

Annexure 6:
Servicing Report



SERVICING REPORT

KIMBERLEY ROAD AND BROADMEADOWS
DRIVE, DARFIELD

DATE
25/09/19

CLIENT
MERF AGRICULTURAL SERVICES LTD

Document Control



Document ID: J:\14200-14249\14243MERFAGRICULTURALSERVICES(KIMBERLEYROAD,DARFIELD)\ENGINEERING\14243
SERVICING REPORT.DOCX

Rev No	Date	Revision Details	Author	Verifier	Approver
A	25/09/19	FOR INFORMATION	CWH	JLC	CWH

Contents

1. Introduction	3
1.1 Scope	3
1.2 Site Background	3
2. Bulk Earthworks	4
2.1 Bulk Earthworks Design	4
2.2 Proposed Earthworks Design Methodology	4
3. Roothing	5
3.1 Proposed Road Network	5
3.1.1 Layout	5
3.1.2 Stormwater drainage	5
3.1.3 Pavement profiles	5
3.1.4 Kerbing Options	5
3.1.5 Footpaths	5
4. Stormwater	6
4.1 Existing Infrastructure	6
4.2 Proposed Stormwater Disposal	6
4.3 Soil profile and Groundwater	6
5. Wastewater	7
6. Water Supply	8
6.1 Existing Infrastructure	8
6.2 Proposed Water Reticulation	8
6.3 Fire fighting requirements	8
7. Power, Telecommunications and Streetlights	9
7.1 Power Supply	9
7.2 Telecommunication Supply	9
7.3 Streetlighting	9

1. Introduction

1.1 Scope

Survus Consultants has been commissioned by Merf Agricultural Services to complete an infrastructure report to support a Private Plan Change for the development area in Darfield. The Infrastructure report will covers the following components:

- Bulk Earthworks
- Roading/Access
- Stormwater drainage
- Water reticulation
- Power and Telecommunications

The following sections examine each of the above components in more detail.

1.2 Site Background

The site is located on the North side of Darfield between Kimberley Road and Broadmeadows Drive. There are currently 3 underlying titles involved, as follows;

Name of Lot/Appellation	Area (ha)	Record of Title (RT)
Lot 4 DP 524058	14.60ha	835350
Part RS 27204	46.00ha	CB44A/1000
Lot 24 DP 366007	8.12ha	267916
Total	68.72ha	

The development is a proposed subdivision that will ultimately provide facilities for up to 550 Low Density and Medium Density lots. There is also provision for an aged care facility. The proposed subdivision is entirely subject to a private plan change.

There are no other resource consents in with SDC or any other consenting authority at this stage for this property.

2. Bulk Earthworks

2.1 Bulk Earthworks Design

The topography of the existing site is generally sloping from north west to south east towards the bottom of the property, with a height difference of approximately 10 metres between the two points. Currently the majority of the site comprises agricultural fields and pasture. There are no existing houses on the subject site.

Geotechnical investigations have been undertaken on the site and concluded an average topsoil depth of 300mm across the site overlaying silty gravels.

Bulk earthwork design would be dictated by the need to have a 1:500 (absolute minimum) grade from the top of kerb to the rear of the sections fronting the road.

The design philosophy for the setting of earthwork levels will be determined by the following criteria:

1. Road gradients not to exceed 1 in 20, not to be less than 1:450 where possible
2. Cut/fill balance where applicable

Overland flow paths for the subdivision are to follow the road layout, with the site overland flows not being different to the current situation.

2.2 Proposed Earthworks Design Methodology

There will be the need to complete a cut/fill balance across the site, to avoid carting material off-site. This means that engineered fill may be utilised in certain areas to reapportion dugout materials from roading areas.

If there is any filling exceeding 300mm it will should be engineered fill and testing requirements will be met as per NZS4431:1989.

It is envisaged that material won from site, will be sufficient to use as structural engineered fill.

3. Roding

3.1 Proposed Road Network

3.1.1 Layout

The proposed roding layout can be seen on the scheme and ODP plans attached as Appendix A.

There are several existing connections onto the subject property, including Broadmeadows Drive, and multiple connections onto Kimberley Road. Proposed connections onto Kimberley Road have been planned to be adjacent to roding connections on the western side of Kimberley Road.

All main legal road corridors will be 15m-20m in legal width. Rights of way will be between 4.5m and 6.5m, dependant on the number of users and length of ROW.

It is envisaged that a full traffic assessment will be undertaken for the plan change to discuss the proposal in more detail

3.1.2 Stormwater drainage

Stormwater runoff within the road corridors will be via swales into appropriately spaced and sized soakpits via sumps. All sumps will have trapped and/or inverted outlets.

The road corridor will be used as overland flow paths to direct stormwater runoff when the soakpits are at full capacity (i.e. larger than a 50 year storm).

3.1.3 Pavement profiles

It is proposed that the above pavement options are based on achieving a CBR of 8 for all roads and CBR of 5 for ROW's. In reviewing the Geotech report, the underlying material should be suitable to achieve the above CBR's

3.1.4 Kerbing Options

Standard "SDC Low Profile" kerb and channel will be used in all roads in the subdivision, with cutdowns where appropriate

3.1.5 Footpaths

Footpaths are to be installed in the roding network. This will be discussed further with SDC at engineering approval stage.

4. Stormwater

4.1 Existing Infrastructure

There is currently no existing reticulated stormwater network located on the subject site, or close to the site.

4.2 Proposed Stormwater Disposal

It is proposed that the stormwater network for the development will consist of a surface water conveyance system which will discharge to soakpits via sumps.

Key design parameters of the system are as follows;

- Kerbs will direct stormwater from roads into the appropriately spaced sumps.
- Some hardstand area from private lots will be accounted for within the roading sumps.
- All soakpits are to have sumps with submerged outlets (or inverted outlet pipes) feeding into the soakpit.
- Stormwater up to and including the two percent annual exceedance probability critical storm for the site will discharge via soakpit.

Stormwater Resource Consents will be applied for in due course which will cover the roading network. It is envisaged that individual lots will apply for individual consents for lot discharges to ground at the time of building consents.

4.3 Soil profile and Groundwater

The shallow soil test results (attached in Appendix B) indicate the site is underlain by a near surface soil profile consisting of; topsoil to 0.2 – 0.4m bgl, overlying firm to stiff silt to 0.4 – 0.9 m bgl, over dense sandy gravel to the test termination depth.

A review of the Environment Canterbury (ECan) database indicates one well (L35/0624) is adjacent to the current site. The borehole log presents a soil profile comprising claybound gravels, sandy gravels and cobbles/boulders to a depth of at least 198m bgl. The borelog also indicates that groundwater at this bore is 128m bgl.

5. Wastewater

Not covered in this report.

6. Water Supply

6.1 Existing Infrastructure

The Darfield water supply is sourced from two deep bores, which supply all unrestricted and restricted supply systems.

There are existing mains in Broadmeadows Drive (150) and Kimberley Road (200-250), which are available to connect onto.

Selwyn District Council have indicated that there is sufficient water supply in the Darfield network to enable the proposed development layout to be sufficiently serviced.

6.2 Proposed Water Reticulation

It is envisaged that a ring water main would be extended from Kimberley Road through to Broadmeadows Drive. All other internal reticulation sizing and layout would be designed to maintain required pressure. A combination of main and submain reticulation would be used throughout the development area.

6.3 Fire fighting requirements

All reticulated supply would be unrestricted, and as such would be subject to the provisions of FW2 from SNZ PAS 4509:2008.

This standard requires at least one fire hydrant to be located within 135 m of any dwelling, and two hydrants located within 270m of any dwelling. Each hydrant must have the capacity to provide a minimum of 12.5 L/s with a minimum residual pressure of 100 kPa.

It is anticipated that there would be sufficient pressure in the current system to comply with the above requirements.

All new mains will have hydrants spaced to satisfy SNZ PAS 4509:2008.

7. Power, Telecommunications and Streetlights

7.1 Power Supply

Orion have confirmed that their network has sufficient capacity to service the proposed subdivision for power. Please find attached evidence of the ability to supply in Appendix C. Detailed designs will be forwarded to SDC once they have been approved by Orion

7.2 Telecommunication Supply

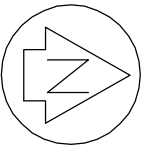
Chorus have confirmed that their network has sufficient capacity to service the proposed subdivision for power. Please find attached evidence of the ability to supply in Appendix D. Detailed designs will be forwarded to SDC once they have been approved by Chorus.

7.3 Streetlighting

All streetlighting will be installed as per industry regulations. A lighting design will be completed at the detailed engineering approval stage.

Appendix A

ODP and Scheme Plan



LEGEND

- PRIMARY ROAD
- SECONDARY ROAD
- RESERVE
- PEDESTRIAN LINK
- AGED CARE FACILITY
- MEDIUM DENSITY AREA (min 430m²)
- LIVING DENSITY AREA (min 1350)

