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Industrial Rezoning for Industrial District Plan Chapter Review

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1. Overview

Central Otago District Council (CODC) commissioned Abley Limited (Abley) to provide transport planning advice regarding proposed industrial zoning changes on the outskirts of the existing McNulty industrial area to inform the industrial chapter in the District Plan review process. In mid-2020 Abley developed a microsimulation model of the Cromwell township using Paramics Discovery software, with the intention to support the implementation of the Cromwell Masterplan Spatial Framework (the Masterplan). The base model representing 2018 was developed, calibrated, and validated but the future year models were not established.

Any impacts on the wider transport network which result from the proposed rezoning need to be viewed in the context of the potential development provided for under the District Plan. To understand the extent of this potential development a future baseline scenario has been developed using growth forecasts reflecting Central Otago District's most recent growth projections. This includes the full build-out of existing industrial zoned land. An additional scenario is also developed containing the proposed zoning changes, with the model outputs analysed to establish the potential effects on the transport network. The area covering the proposed plan change development is shown within the dashed outline zones in **Figure 1.1**.

This technical note documents the assumptions used in setting up the future year baseline scenario and industrial plan change scenario and provides a summary of the transport network performance. Any infrastructure upgrade requirements are also noted.

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Figure 1.1 Proposed industrial Plan Change areas

2. Future Model Landuse Development

2.1 Growth Targets

The future landuse inputs for the model are consistent with the latest demographic forecasts from Central Otago District's 2020 growth projections. These forecasts were developed by Rationale Ltd in December 2020 and were supplied by CODC for this analysis. The agreed future year for this assessment is a long-term model representing the year 2050. The relevant demographic growth statistics are presented in **Table 2.1**.

The Lindis-Nevis Valleys growth area is only partially contained in the model area including Bannockburn, Pisa Moorings, and the agricultural areas between. Based on the 2018 census data it is estimated that 53% of households in the Lindis-Nevis Valleys are within the study area and the forecast future totals have been scaled back accordingly.

Additionally, Abley were provided with the Cromwell Masterplan report (prepared by Rationale in 2018) which has some detail around future growth in the area. Some guidance from this document is used, acknowledging that it has not been updated for the most recent (December 2020) growth forecasts.

Table 2.1 Demographic Forecast Summary from 2018 to 2050

Area	unit/year	2018	2050	Growth	2018 per Occ HH	2050 per Occ HH
Cromwell Township	Usually Resident Population	5780	8770	2990	2.68	2.58
	Number of Jobs	2890	6253	3363	1.34	1.84
	Total Dwellings	2736	4151	1415		
	Occupied Dwellings	2157	3405	1248		
Outer areas (53% of Lindis-Nevis Valleys)	Usually Resident Population	1304	2923	1620	2.36	2.23
	Number of Jobs	1060	1100	40	1.92	0.84
	Total Dwellings	709	1590	881		
	Occupied Dwellings	553	1309	755		
Cromwell and Valleys Combined	Usually Resident Population	7084	11693	4610	2.61	2.48
	Number of Jobs	3950	7353	3403	1.46	1.56
	Total Dwellings	3445	5741	2296		
	Occupied Dwellings	2710	4714	2003		

2.2 Residential Growth Apportionment

Residential growth is split between greenfield and infill, with estimates for each aspect obtained from the Cromwell masterplan. Given the scale of residential growth high yield rates of infill have been assumed. Lot size guidelines from the District Plan have been used to determine the scale of development in the Residential Resource Areas (RRA) and any committed developments such as the Wooing Tree masterplan.

The growth of total households in the sub areas along with the split in greenfield and infill is shown in **Table 2.2**. The masterplan documentation estimated the capacity of the Cromwell urban area for infill housing split into three areas, as shown in **Table 2.3**. There were no details of infill capacity in the outer areas however these are typically more rural in nature. The estimate of total dwelling capacity in various greenfield locations and RRAs calculated from average lot sizes, or as specified in the Cromwell masterplan, are shown in

Table 2.4.

