Geotechnical Completion Report

Falcons Lochhead Subdivision, 39 Braithwaite Drive, Rolleston

Issue Date: **11 December 2023**

Miyamoto Ref: **2003575-RP-001[A]**

Prepared for: **GW Wilfield Ltd**

miyamoto.

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Report Tracking – Falcons Lochhead Subdivision, 39 Braithwaite Drive, Rolleston

Revision	Status	Date	Prepared by	Reviewed by
A	Final	11 December 2023	Joseph Byron-Joyce	Charles McDermott

Authorisation

Author's Signature		**Reviewer's Signature**	
Name	Joseph Byron-Joyce	**Name**	Charles McDermott
Title	Senior Engineering Geologist BSc (Geology) MEngNZ	**Title**	Technical Director (Geotechnics) BEng(Hons) CMEngNZ CPEng IntPE(NZ)

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1. Introduction and Scope

Miyamoto International NZ Ltd (Miyamoto) has been engaged by GW Wilfield Ltd (the Client) to provide geotechnical engineering services related to the earthworks and building platform preparation for 43 residential lots as part of the Falcons Lochhead Subdivision at 39 Braithwaite Drive, Rolleston.

A geotechnical assessment for the wider 'Falcons Landing' subdivision has previously been undertaken by Aurecon which is detailed in their 'Falcons Landing Geotechnical Subdivision Report', dated 16 February 2017.

The purpose of this Geotechnical Completion Report (GCR) is to confirm the suitability of the earthworks and building platforms for building construction. The GCR is also required in order to comply with the Selwyn District Council (SDC) resource consent conditions (refer to Section 3.1 of this Report) and may be used in support of subsequent building consent applications for the individual lots at the SDC.

The following works have been conducted as per the agreed scope of works:

- Construction monitoring during the earthworks:
  - Fill suitability assessment including review of the laboratory testing undertaken for the fill material.
  - Visual inspections and advising the contractor regarding specification compliance.
  - Review of fill compaction verification testing.
- Assessment and reporting included in this Geotechnical Completion Report (GCR).
- Provision of certification documentation including:
  - NZS4404:2010 'Schedule 2A: Statement of professional opinion on suitability of land for building construction'.
  - NZS4431:2022 'Appendix D: Statement of suitability of engineered fill for lightweight structures'.

The subdivision civil design, supervision, and overall management has been completed by Capture Land Development Consultants (Capture), with Paul Smith Earthmoving Limited (Paul Smith) acting as the main civil contractor completing the civil works.

2. Site Description

The site, legally described as Lot 15 DP 509805 (as contained in Record of Title 778868) and Lot 450 DP 566745 (as contained in Record of Title 1019420), is approximately 2.7 ha in area and is located to the south of Braithwaite Drive, ~2.5 km south of State Highway 1.

The site is generally flat and prior to development comprised grassed paddocks with a single dwelling which has since been demolished.

The typical soil profile at the site is shown in Table 1.

Table 1: Typical soil profile

Layer	Typical thickness (m)	Soil Description
Tp	0.3	Topsoil, SILT, brown, with rootlets.
ML	0.2 to 1.1	SILT and Sandy SILT, low plasticity, pale brown, very stiff to hard.
GW	>10.0	Sandy GRAVEL, fine to coarse grained, grey, sub-rounded to rounded.

The site location including the subdivision layout is presented in Figure 1.

Figure 1: Site location and layout (BASE co, 13/04/23)

3. Earthworks

3.1 SDC Resource Consent Conditions

The resource consent conditions provided by the SDC (approval date 5 April 2023) are detailed within RC235028 and RC2235029. This GCR is provided to satisfy conditions 41 of RC235028 and conditions 4 and 5 of RC235029, as detailed below.

RC235028

Site stability and site works

41. At the completion of all earthworks Certificates satisfying the conditions of New Zealand Standard (NZS) 4431:2022 – Engineered fill construction for lightweight structures, are to be provided to the Selwyn District Council. These certificates will detail the extent and nature of all earthworks undertaken.

RC235029

Construction Standards

4. The Consent Holder shall confirm whether any earth fill has been placed on site. All earthworks completed on site are to be carried out in accordance with New Zealand Standard (NZS) 4431:2022 – Engineered fill construction for lightweight structures.

5. At the completion of all earthworks Certificates satisfying the conditions of New Zealand Standard (NZS) 4431:2022 – Engineered fill construction for lightweight structures, are to be provided to the Selwyn District Council. These certificates will detail the extent and nature of all earthworks undertaken.

3.2 General

The earthworks design for the subdivision was completed by Capture Land Development Consultants (Capture) and was designed to raise / lower the grade to appropriate levels for the residential lots and create appropriate fall for drainage. The earthworks plan and as-built levels are included in Appendix A.

The earthworks were caried out between June and October 2023 by Paul Smith Earthmoving Limited (Paul Smith), with Miyamoto, Capture, the SDC, and GW Wilfield Ltd completing regular site visits to observe earthworks and civil works at the site.

The initial design completed by Base co (Capture) included 1,468 m^3 of cut to fill and 1,948 m^3 of imported fill material. Additional importation of material was required for construction of roading, service trenches, and soakage pits.

Earthworks were carried in general accordance with the following New Zealand Standards:

- NZS4431:2022 - Engineered fill construction for lightweight structures.
- NZS4404:2010 - Land Development and Subdivision Infrastructure.

3.3 Cutting and Topsoil Stripping

All residential lots required cutting and / or filling to achieve the desired grade, this necessitated topsoil to be stripped and stockpiled for future spreading. Miyamoto completed visual inspection of topsoil removal during regular site visits and through examination of contractor provided photographs.

Following excavation of topsoil, excavated material typically comprised natural silt and sandy silt which was used as site won engineered fill (refer to Section 3.4 of this Report).

Across the subdivision there was minimal cutting to waste (off-site disposal) of soils, on net there was a requirement for importation of fill material. Any unsuitable material for engineered filling was either incorporated in the topsoil or disposed of offsite.

3.4 Filling

Engineered fill for the residential lots compromised a combination of site won silt and sandy silt (sourced from spoil created from the ‘cut’ lots, services and roading alignments), and imported material.

The site won and imported fill material was sampled and tested at a laboratory for Particle Size Distribution (PSD), and determination of the dry density / water content relationship and assessed to be suitable for use as engineered fill (refer to Appendix B for laboratory test certificates).

The fine-grained site won and imported fill was placed and compacted with a sheep's foot roller, with an additional final pass completed with a flat drum roller. Imported granular material comprising gravelly sand was compacted with a vibratory roller.

Nuclear Densometer (NDM) testing of the placed and compacted fill material was completed by Paul Smith to verify adequate compaction was achieved. Typically, a minimum of two NDM tests were completed per lot per 250 mm of filling with additional testing completed where fill thickness exceeded 250 mm. The results of the NDM testing are included in Appendix C.

3.5 Earthworks Summary

A summary of the cut / fill earthworks and distribution across the site are shown in Table 2 and the as-built levels are provided in Appendix A.

Table 2: Earthworks summary

Lot number	Cut / Fill	Fill Source	Fill Type
1, 27, 28, 29, 30, 31, 32, 33	Fill	Site won	SILT / Sandy SILT
2, 3, 21, 22, 23, 26 (First lift)	Fill	Site won	SILT/ Sandy SILT
2, 3, 21, 22, 23, 26 (Second lift)	Fill	Winstone Quarry	Granular (Gravelly SAND)
4, 5, 6, 11, 12, 18, 19, 20, 24, 25, 33, 34, 35, 36, 37, 38, 39	Fill	Ravenswood Subdivision	SILT / Sandy SILT
7, 8, 9, 10, 13, 17	Cut and Fill	Ravenswood Subdivision	SILT / Sandy SILT
14, 15, 16, 40, 41, 42, 43	Cut	N/A	N/A

3.6 Certification

Based on site observations, laboratory testing and in-situ testing of placed and compacted material, in combination with earthworks planning, design, and construction being completed by experienced developers, engineers and contactors, it is our professional opinion that the earthworks for the residential lots have been completed to a suitable standard for residential development.

The following two documents are appended to this GCR (refer Appendix D and E):

- NZS4404:2010 - 'Schedule 2A: Statement of professional opinion on suitability of land for building construction'.
- NZS4431:2022 - 'Appendix D: Statement of suitability of engineered fill for lightweight structures'.

4. Building Development Design Considerations

4.1 Foundation Suitability

All residential lots within the 43-lot subdivision are considered to have a low liquefaction vulnerability with future seismic performance expected to be equivalent to MBIE Technical Category (TC) 1 as per the MBIE Guidance (2012).

As such, and with consideration of the assessment herein, foundations in accordance with MBIE (2012) TC1 are considered suitable for NZS3604:2011 compliant buildings, notably this includes NZS3604:2011 foundations and 'waffle slab' foundations.

4.2 Bearing Capacity and Other Considerations

The ground conditions across the site within the residential lots will typically comprise topsoil of varying thickness (0.3 to 0.4 m typically) overlying engineered and natural silt and sandy silt soils. In some locations sandy gravel may be encountered beneath topsoil.

Site specific testing should be completed to verify the available Geotechnical Ultimate Bearing Capacity (GUBC) of the soils underlying topsoil.

Preliminarily, assuming conventional residential foundations comprising 'NZS 3604 type' slab on grade with thickened edge beams, shallow timber piles of 0.45 m diameter, or waffle slab foundations with 0.3 m wide footings, foundation designers may assume 200 kPa GUBC beneath topsoil within the SILT and Sandy SILT soils at a minimum of 0.4 mbgl, however, this will need to be verified prior to construction.

Foundation designers should consider the effects of the interface between filled and non-filled ground on the performance of the structure.

4.3 Additional Considerations

A geotechnical plan review of proposed residential developments and the foundation design is recommended and considered best practice to ensure the recommendations of this report have been taken into consideration.

Construction monitoring of foundation excavations is recommended to ensure ground conditions encountered are as expected.

