 3A

SUBDIVISION STAGE BOUNDARY

EARTHWORKS LEGEND:

CUT 20,900 m³

FILL 19,900 m³

EARTH WORKS AREA 2.96 Ha
CONTOUR INTERVAL = 0.5m

NOTE:
ALL LEVELS RELATE TO L & S DATUM.
ALL AREAS SUBJECT TO FINAL SURVEY.

No.	Revision	Drawn	Chk.	Appd.	Date
-	-	-	-	-	-

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Design	L. SOVUS	25/11/2015
Drawn	S. MARSHALL	25/11/2015
Checked	N. DOUGLAS	4/12/2015
Approved	I. T. HUTCHINSON	11/12/2015
Scale	1:1000 @ A3	
Scale vert. exag.		

Matua Residential Estate HUAPAI

Project
CABRA DEVELOPMENTS LTD
MATUA RESIDENTIAL ESTATE
STAGE 4
11 GILBRANSEN ROAD, HUAPAI

Title
AS-BUILT DEPTH CONTOUR PLAN

Job No.
A3-18200AB

Sheet No.
EW-103

I certify that these As-built plans are an accurate record of the works undertaken and that:

- *The **Coordinates** (X, Y) are in terms of NZTM on NZGD(2000).*
- *The **Levels** (Z) are in terms of the Auckland 1946 (MSL) LINZ datum (DOSLI datum).*

Signed: *Chartered Professional Engineer*

Date: 11 December 2015

Name: Ian T. Hutchinson

GILBRANSEN ROAD

KEYSTONE RETAINING WALL WITHIN ROAD RESERVE

INDICATIVE RETAINING WALL HEIGHT

11 GILBRANSEN ROAD

RESTRICTION ZONE WIDTH (FROM TOP & BASE OF WALL)

TIMBER POLE RETAINING WALL

LOT 15

LOT 14

LOT 13

LOT 12

ROAD NINE

NOTE:
ALL LEVELS RELATE TO L & S DATUM.
ALL AREAS SUBJECT TO FINAL SURVEY.

No.	Revision	Drawn	Chk.	Appd.	Date
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Scale	1:300 @ A3	
Scale vert. exag.		

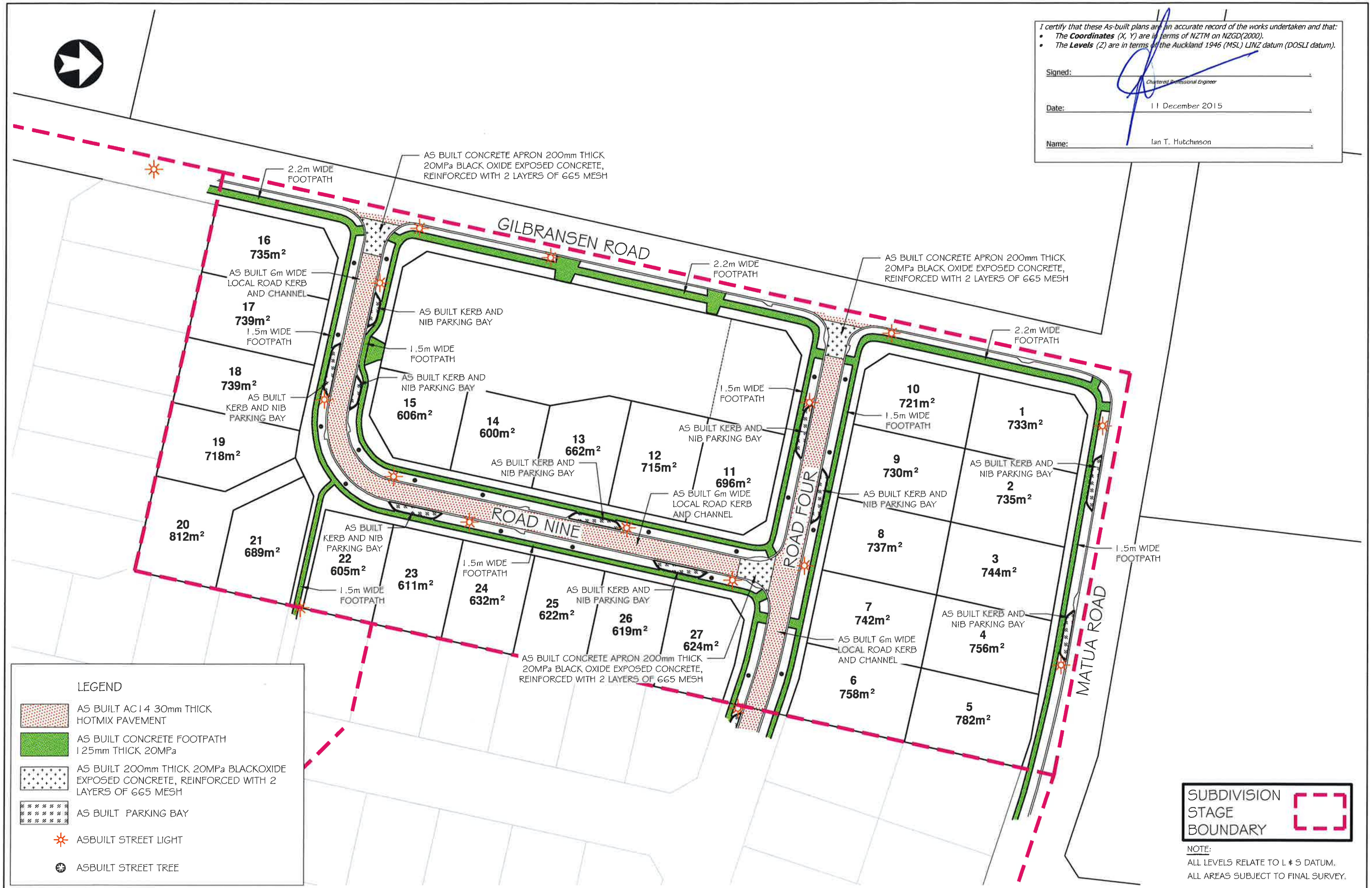
Matua Residential Estate HUAPAI

Project
CABRA DEVELOPMENTS LTD
MATUA RESIDENTIAL ESTATE
STAGE 4
11 GILBRANSEN ROAD, HUAPAI

Title
AS-BUILT RETAINING WALL RESTRICTION ZONE PLAN

Job No.
A3-18200AB

Sheet No.
EW-104


I certify that these As-built plans are an accurate record of the works undertaken and that:
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• The Levels (Z) are in terms of the Auckland 1946 (MSL) LINZ datum (DOSLI datum).
Signed:
Chartered Professional Engineer
Date: 11 December 2015
Name: Ian T. Hutchinson
GILBRANSEN ROAD
ROAD NINE
ROAD FOUR
MATUA ROAD
2.2m WIDE FOOTPATH
AS BUILT CONCRETE APRON 200mm THICK 20MPa BLACK OXIDE EXPOSED CONCRETE, REINFORCED WITH 2 LAYERS OF 665 MESH
AS BUILT 6m WIDE LOCAL ROAD KERB AND CHANNEL
AS BUILT KERB AND NIB PARKING BAY
1.5m WIDE FOOTPATH
16 735m²
17 739m²
18 739m²
19 718m²
20 812m²
21 689m²
22 605m²
23 611m²
24 632m²
25 622m²
26 619m²
27 624m²
15 606m²
14 600m²
13 662m²
12 715m²
11 696m²
10 721m²
9 730m²
8 737m²
7 742m²
6 758m²
5 782m²
4 756m²
3 744m²
2 735m²
1 733m²
LEGEND
AS BUILT AC14 30mm THICK HOTMIX PAVEMENT
AS BUILT CONCRETE FOOTPATH 125mm THICK 20MPa
AS BUILT 200mm THICK 20MPa BLACKOXIDE EXPOSED CONCRETE, REINFORCED WITH 2 LAYERS OF 665 MESH
AS BUILT PARKING BAY
ASBUILT STREET LIGHT
ASBUILT STREET TREE
SUBDIVISION STAGE BOUNDARY
NOTE:
ALL LEVELS RELATE TO L & S DATUM.
ALL AREAS SUBJECT TO FINAL SURVEY.

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Scale vert. exag.		

