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Stantec | Darfield Deferred Residential Rezoning Integrated Transport Assessment | 31 July 2019

## **Executive Summary**

#### Introduction

As part of the Selwyn District Plan review, it is proposed to lift the deferred status on approximately 380ha of residential zoned land in Darfield (the study area). Based on the mix of Living X and Living 2A zoning under the Operative Plan, approximately 1,100 residential lots could be developed across the study area. With the lifting of the deferred status over the study area as part of the District Plan Review the Living X and Living 2A areas would be zoned Low density residential and Large lot residential zones respectively.

It is understood the study area was previously deferred until water supply issues were resolved and Outline Development Plans (ODPs) were developed.

The water supply issues have now been resolved and this report assesses the transportation matters that any proposed ODPs would need to address. The deferred zonings confirm that the areas have already been identified as being appropriate for residential development. Accordingly, the focus of this assessment is on recommended ODP provisions and surrounding transport infrastructure upgrades rather than assessing wider traffic effects. It has still been necessary to consider potential traffic generation of the study area to ensure a full understanding of how it will integrate with and impact the transport network.

#### **ODP Recommendations**

Recommendations on the ODPs have been made, mostly related to primary road connections through the areas and primary road intersection locations on frontage roads. Generally, it is considered primary local roads from the study areas will be able to meet the frontage roads at T-intersections separated from adjacent intersections by at least the District Plan minimum separation requirements. In some specific locations, alternative intersection arrangements may be appropriate e.g. a roundabout on Greendale Road providing convenient access between the two parts of Area 1 either side of Greendale Road.

#### **Frontage Road Upgrades**

At the subdivision stage, SDC will require developers to upgrade frontage roads to the appropriate urban or semi-rural formation. There will be an expectation that all frontage road upgrade works incorporate pedestrian provision. Development of the study area will likely require speed limits to be lowered on currently rural frontage roads. Appropriate speed limits would be considered through separate Road Controlling Authority processes.

#### **Wider Transport Network Improvements**

The following wider transport network improvements are recommended in conjunction with development in the study area:

- Altering the Greendale Road / Creyke Road / Wards Road intersection to simplify the eastern side of the intersection and reduce the vehicle conflict area;
- Providing pedestrian connections from the new frontage road footpaths in all study areas to the existing footpath network;
- Any minor works required at the SH73 / Homebush Road, Kimberley Road / Homebush Road, and Telegraph Road / Creyke Road intersections associated with the sealing of the study area frontage roads.

The following works are considered either already warranted or likely to be warranted when the study area is developed, however they should not solely be the responsibility of the study area developers. Accordingly, it is recommended that SDC / NZTA plan to carry out these works and seek study area developer contributions to partly fund the works:

- A left turn lane for traffic turning left into Creyke Road from SH73;
- A right turn lane for traffic turning right from SH73 into Horndon Street (East);
- Improving the pedestrian crossing of Bray Street / Telegraph Road at the Cardale Street intersection;
- An upgrade to the Telegraph Road / Bray Street / Cardale Street intersection (possibly to a roundabout) at the appropriate time; and
- Widening Cridges Road to a width suitable for two-way traffic.

Railway level crossing safety assessments for the Homebush Road, Mathias Street, Horndon Street (East) and Creyke Road level crossings are recommended, and study area developers could possibly contribute to any required upgrade works associated with additional requirements due to increases in traffic volumes.

While not likely required based solely on traffic volumes, it is recommended that the Selwyn District Council (SDC) consider the use of Horndon Street as a collector road to reduce traffic volumes using intersections closer to the town centre. This may require an upgrade of the Horndon Street / Kimberley Road intersection. Similarly, the SDC could consider whether priority should be given to the McMillan Street to Kimberley Road route through alterations to the two intersections on North Terrace.

Longer term, SDC and/or NZTA may need to consider the following matters, however these are not tied to the development of the deferred areas as such:

- The alignment of the southern Creyke Road approach to SH73;
- Intersection forms along SH73 including the Mathias Street crossroad intersection, the Bray Street/McMillan Street intersections and the SH77 intersection; and
- The form of the Telegraph Road / Creyke Road crossroad intersection.

Based on the ODP recommendations, it is considered that appropriate ODPs will be able to be developed for the study area. Provided the minor wider area works recommended in conjunction with development in the study area are carried out, it is considered from a transportation perspective, the deferred status of the study area can be lifted. Frontage road upgrades will be required to be carried out as part of subdivision and study area developers will be able to contribute to the other wider improvements that have been identified as appropriate.

# Selwyn District Council

Darfield Deferred Residential Rezoning Integrated Transport Assessment

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### **APPENDICES**

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Appendix B Travel Routes

### 1. Introduction

As part of the current Selwyn District Plan review, the Selwyn District Council (SDC) are seeking to lift the deferrals on approximately 380ha of deferred residential zoned land in Darfield. As shown in **Figures 1A** and **1B**, there is a deferred Living X zone, south of the town centre, and there are deferred Living 2 / Living 2A zones in a range of sizes which are located on the outskirts of the town.

The residential zoning was deferred until water supply issues could be resolved and outline development plans (ODPs) were prepared. ODPs are required to ensure the zones achieve good design outcomes, including connectivity for all modes of travel.

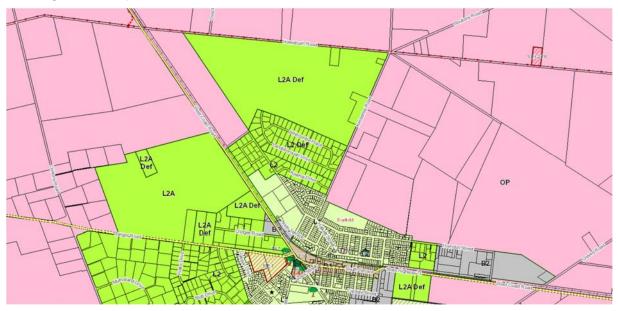


Figure 1A: Selwyn District Plan- Northern Darfield Zoning- Source: Canterbury Maps

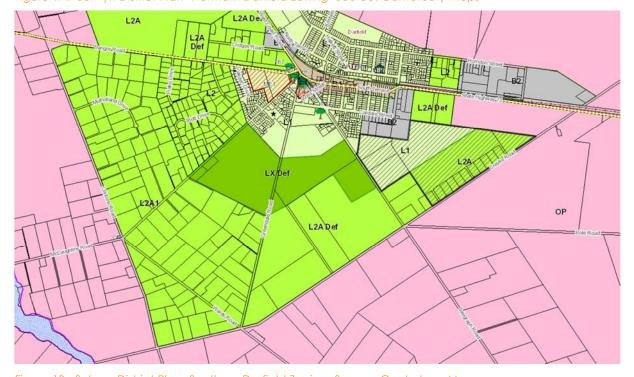


Figure 1B: Selwyn District Plan- Southern Darfield Zoning- Source: Canterbury Maps

The deferred zonings confirm that the areas have already been identified as appropriate for residential development. Accordingly, this Integrated Transport Assessment is focussed on the provisions of the ODPs required to guide future development, rather than transport effects of future residential development. There is still a need to consider potential future traffic generation of the zones, in confirming that new intersection locations are appropriate and whether any upgrades to the existing road network may be required in the future.

#### This report includes:

- A description of the existing transport environment surrounding the deferred zones, including descriptions of keys roads and intersections and a review of the crash history in the area;
- A description of any future changes in the surrounding area that are relevant;
- A summary of the deferred zones and their potential lot yields;
- A traffic generation estimate for the deferred zones;
- · Recommendations for the ODPs, focussed on connectivity to frontage roads and adjacent land uses; and
- Discussion on infrastructure upgrades that may be required initially with development in the zones or in the future.

