Cardno

GISBORNE FUTURES

TRAFFIC AND TRANSPORT RECOMMENDATIONS REPORT - APPENDICES

V180578
24 July 2020

Macedon Ranges Shire Council

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APPENDIX

A

PLANNING POLICY CONTEXT

Appendix A - Planning Policy Context

In addition to the key policy informing the Traffic and Transport elements of the Gisborne Futures Plan, this appendix provides a detailed analysis of the relevant transport policy and strategic documentation that has been referred to in Section 2 of the report. The following sections outline specific Local Strategies that assist in guiding the future delivery of policy goals and objectives.

State & Regional Policy

The Transport Integration Act

The Transport Integration Act (the Act) came into effect on 1 July 2010, with the purpose of creating a framework for the provision of an integrated and sustainable transport system in Victoria.

The Act sets out six transport objectives as follows:

- 'provide a means by which persons can access social and economic opportunities to support individual and community wellbeing;
- facilitate economic prosperity;
- actively contribute to environmental sustainability;
- provide for the effective integration of transport and land use and facilitate access to social and economic opportunities;
- facilitate network-wide efficient, coordinated and reliable movements of persons and goods at all times; and
- be safe and support health and wellbeing.'

In essence the Act aims to ensure all department stakeholders work towards a common goal to provide an integrated and sustainable transport system.

Departments and agencies are bound by the Act and are therefore required to have regard to the transport system objectives and decision-making principles when making decisions and exercising powers.

Plan Melbourne (2017-2050)

Plan Melbourne, the current Metropolitan Planning Strategy, is an integrated land use and transport plan aimed at guiding the way the city will grow and change over the next 35 years. The document sets out the strategy for supporting jobs and growth, while building on Melbourne's legacy of distinctiveness, liveability and sustainability.

Plan Melbourne classifies Gisborne as a *Peri-Urban Regional Centre* with growth potential to increase the land supply for housing and attract population growth out of Melbourne. Peri-urban towns can provide an affordable and attractive alternative to metropolitan living, however strategies are needed for the timely delivery of state and local infrastructure. As a result, long term planning is required to support peri-urban regions, including Gisborne, to ensure these communities can sustain the envisaged growth.

Key relevant directions include investing in regional Victoria to support housing and economic growth, in addition to improving freight and passenger transport connections to regional towns. Transport network planning must also include identification of freight corridors.

Loddon Campaspe Integrated Transport Strategy

The strategy is owned by the Loddon Campaspe Councils and sets six goals as a framework for developing actions and next steps to implement the strategy:

- Goal 1: Protect and enhance a transport system that supports regional economic development and population growth;
- Goal 2: Improve the capacity and function of the transport network, and integrate it with land use;
- Goal 3: Manage the transport system so that it is maintained to a safe and affordable level of service;
- Goal 4: Provide equitable community access and connectivity for large and small communities;

- Goal 5: Support efficient and sustainable transport of products between producers, markets and nodes within the region and with other regions; and
- Goal 6: Support improved community health and environmental outcomes.

This overarching strategy identifies key linkages between the local Council and connections to the wider network throughout Victoria and the importance of maintaining and expanding the network to ensure sustainable outcomes.

Loddon Mallee South Regional Growth Plan

The Loddon Mallee South Regional Growth Plan was published in 2014 and is the strategic land use plan for the region to guide growth and change for the next 30 years.

Strategically significant transport routes traverse this sub-region, with the Calder road and rail corridor well utilised and has supported growth and increased movement between settlements and economic centres. Future transport directions for the region include:

- Strategically renew, maintain and develop transport infrastructure to maximise opportunities to meet anticipated need;
- Ensure that the current and future operation of major infrastructure of state and regional significance, including highways and railways, is not adversely affected by urban development in adjacent areas; and
- Strategically direct growth to locations with good existing infrastructure and infrastructure with the capacity for enhancement.

It is noted that the Bendigo rail line has experienced strong growth in patronage following recent upgrades. This includes high levels of commuting from Bendigo to Melbourne on a daily basis, and increasing levels of commuting from surrounding townships to Bendigo, such as townships within Macedon Ranges Shire, both by car and rail. These commuter trends are expected to continue and are critical for businesses in and outside the region.

Macedon Ranges Shire Council Plan

The Council Plan 2017-2027 (Year Two) is the primary vision and goal setting document for Council during its current term. Priority areas for Council include promoting health and wellbeing and improving the built environment. Strategies include improving local roads, advocating for better access to public transport, increasing walking and cycling connectivity and facilitating physical activity. Key actions in relation to these matters which have an impact on the movement and access network are as follows:

- Meet current renewal demand requirements through the delivery of the $1.9 million building renewal capital works program;
- Advocate for funding to commence construction of a rail trail and off road cycling and walking track from Daylesford to Hanging Rock; and
- Increase cycling and pedestrian connectivity within the shire by delivering the footpath construction program and advocating for external funding to deliver future projects detailed within the 10 year footpath construction program.

New Gisborne Development Plan

The New Gisborne Development Plan sets out the framework, conditions and requirements for future urban growth of the New Gisborne Growth Area. This growth area is located north of the Calder Freeway, on the west side of Station Road and south of the railway line.

Primary access to the growth area will be via Ferrier Road, identified for upgrade to a boulevard-style 24m road reserve connector street. It is noted that the New Gisborne primary school is located near the intersection of Ferrier Road and Station Road and is identified for future improvements to access and car parking.

A neighbourhood activity centre (NAC) is proposed to be located adjacent to Station Road, with a new intersection identified for access to both the NAC and the internal road network of the growth area.

The following key objectives relate to the access and movement network proposed for the growth area:

- To provide a high level of accessibility throughout the Development Plan area for all forms of public and private transport, and a high level of connectivity to the existing urban area of New Gisborne;
- To place emphasis on providing a high level of accessibility by walking and cycling;

- To create a hierarchy of streets that is clearly recognisable in the design and layout of new roads; and
- To minimise additional traffic impacts on Station Road.

Gisborne Business Park Master Plan

The Gisborne Business Park Master Plan is currently being prepared to provide a long term plan to guide development within the existing Business Park, located in New Gisborne. Cardno was engaged to develop a Transport and Infrastructure to inform the development of the Master Plan, which included the following findings and recommendations:

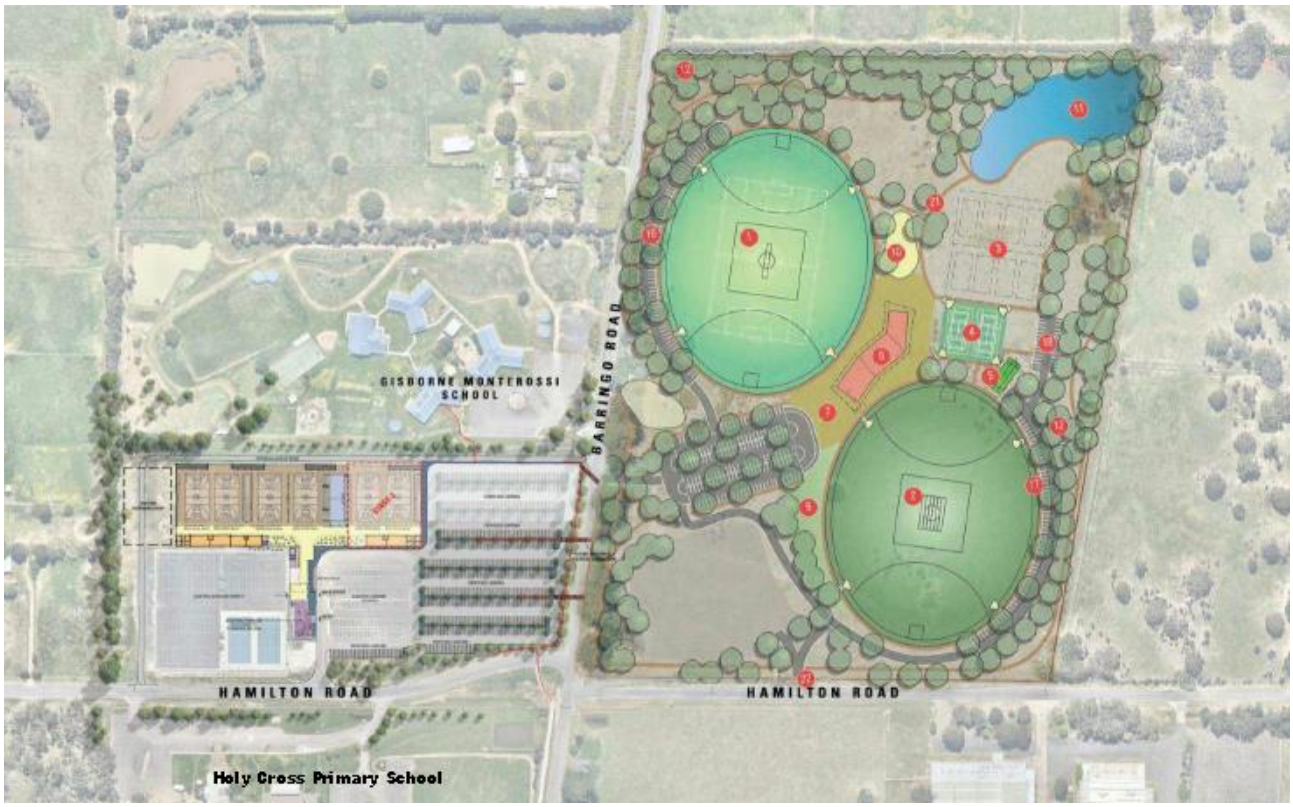
- There is currently a single road access into the existing business park, which is via Barry Road from Saunders Road. It is proposed to provide additional access roads into the expanded business park area as it develops and demand increases. These being the 'Boulevard' access along the eastern boundary of the future business park expansion, accessed off Saunders Road, extension of Payne Road, and a one way eastbound service road along the southern boundary off Saunders Road;
- It is proposed to upgrade Saunders Road to improve the Barry Road intersection;
- The Magnet Lane approach to Saunders Road will be realigned within the existing Saunders road reserve to allow for the provision of a channelised right turn into Magnet Lane from the west;
- In the longer term, aided by the potential residential development east of the expanded business park area, it is proposed that a roundabout with a raised median is provided at the future connector boulevard intersection;
- It is recommended that key links within the business park be designed as bus capable, including the southern section of Barry Road, Ladd Road, the proposed boulevard, and the Payne Road connection toward the east; and
- It will be important to both improve active transport connectivity into the existing and future business park and also provide internal permeability for pedestrians and cyclists.

Traffic surveys undertaken in 2016 indicate that the current business park generates approximately 2,650 daily trips. The expanded business park area is expected to provide an additional 135 lots of varying sizes in an area abutting the eastern and southern boundaries of the existing site. Assuming RTA trip generation rates, the full occupation of the existing and the proposed expanded business park is expected to generate approximately 8,300 total daily trips. In conjunction with the future residential development identified east of the Gisborne Business Park Master Plan, the future growth of New Gisborne needs to be considered in relation to the wider Gisborne transport network.

Gisborne Sports Precinct Infrastructure Plan 2018

A potential Regional Sports Hub has been identified on the north side of Hamilton Road to meet future demand within the Municipality. The sports precinct would comprise a 4.2ha netball complex to the west of Barringo Road and the Sports Hub of 12.8ha to the east, as illustrated in Figure A-1. A traffic impact statement was prepared by MRSC assuming an operational year of 2024 for the sports hub. It was found that the existing staggered cross road intersection of Hamilton Road and Barringo Road would have slightly lower saturation levels and delays than a roundabout, however a roundabout upgrade was preferred to improve the safety of conflicting vehicle movements at the intersection.

Figure A-1 Sports Precinct Concept Plan



Source: Gisborne Sports Precinct Infrastructure Plan 2018

APPENDIX

B

SURVEY DATA

Appendix B – Existing Transport Conditions

Work and Travel Patterns

Method of Travel to Work

2016 ABS census data is presented in Table B-1 providing method of travel to work data for employed persons residing in Gisborne, also including 2011 census data by way of comparison.

The predominant method of travel to work for employed persons residing in Gisborne in 2016 was by car as a driver or passenger, representing 76.1% of mode share. This represents an increase from 72.2% in the previous census year of 2011. It is expected that insufficient public transport and poor pedestrian and cycle links are a contributing factor to such a high proportion of private motor vehicle commuting.

Employed persons travelling to work by public transport represented 7.7% of mode share in 2016, which was an increase from 6.7% in 2011.

It is noted that whilst walking to work was recorded as one of the top responses in 2011, this was replaced with working at home in 2016. With working at home now representing 5% of the 'mode share' in 2016, it is perhaps a sign of the evolving labour market where flexible working hours and working from home are becoming increasingly popular.

Table B1 Method of Travel to Work

Gisborne - Travel to Work (top responses)	2016		2011	
	(no.)	(%)	(no.)	(%)
Car, as driver	3,206	68.7	2,644	66.4
Worked at home	234	5	n/a*	n/a*
Train	196	4.2	131	3.3
Car, as passenger	190	4.1	220	5.5
Train, car as driver	82	1.8	45	1.1
Walked only	n/a*	n/a*	64	1.6
People who travelled to work by public transport	359	7.7	267	6.7
People who travelled to work by car as driver or passenger	3,555	76.1	2,877	72.2

Source: Australian Bureau of Statistics

**Not listed as a top response.*

NOTE: This table is based off a worker's place of usual residence.

Work Patterns

2016 ABS census data for journey to work patterns is available at the Local Government Area (LGA) scale, which in the case of Gisborne is Macedon Ranges Shire. Of the 21,706 employed residents of the Macedon Ranges Shire, 9,111 (42%) work within the same LGA and 11,275 work outside the LGA (51.9%).

The top result for where people work outside of Macedon Ranges Shire is Melbourne LGA (12.8%), followed by Hume LGA (11.6%) (refer to 0). Both of these locations are accessible via both the Calder Freeway and the V/line train service, with the Melbourne LGA particularly accessible by train. Brimbank, Moonee Valley and Melton are the following popular LGA's, which are also located within the corridor northwest of the Melbourne LGA.

Of those working in Macedon Ranges Shire, 9,111 people (72.2%) live within the LGA and 3,503 people (27.8%) live outside the LGA. The top results for the LGA where local workers commute from includes Hume (7.1%) which is an abutting LGA to the southeast and Mount Alexander (3.4%) which is an abutting LGA to the northwest. Both of these LGA's benefit from having access to the Calder Freeway and V/line train services to Gisborne.

Whilst it is noted that the popular LGA's for commuting to and from Gisborne are generally within the V/line and Calder Freeway corridor, mode share statistics for Gisborne residents would indicate that a majority of

commuters are travelling in private motor vehicles. It is expected that the convenience of the Calder Freeway and the lack of public transport connectivity are contributing factors to this trend.

Table B-2 Employment Location of Resident Workers by LGA

Macedon Ranges Shire	2016	
Location	No. of people	%
Live and work in the area	9,111	42.0
Live in the area, but work outside	11,275	51.9
No fixed place of work	1,302	6.1
Melbourne (C)	2,774	12.8
Hume (C)	2,528	11.6
Brimbank (C)	975	4.5
Moonee Valley (C)	480	2.2

Source: Australian Bureau of Statistics, Census of Population and Housing 2016. Compiled by .id

Table B-3 Residential Location of Local Workers

Macedon Ranges Shire	2016	
Location	No. of people	%
Live and work in the area	9,111	72.2
Work in the area, but live outside	3,503	27.8
Hume (C)	900	7.1
Mount Alexander (S)	428	3.4
Melton (C)	375	3.0
Greater Bendigo (C)	314	2.5

Source: Australian Bureau of Statistics, Census of Population and Housing 2016. Compiled by .id

2017 Gisborne Neighbourhood Character Survey Report – Work & Travel

In 2017, MRSC commissioned primary research of the Gisborne community to explore a range of issues, which included method of journey to work. The interview and online surveys reported that 83.1% and 78.1% of respondents, respectively, reported that they travelled to work by car, which is slightly higher than the ABS census results.

In terms of employment location, the most common response was inner Melbourne (19.5% online survey), followed by Gisborne (16% online survey). A significant number of respondents also reported western or northern suburbs of Melbourne, however the report notes that 159 of 391 online survey respondents did not provide a response to this question. These responses are generally consistent with the ABS census data, however those living and working within Gisborne is significantly lower at 16% rather than 42%. This can be explained in part due to the ABS data being at the Macedon Ranges Shire level, meaning that those who live in one township and working in another township within the Shire are counted. The survey data was however limited to only those living and working in Gisborne.

Traffic Survey Summary

In order to gain a thorough understanding of existing traffic conditions in and around Gisborne, VicRoads and MRSC commissioned traffic surveys in October 2018. These included traffic volume surveys, intersection turning movement counts and origin-destination surveys across the road network throughout Gisborne. The results from these surveys and an assessment of the current traffic conditions is summarised below.

Daily Traffic Count Surveys

Seven-day automated tube count (ATC) surveys were undertaken within the Gisborne town centre and the wider structure plan area in October 2018 to gain an understanding of the current traffic characteristics of the road network throughout the area.

A summary of the weekday traffic flows in each direction, the total volumes and proportion of heavy vehicles is provided in Table B-1.

Table B4 Gisborne Traffic Characteristics

Location	Northbound Volume	Southbound Volume	Total Volume	Heavy Vehicle %
Hamilton St (b/w Aitken St & Brantome St)	5,368	5,386	10,754	6%
Hamilton St (b/w Mulgutherie Way & Turanga Rd)	1,150	1,095	2,246	9%
Station Rd (north of Saunders Rd)	2,985	3,358	6,343	6%
Station Rd (south of Saunders Rd)	5,233	5,848	11,081	6%
Station Rd (b/w Ross Watt Rd & McKim Rd)	7,882	7,549	15,431	6%
Saunders Rd (east of Joseph Ave)	1,598	1,656	3,254	12%
Aitken St (b/w Hamilton St & Robertson St)	6,389	5,421	11,809	7%
Aitken St (b/w Hamilton St & Fisher St)	5,337	5,322	10,659	n/a
Aitken St (b/w Howey St & Gisborne-Melton Rd)	5,018	5,033	10,051	6%
Bacchus Marsh-Gisborne Rd (south of Mulgutherie Way)	2,138	2,079	4,217	8%
Gisborne-Melton Rd (south of Braeside Rd)	1,812	1,847	3,569	11%
Black Forest Dr (north of Mt Macedon Rd)	1,622	1,759	3,381	2%
Mt Macedon Rd (b/w Black Forest Dr & Hamilton Rd)	1,830	1,911	3,741	2%
Gisborne-Kilmore Rd (east of Campbell Rd)	2,433	2,351	4,785	5%
Robertson St (b/w Neal St & Goode St)	2,046	2,174	4,220	11%
Melbourne Rd (b/w Aitken St & Kilmore Rd)	5,168	6,105	11,274	5%
Melbourne Rd (b/w Howey St & Calder Fwy)	4,353	4,803	9,157	5%

The theoretical capacity for any two-way and single-lane carriageway is 18,000 vehicles per day. Therefore, Station Road is the only road around Gisborne that is approaching this theoretical capacity, with counts at 15,431 vehicles per day between Ross Watt Road and McKim Road (south of the Calder Freeway). With continued development in the near vicinity, the theoretical capacity of Station Road will be reached in the short to medium term.

Regular ATCs should be conducted at the above locations to track the increase in vehicle volumes, particularly for Hamilton Street, Aitken Street and Melbourne Road, which may be nearing their theoretical capacity within the next 5-10 years.

Intersection Turning Movement Surveys

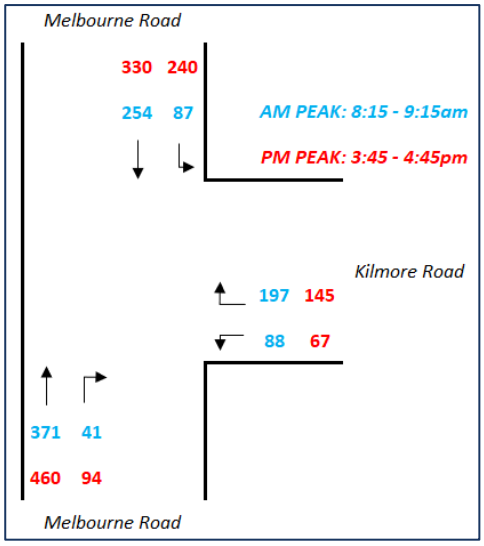
A number of intersection turning movement surveys were undertaken within the Gisborne town centre and the wider structure plan area during the same period as the daily traffic count surveys. These surveys assisted in gaining an understanding of the current performance of key intersections in the town centre and the surrounding area.

These surveys were undertaken at the following intersections:

Hamilton Street / Melbourne Road and Kilmore Road:

The major traffic movements are the through traffic movements along Hamilton Street / Melbourne Road. The majority of traffic originating from Kilmore Road are turning north toward Gisborne town centre. In the PM peak, there is a larger volume of traffic turning in and out of Kilmore Road to and from the town centre.

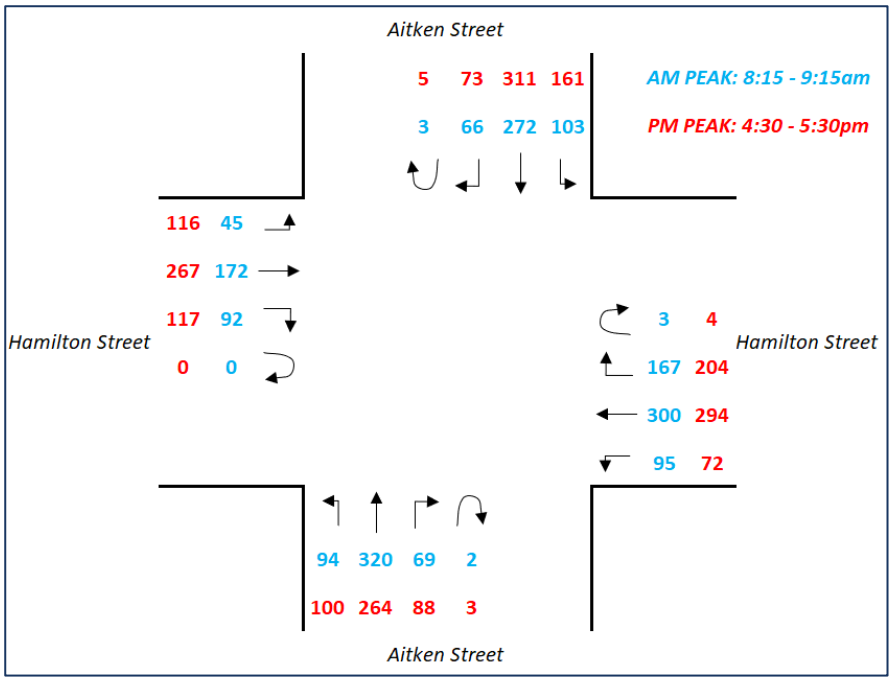
Figure B1 Hamilton Street / Melbourne Road & Kilmore Road TMC



Aitken Street and Hamilton Street:

Peak volumes through the roundabout are relatively even through both the AM and PM peaks, with the largest traffic movements being north-south along Aitken Street and westbound traffic from Hamilton Street. It can be seen that the PM peaks show more left and right-turning traffic from each direction. There is a fair portion of traffic in both peaks that conduct movements along Aitken Street north and Hamilton Street east in both directions.

Figure B2 Aitken Street & Hamilton Street TMC

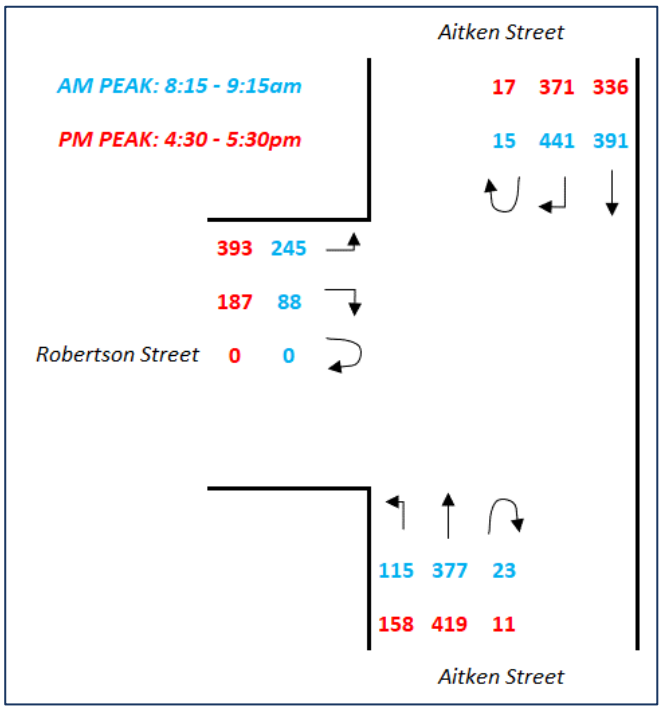


Aitken Street and Robertson Street:

In both peaks a large portion of the traffic volume originates from Aitken Street north, with a little more than half that traffic turning west onto Robertson Street. Similarly, in the PM peak, a large portion of traffic is

turning left from Robertson Street onto Aitken Street. This forms the main traffic movement. North-south Aitken Street traffic movement is also significant at this roundabout.

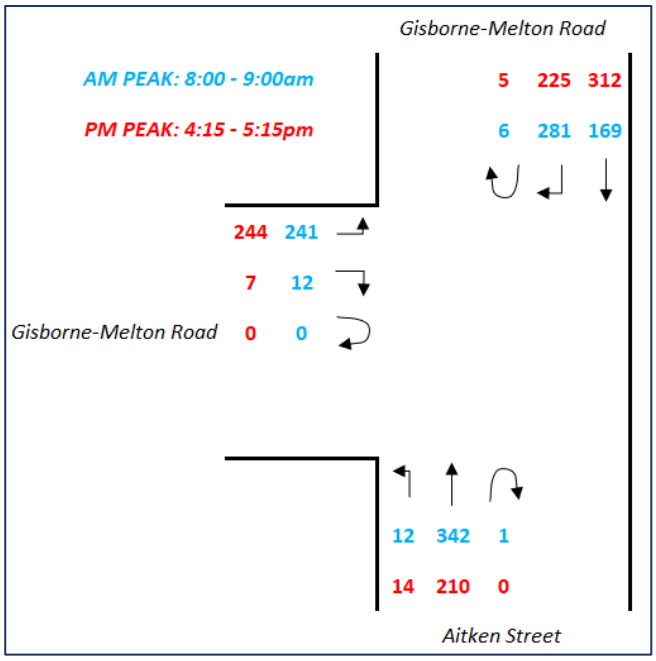
Figure B3 Aitken Street & Robertson Street TMC



Aitken Street and Melton Road:

There are two significant traffic movements through this roundabout: north south traffic along Aitken Street and through traffic on Melton Road and Aitken Street. It is shown that there are higher traffic volumes northbound towards the town centre from the residential areas south of the intersection in the AM peak, and then heavier in the southbound direction away from the town centre in the PM peak. There is little difference in either direction on Melton Road between the peak periods.

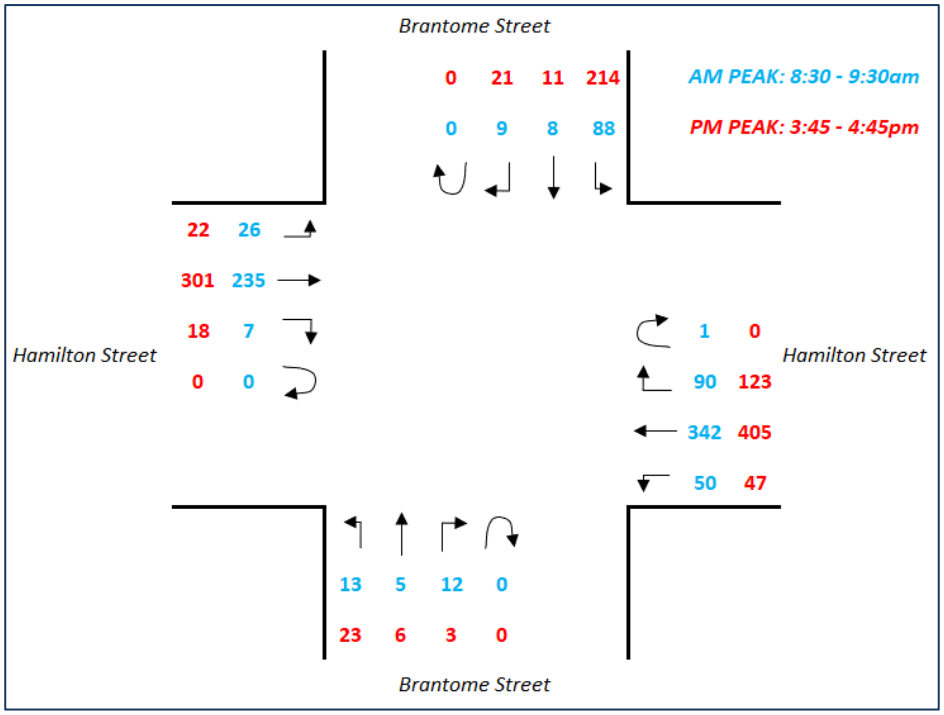
Figure B4 Aitken Street & Gisborne-Melton Road TMC



Hamilton Street and Brantome Street:

The PM peak sees much higher traffic volumes than the AM peak, largely due to the large number of vehicles turning left from Brantome Street onto Hamilton Street. The majority of traffic is running east-west through this intersection. The south approach of Brantome Street sees less traffic than its north approach.

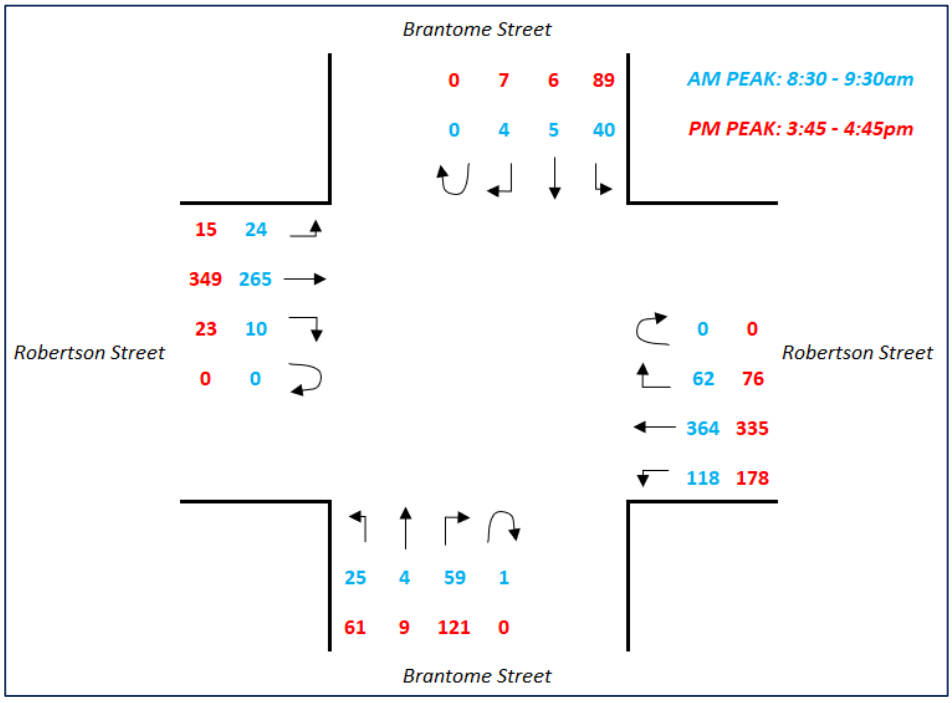
Figure B5 Hamilton Street & Brantome Street TMC



Robertson Street and Brantome Street:

This intersection shares the same characteristics as the Hamilton Street & Brantome Street intersection. However, the south approach of Brantome Street carries more traffic than its north approach. The majority of Brantome Street traffic is still turning east. A large portion of traffic is turning left from Robertson Street into Brantome Street. From this and the previous TMC's it can be seen that the section of Brantome Street between Hamilton Street and Robertson Street attracts large proportion of traffic.

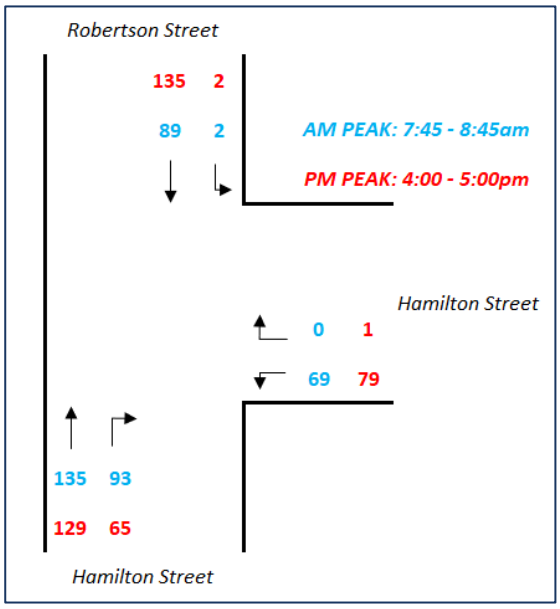
Figure B6 Robertson Street & Brantome Street TMC



Robertson Street (Bacchus Marsh Road) and Hamilton Street:

The majority of traffic through this intersection runs north-south between Bacchus Marsh Road (south) and Robertson Street, although a larger portion is northbound traffic from Bacchus Marsh Road (south), with roughly a third of its volume turning right onto Hamilton Street (east). A similar volume turns left from Hamilton Street (east) to Bacchus Marsh Road (south). There is almost zero traffic that form north-east traffic movements.

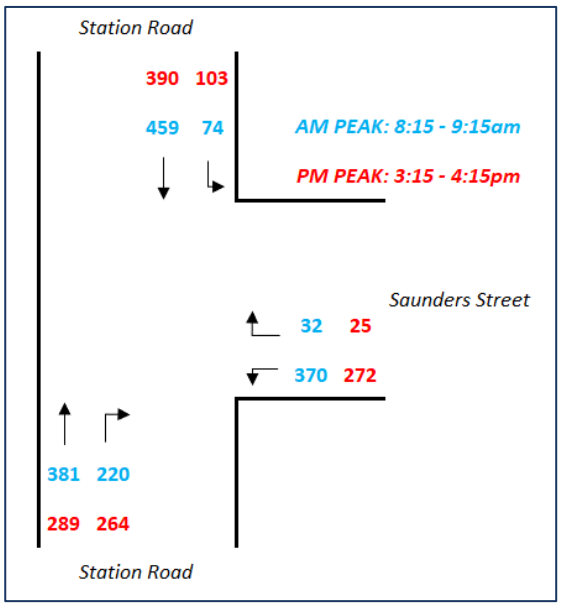
Figure B7 Robertson Street / Bacchus Marsh Road & Hamilton Street TMC



Station Road and Saunders Road:

A relatively similar portion of traffic comes from the north and south approaches of Station Road, with more vehicles travelling in a north-south direction. From the southern approach, a large portion of traffic turns right onto Saunders Street. A large portion of traffic also originates from Saunders Road, however a significant portion turns south towards the Calder Freeway interchange and Gisborne.

Figure B8 Station Road & Saunders Road TMC



Origin-Destination Surveys

Cardno analysed the origin destination (O/D) surveys undertaken on Thursday 25th October 2018, for the 12 hours between 6:30am and 6:30pm to gain an understanding of the more significant vehicle movements, including heavy vehicles, into and through the Gisborne area.

Analysis shows that the more significant strategic vehicle movements i.e. along the arterial roads through or into the town are:

All Vehicles (Cars and heavy vehicles)

- Calder Freeway West to Bacchus Marsh Road and return
- Calder Freeway West to Melton Road and return
- Station Road (New Gisborne) to Town Centre and return
- Calder Freeway East to Town Centre and return

Cars Only:

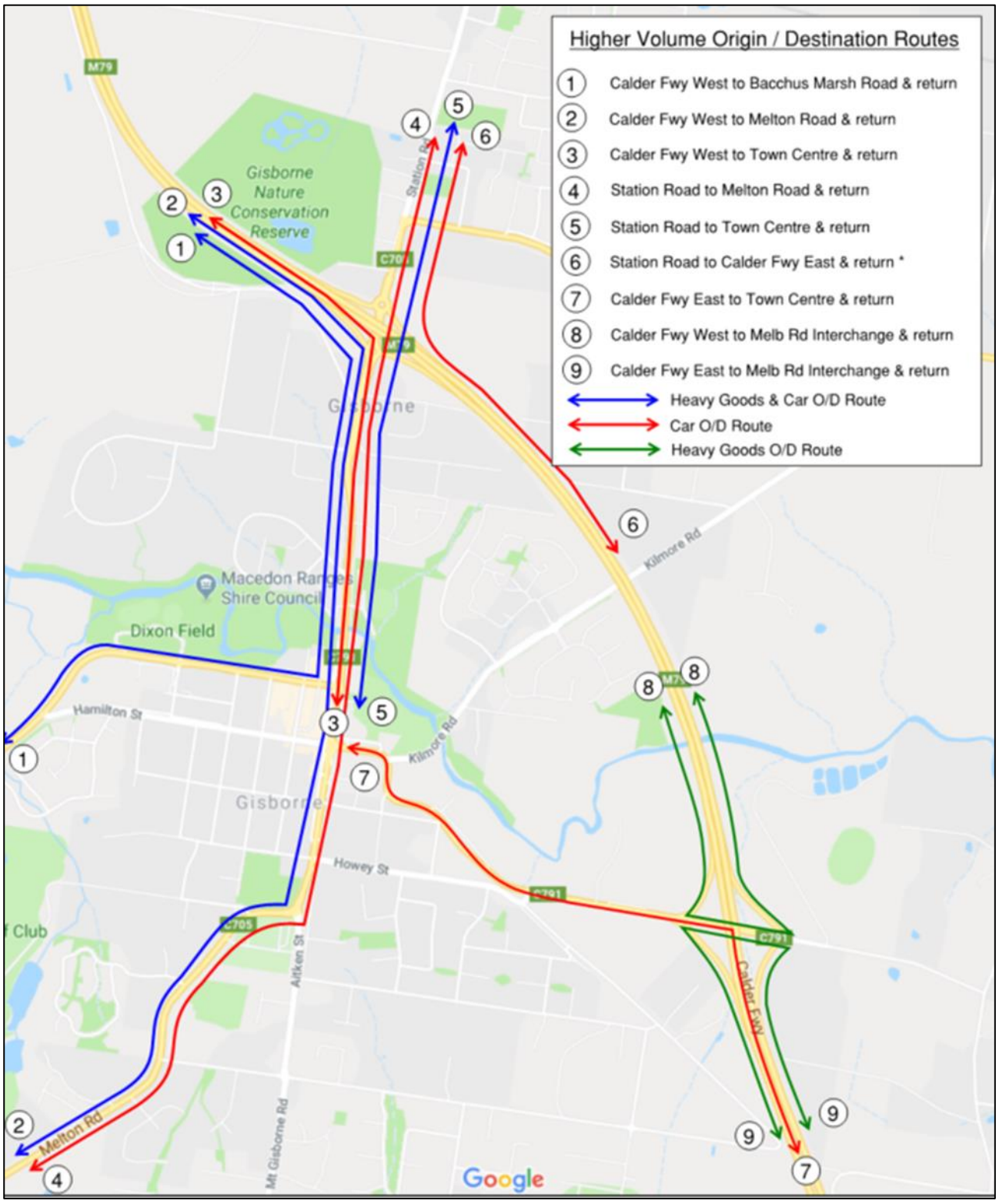
- Calder Freeway West to Town Centre and return
- Station Road (New Gisborne) to Melton Road and return
- Station Road (New Gisborne) to Calder Freeway East and return

Heavy Vehicles Only

- Calder Freeway East to Melbourne Road Interchange and return
- Calder Freeway West to Melbourne Road Interchange and return

These O/D routes are illustrated in Figure B9.

Figure B9 Higher Volume Origin Destination Routes



The above analysis indicates that there is a higher demand for all vehicles travelling THROUGH town from the west and north to Bacchus Marsh Road and Melton Road, and for cars travelling from both directions on the freeway INTO the town centre.

The higher demand through town from the west reflects the fact that there are no alternative routes to Bacchus Marsh or Melton from the west as far back as Kyneton, whereas there are a number of alternative and more direct access to these towns from the east.

APPENDIX

C

EXISTING FOOTPATH NETWORK

Macedon Ranges Shire Council

Paths by Width (m)

- 0.5 - 0.9
- 0.9 - 2.0
- 2.0 - 3.0
- 3.0 - 5.0
- > 5.0

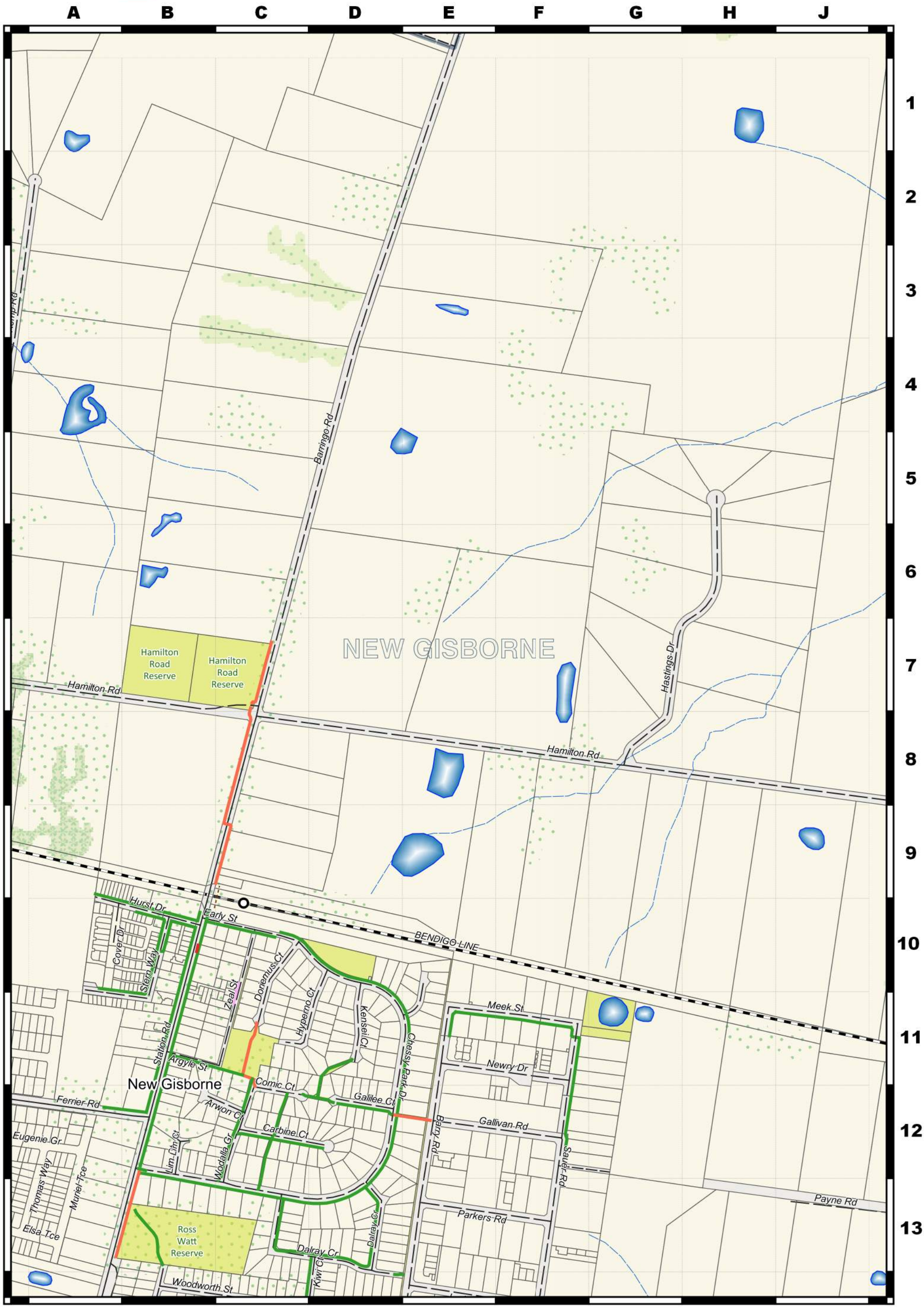
0 100 200 300 400 500 m

Datum - Geocentric Datum of Australia 1994
Map projection - Map Grid of Australia Zone 55

N

Existing Footpaths

Gisborne 1



Map Date - 4/6/2018 Produced by MRSC GIS Unit T:\GIS\WIP\Assets\Footpaths\Footpath_directory_2018.qgs/Footpaths_directory_2018

Macedon Ranges Shire Council

Paths by Width (m)

- 0.5 - 0.9
- 0.9 - 2.0
- 2.0 - 3.0
- 3.0 - 5.0
- > 5.0

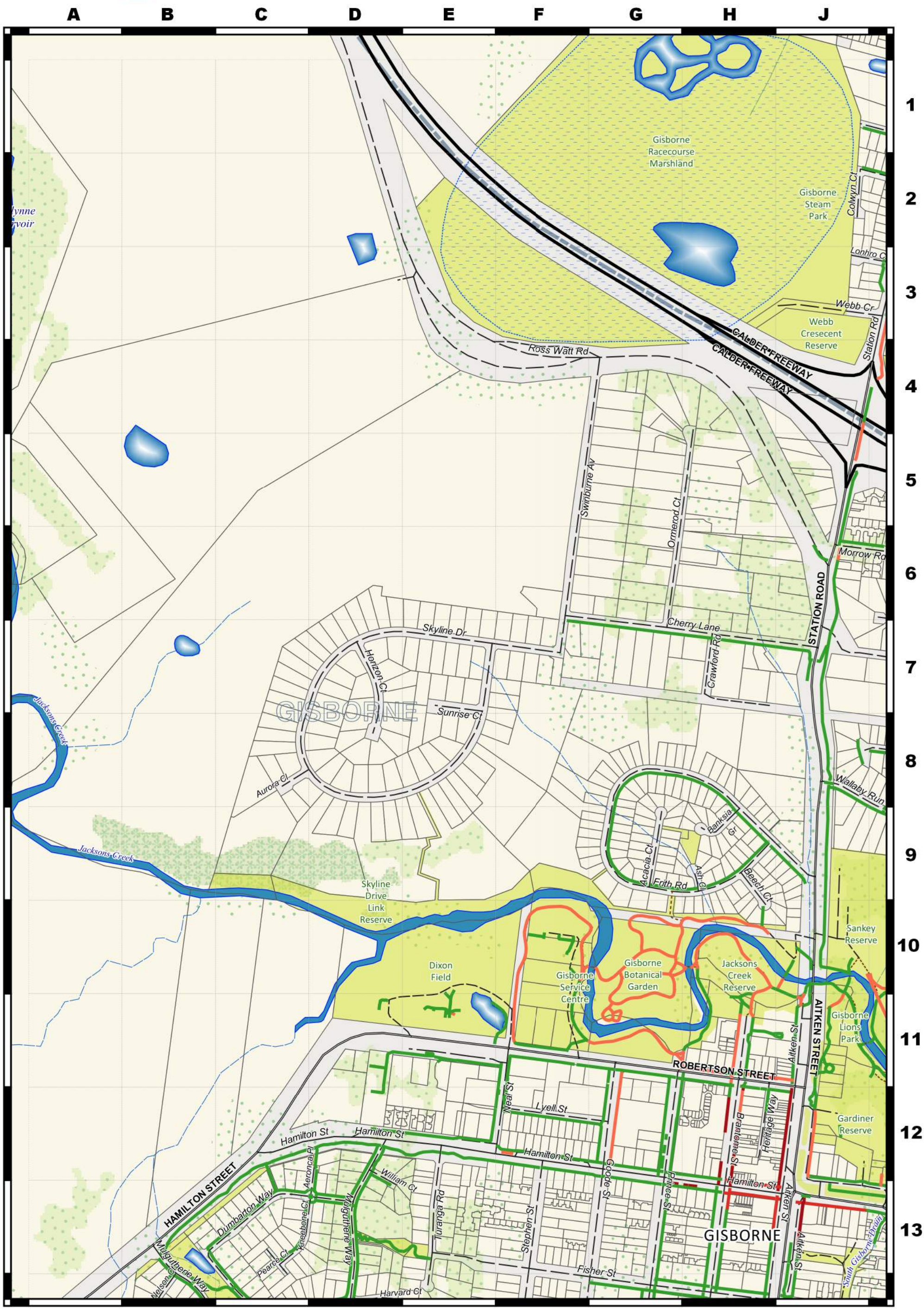
0 100 200 300 400 500 m

Datum - Geocentric Datum of Australia 1994
Map projection - Map Grid of Australia Zone 55

N

Existing Footpaths

Gisborne 2



Map Date - 4/6/2018 Produced by MRSC GIS Unit T:\GIS\WIP\Assets\Footpaths\Footpath_directory_2018.qgs/Footpaths_directory_2018

Macedon Ranges Shire Council

Paths by Width (m)
- 0.5 - 0.9
- 0.9 - 2.0
- 2.0 - 3.0
- 3.0 - 5.0
- > 5.0

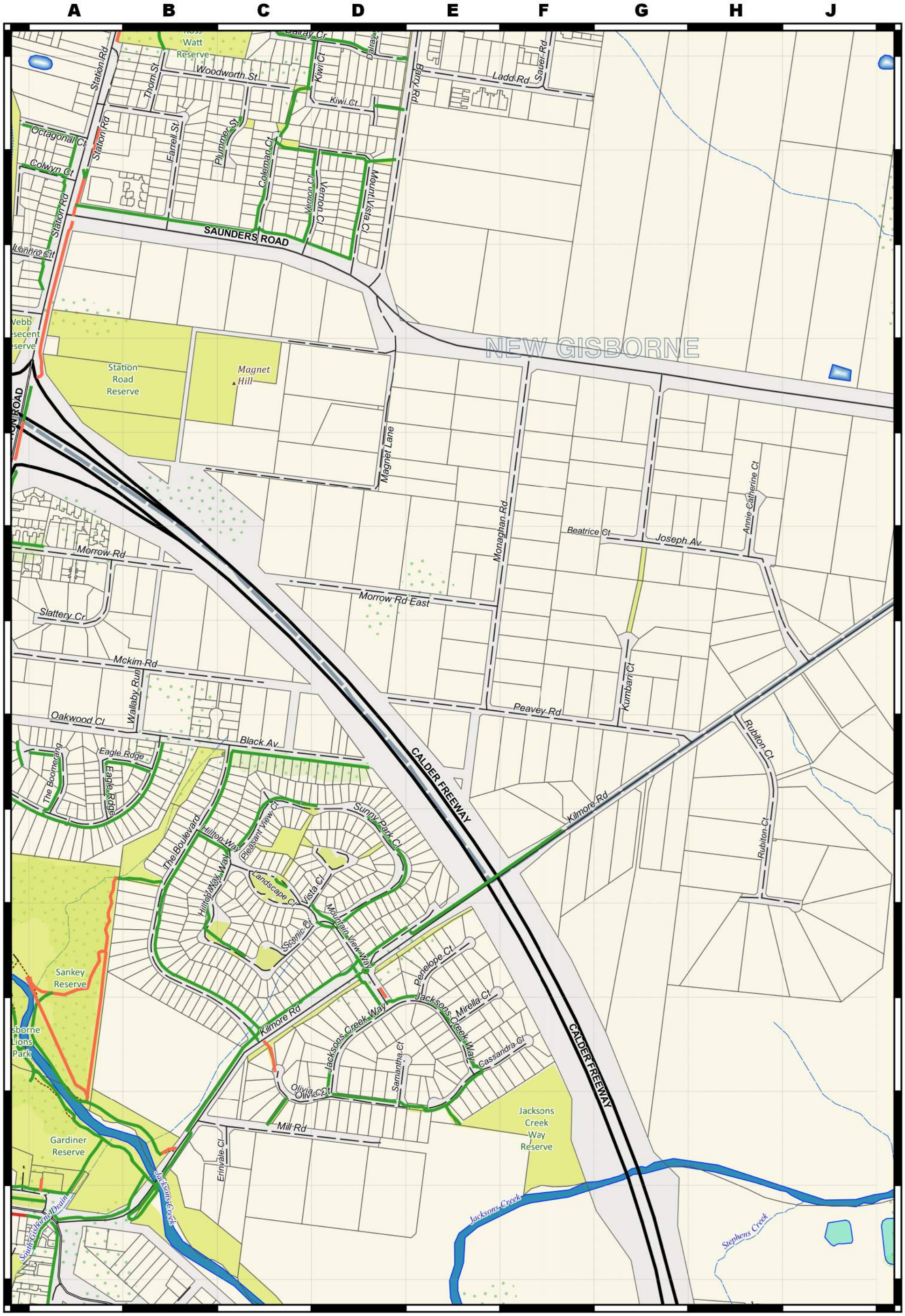
0 100 200 300 400 500 m

Datum - Geocentric Datum of Australia 1994
Map projection - Map Grid of Australia Zone 55

N

Existing Footpaths

Gisborne 3



Map Date - 4/6/2018 Produced by MRSC GIS Unit T:\GIS\WIP\Assets\Footpaths\Footpath_directory_2018.qgs/Footpaths_directory_2018

Macedon Ranges Shire Council

Paths by Width (m)
- 0.5 - 0.9
- 0.9 - 2.0
- 2.0 - 3.0
- 3.0 - 5.0
- > 5.0

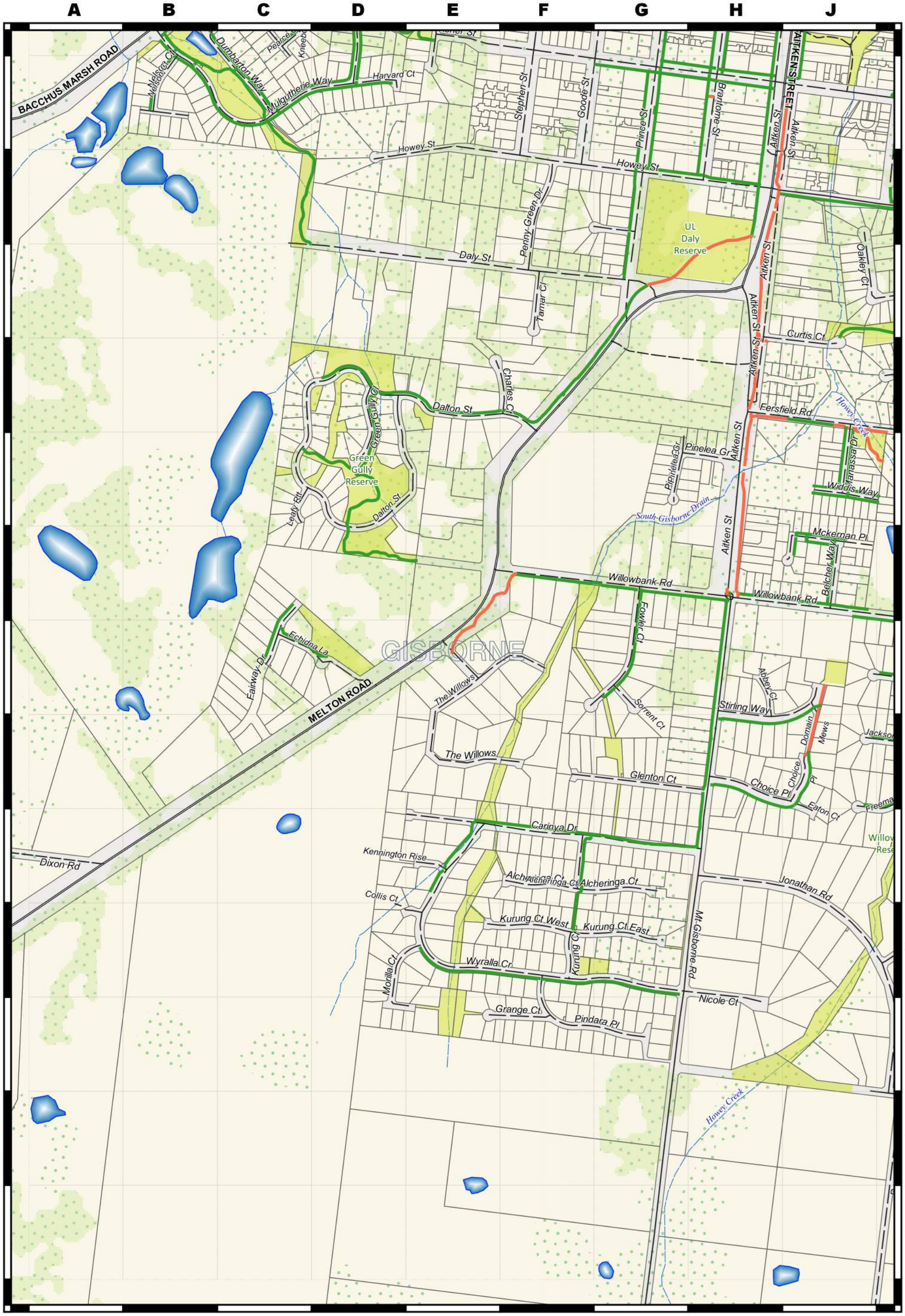
0 100 200 300 400 500 m

Datum - Geocentric Datum of Australia 1994
Map projection - Map Grid of Australia Zone 55

N

Existing Footpaths

Gisborne 4



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APPENDIX

D

GISBORNE STRATEGIC TRAFFIC MODELLING REPORT

Gisborne Strategic Traffic Model Report

Gisborne Futures

V180578

Prepared for

Ethos Urban

24 June 2020

Cardno

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Rev A	5/03/2020	Draft for comment	AW	MM
Rev B	6/05/2020	Final	AW	MM
Rev C	24/06/2020	Minor updates	AW	MM

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Appendix B 2046 Daily Link Volumes

1 Introduction

Cardno, as a sub-consultant to planners' Ethos Urban, has been engaged by Macedon Ranges Shire Council (MRSC) to provide traffic and transport advice to inform the development of the Gisborne Structure Plan and Urban Design Framework, as part of the Gisborne Future Project. Part of this engagement required the development of a strategic traffic model using the Victorian Integrated Transport Model (VITM). The purpose of this model is to inform road network proposals outlined in the Gisborne Structure Plan, and to assist Regional Roads Victoria (RRV) and MRSC make informed decisions for future road infrastructure projects in Gisborne.

This report documents the process of model development for the Gisborne Structure Plan, and summarises the results from the modelling process. The report covers the following areas:

- Review and development of the Gisborne Zoning System;
- Review and addition of required local network in Gisborne and surrounds
- Review and analysis of the survey data as received
  - 7 Day Tube Counts;
  - Turning Movement Counts;
  - Freight Origin/Destination Survey;
  - Other survey data as received.
- Build a Freight Matrix from the results of the Freight OD Survey;
- Establish a subarea model comprising the study area with enough of a boundary to consider strategic route choices, if there are any;
- Calibrate the Base Year model to the observed data;
- Develop a Future Year Base model using the draft Structure Plans;
- Develop and test three (3) Future Year Proposals; including options:
  - Duplicating Station Road between the Calder Freeway Interchange and the Aitken Street / Robertson Street intersection;
  - Providing a Western Link Road between the Mount Macedon Road interchange and Melton Road, intersection Bacchus Marsh Road; and
  - Providing an eastern Link Road between the Kilmore Road / Saunders Road intersection and the Melbourne Road interchange on the Calder Freeway.

2 Development of Gisborne Zoning System

The VITM V1_11 has a range of zoning levels available as shown in **Table 2-1**, and the zoning system for this model will ensure that the finest level of zoning at the core of the study that is compatible with the land use data available.

Table 2-1 Available Zoning Systems levels in the VITM V1_11

Level	Shape File	Zones	Description
1	POA_2016_VIC_AGD66_AMG55_region.shp	698	Postcodes
2	SA2_2016_VIC_AGD66_AMG55_region.shp	462	SA2 Levels
3	SLA11aVic_AGD66_AMG55_region.shp	209	State Local Admin. areas
4	Precincts_170925_AGD66_AMG55_region.shp	31	Various Urban Precincts
5	SA1_2016_VIC_AGD66_AMG55_region.shp	14,069	SA1 Levels
6	HalfMileMesh.shp	363,150	0.5 Square Miles
7	1MileMesh.shp	92,521	1 Square Miles
8	2MileMeshv2.shp	23,985	2 Square Miles
9	4MileMesh.shp	6,426	3 Square Miles
10	8MileMesh.shp	1,842	8 Square Miles
11	16MileMesh.shp	590	16 Square Miles
12	32MileMesh.shp	231	32 Square Miles

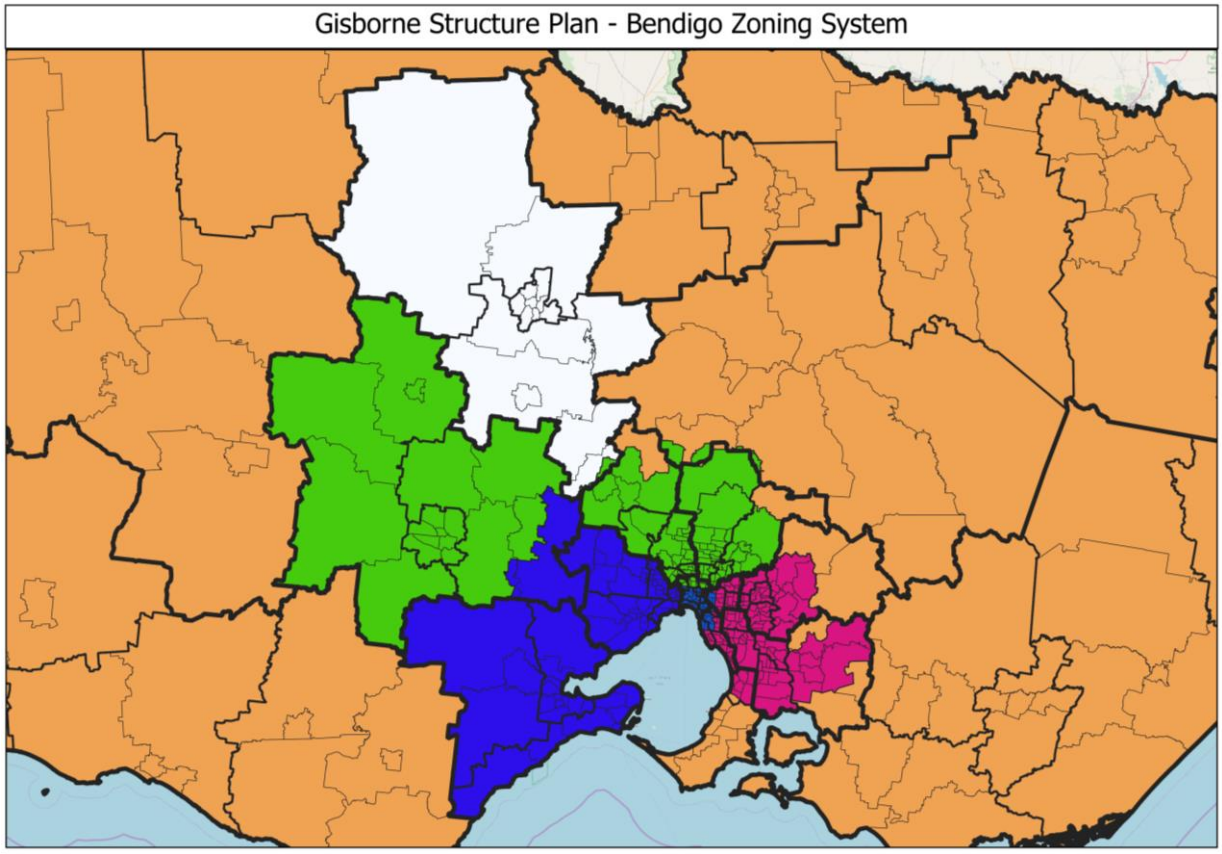
It was initially proposed to base the modelling work on the Bendigo Zone system, as recommended by DEDJTR. This zone system is illustrated in aggregate in **Figure 2-1**.

This figure represents the various levels of aggregation in the zoning system as follows:

- Orange: Zones in these areas are at the SA2 Level
- Blue: Zones in this area are using the 1 Mile Mesh
- Green: Zones in these areas are using the 2 Mile Mesh
- Purple: Zones in these areas are using the 4 Mile Mesh
- White: Zone in this area centred around Bendigo are using the finest level of zoning. This is referred to as the N level, which, if followed for the whole model would have 6973 zones.

However, the area around Gisborne is not optimally zoned in this system, as both Gisborne and Macedon are in the 2 Mile Mesh zoning. The area around Bendigo is over-represented, resulting in additional run-times and unneeded accuracy.

Figure 2-1 Bendigo Zoning System in aggregate



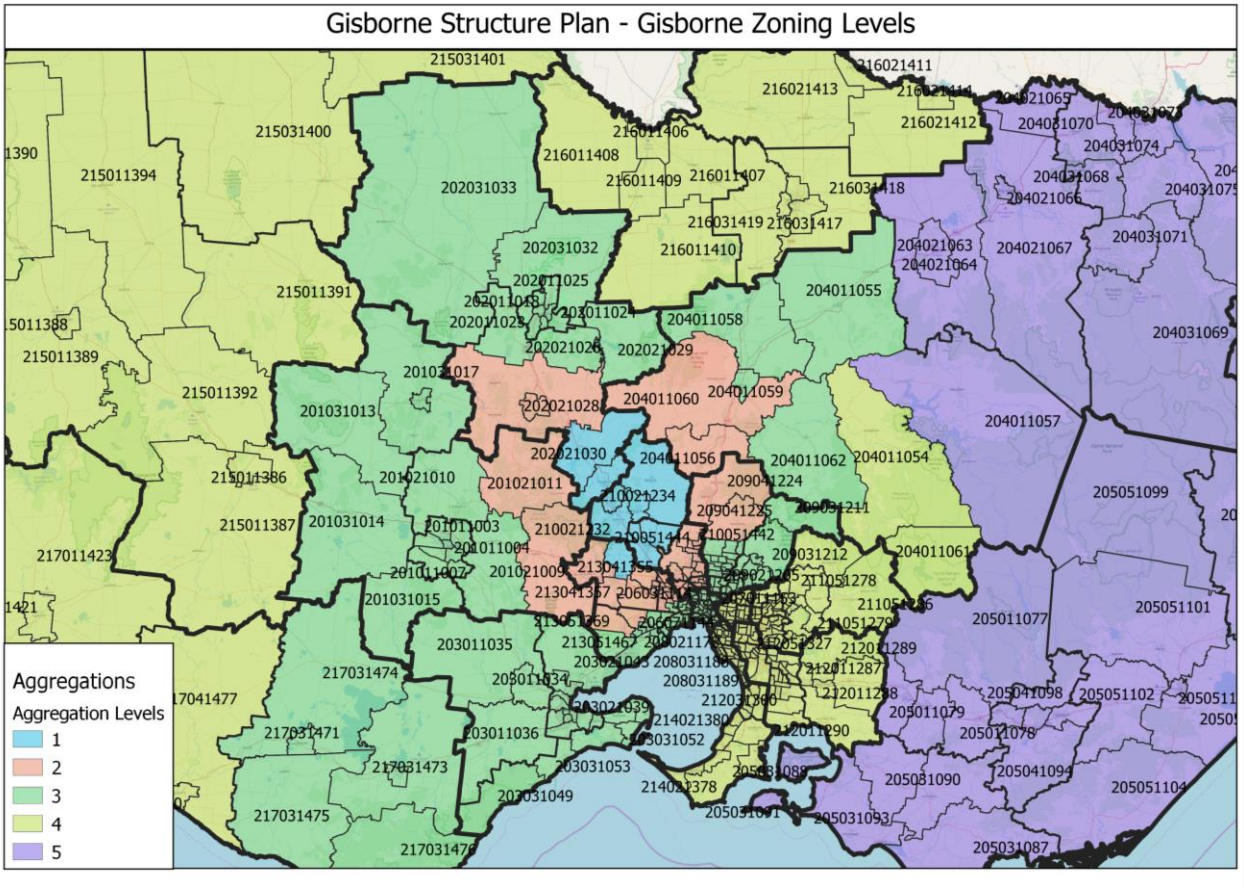
2.2 Methodology of Zone System Development

To develop the zone system for a smaller region within the model, it is necessary to first prepare an aggregate layer as shown above this is done as follows:

1. Take a Shape file with a suitably fine set of geographical boundaries- say SA2;
2. Add a field for the level of zone aggregation, e.g. GISB_level
3. Set this field to either 1 or the worst um;
4. Using a GIS shape file editor, set this field to an appropriate level depending on distance from the study area. It is probably best to set to the largest aggregation for smaller models, so that there is less reassignment to do.
5. Starting with the study area, set the finest zoning to the study area;
6. Outside of the immediate study area, make rough concentric rings of progressively more aggregate levels.
7. Once all the levels have been assigned make a copy of the layer;
8. On the copied layer, using an expression, select each geographic unit with the same level, and merge or dissolve these into one object.
9. Run this new zone boundary shape file through the Python Rezone utility, adjusting the Scenario keys and zone numbers as required.

The Aggregation levels for the Gisborne are shown in **Figure 2-2**. The numbers shown are SA2 Codes.