5. Limitations

This report is subject to the following limitations:

- This report has been prepared by Miyamoto for the Client for the purpose/s agreed with the Client (Purpose). Miyamoto accepts no responsibility for the validity, appropriateness, sufficiency or consequences of the Client using the report for purposes other than for the Purpose.
- This report is not intended for general publication or circulation. This report is not to be reproduced by the Client except in relation to the Purpose, without Miyamoto's prior written permission. Miyamoto disclaims all risk and all responsibility to any third party.
- This report is provided based on the various assumptions contained in the report.
- Miyamoto's professional services are performed using a degree of care and skill reasonably exercised by reputable consultants providing the same or similar services as at the date of this report.
- The Client is responsible for ensuring that the design of any foundations ensures the functionality of the building under SLS level loads.
- The sub surface information has been obtained from investigation carried out at discrete locations, which by their nature only provide information about a relatively small volume of subsoils. While Miyamoto has taken reasonable skill and care in carrying out the investigation to determine the subsoil condition, the subsoil condition could differ substantially from the results of any sampling investigation. Miyamoto is not responsible for and does not accept any liability in respect of any difference between the actual subsoil conditions and the results of our investigation.
- Where the Client provides information to Miyamoto, including design calculations and drawings of the as-built structure, or where the report indicates that we have obtained and/or relied upon information provided from a third party, Miyamoto has not made any independent verification of this information except as expressly stated in the report. Miyamoto assumes no responsibility for any inaccuracies in, or omissions to, that information.
- A change in circumstances, facts, information after the report has been provided may affect the adequacy or accuracy of the report. Miyamoto is not responsible for the adequacy or accuracy of the report as a result of any such changes.

References

Ministry of Business, Innovation, and Employment, 2012. *Repairing and rebuilding houses affected by the Canterbury earthquakes.*

New Zealand Standard NZS3604:2011. Timber-framed buildings.

New Zealand Standard NZS4404:2010. Land Development and Subdivision Infrastructure.

New Zealand Standard NZS4431:2022. Engineered fill construction for lightweight structures.

Appendix A: Earthworks Plan and As-built Levels

LEGEND:

- 40.47 — MAJOR CONTOUR (0.5m)
- - - - - MINOR CONTOUR (0.1m)
- 40.47 FINISHED LEVEL

NOTES:

1. CONTOURS SHOWN ON THIS PLAN DEPICT THE FINISHED TOPSOIL LEVELS OVER THE SITE.
2. ASBUILT INFORMATION WAS COLLECTED AND SUPPLIED BY PAUL SMITH EARTHMOVING LTD.

ORIGIN OF LEVELS:	BURNHAM NO 2 (1127)
REDUCED LEVEL:	69.5942m
DATUM:	LVD 1937 (DEC 13)

REV	DATE	REVISION DETAILS	ISSUED
A	27/11/23	FOR INFORMATION	DG

CAPTURE Land Development Consultants

CLIENT
YOURSECTION FV LTD

PROJECT
LOCHHEAD

DRAWING TITLE
ASBUILT PLAN
EARTHWORKS FINISHED LEVELS AND CONTOURS

STATUS	SCALE	SIZE
FOR INFORMATION	1:750	A3

PROJECT	DRAWING NO	REVISION
1042	AB-01	A

LEGEND:

-0.20 CUT CONTOUR (0.1m)

ZERO CONTOUR

0.30 FILL CONTOUR (0.1m)

NOTES:

1. CONTOURS SHOWN ON THIS PLAN DEPICT THE DEPTH OF CUT OR FILL BETWEEN THE ORIGINAL SURFACE STRIPPED OF TOPSOIL AND ANY UNDERCUT AREAS, VERSUS THE FINAL SURFACE PRIOR TO TOPSOIL BEING RESPREAD.

2. ASBUILT INFORMATION WAS COLLECTED AND SUPPLIED BY PAUL SMITH EARTHMOVING LTD.

ORIGIN OF LEVELS:	BURNHAM NO 2 (1127)
REDUCED LEVEL:	69.5942m
DATUM:	LVD 1937 (DEC 13)

REV	DATE	REVISION DETAILS	ISSUED
A	27/11/23	FOR INFORMATION	DG

CAPTURE Land Development Consultants

CLIENT

YOURSECTION FV LTD

PROJECT

LOCHHEAD

DRAWING TITLE

ASBUILT PLAN
EARTHWORKS CUT/FILL CONTOURS

STATUS	*SCALE*	*SIZE*
FOR INFORMATION	1:750	A3

PROJECT	*DRAWING NO*	*REVISION*
1042	AB-02	A

c:\users\dangowan\capturelandclients - documents\yoursection ltd\1042 lochhead\cad\civil\asbuilts\1042 ab-01-02 earthworks asbuilt plan rev a

Appendix B: Laboratory Test Certificates

ISAAC CONSTRUCTION LTD - LABORATORY
552 McLeans Island Road, Harewood, Christchurch 8543
Phone: (03) 360 2477 Email: info@isaac.co.nz

DRY DENSITY/ WATER CONTENT RELATIONSHIP
STANDARD COMPACTION

SAMPLE DETAILS

Test number:	**23-0762**
Date Tested:	29/05/2023 - 31/05/2023
Tested By:	P. Gooch and K. Wilkinson
Material Tested:	In situ material
Material Origin:	In situ
Sample Date:	Received 29/05/2023
Sampled By:	Client
Client Ref:	Rolleston

CLIENT:

Paul Smith Earthmoving
58 Greywacke Road
Harewood
Christchurch 8051

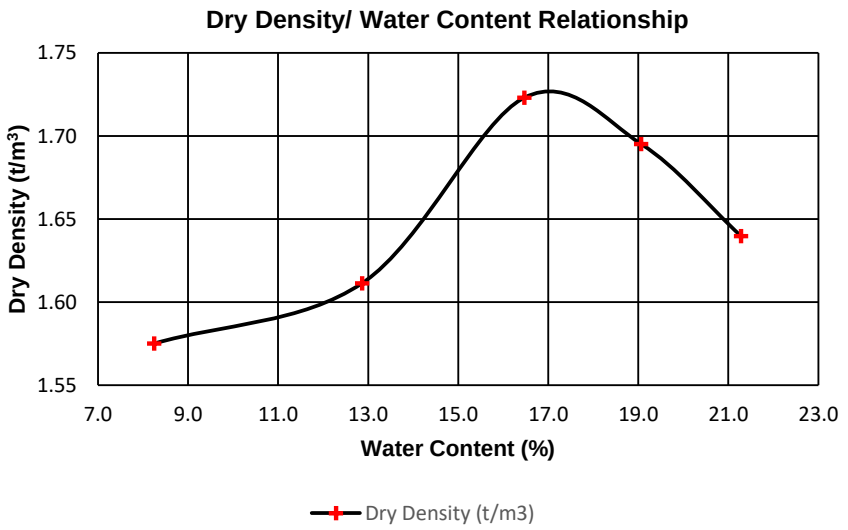
PROJECT:

Rolleston

TEST METHODS:

1. Test results relate to sample as received. Sampling not accredited.
2. Determination of the Dry Density/Water Content Relationship - New Zealand Standard compaction test NZS 4402:1986 Test 4.1.1.

TEST RESULTS:



Maximum Dry Density :	**1.72 t/m³**
Optimum Water Content:	**16 %**
Material retained:	**0 %**
(+19 mm sieve)	

ADDITIONAL INFORMATION:

1. Material received in natural state
2. Entire sample was tested
3. Compaction was performed on sample in a natural state

Test Sample	1	2	3	4	5
Water Content (%)	8.2	12.9	16.5	19.1	21.3
Dry Density (t/m³)	1.58	1.61	1.72	1.70	1.64

Approved by: K. Wilkinson
Date of Issue: 02/06/2023

All test methods reported herein (unless otherwise specified), have been performed in accordance with this laboratory's scope of accreditation.

IANZ Accreditation No. 831

COMMENTS:

ISAAC CONSTRUCTION LTD - LABORATORY
552 McLeans Island Road, Harewood, Christchurch 8543
Phone: (03) 360 2477 Email: info@isaac.co.nz

REPORT ON TESTING OF AGGREGATE FINE MATERIAL

SAMPLE DETAILS:

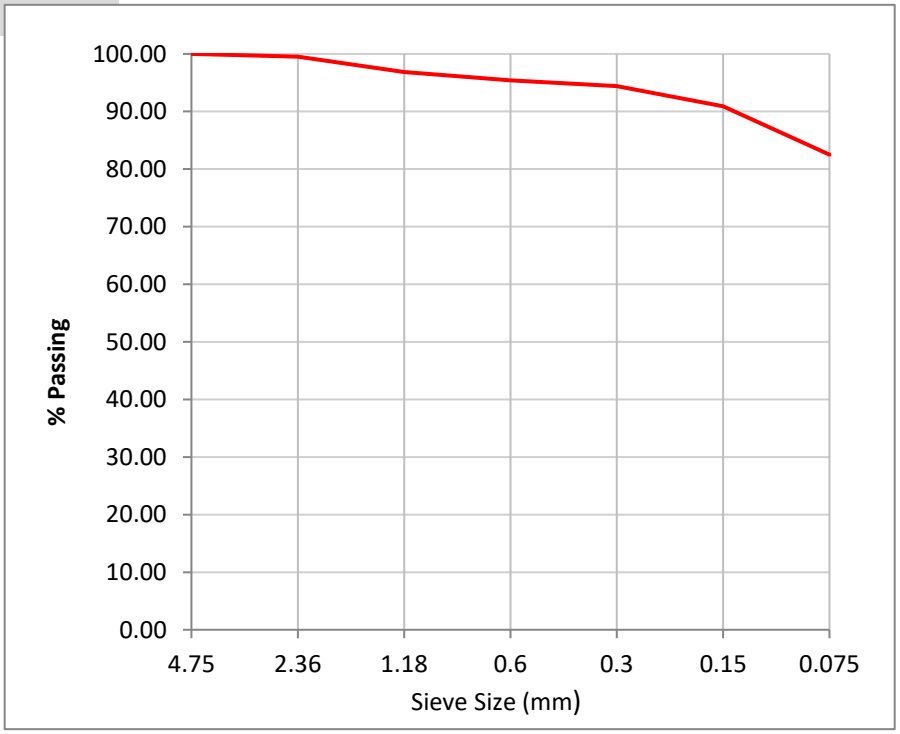
Sample ID:	**23-0813**	**Source:**	In Situ
Date Sampled:	Received 12/06/2023	**Sampled By:**	Client
Date Tested:	13/06/2023	**Tested by:**	C. Mathieson
Supplier:	Rolleston - In Situ		-
Client:	Paul Smith Earthmoving		

TEST METHODS:

1. Test results apply to sample as received. Sampling not accredited.
2. Particle size distribution - Preferred method by wet sieving NZS 4407: 2015, Test Method 3.8.1

PARTICLE SIZE DISTRIBUTION:

Sieve Size (mm)	Sample (% passing)
19.0	**100**
9.5	**100**
4.75	**100**
2.36	**100**
1.18	**97**
0.60	**95**
0.30	**94**
0.150	**91**
0.075	**83**



K Wilkinson

Approved by: K. Wilkinson
Date of Issue: 13/06/2023

ACCREDITED IANZ TESTING LABORATORY

All test methods reported herein (unless otherwise specified), have been performed in accordance with this laboratory's scope of accreditation.