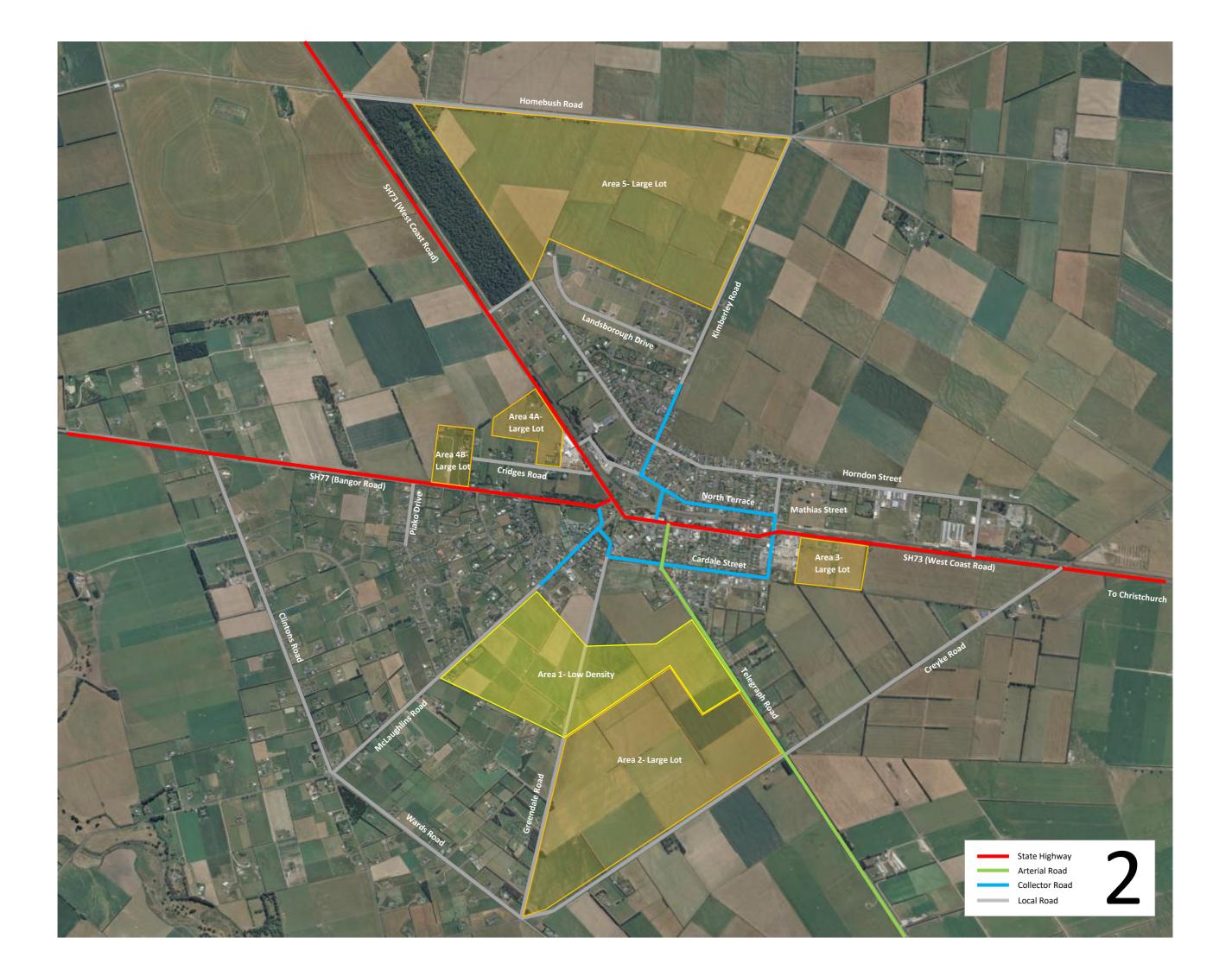
As part of the District Plan review, the 'Living X' and 'Living 2/2A' zone types are proposed to be replaced by 'Low Density' and 'Large Lot' residential zones respectively. Throughout this report, for consistency, only the proposed zone names are used. Also, the deferred residential zones subject to this assessment are referred to collectively as the 'study area' or study areas. The study area is split into six smaller areas (Areas 1, 2, 3, 4A, 4B and 5) to allow for more specific/localised assessment.

### 2. Existing Environment

#### 2.1 Road Network

**Figure 2** shows the outlines of the study areas in the context of the Darfield road hierarchy as defined by the operative District Plan.

**Figure 3** shows a closer aerial view of the township. It also highlights the key activities within the town (the schools, domain, sawmill and town centre).



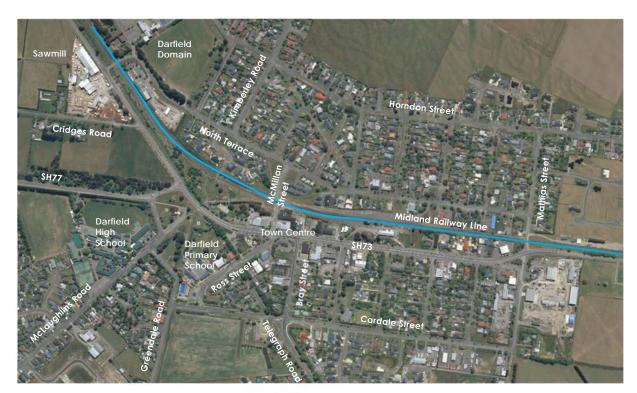


Figure 3: Darfield Township Roading-Source: EMap

The dominant roads in Darfield are state highways (SH) 73 and 77, as well as Telegraph Road/Bray Street, which is an arterial route. SH73 is the main road from Christchurch to the West Coast via Arthurs Pass and it is also the main road through the centre of Darfield. SH77 runs through Central and Mid Canterbury, between Darfield and Ashburton via the Rakaia Gorge and Methven. Telegraph Road connects Darfield to SH1, between Burnham and Dunsandel.

There are two collector roads (Cardale Street and North Terrace) which are both parallel to SH73 and there are radial collector routes extending out from the township (McMillan Street / Kimberley Road, McLaughlins Road and Greendale Road).

As indicated in **Figure 2**, the study areas have frontages to roads ranging from state highways to minor local roads. The following table contains descriptions of the roads that are relevant to this assessment. Photographs of key roads are contained in **Appendix A**.

Table 1: Existing Road Descriptions

able 1. Existing Read Descriptions				
Road	Traffic Volume	Speed Limit	Formation	Pedestrian Provision
STATE HIGHWAY	1			
SH73	5,700vpd	50km/h from 170m east of Mathias Street to 100m west of SH77, 100km/h outside	Rural state highway formation, high standard urban formation in township with flush median	Footpaths on both sides in township, refuge islands at crossing locations
SH77	2,900vpd	50km/h from SH73 to west of McLaughlins Road, 80km/h to west of Piako Drive, 100km/h beyond	Rural state highway formation	Footpath on southern side to Piako Drive
SOUTH OF SH73	SOUTH OF SH73			
Telegraph Road	1,700vpd	50km/h for about 250m from Cardale Street, 100km/h beyond	8m seal width in rural area	Footpath on eastern side in urban area
Bray Street	1,400vpd	50km/h	11m kerb to kerb	Footpath on eastern side

Road	Traffic Volume	Speed Limit	Formation	Pedestrian Provision
McLaughlins Road	1,500vpd			Footpaths both sides in urban area
Greendale Road	600vpd	50km/h to about 300m south of Cardale Street, 100km/h beyond	50km/h to about 300m south of Cardale Street, northern end, 9.3m	
Cardale Street	800vpd	50km/h	Mixture of semi-rural and urban formation	Footpath on northern side
Creyke Road	50vpd	100km/h	6.2m seal width SH73 to Telegraph Road, unsealed beyond	None
Cridges Road	Estimate 50vpd residential, saw mill traffic unknown	50km/h	Narrow rural formation (approx. 4m-5m wide)	None
NORTH OF SH73				
Mathias Street	1,300vpd	50km/h	Mixture of semi-rural and urban formation	Footpath on western side
McMillan Street	2,100vpd	50km/h	Wide, fully urban formation, kerbside parking both sides	Footpaths both sides
North Terrace	1,600vpd	50km/h	Mixture of urban/ semi- rural formation	Combination of one or two footpaths
Horndon Street	500vpd	70km/h from eastern end for about 1km, 50km/h beyond	Combination of urban and semi-rural formation	Footpath on northern side
Kimberley Road	1,100vpd	50km/h from North Terrace to about 80m south of Landsborough Drive, 70km/h to edge of residential development, 100km/h beyond	6.4m seal in rural area, sealed with kerb and channel in urban area	Footpaths on both sides of road in urban area. Footpath on western side extends to Landsborough Drive
Landsborough Drive	200vpd	50km/h	7m seal width, grass swales	Footpath on southern side
Homebush Road	50vpd	100km/h	Unsealed rural road	None

Table 2 contains descriptions of the intersections which are relevant to this assessment.