Figure 2-2 Aggregation levels for Gisborne Zoning System

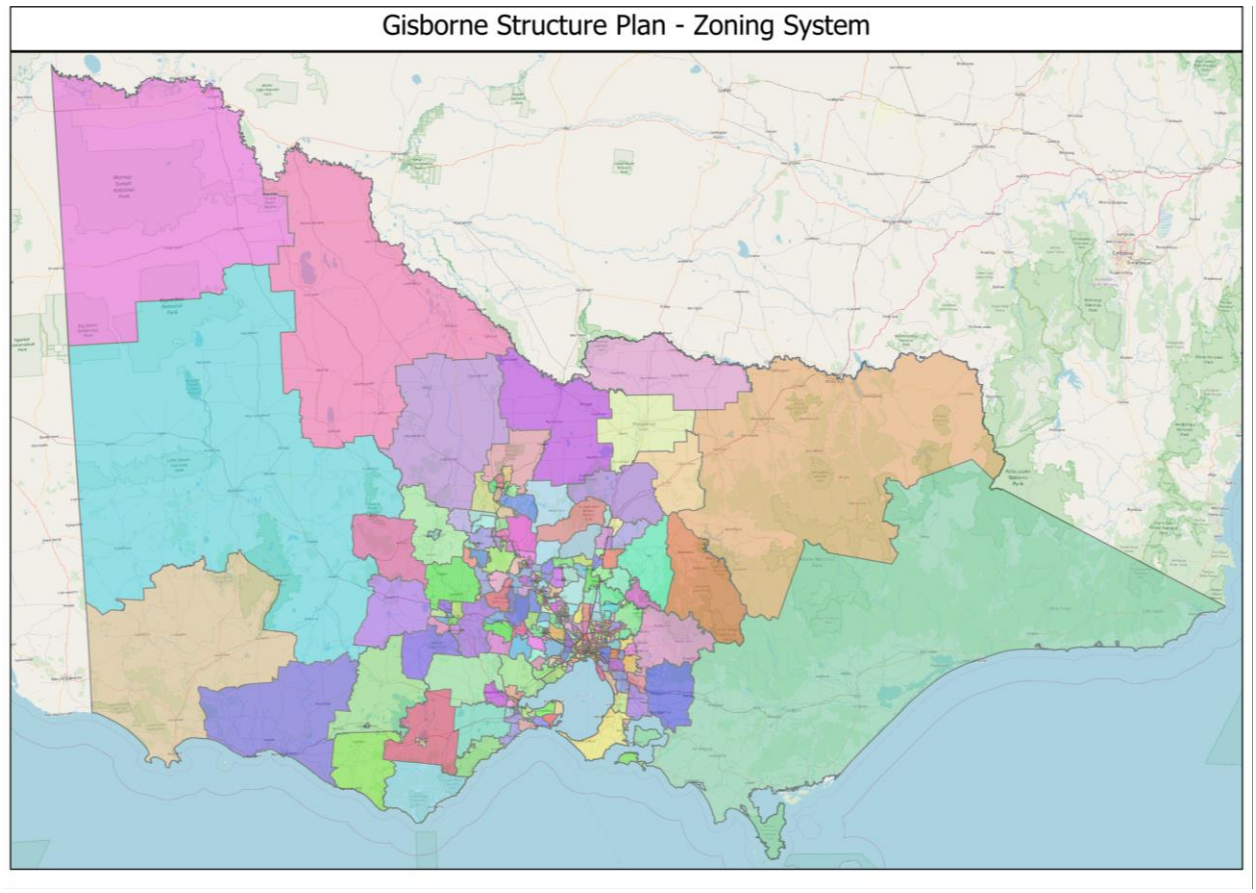


This aggregation level produces a zone system with 494 zones. The Aggregation levels are as shown in **Table 2-2**, with the resulting zone system shown for the entire state in **Figure 2-3**.

Table 2-2 Zone System Aggregation levels

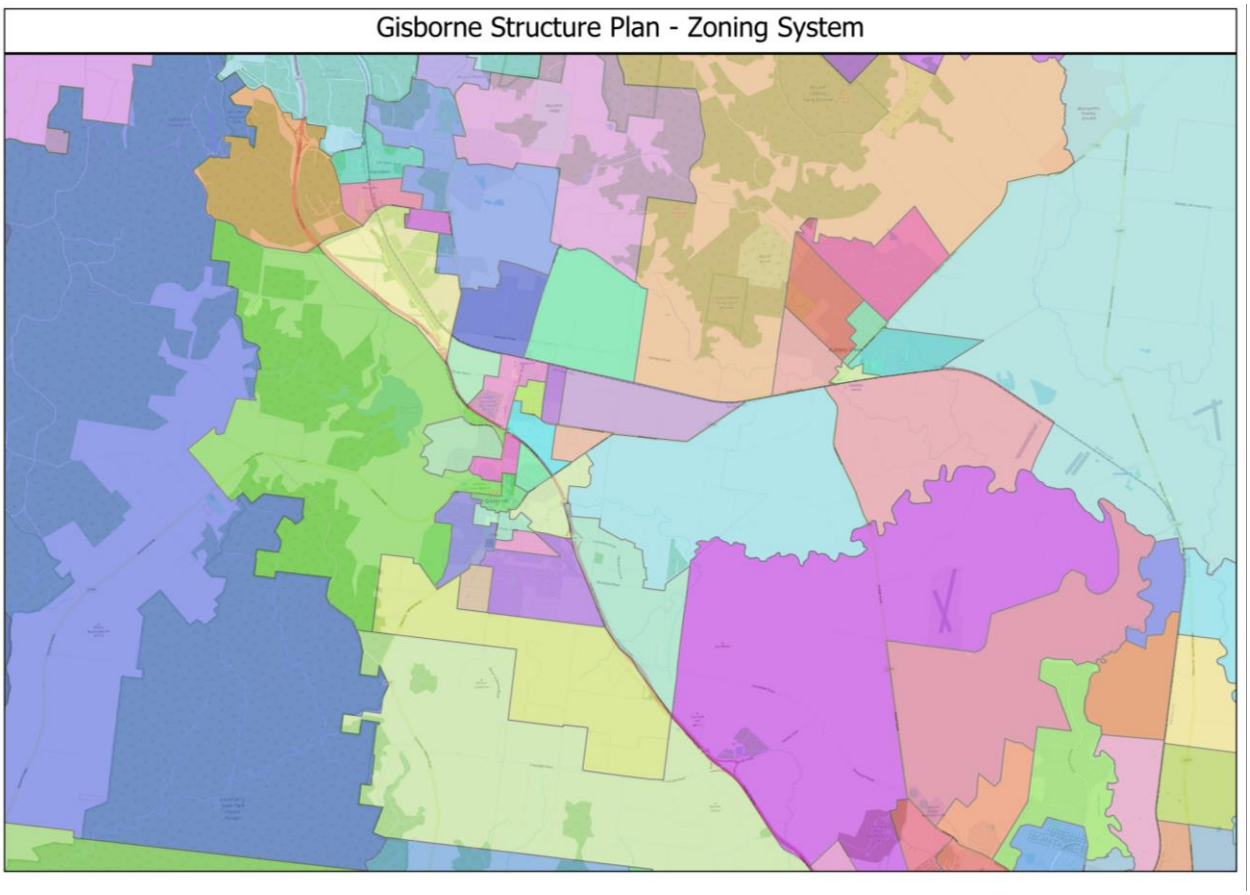
Level	Zone Aggregation
1	N – native zoning
2	MILE8MESH
3	SA2
4	SA3
5	SA4

Figure 2-3 Gisborne Zoning System



The zone system around Gisborne itself is shown in **Figure 2-4**.

Figure 2-4 Figure 1 Gisborne Zoning System (Closeup)



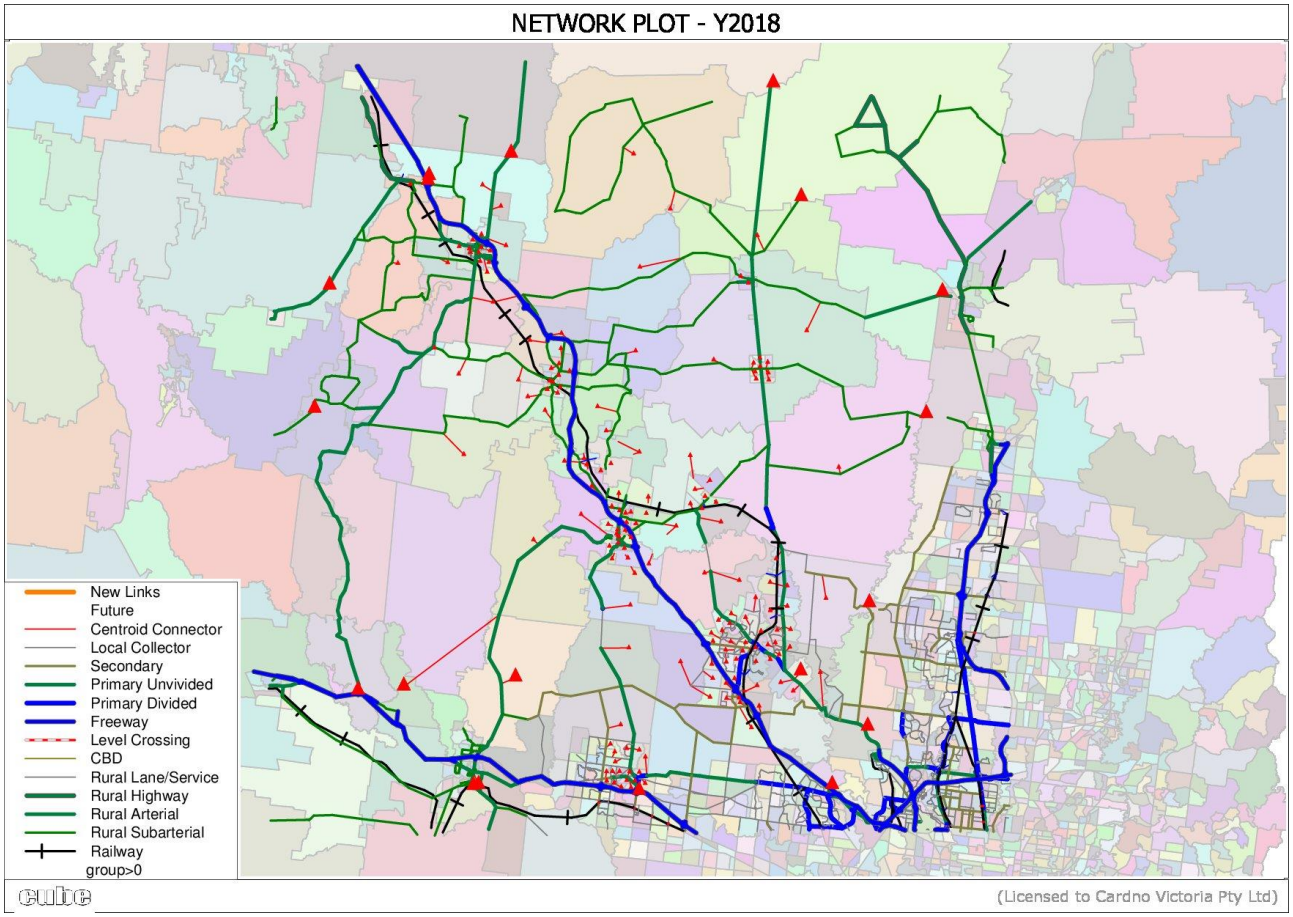
While there are some large zones that appear to be very close to the central study area, most of these are Nature Reserves or State Parks, with Mount Charlie Nature Reserve and Lederberg State Park as examples.

3 Development of Gisborne Local Network

3.1 Strategic Network

The Strategic Network is based on the VITM V1_11 and covers the entire state of Victoria. As the entire network was not necessary to model the local bypass options for Gisborne, a subarea was cut out of the network in order to model the local area. The strategic Network in the Study area is shown in **Figure 3-1**.

Figure 3-1 Strategic VITM V1_11 network in the study subarea



The Subarea includes all the VITM V1_11 network within the boundaries, including the Railway Links. However, modelling the rail trips through the region is beyond the scope of this study and the PT and rail matrices are not incorporated into the new model.

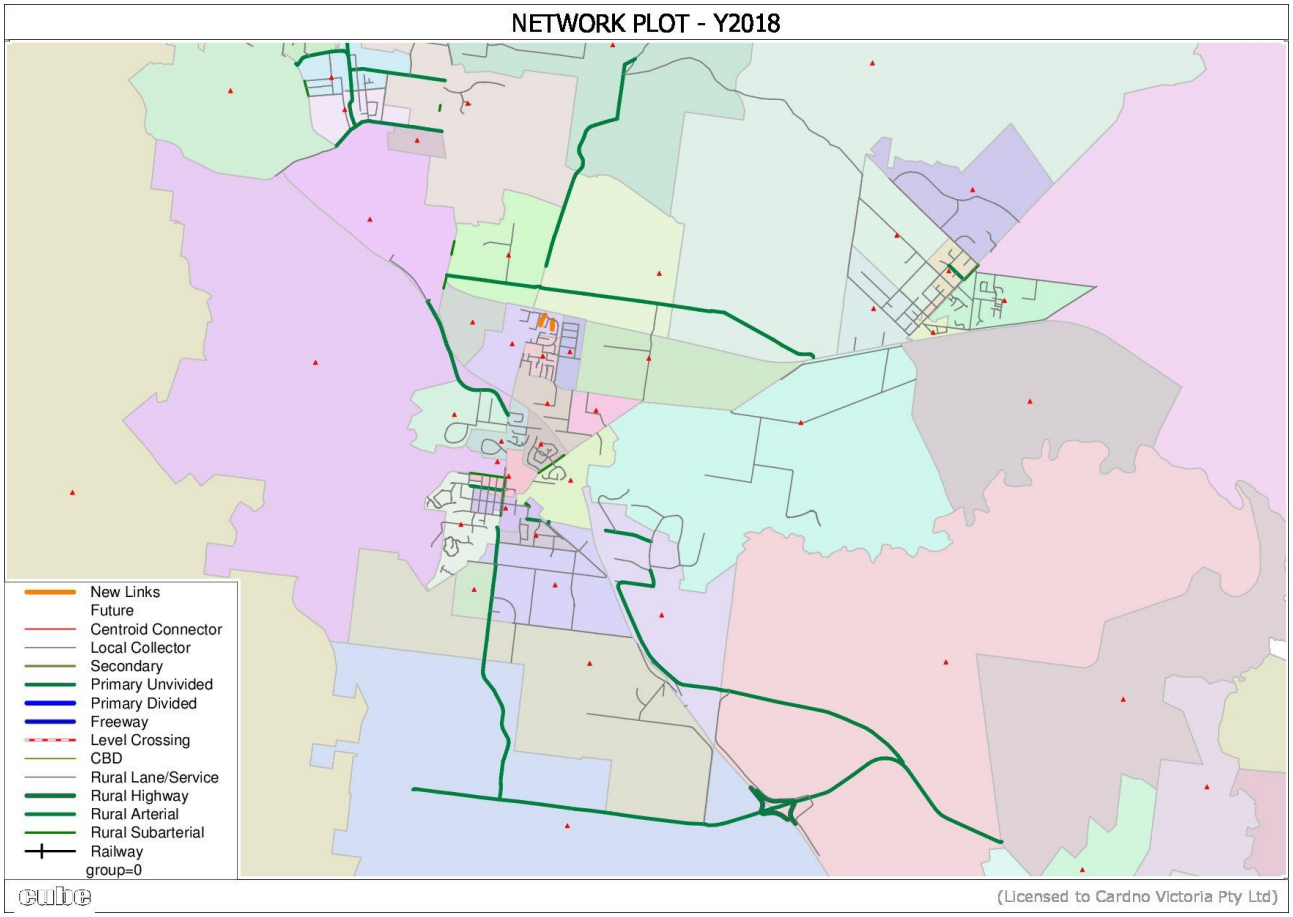
3.2 Local Network

The VITM network was quite strategic in nature and DEDJTR supplied additional local links derived from VICmap. These links covered the immediate Gisborne, New Gisborne and Macedon areas. Further north than Macedon was not included, and this area was felt to not be relevant.

Trips from Kyneton or further north only have access to the immediate area around Gisborne via the Calder highway as the Macedon Plantation and Regional park form a natural choke point to trips from that area. As the purpose of the modelling was to examine the impact of bypass proposals on Gisborne, it was felt that detailed modelling the network in this area was not necessary.

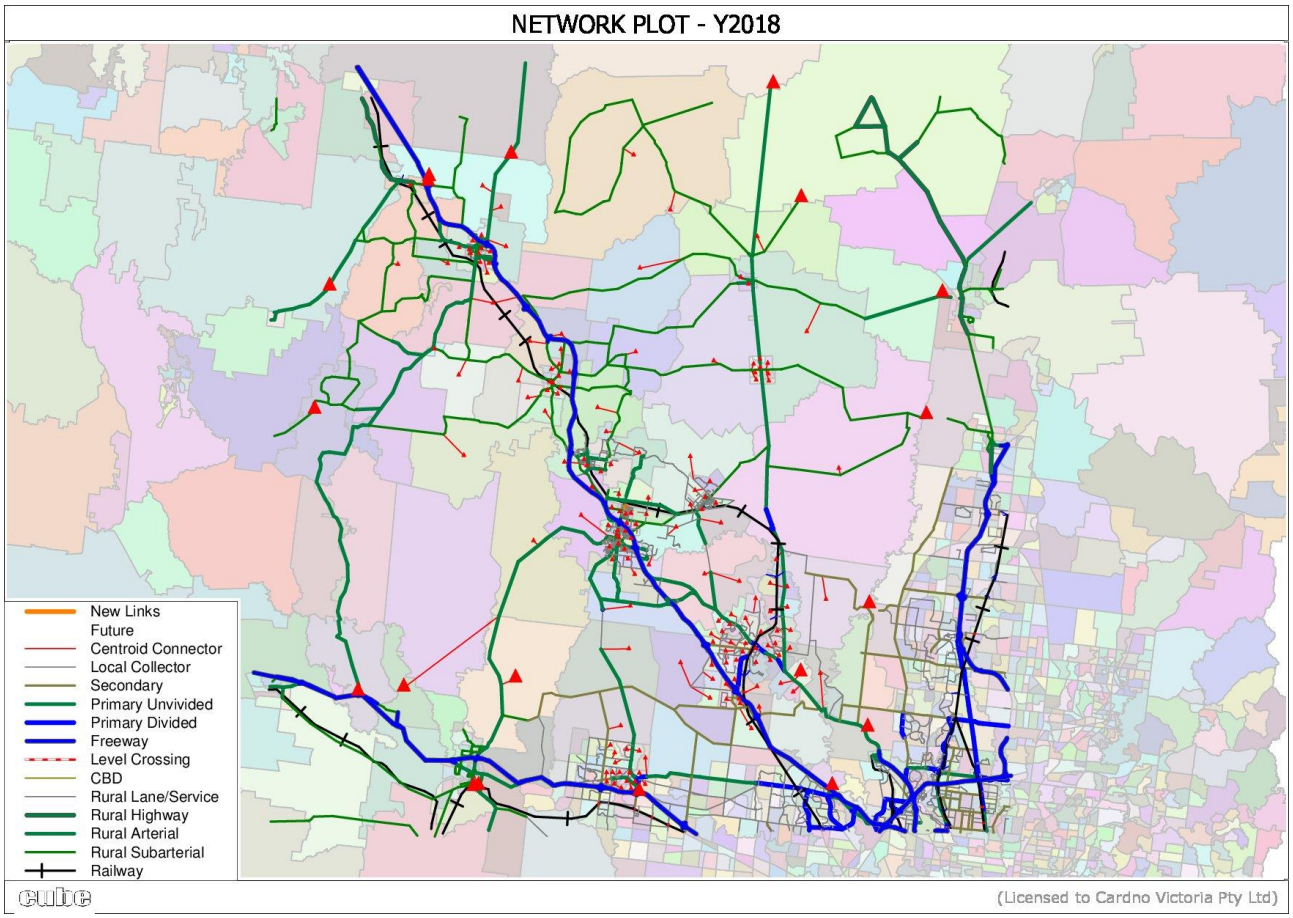
The local area only network that was added is shown in **Figure 3-2**. As part of this process, many of the strategic links needed splitting, and those split links were considered additional network.

Figure 3-2 Additional Local Area Network added



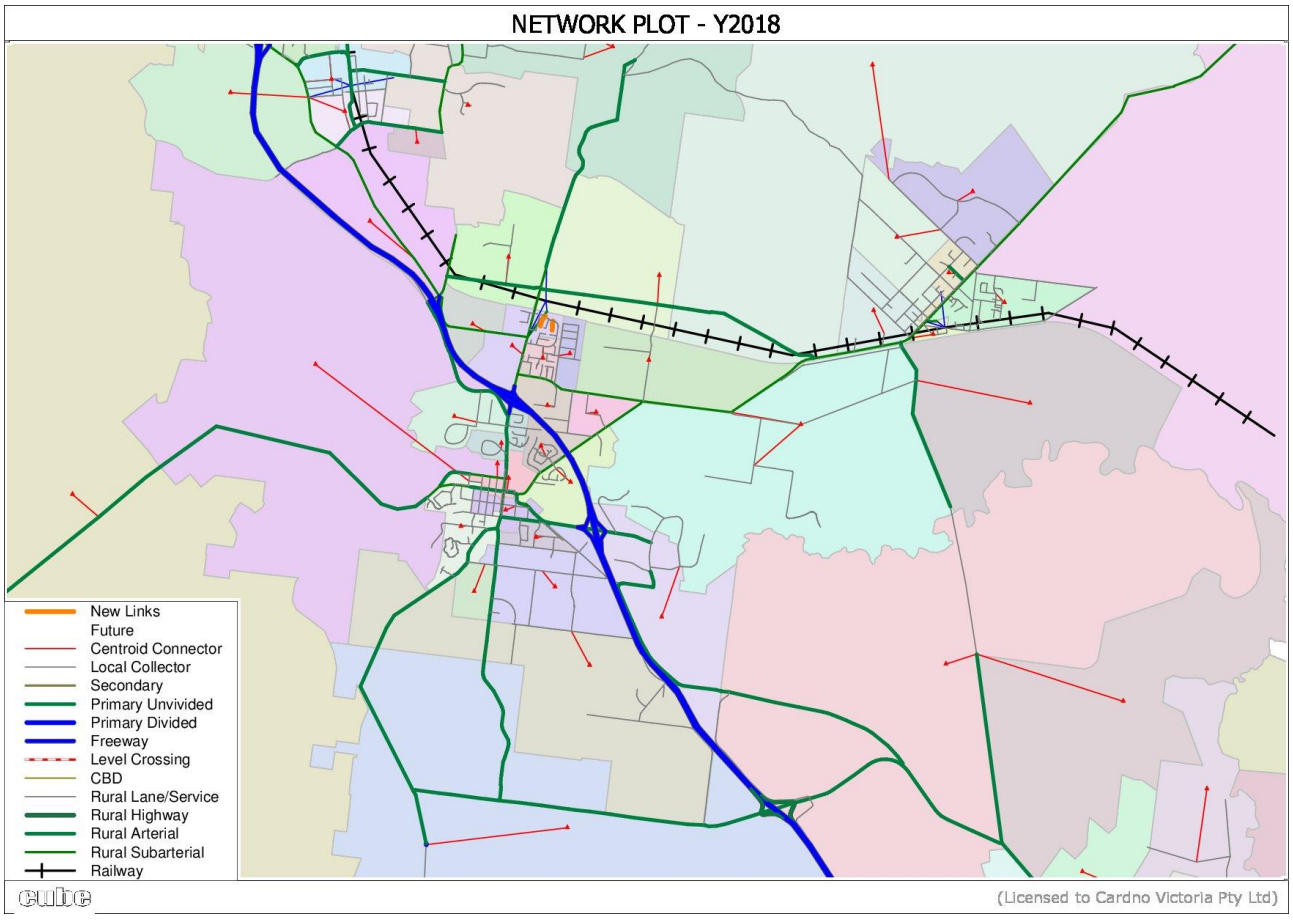
The local link characteristics and classes were matched to those used in the VITM V1_11 in order to maintain as much compatibility between the two systems as possible. The final combined Base Year network is shown in its full extent in **Figure 3-3**.

Figure 3-3 Combined Strategic and Local Network within Subarea



A closer view of the Gisborne and New Gisborne area is shown in **Figure 3-4**.

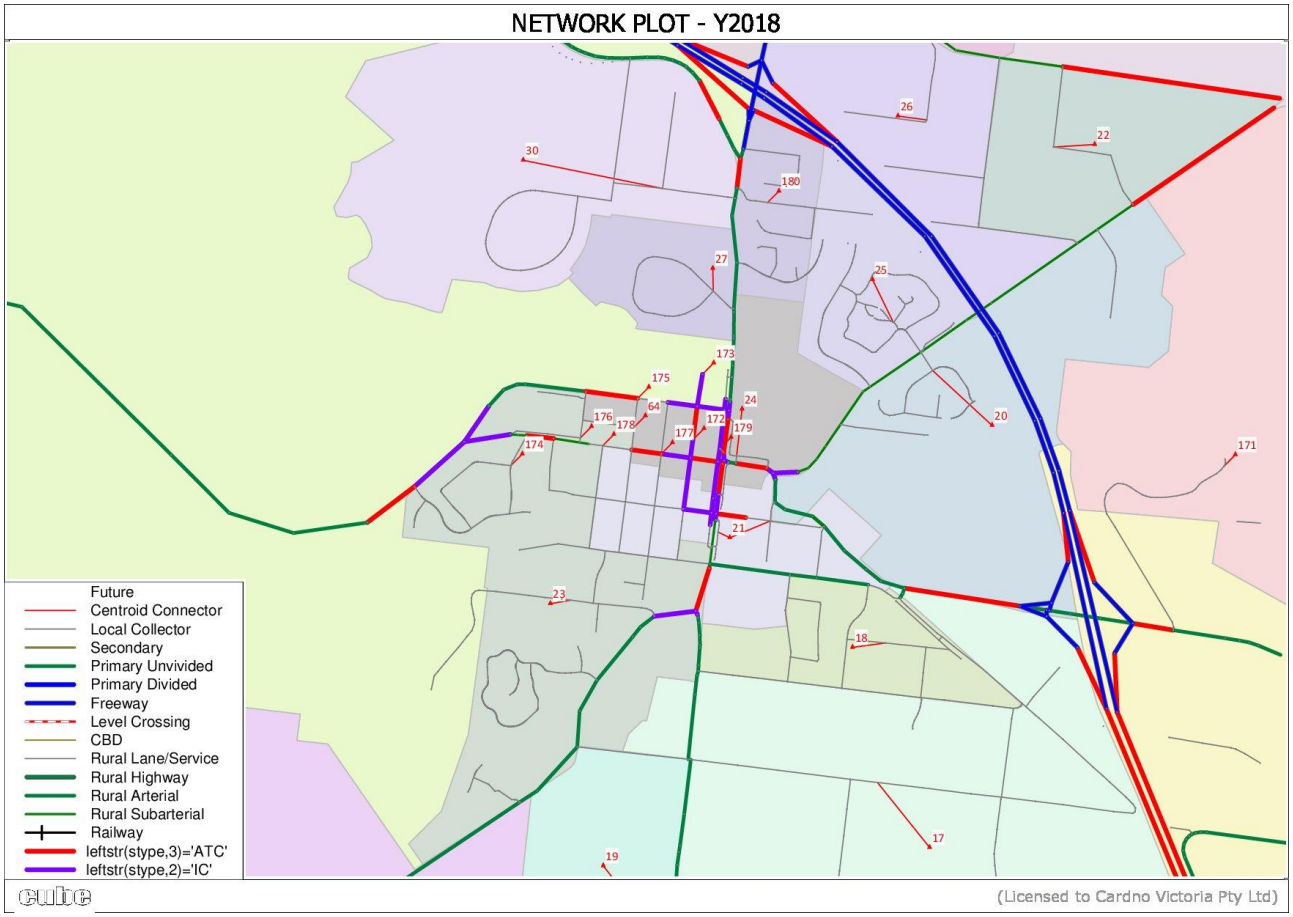
Figure 3-4 Combined Strategic and Local Network - Immediate Gisborne Area



3.3 Zone Connectors

In addition to the strategic zone connectors, it was necessary to add more local trips into the model to replicate travel patterns within and through Gisborne. Some extra internal zones have been added as shown in **Figure 3-5**.

Figure 3-5 New Zones in Central Gisborne



These zones were mostly added by splitting up the existing VITM zones, however some new zones were required for movements that were not relevant to the strategic VITM model. The position and connections from the new zones were decided in accordance with local land use as observed from various online mapping services and the observed traffic flows from the surveys.

4 Review of Survey Data

Surveys were conducted for VicRoads at the end of October 2018. Three survey methods were employed:

- Automatic Traffic Counts at 36 locations;
- Interchange Manual Counts at 9 intersections (with 4 additional service road counts);
- Origin Destination video surveys with registration-plate matching software.

The three type of surveys provide different results, and these will be discussed in the sections below.

4.1 Automatic Traffic Counts (ATC)

The Surveys were conducted over the 7-day period from 23 October 2018 at 36 locations. The precise locations are shown in **Figure 4-3**. The counts are summarised in **Table 4-1** with the daily flows by direction. The count data was reported at 15-minute intervals over the entire 24-hour period.

Table 4-1 Locations and Daily Flows from ATC Surveys

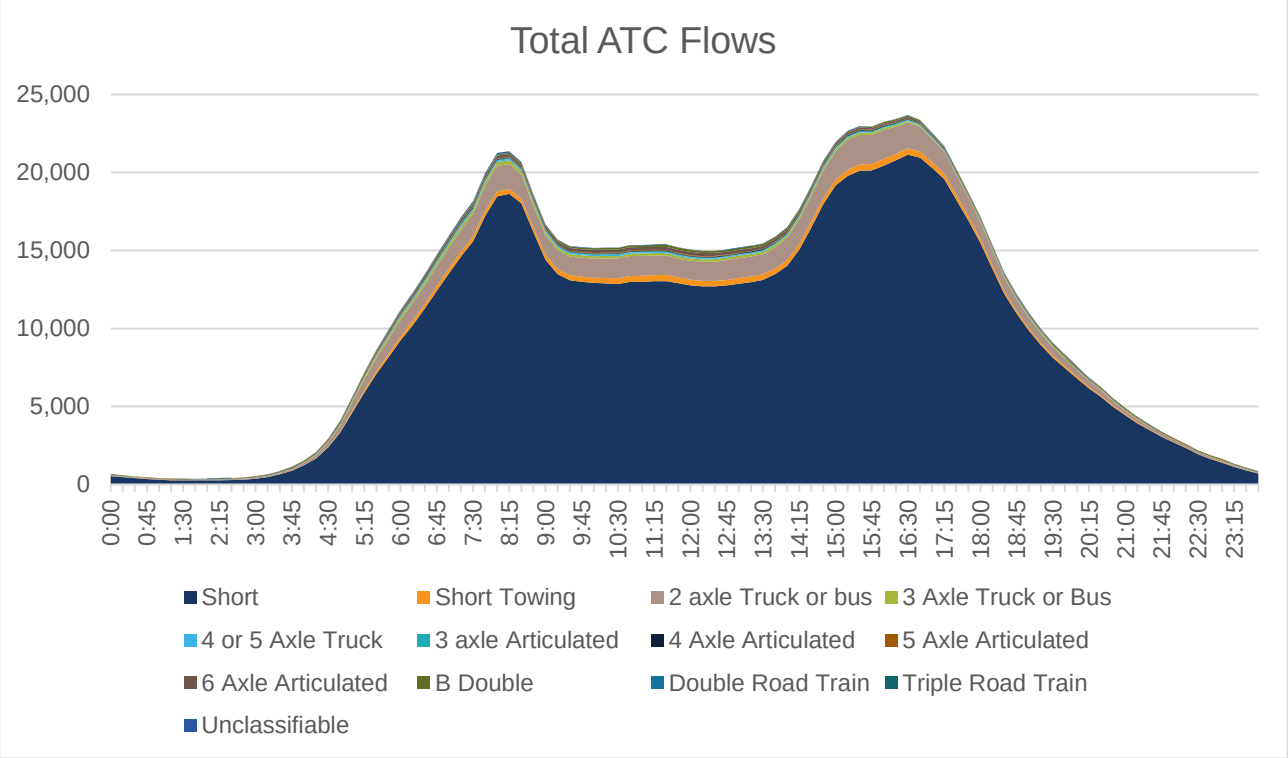
Site	Street Name	Location	NB or EB	SB or WB
local01	Brantome St	Near No.33A Brantome St	1,570	1,887
local02	Hamilton Street	Near No.45 Hamilton Street	2,754	2,038
local03	Hamilton Street	In front of Hyde's Dry Cleaners	5,712	5,795
local04	Fisher Street	Near No.16 Fisher Street	258	258
Site01	Station Road	Near No.176 Station Road	3,322	3,748
Site02	Calder Highway	EB off-ramp to Gisborne Kilmore Road	4,109	-
Site03	Calder Highway	WB on-ramp from Gisborne Kilmore Road	-	3,699
Site04	Calder Highway	EB on-ramp from Gisborne Kilmore Road	1,931	-
Site05	Calder Highway	WB off-ramp to Gisborne Kilmore Road	-	1,688
Site06	Saunders Road	Near No.144 Saunders Road	1,682	1,741
Site07	Kilmore Road	Near No.253 Kilmore Road	1,566	1,394
Site08	Aitken Street	Between Robertson St and Hamilton St Service Road	6,594	5,643
Site09	Bacchus Marsh to Gisborne Rd	South of Mulgutherie Road	2,156	2,087
Site10	Calder Highway	SB off-ramp to Melbourne Road	538	-
Site11	Calder Highway	NB on-ramp from Melbourne Road	583	-
Site12	Calder Highway	SB on-ramp from Melbourne Road	-	3,933
Site13	Calder Highway	NB off-ramp to Melbourne Road	-	4,461
Site14	Gisborne-Melton Road	South of Braeside Road	1,908	1,938
Site15	Mt Gisborne Road	South of Brooking Road	472	464
Site16	Calder Freeway	North of Mount Macedon Road	12,814	12,569
Site17	Black Forest Drive	north of Macedon Road	1,705	1,844
Site18	Mt Macedon Road	Between Black Forest Drive and Hamilton Road	1,863	1,919
Site19	Gisborne-Kilmore Road	East of Campbell Road	2,547	2,439
Site20	Station Road	Near No.157 Station Road	5,793	6,496
Site21	Station Road	Between Ross Watt Road and McKim Road	8,367	8,009
Site22	Ross Watt Road	Near No.21 Ross Watt Road	400	1,033

Site23	Robertson Street	Near Police Station	2,103	2,277
Site24	Hamilton Street	Between Mulgutherie Way and Turanga Road	1,212	1,133
Site25	Melbourne Road	Between Aitken St and Kilmore Rd	5,403	6,387
Site26	Aitken Street	Between Hamilton and Fisher Street	5,581	5,581
Site27	Aitken Street	Between Howey Street and Gisborne-Melton Road	5,267	5,292
Site28	Melbourne Road	Between Howey Street and Calder Freeway	4,633	5,084
Site29	Emmeline Drive	Near No.114 Emmeline Drive	685	672
Site30	Calder Freeway	South of Melbourne Road	16,879	16,618
Site31	Melton Road	South of Couangalt Road	2,098	2,116
Site32	Calder Freeway	South of Couangalt Road	15,002	16,729

Some locations are entry and exit ramps to/from the Calder Freeway, and will have flow in one direction only.

The Average Weekday Profile by vehicle type is shown in **Figure 4-1**. This pattern shows the narrow AM peak and broader PM peak usually found in areas where travel to/from work and school is a major component of the travel pattern.

Figure 4-1 Total ATC Flow Profiles



These counts use an automatic counter that can determine vehicle type, and the proportions of the Observed Vehicles are shown in **Table 4-2**. Unclassified Vehicles are included in the Heavy Vehicles.

Table 4-2 Vehicle Proportions from ATC Surveys

	Class	Observed	%age	Observed	%age
Light	Short	228,992	87%	233,984	88%
	Short Towing	4,992	2%		
Heavy	2 Axle Truck or bus	20,363	8%	23,543	9%
	3 Axle Truck or Bus	2,400	1%		
	4 or 5 Axle Truck	781	0%		
Freight	3 Axle Articulated	814	0%	6,955	3%
	4 Axle Articulated	710	0%		
	5 Axle Articulated	499	0%		
	6 Axle Articulated	2,621	1%		
	B Double	1,763	1%		
	Double Road Train	31	0%		
	Triple Road Train	1	0%		
Unclassified	Unknown	516	0%		

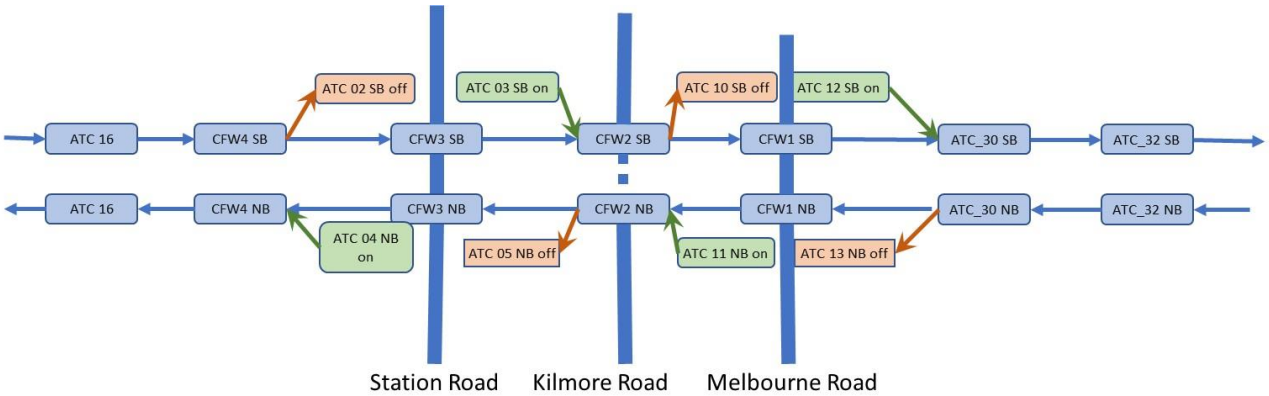
The totals are the combined number of vehicles averaged over the five weekdays, and do not represent average daily flows or total vehicles. The model will use AM and PM Light, Heavy and Freight vehicles from these survey results in the calibration process.

4.1.2 Estimating the intermediate Calder Freeway flows

There are direct observations of the flows at ATC sites 16, 30, and 32, and there are direct observations of the on and off ramps at the Station Road junction as well as the Melbourne Road junction. Using these observations, it is possible to calculate the flows on the Calder Freeway as it passes over Station Road, and under Kilmore Road and Melbourne Road, assuming no other access to the freeway.

The diagrammatic view of Calder Freeway is shown in **Figure 4-2**.

Figure 4-2 Diagrammatic view of Calder Freeway through the Study Area



The Southbound counts are derived northwards from ATC30, as the ATC16 counts were conducted north of the intersection with Mount Macedon Road, and there was intermediate access to the freeway via the south facing slip roads there. Those slip roads were not surveyed.

Table 4-3 Derived counts on Calder Freeway

Site	Calder Freeway at…	Northbound	Southbound
CFW1	Melbourne Road	ATC30 NB – ATC13 NB off	ATC30 SB – ATC12 SB on
CFW2	Kilmore Road	CFW1 + ATC11 NB on	CFW1+ ATC10 SB off
CFW3	Station Road	CFW2 – ATC05 NB off	CFW2 – ATC03 SB on
CFW4	West of Station Road ramps	CFW3 + ATC04 NB on	CFW3 + ATC02 SB off

(There are some rest areas and a crossing point at Brooking Road, and some unfenced portions of the freeway along its length. However, use of these is not likely to be significant during the peak periods.)

4.2 Interchange Counts (IC)

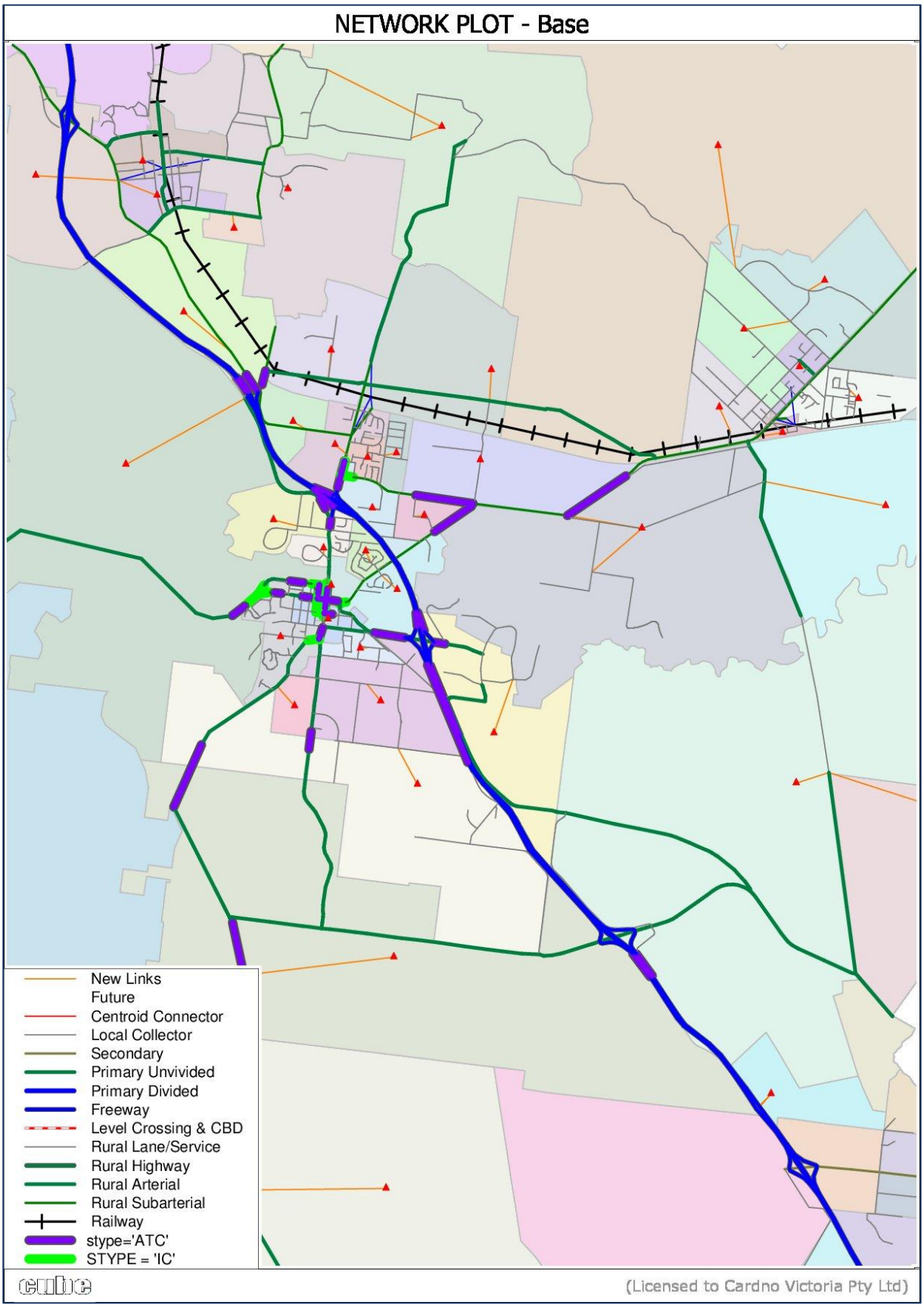
Interchange Turning Movement counts were conducted on the 24th, 25th and 27th October. The counts were conducted from 0630 to 0930 on the 24th, 15:00 to 17:00 on the 25th, and both time periods on the 27th. The Counts were conducted at the locations as shown in **Table 4-4**. This table also shows the total junction throughputs for each of the Peak periods surveyed. The AM and PM Weekday flows were used for model calibration.

Table 4-4 Interchange Locations and Peak Hour Counts

Site Number	Location	AM Peak (Weds)	PM Peak (Thurs)	AM Peak (Sat)	PM Peak (Sat)
1A	Station Road and Saunders Road	1,536	1,343	719	650
1B	Station Service Road	15	14	9	13
2A	Aitken Street and Robertson Street	1,695	1,892	1,295	1,389
2B	Aitken Service Street and Robertson Street	994	1,246	852	967
3A	Aitken Street and Hamilton Street	1,803	1,081	1,381	1,556
3B	Aitken Service Street and Hamilton Street	837	1,081	734	765
4	Robertson Street and Brantome Street	985	1,269	854	865
5	Hamilton Street and Brantome Street	886	1,194	781	811
6	Hamilton Street and Robertson Street	388	411	284	313
7A	Aitken Street and Fisher Street	1,085	1,108	684	779
7B	Aitken Service Street and Fisher Street	274	265	64	99
8	Melbourne Road and Kilmore Road	1,038	1,336	747	924
9	Aitken Street and Melton Road	1,064	1,017	634	752

The Locations of the ATC and IC sites are shown in the figure below (this diagram uses the combined strategic and local networks as shown in Chapter 3).

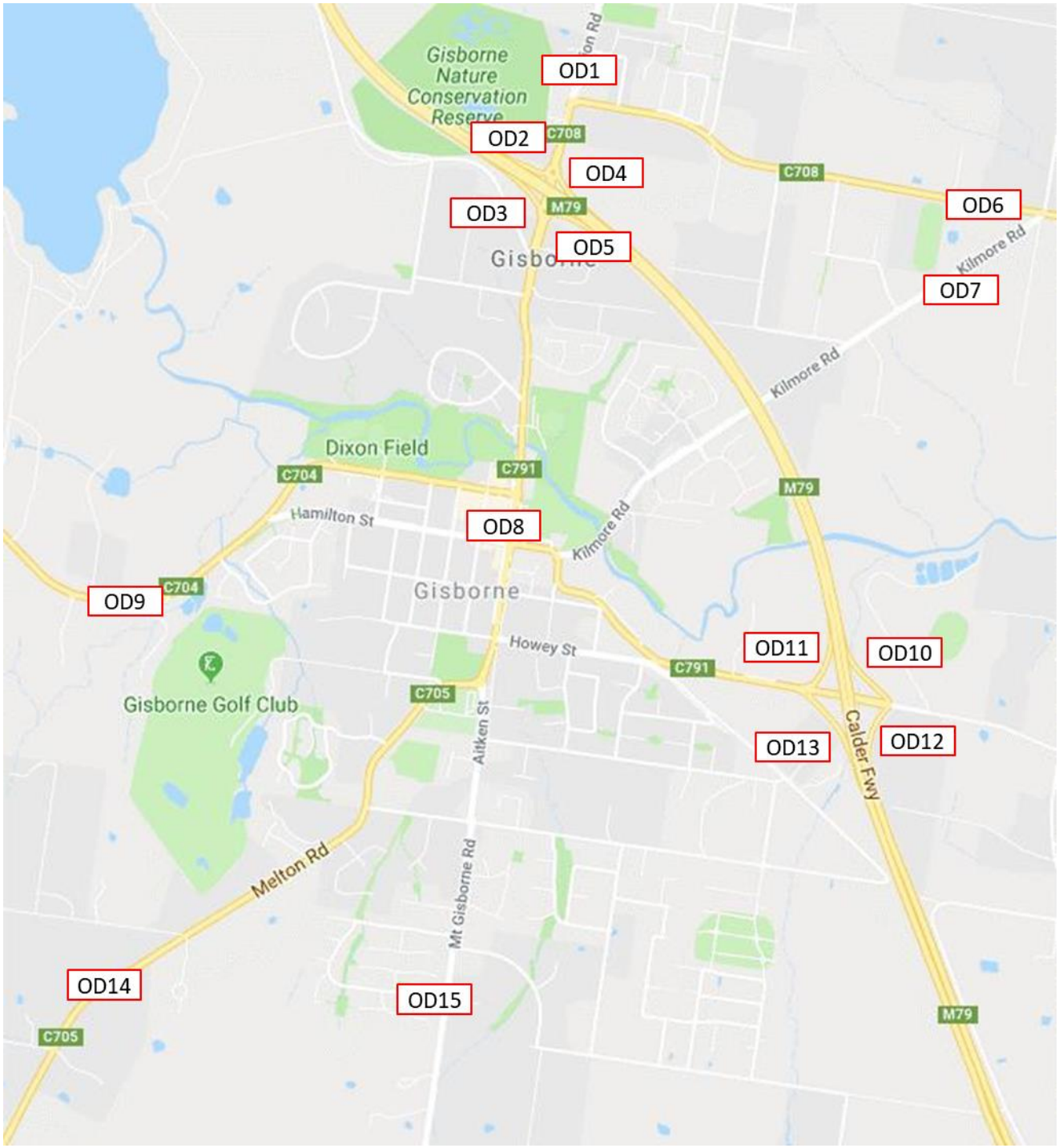
Figure 4-3 Locations of ATC And IC counts sites



4.3 Origin/Destination Surveys (OD)

Origin/Destination surveys were conducted on the 25th October from 0630 to 1830 using number plate recognition technology at 15 sites around Gisborne. These sites are illustrated in **Figure 4-4**.

Figure 4-4 OD Survey Locations



As noted in the survey report:

> Due to blockage of camera view, the data for station 4E was missing. As a result, station 4E is absent in the OD report.

> Also, due to sun glare Site 5 (between 7:50-9:50), Site 9E (between 09:00-12:00), Site 14N (between 12:50-13:50) & Site 15S (between 8:29-8:39) were affected. Factoring were used at these sites.

These sites are shown in **Table 4-5**.

Table 4-5 OD Survey Site Locations

Site ID	Directions	Name of Site
OD1	N/B, S/B	Station Rd
OD2	E/B	Station Rd / Calder Hwy (SB Exit Ramp)
OD3	W/B	Station Rd / Calder Hwy (NB Entry Ramp)
OD4	E/B	Station Rd / Calder Hwy (SB Entry Ramp) - No Data
OD5	W/B	Station Rd / Calder Hwy (NB Exit Ramp)
OD6	E/B, W/B	Saunders Rd
OD7	N/B, S/B	Kilmore Rd
OD8	N/B	Aitken St
OD9	E/B, W/B	Bacchus Marsh-Gisborne Rd
OD10	S/B	Melbourne Rd / Calder Hwy (SB Exit Ramp)
OD11	N/B	Melbourne Rd / Calder Hwy (NB Entry Ramp)
OD12	S/B	Melbourne Rd / Calder Hwy (SB Entry Ramp)
OD13	N/B	Melbourne Rd / Calder Hwy (NB Exit Ramp)
OD14	N/B, S/B	Gisborne-Melton Rd
OD15	N/B, S/B	Mt Gisborne Rd

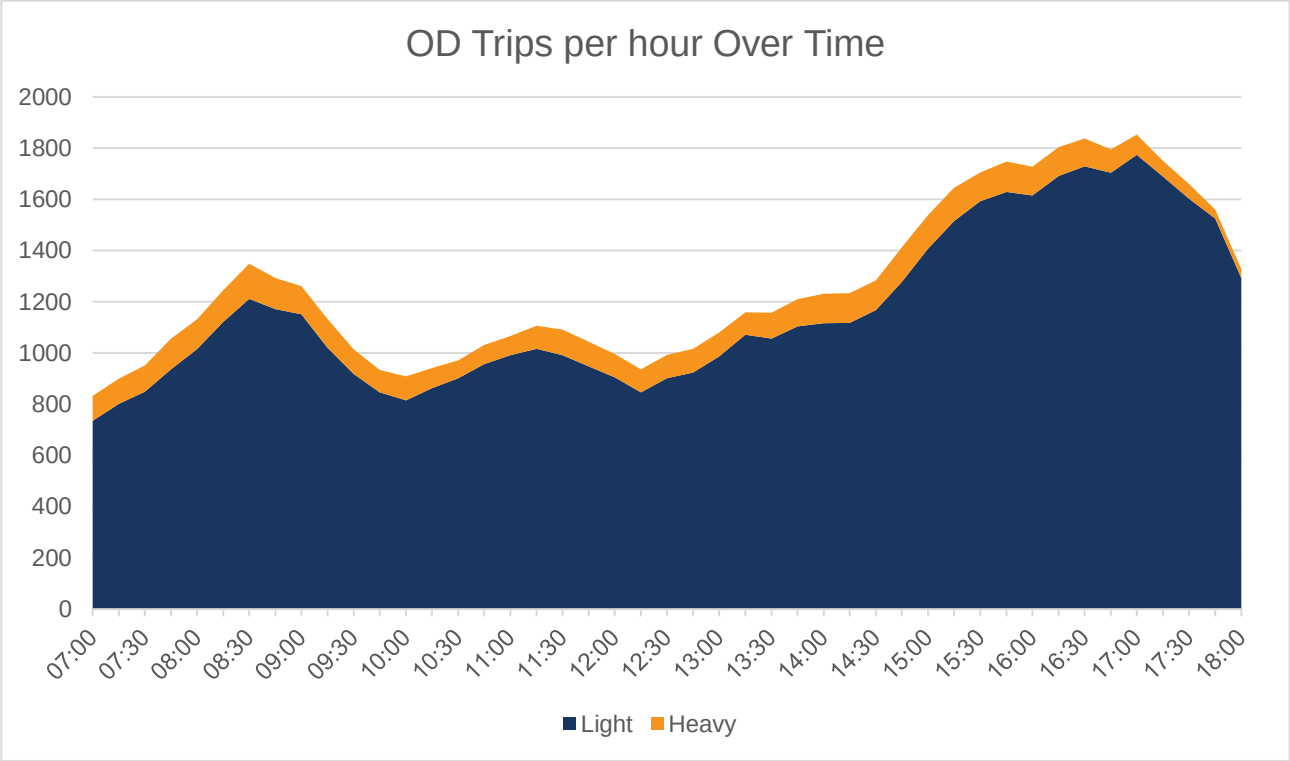
34,403 valid readings were taken, given a total of 7,479 origin/destination pairs, split into Light (92%) and Heavy (8%) Vehicles. The proportions of vehicles are reasonably consistent with the other surveys.

The readings were processed as detailed in the Survey Report (Appendix A). Notably, a cap on the total journey time of 60 minutes was imposed. This was to prevent counting of trips that stopped at some location within the OD Boundaries and then made another journey later. For example, driving into Gisborne to do some shopping then returning home later should be two trips, not one. This decision was made by the survey company and does not reflect CARDNO's view on the issue.

As a matrix of Light, heavy and freight trips was available from the VITM, the OD trips were mainly used for reference and checking and were not a significant factor in the Model calibration. CARDNO consider that the impact of the 60 minutes cut-off vs a shorter time period would have no impact on the model calibration.

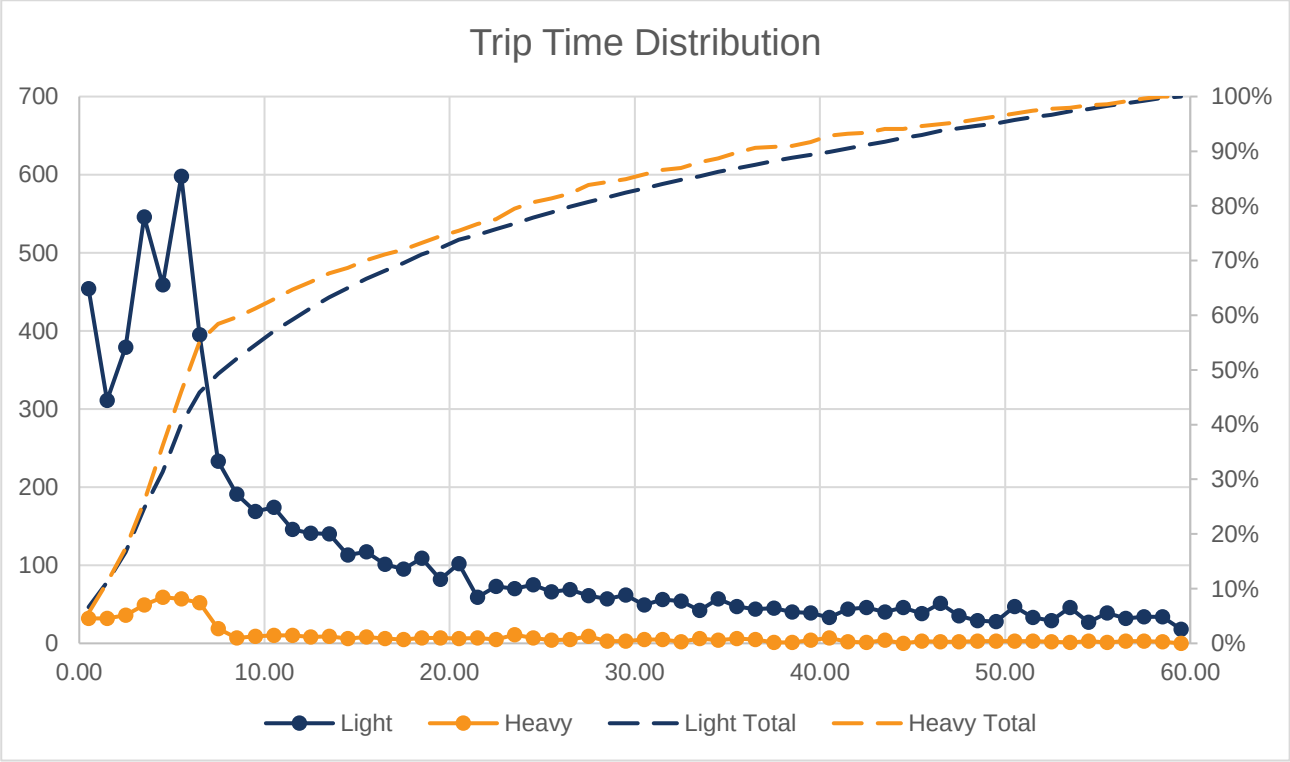
The daily profile of trips as observed the OD Survey is shown in **Figure 4-5**.

Figure 4-5 Daily Profile of OD Trips



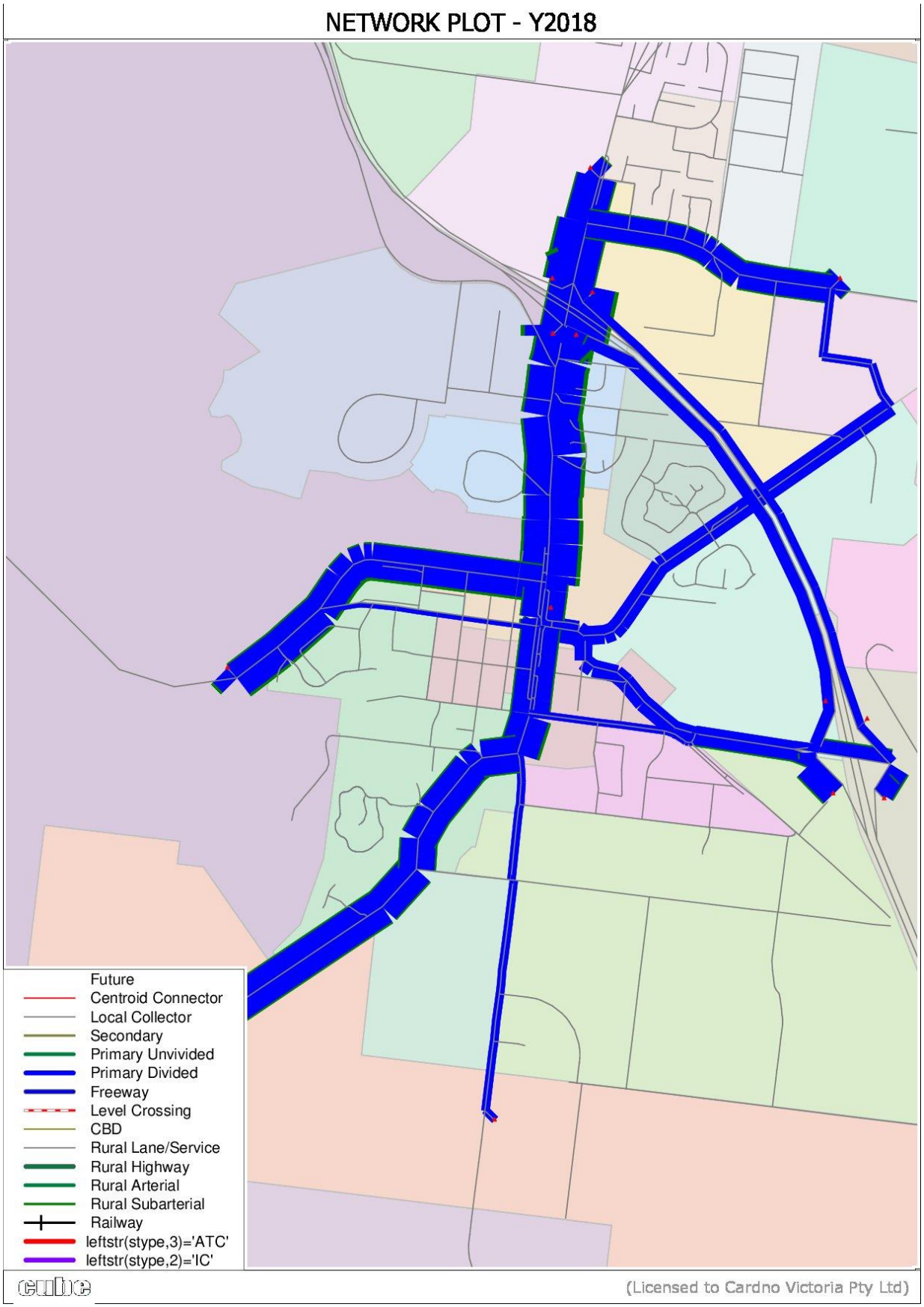
The Trip Time Distribution of the survey is shown in **Figure 4-6**. It should be noted that many of the trips are of very short duration, but only reported to the nearest minute. This makes the short end of the distribution susceptible to sampling distortions

Figure 4-6 Trip Time Distribution from OD Survey



The OD Survey Trips were assigned on the model network and the results are shown in **Figure 4-7**.

Figure 4-7 OD Surveys assigned in Base Model Network



4.4 Screenlines

It is customary to group counts into screenlines – imaginary barriers across which all trips are counted – and corridors. The Screenlines adopted in the Gisborne Model are summarised in **Table 4-6** to **Table 4-11** and graphically in **Figure 4-8**.

Screenline 1 capture the trips that enter the model from the north.

Table 4-6 Screenline 1 – North of Gisborne

Site Ref	Site Name	Direction	AM Peak	PM Peak
ATC_16	Calder Freeway	NB	818	1,195
ATC_16	Calder Freeway	SB	896	966
ATC_17	Black Forest Drive	NB	128	172
ATC_17	Black Forest Drive	SB	211	139
ATC_18	Mt Macedon Road	NB	147	188
ATC_18	Mt Macedon Road	SB	201	132

Screenline 2 capture the trips just to the west of Station Road. Note that the trips along Calder Freeway at this location are derived from the ATC counts along the Freeway and the entry and exit flows as noted in section 4.1.1. As they are not direct measurements, there may be uncaptured movements.

Table 4-7 Screenline 2 – North of Gisborne

Site Ref	Site Name	Direction	AM Peak	PM Peak
ATC_02	Calder Highway EB Off	EB	376	347
ATC_04	Calder Highway WB On	WB	203	194
derived	Calder Highway	NB	640	637
derived	Calder Highway	SB	773	596
ATC_22	Ross Watt Road	EB	40	34
ATC_22	Ross Watt Road	WB	63	52

Screenline 3 captures the trips crossing the southern bound of Gisborne. Note that the trips along Calder Freeway at this location are derived from the ATC counts along the Freeway and the entry and exit flows. As they are not direct measurements, there may be uncaptured movements. This screenline is not entirely 'waterproof', as it passes through some residential roads for which there are no observations. These roads are very local residential distributors and do not see much use in the assignment.

Table 4-8 Screenline 3 – South of Melbourne Road

Site Ref	Site Name	Direction	AM Peak	PM Peak
ATC_09	Bacchus Marsh - Gisborne Rd	EB	207	165
ATC_09	Bacchus Marsh - Gisborne Rd	WB	147	126
ATC_27	Aitken Street	NB	582	517
ATC_27	Aitken Street	SB	474	419
derived	Calder Highway @Melbourne Road	NB	689	666
derived	Calder Highway @Melbourne Road	SB	980	824
ATC_13	Calder Highway - NB Off	NB	311	233
ATC_12	Calder Highway - SB On	SB	310	426

Screenline 4 captures the trips leaving or entering the southern boundary of the study area.

Table 4-9 Screenline 4 – Southern Bounds of Model

Site Ref	Site Name	Direction	AM Peak	PM Peak
ATC_31	Melton Road	NB	153	265
ATC_31	Melton Road	SB	198	172
ATC_32	Calder Freeway	NB	820	1,606
ATC_32	Calder Freeway	SB	1,300	1,085

Screenline 5, similar to screenline 3, captures the trips to the south of Gisborne.

Table 4-10 Screenline 5 – South of Melbourne Road

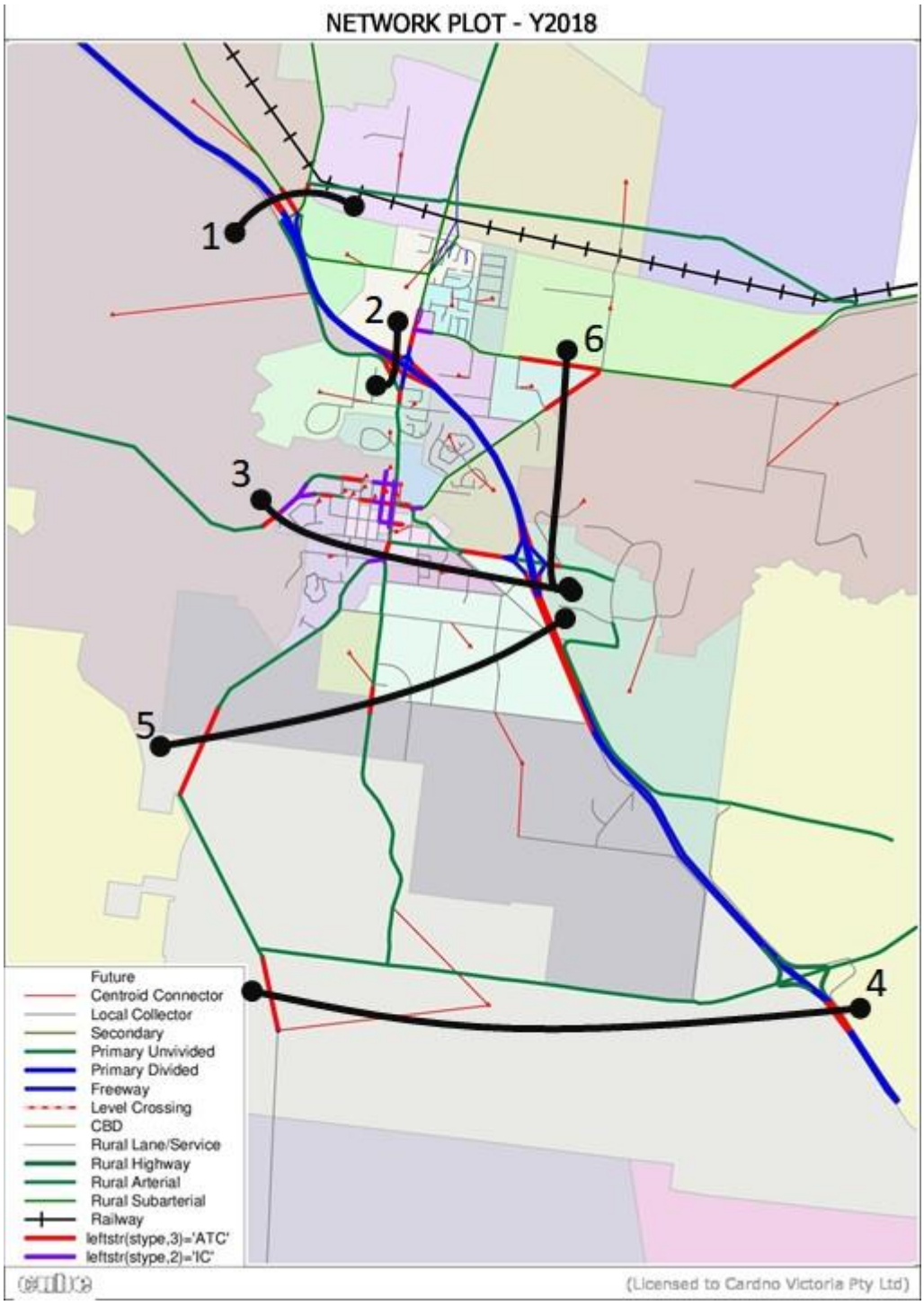
Site Ref	Site Name	Direction	AM Peak	PM Peak
ATC_14	Gisborne-Melton Road	NB	155	220
ATC_14	Gisborne-Melton Road	SB	173	159
ATC_15	Mt Gisborne Road	NB	42	56
ATC_15	Mt Gisborne Road	SB	35	44
ATC_30	Calder Freeway	NB	999	1,618
ATC_30	Calder Freeway	SB	1,290	1,117

Screenline 6 captures the trips along the eastern boundary of Gisborne. It is clear that this movement is not a major one.

Table 4-11 Screenline 6 – Movements to the East

Site Ref	Site Name	Direction	AM Peak	PM Peak
ATC_06	Saunders Road	EB	101	87
ATC_06	Saunders Road	WB	169	136
ATC_07	Kilmore Road	EB	99	87
ATC_07	Kilmore Road	WB	144	100
ATC_29	Emmeline Drive	EB	43	32
ATC_29	Emmeline Drive	WB	66	66

Figure 4-8 Screenline Locations within Model Network



4.5 Corridors

Flows along a corridor can be a useful tool for determining the fitness of a model. Where there is a primary corridor through a study area, calibrating the flows along this corridor can improve the performance of the model.

There are two primary and two secondary corridors through the study area:

- Calder Freeway is the Primary Corridor for Strategic Trips (**-**);
- Station Road/ Aitken Road is the primary North/South corridor for local trips **(Table 4-13**);
- Robertson Street is a secondary corridor used by trips going towards Bacchus Marsh (**Table 4-14**);
- Hamilton Street is a secondary corridor that goes through the commercial centre of Gisborne (**Table 4-15**).