SURVYUS
CONSULTANTS

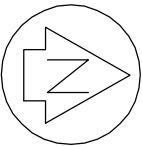
PLANNING + SURVEYING + ENGINEERING

4 Meadow Street, PO Box 5558, Paparua, Christchurch
03 352 5599
03 352 5527
0508 787 887

MANAGING DIRECTOR
03 314 9200
03 307 7021
03 318 8151

DRAWING TITLE

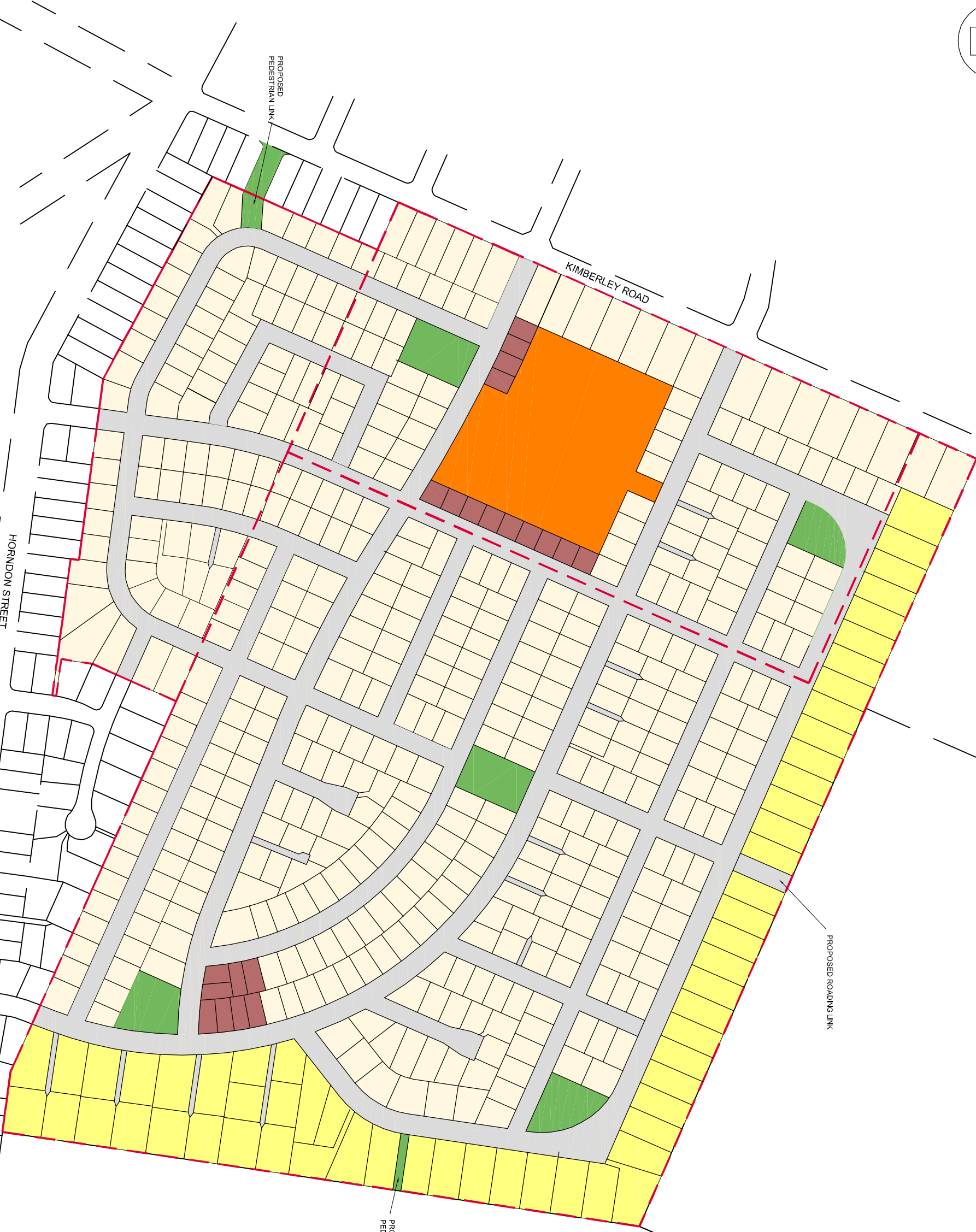
ODP PLAN



- NOTES:
1. THIS SURVEY HAS NOT INCLUDED SITE MARKING OF THE BOUNDARY POSITIONS UNLESS OTHERWISE INDICATED.
 2. NO UNDERGROUND SERVICE INFORMATION IS SHOWN ON THIS PLAN. THE LOCATION OF ANY SUCH SERVICES SHOULD BE CONFIRMED WITH THE RELEVANT LOCAL AUTHORITY OR UTILITY SERVICE PROVIDER.
 3. SCHEME PLAN ONLY. AREAS & DIMENSIONS ARE APPROXIMATE & SUBJECT TO FINAL SURVEY.

LEGEND

- MEDIUM DENSITY AREA (min 450m²)
- ROAD TO WEST
- REC RESERVE TO WEST
- AGED CARE FACILITY
- LIVING DENSITY AREA (min 1500m²)



REV	DATE	REVISION/DETAILS	ISSUED
C	19/08/19	FOR INFORMATION	CWH
B	05/08/19	FOR INFORMATION	CWH
A	22/07/19	FOR INFORMATION	CWH

PROJECT

KIMBERLEY AND BROADMEADOWS
DRIVE, DARFIELD

CLIENT

MERF AGRICULTURAL SERVICES

SURPVUS
CONSULTANTS
PLANNING + SURVEYING + ENGINEERING

4 Meadow Street, PO Box 5558, Papanui, Christchurch
P 03 352 5599
F 03 352 5527
TOLL FREE 0508 787 887
DARFIELD 03 318 8151

PROPOSED SCHEME PLAN
SHEET 1 OF 1

STATUS	SCALE	SIZE
FOR INFORMATION	1:2000	A1
PROJECT NO	DRAWING NO	REVISION

14243 SC-01 C

Appendix B

Geotechnical Report

Mr Mervyn
Todd



Fraser Thomas

ENGINEERS • RESOURCE MANAGERS • SURVEYORS

PROPOSED PLAN CHANGE-
DARFIELD PREFERRED
DEVELOPMENT AREA 7
(MALVERN AREA PLAN)




GEOTECHNICAL INVESTIGATION REPORT

Mr Mervyn
Todd

PROPOSED PLAN CHANGE-
DARFIELD PREFERRED
DEVELOPMENT AREA 7
(MALVERN AREA PLAN)

GEOTECHNICAL INVESTIGATION REPORT

Project No.	CH00114	Approved for Issue	
Version No.	1	Name	M V Reed
Status	Final	Signature	
Authors	K E TWOHILL		
Reviewer	M V Reed	Date	4 September 2019

Fraser Thomas Limited

Consulting Engineers, Licensed Surveyors
Planners & Resource Managers

**Unit 3a Barry Hogan Place,
Riccarton 8041**

**PO Box 39 154, Harewood Post Centre, 8545
Christchurch, New Zealand**

Tel : +64 3 358-5936

Email: mreed@ftl.co.nz

SUMMARY

This report presents the results of a geotechnical investigation and appraisal undertaken for the site at Lot 4 DP 524058, Pt RS 27204 and Pt RS 27203, Darfield. It is understood that the property owners are in the process of preparing a private plan change, in order to have the subject site rezoned from Rural Outer Plains to Living X zone (or low density residential zone, as reflected in the National Policy Statement).

The test pit and borehole logs, presented in the Appendix of this report, indicate that the subject site is, in general, underlain by soils inferred to be alluvial sediments of late Pleistocene age.

Given the nature, age and consistency of the sediments underlying the subject site, i.e. generally unsaturated very dense sandy gravels, it is our opinion that the soils underlying the site are unlikely to be susceptible to liquefaction in response to a future large earthquake event and that the risk of any significant liquefaction induced ground deformation occurring at the site in response to a large earthquake event is considered to be low.

Based on the results of the investigations and appraisal reported herein, it is our opinion that an appropriate foundation solution for the site conditions would be a shallow foundation system designed in accordance with the requirements of NZS 3604: 2011, New Zealand Standard, Timber Framed Buildings, founded in the underlying alluvial sediments.

Foundation design recommendations for future proposed residential development are presented in Sections 7.0 and 8.0 of this report.

The site is, in general, considered suitable for its intended use, with satisfactory conditions for future residential development, subject to the recommendations and qualifications reported herein, and provided the design and inspection of foundations are carried out as would be done under normal circumstances in accordance with the requirements of NZS 3604: 2011, New Zealand Standard, Timber Framed Buildings.

**PROPOSED PLAN CHANGE -
DARFIELD PREFERRED DEVELOPMENT AREA 7
(MALVERN AREA PLAN)**

MR MERVYN TODD

TABLE OF CONTENTS

SUMMARY

1.0	INTRODUCTION	1
2.0	AERIAL PHOTOGRAPHS	1
3.0	GEOLOGY	2
4.0	FIELD INVESTIGATION	2
4.1	GENERAL	2
4.2	RESULTS OF VISUAL APPRAISAL	2
4.3	TEST PIT INVESTIGATION	2
4.4	HAND AUGERED BOREHOLE INVESTIGATION	3
5.0	SUBSURFACE CONDITIONS	3
5.1	GENERAL	3
5.2	TOPSOIL	3
5.3	ALLUVIAL SEDIMENTS	4
5.4	GROUNDWATER	4
6.0	LIQUEFACTION POTENTIAL ASSESSMENT	4
6.1	GENERAL	4
6.2	METHOD OF ANALYSIS	5
6.3	ASSESSMENT OF LIQUEFACTION SUSCEPTIBILITY	6
7.0	FOUNDATION DESIGN CONSIDERATIONS	6
7.1	GENERAL	6
7.2	THE RISK OF THE SITE BEING ADVERSELY AFFECTED BY GROUND DEFORMATIONS ASSOCIATED WITH LIQUEFACTION	6
7.3	SHALLOW FOUNDATIONS LOCATED IN CLOSE PROXIMITY TO THE EXISTING SEDIMENT CONTROL PONDS AT THE SITE	7
7.4	FOUNDATIONS LOCATED IN CLOSE PROXIMITY TO THE EXISTING SOAK PIT	7
8.0	ALLOWABLE FOUNDATION BEARING PRESSURES	8
8.1	GENERAL	8
8.2	SHALLOW PAD OR STRIP FOOTINGS	8
9.0	EXISTING SERVICE LINES	8

10.0	STORMWATER AND EFFLUENT DISPOSAL	9
11.0	DEVELOPMENTAL EARTHWORKS	9
12.0	CONCLUSIONS AND RECOMMENDATIONS	9
12.1	CONCLUSIONS	9
12.2	RECOMMENDATIONS	11
13.0	LIMITATIONS	12

TABLES:

1	ALLOWABLE FOUNDATION BEARING PRESSURES FOR SHALLOW PAD OR STRIP FOOTINGS WITHIN THE UNDERLYING ALLUVIAL SEDIMENTS	8
---	---	---

APPENDICES:

A	FIELD INVESTIGATION RESULTS
---	-----------------------------

DRAWINGS:

G00114-01	SITE PLAN
-----------	-----------

**PROPOSED PLAN CHANGE -
DARFIELD PREFERRED DEVELOPMENT AREA 7
(MALVERN AREA PLAN)**

MR MERVYN TODD

1.0 INTRODUCTION

This report presents the results of a geotechnical investigation and appraisal undertaken for the site at Lot 4 DP 524058, Pt RS 27204 and Pt RS 27203, Darfield. It is understood that the property owners are in the process of preparing a private plan change, in order to have the subject site rezoned from Rural Outer Plains to Living X zone (or low density residential zone, as reflected in the National Policy Statement).

It is understood this rezoning is to allow subdivision that would involve the creation of lots with an average lot size of not smaller than 650 m². The proposal will also include provision for a 2 – 3 ha retirement village.

The roughly 70 ha site is bound by Kimberley Road and Horndon Street, located to the west and southeast respectively. Residential properties are situated along the southern boundary of the site, and the properties surrounding the subject site, to the north and east, are rural properties.

The subsurface conditions of the site have been investigated by means of six hand augered boreholes, and twelve machine excavated test pits with associated Dynamic Cone Penetrometer (DCP) scale tests.

A visual appraisal of the site, a study of historical aerial photographs and a study of geological maps have also been undertaken.

The purpose of the geotechnical investigation reported herein was to determine the subsoil conditions beneath the subject site as they may affect future residential development, with particular regard to foundation considerations, and to determine the suitability of the subject site in support of an application for rezoning of the land.

2.0 AERIAL PHOTOGRAPHS

Historic aerial photographs from 1940 to 2018 were examined, as part of the site appreciation.

Aerial imagery from 1940 indicates that an area in the western part of the site was once covered in trees. The trees are visible in the 1999 aerial photographs. Images from 2009 indicate that the trees were cleared sometime between 1999 and 2009, and this area is now vegetated with paddock grass.