Matua Residential Estate
HUAPAI

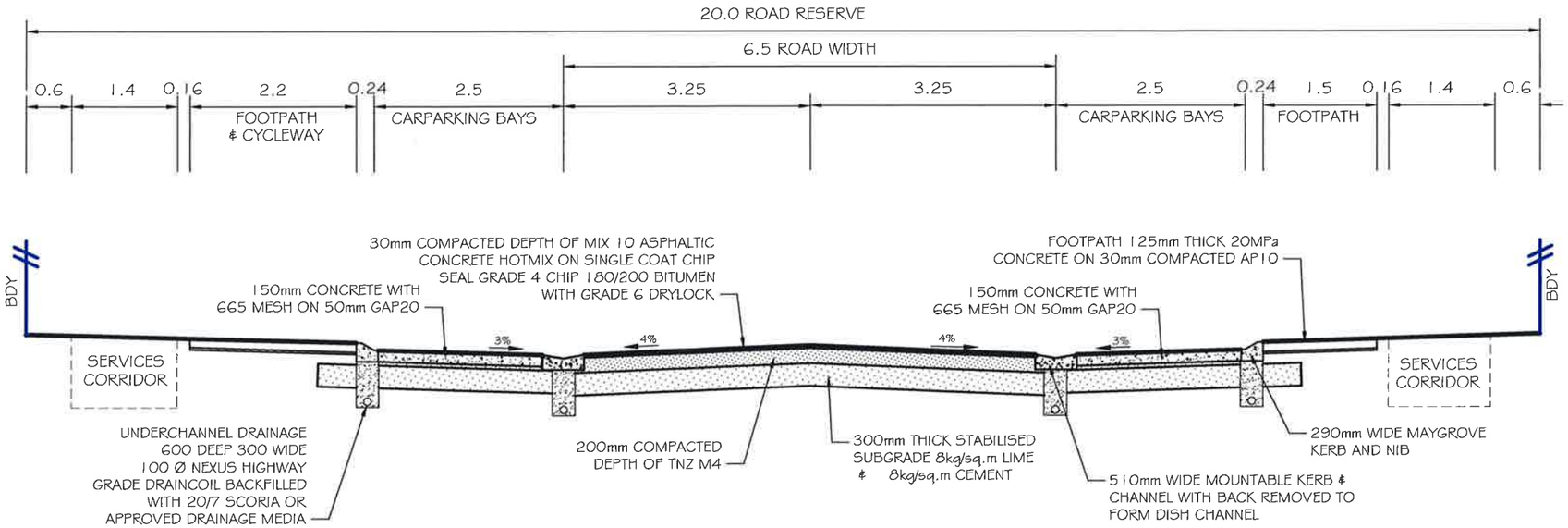
Project
CABRA DEVELOPMENTS LTD
MATUA RESIDENTIAL ESTATE
STAGE 4
11 GILBRANSEN ROAD, HUAPAI

Title
AS-BUILT ROADING PLAN

Sheet No.
RD-201

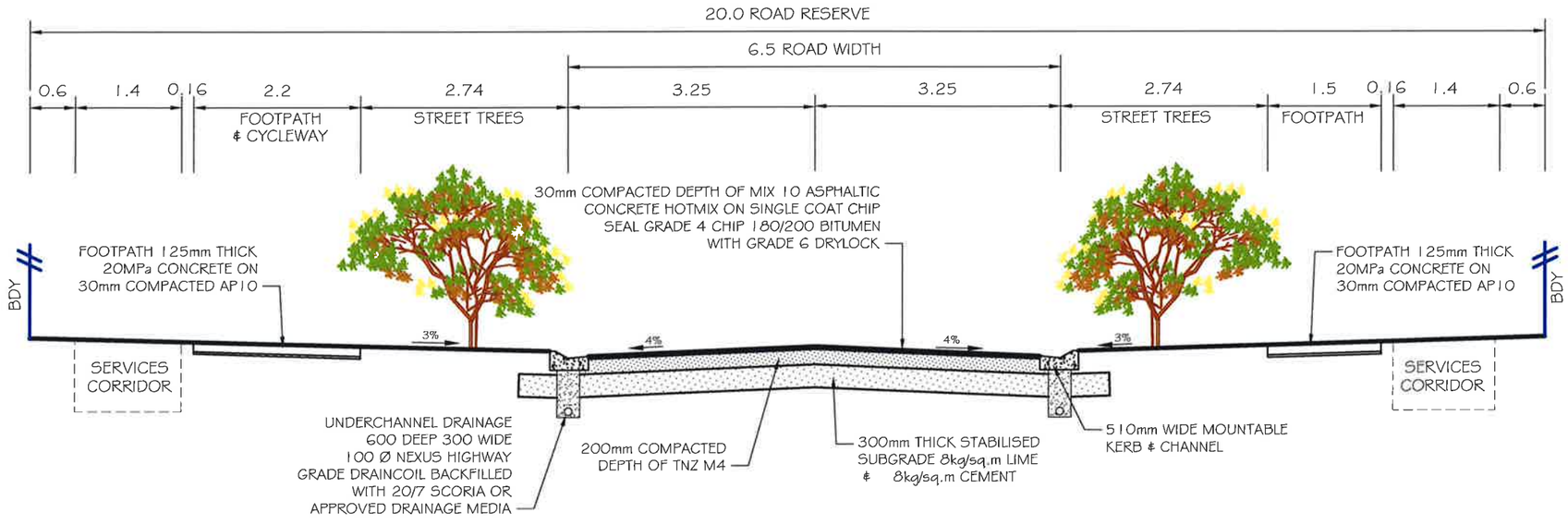
Job No.
A3-18200AB

ROAD NAME	ROAD TYPE	CYCLEWAY LOCATION
MATUA ROAD	6.5m WIDE COLLECTOR/ NEIGHBOURHOOD ROAD IN 20m WIDE RESERVE	NORTHERN (BY OTHERS)
GILBRANSEN ROAD	6.5m WIDE COLLECTOR/ NEIGHBOURHOOD ROAD IN 20m WIDE RESERVE	WESTERN (BY OTHERS)
ROADS THREE, FOUR, FIVE & SIX	6.0m WIDE LOCAL/GREENWAY ROAD IN 19m WIDE RESERVE	N/A
ROAD SEVEN	6.5m WIDE COLLECTOR/ NEIGHBOURHOOD ROAD IN 20m WIDE RESERVE	SOUTHERN
ROAD EIGHT	6.0m WIDE LOCAL/GREENWAY ROAD IN 15m WIDE RESERVE	N/A



TYPICAL AS-BUILT 6.5m WIDE ROAD - COLLECTOR ROAD WITH PARKING

SCALE 1:75 @ A3



TYPICAL AS-BUILT 6.5m WIDE ROAD - COLLECTOR ROAD WITHOUT PARKING

SCALE 1:75 @ A3

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- *The **Levels** (Z) are in terms of the Auckland 1946 (MSL) LINZ datum (DOSLI datum).*

Signed: _____ Chartered Professional Engineer

Date: 1 December 2015

Name: Ian T. Hutchinson

No.	Revision	Drawn	Chk.	Appd.	Date
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Scale vert. exag.		

Matua Residential Estate HUAPAI

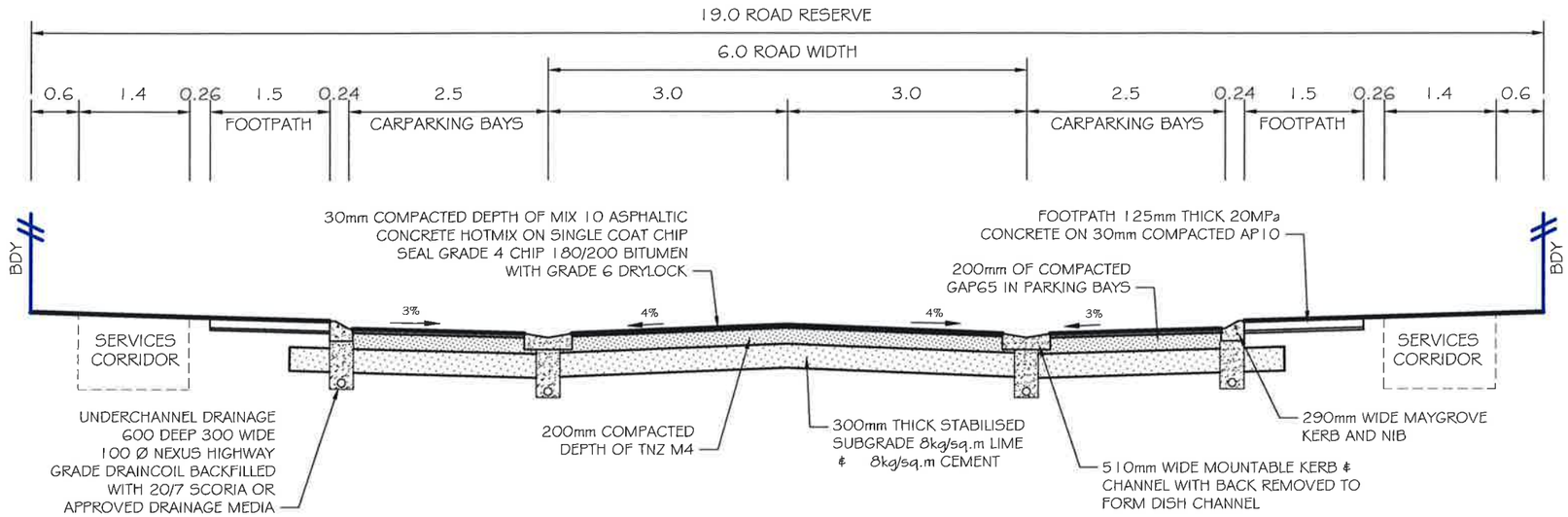
Project
CABRA DEVELOPMENTS LTD
MATUA RESIDENTIAL ESTATE
STAGE 4
11 GILBRANSEN ROAD, HUAPAI