IANZ Accreditation No. 831

COMMENTS:

ISAAC CONSTRUCTION LTD - LABORATORY
552 McLeans Island Road, Harewood, Christchurch 8543
Phone: (03) 360 2477 Email: info@isaac.co.nz

REPORT ON TESTING OF AGGREGATE FINE MATERIAL

SAMPLE DETAILS:

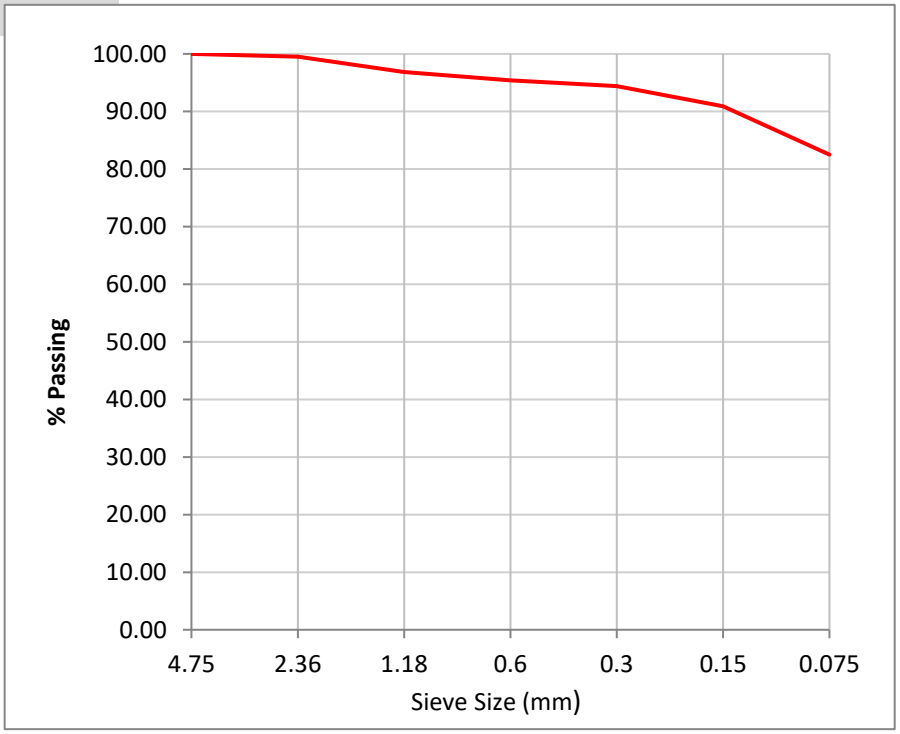
Sample ID:	**23-0813**	**Source:**	In Situ
Date Sampled:	Received 12/06/2023	**Sampled By:**	Client
Date Tested:	13/06/2023	**Tested by:**	C. Mathieson
Supplier:	Rolleston - In Situ		-
Client:	Paul Smith Earthmoving		

TEST METHODS:

1. Test results apply to sample as received. Sampling not accredited.
2. Particle size distribution - Preferred method by wet sieving NZS 4407: 2015, Test Method 3.8.1

PARTICLE SIZE DISTRIBUTION:

Sieve Size (mm)	Sample (% passing)
19.0	**100**
9.5	**100**
4.75	**100**
2.36	**100**
1.18	**97**
0.60	**95**
0.30	**94**
0.150	**91**
0.075	**83**



K Wilkinson

Approved by: K. Wilkinson
Date of Issue: 13/06/2023

ACCREDITED IANZ TESTING LABORATORY

All test methods reported herein (unless otherwise specified), have been performed in accordance with this laboratory's scope of accreditation.

IANZ Accreditation No. 831

COMMENTS:

ISAAC CONSTRUCTION LTD - LABORATORY
552 McLeans Island Road, Harewood, Christchurch 8543
Phone: (03) 360 2477 Email: info@isaac.co.nz

DRY DENSITY/ WATER CONTENT RELATIONSHIP
STANDARD COMPACTION

SAMPLE DETAILS

Test number:	**23-0833**
Date Tested:	19/06/2023 - 21/06/2023
Tested By:	N.Kaur
Material Tested:	In situ silt
Material Origin:	Rolleston - Whinestones
Sample Date:	Received 16/06/23
Sampled By:	Client
Client Ref:	Whinestones

CLIENT:

Paul Smith Earthmoving
58 Greywacke Road
Harewood
Christchurch 8051

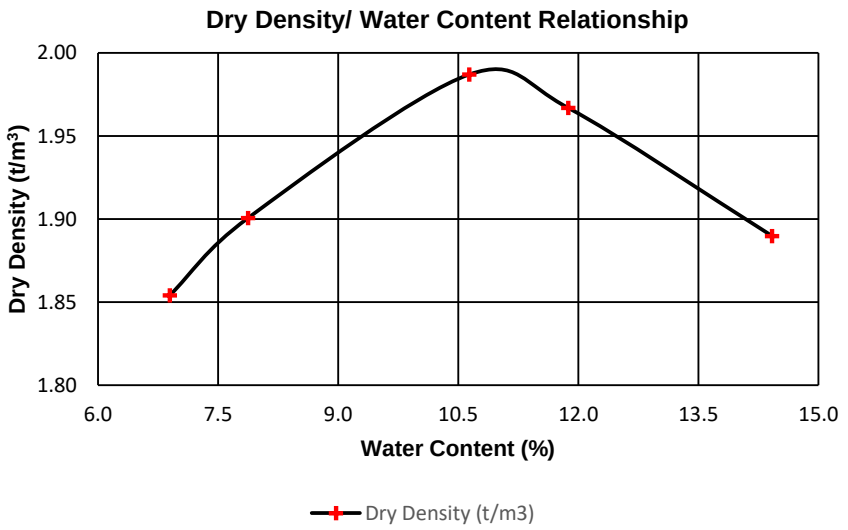
PROJECT:

Whinestones

TEST METHODS:

1. Test results relate to sample as received. Sampling not accredited.
2. Determination of the Dry Density/Water Content Relationship - New Zealand Standard compaction test NZS 4402:1986 Test 4.1.1.

TEST RESULTS:



Test Sample	1	2	3	4	5
Water Content (%)	6.9	7.9	10.6	11.9	14.4
Dry Density (t/m^3)	1.85	1.90	1.99	1.97	1.89

Maximum Dry Density :	**1.99**	**t/m^3**
Optimum Water Content:	**11**	**%**
Material retained:	**19**	**%**
(+19 mm sieve)		

ADDITIONAL INFORMATION:

1. Material received in natural state
2. Sample fraction passing the 19mm sieve was tested
3. Compaction was performed on sample in a natural state

Approved by: C. Mathieson
Date of Issue: 21/06/2023

This test report may only be reproduced in full.

All test methods reported herein (unless otherwise specified), have been performed in accordance with this laboratory's scope of accreditation.

IANZ Accreditation No. 831

COMMENTS:

ISAAC CONSTRUCTION LTD - LABORATORY
552 McLeans Island Road, Harewood, Christchurch 8543
Phone: (03) 360 2477 Email: info@isaac.co.nz

DRY DENSITY/ WATER CONTENT RELATIONSHIP
STANDARD COMPACTION

SAMPLE DETAILS

Test number:	**23-0848**
Date Tested:	22-26/06/2023
Tested By:	C. Mathieson
Material Tested:	In Situ Silt
Material Origin:	Ravenswood
Sample Date:	R. 21/06/2023
Sampled By:	Client
Client Ref:	Ravenswood

CLIENT:

Paul Smith Earthmoving
58 Greywacked Road
Harewood
Christchurch 8051

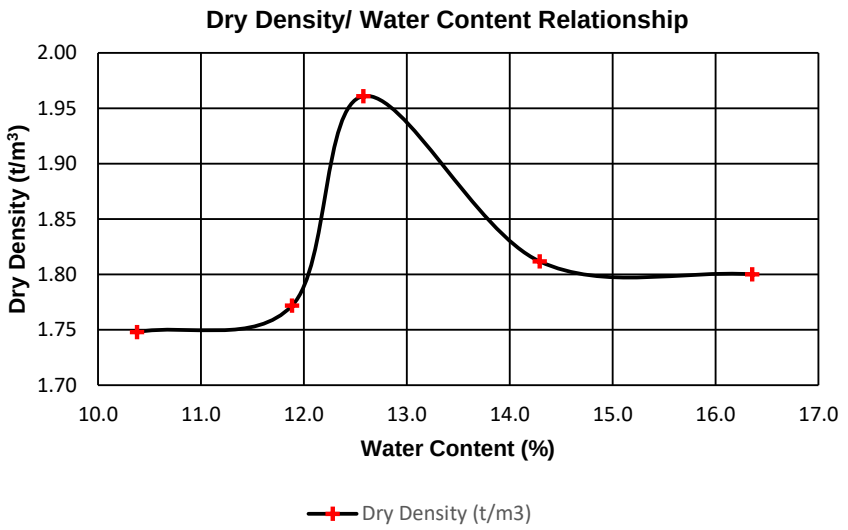
PROJECT:

Ravenswood

TEST METHODS:

1. Test results relate to sample as received. Sampling not accredited.
2. Determination of the Dry Density/Water Content Relationship - New Zealand Standard compaction test NZS 4402:1986 Test 4.1.1.