Table 4-12 Corridor 1 – Calder Freeway

Location	Site	DIR	AM Total	PM Total
Calder Freeway	ATC_16	NB	802	1,195
Calder Freeway	ATC_16	SB	781	966
Calder Highway @W of Station Road	CFW4	NB	889	1,117
Calder Highway @W of Station Road	CFW4	SB	1,057	903
Calder Highway - SB Off	ATC_02	EB	355	353
Calder Highway - NB On	ATC_04	WB	198	142
Calder Highway @Station Road	CFW3	NB	691	974
Calder Highway @Station Road	CFW3	SB	702	551
Calder Highway - NB Off	ATC_05	WB	110	176
Calder Highway - SB On	ATC_03	EB	272	351
Calder Highway @Kilmore Road	CFW2	NB	802	1,150
Calder Highway @Kilmore Road	CFW2	SB	974	902
Calder Highway - NB On	ATC_11	NB	80	49
Calder Highway - SB Off	ATC_10	EB	29	63
Calder Highway @Melbourne Road	CFW1	NB	722	1,101
Calder Highway @Melbourne Road	CFW1	SB	944	839
Calder Highway - NB Off	ATC_13	NB	237	518
Calder Highway - SB On	ATC_12	SB	431	278
Calder Freeway	ATC_30	NB	959	1,618
Calder Freeway	ATC_30	SB	1,376	1,117
Calder Freeway	ATC_32	NB	878	1,606
Calder Freeway	ATC_32	SB	1,369	1,085

As previously described in section 4.1.1, the counts labelled CFW are derived counts.

Table 4-13 Corridor 2 – Station Road / Aitken Street

Location	Site	DIR	AM Total	PM Total
Station Road	ATC_01	NB	484	309
Station Road	ATC_01	SB	484	307
Station Road	ATC_20	NB	529	547
Station Road	ATC_20	SB	732	569
Station Road	ATC_21	NB	677	820
Station Road	ATC_21	SB	855	750
Aitken Street and Robertson Street	IC_2A_Out	NB	663	829
Aitken Street and Robertson Street	IC_2A_In	SB	860	724
Aitken Street and Robertson Street	IC_2A_In	NB	606	588
Aitken Street and Robertson Street	IC_2A_Out	SB	561	534
Aitken Street	ATC_08	NB	606	575
Aitken Street	ATC_08	SB	561	511
Aitken Street and Hamilton Street	IC_3A_Out	NB	608	589
Aitken Street and Hamilton Street	IC_3A_In	SB	556	550
Aitken Street and Hamilton Street	IC_3A_In	NB	533	455
Aitken Street and Hamilton Street	IC_3A_Out	SB	398	503
Aitken Street	ATC_26	NB	533	518
Aitken Street	ATC_26	SB	398	521
Aitken Street and Fisher Street	IC_7A_Out	NB	533	449
Aitken Street and Fisher Street	IC_7A_In	SB	398	510
Aitken Street and Fisher Street	IC_7A_In	NB	533	469
Aitken Street and Fisher Street	IC_7A_Out	SB	398	551
Aitken Street	ATC_27	NB	522	492
Aitken Street	ATC_27	SB	427	525
Aitken Street and Melton Road	IC_9_Out	NB	522	456
Aitken Street and Melton Road	IC_9_In	SB	427	543
Aitken Street and Melton Road	IC_9_In	NB	362	221
Aitken Street and Melton Road	IC_9_Out	SB	142	323
Aitken Street and Melton Road	IC_9_In	EB	223	251
Aitken Street and Melton Road	IC_9_Out	WB	348	236

Table 4-14 Corridor 3 – Hamilton Road

Location	Site	DIR	AM Total	PM Total
Hamilton Street and Robertson Street	IC_6_Out	EB	90	59
Hamilton Street and Robertson Street	IC_6_In	WB	59	68
Hamilton Street	ATC_24	EB	131	92
Hamilton Street	ATC_24	WB	80	124
Hamilton Street	ATC_34	EB	228	246
Hamilton Street	ATC_34	WB	178	199
Hamilton Street and Brantome Street	IC_5_In	EB	253	358
Hamilton Street and Brantome Street	IC_5_Out	WB	361	359
Hamilton Street and Brantome Street	IC_5_Out	EB	320	539
Hamilton Street and Brantome Street	IC_5_In	WB	480	505
Hamilton Street	ATC_35	EB	356	510
Hamilton Street	ATC_35	WB	518	524
Aitken Street and Hamilton Street	IC_3A_In	EB	309	523
Aitken Street and Hamilton Street	IC_3A_Out	WB	460	507
Aitken Street and Hamilton Street	IC_3A_Out	EB	347	500
Aitken Street and Hamilton Street	IC_3A_In	WB	565	467
Melbourne Road	ATC_25	EB	329	530
Melbourne Road	ATC_25	WB	585	580

Table 4-15 Corridor 4 – Robertson Street

Location	Site	DIR	AM Total	PM Total
Hamilton Street and Robertson Street	IC_6_Out	NB	157	122
Hamilton Street and Robertson Street	IC_6_In	SB	135	128
Robertson Street	ATC_23	EB	157	173
Robertson Street	ATC_23	WB	135	225
Robertson Street and Brantome Street	IC_4_In	EB	244	404
Robertson Street and Brantome Street	IC_4_Out	WB	490	320
Robertson Street and Brantome Street	IC_4_Out	EB	254	580
Robertson Street and Brantome Street	IC_4_In	WB	588	464
Aitken Service Street and Robertson Street	IC_2B_In	EB	254	624
Aitken Service Street and Robertson Street	IC_2B_Out	WB	588	594
Aitken Service Street and Robertson Street	IC_2B_Out	EB	346	580
Aitken Service Street and Robertson Street	IC_2B_In	WB	588	529
Aitken Street and Robertson Street	IC_2A_In	EB	346	580
Aitken Street and Robertson Street	IC_2A_Out	WB	588	529

4.6 Other Count Sites

The ATC and Interchange count sites that were not included in the Screenlines or corridors were used in the calibration, and are included in the Modelled vs Observed graphs: **Figure 6-2** and **Figure 6-3** in Chapter 6.

5 Development of Demand Matrices

The initial matrices come from the VITM V1_11 run using the Gisborne zoning system, for the model year 2016.

5.1 Light Vehicle Matrices

The VITM V1_11 Light vehicle matrices consist of the following user classes:

- Car Non-Airport (This is most of the trips);
- Car Employer's Business;
- Light Commercial Vehicle (LCV);
- Private Vehicle Airport Employees;
- Private Vehicle Airport Passengers

All these vehicle classes were aggregated into a single matrix, as it was felt that:

- the impact of Airport Passengers and Employees would not be relevant to a model at this remove from the airport;
- the higher values of Time for Employer's business trips would be less relevant to trips outside the Metropolitan area.

The VITM model also produces car trips that are generated by the Park and Ride Model for AM and IP, as well as trips generated as part of the non-transit legs of PT trips. These were not included in this model, as the magnitude of these trips in the Gisborne model area was found to be very small.

Light Commercial Vehicles were included in a separate matrix.

5.2 Heavy Vehicle and Freight Matrices

The Freight Vehicle Matrices from the VITM V1_11 model run were used as the initial source of the Freight Vehicle matrix. These consisted of, Rigid Vehicles, Articulated Vehicles, B-Doubles, and High Productivity Freight Vehicles (**HPFV**).

The Rigid Vehicles were allocated to the Light Commercial Vehicle matrix and the Articulated Vehicles were allocated to the Freight vehicle matrix. There were no B-Doubles or HPFV vehicles in the matrices.

The initial magnitude of the trips from the VITM matrices are summarised in **Table 5-1**. It is noted that these matrices include trips in the entire VITM area, and therefore many of the trips included are irrelevant to the Gisborne area. It should also be noted that, as the zones outside of the immediate model are very large, there are very large numbers of intrazonal trips in the car and light vehicle matrices, as also shown in **Table 5-1**.

Table 5-1 Initial VITM Matrix Totals

	Car NA	Car EB	LCV	CAR AE	CAR AP	Rigid	Artic	B-Double	HPFV
AM (inc Intra)	1,582,274	57,001	249,110	1,616	9,984	27,315	17.358	0	0
PM (inc Intra)	1,909,952	77,099	286,971	2,708	8,346	22,629	14,379	0	0
AM (Intra)	482,439	15,454	71,639	26	0	0	0	0	0
PM (Intra)	625,365	20,357	87,977	41	0	0	0	0	0

5.3 Initial Matrices

For assignment purposes, the matrices were grouped into the following three categories:

- Cars;
- Commercial Vehicles (LCV and Rigid trucks); and
- Freight Vehicles (Articulated, B-Doubles and HPFV).

In order to use these matrices for the local area modelling it was necessary to determine which trips were likely to traverse the local model area. To this end, the VITM matrices were analysed and zones allocated to rough sectors as shown in **Table 5-2**.

Table 5-2 Strategic Zoning Sectors

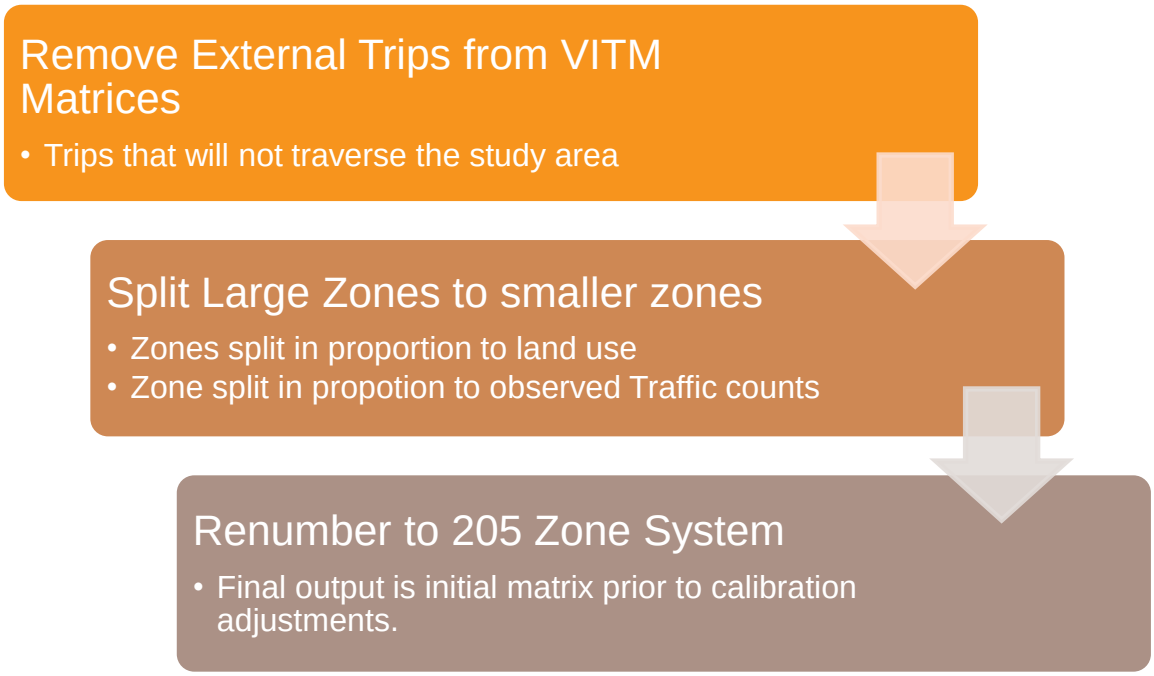
1. North West	2. North	3. North East
4. West	5. Model Area	6. East
7. South West	8. South	9. South East

Using this aggregation, it was possible to determine those trips from the VITM matrices that were not going to traverse the model areas and those that would, and a mechanism was setup to factor trips that would not traverse the model area to zero. For example, trips internal to the South East would not traverse the model area, while trips from South East to North West almost certainly would traverse the model area.

A zone equivalence system was established to equate the 502 zone VITM zoning system to the Gisborne model zoning system which consisted of 205 zones. Many of the external-to-external trips were discarded, and most of the remaining zones were required to be split, as the smallest VITM zones in the area were still much larger than what is considered reasonable for a more detailed study area such as Gisborne.

The procedure to generate the initial matrices is summarised in **Figure 5-1**.

Figure 5-1 Producing the initial Matrices prior to Calibration



6 Calibration of Base Year Model

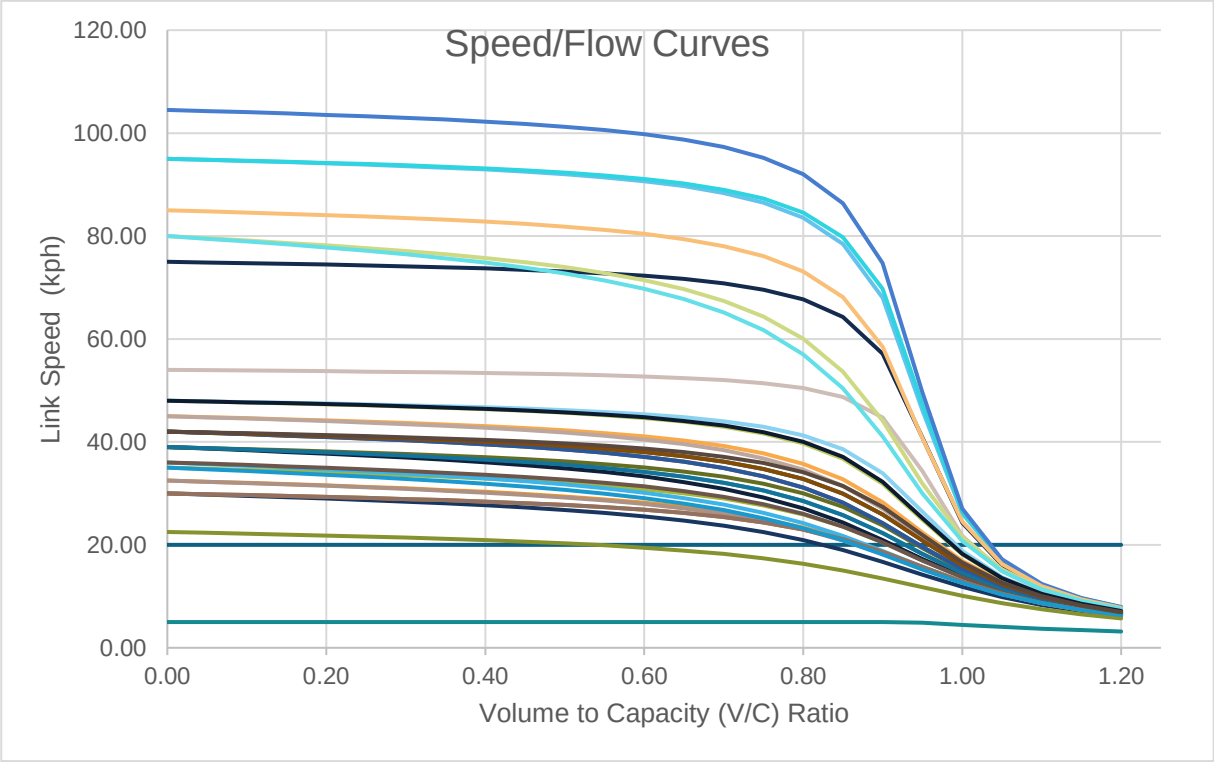
6.1 Assignment Algorithm and Parameters

6.2 Speed Flow Curves

The Gisborne model uses the same speed/flow curves formulation as the VITM V1_11 model as shown in **Figure 6-1** for a selection of link types. Any discontinuities in the figure below are sampling errors, the real relationship is continuous and smooth.

The horizontal line at 20kph is the centroid connector. The horizontal line at around 5kph is the Terminal link type.

Figure 6-1 Speed/Flow Curves as used in the Gisborne Model



The above figure is representative only, as many of the VITM V1_11 links have custom speeds, presumably for calibration purposes. The link attribute “POSTED_SPEED” speeds control the free-flow or starting speed of the speed flow curve, i.e. the speed with V/C = 0.

The overall assignment procedures are as close as possible to the VITM to ensure compatibility.

6.3 Calibration Goals

The goals of the model calibration are to produce a model which behaves in a similar fashion to the real situation. To this end, the model should match several criteria:

- Modelled Traffic Counts should be comparable to Observed Traffic Counts (usually within 10% or GEH 5.00);
- Trips entering and exiting the subarea should match the various screenline totals;
- Travel patterns should be comparable to the OD Surveys, where there are available OD surveys;
- The Modelled to Observed ratio of all the observed sites should be close to 1.0, with an R^2 value of greater than 0.90.

It is also important to judge the model’s fitness for the testing it will be used to carry out. In the case of this model, the options to be tested are various, as yet undefined, bypass proposals, so the flows along the

Calder Freeway Corridor are important. The primary focus of the modelling work has been on the flows diverting through Gisborne that would take advantage of the bypass options.

Another key impact is the upcoming Station Road Duplication, and to this end, the flows along the Station Road/Aitken Road corridor are important, however the model has not been built with this corridor as the main focus and may require additional development to model the impacts of development on this road.

6.4 Calibration of the Model

The calibration procedure used a variety of techniques, including select link adjustment, trip infilling and network adjustments in an iterative fashion:

- Review the Modelled flows vs the observed flows in Screenlines and Corridors;
- Where this assigned flow is lower than a site or screenline, a select link matrix using the site can be used to increase the trip matrix;
- Where the assigned flow is higher than the site or screenline, a select link matrix using the site can be used to reduce the matrix;

This procedure is like Matrix Estimation, however it replaces the automatic factoring with manual factoring, to preserve an element of judgement in the process. This helps avoid common failings of Matrix Estimation, which tends to insert many short trips, often just crossing count sites, leading to shortening of average trips lengths and a model which is unfit for purpose.

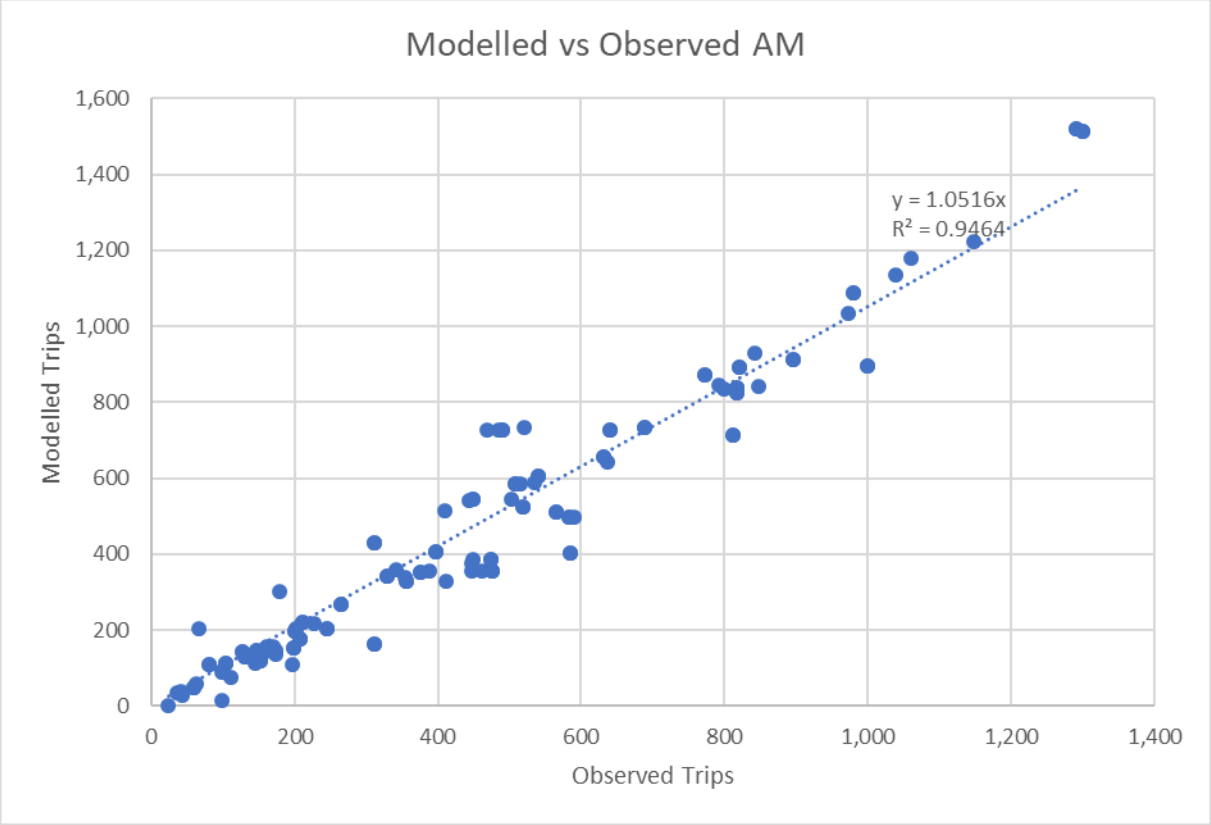
- Where there are no flows through a count site, additional trips will need to be generated, and local trip generation using a gravity model or other appropriate technique can be done.
- Where route choice behaviour is unusual or unexpected, review the network coding in terms of link type and posted speeds.

As the base model was a strategic model, trips internal to the study area were sparse and trips were added to represent local trips.

6.5 AM Calibration - Screenlines

The performance of the model is shown in the Modelled/Observed Graph below.

Figure 6-2 Calibrated Comparison to Modelled to Observed Trips for PM Peak



Some comparisons of Modelled to Observed by screenline are in the tables below. These are for the AM peak model.

Table 6-1 AM Modelled vs Observed Screenline 1

			AM Observed				AM Modelled					
Location	Site	DIR	Light	Heavy	Freight	Total	Light	Heavy	Freight	Total	M/O	GEH
Calder Freeway	ATC_16	NB	678	88	52	818	765	35	24	824	1.01	0.22
Calder Freeway	ATC_16	SB	788	68	40	896	717	123	73	913	1.02	0.57
Black Forest Drive	ATC_17	NB	118	9	1	128	132	9	0	142	1.11	1.21
Black Forest Drive	ATC_17	SB	204	6	1	211	221	1	0	222	1.05	0.73
Mt Macedon Road	ATC_18	NB	140	6	0	147	146	1	0	146	1.00	0.05
Mt Macedon Road	ATC_18	SB	195	6	0	201	191	4	1	196	0.98	0.34
		NB	**937**	**103**	**53**	**1,092**	**1,043**	**45**	**24**	**1,112**	**1.02**	**0.60**
		SB	**1,187**	**80**	**42**	**1,308**	**1,129**	**128**	**74**	**1,332**	**1.02**	**0.64**
		Both	**2,123**	**183**	**95**	**2,401**	**2,173**	**173**	**99**	**2,444**	**1.02**	**0.87**

Table 6-2 AM Modelled vs Observed Screenline 2

			AM Observed				AM Modelled					
Location	Site	DIR	Light	Heavy	Freight	Total	Light	Heavy	Freight	Total	M/O	GEH
Melton Road	ATC_31	NB	332	37	7	376	345	9	0	354	0.94	1.16
Melton Road	ATC_31	SB	185	14	4	203	199	2	1	202	1.00	0.03
Calder Highway	derived	NB	*525*	*71*	*44*	*640*	669	33	23	726	1.13	3.29
Calder Highway	derived	SB	*703*	*37*	*33*	*773*	677	119	74	871	1.13	3.40
Ross Watt Road	ATC_18	NB	37	3	0	40	33	2	0	35	0.87	0.86
Ross Watt Road	ATC_18	SB	58	5	0	63	52	5	0	58	0.92	0.67
		NB	**369**	**40**	**7**	**416**	**378**	**11**	**0**	**389**	**0.93**	**1.36**
		SB	**243**	**19**	**4**	**266**	**252**	**8**	**1**	**260**	**0.98**	**0.34**
		Both	**612**	**59**	**11**	**682**	**629**	**19**	**1**	**649**	**0.95**	**1.28**

Table 6-3 AM Modelled vs Observed Screenline 3

			AM Observed				AM Modelled					
Location	Site	DIR	Light	Heavy	Freight	Total	Light	Heavy	Freight	Total	M/O	GEH
BM-Gisborne Rd	ATC 09	EB	187	14	6	207	165	11	0	176	0.85	2.22
BM-Gisborne Rd	ATC 09	WB	128	15	4	147	125	14	0	139	0.95	0.66
Aitken Street	ATC 27	NB	523	53	7	582	494	2	2	498	0.85	3.64
Aitken Street	ATC 27	SB	433	38	3	474	379	8	0	387	0.82	4.22
Calder Highway	derived	NB	*565*	*77*	*47*	689	675	34	24	733	1.06	1.65
Calder Highway	derived	SB	*886*	*51*	*42*	980	881	131	76	1,088	1.11	3.36
Calder Highway	ATC 13	NB	282	25	3	311	158	4	0	161	0.52	9.71
Calder Highway	ATC 12	SB	288	20	2	310	426	5	0	431	1.39	6.27
		EB/NB	**992**	**92**	**16**	**1,100**	**817**	**17**	**2**	**835**	**0.76**	**8.50**
		WB/SB	**850**	**73**	**9**	**932**	**930**	**27**	**0**	**957**	**1.03**	**0.82**
		Both	**1,842**	**165**	**25**	**2,031**	**1,747**	**44**	**2**	**1,792**	**0.88**	**5.47**

The modelled to observed ratio is overall considered acceptable, although it is noted that some of the northbound flows at ATC13 are low for the AM peak.

Table 6-4 AM Modelled vs Observed Screenline 4

			AM Observed				AM Modelled					
Location	Site	DIR	Light	Heavy	Freight	Total	Light	Heavy	Freight	Total	M/O	GEH
Melton Road	ATC_31	NB	134	15	4	153	137	4	2	143	0.94	0.81
Melton Road	ATC_31	SB	181	14	2	198	144	7	2	153	0.77	3.43
Calder Freeway	ATC_32	NB	672	104	44	820	830	38	24	892	1.09	2.43
Calder Freeway	ATC_32	SB	1,165	100	34	1,300	1,299	138	76	1,513	1.16	5.68
		NB	**806**	**120**	**48**	**974**	**967**	**43**	**25**	**1,035**	**1.06**	**1.94**
		SB	**1,346**	**115**	**37**	**1,498**	**1,443**	**145**	**77**	**1,666**	**1.11**	**4.22**
		Both	**2,152**	**234**	**85**	**2,471**	**2,410**	**188**	**103**	**2,700**	**1.09**	**4.51**

At the southern bounds of the study area, the model matches well with the observed flows.

Table 6-5 AM Modelled vs Observed Screenline 5

			AM Observed				AM Modelled					
Location	Site	DIR	Light	Heavy	Freight	Total	Light	Heavy	Freight	Total	M/O	GEH
Gisborne-Melton Road	ATC_14	NB	136	15	4	155	132	4	2	138	0.89	1.39
Gisborne-Melton Road	ATC_14	SB	153	18	1	173	140	7	0	147	0.85	2.05
Mt Gisborne Road	ATC_15	NB	37	5	0	42	35	3	0	38	0.90	0.64
Mt Gisborne Road	ATC_15	SB	33	2	0	35	34	1	0	35	1.00	0.01
Calder Freeway	ATC_30	NB	847	102	50	999	832	38	24	894	0.89	3.42
Calder Freeway	ATC_30	SB	1,175	72	44	1,290	1,307	136	76	1,519	1.18	6.10
		NB	**1,019**	**122**	**55**	**1,196**	**999**	**46**	**25**	**1,070**	**0.89**	**3.74**
		SB	**1,361**	**92**	**46**	**1,499**	**1,481**	**145**	**76**	**1,702**	**1.14**	**5.07**
		Both	**2,380**	**214**	**101**	**2,695**	**2,480**	**190**	**101**	**2,772**	**1.03**	**1.47**

Modelled and Observed match well over this screenline, however the southbound movement towards Melton is high. The numbers are small, however, and the GEH remains under 5.00.

Table 6-6 AM Modelled vs Observed Screenline 6

			AM Observed				AM Modelled					
Location	Site	DIR	Light	Heavy	Freight	Total	Light	Heavy	Freight	Total	M/O	GEH
Saunders Road	ATC_06	EB	91	6	3	101	91	5	0	96	0.95	0.50
Saunders Road	ATC_06	WB	139	25	5	169	140	15	1	156	0.92	1.02
Kilmore Road	ATC_07	EB	89	8	1	99	81	9	1	90	0.92	0.85
Kilmore Road	ATC_07	WB	132	12	0	144	101	12	0	113	0.78	2.81
Emmeline Drive	ATC_29	EB	34	8	1	43	29	0	0	29	0.67	2.36
Emmeline Drive	ATC_29	WB	55	11	0	66	204	0	0	205	3.12	11.97
		EB	**214**	**22**	**6**	**243**	**201**	**13**	**1**	**215**	**0.89**	**1.80**
		WB	**325**	**49**	**6**	**379**	**446**	**27**	**1**	**474**	**1.25**	**4.57**
		Both	**539**	**71**	**12**	**622**	**647**	**41**	**2**	**689**	**1.11**	**2.62**

This screenline catches the east-west trips, and all counts are considered small in magnitude. While the Modelled to observed falls outside the 10% criteria, the GEH values are under 5.00 and the absolute differences are minor. Overall the difference between the modelled and observed screenline flows are considered acceptable.

6.6 AM Calibration – Corridors

The flows along the various Corridors are shown and compared to the observed. Note that the summary flow at the bottom of the table is the average flow along the corridor.

Table 6-7 Modelled vs Observed Corridor 1

Location	Site	DIR	Observed				Modelled				M/O	GEH
			Light	Heavy	Freight	Total	Light	Heavy	Freight	Total		
Calder Freeway	ATC_16	NB	678	88	52	818	765	35	24	824	1.01	0.22
Calder Freeway	ATC_16	SB	788	68	40	896	717	123	73	913	1.02	0.57
Calder Highway	derived	NB	*710*	*85*	*48*	843	868	36	24	928	1.10	2.88
W of Station Road	derived	SB	*1,035*	*74*	*40*	1,149	1,022	128	74	1,224	1.07	2.19
Calder Highway - SB Off	ATC_02	EB	332	37	7	376	345	9	0	354	0.94	1.16
Calder Highway - NB On	ATC_04	WB	185	14	4	203	199	2	1	202	1.00	0.03
Calder Highway	derived	NB	525	71	44	640	669	33	23	726	1.13	3.29
@Station Road	derived	SB	703	37	33	773	677	119	74	871	1.13	3.40
Calder Highway - NB Off	ATC_05	WB	138	11	4	153	117	1	0	118	0.77	2.99
Calder Highway - SB On	ATC_03	EB	233	22	10	265	253	12	2	266	1.00	0.05
Calder Highway	derived	NB	663	82	48	793	786	35	24	844	1.06	1.79
@Kilmore Road	derived	SB	936	59	43	1,038	930	131	76	1,137	1.09	2.98
Calder Highway - NB On	ATC_11	NB	99	5	1	104	111	0	0	111	1.07	0.70
Calder Highway - SB Off	ATC_10	EB	50	7	1	58	49	0	0	49	0.83	1.33
Calder Highway	derived	NB	565	77	47	689	675	34	24	733	1.06	1.65
@Melbourne Road	derived	SB	886	51	42	980	881	131	76	1,088	1.11	3.36
Calder Highway - NB Off	ATC_13	NB	282	25	3	311	158	4	0	161	0.52	9.71
Calder Highway - SB On	ATC_12	SB	288	20	2	310	426	5	0	431	1.39	6.27
Calder Freeway	ATC_30	NB	847	102	50	999	832	38	24	894	0.89	3.42
Calder Freeway	ATC_30	SB	1,175	72	44	1,290	1,307	136	76	1,519	1.18	6.10
Calder Freeway	ATC_32	NB	672	104	44	820	830	38	24	892	1.09	2.43

Location	Site	DIR	Observed				Modelled				M/O	GEH
			Light	Heavy	Freight	Total	Light	Heavy	Freight	Total		
Calder Freeway	ATC_32	SB	1,165	100	34	1,300	1,299	138	76	1,513	1.16	5.68
		NB	**666**	**87**	**47**	**800**	**775**	**36**	**24**	**834**	**1.04**	**1.20**
		SB	**956**	**66**	**40**	**1,061**	**976**	**129**	**75**	**1,181**	**1.11**	**3.58**
		Both	**1,621**	**153**	**87**	**1,861**	**1,751**	**165**	**99**	**2,015**	**1.08**	**3.50**

This table also includes the on and off ramps at Station Road and Melbourne Road. The Northbound and Southbound rows at the bottom of the table are the average of the directional flows. Both directions match well with the observed over the length of the corridor.

Table 6-8 Modelled vs Observed Corridor 2

Location	Site	DIR	Observed				Modelled				M/O	GEH
			Light	Heavy	Freight	Total	Light	Heavy	Freight	Total		
Station Road	ATC_01	NB	373	22	3	397	403	2	0	405	1.02	0.38
Station Road	ATC_01	SB	515	23	2	539	602	2	1	605	1.12	2.76
Station Road	ATC_20	NB	531	26	9	565	509	1	0	510	0.90	2.37
Station Road	ATC_20	SB	725	51	37	812	699	13	2	714	0.88	3.57
Station Road	ATC_21	NB	586	34	11	631	648	7	1	656	1.04	0.99
Station Road	ATC_21	SB	746	63	9	818	829	11	0	840	1.03	0.77
Aitken Street	IC_2A_ARM3	NB	597	40	0	637	638	2	1	641	1.01	0.15
Aitken Street	IC_2A_ARM3	SB	803	44	0	847	833	9	0	843	0.99	0.15
Aitken Street	IC_2A_ARM1	NB	490	25	0	515	576	10	1	586	1.14	3.05
Aitken Street	IC_2A_ARM1	SB	470	32	0	502	532	14	0	546	1.09	1.91
Aitken Street	ATC_08	NB	461	42	6	509	576	10	1	586	1.15	3.33
Aitken Street	ATC_08	SB	406	40	4	450	532	14	0	546	1.21	4.30
Aitken Street	IC_3A_ARM3	NB	507	28	0	535	578	10	1	588	1.10	2.26
Aitken Street	IC_3A_ARM3	SB	414	30	0	444	527	14	0	541	1.22	4.39

Location	Site	DIR	Observed				Modelled				M/O	GEH
			Light	Heavy	Freight	Total	Light	Heavy	Freight	Total		
Aitken Street	IC_3A_ARM1	NB	459	26	0	485	725	1	2	729	1.50	9.89
Aitken Street	IC_3A_ARM1	SB	425	36	0	461	349	7	0	356	0.77	5.21
Aitken Street	ATC_26	NB	180	302	8	490	725	1	2	729	1.49	9.67
Aitken Street	ATC_26	SB	410	61	5	476	349	7	0	356	0.75	5.91
Aitken Street	IC_7A_ARM3	NB	445	24	0	469	725	1	2	729	1.55	10.61
Aitken Street	IC_7A_ARM3	SB	411	37	0	448	349	7	0	356	0.79	4.60
Aitken Street	IC_7A_ARM1	NB	486	35	0	521	732	1	2	735	1.41	8.52
Aitken Street	IC_7A_ARM1	SB	414	34	0	448	367	7	0	374	0.84	3.64
Aitken Street	ATC_27	NB	523	53	7	582	494	2	2	498	0.85	3.64
Aitken Street	ATC_27	SB	433	38	3	474	379	8	0	387	0.82	4.22
Aitken Street	IC_9_ARM3	NB	555	35	0	590	494	2	2	498	0.84	3.96
Aitken Street	IC_9_ARM3	SB	413	36	0	449	379	8	0	387	0.86	3.05
Aitken Street	IC_9_ARM1	NB	346	8	0	354	340	0	0	340	0.96	0.74
Aitken Street	IC_9_ARM1	SB	188	8	0	196	109	0	0	109	0.56	7.04
Melton Road	IC_9_ARM4	EB	230	29	0	259	217	2	2	221	0.85	2.47
Melton Road	IC_9_ARM4	WB	246	30	0	276	333	7	0	341	1.23	3.68
		NB	**451**	**49**	**3**	**503**	**559**	**4**	**1**	**563**	**1.12**	**2.63**
		SB	**468**	**38**	**4**	**509**	**478**	**9**	**0**	**487**	**0.96**	**1.02**
		Both	**919**	**86**	**7**	**1,012**	**1,036**	**12**	**1**	**1,050**	**1.04**	**1.18**

As with Corridor 1, this corridor shows a reasonable average of north and southbound trips throughout its length. Many high counts can be explained away as the model not being capable of modelling service road usage.

Table 6-9 Modelled vs Observed Corridor 3

Location	Site	DIR	Observed				Modelled				M/O	GEH
			Light	Heavy	Freight	Total	Light	Heavy	Freight	Total		
Hamilton Street	IC_6_ARM2	EB	85	5	0	90	19	0	0	19	0.21	9.58
Hamilton Street	IC_6_ARM2	WB	53	6	0	59	4	0	0	4	0.07	9.83
Hamilton Street	ATC_24	EB	120	10	0	131	129	0	0	130	0.99	0.09
Hamilton Street	ATC_24	WB	68	11	0	80	108	0	0	108	1.36	2.94
Hamilton Street	ATC_34	EB	218	9	0	228	217	1	0	218	0.96	0.61
Hamilton Street	ATC_34	WB	168	10	0	178	299	1	0	300	1.68	7.87
Hamilton Street	IC_5_ARM4	EB	243	10	0	253	291	1	0	293	1.16	2.41
Hamilton Street	IC_5_ARM4	WB	353	8	0	361	517	1	0	518	1.44	7.50
Hamilton Street	IC_5_ARM2	EB	310	10	0	320	327	2	0	329	1.03	0.49
Hamilton Street	IC_5_In	WB	466	14	0	480	524	2	0	526	1.10	2.05
Hamilton Street	ATC_35	EB	323	27	6	356	327	2	0	329	0.92	1.49
Hamilton Street	ATC_35	WB	448	42	28	518	524	2	0	526	1.01	0.34
Hamilton Street	IC_3A_ARM4	EB	299	10	0	309	327	2	0	329	1.06	1.10
Hamilton Street	IC_3A_ARM4	WB	446	14	0	460	524	2	0	526	1.14	2.97
Hamilton Street	IC_3A_ARM2	EB	330	17	0	347	519	13	1	533	1.54	8.85
Hamilton Street	IC_3A_ARM2	WB	536	29	0	565	391	14	0	404	0.72	7.31
Melbourne Road	ATC_25	EB	303	24	2	329	329	13	1	343	1.04	0.74
Melbourne Road	ATC_25	WB	540	38	7	585	388	14	0	402	0.69	8.25
		EB	**248**	**14**	**1**	**263**	**276**	**4**	**0**	**280**	1.07	**1.07**
		WB	**342**	**19**	**4**	**365**	**364**	**4**	**0**	**368**	1.01	**0.16**
		Both	**590**	**33**	**5**	**628**	**640**	**8**	**0**	**648**	1.03	**0.82**

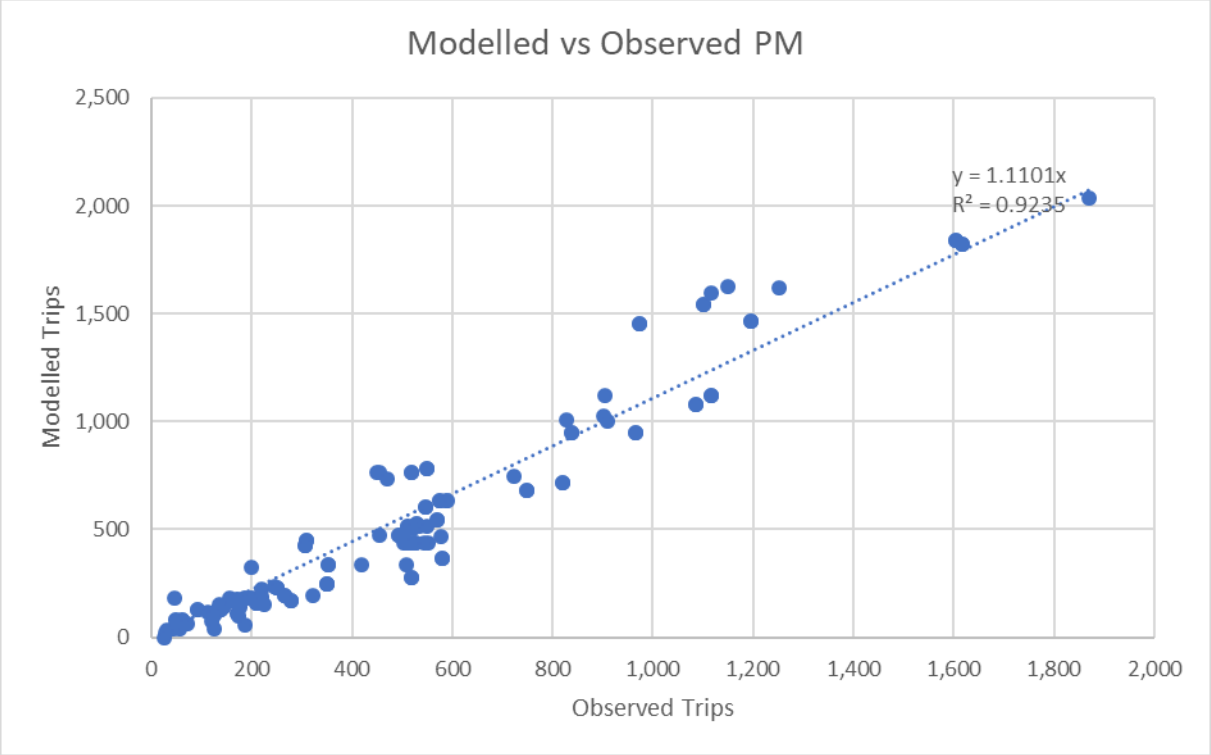
Table 6-10 Modelled vs Observed Corridor 4

Location	Site	DIR	Observed				Modelled				M/O	GEH
			Light	Heavy	Freight	Total	Light	Heavy	Freight	Total		
Robertson Street	IC_6_ARM3	NB	116	14	0	130	146	11	0	157	1.21	2.25
Robertson Street	IC_6_ARM3	SB	70	8	0	78	121	14	0	135	1.73	5.54
Robertson Street	ATC_23	EB	140	14	6	160	146	11	0	157	0.98	0.25
Robertson Street	ATC_23	WB	153	16	5	174	122	14	0	136	0.78	3.11
Robertson Street	IC_4_ARM4	EB	261	19	0	280	232	11	0	243	0.87	2.29
Robertson Street	IC_4_ARM4	WB	354	22	0	376	476	14	0	490	1.30	5.48
Robertson Street	IC_4_ARM2	EB	319	23	0	342	241	11	0	253	0.74	5.19
Robertson Street	IC_4_ARM2	WB	487	23	0	510	574	14	0	588	1.15	3.33
Robertson Street	IC_2B_ARM4	EB	328	26	0	354	241	11	0	253	0.71	5.83
Robertson Street	IC_2B_ARM4	WB	577	24	0	601	574	14	0	588	0.98	0.53
Robertson Street	IC_2B_ARM2	EB	308	25	0	333	334	11	0	345	1.04	0.65
Robertson Street	IC_2B_ARM2	WB	534	22	0	556	573	14	0	588	1.06	1.32
Robertson Street	IC_2A_ARM4	EB	308	25	0	333	334	11	0	345	1.04	0.65
Robertson Street	IC_2A_ARM4	WB	534	22	0	556	573	14	0	588	1.06	1.32
		EB	**254**	**21**	**1**	**276**	**239**	**11**	**0**	**250**	**0.91**	**1.59**
		WB	**387**	**20**	**1**	**407**	**430**	**14**	**0**	**445**	**1.09**	**1.81**
		Both	**641**	**40**	**2**	**683**	**669**	**26**	**0**	**695**	**1.02**	**0.44**

6.7 PM Calibration - Screenlines

The performance of the PM model is shown in the Modelled/Observed Graph below.

Figure 6-3 Calibrated Comparison to Modelled to Observed Trips for PM Peak



Overall, the northbound flows are somewhat higher compared to the observed values as a result of a re-calibration exercise undertake late during the project to ensure that the daily observed traffic volumes would match the observed daily flows (as the daily volumes are extrapolated from the AM and PM peak factors). This primarily resulted in an increase in the PM traffic flows in the northbound direction, although it is noted that this is mostly limited to a few locations.

Table 6-11 PM Modelled vs Observed Screenline 1

			PM Observed				PM Modelled					
Location	Site	DIR	Light	Heavy	Freight	Total	Light	Heavy	Freight	Total	M/O	GEH
Calder Freeway	ATC_16	NB	1,071	82	42	1,195	1,169	188	107	1,464	1.22	7.36
Calder Freeway	ATC_16	SB	885	45	36	966	872	45	30	947	0.98	0.61
Black Forest Drive	ATC_17	NB	168	3	0	172	170	3	0	173	1.00	0.04
Black Forest Drive	ATC_17	SB	136	3	0	139	125	0	0	126	0.90	1.18
Mt Macedon Road	ATC_18	NB	184	3	0	188	181	3	0	184	0.98	0.28
Mt Macedon Road	ATC_18	SB	131	1	0	132	129	0	0	130	0.98	0.21
		NB	**1,424**	**89**	**43**	**1,555**	**1,520**	**193**	**107**	**1,820**	**1.17**	**6.45**
		SB	**1,151**	**50**	**36**	**1,237**	**1,126**	**46**	**30**	**1,202**	**0.97**	**1.00**
		Both	**2,575**	**138**	**79**	**2,792**	**2,646**	**239**	**137**	**3,023**	**1.08**	**4.27**

Table 6-12 PM Modelled vs Observed Screenline 2

			PM Observed				PM Modelled					
Location	Site	DIR	Light	Heavy	Freight	Total	Light	Heavy	Freight	Total	M/O	GEH
Melton Road	ATC_31	NB	319	26	8	353	332	7	0	339	0.96	0.76
Melton Road	ATC_31	SB	131	10	1	142	131	9	0	141	0.99	0.12
Calder Highway	derived	NB	*862*	*83*	*29*	*974*	1,163	182	107	1,452	1.49	13.71
Calder Highway	derived	SB	*502*	*27*	*21*	*551*	715	38	30	783	1.42	9.02
Ross Watt Road	ATC_18	NB	29	0	0	29	24	0	0	24	0.84	0.93
Ross Watt Road	ATC_18	SB	112	1	0	113	116	1	0	117	1.04	0.39
		NB	**348**	**26**	**8**	**382**	**356**	**7**	**0**	**363**	**0.95**	**0.98**
		SB	**243**	**10**	**2**	**255**	**248**	**10**	**0**	**258**	**1.01**	**0.17**
		Both	**590**	**37**	**10**	**637**	**604**	**17**	**0**	**621**	**0.97**	**0.64**
			319	26	8	353	332	7	0	339	0.96	0.76

Table 6-13 PM Modelled vs Observed Screenline 3

			PM Observed				PM Modelled					
Location	Site	DIR	Light	Heavy	Freight	Total	Light	Heavy	Freight	Total	M/O	GEH
BM-Gisborne Rd	ATC_09	EB	157	10	4	170	103	7	0	110	0.65	5.10
BM-Gisborne Rd	ATC_09	WB	198	7	4	209	152	8	0	160	0.76	3.62
Aitken Street	ATC_27	NB	445	43	4	492	463	11	0	475	0.97	0.78
Aitken Street	ATC_27	SB	494	26	4	525	435	3	0	438	0.83	3.99
Calder Highway	derived	NB	*976*	*94*	*31*	1,101	1,250	187	108	1,545	1.40	12.22
Calder Highway	derived	SB	*779*	*36*	*24*	839	877	40	31	947	1.13	3.60
Calder Highway	ATC_13	NB	475	40	3	518	266	9	0	275	0.53	12.19
Calder Highway	ATC_12	SB	268	10	0	278	170	0	0	171	0.61	7.18
		EB/NB	**1,077**	**92**	**10**	**1,180**	**832**	**28**	**0**	**860**	**0.73**	**10.02**
		WB/SB	**960**	**43**	**8**	**1,012**	**757**	**11**	**0**	**768**	**0.76**	**8.18**
		Both	**2,037**	**136**	**19**	**2,192**	**1,588**	**39**	**0**	**1,628**	**0.74**	**12.91**

Table 6-14 PM Modelled vs Observed Screenline 4

			PM Observed				PM Modelled					
Location	Site	DIR	Light	Heavy	Freight	Total	Light	Heavy	Freight	Total	M/O	GEH
Melton Road	ATC_31	NB	245	18	1	265	173	14	0	187	0.71	5.17
Melton Road	ATC_31	SB	155	13	5	172	238	32	0	270	1.57	6.62
Calder Freeway	ATC_32	NB	1,390	180	36	1,606	1,396	105	33	1,534	0.96	1.80
Calder Freeway	ATC_32	SB	975	81	29	1,085	953	34	24	1,011	0.93	2.31
		NB	**1,635**	**198**	**38**	**1,871**	182	13	0	195	182	13
		SB	**1,130**	**93**	**34**	**1,257**	175	1	1	177	175	1
		Both	**2,765**	**291**	**72**	**3,128**	1,533	197	108	1,838	1,533	197

Table 6-15 PM Modelled vs Observed Screenline 5

			PM Observed				PM Modelled					
Location	Site	DIR	Light	Heavy	Freight	Total	Light	Heavy	Freight	Total	M/O	GEH
Gisborne-Melton Road	ATC_14	NB	200	18	2	220	174	13	0	187	0.85	2.34
Gisborne-Melton Road	ATC_14	SB	143	12	4	159	170	1	0	171	1.08	0.94
Mt Gisborne Road	ATC_15	NB	53	2	0	56	35	4	0	40	0.71	2.31
Mt Gisborne Road	ATC_15	SB	40	3	1	44	36	1	0	37	0.85	1.02
Calder Freeway	ATC_30	NB	1,451	134	33	1,618	1,516	197	108	1,821	1.13	4.88
Calder Freeway	ATC_30	SB	1,047	46	24	1,117	1,047	40	31	1,118	1.00	0.01
		NB	**1,704**	**154**	**36**	**1,894**	**1,725**	**214**	**108**	**2,047**	**1.08**	**3.45**
		SB	**1,231**	**60**	**29**	**1,320**	**1,252**	**43**	**31**	**1,326**	**1.00**	**0.16**
		Both	**2,935**	**215**	**65**	**3,214**	**2,977**	**257**	**139**	**3,373**	**1.05**	**2.77**

Table 6-16 PM Modelled vs Observed Screenline 6

			AM Observed				AM Modelled					
Location	Site	DIR	Light	Heavy	Freight	Total	Light	Heavy	Freight	Total	M/O	GEH
Saunders Road	ATC_06	EB	171	5	1	177	133	7	1	142	0.80	2.81
Saunders Road	ATC_06	WB	108	23	4	135	143	9	0	152	1.13	1.44
Kilmore Road	ATC_07	EB	143	12	2	157	176	8	0	183	1.17	2.05
Kilmore Road	ATC_07	WB	118	3	0	120	72	4	0	77	0.64	4.39
Emmeline Drive	ATC_29	EB	63	8	1	73	64	0	0	64	0.88	1.09
Emmeline Drive	ATC_29	WB	41	6	0	47	180	0	0	180	3.82	12.49
		EB	**377**	**25**	**4**	**407**	**372**	**16**	**2**	**389**	**0.96**	**0.89**
		WB	**267**	**31**	**4**	**302**	**395**	**13**	**0**	**409**	**1.35**	**5.67**
		Both	**644**	**56**	**8**	**709**	**767**	**29**	**2**	**798**	**1.13**	**3.25**

6.8 PM Calibration – Corridors

The flows along the various Corridors are shown and compared to the observed. Note that the summary flows at the bottom of the table are the average flow along the corridor.

Table 6-17 Modelled vs Observed Corridor 1

Location	Site	DIR	Observed				Modelled				M/O	GEH
			Light	Heavy	Freight	Total	Light	Heavy	Freight	Total		
Calder Freeway	ATC_16	NB	1,071	82	42	1,195	1,169	188	107	1,464	1.22	7.36
Calder Freeway	ATC_16	SB	885	45	36	966	872	45	30	947	0.98	0.61
Calder Highway	Derived	NB	993	93	30	1,117	1,295	191	107	1,593	1.43	12.95
W of Station Road	derived	SB	821	53	30	903	1,047	45	30	1,123	1.24	6.89
Calder Highway - SB Off	ATC_02	EB	319	26	8	353	332	7	0	339	0.96	0.76
Calder Highway - NB On	ATC_04	WB	131	10	1	142	131	9	0	141	0.99	0.12
Calder Highway	derived	NB	862	83	29	974	1,163	182	107	1,452	1.49	13.71
@Station Road	derived	SB	502	27	21	551	715	38	30	783	1.42	9.02
Calder Highway - NB Off	ATC_05	WB	156	16	4	176	164	5	1	171	0.97	0.35
Calder Highway - SB On	ATC_03	EB	332	14	5	351	243	2	0	245	0.70	6.15
Calder Highway	derived	NB	1,019	99	32	1,150	1,328	187	108	1,624	1.41	12.72
@Kilmore Road	derived	SB	834	41	27	902	958	40	31	1,028	1.14	4.08
Calder Highway - NB On	ATC_11	NB	43	4	2	49	78	0	0	78	1.58	3.61
Calder Highway - SB Off	ATC_10	EB	55	5	3	63	81	0	0	82	1.30	2.24
Calder Highway	derived	NB	976	94	31	1,101	1,250	187	108	1,545	1.40	12.22
@Melbourne Road	derived	SB	779	36	24	839	877	40	31	947	1.13	3.60
Calder Highway - NB Off	ATC_13	NB	475	40	3	518	266	9	0	275	0.53	12.19
Calder Highway - SB On	ATC_12	SB	268	10	0	278	170	0	0	171	0.61	7.18
Calder Freeway	ATC_30	NB	1,451	134	33	1,618	1,516	197	108	1,821	1.13	4.88
Calder Freeway	ATC_30	SB	1,047	46	24	1,117	1,047	40	31	1,118	1.00	0.01
Calder Freeway	ATC_32	NB	1,390	180	36	1,606	1,533	197	108	1,838	1.14	5.61

Location	Site	DIR	Observed				Modelled				M/O	GEH
			Light	Heavy	Freight	Total	Light	Heavy	Freight	Total		
Calder Freeway	ATC_32	SB	975	81	29	1,085	1,007	40	30	1,077	0.99	0.25
		NB	**1,109**	**109**	**33**	**1,252**	**1,322**	**190**	**108**	**1,620**	**1.29**	**9.71**
		SB	**835**	**47**	**27**	**909**	**932**	**41**	**30**	**1,003**	**1.10**	**3.05**
		Both	**1,944**	**156**	**61**	**2,161**	**2,254**	**231**	**138**	**2,623**	**1.21**	**9.45**

Table 6-18 Modelled vs Observed Corridor 2

Location	Site	DIR	Observed				Modelled				M/O	GEH
			Light	Heavy	Freight	Total	Light	Heavy	Freight	Total		
Station Road	ATC_01	NB	281	26	3	309	443	3	0	446	1.44	7.04
Station Road	ATC_01	SB	292	15	0	307	423	1	0	424	1.38	6.09
Station Road	ATC_20	NB	522	20	4	547	598	7	1	606	1.11	2.46
Station Road	ATC_20	SB	546	19	4	569	540	2	0	543	0.95	1.11
Station Road	ATC_21	NB	789	23	8	820	706	10	0	716	0.87	3.77
Station Road	ATC_21	SB	683	56	11	750	678	6	0	684	0.91	2.47
Aitken Street	IC_2A_ARM3	NB	803	26	0	829	996	10	0	1,006	1.21	5.84
Aitken Street	IC_2A_ARM3	SB	706	18	0	724	739	6	0	744	1.03	0.75
Aitken Street	IC_2A_ARM1	NB	575	13	0	588	622	11	0	633	1.08	1.81
Aitken Street	IC_2A_ARM1	SB	525	9	0	534	512	5	0	516	0.97	0.76
Aitken Street	ATC_08	NB	536	37	3	575	622	11	0	633	1.10	2.34
Aitken Street	ATC_08	SB	475	32	4	511	512	5	0	516	1.01	0.24
Aitken Street	IC_3A_ARM3	NB	578	11	0	589	624	11	0	635	1.08	1.88
Aitken Street	IC_3A_ARM3	SB	541	9	0	550	507	5	0	512	0.93	1.66
Aitken Street	IC_3A_ARM1	NB	446	9	0	455	751	11	0	762	1.68	12.46
Aitken Street	IC_3A_ARM1	SB	496	7	0	503	435	1	0	437	0.87	3.05

Location	Site	DIR	Observed				Modelled				M/O	GEH
			Light	Heavy	Freight	Total	Light	Heavy	Freight	Total		
Aitken Street	ATC_26	NB	179	329	10	518	751	11	0	762	1.47	9.67
Aitken Street	ATC_26	SB	457	58	6	521	435	1	0	437	0.84	3.84
Aitken Street	IC_7A_ARM3	NB	441	8	0	449	751	11	0	762	1.70	12.73
Aitken Street	IC_7A_ARM3	SB	501	9	0	510	435	1	0	437	0.86	3.36
Aitken Street	IC_7A_ARM1	NB	461	8	0	469	726	11	0	737	1.57	10.90
Aitken Street	IC_7A_ARM1	SB	545	6	0	551	439	1	0	440	0.80	4.99
Aitken Street	ATC_27	NB	445	43	4	492	463	11	0	475	0.97	0.78
Aitken Street	ATC_27	SB	494	26	4	525	435	3	0	438	0.83	3.99
Aitken Street	IC_9_ARM3	NB	447	9	0	456	463	11	0	475	1.04	0.87
Aitken Street	IC_9_ARM3	SB	534	9	0	543	435	3	0	438	0.81	4.75
Aitken Street	IC_9_ARM1	NB	217	4	0	221	223	0	0	223	1.01	0.13
Aitken Street	IC_9_ARM1	SB	320	3	0	323	193	1	0	193	0.60	8.09
Melton Road	IC_9_ARM4	EB	246	5	0	251	296	11	0	308	1.23	3.39
Melton Road	IC_9_ARM4	WB	230	6	0	236	298	3	0	301	1.27	3.94
		NB	**464**	**38**	**2**	**505**	**602**	**9**	**0**	**612**	**1.21**	**4.54**
		SB	**490**	**19**	**2**	**510**	**468**	**3**	**0**	**471**	**0.92**	**1.80**
		Both	**954**	**57**	**4**	**1,015**	**1,070**	**12**	**0**	**1,083**	**1.07**	**2.08**

Table 6-19 Modelled vs Observed Corridor 3

Location	Site	DIR	Observed				Modelled				M/O	GEH
			Light	Heavy	Freight	Total	Light	Heavy	Freight	Total		
Hamilton Street	IC_6_ARM2	EB	59	0	0	59	12	0	0	12	0.21	7.81
Hamilton Street	IC_6_ARM2	WB	68	0	0	68	8	0	0	9	0.13	9.62
Hamilton Street	ATC_24	EB	85	7	1	92	127	0	0	127	1.38	3.35
Hamilton Street	ATC_24	WB	115	8	1	124	107	0	0	107	0.86	1.59
Hamilton Street	ATC_34	EB	239	6	0	246	233	0	0	234	0.95	0.77
Hamilton Street	ATC_34	WB	193	6	0	199	323	2	0	325	1.64	7.81
Hamilton Street	IC_5_ARM4	EB	353	5	0	358	339	0	0	339	0.95	1.02
Hamilton Street	IC_5_ARM4	WB	351	8	0	359	486	2	0	489	1.36	6.30
Hamilton Street	IC_5_ARM2	EB	533	6	0	539	504	0	0	504	0.94	1.53
Hamilton Street	IC_5_In	WB	498	7	0	505	504	4	0	508	1.01	0.13
Hamilton Street	ATC_35	EB	480	25	6	510	504	0	0	504	0.99	0.28
Hamilton Street	ATC_35	WB	479	37	8	524	504	4	0	508	0.97	0.73
Hamilton Street	IC_3A_ARM4	EB	517	6	0	523	404	0	0	404	0.77	5.53
Hamilton Street	IC_3A_ARM4	WB	500	7	0	507	504	4	0	508	1.00	0.04
Hamilton Street	IC_3A_ARM2	EB	495	5	0	500	651	9	0	660	1.32	6.64
Hamilton Street	IC_3A_ARM2	WB	460	7	0	467	553	9	0	562	1.20	4.19
Melbourne Road	ATC_25	EB	507	23	1	530	517	8	0	526	0.99	0.19
Melbourne Road	ATC_25	WB	544	34	3	580	359	10	0	368	0.63	9.75
		EB	**363**	**9**	**1**	**373**	**366**	**2**	**0**	**368**	0.99	**0.27**
		WB	**356**	**13**	**1**	**370**	**372**	**4**	**0**	**376**	1.01	**0.28**
		Both	**719**	**22**	**2**	**743**	**737**	**6**	**0**	**744**	1.00	**0.01**

Table 6-20 Modelled vs Observed Corridor 4

Location	Site	DIR	Observed				Modelled				M/O	GEH
			Light	Heavy	Freight	Total	Light	Heavy	Freight	Total		
Robertson Street	IC_6_ARM3	NB	114	8	0	122	91	7	0	98	0.80	2.34
Robertson Street	IC_6_ARM3	SB	122	6	0	128	143	8	0	151	1.18	1.96
Robertson Street	ATC_23	EB	156	12	5	173	91	7	0	98	0.56	6.49
Robertson Street	ATC_23	WB	194	23	8	225	146	8	0	154	0.68	5.16
Robertson Street	IC_4_ARM4	EB	388	16	0	404	438	7	0	445	1.10	1.97
Robertson Street	IC_4_ARM4	WB	311	9	0	320	418	9	0	427	1.33	5.54
Robertson Street	IC_4_ARM2	EB	563	17	0	580	600	7	0	606	1.05	1.08
Robertson Street	IC_4_ARM2	WB	452	12	0	464	521	9	0	530	1.14	2.95
Robertson Street	IC_2B_ARM4	EB	607	17	0	624	600	7	0	606	0.97	0.71
Robertson Street	IC_2B_ARM4	WB	582	12	0	594	521	9	0	530	0.89	2.71
Robertson Street	IC_2B_ARM2	EB	565	15	0	580	637	7	0	644	1.11	2.58
Robertson Street	IC_2B_ARM2	WB	518	11	0	529	489	9	0	499	0.94	1.34
Robertson Street	IC_2A_ARM4	EB	565	15	0	580	637	7	0	644	1.11	2.58
Robertson Street	IC_2A_ARM4	WB	518	11	0	529	489	9	0	499	0.94	1.34
			423	**14**	**1**	**438**	**442**	**7**	**0**	**449**	**1.03**	**0.52**
			385	**12**	**1**	**398**	**390**	**9**	**0**	**398**	**1.00**	**0.00**
			808	**26**	**2**	**836**	**831**	**16**	**0**	**847**	**1.01**	**0.38**

7 Development of Future Year Base Network

7.1 Do Nothing (No Development)

The Future year Base Case ("Do Nothing") case consists of the 2018 Calibrated Base Year Network with background traffic growth only.

7.2 Do Minimum (Base)

The Do Minimum Base Case scenario consists of the "Do Nothing" scenario with the background traffic growth plus that resulting from the Structure Plan development

7.3 Reference Case

The Reference Case consist of the "Do Minimum (Base)" case with additional network improvements recommended in the Draft Structure Plan (Sep 2019). These are:

- Station Road Duplication between Saunders Road and the Calder Freeway;
- Intersection Upgrades along Station Road (Saunders Road, Ferrier Rd, Robertson Road);
- General improvements along Kilmore Road, including upgrading of the links to have slightly higher capacities;
- Upgrade to road networks where residential growth is likely (Willowbank Road, Cherry Lane, Ferrier Road);

These are described in additional detail below.

There are concerns that the Reference case network improvements, especially the duplication of Station Road, could irrevocably alter the character of Gisborne, converting the central corridor of the town into a high-capacity throughput rather than a rural main street.

The bypass options were tested in two separate phases, both with and without the reference case network change, however it was felt that the most likely outcomes would be that the reference network upgrade would be implemented first, and that that any major schemes should be considered in terms of the marginal benefits over the Reference case.

7.3.1 Intersections Upgrades

The Draft Structure Plan makes recommendation for several intersection upgrades:

> *"Critical intersection upgrades along Station Road (Saunders Rd, Ferrier Rd, Robertson Rd), including consideration of safe places for pedestrians to cross."*

However, the Gisborne model does not explicitly model signalised junctions or pedestrian crossings, and so it was not possible to include these upgrades into the model.

7.3.2 Station Road Duplication – Saunders Road to Freeway Intersection

The Station Road Duplication form the Calder Freeway to the Intersection with Saunders road was confirmed. The remainder of the Station Road Duplication remains unconfirmed and was rolled into the Station Road Duplication Scheme to be tested separately.

7.3.3 Kilmore Road Improvements

Minor improvements were made to Kilmore Road along the overpass with the Calder Freeway and to the section from The Boulevard to Melbourne Road.

7.3.4 Robertson Road

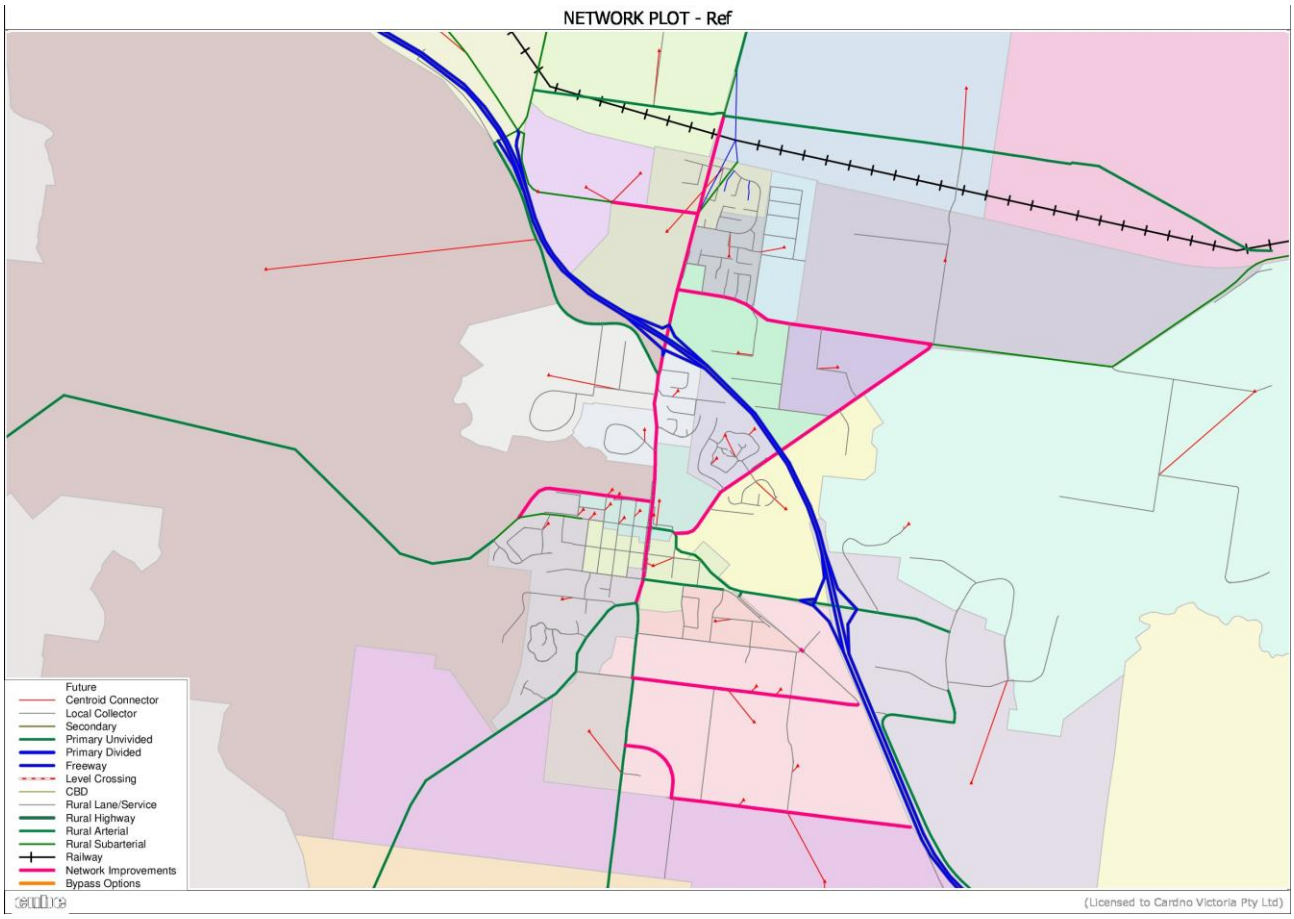
Minor improvements to Robertson road were made to emphasise its function as a distributor and effectively bypass Hamilton Street for trips from Bacchus Marsh going north to the Calder Freeway. These include speed limit increases and changes to link type and capacity from the intersection with Hamilton Road to Aitken Street.

7.3.5 Residential Network upgrades

Various Road Improvements to link capacity were made to WillowBank Road and Brookings Road as there were new residential development there. As with the other improvements, changes in link type from Local Road to Sub-Arterial yielded additional capacity, and would practically be a result of improved lane markings, removal of side-friction, minor junction improvements, etc.