Title
AS-BUILT TYPICAL ROAD CROSS SECTIONS - COLLECTOR ROAD

Job No.
A3-18200AB

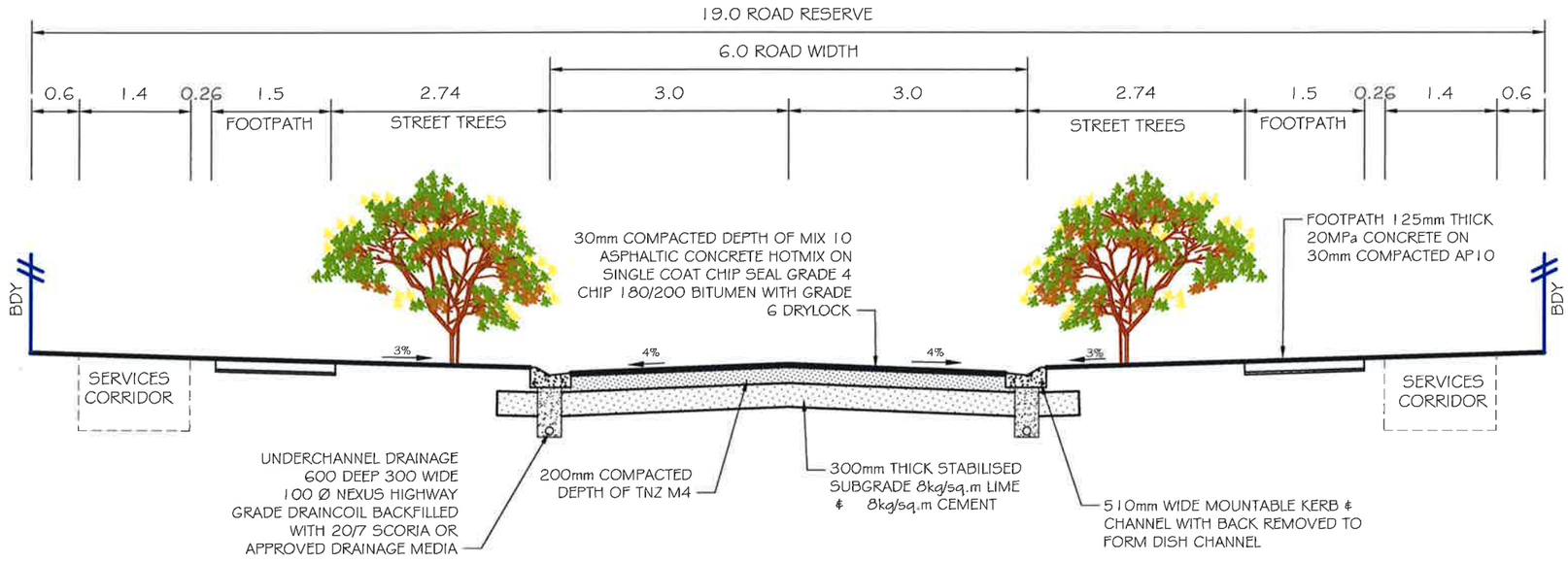
Sheet No.
RD-202

ROAD NAME	ROAD TYPE	CYCLEWAY LOCATION
MATUA ROAD	6.5m WIDE COLLECTOR/ NEIGHBOURHOOD ROAD IN 20m WIDE RESERVE	NORTHERN (BY OTHERS)
GILBRANSEN ROAD	6.5m WIDE COLLECTOR/ NEIGHBOURHOOD ROAD IN 20m WIDE RESERVE	WESTERN (BY OTHERS)
ROADS THREE, FOUR, FIVE & SIX	6.0m WIDE LOCAL/GREENWAY ROAD IN 19m WIDE RESERVE	N/A
ROAD SEVEN	6.5m WIDE COLLECTOR/ NEIGHBOURHOOD ROAD IN 20m WIDE RESERVE	SOUTHERN
ROAD EIGHT	6.0m WIDE LOCAL/GREENWAY ROAD IN 15m WIDE RESERVE	N/A



TYPICAL AS-BUILT 6.0m WIDE ROAD WITH 19.0m ROAD RESERVE - LOCAL / GREENWAY ROAD WITH PARKING

SCALE 1:75 @ A3



TYPICAL AS-BUILT 6.0m WIDE ROAD WITH 19.0m ROAD RESERVE - LOCAL / GREENWAY ROAD WITHOUT PARKING

SCALE 1:75 @ A3

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Signed: _____ Chartered Professional Engineer

Date: 11 December 2015

Name: Ian T. Hutchinson

No.	Revision	Drawn	Chk.	Appd.	Date
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Scale vert. exag.		

Matua Residential Estate HUAPAI

Project: CABRA DEVELOPMENTS LTD MATUA RESIDENTIAL ESTATE STAGE 4 11 GILBRANSEN ROAD, HUAPAI

Title: AS-BUILT TYPICAL ROAD CROSS SECTIONS - LOCAL ROAD

Job No.: A3-18200AB

Sheet No.: RD-203

I certify that these As-built plans are an accurate record of the works undertaken and that:

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Signed: _____ Chartered Professional Engineer

Date: 11 December 2015

Name: Ian T. Hutchinson

GILBRANSEN ROAD

MATUA ROAD

ROAD 9

ROAD 4

1050Ø SWMH B12
LL=25.90
OUT=23.91 /B11
DTI=1.99
mE 1736728.04
mN 5930063.38

1050Ø SWMH B11
LL=25.24
IN=23.80 /B12
OUT=23.72 /B10
DTI=1.52
mE 1736733.85
mN 5930040.89

1050Ø SWMH B10
LL=24.76
IN=23.37 /B11
OUT=23.33 /B9
DTI=1.43
mE 1736778.94
mN 5930030.56

1050Ø SWMH B9
LL=24.64
IN=23.05 /B10
OUT=22.92 /B8
DTI=1.72
mE 1736794.27
mN 5930035.69

1050Ø SWMH B8
LL=23.94
IN=22.21 /B9
OUT=22.11 /B7
DTI=1.83
mE 1736808.64
mN 5930100.75

1050Ø SWMH B7
LL=23.51
IN=21.44 /B8
IN=21.41 /M1
OUT=21.33 /B6
DTI=2.18
mE 1736821.26
mN 5930158.67

1050Ø SWMH B6
LL=23.60
IN=20.96 /B7
OUT=20.88 /B5
DTI=2.72
mE 1736832.36
mN 5930182.89

1050Ø SWMH B5
LL=22.57
IN=19.87 /B6
IN=19.96 /K1
OUT=19.86 /B4
DTI=2.71
mE 1736840.01
mN 5930216.65

1050Ø SWMH B4
LL=21.54
IN=19.68 /B5
IN=19.94 /L1
OUT=19.66 /B3
DTI=1.88
mE 1736846.88
mN 5930248.83

EXISTING
1050Ø SWMH B3
LL=21.87
IN=19.58 /B4
OUT=19.54 /B2
DTI=2.33
mE 1736867.83
mN 5930243.17

1050Ø SWMH L1
LL=21.62
OUT=20.02 /B4
DTI=1.60
mE 1736828.02
mN 5930251.93

1050Ø SWMH M4
LL=24.34
IN=22.40 /M2
OUT=22.40 /M3
DTI=1.94
mE 1736781.30
mN 5930076.21

1050Ø SWMH M2
LL=24.47
OUT=22.53 /M4
DTI=1.94
mE 1736778.40
mN 5930061.25

1050Ø SWMH M3
LL=23.83
IN=21.81 /M4
OUT=21.78 /M1
DTI=2.05
mE 1736796.82
mN 5930145.71

1050Ø SWMH M1
LL=23.58
IN=21.62 /M3
OUT=21.53 /B7
DTI=2.05
mE 1736800.51
mN 5930163.07

1050Ø SWMH K3
LL=23.18
OUT=20.96 /K2
DTI=2.26
mE 1736746.72
mN 5930179.44

1050Ø SWMH K2
LL=22.59
IN=20.78 /K3
OUT=20.75 /K1
DTI=1.84
mE 1736750.33
mN 5930205.66

1050Ø SWMH K1
LL=22.42
IN=20.62 /K2
OUT=20.41 /B5
DTI=2.01
mE 1736756.09
mN 5930233.00

16	735m²	
17	739m²	
18	739m²	
19	718m²	
20	812m²	
21	689m²	
22	605m²	
23	611m²	
24	632m²	
25	622m²	
26	619m²	
27	624m²	
15	606m²	
14	600m²	
13	662m²	
12	715m²	
11	696m²	
10	721m²	
9	730m²	
8	758m²	
7	742m²	
6	758m²	
5	782m²	
4	756m²	
3	744m²	
2	735m²	
1	733m²	

LEGEND

- ASBUILT STORMWATER LINE
- ASBUILT STORMWATER MANHOLE
- ASBUILT CESSPIT
- (10.4) DISTANCE TO CONNECTION FROM DOWNSTREAM MANHOLE

NOTE

ALL CONNECTIONS EXCEPT WHERE NOTED ARE 100mmØ uPVC SN16 BACKFILLED WITH COMPACTED CLAY.