The aerial photographs indicate that the majority of the subject site has been vegetated with paddock grass since at least 1940.

3.0 GEOLOGY

In assessing the geology of the site, reference has been made to the Institute of Geological & Nuclear Sciences Geological Map 16, scale 1:250,000, “Christchurch”.

This map indicates that the site is likely to be underlain by “brownish grey river alluvium” of late Pleistocene age.

The results of the borehole and test pit investigation reported herein, in general, indicate that the surficial soils underlying the site are likely to comprise alluvial sediments of Pleistocene age.

4.0 FIELD INVESTIGATION

4.1 GENERAL

The field investigation comprised a visual appraisal, twelve machine excavated test pits, numbered TP1 to TP12 inclusive, with associated Dynamic Cone Penetrometer (DCP) tests, and six shallow hand augered boreholes, numbered H1 to H6 inclusive.

The approximate locations of the investigation test positions are shown on Fraser Thomas Ltd drawing G00114-01.

4.2 RESULTS OF VISUAL APPRAISAL

A visual appraisal of the subject site was undertaken by a Fraser Thomas Ltd engineering geologist on 1 August 2019.

The site is located on the eastern side of Kimberley Road. Horndon Street is located in close proximity to the south-eastern corner of the subject site. Existing residential properties abut the southern site boundary. The northern and eastern site boundaries abut rural properties.

The topography within the subject site is generally flat, with slight undulations in the land surface, which are likely related to palaeochannels. At the time of the investigation reported herein, the site was generally vegetated with paddock grass and crops.

An existing 3.0 m deep “soak pit” was observed located in the western part of the site. It is understood that this was excavated by the farmer and is used to dispose of overland stormwater from the site.

Two existing ponds, approximately 1.0 m deep, are located along the southern site boundary. It is understood that these ponds are remnant sediment control ponds, which were installed to control sediments generated from the previous subdivisional earthworks, undertaken for the previous subdivision located to the south of the subject site. These ponds were dry at the time of the investigation reported herein.

The approximate inferred locations and extent of the remnant sediment control ponds and the existing soakage pit are shown on the appended drawing G00114-01.

4.3 TEST PIT INVESTIGATION

Twelve machine excavated test pits, numbered TP1 to TP12 inclusive, were put down at the site on 1 August 2019, in order to determine the nature and consistency of the subsoils underlying the site.

The test pits were inspected and logged by a qualified Fraser Thomas engineering geologist.

The test pits were excavated to depths ranging between approximately 1.7 m and 3.1 m below the ground surface existing at the time of the investigation reported herein (i.e. the existing ground surface).

The logs of the test pits are presented in Appendix A of this report.

DCP scala tests were carried out at various depths in some of the test pits, in order to determine the density of the cohesionless soils encountered in the test pits.

The results of the DCP scala tests are also presented in Appendix A of this report.

The approximate locations of the test pits are shown on drawing G00114-01.

4.4 HAND AUGERED BOREHOLE INVESTIGATION

Six hand augered boreholes, numbered H1 to H6 inclusive, were put down at the site on 1 August 2019, in order to determine the nature and consistency of the subsoils underlying the site.

The hand augered boreholes were put down and logged by a qualified Fraser Thomas engineering geologist.

The boreholes were terminated when the soils became too difficult to auger, at depths ranging between approximately 0.3 m and 0.4 m below the existing ground surface.

The logs of the boreholes are presented in Appendix A of this report.

The approximate locations of the hand augered boreholes are shown on drawing G00114-01.

5.0 SUBSURFACE CONDITIONS

5.1 GENERAL

The test pit and borehole logs, presented in the Appendix of this report, indicate that the subject site is, in general, underlain by soils inferred to be alluvial sediments of late Pleistocene age.

It has been assumed that even though the various subsoil strata (depths, thicknesses, and locations of groundwater levels) have been determined only at the locations and within the depths of the various test pits and hand augered boreholes recorded herein, these various subsurface features can be projected between the various test positions. Even though such inference is made, no guarantee can be given as to the validity of this inference or of the nature and continuity of these various subsurface features.

5.2 TOPSOIL

A surficial layer of topsoil, generally comprising silts, was generally encountered at the locations of the test positions, to a depth of between approximately 0.2 m and 0.4 m below the existing ground surface.

A surficial layer of topsoil, approximately 0.6 m thick, was encountered at the location of Test Pit TP1. This thicker layer of topsoil is inferred to be localised and likely associated with previous farm works. This topsoil thickness is not believed to be representative of the topsoil layer thickness across the subject site.

5.3 ALLUVIAL SEDIMENTS

An upper layer of soils, generally comprising silts and gravelly silts, inferred to be alluvial sediments of late Pleistocene age, was encountered beneath the surficial layer of topsoil. These sediments were generally encountered to a depth of between approximately 0.4 m and 0.9 m below the existing ground surface, corresponding to a layer thickness of between approximately 0.2 m to 0.4 m.

In situ undrained shear strength values of between approximately 84 kPa and greater than 200 kPa were generally measured in these sediments, using hand held shear vane equipment, corresponding to a stiff to hard consistency.

Soils generally comprising sandy gravels, inferred to be alluvial sediments of late Pleistocene age, were encountered beneath the surficial layers of silts. These sediments were generally encountered to the extent of the machine excavated test pits.

Dynamic Cone Penetrometer (DCP) scala tests undertaken in the sandy gravels generally obtained blow counts of between 4 and 15 blows per 50 mm penetration in these sediments, corresponding to SPT 'N' values of greater than 50, generally corresponding to a very dense consistency.

The log of a water bore, put down approximately 50 m to the west of the subject site, has been sourced from Environment Canterbury records.

The existing water bore log indicates that gravels are generally located at shallow depths, which is consistent with the subsoil conditions encountered at the subject site. The bore log indicates that these gravels extend to significant depths beneath the ground surface.

5.4 GROUNDWATER

Groundwater was not encountered at the locations of the machine excavated test pits put down at the time of investigation reported herein. Information obtained from water bore logs, located in the vicinity of the site, indicate that the groundwater level in the vicinity of the site is likely to be at depths in excess of 10 m below the ground surface.

6.0 LIQUEFACTION POTENTIAL ASSESSMENT

6.1 GENERAL

This section of the report presents the results of a site-specific liquefaction potential assessment undertaken for the subject site.

Liquefaction is defined as the phenomenon that occurs when soils are subject to a sudden loss in shear stiffness and strength associated with a reduction in effective stress due to cyclic loading (i.e. ground shaking associated with an earthquake).

The two main effects of liquefaction on soils are:

- (a) Consolidation of the liquefied soils
- (b) Reduction in shear strength within the liquefied soils

Liquefaction is considered to occur when the soils reach a condition of “zero effective stress”. It is considered that only “sand like” soils can reach a condition of “zero effective stress” and therefore only “sand like” soils are considered to be liquefiable.

An indication that the underlying soils have been subject to liquefaction is the surface expression of ejected sand and water. This occurs as a result of the dissipation of excess pore water pressures generated within the liquefied soils as a result of the cyclic loading.

It should be noted that cohesive type materials or “clay like” soils are unlikely to be subject to liquefaction, as these soils (due to their nature) are unlikely to develop sufficient excess pore water pressures during cyclic loading to reach a condition of zero effective stress, i.e. the point of liquefaction. However, “clay like” soils do develop some excess pore water pressures during cyclic loading which can result in consolidation settlement and a temporary reduction of the shear strength (i.e. softening) of the soils. Sensitive “clay like” soils are in particular susceptible to softening as a result of cyclic loading.

A liquefaction potential assessment has been undertaken for the soils underlying the subject site.

6.2 METHOD OF ANALYSIS

Guidelines for the assessment of the liquefaction potential of soils is provided by the New Zealand Geotechnical Society in the document entitled “Geotechnical Earthquake Engineering Practice: Module 1- Guideline for the identification, assessment and mitigation of liquefaction hazards”, dated July 2010.

The July 2010 guideline refers to the methods suggested by “Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils”, dated October 2001. The October 2001 report, among others, refers to papers by Youd et al; Seed; Idriss; Boulanger; Robertson and Bray.

The July 2010 guideline suggests a three step process for the liquefaction assessment of sites, being:

- (i) Step 1: Assessment of liquefaction susceptibility
- (ii) Step 2: Triggering of liquefaction
- (iii) Step 3: Consequences of liquefaction

A liquefaction potential assessment of the soils underlying the subject site has been undertaken using the methods suggested by the July 2010 guideline.

6.3 ASSESSMENT OF LIQUEFACTION SUSCEPTIBILITY

The following soils are generally considered to be susceptible to liquefaction:

- (a) Young (typically Holocene age) alluvial sediments (typically fluvial deposits laid down in a low energy environment) or man-made fills
- (b) Poorly consolidated/compacted sands and silty sands
- (c) Areas with a high groundwater level.

As discussed in Section 3.0 of this report, the geological map for the area indicates that the site is likely to be underlain by “brownish grey river alluvium” of late Pleistocene age.

As discussed in Section 5.3 of this report, the results of the field investigations indicate that the site is generally underlain by a surficial layer of silts, which is in turn underlain by sandy gravels. The sandy gravels are generally of a very dense consistency, and are inferred to extend to significant depths below the ground surface.

As discussed in Section 5.4 of this report, the groundwater level in the vicinity of the site is likely to be at depths in excess of 10 m below the ground surface.

Based on the foregoing, given the nature, age and consistency of the sediments underlying the subject site, i.e. generally unsaturated very dense sandy gravels, it is our opinion that the soils underlying the site are unlikely to be susceptible to liquefaction in response to a future large earthquake event and that the risk of any significant liquefaction induced ground deformation occurring at the site in response to a large earthquake event is considered to be low.

7.0 FOUNDATION DESIGN CONSIDERATIONS

7.1 GENERAL

It is our opinion that the soils underlying the subject site will exhibit only a low compressibility under the relatively light static foundation loads associated with a residential building development constructed in accordance with the requirements of NZS 3604: 2011, New Zealand Standard, Timber Framed Buildings.

It is, therefore, our opinion that settlement should not present a problem for any future proposed residential development at the site, providing the inspection and design of foundations are carried out in accordance with the requirements of the relevant New Zealand Standard Codes of Practice, and in accordance with the recommendations presented in this report.

7.2 THE RISK OF THE SITE BEING ADVERSELY AFFECTED BY GROUND DEFORMATIONS ASSOCIATED WITH LIQUEFACTION

As discussed in Section 6.3 of this report, it is our opinion that the surficial soils underlying the subject site are unlikely to be susceptible to liquefaction in response to a future large earthquake event and that the risk of any significant liquefaction induced ground deformation occurring at the site in response to a large earthquake event is low.

Based on the results of the investigations and appraisal reported herein, it is our opinion that an appropriate foundation solution for the site conditions would be a shallow foundation system designed in accordance with the requirements of NZS 3604: 2011, New Zealand Standard, Timber Framed Buildings, founded in the underlying alluvial sediments.