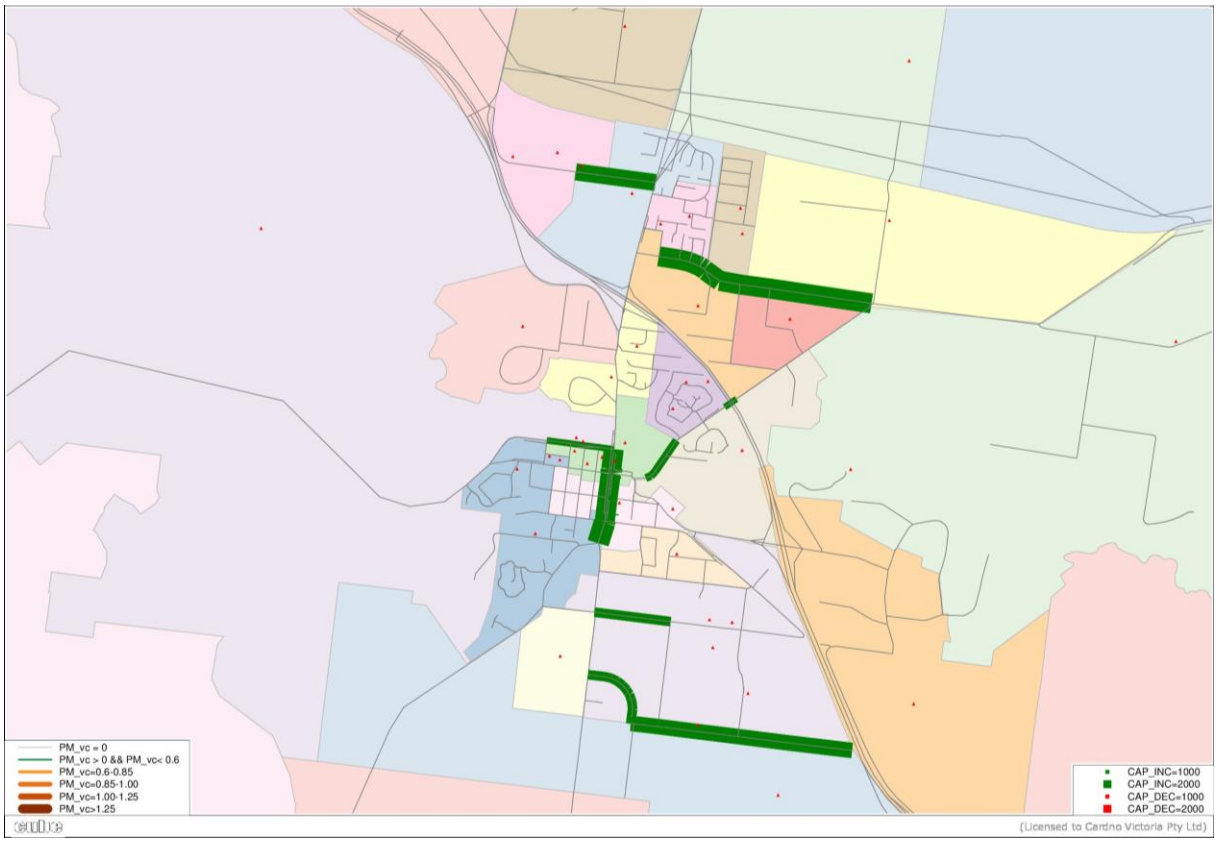
The locations of the combined improvement are shown in **Figure 7-1**.

Figure 7-1 Reference Scenario Network Changes



The capacity increases caused the reference changes are shown in **Figure 7-2**.

Figure 7-2 Reference Scenario Capacity Changes Compared to Do Nothing Network



7.4 Station Road Duplication

Station Road forms the essential core of the transportation network through Gisborne, and, where space permitted, it was upgraded to two lanes per direction starting from the initial forecast year of 2031. There was no available corridor space in New Gisborne between the Saunders Road intersection and the rail crossing.

Analysis of the 2031 and 2046 Base Cases showed high V/C ratios at many points along Station Road, and at these places, the road was widened where possible. In many locations, there is insufficient room to significantly widen the road, but it would be possible to upgrade the road from the current local road link class to undivided sub-arterial. This would be minor upgrade but would increase the capacity of the links by a few hundred PCU per hour per lane. In practical terms, this would be accomplished by removing side friction, clearer road markings, junction improvements, etc.

As noted in the Reference case above, part of the Station Road Duplication has been confirmed and is included in the base network from 2031 onwards. This section is from the intersection with Saunders Road to the Calder Freeway Roundabout.

7.5 Western Link Road (WLR)

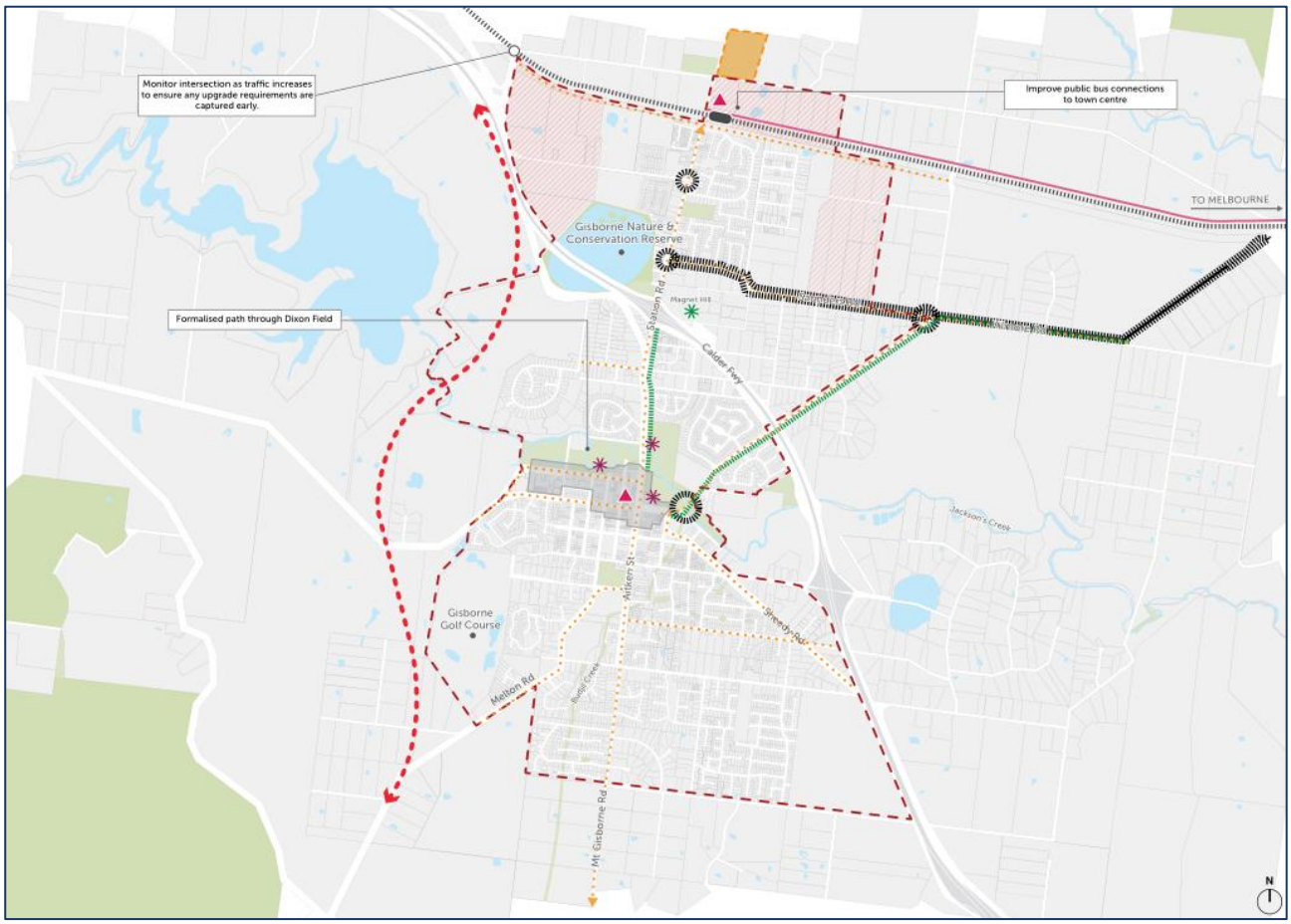
The proposed Western Link Road (WLR) is shown in **Figure 7-3**. This road links the Calder Freeway to Bacchus Marsh Road and then on to Merton Road to the south west of Gisborne. The WLR was coded as a “Divided Arterial” link-class (capacity of 1300 pcu/hr/lane) and assumed to have a posted speed of 80 km/h.

At the northern end, the details of the interconnection with the Calder Freeway are not specified and it has been assumed that:

- Southbound trips using the Calder Freeway, Macedon-Woodend road or Mount Macedon Road will be able to use the Bypass;
- Northbound trips about be able to proceed north on to the freeway or exit and use Mount Macedon Road, as well as Macedon-Woodend Road.

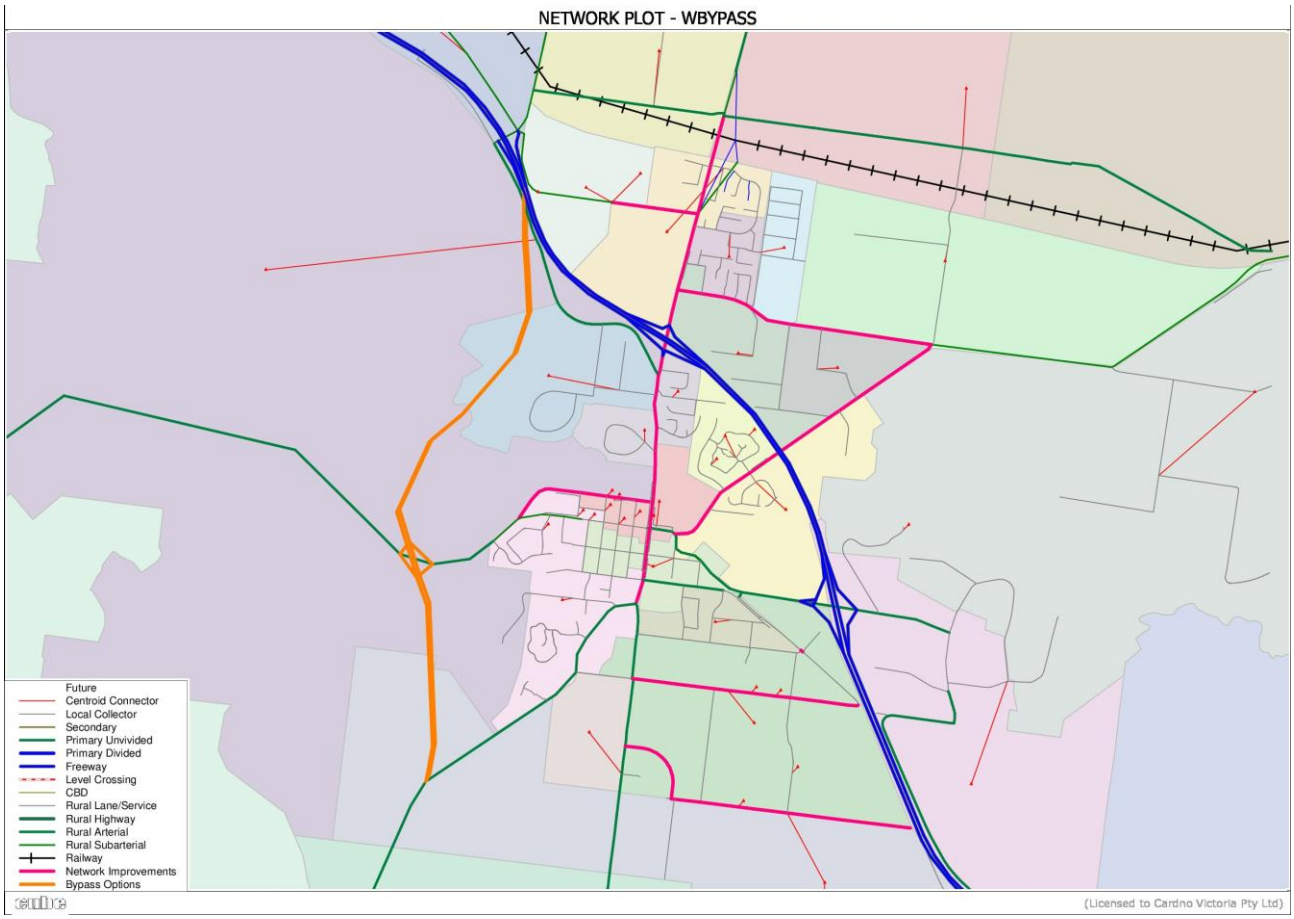
The impact on Ross-Watt Road is unclear, and it has been assumed that the WLR will pass over it and not connect with it.

Figure 7-3 Western Bypass Proposals



The network coding for this is shown in **Figure 7-4**. The WLR has been assumed to be of a “Divided Arterial” standard (nominal capacity of 1,300 PCU/hr/lane), with a single lane in each direction and a posted speed limit of 80km/h.

Figure 7-4 Western Link Road Network Coding



7.6 Eastern Link Road (ELR)

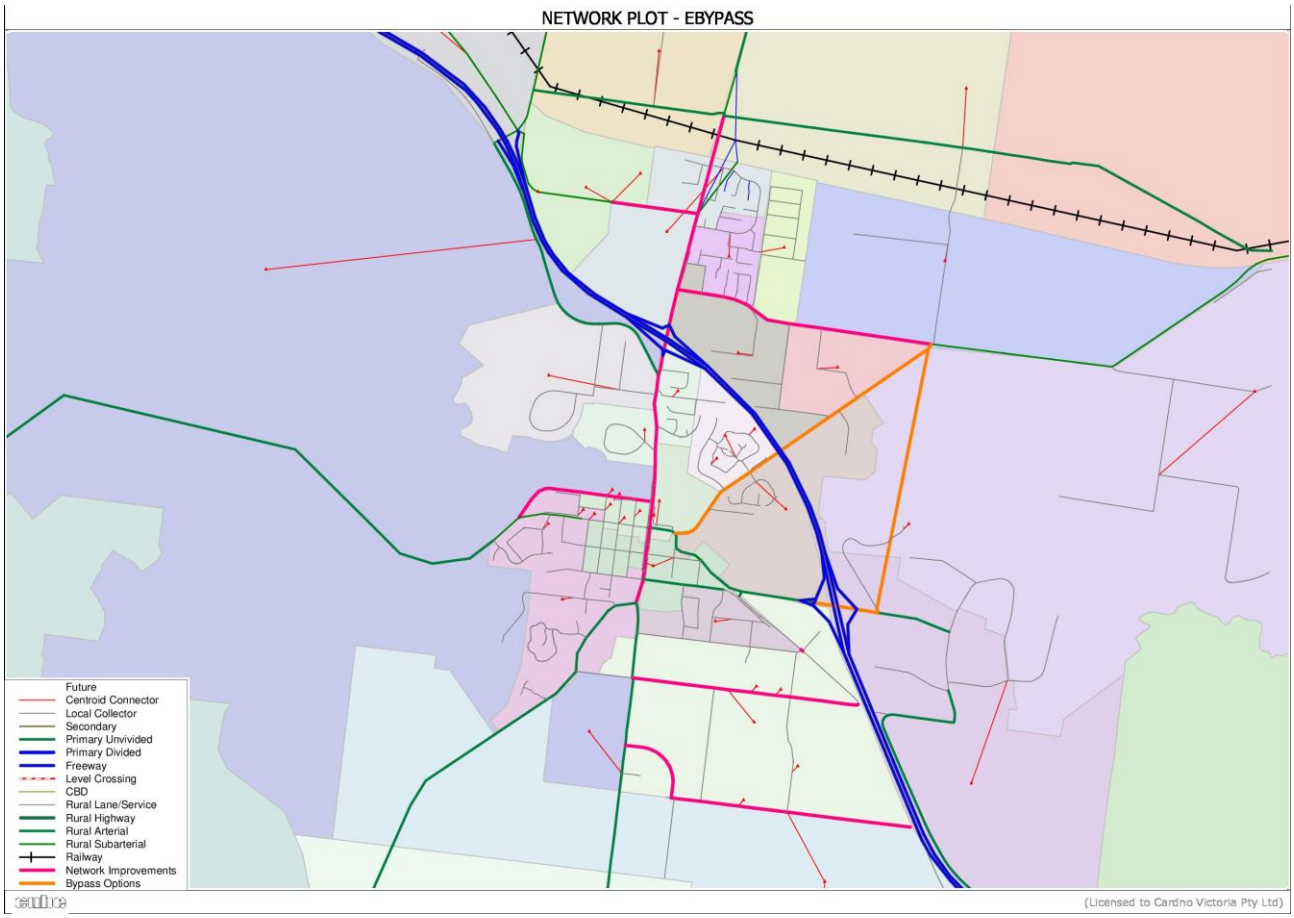
The Eastern Link Road (ELR) option offers direct access from Kilmore Road and Saunders Road to the Calder Freeway. This option requires building a new road on the existing track known as Govan Road from the intersection of Kilmore Road and Saunders Road to the intersection of Emmeline Drive and Calder Freeway. It has also been assumed that these intersections would be improved

This modelling option also includes improving Kilmore Road between Saunders Road and Melbourne Road by widening where feasible and removing side-friction where widening was not feasible. In practical modelling terms, the free flow speed was increased and the link class was upgraded to have a slightly higher capacity.

The upgrading of Kilmore road offers an alternative high capacity route from New Gisborne in the north to the southern part of Gisborne and to the Gisborne-Bacchus Marsh road.

The ELR has been assumed to be of a “Divided Arterial” standard (nominal capacity of 1,300 PCU/hr/lane), with a single lane in each direction and a posted speed limit of 80km/h. The network coding of the ELR is shown in **Figure 7-5**.

Figure 7-5 Eastern Link Road Network Changes



8 Development of Future Year Matrices

There were three primary sources of growth available for the model:

- There is overall VITM growth, taking the state-wide demographic trends into account;
- The Gisborne Futures Structure Plan and Urban Design Framework (UDF) specified the growth in certain specific areas; and
- Gisborne Business Park has been assumed in the future year scenarios.

8.1 VITM Land Use Assumptions

Analysis of the household data in VITM was undertaken for the entire VITM extents, as well as for the Gisborne sub-area, for each of the future scenario years. This analysis is summarised in **Table 8-1**, along with the Compound Annual Growth Rates (CAGR) and the average AM and PM peak hour trip rates.

Table 8-1 VITM and Sub-Area Household Assumptions

Item	2016	2021	2031	2041	2046	2050	2051
ALL VITM Households	2,327,312	2,608,842	3,081,502	3,578,336	3,833,320	4,039,497	4,092,751
Subarea VITM Households	46,651	53,555	68,912	87,527	96,392	103,299	105,102
ALL VITM H/H CAGR	-	2.3%	1.7%	1.5%	1.4%	1.3%	1.3%
Subarea VITM H/H CAGR	-	2.8%	2.6%	2.4%	1.9%	1.7%	1.7%
AM Subarea Vehicles	49,662	-	68,588	-	88,531	-	-
PM Subarea Vehicles	58,514	-	81,520	-	105,844	-	-
AM Subarea Trip Rate per H/H	1.06	-	1.00	-	0.92	-	-
PM Subarea Trip Rate per H/H	1.25	-	1.18	-	1.10	-	-

8.2 Gisborne Masterplan Growth Areas

The development yields (in terms of additional households) in the study area are defined for the short-to-medium term (nominally assumed to occur between 2021 to 2036) and the medium-to-long term (nominally assumed to occur between 2036 to 2050). The land use assumptions for the 2031 and 2046 model scenarios have therefore been based on linear interpolated based on these yields. These development assumptions are summarised in **Table 8-2** and have been based on the "*Gisborne Masterplan Growth Areas.pdf*" (no date or version provided).

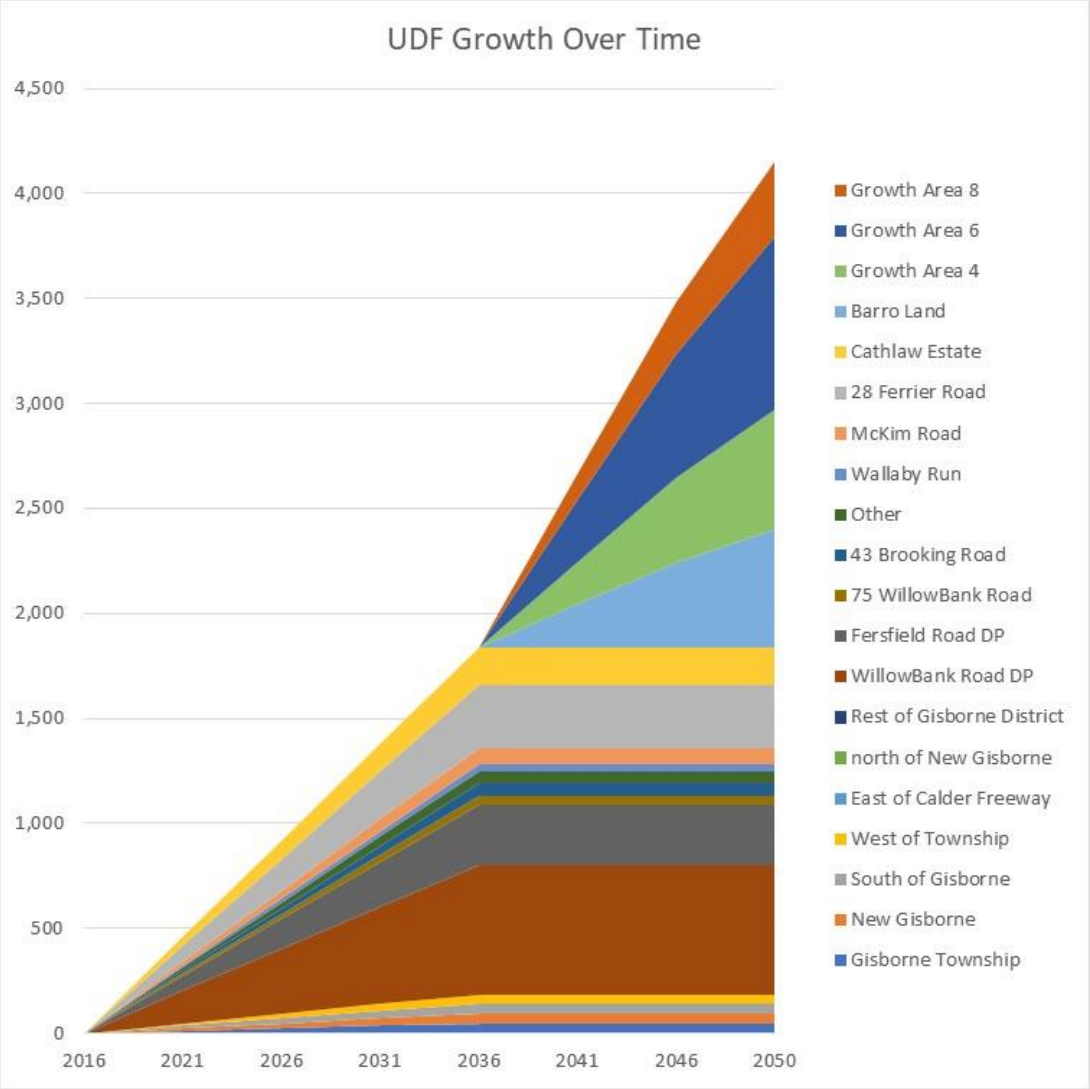
Table 8-2 Household Development Assumptions

Location	2016	2021	2031	2036	2041	2046	2050	2051
Gisborne Township	0	12	**35**	46	46	**46**	46	46
New Gisborne	0	12	**35**	46	46	**46**	46	46
South of Gisborne	0	12	**35**	46	46	**46**	46	46
West of Township	0	12	**35**	46	46	**46**	46	46
East of Calder Freeway	0	0	**0**	0	0	**0**	0	0
North of New Gisborne	0	0	**0**	0	0	**0**	0	0
Rest of Gisborne District	0	0	**0**	0	0	**0**	0	0
Willow Bank Road DP	0	154	**461**	615	615	**615**	615	615
Fersfield Road DP	0	72	**216**	288	288	**288**	288	288
75 Willow Bank Road	0	10	**30**	40	40	**40**	40	40
43 Brooking Road	0	15	**45**	60	60	**60**	60	60
Other	0	15	**44**	58	58	**58**	58	58
Wallaby Run	0	9	**26**	34	34	**34**	34	34

Location	2016	2021	2031	2036	2041	2046	2050	2051
McKim Road	0	20	59	78	78	78	78	78
28 Ferrier Road	0	75	226	301	301	301	301	301
Cathlaw Estate	0	45	136	181	181	181	181	181
Barro Land	0	0	0	0	200	399	559	559
Growth Area 4	0	0	0	0	203	406	568	568
Growth Area 6	0	0	0	0	295	590	826	826
Growth Area 8	0	0	0	0	126	253	354	354
Total	0	460	1,380	1,840	2,664	3,488	4,147	4,147
CAGR	-	-	8%	6%	8%	6%	4%	0%

For reference, the model assumes a population of approximately 14,000 for 2036 for the Gisborne townships (including New Gisborne and the areas to the west of the Calder Freeway). The masterplan increases the total population to around 22,000, including the additional growth areas north of the Calder Freeway.

Figure 8-1 Development Yield Staging Assumptions



8.2.2 Method of application

As the masterplan provides households and not vehicle trips, the assumption was made that the additional masterplan households in each zone would match the trip making characteristics of the existing zone. For example, if an existing zone generates 1.5 trips per household from VITM, and additional masterplan households are added to that zone, the additional trips will be generated pro-rata with the VITM rate.

8.3 Gisborne Business Park

The major industrial/commercial development in the study area was assessed separately, with the traffic generation assumptions for this area sourced from the Gisborne Business Park Technical Report 1 Addendum Traffic & Transport (Cardno 13/08/2019) as summarised in **Table 8-3**.

For the purpose of this assessment, it was assumed that the site would be 40% developed by 2031 and 100% developed by 2046. The new trips were loaded onto Saunders Road between Barry Street and Monaghan Road.

Table 8-3 Gisborne Business Park Masterplan Traffic Generation (Source: Gisborne Business Park Technical Report 1 Addendum Traffic & Transport (Cardno 13/08/2019))

Land Use	Daily Trips per 100m^2	Land Use %	G.F.A (m^2)	Trips	AM/PM Trips per 100m^2	Trips	2031 (40%)	2046 (100%)
Industry	5.00	49.99%	43,311	2,166	1.00	433	433	433
Warehouse	4.00	50.01%	43,329	1,733	0.50	217	217	217
Existing Site Total	**-**	**-**	**86,640**	**3,899**	**-**	**650**	**650**	**650**
Proposed Site	-	-	-	-	-	-	-	-
Industry	5.00	41.88%	41,252	2,063	1.00	413	165	413
Warehouse	4.00	41.87%	41,242	1,650	0.50	206	82	206
Bulky Goods	12.50	8.12%	7,998	1,000	2.50	200	80	200
Hardware Retail	18.00	8.12%	7,998	1,440	3.60	288	115	288
Proposed Site Total	**-**	**-**	**98,500**	**6,153**	**-**	**1,107**	**443**	**1,107**
Business Park Total	**-**	**-**	**185,140**	**10,052**	**-**	**1,757**	**1,093**	**1,757**

9 Forecast Results

The worst case for the future scenario is where the natural growth has occurred and the developments have occurred, but no improvements to the transport network have been made.

The second worst case has the no network improvements, but the developments have not occurred. A key test in transport modelling is to observed changes in the most incremental way possible

To that end, it is instructive to review the possible forecast cases starting with the worst outcomes. All diagrams show in in this section are from the 2046 as it shows the worst possible outcomes of no development. However, the model has also been run for 2031, and those results will be available in the appendices.

A summary of the scenarios evaluated is provided in Table 9-1.

Table 9-1 Summary of Land Use and Network Schemes Evaluated

Scenario	Schemes	Development	2018	2031	2046
Do Nothing	None	VITM Only	Yes	Yes	Yes
Do Min (Base)	None	VITM + GSP/GBP	No	Yes	Yes
Ref	Reference	VITM + GSP/GBP	No	Yes	Yes
Ref\SRDUP	Reference + Station Road Duplication	VITM + GSP/GBP	No	Yes	Yes
Ref\WBYPASS	Reference + Western Link Road	VITM + GSP/GBP	No	Yes	Yes
Ref\EBYPASS	Reference + Eastern Link Road	VITM + GSP/GBP	No	Yes	Yes

Each section will also present a table containing the two-way daily flows on significant links and the relevant marginal impacts of those changes. The impact of the scheme was considered as follows:

- Impact of Development Trips on the Do Minimum case with No Development;
- Impact of Reference Case on Base Case;
- Impact of Station Road Duplication on Reference Case;
- Impact of Western Link Road on Reference Case; and
- Impact of Eastern Link Road on Reference Case.

Daily Link Volumes plots for the 2031 and 2046 scenarios are included in Appendices A and B respectively.

9.1 2046 – Do Nothing

In this scenario, the Structure Plan developments have not occurred, while the natural growth from the VITM has taken place. No network changes have occurred. The Worst V/C ratios – defined as the worst V/C ratio in either the AM or PM scenario - at key links where the V/C ratio is higher than 0.5 is shown in **Figure 9-1**. The model plot shows that there is significant congestion on the both the Calder Freeway and on the Station road/Aitken Road corridor.

Comparisons of the daily traffic volumes between the 2018 and 2031 and 2046 Do Nothing scenarios are included in **Table 9-2**.

Figure 9-1 2046 Base Network, No Development, Worst V/C Ratio

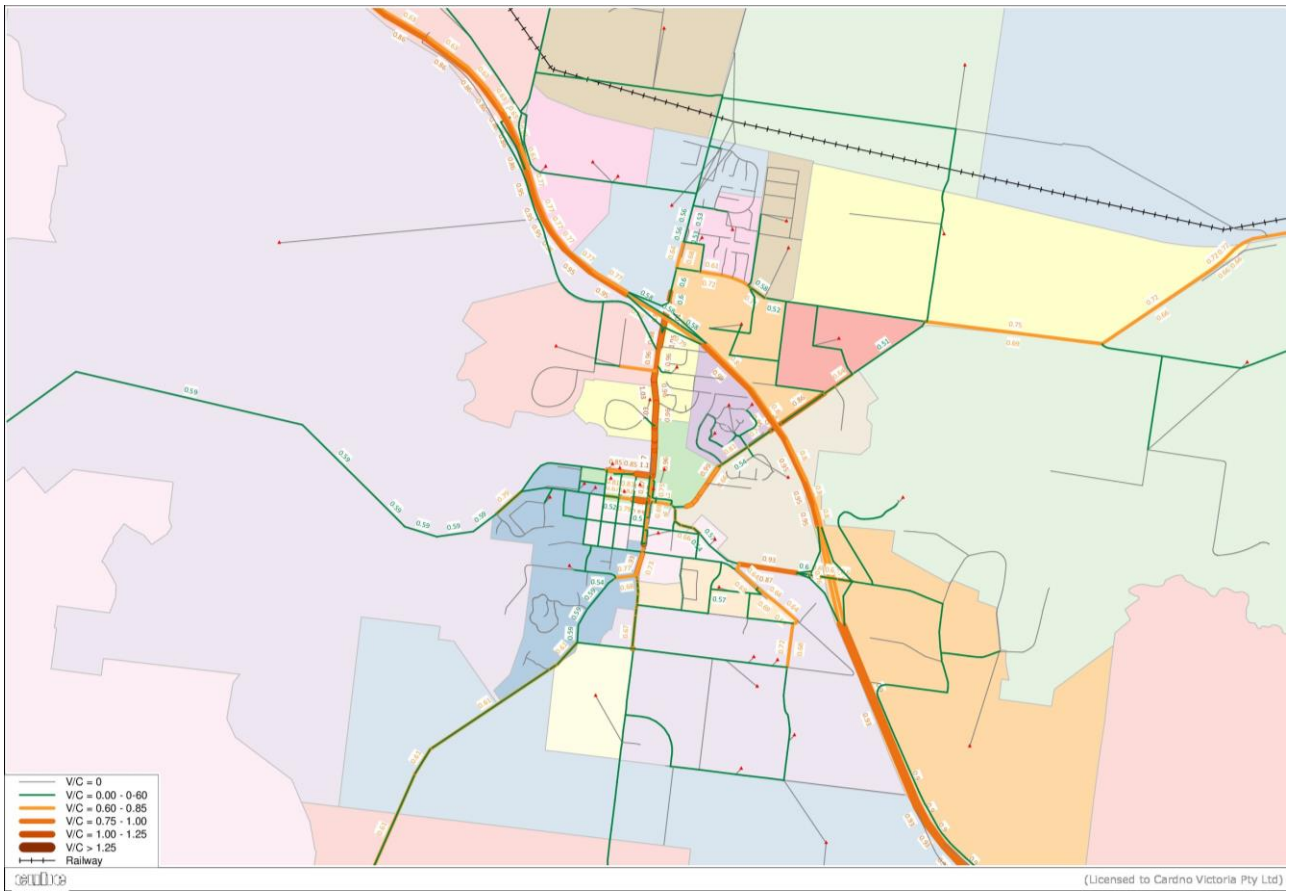


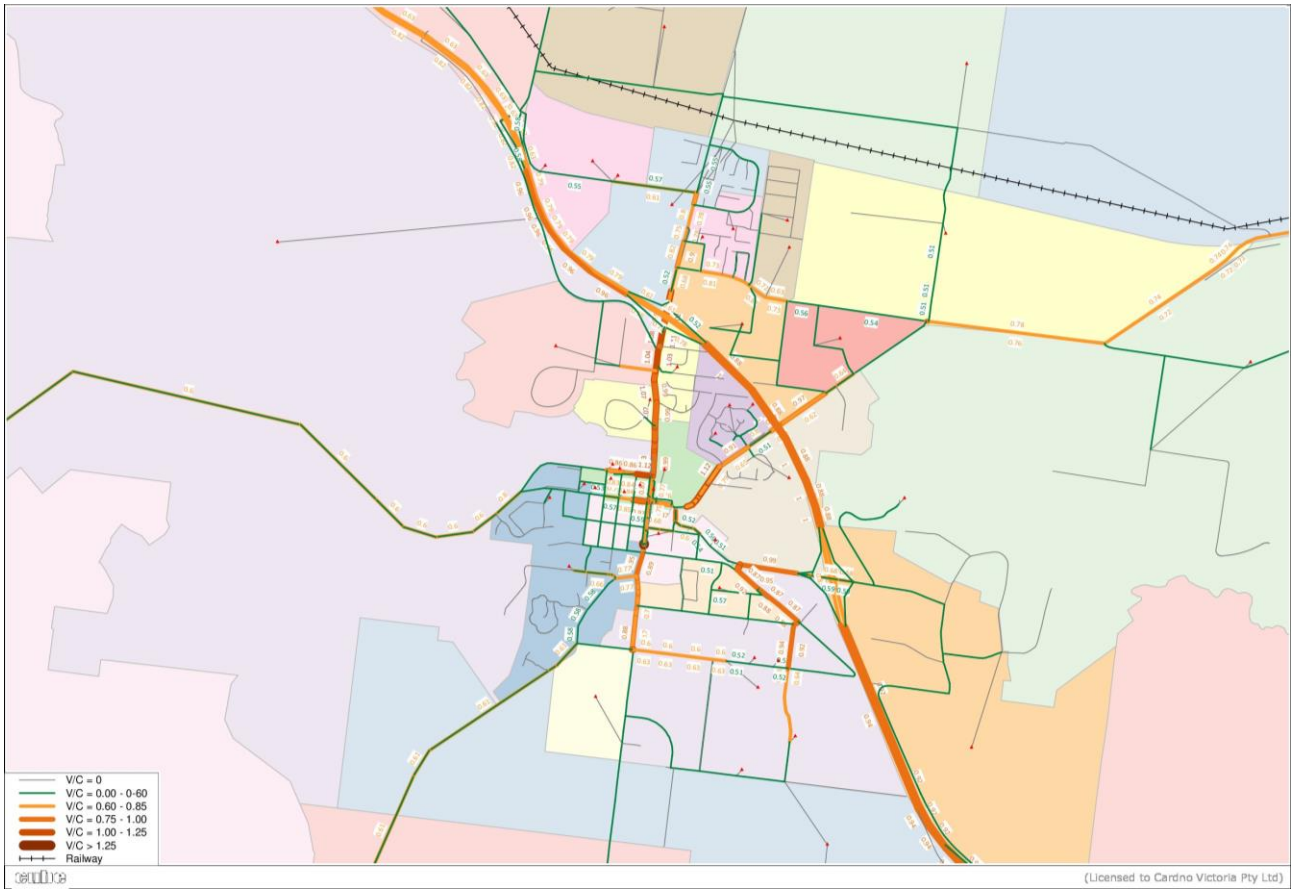
Table 9-2 Comparison of Daily Volumes for 2018 (Base) and 2031 and 2046 Do-Nothing Scenarios

Site	Location	Between	2031	2031	2046	2031	2046	2031	2046	2031	2046
1	Calder Freeway	West of Mount Macedon Road	24,720	33,320	39,560	+8,600	+14,840	+135%	+160%	+2.3%	+1.7%
2	MacedonWoodend Road	East of Calder Freeway	3,840	4,440	5,290	+600	+1,450	+116%	+138%	+1.1%	+1.2%
3	Station Road	Saunders Road & Farrell St	10,870	12,680	14,760	+1,810	+3,890	+117%	+136%	+1.2%	+1.1%
4	Calder Fwy	Mount Macedon Rd & Station Rd	28,880	39,330	47,540	+10,450	+18,660	+136%	+165%	+2.4%	+1.8%
5	Station Rd	Webb Cres & Lonhro Ct	13,740	19,290	23,300	+5,550	+9,560	+140%	+170%	+2.6%	+1.9%
6	Calder Fwy Off-ramp EB	Station Road I/C	4,010	6,770	7,680	+2,760	+3,670	+169%	+192%	+4.1%	+2.3%
7	Calder Fwy On-ramp EB	Station Road I/C	2,970	4,880	6,990	+1,910	+4,020	+164%	+235%	+3.9%	+3.1%
8	Calder Fwy On-ramp WB	Station Road I/C	1,990	4,970	5,410	+2,980	+3,420	+250%	+272%	+7.3%	+3.6%
9	Calder Fwy Off-ramp WB	Station Road I/C	1,680	2,930	4,510	+1,250	+2,830	+174%	+268%	+4.4%	+3.6%
10	Station Rd	Ross Watt Rd & Calder Fwy	15,600	22,780	24,140	+7,180	+8,540	+146%	+155%	+3.0%	+1.6%
11	Western Link Road	Calder Fwy & Bacchus Marsh Rd	-	-	-	+0	+0	-	-	-	-
12	Calder Fwy	Station Rd & Melbourne Rd	27,530	35,390	45,960	+7,860	+18,430	+129%	+167%	+2.0%	+1.8%
13	Kilmore Rd	Joseph Ave & Govan Rd	2,690	4,340	7,050	+1,650	+4,360	+161%	+262%	+3.7%	+3.5%
14	Eastern Link Road	Kilmore Rd & Emmeline Dr	-	-	-	+0	+0	-	-	-	-
15	Bacchus Marsh Rd	West of Western Link Road	3,400	4,000	7,780	+600	+4,380	+118%	+229%	+1.3%	+3.0%
16	Bacchus Marsh Rd	West of Hamilton St	3,400	4,000	7,780	+600	+4,380	+118%	+229%	+1.3%	+3.0%
17	Aitken St	North of Robertson St	18,710	24,790	25,710	+6,080	+7,000	+132%	+137%	+2.2%	+1.1%
18	Aitken St	Robertson St & Hamilton St	13,210	18,350	18,610	+5,140	+5,400	+139%	+141%	+2.6%	+1.2%
19	Kilmore Rd	Melbourne Rd & Mill Rd	5,600	7,710	12,210	+2,110	+6,610	+138%	+218%	+2.5%	+2.8%
20	Aitken St	Hamilton Rd & Fisher St	13,220	16,670	16,820	+3,450	+3,600	+126%	+127%	+1.8%	+0.9%
21	Aitken St	Fisher St & Howey St	11,270	15,590	18,160	+4,320	+6,890	+138%	+161%	+2.5%	+1.7%
22	Aitken St	Melton Rd & Fersfield Rd	5,000	7,840	9,000	+2,840	+4,000	+157%	+180%	+3.5%	+2.1%
23	Aitken St	Fersfield Rd & Willowbank Rd	5,280	8,110	9,290	+2,830	+4,010	+154%	+176%	+3.4%	+2.0%
24	Western Link Road	Bacchus Marsh Rd & Melton Rd	-	-	-	+0	+0	-	-	-	-
25	Melton Rd	Willowbank Road & The Willows	3,730	8,350	10,430	+4,620	+6,700	+224%	+280%	+6.4%	+3.7%
26	Melbourne Rd	Howey St & Calder Fwy	9,160	14,610	21,290	+5,450	+12,130	+159%	+232%	+3.7%	+3.1%
27	Calder Fwy Off-ramp NB	Melbourne Rd I/C	2,530	4,170	5,340	+1,640	+2,810	+165%	+211%	+3.9%	+2.7%
28	Calder Fwy On-ramp NB	Melbourne Rd I/C	1,090	2,260	5,020	+1,170	+3,930	+207%	+461%	+5.8%	+5.6%
29	Calder Fwy Off-ramp SB	Melbourne Rd I/C	750	2,000	3,030	+1,250	+2,280	+267%	+404%	+7.8%	+5.1%
30	Calder Fwy On-ramp SB	Melbourne Rd I/C	3,480	4,900	6,480	+1,420	+3,000	+141%	+186%	+2.7%	+2.2%
31	Calder Fwy	South of Melbourne Rd	31,680	40,190	49,730	+8,510	+18,050	+127%	+157%	+1.8%	+1.6%
32	Melbourne Road	South of Kilmore	7,870	11,900	14,890	+4,030	+7,020	+138%	+218%	+2.5%	+2.8%
33	Melton Road	South of Western Link Rd	3,730	8,350	10,430	+4,620	+6,700	+224%	+280%	+6.4%	+3.7%
34	Mt Gisborne Rd	Willowbank Rd & Jonathan Rd	4,270	5,240	6,020	+970	+1,750	+123%	+141%	+1.6%	+1.2%
35	Saunders Road	Near 144 Saunders Road	3,180	5,350	8,030	+2,170	+4,850	+168%	+253%	+4.1%	+3.4%
36	Robertson Road	Near Police Station	3,370	3,420	4,710	+50	+1,340	+101%	+140%	+0.1%	+1.2%
37	Saunders Road	Station Rd and Farrell St	4,440	10,160	14,590	+5,720	+10,150	+229%	+329%	+6.6%	+4.3%
38	Kilmore Rd	East of Saunders Rd	4,640	8,130	13,690	+3,490	+9,050	+175%	+295%	+4.4%	+3.9%
39	Robertson Road	Brantome St and Aitken St	11,450	12,510	13,530	+1,060	+2,080	+109%	+118%	+0.7%	+0.6%
40	Hamilton St	Aitken St and Kilmore Rd	9,490	14,400	16,780	+4,910	+7,290	+152%	+177%	+3.3%	+2.1%

9.2 2046 – Base

This scenario assumes natural household growth (VITM growth) and that the Gisborne Structure Plan developments have been fully developed, but no changes to the road network have occurred. The Worst V/C Ratios (defined as the highest V/C ratio during either the AM or PM peak hours) for key links where the V/C ratio is higher than 0.5 are shown in **Figure 9-2** and shows that Station Road and Kilmore Road are notably congested, constraining access to the town centre from the North and the East. Robertson Street and Hamilton road are also observed to be congested.

Figure 9-2 2046 Base network with UDF development, Worst V/C ratios



The two-way daily flows are shown in **Table 9-3**.

As expected, the impact of the development leads to an across the board increase with some minor decreases, most likely associated with congestion-based routing changes.

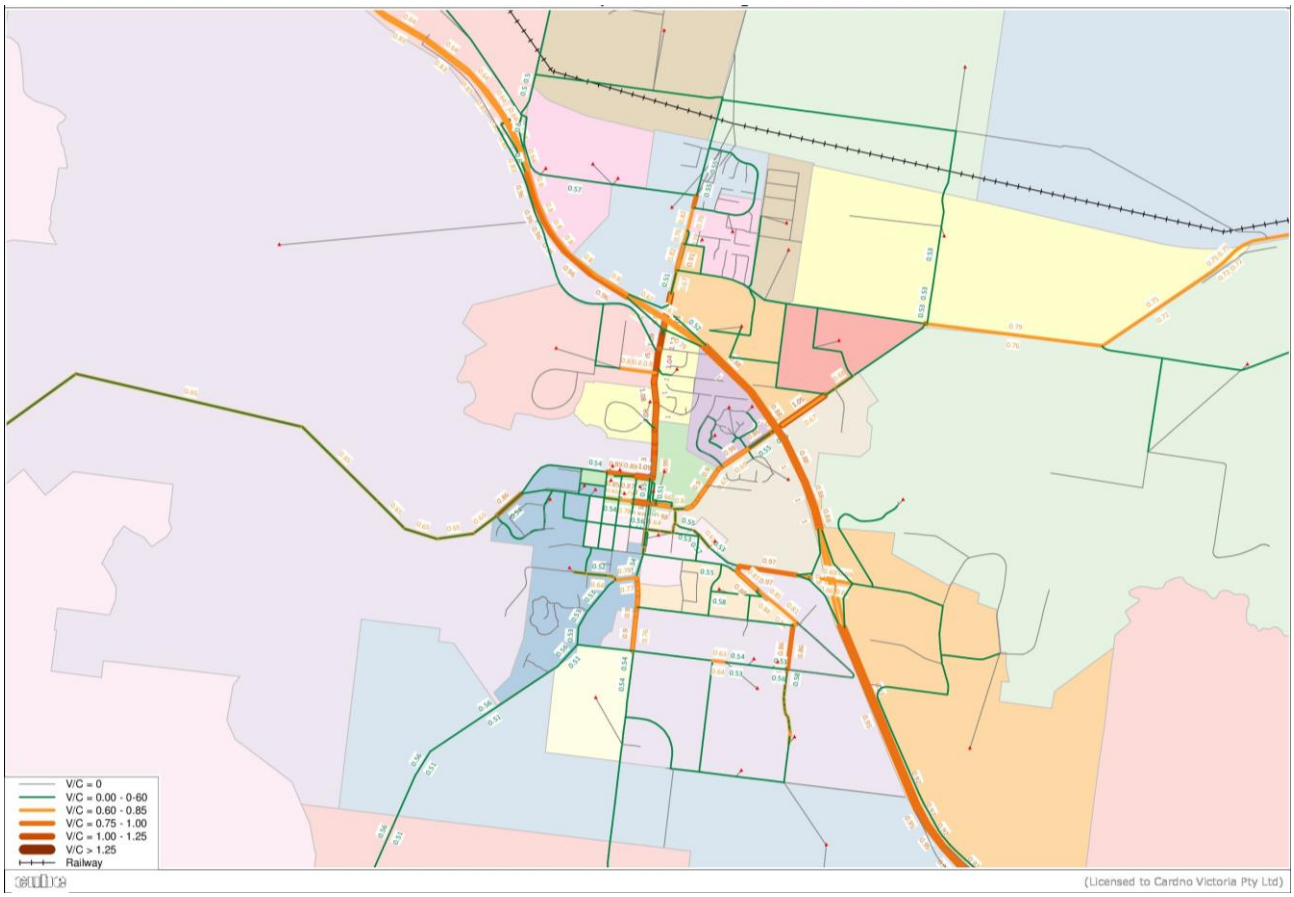
Table 9-3 Daily Flow Changes from No Development to Base Case

Site	Location	Between	No Development		Base Case		Impact		Impact (pct)	
			2031	2046	2031	2046	2031	2046	2031	2046
1	Calder Freeway	West of Mount Macedon Road	33,320	39,560	33,590	39,100	+270	-460	+1%	-1%
2	MacedonWoodend Road	East of Calder Freeway	4,440	5,290	4,920	7,140	+480	+1,850	+11%	+35%
3	Station Road	Saunders Road & Farrell St	12,680	14,760	14,680	19,560	+2,000	+4,800	+16%	+33%
4	Calder Fwy	Mount Macedon Rd & Station Rd	39,330	47,540	41,630	49,960	+2,300	+2,420	+6%	+5%
5	Station Rd	Webb Cres & Lonhro Ct	19,290	23,300	20,330	26,040	+1,040	+2,740	+5%	+12%
6	Calder Fwy Off-ramp EB	Station Road I/C	6,770	7,680	7,120	7,400	+350	-280	+5%	-4%
7	Calder Fwy On-ramp EB	Station Road I/C	4,880	6,990	5,280	8,280	+400	+1,290	+8%	+18%
8	Calder Fwy On-ramp WB	Station Road I/C	4,970	5,410	5,390	5,840	+420	+430	+8%	+8%
9	Calder Fwy Off-ramp WB	Station Road I/C	2,930	4,510	3,540	5,770	+610	+1,260	+21%	+28%
10	Station Rd	Ross Watt Rd & Calder Fwy	22,780	24,140	23,840	25,380	+1,060	+1,240	+5%	+5%
11	Western Link Road	Calder Fwy & Bacchus Marsh Rd	-	-	-	-	+0	+0	-	-
12	Calder Fwy	Station Rd & Melbourne Rd	35,390	45,960	37,940	50,780	+2,550	+4,820	+7%	+10%
13	Kilmore Rd	Joseph Ave & Govan Rd	4,340	7,050	4,620	8,150	+280	+1,100	+6%	+16%
14	Eastern Link Road	Kilmore Rd & Emmeline Dr	-	-	-	-	+0	+0	-	-
15	Bacchus Marsh Rd	West of Western Link Road	4,000	7,780	3,980	8,270	-20	+490	-1%	+6%
16	Bacchus Marsh Rd	West of Hamilton St	4,000	7,780	3,980	8,270	-20	+490	-1%	+6%
17	Aitken St	North of Robertson St	24,790	25,710	25,750	27,050	+960	+1,340	+4%	+5%
18	Aitken St	Robertson St & Hamilton St	18,350	18,610	19,090	19,180	+740	+570	+4%	+3%
19	Kilmore Rd	Melbourne Rd & Mill Rd	7,710	12,210	8,590	15,080	+880	+2,870	+11%	+24%
20	Aitken St	Hamilton Rd & Fisher St	16,670	16,820	17,640	18,240	+970	+1,420	+6%	+8%
21	Aitken St	Fisher St & Howey St	15,590	18,160	17,390	19,770	+1,800	+1,610	+12%	+9%
22	Aitken St	Melton Rd & Fersfield Rd	7,840	9,000	10,100	12,220	+2,260	+3,220	+29%	+36%
23	Aitken St	Fersfield Rd & Willowbank Rd	8,110	9,290	10,370	12,590	+2,260	+3,300	+28%	+36%
24	Western Link Road	Bacchus Marsh Rd & Melton Rd	-	-	-	-	+0	+0	-	-
25	Melton Rd	Willowbank Road & The Willows	8,350	10,430	8,540	11,070	+190	+640	+2%	+6%
26	Melbourne Rd	Howey St & Calder Fwy	14,610	21,290	18,500	24,940	+3,890	+3,650	+27%	+17%
27	Calder Fwy Off-ramp NB	Melbourne Rd I/C	4,170	5,340	5,050	5,120	+880	-220	+21%	-4%
28	Calder Fwy On-ramp NB	Melbourne Rd I/C	2,260	5,020	3,180	6,050	+920	+1,030	+41%	+21%
29	Calder Fwy Off-ramp SB	Melbourne Rd I/C	2,000	3,030	2,820	5,080	+820	+2,050	+41%	+68%
30	Calder Fwy On-ramp SB	Melbourne Rd I/C	4,900	6,480	6,180	6,950	+1,280	+470	+26%	+7%
31	Calder Fwy	South of Melbourne Rd	40,190	49,730	43,170	51,720	+2,980	+1,990	+7%	+4%
32	Melbourne Road	South of Kilmore	11,900	14,890	12,570	16,730	+670	+1,840	+6%	+12%
33	Melton Road	South of Western Link Rd	8,350	10,430	8,540	11,070	+190	+640	+2%	+6%
34	Mt Gisborne Rd / Aitken Road	Willowbank Rd & Jonathan Rd	5,240	6,020	5,570	6,710	+330	+690	+6%	+11%
35	Saunders Road	Near 144 Saunders Road	5,350	8,030	5,460	10,090	+110	+2,060	+2%	+26%
36	Robertson Road	Near Police Station	3,420	4,710	3,320	4,690	-100	-20	-3%	-0%
37	Saunders Road	Station Rd and Farrell St	10,160	14,590	10,980	16,550	+820	+1,960	+8%	+13%
38	Kilmore Rd	East of Saunders Rd	8,130	13,690	8,690	15,940	+560	+2,250	+7%	+16%
39	Robertson Road	Brantome St and Aitken St	12,510	13,530	12,760	16,200	+250	+2,670	+2%	+20%
40	Hamilton St	Aitken St and Kilmore Rd	14,400	16,780	15,380	18,320	+980	+1,540	+7%	+9%

9.3 2046 – Refence Network

This scenario assumes natural household growth (VITM growth) and that the Gisborne Structure Plan developments have been fully developed, as well as the general network improvements described in Section 7.2. The Worst V/C Ratio Plot for this scenario is shown in **Figure 9-3** while the 2-way daily flows are summarised in **Table 9-4**.

Figure 9-3 2046 Reference Network, Worst V/C ratios



The Reference case improvement serves the purpose of both relieving the congestion through the centre of Gisborne, while also removing those trips that use the Calder Freeway for access to the south and eastern parts of the township. This relieves the Calder Freeway of short distance trips and allows for more strategic trips on that corridor. There is an increase in daily trips along the Station Road / Aitken Road corridor

Table 9-4 Daily Flow Changes from Base Case to Reference Case

Site	Location	Between	Base Case		Reference Case		Impact		Impact (pct)	
			2031	2046	2031	2046	2031	2046	2031	2046
1	Calder Freeway	West of Mount Macedon Road	33,590	39,100	33,710	39,370	+120	+270	+0%	+1%
2	MacedonWoodend Road	East of Calder Freeway	4,920	7,140	4,930	7,170	+10	+30	+0%	+0%
3	Station Road	Saunders Road & Farrell St	14,680	19,560	14,870	19,800	+190	+240	+1%	+1%
4	Calder Fwy	Mount Macedon Rd & Station Rd	41,630	49,960	41,550	49,890	-80	-70	-0%	-0%
5	Station Rd	Webb Cres & Lonhro Ct	20,330	26,040	19,510	25,490	-820	-550	-4%	-2%
6	Calder Fwy Off-ramp EB	Station Road I/C	7,120	7,400	7,290	7,200	+170	-200	+2%	-3%
7	Calder Fwy On-ramp EB	Station Road I/C	5,280	8,280	5,100	8,020	-180	-260	-3%	-3%
8	Calder Fwy On-ramp WB	Station Road I/C	5,390	5,840	5,270	5,910	-120	+70	-2%	+1%
9	Calder Fwy Off-ramp WB	Station Road I/C	3,540	5,770	3,200	5,710	-340	-60	-10%	-1%
10	Station Rd	Ross Watt Rd & Calder Fwy	23,840	25,380	23,900	25,030	+60	-350	+0%	-1%
11	Western Link Road	Calder Fwy & Bacchus Marsh Rd	-	-	-	-	+0	+0	-	-
12	Calder Fwy	Station Rd & Melbourne Rd	37,940	50,780	37,280	50,520	-660	-260	-2%	-1%
13	Kilmore Rd	Joseph Ave & Govan Rd	4,620	8,150	5,200	8,370	+580	+220	+13%	+3%
14	Eastern Link Road	Kilmore Rd & Emmeline Dr	-	-	-	-	+0	+0	-	-
15	Bacchus Marsh Rd	West of Western Link Road	3,980	8,270	4,510	8,800	+530	+530	+13%	+6%
16	Bacchus Marsh Rd	West of Hamilton St	3,980	8,270	4,510	8,800	+530	+530	+13%	+6%
17	Aitken St	North of Robertson St	25,750	27,050	26,030	26,790	+280	-260	+1%	-1%
18	Aitken St	Robertson St & Hamilton St	19,090	19,180	20,340	22,280	+1,250	+3,100	+7%	+16%
19	Kilmore Rd	Melbourne Rd & Mill Rd	8,590	15,080	9,640	16,070	+1,050	+990	+12%	+7%
20	Aitken St	Hamilton Rd & Fisher St	17,640	18,240	22,430	22,210	+4,790	+3,970	+27%	+22%
21	Aitken St	Fisher St & Howey St	17,390	19,770	21,400	24,930	+4,010	+5,160	+23%	+26%
22	Aitken St	Melton Rd & Fersfield Rd	10,100	12,220	11,440	13,480	+1,340	+1,260	+13%	+10%
23	Aitken St	Fersfield Rd & Willowbank Rd	10,370	12,590	11,740	13,790	+1,370	+1,200	+13%	+10%
24	Western Link Road	Bacchus Marsh Rd & Melton Rd	-	-	-	-	+0	+0	-	-
25	Melton Rd	Willowbank Road & The Willows	8,540	11,070	8,570	10,740	+30	-330	+0%	-3%
26	Melbourne Rd	Howey St & Calder Fwy	18,500	24,940	18,310	25,110	-190	+170	-1%	+1%
27	Calder Fwy Off-ramp NB	Melbourne Rd I/C	5,050	5,120	5,240	5,190	+190	+70	+4%	+1%
28	Calder Fwy On-ramp NB	Melbourne Rd I/C	3,180	6,050	2,900	5,770	-280	-280	-9%	-5%
29	Calder Fwy Off-ramp SB	Melbourne Rd I/C	2,820	5,080	2,680	5,120	-140	+40	-5%	+1%
30	Calder Fwy On-ramp SB	Melbourne Rd I/C	6,180	6,950	6,200	7,030	+20	+80	+0%	+1%
31	Calder Fwy	South of Melbourne Rd	43,170	51,720	43,140	51,840	-30	+120	-0%	+0%
32	Melbourne Road	South of Kilmore	12,570	16,730	9,430	15,180	-3,140	-1,550	-25%	-9%
33	Melton Road	South of Western Link Rd	8,540	11,070	8,570	10,740	+30	-330	+0%	-3%
34	Mt Gisborne Rd / Aitken Ro	Willowbank Rd & Jonathan Rd	5,570	6,710	6,430	7,310	+860	+600	+15%	+9%
35	Saunders Road	Near 144 Saunders Road	5,460	10,090	5,230	10,140	-230	+50	-4%	+0%
36	Robertson Road	Near Police Station	3,320	4,690	4,390	6,480	+1,070	+1,790	+32%	+38%
37	Saunders Road	Station Rd and Farrell St	10,980	16,550	10,260	16,580	-720	+30	-7%	+0%
38	Kilmore Rd	East of Saunders Rd	8,690	15,940	9,010	16,040	+320	+100	+4%	+1%
39	Robertson Road	Brantome St and Aitken St	12,760	16,200	14,450	16,200	+1,690	+0	+13%	+0%
40	Hamilton St	Aitken St and Kilmore Rd	15,380	18,320	13,200	18,320	-2,180	+0	-14%	+0%

9.4 2046 – Station Road Duplication with Reference network

This scenario assumes natural household growth (VITM growth) and that the Gisborne Structure Plan developments have been fully developed. In terms of network assumptions, this scenario includes the general network improvements, as well duplication of Station Road. The Worst V/C Ratio Plot for this scenario is shown in **Figure 9-4** while the Impact (difference) plot with reference to the 2046 Reference scenario is shown in **Figure 9-5**. The plots show that while the V/C ratio is slightly reduced on Station Road due the its assumed increase in capacity, this also attracts more traffic to Station Road and the volumes on Station Road therefore increase by approximately 7,000 vehicles per day.

Figure 9-4 2046 Station Road Duplication and Reference Network, Worst V/C ratios

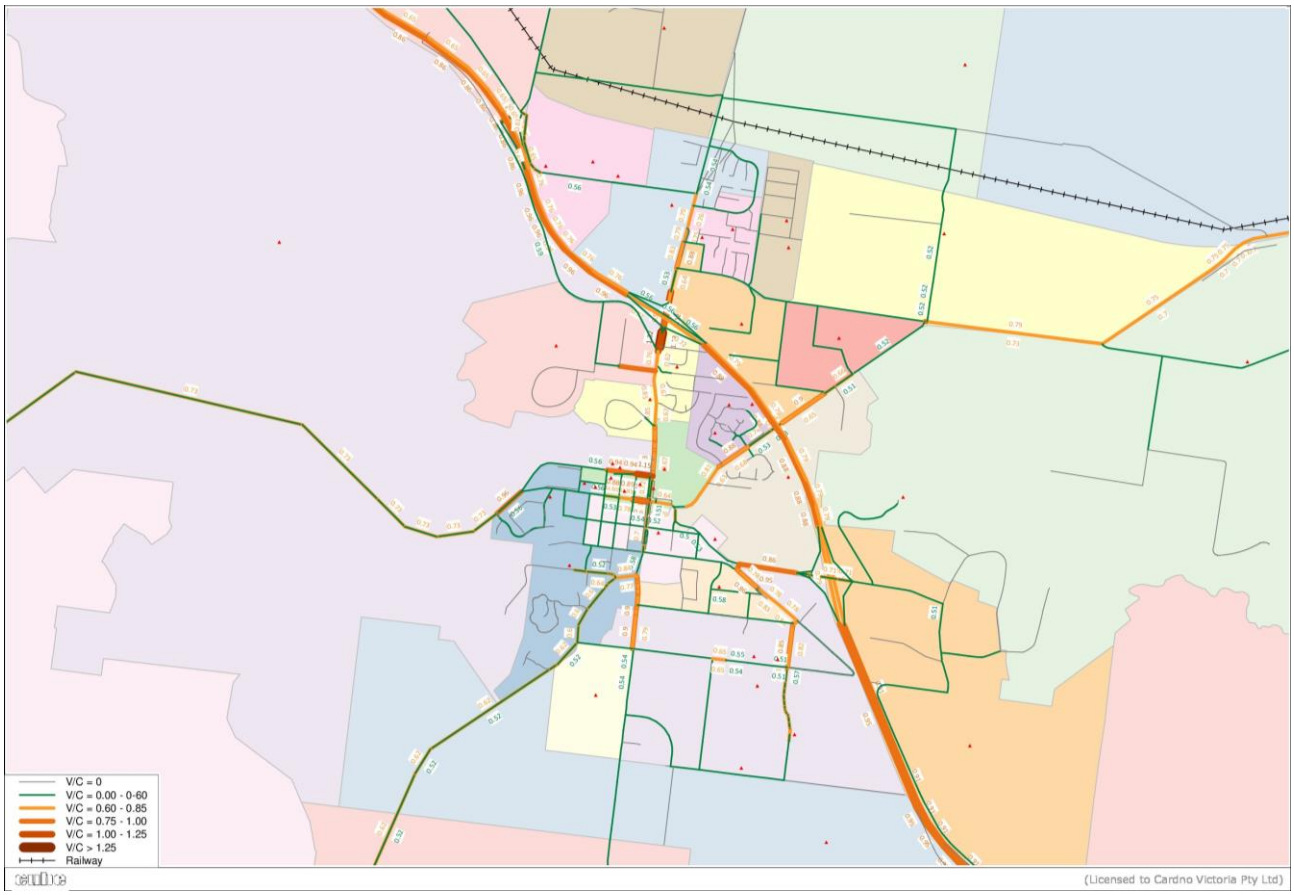
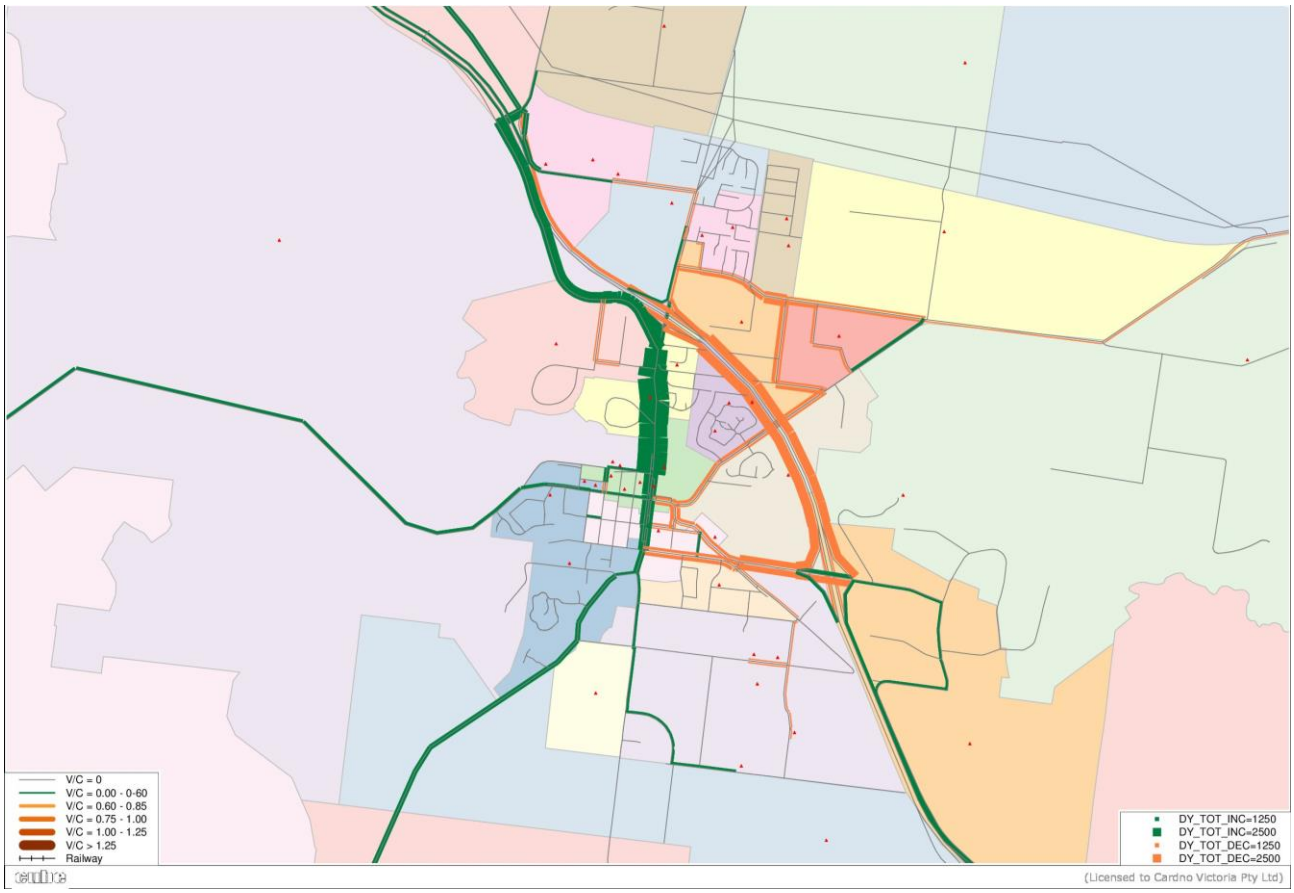


Figure 9-5 Impact of Reference Network with Station Road Duplication on the Base Network



The 2-way daily flows for the Station Road Duplication scenario are summarised in **Table 9-5** and show that there is a clear diversion from the Calder Freeway to the Station Road / Aitken Road corridor. There is also some evidence of longer distance diversion with increases on Bacchus Marsh Road and Melton Road.

Table 9-5 Daily Flow Changes from Reference Case to Station Road Duplication Scheme

Site	Location	Between	Reference Case		Station Road Duplication		Impact		Impact (pct)	
			2031	2046	2031	2046	2031	2046	2031	2046
1	Calder Freeway	West of Mount Macedon Road	33,710	39,370	33,640	39,980	-70	+610	-0%	+2%
2	MacedonWoodend Road	East of Calder Freeway	4,930	7,170	4,970	7,510	+40	+340	+1%	+5%
3	Station Road	Saunders Road & Farrell St	14,870	19,800	14,880	19,800	+10	+0	+0%	+0%
4	Calder Fwy	Mount Macedon Rd & Station Rd	41,550	49,890	41,290	48,700	-260	-1,190	-1%	-2%
5	Station Rd	Webb Cres & Lonhro Ct	19,510	25,490	20,110	25,450	+600	-40	+3%	-0%
6	Calder Fwy Off-ramp EB	Station Road I/C	7,290	7,200	7,460	7,510	+170	+310	+2%	+4%
7	Calder Fwy On-ramp EB	Station Road I/C	5,100	8,020	4,770	6,970	-330	-1,050	-6%	-13%
8	Calder Fwy On-ramp WB	Station Road I/C	5,270	5,910	5,750	7,430	+480	+1,520	+9%	+26%
9	Calder Fwy Off-ramp WB	Station Road I/C	3,200	5,710	2,490	4,470	-710	-1,240	-22%	-22%
10	Station Rd	Ross Watt Rd & Calder Fwy	23,900	25,030	25,760	27,980	+1,860	+2,950	+8%	+12%
11	Western Link Road	Calder Fwy & Bacchus Marsh Rd	-	-	-	-	+0	+0	-	-
12	Calder Fwy	Station Rd & Melbourne Rd	37,280	50,520	35,340	45,190	-1,940	-5,330	-5%	-11%
13	Kilmore Rd	Joseph Ave & Govan Rd	5,200	8,370	5,240	8,950	+40	+580	+1%	+7%
14	Eastern Link Road	Kilmore Rd & Emmeline Dr	-	-	-	-	+0	+0	-	-
15	Bacchus Marsh Rd	West of Western Link Road	4,510	8,800	4,580	9,320	+70	+520	+2%	+6%
16	Bacchus Marsh Rd	West of Hamilton St	4,510	8,800	4,580	9,320	+70	+520	+2%	+6%
17	Aitken St	North of Robertson St	26,030	26,790	28,810	34,690	+2,780	+7,900	+11%	+29%
18	Aitken St	Robertson St & Hamilton St	20,340	22,280	22,120	25,620	+1,780	+3,340	+9%	+15%
19	Kilmore Rd	Melbourne Rd & Mill Rd	9,640	16,070	9,160	15,130	-480	-940	-5%	-6%
20	Aitken St	Hamilton Rd & Fisher St	22,430	22,210	23,480	24,860	+1,050	+2,650	+5%	+12%
21	Aitken St	Fisher St & Howey St	21,400	24,930	22,200	27,090	+800	+2,160	+4%	+9%
22	Aitken St	Melton Rd & Fersfield Rd	11,440	13,480	12,040	13,800	+600	+320	+5%	+2%
23	Aitken St	Fersfield Rd & Willowbank Rd	11,740	13,790	12,340	14,100	+600	+310	+5%	+2%
24	Western Link Road	Bacchus Marsh Rd & Melton Rd	-	-	-	-	+0	+0	-	-
25	Melton Rd	Willowbank Road & The Willows	8,570	10,740	8,600	11,160	+30	+420	+0%	+4%
26	Melbourne Rd	Howey St & Calder Fwy	18,310	25,110	16,810	21,660	-1,500	-3,450	-8%	-14%
27	Calder Fwy Off-ramp NB	Melbourne Rd I/C	5,240	5,190	5,390	5,570	+150	+380	+3%	+7%
28	Calder Fwy On-ramp NB	Melbourne Rd I/C	2,900	5,770	1,880	3,390	-1,020	-2,380	-35%	-41%
29	Calder Fwy Off-ramp SB	Melbourne Rd I/C	2,680	5,120	2,030	2,820	-650	-2,300	-24%	-45%
30	Calder Fwy On-ramp SB	Melbourne Rd I/C	6,200	7,030	6,210	7,630	+10	+600	+0%	+9%
31	Calder Fwy	South of Melbourne Rd	43,140	51,840	43,020	52,170	-120	+330	-0%	+1%
32	Melbourne Road	South of Kilmore	9,430	15,180	9,060	13,370	-370	-1,810	-4%	-12%
33	Melton Road	South of Western Link Rd	8,570	10,740	8,600	11,160	+30	+420	+0%	+4%
34	Mt Gisborne Rd / Aitken Ro	Willowbank Rd & Jonathan Rd	6,430	7,310	6,420	7,540	-10	+230	-0%	+3%
35	Saunders Road	Near 144 Saunders Road	5,230	10,140	5,150	9,210	-80	-930	-2%	-9%
36	Robertson Road	Near Police Station	4,390	6,480	4,460	6,470	+70	-10	+2%	-0%
37	Saunders Road	Station Rd and Farrell St	10,260	16,580	10,710	15,770	+450	-810	+4%	-5%
38	Kilmore Rd	East of Saunders Rd	9,010	16,040	8,990	15,730	-20	-310	-0%	-2%
39	Robertson Road	Brantome St and Aitken St	14,450	16,200	14,710	16,630	+260	+430	+2%	+3%
40	Hamilton St	Aitken St and Kilmore Rd	13,200	18,320	12,430	16,680	-770	-1,640	-6%	-9%

9.5 2046 – Western Link Road and Reference network

This scenario assumes natural household growth (VITM growth) and that the Gisborne Structure Plan developments have been fully developed. In terms of network assumptions, this scenario includes the general network improvements, as well as the Western Link Road. The Worst V/C Ratio Plot for this scenario is shown in **Figure 9-6** while the Impact (difference) plot with reference to the 2046 Reference scenario is shown in **Figure 9-7**.