ALL CESSPIT LEADS EXCEPT WHERE NOTED ARE 225mm DIA. RCRRJ.

ALL PIPES ARE CLASS 2 RCRRJ UNLESS OTHERWISE NOTED. ALL PIPES HAVE H2 BEDDING WITH COMPACTED CLAY BACKFILL EXCEPT THOSE CROSSING ROADS OR ROW'S WHICH ARE BACKFILLED WITH COMPACTED HARDFILL.

No.	Revision	Drawn	Chk.	Appd.	Date
-	-	-	-	-	-

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Scale vert. exag.		

Matua Residential Estate HUAPAI

Project
CABRA DEVELOPMENTS LTD
MATUA RESIDENTIAL ESTATE
STAGE 4
11 GILBRANSEN ROAD, HUAPAI

Title
AS-BUILT STORMWATER MANHOLE DETAILS

Job No.
A3-18200AB

Sheet No.
SW-301

I certify that these As-built plans are an accurate record of the works undertaken and that:

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Signed: _____ Chartered Professional Engineer

Date: 11 December 2015

Name: Ian T. Hutchinson

GILBRANSEN ROAD

MATUA ROAD

ROAD 9

ROAD 4

16 735m²

17 739m²

18 739m²

20 812m²

21 689m²

22 605m²

23 611m²

24 632m²

25 622m²

26 619m²

14 600m²

12 715m²

11 696m²

10 721m²

9 730m²

7 742m²

1 733m²

2 735m²

3 744m²

4 756m²

758m²

782m²

225 NB RCRRJ CLASS 4 22.7m @0.5%

300 NB RCRRJ CLASS 2 45.3m @0.8%

300 NB RCRRJ CLASS 2 15.3m @1.8%

300 NB RCRRJ CLASS 2 15.0m @0.9%

300 NB RCRRJ CLASS 2 71.4m @0.9%

375 NB RCRRJ CLASS 2 65.9m @1.1%

375 NB RCRRJ CLASS 2 58.4m @1.1%

375 NB RCRRJ CLASS 4 25.7m @0.8%

375 NB RCRRJ CLASS 2 27.0m @0.5%

300 NB RCRRJ CLASS 2 17.0m @0.9%

300 NB RCRRJ CLASS 4 20.2m @0.6%

450 NB RCRRJ CLASS 2 33.9m @2.7%

450 NB RCRRJ CLASS 2 26.0m @1.4%

675 NB RCRRJ CLASS 2 31.4m @0.6%

525 NB RCRRJ CLASS 2 84.2m @0.6%

300 NB RCRRJ CLASS 2 18.0m @0.4%

675 NB RCRRJ CLASS 2 21.0m @0.4%

150 NB uPVC SN16 20.9m @8.8%

150 NB uPVC SN16 20.0m CONNECTION

150 NB uPVC SN16 27.3m @3.1%

EXISTING 750 NB RCRRJ CLASS 2 66.5m @0.55%

SINGLE CESSPIT
LL=24.37
OUT=23.52
SUMP=23.25
mE 1736773.10
mN 5930041.13

DOUBLE CESSPIT
LL=24.40
OUT=23.35
SUMP=23.27
mE 1736770.93
mN 5930047.89

SINGLE CESSPIT
LL=24.93
OUT=24.30
SUMP=24.00
mE 1736760.38
mN 5930081.20

SINGLE CESSPIT
LL=23.13
OUT=22.09
SUMP=21.99
mE 1736734.59
mN 5930170.85

SINGLE CESSPIT
LL=23.65
OUT=22.68
SUMP=22.40
mE 1736793.87
mN 5930099.89

SINGLE CESSPIT
LL=23.88
OUT=23.24
SUMP=23.00
mE 1736769.55
mN 5930151.74

SINGLE CESSPIT
LL=22.54
OUT=21.54
SUMP=21.47
mE 1736744.36
mN 5930186.88

SINGLE CESSPIT
LL=22.53
OUT=21.52
SUMP=21.35
mE 1736747.10
mN 5930193.71

DOUBLE CESSPIT
LL=22.01
OUT=21.02
SUMP=20.85
mE 1736751.12
mN 5930245.11

DOUBLE CESSPIT
LL=23.24
OUT=22.26
SUMP=22.09
mE 1736808.48
mN 5930166.92

DOUBLE CESSPIT
LL=20.79
OUT=20.17
SUMP=19.61
mE 1736821.66
mN 5930260.17

SINGLE CESSPIT
LL=23.65
OUT=22.62
SUMP=22.33
mE 1736800.82
mN 5930098.63

SINGLE CESSPIT
LL=23.21
OUT=22.21
SUMP=22.02
mE 1736816.27
mN 5930166.67

B12 B11 B10 B9 B8 B7 B6 B5 B4 B3 B2 B1 M4 M3 M2 M1 K3 K2 K1 L1

LEGEND

- ASBUILT STORMWATER LINE
- ASBUILT STORMWATER MANHOLE
- ASBUILT CESSPIT

NOTE

ALL CONNECTIONS EXCEPT WHERE NOTED ARE 100mmØ uPVC SN16 BACKFILLED WITH COMPACTED CLAY.

ALL CESSPIT LEADS EXCEPT WHERE NOTED ARE 225mm DIA. RCRRJ.

ALL PIPES ARE CLASS 2 RCRRJ UNLESS OTHERWISE NOTED. ALL PIPES HAVE H2 BEDDING WITH COMPACTED CLAY BACKFILL EXCEPT THOSE CROSSING ROADS OR ROW'S WHICH ARE BACKFILLED WITH COMPACTED HARDFILL.

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Matua Residential Estate HUAPAI

Project
CABRA DEVELOPMENTS LTD
MATUA RESIDENTIAL ESTATE
STAGE 4
11 GILBRANSEN ROAD, HUAPAI

Title
AS-BUILT STORMWATER PIPE AND CESSPIT DETAILS

Job No.
A3-18200AB

Sheet No.
SW-302

I certify that these As-built plans are an accurate record of the works undertaken and that:

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Signed: _____
Chartered Professional Engineer

Date: 11 December 2015

Name: Ian T. Hutchinson

No.	Revision	Drawn	Chk.	Appd.	Date
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Matua Residential Estate HUAPAI

Project
CABRA DEVELOPMENTS LTD
MATUA RESIDENTIAL ESTATE
STAGE 4
11 GILBRANSEN ROAD, HUAPAI

Title
AS-BUILT WASTEWATER PLAN

Job No.
A3-18200AB

Sheet No.
WW-401

LEGEND

- EXISTING WATER
- AS BUILT WATERMAIN (PE100 PN16)
- AS BUILT SLUICE VALVE
- AS BUILT PEET VALVE
- AS BUILT HYDRANT
- AS BUILT BLANK CAP

NOTE

MINIMUM COVER TO ASBUILT WATER-MAIN IS 900mm UNDER THE CARRIAGEWAY WITH NUMBER 3 SAND BEDDING AND BACKFILLED WITH COMPACTED GAP 65 BASECOURSE.

MINIMUM COVER TO ASBUILT WATER-MAIN IS 600mm UNDER ALL GRASSED AREAS WITH NUMBER 3 SAND BEDDING AND BACKFILLED WITH COMPACTED ORIGINAL CLAY.

GILBRANSEN ROAD

CONNECTION TO EXISTING WATERMAIN

CONNECTION TO EXISTING WATERMAIN

DN125 PE100 PN16

DN63 PE100 PN16

ROAD 4

ROAD 9

BLANK CAP

MECHANICAL COUPLING

MECHANICAL COUPLING

MATUA ROAD

CONNECTION TO EXISTING WATERMAIN

16	735m²
17	739m²
18	739m²
19	718m²
20	812m²
21	689m²
22	605m²
23	611m²
24	632m²
25	622m²
26	619m²
27	624m²
15	606m²
14	600m²
13	662m²
12	715m²
11	696m²
10	721m²
1	733m²
9	730m²
2	735m²
8	737m²
3	744m²
7	742m²
4	756m²
6	758m²
5	782m²

SUBDIVISION STAGE BOUNDARY

I certify that these As-built plans are an accurate record of the works undertaken and that:

- *The **Coordinates** (X, Y) are in terms of NZTM on NZGD(2000).*
- *The **Levels** (Z) are in terms of the Auckland 1946 (MSL) LINZ datum (DOSLI datum).*

Signed: _____
Chartered Professional Engineer

Date: 11 December 2015

Name: Ian T. Hutchinson

No.	Revision	Drawn	Chk.	Appd.	Date
-	-	-	-	-	-

Hutchinson CONSULTING ENGINEERS
PO Box 150, Orewa 0946
154 Centreway Road, Orewa 0931
Ph: 09 426 5702 www.hc.co.nz

Design	L. SOVUS	25/11/2015
Drawn	S. MARSHALL	25/11/2015
Checked	N. DOUGLAS	4/12/2015
Approved	I. T. HUTCHINSON	11/12/2015
Scale	1:1000 @ A3	
Scale vert. exag.		

