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Application for Private Plan Change

DARFIELD: PREFERRED FUTURE DEVELOPMENT AREA 7, KIMBERLEY ROAD

2019

Selwyn District Council

December 2019

REQUEST TO CHANGE THE SELWYN DISTRICT PLAN UNDER CLAUSE 21 OF THE FIRST SCHEDULE OF THE RESOURCE MANAGEMENT ACT 1991

Request by: Merf Ag Services Ltd and Matthew Reed
C/- Aston Consultants Ltd
PO Box 1435
Christchurch 8140, Attn Fiona Aston

To: The Selwyn District Council

Involving the: Selwyn District Plan

The location to which this application relates is:

An appx **60 ha** land area located on the east of Kimberley Road and north of the existing L1 zoned land adjacent to SH3.

The names of the owners and occupiers of the land to which this application relates are as follows:

Part Rural Section 27204 Matthew Alexander Reed and Kerry Mark Glynn

Lot 24 DP 366007 – Helen Anne Reed and Kerry Mark Glynn

Lot 3-4 DP 524058 – Merf Ag Services Limited

The titles are attached as **Annexure 1** to this Plan Change request.

The Proposed Plan Change (the Proposal) seeks to amend the operative Selwyn District Plan (SDP) to enable development of the 60.5977 ha site ('the Site') for residential purposes, including medium density lots and a retirement village in an appropriate, sustainable and integrated manner that will provide for the long term needs of the Darfield and Selwyn community and that will enable Darfield to fulfil its planned role as a key service centre in the Selwyn District. .

The Proposal includes the following changes to the Selwyn District Plan and associated Planning Maps:

(a) Amend the District Planning Maps to rezone and identify the subject land Living 1 and Living 1 Deferred.

(b) Add an Outline Development Plan for the subject land to ensure a coordinated and consistent approach to land development;

(c) Amend the policies and rules of the District Plan as set out in Section 2 of this request; and

(d) Make any consequential changes to the District Plan text where necessary, including but not limited to, the renumbering of clauses as appropriate.

Signed: ……  ……

Fiona Aston, for and on behalf of Merf Ag Services Ltd and Matthew Reed

Dated: 4th December 2019

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TABLE OF CONTENTS

6. ASSESSMENT AGAINST OTHER PLANNING DOCUMENTS
Malvern Area Plan - 2031
Selwyn District Plan (SDP)
Mahaanui Iwi Management Plan

7. CONSULTATION

Annexures:

Annexure 1: Certificates of Title
Annexure 2: Submission to “Are we on Track” (Oct 2018)
Annexure 3: Outline Development Plan
Annexure 4: Assessment of the Planning Provisions
Annexure 5: Section 32 Evaluation
Annexure 6: Servicing Report
Annexure 7: Wastewater Options Infrastructure Report
Annexure 8: Preliminary Site Investigation
Annexure 9: Geotechnical Assessment
Annexure 10: Consultation Record

Figures:

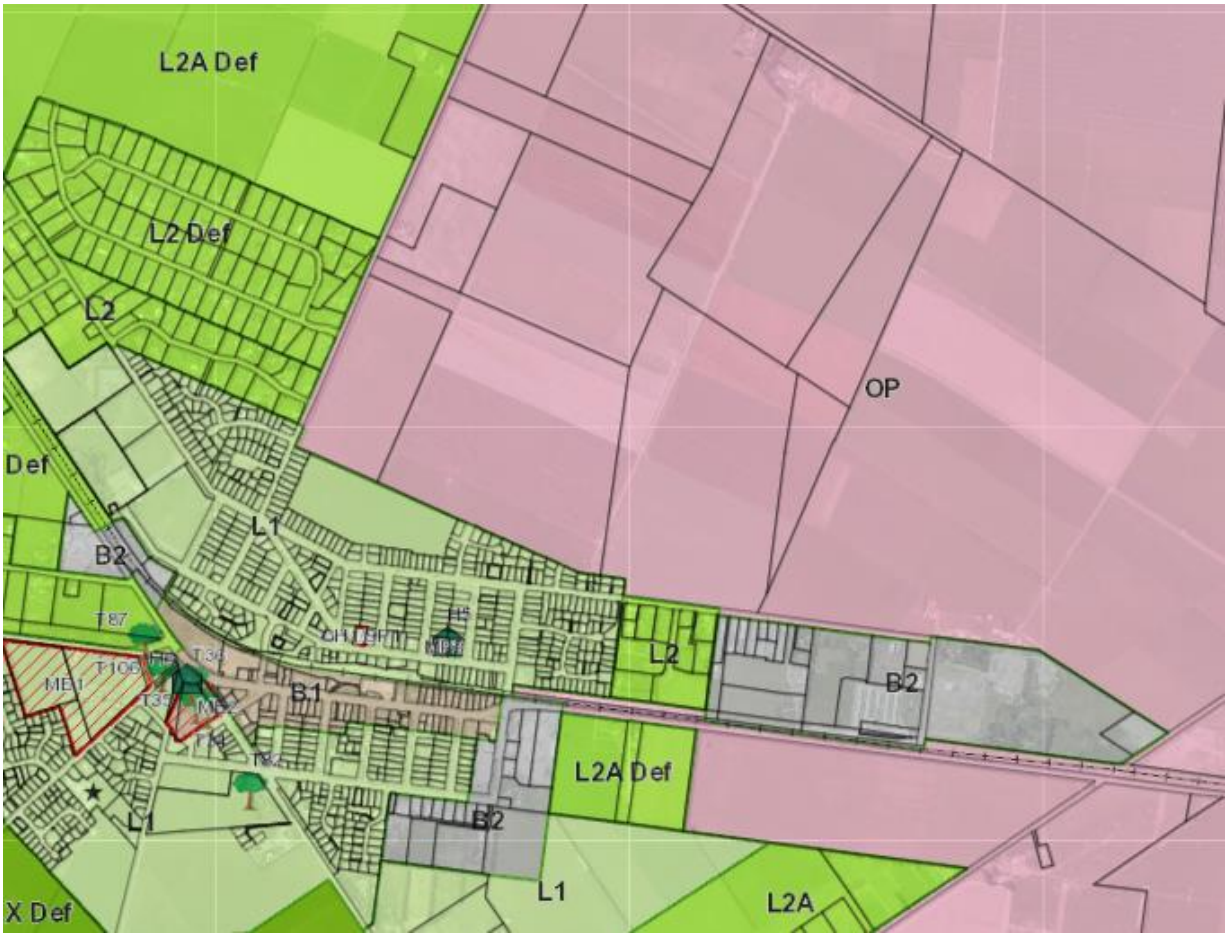
1 OVERVIEW

Purpose of the Plan Change Request (Clause 22(1) RMA)

1.1 The purpose of the proposed Plan Change is to enable the development of appx 60 ha of land ('the Site') north of Dundee Close and east of Kimberley Road for living purposes, including a retirement village and some medium density housing. Land closest to Kimberley Road (14.6 ha) will be zoned Living 1(L1) and the balance land (45.9977 ha) will be zoned Living 1 (Deferred). Development will be in accordance with an Outlined Development Plan (ODP) which includes existing L1 zoned land on the north side of Horndon Street. This land is included as part of the ODP in order to ensure an integrated approach to residential development including provision of appropriate road linkages to the proposed L1 and L1 Deferred zones.

1.2 The existing zoning is shown in Figure 1.

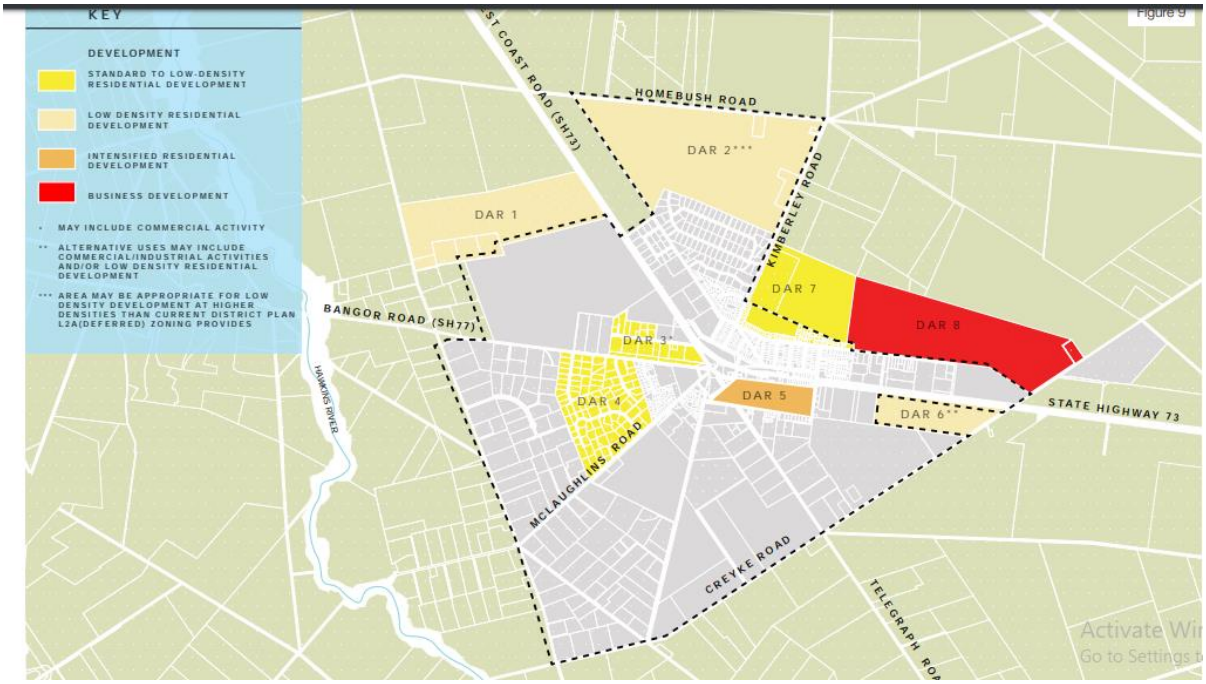
Figure 1: Existing Zoning



1.3 The Site is identified in the Malvern Area Plan 2031 (MAP) at page 28 as a "preferred future development area", and is identified as Area 7 (DAR7) for standard to low density residential

development (Figure 2). Land adjoining to the west is Preferred Future Business Development Area 8.

Figure 2: Malvern Area Plan Preferred Future Development Area Locations



1.4 The proposed rezoning of the Site represents a sustainable and efficient use of the land resource. It is a logical location for urban development within Darfield being located to the north and north east of the existing township which has been identified as a service centre within the Selwyn District in the Malvern Area Plan - 2031.

1.5 It has frontage to Kimberley Road and has access to Horndon Street. Land immediately adjoining the Site to the south is zoned L1 (Broadgate subdivision) with land to the west of Kimberly Road zoned Living 2 (L2) and L2 Deferred. Land immediately to the south of Horndon Street (the eastern edge of the site) is zoned L2.

1.6 The Plan Change request provides for the sustainable and integrated development and provision of residential land managed by way of an Outline Development Plan ('ODP') to ensure coordinated provision of infrastructure and services, including with adjoining land to the east.

1.7 The Proposal will provide in the 14.6ha L1 Zone approximately 90 low density lots, approximately 13 medium density lots, and a retirement village, all to be serviced by a local roading network, pedestrian accessways, reserves and off-site wastewater treatment in a privately owned and operated package treatment plant. The balance 46ha L1 Deferred zone will provide about approximately 283 standard residential lots, approximately 56 lower

density lots (minimum average density 1000m^2) type lots, and approximately eight medium density lots including reserves, a future road connection to the north and south, and a future connection to the off-site wastewater treatment plant or a reticulated public sewer system if available.

Reason for Request (Clause 22(1) RMA)

1.8 The applicants lodged a submission on the Selwyn District Plan Review Consultation Document 'Are we on track' in October 2018. That submission supported identification of DAR 7 as a preferred development area in the Malvern Area Plan (MAP) but noted that it should be identified as a mixed density residential area. The submission requested that it be zoned for this purpose in the District Plan Review, making provision for standard, medium and low density residential development and a retirement village.

1.9 The reason for this Plan Change request is to contribute to the planned development of Darfield. It provides for future residential opportunities in a preferred development location that effectively "squares off" the town. The L1 proposal will provide lot sizes that are presently in short supply in Darfield, as well as provide the first retirement village in Darfield providing all levels of care including hospital/dementia care. This provision will help the Darfield/Selwyn community provide for its well-being and housing needs and secures a long term residential option in the L1 Deferred zone. The Plan Change brings forward in time options for adding depth and choice to residential living that were confirmed in the Malvern Area Plan 2013.

1.10 A Plan Change has been preferred over a resource consent, or a number of resource consents, as the means to achieve a different and planned land use. The applicants wanted to show the overall proposal in an integrated and co-ordinated way through the ODP. This would enable the Darfield community, and other interested persons, to clearly see the extent of the staged proposal as envisaged by the applicants. For a significant change in land use a Plan Change provides investment/financing certainty as to the scale of the proposal including servicing costs.

1.11 Rezoning of the site to L1 zone and Living 1 Deferred Zone as provided in the SDP will enable the future subdivision and development of the site for residential purposes.

1.12 The L1 Zone will facilitate the development of:

a) Approximately 90 standard residential lots (650m^2);
b) Approximately 13 lots within the 430-550m^2 size range;
c) A retirement village with up to 50 – 60 beds, some aged care facilities including dementia and lifecare units and 20 independent villas, approximately 110 residents

1.13 The Living 1 Deferred Zone provides for

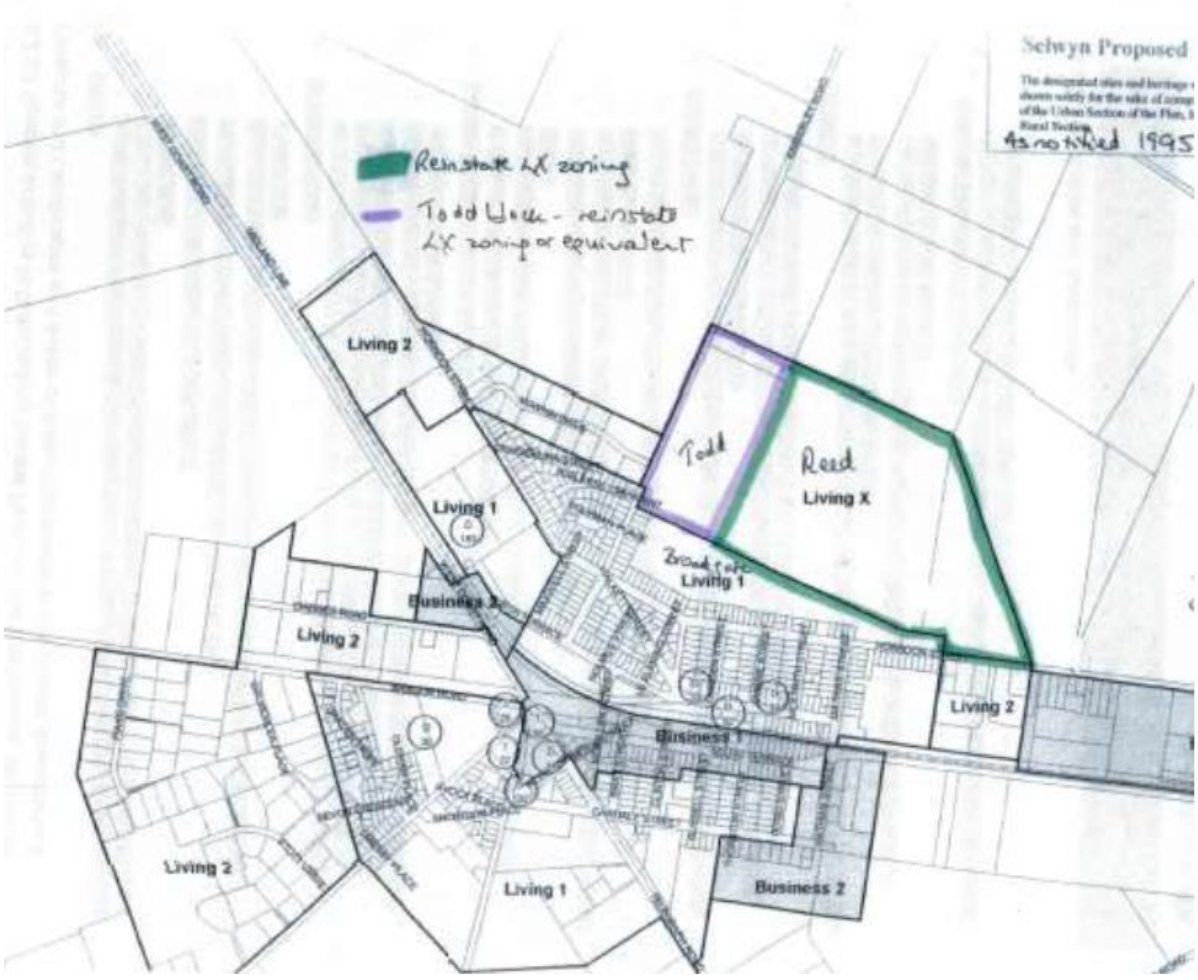
a) Approximately 283 standard residential lots (average lot size not less than 650m^2);

b) Approximately 8 lots to be within the appx 430-550m^2 size range;
c) Approximately 56 lower density L1 lots (average lot size not less than 1000m^2)

Land Use and Planning History

1.14 The 1995 SDC notified District Plan Township Volume identified a larger part of the Reed Property as Living X than is now the case, and it also included the southern Todd block as shown on the map below. It included all of the land sought be rezoned for living purposes through this plan change. The landowners were satisfied with the inclusion of part of their land as Living X, but they were unaware the zoning was removed by way of submission by another party to the District Plan. It is understood that this was as a result of a submission by Selwyn Plantation Board who at that time owned forestry land adjoining the Reed's west boundary (now owned by Todd). The Selwyn Plantation Board had concerns regarding 'reverse sensitivity' effects between forest and residential activity. The trees have since been felled, and the land sold. It is now used for grazing purposes.

Figure 3: 1995 Selwyn District Plan planning map showing LX zoning of the Site (land now owned by Todd and Reed), and requested to be rezoned LX in submission on 'Are we on the right track?' District Plan Review consultation document (2018)



Land parcels

1.15 The **60.5977**ha site encompasses three parcels of land that are legally described as:

a) Part Rural Section 27204;
b) Lot 24 Deposited Plan 366007;
c) Lot 3-4 Deposited Plan 524058

Zoning

1.16 The Site is currently zoned Rural Outer Plains. The Site is located to the east of Kimberley Road and north of Horndon Road. Residential properties are situated along the southern boundary of the site (L1 Zone). Land immediately to the west (opposite side of Kimberley Road) is zone L2 Deferred. Land immediately to the north and east of the Site is zoned Rural Outer Plains (see zoning map above).

Land use

1.17 Merf Ag Services Ltd and Matthew Reed and Kerry Glynn are the owners of Darfield Area 7 (DAR 7).

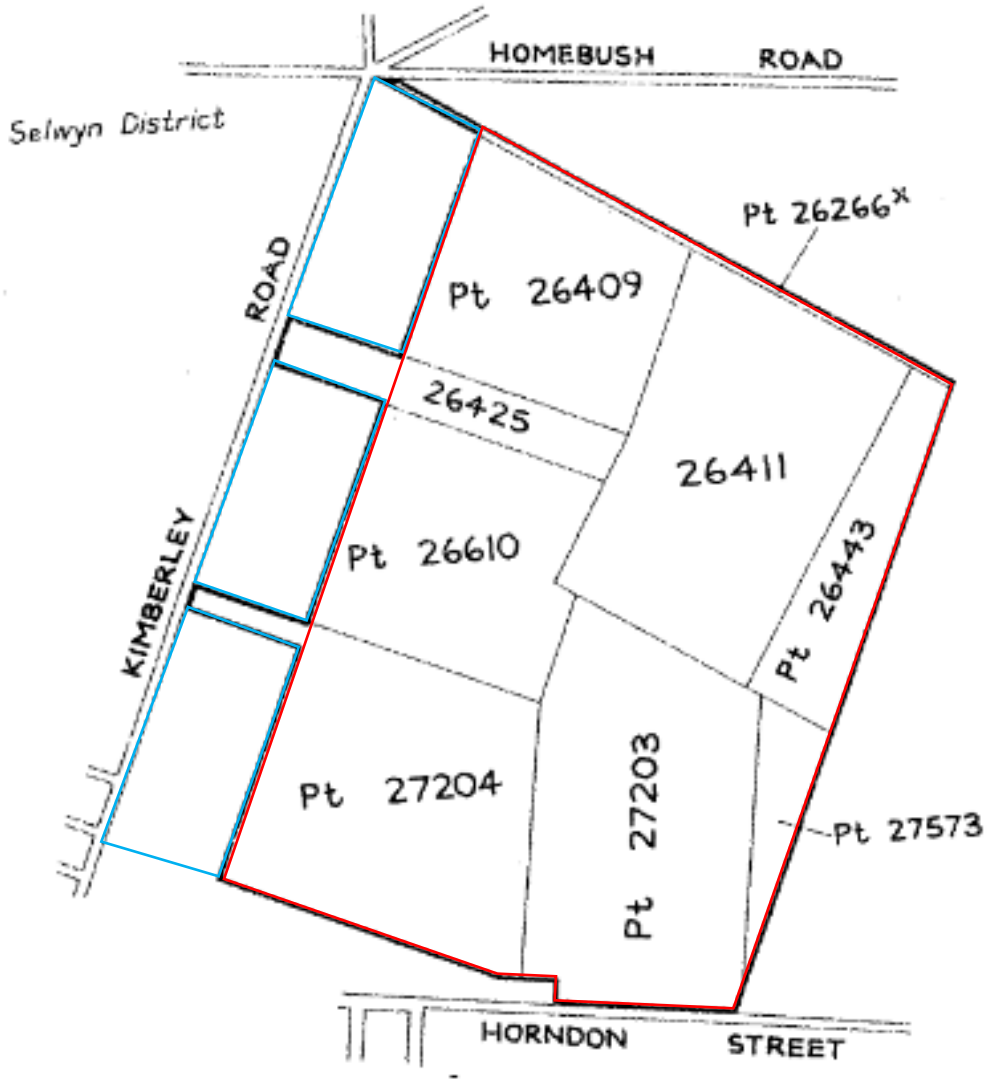
1.18 The topography within the Site is generally flat, with slight undulations in the land surface. The Site is generally vegetated with paddock grass and crops.

1.19 The Merf Ag Services block of 14.6 ha within DAR 7 (Lot 4 DP 524058) is presently used for farming purposes and is one of three blocks with frontage to Kimberley Road (see map below). The southern block (and the adjoining access to the north) is within the MAP Area 7. The three blocks are separated by existing accesses to the Reed farm to the east.

1.20 The Reed block of 45.9977 ha within DAR7 is legally described as Pt RS 27204. Land adjoining to the east is also owned by Reed and is partially within a preferred business development area (Darfield 8).

1.21 The Reed family own 206ha on the north east boundary of the township. This was formally a mixed cropping farm but is now part of the Central Plains Irrigation Scheme and is being developed for mixed cropping including potatoes, peas, radishes, barley, clover and onions. The family has farmed at Darfield since 1897. Part of the original southern portion of the farm is zoned Living X and now forms the Broadgate subdivision, a four stage subdivision providing a total of 75 sections. Stages 1 and 2 of this development are complete (approx. 35 sections) with stages 3 and 4 now underway.

Figure 4: Ag Services and Reed Land



Todd land – outlined in blue
Reed land – outlined in red

Approach and Key Features of the Proposed Plan Change

1.22 It is proposed that the Site be zoned as L1 Zone and Living 1 Deferred Zone (consistent with the provisions of the SDP). The proposal also includes the provision for a retirement village in the L1 Zone within the western part of the Site.

1.23 All subdivision, development and activity standards for the Site will adopt those in the SDC L1 Zone in the Operative SDP. No new activities or standards are proposed in this Proposal, except with respect to wastewater servicing. The Rural Outer Plains standards will apply to

the L1 Deferred zone until such time as an approved community or Council reticulated wastewater scheme is available to service this land. A wastewater discharge consent application is being sought for the L1 land only at this stage, as the balance land will be a Stage 2 development (anticipated as being developed over the next 5-15 years, by which time a Council wastewater scheme may be available to service the land). If not, there is flexibility to extend the proposed community wastewater plant and disposal area for the L1 zone, to service the L1 Deferred land. However, this will require a further wastewater discharge consent.

1.24 All development is to be in accordance with the proposed Outline Development (**Annexure 3**), to be included in the District Plan as Appendix E41B.

1.25 Key features of the ODP include:

a) principal roading layout, including a principal east-west road through the Site linking from Kimberley Road, and to Horndon Street in the future
b) identification of locations for medium density housing
c) minimal rear lots served by right of ways or other access provision
d) Identification of the site of the retirement village close to Kimberley Road
e) 2000-3000m^2 local neighbourhood reserves located within easy walking distance of all sites (no greater than 500m)
f) provision for future road access to land to the north and south
g) provision for pedestrian accessways to the east and west.

1.26 Subdivision within the L1 zone is a controlled activity subject to meeting specified standards. Where development fails to comply with the relevant controlled activity standards, then subdivisions will proceed as either discretionary restricted, discretionary or non-complying activity (as specified in the District Plan rules).

2. PROPOSED AMENDMENTS TO THE DISTRICT PLAN

2.1 The most appropriate means to achieve the proposed Plan Change is to largely adopt the existing provisions of the Living 1 zone of the SDP. No new objectives or policies are proposed as part of this Plan Change request.

2.2 The changes sought to the SDP (more specifically adopting the Living 1 zone provisions, adding a new ODP appendix, and amending the planning maps) are in order to enable the proposed rezoning to proceed are outlined in Table 2.1 below.

2.3 Text that is proposed to be added is shown ***bold italics and underlined*** and text to be deleted is shown in bold italics, with a ***~~strikethrough~~***. Please note that as only the proposed new and amended provisions to the District Plan are shown in the table below, these should be read in conjunction with the full provisions of the District Plan.

Table 2.1: Proposed Amendments to the Selwyn District Plan

Amendment 1	Include the Living 1, Living X and Living 1 Deferred - Kimberley Road Outline Development Plan as attached to this document **(Annexure 3)** as a new Appendix E41B to the District Plan.
Amendment 2	Amend zoning of the Site from Rural Outer Plains to Living 1 Zone (14.6 ha) and Living 1 Deferred (45.9977 ha) as shown on the Living 1, Living X and Living 1 Deferred Darfield - Kimberley Road ODP – District Plan Map in Selwyn District Plan (e-Plan).
Amendment 3	Chapter B4 Growth of Townships – add new policy for Darfield: ***Policy B4.3.28A*** ***To manage, subdivision, land development and use in the Living 1 and Living 1 Deferred zones at Kimberley Road Darfield (as shown on Appendix E41B) to facilitate residential development, serviced by appropriate reticulated wastewater treatment and disposal systems, including some medium density housing and a retirement village.*** ***Explanation and Reasons*** ***The Kimberley Road L1 and L1 Deferred zones make provision for some smaller more affordable housing than other living zones in Darfield and a retirement village. This is in recognition of the ageing population and trend towards smaller households. The location, close to and readily accessible from the existing town centre, is ideal.*** ***The LI zone will be serviced by a consented community wastewater treatment and disposal scheme located on adjoining land to the north. There is flexibility to extend this scheme to service the Stage 2 development area, zoned L1 Deferred. However, this will require a further wastewater discharge consent.***
Amendment 4	Chapter 4.5 Buildings and Sewerage Disposal Add new rule as follows: ***4.5.1C In the case of the Living 1 and Living 1 Deferred zones as identified on the Outline Development Plan at Appendix E41B, the erection of any dwelling or principal building or a retirement village shall be a permitted activity provided that it is connected to a communal 'off site' wastewater treatment plant and land treatment disposal system which is subject to an approved and current wastewater discharge consent. If and when a Selwyn District Council reticulated wastewater treatment and disposal system becomes available to service this area, all existing and new dwellings, principal buildings and the retirement village will be required to connect, pursuant to provisions in the Local Government Act 1974/2002***
Amendment 5	Chapter 4.5 Buildings and Sewerage Disposal Amend Rule 4.5.3: 4.5.3 Any activity which does not comply with Rule 4.5.1, Rule 4.5.1A***, 4.5.1C, 4.5.1D*** or Rule 4.5.2 shall be a non-complying activity

<table>
<tr><td>Amendment 6</td><td>Chapter 4.5 Buildings and Sewerage Disposal
Add to Note 2 as follows:
2. If the Council and the community decide to install a reticulated sewage treatment and disposal system, the Council may require existing dwellings and principal buildings to connect, pursuant to provisions in the Local Government Act 1974. <u>In the case of the Living 1 Zone as identified on the Outline Development Plan at Appendix E41B, this will be compulsory as the proposed community treatment and disposal system which will service this area has been designed to facilitate reticulation to a Council system if and when this becomes available.</u></td></tr>
<tr><td>Amendment 7</td><td>Chapter 4.7 Living Zone – Buildings and Site Coverage
Amend Table C4.1 Site Coverage Allowances as follows:
<table><tr><td>Living 1</td><td>Including garage</td><td>40%</td></tr><tr><td></td><td>Excluding garage</td><td>40% mi</td></tr><tr><td></td><td>Emergency Services only</td><td>50%</td></tr><tr><td></td><td><u>Retirement village as identified in ODP at Appendix E41B. Site coverage will be calculated over the entire retirement village site.</u></td><td><u>45%</u></td></tr></table></td></tr>
<tr><td>Amendment 8</td><td>Chapter 4 Living Zone – Reasons for Rules
Amend as follows:-
Higher levels of site coverage have also been provided for emergency services <u>and retirement villages</u> recognising their importance to the community <u>and that retirement villages are comprehensively designed, including with regard to open space, and retirement housing requires less open space than standard housing</u>. Thei~~r~~ general one-off locations <u>of emergency services</u> throughout the district’s townships will ensure any impact of increased density on the overall character of an area is minimal.</td></tr>
<tr><td>Amendment 8</td><td>Chapter 4 Living Zone – Buildings
Add new Rule 4.19 as follows:-
<u>4.19 Darfield – Retirement Village</u>
<u>Within the L1 Zone at Darfield a retirement village shall be a restricted discretionary activity in the location shown on the Appendix E41B Outline Development Plan. Council shall restrict the exercise of its discretion to the following:</u>
<u>14.19.1 incorporation of Crime Prevention Through Environmental Design (CPTED) principles, including effective lighting, passive surveillance, management of common areas and clear demarcation of boundaries and legible entranceways;</u>
<u>14.19.2 residential amenity for neighbours, in respect of outlook, scale, privacy, light spill, and access to sunlight, through site design, building, outdoor</u></td></tr>
</table>

	living space and service/storage space location and orientation, internal layouts, landscaping and use of screening; ***14.19.3 creation of visual quality and interest through the separation of buildings, variety in building form, distribution of walls and openings, and in the use of architectural detailing, glazing, materials, and colour***
Amendment 9	Chapter 12.1 Subdivision – General Add Rules 12.1.3.4A and 12.1.3.4B as follows:- ***12.1.3.4A*** ***In the case of the Living 1 zone as identified on the Outline Development Plan at Appendix E41B, any lot shall be connected to a communal 'off site' wastewater treatment plant and land treatment disposal system which is subject to an approved and current wastewater discharge consent.*** ***12.1.3.4B*** ***In the case of the Living 1 Deferred zone as identified on the Outline Development Plan at Appendix E41B, any lot shall be connected to a Council reticulated wastewater treatment and disposal system***
Amendment 10	Chapter 12.1 Subdivision – Size and Shape Amend Rule 12.1.3.6 as follows:- 12.1.3.6 Any allotment created, including a balance allotment, contains a building area of not less than 15m x 15m, except for sites greater than 400m^2 in area in a medium density area shown on an Outline Development Plan where the minimum building area shall be not less than 8m x 15m. For sites that form part of a comprehensive Medium Density development in a Medium Density Area covered by an Outline Development Plan ***and Retirement Villages***, there shall be no minimum building area requirement; and
Amendment 11	Chapter 12 Subdivision – Darfield Add Rule 12.1.3.16A as follows:- ***12.1.3.16A*** ***Any subdivision of land within the area shown in Appendix E41B - Living 1, Living X and Living 1 Deferred Zone, Kimberley Road Darfield Outline Development Plan, shall comply with the layout and contents of that Outline Development Plan and shall comply with any standards referred to in the Outline Development Plan.*** ***12.1.3.16B*** ***No subdivision of land in the Living 1 Deferred Zone shown in Appendix E41B shall occur until a Council reticulated wastewater treatment and disposal system is available to service this area and any lots created are connected to this system.***
Amendment 12	Chapter 12 Subdivision – Table C12.1 Allotment Sizes Amend Table C12.1 as follows:-

	Township	**Zone**	**Average Allotment Size Not Less Than**
	Darfield	Living 1	650m^2
		Living 1 Zone at Kimberley Road Darfield as identified in Appendix E41B	***650m^2, except for Medium Density (Small-lots): Maximum average allotment size of 500m^2, with a minimum individual allotment size of 400m^2***
		Living 1 Zone at Kimberley Road Darfield as identified in Appendix E41B	***Retirement Village: no minimum lot size***
		Living 2	5,000m^2
		Living 2 (Deferred)	Refer to Subdivision - General Rules. 5,000m^2 if criteri
Amendment 13	Chapter D Definitions Add definition of Retirement Village as follows:- ***Retirement Village means a managed comprehensive residential complex or facilities used to provide residential accommodation for people who may be retired, and any spouses or partners of such people. It may also include any of the following facilities for residents within the complex: recreation, leisure, supported residential care, welfare and medical facilities (inclusive of hospital care) and other non-residential activities.***		
Amendment 14	Chapter D Definitions Amend definition of Residential Activity as follows:- Residential Activity: means the use of land and buildings for the purpose of living accommodation and ancillary activities. For the purpose of this definition, residential activity shall include: a) Accommodation offered to not more than five guests for reward or payment where the registered proprietor resides on-site b) Emergency and/or refuge accommodation c) Supervised living accommodation and any associated caregivers where the residents are not detained on the site ***d) Retirement villages…***		

3. STATUTORY FRAMEWORK

Requests for Changes to Plans

3.1 Under Clause 22(1) of the First Schedule, a plan change request shall explain the purpose of, and reasons for, the change to a plan, and contain an evaluation report prepared in accordance with section 32 for the proposed change.

3.2 Under Clause 22(2) where environmental effects are anticipated, the request shall describe those effects, taking into account clauses 6 and 7 of Schedule 4, in such detail as corresponds with the scale and significance of the actual or potential environmental effects anticipated from the implementation of the change.

3.3 It is requested that the proposed Plan Change request be accepted in accordance with Clause 25(2)(b) of the First Schedule of the Act and that the Selwyn District Council proceed to publicly notify the request under Clause 26.

3.4 It is considered that there is no reason(s) to reject the request in whole or part under Clause 25(4) of the First Schedule:

a) the request or part of the request is not frivolous or vexatious; and

b) within the last 2 years, the substance of the request or part of the request—

(i) has not been considered and given effect to, or rejected by, the local authority or the Environment Court; and

(ii) has not been given effect to by regulations made under section 360A; and

c) the request or part of the request is in accordance with sound resource management practice; and

d) the request or part of the request would not make the policy statement or plan inconsistent with Part 5; and

e) the request is not to change a plan that has been operative for less than two years.

Section 32 Evaluation (Clause 22(1) RMA)

3.5 Section 32 of the Act requires that an evaluation report is prepared which identifies the objective of the proposal, determines if it is the most appropriate method of achieving the purpose of the Act, and if the proposed amendments to the District Plan are the most efficient and effective method of achieving the objective.

3.6 The Section 32 Evaluation (attached as **Annexure 5)** concludes that, of the possible alternative methods for achieving residential development for this Site, and implementing the District Plan objectives and policies, the plan change is the most efficient and effective method.

Effects on the Environment (Clause 22(2) RMA)

3.7 Actual and potential adverse effects on the environment from implementation of the Proposed Plan Change are discussed here. The discussion draws draw on the various assessments and expert advice and reports received. These are attached as Appendices to this request.