#### Table 2: Key Intersections

Road	Form	Priority Leg(s)	Formation
STATE HIGHWAY 73			
SH73 / Creyke Road	Skewed crossroad, STOP controls	SH73	Separate left turn lane on southern approach, basic formation on SH73
SH73 / Horndon Street (East)	T-intersection, GIVE WAY control	SH73	Basic formation with SH73 shoulder widening
SH73 / Mathias Street	Skewed crossroad, STOP controls	SH73	Right turn bays in flush median, splitter islands on Mathias Street
SH73 / Bray Street	T-intersection, STOP control	SH73	Right turn bay in flush median

Road	Form	Priority Leg(s)	Formation
SH73 / McMillan Street / Ross Street	Crossroad, GIVE WAY controls	SH73	Right turn bays in flush median
SH73 / SH77	T-intersection, STOP control	SH73	Right turn bay in flush median, left turn slip lane on SH73, central island on SH77 and separate left and right turn lanes
SH73 / Cridges Road	T-intersection, STOP control	SH73	Basic formation
SH73 / Homebush Road	Staggered T- intersections, GIVE WAY controls	SH73	Basic formation
STATE HIGHWAY 77			
SH77 / McLaughlins Road	T-intersection, GIVE WAY control	SH77	Basic formation
SOUTH OF SH73			
McLaughlins Road / Clintons Road	Crossroad intersection, STOP control	McLaughlins Road	Basic formation
McLaughlins Road / Greendale Road	T-intersection, STOP control	McLaughlins Road	Basic formation
Greendale Road / Cardale Street	T-intersection, GIVE WAY control	Greendale Road	Basic formation
Greendale Road / Wards Road / Creyke Road	Unconventional 5-leg intersection, STOP and GIVE WAY controls	Greendale Road	Creyke Road meets Wards Road just east of the intersection, with a yellow painted island to channelise traffic
Telegraph Road / Cardale Street / Bray Street	Crossroad, STOP controls	Telegraph Road / Bray Street	Splitter islands on Cardale Street, basic formation on Telegraph Road / Bray Street
Telegraph Road / Creyke Road	Crossroad, STOP controls	Telegraph Road	Basic formation
NORTH OF SH73			
McMillan Street / North Terrace	T-intersection, GIVE WAY control	North Terrace	Basic formation
North Terrace / Kimberley Road	T-intersection, GIVE WAY control	North Terrace	Basic formation
Kimberley Road / Horndon Street	Crossroad, STOP controls	Kimberley Road	Separate left and right turn lanes on eastern approach, basic formation on Kimberley Road
Kimberley Road / Landsborough Drive	T-intersection, STOP control	Kimberley Road	Basic formation
Kimberley Road / Homebush Road	Crossroad intersection, GIVE WAY controls	Kimberley Road	Basic formation of main intersection, located at bend in Kimberley Road, eastern leg splits into two roads and a private driveway just east of intersection

# 2.2 State Highway Traffic Growth

**Figure 4** shows the growth in the annual average daily traffic (AADT) volumes on SH73, near the Horndon Street intersection west of Darfield, over the last ten years. The traffic volumes have been growing by approximately 5% per annum.

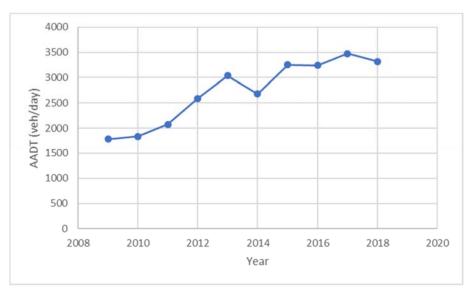


Figure 4: AADT Growth on State Highway

#### 2.3 Rail Network

The Midland railway line, which runs between Rolleston and the West Coast, extends through Darfield on the northern side of SH73, as indicated in **Figure 3**. There are seven level crossings between Homebush Road and Creyke Road (inclusive). Information on the existing level crossings is provided below.

Table 3: Existing Level Crossings in Darfield (West to East)

Level Crossing	Proximity to Intersection	Existing Controls
Homebush Road	Approx. 40m from SH73	STOP sign only
Horndon Street (West)	Approx. 30m from SH73	STOP sign only
North Terrace	Approx. 30m from SH73	Flashing lights
McMillan Street	Approx. 80m from SH73, 100m from North Terrace	Flashing lights
Mathias Street	Approx. 25m from SH73	Flashing lights
Horndon Street (East)	Approx. 10m from SH73	Flashing lights
Creyke Road	Approx. 15m from SH73	Flashing lights

### 2.4 Crash History

The NZTA Crash Analysis System has been used to review crash records in Darfield for the full five-year period of 2014-2018. Also, any crashes reported in 2019, as at June 2019, have been reviewed. The crash search area, indicated in **Figure 5**, is generally bound by Homebush Road, Kimberley Road, Horndon Street, Creyke Road, Wards Road and Clintons Road.



Figure 5: Crash Search Area

26 crashes have been reported since the start of 2014 in the search area, including one fatal, two serious-injury and 10 minor-injury crashes.

The fatal crash involved a motorcyclist accelerating along Thornton Street within the township and crashing off the end of the road.

One serious crash involved a loss of control on Telegraph Road and the other involved a driver failing to give way at the Kimberley Road / Horndon Street crossroad intersection.

Eight of the crashes (four minor-injury and four non-injury) occurred along SH73 within the 50km/h zone. None of these involved pedestrians.

There were no locations specifically identified as safety concerns based on the crash records.

### 2.5 Public Transport

Metro runs the 86 bus service between Darfield and Christchurch City. One bus runs from Darfield to Christchurch in the morning, leaving at 7:10am and one bus runs from Christchurch to Darfield in the evening, arriving at 5:50pm. **Figure 6** shows the bus route through Darfield, which starts on Ross Street near the primary school and also has a pick-up location in the town centre on SH73.



Figure 6: Darfield Bus Pick-Up Locations

# 3. Future Changes

## 3.1 Road Hierarchy

The Proposed District Plan includes three changes to the road hierarchy in Darfield. The following sections of road will have their classifications upgraded from local road to collector road:

- McLaughlins Road, from Cressy Place to Stott Drive (approx. 200m);
- Greendale Road, from Cardale Street to 250m south of Snowdon Place (approx. 300m); and
- Kimberley Road, from Kowhai Drive to Old West Coast Road (approx. 6.5km).

### 3.2 Darfield Development

There are several areas within Darfield which are zoned but have not yet been developed.

The following ODP areas in the operative District Plan are undeveloped:

 Appendix 47 - Living 2A Bangor Road ODP, which is zoned to accommodate approximately 120 lots (Figure 7);

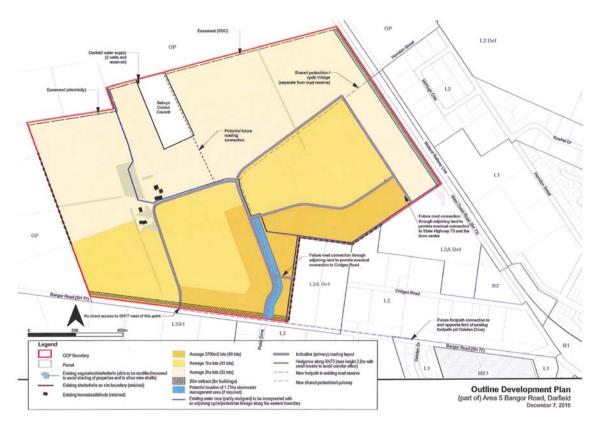


Figure 7: Bangor Road ODP

Appendix 41 - Area 3 ODP (Silverstream) which could accommodate approximately 240 lots (Figure 8);
 and

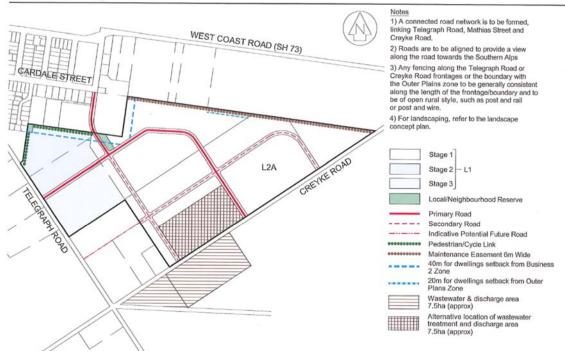


Figure 8: Creyke Road ODP

 Appendix 41A - Living 2 Creyke Road ODP which is zoned to accommodate approximately 15 lots (Figure 9).



Figure 9: Creyke Road / Telegraph Road ODP

The other main undeveloped but zoned areas within Darfield are the Living 1 zoned areas highlighted below. The southern area highlighted in **Figure 10** is approximately 25ha and the northern area is 8ha. Based on an average lot size of 650m<sup>2</sup>, it is estimated approximately 355 residential lots could be developed in these areas.



Figure 10: Living 1 Zoned Undeveloped Areas in Darfield

#### 3.3 Transport Network Changes

The SH73 Darfield to SH73/76 Intersection and SH1 Belfast to Selwyn River Programme Business Case was carried out in 2017 by NZTA. It is focused on roading improvements around the western edge of Christchurch. There are likely to be improvements to the SH73 corridor closer to Christchurch to address safety and intersection access issues, however, no Darfield projects were suggested in the business case and no Darfield specific state highway projects are in the NZTA Regional Land Transport Plan.

No Darfield transport infrastructure upgrades were identified in a review of the Selwyn Long Term Plan 2018-2028.

### 4. Study Area Lot Yield

The study areas outlined in Figure 2 and their potential lot yields are summarised in the table below.