The model results suggest the Western Link Road will provide an alternate and attractive route between the Calder Freeway and Melton Road / Bacchus Marsh, this will result in minor reductions to traffic volumes on Station Road and Melbourne Road as these links have high V/C ratios in the 2046 Ref scenario.

Figure 9-6 2046 Western Link Road and Reference Network, Worst V/C ratios

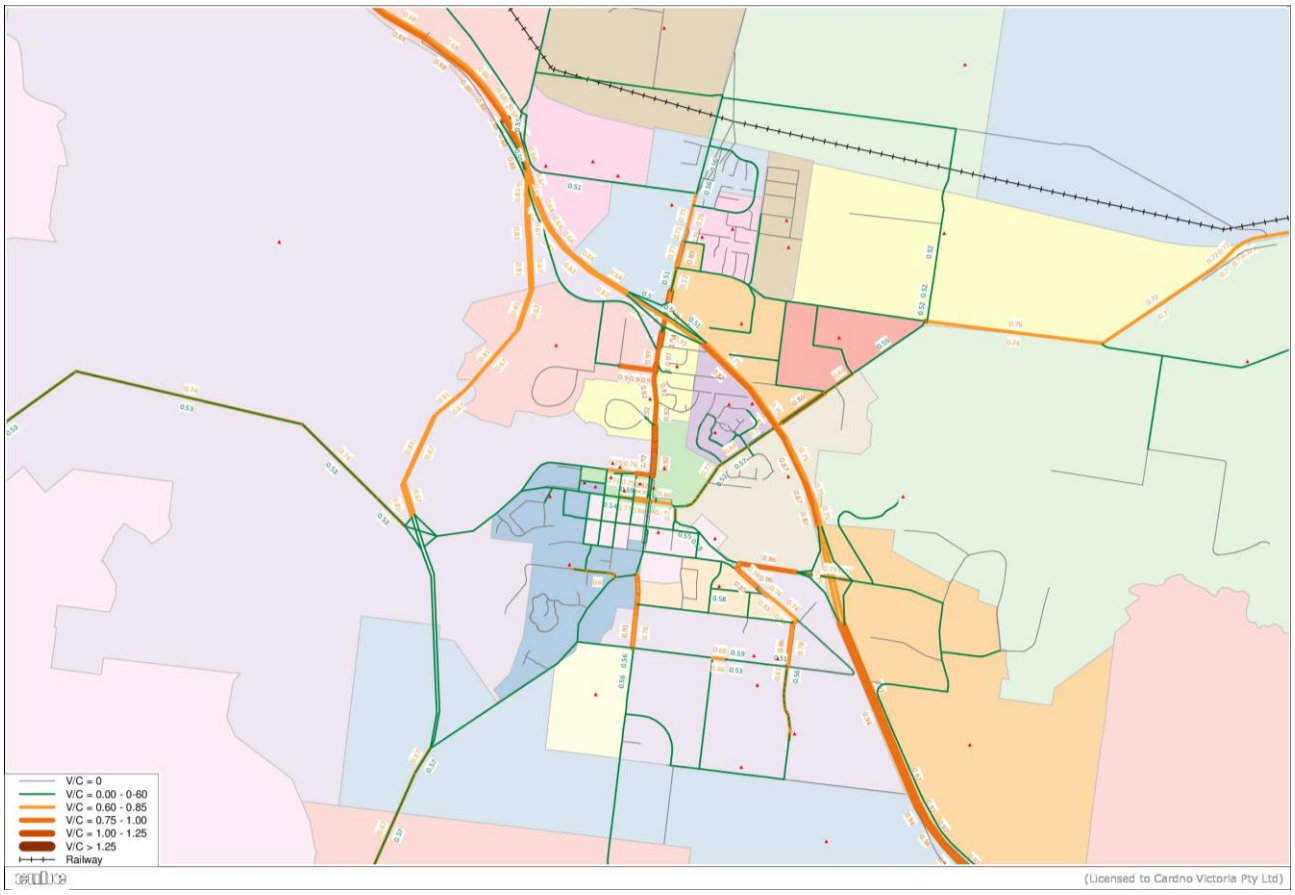
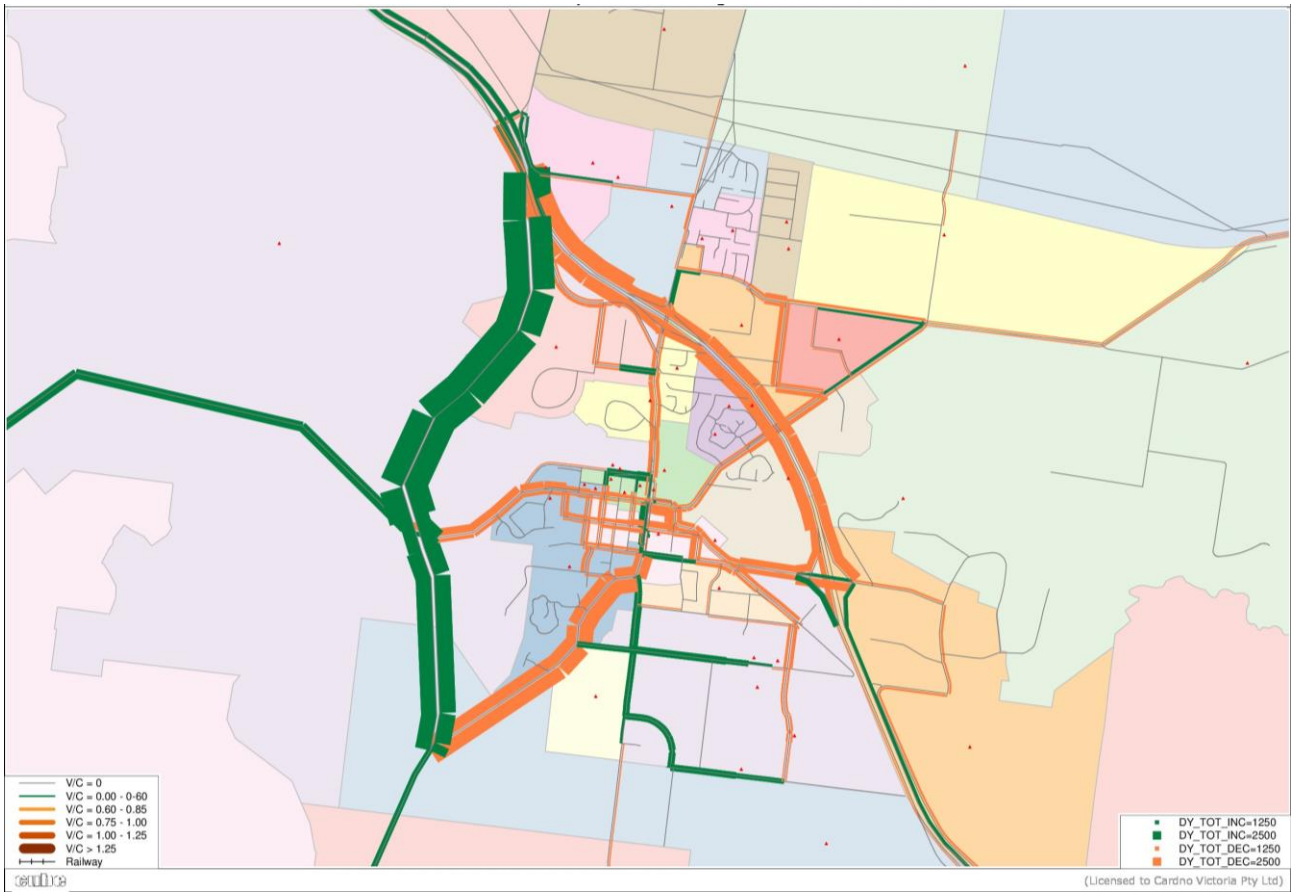


Figure 9-7 Impact of Western Link Road on Reference Network



The 2-way daily flows for the Western Link Road scenario are summarised in **Table 9-6** and show that the Western Link Road substantially reduced traffic volumes on both Calder Freeway and on Station Road through the Gisborne city centre.

Table 9-6 Daily Flow Changes from Reference Case to Western Link Road Case

Site	Location	Between	Reference Case		Western Link Road		Impact		Impact (pct)	
			2031	2046	2031	2046	2031	2046	2031	2046
1	Calder Freeway	West of Mount Macedon Road	33,710	39,370	34,830	41,310	+1,120	+1,940	+3%	+5%
2	MacedonWoodend Road	East of Calder Freeway	4,930	7,170	4,900	7,120	-30	-50	-1%	-1%
3	Station Road	Saunders Road & Farrell St	14,870	19,800	14,450	19,340	-420	-460	-3%	-2%
4	Calder Fwy	Mount Macedon Rd & Station Rd	41,550	49,890	35,040	41,710	-6,510	-8,180	-16%	-16%
5	Station Rd	Webb Cres & Lonhro Ct	19,510	25,490	20,560	26,910	+1,050	+1,420	+5%	+6%
6	Calder Fwy Off-ramp EB	Station Road I/C	7,290	7,200	4,720	5,520	-2,570	-1,680	-35%	-23%
7	Calder Fwy On-ramp EB	Station Road I/C	5,100	8,020	4,690	7,870	-410	-150	-8%	-2%
8	Calder Fwy On-ramp WB	Station Road I/C	5,270	5,910	2,910	4,000	-2,360	-1,910	-45%	-32%
9	Calder Fwy Off-ramp WB	Station Road I/C	3,200	5,710	2,700	4,180	-500	-1,530	-16%	-27%
10	Station Rd	Ross Watt Rd & Calder Fwy	23,900	25,030	20,460	24,320	-3,440	-710	-14%	-3%
11	Western Link Road	Calder Fwy & Bacchus Marsh Rd	-	-	8,160	12,790	+8,160	+12,790	-	-
12	Calder Fwy	Station Rd & Melbourne Rd	37,280	50,520	34,800	44,230	-2,480	-6,290	-7%	-12%
13	Kilmore Rd	Joseph Ave & Govan Rd	5,200	8,370	4,750	8,260	-450	-110	-9%	-1%
14	Eastern Link Road	Kilmore Rd & Emmeline Dr	-	-	-	-	+0	+0	-	-
15	Bacchus Marsh Rd	West of Western Link Road	4,510	8,800	5,330	10,290	+820	+1,490	+18%	+17%
16	Bacchus Marsh Rd	West of Hamilton St	4,510	8,800	2,950	4,950	-1,560	-3,850	-35%	-44%
17	Aitken St	North of Robertson St	26,030	26,790	22,480	24,820	-3,550	-1,970	-14%	-7%
18	Aitken St	Robertson St & Hamilton St	20,340	22,280	15,620	19,350	-4,720	-2,930	-23%	-13%
19	Kilmore Rd	Melbourne Rd & Mill Rd	9,640	16,070	8,680	13,840	-960	-2,230	-10%	-14%
20	Aitken St	Hamilton Rd & Fisher St	22,430	22,210	18,480	20,010	-3,950	-2,200	-18%	-10%
21	Aitken St	Fisher St & Howey St	21,400	24,930	16,990	20,390	-4,410	-4,540	-21%	-18%
22	Aitken St	Melton Rd & Fersfield Rd	11,440	13,480	11,700	13,650	+260	+170	+2%	+1%
23	Aitken St	Fersfield Rd & Willowbank Rd	11,740	13,790	12,000	13,950	+260	+160	+2%	+1%
24	Western Link Road	Bacchus Marsh Rd & Melton Rd	-	-	6,430	8,760	+6,430	+8,760	-	-
25	Melton Rd	Willowbank Road & The Willows	8,570	10,740	2,880	3,830	-5,690	-6,910	-66%	-64%
26	Melbourne Rd	Howey St & Calder Fwy	18,310	25,110	16,230	21,470	-2,080	-3,640	-11%	-14%
27	Calder Fwy Off-ramp NB	Melbourne Rd I/C	5,240	5,190	5,370	6,270	+130	+1,080	+2%	+21%
28	Calder Fwy On-ramp NB	Melbourne Rd I/C	2,900	5,770	2,020	3,970	-880	-1,800	-30%	-31%
29	Calder Fwy Off-ramp SB	Melbourne Rd I/C	2,680	5,120	1,320	2,170	-1,360	-2,950	-51%	-58%
30	Calder Fwy On-ramp SB	Melbourne Rd I/C	6,200	7,030	6,220	7,600	+20	+570	+0%	+8%
31	Calder Fwy	South of Melbourne Rd	43,140	51,840	43,040	51,960	-100	+120	-0%	+0%
32	Melbourne Road	South of Kilmore	9,430	15,180	8,460	12,650	-970	-2,530	-10%	-17%
33	Melton Road	South of Western Link Rd	8,570	10,740	8,700	11,810	+130	+1,070	+2%	+10%
34	Mt Gisborne Rd / Aitken Ro	Willowbank Rd & Jonathan Rd	6,430	7,310	6,190	7,710	-240	+400	-4%	+5%
35	Saunders Road	Near 144 Saunders Road	5,230	10,140	5,350	9,660	+120	-480	+2%	-5%
36	Robertson Road	Near Police Station	4,390	6,480	2,750	4,480	-1,640	-2,000	-37%	-31%
37	Saunders Road	Station Rd and Farrell St	10,260	16,580	10,910	16,330	+650	-250	+6%	-2%
38	Kilmore Rd	East of Saunders Rd	9,010	16,040	8,700	15,540	-310	-500	-3%	-3%
39	Robertson Road	Brantome St and Aitken St	14,450	16,200	13,390	15,440	-1,060	-760	-7%	-5%
40	Hamilton St	Aitken St and Kilmore Rd	13,200	18,320	11,100	14,890	-2,100	-3,430	-16%	-19%

9.5.1 Route Choice for Western Link Road Traffic

To investigate the nature of the traffic shown by the models to be using the Western Link Road, Cardno further interrogated the traffic model by "saving" the trips using the Western Link Road under the 2046 Western Link Road scenario (refer **Figure 9-8**) and assigned these trips to the 2046 Reference scenario (refer **Figure 9-9**). The model results suggest that the without the Western Link Road, most of the traffic that otherwise would have used the Western Link Road are instead using Station Road, Aitken Road and Calder Freeway.

Figure 9-8 Traffic using Western Link Road for Western Bypass Network (2046)

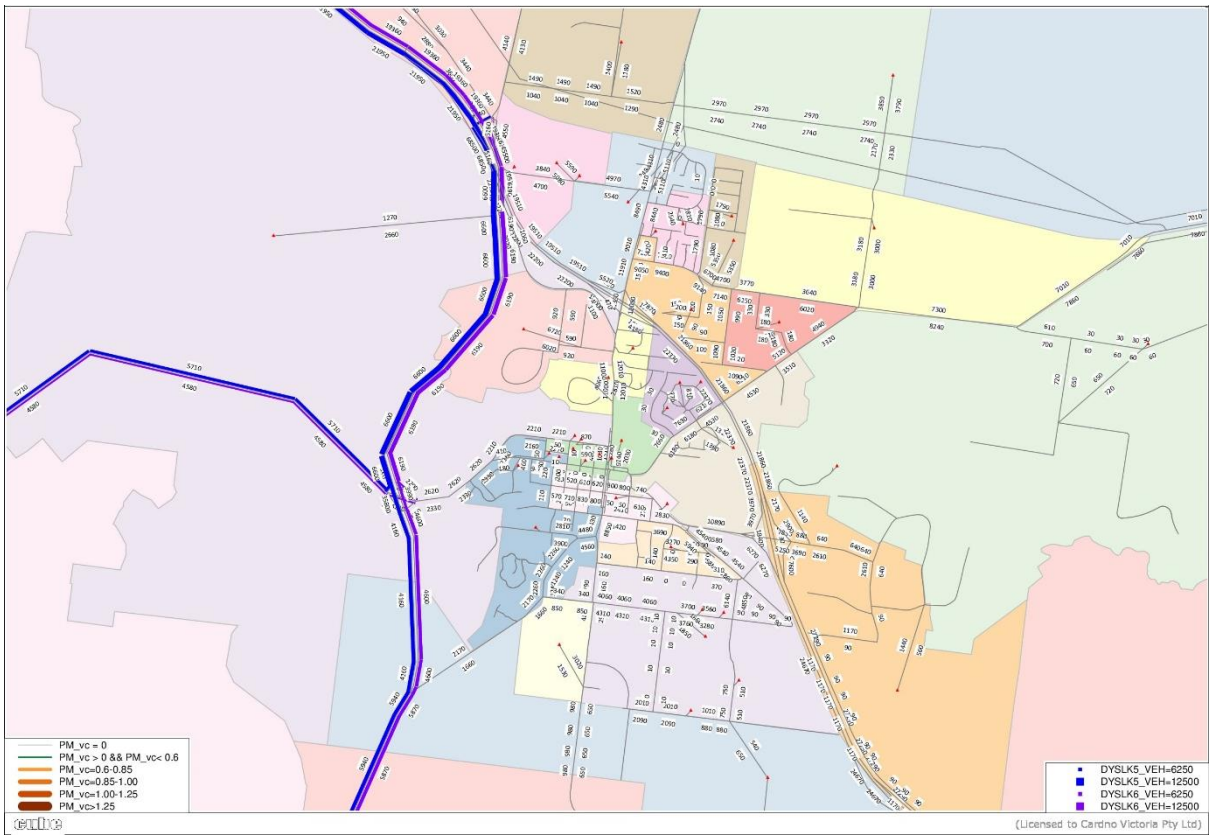
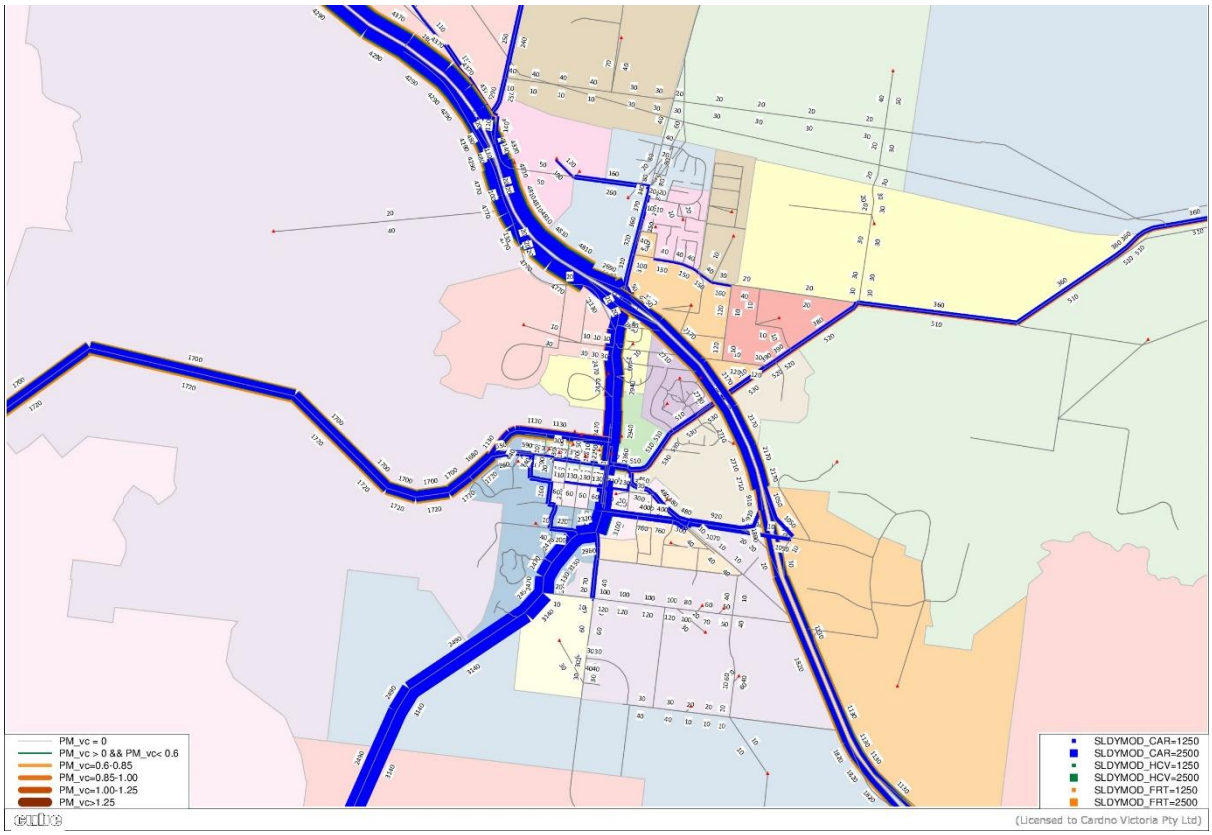


Table 9-7 Western Link Road Traffic Assigned on 2046 Reference Network



9.6 2046 – Eastern Link Road and Reference Network

This scenario assumes natural household growth (VITM growth) and that the Gisborne Structure Plan developments have been fully developed. In terms of network assumptions, this scenario includes the general network improvements, as well as the Eastern Link Road. The Worst V/C Ratio Plot for this scenario is shown in **Figure 9-9** while the Impact (difference) plot with reference to the 2046 Reference scenario is shown in **Figure 9-10**.

The model plots suggest that congestion on Kilmore Road and on Calder Freeway (between the Melbourne Road interchange and the Station Road interchange) will reduce under this scenario as the Eastern Link Road provides an attractive alternate route for this traffic. The model plots also suggest that the Eastern Link Road will result in a reduction of traffic volumes at the Station Road interchange but an increase in the traffic volumes at the Melbourne Road interchange as the Eastern Link Road will provide a shorter route between the Calder Freeway and the eastern New Gisborne area. Traffic volumes on Station Road (south of Calder Freeway) are largely unaffected by the Eastern Link Road.

Figure 9-9 2046 Eastern Link Road with Reference Network, Worst V/C ratios

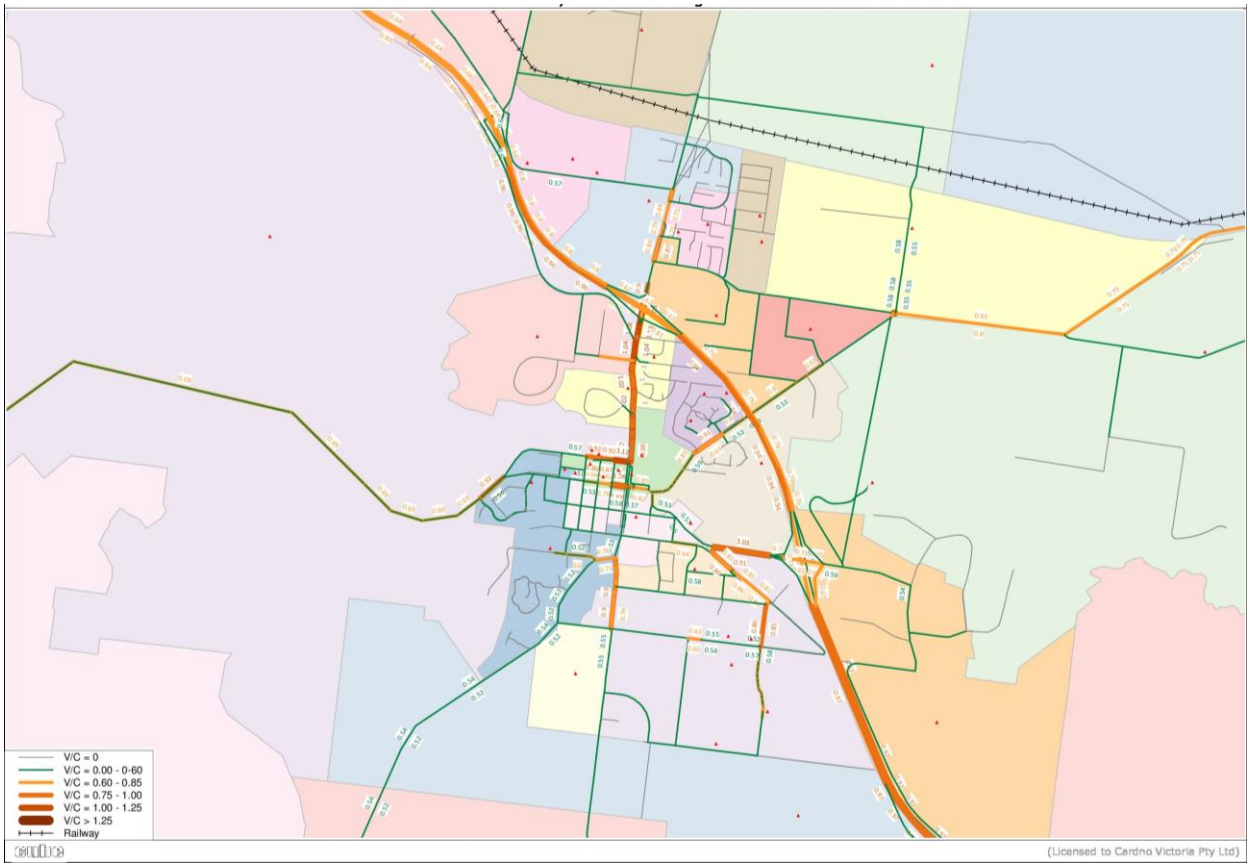
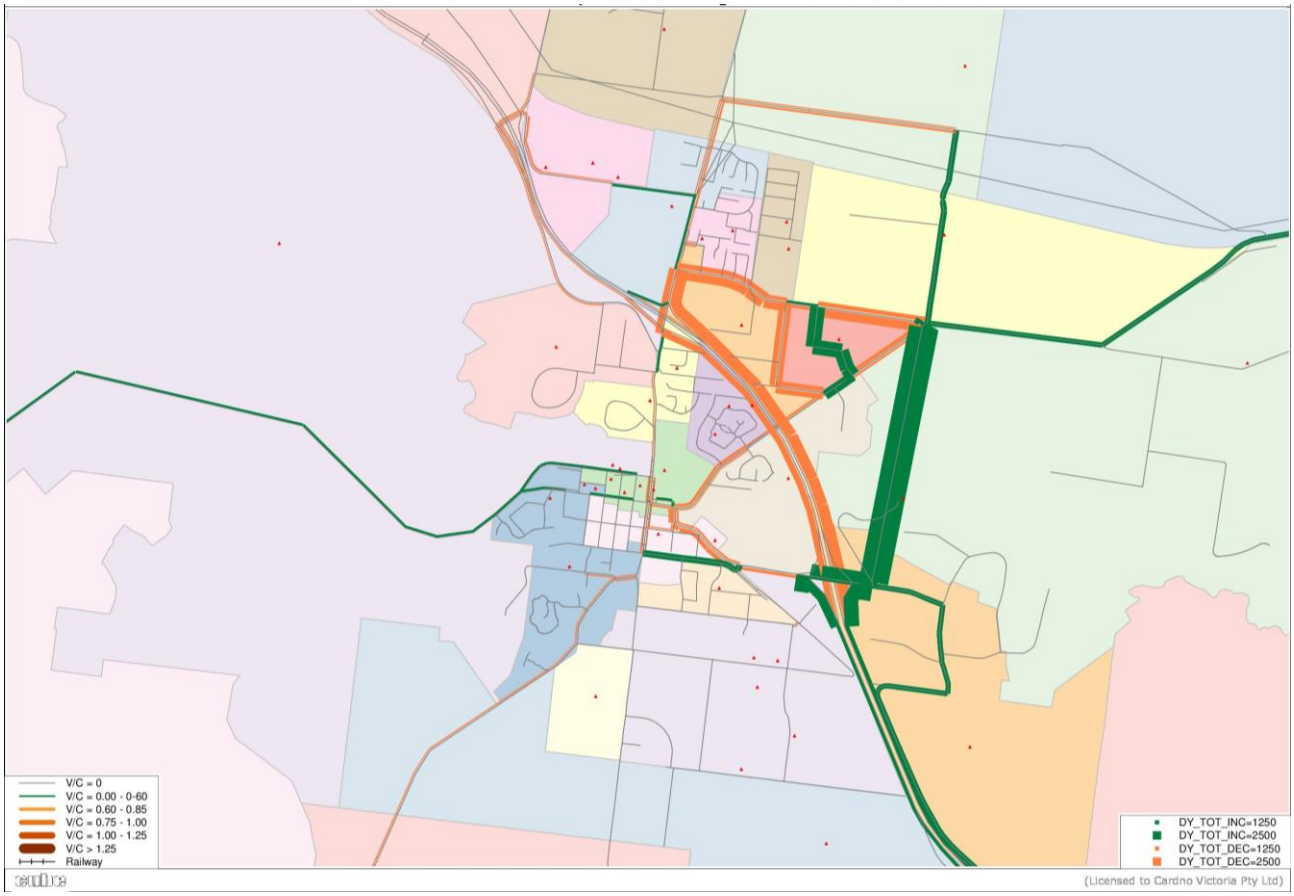


Figure 9-10 Impact of Eastern Link Road on Reference Network



The 2-way daily flows for the Eastern Link Road scenario are summarised in **Table 9-8** and show that the Eastern Link Road reduces the traffic volumes on from Calder Freeway for trips going to and from New Gisborne. There are some minor impacts on Kilmore Road and Melbourne Road.

Table 9-8 Daily Flow Changes from Reference Case to Eastern Link Road Scenario

Site	Location	Between	Reference Case		Eastern Link Road		Impact		Impact (pct)	
			2031	2046	2031	2046	2031	2046	2031	2046
1	Calder Freeway	West of Mount Macedon Road	33,710	39,370	33,030	39,570	-680	+200	-2%	+1%
2	MacedonWoodend Road	East of Calder Freeway	4,930	7,170	4,930	7,110	+0	-60	+0%	-1%
3	Station Road	Saunders Road & Farrell St	14,870	19,800	14,670	19,590	-200	-210	-1%	-1%
4	Calder Fwy	Mount Macedon Rd & Station Rd	41,550	49,890	41,020	49,640	-530	-250	-1%	-1%
5	Station Rd	Webb Cres & Lonhro Ct	19,510	25,490	17,650	20,490	-1,860	-5,000	-10%	-20%
6	Calder Fwy Off-ramp EB	Station Road I/C	7,290	7,200	7,350	7,370	+60	+170	+1%	+2%
7	Calder Fwy On-ramp EB	Station Road I/C	5,100	8,020	3,460	4,790	-1,640	-3,230	-32%	-40%
8	Calder Fwy On-ramp WB	Station Road I/C	5,270	5,910	5,420	5,530	+150	-380	+3%	-6%
9	Calder Fwy Off-ramp WB	Station Road I/C	3,200	5,710	3,010	3,760	-190	-1,950	-6%	-34%
10	Station Rd	Ross Watt Rd & Calder Fwy	23,900	25,030	23,690	25,270	-210	+240	-1%	+1%
11	Western Link Road	Calder Fwy & Bacchus Marsh Rd	-	-	-	-	+0	+0	-	-
12	Calder Fwy	Station Rd & Melbourne Rd	37,280	50,520	34,730	45,300	-2,550	-5,220	-7%	-10%
13	Kilmore Rd	Joseph Ave & Govan Rd	5,200	8,370	4,210	6,960	-990	-1,410	-19%	-17%
14	Eastern Link Road	Kilmore Rd & Emmeline Dr	-	-	3,720	8,020	+3,720	+8,020	-	-
15	Bacchus Marsh Rd	West of Western Link Road	4,510	8,800	4,570	9,090	+60	+290	+1%	+3%
16	Bacchus Marsh Rd	West of Hamilton St	4,510	8,800	4,570	9,090	+60	+290	+1%	+3%
17	Aitken St	North of Robertson St	26,030	26,790	25,770	26,610	-260	-180	-1%	-1%
18	Aitken St	Robertson St & Hamilton St	20,340	22,280	20,250	20,890	-90	-1,390	-0%	-6%
19	Kilmore Rd	Melbourne Rd & Mill Rd	9,640	16,070	8,770	15,110	-870	-960	-9%	-6%
20	Aitken St	Hamilton Rd & Fisher St	22,430	22,210	22,340	21,490	-90	-720	-0%	-3%
21	Aitken St	Fisher St & Howey St	21,400	24,930	21,300	24,120	-100	-810	-0%	-3%
22	Aitken St	Melton Rd & Fersfield Rd	11,440	13,480	11,520	13,560	+80	+80	+1%	+1%
23	Aitken St	Fersfield Rd & Willowbank Rd	11,740	13,790	11,820	13,880	+80	+90	+1%	+1%
24	Western Link Road	Bacchus Marsh Rd & Melton Rd	-	-	-	-	+0	+0	-	-
25	Melton Rd	Willowbank Road & The Willows	8,570	10,740	8,440	10,570	-130	-170	-2%	-2%
26	Melbourne Rd	Howey St & Calder Fwy	18,310	25,110	17,610	24,340	-700	-770	-4%	-3%
27	Calder Fwy Off-ramp NB	Melbourne Rd I/C	5,240	5,190	5,670	7,400	+430	+2,210	+8%	+43%
28	Calder Fwy On-ramp NB	Melbourne Rd I/C	2,900	5,770	2,720	5,690	-180	-80	-6%	-1%
29	Calder Fwy Off-ramp SB	Melbourne Rd I/C	2,680	5,120	2,430	5,170	-250	+50	-9%	+1%
30	Calder Fwy On-ramp SB	Melbourne Rd I/C	6,200	7,030	8,210	11,110	+2,010	+4,080	+32%	+58%
31	Calder Fwy	South of Melbourne Rd	43,140	51,840	43,450	52,950	+310	+1,110	+1%	+2%
32	Melbourne Road	South of Kilmore	9,430	15,180	8,460	13,290	-970	-1,890	-10%	-12%
33	Melton Road	South of Western Link Rd	8,570	10,740	8,440	10,570	-130	-170	-2%	-2%
34	Mt Gisborne Rd / Aitken Ro	Willowbank Rd & Jonathan Rd	6,430	7,310	6,440	7,410	+10	+100	+0%	+1%
35	Saunders Road	Near 144 Saunders Road	5,230	10,140	3,880	6,380	-1,350	-3,760	-26%	-37%
36	Robertson Road	Near Police Station	4,390	6,480	4,450	6,660	+60	+180	+1%	+3%
37	Saunders Road	Station Rd and Farrell St	10,260	16,580	8,450	12,480	-1,810	-4,100	-18%	-25%
38	Kilmore Rd	East of Saunders Rd	9,010	16,040	9,860	16,500	+850	+460	+9%	+3%
39	Robertson Road	Brantome St and Aitken St	14,450	16,200	14,460	16,310	+10	+110	+0%	+1%
40	Hamilton St	Aitken St and Kilmore Rd	13,200	18,320	13,370	17,710	+170	-610	+1%	-3%

10 Summary and Conclusions

As part of the Gisborne Futures traffic and transport advice, Cardno has undertaken a strategic transport modelling exercise which involved the development of a Cube transport model of the wider Gisborne Local Government Agency (LGA) area. This model was developed from a sub-area of the wider Victoria Integrated Transport Model, with further refinement undertaken for the local road network and zone system in order to provide the degree of resolution required to sufficient evaluate a number of network and land use scenarios. A base model calibration exercise was also undertaken to ensure that the model sufficiently could replicate existing (observed) traffic patterns before it was used to evaluate any future year scenarios.

As part of the future year assessment undertaken, the following conclusions have been reached:

- The Do-Nothing network will have insufficient capacity to accommodate the projected long-term population and traffic forecasts for Gisborne.
  - Particularly Station Road and Kilmore Road are noted to have high degrees of congestion under this scenario, resulting in constrained access to the town centre from the North and the East.
- While the Reference network will provide some capacity upgrades, this is still considered insufficient to accommodate the projected long-term population and traffic forecasts for Gisborne.
- Key findings for the Station Road Duplication scenarios include:
  - The increase in capacity on Station Road allows an additional 6,000 trips on the link between the Calder Freeway interchange and Robertson Street by 2046;
  - It is shown that the reduced capacity on Station Road forces trips further along Calder Freeway to the Melbourne Road interchange and into the town centre via Melbourne Road, as there is now a reduction in trips on the Calder Freeway between the Station Road and Melbourne Road interchanges, and Melbourne Road links;
  - Similarly, there is a reduction in traffic on Saunders Road and Kilmore Road, suggesting that traffic was previously using this route, albeit to a lesser extent than Melbourne Road. It is noted that there is otherwise minimal impact on other links in New Gisborne;
  - Despite the relief on Melbourne Road it does still marginally exceed capacity in 2046, however remains within capacity in 2031;
  - The increase in capacity on Station Road does also transfer further south to Aitken Street south of Robertson Street, as vehicles now have a more direct access to Melton Road, Mt Gisborne Road and residential development south of the town centre; and
  - There is minimal change in traffic volumes on other strategic links into Gisborne including Bacchus Marsh Road, Melton Road, and Mt Gisborne Road.
- Key findings for the Western Link Road scenarios include:
  - Traffic volumes decrease significantly on the Calder Freeway between the Mt Macedon Road interchange and the Melbourne Road interchange in both the 2031 and 2046 scenarios;
  - Station Road shows reductions in traffic volumes in both 2031 and 2046, however will still operate above capacity and would require some improvements to cater for the future demand;
  - Aitken Street shows significant reductions in traffic volumes (23% and 17% in 2031 and 2046 respectively), and will fall to within capacity in 2031 and just above capacity in 2046;
  - Similarly, Melbourne Road traffic volumes between Howey Street and the freeway interchange fall by 11% to within capacity in 2031 and 17% to just above capacity in 2046; and
  - A significant reduction in traffic volumes on Bacchus Marsh Road, between the Hamilton Street intersection and WLR connection, also having a positive impact on Robertson Street.
- Key findings for the Eastern Link Road scenarios include:

- Saunders Road shows up to 25% reduction in traffic volumes (1,800 and 4,100 trips in 2031 and 2046 respectively) with the provision of an ELR, reflecting the fact that vehicles from the eastern side of New Gisborne will no longer need to travel that route to access the freeway, particularly if travelling toward Melbourne;
- The ELR has a negligible impact on Station Road, with a 1% reduction in traffic volumes both north and south of Calder Freeway. The link does reduce traffic on Kilmore Road between Saunders Road and Melbourne Road by up to 9%;
- There is a lesser impact on Melbourne Road, with a 3% reduction in traffic volumes in 2046, with the link remaining above capacity.

> On balance, it is considered that the Western Link Road option best achieves the project aims of providing an efficient and attractive bypass outside of the Gisborne town centre area, with minor reduction in traffic volumes on both Station Road and Kilmore Avenue as a result.

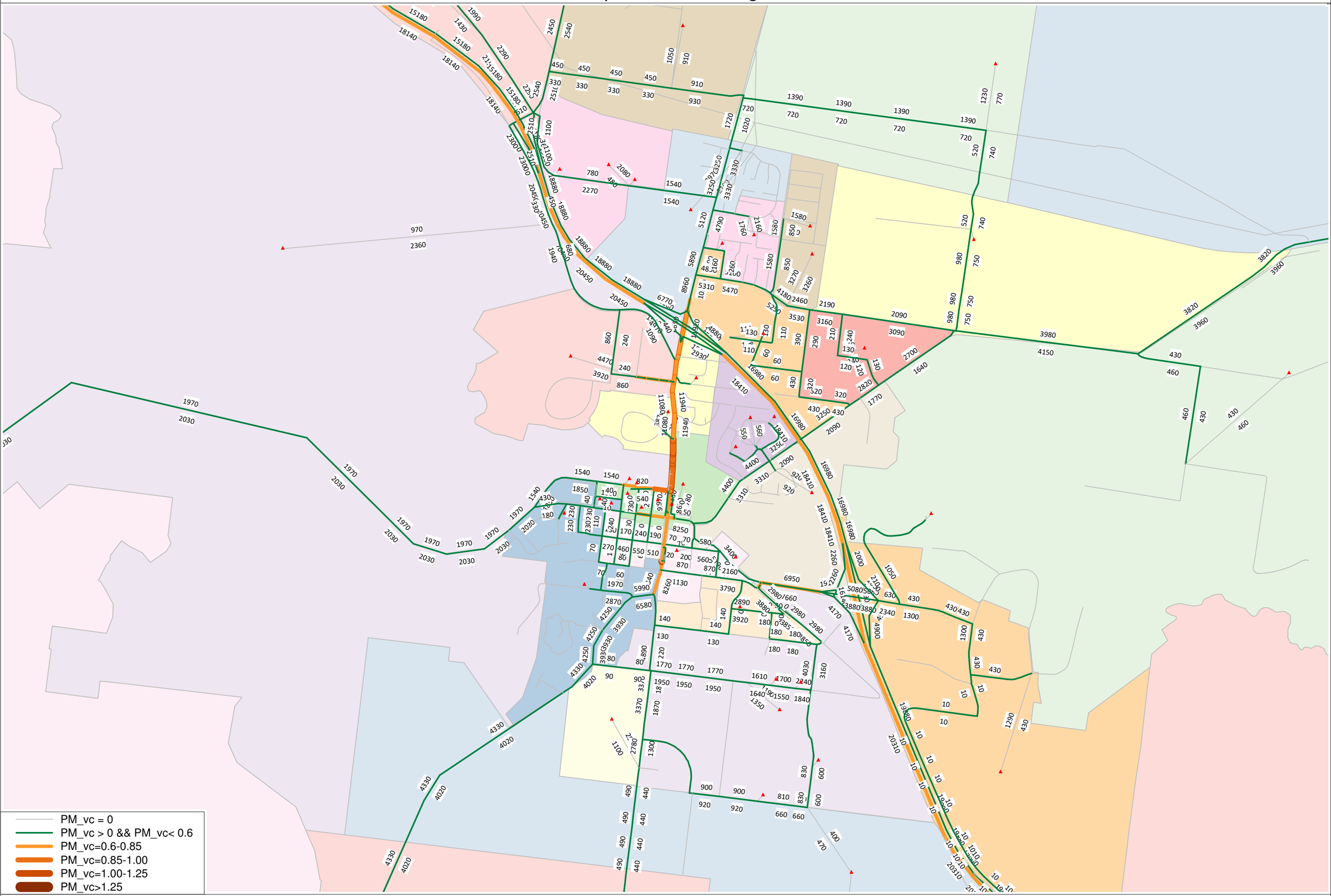
- **It is recommended that a detailed alignment study is undertaken to determine the most suitable alignment of the Western Link Road to account for geographical and engineering constraints.**
- **Further detailed economic assessment is also recommended for the Western Link Road to confirm the economic viability of the project and demonstrate that it will provide a net economic benefit for both Gisborne and the state of Victoria.**

APPENDIX

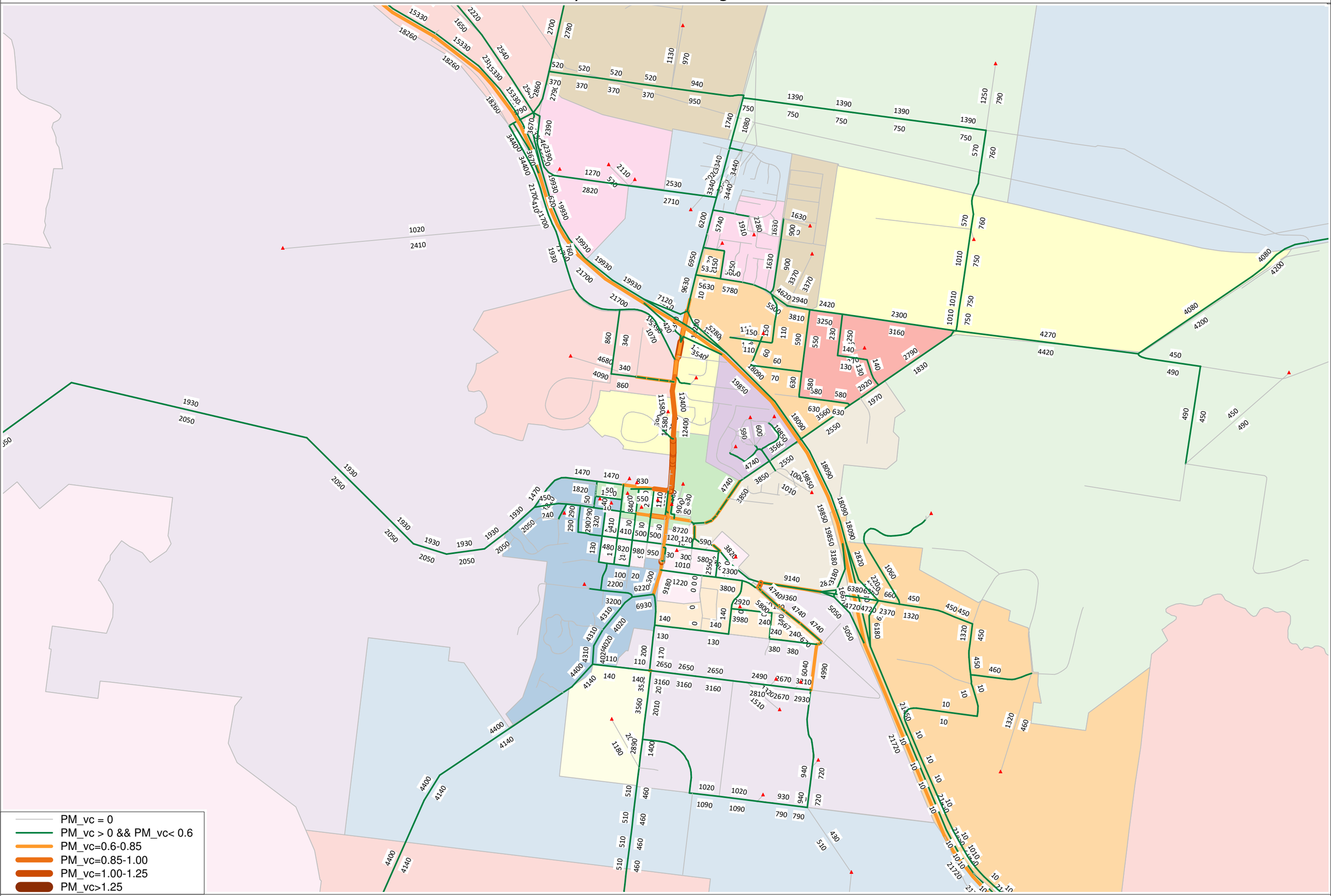
A

2031 DAILY LINK VOLUMES

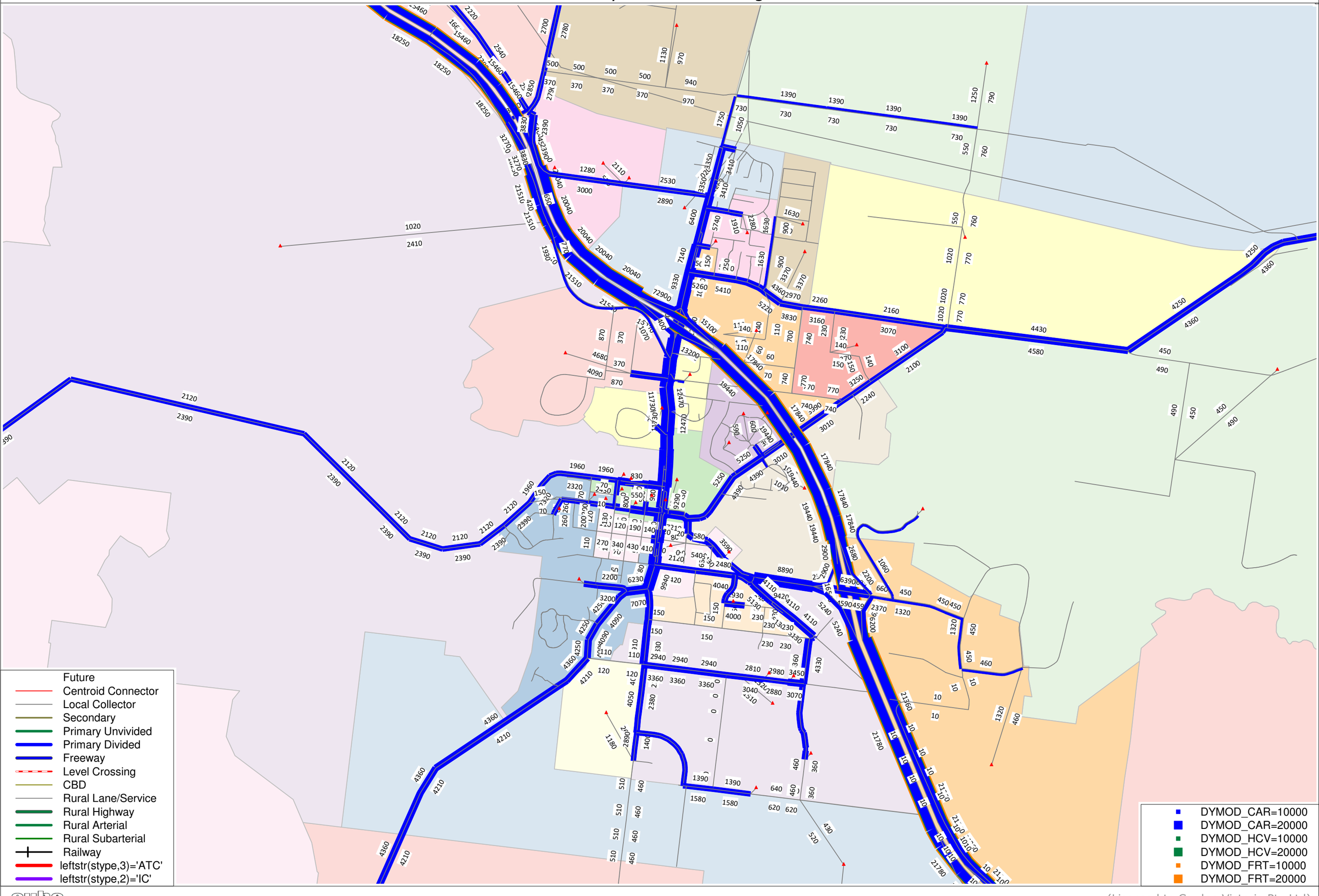
NETWORK PLOT - Daily Vehicles or Changes for 2031 NoDev



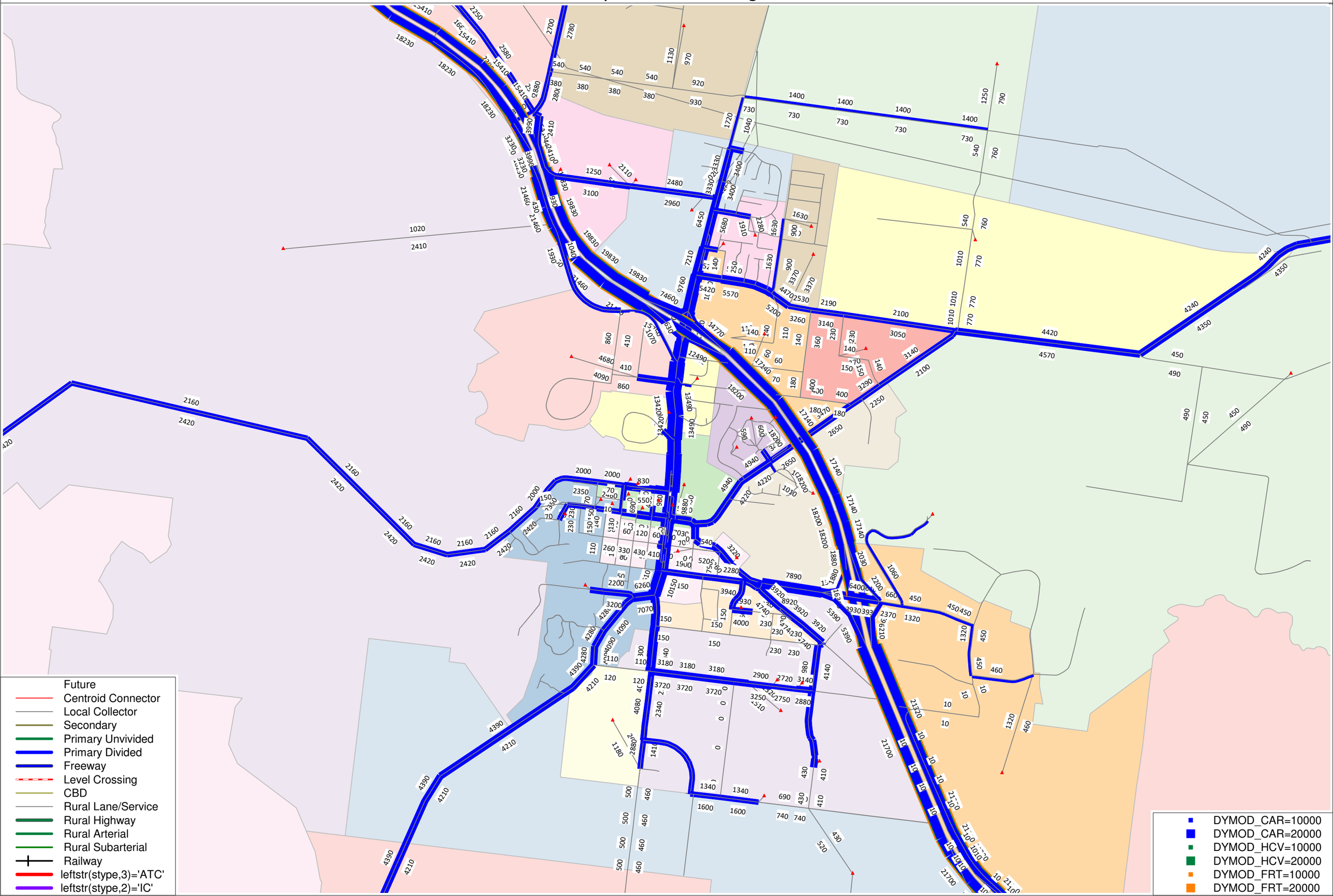
NETWORK PLOT - Daily Vehicles or Changes for 2031 Y2031_GBP05



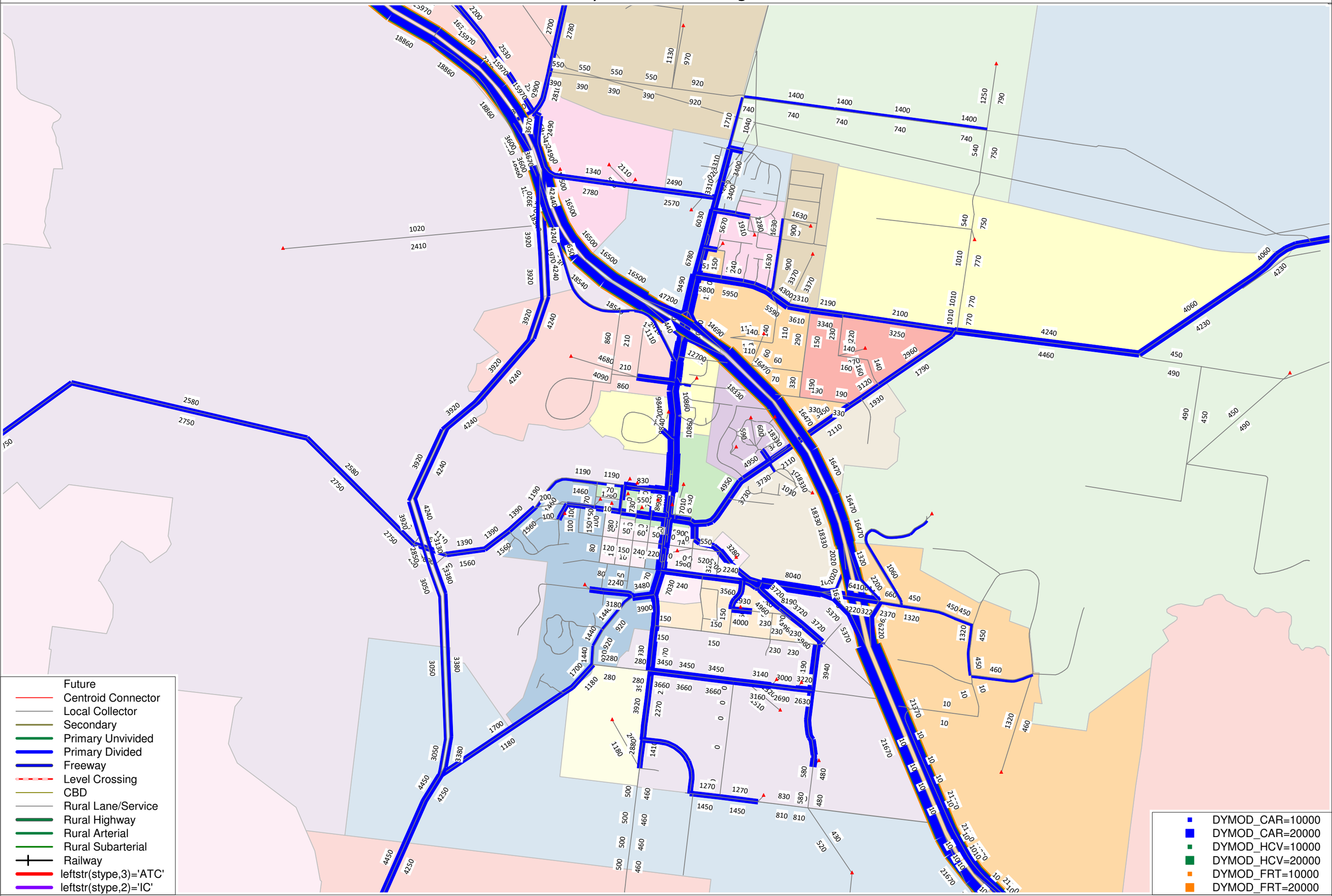
NETWORK PLOT - Daily Vehicles or Changes for 2031 Ref



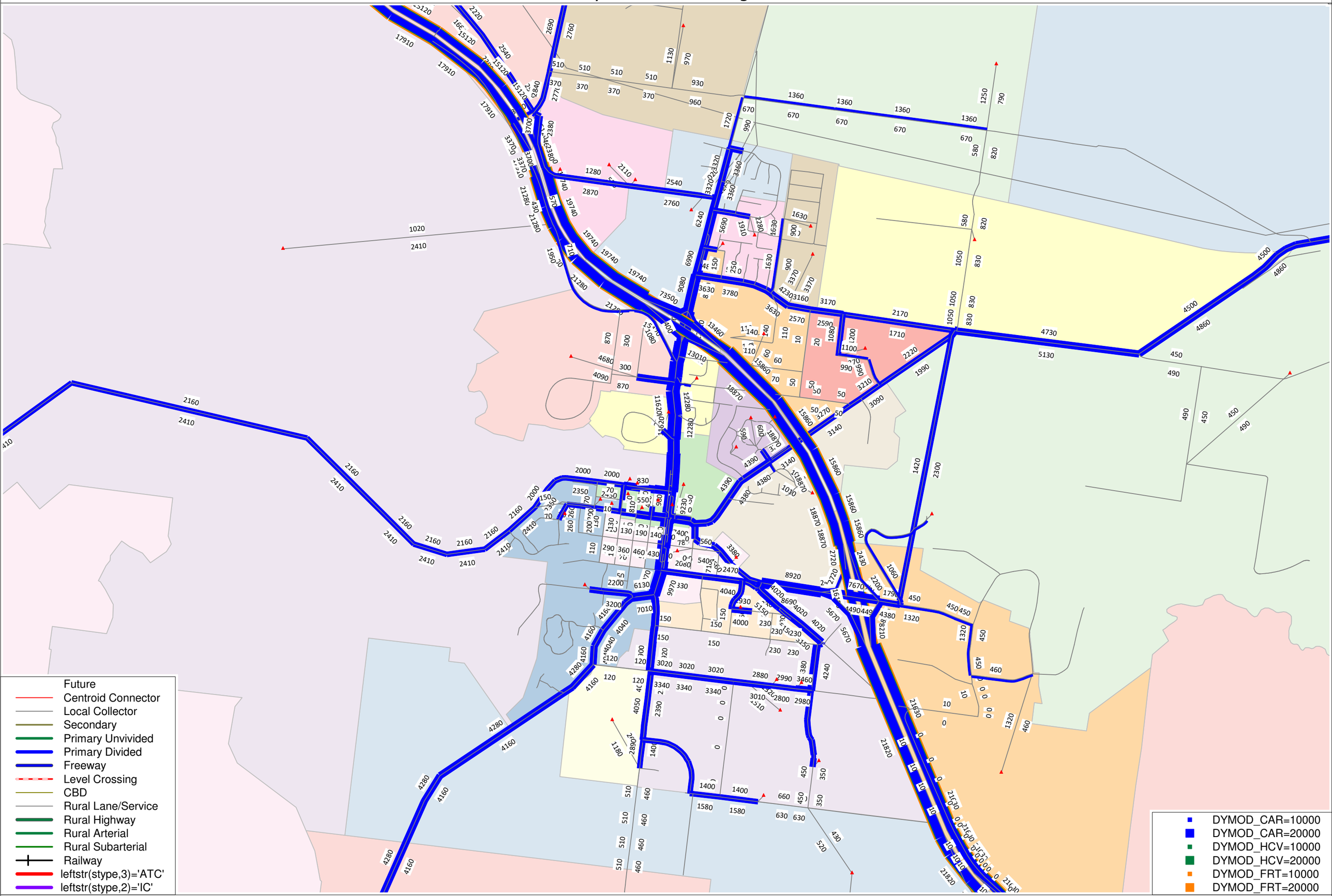
NETWORK PLOT - Daily Vehicles or Changes for 2031 SRDUP



NETWORK PLOT - Daily Vehicles or Changes for 2031 WBP1200



NETWORK PLOT - Daily Vehicles or Changes for 2031 EBYPASS



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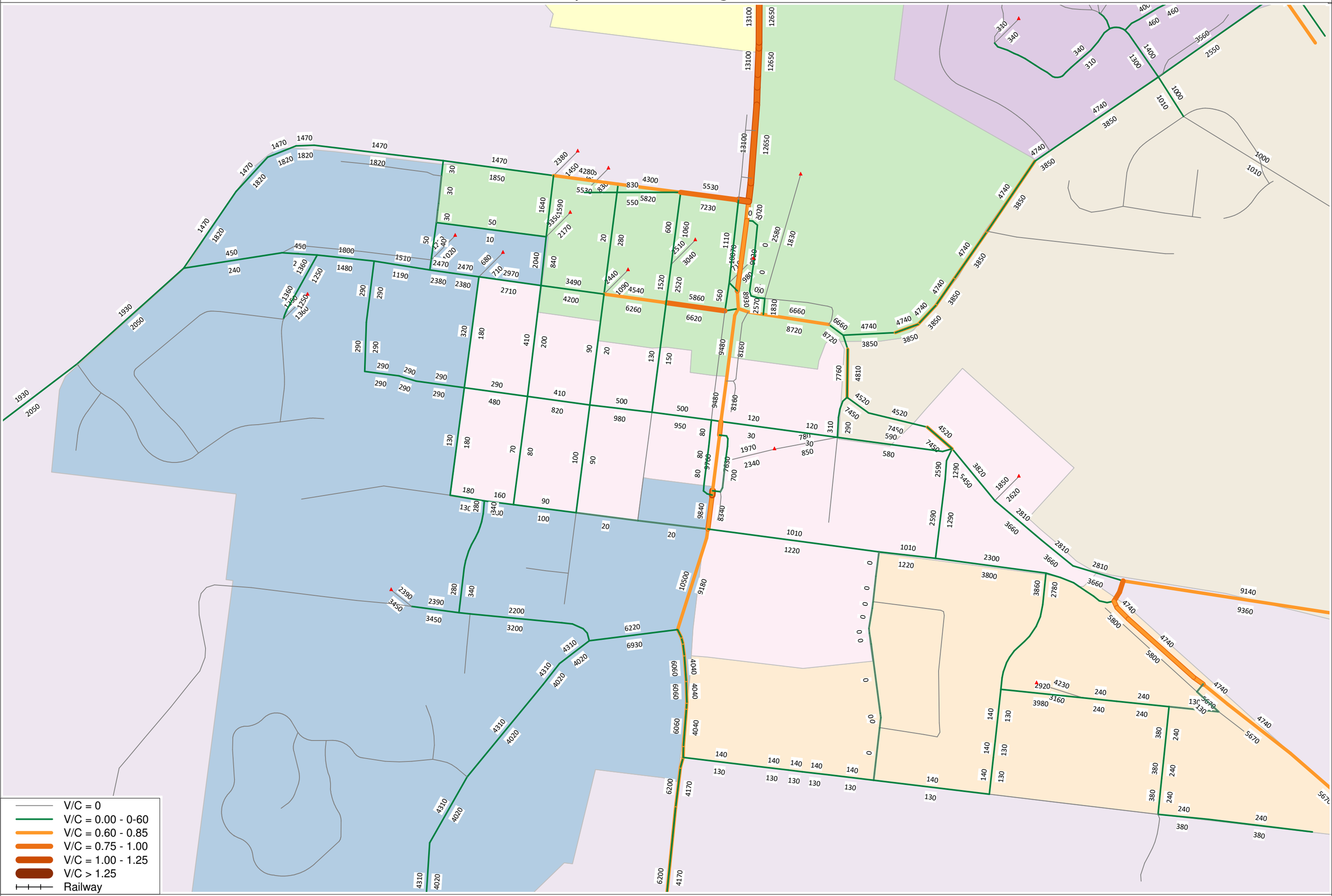