Matua Residential Estate HUAPAI

Project
CABRA DEVELOPMENTS LTD
MATUA RESIDENTIAL ESTATE
STAGE 4
11 GILBRANSEN ROAD, HUAPAI

Title
AS-BUILT WATERMAIN PLAN

Job No.
A3-18200AB

Sheet No.
WS-501

APPENDIX B

Opus International Consultants Field Density and Site Classification Test Results

Hutchinson
CONSULTING ENGINEERS

LINEAR SHRINKAGE TEST REPORT

OPUS

Project:	**Matua Residential Estate - (Stage 4)**
Location:	**11 Gilbrasen Rd, Huapai**
Client:	**Ian Hutchinson Consultants Ltd**
Contractor:	**Bob Hick Earthmoving**
Sampled by:	**Client**
Sampling method:	**Not Stated**
Sample description:	**Clay FILL**
Sample condition:	**As Received**
Sample reference:	**BH3(Lot 9)**
Sample depth:	**0.5 - 0.8m**
Date placed in mould:	**26/05/15**

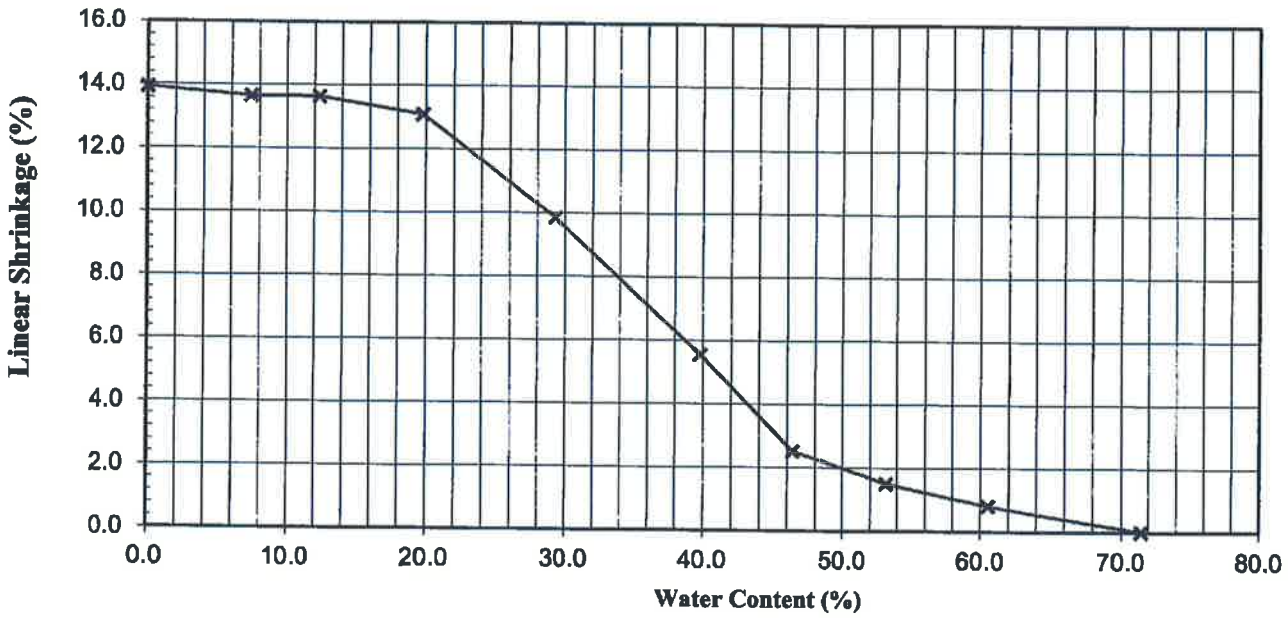
Date sampled: **21/05/15**

Project number:	**1-LA044.15**
Lab ref number:	**009/15**
Client O/N:	**Matua**
Client job number:	**Stage 4**

Test results

Linear Shrinkage (%): 14

Linear Shrinkage (%) Vs Water Content (%)



Test Methods		Notes
Linear Shrinkage:	NZS 4402: 1986: Test 2.6	-Sample Descriptions are not covered by IANZ accreditation. -Test performed on: Fraction passing 425µm -Sample history: Unknown -Plasticity Index method used: Liquid limit -Sample placed in mould at 17 Blows in liquid limit bowl

Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.

Date tested: 26/05/2015 - 04/06/15

This report may only be reproduced in full

IANZ Approved Signatory

Date : 08/06/15

Thirushen Pillay

Senior Civil Engineering Technician

IANZ ACCREDITED LABORATORY

Tests indicated as not accredited are outside the scope of the laboratory's accreditation

OPUS International Consultants Ltd.
Auckland Laboratory
Quality Management Systems Certified to ISO 9001

7a Ride Way, Albany
Private Bag 101982, NS Mail Centre, North
Shore City 0745, New Zealand

Telephone +64 9 415 4660
Facsimile +64 9 415 4661
Website www.opus.co.nz

LINEAR SHRINKAGE TEST REPORT

Project:	**Matua Residential Estate - (Stage 4)**
Location:	**11 Gilbrasen Road, Huapai**
Client:	**Ian Hutchinson Consultants Ltd**
Contractor:	**Bob Hick Earthmoving**
Sampled by:	**Client**
Sampling method:	**Not Stated**
Sample description:	**Clay FILL**
Sample condition:	**As Received**
Sample reference:	**BH1(Lot 26)**
Sample depth:	**0.5 - 0.8m**
Date placed in mould:	**26/05/15**

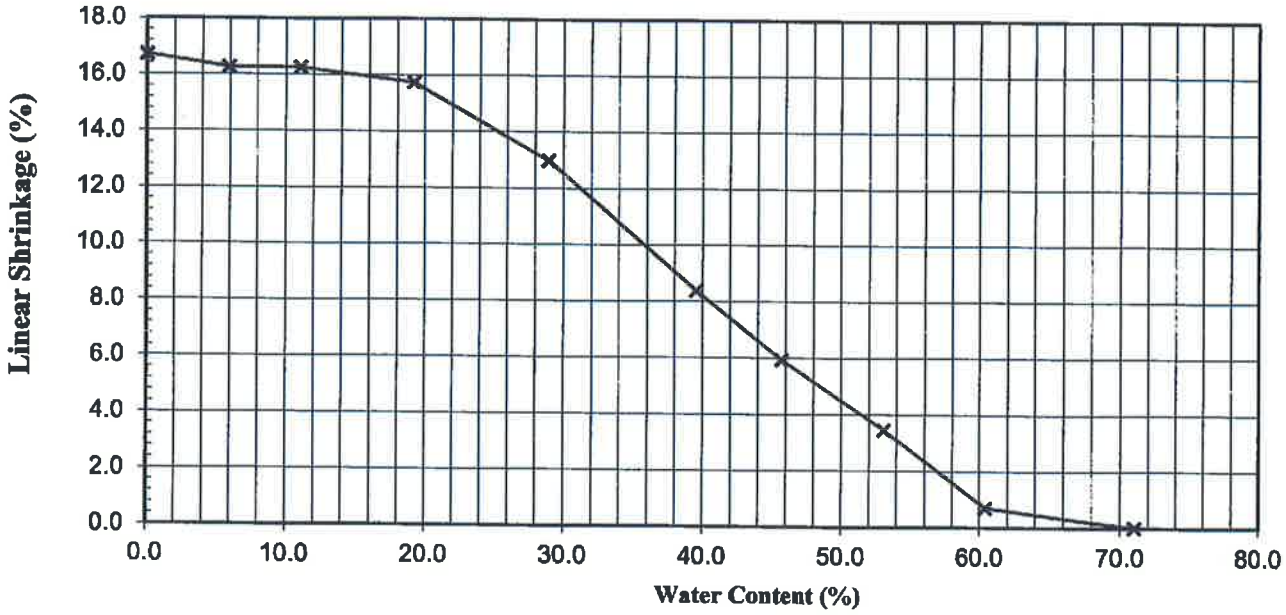
Date sampled: **21/05/15**

Project number:	**1-LA044.15**
Lab ref number:	**010/15**
Client O/N:	**Matua**
Client job number:	**Stage 4**

Test results

Linear Shrinkage (%): 17

Linear Shrinkage (%) Vs Water Content (%)



Test Methods		Notes
Linear Shrinkage:	NZS 4402: 1986: Test 2.6	-Sample Descriptions are not covered by IANZ accreditation. -Test performed on: Fraction passing 425µm -Sample history: Unknown -Plasticity Index method used: Liquid limit -Sample placed in mould at 15 Blows in liquid limit bowl

Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.