TEST RESULTS:



Test Sample	1	2	3	4	5
Water Content (%)	10.4	11.9	12.6	14.3	16.4
Dry Density (t/m^3)	1.75	1.77	1.96	1.81	1.80

Maximum Dry Density :	**1.96**	**t/m^3**
Optimum Water Content:	**13**	**%**
Material retained:	**1**	**%**
(+19 mm sieve)		

ADDITIONAL INFORMATION:

1. Material received in natural state
2. Sample fraction passing the 19mm sieve was tested
3. Compaction was performed on sample in a natural state

K Wilkinson

Approved by: K. Wilkinson
Date of Issue: 26/06/2023

ACCREDITED IANZ TESTING LABORATORY

All test methods reported herein (unless otherwise specified), have been performed in accordance with this laboratory's scope of accreditation.

IANZ Accreditation No. 831

COMMENTS:

Appendix C: Nuclear Densometer Test Results

Paul Smith Earthmoving 2002 Limited
P O Box 2103, Washdyke, **Timaru** 7941
55 Sheffield Street, Washdyke, **Timaru** 7910
P: 03 688 2001 F: 03 688 2552

P O Box 76-084, Harewood, **Christchurch** 8548
56 Greywacke Road, Harewood, **Christchurch** 8051
P: 03 341 7266 F: 03 341 7133

Freephone 0800 773 2002
admin@paulsmithearthmoving.co.nz
www.paulsmithearthmoving.co.nz

NUCLEAR DENSOMETER TEST RESULTS

Project:	Lochhead Falcons View	Report No:	
Location:	Branthwaite Drive	Material:	Insitu Material
Client:	Base Co	Source:	On Site
Tested By:	John Kerr	Max Dry Density:	1720
Date Tested:	16/06/2023	Solid Dry Density	2680
Sample Description:	Granular	Optimum Water Content %:	16.0%
Nuclear Densometer No:	N4 #72928	PSE Job No:	CH4314
Calibration Details:	Cert #717641 Expires 07/12/2024	Test Sheet No:	0001
Note:	Foundation Lots	Entered By/Date:	LL: 22 Jun 23

Test	Location	B/S or Probe	Reduced Level	Dry Density	Wet Density	Compaction %	Air Void %	Moisture %	
1	As Per Plan Single Lift Lots	D/T		1723	2034	100.2		18.0	
2	As Per Plan Single Lift Lots	D/T		1682	1941	97.8		15.4	
3	As Per Plan Single Lift Lots	D/T		1689	1993	98.2		18.0	
4	As Per Plan Single Lift Lots	D/T		1668	1954	97.0		17.1	
5	As Per Plan Single Lift Lots	D/T		1711	1978	99.5		15.6	
6	As Per Plan Single Lift Lots	D/T		1662	1902	96.6		14.5	
7	As Per Plan Single Lift Lots	D/T		1754	2000	102.0		14.0	
8	As Per Plan Single Lift Lots	D/T		1646	1916	95.7		16.4	
9	As Per Plan Single Lift Lots	D/T		1713	1972	99.6		15.1	
10	As Per Plan Single Lift Lots	D/T		1680	1963	97.7		16.8	
11	As Per Plan Single Lift Lots	D/T		1639	1893	95.3		15.5	
12	As Per Plan Single Lift Lots	D/T		1674	1918	97.3		14.6	
13	As Per Plan Single Lift Lots	D/T		1706	2005	99.2		17.5	
14	As Per Plan Single Lift Lots	D/T		1744	1988	101.4		14.0	
15	As Per Plan Single Lift Lots	D/T		1684	1938	97.9		15.1	
16	As Per Plan Single Lift Lots	D/T		1710	1964	99.4		14.9	
17	As Per Plan	B/S		0	0				
18	As Per Plan	B/S		0	0				
19	As Per Plan	B/S		0	0				
20	As Per Plan	B/S		0	0				
	As Per Plan	B/S		0	0				
	As Per Plan	B/S		0	0				
	As Per Plan	B/S		0	0				
	As Per Plan	B/S		0	0				
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	As Per Plan	B/S		0	0				
	As Per Plan	B/S		0	0				

Note: While not measuring strength, density does give an indicative CBR or kPa value as shown in the table below. It should be noted that the test is for the sub-base material only and the kPa shown is only possible providing the ground under the sub-base can withstand these loads.

Density kg/m³	CBR	kPA
2100	60	450
2200	180	700
2300	300	1,000

Name:	John Kerr
Signature:	

BRANTHWAITE DRIVE

MERLIN TERRACE

TALON DRIVE

KESTREL STREET

+0.3m 1v:10h Batter

+0.3m 1v:3h Batter

+0.6m 1v:2h Batter

400mm Self Supporting retaining boards at base of ex fence.

400mm Self Supporting retaining boards at base of ex fence.

INSITU MATRIAL
NOM
16-6-23

SINGLE LIFT
LOTS

ORIGIN OF LEVELS:	BURNHAM NO 2 (1127)
REDUCED LEVEL:	69.5942m
DATUM:	LVD 1937 (DEC 13)

LEGEND:

- 41.00 — MAJOR CONTOUR (0.5m)
- MINOR CONTOUR (0.1m)
- 40.38 — DESIGN FINISHED LEVEL

REV	DATE	REVISION DETAILS	ISSUED
A	17/02/23	FOR INFORMATION	CWH
B	13/04/23	FOR APPROVAL	CWH
C	20/04/23	FOR APPROVAL	CWH

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PROJECT
LOCHHEAD

DRAWING TITLE
FINISHED CONTOUR PLAN
SHEET 1 OF 1

STATUS	SCALE	SIZE
FOR APPROVAL	1:750	A3

PROJECT	DRAWING NO	REVISION
1042	EN-200	C

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NUCLEAR DENSOMETER TEST RESULTS

Project:	**Lochhead Falcons View**
Location:	**Branthwaite Drive**
Client:	**GW Willfield Ltd**
Tested By:	**John Kerr**
Date Tested:	**20/07/2023**
Sample Description:	**Granular**
Nuclear Densometer No:	**N4 #72928**
Calibration Details:	**Cert #717641 Expires 07/12/2024**
Note:	**Foundation Lots**

Report No:	
Material:	**Silt**
Source:	**Winstones**
Max Dry Density:	**1990**
Solid Dry Density	2680
Optimum Water Content %:	**11.0%**
PSE Job No:	**CH4314**
Test Sheet No:	**0018**
Entered By/Date:	**MB 21/08/23**

Test	Location	B/S or Probe	Reduced Level	Dry Density	Wet Density	Compaction %	Air Void %	Moisture %	
1	As Per Plan Single Lift Lots	B/S		2020	2256	101.5		11.7	
2	As Per Plan Single Lift Lots	B/S		1982	2254	99.6		13.7	
3	As Per Plan Single Lift Lots	B/S		1998	2216	100.4		10.9	
4	As Per Plan Single Lift Lots	B/S		1964	2206	98.7		12.3	
5	As Per Plan Single Lift Lots	B/S		1956	2183	98.3		11.6	
6	As Per Plan Single Lift Lots	B/S		1972	2189	99.1		11.0	
7	As Per Plan Single Lift Lots	B/S		1920	2172	96.5		13.1	
8	As Per Plan Single Lift Lots	B/S		2004	2254	100.7		12.5	
9	As Per Plan Single Lift Lots	B/S		1948	2198	97.9		12.8	
10	As Per Plan Single Lift Lots	B/S		1974	2233	99.2		13.1	
11	As Per Plan Single Lift Lots	B/S		1938	2171	97.4		12.0	
12	As Per Plan	B/S		0	0				
13	As Per Plan	B/S		0	0				
14	As Per Plan	B/S		0	0				
15	As Per Plan	B/S		0	0				
16	As Per Plan	B/S		0	0				
17	As Per Plan	B/S		0	0				
18	As Per Plan	B/S		0	0				
19	As Per Plan	B/S		0	0				
20	As Per Plan	B/S		0	0				
21	As Per Plan	B/S		0	0				
22	As Per Plan	B/S		0	0				
23	As Per Plan	B/S		0	0				
24	As Per Plan	B/S		0	0				
25	As Per Plan	B/S		0	0				
26	As Per Plan	B/S		0	0				
27	As Per Plan	B/S		0	0				
28	As Per Plan	B/S		0	0				
29	As Per Plan	B/S		0	0				
30	As Per Plan	B/S		0	0				

Note: While not measuring strength, density does give an indicative CBR or kPa value as shown in the table below. It should be noted that the test is for the sub-base material only and the kPa shown is only possible providing the ground under the sub-base can withstand these loads.