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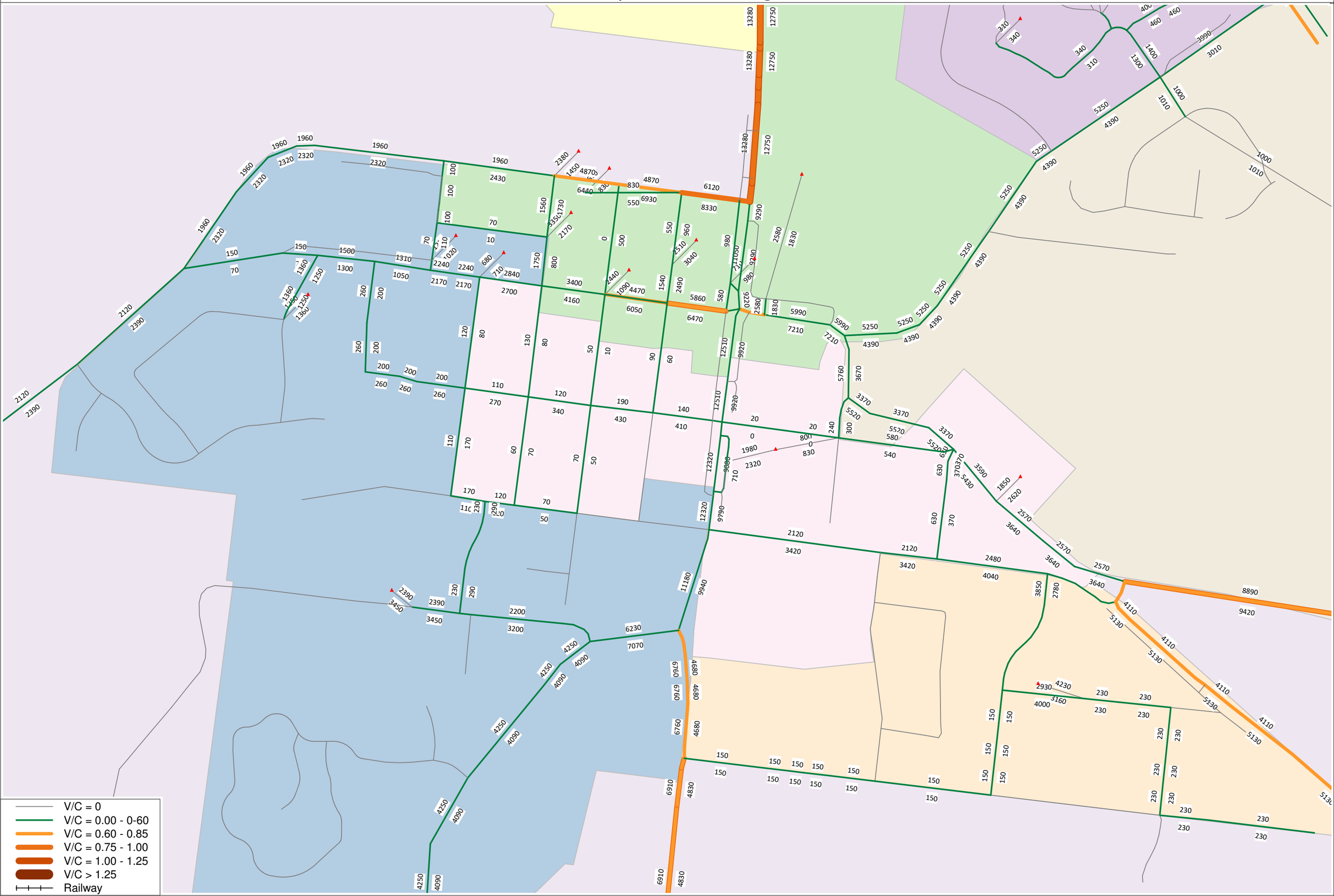
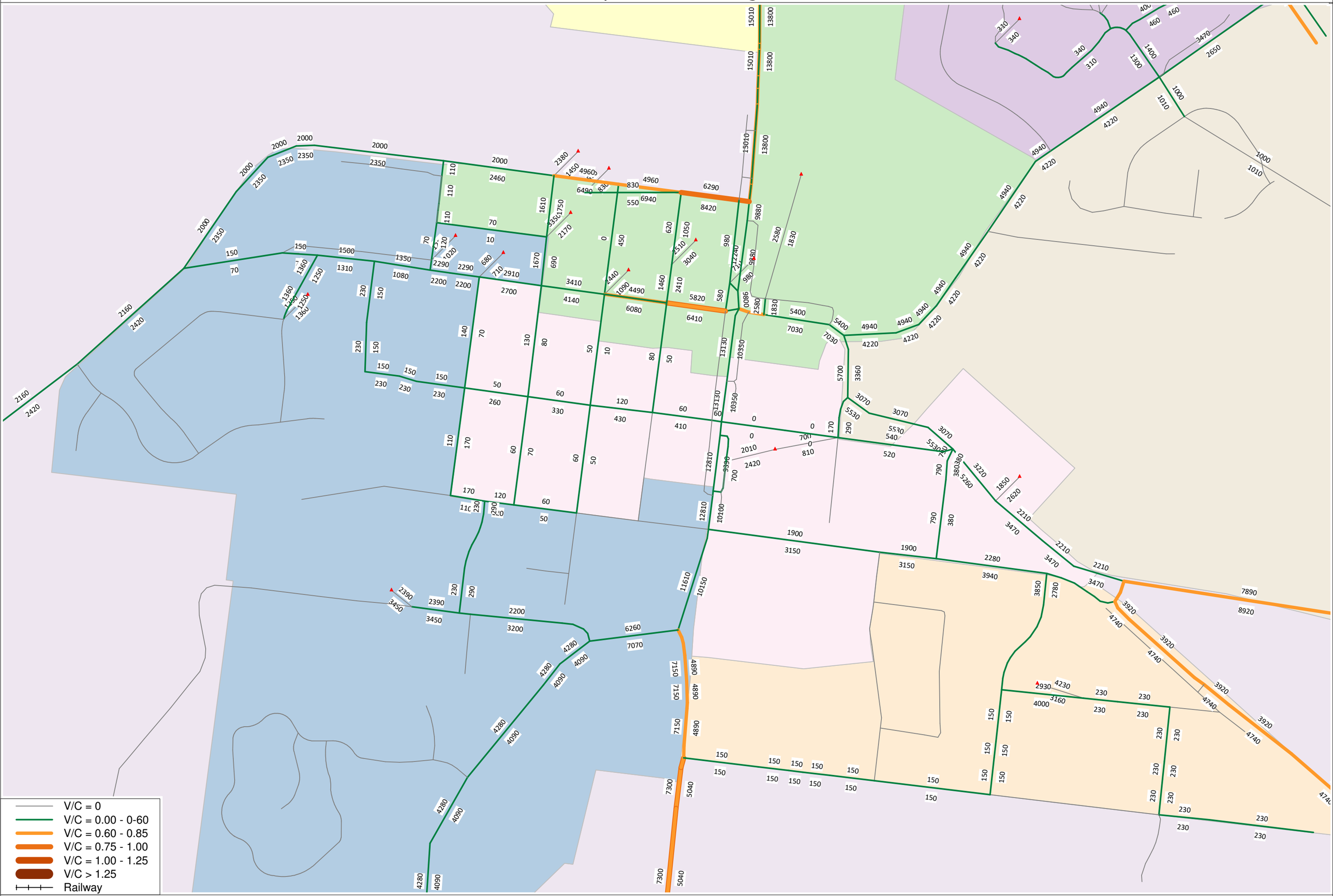


NETWORK PLOT - Daily Vehicles or Changes for 2031 SRDUP



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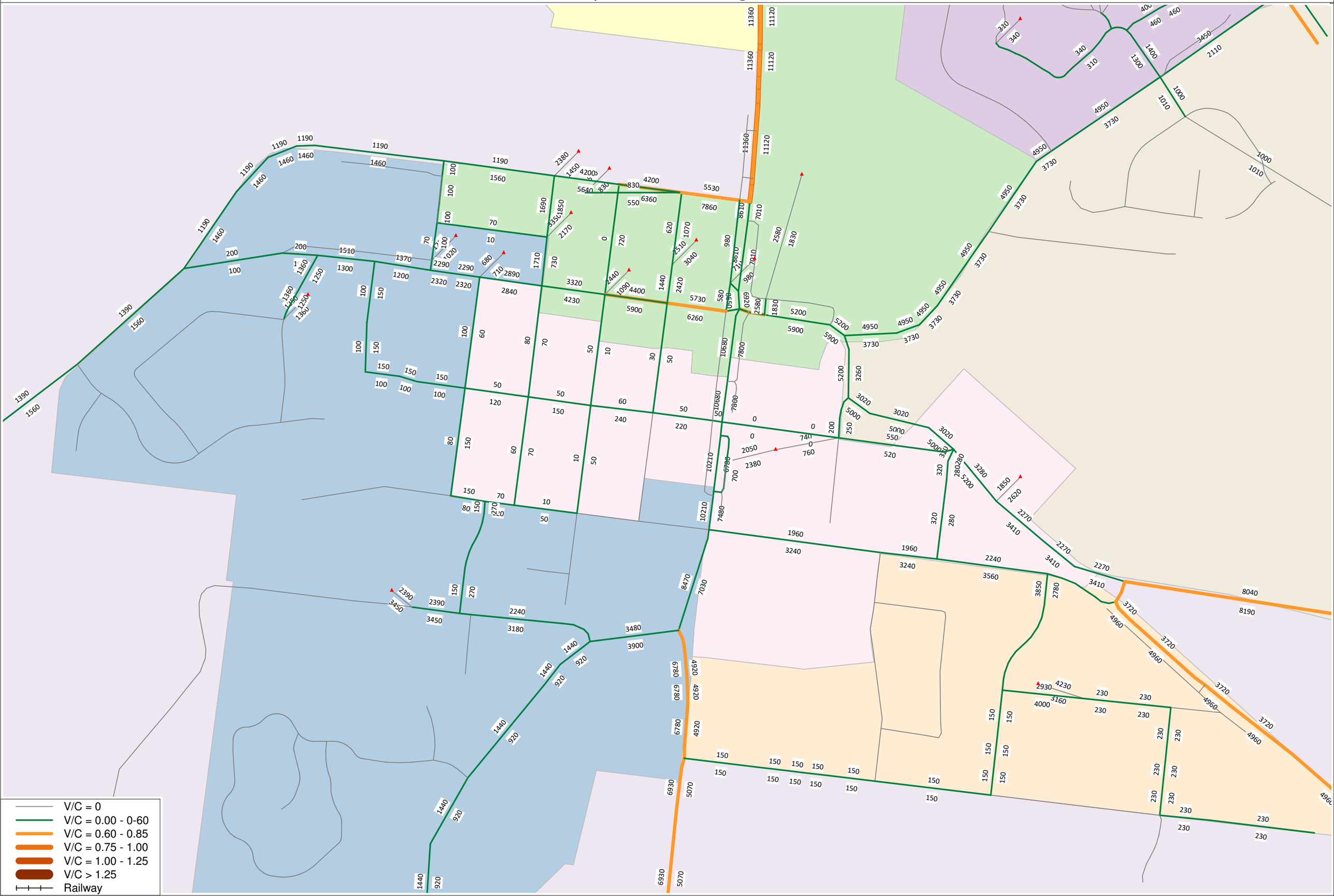
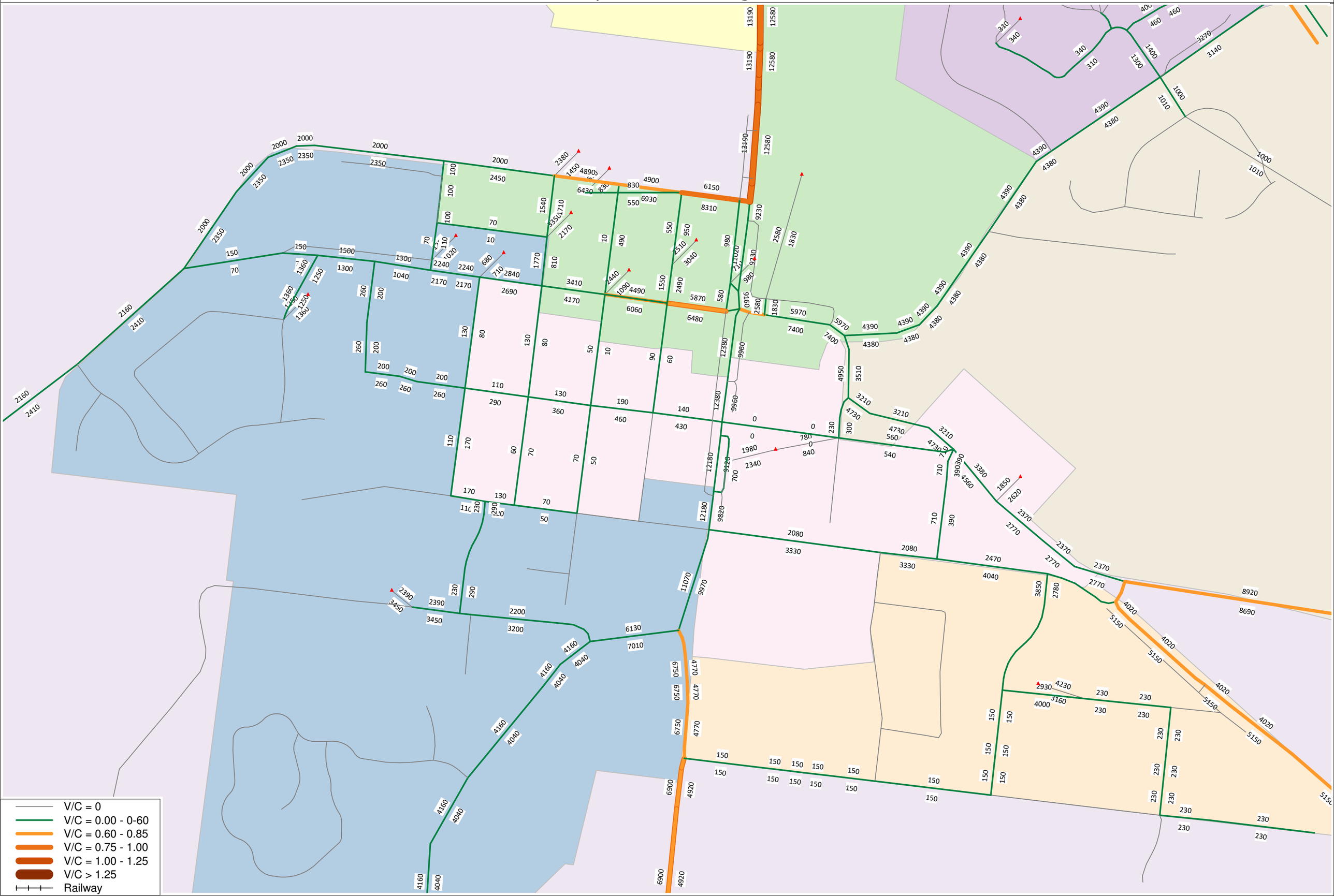


NETWORK PLOT - Daily Vehicles or Changes for 2031 EBYPASS



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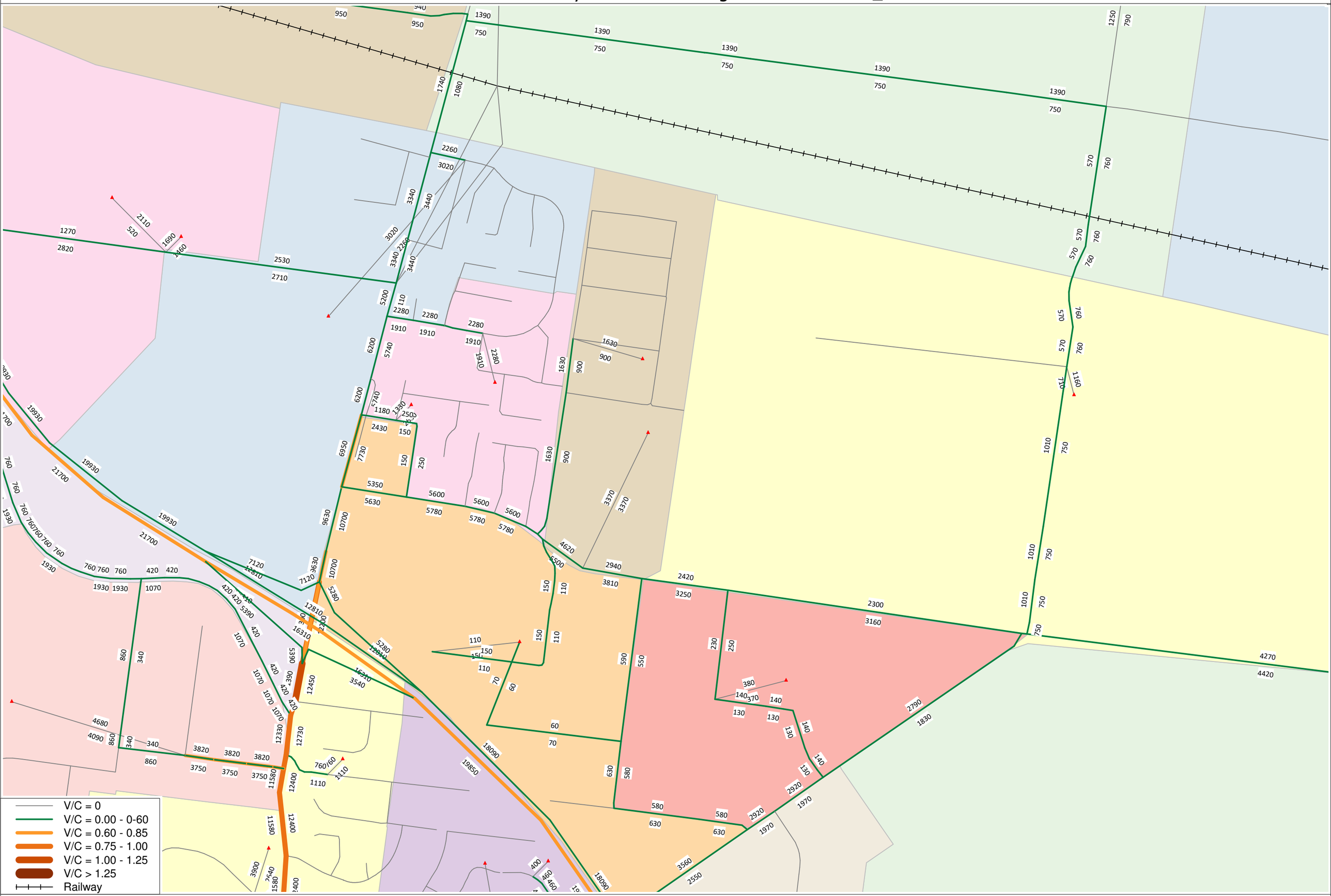

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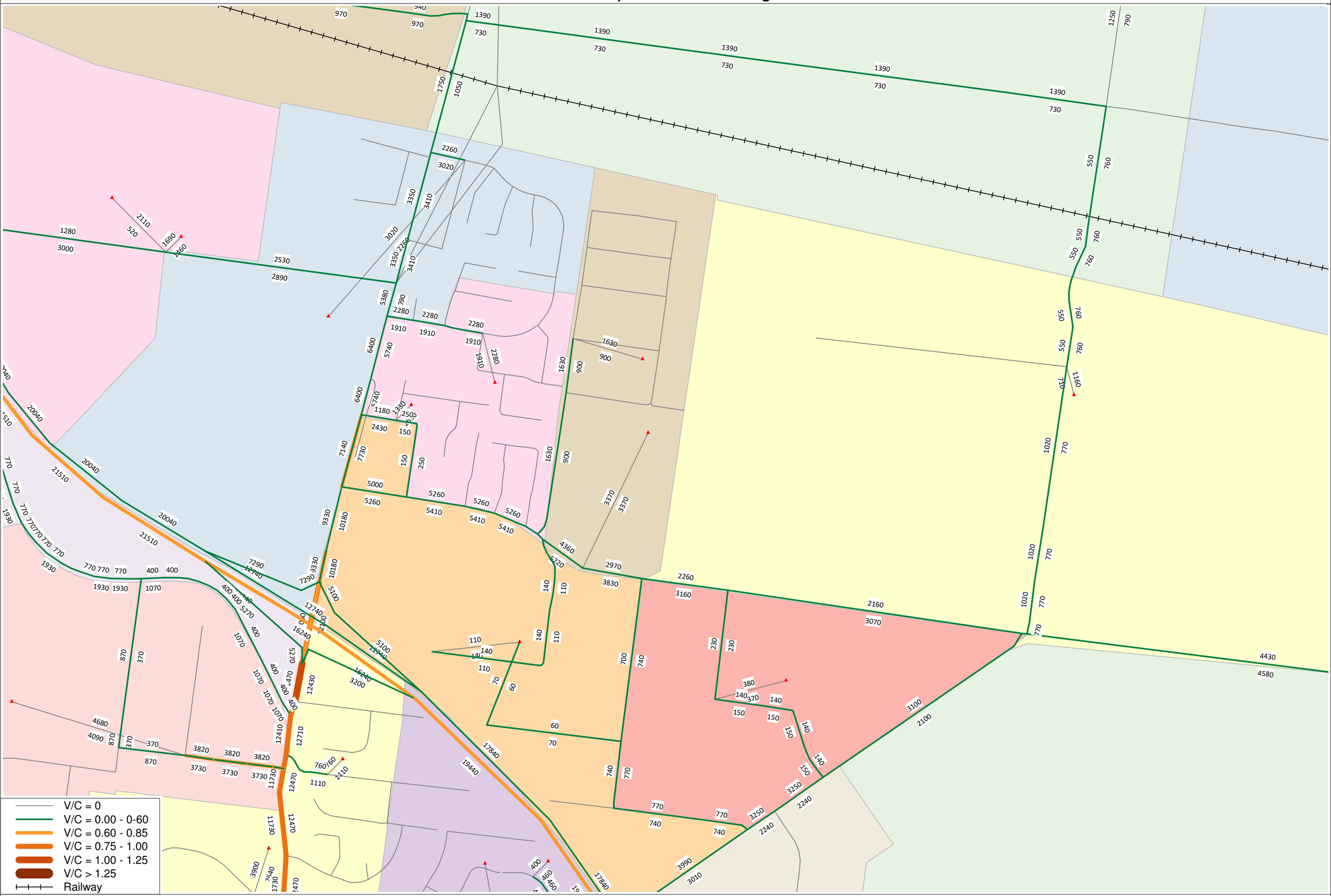

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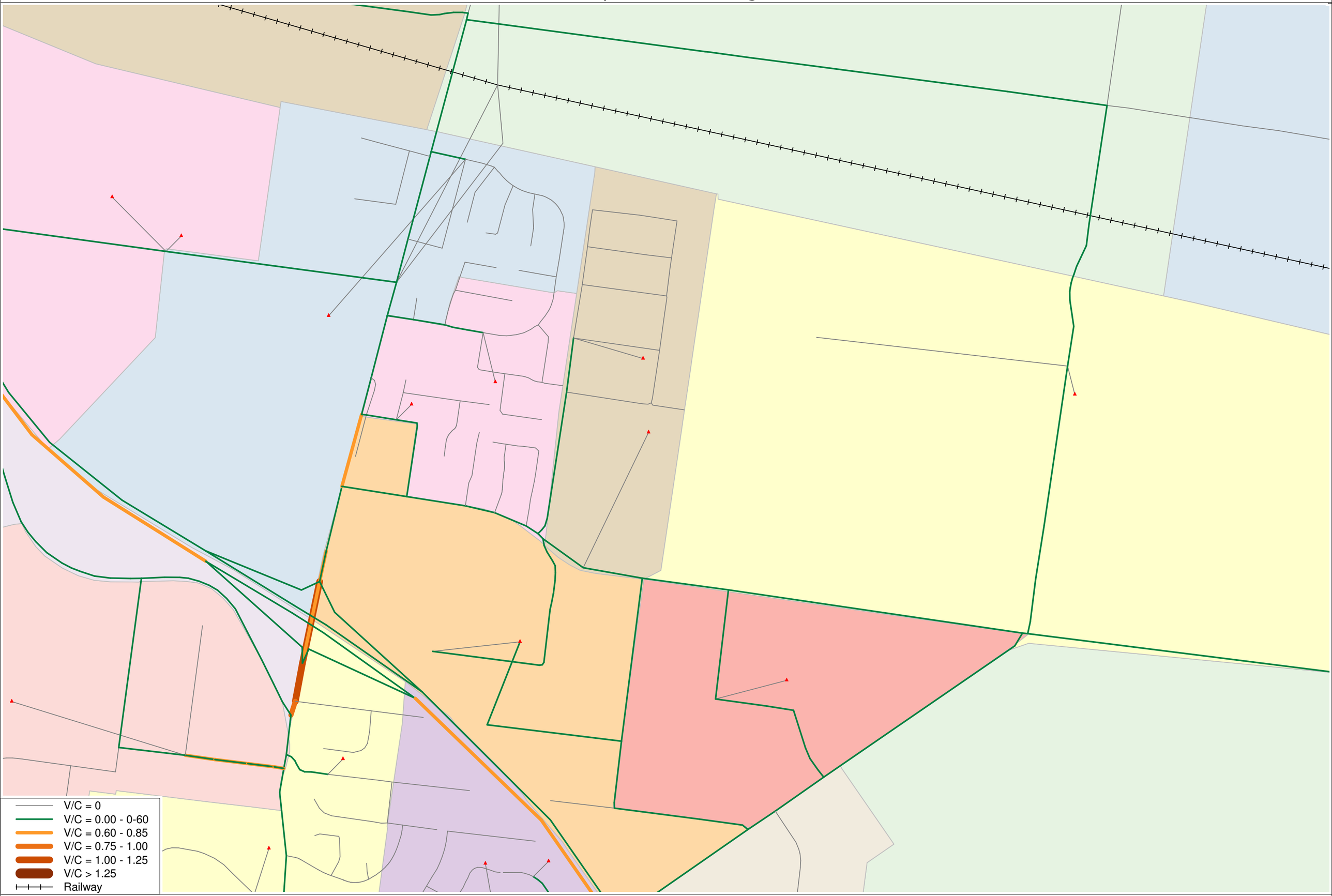

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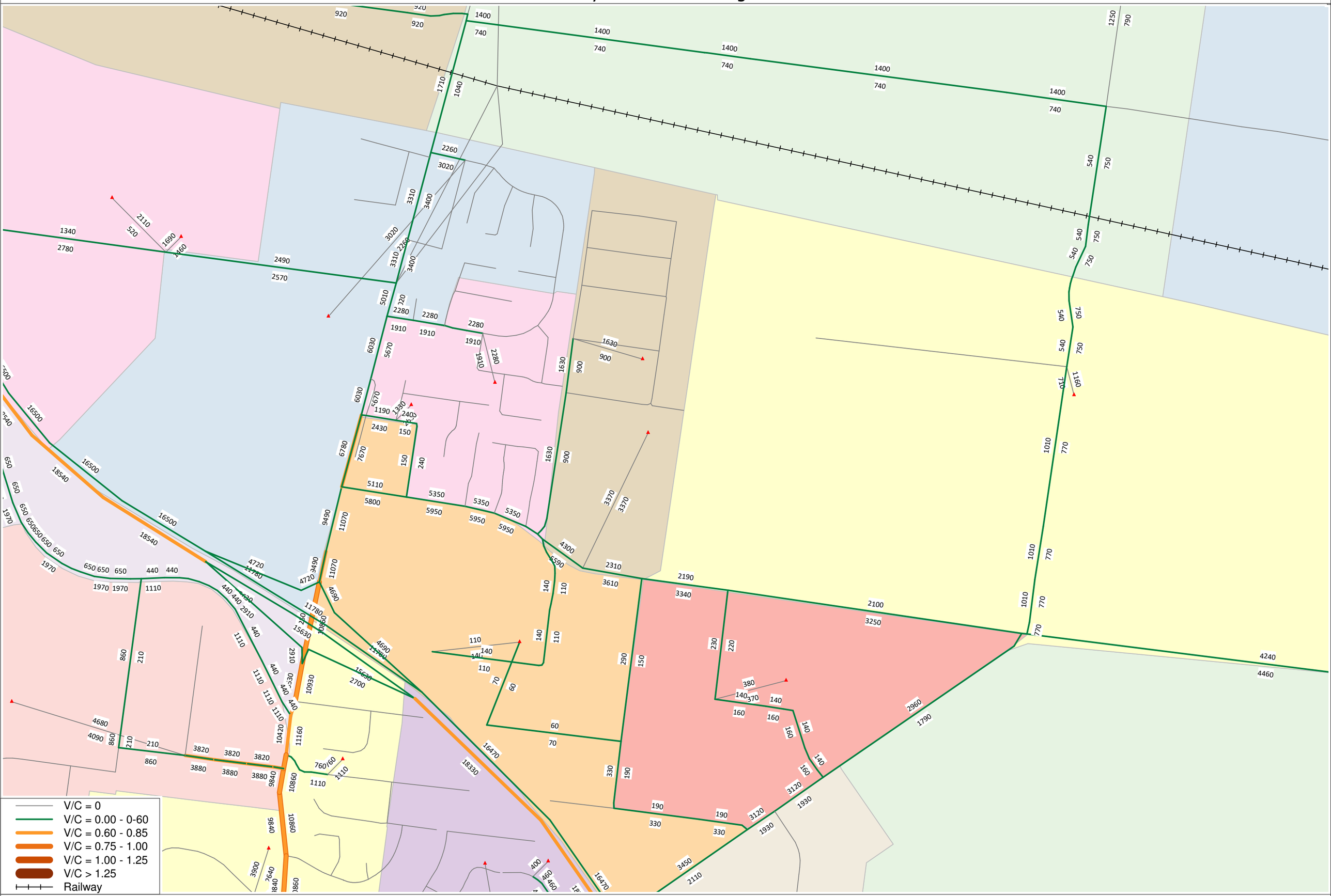
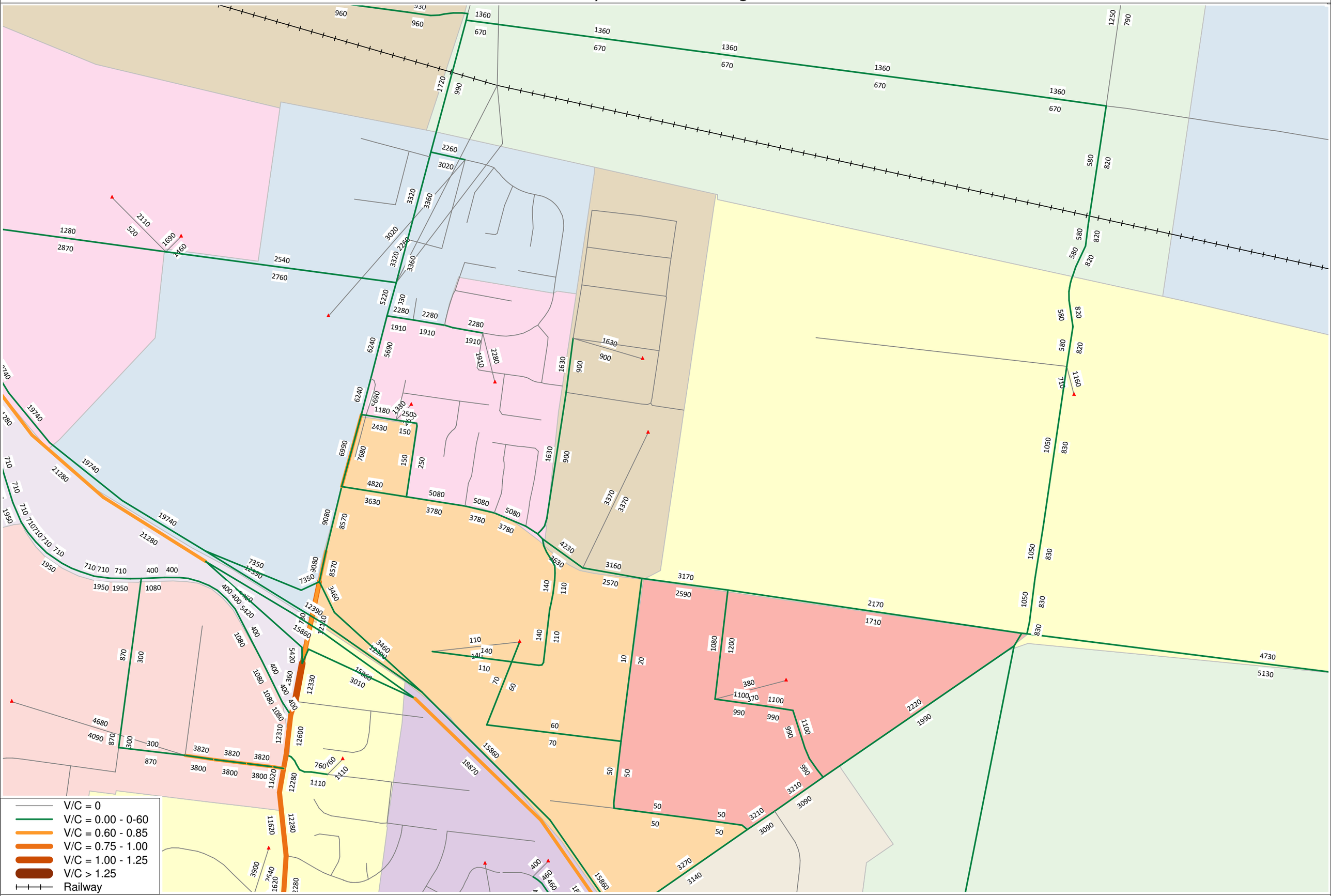


NETWORK PLOT - Daily Vehicles or Changes for 2031 EBYPASS

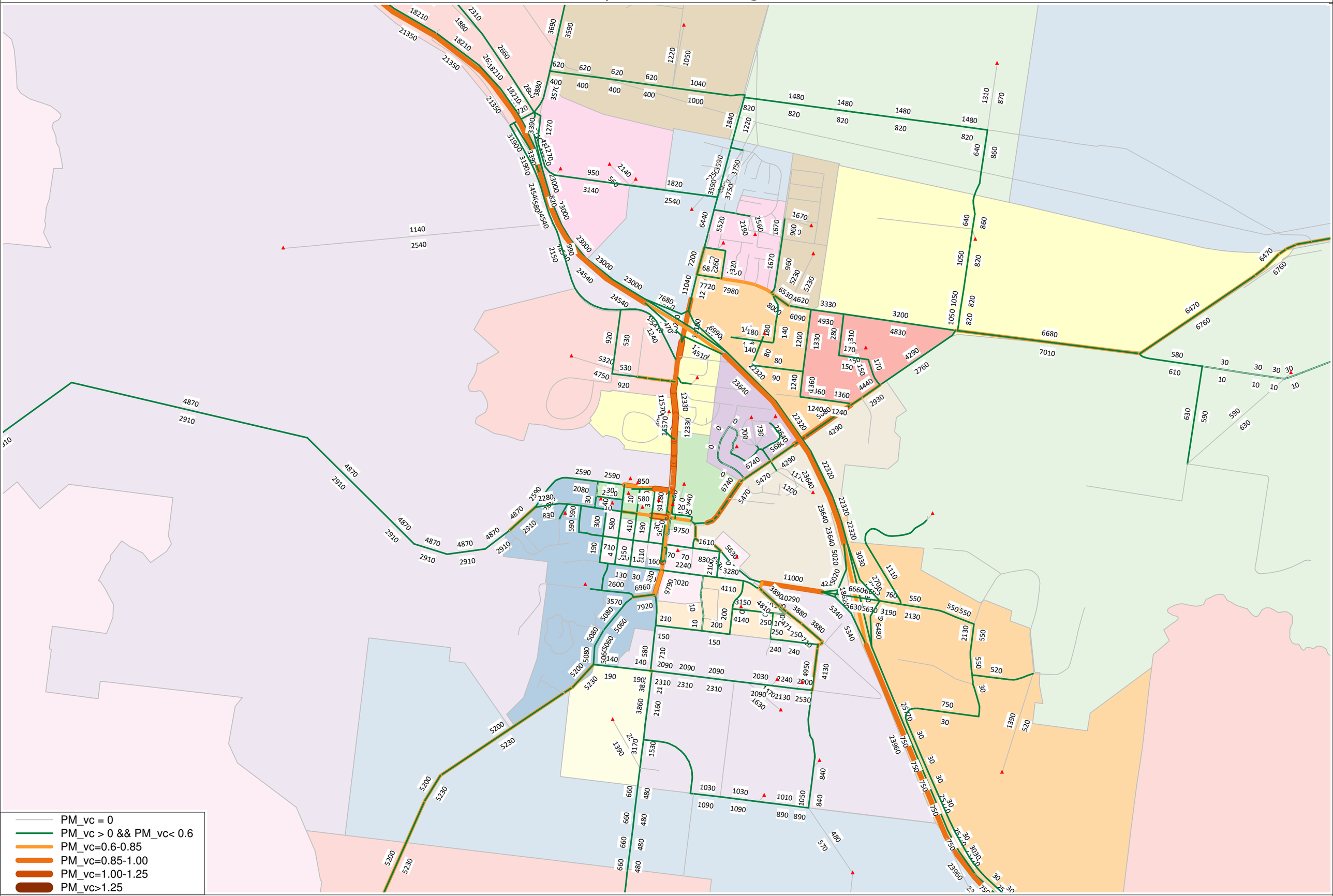


APPENDIX

B

2046 DAILY LINK VOLUMES

NETWORK PLOT - Daily Vehicles or Changes for 2046 NoDev



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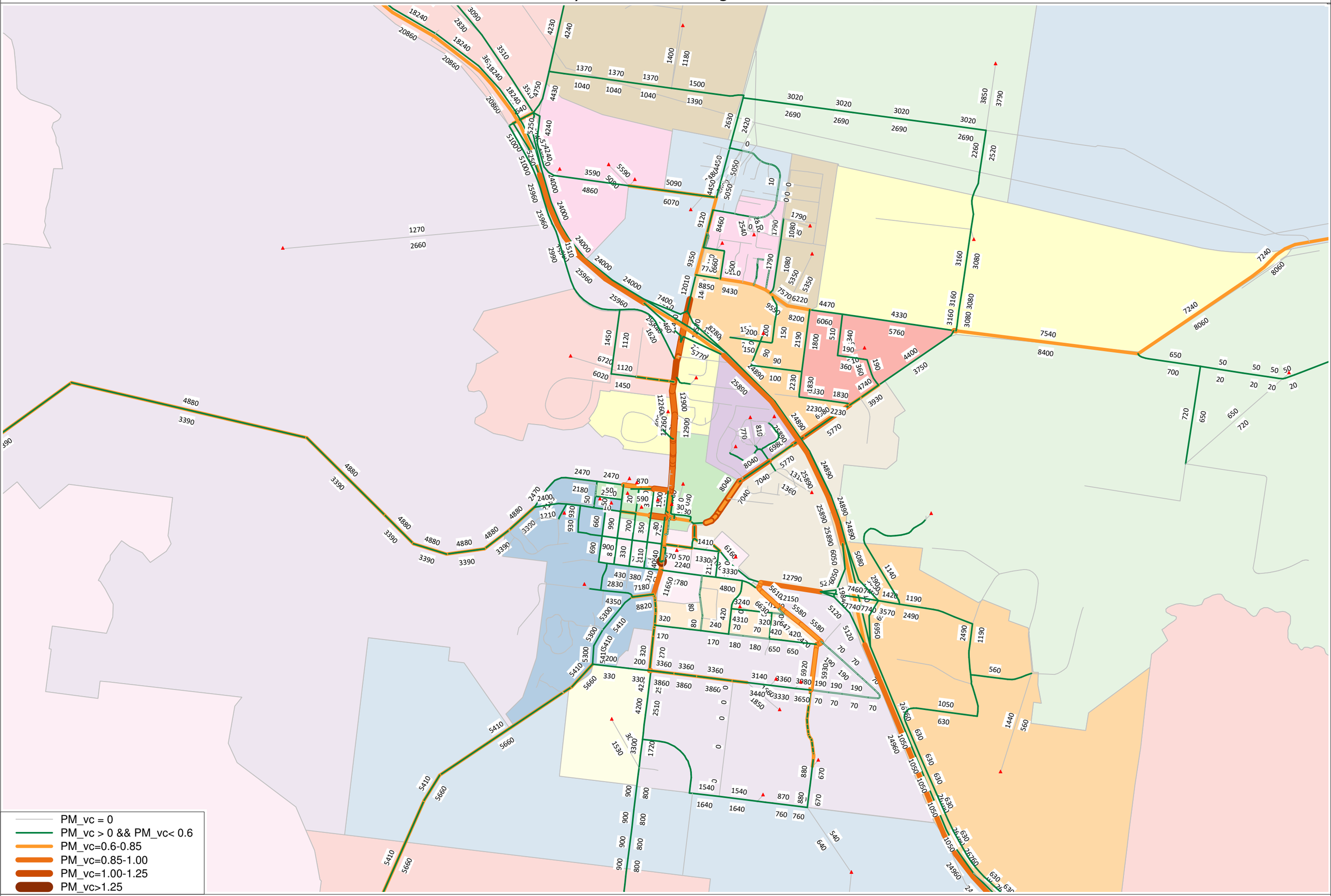

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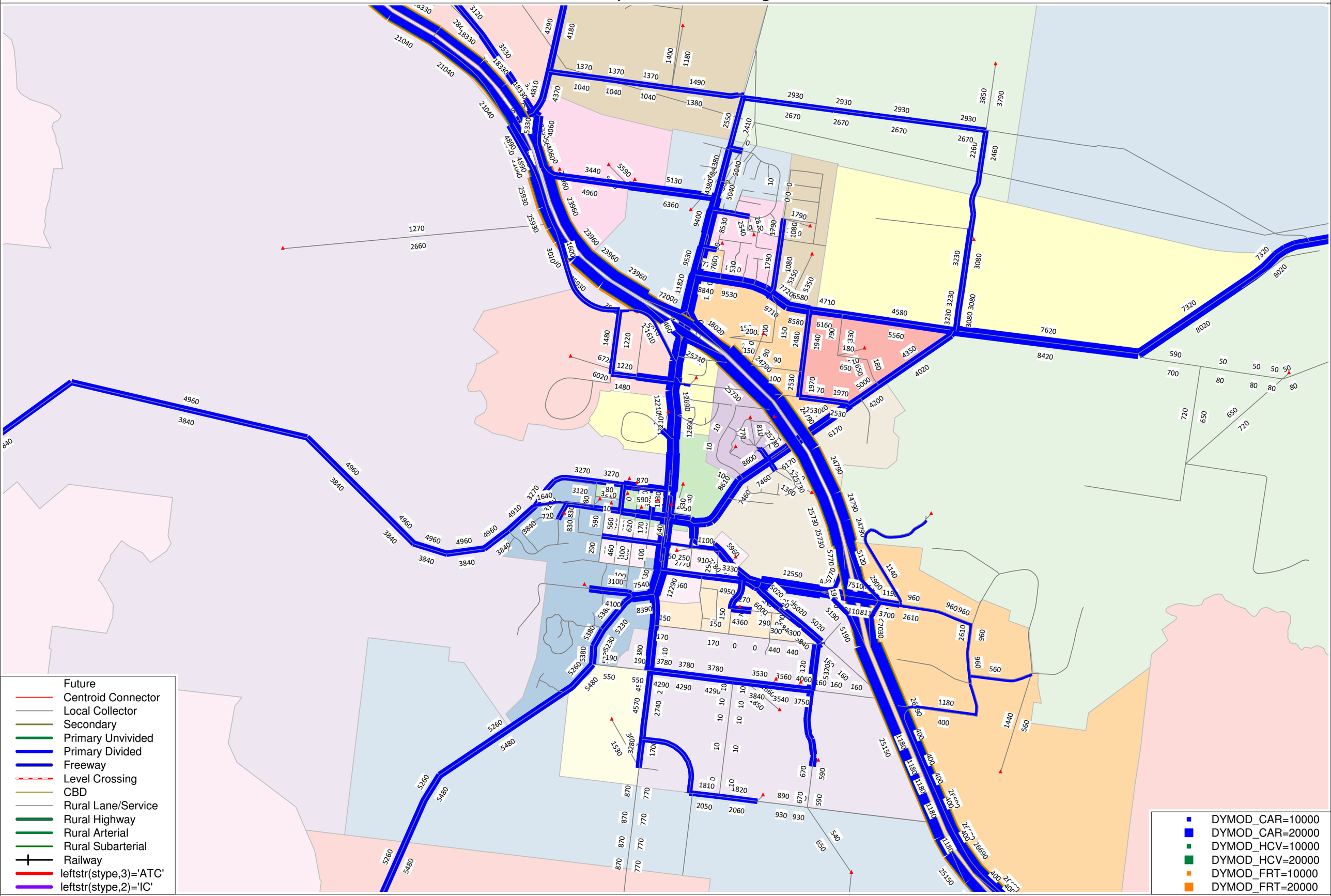

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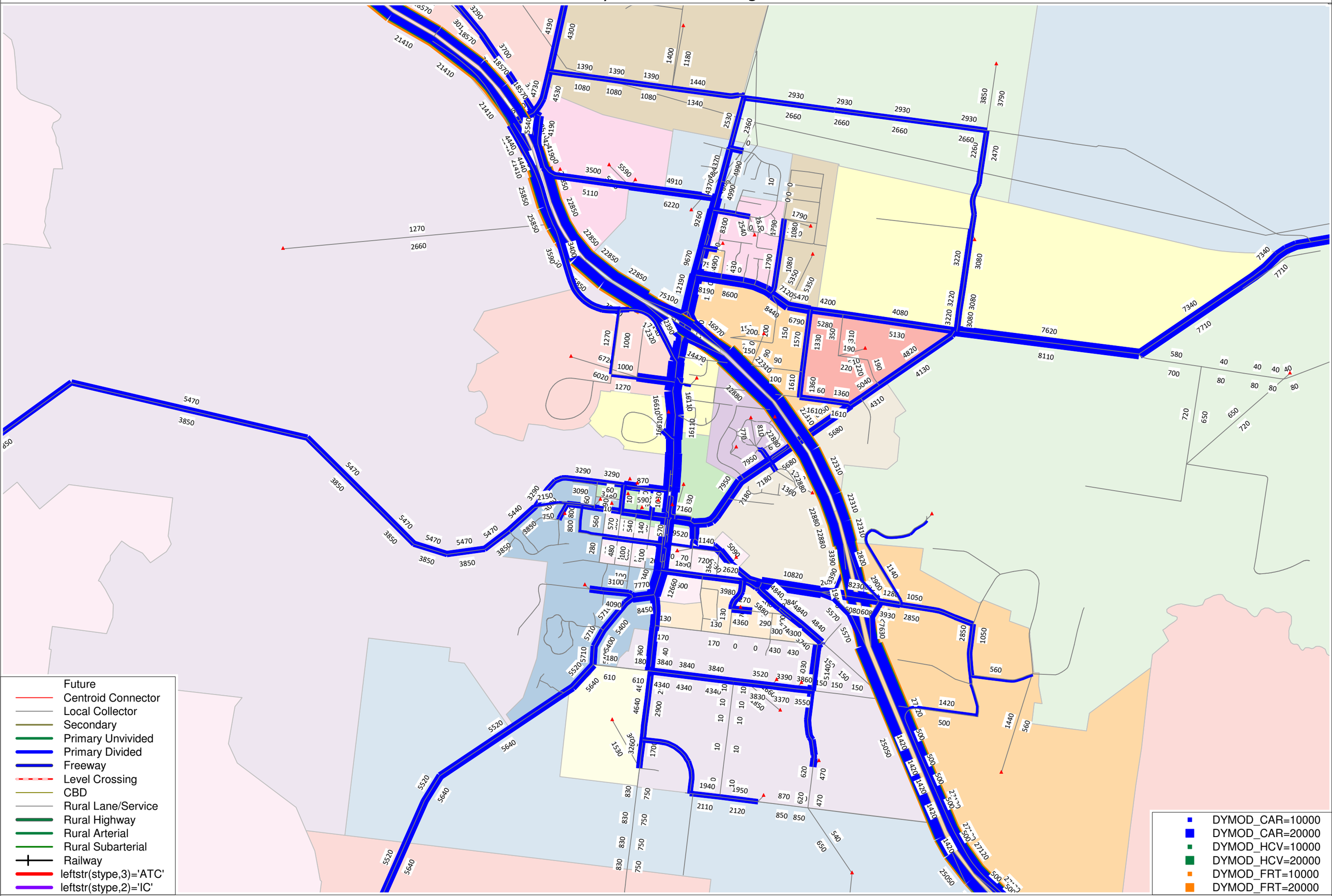

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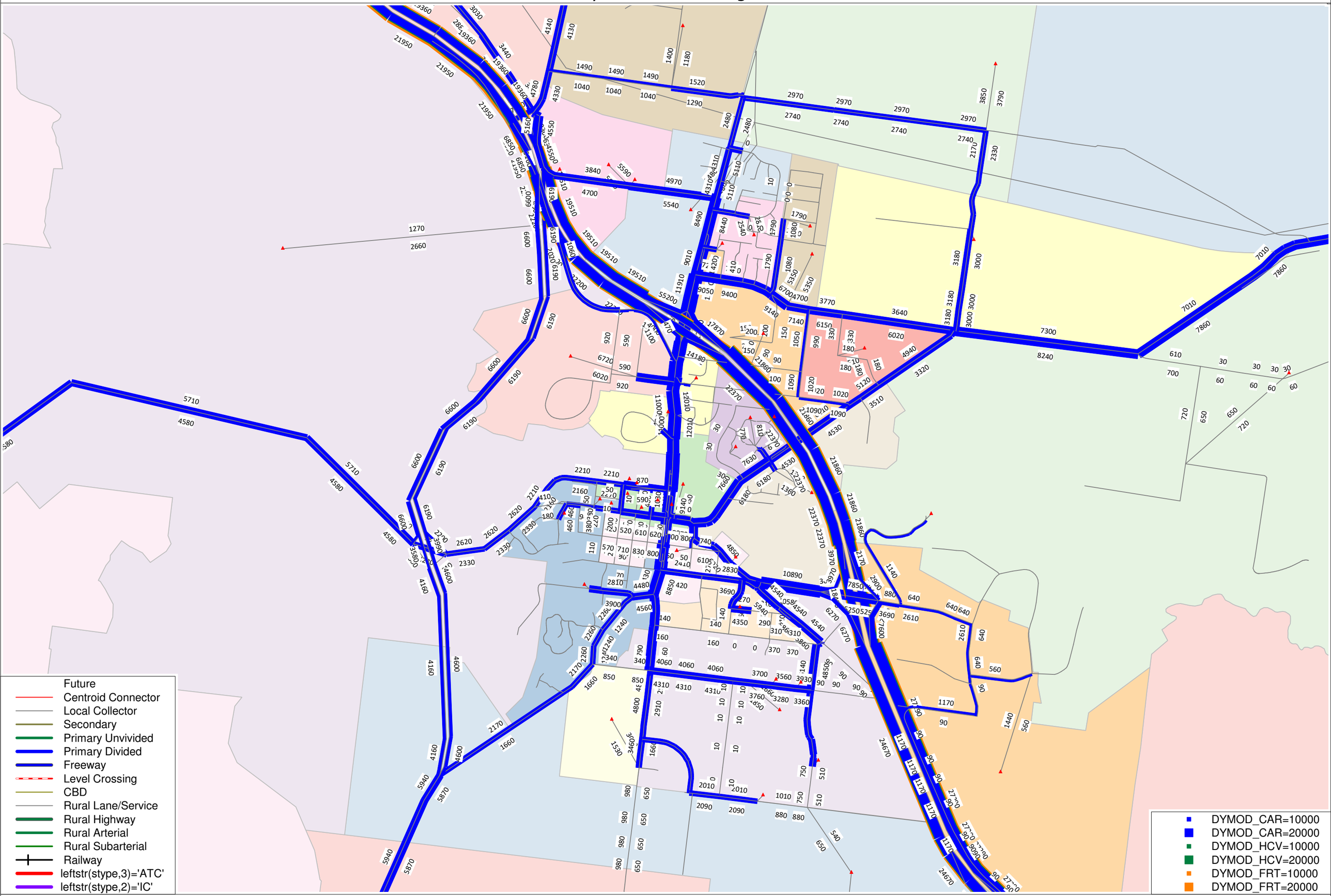

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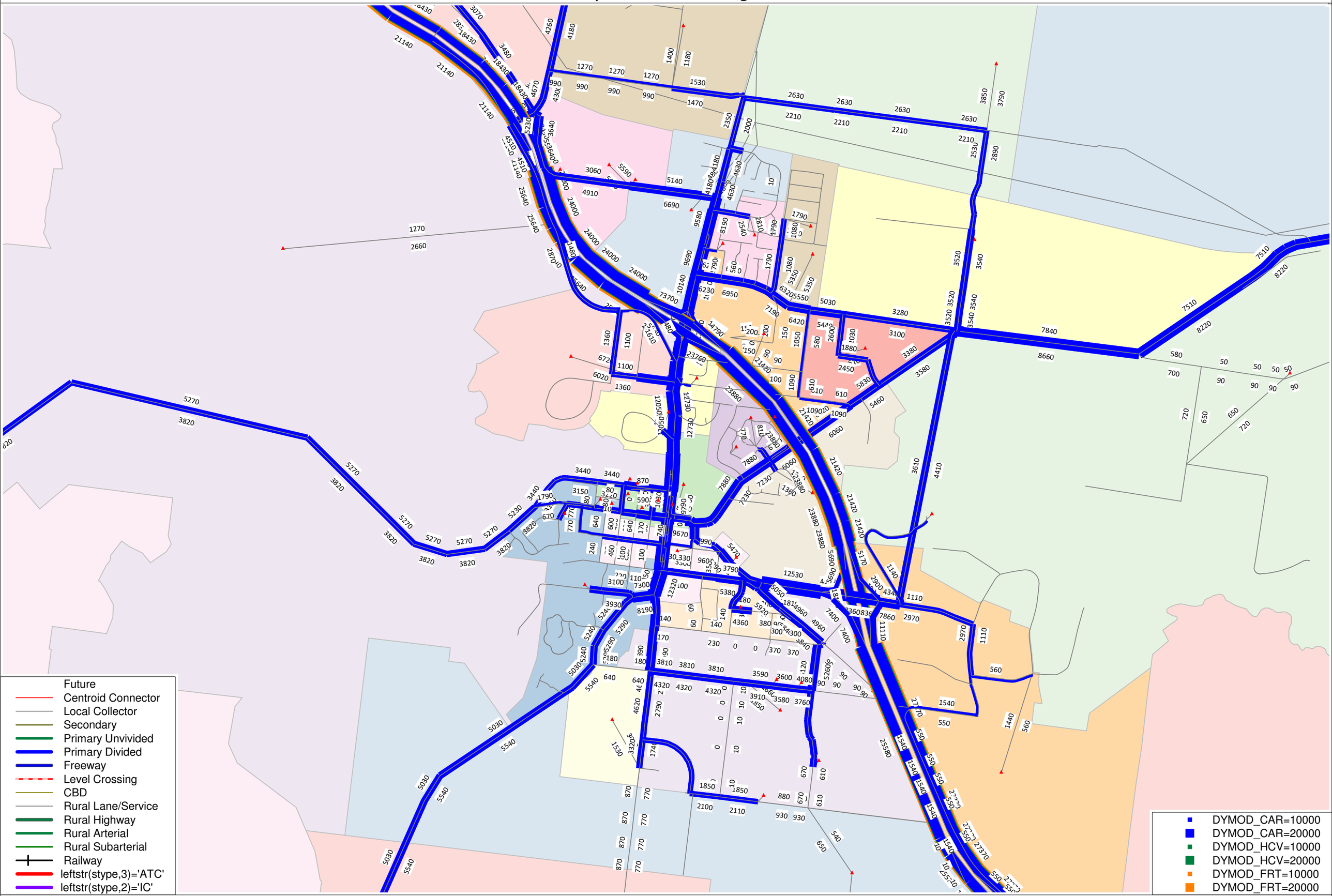

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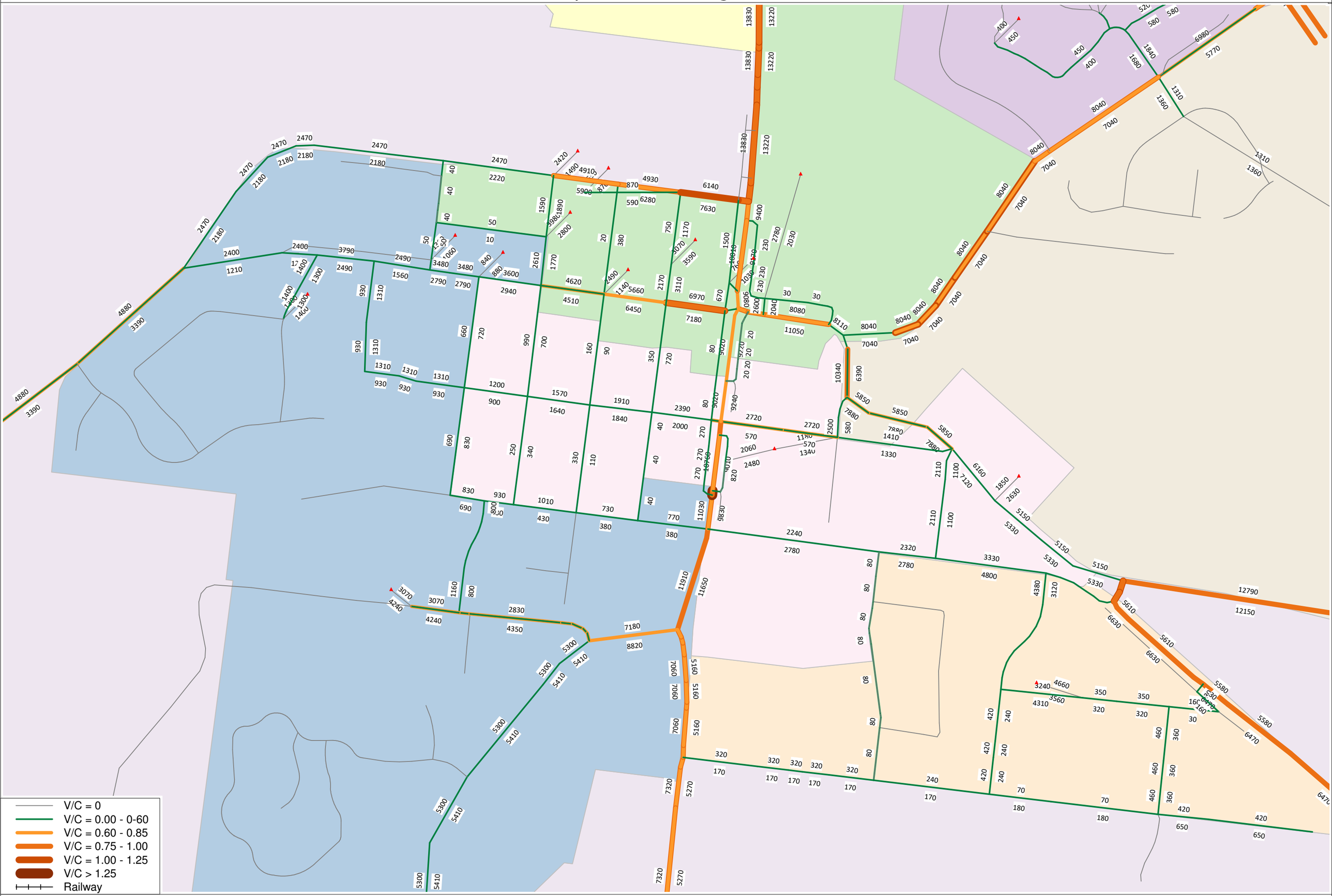

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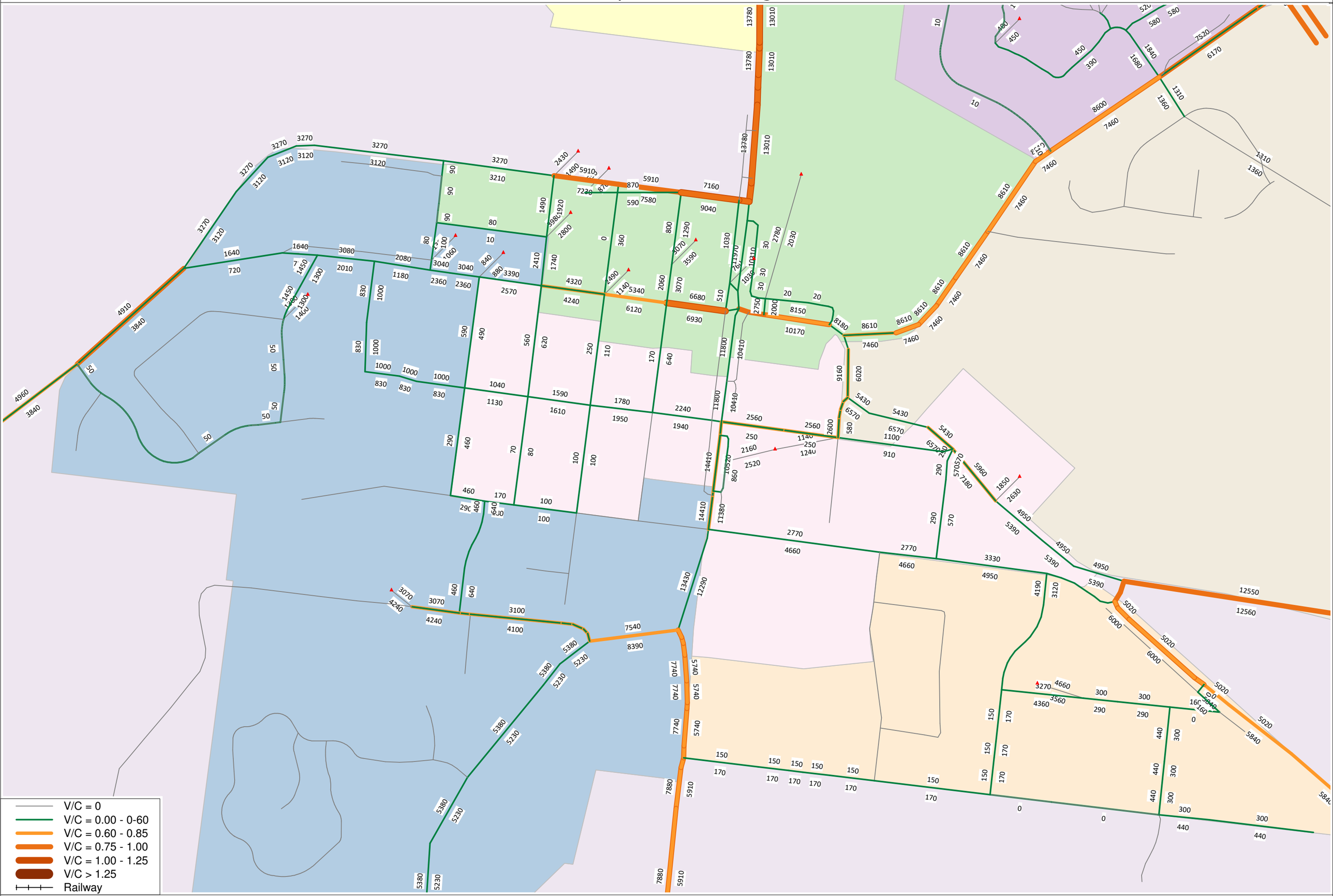

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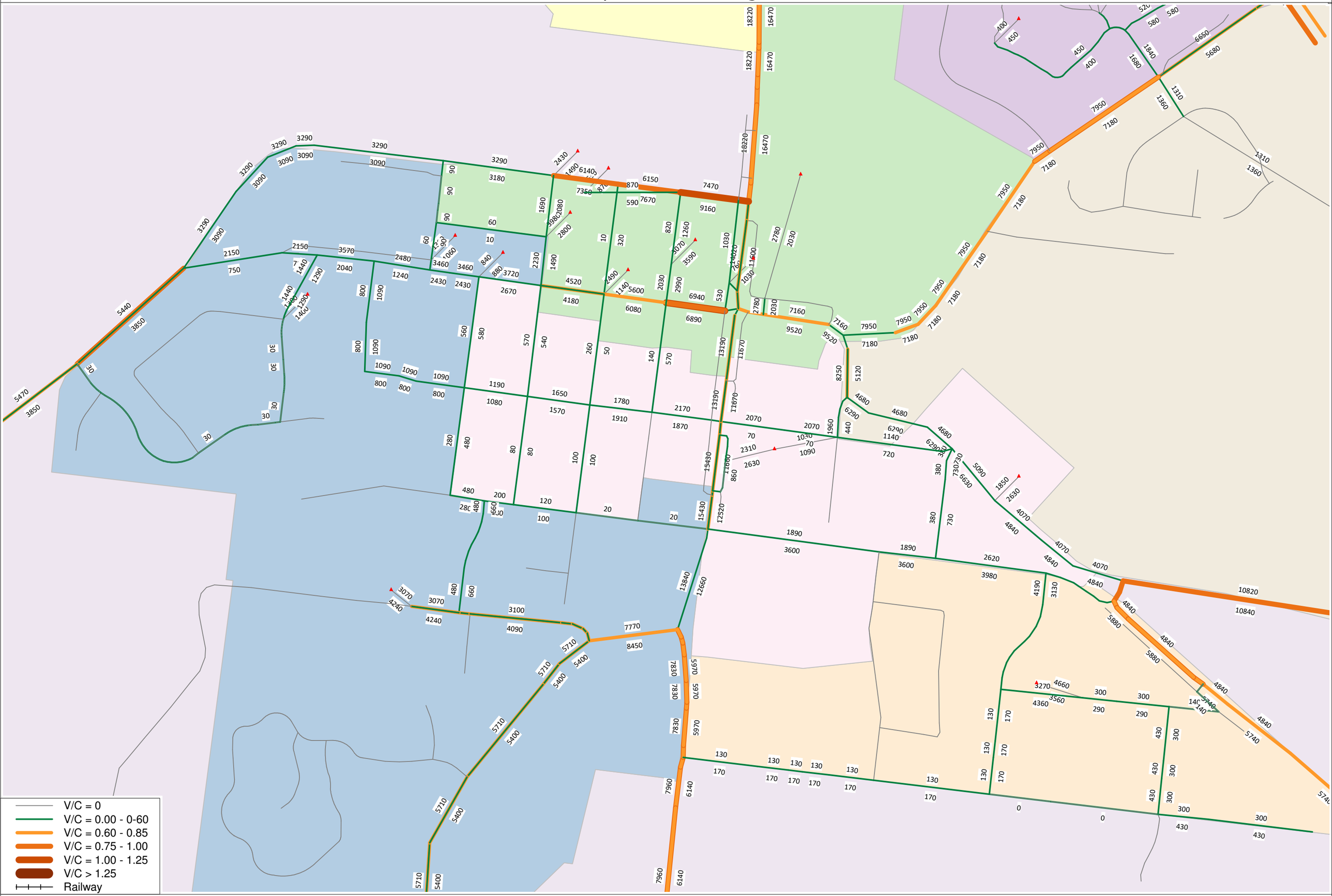

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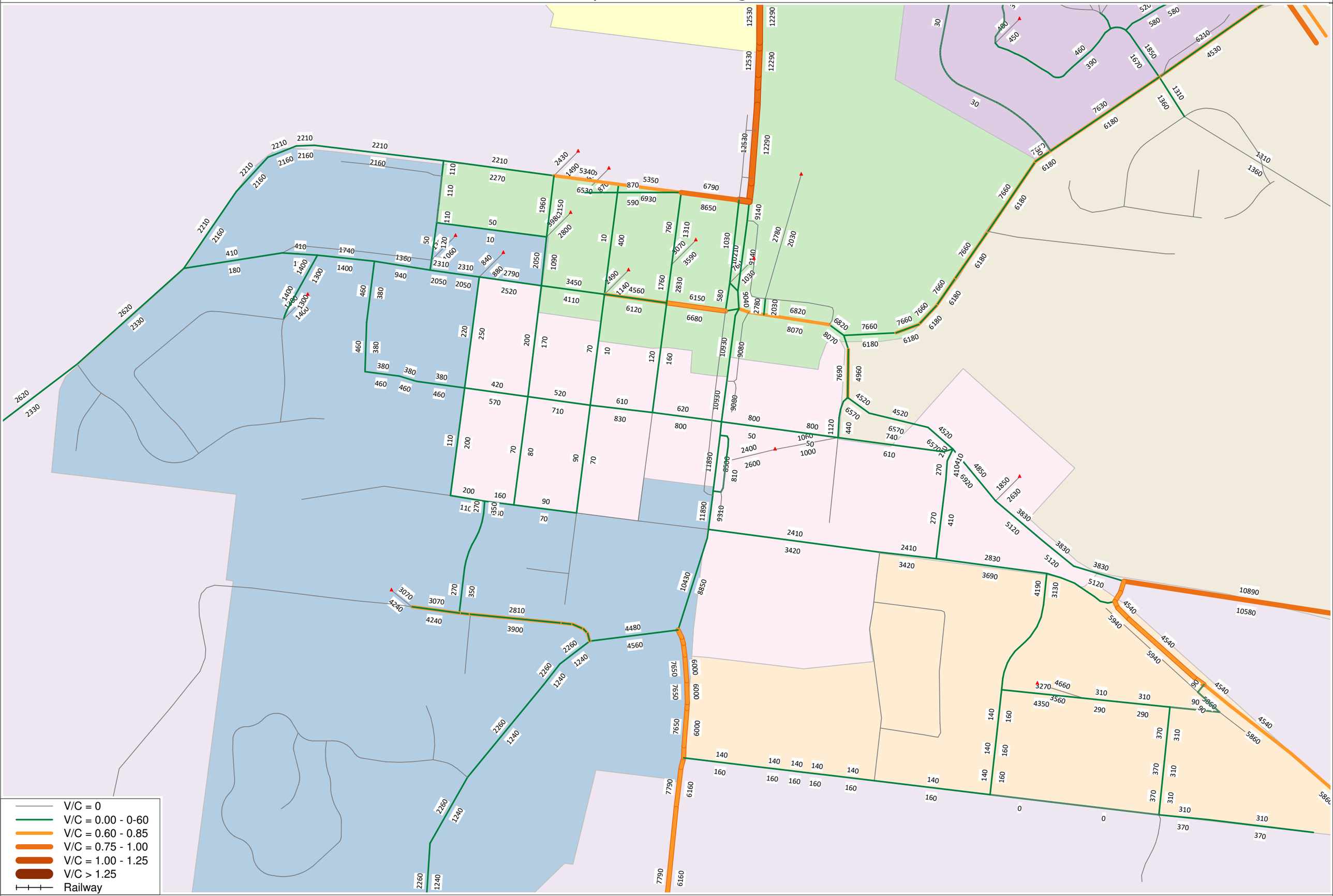
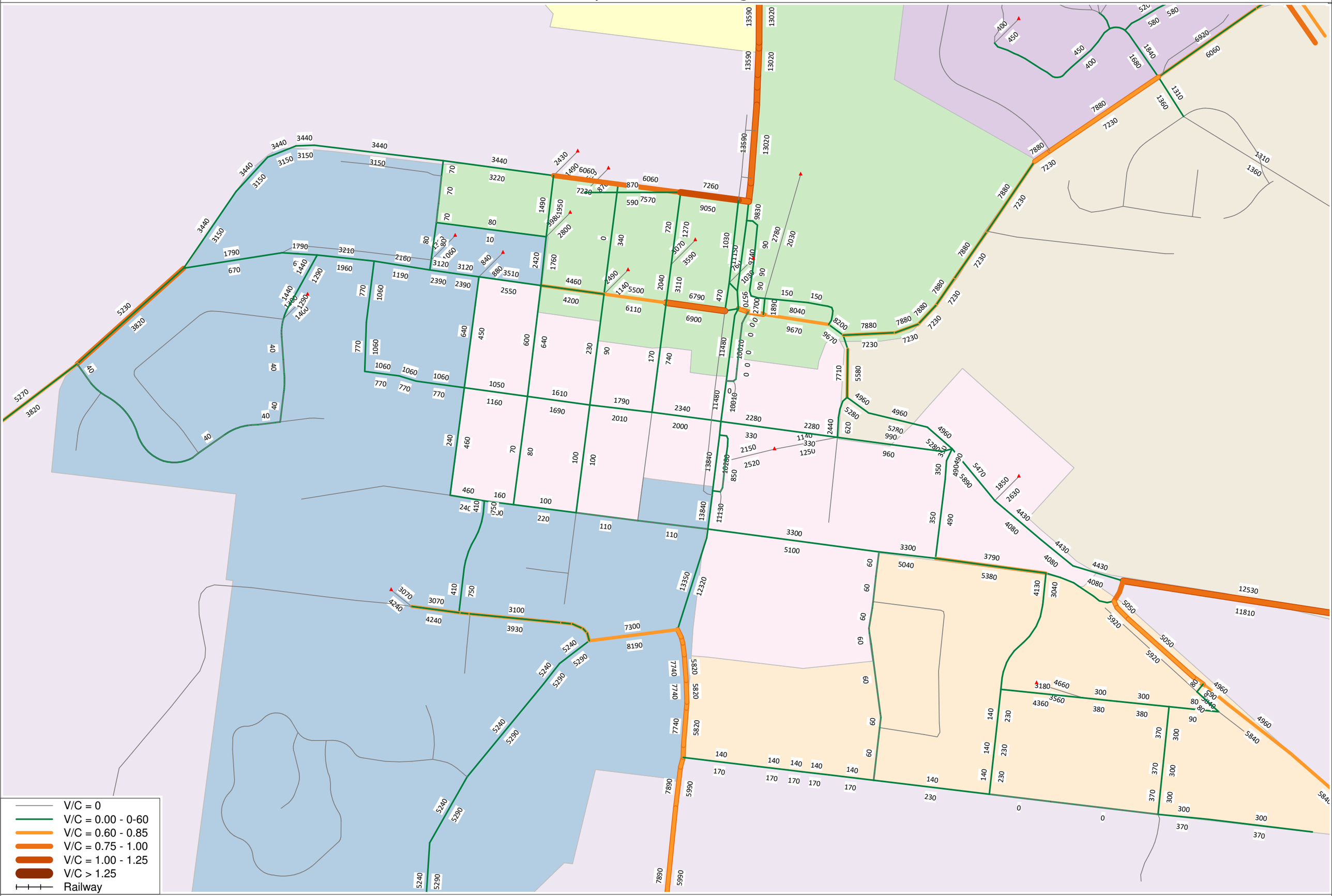