Table 4: Potential Lot Yields

Study Area Number	Zoning	Area	Likely Lot Yield (based on Proposed Zoning and Selwyn Capacity for Growth Model)
1	Low density residential	76ha	554 lots
2	Large lot residential	110ha	196 lots
3	Large lot residential	12ha	21 lots
4A	Large lot residential	11ha	20 lots
4B	Large lot residential	8ha	14 lots
5	Large lot residential	164ha	292 lots
Total		381ha	1,097 lots

The likely lot yields shown above for the respective study areas are not the maximum potential yields based on lot size requirements included in the proposed District Plan, but rather are modified yields based on the outputs of the Selwyn Capacity for Growth Model (SCGM) provided by SDC. This model provides a 'more realistic' picture of land development for Selwyn based on previous development patterns within the district.

It is noted that the lot size requirements for the proposed zones in the proposed District Plan are different to those included in the operative District Plan. The lot sizes for Living X / Low density residential zones will

increase, and the lot sizes for Living 2A / Large lot residential zones will be reduced. **Table 5** summarises the potential lot yields for the two zonings within the study area. It can be seen that the changed lot size requirements could result in a slightly increased number of developable lots in the study area.

Table 5: Potential Lot Yields-Operative and Proposed District Plan Lot Sizes

Zone	Operative Plan Potential Yield	Proposed Plan Likely Yield
Living X / Low density residential	768 lots	554 lots
Living 2A / Large lot residential	268 lots	543 lots
Total	1,036 lots	1,097 lots

Generally, it is considered the scale of development possible within the study area, regardless of the average minimum lot sizes of either the operative zoning or the proposed zoning, would be similar, and therefore traffic volumes generated would be similar on the wider road network. This general scale of development was agreed as acceptable at the time of the zoning deferrals.

The proposed changes to lot sizes would result in more traffic generated to/from the northern side of the town and less traffic generated to/from the southern side of the town. These patterns are given consideration throughout the assessment that follows.

### 5. Traffic Generation

A traffic generation rate of 6 vehicle movements per day (vpd) per household has been used for this assessment. This is lower than the 9-10vpd per household rate commonly used in cities and takes into account the rural location of Darfield, which increases the likelihood of residents to make linked trips e.g. visiting the supermarket and the petrol station on their way home from work in Christchurch. This traffic generation rate has been used and accepted previously in assessments in the Selwyn District, including for Plan Change applications in Darfield and West Melton.

Table 6 summarises the potential daily traffic generation of the six study areas subject to this assessment.

Table 6: Potential Traffic Generation by Study Area

Study Area Number	Potential Lot Yield	Daily Traffic Generation
1	554 lots	3,320vpd
2	196 lots	1,180vpd
3	21 lots	130vpd
4A	20 lots	120vpd
4B	14 lots	80vpd
5	292 lots	1,750vpd
Total	1,097 lots	6,580vpd

### 6. Traffic Distribution

### 6.1 Trip Types

For the purposes of estimating the scale of potential future traffic generation from the study area on specific parts of the road network, a basic traffic model has been developed.

It has been assumed that 50% of traffic generation to/from the study area will be trips to/from work, and 50% will not.

Data for Darfield has been obtained from Stats New Zealand Commuter View, which presents 2013 Census data. This indicates that 38% of workers living in Darfield work in Darfield and 62% travel out of Darfield for work.

Non-work trips will also have origins and destinations both in Darfield and external to Darfield. It is considered likely more of these will be local Darfield based trips than trips external to Darfield. For this assessment, it has been assumed that two thirds of non-work trips generated by the study area will be made within Darfield and one third will be made to/from locations external to Darfield.

#### 6.2 Trip Origins/Destinations

Commuter View also has information on where people travel to for work. The following table summarises the directions people travel when leaving Darfield for work.

Table 7: Destinations from Darfield for Work (Stats NZ Commuter View)

Direction	Proportion of Destinations
East (e.g. Christchurch)	72%
South (e.g. Burnham/Lincoln)	12%
West (e.g. Hororata)	6%
North (e.g. Oxford)	11%

Darfield is surrounded by the Kirwee Stats NZ area unit. Trips to/from that area unit have been split between the four directions based on the level of surrounding development. The Malvern area unit lies further to the north and west of Darfield, so trips to/from that area have similarly been split between those two directions.

For the purposes of this assessment, trips to/from the four directions have all been applied to the state highway and arterial road network, as outlined in the following table. Based on a review of the surrounding road network and observations made during a visit to Darfield, this is considered appropriate based on a lack of attractive alternative travel routes.

Table 8: Destinations from Darfield for Work

Direction	Route	
East	SH73 (West Coast Road)	
South	Telegraph Road	
West	SH77 (Bangor Road)	
North	SH73 (West Coast Road)	

There would often be multiple routes available between a study area and an external destination e.g. for trips from Area 1 to the north, some trips would be made along Telegraph Road/Bray Street to SH73 and some would be made along McLaughlins Road/SH77 to SH73. The route choice would be based on the location of the origin/destination in the study area and personal preference. The table contained in **Appendix B** outlines the likely routes that could be used by study area for each travel direction used in this assessment.

For trips internal to Darfield, it has been assessed that most of these would be made generally towards the town centre. The traffic volumes will dissipate as they get closer to the town centre, as some origins/destinations will be outside of the town centre e.g. the primary school. The traffic generation estimates on the roads closest to the town centre e.g. Bray Street or McMillan Street are intended to be very indicative only. This is considered appropriate given the other factors influencing the performance of the road network in the town centre i.e. state highway traffic growth and growth in other areas already zoned in Darfield. The traffic generation estimates have been used to inform the ODP recommendations in the following section and the assessments of the need for wider infrastructure upgrades.

### 7. Outline Development Plan Recommendations

ODPs are being developed for the six study areas in Darfield. The key transport recommendations for the ODPs are described below.

### 7.1 Road Connectivity

#### 7.1.1 General Comments on Road Layouts

Generally, it is preferable from a road safety perspective that new local road intersections on collector roads and arterial roads (i.e. Telegraph Road, Greendale Road and McLaughlins Road) are located to avoid crossroad intersections. This is because crossroad intersections are inherently less safe than T-intersections due to having more potentially conflicting vehicle movements. The Selwyn District Council Engineering Code of Practice includes the following text:

Within new residential areas, appropriate intersection types include:

- Priority or roundabout l controlled T or Y-intersections (3-way), depending on the balance of traffic flows and classification of the approach roads. All approach legs to Y junctions should be separated by 120 degrees and T junctions by 90, 90 and 180 degrees.
- Four-way intersections at grade generally should be roundabout controlled due to their high crash risk. Local roads should not intersect with the main road network as cross roads and should only form cross junctions with themselves where necessary. Where unavoidable and a reasonable volume of traffic across the busier road is anticipated, offset the quieter roads as a right – left stagger, to minimise the risk of crashes.

Based on that, even local crossroad intersections within the study areas should be considered for roundabout controls at the subdivision stage. It should be reiterated that any T-intersections included on the ODPs should be as close to perpendicular as possible.

It is recommended that primary local roads indicated on the ODPs have minimum 80m radii curves based on the SDC Engineering Code of Practice minimum requirement for 'through streets'.

The following table is from the Proposed Selwyn District Plan and sets out minimum permitted intersection separations, based on the speed limit of the main road. These requirements have been used for the recommendations that follow.

Posted legal speed limit (km/hr)	Road type	Distance (m)
100	All	800
90	All	248
80	All	214
70	All	181
60	All	151
50	State Highways, Arterials and Collector Roads	123

Table 9: Proposed Selwyn District Plan Intersection Separation Requirements

Where these minimum separations cannot be achieved, the Selwyn Engineering Code of Practice states that right-left staggers are preferred to left-right staggers. That is because right-left staggers avoid overlapping right turn movements and reduce the number of potential vehicle conflicts.

Road connectivity specific to each of the six study areas is discussed further below.

#### 7.1.2 Area 1

Area 1 is the Low density residential zoned area to the south of the town centre.

It is recommended that the ODP provides for a primary local road connection through Area 1 from McLaughlins Road to Telegraph Road. Consideration should be given to the alignment of the road, which would preferably provide a direct/attractive route for people to travel to/from the town centre and Telegraph Road.

There is expected to be a demand for travel between the part of the study area west of Greendale Road and Telegraph Road. That traffic will need to cross Greendale Road. To provide the most convenient/direct route for this traffic, it may be preferable to have the road directly lined up either side of Greendale Road. If this is the case, a roundabout would be recommended in this location. Otherwise, the other preferred option would be for two T-intersections off-set by at least 123m. Based on traffic volumes on the local roads in the order of 1,000vpd and a through volume on Greendale Road of 1,000vpd, it is considered either a roundabout or staggered T-intersections would operate safely and efficiently.