Density kg/m³	CBR	kPA
2100	60	450
2200	180	700
2300	300	1,000

Name:	John Kerr
Signature:	

SILT
NDM
20-7-23
SINGLE LIFT
LOTS

N

Cut to Fill Legend

- 35 — Existing Contours
- 0 — Zero Contour
- -1 — Cut Contours & Area
- 1 — Fill Contours & Area
- Extent of Earthworks

REV	DATE	REVISION DETAILS	ISSUED
A	13/04/23	FOR INFORMATION	CWH
B	13/04/23	FOR APPROVAL	CWH
1	03/07/23	FOR CONSTRUCTION	DG

CAPTURE
Land Development Consultants

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PROJECT
LOCHHEAD

DRAWING TITLE
EARTHWORKS CONTOUR PLAN
SHEET 1 OF 1

STATUS	SCALE	SIZE
FOR CONSTRUCTION	1:750	A3

PROJECT	DRAWING NO	REVISION
1042	EN-201	1

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NUCLEAR DENSOMETER TEST RESULTS

Project:	**Lochhead Falcons View**
Location:	**Branthwaite Drive**
Client:	**GW Willfield Ltd**
Tested By:	**John Kerr**
Date Tested:	**31/07/2023**
Sample Description:	**Granular**
Nuclear Densometer No:	**N4 #72928**
Calibration Details:	**Cert #717641 Expires 07/12/2024**
Note:	**Foundation Lots**

Report No:	
Material:	**Silt**
Source:	**Ravenswood**
Max Dry Density:	**1960**
Solid Dry Density	2680
Optimum Water Content %:	**13.0%**
PSE Job No:	**CH4314**
Test Sheet No:	**0019**
Entered By/Date:	**MB 21/08/23**

Test	Location	B/S or Probe	Reduced Level	Dry Density	Wet Density	Compaction %	Air Void %	Moisture %	
1	As Per Plan Single Lift Lots	B/S		1987	2278	101.4		14.6	
2	As Per Plan Single Lift Lots	B/S		1976	2264	100.8		14.6	
3	As Per Plan Single Lift Lots	B/S		1876	2146	95.7		14.4	
4	As Per Plan Single Lift Lots	B/S		1923	2186	98.1		13.7	
5	As Per Plan Single Lift Lots	B/S		1905	2170	97.2		13.9	
6	As Per Plan Single Lift Lots	B/S		1972	2238	100.6		13.5	
7	As Per Plan Single Lift Lots	B/S		1895	2159	96.7		13.9	
8	As Per Plan Single Lift Lots	B/S		1889	2156	96.4		14.1	
9	As Per Plan Single Lift Lots	B/S		1925	2185	98.2		13.5	
10	As Per Plan	B/S		0	0				
11	As Per Plan	B/S		0	0				
12	As Per Plan	B/S		0	0				
13	As Per Plan	B/S		0	0				
14	As Per Plan	B/S		0	0				
15	As Per Plan	B/S		0	0				
16	As Per Plan	B/S		0	0				
17	As Per Plan	B/S		0	0				
18	As Per Plan	B/S		0	0				
19	As Per Plan	B/S		0	0				
20	As Per Plan	B/S		0	0				
21	As Per Plan	B/S		0	0				
22	As Per Plan	B/S		0	0				
23	As Per Plan	B/S		0	0				
24	As Per Plan	B/S		0	0				
25	As Per Plan	B/S		0	0				
26	As Per Plan	B/S		0	0				
27	As Per Plan	B/S		0	0				
28	As Per Plan	B/S		0	0				
29	As Per Plan	B/S		0	0				
30	As Per Plan	B/S		0	0				

Note: While not measuring strength, density does give an indicative CBR or kPa value as shown in the table below. It should be noted that the test is for the sub-base material only and the kPa shown is only possible providing the ground under the sub-base can withstand these loads.

Density kg/m³	CBR	kPA
2100	60	450
2200	180	700
2300	300	1,000

Name:	John Kerr
Signature:	

SILT
NOM
31-7-23
SINGLE LIFT
LOTS

N

Cut to Fill Legend

- 35 — Existing Contours
- 0 — Zero Contour
- -1 — Cut Contours & Area
- 1 — Fill Contours & Area
- Extent of Earthworks

REV	DATE	REVISION DETAILS	ISSUED
A	13/04/23	FOR INFORMATION	CWH
B	13/04/23	FOR APPROVAL	CWH
1	03/07/23	FOR CONSTRUCTION	DG

CAPTURE
Land Development Consultants

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PROJECT
LOCHHEAD

DRAWING TITLE
EARTHWORKS CONTOUR PLAN
SHEET 1 OF 1

STATUS	SCALE	SIZE
FOR CONSTRUCTION	1:750	A3

PROJECT	DRAWING NO	REVISION
1042	EN-201	1

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www.paulsmithearthmoving.co.nz

NUCLEAR DENSOMETER TEST RESULTS

Project:	**Lochhead Falcons View**
Location:	**Branthwaite Drive**
Client:	**GW Willfield Ltd**
Tested By:	**John Kerr**
Date Tested:	**7/08/2023**
Sample Description:	**Granular**
Nuclear Densometer No:	**N4 #72928**
Calibration Details:	**Cert #717641 Expires 07/12/2024**
Note:	**Foundation Lots**

Report No:	
Material:	**Silt**
Source:	**Ravenswood**
Max Dry Density:	**1960**
Solid Dry Density	2680
Optimum Water Content %:	**13.0%**
PSE Job No:	**CH4314**
Test Sheet No:	**0020**
Entered By/Date:	**MB 21/08/23**

Test	Location	B/S or Probe	Reduced Level	Dry Density	Wet Density	Compaction %	Air Void %	Moisture %	
1	As Per Plan Single Lift Lots	B/S		1868	2096	95.3		12.2	
2	As Per Plan Single Lift Lots	B/S		1891	2169	96.5		14.7	
3	As Per Plan Single Lift Lots	B/S		1917	2170	97.8		13.2	
4	As Per Plan Single Lift Lots	B/S		1948	2215	99.4		13.7	
5	As Per Plan Single Lift Lots	B/S		1911	2159	97.5		13.0	
6	As Per Plan Single Lift Lots	B/S		1874	2138	95.6		14.1	
7	As Per Plan Single Lift Lots	B/S		1903	2166	97.1		13.8	
8	As Per Plan Single Lift Lots	B/S		1887	2154	96.3		14.1	
9	As Per Plan	B/S		0	0				
10	As Per Plan	B/S		0	0				
11	As Per Plan	B/S		0	0				
12	As Per Plan	B/S		0	0				
13	As Per Plan	B/S		0	0				
14	As Per Plan	B/S		0	0				
15	As Per Plan	B/S		0	0				
16	As Per Plan	B/S		0	0				
17	As Per Plan	B/S		0	0				
18	As Per Plan	B/S		0	0				
19	As Per Plan	B/S		0	0				
20	As Per Plan	B/S		0	0				
21	As Per Plan	B/S		0	0				
22	As Per Plan	B/S		0	0				
23	As Per Plan	B/S		0	0				
24	As Per Plan	B/S		0	0				
25	As Per Plan	B/S		0	0				
26	As Per Plan	B/S		0	0				
27	As Per Plan	B/S		0	0				
28	As Per Plan	B/S		0	0				
29	As Per Plan	B/S		0	0				
30	As Per Plan	B/S		0	0				

Note: While not measuring strength, density does give an indicative CBR or kPa value as shown in the table below. It should be noted that the test is for the sub-base material only and the kPa shown is only possible providing the ground under the sub-base can withstand these loads.

Density kg/m³	CBR	kPA
2100	60	450
2200	180	700
2300	300	1,000

Name:	John Kerr
Signature:	

SIGT
NDM
7-8-23
SINGLE LIFT
LOTS

N

Cut to Fill Legend

- 35 — Existing Contours
- 0 — Zero Contour
- -1 — Cut Contours & Area
- 1 — Fill Contours & Area
- Extent of Earthworks

REV	DATE	REVISION DETAILS	ISSUED
A	13/04/23	FOR INFORMATION	CWH
B	13/04/23	FOR APPROVAL	CWH
1	03/07/23	FOR CONSTRUCTION	DG

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Land Development Consultants

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PROJECT
LOCHHEAD

DRAWING TITLE
EARTHWORKS CONTOUR PLAN
SHEET 1 OF 1

STATUS	SCALE	SIZE
FOR CONSTRUCTION	1:750	A3

PROJECT	DRAWING NO	REVISION
1042	EN-201	1

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NUCLEAR DENSOMETER TEST RESULTS

Project:	**Lochhead Falcons View**
Location:	**Branthwaite Drive**
Client:	**GW Willfield Ltd**
Tested By:	**John Kerr**
Date Tested:	**8/08/2023**
Sample Description:	**Granular**
Nuclear Densometer No:	**N4 #72928**
Calibration Details:	**Cert #717641 Expires 07/12/2024**
Note:	**Foundation Lots**

Report No:	
Material:	**Silt**
Source:	**Ravenswood**
Max Dry Density:	**1960**
Solid Dry Density	2680
Optimum Water Content %:	**13.0%**
PSE Job No:	**CH4314**
Test Sheet No:	**0022**
Entered By/Date:	**MB 21/08/23**

Test	Location	B/S or Probe	Reduced Level	Dry Density	Wet Density	Compaction %	Air Void %	Moisture %	
1	As Per Plan Single Lift Lots	B/S		1927	2171	98.3		12.7	
2	As Per Plan Single Lift Lots	B/S		1889	2133	96.4		12.9	
3	As Per Plan Single Lift Lots	B/S		1872	2119	95.5		13.2	
4	As Per Plan Single Lift Lots	B/S		1864	2088	95.1		12.0	
5	As Per Plan Single Lift Lots	B/S		1952	2216	99.6		13.5	
6	As Per Plan Single Lift Lots	B/S		1876	2140	95.7		14.1	
7	As Per Plan Single Lift Lots	B/S		1984	2251	101.2		13.5	
8	As Per Plan Single Lift Lots	B/S		1931	2174	98.5		12.6	
9	As Per Plan Single Lift Lots	B/S		1895	2115	96.7		11.6	
10	As Per Plan Single Lift Lots	B/S		1880	2139	95.9		13.8	
11	As Per Plan Single Lift Lots	B/S		1923	2169	98.1		12.8	
12	As Per Plan Single Lift Lots	B/S		1876	2127	95.7		13.4	
13	As Per Plan	B/S		0	0				
14	As Per Plan	B/S		0	0				
15	As Per Plan	B/S		0	0				
16	As Per Plan	B/S		0	0				
17	As Per Plan	B/S		0	0				
18	As Per Plan	B/S		0	0				
19	As Per Plan	B/S		0	0				
20	As Per Plan	B/S		0	0				
21	As Per Plan	B/S		0	0				
22	As Per Plan	B/S		0	0				
23	As Per Plan	B/S		0	0				
24	As Per Plan	B/S		0	0				
25	As Per Plan	B/S		0	0				
26	As Per Plan	B/S		0	0				
27	As Per Plan	B/S		0	0				
28	As Per Plan	B/S		0	0				
29	As Per Plan	B/S		0	0				
30	As Per Plan	B/S		0	0				

Note: While not measuring strength, density does give an indicative CBR or kPa value as shown in the table below. It should be noted that the test is for the sub-base material only and the kPa shown is only possible providing the ground under the sub-base can withstand these loads.