This report may only be reproduced in full

Date tested: 26/05/2015 - 04/06/15

IANZ Approved Signatory

Date : 08/06/15

Thirushen Pillay

Senior Civil Engineering Technician

IANZ ACCREDITED LABORATORY

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Shore City 0745, New Zealand

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Website www.opus.co.nz

PLASTICITY INDEX TEST REPORT

OPUS

Project:	**Matua Estate Stage 4**
Location:	**11 Gilbransen Rd, Huapai**
Client:	**Ian Hutchinson Consultants Ltd**
Contractor:	**Bob Hick Earthmoving**
Sampled by:	**Client**
Sampling method:	**Not Stated**
Sample description:	**Fill**
Sample condition:	**As received**
Sample reference:	**BH1(Lot 26)**
Sample depth:	**0.5-0.8m**

Date sampled: **21/05/15**

Project number:	**1-LA044.15**
Lab ref number:	**011/15**
Client O/N:	**Matua**
Client job number:	**Stage 4**

Test Results

As rec'd water content:	**31.3%**
Liquid limit:	**67**
Plastic limit:	**31**
Plasticity Index:	**36**

Test methods		Notes
Water Content:	NZS 4402 : 1986, Test 2.1	Test performed on: Fraction passing 0.425mm test sieve
Liquid Limit:	NZS 4402 : 1986, Test 2.2	Sample descriptions are not covered by IANZ accreditation.
Plastic Limit:	NZS 4402 : 1986, Test 2.3	
Plasticity Index:	NZS 4402 : 1986, Test 2.4	

Date tested: 26/05/15
Date reported: 08/06/2015

Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
This report may only be reproduced in full

IANZ Approved Signatory
Thirushen Pillay
Designation: *Senior Civil Engineering Technician*
Date: 08/06/2015

IANZ ACCREDITED LABORATORY
Tests indicated as not accredited are outside the scope of the laboratory's accreditation

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PLASTICITY INDEX TEST REPORT

OPUS

Project:	**Matua Estate Stage 4**
Location:	**11 Gilbransen Rd, Huapai**
Client:	**Ian Hutchinson Consultants Ltd**
Contractor:	**Bob Hick Earthmoving**
Sampled by:	**Client**
Sampling method:	**Not Stated**
Sample description:	**Fill**
Sample condition:	**As received**
Sample reference:	**BH3(Lot 9)**
Sample depth:	**0.5-0.8m**

Date sampled: **21/05/15**

Project number:	**1-LA044.15**
Lab ref number:	**012/15**
Client O/N:	**Matua**
Client job number:	**Stage 4**

Test Results

As rec'd water content:	**38.9%**
Liquid limit:	**69**
Plastic limit:	**33**
Plasticity Index:	**36**

Test methods	
Water Content:	NZS 4402 : 1986, Test 2.1
Liquid Limit:	NZS 4402 : 1986, Test 2.2
Plastic Limit:	NZS 4402 : 1986, Test 2.3
Plasticity Index:	NZS 4402 : 1986, Test 2.4

Notes

Test performed on: Fraction passing 0.425mm test sieve

Sample descriptions are not covered by IANZ accreditation.

Date tested: 26/05/15
Date reported: 08/06/2015

Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
This report may only be reproduced in full

IANZ Approved Signatory
Thirushen Pillay
Designation: *Senior Civil Engineering Technician*
Date: 08/06/2015

IANZ ACCREDITED LABORATORY
Tests indicated as not accredited are outside the scope of the laboratory's accreditation

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APPENDIX C
Borehole Logs

Hutchinson
CONSULTING ENGINEERS

LOG OF BOREHOLE NO: 1

50mm DIAMETER HAND AUGER

Hutchinson CONSULTING ENGINEERS

JOB No: 18200
DATE: 17/11/15
TESTED BY: RC
SHEAR VANE No: 4770
(SHEAR VANE TESTING BASED ON BS1377)

CLIENT: CABRA DEVELOPMENTS LTD
LOCATION: LOT 27 MATUA RESIDENTIAL ESTATE, MATUA ROAD, HUAPAI

GEOLOGICAL UNIT	SOIL DESCRIPTION	GRAPHIC LOG	DEPTH (m)	CONSISTENCY	SHEAR STRENGTH (kPa)	MOISTURE CONDITION	GROUNDWATER	COMMENTS
ENGINEERED EARTHFILL	dark brown, Topsoil, rootlets							
	slightly to moderately plastic, light brown with dark brown inclusions, Clayey SILT		0.5	VSt	V169/R97	D/M		
			1.0	H	V203+	M		
	moderately plastic, orange brown/light brown, Silty CLAY		1.5		V203+			
	colour change to light grey							
	some tree remains		2.0	VSt	V156/R100			
	E.O.B. @ 2.0m		2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

LOG OF BOREHOLE NO: 2

50mm DIAMETER HAND AUGER

Hutchinson CONSULTING ENGINEERS

JOB No: 18200
DATE: 17/11/15
TESTED BY: AS
SHEAR VANE No: 4770
(SHEAR VANE TESTING BASED ON BS1377)

CLIENT: CABRA DEVELOPMENTS LTD
LOCATION: LOT 12 MATUA RESIDENTIAL ESTATE, MATUA ROAD, HUAPAI

GEOLOGICAL UNIT	SOIL DESCRIPTION	GRAPHIC LOG	DEPTH (m)	CONSISTENCY	SHEAR STRENGTH (kPa)	MOISTURE CONDITION	GROUNDWATER	COMMENTS
	dark brown, Topsoil, rootlets		0.0	VSt		D/M		
	moderately plastic, brown, SILT with some clay							
	becoming light brown		0.5		V162/R94			
	orange and light grey streaks					M		
			1.0		V150/R87			
	moderately plastic, orange/light grey, Clayey SILT							
			1.5		V119/R66			
			2.0		V119/R72			
	E.O.B. @ 2.0m		2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

LOG OF BOREHOLE NO: 3

50mm DIAMETER HAND AUGER

Hutchinson CONSULTING ENGINEERS

JOB No: 18200
DATE: 17/11/15
TESTED BY: RC
SHEAR VANE No: 4770
(SHEAR VANE TESTING BASED ON BS1377)

CLIENT: CABRA DEVELOPMENTS LTD
LOCATION: LOT 25 MATUA RESIDENTIAL ESTATE, MATUA ROAD, HUAPAI

GEOLOGICAL UNIT	SOIL DESCRIPTION	GRAPHIC LOG	DEPTH (m)	CONSISTENCY	SHEAR STRENGTH (kPa)	MOISTURE CONDITION	GROUNDWATER	COMMENTS
	dark brown, Topsoil, rootlets			VSt		M		
	moderately plastic, grey with orange staining, CLAY with some silt		0.5		V131/R78			
	moderately plastic, light brownish grey, Silty CLAY		1.0		V109/R66			
			1.5		V109/R75			
	some pinkish streaks							
	E.O.B. @ 2.0m		2.0		V125/R89			
			2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

LOG OF BOREHOLE NO: 4

50mm DIAMETER HAND AUGER

Hutchinson CONSULTING ENGINEERS

JOB No: 18200
DATE: 17/11/15
TESTED BY: AS
SHEAR VANE No: 4770
(SHEAR VANE TESTING BASED ON BS1377)

CLIENT: CABRA DEVELOPMENTS LTD
LOCATION: LOT 14 MATUA RESIDENTIAL ESTATE, MATUA ROAD, HUAPAI

GEOLOGICAL UNIT	SOIL DESCRIPTION	GRAPHIC LOG	DEPTH (m)	CONSISTENCY	SHEAR STRENGTH (kPa)	MOISTURE CONDITION	GROUNDWATER	COMMENTS
	dark brown, Topsoil, rootlets			VSt		D/M		
	moderately plastic, grey with orange mottles, Clayey SILT		0.5		V162/R97	M		
	becoming highly plastic, grey		1.0		V156/R97			
			1.5		V153/R100			
	E.O.B. @ 2.0m		2.0		V131/R78			
			2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

LOG OF BOREHOLE NO: 5

50mm DIAMETER HAND AUGER

Hutchinson CONSULTING ENGINEERS

JOB No: 18200
DATE: 4/12/15
TESTED BY: ND/JC
SHEAR VANE No: 1270
(SHEAR VANE TESTING BASED ON BS1377)