It is recommended that any proposed shallow foundations be founded beneath the surficial topsoil into the underlying competent alluvial sediments.

Fraser Thomas Ltd should be engaged to inspect any foundation excavations, prior to the placement of any foundation materials, in order to confirm that the excavations are founded in competent natural ground.

7.3 SHALLOW FOUNDATIONS LOCATED IN CLOSE PROXIMITY TO THE EXISTING SEDIMENT CONTROL PONDS AT THE SITE

As discussed in Section 4.2 of this report, two existing ponds, approximately 1.0 m deep, are located along the southern site boundary. It is understood that these ponds are remnant sediment control ponds, which were installed to control sediments generated from the previous subdivisional earthworks, undertaken for the previous subdivision located to the south of the subject site.

The approximate inferred locations and extent of the remnant sediment control ponds are shown on the appended drawing G00114-01.

Loose sediments are likely to have been deposited in the base of the sediment control ponds.

There is a risk that shallow building foundations founded within the footprint of the existing ponds may be subject to differential settlement.

In order to mitigate the risk of any proposed future shallow foundations being adversely affected by the settlement of sediments in these ponds, it is recommended, unless further specific investigation and appraisal works are undertaken by a Chartered Professional Engineer experienced in geotechnical engineering, that shallow foundations associated with any proposed future dwellings at the site, be located no closer than a horizontal distance of 5 m from the edge of the existing ponds.

7.4 FOUNDATIONS LOCATED IN CLOSE PROXIMITY TO THE EXISTING SOAK PIT

As discussed in Section 4.2 of this report, an existing 3.0 m deep “soak pit” was observed located in the western part of the site. It is understood that this was excavated by the farmer and is used to dispose of overland stormwater from the site.

The approximate inferred location and extent of the existing soak pit is shown on the appended drawing G00114-01.

There is, in our opinion, a risk that shallow foundations founded within the vicinity of the soak pit, may be subject to differential settlement, which may adversely affect future building development in this area. It is therefore recommended that further site specific geotechnical investigation works be undertaken, for any proposed building development located in the vicinity of the existing soak pit, in order to provide appropriate recommendations and parameters for foundation design purposes.

8.0 ALLOWABLE FOUNDATION BEARING PRESSURES

8.1 GENERAL

In this section of the report, ultimate bearing capacity values and strength reduction factors are provided in order to allow calculation of design (dependable) foundation bearing capacities, in accordance with the limit state design methods outlined in AS/NZS 1170: 2002, Structural Design Actions, by applying the appropriate strength reduction factors, as provided in this report, and the factored load combinations required by AS/NZS 1170. Allowable foundation bearing pressures are also provided, based on conventional factors of safety, for cases where unfactored load combinations are being considered.

8.2 SHALLOW PAD OR STRIP FOOTINGS

A minimum ultimate static bearing capacity value for vertical loading of 300 kPa is recommended for shallow pad or strip footings founded within the underlying alluvial sediments. It is recommended that a strength reduction factor (Φ_{bc}) of 0.5 be adopted for limit state design in accordance with the requirements of AS/NZS 1170, resulting in a design (dependable) bearing capacity value of 150 kPa.

If unfactored load combinations are to be considered, the allowable foundation bearing pressures presented in Table 1 are recommended for shallow pad or strip footings, founded within the underlying alluvial sediments.

TABLE 1: ALLOWABLE FOUNDATION BEARING PRESSURES FOR SHALLOW PAD OR STRIP FOOTINGS WITHIN THE UNDERLYING ALLUVIAL SEDIMENTS

Load Case	Factor of Safety	Allowable Bearing Pressure (kPa)
Dead Load and Permanent Live Load	3.0	100
Dead plus Live plus Transient Load	2.0	150

9.0 EXISTING SERVICE LINES

It is recommended that the location and depth of any buried services should be verified at the site prior to the commencement of any new foundation construction.

It is expected that any service line trenches would have been backfilled by conventionally acceptable means, which did not involve specific compaction. It would therefore be expected that some consolidation settlement of the service trench backfill could occur, which could result in lateral and vertical deformation of the undisturbed ground on each side of the trench backfill. The deformation is caused by the soil wedge behind the side wall of the trench moving downwards and

inwards with time, towards the trench backfill as the backfill consolidates. The geometry of the soil wedge defines the theoretical zone of influence of the service trench backfill.

Due to the risk of consolidation settlement of the trench backfill occurring, it is recommended that, if any foundations of any proposed new dwelling are located within the zone of influence of any existing service line, either the trench backfill be excavated and replaced with compacted hardfill or the foundations and floor of the proposed new dwelling be designed to span across the trench backfill and the adjacent zone of influence.

The zone of influence is defined by a theoretical line projecting upwards in both directions from the centreline of the pipeline at the invert level of the pipeline at an angle of 45° to the vertical. The zone of influence is defined by the zone between the intersection point of the theoretical line and the ground surface on each side of the pipeline.

10.0 STORMWATER AND EFFLUENT DISPOSAL

It is understood that issues relating to stormwater discharge and effluent disposal will be addressed by others.

11.0 DEVELOPMENTAL EARTHWORKS

It is recommended that, unless the stability of any developmental earthworks (i.e. constructed for an access driveway, building platform or landscaping) is considered in detail by a chartered professional engineer experienced in geotechnical engineering, and particularly slope stability considerations, permanent fill end and cut slopes should be constructed to a maximum batter slope of 26° (1V:2H) with maximum batter heights of approximately 1.0 m. Any proposed higher permanent batter slopes should be subject to specific stability appreciation so as to determine stable limiting batter slopes.

It is recommended that any temporary excavated slopes be constructed to a maximum batter slope of 45° (1V:1H), with a maximum batter height of approximately one meter. It is recommended that any temporary excavation slopes not be left unsupported for a period exceeding one month. It is also recommended that stormwater run-off be diverted away from the crest of any proposed temporary excavation slopes.

12.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations should be read together and not be taken in isolation.

12.1 CONCLUSIONS

Our conclusions based on the field data obtained from the site and as presented in this report, our visual appraisal of the site, our study of the geological maps relating to the area and our professional judgement and opinions, are as follows:

- (a) The site is, in general, considered suitable for its intended use, with satisfactory conditions for future residential development, subject to the recommendations and qualifications reported herein, and provided the design and inspection of foundations are carried out as

would be done under normal circumstances in accordance with the requirements of NZS 3604: 2011, New Zealand Standard, Timber Framed Buildings.

In arriving at this conclusion and expressing this opinion, reliance has been based on the various topographical data as discussed herein and on subsoil information which has only been obtained at the locations and within the depths of the test pits and hand augered boreholes reported herein. It has been assumed that this subsoil information can be projected between the various test positions. Even though such inference is made and forms the basis of the conclusions and opinions expressed herein, no guarantee can be given as to the validity of this inference or of the nature and continuity of the subsoils underlying the subject site.

- (b) The purpose of the geotechnical investigation reported herein was to determine the subsoil conditions beneath the subject site as they may affect future residential development, with particular regard to foundation considerations, and to determine the suitability of the subject site in support of an application for rezoning of the land.
- (c) The test pit and borehole logs, presented in the Appendix of this report, indicate that the subject site is, in general, underlain by soils inferred to be alluvial sediments of late Pleistocene age.
- (d) A surficial layer of topsoil, generally comprising silts, was generally encountered at the locations of the test positions, to a depth of between approximately 0.2 m and 0.4 m below the existing ground surface.

A surficial layer of topsoil, approximately 0.6 m thick, was encountered at the location of Test Pit TP1. This thicker layer of topsoil is inferred to be localised and likely associated with previous farm works. This topsoil thickness is not believed to be representative of the topsoil layer thickness across the subject site.

- (e) An upper layer of soils, generally comprising stiff to hard silts and gravelly silts, inferred to be alluvial sediments of late Pleistocene age, was encountered beneath the surficial layer of topsoil. These sediments were generally encountered to a depth of between approximately 0.4 m and 0.9 m below the existing ground surface, corresponding to a layer thickness of between approximately 0.2 m to 0.4 m.
- (f) Soils generally comprising very dense sandy gravels, inferred to be alluvial sediments of late Pleistocene age, were encountered beneath the surficial layers of silts. These sediments were generally encountered to the extent of the machine excavated test pits.

The log of a water bore, put down approximately 50 m to the west of the subject site, has been sourced from Environment Canterbury records.

The existing water bore log indicates that gravels are generally located at shallow depths, which is consistent with the subsoil conditions encountered at the subject site. The bore log indicates that these gravels extend to significant depths beneath the ground surface.

- (g) Groundwater was not encountered at the locations of the machine excavated test pits put down at the time of investigation reported herein. Information obtained from water bore logs, located in the vicinity of the site, indicate that the groundwater level in the vicinity of the site is likely to be at depths in excess of 10 m below the ground surface.

- (h) Given the nature, age and consistency of the sediments underlying the subject site, i.e. generally unsaturated very dense sandy gravels, it is our opinion that the soils underlying the site are unlikely to be susceptible to liquefaction in response to a future large earthquake event and that the risk of any significant liquefaction induced ground deformation occurring at the site in response to a large earthquake event is considered to be low.
- (i) Based on the results of the investigations and appraisal reported herein, it is our opinion that an appropriate foundation solution for the site conditions would be a shallow foundation system designed in accordance with the requirements of NZS 3604: 2011, New Zealand Standard, Timber Framed Buildings, founded in the underlying alluvial sediments.
- (j) It is our opinion that the soils underlying the subject site will exhibit only a low compressibility under the relatively light static foundation loads associated with a residential building development constructed in accordance with the requirements of NZS 3604: 2011, New Zealand Standard, Timber Framed Buildings.

It is, therefore, our opinion that settlement should not present a problem for any future proposed residential development at the site, providing the inspection and design of foundations are carried out in accordance with the requirements of the relevant New Zealand Standard Codes of Practice, and in accordance with the recommendations presented in this report.

12.2 RECOMMENDATIONS

Our recommendations based on the field data obtained from the site and as presented in this report, our visual appraisal of the site, our study of the geological maps relating to the area and our professional judgement and opinions, are as follows:

- (a) That any proposed shallow foundations be founded beneath the surficial topsoil into the underlying competent alluvial sediments.

Fraser Thomas Ltd should be engaged to inspect any foundation excavations, prior to the placement of any foundation materials, in order to confirm that the excavations are founded in competent natural ground.
- (b) That, unless further specific investigation and appraisal works are undertaken by a Chartered Professional Engineer experienced in geotechnical engineering, shallow foundations associated with any proposed future dwellings at the site, should be located no closer than a horizontal distance of 5 m from the edge of the existing ponds.
- (c) That further site specific geotechnical investigation works be undertaken, for any proposed building development located in the vicinity of the existing soak pit, in order to provide appropriate recommendations and parameters for foundation design purposes.
- (d) A minimum ultimate static bearing capacity value for vertical loading of 300 kPa is recommended for shallow pad or strip footings founded within the underlying alluvial sediments. It is recommended that a strength reduction factor (Φ_{bc}) of 0.5 be adopted for limit state design in accordance with the requirements of AS/NZS 1170, resulting in a design (dependable) bearing capacity value of 150 kPa.
- (e) That the location and depth of any buried services should be verified at the site prior to the commencement of any new foundation construction.