It is recommended any local road intersections on McLaughlins Road are off-set by at least 151m from other intersections (the minimum requirement for a 60km/h speed limit). Based on estimated turning volumes in the order of 500vpd at the primary McLaughlins Road intersection and approximately 1,000vpd on McLaughlins Road, it is considered this intersection could have a basic T-intersection form with a GIVE WAY or STOP control, depending on available sightlines and SDC preference. It is considered no turning provision would be warranted based on the low turning volume and particularly the low demand for the right turn in.

Any Area 1 intersections on Telegraph Road should be off-set by at least 123m from other intersections, including future intersections on the eastern side of Telegraph Road. If the minimum spacing cannot be achieved because of the spacing of the local roads on the opposite side of the road, the preferred compromise would be to have a lesser separation to the intersection with the right-left stagger with the 123m separation maintained in the other direction.

Based on through volumes in the order of 2,000vpd on Telegraph Road, and possible traffic volumes on the Area 1 primary local road in the order of 1,500vpd, a GIVE WAY or STOP controlled T-intersection is expected to be appropriate. A right turn bay on Telegraph Road may be warranted at some point. It is considered the length of Telegraph Road within Darfield and intersection designs along it should be considered together. It may be appropriate for a flush median with right turn bays for the multiple future intersections to be developed, given the arterial function of Telegraph Road.

Secondary local roads being included in the Area 1 ODP are not considered critical from a transport perspective. Highlighting indicative future connections should be considered to the adjacent residential zoned land to the north, and into Area 2 to the south.

#### 7.1.3 Area 2

Similar to Area 1, it is recommended to have a primary local road through Area 2 between Telegraph Road and Greendale Road.

The whole of Area 2 may only generate approximately 1,200vpd so it is considered there is not a need to show secondary roads on the ODP from a traffic perspective. Minor local roads / lanes to serve Area 2 will be able to be developed through subdivision.

Connections into Area 1 could be indicated for connectivity through the combined Area 1 / Area 2 study area.

It is considered local road intersections on Greendale Road, Creyke Road and Telegraph Road will be acceptable. It is considered there will be no need for Area 2 intersections to form crossroad intersections on any of the frontage roads. It is noted that the land across Greendale Road from Area 2 is largely developed at a scale envisaged by the operative District Plan so new primary local road intersections opposite Area 2 are unlikely. The southern side of Creyke Road is outside of the township boundary and is zoned Rural so no intersections across this road are anticipated.

T-intersections on all three frontage roads should ideally be separated from adjacent intersections by the appropriate District Plan separations based on the anticipated speed limits (60km/h on Greendale Road and Telegraph Road and 80km/h on Creyke Road). Speed limits are discussed further in Section 8 of this report.

A T-intersection on Telegraph Road with 151m separation to Creyke Road and the Living 2 Creyke Road ODP road will not be achievable. Given this and the arterial classification of Telegraph Road, it is recommended no road connects to Telegraph Road between these two intersections. A local road connection into Area 2 from Telegraph Road will be able to be provided at least 151m north of the Living 2 Creyke Road ODP road.

As discussed for Area 1, the forms of all the proposed intersections along the arterial Telegraph Road should be considered together. The Area 2 local road may carry approximately 500vpd and therefore a lower standard than the Area 1 intersection may be appropriate.

Based on low traffic volumes of less than 500vpd on the local roads within Area 2, it is considered basic uncontrolled T-intersections on Greendale Road and Creyke Road will be appropriate.

#### 7.1.4 Area 3

It is considered Area 3 would only warrant a single intersection on SH73. It is recommended this is provided at least 214m east of the Mathias Road crossroad intersection, which is the minimum District Plan intersection separation requirement on an 80km/h road. This separation would ensure there is good visibility to eastbound traffic, after it has travelled through the Mathias Street intersection and around the bend in SH73.

The likely lot yield of Area 3 is approximately 21 lots, which could generate approximately 130vpd to and from the highway. Alternative connections via extension of Cardale Street or through to the Living 1 land to the south would be desirable, but would make development difficult to undertake without reliance on other land developments. SH73 carries approximately 5,600vpd in this location currently and that will increase over time as state highway volumes grow and as development occurs in Darfield. Based on the

low turning volumes, it is considered a right turn bay may not be required but local widening of the carriageway would be necessary to provide basic turning provision for left and right turns in.

#### 7.1.5 Area 4A

Area 4A has frontages to SH73 and Cridges Road and it is understood intersections will be indicated on the ODP on both roads.

The SH73 intersection, which is anticipated on the Living 2A Bangor Road ODP, should be provided at least 214m from the North Terrace intersection to comply with the District Plan intersection separation standard for an 80km/h road. The state highway intersection would likely serve a large proportion of the Living 2A Bangor Road ODP area, as shown in **Figure 7**, as well as Area 4A. It is estimated that the local road would carry less than 500vpd and SH73 carries approximately 4,000vpd in this location. Based on these traffic volumes, a standard low-volume state highway intersection may be appropriate. It is considered a right turn bay would not be warranted given the likely low volumes of vehicles turning right in.

A secondary connection to Cridges Road would be recommended for local area connectivity and network resilience. It would be preferable that the primary road from \$H73 into the adjacent ODP area has priority with the secondary connection meeting it at a 90-degree T-intersection. The internal intersection should be at least 123m from the state highway intersection.

The Cridges Road / Area 4A intersection would be a minor local road intersection with low traffic volumes. An uncontrolled T-intersection would likely be appropriate.

#### 7.1.6 Area 4B

It is recommended Area 4B is provided with an east-west local road connection between Cridges Road and the adjacent Bangor Road ODP area, consistent with the adjacent ODP area network, as shown in **Figure 7**. This ODP indicates a road connection to \$H77 opposite Piako Drive, which is approximately 100m to the west of Area 4B. Accordingly, it is considered that Area 4B would not warrant another intersection on \$H77.

#### 7.1.7 Area 5

It is recommended Area 5 is provided with primary road connections to Kimberley Road, since the majority of traffic generated by Area 5 will use Kimberley Road. Minor connections to Homebush Road are not critical from a transport perspective but will allow for more direct routes to/from the north.

A secondary connection is recommended to Landsborough Drive for local area connectivity. However, it is considered subdivision design should aim to discourage its use by a significant part of Area 5, given it is an established residential area and residents could be sensitive to traffic volume increases.

Intersection locations on Kimberley Road and Homebush Road should achieve at least 214m separation to adjacent intersections, with the exception of Loes Road. This appears to be formed as a farm track and is likely to carry very low traffic volumes and accordingly a shorter separation would be considered appropriate.

The land opposite both the Kimberley Road and Homebush Road frontages is zoned to remain rural in use and therefore intersections are not anticipated.

Although Kimberley Road along the Area 5 frontage is proposed to have its classification upgraded to a collector road, it is expected it will continue to carry low through traffic volumes in the order of 500vpd. The local roads in Area 5 are forecast to carry low traffic volumes up to approximately 800vpd. It is considered the intersections along Kimberley Road and Homebush Road will be able to be formed to basic T-intersection standards.

### 7.2 Pedestrian Connectivity

Generally, pedestrian connectivity to/from the study areas would be along new roads, connecting to pedestrian infrastructure on the frontage roads.

Recreational off-road pedestrian routes could be indicated in the ODPs e.g. in Area 5 connecting to the walking tracks in the adjacent forest.

For Area 3, it would be preferable if a pedestrian connection could be provided through to Cardale Street so that pedestrians do not have to walk along SH73. However, that may not be possible due to the land between the study area and Cardale Street being owned by different people.

Further details of the pedestrian network would be considered through subdivision design processes.

### 7.3 Cycling

No specific cycling connections are required in the study areas. All roads within the study areas will carry low traffic volumes consistent with typical local road traffic volumes and will be suitable for cyclists to share with cars. Cyclist provision could be considered further in subdivision design.

### 8. Infrastructure Upgrades

### 8.1 Frontage Roads

There will be an expectation that frontage roads are upgraded to an appropriate form at the time of subdivision. The following table outlines infrastructure upgrades along the frontage roads of the study areas that it is expected SDC will require the developers to complete at the time of subdivision. It also includes comments on changes to speed limits that may be warranted as development occurs, but which would be addressed through separate Road Controlling Authority processes.