Table 2.2 Subarea residential forecasts for total dwellings

Sub Area	Total Growth	Greenfield	Infill (Inferred)
Cromwell	1415	935	480
Valleys	881	270	611
Total	2296	1205	1091

Table 2.3 Cromwell Residential Infill Estimates

Area of Cromwell	Assuming Low Yield	Assuming High Yield	High Yield as occupied dwellings
East Cromwell	315	420	370
West Cromwell	270	360	318
North Cromwell	90	135	119
Total	675	915	598

Table 2.4 Greenfield Residential Dwelling Estimates

Growth Area	RRA and Specified total dwellings	as occupied dwellings
RR12	446	393
RR3	38	34
Wooing Tree Masterplan area	210	185
Top 10 holiday park	180	159
Gair Ave final stage	60	53
Bannockburn	140	120
Pisa Moorings	100	86
Lowburn	30	26

Once the greenfield dwellings were assigned there were 1091 dwellings remaining to be assigned to infill areas, with a higher proportion of this going to the outer areas (611 in the Valleys subarea from **Table 2.2**). In reviewing the outer areas and the Cromwell Masterplan it was decided the urban areas would absorb infill housing more readily. The higher rates of infill were assumed from **Table 2.3** for East and West Cromwell, with a lower rate assumed for the North Cromwell area.

2.3 Commercial Growth Apportionment

The revised methodology included increasing the commercial activity by 20% across the study area including the Town Centre. The currently zoned industrial areas south of McNulty Rd were analysed further as this is a key growth area with capacity to accommodate future development. The recently consented industrial subdivision in the east of the McNulty industrial area was included in this analysis as it would be expected to develop in line with existing industrial areas over the short to medium term.

Analysis of existing developed industrial areas informed the assumptions for new industrial areas under the future baseline and industrial plan change scenarios. This included calculating a total floor area from the total site area assuming 77% coverage once roads and reserves are established and then 20% site coverage of land with gross floor area (gfa). The Cromwell Masterplan identified the total areas of the industrial areas as follows in **Figure 2.1**.

A detailed study undertaken to check the coverage and utilisation rates within the existing McNulty industrial areas from aerial photography. The coverage was deemed appropriate however the utilisation ranged somewhat with a denser warehousing block having a utilisation of 38% but more typical areas ranging from 15% to 25%. The average utilisation ranged from 18% to 22% depending on the inclusion of the warehousing block, so a utilisation rate of 20% has been adopted in this analysis. The calibrated trip rate from the existing McNulty area was retained and applied to any infill available in the area, whereas the evening peak trip rate for the recently consented development (1.3 trips per 100m^2 GFA in peak hour) was used for development in new industrial areas including the proposed Plan Change development.

The total area of the McNulty Industrial area that can be utilised is calculated to be approximately 150,000m^2 GFA. Of the total available area approximately 111,600m^2 is existing and the consented site would take up 26,700m^2.

To make this area fully utilised for the Baseline Scenario the existing floorspace and trip making activity is scaled by 1.105. The breakdown of utilised land and associated trip generation of the industrial areas is shown in **Table 2.5**.