3.8 Schedule 4, Clause 6 (1) (a) – (h) of the Act sets out the information required in an assessment of effects on the environment (AEE). Clause 7 of Schedule 4 helpfully identifies the matters that an AEE must address. These matters have been considered below and also include consideration of the matters and issues identified in the relevant District and Regional planning documents.

Neighbourhood and wider community effects (Clause 7(1)(a) Schedule 4)

3.9 The proposal helps deliver an outcome sought through the Malvern Area Plan 2016 of "squaring up" Darfield as a service centre and providing more balance to the town's form. It avoids development stringing out along the State Highway, something the SDP specifically identifies as an undesirable outcome:

> Policy B3.4.6: Encourage townships to expand in a compact shape where practical.

It provides residential lot choices anticipated by its identification as DAR 7 and, together with the retirement village provides a positive effect of enabling choices for the Darfield and wider community in providing for their well-being and housing needs. The provision of some smaller medium density housing will accommodate smaller, more affordable housing, a house typology currently 'missing' at Darfield, partly due to the larger minimum site sizes required for on-site wastewater treatment and disposal. That constraint does not exist with the subject plan change, because a reticulated community treatment and disposal system is proposed to service the development.

3.10 The effects of new residential development are not unplanned for, nor unexpected given the preferred future residential development status of the Site in the MAP. Adopting the existing SDP plan development and subdivision standards (and in addition, with specific provision in an identified location for a retirement village and some medium density housing) will provide continuity in town character, amenity and quality of environment. It will add seamlessly to the townscape that currently exists. The proposal is consistent with Policy B3.4.3 which sets out the desired attributes and qualities of Living Zones.

3.11 Including an ODP in the proposal signals early to the community the form and layout of the development, and confirms its "fit" within the townscape. This provides a high level of certainty to the community, rather than pursuing a staggered, possibly ad hoc, approach to

development through several resource consents. It also ensures a coordinated and comprehensive approach to development.

3.12 The provision of a 'full service' retirement village as the first of its type for the town will meet a need which has been established in research and advice provided by Colliers International. The likely catchment area will include Darfield and a secondary area including Kirwee, Oxford, Glentunnel, Hororata and Springfield. The overall proposal is looking to address future community needs in part from the forecast aging of population, and in part from the trend to various forms of supported living environment. Darfield already has a significantly higher percentage of persons aged over 65 (21.7% in 2013 census) compared with the national average (14.31%).

3.13 There are other positive effects. The proposal enables the continued growth of Darfield and enhances its potential role as a service centre foreshadowed in the Malvern Area Plan. It provides more scale to the township assisting in the retention of and provision of new or additional services and facilities.

3.14 The Site is a coherent block that minimises edge effects to the remaining farming land that will retain its Rural Outer Plains Zoning. That by itself minimises any risk of reverse sensitivity effects from farming operations to residential use, and vice versa. The provision of larger lots on the edge of the Site also will effectively manage the residential/farm interface. As a mixed cropping operation the rural effects are relatively benign and low key in terms of noise, dust and odour.

3.15 If the proposal is not confirmed by the Council, there will still be edge and reverse sensitivity effects arising from the present disposition of residential and rural land uses. The proposal simply shifts and reduces the less than minor effects that may present themselves.

3.16 Overall the effects on the neighbourhood and wider community will be positive and welcomed.

Physical effects on the locality/ landscape and visual effects (Clause 7(1)(b) Schedule 4)

3.17 The dominant physical, visual and landscape effect will be a change from a rural outlook and quality to an urban form and amenity. An openness will be replaced by a built-up feel; a uniformity in the seasonal rural colour palette will be replaced by a greater variety and intensity of colour; new qualities and attributes like lighting at night, controlled water run-off, and a greater proportion of hard surfaces, and a general busy-ness is typical of replacing farming with housing.

3.18 During subdivision and lot development there will be land disturbance, but that will be a temporary effect. There will be no net loss of soil from the site as a quality residential development needs to draw on good ground to establish.

Effects on ecosystems and habitats (Clause 7(1)(c)) Schedule 4)

3.19 There are presently no areas with indigenous vegetation remnants on the Site; there are no watercourses or riparian features to be lost; there will be no net loss of biodiversity as a grassland/cropping environment is replaced with the biodiversity generated from landscaped residential and reserve lots.

Effects on natural and physical resources (Clause 7(1)(d)) Schedule 4)

3.20 There are no natural and physical resources on the Site having aesthetic, recreational, scientific, historical, spiritual, or cultural value, or other special value, for present or future generations.

3.21 Clearly there is a less than minor effect from the minimal loss of a physical farming resource (which does not comprise LUC 1 & 2 versatile soils). Offsetting that, the productivity arising from the proposed use of the land for residential activity, and the provision of a retirement village, will be enduring and sustainable.

Discharges of contaminants into the environment (Clause 7(1)(e)) Schedule 4)

3.22 The proposal does not involve the discharge of contaminants other than minor and temporary effects of noise and dust discharges during subdivision and lot development. There are no hazardous substances involved in the proposal.

Risks from natural hazards or hazardous installations (Clause 7(1)(f)) Schedule 4)

3.23 The Site is adjacent to the existing township. No planning documents identify any risks from natural hazards such as flooding, liquefaction or slippage/subsidence. The Site is flat to undulating and is ideally suited to residential building.

Contaminated land

3.24 The National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS) ensures that land affected by contaminants in soil is appropriately identified and assessed before it is developed, and if necessary, the land is remediated or the contaminants contained to make the land safe for human use. The NESCS classifies as permitted activities the sub-dividing land or changing land use where a preliminary investigation shows it is highly unlikely the proposed new use will pose a risk to human health.

3.25 Fraser Thomas Limited (FTL) undertook a Preliminary Site Investigation in October 2019 (**Annexure 8)** in accordance with the NESCS to assess the likelihood of soil contamination on the Site. This investigation has confirmed that the subject site has only been used for tree plantation and pastoral purposes, and has not found any HAIL activities affecting the site. Therefore, under Regulation 5(7), the NESCS does not apply to the subject site.

Geotechnical Issues

3.26 **Annexure 9** contains a Geotechnical Assessment of the Site. In summary the Assessment concludes that the site is unlikely to be susceptible to liquefaction, and "*the risk of any significant liquefaction induced ground deformation occurring at the site in response to a large earthquake is considered to be low."* (Summary)

The Geotechnical Investigation Report concludes that *"the site is considered suitable for its intended use*."

3.27 Foundation design recommendations for future proposed residential development are set out in Sections 7 and 8 of the report. It concludes that the design and inspection of foundations should be in accordance with NZS 3604:2011, New Zealand Standard, Timber Framed Buildings.

Alternative locations or methods for the activity (Clause 6(1)(a) and (h) Schedule 4)

3.28 There is no need to argue for an alternative location for the proposal or an alternative method to provide for residential development:

a) The AEE shows there to be less than minor effects, and a number of positive effects arising from the proposal;
b) The activity will not affect the exercise of a protected customary right.

4. SERVICING FOR THE PROPOSAL AND EFFECTS ARISING FROM SERVICING

4.1 The site is presently farmland and as such it is not serviced by any public infrastructure services. It is bare land. A specific report on wastewater options is at **Annexure 7,** while **Annexure 6** contains a Servicing Report which outlines the status and capacity of existing utilities that will service the proposed residential development of the Site.

Wastewater

4.2 **Annexure 7** contains detailed options and proposals for the wastewater treatment plant. The report concludes that

"Based on the environmental conditions within the Darfield vicinity, it is considered that all options presented for the sewage collection, wastewater treatment and effluent discharge, are viable and a discharge consent is likely to be procured for all options."

4.3 The 14.6ha site to be re-zoned L1 is to be serviced by a privately owned communal package treatment plant and effluent disposal area to be located on adjoining farmland presently zoned Outer Plains.

4.4 The 40ha site to be zoned L1 Deferred will either be connected to that package treatment plant in an expanded form, or to a Council scheme if one is available at the time that site is to be developed.

4.5 A land use resource consent and a discharge consent are being applied for concurrently with this plan change request for the development and operation of the package treatment plant. Those consents will ensure that any adverse effects on the environment will be properly managed.

4.6 This shows that the wastewater proposals are a feasible option and will adequately service the 14.6ha site as the first stage, and the L1 Deferred.

Roading and traffic effects

4.7 The proposal is managed through an ODP. Part of that is to establish a roading pattern, showing connections to existing road networks, future connections to the land to be re-zoned Living 1 Deferred, and provision for internal circulation in the site.

4.8 The location of the retirement village has been chosen within the ODP to recognise its specific traffic generation characteristics and the need for it to have good road connections.

4.9 It is not anticipated that the scale of the Stage 1 development, including the retirement Village, will have a significant effect on the township roading network, nor the State Highway.

Stormwater servicing

4.10 There is currently no existing reticulated stormwater network on the Site, or close to the site. The proposal is for stormwater to be managed by onsite soakage from buildings. Stormwater run-off within the road corridors will be via swales in to appropriately spaced and sized soakpits via sumps. The road corridor will be used as overland flow paths to direct stormwater runoff when the soakpits are at full capacity (50 year design storm).

Stormwater discharge resource consents will be required.

Water supply

4.11 The Darfield water supply is sourced from two town supply deep wells, and reticulated water mains in Kimberley Road and Broadmeadows Drive can be connected into.

4.12 Selwyn District Council has indicated that there is sufficient supply in the Darfield network to service the proposed development, and there will be sufficient pressure in the system to meet firefighting requirements.

Power and Telecommunications

4.13 Orion has confirmed that its network has capacity to service the proposal. The development will be serviced by street lighting to industry standards to be confirmed at subdivision stage.

4.14 Chorus has confirmed that its network has capacity to service the proposal.

5. SECTIONS 74 AND 75 – MATTERS TO BE CONSIDERED

5.1 Sections 74 and 75 of the Act set out the matters to be considered by a territorial authority in deciding to change its plan, including changing its plan through a Plan Change request.

5.2 Before a plan change can be incorporated into a District Plan, the key matters that need to be considered include:

74 Matters to be considered by territorial authority

A territorial authority must prepare and change its district plan in accordance with—

(a) its functions under section 31; and
(b) the provisions of Part 2; and
(c) a direction given under section 25A(2); and
(d) its obligation (if any) to prepare an evaluation report in accordance with section 32; and
(e) its obligation to have particular regard to an evaluation report prepared in accordance with section 32; and
***(ea)** a national policy statement, a New Zealand coastal policy statement, and a national planning standard; and*
***(f)** any regulations.*

75 Contents of district plans

(3) A district plan must give effect to—
(a) any national policy statement; and
(b) any New Zealand coastal policy statement; and
(ba) a national planning standard; and
(c) any regional policy statement.

5.3 An assessment of the proposed Plan Change in relation to each of the above matters is outlined below.

Functions under section 31

5.4 The proposal, if approved, will form part of the Selwyn District Plan and will enable the Council to give effect to its obligations under section 31 RMA

The purpose of the preparation, implementation, and administration of district plans is to assist territorial authorities to carry out their functions in order to achieve the purpose of this Act. (section 72 RMA)

5.5 Those functions relevantly for this plan change include

(a) integrated management of the effects of the use, development, or protection of land and associated natural and physical resources of the district:

(aa) the establishment, implementation, and review of objectives, policies, and methods to ensure that there is sufficient development capacity in respect of housing and business land to meet the expected demands of the district:

(b) the control of any actual or potential effects of the use, development, or protection of land

5.6 The Proposal includes provisions to address these matters and will ensure sufficient residential land of a form, location, urban design and development and subdivision standards to achieve a number of SDP policies. It will help deliver the Council's strategic intentions for Darfield.

5.7 The Council has the key function of maintaining a district plan as provided in section 73 RMA

(1) There must at all times be 1 district plan for each district, prepared in the manner set out in the relevant Part of Schedule 1.

(1A) A district plan may be changed in the manner set out in the relevant Part of Schedule 1.

(2) Any person may request a territorial authority to change a district plan, and the plan may be changed in the manner set out in Part 2 or 5 of Schedule 1.

Part 2 Resource Management Act 1991

5.8 The proposal will only be approved if the Council determines that the proposed plan change will achieve the purpose of the Act which is the essence of Part 2. There are checks and balances in the plan change process to assist with that decision including public consultation, submissions and hearings, and the documentation requirements of the First Schedule and section 32 RMA.

5.9 The proposal has been based on expert advice, consulted on before notification, and has met all the requirements of the First Schedule to assist in setting out how the proposal will achieve Part 2 purposes.

Direction under Section 25A(2)

5.10 The proposal does not arise from a direction from the Minister.

Evaluation under section 32

5.11 An evaluation report has been prepared for the proposal. This is at **Annexure 5.**

5.12 The section 32 report shows that

a) the objectives of the proposal are the most appropriate way to achieve the purpose of this Act; and
b) the provisions in the proposal are the most appropriate way to achieve the objectives.

5.13 The report contains a level of detail that corresponds to the scale and significance of the environmental, economic, social, and cultural effects that are anticipated from the implementation of the proposal.

National Policy Statements

5.14 The Minister for the Environment recently publicly advertised for submission two proposed National Policy Statements:

a) a proposed NPS for Highly Productive Land, and
b) a proposed NPS on Urban Development.

As proposals subject to submissions and decisions by the Minister they are at a very early stage in their development as statutory instruments. This plan change has not been assessed against them.

5.16 The National Policy Statement – Urban Development Capacity 2016 provides direction to decision-makers under the Resource Management Act 1991 (RMA) on planning for urban environments.

It recognises the national significance of well-functioning urban environments, with particular focus on ensuring that local authorities, through their planning, both:

• enable urban environments to grow and change in response to the changing needs of the communities, and future generations; and

• provide enough space for their populations to happily live and work. This can be both through allowing development to go "up" by intensifying existing urban areas, and "out" by releasing land in greenfield areas.

This national policy statement aims to ensure that planning decisions enable the supply of housing needed to meet demand. (Preamble page 3)

5.17 The NPS usefully defines an urban environment

Urban environment *means an area of land containing, or intended to contain, a concentrated settlement of 10,000 people or more and any associated business land, irrespective of local authority or statistical boundaries.*

5.17 The proposal is to re-zone land for residential purposes adjacent to, and connected with, the existing built environment of Darfield township. The township at the 2013 Census was home to 1935 people. Although the results of the 2018 Census are still unavailable, and even though

the NPS addresses future growth and development, it is improbable that Darfield will reach the 10,000 population threshold for the NPS to apply.

5.18 NPS policies PA1-PA4 apply to any urban environment (defined as greater than 10000 pop) that is expected to experience growth. Darfield does not qualify as an urban area (being less than 10000), and it is arguable it will experience growth at the forecast rate that qualifies Christchurch as a high urban growth area. The focus of the policies are on urban areas (as defined by Statistics NZ in 2016).

5.19 A local authority has other certain duties for its urban areas arising from other policies, but the thresholds used in the NPS – UDC are for urban areas between 10,000 and 30,000, and for urban areas over 30,000 population, and where they are forecast to experience medium or high growth.

5.20 The focus of the NPS is on analysis and assessment for qualifying urban areas by local authorities. Selwyn District is not an urban area; it is a local authority within which certain urban areas may qualify for consideration under those policies. The duties arising from PA1 – PA4 are in relation to qualifying urban areas by local authorities.

5.21 Darfield as an urban area of well under 10,000 population is well below the threshold for application of the NPS – UDC. Accordingly the NPS-UDC does not apply. SDC officers have confirmed that they agree with this conclusion.

5.22 This proposal has not considered the feasibility of the proposal, nor the demand parameters that the NPS requires, as a formal part of justifying this plan change proposal against the NPS. However the applicants have commissioned research in to such matters by Colliers International (November 2019). Colliers has confirmed that the proposal for retirement village is feasible if it draws form a sub-regional area wider than the immediate environs of Darfield, and the residential component of the proposed plan change can be successfully marketed over time.

5.23 The Colliers Report contains market sensitive information and does not form part of the application. The investment risk is for the applicants to manage, and especially as the applicants propose to provide a community wastewater scheme themselves, there is little risk to the Council as an infrastructure provider.

5.24 There are no other NPS that are relevant to this proposal.

National Planning Standards

5.25 The purpose of the 2017 National Planning Standards is to improve consistency in plan and policy statement structure, format and content.

5.26 The applicants consider there is a choice whether the proposal adopts either the existing SDP residential zone names, or the National Standards descriptors.

5.27 Discussions with SDC planning staff confirm a preference to retain existing SDP Zone names and, if the proposal is adopted, then alignment with the National Standards can happen as part of the SDP review (2020). The alternative names from the National Standards are: Low density residential zone, General residential zone, or Medium density residential zone.

5.28 The proposed plan change will adopt the L1 Zoning and Living 1 (Deferred) Zone.

Regulations

5.29 No Regulations are relevant for this proposal as they are mostly dealing with administrative matters.

Canterbury Regional Policy Statement 2013 (CRPS)

5.30 An assessment of the proposed Plan Change against the relevant provisions of the RPS is contained in **Annexure 4 (**Table 1).

5.31 This demonstrates that the proposed Plan Change is in accordance with the relevant objectives and policies of the RPS.

6. ASSESSMENT AGAINST OTHER PLANNING DOCUMENTS

Malvern Area Plan - 2031

6.1 The primary purpose of the Malvern Area Plan (MAP) is to provide high-level planning direction to guide the growth and sustainable management of each township in the Malvern area through to the year 2031.

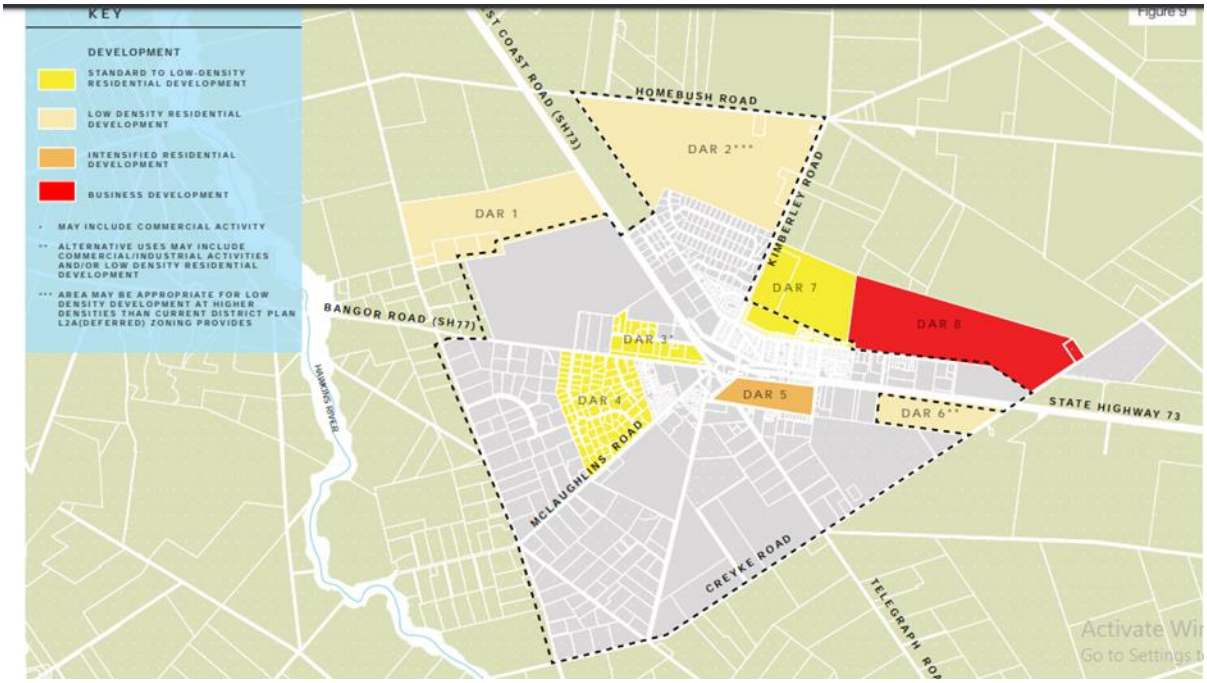
6.2 The Area Plan does not rezone land, but indicates a range of issues and opportunities that will inform the ongoing strategic planning and management of growth for each township through to 2031. While the Area Plan is non-statutory, it does help to inform the District Plan Review (DPR) and other statutory planning processes under the Resource Management Act (RMA), and Local Government Act 2002.

6.3 In terms of opportunities for population, growth capacity and urban form, the MAP acknowledges that there are *opportunities to facilitate more intensive housing typologies within close proximity to the town centre to better meet the needs of the wider community*.

6.4 The Council's preferred approach for this is however is to develop and apply intensification criteria through the District Plan Review process to facilitate elderly persons housing and/or medium-density development options in appropriate locations. The MAP goes onto states that *any proposed growth locations should be concentrated around existing areas of development*

that have not been fully utilised or located at the northern end of the township near existing water bores to utilise water supply pump pressure and avoid large upgrades to the existing network. The Site is located at the northern end of the township, but still close to the town centre.

6.5 The MAP identifies the Site as Preferred Future Development Area 7 (DAR7) for standard to low density residential development



6.6 DAR 7 acknowledges that the Site has a potential opportunity to provide mixed-use living densities to be progressively developed from the current township boundary in the north-east direction.

6.7 Advantages of developing the Site include:

a) The area is close to the Darfield town centre and other community services and provides for a compact and concentric urban development pattern. A mixed-use living zone would be consistent with adjacent urban areas. The area has high amenity values, with views to the Torlesse Range.

b) The area is a suitable location from an infrastructure servicing perspective because it can provide for its own servicing, and is well connected to existing roading networks.

6.8 The proposed Plan Change has addressed these matters in the following ways:

a) The development of the Site will achieve a consolidated settlement pattern with clear township boundaries which are well integrated with the town centre.

b) The Site is close to the existing Darfield township centre and is a logical area for growth given close proximity to the town centre. The Site can achieve a high level of connectivity and integration with the existing township.
c) The proposed Outline Development Plan for Area 7 illustrates how the land can be developed in a comprehensive and integrated way with provision for roading links to adjoining zoned and developed areas, and to future development areas to the north and east.
d) The Site is conveniently located to the main bus line, where Red Bus operates a fully funded weekday morning and afternoon commuter service between Darfield and Christchurch Central, offering alternative modes of transport to the Central City.
e) Darfield is identified as a Service Centre in the document Selwyn Development 2031. The population of Darfield is predicted to experience the largest amount of growth in the Malvern Ward out to 2031 with an increase in population from 2,890 (2014/15) to 3,965 persons (2030/31). As a Service Centre, with a projected increase in population it is essential that the SDP focusses on the strategic growth needs of the township, which is the key service centre for the northern area of the District, west of Greater Christchurch.
f) The Site is a logical residential growth direction for the township, which would result in a more concentric urban form, in keeping with Policy B4.3.6 - Encourage townships to expand in a compact shape where practical

6.9 Possible disadvantages of developing the Site identified in Malvern 2031 include:

a) Suitable setbacks or interface treatments will be required to avoid any adverse reverse sensitivity effects with the Business 2 land to the south-east, and if any greenfield industrial Business 2 areas were to establish in Area 8 to the east.
b) The land is comprised of Class 3 soils, which are valued for their productive capacity but are less valuable than Class 1 & 2 versatile soils.
c) In the adjoining Living 1 zone there is the potential for adverse impacts on existing residents who have become accustomed to the character of the area

6.10 The proposed Plan Change has addressed these matters in the following ways:

a) Reverse sensitivity (Business 2 land and Area 8): appropriate setbacks and other mitigation measures (noise standards, planting etc) can be implemented at the residential/business zone boundary.
b) Class 3 soils: facilitating standard (and potentially medium density) residential development will minimize the amount of land to be utilized for urban development (compared to lower density residential development).

Selwyn District Plan (SDP)

6.11 **Annexure 4** (Table 2) contains a detailed assessment of the proposed Plan Change against the relevant objectives and policies of the SDP. This assessment demonstrates that the

proposed Plan Change is in accordance with the relevant requirements of the L1 zone of the SDP and other relevant objectives and policies.

Mahaanui Iwi Management Plan

6.12 The Mahaanui Iwi Management Plan (MIMP) 2013 was released on 1 March 2013. It was prepared by the six Papatipu Rūnaka of the takiwā that extends from the from the Hurunui River in the north, to the Hakatere/Ashburton River in the south, inland to Kā Tiritiri o Te Moana (the Southern Alps), and including Te Pātaka o Rākaihautū (Banks Peninsula), and the coast. These runanga are:

- Ngāi Tūāhuriri Rūnanga
- Te Hapū o Ngāti Wheke (Rāpaki) Rūnanga
- Te Rūnanga o Koukourārata
- Ōnuku Rūnanga
- Wairewa Rūnanga
- Te Taumutu Rūnanga

6.13 The MIMP is a tool for tangata whenua to express their identity as manawhenua and their objectives as kaitiaki, to protect their taonga and resources, and their relationships with these. The MIMP seeks to ensure that these taonga and resources are recognised and protected in the decision-making of agencies with statutory responsibilities to tangata whenua. Importantly it is also a tool that assists Papatipu Rūnanga representatives to articulate their values, issues and policy into statutory processes.

6.14 The MIMP includes both general objectives and policies about the management of land, air, and water, and also includes region specific objectives and policies including for the Te Waihora area, which includes Darfield.

6.15 With respect to general objectives and policies the proposed plan change and application site will not affect landscapes, or sites of cultural heritage or significance (Chapter 5.8). The application site does not contain any areas of significant biodiversity, and the proposal seeks to include landscaping within the reserves, and in road corridors adding to the overall biodiversity of the Canterbury Plains consistent with Chapter 5.5 of the MIMP.

6.16 The proposal includes the use of an off-site community wastewater package treatment plant for managing sewage from the Site. The Wastewater Infrastructure Option Report shows that treatment and disposal however is feasible and there will not be adverse effects on groundwater or surface water. A discharge consent for the operation of this plant is being sought.

6.17 Stormwater from buildings and roads can be disposed of to ground consistent with the objectives and policies contained in Chapters 5.3 and 5.4 of the MIMP. The proposal does not preclude individual land owners from installing rainwater collection and use from roof areas at the time of building development.

6.18 Chapter 6.11 is the area specific section for the Te Waihora area and has a key theme of Ki Uta Ki Tai (from the mountains to the sea) with respect to effects on Te Waihora/ Lake Ellesmere. The proposed plan change has been designed taking into consideration the potential effect of resultant subdivision and development on the rivers and streams that flow into Te Waihora/Lake Ellesmere.

6.19 There are no identified sites of significance within the Site, nor are there any known areas of mahinga kai. The Site has a long history of use for cropping and grazing purposes.

6.20 A summary of the Plan Change was provided to Mahaanui Kurataiao (MKT) for its comment, in tandem with consultation on the wastewater discharge consent application for the proposed community wastewater treatment and disposal scheme. No response has been received to date.

6.20 Overall it can be considered that the proposal is in accordance with the provisions of the Mahaanui IMP, and appropriate steps will be taken at the subdivision stage to ensure consistency with the relevant objectives and policies.

7. CONSULTATION

7.1 Consultation has been carried out with SDC, ECAN, Canterbury District Health Board and Mahaanui Kurataiao during the course of developing the proposed Plan Change, and in relation to the ODP. A consultation record is attached as **Annexure 10.**

7.2 The ODP has been revised in response to SDC feedback, including ensuring appropriate provision of neighbourhood reserves (within 500m of all residential sites); location of medium density housing close to reserves; appropriate internal roading network and connectivity for vehicles and pedestrians, including connections to north, east and south.

7.3 An off-site community treatment plant and disposal plant has been chosen as the preferred wastewater servicing option, notwithstanding the greater cost to the applicant. This is in response to concerns raised by ECAN and in particular CDHB regarding on site wastewater treatment and disposal. Currently, SDC has no plans to provide a reticulated sewerage scheme at Darfield.

7.4 The Site's location as a preferred future development area has already been consulted on as part the MAP consultation process. Accordingly, not further specific consultation with the community has been undertaken. Matthew Reed and family (one of the applicants) owns the adjoining Broadgate subdivision to the south.

8. CONCLUSION

8.1 The proposed Plan Change seeks to rezone 60.5977ha of land adjoining Darfield, from Outer Plains Zone to L1 and L1 Deferred.

8.2 The Site has a long history of farming use and is not restricted by potential natural hazards, sites of significance to iwi, there are no water bodies or rivers. The Site has some road frontage but otherwise is wholly unserviced. It is well suited for conversion to residential use.

8.3 The Site is identified within the Malvern Area Plan as a preferred future development area (DAR 7). It is in a location that achieves compact town growth offering ease of access to business services, community facilities and the primary road network.

8.4 The proposal provides for a connected and high amenity residential living environment while avoiding and/or mitigating any potential adverse effects on the environment. It will provide for continuing demand for standard residential sections in an ideal location, within easy walking distance of the existing town centre services and facilities. It will broaden the range of housing available and will provide the first 'full service' retirement village in Darfield.

8.5 The use of this Site for residential purposes has been demonstrated through this Plan Change request to be a sustainable and efficient use of land and infrastructure. The re-zoning better provides for the social, economic, environmental well-being of the Darfield community than continuation of the current low intensity farming use.

8.6 Rezoning of the site to L1 Zone and L1 Deferred Zone is consistent with the policies and objectives of the SDP and the CRPS.

8.7 As the proposed Plan Change helps achieve the Purpose of the Act, and has been shown to be consistent with the relevant provisions of the various National Policy Statements, and the relevant regional and district policies and plans, it can be accepted by Selwyn District Council in accordance with Clause 25(2) of the First Schedule of the Act.

Annexure 1:

Certificates of Title

COMPUTER FREEHOLD REGISTER
UNDER LAND TRANSFER ACT 1952

Historical Search Copy

R.W. Muir
Registrar-General
of Land

Identifier	**835350**
Land Registration District	**Canterbury**
Date Issued	03 July 2018

Prior References
CB81/214

Estate	Fee Simple
Area	20.0200 hectares more or less
Legal Description	Lot 3-4 Deposited Plan 524058

Original Proprietors
Merf Ag Services Limited

Interests

10225814.3 Mortgage to Bank of New Zealand - 30.10.2015 at 9:50 am

Subject to Section 241(2) Resource Management Act 1991 (affects DP 524058)

11140635.2 Consent Notice pursuant to Section 221 Resource Management Act 1991 - 3.7.2018 at 9:40 am
(Affects Lot 3 DP 524058)

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Historical Search Copy

R.W. Muir
Registrar-General
of Land

Constituted as a Record of Title pursuant to Sections 7 and 12 of the Land Transfer Act 2017 - 12 November 2018

Identifier	**267916**
Land Registration District	**Canterbury**
Date Issued	05 July 2007

Prior References
14426

Estate	Fee Simple
Area	8.1260 hectares more or less
Legal Description	Lot 24 Deposited Plan 366007

Original Registered Owners
Helen Anne Reed and Kerry Mark Glynn

Interests

7450171.11 Bond pursuant to Section 108(2)(b) Resource Management Act 1991 - 5.7.2007 at 9:00 am

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Historical Search Copy

R.W. Muir
Registrar-General
of Land

Constituted as a Record of Title pursuant to Sections 7 and 12 of the Land Transfer Act 2017 - 12 November 2018

Identifier	**CB44A/1000**
Land Registration District	**Canterbury**
Date Issued	05 February 1998

Prior References
CB9F/1206

Estate	Fee Simple
Area	204.4406 hectares more or less
Legal Description	Rural Section 26411, Rural Section 26425, Part Rural Section 26266X, Part Rural Section 26409, Part Rural Section 26443, Part Rural Section 26610, Part Rural Section 27203, Part Rural Section 27204 and Part Rural Section 27573

Original Registered Owners
Kenneth Roland Reed as to a 1/2 share

Helen Anne Reed as to a 1/2 share

Interests

7450171.1 Transmission of the 1/2 share of Kenneth Roland Reed to Helen Anne Reed as Executor - 5.7.2007 at 9:00 am

7450171.2 Transfer to Helen Anne Reed - 5.7.2007 at 9:00 am

Subject to a right (in gross) to drain water over part Rural Section 27204 marked G, H on DP 366007 in favour of Selwyn District Council created by Easement Instrument 7450171.6 - 5.7.2007 at 9:00 am

The easement created by Easement Instrument 7450171.6 is subject to Section 243 (a) Resource Management Act 1991

9862067.1 Transfer to Matthew Alexander Reed and Kerry Mark Glynn - 16.4.2015 at 12:15 pm

9862067.2 Mortgage to ASB Bank Limited - 16.4.2015 at 12:15 pm

10717419.1 CAVEAT BY CENTRAL PLAINS WATER LIMITED - 1.3.2017 at 11:02 am

11167166.1 CAVEAT BY ORION NEW ZEALAND LIMITED - 9.7.2018 at 11:37 am

Annexure 2:

Submission on ‘Are we on track?’ (Oct 2018)

Submission on Selwyn District Plan Consultation Document ‘Are we on track’

Mervyn Todd & Matthew Reed

October 2018

Selwyn District Council

SELWYN DISTRICT COUNCIL

SUBMISSION ON SELWYN CONSULTATION DOCUMENT 'ARE WE ON TRACK'

Submitter Details

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Phone Number: 03 3322618

Mobile Number: 0275 332213

Contact Person Fiona Aston

Submission:

Our submission applies in particular to Darfield township and environs, including zoning of Darfield Preferred Development Area 7 (DAR 7) as identified in the Malvern Area Plan ('the MAP') – see **Appendix A** and is zoned Outer Plains in the Operative Selwyn District Plan.

DAR 7 is located to the north and north east of the existing township of Darfield. It has frontage to Kimberley Road and partial frontage to Horndon Street. Land immediately adjoining the Site to the south is zoned L1 (Broadgate subdivision) with land to the west of Kimberly Road zoned L2 and L2 Deferred. Land immediately to the south of Horndon Street (the eastern edge of the site) is zoned L2.

DAR 7 is identified as suitable for standard to low density residential development on MAP Figure 9 Darfield Preferred Development Areas, which is not entirely consistent with the MAP written commentary for DAR 7 which notes that it *"presents an opportunity to provide mixed-use living densities to be progressively developed from the current township boundary in the north-east direction ….it is close to the Darfield town centre and other community services and provides for a compact and concentric urban development pattern. A mixed-use living zone would be consistent with adjacent urban areas. The area has high amenity values, with views to the*

Torlesse Range….The area is a suitable location from an infrastructure servicing perspective, other than the requirement for restricted water supplies to be imposed in Living 2 areas."
What is meant by the term 'mixed used living zone' is unclear – possibly the wording was intended to be mixed density living zone as the adjoining Darfield living zones are not typically mixed use. A mixed density living zone including provision for some medium density housing and a retirement village would be appropriate given the proximity to the town centre and existing services and facilities; the previous Transitional District Plan Living X zoning which allowed the developer to nominate section sites not less than the Living 1 zone standard; and the landowners' proposal to provide for a variety of section sizes including a retirement village.

Our submission supports identification of DAR 7 as a preferred development area in the MAP but notes that it should be identified as a mixed density residential area, and seeks that it be zoned as for this purpose in the District Plan Review, including for standard, medium and low density residential development and a retirement village. The submitter wishes to develop part of the site for a retirement village.

The Submitters:

Mervyn Todd and Matthew Reed are the owners of Darfield Area 7 (DAR 7).

The Todd block within DAR 7 (legally described as Lot 4 DP 524058, 14.6 ha – see quick map attached as **Appendix F**) is presently used for farming purposes and is one of three blocks with frontage to Kimberley Road, as shown on the plan below in blue. The southern block (and the adjoining access to the north) is within the MAP Area 7. The three blocks are separated by existing accesses to the Reed farm to the east.

The Reed Family has farmed at Darfield since 1897. They own 206ha on the north east boundary of the township, most of which is a dryland sheep farm. Part of the original southern portion of the farm was rezoned for living purposes and now forms the Broadgate subdivision, a four stage subdivision encompassing a total of 75 sections. Stages 1 and 2 of this development are complete (approx. 35 sections) with stages 3 and 4 now underway. The Reed block within DAR7 is legally described as Pt RS 27204 (45.9977 ha). Land adjoining to the east is also owned by Reed and is partially within a preferred business development area (see quick map attached as **Appendix F**). Reed supports identification of his land for business although would like to confirm an appropriate boundary line with the Council. Inclusion of part of the Reed land within a future business area

will enable the Reeds to manage the living/business zone interface with suitable buffers/setbacks etc.