Table 10: Frontage Road Infrastructure Upgrades and Speed Limit Considerations

Area	Frontage Road	Infrastructure Upgrades	Speed Limit Comment
1	McLaughlins Road	Urban infrastructure along Low density residential zone frontage, including kerb and channel and a footpath	50km/h or 60km/h speed limit may be appropriate with Low density residential development on one side of the road and Large lot residential development opposite
	Greendale Road	Urban infrastructure along Low density residential zone frontage, including kerb and channel and a footpath	50km/h speed limit likely appropriate with Low density residential development on both sides of the road
	Telegraph Road	Urban infrastructure along Low density residential zone frontage, including kerb and channel and a footpath	50km/h speed limit likely appropriate with Low density residential development on both sides of the road
2	Greendale Road	Carriageway may not require upgrades along Large lot residential frontage. Footpath will be required.	60km/h speed limit may be appropriate with Large lot residential development on both sides of the road
	Telegraph Road	Carriageway may not require upgrades along Large lot residential frontage. Footpath will be required.	60km/h speed limit may be appropriate with Large lot residential development on both sides of the road. Preferably the lower speed limit would start south of the Creyke Road intersection.
	Creyke Road	Road to be sealed. The standard of the Creyke Road formation between SH73 and Telegraph Road (6.2m seal) likely an appropriate standard. Footpath likely to be required	80km/h speed limit may be appropriate with Large lot residential development on one side of the road only
3	SH73	SH73 will not need any carriageway upgrades. A footpath connecting to the township would be desirable but would be subject to NZTA approval.	80km/h speed limit may be appropriate with Large lot residential development on one side of the road only
4A	SH73	SH73 will not need any carriageway upgrades. A footpath connecting to the township would be desirable but will be subject to NZTA approval.	80km/h speed limit may be appropriate with Large lot residential development on one side of the road only. The sawmill, North Terrace and Cridges Road would benefit from a reduced speed limit.
	Cridges Road	The ODP area only has a short frontage to Cridges Road but the whole road may need to be widened	50km/h speed limit will remain appropriate

Area	Frontage Road	Infrastructure Upgrades	Speed Limit Comment
		to at least 5.5m to provide for two- way traffic movement if it is to provide a connection right through to the Appendix 47 - Living 2A Bangor Road ODP (Figure 7) area. A footpath along Cridges Road connecting to the existing footpath network east of the SH77 intersection would be desirable.	
4B	SH77	SH77 unlikely to need any carriageway upgrades. A footpath connection to the footpath on the southern side of the road will be required for connectivity to the schools and the wider township.	60km/h speed limit may be appropriate with Large lot residential development on both sides of the road
5	Kimberley Road	Carriageway may not require upgrades along Large lot residential frontage. Footpath will be required.	80km/h speed limit likely appropriate with Large lot residential development on one side of the road only
	Homebush Road	Road to be sealed. The standard of the Creyke Road formation between SH73 and Telegraph Road (6.2m seal) likely an appropriate standard	80km/h speed limit likely appropriate with Large lot residential development on one side of the road only

With revised speed limits, it is considered direct property access will be appropriate on all SDC controlled frontage roads.

It is understood that NZTA's stance on direct property access has changed in recent years. They are now more open to property access and new intersections than they have been historically because they help with justification for lowering speed limits. It is understood direct lot access to SH77 from Area 4B will be acceptable, given the Living 2A Bangor Road ODP allows direct access to west of Piako Drive. Direct access to SH73 from Areas 3 and 4A may assist with justification to lower the speed limits on the highway either side of Darfield but it would need to be agreed with NZTA given the higher traffic volumes/importance of SH73.

### 8.2 Wider Network Upgrades

#### 8.2.1 Intersection Comments

**Table 11** contains discussion on the main Darfield intersections that will have increased traffic volumes if the deferred status of the study area is lifted. While upgrades to some intersections, e.g. several of the town centre intersections, are likely to be required at some point in the future, these are not directly related to the development of the deferred areas due to other factors such e.g. other growth areas and state highway traffic growth. However, some changes are recommended to be made when the deferred areas are developed.

Table 11: Intersection Upgrade Discussion

Intersection	Future Traffic Volumes	Comment	Responsibility / Timing
SH73 / SH77	Estimated increase of approximately 400vpd into and out of SH77 and approx. 400vpd on SH73	The traffic volume changes forecast as a result of the lifting of the deferrals are relatively modest and accordingly no changes to the intersection of the two state highway routes would be warranted.  SH73 carries between 3,300vpd and 5,700vpd and SH77 currently carries 2,900vpd. From observations, the intersection is operating with acceptable delays at present. As the traffic volumes continue to increase on the state highway routes, delays during peak times will increase and safety concerns could develop. In the longer term, an intersection improvement (e.g. a roundabout) to ensure capacity and safety may be warranted at this three-legged state highway intersection.	An upgrade may be warranted in the future. Any upgrade would be considered in NZTA long term planning.
SH73 / Bray Street and SH73 / McMillan Street / Ross Street	Estimate that development of the study areas could add 800vpd to McMillan Street and 1,100vpd to Bray Street	These intersections are in close proximity. Bray Street and McMillan Street are the main roads into the town centre from the southern and the northern parts of Darfield respectively. They both currently carry approximately 1,500vpd, and these volumes will continue to grow with zoned development on both sides of the town. SH73 carries approximately 5,700vpd through the town centre. From observations, there are some delays already at these intersections during the peak times. While the through volumes on the highway are not high, there are interactions between conflicting turning vehicles and other activities e.g. car parking contributing to delays. These delays will continue to increase as traffic volumes increase, both on the side roads and on the highway. Initial treatments could include local area traffic management measures such as removing car parking on the sides of the highway (use of service lanes might be possible), and possibly closing Ross Street at the SH73 end. These measures would reduce the number of vehicle interactions in the vicinity of the two main intersections and could improve efficiencies. Longer term, if the town continues to expand, traffic signals could be warranted in the town centre at these two intersections, given the way the main roads all meet in one point. Traffic signals would improve accessibility to and from McMillan Street and Bray Street, as well as for pedestrians crossing SH73. It is considered the need for any upgrade of these intersections would not be a direct consequence of the development in the study area, given other factors also affecting their performance e.g. other undeveloped zoned land and state highway traffic increases. It is considered no changes to this intersection would be required as part of the proposed lifting of the deferrals.	Upgrades may be warranted in the future but it is considered they could not be tied to development in the Study Area. Any upgrade would be considered in NZTA long term planning.
SH73 / Mathias Street	Estimate less than 200vpd on each leg of Mathias Street generated by development of the study areas	The changes in volumes at this crossroad intersection would be relatively small and accordingly no changes to the intersection should be required by the lifting of the deferrals.  As through volumes continue to increase on the highway and traffic volumes generally increase as Darfield expands, safety concerns with a crossroad intersection could be exacerbated.  Longer term, an intersection improvement (e.g. a roundabout) to ensure capacity and safety may be warranted at this crossroad intersection of the highway and Mathias Street, which is a collector road.	An upgrade may be warranted in the future but it is considered it could not be tied to development in the Study Area. Any upgrade would be considered in NZTA long term planning.
SH73 / Horndon Street (East)	Estimate of 400vpd into and out Horndon Street generated by development of Area 5	It is expected that the Horndon Street route between Kimberly Road and SH73 would be an attractive route for traffic to and from Area 5, based on the travel distance and likely travel time savings. Based on the existing speed limit of 100km/h on the highway, the existing traffic volumes of approximately 500vpd on Horndon Street and the through volumes of over 5,000vpd, a right turn lane is likely already warranted at the intersection. Horndon Street is not classified as a collector road by the SDC so it should be considered further whether Horndon Street is to be encouraged or discouraged for use as a collector road. A right turn bay on SH73 would formalise the use of Horndon Street as a collector type road. This could have the benefit of removing traffic from intersections closer to the town centre, including the Mathias Street crossroad intersection and McMillan Street. This is also raised below in the Kimberley Road / Horndon Street discussion, as Horndon Street currently is the minor route where it meets Kimberley Road at a crossroad intersection.	SDC to consider the use of Horndon Street as a collector-type road. NZTA to plan an upgrade of the intersection to allow Study Area developer contributions to partly fund the work.
SH73 / Creyke Road	Estimate approximately 1,100vpd generated by development of the study areas on Creyke Road south of SH73	Based on the 100km/h speed limit, a left turn lane on SH73 would be warranted once subdivision is underway in the Appendix 41 - Area 3 ODP (Silverstream) (Figure 8) area (east of Telegraph Road). Development of the study areas is likely to add to that need. Ideally the southern portion of Creyke Road would meet SH73 west of the existing intersection, to separate the two Creyke Road approaches and reduce the number of potential vehicle conflicts. However, that would be dependent on obtaining land on the south-western corner of the intersection. It would also be preferable to extend a reduced speed limit on SH73 through to east of the intersection.	NZTA to plan to upgrade the intersection to allow Study Area developer contributions to partly fund the work. It is noted that the Silverstream subdivision would also contribute to the need for the upgrade, so it is considered the Study Area developers should not have to fund all of the upgrade.  NZTA to be alert to any opportunities to realign the intersection through the adjacent land.
SH73 / Homebush Road	Estimate approximately 100vpd generated by development of the study area on Homebush Road east of SH73	Given through volumes and the 100km/h speed limit on SH73, basic left turn and right turn treatments would be warranted on the highway. It is limited what can be achieved for the right turn given the proximity of the staggered intersection opposite. Minor upgrades to the intersection should be considered along with the upgrading of Homebush Road.	Developers of Area 5 to carry out any minor intersection works required as part of the Homebush Road upgrade
SH73 / Cridges Road	Estimate that development of the study area could increase traffic volumes on Cridges Road by	The low increase in traffic volume using the Cridges Road intersection would be unlikely to require any change to the layout of the existing intersection. There is a wide shoulder for left turns into Cridges Road and this basic treatment is forecast to remain appropriate.  The safety of this intersection would be improved by any extension to the reduced speed limit on SH73.	n/a