NETWORK PLOT - Daily Vehicles or Changes for 2046 EBYPASS



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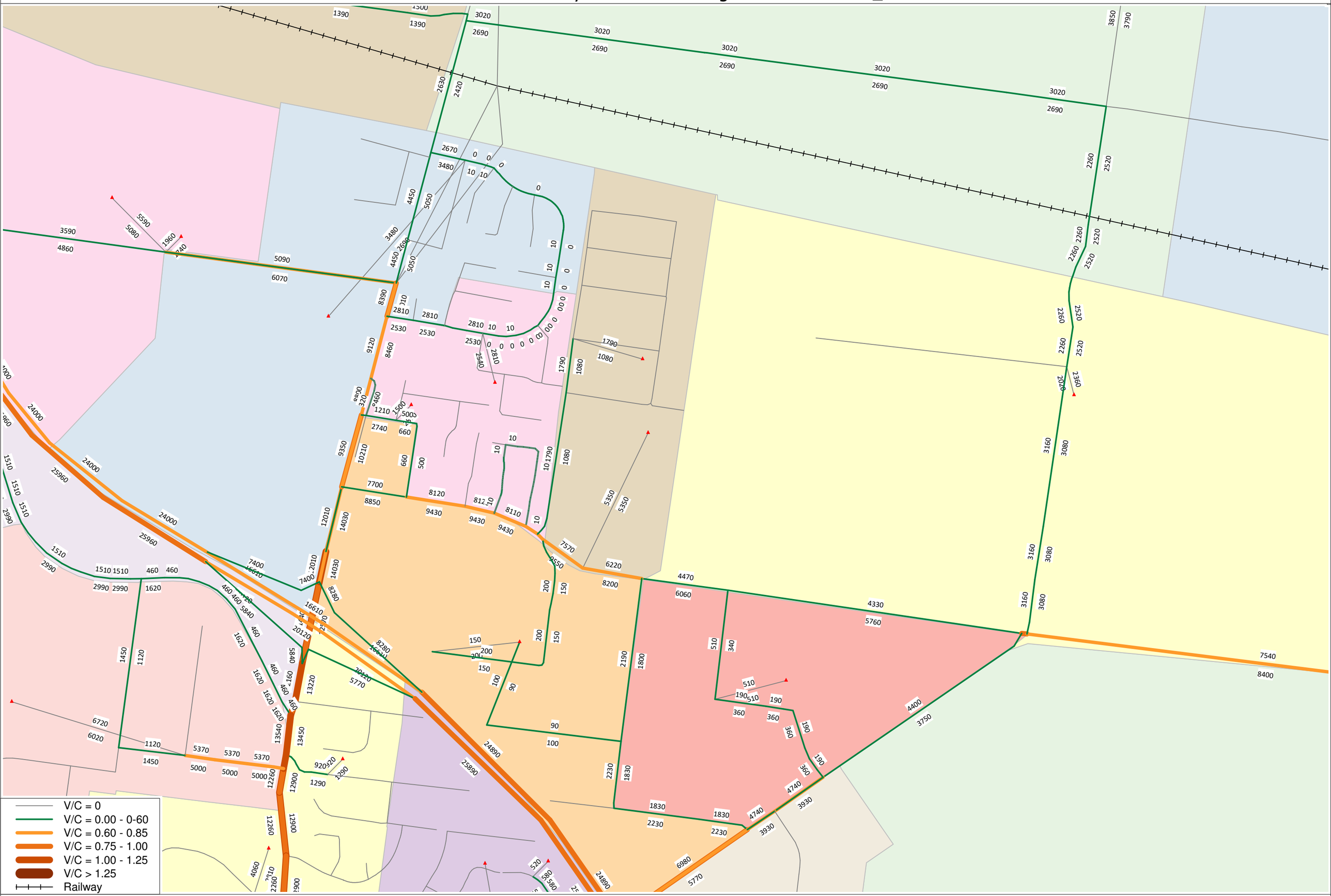

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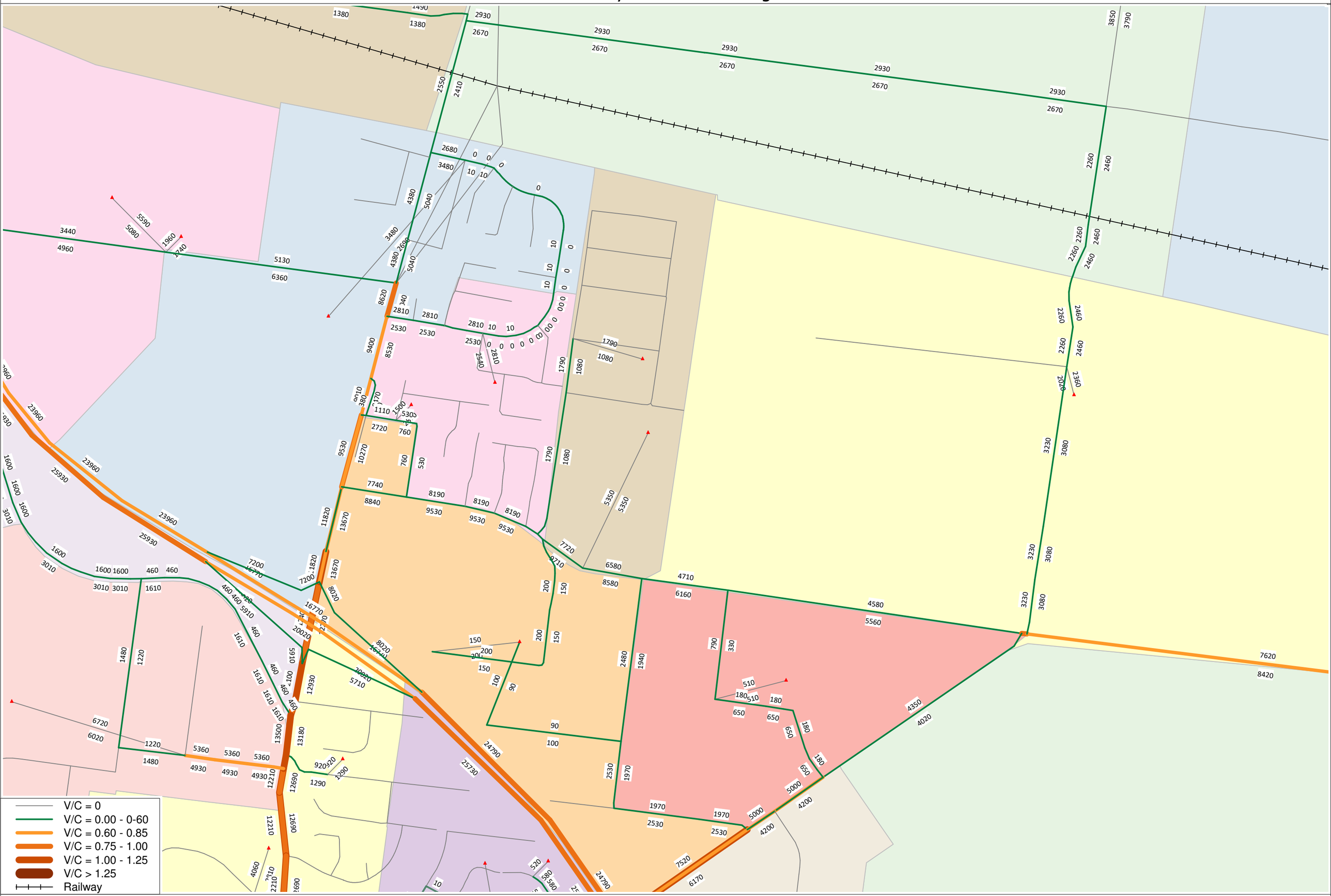

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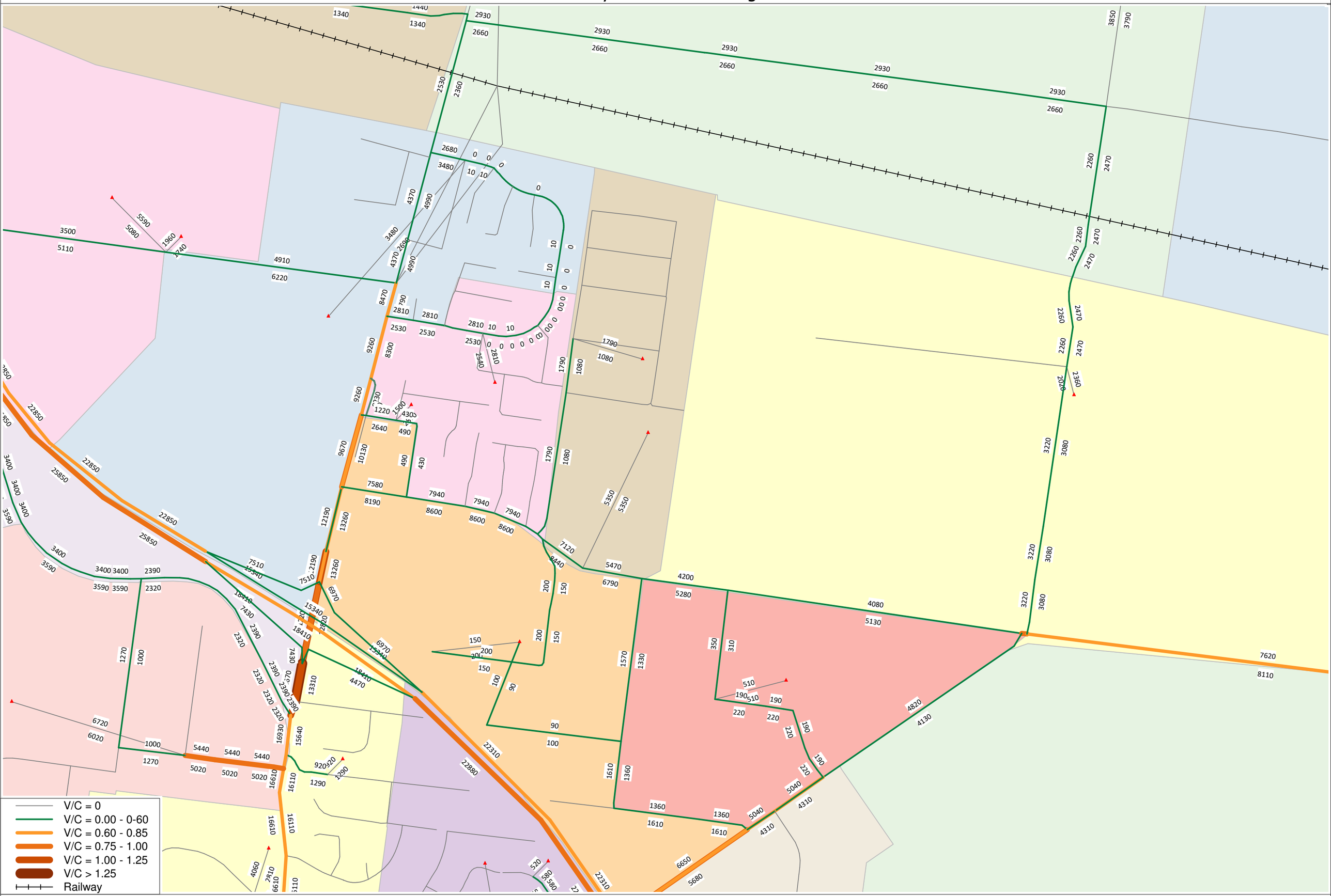

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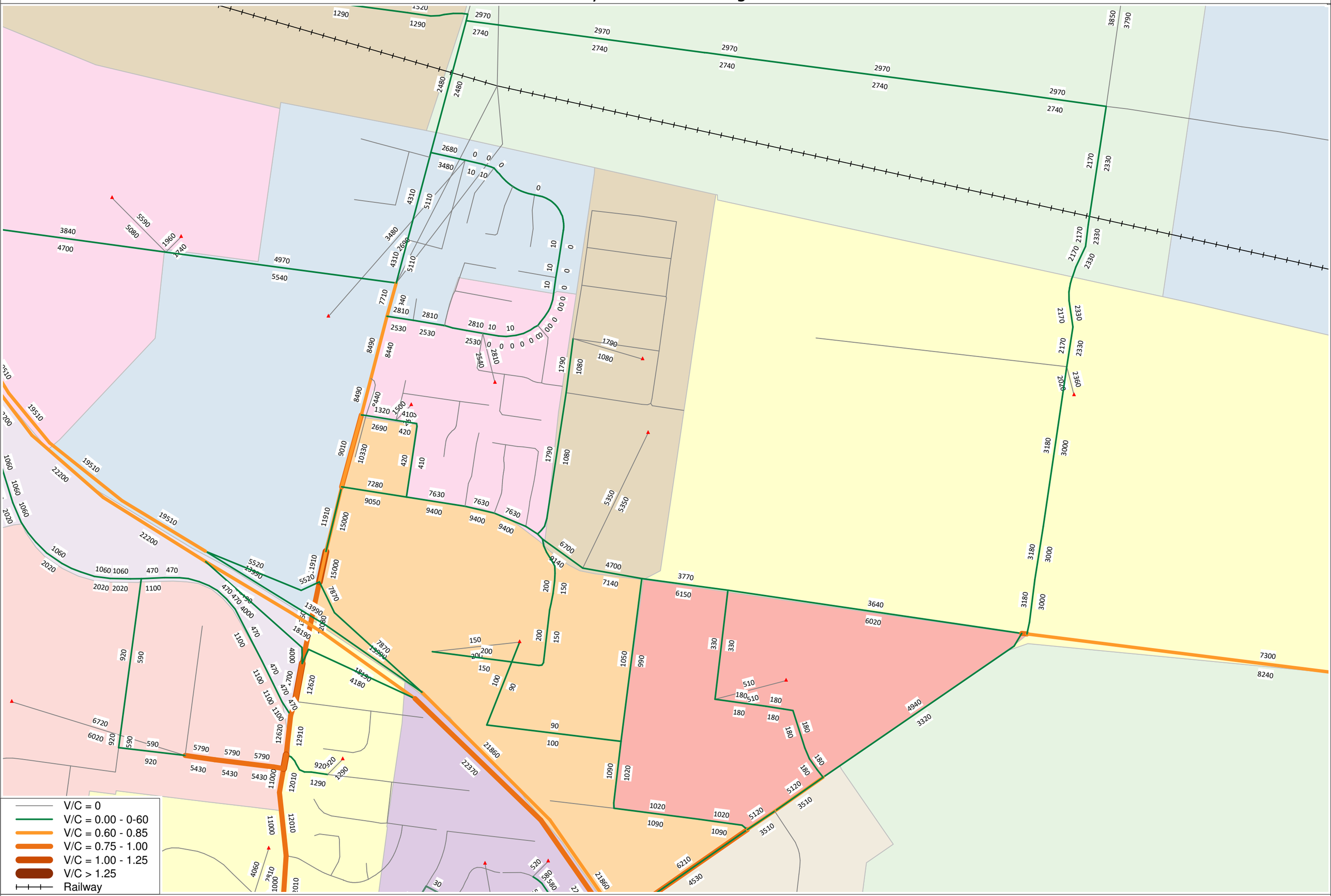
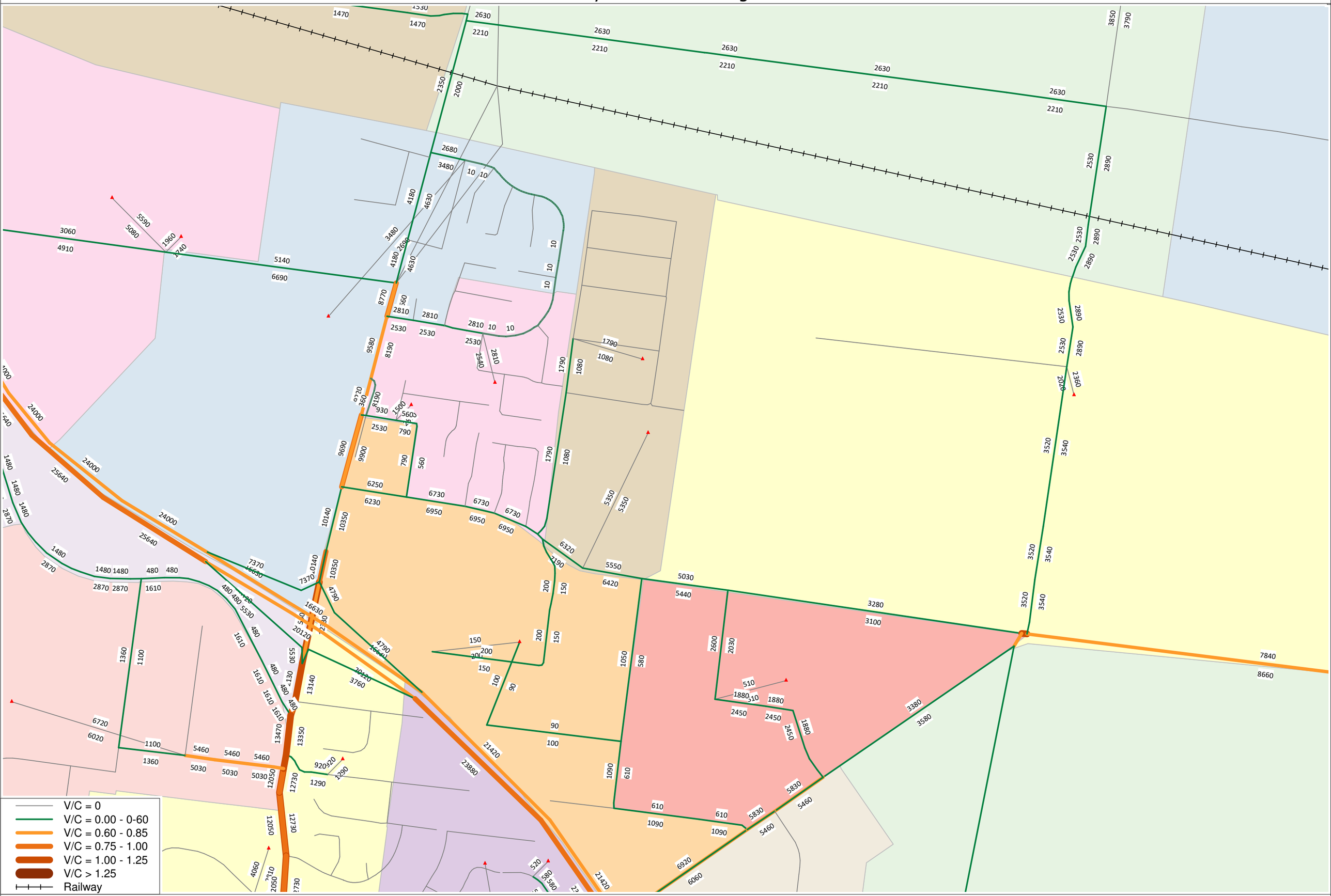


NETWORK PLOT - Daily Vehicles or Changes for 2046 EBYPASS



About Cardno

Cardno is a professional infrastructure and environmental services company, with expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno's team includes leading professionals who plan, design, manage and deliver sustainable projects and community programs. Cardno is an international company listed on the Australian Securities Exchange [ASX:CDD].

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APPENDIX

E

LOCAL SIDRA INTERSECTION OUTPUTS

Appendix E – SIDRA Intersection Modelling Result Tables

Station Road / Ferrier Road

Table E1 Station Road / Saunders Road Intersection SIDRA Results

Layout	Year	Demand Scheme	Approach	AM			PM		
				DOS	Average Delay (s)	95th%ile Queue Length (m)	DOS	Average Delay (s)	95th%ile Queue Length (m)
Existing	2031	Reference	Station Road (S)	0.274	2.4	0	0.219	3	0
			Station Road (N)	0.221	1	2.7	0.124	1.7	2.5
			Ferrier Road (W)	0.298	10.1	8.4	0.283	7.9	7.9
		WByPass	Station Road (S)	0.258	2.3	0	0.2	2.8	0
			Station Road (N)	0.219	0.9	2.6	0.123	1.6	2.4
			Ferrier Road (W)	0.288	9.8	8	0.271	7.7	7.2
Proposed Option		Reference	Station Road (S)	0.274	2.4	0	0.219	3	0
			Station Road (N)	0.221	1	2.7	0.124	1.7	2.5
			Ferrier Road (W)	0.261	9.7	6.7	0.247	7.7	6.3
		WByPass	Station Road (S)	0.258	2.3	0	0.2	2.8	0
			Station Road (N)	0.219	0.9	2.6	0.123	1.6	2.4
			Ferrier Road (W)	0.249	9.4	6.3	0.233	7.6	5.8
Existing	2046	Reference	Station Road (S)	0.39	3.4	0	0.408	3.6	0
			Station Road (N)	0.379	3.8	15.7	0.248	5.2	10.4
			Ferrier Road (W)	0.825	24.9	47.4	0.866	22.1	70
		WByPass	Station Road (S)	0.368	3.2	0	0.344	3.4	0
			Station Road (N)	0.378	3.5	14.8	0.227	4	8
			Ferrier Road (W)	0.725	19.9	33.2	0.806	17.5	56.6
Proposed Option		Reference	Station Road (S)	0.39	3.4	0	0.408	3.6	0
			Station Road (N)	0.379	3.8	15.7	0.248	5.2	10.4
			Ferrier Road (W)	0.758	19.7	31.8	0.781	16.3	41.8
		WByPass	Station Road (S)	0.368	3.2	0	0.344	3.4	0
			Station Road (N)	0.378	3.5	14.8	0.227	4	8
			Ferrier Road (W)	0.658	16.8	23.4	0.719	13.9	35.8

Station Road / Saunders Road

Table E2 Station Road / Saunders Road Intersection SIDRA Results

Layout	Year	Demand Scheme	Approach	AM			PM		
				DOS	Average Delay (s)	95thO%ile Queue Length (m)	DOS	Average Delay (s)	95thO%ile Queue Length (m)
Existing	2031	Reference	Station Road (S)	0.606	8.4	43.9	0.515	6	36.5
			Saunders Road (E)	1.141	71.5	117.2	0.879	27	39.7
			Station Road (N)	0.387	0.8	0	0.307	1.2	0
		WByPass	Station Road (S)	0.612	8.4	44.6	0.521	6.1	36.8
			Saunders Road (E)	0.922	31.7	40.9	0.768	20.1	27
			Station Road (N)	0.384	0.7	0	0.311	1.1	0
Proposed Option		Reference	Station Road (S)	0.532	8.2	36.7	0.547	8.8	44.2
			Saunders Road (E)	0.605	14.9	24.3	0.499	12.5	19.2
			Station Road (N)	0.714	19.3	57.7	0.682	16.5	33.5
		WByPass	Station Road (S)	0.544	8.3	36.6	0.568	8.9	44.5
			Saunders Road (E)	0.482	13	28.9	0.414	11.5	18.3
			Station Road (N)	0.716	19.5	58	0.715	17.3	36.2
Existing	2046	Reference	Station Road (S)	1.076	61.2	301.8	0.947	22.5	158.3
			Saunders Road (E)	5.282	1259.5	1012.3	5.269	1756.8	1356.8
			Station Road (N)	0.502	0.8	0	0.423	1.5	0
		WByPass	Station Road (S)	1	36.4	192.3	0.884	16.5	113.6
			Saunders Road (E)	4.306	801.7	781	3.877	874.9	871.4
			Station Road (N)	0.561	0.9	0	0.508	1.4	0
Proposed Option		Reference	Station Road (S)	0.734	13.8	85.4	0.811	17.1	116.5
			Saunders Road (E)	0.878	23.2	73.2	0.886	25.6	102.1
			Station Road (N)	0.866	31.6	126.7	0.879	31.8	97.2
		WByPass	Station Road (S)	0.692	11.3	59.9	0.722	11	61.9
			Saunders Road (E)	0.831	18.9	55.6	0.815	17	47.9
			Station Road (N)	0.865	28.2	109.7	0.906	27.6	80.2

Station Road / Aitken Street / Robertson Street

Table E3 Station Road / Robertson Road Intersection SIDRA Results

Layout	Year	Demand Scheme	Approach	AM			PM		
				DOS	Average Delay (s)	95th%ile Queue Length (m)	DOS	Average Delay (s)	95th%ile Queue Length (m)
Existing	2031	Reference	Aitken Street (S)	1.298	284.7	1234.1	0.9	18.9	150.5
			Station Road (N)	0.858	10.2	120.3	0.859	8.3	115.7
			Robertson-street (W)	0.545	13	36.1	1.1	122.9	498.8
		WByPass	Aitken Street (S)	0.876	21.4	127.5	0.758	11.2	76.5
			Station Road (N)	0.719	7.5	71.8	0.675	7.1	61.8
			Robertson-street (W)	0.361	9.6	19.4	0.956	37.3	200.5
Option 1		Reference	Aitken Street (S)	0.893	33.8	212.4	0.835	19.1	80.1
			Station Road (N)	0.89	29.9	231.1	0.788	13.9	78.7
			Robertson-street (W)	0.621	30.9	60.2	0.651	14.1	56.4
		WByPass	Aitken Street (S)	0.84	24.3	92.7	0.747	17.5	64.8
			Station Road (N)	0.889	22.5	138.8	0.78	14.8	71.7
			Robertson-street (W)	0.317	16.8	17.8	0.649	12.6	55
Existing	2046	Reference	Aitken Street (S)	1.281	270.8	1148.9	1.126	134.1	719.8
			Station Road (N)	0.857	10.6	120.9	1.029	53.7	445.3
			Robertson-street (W)	0.611	13.3	44.5	1.437	412.9	1387.1
		WByPass	Aitken Street (S)	1.167	173.9	750.5	0.946	27.8	200.9
			Station Road (N)	0.841	9.1	106.2	0.902	14.8	158.1
			Robertson-street (W)	0.508	11.1	31.7	1.334	320.9	1175.9
Option 1		Reference	Aitken Street (S)	0.88	30.3	166.2	0.881	27.6	151.1
			Station Road (N)	0.878	26.3	196.1	0.886	23.4	145.1
			Robertson-street (W)	0.618	24.6	52.2	0.888	26.8	118.5
		WByPass	Aitken Street (S)	0.857	26.3	121.7	0.833	22.1	97.1
			Station Road (N)	0.88	23	164.6	0.844	18.4	101.6
			Robertson-street (W)	0.537	20.5	34.8	0.857	19.9	73.2

Aitken Street / Hamilton-Street

Table E4 Aitken Street / Hamilton-street Intersection SIDRA Results

Layout	Year	Demand Scheme	Approach	AM			PM		
				DOS	Average Delay (s)	95thou%ile Queue Length (m)	DOS	Average Delay (s)	95thou%ile Queue Length (m)
Existing	2031	Reference	Aitken Street (S)	1.422	395.3	1670.8	1.303	290.8	1238.6
			Hamilton-street (E)	0.914	32.8	149.2	1.156	172.7	623.6
			Aitken Street (N)	0.807	15.1	92.3	1.27	265.9	991
			Hamilton-street (W)	0.753	24.4	69.2	0.938	54	158.9
		WByPass	Aitken Street (S)	1.003	48.4	312.9	1.244	241.1	974.7
			Hamilton-street (E)	0.646	12	50.2	0.93	36	167.3
			Aitken Street (N)	0.657	10.8	52.6	0.892	28.7	131.8
			Hamilton-street (W)	0.718	21.6	63	0.843	32.7	100.1
Proposed Option		Reference	Aitken Street (S)	0.984	26.8	205.5	0.869	13.2	81.5
			Hamilton-street (E)	0.598	11.2	40.4	0.584	12.7	38.5
			Aitken Street (N)	0.866	14.5	84.5	1.288	273.1	979.6
			Hamilton-street (W)	0.573	23.9	39.3	0.62	25.3	45.7
		WByPass	Aitken Street (S)	0.653	7.9	40	0.699	9.6	43.7
			Hamilton-street (E)	0.44	8.3	21.1	0.451	10.4	23.8
			Aitken Street (N)	0.681	9.4	41.3	0.892	18.9	87.2
			Hamilton-street (W)	0.316	11	15.4	0.454	15.3	26.2
Existing	2046	Reference	Aitken Street (S)	1.396	374.2	1480.7	1.286	276.4	1147.2
			Hamilton-street (E)	1.314	302.8	1161.2	1.176	182.5	786.7
			Aitken Street (N)	0.87	22.9	120.7	1.343	325.8	1371.1
			Hamilton-street (W)	0.822	30.5	90.2	1.15	175.3	523.7
		WByPass	Aitken Street (S)	1.373	353.5	1375.9	1.196	199.2	817.6
			Hamilton-street (E)	1.026	72.3	327.2	1.037	75.7	361.7
			Aitken Street (N)	0.819	17.9	95.5	1.169	175.8	757.2
			Hamilton-street (W)	0.758	24	71.2	0.896	38.7	129
Proposed Option – inc northern approach option		Reference	Aitken Street (S)	1.182	167.1	781.6	0.859	12.4	76.1
			Hamilton-street (E)	0.919	24.1	145	0.68	11.1	52.1
			Aitken Street (N)	0.905	19.1	98.1	1.467	431	1614.3
			Hamilton-street (W)	0.528	18.6	33.7	0.734	30.3	64.7
		WByPass	Aitken Street (S)	0.884	14.2	91.7	0.668	8.7	39
			Hamilton-street (E)	0.634	11.4	45.2	0.571	10.3	36.3
			Aitken Street (N)	0.865	15.8	79.8	1.066	83	369.7
			Hamilton-street (W)	0.505	18.5	32.1	0.464	13.9	26.9
		WByPass	Aitken Street (S)	0.879	13.9	89.3	0.665	8.7	38.6
			Hamilton-street (E)	0.607	11.1	40.6	0.558	10.5	34.2
			Aitken Street (N)	0.499	7.6	23	0.517	7.2	24.4
			Hamilton-street (W)	0.503	18.4	31.9	0.463	13.9	26.8

Aitken Street / Melton Road

Table E5 Aitken Street / Melton Road Intersection SIDRA Results

Option Layout	Demand Scheme	Approach	AM			PM		
			DOS	Average Delay (s)	95th%ile Queue Length (m)	DOS	Average Delay (s)	95th%ile Queue Length (m)
Existing - Priority	2031 Reference	Aitken Street (S)	0.805	15.1	91.9	0.504	9	30.2
		Aitken Street (N)	0.455	7.5	32.6	0.721	7.6	72.2
		Melton Road (W)	0.684	13.8	57.6	0.601	8.4	42.8
	2031 WBP	Aitken Street (S)	0.676	8	52.3	0.353	5.3	17.1
		Aitken Street (N)	0.358	6.8	21.1	0.483	6	30.9
		Melton Road (W)	0.254	8.7	12.5	0.415	7.4	20.9
	2046 Reference	Aitken Street (S)	1.066	100.2	435.6	0.688	12.6	58.4
		Aitken Street (N)	0.643	7.8	62.9	0.815	7.8	102.8
		Melton Road (W)	0.719	15.8	63.8	0.936	28.1	183.1
	2046 WBP	Aitken Street (S)	0.778	11.5	82.1	0.47	6	25.7
		Aitken Street (N)	0.451	6.9	31	0.622	6.5	50.2
		Melton Road (W)	0.417	10.4	23.7	0.56	9.3	36.4

Bacchus Marsh Road / Hamilton Street

Table E6 Bacchus Marsh Road / Hamilton-street Intersection SIDRA Results

Option Layout	Demand Scheme	Approach	AM			PM		
			DOS	Average Delay (s)	95th%ile Queue Length (m)	DOS	Average Delay (s)	95th%ile Queue Length (m)
Existing - Priority	2031 Reference	BM Road (S)	0.086	0.6	0.4	0.085	0.3	0.2
		Hamilton-street (E)	0.004	6.3	0.1	0.006	6.3	0.2
		Robertson St (N)	0.098	0	0	0.104	0	0
	2031 WBP	BM Road (S)	0.052	1.1	0.5	0.054	0.6	0.2
		Hamilton-street (E)	0.004	6	0.1	0.009	6	0.3
		Robertson St (N)	0.062	0	0	0.069	0	0
	2046 Reference	BM Road (S)	0.085	0.6	0.4	0.202	2.7	6.8
		Hamilton-street (E)	0.092	6.5	2.7	0.009	6.8	0.2
		Robertson St (N)	0.132	0	0	0.136	0	0
	2046 WBP	BM Road (S)	0.057	1.5	0.7	0.142	0.7	0.8
		Hamilton-street (E)	0.006	6.3	0.2	0.017	6.2	0.5
		Robertson St (N)	0.103	0	0	0.09	0	0

APPENDIX

F

GISBORNE BUSINESS PARK MASTERPLAN TRAFFIC & TRANSPORT REPORT

Technical Report
Traffic and Transport

Gisborne Futures - Gisborne Business Park

V171269

Prepared for
Macedon Ranges Shire Council

16 July 2020

Cardno
Shaping the Future

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1 Introduction

1.1 General

Cardno was initially engaged by Macedon Ranges Shire Council in 2017 to develop a Transport and Infrastructure Study that will inform the Gisborne Business Park Master Plan. The purpose of the study was to develop a strategy for the existing road, drainage and footpath infrastructure networks that will assist Council for future planning and development of the Gisborne Business Park as well as the development of a Rural Land Zone Parcel adjacent.

Having secured funding under the Victorian Planning Authority's 'Streamlining for Growth Program', the study was to assist Council in the future development of the Gisborne Business Park including road network, drainage and infrastructure works.

The objectives of the study were to:

> Identify infrastructure works and upgrades required to service predicted future vehicle, cyclist and pedestrian movements generated by the development of the identified Business Park Expansion Area;

> Provide a detailed analysis of the footpath network and kerb and channel infrastructure within the existing business park, and determine improvements to ensure it is fully integrated into the future business park development;

> Ensure that the business park is developed with consideration to the surrounding land use and transport network as well as providing functional and efficient access within the broader network;

> Provide a high level cost estimate for the proposed transport infrastructure, and suggest a funding arrangement for the provision of the works; and

> Address the concerns raised during community consultation of the draft Gisborne Business Park Master Plan. These include:

  - A traffic impact analysis on the adjacent road network, including Saunders Road, Barry Road and Station Road due to the business park expansion;
  - An option to provide a roundabout at the Barry Road / Saunders Road intersection in addition to the improved priority intersection investigated in the initial assessment;
  - An option to remove entry to the service road from Saunders Road and instead provide internally off Barry Road;
  - An intersection modelling exercise assessing the performance of the Station Road / Saunders Road intersection under its current priority configuration, and under a future signalised configuration considering the additional traffic generated by the business park expansion;
  - Future pedestrian connectivity and potential measures accessing the business park; and
  - A high level safety analysis considering the above points.

This study involved detailed investigations of the existing conditions within Gisborne Business Park. A review of business owner engagement feedback has also been undertaken, along with a comprehensive review of the following key documents:

> Gisborne Movement Network Study 2016;

> Macedon Ranges Shire Council Walking and Cycling Strategy 2014;

> Macedon Ranges Shire Council's Infrastructure Guidelines; and

> Macedon Ranges Shire Council Planning Scheme.

Following community consultation on the draft masterplan in 2018, Cardno has reviewed and updated the original study to address some of the questions raised from the consultation, with the benefit of additional information gained through our involvement in the Gisborne Futures project.

This report has been prepared to assess the transport infrastructure for the existing and proposed Gisborne Business Park areas, identify existing network gaps and constraints, and to highlight potential areas for improvement which can be adopted by Council. The development of Gisborne Business Park is now a project under the Gisborne Futures Plan to guide future planning projects and to ensure that future growth of the area is accommodated.

2 Background and Existing Conditions

2.1 Regional Context

The Gisborne Business Park is located in New Gisborne, approximately 2.5km to the north of the Gisborne Town Centre, within Macedon Ranges Shire. Gisborne is located on the Calder Freeway, approximately 60 kilometres north west of Melbourne's Central Business District and 100 kilometres south west of Bendigo. Gisborne has a population of approximately 10,000 people. The regional towns of Kyneton, Sunbury, Melton and Bacchus Marsh are also within 20 to 30km from Gisborne.

Gisborne is also located on the regional rail line between Melbourne and Bendigo, with a commuter station located in New Gisborne.

The location of Gisborne in the context of the surrounding regional centres, is shown in Figure 2-1.

Figure 2-1 Gisborne in the Regional Context

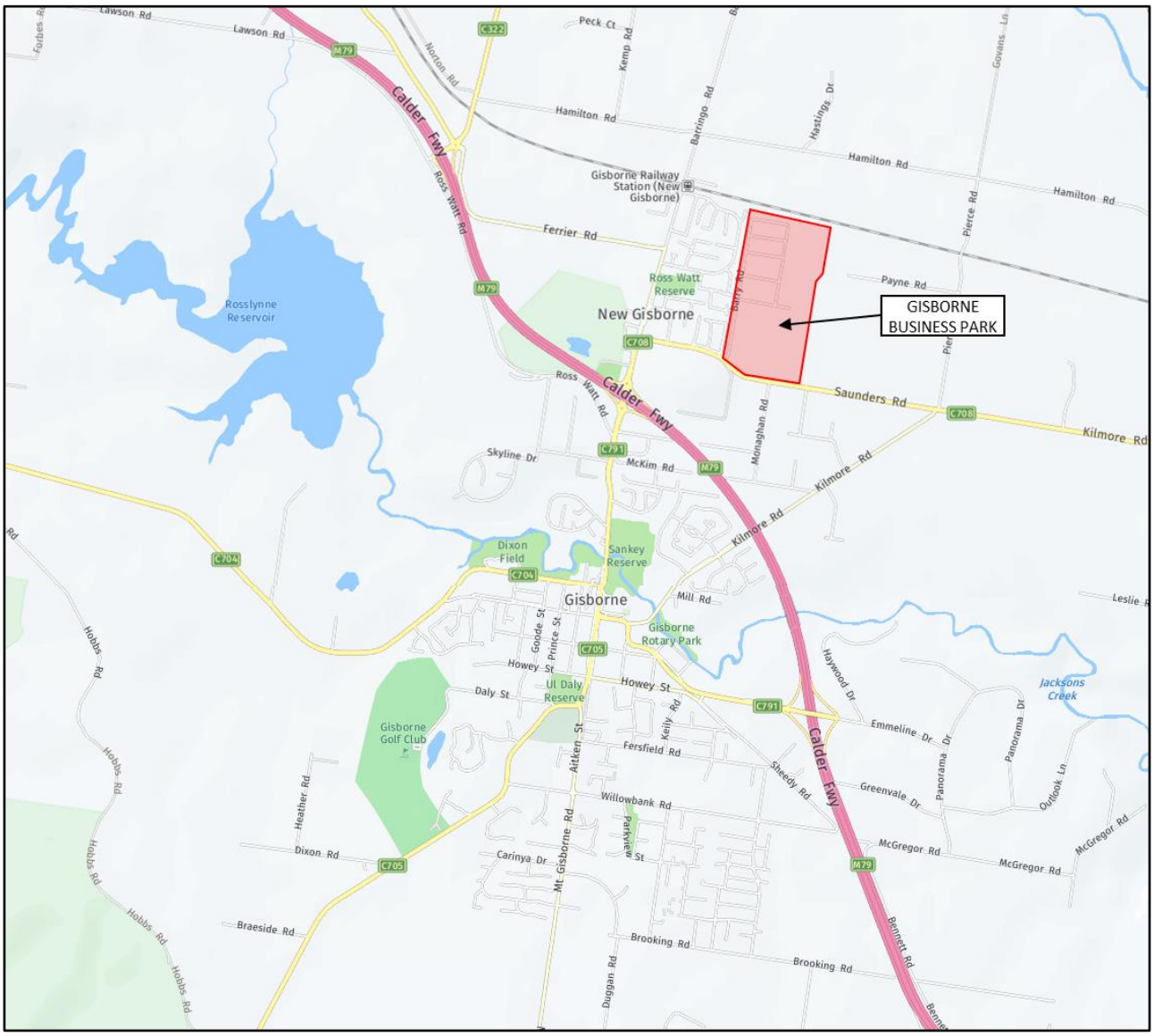
2.2 Local Context

The Calder Freeway (M79) bisects Gisborne township to the south and New Gisborne to the north, with full access provided from the freeway in both directions via an interchange at Station Road (C971 / C708). Bacchus Marsh Road (C704) and Melton Road (C705) provide strategic access through Gisborne to Bacchus Marsh and Melton respectively, on the Western Freeway to the south. Saunders Road / Kilmore Road (C708) extends east from New Gisborne through Riddells Creek to Melbourne-Lancefield Road (C325).

Most of the residential development and the primary town centre is located in Gisborne south of the freeway, whilst a smaller area of residential development with a primary school and the Gisborne Business Park are located in New Gisborne, north of the freeway.

The location of the Gisborne Business Park in the context of the wider Gisborne area is shown in Figure 2-2.

Figure 2-2 Gisborne Business Park in the Local Context



2.3 Study Area

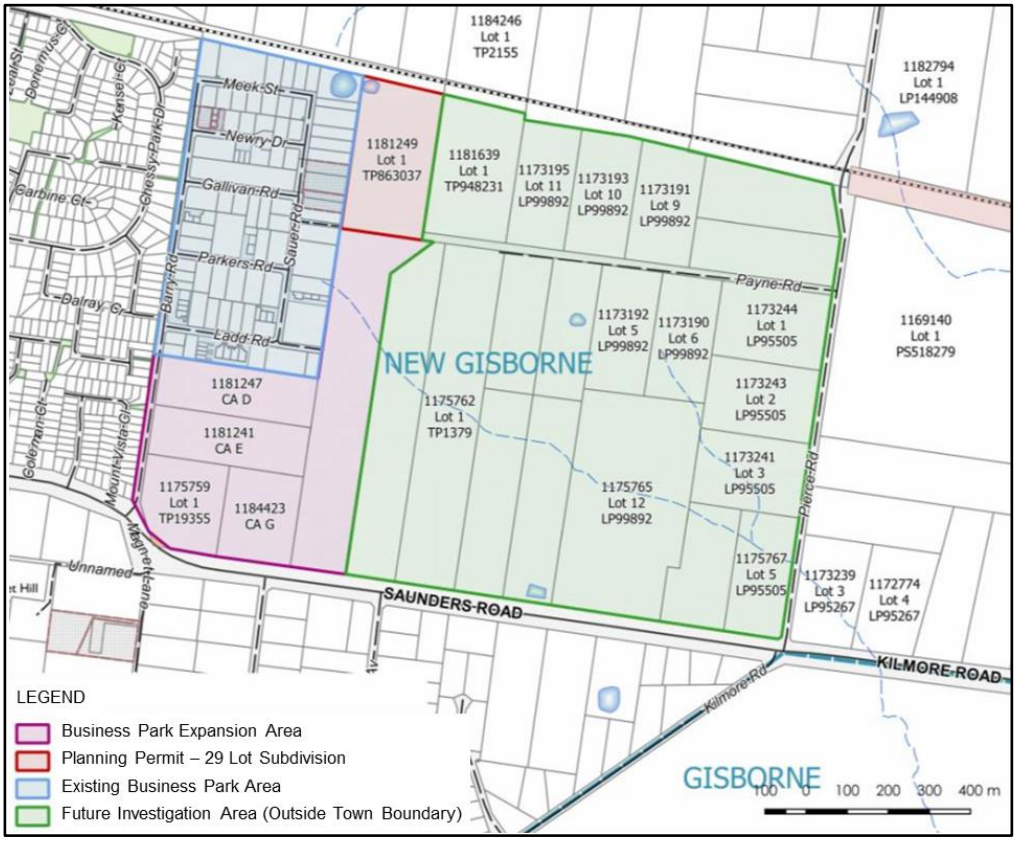
2.3.1 Study Area Boundaries

The study area for the Gisborne Business Park Traffic & Infrastructure Study generally considers the existing Gisborne Business Park off Barry Road east of the residential area, the proposed business park expansion area with a 29 Lot Subdivision to the east and south of the existing development. Whilst not considered part of the study area, consideration is also given to a 'Future Investigation Area' of Rural Land Zone between the study area and Pierce Road.

The study area is generally bound by Barry Road to the west, the Future Investigation Area to the east, Saunders Road to the south, and the Melbourne - Bendigo Railway Line to the north.

The study area is shown in Figure 2-3.

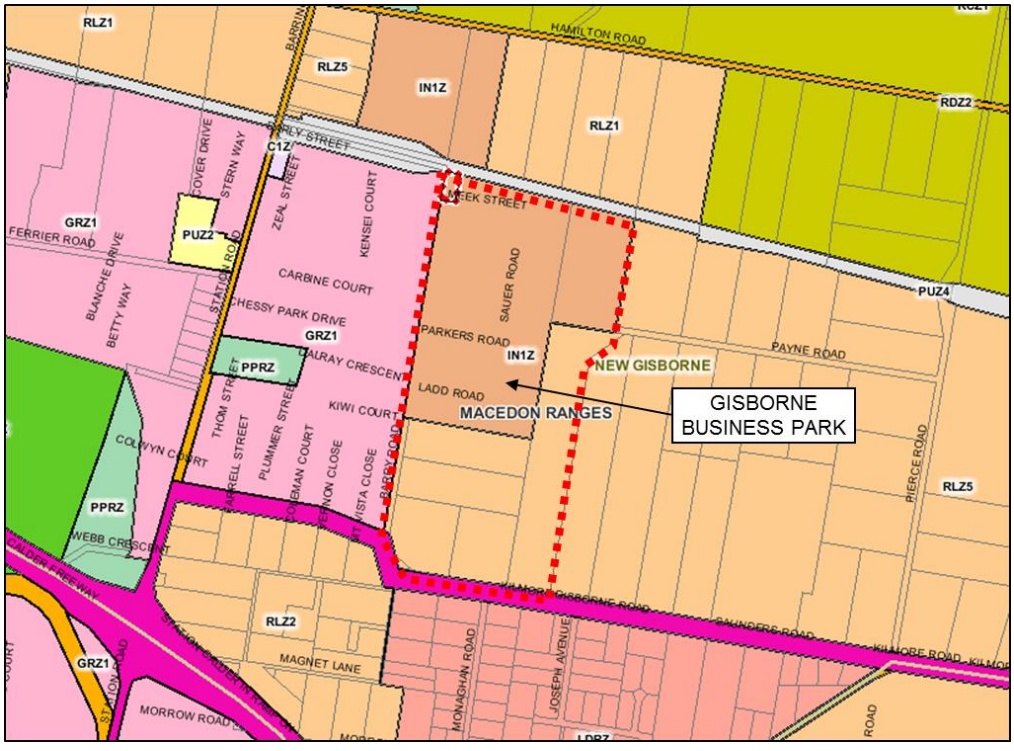
Figure 2-3 Gisborne Business Park Study Area



2.3.2 Existing Land Use

The current land zones under the Planning Scheme within the study area are Industrial Zone 1 (IN1Z) over the existing business park, and Rural Land Zone 5 (RLZ5) over the remainder of the study area as shown in Figure 2-4.

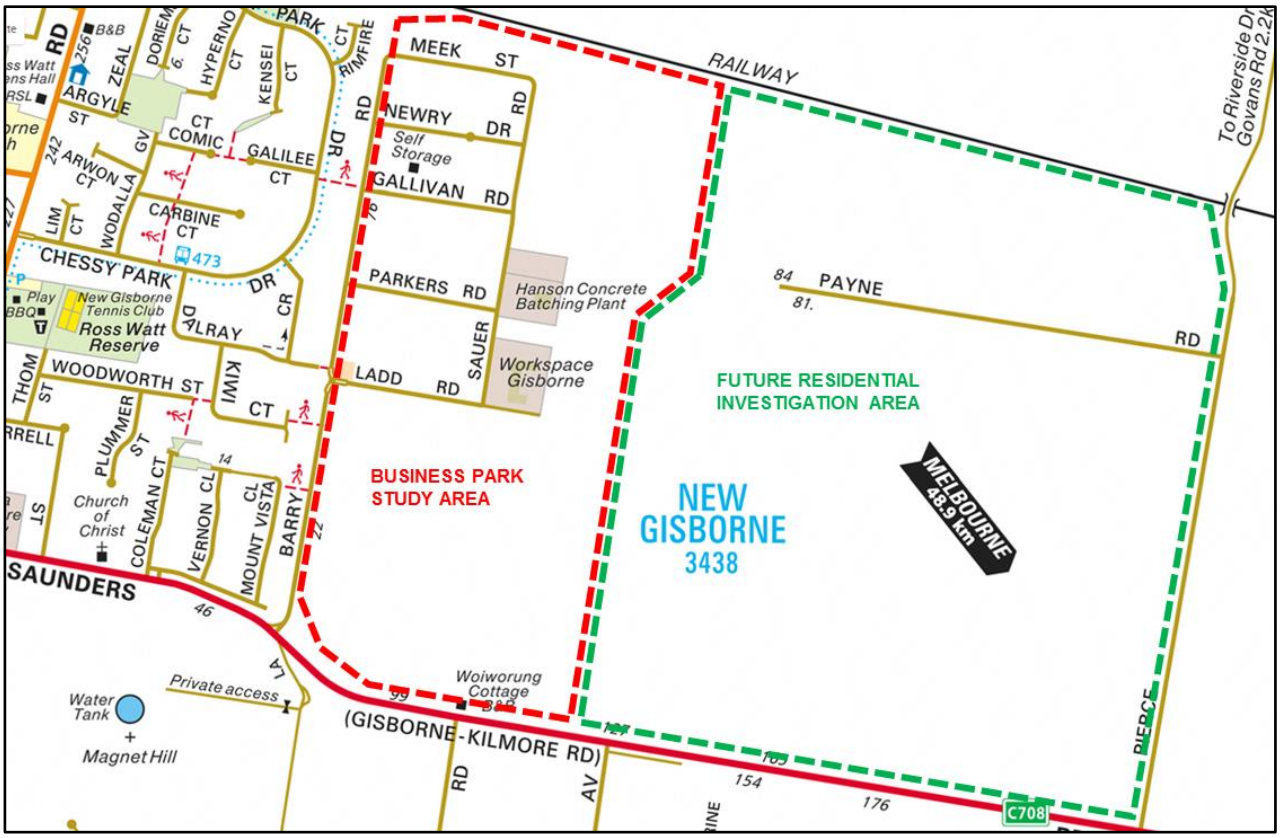
Figure 2-4 New Gisborne Planning Zone Map



2.4 Existing Road Network

The primary access road into the existing business park is via Barry Road, which extends north from Saunders Road. Future access may also be provided off Payne Road, which extends west from Pierce Road. The road network within the business park comprises a number of east-west links between Barry Road and Sauer Road. Figure 2-5 shows the immediate road network around and within the business park study area.

Figure 2-5 Existing Road Network



The following sections provide more detail on each of the road links, with traffic volume information provided where available.

2.4.2 External Road Network

2.4.2.1 Saunders Road (C708)

Saunders Road is a VicRoads operated road within a 60 metre wide Road Zone Category 1 reserve that extends east from Station Road, where it becomes Kilmore Road from the Pierce Road intersection and continues east through the small town of Riddell.

Saunders Road generally provides a single lane in each direction, with an auxiliary right turn lane and left turn deceleration lane into Barry Road, and another auxiliary right turn into Joseph Avenue. Road shoulders are generally in place for the length of Saunders Road. The carriageway varies, ranging from 8.6 metres (90 metres west of Monahans Road) to 12.3 metres (25 metres west of Joseph Avenue).

The speed limit varies along the frontage of the site, being 60km/h between the Station Road intersection and increasing to 80km/h approximately 200 metres east of the Barry Road intersection.

A 2.5 metre wide shared path is provided along the frontage of the residential development between Station Road and Coleman Court, reducing to a 1.6 metre wide footpath toward Barry Road. No other pedestrian or cycle provisions are present along Barry Road.

Traffic volumes surveys show an increase from 4,550 vehicles per day (vpd) in 2006 to 5,800 vpd in 2016 on the section of Saunders Road between Station Road and Barry Road.

Figure 2-6 shows Saunders Road looking towards the east.

Figure 2-6 Saunders Road on the Southern Frontage of the Site

The Saunders Road / Station Road intersection will be impacted by additional traffic generated by the expansion of the business park. The existing intersection layout is a priority intersection, with Saunders Road being the minor arm. Station Road remains a single lane in each direction widening to provide a northbound passing lane around a through/right turn lane into Saunders Road. The Saunders Road arm provides a left turn slip lane onto Station Road. A shared path crosses the Saunders Road approach with very poor pedestrian crossing facilities. Figure 2-7 shows the current intersection configuration.

Figure 2-7 Existing Station Road / Saunders Road Intersection

2.4.2.2 Barry Road

Barry Road is a council owned road, extending north along the eastern boundary of the existing residential development, and is currently the only access point for the Gisborne Business Park. There is limited property access along the southern section of Barry Road, south of Ladd Road, whilst there are individual crossovers into businesses along the eastern boundary north of Ladd Road.

Barry Road consists of an 8.4 metre wide carriageway with a single lane in each direction, within a 20 metre road reserve. There no formal parking provided within the road reserve along the extent of Barry Road.

Barry Road has a 50km/h speed limit. There are no pedestrian facilities along the extent of the road, even though there are a number of pedestrian access points from the residential area on the western side of the road.

Traffic volume surveys undertaken in 2017 showed daily traffic flows of 2,650 vpd, with approximately 10% of these flows in either peak period.

Figure 2-8 shows Barry Road south of Ladd Road.

Figure 2-8 Barry Road South of Ladd Road

The existing intersection on Saunders Road at Barry Road is currently a priority intersection with an auxiliary left turn lane from the west into Barry Road with a painted splitter island, and an auxiliary right turn lane from the east. The current intersection layout at Barry Road is shown in Figure 2-9.

Figure 2-9 Existing Saunders Road / Barry Road Intersection

2.4.2.3 Pierce Road

Pierce Road provides a rural connection to the north from Saunders Road with a grade separated crossing over the rail line, and continues north to Hamilton Road, where it continues further as Govans Lane. Pierce Road provides access to individual farm properties along the extent of the road.

Pierce Road consists of an approximate 6.5 metre wide carriageway within a 20 metre wide road reserve, and provides a single lane in each direction with no line marking. No speed restrictions are posted on Pierce Road.

Figure 2-10 shows Pierce Road northbound, and approaching the Payne Road intersection.

Figure 2-10 Pierce Road Looking Towards the North

2.4.2.4 Payne Road

Payne Road extends west from Pierce Road toward the business park, terminating approximately 180 metres east of the study area, however may be extended into the business park as an additional future access. Payne Road provides access to a number of rural properties.

Payne Road has a 20 metre reserve and currently has an unmarked 4.5 – 5.0 metre wide paved carriageway with a gravel verge on either side that allows vehicles to slow to let oncoming vehicles pass.

Figure 2-11 shows Payne Road looking towards the west from the Pierce Road intersection, and at the end of the existing road.

Figure 2-11 Payne Road Looking Towards the West

2.4.3 Internal Road Network

The current internal road network consists of a number of local roads extending west from Barry Road to the north-south Sauer Road. The speed limit within the business park is 50km/h, with each road detailed below:

> **Sauer Road:** an 8.5 metres sealed road within a 20 metre reserve, with a concrete kerb and channel on the northern section, between Gallivan Road and Meek Street, and a gravel verge south of Gallivan Road to Ladd Road. A 1.5 metre wide footpath is provided along the eastern side of the reserve between Meek Street and Gallivan Road. Individual gravel or concrete crossovers are provided into each property;

> **Ladd Road:** the southernmost access into the park with a 7.5 metre sealed road with gravel verges within a 20 metre reserve. Individual gravel or concrete crossovers are provided into each property;

> **Parkers Road:** similar to Ladd Road, with approximately 7.5 metre sealed road with gravel verges within a 20 metre reserve. Individual gravel or concrete crossovers are provided into each property;

> **Gallivan Road:** similar to Ladd and Parkers Road, however with a slightly narrower paved road at 7.0 metres wide

> **Newry Street:** provides a 6.5 metre carriageway with a concrete kerb and channel on both sides within a 20 metres reserve. Individual concrete crossovers are provided into each property. A turning circle is provided half way along the street where it appears that the road used to terminate in the past; and

> **Meek Street:** the northernmost access, which similar to Newry Street, with a wider 8.5 metre paved carriageway with a concrete kerb and channel on both sides within a 20 metre reserve. A 1.5 metre wide footpath is also provided along the southern side of the reserve, with concrete crossovers provided access to the properties.

All intersections are priority controlled T-intersections with a single lane on each approach at all intersections. A seagull treatment is in place on Barry Road at Ladd Road that allows all movements at the T-intersection.

The existing roads within the study area are shown in Figure 2-12.

Figure 2-12 Existing Internal Road Network

2.5 Existing Traffic Conditions

2.5.1 Traffic Volumes

Traffic volume information has been sourced from VicRoads and Macedon Ranges Shire Council to provide an understanding of the current operating conditions and functions of the roads accessing Gisborne Business Park, with the available traffic data summarised in Table 2-1.

Table 2-1 AADT Volumes on Roads Accessing Gisborne Business Park

Road Name	Section	Survey Date	AADT	% Heavy Vehicles
Barry Road	200m north of Saunders Road	April 2017	2,650	19%
Saunders Road	100m east of Station Street (Council)	2016	5,800	12%
Saunders Road	800m east of Barry Road	Oct 2018	3,423	14%
Station Road	100m north of Saunders Road	Oct 2018	7,065	7%
Station Road	100m south of Saunders Road	Oct 2018	12,289	7%

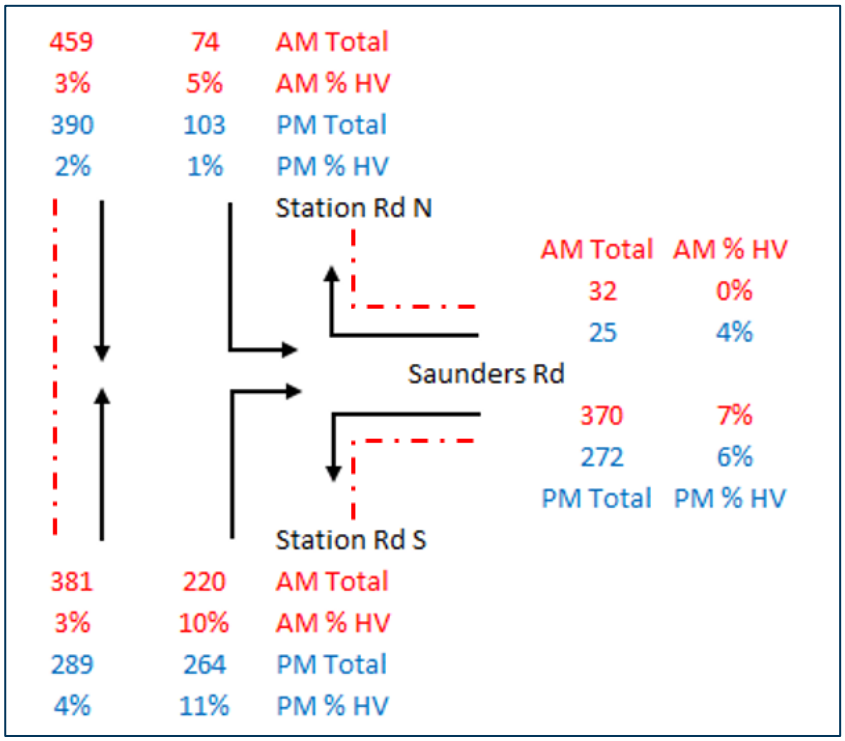
Traffic volumes on Barry Road generally reflect those of a Collector Street under IDM guidelines and an Industrial Access Street under the MPA/VPA guidelines.

It is shown that there has been approximately 2.6% annual traffic growth on Saunders Road over the 10 years between 2006 and 2016.

2.5.2 Station Road / Saunders Road Intersection Turning Movements

Intersection turning movement counts were undertaken in October 2018 at a number of locations for the Gisborne Futures project, including at Station Road / Saunders Road. AM and PM peak hour turning movements are summarised in Figure 2-1 below, including the proportion of heavy vehicles (HV).

Figure 2-13 Station Road / Saunders Road Intersection Turning Movements (2018)



It is shown that from the south, a significant portion (up to almost 50% in the PM) turn right into Saunders Road, and almost 90% of vehicles turn left from Saunders Road back in to Station Road southbound in both AM and PM peaks.

The operation of the existing Station Road / Saunders Road intersection was analysed using SIDRA Intersection. This computer package, originally developed by the Australian Road Research Board, provides information about the capacity of an intersection in terms of a range of parameters, as described below:

Degree of Saturation (D.O.S.) is the ratio of the volume of traffic observed making a particular movement compared to the maximum capacity for that movement. Various values of degree of saturation and their rating are shown in Table 2-2.

Table 2-2 Rating of Degrees of Saturation

D.O.S.	Rating
Up to 0.6	Excellent
0.6 to 0.7	Very Good
0.7 to 0.8	Good
0.8 to 0.9	Fair
0.9 to 1.0	Poor
Above 1.0	Very Poor

It is considered acceptable for some critical movements in an intersection to operate in the range of 0.9 to 1.0 during the high peak periods, reflecting actual conditions in a significant proportion of suburban signalised intersections.

The ***95th Percentile (95%ile) Queue*** represents the maximum queue length, in metres, that can be expected in 95% of observed queue lengths in the peak hour; and

Average Delay is the delay time, in seconds, which can be expected over all vehicles making a particular movement in the peak hour.

The SIDRA intersection modelling shows that the intersection in its current configuration as shown in Figure 2-2, operates well within capacity in both the AM and PM peak periods with Degrees of Saturation all remaining at or below 0.4, and with minimal average delay on all approaches as shown in Table 2-3 below.

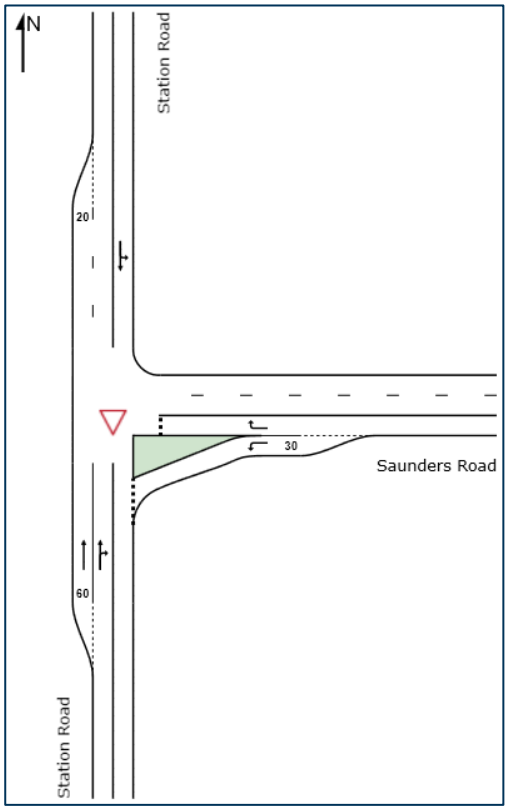
Given the existing conditions reflect the scenario with the business park approximately 75% developed, Cardno undertook a separate analysis on the existing intersection layout, but with the existing business park 100% developed. These results, also provided in Table 2-3, show that the intersection would remain within capacity, with only slight increases in the above parameters.

It is noted that Section 3.3.4 of this report analyses the intersection performance when considering the combined existing business park and the development of the business park expansion area.

Table 2-3 Station Road / Saunders Road Intersection - Existing Business Park SIDRA Results

Scenario	Approach	AM			PM		
		DOS	Average Delay (s)	95th%ile Queue Length (m)	DOS	Average Delay (s)	95th%ile Queue Length (m)
Existing Conditions (75% Developed)	Station Road (S)	0.382	5.0	21.9	0.370	5.4	20.0
	Saunders Road (E)	0.406	9.9	17.4	0.271	8.5	8.7
	Station Road (N)	0.294	0.8	0.0	0.272	1.2	0.0
Existing Business Park (100% Developed)	Station Road (S)	0.457	6.0	29.4	0.388	5.6	21.5
	Saunders Road (E)	0.426	10.3	19.0	0.346	8.9	13.2
	Station Road (N)	0.299	0.9	0.0	0.273	1.2	0.0

Figure 2-14 Station Road / Saunders Road Intersection Layout (Existing Layout)



2.5.3 Saunders Road / Barry Road Intersection Turning Movements

Further to the 30-minute off-peak site observation undertaken at the Saunders Road / Barry Road intersection informing the initial report, AM and PM peak hour turning movements have been estimated using the peak hour directional counts on each of the arms gained in the traffic surveys undertaken since the initial assessment. There is a small discrepancy due to the differing survey dates on each arm, but does provide an indication of the turning proportions and volumes. The estimated turning proportions and movements are shown in Figure 2-15 and Figure 2-16 respectively.

Figure 2-15 Saunders Road / Barry Road Intersection Turning Movement Proportions (2018)

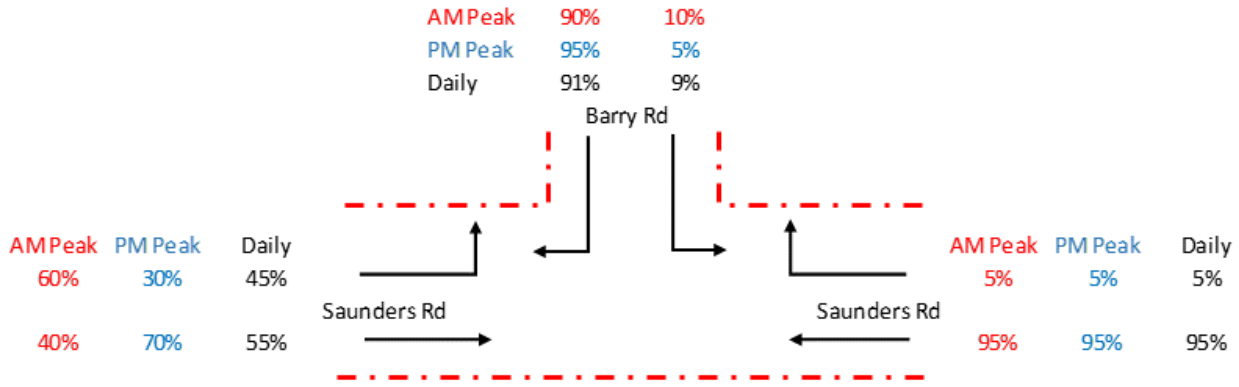
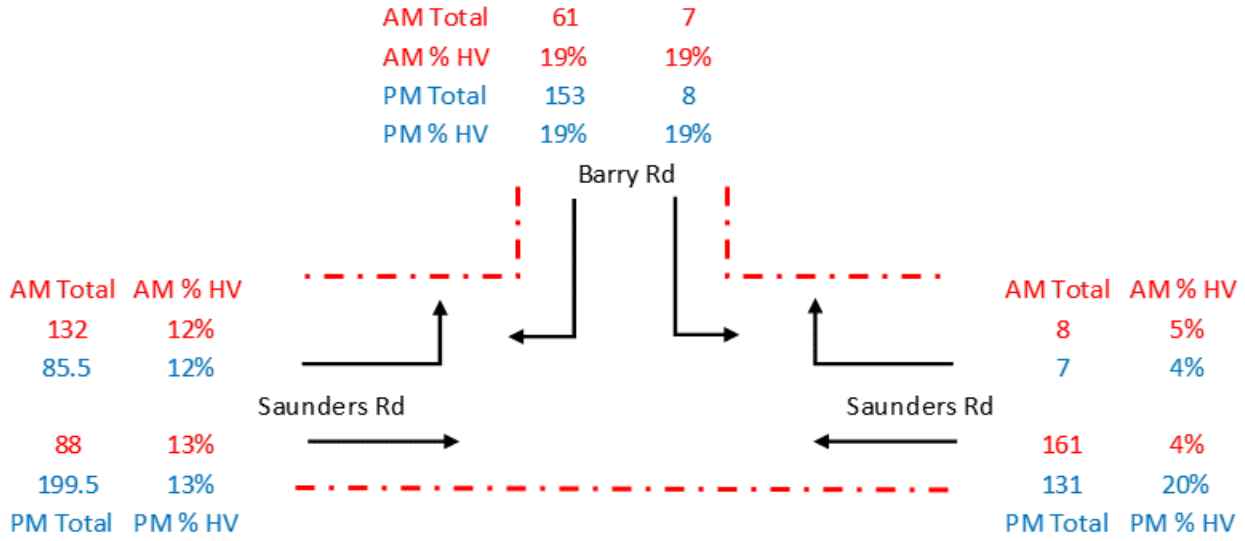


Figure 2-16 Saunders Road / Barry Road Intersection Peak Hour Turning Movements Volumes (2018)



These turning movements reflect the general expectation that movements into the business park are higher in the morning peak, and outbound turning movements higher in the evening peak. These results also demonstrate that a high proportion of traffic generated by the existing business park come from Station Road and Saunders Road to the west.