- (f) That, if any foundations of any proposed new dwelling are located within the zone of influence of any existing service line, either the trench backfill be excavated and replaced with compacted hardfill or the foundations and floor of the proposed new dwelling be designed to span across the trench backfill and the adjacent zone of influence.
- (g) That, unless the stability of any developmental earthworks (i.e. constructed for an access driveway, building platform or landscaping) is considered in detail by a chartered professional engineer experienced in geotechnical engineering, and particularly slope stability considerations, permanent fill end and cut slopes should be constructed to a maximum batter slope of 26° (1V:2H) with maximum batter heights of approximately 1.0 m. Any proposed higher permanent batter slopes should be subject to specific stability appreciation so as to determine stable limiting batter slopes.
- (h) That any temporary excavated slopes be constructed to a maximum batter slope of 45° (1V:1H), with a maximum batter height of approximately one meter. It is recommended that any temporary excavation slopes not be left unsupported for a period exceeding one month. It is also recommended that stormwater run-off be diverted away from the crest of any proposed temporary excavation slopes.

13.0 LIMITATIONS

The professional opinion expressed herein has been prepared solely for, and is furnished to our client, Mr Mervyn Todd and his professional advisors, and Selwyn District Council for their purposes only with respect to the particular brief given to us, on the express condition that it will not be relied upon by any other person or for any other purposes without our prior written agreement, and relates to the conditions that exist up to and at the time of this report.

No liability is accepted by this firm or by any principal, or director, or any servant or agent of this firm, in respect of the use of this report by any other person, and any other person who relies upon any matter contained in this report does so entirely at its own risk. This disclaimer shall apply notwithstanding that this report may be made available to any person by any person in connection with any application for permission or approval, or pursuant to any requirement of law.

This report does not comment on stormwater management, flooding, root effects and land uses outside the specific site, which may be required to be assessed to complete a foundation design for building consent application purposes.

Notwithstanding the foregoing, if the circumstances at the subject site change with respect to topography or the proposed development concept, or the buildings are subject to further damaging earthquakes, or if a period of more than three years has elapsed since the date of this report, this report should not be used without our prior review and written agreement.

The conclusions and recommendations expressed herein should be read in conjunction with the remainder of this report and should not be referred to out of context with the remainder of this report.

Report prepared by:
FRASER THOMAS LTD.



K E TWOHILL
Engineering Geologist

Report reviewed and approved by:



M V REED
Director
Chartered Professional Engineer

J:_CH Series\CH00114 - North Darfield\Geotechnical\Reports\TODD North Darfield REP 190801 KT.doc

Appendix A

Field Investigation Results

Hand Augered Boreholes



BOREHOLE AND TEST PIT LOGS SYMBOLS AND TERMS

SYMBOLS AND ABBREVIATIONS

RL	Reduced Level
EOH	End of Hole
•	Shear vane test result
UTP	Unable to Penetrate
TDTA	Too Difficult to Auger
SPT	Standard Penetration Test
N	SPT blows per 300mm penetration
35/90	35 blows per 90mm penetration after seating for SPT
(s)	Inclusive of seating blow count for SPT
GWL	Ground Water Level

Wf	Field water content
Wp	Plastic limit (%)
WL	Liquid Limit (%)
RQD	Rock Quality Designation
SG	Specific Gravity
%F	Percentage fines (<75 microns)
PSD	Particle size distribution
CONS	Consolidation test
COMP	Compaction test
UCS	Unconfined Compressive Strength
k	Permeability coefficient (m/s)
LS	Linear Shrinkage (%)
OC	Organic Content (%)

SOIL

	TOPSOIL		COBBLES
	CLAY		BOULDERS
	SILT		PEAT
	SAND		FILL
	GRAVEL		

CONSISTENCY TERMS

Cohesive Description	Undrained Shear Strength (kPa)
Very Soft	<12
Soft	12 - 25
Firm	25 - 50
Stiff	50 - 100
Very Stiff	100 - 200
Hard	>200

RELATIVE DENSITY

Non-cohesive Description	SPT "N" Value
Very Loose	<4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	> 50

ROCK

	LIMESTONE		RYHOLITE
	MUDSTONE		ANDESITE
	SANDSTONE		BASALT
	CONGLOMERATE		
	BRECCIA		

STRENGTH

Description	Unconfined Compressive Strength MPa
Extremely Weak	< 1
Very Weak	1 - 5
Weak	5 - 20
Moderately Strong	20 - 50
Strong	50 - 100
Very Strong	100 - 250
Extremely Strong	> 250

WEATHERING

UW	- Unweathered (fresh rock)
SW	- Slightly Weathered
MW	- Moderately Weathered
HW	- Highly Weathered
CW	- Completely Weathered
RS	- Residual Soil

SPACING OF DISCONTINUITIES

Term	Aperture (mm)
Very widely spaced	>2000
Widely spaced	600 - 2000
Moderately widely spaced	200 - 600
Closely spaced	60 - 200
Very closely spaced	20 - 60
Extremely closely spaced	<20

Notes

1. Based on New Zealand Geotechnical Society "Field Description of Soil and Rock, Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes" December 2005
2. Composite soil types are signified by combined symbols



**Fraser
Thomas**

ENGINEERS • RESOURCE MANAGERS • SURVEYORS

HAND AUGER LOG

Hole No:

H1

Project No:

CH00114

Project: **Mervyn Todd**

Kimberley Road, Darfield, Canterbury

Shear Vane:

Date Drilled:

01/08/2019

Logged By:

KT

Checked By:

Depth (m)	Description of Strata	Geological Unit	Graphic Log	Undrained Shear Strength (kPa)		Values	Depth (m)	Dynamic Cone Penetrometer											Groundwater
				● Shear Vane	○ Residual Shear Vane			Test Method: NZS 4402:1988, Test 6.5.2 (Blows / 0mm)											
				50	100	150	200		2	4	6	8	10	12	14	16			
0.2	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S						UTP									GWNE		
0.4	SILT, gravelly (fine to medium, subangular to subrounded), yellowish brown, stiff, moist, non plastic [ALLUVIAL SEDIMENTS]																		
0.6	EOH: 0.40 m TOO DIFFICULT TO AUGER																		
0.8																			
1.0																			
1.2																			
1.4																			
1.6																			
1.8																			
2.0																			
2.2																			
2.4																			
2.6																			
2.8																			
3.0																			
3.2																			
3.4																			
3.6																			
3.8																			
4.0																			
4.2																			
4.4																			
4.6																			
4.8																			
Remarks:								Datum:											
								Coordinates:											



**Fraser
Thomas**

ENGINEERS • RESOURCE MANAGERS • SURVEYORS

HAND AUGER LOG

Hole No:

H2

Project No:

CH00114

Project: **Mervyn Todd**

Kimberley Road, Darfield, Canterbury

Shear Vane:

Date Drilled:

01/08/2019

Logged By:

KT

Checked By:

Depth (m)	Description of Strata	Geological Unit	Graphic Log	Undrained Shear Strength (kPa)		Values	Depth (m)	Dynamic Cone Penetrometer									Groundwater
				● Shear Vane	○ Residual Shear Vane			Test Method: NZS 4402:1988, Test 6.5.2 (Blows / 0mm)									
				50	100	150	200		2	4	6	8	10	12	14	16	
0.2	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S															GWNE
0.4	EOH: 0.30 m TOO DIFFICULT TO AUGER																
0.6																	
0.8																	
1.0																	
1.2																	
1.4																	
1.6																	
1.8																	
2.0																	
2.2																	
2.4																	
2.6																	
2.8																	
3.0																	
3.2																	
3.4																	
3.6																	
3.8																	
4.0																	
4.2																	
4.4																	
4.6																	
4.8																	
Remarks:							Datum:										
							Coordinates:										



**Fraser
Thomas**

ENGINEERS • RESOURCE MANAGERS • SURVEYORS

HAND AUGER LOG

Hole No:

H3

Project No:

CH00114

Project: **Mervyn Todd**

Kimberley Road, Darfield, Canterbury

Shear Vane:

Date Drilled:

01/08/2019

Logged By:

KT

Checked By:

Depth (m)	Description of Strata	Geological Unit	Graphic Log	Undrained Shear Strength (kPa)		Values	Depth (m)	Dynamic Cone Penetrometer									Groundwater
				● Shear Vane	○ Residual Shear Vane			Test Method: NZS 4402:1988, Test 6.5.2 (Blows / 0mm)									
				50	100	150	200		2	4	6	8	10	12	14	16	
0.2	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S															
0.4	EOH: 0.30 m TOO DIFFICULT TO AUGER																
0.6																	
0.8																	
1.0																	
1.2																	
1.4																	
1.6																	
1.8																	
2.0																	
2.2																	
2.4																	
2.6																	
2.8																	
3.0																	
3.2																	
3.4																	
3.6																	
3.8																	
4.0																	
4.2																	
4.4																	
4.6																	
4.8																	
Remarks:							Datum:										
							Coordinates:										



**Fraser
Thomas**

ENGINEERS • RESOURCE MANAGERS • SURVEYORS

HAND AUGER LOG

Hole No:

H4

Project No:

CH00114

Project: **Mervyn Todd**

Kimberley Road, Darfield, Canterbury

Shear Vane:

2512

Date Drilled:

01/08/2019

Logged By:

KT

Checked By:

Depth (m)	Description of Strata	Geological Unit	Graphic Log	Undrained Shear Strength (kPa)		Values	Depth (m)	Dynamic Cone Penetrometer										Groundwater
				● Shear Vane	○ Residual Shear Vane			Test Method: NZS 4402:1988, Test 6.5.2 (Blows / 0mm)										
				50	100	150	200		2	4	6	8	10	12	14	16		
0.2	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S																
0.4	SILT, gravelly (fine to medium, subangular to subrounded), yellowish brown, stiff, moist, non plastic [ALLUVIAL SEDIMENTS]				●			84										
0.6	EOH: 0.40 m TOO DIFFICULT TO AUGER																	
0.8																		
1.0																		
1.2																		
1.4																		
1.6																		
1.8																		
2.0																		
2.2																		
2.4																		
2.6																		
2.8																		
3.0																		
3.2																		
3.4																		
3.6																		
3.8																		
4.0																		
4.2																		
4.4																		
4.6																		
4.8																		
Remarks:								Datum:										
								Coordinates:										



**Fraser
Thomas**

ENGINEERS • RESOURCE MANAGERS • SURVEYORS

HAND AUGER LOG

Hole No:

H5

Project No:

CH00114

Project: **Mervyn Todd**

Kimberley Road, Darfield, Canterbury

Shear Vane:

Date Drilled:

01/08/2019

Logged By:

KT

Checked By:

Depth (m)	Description of Strata	Geological Unit	Graphic Log	Undrained Shear Strength (kPa)		Values	Depth (m)	Dynamic Cone Penetrometer									Groundwater
				● Shear Vane	○ Residual Shear Vane			Test Method: NZS 4402:1988, Test 6.5.2 (Blows / 0mm)									
				50	100	150	200		2	4	6	8	10	12	14	16	
0.2	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S															
0.4	EOH: 0.30 m TOO DIFFICULT TO AUGER																
0.6																	
0.8																	
1.0																	
1.2																	
1.4																	
1.6																	
1.8																	
2.0																	
2.2																	
2.4																	
2.6																	
2.8																	
3.0																	
3.2																	
3.4																	
3.6																	
3.8																	
4.0																	
4.2																	
4.4																	
4.6																	
4.8																	
Remarks:							Datum:										
							Coordinates:										



**Fraser
Thomas**

ENGINEERS • RESOURCE MANAGERS • SURVEYORS

HAND AUGER LOG

Hole No:

H6

Project No:

CH00114

Project: **Mervyn Todd**

Kimberley Road, Darfield, Canterbury

Shear Vane:

Date Drilled:

01/08/2019

Logged By:

KT

Checked By:

Depth (m)	Description of Strata	Geological Unit	Graphic Log	Undrained Shear Strength (kPa)		Values	Depth (m)	Dynamic Cone Penetrometer									Groundwater
				● Shear Vane	○ Residual Shear Vane			Test Method: NZS 4402:1988, Test 6.5.2 (Blows / 0mm)									
				50	100	150	200		2	4	6	8	10	12	14	16	
0.2	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S															GWNE
0.4	EOH: 0.30 m TOO DIFFICULT TO AUGER																
0.6																	
0.8																	
1.0																	
1.2																	
1.4																	
1.6																	
1.8																	
2.0																	
2.2																	
2.4																	
2.6																	
2.8																	
3.0																	
3.2																	
3.4																	
3.6																	
3.8																	
4.0																	
4.2																	
4.4																	
4.6																	
4.8																	
Remarks:							Datum:										
							Coordinates:										

***Machine Excavated
Test Pits***



**Fraser
Thomas**

ENGINEERS • RESOURCE MANAGERS • SURVEYORS

HAND AUGER LOG

Hole No:

TP1

Project No:

CH00114

Project: **Mervyn Todd**

Kimberley Road, Darfield, Canterbury

Shear Vane:

2512

Date Drilled:

01/08/2019

Logged By:

KT

Checked By:

Depth (m)	Description of Strata	Geological Unit	Graphic Log	Undrained Shear Strength (kPa)		Depth (m)	Dynamic Cone Penetrometer											Groundwater		
				Shear Vane	Residual Shear Vane		Test Method: NZS 4402:1988, Test 6.5.2 (Blows / 50mm)													
				50	100	150	200	Values		2	4	6	8	10	12	14	16			
0.2	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S							UTP									GWNE		
0.4	0.3 m: becomes gravelly																			
0.6																				
0.8	SILT, some sand (fine), trace gravel (fine, subangular), yellowish brown, hard, moist [ALLUVIAL SEDIMENTS]	River Alluvium																		
1.0	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), trace cobbles, greyish brown, very dense, moist																			
1.2																				
1.4																				
1.6																				
1.8																				
2.0																				
2.2																				
2.4																				
2.6	2.5 m - 2.7 m: Colour change to light grey, less fines																			
2.8	EOH: 2.90 m TARGET DEPTH																			
3.0																				
3.2																				
3.4																				
3.6																				
3.8																				
4.0																				
4.2																				
4.4																				
4.6																				
4.8																				
Remarks:									Datum:											
									Coordinates:											



**Fraser
Thomas**

ENGINEERS • RESOURCE MANAGERS • SURVEYORS

HAND AUGER LOG

Hole No:

TP2

Project No:
CH00114

Project: Mervyn Todd
Kimberley Road, Darfield, Canterbury

Shear Vane:
2512

Date Drilled:
01/08/2019

Logged By:
KT

Checked By:

Depth (m)	Description of Strata	Geological Unit	Graphic Log	Undrained Shear Strength (kPa)		Values	Depth (m)	Dynamic Cone Penetrometer		Groundwater
				Shear Vane	Residual Shear Vane			Test Method: NZS 4402:1988, Test 6.5.2 (Blows / 50mm)		
0.2	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S					0.2	1		
0.4	SILT, gravelly (fine, subangular), minor sand (fine), yellowish brown, hard, moist, low plasticity [ALLUVIAL SEDIMENTS]						0.4	2		
0.6							0.6	3		
0.8	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), minor cobbles, trace boulders, greyish brown, very dense, moist						0.8	6		
1.0							1.0	11		
1.2							1.2	18		
1.4							1.4			
1.6							1.6			
1.8							1.8			
2.0							2.0			
2.2							2.2			
2.4							2.4			
2.6							2.6			
2.8							2.8			
3.0							3.0			
3.2							3.2			
3.4							3.4			
3.6							3.6			
3.8							3.8			
4.0							4.0			
4.2							4.2			
4.4							4.4			
4.6							4.6			
4.8							4.8			
Remarks:							Datum:			
							Coordinates:			



**Fraser
Thomas**

ENGINEERS • RESOURCE MANAGERS • SURVEYORS

HAND AUGER LOG

Hole No:

TP3

Project No:

CH00114

Project: Mervyn Todd

Kimberley Road, Darfield, Canterbury

Shear Vane:

2512

Date Drilled:

01/08/2019

Logged By:

KT

Checked By:

Depth (m)	Description of Strata	Geological Unit	Graphic Log	Undrained Shear Strength (kPa)		Values	Depth (m)	Dynamic Cone Penetrometer		Groundwater
				Shear Vane	Residual Shear Vane			Test Method: NZS 4402:1988, Test 6.5.2 (Blows / 50mm)		
0.2	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S					0.2	1		GWNE
0.4	SILT, gravelly (fine to medium, subangular to subrounded), minor sand (fine), yellowish brown, hard, moist, low plasticity [ALLUVIAL SEDIMENTS]	River Alluvium					0.4	2		
0.6							0.6	6	15	
0.8	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), trace cobbles, trace boulders, greyish brown, very dense, moist						0.8			
1.0							1.0			
1.2							1.2			
1.4							1.4			
1.6							1.6			
1.8							1.8			
2.0							2.0			
2.2						2.2				
2.4	2.3 m - 2.5 m: Lense of GRAVEL (fine to medium), grey, wet					2.4				
2.6						2.6				
2.8						2.8				
3.0	EOH: 3.10 m TARGET DEPTH					3.0				
3.2						3.2				
3.4						3.4				
3.6						3.6				
3.8						3.8				
4.0						4.0				
4.2						4.2				
4.4						4.4				
4.6						4.6				
4.8						4.8				
Remarks:							Datum:			
							Coordinates:			



**Fraser
Thomas**

ENGINEERS • RESOURCE MANAGERS • SURVEYORS

HAND AUGER LOG

Hole No:

TP4

Project No:
CH00114

Project: Mervyn Todd
Kimberley Road, Darfield, Canterbury

Shear Vane:

Date Drilled:
01/08/2019

Logged By:
KT

Checked By:

Depth (m)	Description of Strata	Geological Unit	Graphic Log	Undrained Shear Strength (kPa)		Depth (m)	Dynamic Cone Penetrometer											Groundwater	
				Shear Vane	Residual Shear Vane		Test Method: NZS 4402:1988, Test 6.5.2 (Blows / 50mm)												
				50	100	150	200	Values	2	4	6	8	10	12	14	16			
0.2	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S																	
0.4	SILT, gravelly (fine to medium, subangular to subrounded), minor sand (fine), yellowish brown, hard, moist, non plastic [ALLUVIAL]	River Alluvium																	
0.6	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), with cobbles, greyish brown, very dense, moist																		
0.8																			
1.0																			
1.2																			
1.4																			
1.6																			
1.8			EOH: 1.80 m TARGET DEPTH																
2.0																			
2.2																			
2.4																			
2.6																			
2.8																			
3.0																			
3.2																			
3.4																			
3.6																			
3.8																			
4.0																			
4.2																			
4.4																			
4.6																			
4.8																			
Remarks:									Datum:										
									Coordinates:										



**Fraser
Thomas**

ENGINEERS • RESOURCE MANAGERS • SURVEYORS

HAND AUGER LOG

Hole No:

TP5

Project No:
CH00114

Project: Mervyn Todd
Kimberley Road, Darfield, Canterbury

Shear Vane:
2512

Date Drilled:
01/08/2019

Logged By:
KT

Checked By:

Depth (m)	Description of Strata	Geological Unit	Graphic Log	Undrained Shear Strength (kPa)		Values	Depth (m)	Dynamic Cone Penetrometer		Groundwater	
				Shear Vane	Residual Shear Vane			Test Method: NZS 4402:1988, Test 6.5.2 (Blows / 50mm)			
0.2	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S		●			0.2	1		GWNE	
0.4	SILT, gravelly (fine to medium, subangular to subrounded), minor sand (fine), yellowish brown, stiff, moist, non plastic [ALLUVIAL]	River Alluvium		●		98	0.4	2	15		
0.6	GRAVEL (fine to medium, subrounded, greywacke), silty, yellowish brown, very dense, moist							0.6	5		15
0.8								0.8	7		15
1.0	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), trace cobbles, greyish brown, very dense, moist							1.0	7		15
1.2						1.2					
1.4						1.4					
1.6						1.6					
1.8						1.8					
2.0						2.0					
2.2						2.2					
2.4						2.4					
2.6	EOH: 2.80 m TARGET DEPTH						2.6				
2.8							2.8				
3.0							3.0				
3.2							3.2				
3.4							3.4				
3.6							3.6				
3.8							3.8				
4.0							4.0				
4.2							4.2				
4.4							4.4				
4.6							4.6				
4.8							4.8				
Remarks:							Datum:				
							Coordinates:				



**Fraser
Thomas**

ENGINEERS • RESOURCE MANAGERS • SURVEYORS

HAND AUGER LOG

Hole No:

TP6

Project No:
CH00114

Project: **Mervyn Todd**
Kimberley Road, Darfield, Canterbury

Shear Vane:
2512

Date Drilled:
01/08/2019

Logged By:
KT

Checked By:

Depth (m)	Description of Strata	Geological Unit	Graphic Log	Undrained Shear Strength (kPa)		Depth (m)	Dynamic Cone Penetrometer		Groundwater
				Values					
				Vane readings corrected as per BS 1377 ● Shear Vane ○ Residual Shear Vane			Test Method: NZS 4402:1988, Test 6.5.2 (Blows / 50mm)		
				50	100		2	4	
0.2	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S				0.2	1		
0.4	SILT, gravelly (fine to medium, subangular to subrounded), minor sand (fine), yellowish brown, hard, moist, non plastic, trace rootlets [ALLUVIAL SEDIMENTS]	River Alluvium				0.4	2		
0.6				0.6	3				
0.8	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), greyish brown, very dense, moist			0.8	6				
1.0				1.0	7				
1.2						1.2			
1.4						1.4			
1.6						1.6			
1.8	EOH: 1.90 m TARGET DEPTH					1.8			
2.0						2.0			
2.2						2.2			
2.4						2.4			
2.6						2.6			
2.8						2.8			
3.0						3.0			
3.2						3.2			
3.4						3.4			
3.6						3.6			
3.8						3.8			
4.0						4.0			
4.2						4.2			
4.4						4.4			
4.6						4.6			
4.8						4.8			
Remarks:						Datum:			
						Coordinates:			



**Fraser
Thomas**

ENGINEERS • RESOURCE MANAGERS • SURVEYORS

HAND AUGER LOG

Hole No:

TP7

Project No:

CH00114

Project: **Mervyn Todd**

Kimberley Road, Darfield, Canterbury

Shear Vane:

2512

Date Drilled:

01/08/2019

Logged By:

KT

Checked By:

Depth (m)	Description of Strata	Geological Unit	Graphic Log	Undrained Shear Strength (kPa)		Depth (m)	Dynamic Cone Penetrometer											Groundwater
				Shear Vane	Residual Shear Vane		Test Method: NZS 4402:1988, Test 6.5.2 (Blows / 50mm)											
				50	100	150	200	Values	2	4	6	8	10	12	14	16		
0.2	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S																
0.4	SILT, gravelly (fine to medium, subangular to subrounded), minor sand (fine), yellowish brown, very stiff, moist, non plastic [ALLUVIAL SEDIMENTS]	River Alluvium						196										
0.6																		
0.8	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), minor cobbles, greyish brown, very dense, moist	River Alluvium						112										
1.0																		
1.2	EOH: 1.70 m TARGET DEPTH	River Alluvium																
1.4																		
1.6	EOH: 1.70 m TARGET DEPTH	River Alluvium																
1.8																		
2.0	EOH: 1.70 m TARGET DEPTH	River Alluvium																
2.2																		
2.4	EOH: 1.70 m TARGET DEPTH	River Alluvium																
2.6																		
2.8	EOH: 1.70 m TARGET DEPTH	River Alluvium																
3.0																		
3.2	EOH: 1.70 m TARGET DEPTH	River Alluvium																
3.4																		
3.6	EOH: 1.70 m TARGET DEPTH	River Alluvium																
3.8																		
4.0	EOH: 1.70 m TARGET DEPTH	River Alluvium																
4.2																		
4.4	EOH: 1.70 m TARGET DEPTH	River Alluvium																
4.6																		
4.8	EOH: 1.70 m TARGET DEPTH	River Alluvium																

Remarks:

Datum:

Coordinates:



**Fraser
Thomas**

ENGINEERS • RESOURCE MANAGERS • SURVEYORS

HAND AUGER LOG

Hole No:

TP8

Project No:

CH00114

Project: Mervyn Todd

Kimberley Road, Darfield, Canterbury

Shear Vane:

Date Drilled:

01/08/2019

Logged By:

KT

Checked By:

Depth (m)	Description of Strata	Geological Unit	Graphic Log	Undrained Shear Strength (kPa)		Depth (m)	Dynamic Cone Penetrometer		Groundwater	
				Values			Test Method: NZS 4402:1988, Test 6.5.2 (Blows / 50mm)			
0.2	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S				0.2				
0.4	SILT, gravelly (fine to medium, subangular to subrounded), yellowish brown, hard, moist, non plastic [ALLUVIAL SEDIMENTS]	River Alluvium				0.4	1	2		
0.6							0.6	3	6	
0.8	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), trace cobbles, greyish brown, dense to very dense, moist						0.8	7	8	
1.0						1.0	9	15		
1.2						1.2				
1.4						1.4				
1.6						1.6				
1.8						1.8				
2.0						2.0				
2.2	EOH: 2.30 m TARGET DEPTH					2.2				
2.4						2.4				
2.6						2.6				
2.8						2.8				
3.0						3.0				
3.2						3.2				
3.4						3.4				
3.6						3.6				
3.8						3.8				
4.0						4.0				
4.2						4.2				
4.4						4.4				
4.6						4.6				
4.8						4.8				
Remarks:						Datum:				
						Coordinates:				



**Fraser
Thomas**

ENGINEERS • RESOURCE MANAGERS • SURVEYORS

HAND AUGER LOG

Hole No:

TP9

Project No:

CH00114

Project: **Mervyn Todd**

Kimberley Road, Darfield, Canterbury

Shear Vane:

2512

Date Drilled:

01/08/2019

Logged By:

KT

Checked By:

Depth (m)	Description of Strata	Geological Unit	Graphic Log	Undrained Shear Strength (kPa)		Values	Depth (m)	Dynamic Cone Penetrometer																Groundwater
				● Shear Vane	○ Residual Shear Vane			Test Method: NZS 4402:1988, Test 6.5.2 (Blows / 50mm)																
				50	100	150	200		2	4	6	8	10	12	14	16								
0.2	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S																						
0.4	SILT, gravelly (fine to medium, subangular to subrounded), yellowish brown, stiff to hard, moist, non plastic [ALLUVIAL SEDIMENTS]	River Alluvium																						
0.6	GRAVEL (fine to medium, subrounded, greywacke), sandy (fine to coarse), greyish brown, very dense, moist																							
0.8	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), trace cobbles, trace boulders, greyish brown, very dense, moist																							
1.0	EOH: 1.70 m TARGET DEPTH																							
1.2																								
1.4																								
1.6																								
1.8																								
2.0																								
2.2																								
2.4																								
2.6																								
2.8																								
3.0																								
3.2																								
3.4																								
3.6																								
3.8																								
4.0																								
4.2																								
4.4																								
4.6																								
4.8																								
Remarks:							Datum:																	
							Coordinates:																	



**Fraser
Thomas**

ENGINEERS • RESOURCE MANAGERS • SURVEYORS

HAND AUGER LOG

Hole No:

TP10

Project No:

CH00114

Project: Mervyn Todd

Kimberley Road, Darfield, Canterbury

Shear Vane:

Date Drilled:

01/08/2019

Logged By:

KT

Checked By:

Depth (m)	Description of Strata	Geological Unit	Graphic Log	Undrained Shear Strength (kPa)		Depth (m)	Dynamic Cone Penetrometer											Groundwater
				Shear Vane	Residual Shear Vane		Test Method: NZS 4402:1988, Test 6.5.2 (Blows / 50mm)											
				50	100	150	200	Values	2	4	6	8	10	12	14	16		
0.2	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S																
0.4	SILT, gravelly (fine to medium, subangular to subrounded), minor sand (fine), yellowish brown, moist, non plastic [ALLUVIAL SEDIMENTS]	River Alluvium																
0.6																		
0.8	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), trace cobbles, greyish brown, very dense, moist																	
1.0																		
1.2																		
1.4																		
1.6																		
1.8																		
2.0	EOH: 2.10 m TARGET DEPTH																	
2.2																		
2.4																		
2.6																		
2.8																		
3.0																		
3.2																		
3.4																		
3.6																		
3.8																		
4.0																		
4.2																		
4.4																		
4.6																		
4.8																		
Remarks:									Datum:									
									Coordinates:									



**Fraser
Thomas**

ENGINEERS • RESOURCE MANAGERS • SURVEYORS

HAND AUGER LOG

Hole No:

TP11

Project No:

CH00114

Project: Mervyn Todd

Kimberley Road, Darfield, Canterbury

Shear Vane:

Date Drilled:

01/08/2019

Logged By:

KT

Checked By:

Depth (m)	Description of Strata	Geological Unit	Graphic Log	Undrained Shear Strength (kPa)		Depth (m)	Dynamic Cone Penetrometer		Groundwater
				Values	Values		Test Method: NZS 4402:1988, Test 6.5.2 (Blows / 50mm)	Values	
0.2	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S				0.2	1		GWNE
0.4	GRAVEL (fine to medium, subangular to subrounded), silty, yellowish brown, medium dense to dense, moist [ALLUVIAL SEDIMENTS]	River Alluvium				0.4	2		
0.6	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), trace cobbles, greyish brown, very dense, moist					0.6	3		
0.8						0.8	4		
1.0						1.0	11		
1.2						1.2	15		
1.4						1.4			
1.6						1.6			
1.8						1.8			
2.0	EOH: 2.10 m TARGET DEPTH					2.0			
2.2		2.2							
2.4		2.4							
2.6		2.6							
2.8		2.8							
3.0		3.0							
3.2		3.2							
3.4		3.4							
3.6		3.6							
3.8		3.8							
4.0		4.0							
4.2		4.2							
4.4		4.4							
4.6		4.6							
4.8		4.8							
Remarks:						Datum:			
						Coordinates:			



**Fraser
Thomas**

ENGINEERS • RESOURCE MANAGERS • SURVEYORS

HAND AUGER LOG

Hole No:

TP12

Project No:

CH00114

Project: Mervyn Todd

Kimberley Road, Darfield, Canterbury

Shear Vane:

2512

Date Drilled:

01/08/2019

Logged By:

KT

Checked By:

Depth (m)	Description of Strata	Geological Unit	Graphic Log	Undrained Shear Strength (kPa)		Values	Depth (m)	Dynamic Cone Penetrometer																Groundwater
				● Shear Vane	○ Residual Shear Vane			Test Method: NZS 4402:1988, Test 6.5.2 (Blows / 50mm)																
				50	100	150	200		2	4	6	8	10	12	14	16								
0.2	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S																						
0.4	SILT, some gravel (fine to medium, subangular to subrounded), yellowish brown, stiff to very stiff, moist, non plastic [ALLUVIAL SEDIMENTS]				●																			
0.6																								
0.8	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), trace cobbles, greyish brown, moist	River Alluvium																						
1.0																								
1.2																								
1.4																								
1.6																								
1.8																								
2.0	EOH: 2.00 m TARGET DEPTH																							
2.2																								
2.4																								
2.6																								
2.8																								
3.0																								
3.2																								
3.4																								
3.6																								
3.8																								
4.0																								
4.2																								
4.4																								
4.6																								
4.8																								
Remarks:							Datum:																	
							Coordinates:																	

Appendix C

Orion Confirmation Letter

24 September 2019

Kimberley and Broadmedows Drive Darfield

Craig Hurford
craig@survus.co.nz

Dear customer,

Proposed subdivision connection to the Orion network

Kimberley and Broadmeadows Drive Darfield, Lot 24 DP366007, Lot 4 DP52058 & PT RS 27204

I refer to your letter and the above named property(s). I have investigated your request and comment as follows;

1. Orion has the capacity on the network to supply the proposed development area
2. There is no specific connection(s) available, however;
3. Connections for one or more dwellings could be made available with alteration to the Orion network.
4. There may be costs associated with providing the connection(s).
5. This type of project will be considered under our subdivision policy.
6. The next step for the customer will be to engage an authorised Orion subdivision designer to help you through the process and submit a suitable design proposal so your development to connect to the network.