Land Use and Planning History

Previous Living X Zoning in the 1995 SDC notified District Plan Township Volume identified a larger part of the Reed Property as Living X than is now the case, and the southern Todd block(see notified 1995 planning map in **Appendix B**). Unbeknown to the landowners, who were satisfied with the inclusion of part of their land as Living X, the zoning was removed by way of submission to the District Plan (see **Appendix C**). It is understood that this was as a result of a submission by Selwyn Plantation Board who at that time owned land adjoining their west boundary (now owned by Todd) which was used for forestry, and had concerns regarding 'reverse sensitivity' effects between forest and residential activity. The trees have since been felled, and the land sold. It is now used for grazing purposes.

The attached (in **Appendix D**) subdivision plans prepared in 1997 for 82 lots is evidence of the stage they had proceeded to on the basis that they were not aware that the LX zoning of their land had been removed.

Servicing

It is understood that previous township growth constraints relating to water supply have now been resolved. Preliminary discussions with the Council's Asset Department indicate that there are wastewater constraints for smaller lot subdivision i.e. septic tanks may not be approved for smaller residential lots. The Long Term Plan (p14) notes that the Council has *"endorsed the plan to progress further work to explore wastewater options for Darfield and Kirwee, to gather more information and undertake targeted consultation with the community."* There is no financial commitment or timeframe for establishing a reticulated wastewater system at Darfield so the retirement village proposal is likely to require consent for a communal package plant. The feasibility of a plant providing sufficient capacity for residential intensification within the existing residential area could be investigated, and is an option the Submitters are willing to explore with the Council. We note that approval was obtained in 2013 for L1 and L2 rezoning at Cardale Street, Creyke Road and Telegraph Road, Darfield under Plan Change 24 (Silverstream), with the rezoning providing for 151 x L1 sites and 46 X L2 sites. A community package plant was proposed with a 7.5 ha on site wastewater disposal area (see copy of approved Outline Development Plan attached as **Appendix E**).

Relief Sought

i) Rezone DAR 7 Living X or equivalent i.e. what the subdivider nominates but not less than the minimum standard residential zone site size for the township (currently 650m^2), but with an allowance for up to 25% of lots within any subdivision to be small lot medium density lots as defined below, and additional provision for retirement villages as set out below;

ii) Selwyn District Council work with the landowners of DAR 7 in preparing an Outline Development Plan and commissioning of any required supporting technical reports and advice, and in relation to wastewater options for the site (and potentially existing urban areas with potential for residential intensification) with SDC funding the same;

iii) Provide for retirement villages as a permitted activity in the Living X zone (as it applies to Darfield and potentially other townships) including within DAR 7 and/or as an overlay for DAR7. A suggested definition of retirement villages (taken from the Christchurch District Plan) is:-

means any land, building or site that:

a. is used for accommodation predominantly for persons in their retirement, or persons in their retirement and their spouses or partners; and

b. satisfies either of the following:

(i) it is registered as a retirement village under the Retirement Villages Act 2003 or will be so registered prior to it being occupied by any resident; or

(ii) it is a rest home within the meaning of s58(4) of the Health and Disability Services (Safety) Act 2001; and

c. includes not less than two residential units; and

d. may include any or all of the following facilities or services for residents on the site:

(i) a care home within a retirement village;

(ii) a hospital within a retirement village;

(iii) nursing, medical care, welfare, accessory non-residential and/or recreation facilities and/or services.

iv) Provide for the equivalent of small lot medium density subdivision and housing as a permitted activity in the Living X zone at Darfield (and potentially other townships) including at DAR 7. Small lot medium density lots are those with a minimum average size of 500m^2 and minimum individual allotment size of 400m^2 (ie. the same as for the Living Z priority greenfield residential areas with the Selwyn Greater Christchurch area i.e. Rolleston, Prebbleton and Lincoln).

v) Any other consequential amendments to the Selwyn Proposed District Plan and other relevant documents, and any other actions by Selwyn District Council which are necessary to give effect to the intent of this submission.

Explanation – Reasons for Submission

1) The proposed rezoning is consistent with the MAP which identifies DAR 7 as providing the opportunity for the development of a mixed use residential area close to the town centre – it is unclear what is meant by a 'mixed use' zone, and we question whether the intended wording was 'mixed density' rather than 'mixed use'.
2) The rezoning will re-instate living zoning of this site as was proposed in the notified 1995 District Plan (Living X). The zoning was removed without the landowners' knowledge or agreement. We understand it was in response to a submission by Selwyn Plantation Board who at that time owned the land now owned by Mervyn Todd. The plantation trees on the Todd land have since been removed and the land is now in private ownership.
3) DAR 7 is far closer to the existing town centre than any other proposed Darfield preferred development area, and much of the existing living zoned land, in particular the various L2 areas which extend southeast and southwest to Creyke Road and Clintons Road. Development here will support a consolidated and concentric urban form for Darfield. It is ideally located to provide for a retirement village (which will require approximately 1 ha of greenfield land) and a mixed density subdivision include some smaller medium density housing lots. The only other area identified for intensification (DAR 5) contains existing older housing stock including some larger sites, but any redevelopment to higher density housing here is likely to piecemeal, 'organic' and occur over an extended timeframe.
4) As noted in the MAP, there is no supply of more intensive residential development less than the standard Living 1 zone, and *"there are opportunities to facilitate more intensive housing typologies within close proximity to the town centre to better meet the needs of the wider community…. A preferred approach would be to develop and apply intensification criteria through the District Plan Review process to facilitate elderly persons housing and/or medium-density development options in appropriate locations: or to rezone the Living 1 zone land within a 400m radius of the town centre Business 1 zone to a mix-density Living Z zone, which is preferred to spot zoning as it would provide flexibility and recognises the presence of older housing stock that could accommodate multi-lot developments"* . The above options both involve intensification of existing sites and will not accommodate a purpose built retirement village which requires approximately 1 – 3 ha of greenfield land. As

noted DAR7 is ideally located for this purpose given the proximity to the town centre – it is located 700m from the Darfield B1 zone.

5) The landowners are committed to, and have a proven successful track record in land development (the Reed family who have developed the adjoining Broadfield subdivision).

6) It is our understanding that unresolved issues relating to wastewater disposal at Darfield, in particular for medium density housing development on smaller sites, have restricted the ability of the township to provide for a range of housing choices, in particular elderly persons housing. Darfield is a popular retirement centre and this matter needs urgent resolution.

7) The circumstances of the rezoning of this Site are a unique situation in that it will re-instate the previous urban zoning which was removed without the landowners' knowledge or agreement. Indeed they would have strongly opposed Selwyn Plantation Board submission to removed the rezoning had they been aware of it. Clearly the site is ideally suited for urban development and in the circumstances, the submitters request that the Council support and fund the cost of the rezoning process.

8) The District Plan has a minimum 10-15 year planning horizon. Rezoning DAR 7 for mixed density living purposes is necessary to fulfill the Council's function under Section 31 (1) (aa) of the Resource Management Act 1991 (RMA) i.e. to establish, implement, and review objectives, policies, and methods to ensure that there is sufficient development capacity in respect of housing and business land to meet the expected demands of the district.

……

(Signature of applicant or person authorized to sign on behalf of the applicant)

Date: October 31, 2018

Appendices:

Appendix A: Malvern Area Plan Preferred Development Areas - Darfield

Appendix B: Selwyn District Plan as notified 1995 (Township Volume) – zoning Todd & Reed land

Appendix C: Operative Selwyn District Plan – zoning Todd & Reed land

Appendix D: Reed 1997 subdivision plans

Appendix E: Approved Outline Development Plan for Plan Change 24 (Silverstream – Creyke & Telegraph Roads Darfield)

Appendix E: Quick Map – Todd and Reed land

Annexure 3:

Outline Development Plan

LEGEND

- PRIMARY ROAD
- SECONDARY ROAD
- RESERVE
- PEDESTRIAN LINK
- RETIREMENT VILLAGE
- "MEDIUM DENSITY" AREA (SMALL LOTS)
- AVERAGE LOT SIZE NOT LESS THAN 1000m²
- LIVING 1
- LIVING 1 DEFERRED
- EXISTING LIVING X (NO CHANGE)

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DRAWING TITLE

LIVING 1, LIVING X & LIVING 1 DEFERRED
KIMBERLEY ROAD DARFIELD - ODP

Annexure 4

Assessment Against Planning Provisions

Canterbury Regional Policy Statement (CRPS, Operative 2013)

The following assessment of the proposed Plan Change has been undertaken against the relevant provisions of the CRPS relevant objectives and policies.

Table 1: Relevant Objectives and Policies of the Canterbury Regional Policy Statement

Canterbury Regional Policy Statement (CRPS)	Assessment of Proposal Against Relevant Provisions of the CRPS
Objective 5.2.1 – Location Design and Function of Development (Entire Region) Development is located and designed so that it functions in a way that: 1. achieves consolidated, well designed and sustainable growth in and around existing urban areas as the primary focus for accommodating the region's growth; and 2. enables people and communities, including future generations, to provide for their social, economic and cultural well-being and health and safety; and which: a) maintains, and where appropriate, enhances the overall quality of the natural environment of the Canterbury region, including its coastal environment, outstanding natural features and landscapes, and natural values; b) provides sufficient housing choice to meet the region's housing needs; c) encourages sustainable economic development by enabling business activities in appropriate locations; d) minimises energy use and/or improves energy efficiency; e) enables rural activities that support the rural environment including primary production; f) is compatible with, and will result in the continued safe, efficient and effective use of regionally significant infrastructure; g) avoids adverse effects on significant natural and physical resources including	The proposed Plan Change has been designed based on good urban design principles. It has been modified to address issues raised by Selwyn Council staff. The application site ('the Site') adjoins Darfield township and is an area identified in SDC strategy documents for rezoning, in part because it can achieve a high level of connectivity and integration with the existing township There will be no adverse effects on significant natural and physical resources including strategic infrastructure. There is an anticipated growing demand for sections at Darfield resulting from economic activity in the area, including the new dairy factory and Central Plains Irrigation Scheme, and retiring farmers. The proposed Plan Change provides additional housing choice (inclusive of the retirement village/aged care facility) which will help satisfy the anticipated growing demand. The proposed road network within the site will accommodate alternative forms of transport, which will help to minimise energy use. The proposal will be contiguous with areas that are already developed and/or zoned for urban purposes and will consolidate the existing urban form. The proposal will encourage housing choice through the provision of standard sized lots, some higher density lots, and some larger lots at the northern edge adjoining the Rural Outer Plains Zone. The aged care facility is effectively an intensive form of comprehensive development on the western margin of the Site nearest the township.

regionally significant infrastructure, and where avoidance is impracticable, remedies or mitigates those effects on those resources and infrastructure; h) facilitates the establishment of papakāinga and marae; and i) avoids conflicts between incompatible activities.	The proposal results in a consolidated form of development. The proposed Outline Development Plan (ODP) ensures appropriate roading and off-road linkages with neighbouring land, and integrates with existing infrastructure.
Policy 5.3.1 - Regional growth (Wider Region) To provide, as the primary focus for meeting the wider region's growth needs, sustainable development patterns that: 1. ensure that any (a) urban growth; and (b) limited rural residential development occur in a form that concentrates, or is attached to, existing urban areas and promotes a coordinated pattern of development; 3. encourage within urban areas, housing choice, recreation and community facilities, and business opportunities of a character and form that supports urban consolidation; 4. promote energy efficiency in urban forms, transport patterns, site location and subdivision layout; 5. maintain and enhance the sense of identity and character of the region's urban areas; and 6. encourage high quality urban design, including the maintenance and enhancement of amenity values.	As detailed on the ODP, the proposed Plan Change promotes housing choice by a diversity of residential lot sizes (ie standard, medium density lots, large lots and aged care), which respond to the character of the surrounding environment and help meet the housing needs of the ageing population within Selwyn District. Inclusion of the retirement village as a Restricted Discretionary activity with relevant assessment matters further ensures a high amenity environment will be maintained, in keeping with the amenity values of Darfield. The proposal takes a sustainable development pattern by being attached to the existing town, and the road network provides for a co-ordinated pattern of development providing a concentrated urban form.
Policy 5.3.2 - Development conditions (Wider Region) To enable development including regionally significant infrastructure which: 1. ensure that adverse effects are avoided, remedied or mitigated, including where these would compromise or foreclose : (a) existing or consented regionally significant infrastructure; (b) options for accommodating the consolidated growth and development of existing urban areas; (c) the productivity of the region's soil resources, without regard to the need to make appropriate use of soil which is valued for existing or foreseeable future	Assessed above for Objective 5.2.1. The Geotechnical Investigation, and Servicing, Reports, further attest that any potential adverse effects of the development can be avoided, remedied or mitigated. The present rural use is a low intensity dry-land farming activity. The Site does not contain Land Use Capability (LUC) Class 1 or 2 versatile soils (it contains LUC 3 soils). Facilitating standard and medium density residential development will minimize the amount of rural land to be utilized for urban development (compared to lower density residential or rural-residential development) and will ensure the productivity of the region's soil resources are not

primary production, or through further fragmentation of rural land; (d) the protection of sources of water for community supplies; (e) significant natural and physical resources; 2. avoid or mitigate: (a) natural and other hazards, or land uses that would likely result in increases in the frequency and/or severity of hazards; (b) reverse sensitivity effects and conflicts between incompatible activities, including identified mineral extraction areas; and 3. integrate with: (a) the efficient and effective provision, maintenance or upgrade of infrastructure; and (b) transport networks, connections and modes so as to provide for the sustainable and efficient movement of people, goods and services, and a logical, permeable and safe transport system.	significantly reduced. There are no natural hazards identified for the Site within any planning documents. The Geotechnical Investigation Report concludes that the Site is unlikely to be susceptible to liquefaction, and "*the risk of any significant liquefaction induced ground deformation occurring at the site in response to a large earthquake is considered to be low."* The Geotechnical Investigation Report (**Annexure 9***)* concludes that *"the site is considered suitable for its intended use*." As discussed in the assessment of effects Plan Change application, the proposed Plan Change will not result in reverse sensitivity effects.
Policy 5.3.3 - Management of development (Wider Region) To ensure that substantial developments are designed and built to be of a high-quality, and are robust and resilient: 1. through promoting, where appropriate, a diversity of residential, employment and recreational choices, for individuals and communities associated with the substantial development; and 2. where amenity values, the quality of the environment, and the character of an area are maintained, or appropriately enhanced.	As for assessment for Objective 5.2.1 and Policy 5.3.1 above
Policy 5.3.7 – Strategic land transport network and arterial roads (Entire Region) In relation to strategic land transport network and arterial roads, the avoidance of development which: 1. adversely affects the safe efficient and effective functioning of this network and these roads, including the ability of this infrastructure to	The Site is not located on strategic land transport routes. It is accessed by the local road network from which there is controlled access to the State Highway. Development enabled by the proposed Plan Change will not adversely impact on the safe and effective functioning of the strategic land transport network.

support freight and passenger transport services; and 2. in relation to the strategic land transport network and arterial roads, to avoid development which forecloses the opportunity for the development of this network and these roads to meet future strategic transport requirements.	
5.3.8 Land use and transport integration (Wider Region) Integrate land use and transport planning in a way: 1. that promotes: (a) the use of transport modes which have low adverse effects; (b) the safe, efficient and effective use of transport infrastructure, and reduces where appropriate the demand for transport; 2. that avoids or mitigates conflicts with incompatible activities; and 3. where the adverse effects from the development, operation and expansion of the transport system: (a) on significant natural and physical resources and cultural values are avoided, or where this is not practicable, remedied or mitigated; and (b) are otherwise appropriately controlled.	Assessed above for Policy 5.3.7 Darfield is serviced by a public transport service linking the town to Christchurch. The Site is within walking distance of the town centre. There are no significant natural and physical resources, nor cultural values within the Site.
Objective 11.2.1 Avoid new subdivision, use and development of land that increases risks associated with natural hazards New subdivision, use and development of land which increases the risk of natural hazards to people, property and infrastructure is avoided or, where avoidance is not possible, mitigation measures minimise such risks **Policy 11.3.1 Avoidance of inappropriate development in high hazard areas**	As detailed in the Geotechnical Investigation Report (**Annexure 9***), the site is considered suitable for its intended use*. The Geotechnical Investigation Report concludes that the Site is unlikely to be susceptible to liquefaction, and "*the risk of any significant liquefaction induced ground deformation occurring at the site in response to a large earthquake is considered to be low."* (Summary)

To avoid new subdivision, use and development (except as provided for in Policy 11.3.4) of land in high hazard areas, unless the subdivision, use or development… **Policy 11.3.3 – Earthquake Hazards** New subdivision, use and development of land on or close to an active earthquake fault trace, or in areas susceptible to liquefaction and lateral spreading, shall be managed in order to avoid or mitigate the adverse effects of fault rupture, liquefaction and lateral spreading.	Foundation design recommendations for future proposed residential development are at sections 7.0 and 8.0 of that Report. No planning document identifies any natural hazards for the Site. The Site is not a high hazard area, as defined in the CRPS (which includes specified risk areas relating to flooding, coastal erosion and seawater inundation).

Summary of assessment against CRPS

1. Overall the proposal to change the Selwyn District Plan fromm Rural Outer Plains to L1 and Future Urban Zone is consistent with the RPS policies and will help achieve the purpose of the RMA.
2. The proposal:-
   a) Achieves consolidated, well designed and sustainable growth in and around an existing urban areas.
   b) Enables people and communities, including future generations, to provide for their social, economic and cultural well-being and health and safety.
   c) Provides a focus for meeting the wider region's growth needs, and in a sustainable development pattern.
   d) Does not impact on regionally significant infrastructure.
   e) Ensures that the development of residential land, and an aged care facility, is designed and built to be of a high-quality, and are robust and resilient developments being consistent the SDP zoning approach, and through use of an ODP to provide co-ordinated and integrated development.
   f) Integrates land use and transport planning through the ODP ensuring appropriate connections to the existing road network and making provision for future raiding connections.
   g) Is not on a site subject to natural hazards nor at risk from liquefaction.

Assessment against Selwyn District Plan Objectives and Policies

The following assessment of the proposed Plan Change focuses on those objectives and policies of most relevance to the plan change.

Table 2: Relevant Objectives and Policies in the Selwyn District Plan

Selwyn District Plan – Townships Volume **Chapter B1 – Natural Resources**	**Assessment of the Proposal Against Relevant Objectives and Policies within the Selwyn District Plan**
Objective B1.1.2 New residential or business activities do not create shortages of land or soil resources for other activities in the future.	The proposed Plan Change will enable the use of conversion of approximately 60ha of farmland to residential use. This is marginal loss of rural productive land for a future land use signalled in the Selwyn strategic planning documents Malvern – 2031. The land is not prime agricultural land (it is LUC 3).
Policy B1.1.3 Avoid adverse effects on people's health or well-being from exposure to contaminated soil.	There is no evidence of contaminated land. See Annexure 8
Policy B1.1.8 Avoid rezoning land which contains versatile soils for new residential or business development if: 1) The land is appropriate for other activities; and 2) There are other areas adjoining the township which are appropriate for new residential or business development which do not contain versatile soils.	The Site is shown as Preferred Future Residential Development Area DAR7 in the strategic growth document Malvern – 2031. It does not contain versatile soils (classed as LUC 1&2 soils). The Site contains LUC 3 soils.
Objective B1.2.1 Expansion of townships in Selwyn District maintains and enhances the quality of ground or surface water resources.	There is unlikely to be an adverse impact on the quality of ground or surface water. A stormwater discharge consent is required for on-site discharge of stormwater to ground, and for the wastewater treatment plant preferred option (a community wastewater treatment plant and disposal area on land to the north of the Site).
Policy B1.2.2 Ensure land rezoned to a Living or Business zone can be serviced with a water supply and effluent and stormwater disposal without adversely affecting ground water or surface waterbodies.	The proposal includes appropriate servicing proposals including a privately owned package sewage treatment plant off-site for which the necessary consents have been applied for. The Servicing Report notes that SDC has confirmed there is sufficient water supply in the

	Darfield water supply to meet reticulation needs, including for firefighting purposes.(para 6.1) An explanation in support of Policy B1.2.5 notes: *Darfield and Kirwee:* *A study done for the Council (Lewis and Barrow 1999) indicates that on–site effluent treatment and disposal at Darfield and Kirwee is unlikely to contaminate groundwater within the life of this District Plan. This result is due to the significant depth to groundwater in this area. The results of the Lewis and Barrow Study (1999) are neither accepted at Environment Canterbury nor supported by an independent review by URS (2000). However, Environment Canterbury has indicated that:* *It will continue to issue discharge permits for on–site sewage treatment and disposal for new houses in residential areas at Darfield and Kirwee.*
Policy B1.2.3 Require the water supply to any allotments or building in any township and the Living 3 Zone to comply with the current New Zealand Drinking Water Standards and to be reticulated in all, except for sites in the existing Living 1 Zone in Doyleston.	The Servicing Report confirms water is available from the Darfield water supply
Chapter B2 – Physical Resources	
Objective B2.1.1 An integrated approach to land use and transport planning to ensure the safe and efficient operation of the District's roads, pathways, railway lines and airfields is not compromised by adverse effects from activities on surrounding land or by residential growth.	The proposed ODP (see **Annexure 3**) shows a preferred roading layout including points of connection to the existing roads, and indicative internal access and roading. Internal access and roading within the Site will be developed in accordance with relevant traffic standards, as will local traffic-related upgrades (and be confirmed through the subdivision consent process). This will ensure good connectivity to Darfield.
Objective B2.1.2 An integrated approach to land use and transport planning to manage and minimise adverse effects of transport networks on adjoining land uses and to avoid "reverse sensitivity" effects on the operation of transport networks.	There are five access points into the overall 46ha site shown on the ODP. SDC staff have been consulted on the draft Plan Change including ODP, and have not raised any concerns regarding traffic effects of the proposal on the local transport network.
Policy B2.1.1 Apply a road hierarchy classification in Selwyn District to recognise the different functions and roles of the District's roads.	The Site adjoins existing development and makes transport connections to this development, thus promoting an efficient and consolidated land use pattern.

	The internal roads are consistent with the existing road hierarchy. The ODP identifies five indicative access points to/from the Site, which will provide a direct and safe pedestrian and cycle route into the Darfield. The ODP shows primary and secondary roads within the proposed development area, including two primary road links to each of Horndon and Kimberley Roads respectively.
Policy B2.1.2 Manage effects of activities on the safe and efficient operation of the District's existing and planned road network, considering the classification and function of each road in the hierarchy.	See above assessment
Policy B2.1.4(a) Ensure all sites, allotments or properties have legal access to a legal road which is formed to the standard necessary to meet the needs of the activity considering: • the number and type of vehicle movements generated by the activity; • the road classification and function; and • any pedestrian, cycle, public transport or other access required by the activity.	All sites, allotments or properties have legal access to a legal road which will be formed to the standard necessary to meet the needs of the activity at the subdivision stage.
Policy B2.1.5 Ensure the development of new roads is: a) integrated with existing and future transport networks and landuses; and b) designed and located to maximize permeability and accessibility; through achieving a high level of connectivity within and through new developments to encourage use of public and active transport; whilst having regard to the road hierarchy.	For the reasons outlined above, the proposed Plan Change is in accordance with Objectives B2.1.1 and B2.1.2 and Policies B2.1.2, B2.1.5, B2.1.9, B2.1.12, B2.1.13, B2.1.15.
Policy B2.1.9 Ensure buildings are set back a sufficient distance from road boundaries to maintain good visibility for all road users including motorist, cyclists and pedestrians, and to allow safe access and egress and to mitigate reverse sensitivity effects on land adjoining the State Highway.	For the reasons outlined above, the proposed Plan Change is in accordance with Objectives B2.1.1 and B2.1.2 and Policies B2.1.2, B2.1.5, B2.1.9, B2.1.12, B2.1.13, B2.1.15.
Policy B2.1.11 Ensure roads are designed, constructed, maintained and upgraded to an appropriate standard to carry the volume and types of traffic safely and efficiently.	For the reasons outlined above, the proposed Plan Change is in accordance with Objectives B2.1.1 and B2.1.2 and Policies B2.1.2, B2.1.5, B2.1.9, B2.1.12, B2.1.13, B2.1.15.

Policy B2.1.12 Address the impact of new residential or business activities on both the local roads around the site and the District's road network, particularly Arterial Road links with Christchurch City.	For the reasons outlined above, the proposed Plan Change is in accordance with Objectives B2.1.1 and B2.1.2 and Policies B2.1.2, B2.1.5, B2.1.9, B2.1.12, B2.1.13, B2.1.15.
Policy B2.1.13 Minimise the effects of increasing transport demand associated with areas identified for urban growth by promoting efficient and consolidated land use patterns that will reduce the demand for transport.	For the reasons outlined above, the proposed Plan Change is in accordance with Objectives B2.1.1 and B2.1.2 and Policies B2.1.2, B2.1.5, B2.1.9, B2.1.12, B2.1.13, B2.1.15.
Policy B2.1.15 Require pedestrian and cycle links in new and redeveloped residential or business areas where such links are likely to provide a safe, attractive and accessible alternative route for pedestrians and cyclists, to surrounding residential areas, business or community facilities.	For the reasons outlined above, the proposed Plan Change is in accordance with Objectives B2.1.1 and B2.1.2 and Policies B2.1.2, B2.1.5, B2.1.9, B2.1.12, B2.1.13, B2.1.15. The Site is well connected to existing roads and is conveniently located to the town centre, being easily accessed on foot or by cyclists. The ODP makes provision for a pedestrian link to DAR 8 Preferred Future Business Development Area (as identified in the Malvern Area Plan), which adjoins the Site to the east.
Policy B2.2.1 Require that the need to supply utilities and the feasibility of undertaking, is identified at the time a plan change request is made to rezone land for residential or business development.	The proposed Plan Change is in accordance with Policy B.2.2.1 as the development can be serviced by utilities: water, power, telecoms, streetlighting, stormwater (Servicing Report, **Annexure 6**) and for wastewater (the Wastewater Infrastructure Option Report **Annexure 7)**
Policy B2.2.2 Ensure activities have access to the utilities they require at the boundary prior to any new allotment being sold; or prior to any new activity taking place on an existing allotment.	This will be ensured through the subdivision consent process.
Policy B2.2.3 Encourage the "market" to determine the efficient use of utilities.	The proposal is to provide wastewater services by a privately owned package treatment plant on an adjoining site.
Objective B2.3.1 Residents have access to adequate community facilities.	The Site DAR7 was identified by SDC in its strategic growth document Malvern – 2031. The Site is conveniently position to "square up" the town and provide ease of access to community facilities.
Objective B2.3.2 Community facilities do not adversely affect residential amenity values or other parts of the environment.	There are no community facilities proposed within the Site as defined in the SDP Part 4.
Policy B2.3.8	Discussions with SDC staff have identified the best provision of reserves within the

<table>
<tr><td>Ensure residents in Selwyn District have access to sufficient reserve areas to meet their needs for space for active and passive recreation.</td><td>development and are shown on the ODP for location, orientation and size.</td></tr>
<tr><td>Policy B2.4.4
Ensure land rezoned for new residential or business development has a regular solid waste collection and disposal service available to residents.</td><td>Once zoned and subdivided this service will be provided by Council.</td></tr>
<tr><td colspan="2">Chapter B3 – People's Health, Safety and Values.</td></tr>
<tr><td>Objective B3.1.1
Ensure activities do not lead to or intensify the effects of natural hazards.

Policy B3.1.2
Avoid allowing new residential or business development in areas known to be vulnerable to a natural hazard, unless any potential risk of loss of life or damage to property is adequately mitigated.</td><td>The Site is not identified in the SDP as being at risk from natural hazards.

The Geotechnical Investigation Report concludes that the Site

• is unlikely to be susceptible to liquefaction, and "the risk of any significant liquefaction induced ground deformation occurring at the site in response to a large earthquake is considered to be low." (Summary)
• "is considered suitable for its intended use." (Summary)

This achieves the direction of Policy B3.1.2.</td></tr>
<tr><td>Objective B3.4.1
The District's townships are pleasant places to live and work in.

Objective B3.4.2
A variety of activities are provided for in townships, while maintaining the character and amenity values of each zone.

Objective B3.4.3
"Reverse sensitivity" effects between activities are avoided.

Objective B3.4.4
Growth of existing townships has a compact urban form and provides a variety of living environments and housing choices for residents, including medium density housing typologies located within areas identified in an Outline Development Plan.

Objective B3.4.5
Urban growth within and adjoining townships will provide a high level of connectivity both within the development and with adjoining land areas (where these have been or are likely to be developed for urban activities or public reserves) and will provide suitable access to a variety of forms of transport.

Policy B3.4.1</td><td>The proposal is seeking to provide a high quality urban environment that, by adopting existing SDP standards and zones, and following the direction of Malvern – 2031, will

• maintain the character and amenity values of the L1 Zone

<table><tr><td>Living 1</td><td>Areas that are managed to maintain environments that are most pleasant for residing in. Activities in Living zones have effects which are compatible with residential activities and amenity values.</td></tr></table>
• minimise reverse sensitivity effects,
• provide a compact form to Darfield
• provide a choice of three living environments on the 14.6ha site (medium/high density lots and an aged care facility), and three possible living environments foreshadowed in the Future Urban Zone
• provide high levels of connectivity to existing roads and town centre
• meet the policy intent of Policy B3.4.3</td></tr>
</table>

To provide zones in townships based on the existing quality of the environment, character and amenity values, except within Outline Development Plan areas in the Greater Christchurch area where provision is made for high quality medium density housing. **Policy B3.4.2** To provide for any activity to locate in a zone provided it has effects which are compatible with the character, quality of the environment and amenity values of that zone. **Policy B3.4.3** To provide Living zones which: • are pleasant places to live in and provide for the health and safety of people and their communities; • are less busy and more spacious than residential areas in metropolitan centres; • have safe and easy access for residents to associated services and facilities; • provide for a variety of living environments and housing choices for residents, including medium density areas identified in Outline Development Plans; • ensure medium density residential areas identified in Outline Development Plans are located within close proximity to open spaces and/or community facilities and • ensure that new medium density residential developments identified in Outline Development Plans are designed in accordance with the following design principles: • access and connections to surrounding residential areas and community facilities and neighbourhood centres are provided for through a range of transport modes; • block proportions are small, easily navigable and convenient to encourage cycle and pedestrian movement; • streets are aligned to take advantage of views and landscape elements; • section proportions are designed to allow for private open space and sunlight admission;	The medium density areas show on the ODP adjoin or are close to reserves, which provide an open space setting for the higher density development. The proposed retirement village is on a generously sized approximately 3 ha site, which will provide ample opportunity for open space within the development.

• a subdivision layout that minimises the number of rear lots; • layout and design of dwellings encourage high levels of interface with roads, reserves and other dwellings; • a diversity of living environments and housing types are provided to reflect different lifestyle choices and needs of the community; • a balance between built form and open spaces complements the existing character and amenity of the surrounding environment and; • any existing natural, cultural, historical and other unique features of the area are incorporated where possible to provide a sense of place, identity and community	
Policy B3.4.38 Where Living zones and Business 2 Zones adjoin, ensure any new activity occurring along the boundary in either zone, includes measures to mitigate any potential 'reverse sensitivity' effects on existing activities.	Land adjoining to the east of the proposed Future Urban Zone is DAR 8 Preferred Future Business Development Area (as identified in the Malvern Area Plan). The western portion of DAR 8 is part of Broadfield Farm, which also includes the Future Urban Zone. It is anticipated that when DAR 8 is rezoned, the Business zoning will incorporate suitable buffers and/or other mitigation along the boundary with the Future Urban Zone.
Chapter B4 – Growth Of Townships	
Objective B4.1.1 A range of living environments is provided for in townships, while maintaining the overall 'spacious' character of Living zones, except within Medium Density areas identified in an Outline Development Plan where a high quality, medium density of development is anticipated. **Objective B4.1.2** New residential areas are pleasant places to live and add to the character and amenity values of townships Policy B4.1.1 (a)Provide for a variety of allotment sizes for erecting dwellings in Living 1 Zones, while maintaining average section size similar to that for existing residential areas in townships, except	See above assessment. For Policy B4.1.11 the new residential areas will be designed to maintain or enhance the aesthetic values of the township noting that there are no existing trees, bush, or other natural features on site to be retained and that reserves will be vested in or developed to its requirements so the public space is appropriately landscaped. Policy B4.1.13 will be achieved through the subdivision process and compliance with SDP development and activity standards.

within the Living Z Zone, including any Medium Density area identified in an Outline Development Plan where a higher density of development is anticipated. **Policy B4.1.11** Encourage new residential areas to be designed to maintain or enhance the aesthetic values of the township, including (but not limited to): • Retaining existing trees, bush, or other natural features on sites; and • Landscaping public places. **Policy B4.1.13** To ensure that development in Medium Density areas identified in an Outline Development Plan provides a high quality living environment and achieves a good level of urban design, appearance and amenity. Relevant urban design considerations include: • That the design of medium density developments is of a high quality, with a good balance of consistency and variety in form, alignment, materials and colour and a sufficient level of architectural detailing; • That residential units provide an open and attractive streetscene through being oriented towards the street or other adjacent public spaces, have low or no front fencing, front facades that are not dominated by garaging but instead have clearly visible pedestrian front entrances and a balanced ratio of glazing to solid walls; • That opportunities for landscaping and tree planting is provided, commensurate with a medium density living environment; • That opportunity for comprehensive developments are provided, including the ability to erect short terraces or share internal side boundary walls; • That medium density developments make provision for adequate, well located and well designed private outdoor living areas; • That internal amenity is provided for occupants through levels of privacy and access to sunlight appropriate to a medium density living environment; • That the appearance of cramped development is avoided by limiting site coverage and ensuring there is open space	

between houses, duplexes or blocks of terraces, particularly at first floor level.	
Policy B4.2.11 Encourage subdivision designs within Outline Development Plan areas to provide for a variety of section sizes that are designed to cater for different housing types.	The Explanation and Reasons states: A range of housing types are required to cater to different living requirements and different age groups within Outline Development Plan areas. It is likely that a person's housing needs will change throughout their life and it should be possible for them to meet their needs within the District. Policy B4.2.11 therefore seeks to ensure that new residential areas are designed to provide for housing diversity by creating variety in section sizes and subsequent housing types. Darfield has a higher proportion of retired people than the average for Selwyn District, but with very limited provision for retirement housing. There are also no existing medium density housing areas or zones in the township, with no ability therefore to provide smaller more affordable housing. The proposed rezoning and ODP recognises these unmet local housing needs, including enabling retired people to remain living locally, close to family.
Objective B4.3.1 The expansion of townships does not adversely affect: • Natural or physical resources; • Other activities; • Amenity values of the township or the rural area; or Sites with special ecological, cultural, heritage or landscape values. **Objective B4.3.2** For townships outside the Greater Christchurch area, new residential or business development adjoins existing townships at compatible urban densities or at a low density around townships to achieve a compact township shape which is consistent with the preferred growth direction for townships and other provisions in the Plan **Objective B4.3.4** New areas for residential or business development support the timely, efficient and integrated provision of infrastructure, including appropriate transport and movement networks through a coordinated and phased development approach.	The Site is currently bare farmland. It has no sites of special ecological, cultural, heritage or landscape values. The proposal is seeking to provide a high quality urban environment that, by adopting existing SDP standards and zones, and following the direction of Malvern – 2031, will • Contribute to a compact township shape • Support the timely, efficient and integrated provision of infrastructure through seeking consent for the wastewater treatment plant concurrently with the proposed plan change • Ensure a coordinated and phased development approach through the ODP and provision for a Future urban Zone • Provide consolidation of Darfield within the planned township boundaries • Adjoin an existing Living Zone as required by Policy B4.3.2 • Avoid a zoning pattern that leaves land zoned Rural surrounded on three or more boundaries with land zoned Living;

Objective B4.3.5 Ensure that sufficient land is made available in the District Plan to accommodate additional households in the Selwyn District portion of the Greater Christchurch area between 2013 and 2028 through both Greenfield growth areas and consolidation within existing townships. **Policy B4.3.1** Ensure new residential, rural residential or business development either: • Complies with the Plan policies for the Rural Zone; or • The land is rezoned to an appropriate Living Zone that provides for rural-residential activities (as defined within the Regional Policy Statement) in accordance with an Outline Development Plan incorporated into the District Plan; or • The land is rezoned to an appropriate Living or Business zone and, where within the Greater Christchurch area, is contained within existing zoned land and greenfield priority areas identified in the Regional Policy Statement and developed in accordance with an Outline Development Plan incorporated into the District Plan. **Policy B4.3.2** In areas outside the Greater Christchurch area, require any land rezoned for new residential or business development to adjoin, along at least one boundary, an existing Living or Business zone in a township, except that low density living environments need not adjoin a boundary provided they are located in a manner that achieves a compact township shape. **Policy B4.3.3** Avoid zoning patterns that leave land zoned Rural surrounded on three or more boundaries with land zoned Living or Business. **Policy B4.3.6** Encourage townships to expand in a compact shape where practical. **Policy B4.3.8** Each Outline Development Plan shall include: • Principal through roads, connection and integration with the surrounding road networks, relevant infrastructure services and areas for possible future development;	the Site will have two boundaries to the Outer Plains Zone. • Be controlled through an ODP to provide overall Site co-ordination and integration of development that meets the requirements of Policy B4.3.8

• Any land to be set aside for community facilities or schools; parks and land required for recreation or reserves; • any land to be set aside for business activities; • the distribution of different residential densities; • land required for the integrated management of water systems, including stormwater treatment, secondary flow paths, retention and drainage paths; • land reserved or otherwise set aside from development for environmental or landscape protection or enhancement; and • land reserved or otherwise set aside from development for any other reason, and the reasons for its protection. • Demonstrate how each ODP area will achieve a minimum net density of at least 10 lots or household units per hectare ; • Identify any cultural (including Te Taumutu Rūnanga values), natural, and historic or heritage features and values and show how they are to be enhanced or maintained; • Indicate how required infrastructure will be provided and how it will be funded; • Set out the phasing and co-ordination of subdivision and development in line with the phasing shown on the Planning Maps and Appendices; • Demonstrate how effective provision is made for a range of transport options, including public transport systems, pedestrian walkways and cycleways, both within and adjoining the ODP area; • Show how other potential adverse effects on and/or from nearby existing or designated strategic infrastructure (including requirements for designations, or planned infrastructure) will be avoided, remedied or appropriately mitigated; • Show how other potential adverse effects on the environment, the protection and enhancement of surface and groundwater	

quality, are to be avoided, remedied or mitigated; • Include any other information which is relevant to an understanding of the development and its proposed zoning; and • Demonstrate that the design will minimise any reverse sensitivity effects.	
Policy B4.3.27 Ensure any land rezoned for new residential or business development does not create or exacerbate 'reverse sensitivity' issues in respect of activities in the existing Business 2 Zones or the Midland Railway.	The Site is located at a distance from the Midland Railway and existing Business 2 Zones and so minimises the risk of reverse sensitivity issues arising. Land adjoining to the east of the proposed Future Urban Zone is DAR 8 Preferred Future Business Development Area (as identified in the Malvern Area Plan). The western portion of DAR 8 is part of Broadfield Farm, which also includes the Future Urban Zone. It is anticipated that when DAR 8 is rezoned, the Business zoning will incorporate suitable buffers and/or other mitigation along the boundary with the Future Urban Zone.