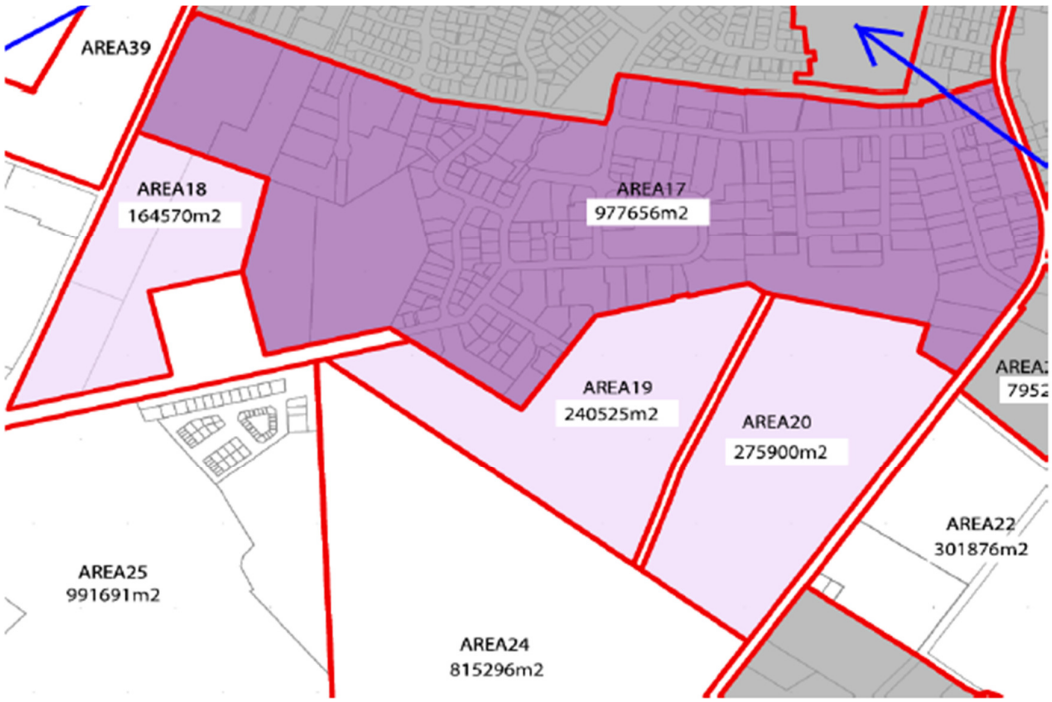

Figure 2.1 General scale of Industrial areas and Plan Change site

Table 2.5 Existing and Proposed Industrial Building areas

Industrial Area	Raw Area	Site Coverage (77%)	Utilisation (20%)	PM peak hour trips	PM 2 hour total
Existing 2018 McNulty	978,000	n/a	111,600	1,515	2,714
Recent Consented Area	174,000	134,000	26,700	347	622
Total 2050 Baseline	978,000		150,100	2,022	3,621
Area 20 (Z303)	276,000	212,000	42,350	551	986
Area 19 (Z303)	241,000	185,000	36,900	480	860
Area 18 (Z305)	165,000	126,000	25,300	328	588

To obtain the two-hour demand the peak hour demand is scaled by 1.791, as per the base model. The overall interpeak activity from the industrial areas has been derived by comparing the base model total volumes in the two-hour evening peak period to the five-hour interpeak period, resulting in a scaling factor of 1.597 to get from evening peak demand to interpeak demand.

2.4 External Zone Traffic Volume Growth

The most recent Average Annual Daily Traffic (AADT) volumes for the four roads representing the external connections of the model were obtained from Waka Kotahi (WK), covering the five years from 2016 to 2020. There was a noticeable drop in the 2020 count values potentially due to effects from Covid-19 travel restrictions. The average growth across all sites from 2016 to 2019 was 4.35% annually which aligned with the population growth of Cromwell in the 2016 and 2017 years as shown in the Cromwell Masterplan report.

Given the traffic growth rate is generally in line with population growth the external volumes have been increased by the forecast growth in population of the modelled area. This is equal to 65% more traffic in 2050 when compared to 2018.

3. Future Year Network

3.1 Baseline Network

The initial road network set up for the 2050 future year was generally in line with the 2018 base network. A key infrastructure input is a new single lane roundabout at the SH6 and SH8B intersection which has been coded in line with the layout proposed for NZUP[1]. The 2018 network was simplified when it was set up with many intersections with single lane approaches. The future network operation was observed for performance issues that were related to this, with additional capacity added where there is existing space for vehicles to pass another that is waiting to turn. This was not a response to provide additional capacity over what is already provided but to better match the existing intersection layouts.

The main additional network detail in the currently industrial zones area was new roading connections between McNulty Road and Cemetery Road, in line with the previous modelling undertaken for CODC by Abley.