Intersection	Future Traffic Volumes	Comment	Responsibility / Timing
	approximately 100vpd. The Living 2A Bangor Road ODP area development could further add to traffic volumes on Cridges Road.		
SH77 / McLaughlins Road	Estimate an increase up to 200vpd on SH77 west of McLaughlins Road and up to 500vpd on McLaughlins Road	This T-intersection will continue to operate with spare capacity and it is not foreseeable that it will need any upgrades.	n/a
McLaughlins Road / Clintons Road	Low traffic volumes increases of less than 50vpd are forecast on the legs of this intersection.	It is considered the small increases in traffic volumes forecast would not warrant any changes to the intersection.	n/a
McLaughlins Road / Greendale Road	Estimate increases less than 500vpd on McLaughlins Road and Greendale Road	This T-intersection will continue to operate with spare capacity and it is not foreseeable that it needs any upgrades. If the traffic volumes continue increasing, at some point the car parking on McLaughlins Road opposite the end of Greendale Road may need to be removed to avoid vehicle manoeuvring within the intersection and to provide widening for through traffic to pass a right turning vehicle.	n/a
Greendale Road / Cardale Street	Possible 1,300vpd increase on Greendale Road and a similar increase on Cardale Street	This T-intersection will continue to operate with spare capacity and it is not foreseeable that it will need any upgrades.	n/a
Greendale Road / Wards Road / Creyke Road	Low increases less than 50vpd are forecast to be generated by development of the study area at this intersection.	Upgrading Creyke Road between Greendale Road and Telegraph Road may increase its wider use as a route to the east of Darfield e.g. by residential land along Wards Road. This would result in an increased crossing demand between Wards Road and Creyke Road.  It is considered that this intersection should be altered so that Creyke Road to the east is the main route to the east of Greendale Road, rather than Wards Road as is the case currently. Wards Road would be realigned to tie into Creyke Road some distance from Greendale Road. This work would reduce the size of the potential conflict area and better define vehicle paths. Also, it would be preferable for any speed limit reduction on Greendale Road to be extended through the intersection.	Developers to carry out intersection upgrade in conjunction with Creyke Road upgrade
Telegraph Road / Cardale Street / Bray Street	It is estimated that development of the study area could add approximately 2,000vpd through this crossroad intersection.	This intersection is an arterial road / collector road crossroad intersection. Due to the collector road function of Cardale Street, there are relatively high crossing and right turn demands from the side roads. Even though the through volumes on both roads are relatively modest, there are some delays during peak times already at the intersection.  From observations, vehicle speeds on Telegraph Road are higher than desirable, which could contribute to drivers on Cardale Street being more cautious.  As development occurs within the already zoned land and the study area, the traffic volumes on both Telegraph Road and Cardale Road will increase. It is expected that delays will increase at the intersection and safety concerns could develop due to the number of potential conflicts at a large crossroad intersection such as this.  It is recommended an upgrade to this intersection (e.g. to a roundabout) is considered sooner than later. It would improve access to and from Cardale Street and it would have other benefits including options to improve pedestrian crossing provision in the vicinity of the intersection and to slow traffic down. It is acknowledged that Telegraph Road is an arterial road with large heavy vehicles, but a roundabout design should be possible in the available land to accommodate large vehicle tracking requirements.	Recommend that SDC plan to upgrade the intersection to allow Study Area developer contributions to partly fund the work.
Telegraph Road / Creyke Road	Approximately 400vpd on Creyke Road west of Telegraph Road and approximately 1,100vpd on Creyke Road east of Telegraph Road	A crossroad intersection on a high-speed arterial route is not ideal. Any reduced speed limit on Telegraph Road should extend through the intersection.  The through volumes on Telegraph Road will initially remain at a level that traffic from Creyke Road can access it. In the longer term, as development continues and through traffic volumes increase on the arterial Telegraph Road, delays could develop on Creyke Road and safety concerns with the crossroad intersection could become worse.  It is recommended that any subdivision adjacent to the intersection should allow enough land for a large roundabout in the future which would act as an entry to the town and to calm traffic.	SDC to monitor the intersection performance and any upgrade would be through the long term planning process

Intersection	Future Traffic Volumes	Comment	Responsibility / Timing
	could be generated by development of the study area.		
McMillan Street / North Terrace	Estimate approximately 1,200vpd could be added to this intersection.	Although all three legs of this intersection are collector road legs, the dominant movements are those between McMillan Street and North Terrace to the west.  This would be expected to be the same for the additional traffic from Area 5 as well as for some of the zoned but undeveloped area to the north.  Traffic volumes are likely to remain low enough that the T-intersection can operate efficiently, however it is considered a change to the priority at the intersection would be appropriate. It is noted there is a large reserve next to the intersection, which could provide design flexibility for an altered intersection.	SDC to consider a change of priority and Study Area developer contributions possibly to partly fund the work
North Terrace / Kimberley Road	Estimate approximately 1,200vpd could be added to this intersection.	Almost all of the additional traffic using this intersection associated with development of Area 5 would turn left from Kimberley Road into North Terrace and right from North Terrace into Kimberley Road. This additional traffic could approximately double the existing traffic volumes on Kimberley Road. The volume of traffic travelling between Kimberley Road and North Terrace to the east of this intersection would far exceed the volume of traffic on North Terrace to the west of this intersection. As with the McMillan Street / North Terrace intersection, the traffic volumes at the T-intersection mean that it will continue to operate efficiently. However, it is recommended that a change in priority at the intersection is investigated, so that priority would run between the two collector road legs of the intersection.	SDC to consider a change of priority and Study Area developer contributions possibly to partly fund the work
Kimberley Road / Horndon Street	Estimate additional 1,200vpd southbound on Kimberley Road and 400vpd on Horndon Street east of Kimberley Road	Kimberley Road is a collector road and as mentioned above, Horndon Street between Kimberley Road and SH73 to the east could perform a collector road role. With increasing traffic volumes, and due to safety concerns with crossroad intersections, it may become more appropriate for a roundabout to be constructed in this location.  A roundabout in this location may encourage more use of Horndon Street as a collector type road. This could have a benefit of having more through traffic to and from the east bypass the centre of town, removing traffic from intersections such as SH73 / McMillan Street or the SH73/Mathias Street crossroad.	SDC to consider the use of Horndon Street as a collector-type route and to consider the form of this intersection. If an upgrade e.g. to a roundabout, is considered appropriate then Study Area developer contributions could partly fund the work.
Kimberley Road / Landsborough Drive	Area 5 could increase the combined traffic volumes past and into Landsborough Drive by approximately 1,600vpd.	Basic T-intersection likely to remain appropriate at these low traffic volumes	n/a
Kimberley Road / Homebush Road	Low traffic volume increases would be expected at this intersection.	Basic crossroad intersection likely to remain appropriate. Minor intersection upgrades may be required at the time that the Homebush Road frontage is upgraded.	n/a

#### 8.2.2 Level Crossing Upgrades

Approximate possible traffic volume increases resulting from the development of the study areas at each of the level crossings are reported in the table below. Comments on the effects of the increases on the appropriateness of the controls are also provided.