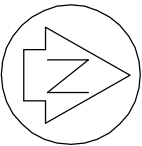
Once accepted the design can be competently tendered and Orion will then forward a connection agreement outlining its contribution. All terms and conditions will encompass Orion's policies and practices current at the time.

Please don't hesitate to contact me on (03) 363 9722 if you have any questions, or email me at craig.marshall@oriongroup.co.nz.

Yours sincerely



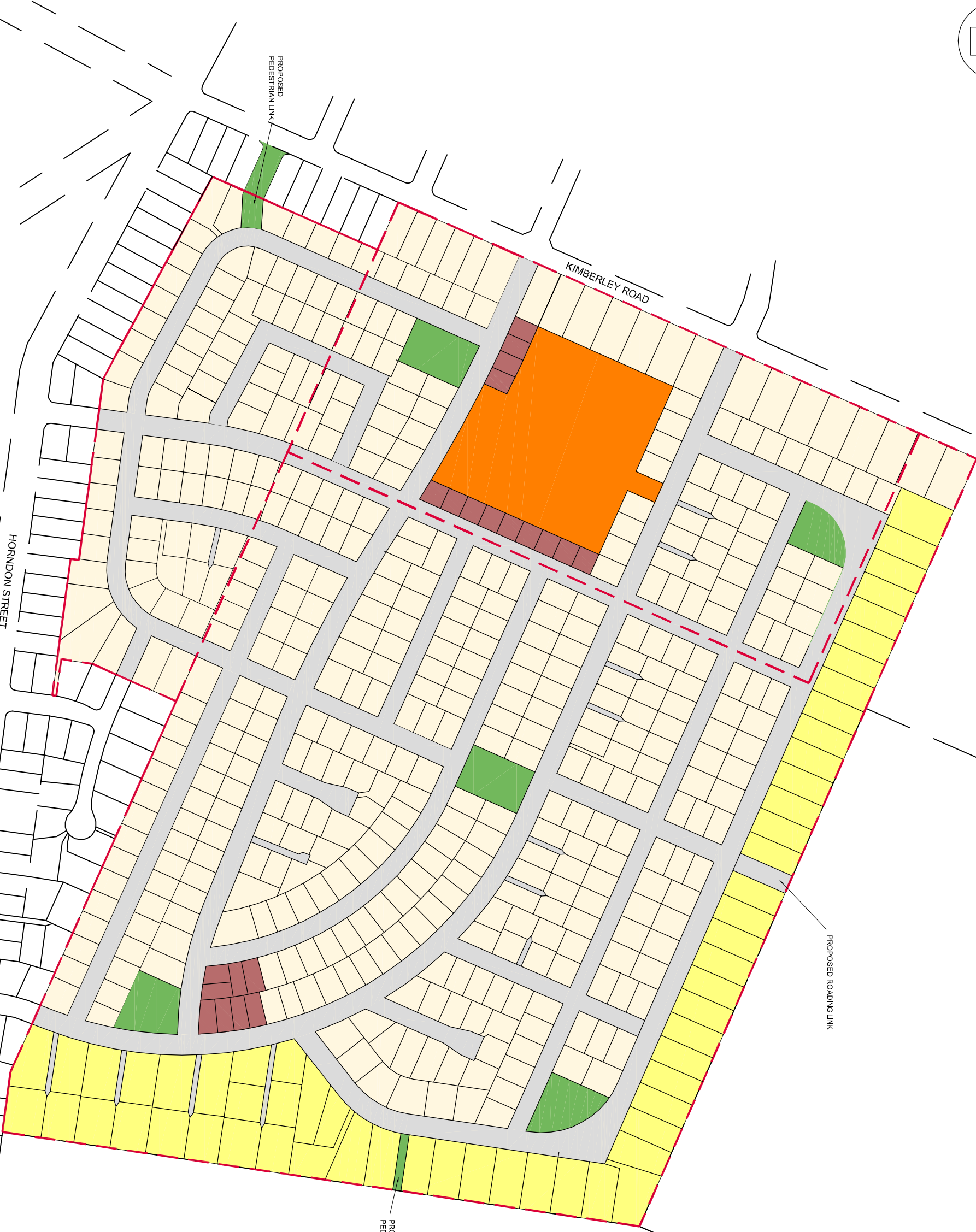
Craig Marshall
Reticulation Support Engineer



- NOTES:
1. THIS SURVEY HAS NOT INCLUDED SITE MARKING OF THE BOUNDARY POSITIONS UNLESS OTHERWISE INDICATED.
 2. NO UNDERGROUND SERVICE INFORMATION IS SHOWN ON THIS PLAN. THE LOCATION OF ANY SUCH SERVICES SHOULD BE CONFIRMED WITH THE RELEVANT LOCAL AUTHORITY OR UTILITY SERVICE PROVIDER.
 3. SCHEME PLAN ONLY. AREAS & DIMENSIONS ARE APPROXIMATE & SUBJECT TO FINAL SURVEY.

LEGEND

- MEDIUM DENSITY AREA (min 450m²)
- ROAD TO WEST
- REC RESERVE TO WEST
- AGED CARE FACILITY
- LIVING DENSITY AREA (min 1500m²)



REV	DATE	REVISION/DETAILS	ISSUED
C	19/08/19	FOR INFORMATION	CWH
B	05/08/19	FOR INFORMATION	CWH
A	22/07/19	FOR INFORMATION	CWH

PROJECT

KIMBERLEY AND BROADMEADOWS
DRIVE, DARFIELD

CLIENT

MERF AGRICULTURAL SERVICES

SURVYUS
CONSULTANTS
PLANNING + SURVEYING + ENGINEERING

4 Meadow Street, PO Box 5558, Papanui, Christchurch
P 03 352 5599
F 03 352 5527
TOLL FREE 0508 787 887

DARFIELD 03 318 8151

DRAWING TITLE

PROPOSED SCHEME PLAN
SHEET 1 OF 1

STATUS	SCALE	SIZE
FOR INFORMATION	1:2000	A1
PROJECT NO	DRAWING NO	REVISION

14243

SC-01

C

Appendix D

Chorus Confirmation Letter

Craig Hurford

From: Kathleen Bell <Kathleen.Bell@chorus.co.nz>
Sent: Wednesday, 25 September 2019 9:47 AM
To: Craig Hurford
Cc: Chorus Property Developments
Subject: RE: Proposed Subdivision - Darfield **high level confirmation team**

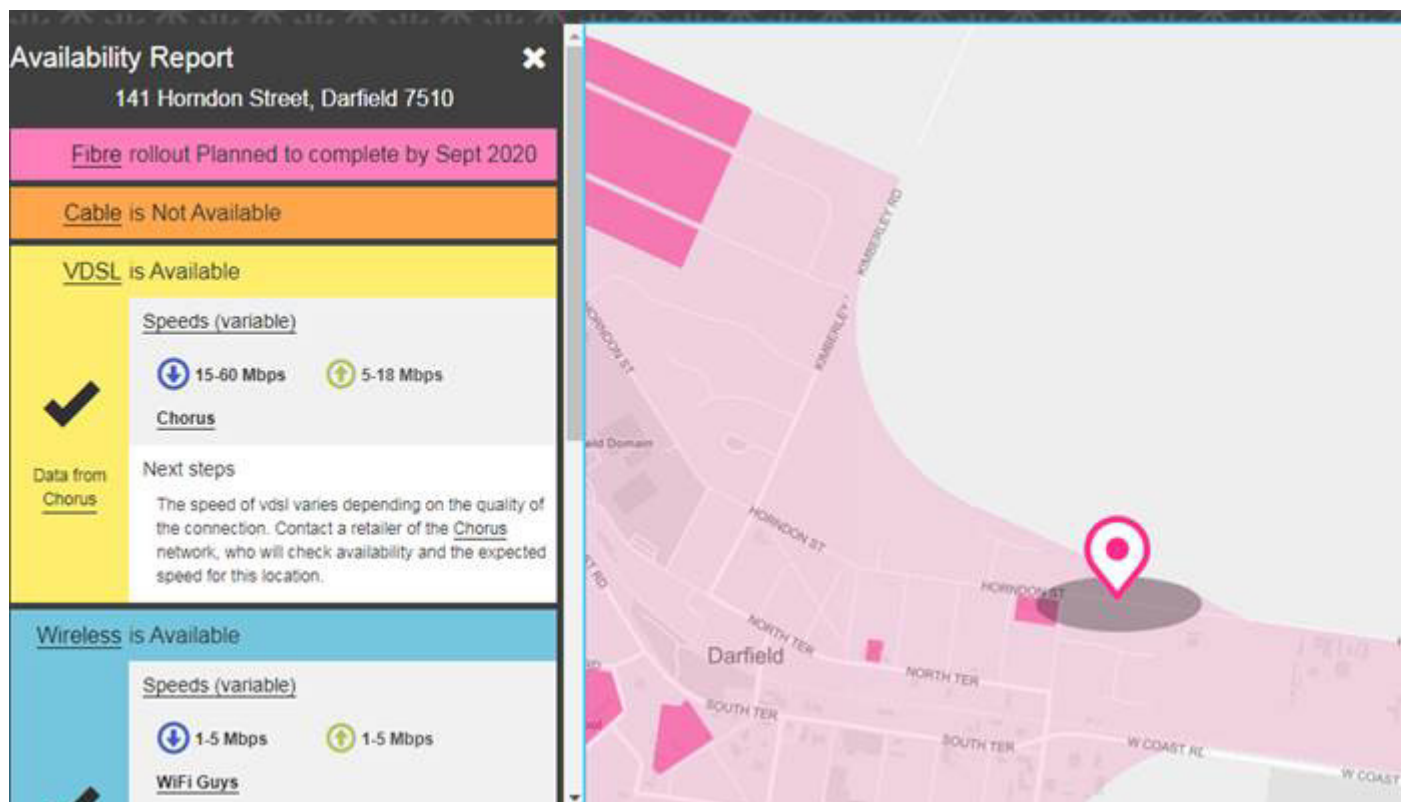
Hi Craig,

Thank you for providing an indication of your development plans in this area.

I can confirm that we have infrastructure in the general land area that you are proposing to develop.

Chorus will be able to extend our network to provide connection availability. However, please note that this undertaking would of course be subject to Chorus understanding the final total property connections that we would be providing, roll-out of property releases/dates and what investment may or may not be required from yourselves and Chorus to deliver the infrastructure to and throughout the site in as seamless and practical way as possible.

The cost involved would be a minimum of our current standard fee of \$1,200 or \$1,600 per lot excluding GST. The higher cost is for the lots that fall outside the UFB planned area (pink area)



Chorus is happy to work with you on this project as the network infrastructure provider of choice. What this ultimately means is that the end customers (business and home owners) will have their choice of any retail service providers to take their end use services from once we work with you to provide the physical infrastructure.

Please reapply with a detailed site plan when you are ready to proceed.

Thanks