3.2 Network with Proposed Industrial Plan Changes

There are presently no details on what the road network would look like within the proposed industrial plan changes, and this would normally be presented as part of an Outline Development Plan (ODP). However, the likely main roads that would serve these large areas have been assumed for this testing stage. The western site of Area 18 has been connected via the recently consented site and via Cemetery Road on the west side of the cemetery. For the two south-eastern sites a new road has been assumed on the south-western boundary of both sites between Bannockburn Road and Cemetery Road. Another link has been assumed to run off this new road between the two sites, connecting them both into the existing area via the western side of Ree Cresent. The industrial area network including the proposed Plan Change sites is shown in **Figure 3.1**.

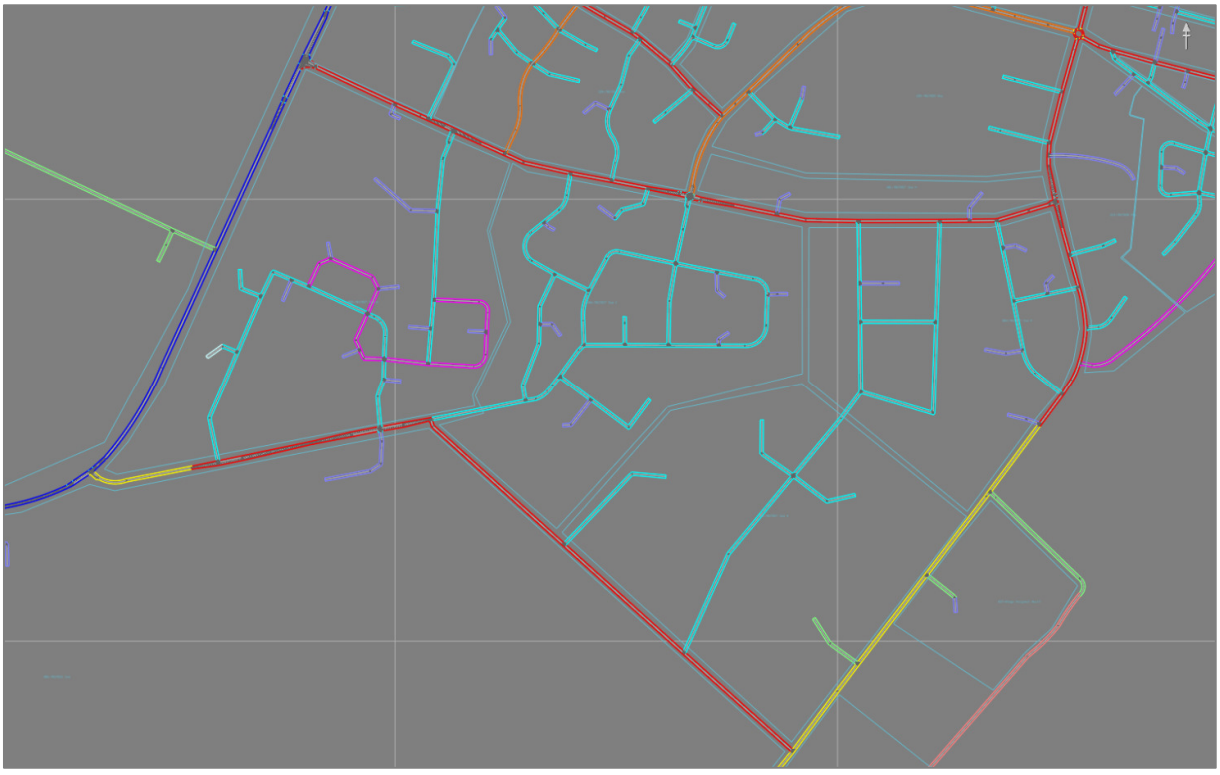

Figure 3.1 Future road network with industrial plan change areas

[1] https://www.nzta.govt.nz/projects/sh6-sh8b-cromwell-intersection-improvements/