Summary of assessment against the Selwyn District Plan

1. Overall the proposal to change the Selwyn District Plan from Rural Outer Plains to L1 and Future Urban Zone is consistent with the SDP objectives and policies, and will help achieve the purpose of the RMA.
2. The proposal:-
    a) Does not create shortages of land or soil resources for other activities in the future.
    b) Has taken up a site shown as a Preferred Future Development Area DAR7 in the strategic growth document Malvern – 2031 Malvern Area Plan.
    c) Can be serviced with a reticulated public water supply, effluent disposal on an adjoining site, and stormwater disposal to ground within the Site.
    d) Provides an integrated approach to land use and transport planning to ensure the safe and efficient operation of the District's roads through the proposed ODP and adoption of existing road hierarchies for roads within the Site.
    e) Achieves a high level of connectivity within the Site to encourage use of public and active transport; whilst having regard to the road hierarchy.
    f) Has identified the need to supply utilities and to assess the feasibility of such through a servicing assessment and to lodge resource consents for the wastewater system at the time the plan change request is made.
    g) Will ensure residents in the development area and Darfield have access to sufficient reserve areas to meet their needs for space for active and passive recreation.
    h) Is on a Site with no known natural hazards, is not at risk from liquefaction, contains no sites with special ecological, cultural, heritage or landscape values, nor any existing trees, bush, or other natural features that should be

retained. There are no water courses or bodies that need to be incorporated into the new development.

i) Will contribute to Darfield township being a pleasant place to live and work in.

j) Will contribute to the growth of Darfield township in a compact urban form and provide a variety of living environments and housing choices for residents, including medium density housing typologies located within areas identified in an Outline Development Plan.

k) Will provide zones in Darfield based on the existing quality of the environment, character and amenity values set through adopting existing zoning and its development and activity SDP standards.

l) Specifically meets Objective B4.3.2 for townships outside the Greater Christchurch area: new residential development should adjoin existing townships at compatible urban densities or at a low density around townships to achieve a compact township shape which is consistent with the preferred growth direction for townships and other provisions in the Plan.

m) Achieves the policy intent of Policy B4.3.8 that each Outline Development Plan should contain a range of measures for the co-ordination and integration of development that will create quality living environments.

Annexure 5:

Section 32 Evaluation

Annexure 5 Section 32 RMA Assessment

Introduction and RMA requirements

1. Merf Agricutural Services and Matthew Reed (the applicants) are requesting a change to the operative Selwyn District Plan (SDP) to change the zoning of the application site from Rural Outer Plains to a mix of Living 1 and Living 1 Deferred zoned land.
2. This application has outlined the background to and reasons for the requested Plan Change.
3. The amendments to the SDP are outlined in Section 2 of this application. No adverse environmental effects are anticipated by the change of zoning, however the potential environmental effects of implementation of the proposed plan change have been described in Section 3 of this application.
4. Any change to a plan needs to be evaluated in accordance with section 32 of the Resource Management Act. Section 32 states:

   Requirements for preparing and publishing evaluation reports

   (1) An evaluation report required under this Act must—

   (a) examine the extent to which the objectives of the proposal being evaluated are the most appropriate way to achieve the purpose of this Act; and
   (b) examine whether the provisions in the proposal are the most appropriate way to achieve the objectives by—
   (i) identifying other reasonably practicable options for achieving the objectives; and
   (ii) assessing the efficiency and effectiveness of the provisions in achieving the objectives; and
   (iii) summarising the reasons for deciding on the provisions; and
   (c) contain a level of detail that corresponds to the scale and significance of the environmental, economic, social, and cultural effects that are anticipated from the implementation of the proposal.

   (2) An assessment under subsection (1)(b)(ii) must—

   (a) identify and assess the benefits and costs of the environmental, economic, social, and cultural effects that are anticipated from the implementation of the provisions, including the opportunities for—
   (i) economic growth that are anticipated to be provided or reduced; and
   (ii) employment that are anticipated to be provided or reduced; and
   (b) if practicable, quantify the benefits and costs referred to in paragraph (a); and (c) assess the risk of acting or not acting if there is uncertain or insufficient information about the subject matter of the provisions.

   (3) If the proposal (an amending proposal) will amend a standard, statement, national planning standard, regulation, plan, or change that is already proposed or that already exists (an existing proposal), the examination under subsection (1)(b) must relate to—
   (a) the provisions and objectives of the amending proposal; and
   (b) the objectives of the existing proposal to the extent that those objectives—
   (i) are relevant to the objectives of the amending proposal; and
   (ii) would remain if the amending proposal were to take effect.

Objective of the Proposed Plan Change

5. The objective of the proposed plan change is to change the zoning of the application site from Rural Outer Plains to Living 1 and Deferred Living 1 in a controlled and

managed way through an ODP and by adopting, as far as possible, existing planning zones and standards.

6. Implementation of the proposed plan change will:
   a) Provide for additional housing and residential land choice in Darfield at densities that complement the immediately surrounding land without compromising the character or amenity of that residential land;
   b) Provide for future subdivision and development that will contribute to the growth of Darfield, while not detracting from the quality and amenity of existing Darfield residential areas;
   c) Provide for concentrated development around an existing township in a manner that enables efficient use of existing and future infrastructure and current land resources as foreshadowed in strategic planning documents Malvern 2031.

Identification of options

7. In determining the most appropriate means to achieve the objectives of the proposed plan change, a number of alternative options are assessed below.
8. These options are:

   a) Option 1: status quo/do nothing: Do not rezone the application site from Rural Outer Plains to Living 1 and Living 1 Deferred.
   b) Option 2: rezone the whole 60ha site for residential use: Seek to rezone the whole site for staged residential use, being Living 1 and Living 1 Deferred.
   c) Option 3: rezone only the 14.6ha site adjoining Kimberley Road as Living 1 and retain the existing Rural Outer Plains zoning on the balance 45.4 ha of land.
   d) Option 4: resource consent: land use and subdivision consent for the retirement village, and subdivision of the application site through a non-complying subdivision and land use consent for residential use.

9. A further option could be to rezone the full 60 ha Living 1. This is not considered below because a staged urban development is proposed and the balance 45 ha may not be required for next 5-15 years, by which time a SDC reticulated wastewater system may be available to service Darfield township. Accordingly, wastewater discharge consent is only being sought at this time for the Stage 1 area i.e. 14.6 ha. CDHB and SDC preference is for the balance land to be reticulated to a potential future SDC system, not a community system.

S32 Matter	Option 1: Rural Outer Plains	Option 2: L1 and L1 Deferred	Option 3: L1 14.6ha & Rural Outer Plains	Option 4: Consents
Cost	None	Time and money cost to applicant for plan change & wastewater consent for 14. 6 ha. Cost of off-site treatment plant.	Increased time and money costs to applicants for plan changes because two plan changes will be required over time (second to rezone balance 45.4 ha in due course). Less integrated and comprehensive approach to development of DAR7 future development area as not subject to one overall ODP (as is proposed under Option 2) Cost of off-site treatment plant.	Time and money cost to applicant to seek noncomplying land use and subdivision consents & discharge consents. Community cost and uncertainty in not seeing the full scale of possible development at any time.
S32 Matter	**Option 1: Rural Outer Plains**	**Option 2: L1 and Future Urban**	**Option 3: L1 14.6ha & Rural Outer Plains**	**Option 4: Consents**
Benefit	Ongoing low output rural production on the application site.	Additional housing stock contributing to the growth of Darfield. Provides a planned aged care facility for aging population. ODP provides overall plan of integrated land development. Provides residential sites in short supply. Obtaining wastewater discharge & land use consent concurrently/ahead of plan change application provides certainty regarding proposed servicing.	Lesser volume of housing stock contributing to the growth of Darfield. Provides a planned aged care facility for aging population. ODP provides overall plan of integrated land development for smaller site. Provides residential sites in short supply. Obtaining wastewater discharge & land use consent concurrently/ahead of plan change provides certainty	No plan change required.

			regarding proposed servicing.	
S32 Matter	**Option 1: Rural Outer Plains**	**Option 2: L1 and L1 Deferred**	**Option 3: L1 14.6ha & Rural Outer Plains**	**Option 4: Consents**
Efficiency/ Effectiveness	Application site remains low productivity rural land bounded by urban land use. Development occurs elsewhere around Darfield in a manner that does not achieve compact and consolidated development (DAR 7 is the closest future development area to the existing town centre). Fails to deliver on Malvern 2031 proposals.	Private provision of centralised wastewater services more effective than on-site disposal & supported by SDC & CDHB. Effective as it utilises rural land currently surrounded on two sides by urban activities to also be used residential activities & land adjoining to north will be utilised for off-site treatment and disposal, providing an appropriate buffer use to neighbouring rural land. Comprehensively provides for extension of the township as planned for.	Private provision of centralised wastewater services more effective than on-site disposal & supported by SDC & CDHB. Less effective than Option 2 because of scale and to a lesser extent utilises rural land currently surrounded on two sides by urban activities for some residential activities& land adjoining to north will be utilised for off-site treatment and disposal, providing an appropriate buffer use to neighbouring rural land. Incrementally extends the township as planned for.	Least effective as outcomes from consent processes are uncertain, and potentially un-coordinated and lack proper planned integration with the township utilities.
S32 Matter	**Option 1: Rural Outer Plains**	**Option 2: L1 and L1 Deferred**	**Option 3: L1 14.6ha & Rural Outer Plains**	**Option 4: Consents**
Risk	Site is used for ongoing rural activities that potentially conflict with adjoining residential activities.	None. Continued interim use of Future Urban Zone for farming purposes can be appropriately managed with regard to any potential reverse sensitivity effects as applicant/his family also own adjoining farmland to north (Broadgate Farm) & existing residential subdivision to south	None. Continued interim use of Future Urban Zone for farming purposes can be appropriately managed with regard to any potential reverse sensitivity effects as applicant/his family also own adjoining farmland to north (Broadgate Farm) & existing residential	Consenting risk. Environmental outcomes uncertain and not integrated with delivery of utilities. Consents are not granted and the application site remains as low productivity rural land frustrating strategic growth proposals.

		(Broadgate subdivision).	subdivision to south (Broadgate subdivision)	

Risks of Acting or Not Acting

Selwyn District Council has given considerable thought into how to best provide for the future sustainable growth and development of Darfield so it fulfils its intended role as service centre. The Council's strategic intentions for Darfield are contained in Malvern 2031. That document specifically identified the application Site as DAR7 ie it is tagged for future residential development. That proposal has been fully assessed, evaluated and consulted on.

The applicants for this Plan Change have commissioned a range of reports: soil contamination, geotechnical, servicing reports and a confidential market appraisal to inform and shape the development proposal. Relevant parties have been consulted so their advice and views have been taken in to account in the proposal.

All these inputs to the proposal mean there is little, if any, uncertain or missing information in relation to this proposal.

It is therefore considered that there are no significant risks of acting or not acting.

Summary of s32 evaluation

S32 Evaluation	Option 1: Rural Outer Plains	Option 2: L1 and L1 Deferred	Option 3: L1 14.6ha	Option 4: Consents
Objectives of the proposal being evaluated are the most appropriate way to achieve the purpose of this Act	±	+	+	×
Whether the provisions in the proposal are the most appropriate way to achieve the objectives	×	+	±	×
Benefits	+	+	+	×
Costs	+	±	±	×
Risks	+	+	±	×

Overall Assessment

10. Based on the above assessment, it is concluded that the Proposed Plan Change (Option 2) is the most appropriate method for achieving the objectives and policies of the District Plan, and the objectives of the proposal, than the other alternatives also considered above.

11. Option 3, being to rezone only 14.6ha of the Site to L1 would be appropriate to partially achieve the objectives and policies of the District Plan, as it is only a partial response to the clear strategic intention signalled in Malvern 2031 and the identification of DAR7 as the whole 60ha site. It would also incur significant additional costs for the applicant as two plan change applications would be required.

12. Option 2 to re-zone 14.6ha L1 and 46ha L1 Deferred is the most appropriate given:

    a) the L1 Zone portion of the Plan Change area is adopting an existing District Plan zone, and development and activity standards, notwithstanding the need for specific provision for the aged care facility, which is a new land use for the Plan; this ensures continuity of District Plan anticipated environmental outcomes and urban amenity for Darfield and adjoining residential areas;
    b) Will be consistent with and give effect to the District Plan objectives and policies;
    c) it is a logical extension to the developed and developing residential land adjoining the Site while achieving a compact, efficient urban form that removes pressure on isolated rural land elsewhere in the Rural Outer Plains Zone;
    d) there is no additional cost to the Council in re-zoning the Site land in this Plan Change application as there is capacity in the town water supply, and wastewater will be managed by a community package treatment plant capable of expansion to service the Future Urban Zone;
    e) the proposed retirement village provides for a local need in the form of elderly persons housing not presently available in the town; and
    f) the proposed ODP provides certainty of the final form and disposition of the re-zoned area including its proposals for reserves, roading, future linkages for pedestrian and vehicular traffic. Density and site coverage rules have been drafted to ensure that little additional subdivision will be permitted within the existing developed parts of the Living 2 Zone area, to protect the amenity of existing residents in the area;

13. The inclusion of the L1 and L1 Deferred zones in the Plan Change is considered to be appropriate to achieve the long term sustainable growth and development of Darfield.

14. The economic, social and environmental benefits of the Proposed Plan Change outweigh the potential costs.

15. The overall efficiency and effectiveness of the Plan Change is high, in comparison the alternative options which are low (Option One) or low to moderate (Option Two)

16. The proposed rezoning is considered to be an appropriate, efficient and effective means of achieving the purpose of the Resource Management Act 1991.

Annexure 6:

Servicing Report

SERVICING REPORT

KIMBERLEY ROAD AND BROADMEADOWS DRIVE, DARFIELD

DATE
25/09/19

CLIENT
MERF AGRICULTURAL SERVICES LTD

SURVUS CONSULTANTS
surveying engineering property development

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

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. Roading

3.1 Proposed Road Network

3.1.1 Layout

The proposed roading 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 roading 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 roading 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 1350²)

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ASHBURTON 03 307 7021
DARFIELD 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 430m²)
- ROAD TO VEST
- REC RESERVE TO VEST
- AGED CARE FACILITY
- LIVING DENSITY AREA (min 1350m²)

REV	DATE	REVISION DETAILS	ISSUED
C	19/09/19	FOR INFORMATON	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

survus CONSULTANTS
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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 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

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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

TABLES:

APPENDICES:

DRAWINGS:

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 m^2. 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) scala 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^{o} (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

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Appendix A

Field Investigation Results

Hand Augered Boreholes

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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
CLAY
SILT
SAND
GRAVEL
COBBLES
BOULDERS
PEAT
FILL

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
MUDSTONE
SANDSTONE
CONGLOMERATE
BRECCIA
RYHOLITE
ANDESITE
BASALT

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

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HAND AUGER LOG

Hole No: H1

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury		01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
0.4	SILT, gravelly (fine to medium, subangular to subrounded), yellowish brown, stiff, moist, non plastic [ALLUVIAL SEDIMENTS]		TS
0.6	EOH: 0.40 m TOO DIFFICULT TO AUGER		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 Values
UTP

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 0mm)
2 4 6 8 10 12 14 16

Groundwater
GWNE

Remarks:

Datum:

Coordinates:

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HAND AUGER LOG

Hole No: H2

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury		01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.2	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
0.4	EOH: 0.30 m TOO DIFFICULT TO AUGER		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 Values

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 0mm)
2 4 6 8 10 12 14 16

Groundwater: GWNE

Remarks:

Datum:

Coordinates:

Fraser Thomas
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HAND AUGER LOG

Hole No: H3

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury		01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
0.3	EOH: 0.30 m TOO DIFFICULT TO AUGER		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 Values

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 0mm)
2 4 6 8 10 12 14 16

Groundwater: GW/NE

Remarks:

Datum:

Coordinates:

Fraser Thomas
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HAND AUGER LOG

Hole No: H4

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury	2512	01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	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]		
0.4	EOH: 0.40 m TOO DIFFICULT TO AUGER		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 Values
84

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 0mm)
2 4 6 8 10 12 14 16

Groundwater: GWNE

Remarks:

Datum:

Coordinates:

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HAND AUGER LOG

Hole No: H5

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury		01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
0.3	EOH: 0.30 m TOO DIFFICULT TO AUGER		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 Values

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 0mm)
2 4 6 8 10 12 14 16

Groundwater: GW/NE

Remarks:

Datum:

Coordinates:

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HAND AUGER LOG

Hole No: H6

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury		01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.2	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
0.4	EOH: 0.30 m TOO DIFFICULT TO AUGER		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 Values

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 0mm)
2 4 6 8 10 12 14 16

Groundwater: GW/NE

Remarks:

Datum:

Coordinates:

Machine Excavated Test Pits

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HAND AUGER LOG

Hole No: TP1

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury	2512	01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	
0.3	0.3 m: becomes gravelly		
0.6	SILT, some sand (fine), trace gravel (fine, subangular), yellowish brown, hard, moist [ALLUVIAL SEDIMENTS]	River Alluvium	
0.9	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), trace cobbles, greyish brown, very dense, moist		
2.5	2.5 m - 2.7 m: Colour change to light grey, less fines		
2.9	EOH: 2.90 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200

Values: UTP

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 50mm)
2 4 6 8 10 12 14 16

Groundwater: GWNE

Remarks:

Datum:

Coordinates:

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HAND AUGER LOG

Hole No: TP2

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury	2512	01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
0.2	SILT, gravelly (fine, subangular), minor sand (fine), yellowish brown, hard, moist, low plasticity [ALLUVIAL SEDIMENTS]	River Alluvium	
0.6	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), minor cobbles, trace boulders, greyish brown, very dense, moist		
2.2	2.2 m - 2.4 m: Lense of GRAVEL (fine to medium), light grey, wet		
2.7	EOH: 2.70 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 Values
UTP

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 50mm)
2 4 6 8 10 12 14 16
1 1 1 2 2 3 6 11 18

Groundwater: GWNE

Remarks:

Datum:

Coordinates:

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HAND AUGER LOG

Hole No: TP3

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury	2512	01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
0.4	SILT, gravelly (fine to medium, subangular to subrounded), minor sand (fine), yellowish brown, hard, moist, low plasticity [ALLUVIAL SEDIMENTS]	River Alluvium	
0.6	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), trace cobbles, trace boulders, greyish brown, very dense, moist		
2.3	2.3 m - 2.5 m: Lense of GRAVEL (fine to medium), grey, wet		
3.0	EOH: 3.10 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 Values
UTP

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 50mm)
2 4 6 8 10 12 14 16
1 1 1 2 2 2 6 15 20 >>

Groundwater
GWNE

Remarks:

Datum:

Coordinates:

Generated with CORE-GS by Geroc - Hand Auger MASTER - 9/09/2019 8:59:29 AM

Fraser Thomas
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HAND AUGER LOG

Hole No: TP4

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury		01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	
0.2	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		
1.8	EOH: 1.80 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 Values

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 50mm)
2 4 6 8 10 12 14 16

Depth (m) 0.0 0.2 0.4 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

Groundwater: GWNE

Remarks:

Datum:

Coordinates:

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HAND AUGER LOG

Hole No: TP5

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury	2512	01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
0.4	SILT, gravelly (fine to medium, subangular to subrounded), minor sand (fine), yellowish brown, stiff, moist, non plastic [ALLUVIAL	River Alluvium	
0.6	GRAVEL (fine to medium, subrounded, greywacke), silty, yellowish brown, very dense, moist		
1.0	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), trace cobbles, greyish brown, very dense, moist		
2.6	EOH: 2.80 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 — Values: 98

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 50mm)
2 4 6 8 10 12 14 16

Depth (m)	Blows / 50mm
0.0–0.2	1, 1, 1, 2
0.2–0.4	5, 7, 7
0.4–0.6	15, 11, 15, 15

Groundwater: GWNE

Remarks:

Datum:

Coordinates:

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HAND AUGER LOG

Hole No: TP6

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury	2512	01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
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, trace rootlets [ALLUVIAL SEDIMENTS]	River Alluvium	
0.6	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), greyish brown, very dense, moist		
1.0	EOH: 1.90 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200

Values: UTP

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 50mm)
2 4 6 8 10 12 14 16

Depth (m): 0.2, 0.4, 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

Groundwater: GWNE

Remarks:

Datum:

Coordinates:

Fraser Thomas
50 Years
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HAND AUGER LOG

Hole No: TP7

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury	2512	01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0 – 0.4	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
0.4 – 0.7	SILT, gravelly (fine to medium, subangular to subrounded), minor sand (fine), yellowish brown, very stiff, moist, non plastic [ALLUVIAL SEDIMENTS]	River Alluvium	
0.7 – 1.7	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), minor cobbles, greyish brown, very dense, moist	River Alluvium	
1.7	EOH: 1.70 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200

Values
196
112

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 50mm)
2 4 6 8 10 12 14 16

Groundwater: GWNE

Remarks:

Datum:

Coordinates:

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HAND AUGER LOG

Hole No: TP8

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury		01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
0.4	SILT, gravelly (fine to medium, subangular to subrounded), yellowish brown, hard, moist, non plastic [ALLUVIAL SEDIMENTS]	River Alluvium	
0.6	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), trace cobbles, greyish brown, dense to very dense, moist		
2.2	EOH: 2.30 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 Values

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 50mm)
2 4 6 8 10 12 14 16

Depth (m)	Dynamic Cone Penetrometer (Blows / 50mm)
0.2	1
0.4	2
0.6	3
0.8	6
1.0	7
1.2	8
1.4	9
1.6	15

Groundwater: GW/NE

Remarks:

Datum:

Coordinates:

Fraser Thomas
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HAND AUGER LOG

Hole No: TP9

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury	2512	01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
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		
1.6	EOH: 1.70 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200

Values
98
UTP

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 50mm)
2 4 6 8 10 12 14 16

Depth (m): 0.2, 0.4, 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

Dynamic cone blows (Blows / 50mm): 1, 1, 1, 1, 2, 2, 3, 15, 15

Groundwater: GWNE

Remarks:

Datum:

Coordinates:

Fraser Thomas
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HAND AUGER LOG

Hole No: TP10

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury		01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
0.4	SILT, gravelly (fine to medium, subangular to subrounded), minor sand (fine), yellowish brown, moist, non plastic [ALLUVIUAL SEDIMENTS]	River Alluvium	
0.6	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), trace cobbles, greyish brown, very dense, moist		
2.0	EOH: 2.10 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 Values

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 50mm)
2 4 6 8 10 12 14 16

Depth (m) 0.0 0.2 0.4 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

Groundwater: GWNE

Remarks:

Datum:

Coordinates:

Fraser Thomas
ENGINEERS • RESOURCE MANAGERS • SURVEYORS

HAND AUGER LOG

Hole No: TP11

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury		01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	
0.4	GRAVEL (fine to medium, subangular to subrounded), silty, yellowish brown, medium dense to dense, moist [ALLUVIUAL SEDIMENTS]	River Alluvium	
0.8	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), trace cobbles, greyish brown, very dense, moist		
2.0	EOH: 2.10 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 Values

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 50mm)
2 4 6 8 10 12 14 16

Depth (m)	Blows / 50mm
0.0 – 0.2	1, 1, 1, 1
0.2 – 0.4	2, 2
0.4 – 0.6	3, 3
0.6 – 0.8	4
0.8 – 1.0	11
1.0 – 2.0	15

Groundwater: GWNE

Remarks:

Datum:

Coordinates:

Fraser Thomas
ENGINEERS • RESOURCE MANAGERS • SURVEYORS

HAND AUGER LOG

Hole No: TP12

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury	2512	01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0 – 0.2	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
0.2 – 0.7	SILT, some gravel (fine to medium, subangular to subrounded), yellowish brown, stiff to very stiff, moist, non plastic [ALLUVIAL SEDIMENTS]	River Alluvium	
0.7 – 2.0	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), trace cobbles, greyish brown, moist	River Alluvium	
2.0	EOH: 2.00 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200

Depth (m)	Values
0.4	84
0.6	112

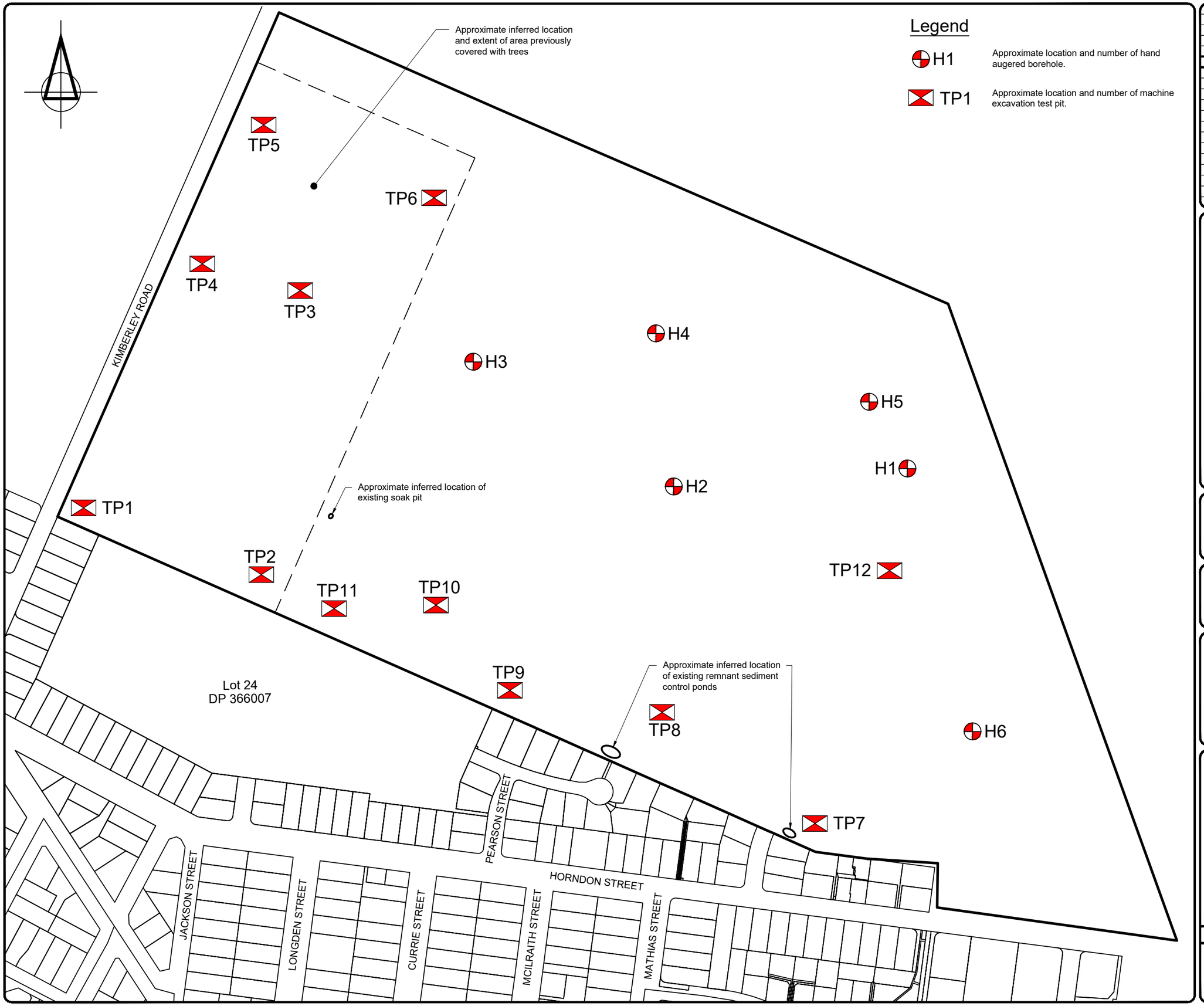
Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 50mm)
2 4 6 8 10 12 14 16

Groundwater: GWNE

Remarks:

Datum:

Coordinates:



SURVEYED			APPROVED DATE
DESIGNED			MVR
DRAWN	KT	08/07/19	
CAD	G SINGH	10/07/19	
CHECKED			

REVISION	CHANGES	CHECKED	DATE

NOTES

1. This plan has been adopted from Quick map. The location and extent of the site boundaries and site features are therefore considered to be approximate only.

CLIENT

MR MERVYN TODD

PROJECT

KIMBERLEY ROAD
DARFIELD

TITLE

SITE PLAN

Fraser Thomas
ENGINEERS ● RESOURCE MANAGERS ● SURVEYORS
21 EL KOBAR DRIVE, HIGHBROOK
PO BOX 204006, HIGHBROOK BOX
LOBBY, AUCKLAND 2161
TEL+64-9-278 7078
UNIT 7 BARRY HOGAN PLACE, RICCARTON
PO BOX 39 154, CHRISTCHURCH 8545
TEL+64-3-358 5936

SCALE 1:4000 (A3)

DRAWING No G00114-01 REVISION A

SHEET 1 of 1

Appendix C

Orion Confirmation Letter

Direct: +64 3 363 9722
Email: craig.marshall@oriongroup.co.nz
ES393836

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 430m²)
- ROAD TO VEST
- REC RESERVE TO VEST
- AGED CARE FACILITY
- LIVING DENSITY AREA (min 1350m²)

REV	DATE	REVISION DETAILS	ISSUED
C	19/09/19	FOR INFORMATON	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

survus CONSULTANTS
PLANNING + SURVEYING + ENGINEERING

4 Meadow Street, PO Box 5558, Papanui, Christchurch
P 03 352 5599 *AMBERLEY 03 314 9200*
F 03 352 5527 *ASHBURTON 03 307 7021*
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

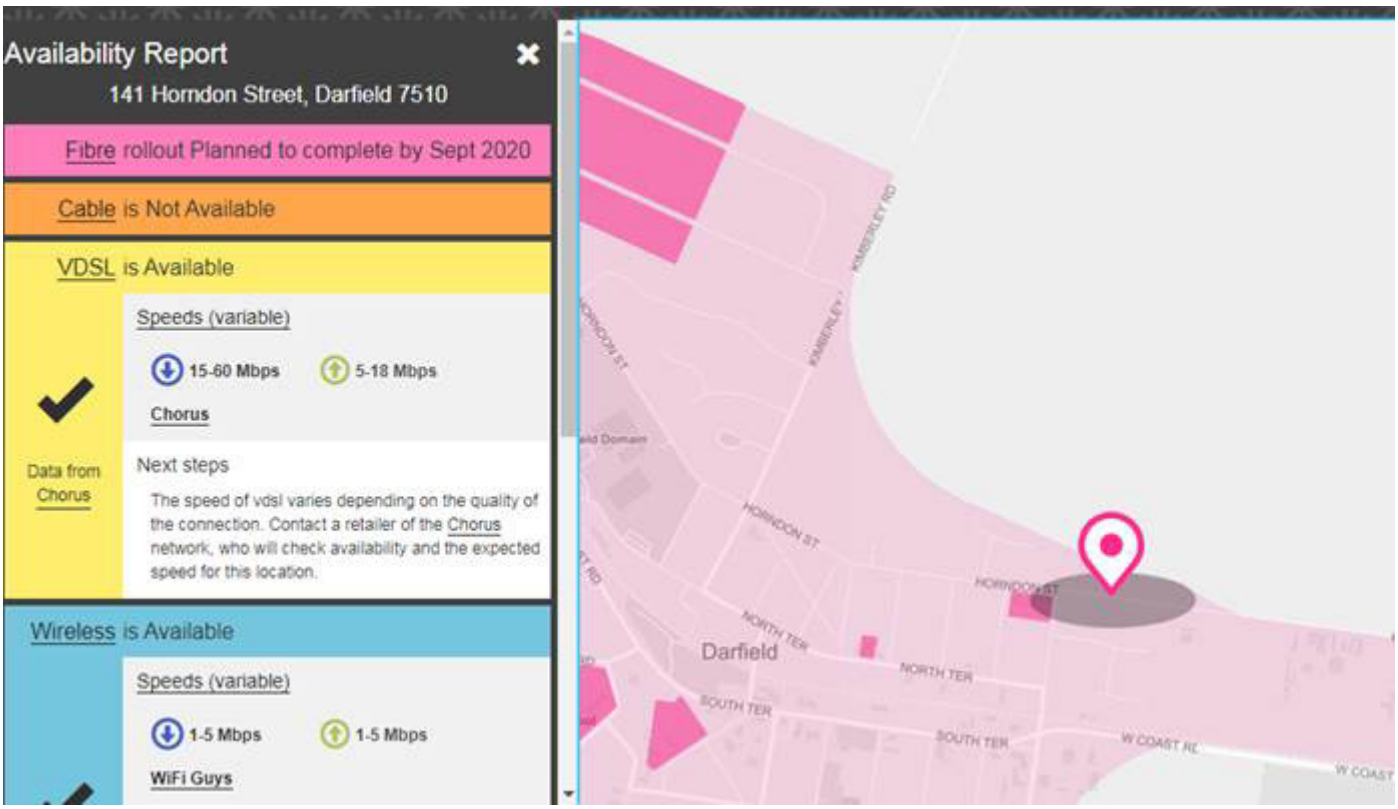
Craig Hurford

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

Annexure 7:

Wastewater Options Infrastructure Report

Kimberley and Broadmeadows Drive

Wastewater Infrastructure Option Report

Prepared for

MERF Agricultural Services Ltd

Prepared by

LOWE Environmental Impact

October 2019

Kimberley and Broadmeadows Drive Wastewater Infrastructure

Option Report

This report has been prepared for the **MERF Agricultural Services** by Lowe Environmental Impact (LEI). No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other parties.