Density kg/m³	CBR	kPA
2100	60	450
2200	180	700
2300	300	1,000

Name:	John Kerr
Signature:	

SILT
NOM
8 - 8 - 23

SINGLE LIFT
LOTS

N

Cut to Fill Legend

35	Existing Contours
0	Zero Contour
-1	Cut Contours & Area
1	Fill Contours & Area
	Extent of Earthworks

REV	DATE	REVISION DETAILS	ISSUED
A	13/04/23	FOR INFORMATION	CWH
B	13/04/23	FOR APPROVAL	CWH
1	03/07/23	FOR CONSTRUCTION	DG

CAPTURE
Land Development Consultants

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GW WILLFIELD LTD

PROJECT
LOCHHEAD

DRAWING TITLE
EARTHWORKS CONTOUR PLAN
SHEET 1 OF 1

STATUS	SCALE	SIZE
FOR CONSTRUCTION	1:750	A3

PROJECT	DRAWING NO	REVISION
1042	EN-201	1

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NUCLEAR DENSOMETER TEST RESULTS

Project:	**Lochhead Falcons View**	Report No:	
Location:	**Branthwaite Drive**	Material:	**Silt**
Client:	**GW Willfield Ltd**	Source:	**Ravenswood**
Tested By:	**John Kerr**	Max Dry Density:	**1960**
Date Tested:	**21/08/2023**	Solid Dry Density	2680
Sample Description:	**Granular**	Optimum Water Content %:	**13.0%**
Nuclear Densometer No:	**N4 #72928**	PSE Job No:	**CH4314**
Calibration Details:	**Cert #717641 Expires 07/12/2024**	Test Sheet No:	**0023**
Note:	**Lots**	Entered By/Date:	**MB 11/10/23**

Test	Location	B/S or Probe	Reduced Level	Dry Density	Wet Density	Compaction %	Air Void %	Moisture %	
1	As Per Plan Lift One Lot 37	D/T		1903	2135	97.1		12.2	
2	As Per Plan Lift One Lot 37	D/T		1915	2154	97.7		12.5	
3	As Per Plan Lift Two Lot 37	D/T		1886	2108	96.2		11.8	
4	As Per Plan Lift Two Lot 37	D/T		1931	2184	98.5		13.1	
5	As Per Plan	B/S		0	0				
6	As Per Plan	B/S		0	0				
7	As Per Plan	B/S		0	0				
8	As Per Plan	B/S		0	0				
9	As Per Plan	B/S		0	0				
10	As Per Plan	B/S		0	0				
11	As Per Plan	B/S		0	0				
12	As Per Plan	B/S		0	0				
13	As Per Plan	B/S		0	0				
14	As Per Plan	B/S		0	0				
15	As Per Plan	B/S		0	0				
16	As Per Plan	B/S		0	0				
17	As Per Plan	B/S		0	0				
18	As Per Plan	B/S		0	0				
19	As Per Plan	B/S		0	0				
20	As Per Plan	B/S		0	0				
21	As Per Plan	B/S		0	0				
22	As Per Plan	B/S		0	0				
23	As Per Plan	B/S		0	0				
24	As Per Plan	B/S		0	0				
25	As Per Plan	B/S		0	0				
26	As Per Plan	B/S		0	0				
27	As Per Plan	B/S		0	0				
28	As Per Plan	B/S		0	0				
29	As Per Plan	B/S		0	0				
30	As Per Plan	B/S		0	0				

Note: While not measuring strength, density does give an indicative CBR or kPa value as shown in the table below. It should be noted that the test is for the sub-base material only and the kPa shown is only possible providing the ground under the sub-base can withstand these loads.

Density kg/m³	CBR	kPA
2100	60	450
2200	180	700
2300	300	1,000

Name:	John Kerr
Signature:	

SILT
NDM
21-8-23
TWO LIFTS
LOTS

N

Cut to Fill Legend

35	Existing Contours
0	Zero Contour
-1	Cut Contours & Area
1	Fill Contours & Area
	Extent of Earthworks

REV	DATE	REVISION DETAILS	ISSUED
A	13/04/23	FOR INFORMATION	CWH
B	13/04/23	FOR APPROVAL	CWH

CAPTURE
Land Development Consultants

CLIENT
GW WILLFIELD LTD

PROJECT
LOCHHEAD

DRAWING TITLE
EARTHWORKS CONTOUR PLAN
SHEET 1 OF 1

STATUS	SCALE	SIZE
FOR APPROVAL	1:750	A3

PROJECT	DRAWING NO	REVISION
1042	EN-201	B

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NUCLEAR DENSOMETER TEST RESULTS

Project:	**Lochhead Falcons View**
Location:	**Branthwaite Drive**
Client:	**GW Willfield Ltd**
Tested By:	**John Kerr**
Date Tested:	**23/08/2023**
Sample Description:	**Granular**
Nuclear Densometer No:	**N4 #72928**
Calibration Details:	**Cert #717641 Expires 07/12/2024**
Note:	**Lots**

Report No:	
Material:	**Silt**
Source:	**Ravenswood**
Max Dry Density:	**1960**
Solid Dry Density	2680
Optimum Water Content %:	**13.0%**
PSE Job No:	**CH4314**
Test Sheet No:	**0024**
Entered By/Date:	**MB 11/10/23**

Test	Location	B/S or Probe	Reduced Level	Dry Density	Wet Density	Compaction %	Air Void %	Moisture %	
1	As Per Plan Single Lift Lot 36	D/T		1923	2213	98.1		15.1	
2	As Per Plan Single Lift Lot 36	D/T		2009	2288	102.5		13.9	
3	As Per Plan Single Lift Lot 35	D/T		1929	2203	98.4		14.2	
4	As Per Plan Single Lift Lot 35	D/T		2025	2284	103.3		12.8	
5	As Per Plan Single Lift Lot 34	D/T		1942	2205	99.1		13.5	
6	As Per Plan Single Lift Lot 34	D/T		1895	2161	96.7		14.0	
7	As Per Plan	B/S		0	0				
8	As Per Plan	B/S		0	0				
9	As Per Plan	B/S		0	0				
10	As Per Plan	B/S		0	0				
11	As Per Plan	B/S		0	0				
12	As Per Plan	B/S		0	0				
13	As Per Plan	B/S		0	0				
14	As Per Plan	B/S		0	0				
15	As Per Plan	B/S		0	0				
16	As Per Plan	B/S		0	0				
17	As Per Plan	B/S		0	0				
18	As Per Plan	B/S		0	0				
19	As Per Plan	B/S		0	0				
20	As Per Plan	B/S		0	0				
21	As Per Plan	B/S		0	0				
22	As Per Plan	B/S		0	0				
23	As Per Plan	B/S		0	0				
24	As Per Plan	B/S		0	0				
25	As Per Plan	B/S		0	0				
26	As Per Plan	B/S		0	0				
27	As Per Plan	B/S		0	0				
28	As Per Plan	B/S		0	0				
29	As Per Plan	B/S		0	0				
30	As Per Plan	B/S		0	0				

Note: While not measuring strength, density does give an indicative CBR or kPa value as shown in the table below. It should be noted that the test is for the sub-base material only and the kPa shown is only possible providing the ground under the sub-base can withstand these loads.

Density kg/m³	CBR	kPA
2100	60	450
2200	180	700
2300	300	1,000

Name:	John Kerr
Signature:	

BRANTHWAITE DRIVE

MERLIN TERRACE

TALON DRIVE

KESTREL STREET

+0.3m 1v:10h Batter

+0.3m 1v:4h Batter

+0.6m 1v:4h Batter

Internal Batter within Lots

Internal Batter within Lots as per EN-202

SILT
NAM
23-8-23
SINGLE CUT
LOTS

ORIGIN OF LEVELS: BURNHAM NO 2 (1127)
REDUCED LEVEL: 69.5942m
DATUM: LVD 1937 (DEC 13)

LEGEND:

- 41.00 MAJOR CONTOUR (0.5m)
- MINOR CONTOUR (0.1m)
- 40.38 DESIGN FINISHED LEVEL

REV	DATE	REVISION DETAILS	ISSUED
A	17/02/23	FOR INFORMATION	CWH
B	13/04/23	FOR APPROVAL	CWH
C	20/04/23	FOR APPROVAL	CWH
D	13/06/23	FOR APPROVAL	CWH
E	16/06/23	FOR APPROVAL	CWH
F	28/06/23	FOR APPROVAL	CWH

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PROJECT
LOCHHEAD

DRAWING TITLE
FINISHED CONTOUR PLAN
SHEET 1 OF 1

STATUS	SCALE	SIZE
FOR APPROVAL	1:750	A3

PROJECT	DRAWING NO	REVISION
1042	EN-200	F

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admin@paulsmithearthmoving.co.nz
www.paulsmithearthmoving.co.nz

NUCLEAR DENSOMETER TEST RESULTS

Project:	Lochhead Falcons View	Report No:	
Location:	Branthwaite Drive	Material:	Silt
Client:	GW Willfield Ltd	Source:	Ravenswood
Tested By:	John Kerr	Max Dry Density:	1960
Date Tested:	15/08/2023	Solid Dry Density	2680
Sample Description:	Granular	Optimum Water Content %:	13.0%
Nuclear Densometer No:	N4 #72928	PSE Job No:	CH4314
Calibration Details:	Cert #717641 Expires 07/12/2024	Test Sheet No:	0025
Note:	Lots	Entered By/Date:	MB 11/10/23