Table 12: Comments on Darfield Level Crossing and Possible Assessments

Laval Crassing	Twisting Controls	Danible Traffic	Commont
Level Crossing	Existing Controls	Possible Traffic Volume Increase	Comment
Homebush Road	STOP sign only	100vpd	Extra traffic may warrant an upgrade to flashing lights. A level crossing safety assessment should be carried out for this level crossing. The need for any upgrade to this level crossing could likely be attributed to development of Area 5 and the upgrading of Homebush Road.
Horndon Street (West)	STOP sign only	<30vpd	Considered unlikely to change performance of level crossing
North Terrace	Flashing lights	<30vpd	Considered unlikely to change performance of level crossing
McMillan Street	Flashing lights	800vpd	A 2017 Level Crossing Safety Impact Assessment (LCSIA) for the level crossing recommended an upgrade to half arm barriers. This upgrade is planned for the 2019/20 financial year and the form of protection is expected to remain appropriate for the foreseeable future.
Mathias Street	Flashing lights	200vpd	The 2017 LCSIA recommended that Kiwirail consider whether the Mathias Street level crossing should be upgraded along with the McMillan Street level crossing. It is understood this has not occurred and it is recommended that a level crossing safety assessment specific to this is intersection is carried out. It is recommended that Kiwirail carry out the assessment, given the distance to any study area and the fact Mathias Street is an existing collector road. Study area developers could possibly contribute to the cost of any upgrade associated with traffic volume increases.
Horndon Street (East)	Flashing lights	400vpd	Recommend that a level crossing safety assessment is carried out for the Horndon Street crossing as it is likely to be an attractive route for trips to and from Area 5. It is recommended that Kiwirail carry out the assessment, given the distance to any study area. Study area developers could possibly contribute to the cost of any upgrade associated with traffic volume increases.
Creyke Road	Flashing lights	1,100vpd on Creyke Road (South Approach)	Extra traffic on the southern approach may have an effect on the performance of the northern approach. Recommend that a level crossing safety assessment is carried out by Kiwirail and study area developers could contribute to any upgrades associated with traffic volume increases.

### 8.2.3 Pedestrian Upgrades

Away from the frontage road upgrades which will need to include footpaths, it is important that pedestrians can walk from the various study areas to the town centre and destinations such as the schools, the supermarket and the bus stops.

The level of development in the southern part of Darfield is low currently and pedestrian provision is poor around the area of Cardale Street/Telegraph Road.

Improving pedestrian provision along the frontage of the already zoned Living 1 land (to the north of Area 1) would ordinarily be the responsibility of developers in that zone. It would be expected that upgrades would include footpaths along the western side of Telegraph Road, both sides of Greendale Road and the southern side of Cardale Street. However, if this land is not developed at the time that Areas 1 and/or 2 further south are developed, it is considered the study area frontage road footpaths should be extended to provide a minimum level of service for pedestrians walking towards the schools and the town. This would include connections to existing footpaths on Cardale Street, Telegraph Road / Bray Street and Greendale Road.

From observations at the end of the school day, there is demand for pedestrians to cross Bray St / Telegraph St at the Cardale Street intersection. This is a wide road and the volume and nature of the traffic on the road provides a barrier to pedestrians. A possible intersection upgrade, as discussed above, could allow pedestrians to cross Bray Street or Telegraph Road in a staged manner. Regardless of whether this intersection is upgraded, it is recommended that pedestrian provision in the vicinity of the intersection, primarily for pedestrians crossing Bray Street, is improved. While the study area would not add significantly to the pedestrian crossing demand on Bray Street, it is an existing issue that has been identified and any study area traffic generation will exacerbate it. It is recommended that SDC plan to improve the pedestrian provision in the vicinity of this intersection and study area developer contributions could partly fund the works.

The smaller Area 3, to the east, and areas 4A and 4B, to the west, should also be provided with pedestrian connections towards the town. It may be preferable that these connections avoid the SH73 corridor, where possible e.g. along Cridges Road to SH73, due to the higher traffic volumes on the state highway, however pedestrian desire lines should also be considered.

The northern side of the town is better connected for pedestrians, with footpaths already provided along Kimberley Road and McMillan Street.

Refuge islands on SH73 will continue to provide adequate crossing of the main road for pedestrians. If future traffic volumes warrant traffic signals at McMillan Street / Bray Street, the pedestrian crossing level of service in the vicinity of those intersections would likely be improved.

### 9. Conclusion

Recommendations on the ODPs that are being developed for the currently deferred residential zones in Darfield have been made from a transportation perspective.

It is considered connections to the surrounding road network will be able to be appropriately located and will be able to be designed to an appropriate form at the time of subdivision.

As part of any subdivision, upgrades will be required to the frontage roads, to bring them up to an appropriate standard for residential frontages. Those upgrades will include pedestrian provision, upgrades to urban infrastructure (e.g. kerb and channel) adjacent to Area 1 and sealing of unsealed roads. Speed limit changes will likely be warranted but they would be considered through separate Road Controlling Authority processes.

It will be necessary to ensure that developments in the various study areas all provide appropriate minimum levels of service for pedestrians walking to/from the town centre and other key destinations. This would, at a minimum, involve extending frontage road footpaths to tie into the existing footpath network.

Development of the study area could represent a relatively large increase to the size of Darfield and result in significant changes to traffic volumes on the roads around the town. A number of recommended or possible long-term intersection upgrades have been identified under the following categories:

- Work recommended to be done as part of development in the study area, e.g. a minor realignment of the Greendale Road / Creyke Road intersection;
- Work recommended to be planned by SDC or NZTA with study area developer contributions partly funding the work, e.g. a left turn lane being added at the SH73 / Creyke Road intersection;
- Work to be considered further by SDC with study area developer contributions possibly able to partly fund the work, e.g. a change of priority at the McMillan Street / North Terrace intersection; and
- Possible future intersection upgrades that would be considered through long-term planning processes e.g. an upgrade to the Bray Street and McMillan Street intersections on SH73.

Safety assessments at several railway level crossings have been recommended and it may be appropriate for study area developers to fund or partially fund any required upgrades.

The crossing of Bray Street / Telegraph Road at the Cardale Road intersection for pedestrians has been identified as one location in the wider network that improvements are considered warranted for pedestrians. It is recommended that, regardless of whether an intersection upgrade is progressed in the short term, SDC plan to improve the pedestrian provision in the area and study area developer contributions could go towards funding the work.

It is concluded that the ODPs will be able to ensure an appropriate form of development and with the minor wider area upgrades that are recommended to be carried out by the study area developers, the lifting of the deferrals can be supported from a transportation perspective.



# Appendix A Road Photographs



Photograph 1: McLaughlins Road, North of Stott Drive, Looking North



Photograph 2: McLaughlins Road, North of Clintons Road, Looking North



Photograph 3: Greendale Road, South of Cardale Street, Looking North



Photograph 4: Greendale Road, South of Darfield, Looking South



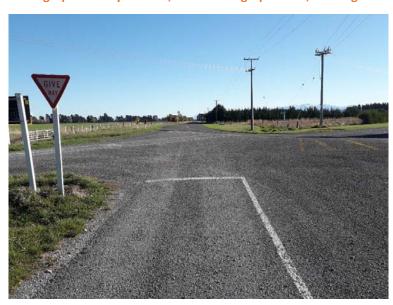
**Photograph 5: Bray Street Approach to Cardale Street Intersection** 



Photograph 6: Telegraph Road, South of Darfield, Looking North



Photograph 7: Creyke Road, East of Telegraph Road, Looking East



Photograph 8: Creyke Road Approach to Greendale Road Intersection



Photograph 9: Kimberley Road Study Area Frontage, Looking Towards Darfield

# **Appendix B** Travel Routes

Area		Direction					
	North	West	South	East			
1	-McLaughlins/SH77/SH73 -Greendale/McLaughlins/SH77/SH73 -Telegraph/Bray/SH73	-McLaughlins/Clintons/SH77 -McLaughlins/SH77 -Greendale/McLaughlins/SH77 -Telegraph/Cardale/Greendale/McLaughlins/SH77	-Telegraph	-Telegraph/Creyke/SH73 -Telegraph/Cardale/Mathias/SH73 -Telegraph/Bray/SH73 -Greendale/Cardale/Bray/SH73 -Greendale/Cardale/Mathias/SH73 -McLaughlins/SH77/SH73			
2	-Greendale/McLaughlins/SH77/SH73 -Telegraph/Bray/SH73	-Greendale/McLaughlins/SH77 -Creyke/Wards/Clintons/SH77 -Greendale/Clintons/SH77 -Telegraph/Cardale/Greendale/McLaughlins/SH77	-Telegraph -Creyke/Telegraph	-Telegraph/Creyke/SH73 -Creyke/SH73			
3	-SH73	-SH73/SH77	-SH73/Bray/Telegraph -SH73/Mathias/Cardale/Telegraph	-SH73			
4A	-SH73	-SH77	-SH73/Bray/Telegraph -Cridges/SH73/Bray/Telegraph	-SH73 -Cridges/SH73			
4B	-Cridges/SH73	-SH77	-Cridges/SH73/Bray/Telegraph -SH77/McLaughlins/Greendale/Cardale/Telegraph	-Cridges/\$H73			
5	-Homebush/SH73	-Homebush/SH73/SH77 -Kimberley/North/McMillan St/SH73/SH77 -Kimberley/North/SH73/SH77	-Kimberley/North/McMillan/SH73/Bray/Telegraph	-Kimberley/Horndon/SH73 -Kimberley/North/McMillan/SH73 -Kimberley/North/Mathias/SH73			

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