Quality Assurance Statement		
Task	Responsibility	Signature
Project Manager:	Rob Potts	
Prepared by:	Henry van der Vossen	
Reviewed by:	Brian Ellwood & Rob Potts	
Approved for Issue by:	Rob Potts	
Status:	Draft	

Prepared by:

Lowe Environmental Impact
P O Box 29288
Christchurch 8540

| T | [+64] 3 359 3059
| E | office@lei.co.nz
| W| www.lei.co.nz

Ref: 1164.MERF-Wastewater_Infrastructure-191011-Draft2

Job No.: 10661

Date: October 2019

TABLE OF CONTENTS

1 INTRODUCTION

1.1 Overview

MERF Agricultural Services (MERF) are progressing a private plan change for their land in the vicinity of Darfield adjacent to already existing and consented residential activities. This site is located near the corner of Kimberley Road and Horndon Street, Darfield. MERF owns a 14.6 ha title (835350 Lot 4 DP 524058) upon which no dwellings are currently erected. MERF also owns an adjacent 5.4 ha title (835350 Lot 3 DP 524058) to the North.

Parts of the site have been used for many years for grazed pasture and lucerne and before this the site was part of the Selwyn Plantation Board and planted with trees. The trees were subsequently felled in 2009 and the land has since been used for grazing.

The proposal is to re-zone land at North Darfield Living X (with some site specific provisions), to enable development of a number of residential lots, in an area that will cover 14.6 ha. This development will consist of:

- An Aged Care Facility (ACF) (villas plus hospital/hospice), the proposed ACF will be home to 110 residents with an assumed staff of 25 x 2 shifts, and 8 for a 3rd shift. There will be approximately 50-60 beds in the home, including dementia and lifecare units, and approximately 20 independent villas on 400 – 500 m^2 sections;
- 13 Medium Density Lots (MDL), in the 430 - 550 m^2 size range;
- 90 Low Density Lots (LDL), with average lot sizes not less than 650 m^2 ; and
- Reserve spaces.

The 14.6 ha site is part of the Darfield Area 7 Preferred Residential Area, as identified in the Malvern Area Plan. The balance of Darfield Area 7 is proposed as a Future Urban Zone and is not covered in this report.

This report presents options for the treatment and application of wastewater to land to support the private plan change application. Options are outlined for the use of land for land dispersal within the Aged Care Facility (ACF) zone (this includes the medium density lots (MDL) and lower density lots (LDL) for infrastructure services, such as on-site sewage treatment and land discharge. In addition, options for community scale treatment and land application are presented using the additional 5.4 ha land that MERF owns that could be used for wastewater treatment services.

Water supply and stormwater infrastructure are addressed by others.

1.2 Project Scope

Lowe Environmental Impact (LEI) has been engaged by the MERF to provide technical support for wastewater infrastructure for the private plan change and a technical report and assessment of environmental effects to support a discharge to land consent application to Environment Canterbury.

This report provides MERF with wastewater infrastructure options and an assessment of the viability of each option, i.e. is there sufficient resources and land availability for the option to function appropriately. Options for the deferred Future Zone are briefly outlined but with far lesser detail.

This report focuses on technical viability, i.e. can it be done affordably. However, as there is growing concern on nitrate levels in Canterbury aquifers, a brief assessment on nitrogen leaching is included.

This report also includes high-level costings of a number of options from a package plant provider who also provides community systems to show affordability.

The Aged Care Facility (ACF) is an approximately 3 ha site that is expected to have a total of 110 residents, and conservatively assumed staff of 25 in 2 shifts, and 8 for a 3rd shift. It is assumed the ACF will have kitchen and laundry facilities.

The medium density zoning allows for 430 - 550 m^2 sections adjacent to the ACF. There are 13 sections in this zone.

The remaining zone of lower density contains either 1,000 m^2 lots (adjacent to Kimberley Rd), of which there are approximately 19, or minimum 650 m^2 lots, of which there are approximately 71.

2 WASTEWATER MANAGEMENT OPTIONS

2.1 Overview of Wastewater Options

There are four main wastewater treatment plant (WWTP) and discharge options, with a number of sub-options within the main four. The Options and sub-options are:

Option 1 – Individual on-site systems (treatment and dispersal) for LDL to a standard meeting AS/NZS1547. The LDL individual on-site treatment systems have two suitable sub-option methods for the discharge to land:

a) Low Pressure Effluent Dosed (LPED) discharge – via a 30 - 40 m^2 600 mm deep sand trench (to reduce pathogens); or
b) Subsurface drip irrigation, over approximately 240 m^2 area buried 100 to 250 mm deep.

For Option 1, the ACF and MDL wastewater would be centrally collected for treatment, with discharge via subsurface drip irrigation within approximately 0.5 ha of landscaping in the 3 ha ACF area. An overview of Option 1 utlising a STEP reticulation system (see Section 2.3.1) is shown in Figure 2.1 below.

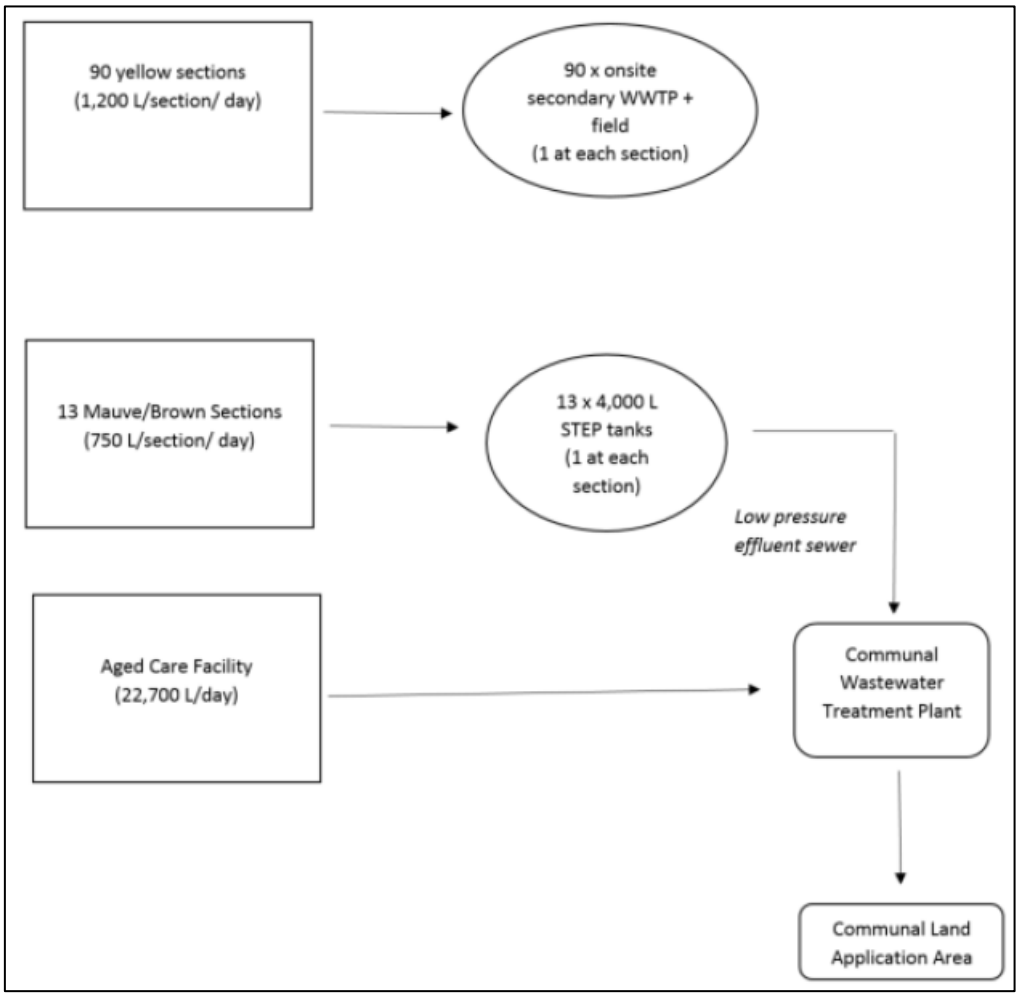


Figure 2.1: Option 1 Overview

Option 2 – LDL with individual on-site WWTPs with the effluent reticulated to a dedicated communal land treatment area. The ACF and MDL would have their wastewater reticulated to a communal WWTP (either sited within the 3 ha ACF as per Option 1, or in the adjacent landholding

where the lant treatment area is proposed) and combined with the LDL treated effluent and applied via subsurface drip to a communal land treatment area. The communal discharge land treatment area could either be located within the reserve areas (more area is required as nitrogen removal is less) or on the adjacent 5.4 ha landholding which will be in cut and carry lucerne. An overview of Option 2, also with STEP reticulation is shown in Figure 2.2.

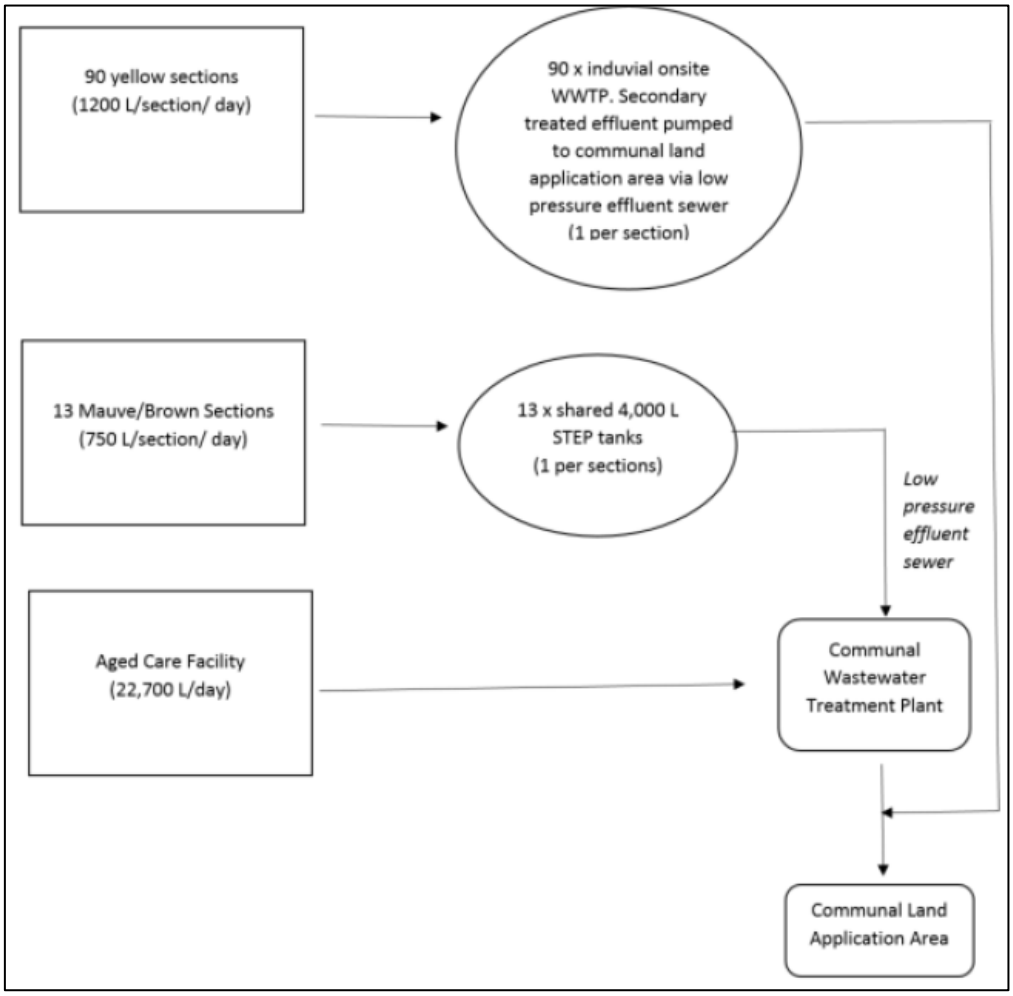


Figure 2.2: Option 2 Overview

Option 3 – All lots and ACF are reticulated to a communal WWTP and a land treatment via subsurface drip on the 5.4 ha of land adjacent to the Plan Change area. An overview, also utilising STEP reticulation is shown in Figure 2.3 below.

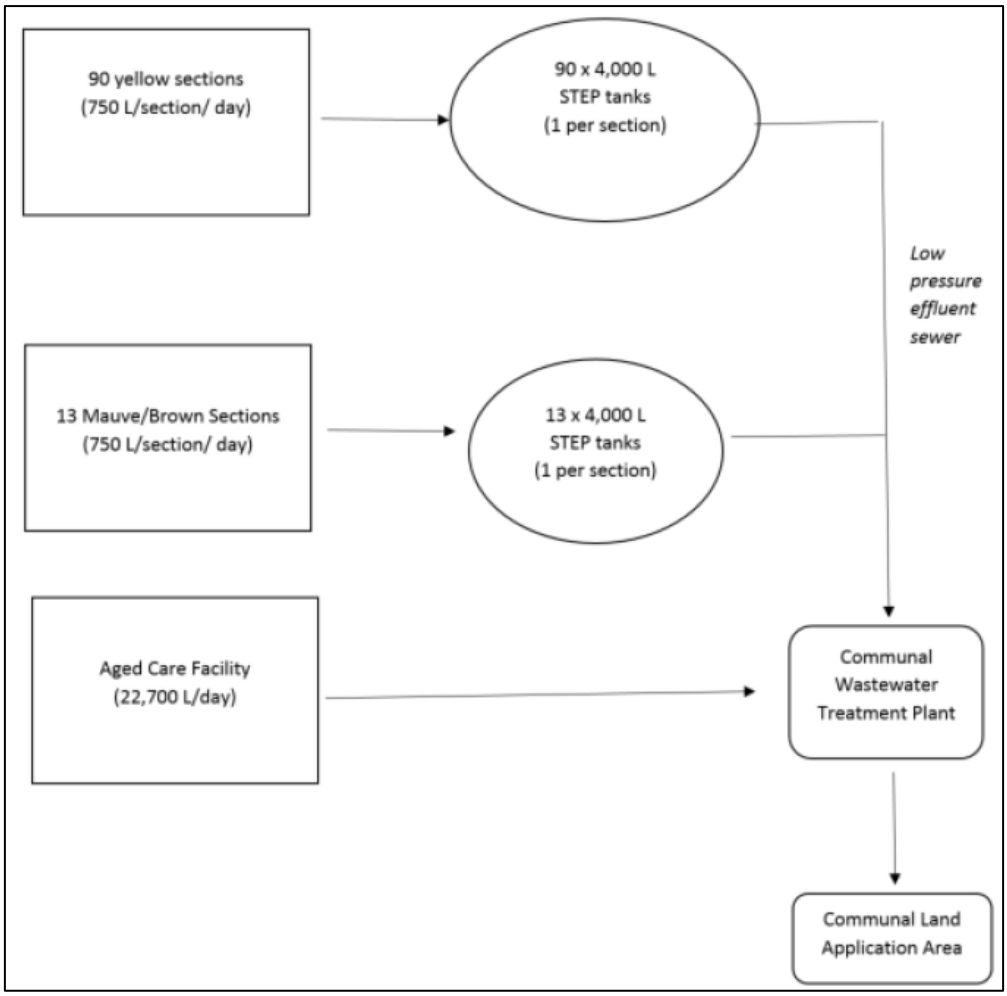


Figure 2.3: Option 3 Overview

Option 4 – All lots and ACF reticulated to SDC owned land and treated in a communal WWTP. This could be a modular plant that SDC can expand as demand dictates. The MERF subdivision could form the start of the district scheme. The layout would be similar to the overview diagram shown for Option 3 above but with the communal WWTP and land treatment area on SDC land.

The current proposal for the SDC WWTP is a pond based system. This type of system is not easily staged, so the MERF development would need to proceed with development of the District Scheme. The District scheme is not within the current LTP, so is unlikely to proceed until after 2034 or later following approvals and design.

2.2 Design Flow Rates and Wastewater Strength

2.2.1 Adopted Flow Rates

To assess the options, differing design flow rates are used due to on-site systems having to be sized for absolute peak loading of the property while communal systems are able to average flows across a number of connections reducing the peak flow rate requiring treatment. The Darfield community has a higher percentage of retired people than most towns, so there is a very high proportion of 1 and 2 people dwellings, e.g. Darfield has 21% of its population over 65 years old, compared to the remainder of Selwyn District of 10.8%, i.e. double the norm. Average household size of Darfield is 2.5 people/house cf Selwyn of 2.9 people/house (Statistics NZ, 2013).

Design flow rates have been calculated using standards relevant for residential/ business activities from AS/NZS 1547:2012 On-site Domestic Wastewater Management for individual on-site systems and NZS4404:2010 Land Development and Subdivision Infrastructure for communal systems. The relevant AS/NZS1547:2012 flow rates for individual on-site systems are outlined in Table 2.1 and NZS4404 in Table 2.2. Rates are shown in Litres/person/day (L/p/d) or Litres/household/day (L/h/d).

Table 2.1: On-site Design Flow Rates AS/NZS 1547:2012

Source	Typical Wastewater Design Flows	
	Reticulated community or a bore-water supply (L/p/d)	Adopted Values
Households with standard fixtures	200	200 L/p/d
Households with standard water reduction fixtures	165	
Households with full water-reduction facilities	145	
Motels/hotels (ACF Residents)		
Visitors	220	180 L/p/d
Non-resident Staff	30	50 L/p/d
1 to 3 Bedrooms	1 to 5 people	1,000 L/d
4 Bedrooms	6 to 7 people	1,200 L/d

Table 2.2: Communal Design Flow Rates NZS 4404:2010

Parameter		
	Range	Adopted Values
No. people per dwelling	2.5 – 3.5	250 L/p/d
Average Dry Weather Flow	180 – 250 L/p/d	750 L/household/d
Wet Weather Peaking Factor	2.0	1,500 L/household/d
Dry Weather Diurnal Peaking Factor	2.5	For sizing pumps/pipes

Some stormwater infiltration and inflows (I/I) can be expected as the system ages; however, this I/I is significantly less likely in STEP and pressure sewer options (see Section 2.3) with it more appropriate to allow for in gravity sewers. Therefore the flows rates above that include for a peaking factor of 2 to allow for I/I, are considered very conservative. LEI generally allow an additional 30% for wet weather flows for effluent and pressure sewers.

ACF and Medium Density Flows

The calculated flows allow for normal kitchen and on-site laundry operations in the ACF, producing normal domestic type wastewater strength and volumes. For 110 residents plus an assumed 25 staff in 2 shifts, and 8 staff for a 3rd shift, then the adopted design daily volumes, based on 180 L/p/d for residents and 50 L/staff/shift is 22,700 L/day.

It is likely that the MDL's will have smaller houses, however, as these lots are reticulated, the values in NZS4404 have been adopted that are bedroom number independent, i.e. dry weather flow of 750 L/house/d. This gives a further 9,750 L/d to the communal WWTP.

Total flow to treatment of 32.45 m^3/d.

Low Density Lots Individual On-site Treatment

The LDL area for individual on-site treatment are likely to be either 3 or 4 bedroom houses, i.e. 5 to 6 people at 200 L/p/d, giving up to **1,200 L/house/day**.

Low Density Lots Communal Treatment

The LDL area for communal treatment is based on an average of 3 people at 250 L/p/d, **or 750 L/household/day dry weather flow** and **975 L/household/day wet weather flow**.

2.2.2 Wastewater and Effluent Strength

All wastewater, including the ACF is generally only from each lot's on-site toilets, showers, laundry and kitchens with the characteristics of conventional domestic sewage. Therefore, the influent wastewater constituents are expected to have a BOD_5 <400 mg/L, TSS <500 mg/L and TKN: <70 mg/L.

The effluent quality from the WWTP, prior to the land dispersal system, will be dependent on the wastewater treatment plant selected. For both the on-site and communal WWTP options, the expected effluent quality is $cBOD_5$ 20 mg/L, TSS 30 mg/L, total nitrogen of 20 to 30 mg/L, and E.coli 10^4 MPN/100 mls. All wastewater treatment units (on-site and communal) considered in this report can achieve secondary treatment quality, providing a TN reduction of between 60 - 70%, to produce a final effluent TN strength of 20 to 30 mg/L prior to further reduction in the land treatment system.

The soil N and hydraulic loading rate will be dependent on the land dispersal method selected, however, at this early stage of design, a rate of 5 mm/day for drip irrigation and 30 – 40 mm/d for LPED systems, have been adopted.

2.3 Sewer Reticulation Systems

LEI considers there to be three available sewer reticulation options for the MERF wastewater scheme, these are:

1. Sedimentation Tank Effluent Pumping (STEP) system;
2. Sump and grinder pump/progressive cavity pressure sewer system; and
3. Modified gravity system.

These reticulation options are considered for all four main Options. There is no reticulation required for the LDL on-site systems option.

The following sections detail the reticulation options.

2.3.1 System 1 – STEP System

Wastewater from each lot will be collected in a Sedimentation Tank Effluent Pumping (STEP) unit. The STEP system is composed of a tank fitted with an effluent filter and a pumping assembly which will pump liquid waste (effluent only, low solids) to the wastewater treatment system via a low pressure, small diameter sewer network. The primary sedimentation tanks on each property need pumping out on about a 10 – 15 year interval.

Each STEP would be connected to the wastewater effluent sewer main via a boundary kit service connection. This service connection protects the building from back-pressure and allows the building to be isolated from the effluent sewer in an emergency.

The STEP system provides primary treatment and will effectively buffer flows. The effluent main can be a small diameter MDPE pipe and can follow the contour reducing the depth and volume of excavation needed and ensure the pipe stays above groundwater. I/I in these systems should be non-existent, however, as above LEI allows an additional 30% to STEP systems for wet weather flows.

This system has been used with good success in many parts of New Zealand.

2.3.2 System 2 – Sump and Grinder Pump or Progressive Cavity Pump and Pressure Sewer

A pressure sewer system consists of a network of on-lot sumps and either grinder/macerator pumps or progressive cavity pumps that connect to medium pressure pipe mains, which integrate to form a collection system.

This system provides watertight reticulation and is similar to Option 1 in most facets but with primary treatment taking place at the treatment plant. This can have an advantage if advanced nitrogen removal is required as the primary tank in the treatment system can be used as a carbon source for enhanced nitrogen removal in anoxic treatment stages. Maintenance aspects are higher than the STEP system, as the grinder pumps generally require greater maintenance.

2.3.3 System 3 – Modified Gravity

The wastewater is reticulated via gravity, from each building to a central gravity main. This can either feed one or more pump stations (this potentially can be at the WWTP) or if sufficient fall is available, via gravity right to the WWTP primary screen.

This option has no solids removal prior to the treatment plant; thus, pipes need to be larger and laid at sufficient gradient to convey solids to maintain self-cleansing velocities.

The gravity option proposed here is termed a modified system, as it would involve smaller diameter flexible pipe systems with limited manholes compared to conventional systems.

Modified gravity systems can be prone to stormwater ingress because, whilst utilising flexible pipe and fewer manholes over that of a conventional gravity system, the manholes are not completely sealed and therefore can potentially result in wet weather flows entering that require a larger capacity WWTP. However, wet weather flows for modified gravity mains are generally less than conventional gravity systems.

Due to the flat slope of the site, the excavation depths of these pipes to achieve sufficient gravity fall may make this option uneconomic for this application, particularly for Options' 2 and 3 as the off-site communal WWTP is upgradient of the site.

2.4 Wastewater Treatment Plant

2.4.1 Indiviudal On-site

There are numerous options for the individual on-site WWTPs. Only two treatment systems have been considered here but there are many available. The system would have to be certified by

the NZ testing facility (OSET) as meeting AS/NZS1547 secondary treatment standard for BOD and TSS. It would also need to meet Grade C or better for nitrogen reduction. These include the following;

1. Recirculating Textile Packed Bed Reactor (rPBR); and
2. Activated Sludge, e.g. Submerged Aerated Filter (SAF).

(1) Recirculating Textile Packed Bed Reactor (rPBR)

The recirculating packed bed reactor is a multiple pass packed bed aerobic wastewater treatment system. The packed bed media is an engineered textile, which has a high void capacity allowing for a large surface area. Wastewater enters a processing tank (recirculating tank) where anaerobic digestion and suspended solids removal can take place. Effluent is then pumped to the secondary treatment chamber where it percolates down through a textile media and is collected in the bottom of a filter pod. This process does not utilise forced aeration. From the filter pod, the flow is split (diverted) between the processing tank and the final discharge.

Recirculating Textile Packed Bed Reactor (rPBR) technology is well established in New Zealand for both on-site and small community systems, giving a high-quality effluent, with low power usage and functions well under fluctuating loads. This type of system is commonly used for community wastewater where a high level of organic treatment, nitrogen reduction and the removal of pathogens are important considerations.

(2) Activated Sludge System (SAF)

The SAF system is a form of the activated sludge process (a wastewater treatment process characterised by a suspended growth of biomass), usually with a floating media to enhance biofilm development and with settlement of solids taking place within a clarifier.

In more detail: Wastewater enters a recirculating (primarily anaerobic) chamber where oxidising bacteria break down suspended solids; the influent is also mixed with returned activated aerated sludge from the clarifying chamber. This mixing stimulates bacteria and enhances the solids digestion. Following primary treatment wastewater enters an aeration chamber which contains submerged media on "bioblocks" (bioblocks allow for an increased surface area). Treated wastewater passes from the aeration chamber to a clarifying chamber in which remaining particles, of suspended solids, settle out of suspension. The suspended solids that sink to the bottom of the chamber are drawn back to the first primary chamber for further processing or removed for disposal off-site.

2.4.2 Communal Sytems

There are also numerous options for communal WWTPs. Only three treatment systems have been considered here but there are many available, including package plants, or bespoke designed plants. The option of reticulating to the Selwyn District Council site could also utilise any of these options, however, the SDC system at this stage is proposed to be a stabilisation pond system, which is not easily staged.

The options include include the following and are summarised in Table 3.3;

(1) Recirculating Textile Packed Bed Reactor (rPBR);
(2) Activated Sludge, e.g. Submerged Aerated Filter (SAF); and
(3) Sequence Batch Reactor (SBR).

(1) Recirculating Textile Packed Bed Reactor (rPBR)

As above for individual on-site systems but at a larger scale. The system is very modular so can be staged as development progresses. The WWTP can be followed by further filtration (125 micron) and UV sterilisation to reduce pathogens, if required.

(2) Activated Sludge System (SAF)

As above for individual on-site systems but at a larger scale. The system is less easy to stage compared to a rPBR but still can be. The WWTP can be followed by further filtration (125 micron) and UV sterilisation to reduce pathogens, if required.

(3) Sequence Batch Reactor (SBR)

In a typical SBR process train, influent wastewater generally passes through screens and grit removal prior to the SBR. The wastewater then enters a partially filled reactor, containing biomass, which is acclimated to the wastewater constituents during preceding cycles. Once the reactor is full, it behaves like a conventional activated sludge system, but without a continuous influent or effluent flow. The aeration and mixing are discontinued after the biological reactions are complete, the biomass settles, and the treated supernatant is removed. Excess biomass is wasted at any time during the cycle. Frequent biomass wasting results in holding the mass ratio of influent substrate to biomass nearly constant from cycle to cycle.

SBR technology generally requires a high level of operator assistance to ensure the system is maintained and operating to a high standard; otherwise, it can be prone to failure and poor effluent quality. SBR's are an aerated technology and therefore require a high power input, significantly exceeding that of an rPBR system; as a result of the high level aerobic microbial activity, a large volume of sludge is produced requiring management and disposal.

An SBR is more suited to larger installations as it is not as modular and cannot be as easily staged as an rPBR system.

Table 2.3: Summary of Wastewater Treatment Options
(3 = Best, 2 = Moderate, 1 = Least Desirable)

Parameter	SBR		SAF		rPBR	
	Description	Score	Description	Score	Description	Score
Capital expenditure	Moderate to High	1	Moderate	2	Moderate	2
Running costs	Moderate to High	2	Moderate to High	2	Low	3
Additional carbon dosing	Unlikely	3	Unlikely	3	Posibly depending on required N conc	1
Power requirement	Moderate	2	Moderate	2	Low	3
Modularity/staging	Poor to moderate	2	Moderate	2	Good	3
Maintenance requirement	Potentially High	2	Potentially High	2	Moderate	3
Sludge production	Moderate	2	Moderate	2	Low	3
Suitable for intermittent flow regimes	Yes, needs buffering	3	Moderate	2	Moderate	2
Noise	Moderate	2	Moderate	2	Low	3
Remote servicing and trouble shooting	Yes	3	Yes	3	Yes	3
Visual impact	Moderate	2	Low	3	Low	3
Operation simplicity	High	1	Moderate	2	Good	3
Anaerobic pre-treatment	Good	3	Good	3	Good	3
Odour production	Moderate	2	Low	3	Low	3
Reliability	Moderate	2	Moderate	2	High	3
Effluent treatment stability	Good	3	Moderate	2	Good	3
Total Score		**35**		**37**		**44**

From Table 2.3, it would appear that a rPBR is likely to be the preferred option, however, the WWTP will be tendered out and tender evaluation attributes taken into account to select a WWTP.

2.5 Available Discharge Options

2.5.1 Statutory Provisions

The proposed wastewater discharge activities have been assessed against Plan Change 7 to the Canterbury Regional Council Land and Water Regional Plan and are considered to be a **discretionary activity** as per Rule 5.9 of the Plan (proposed activities do not fully satisfy Rules 12.A.1.1. to 12.A.1.4 of the Plan).

2.5.2 Land Application Methods

Based on soil type, soil profile, soil permeability, groundwater levels, required treatment outcomes and the potential quality of the effluent from the wastewater treatment plant, it is considered that a number of land application methods could be used for the land application of treated effluent. The most likely for land treatment is subsurface drip irrigation and this could be in combination with low pressure effluent dosed sand trenches for LDL individual on-site discharge. For completeness surface spray irrigation is also discussed.

These options have their advantages and disadvantages as per Table 2.4 below.

Table 2.4: Land Discharge Options

	Advantages	Disadvantages
Subsurface Drip	Is below ground, so no issues with spray drift, freezing, vandalism, public access	Higher cost, distribution efficiency is lower, it is lower than some topsoil profile so nutrient renovation can be lower, harvesting damage if soils are wet
Surface Spray	Lower cost than drip, better distribution performance, utilises the entire rooting depth, is visible so problems easily identified,	Required buffer distances for spray drift and aerosols, needs to be fenced and signage warning public, may need higher quality pathogen removal, harder to harvest around
Low Pressure Effluent Dosing	Low land area requirements	Higher cost than drip if a sand trench, no nutrient reduction via plant uptake

All discharge options are viable. However, Surface Spray irrigation requires greater buffer zones to the site boundary, can have limits on the daily discharge time and a need for filtration and UV treatment, and it may need storage during times of sitting snow or frozen ground, so this method has not been considered further.

2.5.3 Communal Land Treatment Area Management (Subsurface Drip)

An important part of any land application design is choosing the correct vegetation type and maintenance of the established vegetation. Factors to consider when selecting a vegetation type are:

- Short rotation crops;
- Climatic conditions;
- Soil types;
- Environmental constraints;
- Effluent composition;
- Effluent application system;
- Aesthetic requirements; and
- Nutrient and water uptake requirements.

Land use of the communal land treatment area is generally one of the following three methods stated in the order of preference for nitrogen renovation:

1. Cut and Carry;
2. Sheep grazing; and
3. Landscaped areas or cut and leave.

Cut and Carry

"Cut" refers to mowing grass or grass-type crops, tree felling (replanting with juvenile plants) or pruning vegetation back to stimulate regrowth; "carry" refers to removing all dry matter from the site for sale or grazing elsewhere. If vegetation is not removed off-site, biological decay will result in the transfer of nutrients held within the plant back into the soil matrix, with the net plant uptake being zero.

Sheep Grazing

Sheep grazing removes dry matter (and thus nutrients) but recycles some back to the soil store; the net input of nutrients from sheep urine and faeces back to the soil will be less than that eaten by the sheep and turned into meat, wool and energy. Sheep are generally rotated around the site to optimise grazing and vegetation removal. Sheep grazing, however, is not suitable for the LTA within the ACF proposed area but could be used in the off-site block.

Landscaped or Cut and Leave

This option is suitable for the ACF proposed area LTA. Lawn and landscaped areas are managed for aesthetic reasons for which vegetation growth and then removal is not desirable. The net result is limited nutrient removal off-site; the plant life cycle of regeneration and decay will inevitably result in most nutrients taken up by the plants, re-entering the soil matrix during the decay phase. However, plant uptake will slow the rate of nutrient leaching and nitrogen losses occur due to denitrification and in addition, evapotranspiration will reduce hydraulic pressure on the soils.

LTA Management Summary

If main Options 2 or 3 are selected, then an off-site LTA would be selected and that block is proposed to be "Cut and Carry" lucerne.

2.5.4 On-site Discharge Options

There are two main types of on-site discharge options. These are:

1. Discharge into land via rapid infiltration, such as a low-pressure effluent dosing system (LPED) with sand trench; or
2. Apply to land at a lower rate via subsurface drip irrigation.

2.5.5 Discharge to Land via LPED

This option's advantage is a much smaller land area is required than sub-surface drip irrigation. The key disadvantage is there is very limited further reduction in nitrogen in the soil/subsoil system post the WWTP.

Depending on detailed soil analysis of the site, individual on-site systems would likely require 30 – 40 m^2 of LPED and thus it is suitable for all lots. A sand trench would be recommended for enhanced pathogen removal, as one-log reduction per 150 mm of sand can be achieved.

2.5.6 Discharge to Land via Subsurface Drip Irrigation

This option requires a stable WWTP producing low BOD and TSS, as per the recommended systems. Alternatively, further filtration can be provided but this is not recommended for individual on-site systems due to the regular maintenance that is required.

This option's advantages are; a reduction in nitrogen can be achieved through treatment in the soil/plant matrix, and it can provide irrigation to landscape or grass areas in an area that has severe summer soil moisture deficits. The disadvantage is there is a need for larger land area. This method of discharge typically has an application rate of 4 - 5 mm/d, to allow for the nutrient uptake by plants. In some situations, this crop can then be cut and exported to remove nutrients from the site.

Land area requirements for individual on-site systems would be in the order of 240 m^2 for a 4-bedroom house. For communal systems the land area requirements will likely be driven by nitrogen loading.

2.6 Communal Land Treatment

2.6.1 Land Treatment Area (LTA) Identification

Based on the desktop site investigations, on-site test pits (by others), and soil type hydraulic conductivity, the required LTA areas for the various options have been assessed. Three areas have been identified. These are on-site within the 3 ha ACF, or off-site within the 5.4 ha area to the North, or at the SDC site on Creyke Road.

Figure 2.4 shows the three identified areas.