Test	Location	B/S or Probe	Reduced Level	Dry Density	Wet Density	Compaction %	Air Void %	Moisture %	
1	As Per Plan Single Lift Lots	D/T		1895	2136	96.7		12.7	
2	As Per Plan Single Lift Lots	D/T		1880	2116	95.9		12.6	
3	As Per Plan Single Lift Lots	D/T		1864	2104	95.1		12.9	
4	As Per Plan Single Lift Lots	D/T		1893	2122	96.6		12.1	
5	As Per Plan	B/S		0	0				
6	As Per Plan	B/S		0	0				
7	As Per Plan	B/S		0	0				
8	As Per Plan	B/S		0	0				
9	As Per Plan	B/S		0	0				
10	As Per Plan	B/S		0	0				
11	As Per Plan	B/S		0	0				
12	As Per Plan	B/S		0	0				
13	As Per Plan	B/S		0	0				
14	As Per Plan	B/S		0	0				
15	As Per Plan	B/S		0	0				
16	As Per Plan	B/S		0	0				
17	As Per Plan	B/S		0	0				
18	As Per Plan	B/S		0	0				
d Falco	As Per Plan	B/S		0	0				
20	As Per Plan	B/S		0	0				
21	As Per Plan	B/S		0	0				
22	As Per Plan	B/S		0	0				
23	As Per Plan	B/S		0	0				
24	As Per Plan	B/S		0	0				
25	As Per Plan	B/S		0	0				
26	As Per Plan	B/S		0	0				
27	As Per Plan	B/S		0	0				
28	As Per Plan	B/S		0	0				
29	As Per Plan	B/S		0	0				
30	As Per Plan	B/S		0	0				

Note: While not measuring strength, density does give an indicative CBR or kPa value as shown in the table below. It should be noted that the test is for the sub-base material only and the kPa shown is only possible providing the ground under the sub-base can withstand these loads.

Density kg/m³	CBR	kPA
2100	60	450
2200	180	700
2300	300	1,000

Name:	John Kerr
Signature:	

SILT
NOM
15-8-23

SINGLE LIFT
LOTS

N

Cut to Fill Legend

35	Existing Contours
0	Zero Contour
-1	Cut Contours & Area
1	Fill Contours & Area
	Extent of Earthworks

REV	DATE	REVISION DETAILS	ISSUED
A	13/04/23	FOR INFORMATION	CWH
B	13/04/23	FOR APPROVAL	CWH

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PROJECT
LOCHHEAD

DRAWING TITLE
EARTHWORKS CONTOUR PLAN
SHEET 1 OF 1

STATUS	SCALE	SIZE
FOR APPROVAL	1:750	A3

PROJECT	DRAWING NO	REVISION
1042	EN-201	B

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NUCLEAR DENSOMETER TEST RESULTS

Project:	**Lochhead Falcons Veiw**	Report No:	
Location:	**Branthwaite Drive**	Material:	**Silt**
Client:	**GW Willfield Ltd**	Source:	**Ravenswood**
Tested By:	**John Kerr**	Max Dry Density:	**1960**
Date Tested:	**15/09/2023**	Solid Dry Density	2680
Sample Description:	**Granular**	Optimum Water Content %:	**13.0%**
Nuclear Densometer No:	**N4 #72928**	PSE Job No:	**CH4314**
Calibration Details:	**Cert #717641 Expires 07/12/2024**	Test Sheet No:	**0026**
Note:	**Foundation Lots**	Entered By/Date:	**MB 11/10/23**

Test	Location	B/S or Probe	Reduced Level	Dry Density	Wet Density	Compaction %	Air Void %	Moisture %	
1	As Per Plan Level Two Lift Lot 34	B/S		1935	2211	98.7		14.3	
2	As Per Plan Level Two Lift Lot 34	B/S		1931	2201	98.5		14.0	
3	As Per Plan Level Two Lift Lot 35	B/S		1962	2233	100.1		13.8	
4	As Per Plan Level Two Lift Lot 35	B/S		1919	2163	97.9		12.7	
5	As Per Plan Level Two Lift Lot 36	B/S		1915	2168	97.7		13.2	
6	As Per Plan Level Two Lift Lot 36	B/S		1942	2203	99.1		13.4	
7	As Per Plan	B/S		0	0				
8	As Per Plan	B/S		0	0				
9	As Per Plan	B/S		0	0				
10	As Per Plan	B/S		0	0				
11	As Per Plan	B/S		0	0				
12	As Per Plan	B/S		0	0				
13	As Per Plan	B/S		0	0				
14	As Per Plan	B/S		0	0				
15	As Per Plan	B/S		0	0				
16	As Per Plan	B/S		0	0				
17	As Per Plan	B/S		0	0				
18	As Per Plan	B/S		0	0				
19	As Per Plan	B/S		0	0				
20	As Per Plan	B/S		0	0				
21	As Per Plan	B/S		0	0				
22	As Per Plan	B/S		0	0				
23	As Per Plan	B/S		0	0				
24	As Per Plan	B/S		0	0				
25	As Per Plan	B/S		0	0				
26	As Per Plan	B/S		0	0				
27	As Per Plan	B/S		0	0				
28	As Per Plan	B/S		0	0				
29	As Per Plan	B/S		0	0				
30	As Per Plan	B/S		0	0				

Note: While not measuring strength, density does give an indicative CBR or kPa value as shown in the table below. It should be noted that the test is for the sub-base material only and the kPa shown is only possible providing the ground under the sub-base can withstand these loads.

Density kg/m³	CBR	kPA
2100	60	450
2200	180	700
2300	300	1,000

Name:	John Kerr
Signature:	

BRANTHWAITE DRIVE

MERLIN TERRACE

TALON DRIVE

KESTREL STREET

+0.3m 1v:10h Batter

+0.6m 1v:2h Batter

+0.3m 1v:3h Batter

400mm Self Supporting retaining boards at base of ex fence.

400mm Self Supporting retaining boards at base of ex fence.

15-9-23

BACKFILL ON LOTS LEFT TWO LIFT

ORIGIN OF LEVELS: BURNHAM NO 2 (1127)
REDUCED LEVEL: 69.5942m
DATUM: LVD 1937 (DEC 13)

LEGEND:

- 41.00 MAJOR CONTOUR (0.5m)
- MINOR CONTOUR (0.1m)
- 40.38 DESIGN FINISHED LEVEL

REV	DATE	REVISION DETAILS	ISSUED
A	17/02/23	FOR INFORMATION	CWH
B	13/04/23	FOR APPROVAL	CWH
C	20/04/23	FOR APPROVAL	CWH

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PROJECT
LOCHHEAD

DRAWING TITLE
FINISHED CONTOUR PLAN
SHEET 1 OF 1

STATUS	SCALE	SIZE
FOR APPROVAL	1:750	A3

PROJECT	DRAWING NO	REVISION
1042	EN-200	C

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NUCLEAR DENSOMETER TEST RESULTS

Project:	**Falcons Landing**
Location:	**39 Branthwaite Drive**
Client:	**GW Willfield LTD**
Tested By:	**John Kerr**
Date Tested:	**23/08/2023**
Sample Description:	**Granular**
Nuclear Densometer No:	**N4 #72928**
Calibration Details:	**Cert #717641 Expires 07/12/2024**
Note:	**Lots**

Report No:	
Material:	**Silt**
Source:	**Ravenswood**
Max Dry Density:	**1960**
Solid Dry Density	2680
Optimum Water Content %:	**13.0%**
PSE Job No:	**CH4314**
Test Sheet No:	**0042**
Entered By/Date:	**MB 11/10/23**

Test	Location	B/S or Probe	Reduced Level	Dry Density	Wet Density	Compaction %	Air Void %	Moisture %	
1	As Per Plan Second Lift Lot 33	B/S		1917	2204	97.8		15.0	
2	As Per Plan Second Lift Lot 33	B/S		1952	2222	99.6		13.8	
3	As Per Plan	B/S		0	0				
4	As Per Plan	B/S		0	0				
5	As Per Plan	B/S		0	0				
6	As Per Plan	B/S		0	0				
7	As Per Plan	B/S		0	0				
8	As Per Plan	B/S		0	0				
9	As Per Plan	B/S		0	0				
10	As Per Plan	B/S		0	0				
11	As Per Plan	B/S		0	0				
12	As Per Plan	B/S		0	0				
13	As Per Plan	B/S		0	0				
14	As Per Plan	B/S		0	0				
15	As Per Plan	B/S		0	0				
16	As Per Plan	B/S		0	0				
17	As Per Plan	B/S		0	0				
18	As Per Plan	B/S		0	0				
19	As Per Plan	B/S		0	0				
20	As Per Plan	B/S		0	0				
21	As Per Plan	B/S		0	0				
22	As Per Plan	B/S		0	0				
23	As Per Plan	B/S		0	0				
24	As Per Plan	B/S		0	0				
25	As Per Plan	B/S		0	0				
26	As Per Plan	B/S		0	0				
27	As Per Plan	B/S		0	0				
28	As Per Plan	B/S		0	0				
29	As Per Plan	B/S		0	0				
30	As Per Plan	B/S		0	0				

Note: While not measuring strength, density does give an indicative CBR or kPa value as shown in the table below. It should be noted that the test is for the sub-base material only and the kPa shown is only possible providing the ground under the sub-base can withstand these loads.