CLIENT: CABRA DEVELOPMENTS LTD
LOCATION: LOT 18 MATUA RESIDENTIAL ESTATE, MATUA ROAD, HUAPAI

GEOLOGICAL UNIT	SOIL DESCRIPTION	GRAPHIC LOG	DEPTH (m)	CONSISTENCY	SHEAR STRENGTH (kPa)	MOISTURE CONDITION	GROUNDWATER	COMMENTS
	dark brown, Topsoil, rootlets			VSt		D/M		
	moderately to highly plastic, greyish brown, Clayey SILT		0.5		V190/R53			
			1.0		V144/R27	M		
	highly plastic, greyish brown, Silty CLAY		1.5		V124/R23			
	highly plastic, bluish grey, CLAY		2.0		V126/R21			
			2.5	St	V80/R22			
			3.0		V84/R47			
	E.O.B. @ 3.5m		3.5	VSt	V128/R106			
			4.0					
			4.5					
			5.0					

LOG OF BOREHOLE NO: 6

50mm DIAMETER HAND AUGER

Hutchinson CONSULTING ENGINEERS

JOB No: 18200
DATE: 17/11/15
TESTED BY: RC
SHEAR VANE No: 1270
(SHEAR VANE TESTING BASED ON BS1377)

CLIENT: CABRA DEVELOPMENTS LTD
LOCATION: LOT 16 MATUA RESIDENTIAL ESTATE, MATUA ROAD, HUAPAI

GEOLOGICAL UNIT	SOIL DESCRIPTION	GRAPHIC LOG	DEPTH (m)	CONSISTENCY	SHEAR STRENGTH (kPa)	MOISTURE CONDITION	GROUNDWATER	COMMENTS
	dark brown, Topsoil, rootlets			VSt		D/M		
	moderately plastic, orange brown, Clayey SILT		0.5		V186/R79			
			1.0		V146/R39	M		
	colour change to light grey/light brown		1.5	H	V217+			
	E.O.B. @ 2.0m		2.0	VSt	V109/R73			
			2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

LOG OF BOREHOLE NO: 7

50mm DIAMETER HAND AUGER

Hutchinson CONSULTING ENGINEERS

JOB No: 18200
DATE: 19/11/15
TESTED BY: AS
SHEAR VANE No: 4770
(SHEAR VANE TESTING BASED ON BS1377)

CLIENT: CABRA DEVELOPMENTS LTD
LOCATION: LOT 1 MATUA RESIDENTIAL ESTATE, MATUA ROAD, HUAPAI

GEOLOGICAL UNIT	SOIL DESCRIPTION	GRAPHIC LOG	DEPTH (m)	CONSISTENCY	SHEAR STRENGTH (kPa)	MOISTURE CONDITION	GROUNDWATER	COMMENTS
ENGINEERED EARTHFILL	dark brown, Topsoil, rootlets			H		D/M		
	moderately plastic, orange brown with grey mottles, Clayey SILT		0.5		V203+			
			1.0	VSt	V184/R75	M		
	moderately plastic, dark grey with orange staining, Silty CLAY		1.5	H	V200/R100			
	light grey becoming highly plastic							
	E.O.B. @ 2.0m		2.0	VSt	V187/R91			
			2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

LOG OF BOREHOLE NO: 8

50mm DIAMETER HAND AUGER

Hutchinson CONSULTING ENGINEERS

JOB No: 18200
DATE: 17/11/15
TESTED BY: RC
SHEAR VANE No: 1270
(SHEAR VANE TESTING BASED ON BS1377)

CLIENT: CABRA DEVELOPMENTS LTD
LOCATION: LOT 9 MATUA RESIDENTIAL ESTATE, MATUA ROAD, HUAPAI

GEOLOGICAL UNIT	SOIL DESCRIPTION	GRAPHIC LOG	DEPTH (m)	CONSISTENCY	SHEAR STRENGTH (kPa)	MOISTURE CONDITION	GROUNDWATER	COMMENTS
ENGINEERED EARTHFILL	dark brown, Topsoil, rootlets		0.0	H		D/M		
	moderately plastic, whitish grey with orange brown and dark brown inclusions, Silty CLAY with trace fine sand		0.5		V217+			
	colour change to orange brown/ dark brown		1.0		V217+			
			1.5		V217+			
	E.O.B. @ 2.0m		2.0		UTP			
			2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

LOG OF BOREHOLE NO: 9

50mm DIAMETER HAND AUGER

Hutchinson CONSULTING ENGINEERS

JOB No: 18200
DATE: 19/11/15
TESTED BY: AS
SHEAR VANE No: 4770
(SHEAR VANE TESTING BASED ON BS1377)

CLIENT: CABRA DEVELOPMENTS LTD
LOCATION: LOT 3 MATUA RESIDENTIAL ESTATE, MATUA ROAD, HUAPAI

GEOLOGICAL UNIT	SOIL DESCRIPTION	GRAPHIC LOG	DEPTH (m)	CONSISTENCY	SHEAR STRENGTH (kPa)	MOISTURE CONDITION	GROUNDWATER	COMMENTS
ENGINEERED EARTHFILL	dark brown, Topsoil, rootlets			H		D/M		
	moderately plastic, light brown/orange brown with grey mottles, Clayey SILT		0.5		V203+			
	dark brown and orange inclusions		1.0		V203+			
			1.5		V203+	M		
			2.0		V203+			
	E.O.B. @ 2.0m		2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

LOG OF BOREHOLE NO: 10

50mm DIAMETER HAND AUGER

Hutchinson CONSULTING ENGINEERS

JOB No: 18200
DATE: 17/11/15
TESTED BY: RC
SHEAR VANE No: 1270
(SHEAR VANE TESTING BASED ON BS1377)

CLIENT: CABRA DEVELOPMENTS LTD
LOCATION: LOT 7 MATUA RESIDENTIAL ESTATE, MATUA ROAD, HUAPAI

GEOLOGICAL UNIT	SOIL DESCRIPTION	GRAPHIC LOG	DEPTH (m)	CONSISTENCY	SHEAR STRENGTH (kPa)	MOISTURE CONDITION	GROUNDWATER	COMMENTS
ENGINEERED EARTHFILL	dark brown, Topsoil, rootlets			St		D/M		
	moderately plastic, orange brown with dark brown inclusions and grey streaks, Silty CLAY		0.5		V85/R47			
						M		
			1.0	H	V217+			
			1.5		V217+			
			2.0		V217+			
	E.O.B. @ 2.0m		2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

LOG OF BOREHOLE NO: 11

50mm DIAMETER HAND AUGER

Hutchinson CONSULTING ENGINEERS

JOB No: 18200
DATE: 19/11/15
TESTED BY: AS
SHEAR VANE No: 4770
(SHEAR VANE TESTING BASED ON BS1377)

CLIENT: CABRA DEVELOPMENTS LTD
LOCATION: LOT 5 MATUA RESIDENTIAL ESTATE, MATUA ROAD, HUAPAI

GEOLOGICAL UNIT	SOIL DESCRIPTION	GRAPHIC LOG	DEPTH (m)	CONSISTENCY	SHEAR STRENGTH (kPa)	MOISTURE CONDITION	GROUNDWATER	COMMENTS
ENGINEERED EARTHFILL	dark brown, Topsoil, rootlets		0.0	H		D/M		
	moderately plastic, brown with orange and light grey inclusions, Clayey SILT		0.5		V203+			
						M		
			1.0		V203+			
	orange brown and dark brown mottles		1.5	VSt	V156/R81			
			2.0	H	V203+			
	E.O.B. @ 2.0m		2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

LOG OF BOREHOLE NO: 12

50mm DIAMETER HAND AUGER

Hutchinson CONSULTING ENGINEERS

JOB No: 18200
DATE: 17/11/15
TESTED BY: RC
SHEAR VANE No: 1270
(SHEAR VANE TESTING BASED ON BS1377)

CLIENT: CABRA DEVELOPMENTS LTD
LOCATION: LOT 6 MATUA RESIDENTIAL ESTATE, MATUA ROAD, HUAPAI

GEOLOGICAL UNIT	SOIL DESCRIPTION	GRAPHIC LOG	DEPTH (m)	CONSISTENCY	SHEAR STRENGTH (kPa)	MOISTURE CONDITION	GROUNDWATER	COMMENTS
ENGINEERED EARTHFILL	dark brown, Topsoil, rootlets			VSt		D/M		
	moderately plastic, light brown with orange brown and grey inclusions		0.5		V122/R45			
			1.0		V165/R39			
						M		
			1.5	H	V203+			
	E.O.B. @ 2.0m		2.0		V203+			
			2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

LOG OF BOREHOLE NO: 13

50mm DIAMETER HAND AUGER

Hutchinson CONSULTING ENGINEERS

JOB No: 18200
DATE: 24/11/15
TESTED BY: RC
SHEAR VANE No: 4770
(SHEAR VANE TESTING BASED ON BS1377)