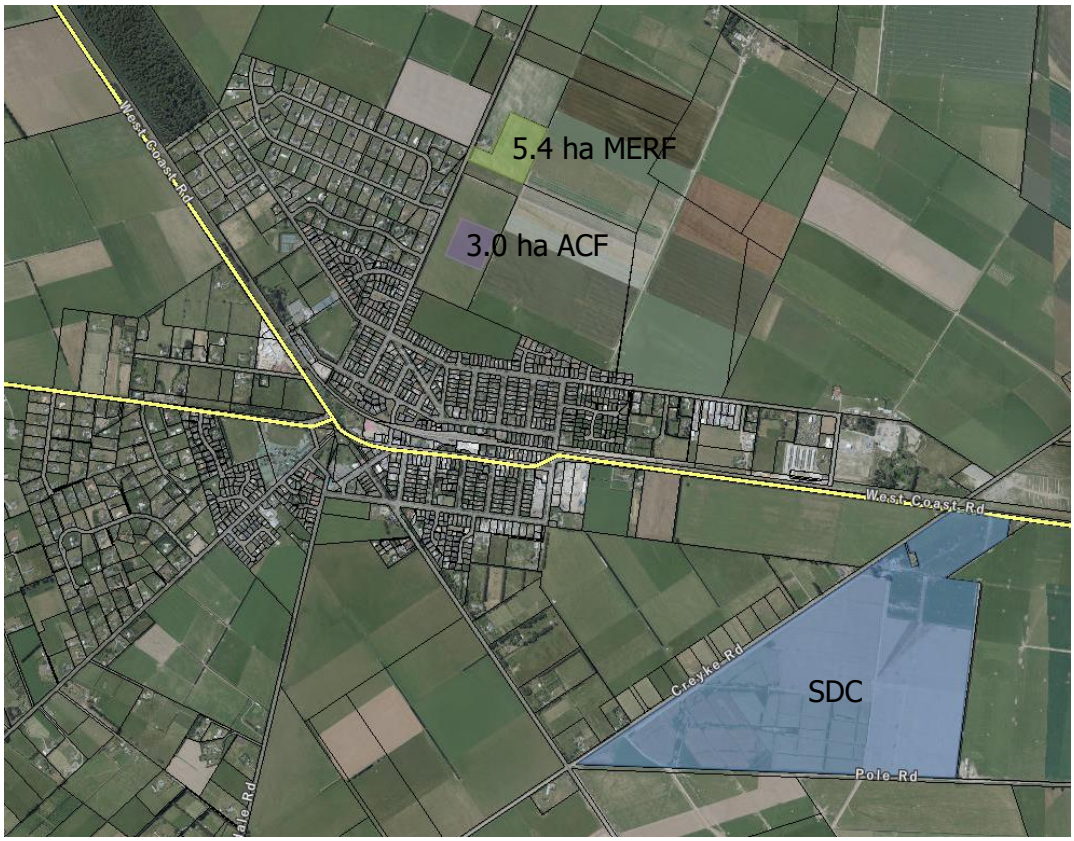


Figure 2.4: Potential Land Treatment Areas

2.6.2 Soil Classification

S-Map Landcare Research

The soil within and around the proposed LTA zone on the MERF site is mapped as a Pallic Firm Brown Soil, well drained Lismore silty loam (Landcare Research, 2019). The S-Map report is attached in Appendix A. Further details can be found in Table 2.5.

Table 2.5: Summary of Soils and Geology within Site

Characteristic	Description	Reference
Surface Geology	Alluvial sediments of the late Pleistocene age.	Fraser Thomas Limited report (2019)
	Flat to very gently undulating land with good drainage/permeability	S-map Soil Report (2019)
Subsurface Geology		
S-map soils description	Lismore Stony Silty Loam. Shallow soil (20 – 45 cm); silty and well drained	S-map Soil Report (2019)
Hydraulic conductivity	Moderate (4 - 72 mm/h) 48 to 1,728 mm/day	S-map Soil Report (2019)

Fraser Thomas Report

Bores on-site were logged by Fraser Thomas on the 1st August 2019, primarily for the foundation design (see Appendix A). The bore logs' location is shown in Figure 3.2. These can be used to look at the depth of the soil across the site and are summarised in Table 2.6.

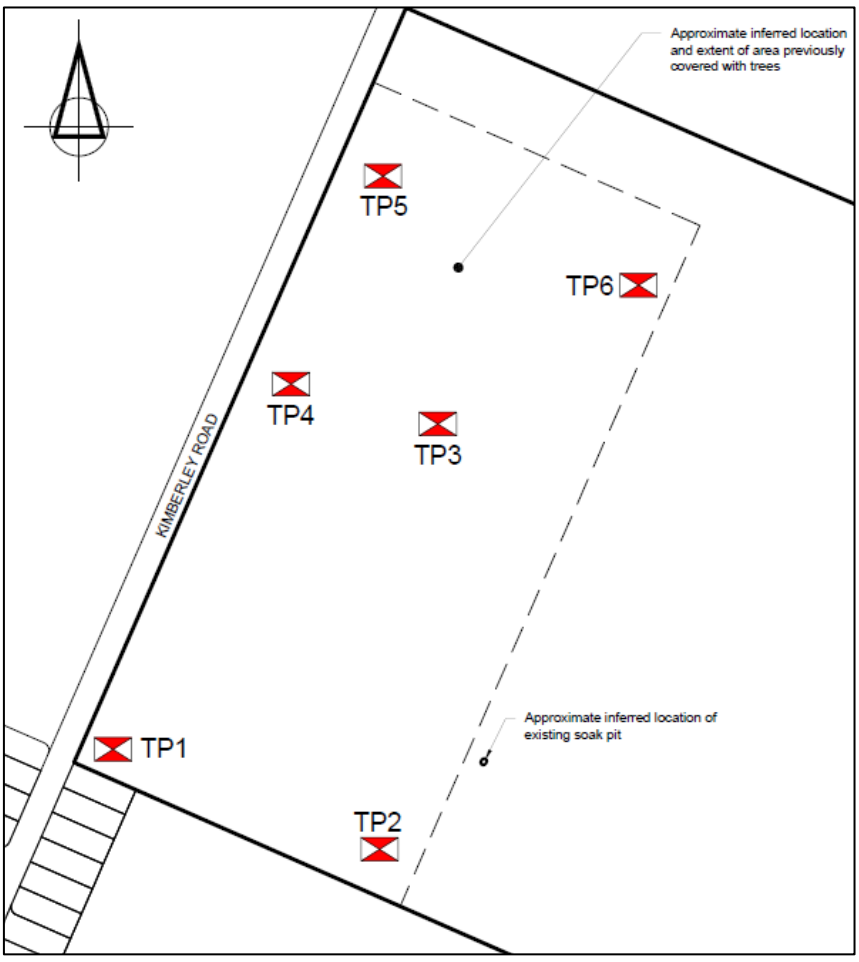


Figure 2.5: Fraser Thomas Bore Logs' Location

Table 2.6: Fraser Thomas Bore Logs (August 2019)

m bgl	TP1	TP2	TP3	TP4	TP5	TP6
0-0.2	Silt, some gravel, dark brown, moist, rootlets (topsoil).	Silt, some gravel, dark brown, moist, rootlets (topsoil).	Silt, some gravel, dark brown, moist, rootlets (topsoil).	Silt, some gravel, dark brown, moist, rootlets (topsoil).	Silt, some gravel, dark brown, moist, rootlets (topsoil).	Silt, some gravel, dark brown, moist, rootlets (topsoil).
0.2-0.3		Silt, gravelly (fine), minor sand (fine, subangular), yellowish brown, hard, moist, low plasticity (alluvial sediments).		Silt, gravelly (fine to medium, subangular to subrounded), minor sand (fine), yellowish brown, hard, moist, non-plastic (alluvial sediments).		
0.3-0.5	Topsoil starts to become gravelly.		Silt, gravelly (fine to medium, subangular to subrounded), minor sand (fine), yellowish brown, hard, moist, low plasticity (alluvial sediments).		Silt, gravelly (fine to medium, subangular to subrounded), minor sand (fine), yellowish brown, stiff, moist, non-plastic (alluvial sediments).	Silt, gravelly (fine to medium, subangular to subrounded), minor sand (fine), yellowish brown, hard, moist, non-plastic, trace rootlets (alluvial sediments).
0.5-0.6				Gravel (fine to coarse, subrounded, grey wacked), sandy (fine to coarse), with cobbles, greyish brown, very dense, moist.		
0.6-0.7	Silt, some sand (fine), trace gravel (fine), yellowish brown, hard, moist (alluvial sediments)	Gravel (fine to coarse, subrounded, greywacke), sandy (fine to coarse), minor cobbles, trace boulders, greyish brown, very dense, moist.	Gravel (fine to coarse, subrounded, greywacke), sandy (fine to coarse), trace cobbles, trace boulders, greyish brown, very dense, moist.		Gravel (fine to medium, subrounded, greywacke), silty, yellowish brown, very dense, moist	Gravel (fine to coarse, subrounded, greywacke), sandy (fine to coarse), greyish brown, very dense, moist.
0.7-0.9						
0.9-1.8					Gravel (fine to coarse, subrounded, greywacke), sandy (fine to coarse), trace cobbles, greyish brown, very dense, moist.	
1.8-1.9	Gravel (fine to course, subrounded greywacke), sand (fine to coarse), trace cobbles, greyish brown, very dense, moist.					
1.8-2.7						
2.7-2.8						
2.8-2.9						
2.9-3.1						

These soils logs show a consistent silt layer with some sands and gravels which are likely to have a soil texture that is representative of Soil Categories 2 and 3 within AS/NZS 1547:2012. Categories 2 and 3 are representative of Loams and Sandy Loams, with a Design Irrigation Rate (DIR) of 4 to 5 mm/d for drip irrigation and 30 - 50 mm/d for LPED trench.

2.6.3 Design Nitrogen Loading

Based on the calculated design flows, the design Nitrogen annual loading has been calculated, as shown in Table 2.7 below. Note that although the individual on-site systems have to be designed for peak hydraulic loading, nitrogen loading can be based on average loading, so the 1,200 L/d for the individual on-site lots, which is based on 6 people per household can be reduced to a similar volums as the communal system.

The final 2 columns give the two individual on-site dispersal options – subsurface drip and LPED.

Table 2.7: Design Nitrogen Loading to Soil System

Wastewater Source	ACF	MDL	LDL (Communal)	LDL (On-site)	LDL (On-site)
Average Daily Dry Weather Flow (m^3/d)	22.7	9.8	67.5	67.5	67.5
Wet weather Flow/Peak Hydraulic (m^3/d)	22.7	12.7	87.8	108	108
Annual flow (m^3/yr)	8,286	3,559	24,638	24,638	24,638
Land Treatment system	Subsurface drip			Drip	LPED
Design treated wastewater N concentration (mg/L)	30			30	
Annual Nitrogen load (kg N/yr)	248	106	739	739	739
LTA area @ 5 mm/day application Drip Or 30 mm/d LPED (m^2)	4,540	2,540	17,560	21,600	3,600
LTA area (m^2)	24,640			240 per lot	40 per Lot
Design Nitrogen loading (kg N/ha/yr)	444			342	2,053
Average Nitrogen load for proposed plan change area of 14.6 ha (kg N/ha/yr)	75			75	75

Based on models developed by LEI in the past for other land treatment schemes, the following can be assumed:

- Soil loss factors that include for denitrification, soil storage, microbe use and volatilisation will be low in summer due to high plant uptake and the relatively free-draining nature of the soils and higher in winter. The summer loss of 10% of N applied is assumed increasing to 20% in the winter months when plant uptake is minimal;
- With main Options 2 and 3, vegetation production is conservatively assumed at 12 t DM/yr, with 90% removed via harvesting, with an average N concentration of 2.5%. This gives 270 kg N/ha/yr removed by harvesting.

Using the above assumptions, a simple nitrogen balance is shown in Table 2.8 below for the communal LTA area with an area of 2.46 ha and with an additional 0.7 ha, giving a 3.16 ha option.

Table 2.8: Nitrogen Leaching from Options' 2 and 3

	Unit	Communal LTA	
Land Area	(ha)	2.46	3.16
Loading scenario	(kg N/ha/yr)	444	346
N removed with Harvesting	(kg N/ha/yr)	270	270
N removed via soil losses	(kg N/ha/yr)	67	52
Theoretical Leaching per ha	(kg N/ha/yr)	107	24
Theoretical Leaching for Site	(kg N/yr)	264	75

Table 3.7 above shows that the communal LTA will have a theoretical leaching mass of between 75 kg and 264 kg N per year that would need to be allowed for within the regional nitrogen allocation. The leaching per hectare of 24 kg N/ha/yr for the 3.216 ha area is in-line with farming practices in the area.

It is recommended that 2.5 to 3.5 ha area is set aside for a communal land treatment area. This is likely to allow WWTPs to produce up to 30 mg/L of nitrogen in their effluent, although the concentration is really only important in the months of April to August.

The individual on-site discharge options of either drip (if there is sufficient land area following house and driveway construction), or LPED (more likely) will result in higher N leaching, as follows:

- The LPED option gives no further nitrogen renovation as the effluent passes through the soil, so the theortetical leaching is the same as the N load from the WWTP, i.e. 739 kg N/yr if all LDL are LPED systems;

- The drip option will have gaseous N losses in the soil system, as per the communal system, but no plant removal allowed for. Theoretical N leaching is therefore 627 kg N/yr if all LDL are drip systems.

The cummulative effects of the nitrogen leaching load on groundwater and where the regional allocation of the community wastewater N load (Table 11i of the Canterbury Land and Water Plan) will be assessed in detail in the discharge consent application to ECan.

3 SHORT AND LONG-TERM OWNERSHIP AND OPERATION

The short and long-term ownership of the wastewater infrastructure has not yet been decided. It is likely that if Option 3 is selected, then the communal scheme is likely only required for short to medium term, as a District scheme for Darfield will likely occur at some time in the next 15 – 20 years. Community treatment options for this development, could be made redundant when a District Scheme is available, however, there is likely to be salvage value for it to be reused elsewhere. Portable systems, such as containerisied or skid mounted systems can therefore be considered favourably, or systems easily removed from within the ground.

Discussions are being held with SDC regarding community infrastructure design standards and ownership. The commentary below is to show that should the developers decide not to vest to Council, or SDC do not wish to take over the asset, then there are other satisfactory outcomes.

A number of Regional Councils have established model conditions to provide certainty that the systems are going to be managed and maintained with future homeownership, as has been the case at Jacks Point in Otago, and in Auckland and Hawkes Bay model conditions.

The model conditions require:

- The consent holder to transfer the consent to a body corporate entity which will own and be responsible for the infrastructure maintenance and operation;
- The constitution of the body corporate requires all lot owners to be equal shareholders and to transfer the shares to purchases when they sell;
- Lot owners must pay any money levied on them by the body corporate and grant a covenant on their property title in favour of the Council; those encumbrances are:

"…recording the obligations of each lot owner in respect of the operation and maintenance of the Wastewater System in accordance with the conditions of this consent, and charging the owner's land with an annual rent charge to ensure performance of the covenants relating to the Wastewater System, such Encumbrance to be enforceable by the Body Corporate/Company against the Lot owner in case of default."

Other Regional Councils have put specific conditions on discharge consents to ensure that environmental effects are limited, as has been used for Kaiuma Park in the Marlborough Sounds.

The Kaiuma Park conditions required:

- In both the discharge consent and the subdivision consent that a Memorandum of Encumbrance (MoE) be entered for all allotments. The discharge consent condition is:

"The Consent Holder shall enter into a covenant in favour of the Council to be registered against the title to each lot recording the obligations of each lot owner in respect of the operation and maintenance of the wastewater treatment system in accordance with the conditions of this consent."

- Other relevant conditions require the wastewater system to be owned, operated and maintained by a services company and that each owner is required to be an equal shareholder in the services company.

- The MoE requires all lot owners to pay the Council $3,200/year, but if in the preceding 12 months, there has been no breach of the landowner obligations for wastewater contained in the covenants, then the annual fee is deemed to have been paid. This provides the economic

incentive for each lot owner to undertake their duties and enables the Council to assist the Body Corporate in managing the system if lot owners are not performing their duties to the Body Corporate. The MoE does not waive, cancel or diminish Council's ability under the RMA1991 to take any other enforcement action.

At the Jacks Point, near Queenstown, water supply and wastewater remains in private ownership and is managed by the Body Corporate who since installation have engaged the system designers and builders (Innoflow Technologies) to operate the wastewater system. The Jacks Point discharge consents do not require covenants on titles related to management-related failure, but there are two conditions relating to risk:

- The requirement of an Operations and Management (O&M) Manual, outlining a schedule of maintenance, timing, monitoring procedures, contingency plans, dealing with malfunctions and reporting; and

- The consent holder is required to enter into a maintenance service contract with a suitably qualified person, who is required to operate and service in accordance with the O&M Manual.

However, the Jacks Point subdivision consents from QLDC require a consent notice to be lodged against all titles relating to the wastewater system. This requires all owners to install the on-site (STEP) components of the decentralised system when seeking building consent, as per below.

"The consent holder shall provide evidence to the Council of a responsible body (management group) which will undertake responsibility for the maintenance of the infrastructure including the private roads, water reservoir and associated network, stormwater reticulation, sewage reticulation (including primary sewage treatment tanks located on individual lots) and discharge fields (including regular monitoring and maintenance in accordance with the recommendations of the system designer of the individually owned primary treatment tanks) and open space. The management group shall also be responsible for the ongoing monitoring of the water supply to ensure that it continues to comply with the Drinking Water Standard for New Zealand 2005. Details of maintenance and operation of all infrastructure shall also be provided by the consent holder."

Discussions with SDC will address these options and their preference. In summary, there are a number of mechanisms available to Council to ensure the wastewater infrastructure, if it remains in private ownership, is managed accordingly.

4 OPTION COST ANALYSIS

The four main options are detailed in Section 3.

A package plant treatment plant provider (Innoflow Technologies Ltd) was approached for the prefeasibility costing of the main wastewater treatment plant (WWTP) and discharge options. These options are summarised in Tables 5.1 to 5.5.

Table 4.1: Option 1 - Cost Assessment

	Cost	Requirement
LDL On-site Treatment and LTA	$ 20,000	AdvanTex AX20 system and 240 m² of drip field at each section
MDL	$ 13,200	4,000 L STEP tanks and boundary kit at each section (this cost will be slightly lower for a grinder sewer system)
ACF	$ 354,470	Communal Reticulation, Wastewater Treatment Plant & Land Application Area for Aged Care Facility and MDL
Total cost	$ 2,326,070	

Note that the LDL individual on-site systems with LPED and sand trench would be an additional $3,000/lot over the subsurface drip option.

Table 4.2: Option 2 - Cost Assessment

	Cost	Requirement
LDL On-site Treatment	$ 19,000	A AdvanTex AX20 system at each section plus boundary kit. Reticulated to communal LTA
MDL	$ 13,200	4,000 L STEP tanks and boundary kit at each section (this cost will beslightly lower for a grinder sewer system)
MERF (ACF Off-site communal)	$ 490,270	Communal Reticulation, Wastewater Treatment Plant for ACF and MDL and Land Application Area for ACF, MDL and LDL
Total cost	$ 2,371,870	

Table 4.3: Option 3 - Stage 1 - Cost Assessment

Stage 1	Cost	Requirement
LDL	$ 13,200	20 lots with 4,000 L STEP tanks and boundary kit at each section (this cost will be slightly lower for a grinder sewer)
MDL	$ 13,200	4,000 L STEP tanks and boundary kit at each section (this cost will be lower for a grinder sewer)
Communal WWTP and LTA for ACF, MDL and LDL off-site)	$ 485,950	Communal Wastewater Treatment Plant and LTA for ACF, MDL and 20 LDL
Total cost	$ 921,550	

Table 4.4: Option 3 - Stage 2 - Cost Assessment

Stage 2	Cost	Requirement
LDL	$ 13,200	35 lots with 4,000 L STEP tanks and boundary kit at each section (this cost will be slightly lower for a grinder sewer)
MDL	$ -	No development in this Stage
Expansion of Community WWTP and LTA	$ 215,985	Expansion of Communal Wastewater Treatment Plant and LTA for further 35 LDL
Total cost	$ 677,985	

Table 4.5: Option 3 - Stage 3 - Cost Assessment

Stage 3	Cost	Requirement
LDL	$ 13,200	35 lots with 4,000 L STEP tanks and boundary kit at each section (this cost will be slightly lower for a grinder sewer)
MDL	$ -	No development in this Stage
Expansion of Community WWTP and LTA	$ 215,985	Expansion of Communal Wastewater Treatment Plant and LTA for further 35 LDL
Total cost	$ 677,985	

A summary of the options and indicative costs that have been considered for the development of the 14.6 ha MERF site are presented below.

Option 1 will allow the costs of wastewater treatment and discharge to be deferred to the purchaser of the LDL Lots and the STEP tank and boundary kit for the MDL. This cost will be $20,000 per LDL and $13,200 per MDL. The WWTP and reticulation for the ACF and the MDL will be funded by MERF at the cost of $355,500.

Option 2 will allow the costs of wastewater treatment to be deferred to the purchaser of the LDL Lots and the STEP tank and boundary kits for the MDL. This cost will be $19,000 per LDL and $13,200 per MDL. The WWTP and reticulation for the ACF and the MDL and reticulation and the communal land treatment for all lots will be funded by MERF at the cost of $490,000.

Option 3 will have a higher upfront cost to MERF with only the STEP tank and boundary kit cost deferred to the purchaser. This cost will be $13,200 for all the LDL and the MDL Lots. The reticulation, communal WWTP and land treatment will be funded by MERF at a full cost of $836,000, or can be staged in three steps in the order of $486,000, $216,000, and $216,000.

Option 4 will have much the same costs as Option 3, assuming there is no charge by SDC to utlise the land in Creyke Rd. However, the reticulation costs increase from $45,000 to $260,000, based on $50/m plus a PC sum of $50,000 for jacking under SH73 and the main west coast railway.

The cost estimates from Innoflow Technologies are attached in Appendix D. It is important to note not all option combinations have been costed. The estimates for the on-site systems are for the lower cost subsurface dripper line. Likewise, the cost for a STEP system has been included in the base estimates, and the estimated costs will be slightly less for a grinder/progressive cavity pump system.

5 FUTURE DEFERRED ZONE

The future deferred zone has not been analysed in any detail. It is likely to be deferred until the District Scheme is available.

Should it progress sooner, then it could be added to the communal WWTP and LTA in Option 3. Based on approximately 300 lots, then an additional 5.8 ha of land would be required for a LTA. This could partially be accommodated in the MERF owned land to the North and within an area of the Future Urban Zone that could subsequently be developed at a later stage; or within adjoining land to the north of the Future Urban Zone, also owned by the owner of the Future Urban Zone.

6 RECOMMENDATIONS

Based on the environmental conditions within the Darfield vicinity, it is considered that all options presented for the sewage collection, wastewater treatment and effluent discharge, are viable and a discharge consent likely to be procured for all options.

However, MERF want to proceed with the option that has least environmental effect and likely to be accepted by all stakeholders and have therefore decided to apply for discharge consent for Option 3, with a communal WWTP and subsurface cut and carry LTA on the adjacent 5.4 ha lot. This has the infrastructure in-place for connection to a Council run scheme in the future.

7 REFERENCES

Fraser Thomas Limited report, September 2019. Proposed Plan Change Darfield Preferred Development Area 7 (Malvern Area Plan) Geotechnical Investigation Report.

Landcare Research, 2019. https://smap.landcareresearch.co.nz

Statistics New Zealand, 2013. http://archive.stats.govt.nz/Census/2013-census/profile-and-summary-reports/quickstats-about-a-place.aspx?request_value=14889&parent_id=14888&tabname=&p=y&printall=true

8 APPENDICES

Appendix A: Location Map
Appendix B: S-Map Soils Assessment
Appendix C: Fraser Thomas Bore Logs

APPENDIX A

Location Map

APPENDIX B

S-Map Soils Assessment

APPENDIX C

Fraser Thomas Bore Logs

Annexure 8:

Preliminary Site Investigation

MR MERVYN TODD

Fraser Thomas

ENGINEERS • RESOURCE MANAGERS • SURVEYORS

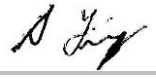
PROPOSED PLAN CHANGE
DARFIELD PREFERRED
DEVELOPMENT AREA 7
(MALVERN AREA PLAN)

PRELIMINARY SITE INVESTIGATION- CONTAMINATION

MR MERVYN TODD

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

PRELIMINARY SITE INVESTIGATION - CONTAMINATION

Project No.	32751	Approved for Issue	
Version No.	1	Name	Sean Finnigan
Status	Final	Signature	
Authors	A Borker		
Reviewer	S Finnigan	Date	21 October 2019

Fraser Thomas Limited
Consulting Engineers, Licensed Surveyors
Planners & Resource Managers
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PROPOSED PLAN CHANGE
DARFIELD PREFERRED DEVELOPMENT AREA 7 (MALVERN AREA PLAN)
MR MERVYN TODD

PRELIMINARY SITE INVESTIGATION - CONTAMINATION

EXECUTIVE SUMMARY

In response to instructions from Aston Consultants, Fraser Thomas Limited (FTL) undertook a Preliminary Site Investigation (PSI) of Lot 4 DP 524058, Pt RS 27203 & Lot 24 DP 366007 ('site'). The site is located north of Horndon Street and bounded by Kimberley Road to the west and is approximately 70ha in area.

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 m^2. The proposal will also include provision for a 2 – 3 ha retirement village and around 10% of the lots to be within the approximate 430-550m^2 size range.

This investigation involved a desktop study, site walkover, and reporting associated with potential land contamination issues.

The main rationale and objectives for this investigation were:

- To identify the main actual or potential contamination issues due to ongoing and historic use of land within the subject site.
- To confirm that the site is suitable or can be made suitable for the proposed residential use.

This investigation has been managed, reviewed and approved by a Suitably Qualified and Experienced Practitioner (SQEP), as defined in the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS).

The NESCS governs a number of activities, including soil sampling, soil disturbance, subdivision and changes of land use on potentially contaminated land in New Zealand. In general, the rules of the NESCS apply to sites on which it is "more likely than not" that a HAIL (Hazardous Activities and Industries List) activity has occurred or is occurring (Regulation 5(7)).

This investigation has confirmed that the subject site has only been used for tree plantation and pastoral purposes, and has not found any HAIL activities affecting the site. Therefore, under Regulation 5(7), the NESCS does not apply to the subject site.

No liability is accepted by this firm or by any principal, or director, or any servant or agent of this firm, in respect of its use 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.

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MR MERVYN TODD

PRELIMINARY SITE INVESTIGATION - CONTAMINATION

TABLE OF CONTENTS

APPENDICES

ASTON CONSULTANTS
PRELIMINARY SITE INVESTIGATION - CONTAMINATION
TODD AND REED BLOCKS, DARFIELD, CANTERBURY

1.0 INTRODUCTION

In response to instructions from Aston Consultants, Fraser Thomas Limited (FTL) undertook a Preliminary Site Investigation (PSI) of Lot 4 DP 524058, Pt RS 27203 & Lot 24 DP 366007 ('site'). The site is located north of Horndon Street and bounded by Kimberley Road to the west and is approximately 70ha in area. 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).

This investigation involved a desktop study, site walkover and reporting associated with potential land contamination issues.

The format of this report is as follows:

- Rationale, objectives and scope of work.
- Site details.
- Investigation methodology.
- Desktop study and site walkover results.
- Discussion, conclusions and recommendations.
- Site plans, representative photographs and other relevant information in appendix form.

This investigation has been managed, reviewed and approved by a Suitably Qualified and Experienced Practitioner (SQEP), as defined in the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS).

2.0 RATIONALE, OBJECTIVES AND SCOPE OF WORK

The main rationale and objectives for this investigation were:

- To identify the main actual or potential contamination issues due to ongoing and historic use of land within the site.
- To confirm that the site is suitable or can be made suitable for the proposed residential use.

3.0 INVESTIGATION METHODOLOGY

The methodology used for this site assessment is summarised below:

1. Desktop study involving review of existing historical information for the subject site including aerial photographs, certificates of title, Council property files/databases and interviews with relevant people.
2. Site walkover investigation of the subject site, with a visual appraisal to identify any disturbed and potentially contaminated areas. Relevant photographs are set out in Appendix C.

3. Preparation of a Preliminary Site Investigation (PSI) report including the results of the desktop study, site walkover survey, conclusions and recommendations.
4. Provision of site plans, relevant documentation and representative photographs as appendices to this report.

Fraser Thomas Limited Health and Safety Management Plan procedures were followed throughout the duration of the investigation.

4.0 SITE DETAILS

4.1 LOCATION AND ZONING

The subject site (Lot 4 DP 524058, Pt RS 27203 & Lot 24 DP 366007) is located north of Horndon Street and bounded by Kimberley Road to the west (Todd and Reed Blocks) and is approximately 70ha in area. The subject site is zoned 'Outer Plains' under the Selwyn District Plan.

4.2 TOPOGRAPHY, GEOLOGY AND SOILS

In carrying out the appraisal of the site, reference has been made to the Institute of Geological and Nuclear Sciences geological web map (NZ 1:250,000). The map indicates that the site is underlain by mud, sand, gravel and peat of alluvial and colluvial origin.

4.3 PROPOSED DEVELOPMENT

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 m^2. The proposal will also include provision for a 2 – 3 ha retirement village and around 10% of the lots to be within the approximate 430-550m^2 size range.

5.0 DESKTOP STUDY AND WALKOVER SURVEY RESULTS

The results of the desktop study and the site walkover survey are summarised in this section and illustrated in the attached site features plan, aerial photographs (Appendix B) and site photographs (Appendix C). Throughout the site walkover survey, a visual assessment was used to classify any foreign materials as particular contaminants, without any formal identification. Hence, reference to a specific contaminant in the survey results should essentially be read as "suspected contaminant", unless otherwise stated.

5.1 SITE IDENTIFICATION AND USE

The site details and ownership history are summarised below.

Table 1: Site Details and Ownership History

Registered Owners	Lot 4 DP 524058 owned by Merf Ag Services Limited, Pt RS 27203 owned by Matthew Alexander Reed and Kerry Mark Glynn and **Lot** 24 DP 366007 owned by Helen Anne Reed and Kerry Mark Glynn	
Street Address	Site located east of Kimberley Road and north of Horndon Street	
Legal Description	Lot 4 DP 524058, Pt RS 27203 & Lot 24 DP 366007	
Title	835350, CB44A/1000	
Total Area (ha)	Approx. 70 ha	
Zoning	Outer Plains	
Ownership History		
CTs	**From**	**Registered Owner**
		Lot 4 DP 524058
CB81/214	June 1882 Oct 2010 March 2014 Oct 2015	Selwyn Plantation Board Limited Transfer to Todd Clan Limited Transfer to Mervyn George Todd Transfer to Merf Ag Services Limited
835350	July 2018	Merf Ag Services Limited
		Pt RS 27203
CB6B/123	June 1966	Roland Karl Reed of Darfield, Farmer
CB9F/1206	May 1970 Aug 1971 Nov 1975 April 1980 Aug 1983 March 1992 Nov 1995	Roland Karl Reed of Darfield, Farmer Transfer 841235 of an individual one-half share to Kenneth Roland Reed of Darfield, Farmer Transfer 59906/1 of a one-quarter share Roland Karl Reed to Kenneth Roland Reed of Darfield, farmer Transfer 271675/1 of his share Roland Karl Reed to Helen Anne Reed of Darfield, Married Woman Transmission 447622/1 of Mortgage 271675/2 to Mary Joan Reed and Pyne Gould Guinness Limited as Executors Transfer 984513/1 of a 1/3 of his share Kenneth Roland and Reed to Helen Anne Reed of Darfield, Married Woman Transmission A207658/1 of Mortgage 271675/2 to (now) PGG Trust Limited as Survivor
CB44A/1000	Feb 1998 July 2007 July 2007 April 2015	Kenneth Roland Reed as to ½ share and Helen Anne Reed as to ½ a share Transmission of the ½ share of Kenneth Roland Reed to Helen Reed as Executor Transfer to Helen Anne Reed Transfer to Matthew Alexander Reed and Kerry Mark Glynn
		Lot 24 DP 366007
CB6B/123	June 1966 May 1970	Roland Karl Reed of Darfield Farmer Transfer 797685 of Lots 1,2 & 3 DP 27860 to Pyne, Gould Guinness Limited and Geoffrey Hubert Reed
CB9K/98	May 1970 Aug 1971	Pyne, Gould Guinness Limited a Company having its registered office at Christchurch and Geoffrey Hubert Reed of Darfield farmer Transfer 841234 to Kenneth Roland Reed of Darfield, Farmer
CB13B/397	Nov 1973	Kenneth Roland Reed of Darfield, Farmer
CB15A/345	March 1975	Kenneth Roland Reed of Darfield, Farmer
CB44A/999	Feb 1998	Kenneth Roland Reed and Helen Anne Reed in equal shares

	May 2000	Transfer to Kenneth Roland Reed, Helen Anne Reed and Kerry Mark Glynn
CB14426	May 2002 April 2003	Kenneth Roland Reed, Helen Anne Reed and Kerry Mark Glynn Transmission to Helen Anne Reed and Kerry Mark Glynn as survivors
CB267916	July 2007	Helen Anne Reed and Kerry Mark Glynn

The CT information available indicates that part of the subject site (Pt RS 27203 and Lot 24 DP 366007) was owned by farmers until 1975, and has been privately owned since then. The remaining lot (Lot 4 DP 524058) was owned by the Selwyn Plantation Board from 1882, following which it has been privately owned since 2010.

5.2 INTERVIEWS

Mervyn George Todd (Owner - Lot 4 DP 524058)

According to the information provided by the site owner, before purchasing it in 2014 the western section of the property was previously owned by the Selwyn Plantation Board for growing trees, and they occasionally undertook weed killing spraying using glyphosate ('Roundup'). The site is now used for cattle grazing purposes.

5.3 AERIAL PHOTOGRAPHS

Historical aerial photographs from 1940-1944, 1955-1959, 1965-1969,1975-1979, 1985-1989, 1995-1999, 2000-2004, 2004-2010, 2010-2015, 2017 were reviewed as part of the desktop study. All photos were accessed from Canterbury Maps.

1940-1944 Aerial

Part of the site (Pt RS 27203 & Lot 24 DP 366007) is covered with grass and appears to be used for pastoral purposes, while many trees can be seen on Lot 4 DP 524058. The surrounding properties have a similar land use. A few residential properties can be seen north of the site.

1955-1965-1975-1985-1995-2010 Aerial

The site appears similar to the previous aerial.

2010-2015 Aerial

The site appears similar to the previous aerial, apart from the trees visible in the previous aerials are no longer present. The surrounding properties to the north and west are residential in use.

2017 Aerial

The site appears similar to the previous aerial.

Overall, the aerial photographs and desktop information show that part of the site (Pt RS 27203 & Lot 24 DP 366007) has only been used for pastoral purposes while Lot 4 DP 524058 was formerly owned by the Selwyn Plantation Board until 2010 following which the trees were

subsequently harvested and the land is now used for grazing purposes. All three lots have remained undeveloped and not undergone any significant change at least since 1940.

5.4 FRASER THOMAS LIMITED- GEOTECHNICAL INVESTIGATION REPORT- SEPTEMBER 2019

A geotechnical investigation report was prepared by FTL titled "Proposed plan change- Darfield Preferred development Area 7 (Malvern Area Plan)", dated September 2019. 12 machine excavated test pits were put down at the site to depths ranging between approximately 1.7m and 3.1m bgl, in order to determine the nature and consistency of the subsoils underlying the site. Soils generally comprising silts and gravelly silts was encountered beneath the surficial layer of topsoil. No fill was found in any of the 12 test pits.

5.5 COUNCIL RECORDS

5.5.1 Selwyn District Council

Council have advised that there is no property file for the site.

5.5.2 Listed Land Use Register (LLUR)

A contaminated site enquiry was sent to Canterbury Regional Council ('Environment Canterbury') on 7th June 2019, for information on the subject site held on their Listed Land Use Register (LLUR). There are no records associated with the site under the Environment Canterbury LLUR. The LLUR statement for this site is included in Appendix D.

5.6 SITE WALKOVER RESULTS

A site walkover of the subject site was undertaken by FTL Engineering Geologist Kelly Twohill on 19th August 2019. Site investigation photographs are provided in Appendix C.

The site was accessed from Kimberley Road. Several trees line the western site boundary. The site is currently vacant and is surrounded by several residential properties. There are remnant sediment control ponds, associated with the neighbouring subdivision (which the same farmer previously developed) on the subject site. They are 1.0 m deep and located along the southern site boundary. There is also a 3.0 m deep "soak hole" on the property, which the farmer dug to dispose of overland stormwater. The approximate locations of these features are shown on Figure 1 below.

Overall, no features of note or areas of potential contamination were identified during the site walkover survey.