4. Future Model Operation Comparison

4.1 Intersection Performance

The performance of key intersections has been summarised in Table 4.1 for the 2050 interpeak hour and Table 4.2 for the 2050 evening peak hour. The results include the total traffic movements per hour through the intersection, average intersection delay for delayed vehicles (in seconds) and Level of Service. Level of Service (LoS) is a function of delay and is a concept used by transportation engineers to qualitatively describe network performance as shown in the classifications below:

Level of Service Band	General Traffic Flow Description
LoS A	Primarily free-flow operation
LoS B	Reasonably unimpeded operation
LoS C	Stable operation
LoS D	A less stable condition in which small increases in flow may cause substantial increases in delay and decreases in travel speed
LoS E	Characterised by unstable operation and significant delay
LoS F	Characterised by flow at extremely low speed. Congestion is likely occurring at the boundary intersections, as indicated by high delay

These results show good performance in the interpeak hour in both the baseline and when including the industrial zoning plan changes. Changes in intersection delay are low and level of service is mostly very good, with no intersection exceeding LOS B in either scenario.

The evening peak periods are much busier than the interpeak which is consistent with the 2018 base model and there are some notable changes described following the tables.

Table 4.1 2050 future year Interpeak Hour intersection performance comparison

Intersection	2050 Baseline PM Peak			2050 IPC PM Peak			Change	
	Volume	Delay	LOS	Volume	Delay	LOS	Volume	Delay
SH6 / Pisa Moorings Rd / Clark Rd	732	5.1	A	741	4.9	A	9	-0.2
SH6 / Lowburn Valley Rd	839	6.3	A	848	6.3	A	9	0
SH6 / Burn Cottage Rd	857	1.8	A	864	2	A	7	0.2
SH6 / Shortcut Rd	874	2.3	A	885	2.4	A	11	0.1
SH6 / SH8b	1410	7	A	1505	7.8	A	95	0.8
SH6 / Ripponburn	855	3.1	A	971	3	A	116	-0.1
SH6 / Ripponvale Rd	836	3.8	A	955	4.2	A	119	0.4
SH6 / McNulty Rd	1147	10.3	B	1257	11.2	B	110	0.9
SH6 / Ord Rd	914	5.2	A	1033	7	A	119	1.8
SH6 / Cemetery Rd	881	6.6	A	1076	10.1	B	195	3.5
SH6 / Sandflat Rd	427	6.2	A	419	6.3	A	-8	0.1
SH6 / Pearson Rd / Ripponvale Rd	394	5.2	A	395	5.4	A	1	0.2
SH8b / Sargood Rd	977	4.8	A	992	4.7	A	15	-0.1
SH8b / Barry Ave	1026	5.3	A	1077	5.8	A	51	0.5
SH8b / Shortcut Rd	664	8.5	A	675	9.3	A	11	0.8
SH8b / Bell Ave	540	6.9	A	553	7.7	A	13	0.8
SH8b / Alpha St	729	8.9	A	719	8.2	A	-10	-0.7
SH8 / SH8b	888	5.1	A	887	5.4	A	-1	0.3
Barry Ave / Inniscort St / Gair Ave	893	3.7	A	1116	4.5	A	223	0.8
Barry Ave / McNulty Rd	623	3.9	A	773	5.1	A	150	1.2