CLIENT: CABRA DEVELOPMENTS LTD
LOCATION: LOT 17 MATUA RESIDENTIAL ESTATE, MATUA ROAD, HUAPAI

GEOLOGICAL UNIT	SOIL DESCRIPTION	GRAPHIC LOG	DEPTH (m)	CONSISTENCY	SHEAR STRENGTH (kPa)	MOISTURE CONDITION	GROUNDWATER	COMMENTS
	dark brown, Topsoil, rootlets			H		D/M		
	moderately plastic, orange brown, Clayey SILT		0.5		V203+			
	colour change to dark brown		1.0		V203+	M		
	moderately to highly plastic, light grey, Silty CLAY		1.5	VSt	V108/R31			
			2.0	St	V91/R67			
	moderately to highly plastic, bluish grey, CLAY with some silt		2.5		V97/R58			
	E.O.B. @ 3.0m		3.0		V95/R73			
			3.5					
			4.0					
			4.5					
			5.0					

LOG OF BOREHOLE NO: 14

50mm DIAMETER HAND AUGER

Hutchinson CONSULTING ENGINEERS

JOB No: 18200
DATE: 24/11/15
TESTED BY: AS
SHEAR VANE No: 1270
(SHEAR VANE TESTING BASED ON BS1377)

CLIENT: CABRA DEVELOPMENTS LTD
LOCATION: LOT 19 MATUA RESIDENTIAL ESTATE, MATUA ROAD, HUAPAI

GEOLOGICAL UNIT	SOIL DESCRIPTION	GRAPHIC LOG	DEPTH (m)	CONSISTENCY	SHEAR STRENGTH (kPa)	MOISTURE CONDITION	GROUNDWATER	COMMENTS
	dark brown, Topsoil, rootlets							
	moderately plastic, greyish brown, Clayey SILT		0.5	VSt	V133/R47	D/M		
	moderately plastic, bluish grey, CLAY with some silt		1.0		V138/R83	M		
			1.5		V121/R69			
	moderately plastic, bluish grey, Silty CLAY		2.0	St	V86/R55			
			2.5		V80/R52			
	E.O.B. @ 3.0m		3.0		V78/R43			
			3.5					
			4.0					
			4.5					
			5.0					

LOG OF BOREHOLE NO: 15

50mm DIAMETER HAND AUGER

Hutchinson CONSULTING ENGINEERS

JOB No: 18200
DATE: 24/11/15
TESTED BY: AS
SHEAR VANE No: 1270
(SHEAR VANE TESTING BASED ON BS1377)

CLIENT: CABRA DEVELOPMENTS LTD
LOCATION: LOT 22 MATUA RESIDENTIAL ESTATE, MATUA ROAD, HUAPAI

GEOLOGICAL UNIT	SOIL DESCRIPTION	GRAPHIC LOG	DEPTH (m)	CONSISTENCY	SHEAR STRENGTH (kPa)	MOISTURE CONDITION	GROUNDWATER	COMMENTS
	dark brown, Topsoil, rootlets			VSt		D/M		
	moderately plastic, grey with orange staining, Silty CLAY		0.5		V124/R65	M		
			1.0		V109/R62			
			1.5	St	V78/R47			
	highly plastic, bluish grey, CLAY with some silt		2.0		V74/R40			
			2.5		V74/R40	M/W		
	E.O.B. @ 3.0m		3.0		V90/R47			
			3.5					
			4.0					
			4.5					
			5.0					

LOG OF BOREHOLE NO: 16

50mm DIAMETER HAND AUGER

Hutchinson CONSULTING ENGINEERS

JOB No: 18200
DATE: 24/11/15
TESTED BY: RC
SHEAR VANE No: 4770
(SHEAR VANE TESTING BASED ON BS1377)

CLIENT: CABRA DEVELOPMENTS LTD
LOCATION: LOT 15 MATUA RESIDENTIAL ESTATE, MATUA ROAD, HUAPAI

GEOLOGICAL UNIT	SOIL DESCRIPTION	GRAPHIC LOG	DEPTH (m)	CONSISTENCY	SHEAR STRENGTH (kPa)	MOISTURE CONDITION	GROUNDWATER	COMMENTS
	dark brown, Topsoil, rootlets			VSt		D/M		
	moderately plastic, light grey with orange staining, Silty CLAY		0.5		V159/R64			
			1.0		V145/R78	M		
	moderately plastic, bluish grey, CLAY with minor silt		1.5		V128/R75			
	E.O.B. @ 2.0m		2.0		V109/R67			
			2.5					
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

LOG OF BOREHOLE NO: 17

50mm DIAMETER HAND AUGER

Hutchinson CONSULTING ENGINEERS

JOB No: 18200
DATE: 24/11/15
TESTED BY: AS
SHEAR VANE No: 1270
(SHEAR VANE TESTING BASED ON BS1377)

CLIENT: CABRA DEVELOPMENTS LTD
LOCATION: LOT 20 MATUA RESIDENTIAL ESTATE, MATUA ROAD, HUAPAI

GEOLOGICAL UNIT	SOIL DESCRIPTION	GRAPHIC LOG	DEPTH (m)	CONSISTENCY	SHEAR STRENGTH (kPa)	MOISTURE CONDITION	GROUNDWATER	COMMENTS
	dark brown, Topsoil, rootlets			VSt		D/M		
	moderately plastic, brownish grey, Clayey SILT		0.5		V174/R68			
	moderately plastic, grey, Silty CLAY		1.0		V136/R71	M		
			1.5	St	V96/R53			
	colour change to bluish grey, becoming highly plastic		2.0		V93/R50			
			2.5	VSt	V109/R37			
	E.O.B. @ 3.0m		3.0		V127/R28			
			3.5					
			4.0					
			4.5					
			5.0					

LOG OF BOREHOLE NO: 18

50mm DIAMETER HAND AUGER

Hutchinson CONSULTING ENGINEERS

JOB No: 18200
DATE: 24/11/15
TESTED BY: RC
SHEAR VANE No: 4770
(SHEAR VANE TESTING BASED ON BS1377)

CLIENT: CABRA DEVELOPMENTS LTD
LOCATION: LOT 21 MATUA RESIDENTIAL ESTATE, MATUA ROAD, HUAPAI

GEOLOGICAL UNIT	SOIL DESCRIPTION	GRAPHIC LOG	DEPTH (m)	CONSISTENCY	SHEAR STRENGTH (kPa)	MOISTURE CONDITION	GROUNDWATER	COMMENTS
	dark brown, Topsoil, rootlets			VSt		D/M		
	moderately plastic, brownish grey, Silty CLAY		0.5		V172/R87			
	colour change to light grey		1.0		V111/R67	M		
			1.5		V101/R58			
	moderately plastic, bluish grey, Clayey SILT		2.0	St	V78/R42			
	E.O.B. @ 2.5m		2.5	VSt	V120/R53			
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

LOG OF BOREHOLE NO: 18

50mm DIAMETER HAND AUGER

Hutchinson CONSULTING ENGINEERS

JOB No: 18200
DATE: 24/11/15
TESTED BY: RC
SHEAR VANE No: 4770
(SHEAR VANE TESTING BASED ON BS1377)

CLIENT: CABRA DEVELOPMENTS LTD
LOCATION: LOT 21 MATUA RESIDENTIAL ESTATE, MATUA ROAD, HUAPAI

GEOLOGICAL UNIT	SOIL DESCRIPTION	GRAPHIC LOG	DEPTH (m)	CONSISTENCY	SHEAR STRENGTH (kPa)	MOISTURE CONDITION	GROUNDWATER	COMMENTS
	dark brown, Topsoil, rootlets			VSt		D/M		
	moderately plastic, brownish grey, Silty CLAY		0.5		V172/R87			
	colour change to light grey		1.0		V111/R67	M		
			1.5		V101/R58			
	moderately plastic, bluish grey, Clayey SILT		2.0	St	V78/R42			
	E.O.B. @ 2.5m		2.5	VSt	V120/R53			
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					

LOG OF BOREHOLE NO: 18

50mm DIAMETER HAND AUGER

Hutchinson CONSULTING ENGINEERS

JOB No: 18200
DATE: 24/11/15
TESTED BY: RC
SHEAR VANE No: 4770
(SHEAR VANE TESTING BASED ON BS1377)

CLIENT: CABRA DEVELOPMENTS LTD
LOCATION: LOT 21 MATUA RESIDENTIAL ESTATE, MATUA ROAD, HUAPAI

GEOLOGICAL UNIT	SOIL DESCRIPTION	GRAPHIC LOG	DEPTH (m)	CONSISTENCY	SHEAR STRENGTH (kPa)	MOISTURE CONDITION	GROUNDWATER	COMMENTS
	dark brown, Topsoil, rootlets			VSt		D/M		
	moderately plastic, brownish grey, Silty CLAY		0.5		V172/R87			
	colour change to light grey		1.0		V111/R67	M		
			1.5		V101/R58			
	moderately plastic, bluish grey, Clayey SILT		2.0	St	V78/R42			
	E.O.B. @ 2.5m		2.5	VSt	V120/R53			
			3.0					
			3.5					
			4.0					
			4.5					
			5.0					