Figure 1: Site Layout and Features from Site Walkover

5.7 CHEMICAL RISK ASSESSMENT

According to information received from the client, the only chemical used on site during the last few years is sodium glyphosate ('Roundup'). Glyphosate is not present in the risk assessment prepared for Environment Canterbury ("Sports Turf Scoping Study, Canterbury" (Geoscience NZ Ltd and Renovate Turf Consultants, 2013), to highlight whether the herbicides used on the subject site could potentially be of concern to site users and construction workers during development). However, it is not considered an environmentally persistent herbicide, and is expected to degrade to non-detectable concentrations within a few years of application. Consequently, it is unlikely that the glyphosate application would lead to any soil contamination.

6.0 NESCS CONSENTING REQUIREMENTS

The NESCS governs a number of activities, including soil sampling, soil disturbance, subdivision and changes of land use on potentially contaminated land in New Zealand. In general, the rules of the NESCS apply to sites on which it is "more likely than not" that a HAIL (Hazardous Activities and Industries List) activity has occurred or is occurring (Regulation 5(7).

Our investigation has not found any evidence of HAIL activities having been carried out on the subject site. Therefore, under Regulation 5(7), the NESCS does not apply to the subject site.

7.0 CONCLUSIONS AND RECOMMENDATIONS

This investigation has confirmed that the subject site has only been used for tree plantation and pastoral purposes and has not found any evidence of HAIL activities. Therefore, under Regulation 5(7), the NESCS does not apply to the subject site.

In summary, based on the information presented in this report, there are no potential contamination issues affecting the proposed subdivision of the subject site based on this investigation. There does not appear to be any contamination issues on the subject site that might present a risk to the health of future residents.

8.0 LIMITATIONS

We have performed our services for this project in accordance with current professional standards for an assessment of the nature and extent of any soil contamination on-site, based upon detailed site assessment investigations and current regulatory standards for site contamination. The scope of the site assessment activities was generally in accordance with the Ministry for Environment Contaminated Land Management Guideline's (Parts 1 (2003), 2 (2003) and 5 (2004)) and the NESCS (2011). Conclusions on actual or potential contamination cannot be applied to areas outside of the site investigation.

We do not assume any liability for misrepresentation or items not visible, accessible or present at the subject site during the time of the site inspection.

Appendix A

Ministry for the Environment
Contaminated Site Report Checklist

PROPOSED PLAN CHANGE
DARFIELD PREFERRED DEVELOPMENT AREA 7 (MALVERN AREA PLAN)
MR MERVYN TODD

SUMMARY CONTAMINATED SITES REPORT CHECKLIST

Report sections and information to be presented	**PSI**	**SIR**	**RAP**	**SVR**	**MMP**	**Notes**
Executive summary	R ☑	R ☐	R ☐	R ☐	R ☐	
Scope of work	R ☑	R ☐	R ☐	R ☐	R ☐	
Site identification	R ☑	R ☐	R ☐	R ☐	R ☐	
Site history	R ☑	S ☐	S ☐	S ☐	S ☐	
Site condition and surrounding environment	R ☑	S ☐	S ☐	S ☐	S ☐	
Geology and hydrology	A ☑	R ☐	S ☐	S ☐	S ☐	
Sampling and analysis plan and sampling methodology	A ☑	R ☐	X	R ☐	R ☐	
Field quality assurance and quality control (QA/QC)	N ☑	R ☐	X	R ☐	S ☐	
Laboratory QA/QC	N ☑	R ☐	X	R ☐	X	
QA/QC data evaluation	N ☐	R ☐	R ☐	R ☐	X	
Basis for guideline values	R ☑	R ☐	R ☐	R ☐	R ☐	
Results	A ☑	R ☐	R ☐	R ☐	S ☐	
Site Characterisation	R ☑	R ☐	R ☐	R ☐	R ☐	
Remedial actions	X	X	R ☐	S ☐	S ☐	
Validation	X	X	X	R ☐	S ☐	
Site management plan	X	X	R ☐	S ☐	S ☐	
Ongoing monitoring	X	X	X	N ☐	R ☐	
Conclusions and recommendations	R ☑	R ☐	R ☐	R ☐	R ☐	

KEY:

1. PSI = preliminary site inspection report
   SIR = detailed site investigation report
   RAP = site remedial action plan
   SVR = site validation report
   MMP = ongoing monitoring and management plan
2. R = corresponding details required
   A = readily available information should be included;
   S = summary of this section's details is adequate if detailed information has been included in an available referenced report;
   N = include only if no further site investigation is to be undertaken;
   X = not applicable and may be omitted.

Appendix B

Aerial Photographs

Canterbury Maps

1940-1944 Aerial

N

0 0.1 0.1 0.2 0.3 Kilometres

Scale: 1:7,000 @A4

Map Created by Canterbury Maps on 10/09/2019 at 9:13 AM

Canterbury Maps

1955-1959 Aerial

N

0 0.1 0.1 0.2 0.3 Kilometres

Scale: 1:7,000 @A4

Map Created by Canterbury Maps on 10/09/2019 at 9:15 AM

Canterbury Maps

1975-1979 Aerial

N

0 0.1 0.1 0.2 0.3 Kilometres

Scale: 1:7,000 @A4

Map Created by Canterbury Maps on 10/09/2019 at 9:16 AM

canterbury maps

Canterbury Maps

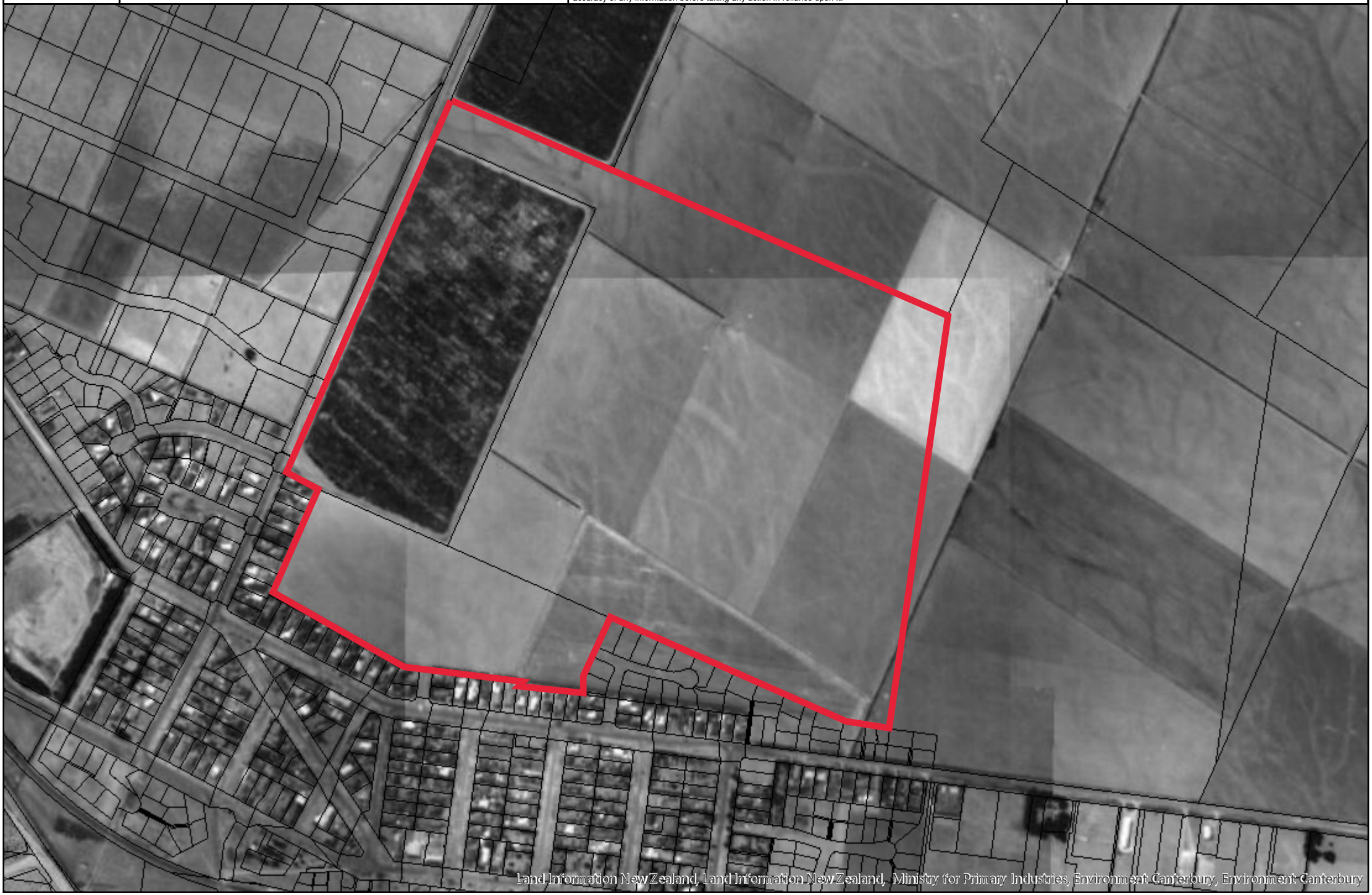
1980-1984 Aerial

N

0 0.1 0.1 0.2 0.3 Kilometres

Scale: 1:7,000 @A4

Map Created by Canterbury Maps on 10/09/2019 at 9:17 AM



canterbury maps

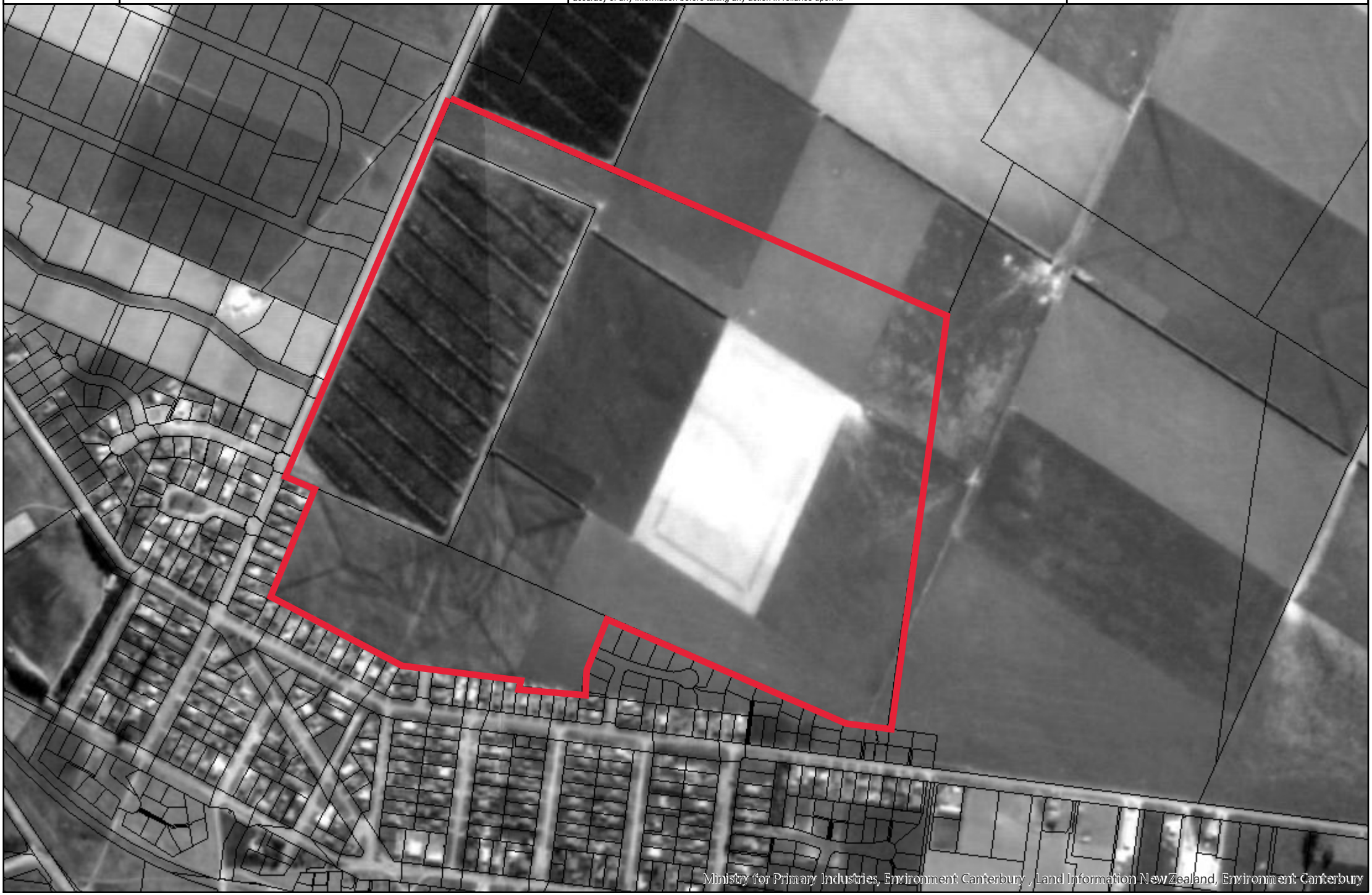
Canterbury Maps
1985-1989 Aerial

N

0 0.1 0.1 0.2 0.3 Kilometres

Scale: 1:7,000 @A4

Map Created by Canterbury Maps on 10/09/2019 at 9:17 AM



canterbury maps

Canterbury Maps
1995-1999 Aerial

N

0 0.1 0.1 0.2 0.3 Kilometres

Scale: 1:7,000 @A4

Map Created by Canterbury Maps on 10/09/2019 at 9:18 AM

Canterbury Maps

2004-2010 Aerial

N

0 0.1 0.1 0.2 0.3 Kilometres

Scale: 1:7,000 @A4

Map Created by Canterbury Maps on 10/09/2019 at 9:19 AM

canterbury maps

Canterbury Maps
2010-2015 Aerial

N

0 0.1 0.1 0.2 0.3 Kilometres

Scale: 1:7,000 @A4

Map Created by Canterbury Maps on 10/09/2019 at 9:19 AM

canterbury maps

Canterbury Maps

2017 Aerial

N

0 0.1 0.1 0.2 0.3 Kilometres

Scale: 1:7,000 @A4

Map Created by Canterbury Maps on 10/09/2019 at 9:20 AM

Appendix C

Site Walkover Photographs

SITE WALKOVER PHOTOS

Photo 1. View of the site looking south-west.

Photo 2. View of the site. Looking south towards Horndon Street

Photo 3. Small test pit (TP3) dug along western portion of the site. No fill noted- only natural silt.

Photo 4. Soak hole located along the western site boundary of Pt RS 27203

Photo 5. View of the site. Looking north

Photo 6. View of the site. Looking south

Appendix D

Listed Land Use Register (LLUR)

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Customer Services
P. 03 353 9007 or 0800 324 636

PO Box 345
Christchurch 8140

P. 03 365 3828
F. 03 365 3194
E. ecinfo@ecan.govt.nz

www.ecan.govt.nz

Dear Sir/Madam

Thank you for submitting your property enquiry in regards to our Listed Land Use Register (LLUR) which holds information about sites that have been used, or are currently used for activities which have the potential to have caused contamination.

The LLUR statement provided indicates the location of the land parcel(s) you enquired about and provides information regarding any LLUR sites within a radius specified in the statement of this land.

Please note that if a property is not currently entered on the LLUR, it does not mean that an activity with the potential to cause contamination has never occurred, or is not currently occurring there. The LLUR is not complete, and new sites are regularly being added as we receive information and conduct our own investigations into current and historic land uses.

The LLUR only contains information held by Environment Canterbury in relation to contaminated or potentially contaminated land; other information relevant to potential contamination may be held in other files (for example consent and enforcement files).

If your enquiry relates to a farm property, please note that many current and past activities undertaken on farms may not be listed on the LLUR. Activities such as the storage, formulation and disposal of pesticides, offal pits, foot rot troughs, animal dips and underground or above ground fuel tanks have the potential to cause contamination.

Please contact and Environment Canterbury Contaminated Sites Officer if you wish to discuss the contents of the LLUR statement, or if you require additional information.
For any other information regarding this land please contact Environment Canterbury Customer Services.

Yours sincerely

Contaminated Sites Team

Property Statement
from the Listed Land Use Register

Visit www.ecan.govt.nz/HAIL for more information about land uses.

Environment Canterbury
Regional Council
Kaunihera Taiao ki Waitaha

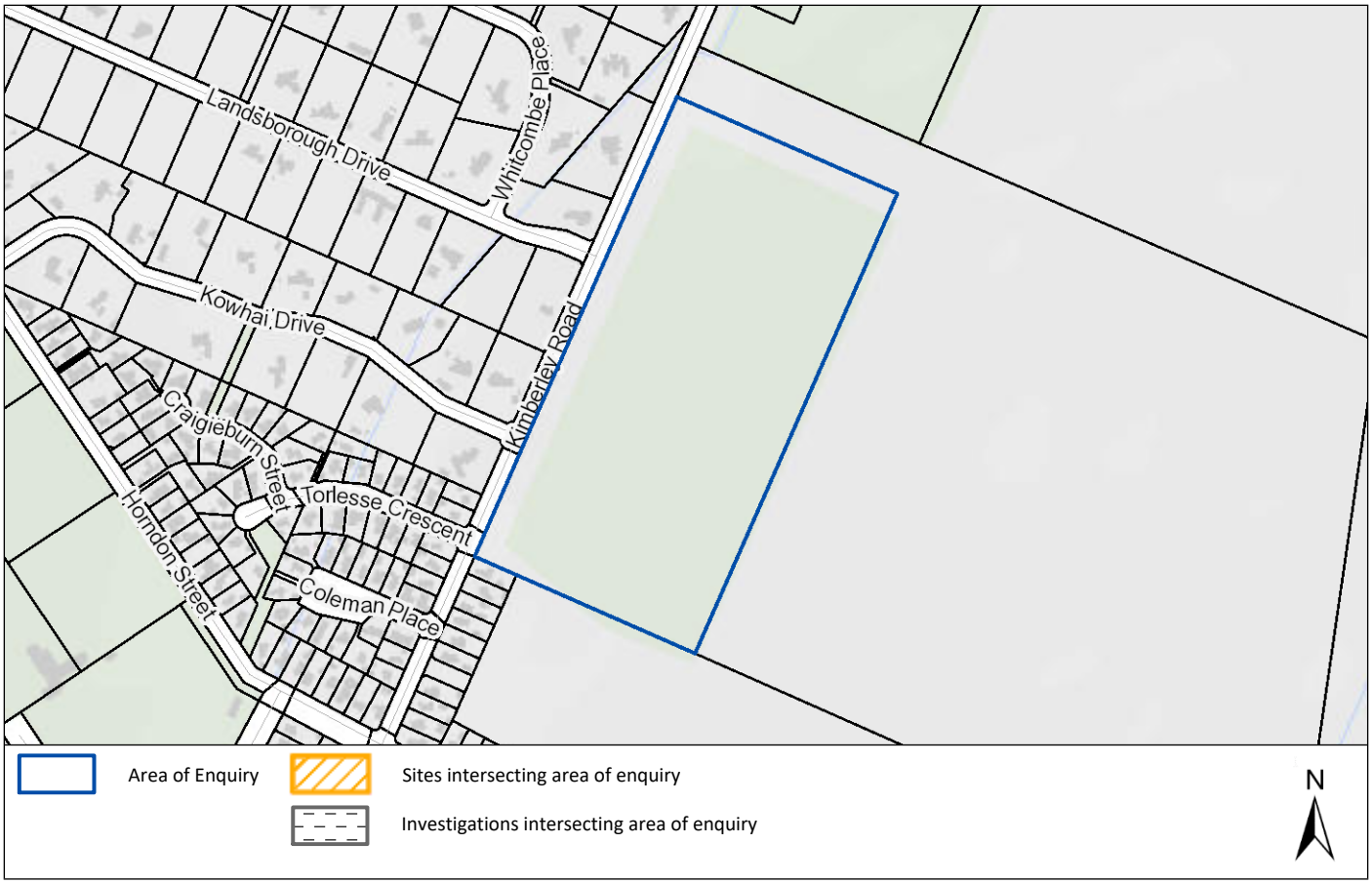
Customer Services
P. 03 353 9007 or 0800 324 636

PO Box 345
Christchurch 8140

P. 03 365 3828
F. 03 365 3194
E. ecinfo@ecan.govt.nz

www.ecan.govt.nz

Date:	07 June 2019
Land Parcels:	Lot 4 DP 524058 Valuation No(s): Not Available



The information presented in this map is specific to the property you have selected. Information on nearby properties may not be shown on this map, even if the property is visible.

Summary of sites:

There are no sites associated with the area of enquiry.

Information held about the sites on the Listed Land Use Register

There are no sites associated with the area of enquiry.

Information held about other investigations on the Listed Land Use Register

For further information from Environment Canterbury, contact Customer Services and refer to enquiry number ENQ235803.

Disclaimer:

The enclosed information is derived from Environment Canterbury's Listed Land Use Register and is made available to you under the Local Government Official Information and Meetings Act 1987 and Environment Canterbury's Contaminated Land Information Management Strategy (ECan 2009).

The information contained in this report reflects the current records held by Environment Canterbury regarding the activities undertaken on the site, its possible contamination and based on that information, the categorisation of the site. Environment Canterbury has not verified the accuracy or completeness of this information. It is released only as a copy of Environment Canterbury's records and is not intended to provide a full, complete or totally accurate assessment of the site. It is provided on the basis that Environment Canterbury makes no warranty or representation regarding the reliability, accuracy or completeness of the information provided or the level of contamination (if any) at the relevant site or that the site is suitable or otherwise for any particular purpose. Environment Canterbury accepts no responsibility for any loss, cost, damage or expense any person may incur as a result of the use, reference to or reliance on the information contained in this report.

Any person receiving and using this information is bound by the provisions of the Privacy Act 1993.

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Listed Land Use Register

What you need to know

Everything is connected

What is the Listed Land Use Register (LLUR)?

The LLUR is a database that Environment Canterbury uses to manage information about land that is, or has been, associated with the use, storage or disposal of hazardous substances.

Why do we need the LLUR?

Some activities and industries are hazardous and can potentially contaminate land or water. We need the LLUR to help us manage information about land which could pose a risk to your health and the environment because of its current or former land use.

Section 30 of the Resource Management Act (RMA, 1991) requires Environment Canterbury to investigate, identify and monitor contaminated land. To do this we follow national guidelines and use the LLUR to help us manage the information.

The information we collect also helps your local district or city council to fulfil its functions under the RMA. One of these is implementing the National Environmental Standard (NES) for Assessing and Managing Contaminants in Soil, which came into effect on 1 January 2012.

For information on the NES, contact your city or district council.

How does Environment Canterbury identify sites to be included on the LLUR?

We identify sites to be included on the LLUR based on a list of land uses produced by the Ministry for the Environment (MfE). This is called the Hazardous Activities and Industries List (HAIL)[1]. The HAIL has 53 different activities, and includes land uses such as fuel storage sites, orchards, timber treatment yards, landfills, sheep dips and any other activities where hazardous substances could cause land and water contamination.

We have two main ways of identifying HAIL sites:

- We are actively identifying sites in each district using historic records and aerial photographs. This project started in 2008 and is ongoing.
- We also receive information from other sources, such as environmental site investigation reports submitted to us as a requirement of the Regional Plan, and in resource consent applications.

[1] The Hazardous Activities and Industries List (HAIL) can be downloaded from MfE's website www.mfe.govt.nz, keyword search HAIL

How does Environment Canterbury classify sites on the LLUR?

Where we have identified a HAIL land use, we review all the available information, which may include investigation reports if we have them. We then assign the site a category on the LLUR. The category is intended to best describe what we know about the land use and potential contamination at the site and is signed off by a senior staff member.

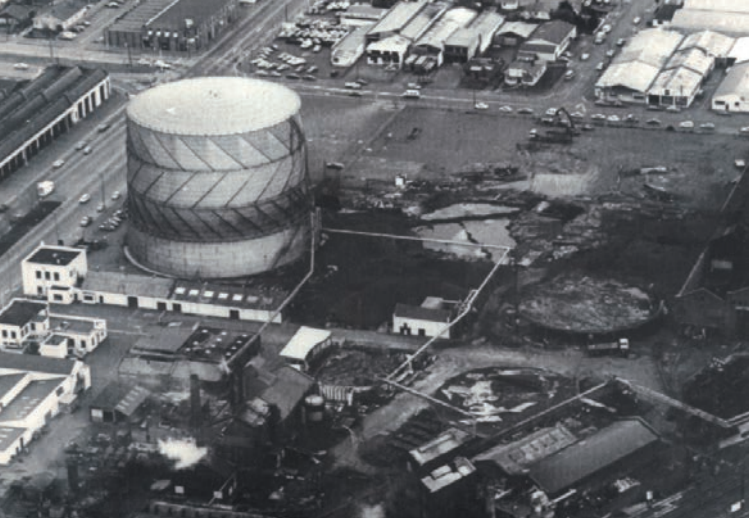
Please refer to the Site Categories and Definitions factsheet for further information.

What does Environment Canterbury do with the information on the LLUR?

The LLUR is available online at www.llur.ecan.govt.nz. We mainly receive enquiries from potential property buyers and environmental consultants or engineers working on sites. An inquirer would typically receive a summary of any information we hold, including the category assigned to the site and a list of any investigation reports.

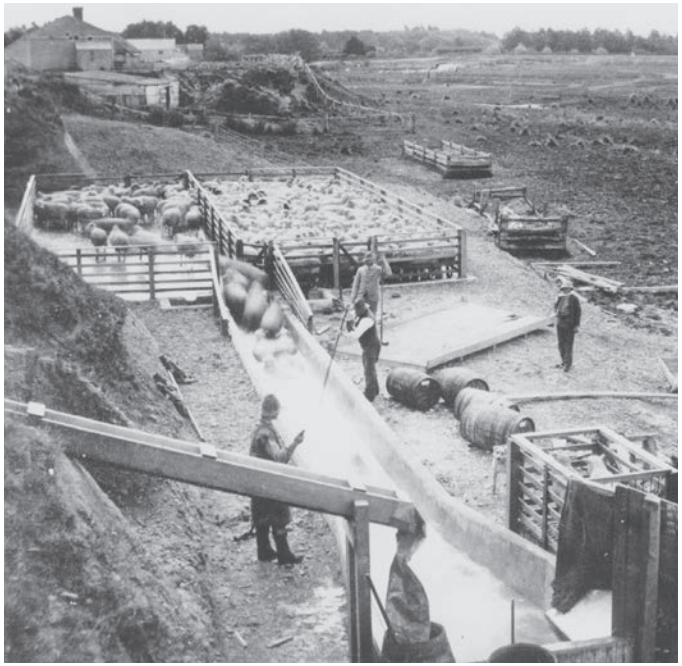
We may also use the information to prioritise sites for further investigation, remediation and management, to aid with planning, and to help assess resource consent applications. These are some of our other responsibilities under the RMA.

If you are conducting an environmental investigation or removing an underground storage tank at your property, you will need to comply with the rules in the Regional Plan and send us a copy of the report. This means we can keep our records accurate and up-to-date, and we can assign your property an appropriate category on the LLUR. To find out more, visit www.ecan.govt.nz/HAIL.



IMPORTANT!

The LLUR is an online database which we are continually updating. A property may not currently be registered on the LLUR, but this does not necessarily mean that it hasn't had a HAIL use in the past.



Sheep dipping (ABOVE) and gas works (TOP) are among the former land uses that have been identified as potentially hazardous. (Photo above by Wheeler & Son in 1987, courtesy of Canterbury Museum.)

My land is on the LLUR – what should I do now?

IMPORTANT! Just because your property has a land use that is deemed hazardous or is on the LLUR, it doesn't necessarily mean it's contaminated. The only way to know if land is contaminated is by carrying out a detailed site investigation, which involves collecting and testing soil samples.

You do not need to do anything if your land is on the LLUR and you have no plans to alter it in any way. It is important that you let a tenant or buyer know your land is on the Listed Land Use Register if you intend to rent or sell your property. If you are not sure what you need to tell the other party, you should seek legal advice.

You may choose to have your property further investigated for your own peace of mind, or because you want to do one of the activities covered by the National Environmental Standard for Assessing and Managing Contaminants in Soil. Your district or city council will provide further information.

If you wish to engage a suitably qualified experienced practitioner to undertake a detailed site investigation, there are criteria for choosing a practitioner on www.ecan.govt.nz/HAIL.

I think my site category is incorrect – how can I change it?

If you have an environmental investigation undertaken at your site, you must send us the report and we will review the LLUR category based on the information you provide. Similarly, if you have information that clearly shows your site has not been associated with HAIL activities (eg. a preliminary site investigation), or if other HAIL activities have occurred which we have not listed, we need to know about it so that our records are accurate.

If we have incorrectly identified that a HAIL activity has occurred at a site, it will be not be removed from the LLUR but categorised as Verified Non-HAIL. This helps us to ensure that the same site is not re-identified in the future.

Contact us

Property owners have the right to look at all the information Environment Canterbury holds about their properties.

It is free to check the information on the LLUR, online at www.llur.ecan.govt.nz.

If you don't have access to the internet, you can enquire about a specific site by phoning us on (03) 353 9007 or toll free on 0800 EC INFO (32 4636) during business hours.

Contact Environment Canterbury:

Email: ecinfo@ecan.govt.nz

Phone:
Calling from Christchurch: (03) 353 9007
Calling from any other area: 0800 EC INFO (32 4636)

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

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www.ecan.govt.nz E13/101

Listed Land Use Register

Site categories and definitions

When Environment Canterbury identifies a Hazardous Activities and Industries List (HAIL) land use, we review the available information and assign the site a category on the Listed Land Use Register. The category is intended to best describe what we know about the land use.

If a site is categorised as **Unverified** it means it has been reported or identified as one that appears on the HAIL, but the land use has not been confirmed with the property owner.

If the land use has been confirmed but analytical information from the collection of samples is not available, and the presence or absence of contamination has therefore not been determined, the site is registered as:

Not investigated:

- A site whose past or present use has been reported and verified as one that appears on the HAIL.
- The site has not been investigated, which might typically include sampling and analysis of site soil, water and/or ambient air, and assessment of the associated analytical data.
- There is insufficient information to characterise any risks to human health or the environment from those activities undertaken on the site. Contamination may have occurred, but should not be assumed to have occurred.

If analytical information from the collection of samples is available, the site can be registered in one of six ways:

At or below background concentrations:

The site has been investigated or remediated. The investigation or post remediation validation results confirm there are no hazardous substances above local background concentrations other than those that occur naturally in the area. The investigation or validation sampling has been sufficiently detailed to characterise the site.

Below guideline values for:

The site has been investigated. Results show that there are hazardous substances present at the site but indicate that any adverse effects or risks to people and/or the environment are considered to be so low as to be acceptable. The site may have been remediated to reduce contamination to this level, and samples taken after remediation confirm this.

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Managed for:

The site has been investigated. Results show that there are hazardous substances present at the site in concentrations that have the potential to cause adverse effects or risks to people and/or the environment. However, those risks are considered managed because:

- the nature of the use of the site prevents human and/or ecological exposure to the risks; and/or
- the land has been altered in some way and/or restrictions have been placed on the way it is used which prevent human and/or ecological exposure to the risks.

Partially investigated:

The site has been partially investigated. Results:

- demonstrate there are hazardous substances present at the site; however, there is insufficient information to quantify any adverse effects or risks to people or the environment; or
- do not adequately verify the presence or absence of contamination associated with all HAIL activities that are and/or have been undertaken on the site.

Significant adverse environmental effects:

The site has been investigated. Results show that sediment, groundwater or surface water contains hazardous substances that:

- have significant adverse effects on the environment; or
- are reasonably likely to have significant adverse effects on the environment.

Contaminated:

The site has been investigated. Results show that the land has a hazardous substance in or on it that:

- has significant adverse effects on human health and/or the environment; and/or
- is reasonably likely to have significant adverse effects on human health and/or the environment.

If a site has been included incorrectly on the Listed Land Use Register as having a HAIL, it will not be removed but will be registered as:

Verified non-HAIL:

Information shows that this site has never been associated with any of the specific activities or industries on the HAIL.