Table 4.2 2050 future year Evening Peak Hour intersection performance comparison

Intersection	2050 Baseline PM Peak			2050 IPC PM Peak			Change	
	Volume	Delay	LOS	Volume	Delay	LOS	Volume	Delay
SH6 / Pisa Moorings Rd / Clark Rd	1025	7.1	A	1035	6.9	A	10	0
SH6 / Lowburn Valley Rd	1187	7.9	A	1190	9.9	A	3	2
SH6 / Burn Cottage Rd	1198	2.4	A	1197	2.2	A	0	0
SH6 / Shortcut Rd	1231	2.6	A	1231	2.6	A	0	0
SH6 / SH8b	1836	18.5	B	1930	37.1	D	94	19
SH6 / Ripponburn	1071	4.2	A	1194	5.4	A	124	1
SH6 / Ripponvale Rd	1048	4.8	A	1173	5.3	A	125	0
SH6 / McNulty Rd	1471	45.1	E	1591	142	F	120	97
SH6 / Ord Rd	1116	7	A	1297	14.3	B	181	7
SH6 / Cemetery Rd	1084	9.9	A	1356	143.5	F	272	134
SH6 / Sandflat Rd	469	8.4	A	449	9.2	A	-20	1
SH6 / Pearson Rd / Riponvale Rd	434	5.6	A	424	5.5	A	-10	0
SH8b / Sargood Rd	1348	17.7	C	1373	21.4	C	25	4
SH8b / Barry Ave	1319	33.9	D	1364	34	D	46	0
SH8b / Shortcut Rd	738	35.9	E	756	51.8	F	18	16
SH8b / Bell Ave	568	7.9	A	573	7.6	A	4	0
SH8b / Alpha St	874	43.3	E	857	33.7	D	-17	-10
SH8 / SH8b	1160	10.3	B	1137	9.7	A	-23	-1
Barry Ave / Inniscort St / Gair Ave	1274	10.6	B	1546	25.1	C	272	15
Barry Ave / McNulty Rd	799	11.4	B	1029	63.6	F	230	52

Key observations are:

- The proposed roundabout at the intersection of SH6 /SH8B operates acceptably in both scenarios (LOS B – D) as a single circulating lane. There is provision in the plans for a second circulating lane that would provide increased capacity and potentially provide a more attractive route via the State Highway network compared to through town via Barry Ave. If the State Highway network is more attractive, operation of the congested right turns from Cemetery and McNulty will need to be carefully considered.
- The town centre experiences significant congestion in the evening peak hour irrespective of the industrial rezoning. This is mainly due to limited capacity at Waenga/Sargood and Barry/Waenga restricting the southbound flow and then blocking back, introducing a large amount of side-road congestion. Delays at SH8B/Sargood and SH8B/Barry are acceptable (LOS C – D), however there are instances of turns into the Town Centre blocking back close to the State Highway and introducing delays to the through movements on SH8B.

The most notable changes resulting from the inclusion of the industrial rezoning are:

- SH6/Cemetery is significantly more attractive to industry in the south, increasing by ~240 vehicles in peak hour.
  - The majority of these are on the right turn out of Cemetery, with ~50 vehicles rerouting from SH6/McNulty.
  - Overall delays are significant, at LOS F.
- SH6/McNulty turning volumes from McNulty reduce slightly, mostly from the right turn onto SH6.

  - Even with this decrease in turning volumes delays increase significantly to LOS F, indicating the intersection is operating over capacity.
- Traffic from the industrial rezoning areas increase northbound volumes through Bannockburn significantly, by around 250-300 vehicles in peak hour.
  - This northbound increase impacts the operation of Barry/McNulty (LOS F) and the Barry/Gair/Inniscort roundabout (LOS C), and increases traffic from existing industrial areas routing via Gair, Jollys and Waenga in preference to using Barry/McNulty.
  - McNulty is less attractive overall, as egresses at both ends of the road are significantly more congested than the baseline.
  - New accesses have been assumed to connect the plan change areas and link Bannockburn Rd, Cemetery Rd and Ree Cr. These carry around 350 vehicles at the Cemetery Rd end, 400 vehicles at the Bannockburn Rd end, and 370 vehicles at the Ree Cr connection in peak hour.
  - Without this connection capacity is likely to be exceeded on McNulty and Bannockburn Rd and is likely to cause significant deterioration of surrounding intersections as traffic is forced to reroute.
- The highest traffic volumes occur on Barry Rd to the south of Gair (around 1000 vehicles in peak hour) and on SH8B between Barry and Shortcut (950-1000 vehicles in peak hour).

The pattern of traffic volume change can be seen in **Figure 4.1** for the evening peak hour.