Density kg/m³	CBR	kPA
2100	60	450
2200	180	700
2300	300	1,000

Name:	John Kerr
Signature:	

N

Cut to Fill Legend

- 35 — Existing Contours
- 0 — Zero Contour
- -1 — Cut Contours & Area
- 1 — Fill Contours & Area
- Extent of Earthworks

REV	DATE	REVISION DETAILS	ISSUED
A	13/04/23	FOR INFORMATION	CWH
B	13/04/23	FOR APPROVAL	CWH
1	03/07/23	FOR CONSTRUCTION	DG

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PROJECT
LOCHHEAD

DRAWING TITLE
EARTHWORKS CONTOUR PLAN
SHEET 1 OF 1

STATUS	SCALE	SIZE
FOR CONSTRUCTION	1:750	A3

PROJECT	DRAWING NO	REVISION
1042	EN-201	1

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NUCLEAR DENSOMETER TEST RESULTS

Project:	**Lochhead Falcons View**
Location:	**Branthwaite Drive**
Client:	**GW Willfield Ltd**
Tested By:	**John Kerr**
Date Tested:	**10/07/2023**
Sample Description:	**Granular**
Nuclear Densometer No:	**N4 #72928**
Calibration Details:	**Cert #717641 Expires 07/12/2024**
Note:	**Foundation Lots**

Report No:	
Material:	**Insitu Material**
Source:	**On Site**
Max Dry Density:	**1720**
Solid Dry Density	2680
Optimum Water Content %:	**16.0%**
PSE Job No:	**CH4314**
Test Sheet No:	**0044**
Entered By/Date:	**MB 11/10/23**

Test	Location	B/S or Probe	Reduced Level	Dry Density	Wet Density	Compaction %	Air Void %	Moisture %	
1	As Per Plan Single Lift Lots 3	D/T		1708	1968	99.3		15.2	
2	As Per Plan Single Lift Lots 3	D/T		1687	1952	98.1		15.7	
3	As Per Plan Single Lift Lots 2	D/T		1692	1945	98.4		14.9	
4	As Per Plan Single Lift Lots 2	D/T		1686	1938	98.0		15.0	
5	As Per Plan Single Lift Lots 26	D/T		1677	1950	97.5		16.3	
6	As Per Plan Single Lift Lots 26	D/T		1730	2026	100.6		17.1	
7	As Per Plan Single Lift Lots 23	D/T		1715	1996	99.7		16.4	
8	As Per Plan Single Lift Lots 23	D/T		1703	1974	99.0		15.9	
9	As Per Plan Single Lift Lots 22	D/T		1705	1960	99.1		15.0	
10	As Per Plan Single Lift Lots 22	D/T		1677	1940	97.5		15.7	
11	As Per Plan Single Lift Lots 21	D/T		1656	1926	96.3		16.3	
12	As Per Plan Single Lift Lots 21	D/T		1687	1937	98.1		14.8	
13	As Per Plan	B/S		0	0				
14	As Per Plan	B/S		0	0				
15	As Per Plan	B/S		0	0				
16	As Per Plan	B/S		0	0				
17	As Per Plan	B/S		0	0				
18	As Per Plan	B/S		0	0				
19	As Per Plan	B/S		0	0				
20	As Per Plan	B/S		0	0				
21	As Per Plan	B/S		0	0				
22	As Per Plan	B/S		0	0				
23	As Per Plan	B/S		0	0				
24	As Per Plan	B/S		0	0				
25	As Per Plan	B/S		0	0				
26	As Per Plan	B/S		0	0				
27	As Per Plan	B/S		0	0				
28	As Per Plan	B/S		0	0				
29	As Per Plan	B/S		0	0				
30	As Per Plan	B/S		0	0				

Note: While not measuring strength, density does give an indicative CBR or kPa value as shown in the table below. It should be noted that the test is for the sub-base material only and the kPa shown is only possible providing the ground under the sub-base can withstand these loads.

Density kg/m³	CBR	kPA
2100	60	450
2200	180	700
2300	300	1,000

Name:	John Kerr
Signature:	

INSITU SITE
NDM
10-7-23

SINGLE LIFT
LOTS

N

Cut to Fill Legend

- 35 — Existing Contours
- 0 — Zero Contour
- -1 — Cut Contours & Area
- 1 — Fill Contours & Area
- Extent of Earthworks

REV	DATE	REVISION DETAILS	ISSUED
A	13/04/23	FOR INFORMATION	CWH
B	13/04/23	FOR APPROVAL	CWH

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Land Development Consultants

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PROJECT
LOCHHEAD

DRAWING TITLE
EARTHWORKS CONTOUR PLAN
SHEET 1 OF 1

STATUS	SCALE	SIZE
FOR APPROVAL	1:750	A3

PROJECT	DRAWING NO	REVISION
1042	EN-201	B

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Appendix D: NZS4404:2010 – Schedule 2A

SCHEDULE 2A

STATEMENT OF PROFESSIONAL OPINION ON SUITABILITY OF LAND FOR BUILDING CONSTRUCTION

Development Falcons Lochhead Subdivision

Developer Yoursection FV Ltd

Location 39 Braithwaite Drive, Rolleston

I Charles McDermott (*Full name*) of Miyamoto International NZ Ltd (236 Hereford Street, Christchurch 8011) (*Name and address of firm*)

Hereby confirm that:

1. I am a geo-professional as defined in clause 1.2.2 of NZS 4404:2010 and was retained by the developer as the geo-professional on the above development.

2. The extent of ~~my~~ the preliminary investigations are described in ~~my~~ Aurecon's Report(s) number 254246, dated 16 February 2017, and the conclusions and recommendations of that/those document(s) have been re-evaluated in the preparation of this report. The extent of ~~my~~ Miyamotos inspections during construction, and the results of all tests and/or re-evaluations carried out are as described in ~~my~~ Miyamotos geotechnical completion report dated 11 December 2023

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

   (a) The earth fills shown on the ~~attached~~ Plan ~~No.~~ in Appendix A of this GCR (Miyamoto 2003575-RP-001[A]) have been placed in compliance with the requirements of the Selwyn District Council and ~~my specification.~~ NZS4431:2022

   (b) The completed works take into account land slope and foundation stability considerations, subject to the appended foundation recommendations and earthworks restrictions, (which should be read in conjunction with the appended final site contour plan).

   (c) Subject to 3(a) and 3(b) of this Schedule, the original ground not affected by filling is suitable for the erection of buildings designed according to NZS 3604 provided that:
   (i) the recommendations included in the Miyamoto GCR (2003575-RP-001[A], dated 11 December 2023) are followed.
   (ii) .....

   (d) Subject to 3(a) and 3(b) of this Schedule, the filled ground is suitable for the erection of buildings designed according to NZS 3604 provided that:
   (i) the recommendations included in the Miyamoto GCR (2003575-RP-001[A], dated 11 December 2023) are followed.
   (ii) .....

   (e) The original ground not affected by filling and the filled ground are not subject to erosion, subsidence, or slippage in accordance with the provisions of section 106 of the Resource Management Act 1991 provided that:
   (i) the recommendations included in the Miyamoto GCR (2003575-RP-001[A], dated 11 December 2023) are followed.
   (ii) .....

NOTE – These subclauses may be deleted or added to as appropriate, to include such considerations as expansive soils where excluded from NZS 3604, and site seismic characteristics as covered in clause 3.1.3 of NZS 1170.5.

4. This professional opinion is furnished to the TA and the developer for their purposes alone on the express condition that it will not be relied upon by any other person and does not remove the necessity for the normal inspection of foundation conditions at the time of erection of any building.

5. This certificate shall be read in conjunction with my geotechnical report referred to in clause 2 above and shall not be copied or reproduced except in conjunction with the full geotechnical completion report.

Signed ..... Date 11 December 2023

Charles McDermott
BEng(Hons) CMEngNZ CPEng IntPE(NZ)
.....
.....
(Name, title, and professional qualifications)

Appendix E: NZS4431:2022 – Appendix D

APPENDIX D – STATEMENT OF SUITABILITY OF ENGINEERED FILL FOR LIGHTWEIGHT STRUCTURES

(Informative)

To: *(name and address of local authority)*	Selwyn District Council
Development name:	Falcons Lochhead Subdivision
Land title(s):	Lot 15 DP 509805 (as contained in Record of Title 778868) and Lot 450 DP 566745 (as contained in Record of Title 1019420)
Development location/address:	39 Braithwaite Drive, Rolleston
Relevant resource consent number(s):	RC235028 and RC2235029
Developer's name and company:	GW Wilfield Ltd
Geotechnical designer's name and company:	Charles McDermott of Miyamoto International NZ Ltd
Certifier's name and company:	Charles McDermott of Miyamoto International NZ Ltd

Attachments (give reference numbers):

(1) Site layout plan(s) Appendix A of this GCR (Miyamoto 2003575-RP-001[A]

(2) Fill layout plan(s) Appendix A of this GCR (Miyamoto 2003575-RP-001[A]

~~(3) Fill section(s)~~

(4) Design report Appendix F of this GCR (Miyamoto 2003575-RP-001[A]

(5) ~~Earthworks~~ Geotechnical completion report, including the following appendices: This document comprises Appendix E of the GCR (Miyamoto 2003575-RP-001[A]

- (a) As-built survey;
- (b) Cut-fill plan (with contours);
- (c) Inspection and test plan;
- (d) Earthworks specification;
- (e) All test results;
- (f) All inspection records.

I confirm I am qualified as a certifier as defined in NZS 4431:2022.

During this work, I was retained as certifier, and I or my certifier's representative undertook inspections and testing as documented in the attached ~~earthworks~~ Geotechnical completion report.

I am satisfied that the engineered fill shown in the attached as-built survey was placed, compacted, and tested in accordance with the ~~attached~~ earthworks specification and that all variations and non-compliances have been documented in the ~~earthworks~~ Geotechnical completion report.

Based on the information available, I certify that, to the best of my knowledge, the intent of the geotechnical designer (as presented in their design, drawings, and earthworks specification) has been achieved.

The area shown on the as-built survey plan referenced above is considered suitable for development as per NZS 3604. (*strike out if not relevant*)

This certification does not remove the necessity for normal inspection and design of foundations as would be made in natural ground.

Certifier's signature:	Date: 11 December 2023

Certifier's qualifications, ~~professional registration~~ type, and number:

BEng(Hons), CMEngNZ, CPEng (1024840)

Figure 12 – Statement of suitability of engineered fill for lightweight structures