Please contact Environment Canterbury for further information:

(03) 353 9007 or toll free
on 0800 EC INFO (32 4636)
email ecinfo@ecan.govt.nz

Environment Canterbury Regional Council
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E13/102

Annexure 9:

Geotechnical Assessment

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

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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

TABLES:

APPENDICES:

DRAWINGS:

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 m^2. 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) scala 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^{o} (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

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Appendix A

Field Investigation Results

Hand Augered Boreholes

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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
CLAY
SILT
SAND
GRAVEL
COBBLES
BOULDERS
PEAT
FILL

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
MUDSTONE
SANDSTONE
CONGLOMERATE
BRECCIA
RYHOLITE
ANDESITE
BASALT

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

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HAND AUGER LOG

Hole No: H1

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury		01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
0.4	SILT, gravelly (fine to medium, subangular to subrounded), yellowish brown, stiff, moist, non plastic [ALLUVIAL SEDIMENTS]		TS
0.6	EOH: 0.40 m TOO DIFFICULT TO AUGER		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 Values
UTP

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 0mm)
2 4 6 8 10 12 14 16

Groundwater
GWNE

Remarks:

Datum:

Coordinates:

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HAND AUGER LOG

Hole No: H2

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury		01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.2	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
0.4	EOH: 0.30 m TOO DIFFICULT TO AUGER		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 Values

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 0mm)
2 4 6 8 10 12 14 16

Groundwater: GWNE

Remarks:

Datum:

Coordinates:

Fraser Thomas
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HAND AUGER LOG

Hole No: H3

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury		01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
0.3	EOH: 0.30 m TOO DIFFICULT TO AUGER		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 Values

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 0mm)
2 4 6 8 10 12 14 16

Groundwater: GW/NE

Remarks:

Datum:

Coordinates:

Fraser Thomas
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HAND AUGER LOG

Hole No: H4

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury	2512	01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	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]		
0.4	EOH: 0.40 m TOO DIFFICULT TO AUGER		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 Values
84

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 0mm)
2 4 6 8 10 12 14 16

Groundwater: GWNE

Remarks:

Datum:

Coordinates:

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HAND AUGER LOG

Hole No: H5

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury		01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
0.3	EOH: 0.30 m TOO DIFFICULT TO AUGER		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 Values

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 0mm)
2 4 6 8 10 12 14 16

Groundwater: GW/NE

Remarks:

Datum:

Coordinates:

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HAND AUGER LOG

Hole No: H6

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury		01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.2	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
0.4	EOH: 0.30 m TOO DIFFICULT TO AUGER		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 Values

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 0mm)
2 4 6 8 10 12 14 16

Groundwater: GW/NE

Remarks:

Datum:

Coordinates:

Machine Excavated Test Pits

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HAND AUGER LOG

Hole No: TP1

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury	2512	01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	
0.3	0.3 m: becomes gravelly		
0.6	SILT, some sand (fine), trace gravel (fine, subangular), yellowish brown, hard, moist [ALLUVIAL SEDIMENTS]	River Alluvium	
0.9	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), trace cobbles, greyish brown, very dense, moist		
2.5	2.5 m - 2.7 m: Colour change to light grey, less fines		
2.9	EOH: 2.90 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200

Values: UTP

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 50mm)
2 4 6 8 10 12 14 16

Groundwater: GWNE

Remarks:

Datum:

Coordinates:

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HAND AUGER LOG

Hole No: TP2

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury	2512	01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
0.2	SILT, gravelly (fine, subangular), minor sand (fine), yellowish brown, hard, moist, low plasticity [ALLUVIAL SEDIMENTS]	River Alluvium	
0.6	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), minor cobbles, trace boulders, greyish brown, very dense, moist		
2.2	2.2 m - 2.4 m: Lense of GRAVEL (fine to medium), light grey, wet		
2.7	EOH: 2.70 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 Values
UTP

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 50mm)
2 4 6 8 10 12 14 16
1 1 1 2 2 3 6 11 18

Groundwater: GWNE

Remarks:

Datum:

Coordinates:

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HAND AUGER LOG

Hole No: TP3

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury	2512	01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
0.4	SILT, gravelly (fine to medium, subangular to subrounded), minor sand (fine), yellowish brown, hard, moist, low plasticity [ALLUVIAL SEDIMENTS]	River Alluvium	
0.6	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), trace cobbles, trace boulders, greyish brown, very dense, moist		
2.3	2.3 m - 2.5 m: Lense of GRAVEL (fine to medium), grey, wet		
3.0	EOH: 3.10 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 Values
UTP

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 50mm)
2 4 6 8 10 12 14 16
1 1 1 2 2 2 6 15 20 >>

Groundwater
GWNE

Remarks:

Datum:

Coordinates:

Generated with CORE-GS by Geroc - Hand Auger MASTER - 9/09/2019 8:59:29 AM

Fraser Thomas
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HAND AUGER LOG

Hole No: TP4

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury		01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	
0.2	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		
1.8	EOH: 1.80 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 Values

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 50mm)
2 4 6 8 10 12 14 16

Depth (m) 0.0 0.2 0.4 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

Groundwater: GWNE

Remarks:

Datum:

Coordinates:

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HAND AUGER LOG

Hole No: TP5

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury	2512	01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
0.4	SILT, gravelly (fine to medium, subangular to subrounded), minor sand (fine), yellowish brown, stiff, moist, non plastic [ALLUVIAL	River Alluvium	
0.6	GRAVEL (fine to medium, subrounded, greywacke), silty, yellowish brown, very dense, moist		
1.0	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), trace cobbles, greyish brown, very dense, moist		
2.6	EOH: 2.80 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 — Values: 98

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 50mm)
2 4 6 8 10 12 14 16

Depth (m)	Blows / 50mm
0.0–0.2	1, 1, 1, 2
0.2–0.4	5, 7, 7
0.4–0.6	15, 11, 15, 15

Groundwater: GWNE

Remarks:

Datum:

Coordinates:

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HAND AUGER LOG

Hole No: TP6

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury	2512	01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
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, trace rootlets [ALLUVIAL SEDIMENTS]	River Alluvium	
0.6	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), greyish brown, very dense, moist		
1.0	EOH: 1.90 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200

Values: UTP

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 50mm)
2 4 6 8 10 12 14 16

Depth (m): 0.2, 0.4, 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

Groundwater: GWNE

Remarks:

Datum:

Coordinates:

Fraser Thomas
50 Years
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HAND AUGER LOG

Hole No: TP7

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury	2512	01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0 – 0.4	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
0.4 – 0.7	SILT, gravelly (fine to medium, subangular to subrounded), minor sand (fine), yellowish brown, very stiff, moist, non plastic [ALLUVIAL SEDIMENTS]	River Alluvium	
0.7 – 1.7	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), minor cobbles, greyish brown, very dense, moist	River Alluvium	
1.7	EOH: 1.70 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200

Values
196
112

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 50mm)
2 4 6 8 10 12 14 16

Groundwater: GWNE

Remarks:

Datum:

Coordinates:

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HAND AUGER LOG

Hole No: TP8

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury		01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
0.4	SILT, gravelly (fine to medium, subangular to subrounded), yellowish brown, hard, moist, non plastic [ALLUVIAL SEDIMENTS]	River Alluvium	
0.6	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), trace cobbles, greyish brown, dense to very dense, moist		
2.2	EOH: 2.30 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 Values

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 50mm)
2 4 6 8 10 12 14 16

Depth (m)	Dynamic Cone Penetrometer (Blows / 50mm)
0.2	1
0.4	2
0.6	3
0.8	6
1.0	7
1.2	8
1.4	9
1.6	15

Groundwater: GW/NE

Remarks:

Datum:

Coordinates:

Fraser Thomas
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HAND AUGER LOG

Hole No: TP9

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury	2512	01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
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		
1.6	EOH: 1.70 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200

Values
98
UTP

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 50mm)
2 4 6 8 10 12 14 16

Depth (m): 0.2, 0.4, 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

Dynamic cone blows (Blows / 50mm): 1, 1, 1, 1, 2, 2, 3, 15, 15

Groundwater: GWNE

Remarks:

Datum:

Coordinates:

Fraser Thomas
ENGINEERS • RESOURCE MANAGERS • SURVEYORS

HAND AUGER LOG

Hole No: TP10

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury		01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
0.4	SILT, gravelly (fine to medium, subangular to subrounded), minor sand (fine), yellowish brown, moist, non plastic [ALLUVIUAL SEDIMENTS]	River Alluvium	
0.6	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), trace cobbles, greyish brown, very dense, moist		
2.0	EOH: 2.10 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 Values

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 50mm)
2 4 6 8 10 12 14 16

Depth (m) 0.0 0.2 0.4 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

Groundwater: GWNE

Remarks:

Datum:

Coordinates:

Fraser Thomas
ENGINEERS • RESOURCE MANAGERS • SURVEYORS

HAND AUGER LOG

Hole No: TP11

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury		01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	
0.4	GRAVEL (fine to medium, subangular to subrounded), silty, yellowish brown, medium dense to dense, moist [ALLUVIUAL SEDIMENTS]	River Alluvium	
0.8	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), trace cobbles, greyish brown, very dense, moist		
2.0	EOH: 2.10 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200 Values

Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 50mm)
2 4 6 8 10 12 14 16

Depth (m)	Blows / 50mm
0.0 – 0.2	1, 1, 1, 1
0.2 – 0.4	2, 2
0.4 – 0.6	3, 3
0.6 – 0.8	4
0.8 – 1.0	11
1.0 – 2.0	15

Groundwater: GWNE

Remarks:

Datum:

Coordinates:

Fraser Thomas
ENGINEERS • RESOURCE MANAGERS • SURVEYORS

HAND AUGER LOG

Hole No: TP12

Project No:	Project:	Shear Vane:	Date Drilled:	Logged By:	Checked By:
CH00114	Mervyn Todd Kimberley Road, Darfield, Canterbury	2512	01/08/2019	KT	

Depth (m)	Description of Strata	Geological Unit	Graphic Log
0.0 – 0.2	SILT, some gravel, dark brown, moist, rootlets [TOPSOIL]	T/S	TS
0.2 – 0.7	SILT, some gravel (fine to medium, subangular to subrounded), yellowish brown, stiff to very stiff, moist, non plastic [ALLUVIAL SEDIMENTS]	River Alluvium	
0.7 – 2.0	GRAVEL (fine to coarse, subrounded, greywacke), sandy (fine to coarse), trace cobbles, greyish brown, moist	River Alluvium	
2.0	EOH: 2.00 m TARGET DEPTH		

Undrained Shear Strength (kPa)
Vane readings corrected as per BS 1377
● Shear Vane ○ Residual Shear Vane
50 100 150 200

Depth (m)	Values
0.4	84
0.6	112

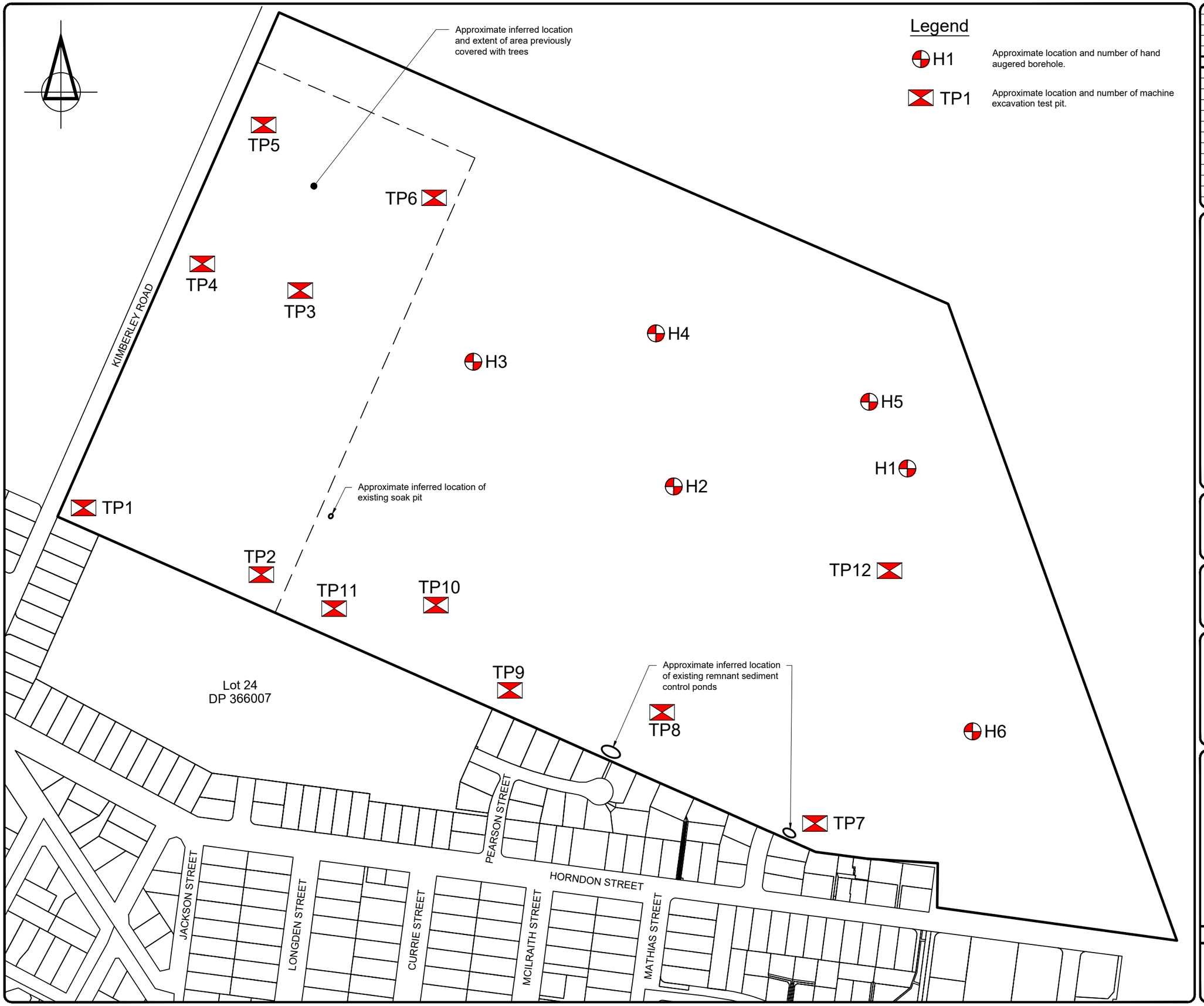
Dynamic Cone Penetrometer
Test Method: NZS 4402:1988, Test 6.5.2
(Blows / 50mm)
2 4 6 8 10 12 14 16

Groundwater: GWNE

Remarks:

Datum:

Coordinates:



SURVEYED			APPROVED DATE
DESIGNED			MVR
DRAWN	KT	08/07/19	
CAD	G SINGH	10/07/19	
CHECKED			

REVISION	CHANGES	CHECKED	DATE

NOTES

1. This plan has been adopted from Quick map. The location and extent of the site boundaries and site features are therefore considered to be approximate only.

CLIENT

MR MERVYN TODD

PROJECT

KIMBERLEY ROAD
DARFIELD

TITLE

SITE PLAN

Fraser Thomas
ENGINEERS ● RESOURCE MANAGERS ● SURVEYORS
21 EL KOBAR DRIVE, HIGHBROOK
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SCALE 1:4000 (A3)

DRAWING No G00114-01 REVISION A

SHEET 1 of 1

Annexure 10:

Consultation Record

Meeting re ECAN feedback on Proposed Wastewater Servicing, Darfield Plan Change (Kimberley Road)

Date: 4th November 2019
Time: 3pm
Location: ECAN offices

ATTENDEES

For Applicant

Fiona Aston (FA, Planner – Aston Consultants)	Merv Todd (MT, Applicant)
Rob Potts (RP, Wastewater engineer – Lowe Environmental)	

For ECAN

Paul Hopwood (PH, Principal Consents Advisor - ECAN)	Susan Aitken (SA, Senior Consents Planner - ECAN)
Kate Whiting (KW, Consents Planner – ECAN)	Maureen Whalen (MW, Groundwater Scientist – ECAN)
Sam Leonard (Planner – ECAN)	

1. Introduction

RP introduced the wastewater treatment options and confirmed that the applicant intends to proceed with Option 3 – a community wastewater treatment and land treatment scheme (WWT & LT scheme) on adjoining land, utilising subsurface drip irrigation and cut and carry Lucerne/pasture. We have met with Selwyn District Council (SDC) and they are 'happy'. Also met with Canterbury District Health Board (CDHB) & they are 'ecstatic' (!) and will provide a letter in support. The proposed residential development will connect to the SDC scheme if/when this is available. The WWT & LT scheme can be salvaged and re-used elsewhere.

2. Environmental effects including nitrogen losses & L&W Plan standards

RP – the WWT & LT scheme meets the nitrogen loss target limits of Table 11(i) of the Land and Water Plan as below. It is possible to increase the land area for land treatment but noting that subsurface drip irrigation costs $50,000/ha to install. The max permitted leaching of nitrogen per year to Te Waihora is 62t. Current level is 38t (as report in s32 report for Change 6). The proposed WWT & LT scheme will add approximately 0.25 – 0.3 t.

SA – what will be the additional impact on the baseline values i.e. existing wells? Need to provide a map of current onsite systems & bores. There are high numbers up and down gradient.

Table 11(i): Sub-region Target Limits for Nitrogen Losses from Farming Activities, Community Sewerage Systems and Industrial or Trade Processes

Sub-region	Activity	Nitrogen Load (tonnes/year)	Limit/Target
Selwyn Te Waihora	Farming	4830(1)(2)	Target to be met by no later than 2037
	Community sewerage systems	62	Limit
	Industrial or trade processes	152.4	Limit

*By the National Policy Statement for Freshwater Management 2014 a target is a limit to be met within a defined timeframe.

(1) This limit/target includes the nitrogen lost from any Irrigation Scheme provided for in Table 11(j)

(2) Despite note (1), the Irrigation Scheme Nitrogen Limits in Table 11(j) have been calculated on a different basis to the limits/targets included in Table 11(i).

RP – it's not feasible to estimate the impact on individual wells. Can only provide a mass balance estimate.
PH – what are the expectations of the L&W Plan? Permitted baseline for period 2009-2013 is 'grandparented' and is to be gradually reduced by 2025 to 15 kg N/ha/yr.
PH – approval term likely to be 15 years
RP – we will request 25 year consent. SDC scheme for Darfield isn't in the SDC Long Term Plan so earliest it could be available is 2034. We will consult with iwi.
PH – are there any community supply bores nearby?
RP – closest is appx 2 1/2 km away.
PH – can the package plant function if development happens over time?
RP – the proposed recirculating textile packed bed reactor is more robust than other systems in handling this situation. The Aged Care Facility (ACF) will be developed at an early stage, for up to 110 residents.
MW – there could be local variations in the permeability of soils. How will this be addressed in AEE?
RP – drip irrigation will be 200ml below surface with light cultivation on top. There is generally appx 400ml top soil, then gravels. We can look at layering in bore logs as part of the groundwater assessment.
SA – we need to know what is happening in the environment now – where are the bores and where are the sensitive environments? What will the impact be? Potentially it could be better compared with previous uses. We would like to review a draft of the application.

3. Composition of effluent

MW – will there be any medicines in the effluent? (associated with ACF). Could there be drugs which would potentially kill WTTP bacteria? Effluent from residents on drugs could be excluded. Need to evaluate effluent for pathogens
RP – the AEE will address this.

4. Monitoring

RP – we aren't promoting monitoring of bores as it's a big cost.
MW – how will you monitor actual effects?
RP – Monitoring wouldn't happen if it was individual on-site systems. Groundwater is very deep and identifying a plume from this plant would be difficult. We will monitor the cut and carry harvest material. What's exported from site and the loading from the plant itself. We don't need to worry about phosphorus as it's not very mobile and a large distance to groundwater.

5. Maintenance

RP – SDC aren't keen to manage or take over the WWTP & LT scheme. It will be managed by a body corporate. LEI are involved with an example at Jacks Point Otago. The body corporate contract out the WWTP & LT operation and cut and carry monitoring & clean out the on site STEP systems.

SA – we need to ensure a responsible body can maintain the WWT & LT system.
RP – a proposed consent condition could be the requirement for an Operations & Maintenance Plan which requires Council certification 3-6 months after the consent is granted. This will be included as a requirement in the Design and Build tenders.
PH – we want to avoid need for applications for future changes to the system. Establish known parameters now. Anticipate requirements of the 3 Waters Review and be consistent with what's coming.
RP – there is still uncertainty regarding the 3 Waters Review. I'm concerned regarding a potential 'one size fits all' approach.

6. Air Discharge

RP – AEE will have section on effects on air. The drip irrigation is underground so no effects.

7. Planning/notification

SL – a reticulated WWT&LT system is a better 'fit' with the Canterbury Regional Policy Scheme (CRPS) but is not an explicit requirement. See Chapter 5.
PH – there would appear to be a good case here for non notification.

8. Contact Point

SA is ECAN primary contact point for the application. Works Monday-Wednesday inclusive.
SA will look at rules for discharge, land use and air and get back to RP.

Meeting with CDHB on Proposed Plan Change at Darfield

Date: 30th October 2019
Time: 2.30pm
Location: CDHB offices

ATTENDEES

For Applicant

Fiona Aston (Planner – Aston Consultants)	Merv Todd (Applicant)
Robert Potts (Lowe Environmental Impact)	

For CDHB

Alastair Humphrey (CDHB CEO)	Matt Willoughby (Health Protection Officer – CDHB)

1. Draft wastewater report

RP briefly summarized the draft Lowe Wastewater Report including 3 alternative treatment and disposal options. Option 3 is the preferred option, principally because it is considered to be the most readily consentable option (noting however that all options should be consentable).

Option 4 (reticulation to SDC site) could become the nucleus for a township wide scheme. However, costings not ideal for client (an extra $260k, including estimated $50k for pipe across SH) + staging is not ideal. Pipes would be underutilized in short term and there would be potential septicity issues and couldn't achieve flushing flows.

Under Option 3, the package plant would become redundant if and when a Council reticulated system becomes available at Darfield.

The plant will be 'design and build'. There will be a small on site component – grinder or STEP tank or similar. This will be maintained by owners but there will be a body corporate. Similar to management approach taken for Jacks Point, Queenstown. Individual owners pay management fee for management of the plant and treatment area.

2. CDHB feedback

6 or 8 community package plants at Darfield are better than further onsite septic tanks. We support Option 3 – "it's a start". There is a nitrogen plume at Darfield. CDHB have been talking to SDC about a reticulated system at Darfield for 15 years. CDHB will provide letter of support and affected party approval for wastewater discharge consent application based on Option 3.

Meeting with SDC on Proposed Plan Change at Darfield

Date: 30th October 2019
Time: 9am
Location: SDC offices

ATTENDEES

For Applicant

Fiona Aston (Planner – Aston Consultants)	Merv Todd (Applicant)
Rob Potts (Lowe Environmental Impact)	

For SDC

Murray England (Assets Manager Infrastructure)	Ben Rhodes (Team Leader Strategy & Policy)
Robert Love (Strategy & Policy Planner)	

1. Draft wastewater report

RP briefly summarized the draft Lowe Wastewater Report including 3 alternative treatment and disposal options. Option 3 is the preferred option, principally because it is considered to be the most readily consentable option (noting however that all options should be consentable).

Option 4 (reticulation to SDC site) could become the nucleus for a township wide scheme. However, costings not ideal for client (an extra $260k, including estimated $50k for pipe across SH) + staging is not ideal. Pipes would be underutilized in short term and there would be potential septicity issues and couldn't achieve flushing flows.

Under Option 3, the package plant would become redundant if and when a Council reticulated system becomes available at Darfield. The plant is salvageable and can be used elsewhere e.g. Selwyn Huts and the drip irrigation could be used for farm irrigation.

We are seeking SDC feedback on the preferred option and management options for the package plant and treatment plant. Could be managed by a body corporate, SDC take over, or rated separately and SDC have contract with contractors (as happens at Rotorua - $130 annual wastewater rate). Suggest if SDC doesn't manage, then SDC can take over management at the boundary with a boundary kit included in design.

2. SDC requirements and feedback

BR – for plan change application, just need to know there is a viable option(s). A rule in the plan change should specify that a reticulated system is required to service the development area.

ME – don't want 3 or 4 community package plants around Darfield. However, risk of this seems low. All options are fine and should work. SDC doesn't want to take over management of the package plant. There is a community package plant at Claremont Templeton (rural residential subdivision) which SDC now manages. Will send information re design etc to RP. There shouldn't be any infiltration issues at Darfield.

SDC already has a district wide wastewater rate - $63 per year, for all ratepayers.

Wastewater matter will be an early discussion point for the new council (recently elected).

3. Planning

BR – SDC may not support the proposed Future Urban Zone. Legal advice is that for deferred zones, there needs to be a mechanism and timeline for removal of deferred status. There is no confirmed timeline for township wide reticulation – not in LTP. A possible alternative could be a 'development area' overlay.

Re NPS-Highly Productive Land – SDC has submitted seeking policies re HPL exclude areas identified for urban development in strategic plans.

Zoning could be L1 or Low Density Residential. DPReview must comply with the national planning standards but otherwise have 5 years to comply from date of gazettal of standards. L1 Darfield zone has minimum average lot size 650m^2 whereas proposed DPR Low Density Residential will have minimium average 750m^2. Retirement villages will be restricted discretionary. Prefer L1 not LX.

NPS – Urban Development Capacity. Need to include assessment of overall supply and demand for residential sections at Darfield. There is a lot of zoned land at Darfield but most of it is lower density (rural residential) and land banked with small number of larger landowners. Need to establish that there isn't an oversupply. + need to establish that the proposed development area is feasible development as defined in the NPS-UDC.

Action Points

1. ME – to supply information regarding the design and operation of the Claremont package plant and other design information for systems at Manse Road Leeston and Prebbleton.
2. MT – to supply copy of Colliers report assessing and confirming demand for ACF at Darfield (to include with plan change application)
3. MT – to obtain written advice from local real estate agent confirming demand for small lot residential sections (430-550m^2 size range) and low density residential sections (average lot sizes not less than 650m^2).
4. FA – to follow up with Survus re development feasibility (development costs per lot & development contributions + wastewater servicing costs as per Lowe report).

Meeting with ECAN. CDHB & SDC on Proposed Plan Change at Darfield

Date: 27th September 2019
Time: 9am
Location: ECAN offices

ATTENDEES

For Applicant

Fiona Aston (Planner – Aston Consultants)	Merv Todd (Applicant)
Chris Kortegast (Engineer – Waterbased)	Craig Hurford (Surveyor – Survus)

For ECAN

Catherine DeGraaff (Team Leader, Plannng – ECAN)

For SDC

Murray England (Assets Manager – SDC)

For CDHB

Helen Graham (Team Leader, Health Protection Officer – CDHB)	Matt Willoughby (Health Protection Officer - CDHB

1. Introduction

FA introduced the objective of the meeting – to obtain initial CDHB feedback on proposed Plan Change at Darfield and have a 'round table' discussion of proposal with ECAN, SDC and CDHB representatives, in particular regarding wastewater servicing options (given that Darfield does not have reticulated wastewater). Included initial introduction of location of site, proposed development (ie rezone to Living X but with some medium density lots and inclusion of a retirement village).

2. Onsite wastewater discharge to land - applicant

CK introduced the proposed system option as being an advanced on site wastewater treatment system to sand bed with enhanced treatment A dripline application system would not be an option as CK had concerns over longevity and robustness of system.

For 400m^2 lots, a 20m^2 disposal area would be required, so this is feasible. CK noted that there can be maintenance issues with onsite systems.

CK considered it would be costly and inefficient to require lot owners to install on site systems ($25 - $30 000 each) and then retire these and pay to connect to the Council's reticulated system if and when it became available.

CK note that the Ascot Park Darfield subdivision for 171 lots had been reconsented in 2017 with on site wastewater systems with a total nitrate discharge rate of 30 mg/day (it was originally consented at 15 mg/day but these levels were hard to achieve given available systems).

FA - Darfield Area 7 is held be two landowners. The retirement village and residential development of the balance of the Todd land (appx 110 lots) is the priority and the balance residential development (a further appx 400 lots) is unlikely to be developed in the short – medium term i.e. next 5-10 years. The Reed family own surrounding farmland and are seeking to regain residential zoning of Area 7. The land was zoned Living X in the 1995 SD Plan but rezoned Rural Outer Plains by way of submission from Selwyn Plantation Board (the land now owned by Mervin Todd was at that time a small forestry block, since felled). The Reeds were not aware of and did not support the Rural rezoning.

FA – suggested a possible Future Urban Zone for the balance Reed land (400 lots) may be an option which could be explored.

CK – a community package plant (ME estimates as $15 - $20 million) for Area 7 only is not a realistic option given that 4/5th of the land is unlikely to be developed in the short-medium term i.e. the cost recovery will be very slow and uncertain and a bank will not lend on this basis.

3. SDC Feedback

ME – Stantec is currently investigating whether there is a business case for reticulated wastewater at Darfield. They have had around 500 responses to a ratepayer survey, with a roughly 50:50 split (if take out owners of multiple lots) between ratepayers favouring reticulation and those opposing it. Generally the older generation are less in favour. The final report will be available in appx December 2019.

SDC own land at Telegraph Road which could be developed for a Darfield wastewater treatment and disposal area. This would be a standalone system for Darfield only. The oxidation pond would be appx 300m from the nearest residential zone boundary. There is a 10 year lease on this land for farming but the lease term can be changed if the land is needed sooner for wastewater management purposes.

There are numerous existing reports on wastewater issues for Darfield. General findings are that on site disposal is not having a noticeable effect on groundwater. The levels of nitrate leaching are no worse than from the surrounding agricultural land. So – it is difficult to definitively prove an adverse effect resulting from onsite systems at Darfield where distance to groundwater is 60-70m. This is different to the situation at West Melton (distance to GW 30m and has fluctuated and been higher + location is just outside the aquifer recharge zone for Christchurch's drinking water) and Rolleston (distance to GW appx 15m).

If SDC did decide to reticulate tomorrow (which seems unlikely), it would be 3-5 years before connections would be available (allowing for design and consenting requirements).

If a package plant was proposed for Area 7, the area set aside for this could be changed to use as a pumping station when reticulated services were available.

4. ECAN feedback

CdG suggested applicant request that the discharge consent application be notified. This would allow for a fair and robust process. ECAN would consult with runanga, Selwyn District Council, CDHB and DoC and Forest and Bird regarding the application.

CdG noted that the responsibility for maintaining onsite wastewater systems was with the consent holder. Consent conditions ensured appropriate monitoring for newly consented systems including requirement for a maintenance and servicing scheme. Maintenance issues were more of an issue for older 'historical' on site systems.

5. CDHB feedback

HG – CDHB prefer reticulation at Darfield. It would oppose onsite systems for Area 7. Onsite systems were not designed for smaller sections. The Ministry of Health advocates and promotes reticulated systems on public health grounds – to reduce the risk of adverse health effects. Wants to avoid another Havelock North scenario where the public drinking water supply was contaminated. The question is 'what is the tipping point' for potential for adverse health effects. The proposed subdivision for appx 550 lots is a significant one in the context of Darfield[1]with a current population of around 3000. CDHB is concerned about the cumulative effect of additional onsite systems.

CDHB opposes further onsite systems for Darfield with or without Area 7.

[1] Note – 2015 Darfield population 2,909 people (1,039 households), with this population projected to grow to a 2031 population of 4,141 people (1,479 households) – Darfield Area Plan 2031

Meeting re SDC feedback on Proposed Plan Change at Darfield

Date: 14th August 2019
Time: 10:00am
Location: SDC offices

ATTENDEES

For Applicant

Liz Stewart (LS) (Planner – Aston Consultants)	Merv Todd (Applicant)
Chris Kortegast (Engineer – Waterbased)	Craig Hurford (Surveyor – Survus)

For SDC

Robert Love (Strategy and Policy Planner – SDC)	Andrew Mazey (Asset Manger, Transportation – SDC)
Ben Rhodes (Team leader Strategy and Planning – SDC)	Murray England (Asset Manager, Water Services – SDC)
Mark Rykers (Asset Manager, Green Space – SDC)	

1. Introduction

LS introduced the objective of the meeting – to obtain initial SDC feedback on proposed Plan Change at Darfield. Included initial introduction of location of site, proposed development (ie rezone to Living X but with some medium density lots and inclusion of a retirement village).

2. Retirement Village

LS introduced the concept of a permitted activity status for the proposed retirement village. BR stated that SDC is currently looking at introducing a Restricted Discretionary ('RDA') status for retirement villages in the revised District Plan. It was noted that the RDA assessment matters have yet to be finalized.

3. Lot Layout

LS referred to the proposed preliminary subdivision concept plan (**Appendix A**). RL after receiving guidance from Gabi Wolfer (GW) commented as follows:

- General concern over the number of rear lots proposed;
- Reserves should be located at 'T' intersections in order to connect them with roads;
- Proposed medium density lots should be located proximate the reserves;

- Lots to the north of the site adjacent to the Rural Outer Plains Zone should have a transitional lot size.

4. Road Access and Connectivity

AM advised that in moving forward with the ODP we would need to indicate principal and secondary access roads. In addition, AM commented as follows:

- Proposed road access to the SW of the site (onto Kimberley Road and as owned by SDC) should be changed to cycle/pedestrian link;
- The ODP should include an indicative future road link to the Rural Outer Plains zoned land to the north;
- Two pedestrian connections onto Kimberley Road recommended. One via the existing Council owned land (currently shown as a road to the SW) and one further to the north of the Site.
- The road frontage along Kimberley Road would need to be upgraded;
- Provide a pedestrian/cycle link to land to the east. Pedestrian/cycle links should be between 5-6m wide).

5. Servicing

Wastewater

ME advised that Stantec is currently tasked with investigating reasons for and against reticulation in Darfield. The results of this study are due to be released early - mid December. LS questioned if it would be of benefit to advise Stantec of the proposed Plan Change.

ME advised that Darfield is struggling with septic tanks. If development becomes more intensified within Darfield, then reticulation would be the best option. ME advised that the proposed Plan Change site may be the catalyst for reticulation in Darfield. ME also noted that the respective cost for reticulation vs septic tanks are generally equivalent to one another.

ME noted that Canterbury wide, there is an issue with the level of nitrates and this is not just restricted to Darfield. ME advised that SDC is amenable to working alongside us in respect of providing reticulated services to Darfield. SDC is currently investigating a low pressure system in Darfield. The Long Term Plan (LTP) states that Darfield wastewater will not be addressed until 2021.

BR advised that the cost of the development and potential use of septic tanks needs to be considered in terms of growth and feasibility (refer to NPS – UDC).

Water

ME advised that water is not an issue for Darfield. Darfield may however need to increase the size of the existing pipe network. ME also advised that restricted connections may be required for the larger lots to the east of the ODP.

ME noted that there may be a water race to the east of the site that needs to be investigated?

Stormwater

Stormwater will be to ground.

6. Density and zoning

BR advised that future zoning should follow the format of the National Planning Standards.

7. Reserve Requirements

MR noted:

- The reserve standard is 1.2 hectares of reserve per 1000 population. The conversion rate is 2.7 people per lot.
- Reserves need to be located within easy walking distance (appx 500 – 600m).
- 2000m^2 is the standard size for reserves. Any smaller than this is considered to be too small by SDC standards;
- Medium density lots should be located proximate the reserve/greenspaces.

MR questioned if there were any landscape features worthy of retention? MT advised that there were no existing landscaping features that needed preserving.

8. ODP Requirements

BR indicated that he was keen for the ODP to show the location of proposed medium density lots.

With respect to the interface with land to the east (ie Darfield Area 8 – Business Development in Malvern Area Plan), BR advised that it will be zoned on a first in first served basis. At present Area 8 is zoned Rural Outer Plains and potentially marked for business development (Malvern Area Plan). Proposed Plan change should acknowledge this.

BR advised that the private Plan Change should be lodged prior to April 2020 (ie before the District Plan Review). Lodgement post April would result in a submission to the District Plan Review. SDC however need legal advice on this matter.

3. ACTION POINTS

Table of actions generated from meeting are as follows:

Action 1: LS to forward copy of meeting minutes from SDC to ECAN and vice versa
Action 2: LS to set up a consultation meeting with SDC, ECAN and CDHB

Post meeting conversation:

26th August LS had a post meeting conversation with Jocelyn Lewis in respect of items (2) and (6) above. These can be summarized as follows:

Retirement village

JL advised that the Restricted Discretionary matters for retirement villages are still in the process of being finalized. However, as a general overview, JL noted that the RD matters will be centered around urban design and onsite layout, external appearance and provision of utility spaces (ie collective bin storage and carparking), effects on nearby resident, on site amenity, fencing and boundary treatment.

Density and zoning

JL advised that the NPS allocates six zones for residential use. In accordance with the NPS, Darfield would be zoned 'low density' residential zone. Notwithstanding, within the zone structure, the 'low density' zone would provide for higher density housing such as retirement villages. The proposed 'low density' zone if only intended as a zone description and not intended to restrict all development within the zone. Opportunities for more intensive zoning will exist.

Appendix A

Draft Scheme 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 430m²)
- ROAD TO VEST
- REC RESERVE TO VEST
- AGED CARE FACILITY

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

PROJECT

KIMBERLEY AND BROADMEADOWS DRIVE, DARFIELD

CLIENT

MERF AGRICULTURAL SERVICES

SURVUS CONSULTANTS
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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	B

Meeting re ECAN feedback on Proposed Plan Change at Darfield

Date: 8th August 2019
Time: 11:30am
Location: ECAN offices

ATTENDEES

For Applicant

Liz Stewart (LS) (Planner – Aston Consultants)	Merv Todd (Applicant)
Chris Kortegast (Engineer – Waterbased)	

For ECAN

Catherine DeGraaff (Team Leader - planning– ECAN)	Jessica Steel (Wastewater planner – ECAN)
Kate Whiting (Consents Planner – ECAN)	

1. Introduction

LS introduced the objective of the meeting – to obtain initial ECAN feedback on proposed Plan Change at Darfield. Included initial introduction of location of site, proposed development (ie rezone to Living X but with some medium density lots and inclusion of a retirement village).

2. Onsite wastewater discharge to land

CK introduced the proposed system option as being an advanced wastewater treatment system to sand bed, enhanced treatment and robustness on site sites. A dripline application system would not be an option as CK had concerns over longevity and robustness of system.

JS - ECAN has concerns generally about Darfield and the general decline in water quality. While it was noted that the water depths are deep (in excess of 70m), ECAN had concerns over cumulative impacts on water quality and nitrate concentrations.

CK - recent data has indicated that there has been a decline in the nitrogen levels in Darfield.

JS - ECAN's preference is for wastewater reticulation or for an onsite treatment plant. CK noted that the latter would result in the same amount of wastewater and it's the quality of discharge that is of relevance, namely total nitrogen (TN) levels, and ultimately nitrate levels in groundwater.

JS - ECAN could not eliminate the potential for public notification of the proposal. The applicant would need to put forward a strong argument, including a robust assessment of cumulative effects of nitrates. Early consultation with CDHB and relevant runanga is recommended. CDHB has a strong interest in all development within Darfield. It may be beneficial to have a team meeting with SDC, ECAN and CDHB to discuss the proposal when more investigation has been undertaken.

JS wasn't sure if the wastewater consent should be pre or post the Plan Change process. ECAN would also consider the positive attributes of the proposal in considering whether to grant or decline the proposal. JS also questioned whether we had undertaken a cost/benefit analysis of reticulation vs onsite treatment?

CK - would it be possible to do a partial development (ie retirement village separate from residential etc)? JS noted that it was possible, as there was no guarantee that the whole proposal would go ahead given cumulative nitrate effects are the principal concern. LS questioned the feasibility of this approach at the Plan Change stage. Would be possible at subdivision stage, but SDC Council may have issues with this?

ECAN concluded by stating that they could not guarantee an outcome/pathway for on site systems and that their preference is for reticulation. ECAN interested in recommendations made by SDC and need for a further meeting with SDC, ECAN and CDHB.

3. ACTION POINTS

Table of actions generated from meeting are as follows:

Action 1: LS to forward copy of meeting minutes from SDC to ECAN and vice versa

Appendix A

Draft Scheme 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 430m²)
- ROAD TO VEST
- REC RESERVE TO VEST
- AGED CARE FACILITY

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

PROJECT

KIMBERLEY AND BROADMEADOWS DRIVE, DARFIELD

CLIENT

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