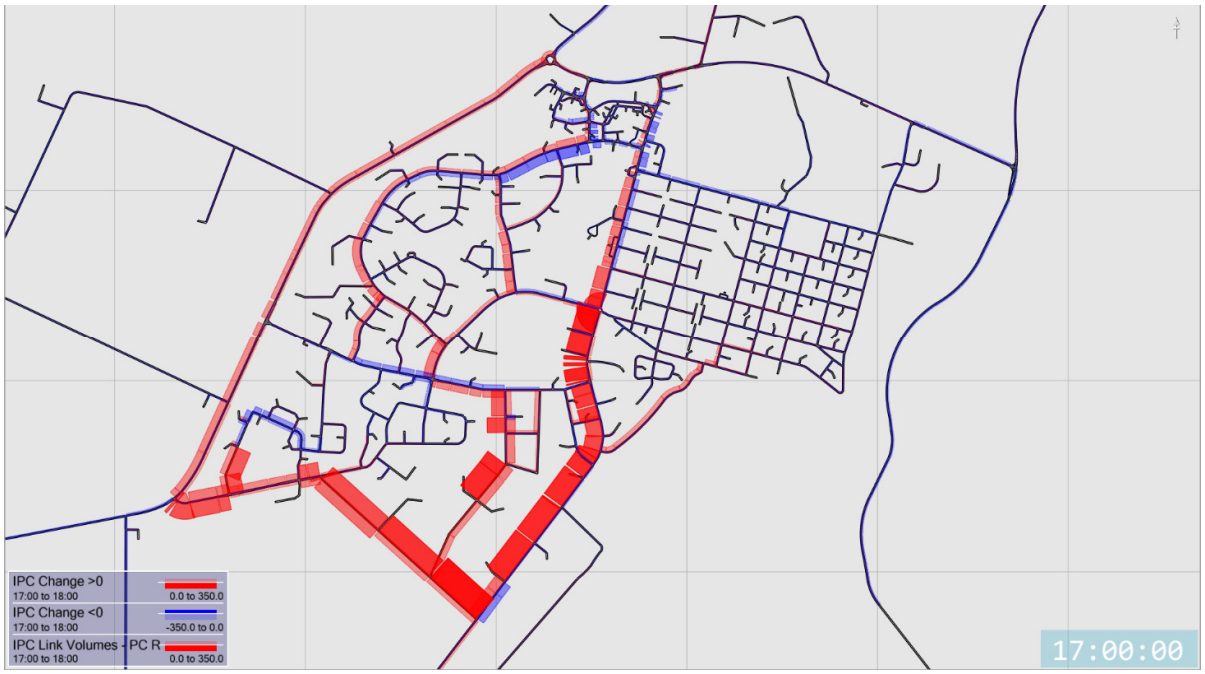

Figure 4.1 Evening Peak Hour Volumes Change with Plan Changes implemented

5. Conclusions

The transportation modelling has provided guidance as to the likely effects on the Cromwell road network due to the proposed industrial rezoning. It is concluded that:

- Upgrades are likely to be required at the SH6 intersections at McNulty Road and Cemetery Road.
  - A roundabout is likely to form the most suitable upgrade of the SH6 / McNulty Road intersection and may meet the performance threshold for requirement in the baseline scenario.
  - Cemetery Road could require a lesser upgrade (such as a formalised Seagull right-turn treatment) if a roundabout at the McNulty intersection is installed.
  - Further assessment and engagement with Waka Kotahi will be required to confirm the most suitable form for these intersections.
- An upgrade of the Barry Ave / McNulty Rd intersection will likely be required as a result of the rezoning and a roundabout is likely to be the most suitable intersection form.
- Consideration of a management and access plan for the SH8B corridor however this is likely required irrespective of the proposed industrial rezoning. This includes the Barry Ave and Shortcut Rd intersections which could potentially be resolved with the implementation of the roundabout associated with the Wooing Tree masterplan. As with changes to McNulty Rd, this would require further analysis to quantify the change to vehicle routing behaviour and confirm the most suitable for of these intersections.
- It has been highlighted in the report that the town centre has issues with pinch points and resulting congestion at the ring roads such as at Waenga Dr, Barry Ave, Murray Tce and Sargood St. This is recommended to be addressed through future Masterplan work and is required irrespective of the industrial rezoning.