2.5.4 Crash History

A review of the crash statistics in the vicinity of the business park shows 2 ‘other injury’ accidents at the Barry Road / Saunders Road intersection and two at the Station Road / Saunders Road intersection. The Saunders Road / Kilmore Road intersection shows considerably more accidents, with 2 ‘fatal accidents’, 2 ‘serious injury’ and 4 ‘other injury’ accidents.

2.6 Existing Active Transport Network

There is currently limited provision for pedestrians and cyclists accessing or travelling within Gisborne Business Park.

A shared path is provided along the northern side of Saunders Road between Station Road and Coleman Court, with a footpath continuing on to Barry Road. There is no further connection into the site along Barry Road.

There are two footpath connections from the residential development to Barry Road further south, one from Kiwi Court, and the other from Mount Vista Close. In both of these locations, there is also no further pedestrian connectivity at Barry Road.

Further north, there is a shared path connection from Chessy Park Drive within the residential area west of the business park to Barry Road at Gallivan Road. This link provides a connection from the bus stop on Chessy Park Drive, however there are no further connections from this point further into the business park. Figure 2-17 illustrates this lack of connection.

Figure 2-17 Existing Shared Path Link at Gallivan Road / Barry Road

Within the business park, footpaths have been provided on Meek Street, Newry Drive, and the northern section of Sauer Road, provided at the same time that the roads were upgraded with drainage and kerb and channels.

Figure 2-18 shows the existing active transport provision into and within the business park site.

Figure 2-18 Existing Pedestrian Connectivity

2.7 Public Transport

2.7.1 Train Services

Gisborne is located on the Melbourne to Bendigo rail line, with the station located on Station Street in New Gisborne. The station is located approximately 600 metres from Meek Street in the northern section of the business park, however formal pedestrian access to the station is around 800 metres via Chessy Park Drive. Trains run approximately every 30 minutes in each direction at this station.

2.7.2 Bus Services

Public transport services in Gisborne are currently limited to two (2) regional bus services, operating from between the Gisborne Township and Gisborne Station. These bus services are summarised as follows:

Route 473: Gisborne – Gisborne Station (via Fersfield Road)

This Monday to Friday service operates from the terminus at Gisborne Station and runs via Early Street, **Chessy Park Drive**, Station Road, Aitken Street, Robertson Street, Goode Street, Howey Street, Penny Green Drive, Daly Street, Gisborne-Melton Road, Willowbank Road, Aitken Street, Fersfield Road, Keily Road, Howey Street, Rodney Street, Fisher Street, Calthorpe Street, Melbourne Road, Aitken Street, Station Road, Chessy Park Drive, Station Road to the terminus at Gisborne Station.

This service runs approximately hourly between 6:30am and 8:00pm Monday to Friday.

Route 474: Demand Responsive Service

This service operates the same route as Route 473 as described above but required pre-bookings via 'GisBus' prior to the day of travel.

These services run via Chessy Park Drive, within the residential development on the west side of the business park. Bus stops are located immediately adjacent the shared path link through to Barry Road at Colliban Road as discussed in the previous section of this report. The bus route is shown in Appendix A and the stops on Chessy Park Drive at the shared path link are shown in Figure 2-19 below.

Figure 2-19 473 / 474 Bus Stop at Chessy Park Drive

3 Gisborne Business Park Development Proposal

3.1 Development Proposal

It is ultimately proposed to expand the existing business park both to the east and south of the existing site to the Saunders Road frontage to include an additional 135 Lots, as illustrated in Figure 3-1 and discussed further below.

It is understood that the approved sub-division in the northeast corner of the expansion area has a Planning Permit for 29 lots.

This transport and infrastructure assessment is to inform and assess the proposed masterplan for both the existing site and the proposed business park expansion. Figure 3-1 illustrates the masterplan for the expanded Gisborne Business Park, subject of this assessment report.

Figure 3-1 Draft Gisborne Business Park Masterplan

3.2 Integration with Existing Development

Figure 3-1 demonstrates how the new development will connect to and integrate with the existing business park. Key access connections will be via Ladd Road, from Barry Road and Sauer Road, and Payne Road, from Sauer Road. Meek Street will also be extended east from the existing site into the new development in the north east.

Upgrades to the existing access network will ensure that the road network will be of similar standard to the newer development and to help it to be in character with the new development. The upgrades to the existing road network will also ensure that improved connectivity is provided for pedestrians and cyclists, both within the existing park and through to the new development network.

It is also understood that there are long term plans for additional residential development in the rural zoned land east of the proposed business park expansion area, through to Pierce Road further east, as shown in Figure 3-1. Whilst it would be appropriate to provide an adequate distinction between the business park and residential development, the proposed road network will allow for future connectivity between the two. An example of this being the proposed extension of Payne Road from Pierce Road through to the business park.

3.3 Development Traffic Generation & Distribution

3.3.1 Development Yield

The existing business park provides a total of 114 lots of varying sizes, the average being approximately 1,900m^2, but only approximately 85 being currently occupied. With an average floor area being 40% of the lot size, this provides approximately 86,640m^2 floor area.

The proposed business park expansion area, including the section of 29 lots in the north east corner of the site subject to the approved Planning Permit, is approximately 35 hectares (Ha). The draft masterplan shows that there will be a total of 135 lots of varying sizes. An analysis of the masterplan shows that the average lot size is approximately 1,825m^2 as shown in Table 3-1 below.

Table 3-1 Development Lot Sizes and Floor Area

Lot Size	Approximate Lot Area (m^2)	Number of Lots	Total Lot Area (m^2)	Floor Area (%)	Total Floor Area (m^2)
Existing Site					
Total Existing Site	**1,900 (Avg)**	**114**	**216,600**	**40%**	**86,640**
Proposed Site					
Small Lot	850	50	42,500	40%	17,000
Mid Size Lot	2,050	75	153,750	40%	61,500
Large Lot	5,000	10	50,000	40%	20,000
Total Proposed Site		**135**	**246,250**		**98,500**
Average Proposed	*1,825*	*135*	*246,250*	*40%*	*98,500*
Total Business Park		***249***	***462,850***	***40%***	***185,140***

The detailed nature of the business types that will occupy the expanded business park is not known at this stage, however for the purpose of understanding the levels of traffic that will be generated by the development area, it has been assumed that 50% of development will be classified “Industrial”, and the other 50% “Warehousing” under the Planning Scheme.

3.3.2 Traffic Generation

An analysis of the current trip generation rates at the existing business park has been undertaken. The existing business park currently has around 85 of the total 114 lots occupied, and is currently generating 2,650 daily trips as per the 2017 traffic survey. With an approximate floor area ratio (40%), it is estimated that the current trip generation rate is around 3.2 trips per 100m^2 of total floor area.

Looking forward as the business park develops and the existing road network and service provision is upgraded as the park develops, it would be expected that the empty lots will become occupied, and as such, should be considered when forecasting the future trip generation.

The levels of traffic generated depend on acknowledged trip generation rates for various land uses. As discussed above, it has been assumed for this assessment that there will be a mix of Industrial and Warehousing type premises.

The assumed future trip generation rates used are as per the RTA (NSW) "Guide to Traffic Engineering Developments", 1992, as shown in Table 3-2 below. The trip rates are applied to the total floor area to calculate the total daily traffic generation.

Table 3-2 shows trip rates for each land use and the future levels of trips generated by the total expanded business park area using the RTA trip rates for the entire business park.

Table 3-2 Gisborne Business Park Masterplan Traffic Generation (RTA Guide)

Land Use	Trip Generation Rate (Daily)	Land Use Proportion	Total Floor Area (m^2)	Daily Trips Generated	Trip Generation Rate (Hourly)	Hourly Trips Generated
Existing Site						
Industry	5 per 100m^2	50%	43,320	2,166	1 per 100m^2	433
Warehouse	4 per 100m^2	50%	43,320	1,733	0.5 per 100m^2	217
Existing Site Total			***86,640***	***3,889***		***650***
Proposed Site						
Industry	5 per 100m^2	42%	41,250	2,063	1 per 100m^2	413
Warehouse	4 per 100m^2	42%	41,250	1,650	0.5 per 100m^2	206
Bulky Goods	12.5 per 100m^2	8%	8,000	1,000	2.5 per 100m^2	200
Hardware Retail	18 per 100m^2	8%	8,000	1,440	3.6 per 100m^2	288
Proposed Site Total			***98,500***	***6,153***		***1,107***
Business Park Total			**185,140**	**10,042**		**1,757**

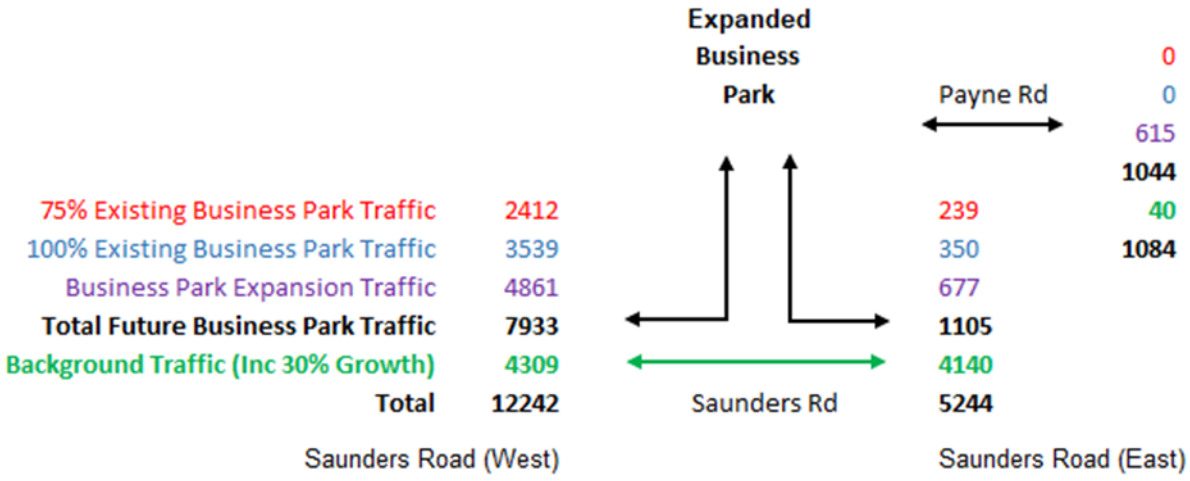
It is noted that the calculations used for the existing business park are based on the full development of the existing site. The existing site is currently approximately 75% developed.

It is also noted that the traffic generation and distribution does not account for any future residential or other development east of the proposed business park expansion and Pierce Road.

3.3.3 Traffic Distribution

The assumed future traffic distribution is based on the existing distribution with an assumed 10% using Payne Road should it be extended into the business park from the east. This link would provide an alternative access to the north of the rail line, and an alternative access to Kilmore Road and Saunders Road via Pierce Road. A breakdown of the total trips generated, and the impact on the connecting road network either side of the business park is illustrated in Figure 3-2.

Figure 3-2 Traffic Distribution and Two-Way Link Flows Adjacent to Business Park



The proposed business park expansion will result in an additional 4861 daily vehicles on Saunders Road west of Barry Road, accounting for around 40% of the total future vehicles on this section of Saunders Road.[1]

Similarly, the business park expansion will add approximately 677 daily vehicles to Saunders Road east of the proposed boulevard, accounting for around 13% of total future traffic flows on this link.

Based on the existing vehicle type proportions on Barry Road, approximately 19% of vehicles generated by the business park are heavy goods vehicles. This translates into an additional 923 daily heavy vehicles on Saunders Road west of the business park, and 126 daily heavy vehicles to the east.

3.3.4 Traffic Impact on Station Road / Saunders Road Intersection

3.3.4.1 2018 First Principles Analysis

As shown, the proposed business park expansion results in around 3,500 vehicles daily on Saunders Road between Barry Road and Station Road, in addition to the existing business park traffic. This additional traffic, along with background traffic growth due to residential and other commercial development, will impact the performance of the Station Road and Saunders Road intersection.

A breakdown of future vehicle turning movements for both the AM and PM peak is provided as Appendix A, identifying the existing traffic, traffic generated by the business park expansion, and background traffic growth.

Cardno has undertaken a SIDRA intersection analysis with the expected future traffic volumes assuming background traffic growth in line with that identified in the 2016 Gisborne Movement Network Study, and full development of both the existing business park and proposed business park expansion. Again it is noted that the nature of background traffic growth is subject to the development scenario identified in the Gisborne Futures study, and this may impact the results of this exercise.

An initial SIDRA test was undertaken using the future traffic volumes WITH and WITHOUT the business park expansion on the existing intersection configuration, which showed that the intersection significantly exceeded capacity in both scenarios, resulting in unacceptable queue lengths and delays on all approaches.

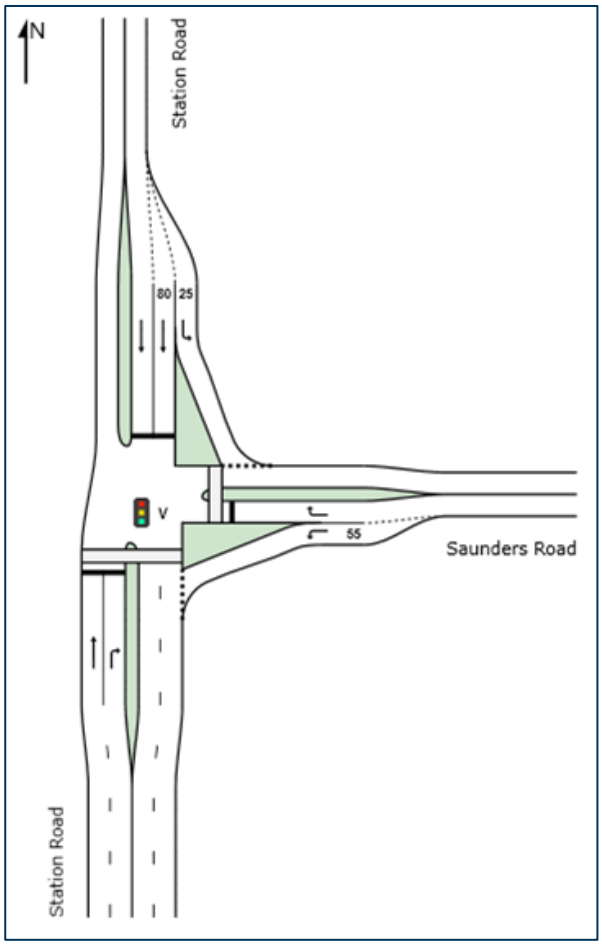
Cardno subsequently undertook an analysis of the intersection assuming Station Road was duplicated with 2 lanes in each direction between Saunders Road and the Calder Freeway interchange, with signals at the Saunders Road intersection. It is noted that the Station Road duplication projected was identified in the Gisborne Movement Network Study 2016 as a VicRoads project with a 5 years+ timeframe for

[1] This assumes a 30% growth in background traffic on Saunders Road. Future volumes will be dependent on development identified in Gisborne Futures.

implementation (ie. 2021 at the earliest), subject to successful funding and favourable planning and development outcomes.

It is understood that the intersection is proposed to be signalised, with Station Road duplicated between the Calder Freeway interchange and Saunders Road, and merging again to a single carriageway further north of the intersection. Pedestrian crossing facilities will be incorporated into the intersection design. Functional design plans have been provided for RRV, illustrating the proposed layout, as per Figure 3-3 below.

Figure 3-3 Proposed Station Road / Saunders Road Intersection



In order to assess the future impact of the business park expansion on the intersection, SIDRA analysis was undertaken assuming the existing business park was 100% developed and background traffic assigned, both WITHOUT the expansion, and WITH the expansion traffic added. The intersection arrangement is shown in Figure 2-6, and the results of this analysis are shown in Table 2-5.

Table 3-3 Station Road / Saunders Road Intersection – Future Conditions SIDRA Results

Scenario	Approach	AM			PM		
		DOS	Average Delay (s)	95th%ile Queue Length (m)	DOS	Average Delay (s)	95th%ile Queue Length (m)
Signalised Intersection – 2035 (without Business Park expansion)	Station Road (S)	0.644	10.1	68.0	0.647	9.4	42.5
	Saunders Road (E)	0.505	13.5	50.9	0.424	11.0	34.2
	Station Road (N)	0.853	27.1	111.9	0.849	23.5	80.3
Signalised Intersection – 2035 (with Business Park expansion)	Station Road (S)	0.926	31.3	336.2	0.721	12.3	71.6
	Saunders Road (E)	0.561	19.7	106.9	0.742	15.4	101.6
	Station Road (N)	0.827	37.5	172.4	0.895	31.2	105.0

3.3.4.2 2020 Post VITM Analysis

A subsequent analysis was undertaken once the strategic modelling was completed for the Gisborne Futures project. Options were tested for a "Reference Case", with known intersection upgrades, including this Station Road / Saunders Road intersection to signals. A second option included the Reference case, but with a Western Link Road (WLR), extending south from the Calder Freeway at the Mount Macedon Road interchange, connecting Bacchus Marsh Road and Melton Road. Future year scenarios included an interim 2031 scenario which assumed that 40% of the business park expansion had been developed, and an ultimate 2046 scenario with the business park 100% developed.

Table 3-1 summarises the SIDRA results for each of the scenarios outlined above.

Table 3-1 Station Road / Saunders Road Intersection SIDRA Results

Layout	Year	Demand Scheme	Approach	AM			PM		
				DOS	Average Delay (s)	95th%ile Queue Length (m)	DOS	Average Delay (s)	95th%ile Queue Length (m)
Existing	2031	Reference	Station Road (S)	0.606	8.4	43.9	0.515	6	36.5
			Saunders Road (E)	1.141	71.5	117.2	0.879	27	39.7
			Station Road (N)	0.387	0.8	0	0.307	1.2	0
		WByPass	Station Road (S)	0.612	8.4	44.6	0.521	6.1	36.8
			Saunders Road (E)	0.922	31.7	40.9	0.768	20.1	27
			Station Road (N)	0.384	0.7	0	0.311	1.1	0
Proposed Option		Reference	Station Road (S)	0.532	8.2	36.7	0.547	8.8	44.2
			Saunders Road (E)	0.605	14.9	24.3	0.499	12.5	19.2
			Station Road (N)	0.714	19.3	57.7	0.682	16.5	33.5
		WByPass	Station Road (S)	0.544	8.3	36.6	0.568	8.9	44.5
			Saunders Road (E)	0.482	13	28.9	0.414	11.5	18.3
			Station Road (N)	0.716	19.5	58	0.715	17.3	36.2
Existing	2046	Reference	Station Road (S)	1.076	61.2	301.8	0.947	22.5	158.3
			Saunders Road (E)	5.282	1259.5	1012.3	5.269	1756.8	1356.8
			Station Road (N)	0.502	0.8	0	0.423	1.5	0
		WByPass	Station Road (S)	1	36.4	192.3	0.884	16.5	113.6
			Saunders Road (E)	4.306	801.7	781	3.877	874.9	871.4
			Station Road (N)	0.561	0.9	0	0.508	1.4	0
Proposed Option		Reference	Station Road (S)	0.734	13.8	85.4	0.811	17.1	116.5
			Saunders Road (E)	0.878	23.2	73.2	0.886	25.6	102.1
			Station Road (N)	0.866	31.6	126.7	0.879	31.8	97.2
		WByPass	Station Road (S)	0.692	11.3	59.9	0.722	11	61.9
			Saunders Road (E)	0.831	18.9	55.6	0.815	17	47.9
			Station Road (N)	0.865	28.2	109.7	0.906	27.6	80.2

Table 3-1 indicates that the existing priority intersection arrangement exceeds capacity by 2031, particularly in the AM peak, and fails significantly by 2046.

It is demonstrated that the signalised intersection configuration will operate within capacity in 2031 with both the Reference Case and WLR traffic volumes, with DoS remaining below 0.72. Queue lengths and delay times also remain at acceptable levels on all arms of the intersection. This remains in line with the initial analysis.

In 2046, the proposed intersection continues to operates within capacity in the AM and PM peak periods with both the Reference Case traffic volumes and WLR scenario volumes, with DoS not exceeding 0.9 and queue length and delay times remaining acceptable.

4 Proposed Road Network

4.1 External Site Access

As discussed in Section 2.4.2, there is currently a single road access into the existing business park, which is via Barry Road from Saunders Road.

It is proposed to provide additional access roads into the expanded business park area as it develops and demand increases. These being the 'Boulevard' access along the eastern boundary of the site, accessed off Saunders Road, extension of Payne Road, and a one way eastbound service road along the southern boundary off Saunders Road. These access locations are shown on the draft masterplan in Figure 3-1.

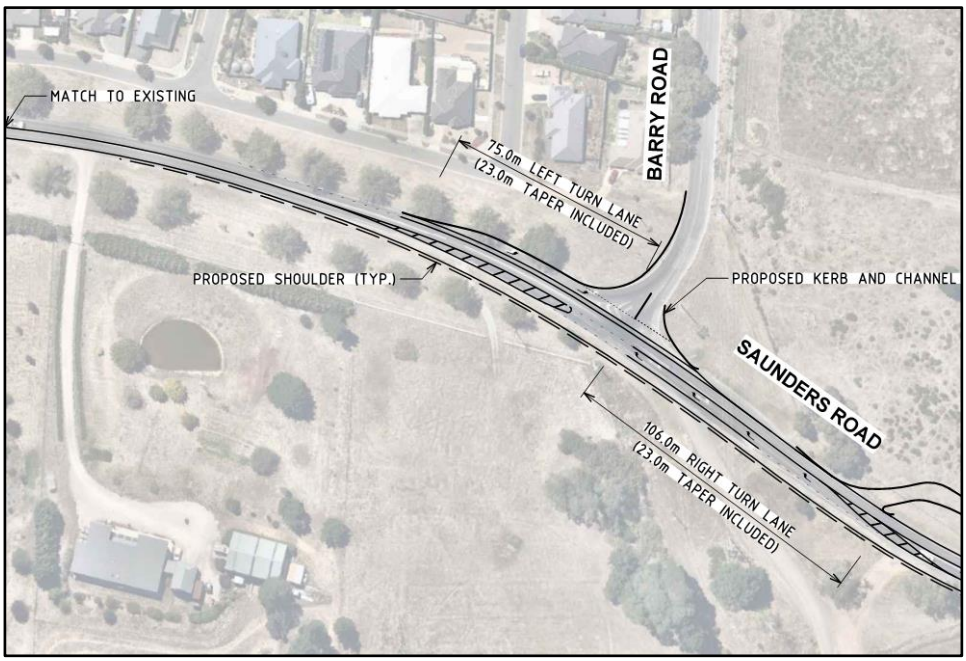
It is understood that the community consultation exercise presenting the draft masterplan for the business park expansion raised a number of concerns from the community. A number of these concerns were regarding the levels of traffic generated, particularly heavy vehicles, and the impact on the surrounding road network. It is also understood that road safety including pedestrian safety and access, along with a perception that there may be a loss of the 'rural' character of the area is a primary concern of the community.

4.1.1 Saunders Road / Barry Road Intersection

Barry Road will continue to be a primary access into the business park. There will be an increase in traffic of 3,500 vehicles per day (vpd) on Saunders Road west of Barry Road due to the business park expansion, representing a 47% increase in traffic from that otherwise expected in future given background traffic growth. The total future traffic on this section of road (10,883vpd) remains within the Austroads capacity of 18,000 vpd for a single carriageway road with one lane in each direction. This capacity will also allow for the additional 'heavy vehicles' generated by the expansion.

It is proposed to improve the functionality and safety of this intersection by providing a channelised right turn lane into Barry Road from the east, maintaining the auxiliary left turn into Barry Road from the west but removing the painted island. It is also proposed to improve the alignment of the Barry Road approach and realigning the kerb to provide space for both left and tight turn lanes at the give way line. These improvements are shown in Figure 4-1.

Figure 4-1 Saunders Road / Barry Road Intersection Improvements



Consideration has been given to providing a roundabout at the Barry Road intersection. A review of Austroads guidance suggests that a roundabout with a radius of 20.5 metres be required (centre island and circulating carriageway) with the appropriate approaches. The existing alignment of Barry Road within the road reserve at the intersection is such that there would need to be considerable realignment, particularly on

the Saunders Road approaches. Figure 4-2 provides some context as to how a 20.5m roundabout may align with the existing road alignment, including the potential loss of established trees and the relocation of the power pole.

Figure 4-2 Roundabout footprint at Saunders Road / Barry Road intersection

Given the location of the intersection near the crest of a hill, poor vertical sight lines may also be a consideration when assessing the viability of providing a roundabout at this location. A more detailed assessment would need to be carried out to determine the limitations and requirements for providing a roundabout at this location.

4.1.2 Saunders Road / Proposed Boulevard Intersection

The masterplan has identified a second access off Saunders Road to be provided in the longer term, via a new 'boulevard' along the eastern boundary of the proposed business park extension.

There will be an increase in traffic of around 500vpd on Saunders Road east of the proposed boulevard due to the business park expansion, representing a 10% increase in total traffic. The total future traffic on this section of road (5055vpd) also remains within the Austroads capacity of 18,000 vpd for a single carriageway road with one lane in each direction. Again, this capacity will also allow for the additional heavy vehicles generated by the expansion on this link.

The boulevard will also ultimately provide access to future residential development east of the business park, and as such future traffic volumes will be higher than those generated by the business park.

With these considerations in mind, and given the current 80km/h speed limit on Saunders Road at this location, it is proposed to provide a roundabout with a raised central median at this intersection to cater for both the boulevard traffic and the service road traffic wishing to turn back towards Gisborne.

It is understood that a concept design for this roundabout is not required at this stage however the location of this access and proposed roundabout is indicated in Figure 4-3 in Section 4.2.1 of this report.

4.1.3 Payne Road

It is proposed that Payne Road will extend into the business park from the east, providing a connection through to Pierce Road and access to north of the rail line. It is estimated that around 10% of traffic

generated by the business park will ultimately use this access, in addition to future vehicles accessing the boulevard from new residential development east of the site. The Payne Road access is indicated on Figure 4-3 in the following section.

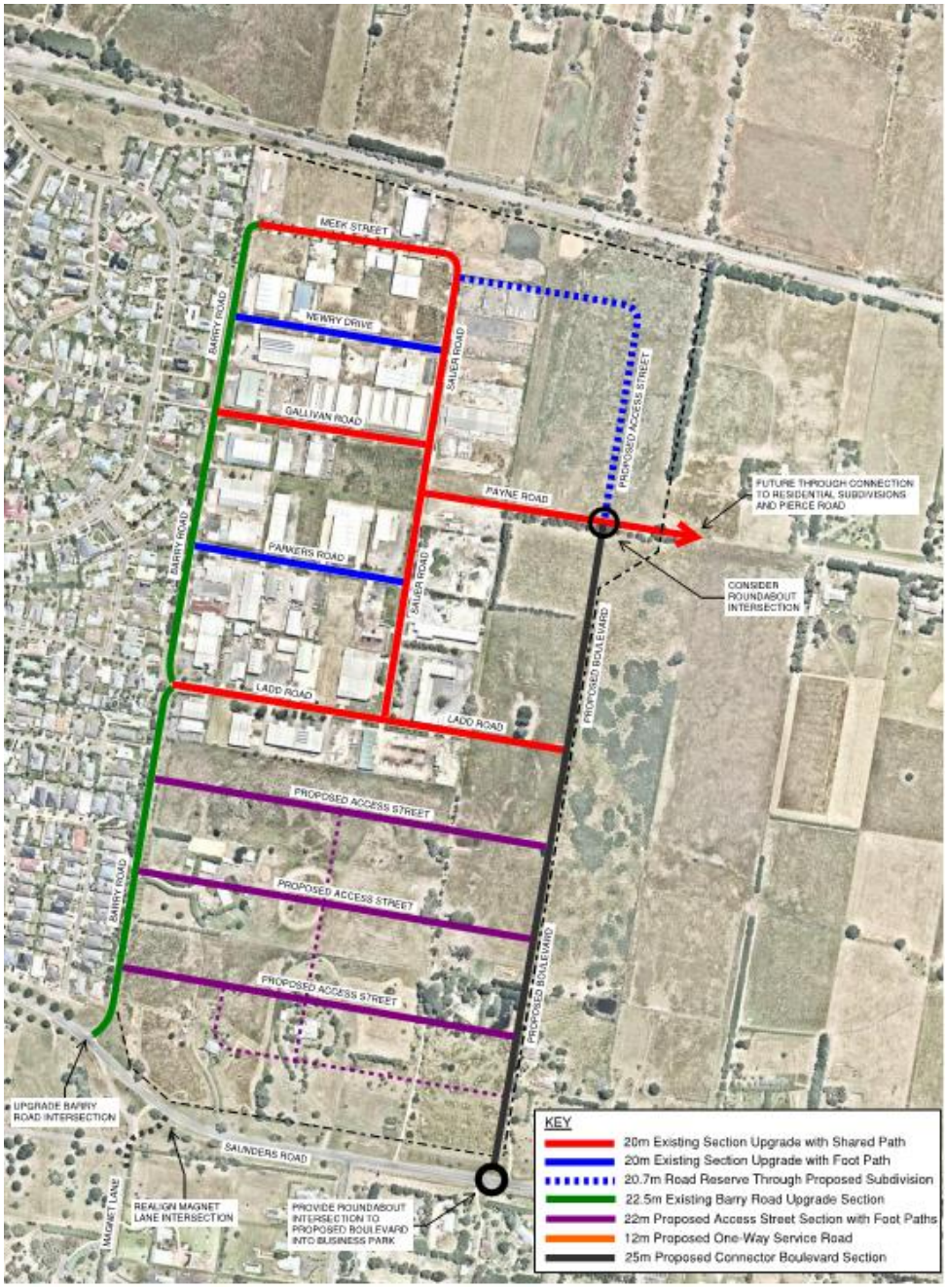
4.2 Internal Road Network

4.2.1 Network Plan

The internal road network will comprise the existing business park road network which is intended to be upgraded to a standard similar to that of the new road network that will be provided within the expanded business park area. The upgraded streets will be such that it maximises the use of the existing cross section whilst providing the required infrastructure. The cross sections provided for these streets are indicative only and should be modified to the local conditions.

Figure 4-3 illustrates the existing and proposed internal road network, with a larger scale plan and the proposed cross section type for each of the existing and proposed network links provided in Appendix B.

Figure 4-3 Proposed Internal Business Park Road Network



4.2.2 Barry Road

Barry Road runs along the western boundary of the site, providing access to the existing business park and will continue to provide access to a significant area of the expanded business park. It is understood that there is a desire to upgrade the existing business park road infrastructure in line with that of the expanded section, so that it is integrated and the appropriate pedestrian and drainage infrastructure is provided.

As such, it is proposed to upgrade the northern section through the existing park with the 22.5m wide road reserve to maintain the swale along the western side but provide formalised pedestrian and shared paths, service strips and on street parking as indicated in Figure 7 in Appendix B.

The southern section of Barry Road will provide access to the proposed east-west local access roads through the southern section of the business park, and two cross section options have been identified. Again, to utilise the existing swale along the western side of the road reserve, the same single carriageway 23m wide cross section as that for the northern section indicated in Figure 7 in Appendix B may be extended south to Saunders Road.

Alternatively, the southern section of Barry Road may be divided to provide a 23m wide boulevard treatment with the swale in the centre of the reserve and parking and a shared path on the eastern side of the road reserve as shown in Figure 7 in Appendix B.

4.2.3 Proposed Boulevard

A 25m wide road reserve is proposed to run along the eastern boundary of the expanded business park, to provide a connector road access from Payne Road down to Saunders Road, providing additional access to each of the existing and proposed east-west local access streets within the business park.

It is proposed to provide a ‘boulevard’ within this reserve, with a swale separating the northbound and southbound carriageways. It is intended to provide a shared path along the western boundary, with service strips and parallel parking on both sides of the boulevard, with a footpath along the eastern boundary. The proposed cross section is shown in Figure 8 in Appendix B.

Gaps would be provided in the central median at each of the intersections to allow turning traffic into and out of each access street and U-turns as required.

4.2.4 Proposed Service Road

In order to maximise exposure and access to the lots along the southern frontage of the business park, it is proposed to provide a one-way, eastbound service road within the property boundary to provide access to these lots. A 12m road reserve would be provided to accommodate a footpath along the property frontage, a nature strip and carriageway to accommodate parking on the near side, as shown in Figure 6 in Appendix B. It is proposed to limit access for larger trucks and delivery vehicles on the service road, with all delivery and loading areas, and truck access to these lots being provided via the local access street at the rear, northern aspect of the properties.

4.2.5 Meek Street

It is proposed up upgrade Meek Street to provide a shared path along the northern side of the road reserve, connecting a proposed shared path from the rail station to Barry Road and Sauer Road. Otherwise the road cross section will generally fit to the existing kerb and channel drainage infrastructure as shown in Figure 4 in Appendix B.

4.2.6 Newry Drive

Similar to Meek Street, Newry Street will be upgraded to provide footpaths along each side of the road, and otherwise match to fit the existing carriageway with kerb and channel. Consideration may be given to widening the carriageway on one side to provide parallel parking as shown in Figure 4 in Appendix B.

4.2.7 Gallivan Drive / Ladd Road / Sauer Road / Payne Road

Gallivan Drive currently has no drainage infrastructure and as such may be upgraded to provide a swale along one side of the road reserve and a shared path connection between the access from Chessy Park Drive to Barry Road, through to Sauer Road. Ladd Road also has no drainage infrastructure and may also

be upgraded to provide a shared path link midway up the business park, between Barry Road and the proposed boulevard. A proposed cross section is shown in Figure 5 in Appendix B.

4.2.8 Parkers Road / Approved Subdivision

Parkers Road currently does not have kerb and channel or other drainage infrastructure, and as such may be upgraded to widen the road pavement to provide car parking along one side of the road, and provide footpaths along both sides with a drainage swale along one side of the reserve, as shown in Figure 5 in Appendix B. The proposed road through the approved subdivision in the north east corner has a 21m road reserve, and this cross section may be modified to suit the slightly wider reserve.

4.2.9 Proposed East West Links through Expanded Business Park Area

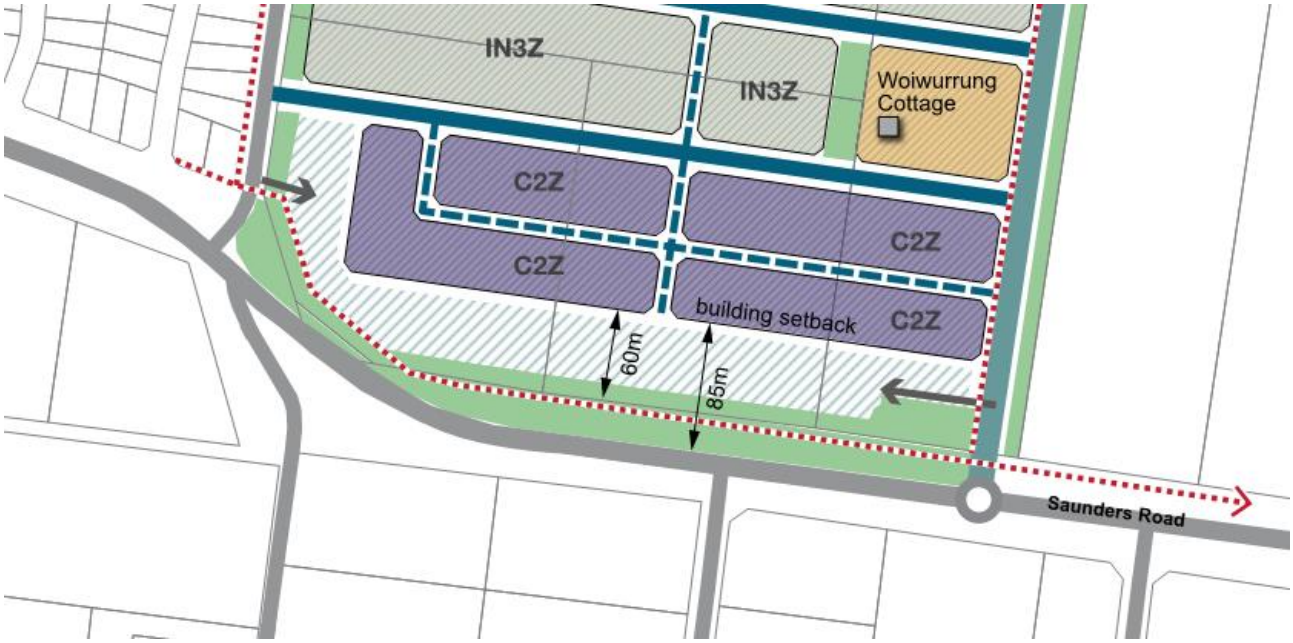
Three additional east west local access street links are proposed through the expanded business park area between Barry Road and the Boulevard. It is proposed to provide a 22m road reserve as per the Macedon Ranges Shire Design Guidelines for Industrial & Commercial Development. This will allow for a drainage swale along one boundary, footpaths and on street car parking along both sides of the carriageway as shown in Figure 6 in Appendix B.

4.3 Negating the Loss of Rural Character

The community consultation identified a strong desire to negate any loss of the existing rural character east of Barry Road.

Macedon Ranges Shire Council has identified an access arrangement to the commercial properties along the Saunders Road frontage that would reduce the visibility from Saunders Road, for further consideration and discussion with RRV. It also sets the access road further back form Saunders Road, enhancing the buffer with landscaping, green space etc. Figure 4-4 illustrates a high level concept for this arrangement as developed by Council.

Figure 4-4 Indicative Access to Commercial Frontage



Source: Gisborne Futures – Draft Structure Plan (May 2020)

Key considerations identified from a traffic point of view in this proposal include:

> Removing the need for direct service road access to Saunders Road is likely be supported by RRV, as it removes any potential conflict points created by the addition of the service road ingress and egress;

> RRV initially specified a 100 metre setback for any access to Barry Road from the Saunders Road intersection. The addition of the access intersection on Barry Road, and the proposed boulevard may not

be supported by RRV as it is currently proposed to be offset approximately 60 metres from Saunders Road;

> Factors to present to RRV that may support an exception in this case include:
  - Numerous examples of intersections within 100 metres of RRV' roads of a similar nature throughout regional, peri-urban and metro areas;
  - Reducing conflict on other arms of the Barry Road / Boulevard intersections with removal of the service road access from Saunders Road;
  - The lower levels of traffic generation on the service road (initially estimated to be around 620 vehicles per day, however reverting the road to 2-way access may increase these flows, which will also be influenced by the nature of the businesses along the frontage);
  - Restricting access to the access to cars and light vehicles only, providing access for heavy vehicles and service vehicles to 'back of house' access off the street along the northern frontage of these properties; and
  - Traffic management measures along the internal access to distribute traffic to both Barry Road and Boulevard intersections.

Considering the above benefits, further discussions with RRV will be required to gain their in-principle support for the proposed alternate service road access arrangements.

4.4 Road Safety

Road safety has been raised as a concern by the community with respect to all road users. This section discusses road safety in terms of vehicles, and pedestrian safety is discussed further in Section 5-2.

There have been a number of traffic incidents along Saunders Road over the previous 5 years to early 2018. Whilst there have been two 'other injury' incidents at each of the Barry Road and Saunders Road intersections, the most severe incidents have been further east at the Kilmore Road intersection, including 2 fatalities. It is also noted that one of these involved alcohol.

In regards to improving road safety, measures to address this along Saunders Road are being considered in both this business park masterplan development and also the wider Gisborne Futures Structure Planning project. These being:

> Improvements to the Station Road / Saunders Road intersection, including increasing capacity and safety through duplication of Station Road to the south and provision of signals at the intersection. A full road safety audit would be undertaken during the detailed design stage to ensure appropriate safety measures be incorporated into the intersection design;

> Improvements to the Barry Road intersection as proposed providing dedicated turning lanes from both directions on Saunders Road;

> Improvements to the Kilmore Road intersection will be considered as part of the Gisborne Futures project, the nature of which to be confirmed when future traffic volumes and turning movements are better understood through the traffic modelling process. It is likely that intersection improvements at this location are undertaken in a staged process, with shorter term measures to improve safety, and longer term measures to improve both safety and capacity if required.

> A review of the speed limit along Saunders Road may also be considered as part of the Gisborne Futures study, considering an extension of the 60kph zone further east. This would be subject to RRV consultation and approval.

Considering the internal road network, Cardno believes that the existing and proposed street network hierarchy, layout and cross section design with associated speed limits provides adequate safety to cater for the expected traffic generation. Again, road safety measures will be considered in more detail during future concept and detailed design stages.

5 Public & Active Transport

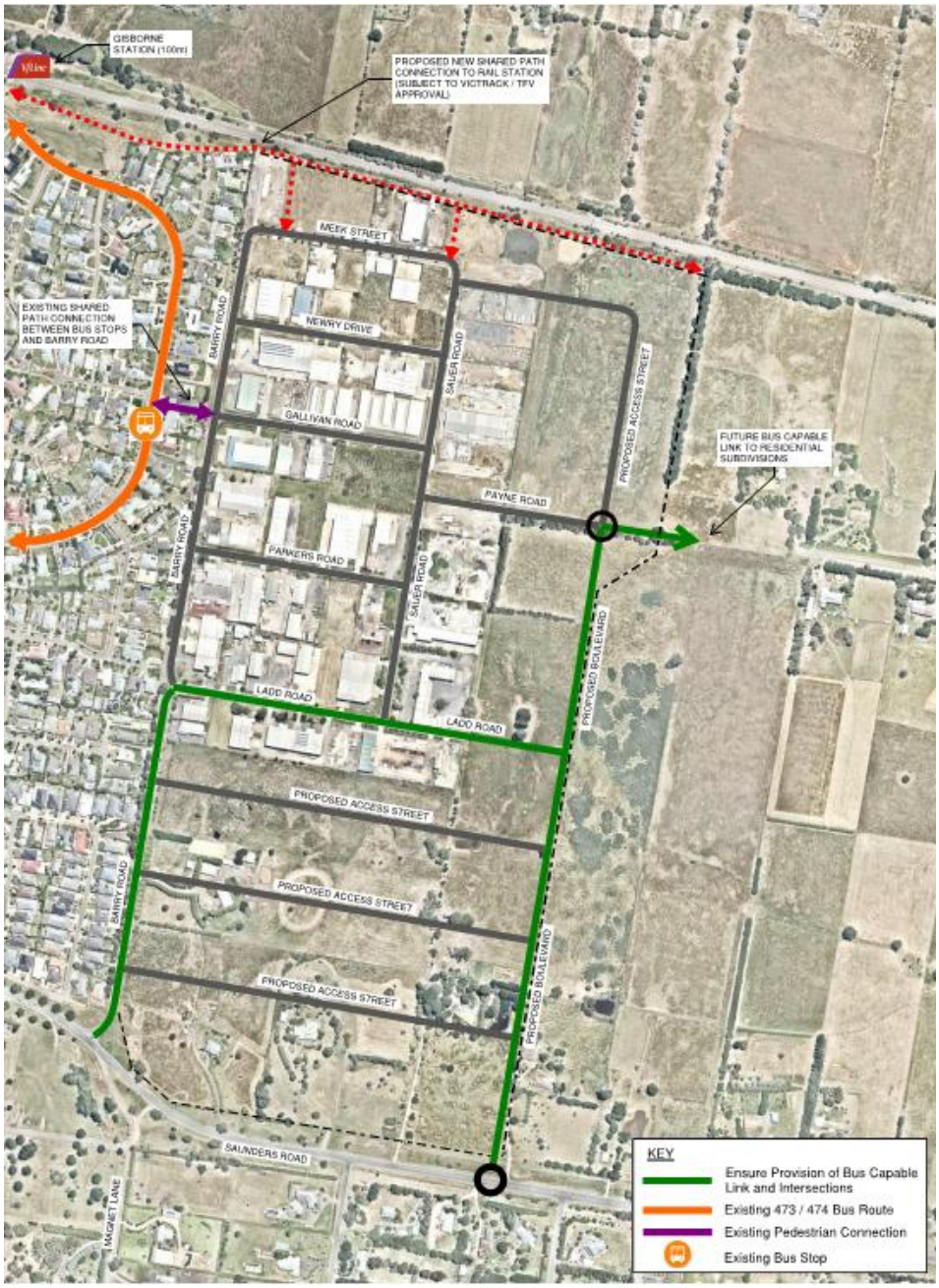
5.1 Public Transport

5.1.1 Bus Provision

There is currently no provision for public transport within the existing business park. Given that there is consideration for significant future residential development east of the business park, and the additional demand that the extended business park may provide, it would be proposed to provide a bus capable link through the business park to Payne Road that can extend further east. This will allow for future bus service provision as commercial and residential demand increases in the future.

Bus capable links within the business park would include Barry Road, Ladd Road, the proposed boulevard and Payne Road, as indicated in Figure 5-1 below and in Figure 2 in Appendix B.

Figure 5-1 Bus Capable Network



5.1.2 Rail Access

As discussed, the business park is located close to Gisborne Rail Station, and there is a clear pedestrian desire line between the northern boundary of the business park to the station along the VicTrack rail reserve. The following section discusses further provision for pedestrians, including the potential to provide a formal link to the rail station.

5.2 Active Transport

It has been identified that there is currently very poor connectivity for active transport modes to and within the existing business park area. With the expansion of the business park and through upgrades to the existing business park road network, there is considerable scope to improve accessibility for pedestrians and cyclists at the business park, as outlined in the following sections.

5.2.1 External Connectivity

There is currently limited connectivity for pedestrians and cyclists into the business park from the surrounding street network, with the only access being via a couple of pedestrian links from the residential development on the western side of the business park to Barry Road. There is no connectivity beyond these points. Upgrades to the shared path and footpath network within the business park will improve the connectivity from the residential areas to the west.

As discussed, a shared path is provided along the northern side of Saunders Road from Station Road toward the business park, terminating at Coleman Court. It would be considered appropriate to extend this shared path link further east along Saunders Road to provide a connection at Barry Road and also at the proposed boulevard access into the expanded business park. With potential further residential development further east, the shared path may be extended beyond the proposed boulevard intersection as demand increases.

A pedestrian desire line has been identified between the rail station and the northern boundary of the business park, along the rail reserve and through to Meek Street. With the expansion of the business park and also potential additional demand from residential development further east, consideration should be given to providing a formal shared path along the rail reserve from the station along the northern boundary of the business park. One or more formal shared path access points can be provided between this path and the internal shared and pedestrian path network via Meek Street.

It is understood that approval is needed from VicTrack and Transport for Victoria for Council to lease the land available within the rail reserve for a shared path, with Council being responsible for the construction and maintenance of the shared path.

Concern has been expressed at the number of pedestrians crossing Saunders Road along the southern frontage of the business park site. It is understood that some of these pedestrians may be students crossing the road to access school bus stops, as indication of Figure 5-2.

Figure 5-2 Current Saunders Road School Bus Stop Locations

It has also been advised that these bus stops may not be permanent at these locations, and are reviewed and located according to demand on an annual basis. Given the current desire line however, it is deemed desirable to provide a pedestrian crossing facility on Saunders Road.

There are safety concerns with a crossing being located near the current Barry Road intersection as there are poor horizontal and vertical sight lines at this location and a considerable distance either side therefor preventing a crossing near this intersection. Should this intersection be upgraded, pedestrian crossing facilities should be considered.

It would be recommended that a more formal uncontrolled crossing be provided to the east at the bus stops near the Monaghan Road intersection. Crossing warning signs should also be provided on both approaches. This crossing will also benefit pedestrians accessing the business park and beyond from south of Saunders Road.

It is noted that with an understanding of the location of future development provided by the Gisborne Futures project, pedestrian desire lines and locations for future bus stops may be identified around this area, and appropriate permanent pedestrian path and crossing facilities be recommended.

The proposed external active transport links, and their connectivity to the internal network are illustrated in Figure 5-3 and in Figure 3 in Appendix B.

5.2.2 Internal Network & Connectivity

There is currently very poor provision for pedestrians and cyclists within the existing business park, with a footpath only provided along one side of Meek Street and the northern end of Sauer Road. The upgrades to the existing street network and the provision of the new road links within the expanded business park area provides a good opportunity to provide a well-connected internal pedestrian and shared path network.

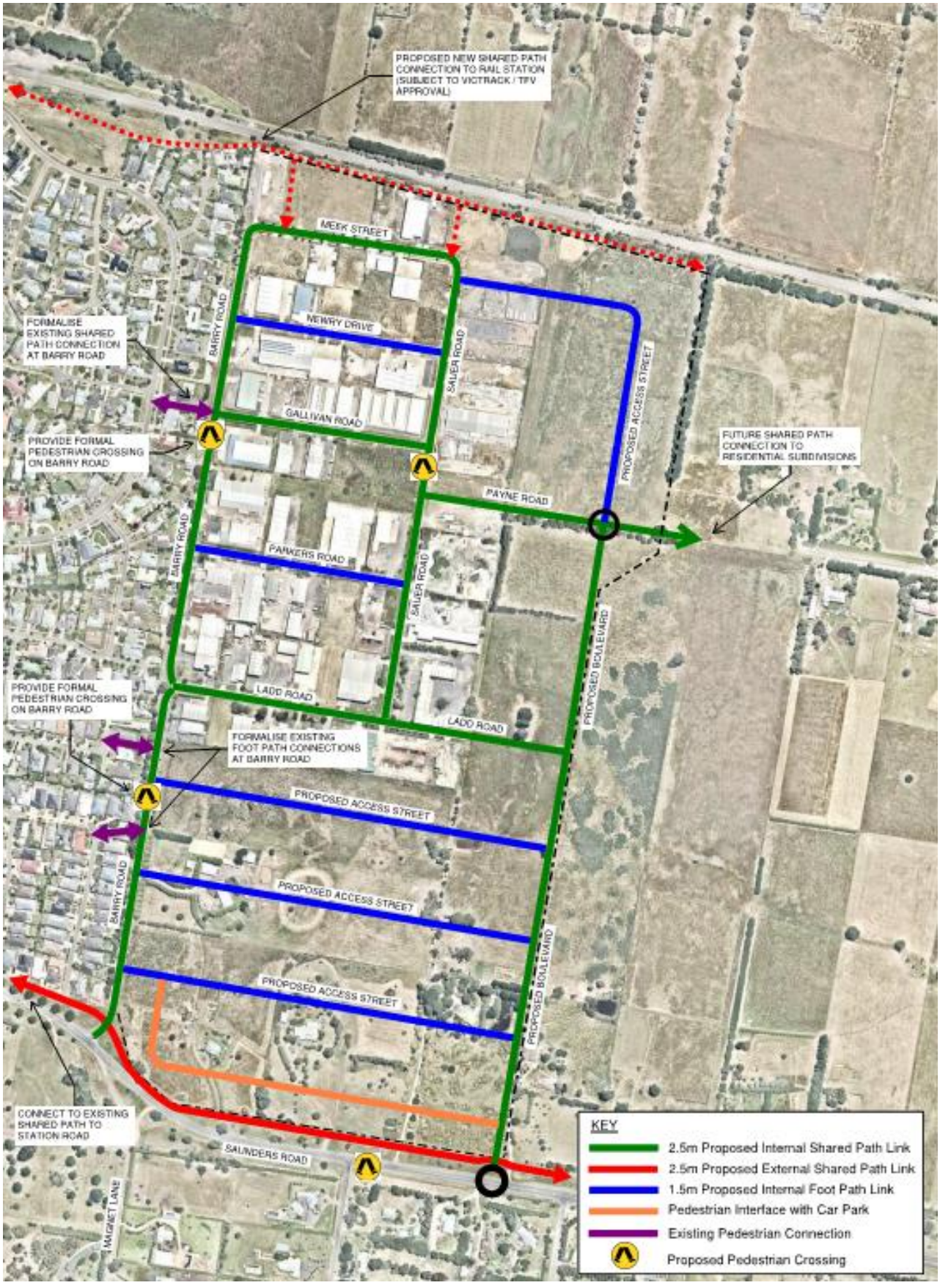
It is proposed to provide shared path access along Barry Road and the new boulevard from the south, with key east-west links provided on Ladd Road, Meek Street, and Gallivan Drive / Payne Road, to provide a direct connection between the Chessy Park Drive link to the west and any proposed development off Payne Road to the east.

As discussed, there are two pedestrian access points and one shared path access to Barry Road from the residential area west of the business park. It is proposed that a formal pedestrian crossing be provided on Barry Road at the shared path link to connect the internal shared path network. Given the lower levels of foot traffic on the other two foot path links to Barry Road from the residential area, it would be appropriate to formalise a single pedestrian crossing between the two, adjacent to the proposed east-west road link below Ladd Road, as shown in Figure 5-3 and Figure 3 in Appendix B.

The remaining road network will provide pedestrian footpaths on both sides of the road reserve, to provide full connectivity throughout the existing and expanded business park area. The provision of the shared path and footpaths within the street cross sections are illustrated in Figures 4 to 8 in Appendix B, and Figure 5-3 illustrated the shared path and footpath connectivity throughout the expanded business park area.

Consideration should also be given to the provision of on road cycle lanes on Barry Road and the proposed boulevard. Adequate end of trip facilities should be provided for cyclists in all new development proposals within the business park.

Figure 5-3 Proposed Active Transport Network



6 Conclusions & Recommendations

Cardno had been engaged in 2017 by Macedon Ranges Shire Council to develop a Transport and Infrastructure study to inform the development of the Gisborne Business Park Masterplan. An assessment has been undertaken of the existing transport conditions within and accessing the existing business park to gain an understanding of the current issues and opportunities.

An analysis has also been undertaken of the potential future transport demand upon full occupation of the existing business park and completion of development of the expanded business park area. The additional transport infrastructure and services required to meet the expected transport needs of the expanded business park have subsequently been determined.

Following community consultation on the draft masterplan in 2018, Cardno has reviewed and updated the original study to address some of the questions raised from the consultation, with the benefit of additional information gained through our involvement in the Gisborne Futures project

The key findings and proposed recommendations are summarised below:

> The existing Gisborne Business Park currently provides approximately 114 lots of varying sizes and business types, with around 85 lots currently occupied. Access is currently provided via Barry Road, off Saunders Road, with a number of internal local streets providing access to each of the properties. Traffic surveys undertaken in 2016 indicate that the current business park generates approximately 2,650 daily trips;

> Recent upgrades to sections of the internal road network have resulted in varying access conditions for vehicles and pedestrians throughout the business park, with some streets providing footpaths, formal drainage systems and improved road pavement and crossover conditions;

> Existing provision for pedestrians and cyclists trying to access the business park is very poor, with the only access being via a shared path from Chessy Park Drive in the neighbouring residential area to the west of the site. Whilst there is no formal access, there is evidence that pedestrians walk to the business park from the rail station via the rail reserve and into Meek Street at the northern end of the site;

> The expanded business park area is expected to provide an additional 135 lots of varying sizes in an area abutting the eastern and southern boundaries of the existing site. Assuming RTA trip generation rates, the full occupation of the existing and the proposed expanded business park is expected to generate approximately 10,100 total daily trips;

> As part of the development of the expanded business park, a second access is to be provided on Saunders Road in the form of a connector boulevard. Additional access points will be provided with the completion of Sayers Road to the east of the park;

> Internally, the Masterplan provides for upgrades to the existing business park road network so that it becomes fully integrated with the expanded area, and there is free movement for vehicles and pedestrians throughout the business park. It is proposed that Barry Road and the new boulevard provide Connector Road access, with the remaining existing and proposed streets being Local Access Streets. A plan illustrating the proposed road network hierarchy with associated cross sections is provided in Appendix B;

> It is proposed to upgrade the Saunders Road / Barry Road intersection, with two options considered. i.e.

  - . Provide a channelised right turn into Barry Road from the east and an improvement to the alignment of the Barry Road approach with the provision of separate left and right turn lanes; or
  - Upgrade to a roundabout, which will require a more detailed assessment as it will require significant offset to the existing road alignment due to the shape of the road reserve, and the required vertical sight distances may be impacted by the location of the intersection at the apex of a hill. This option will require a more detailed assessment.

> The Magnet Lane approach to Saunders Road will be realigned within the existing Saunders road reserve to allow for the provision of a channelised right turn into Magnet Lane from the west,

> The upgrade of Station Road / Saunders Road intersection to signals will significantly increase capacity and safety for all road users, and will cater for additional traffic generated by the business park expansion.

> Saunders Road will remain within capacity as a single carriageway road in future, catering for additional traffic generated by the business park expansion;

> In the longer term, aided by the potential residential development east of the expanded business park area, it is proposed that a roundabout with a raised median is provided at the future connector boulevard intersection;

> The nearest bus service is an hourly local bus service between Gisborne Town Centre and Gisborne Station, with a stop adjacent to the business park on Chessy Park Drive. As the business park develops and with potential residential development further east, it is recommended that key links within the business park be designed as bus capable, including the southern section of Barry Road, Ladd Road, the proposed boulevard, and the Payne Road connection toward the east;

> It will be important to both improve active transport connectivity into the existing and future business park and also provide internal permeability for pedestrians and cyclists. Recommendations include:

- Continue the shared path along the northern boundary of Saunders Road further east, past Barry Road and to the proposed boulevard intersection;
- Provide shared paths in the north south directions along Barry Road and the proposed boulevard;
- Improve the foot path and shared path connections from the west and integrate with those on Barry Road;
- In consultation with VicTrack and Transport for Victoria, provide a formal shared path from the rail station along the rail reserve along the northern boundary to the site, with access points in to Meek Street;
- Provide adequate east-west shared path and footpath connections throughout the site, including to the Payne Road connection to the east;
- Provide formal pedestrian crossings on Barry Road and Sauer Road at key desire lines to provide safe access for pedestrians at these locations; and
- Consider the provision of on road cycle lanes on Barry Road and the proposed boulevard. Adequate end of trip facilities should be provided for cyclists in all new development proposals within the business park.

Gisborne Futures - Gisborne Business Park

APPENDIX A

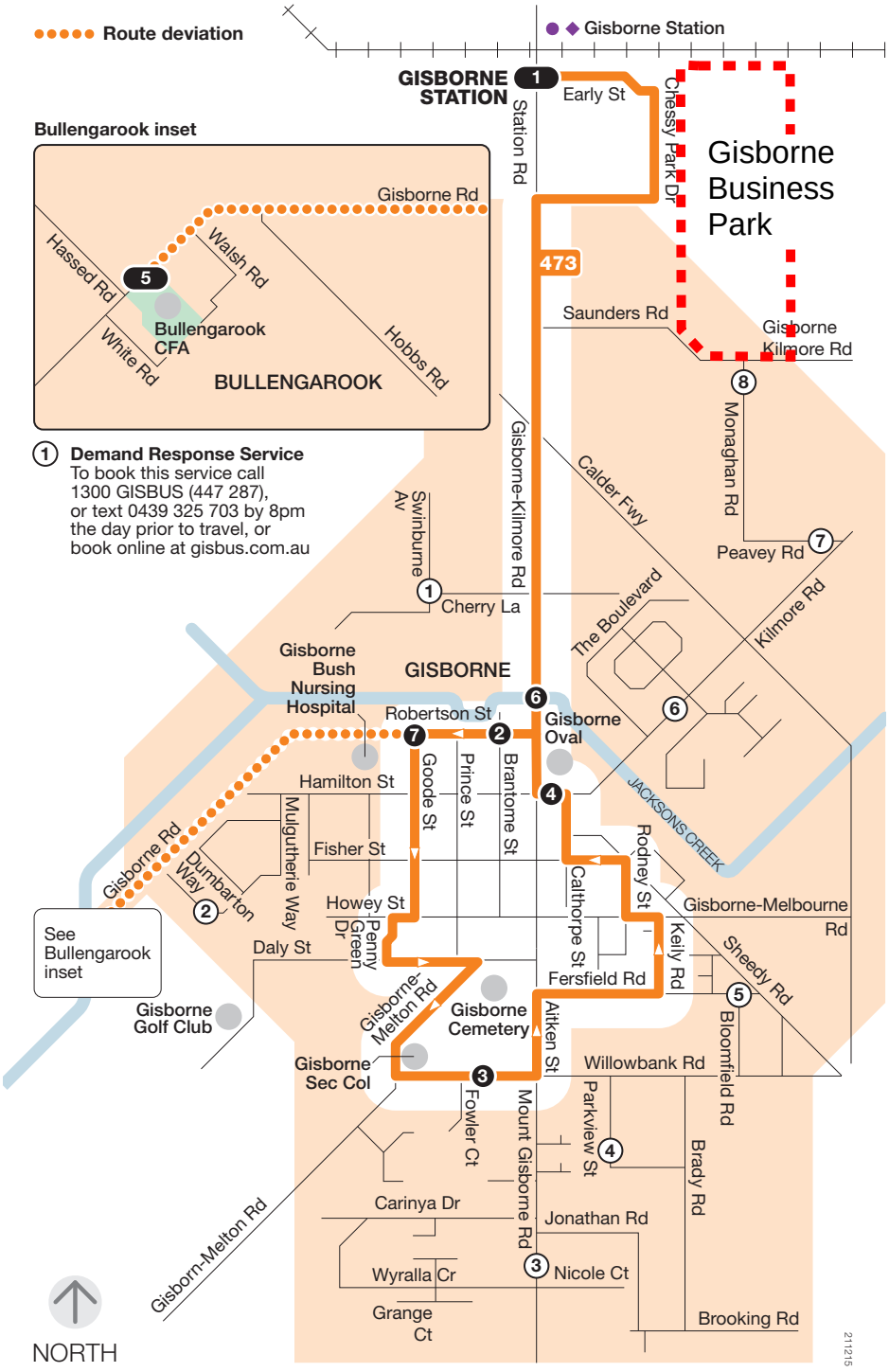
GISBORNE LOCAL BUS NETWORK

Cardno
Shaping the Future

Gisborne – Gisborne Station

Route 473 via Fersfield Rd

Route 474 Demand Responsive Service



For more information visit **ptv.vic.gov.au** or call **1800 800 007**

MAP NOT TO SCALE

Gisborne Futures - Gisborne Business Park

APPENDIX B

TRANSPORT NETWORK PLANS & INTERNAL ROAD CROSS SECTIONS

Cardno
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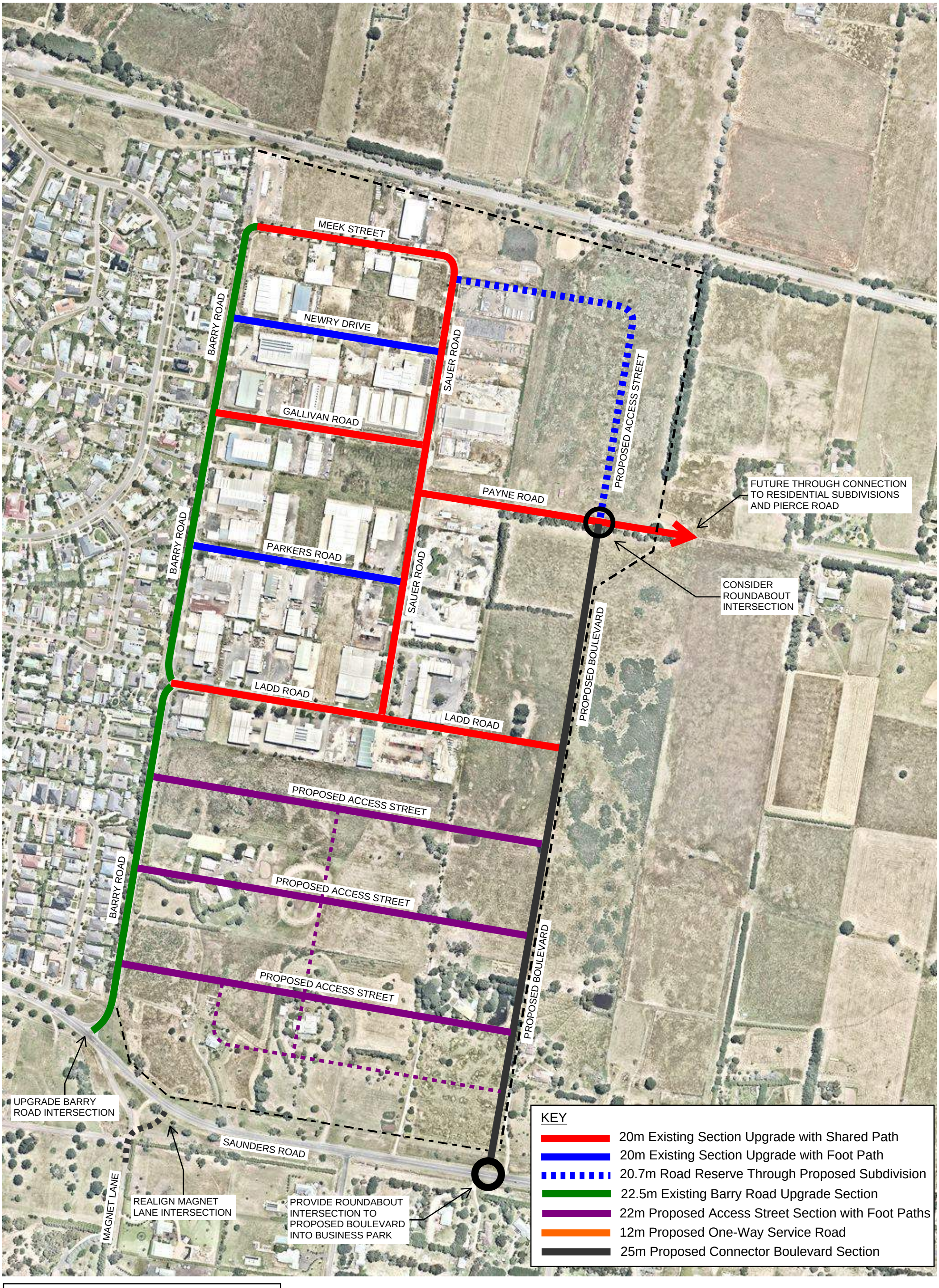
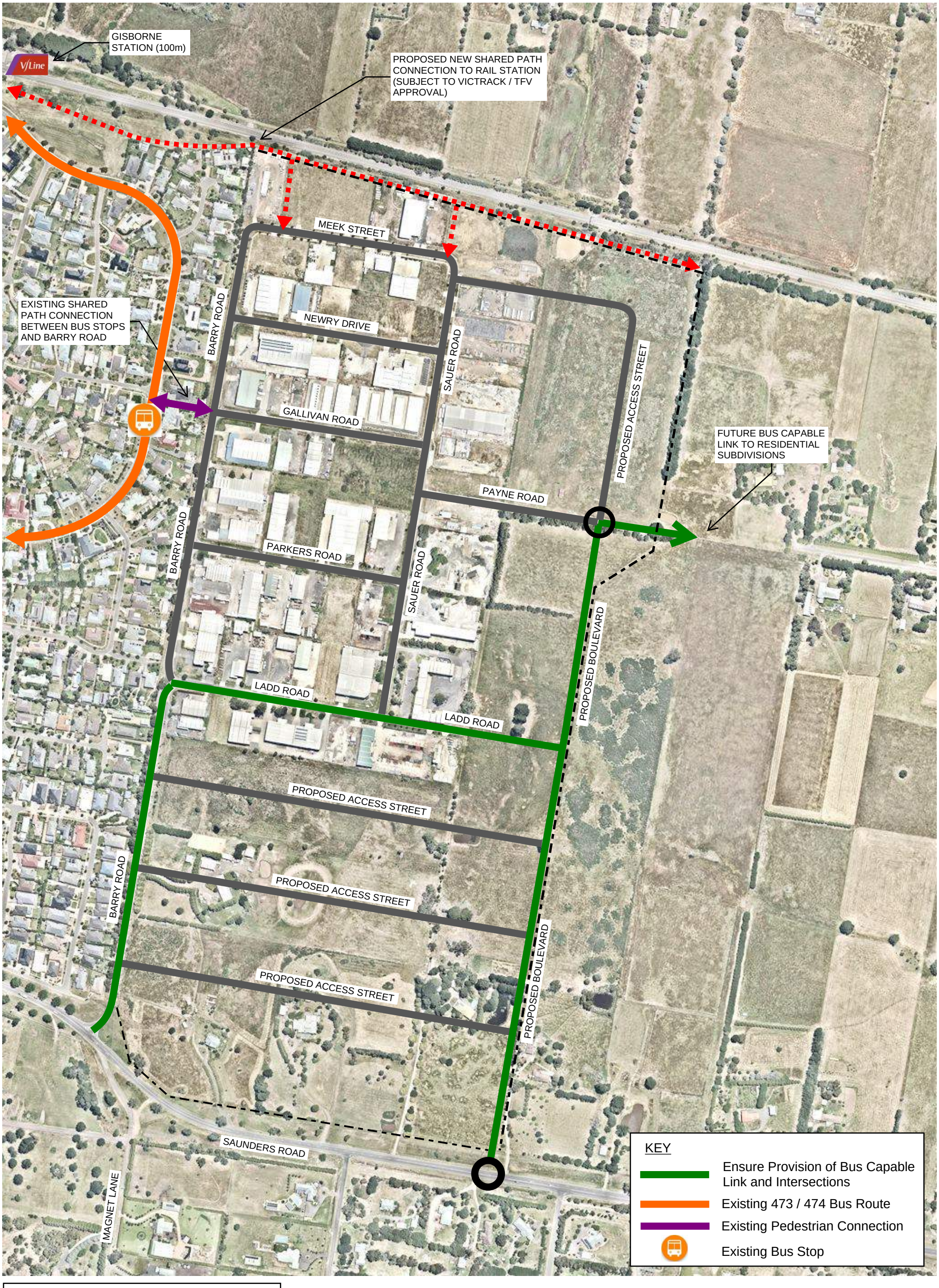


V171269 - GISBORNE BUSINESS PARK
FIGURE 1 - ROAD NETWORK LINK PLAN
Cardno Shaping the Future REV E 15/05/2018



V171269 - GISBORNE BUSINESS PARK
FIGURE 2 - PUBLIC TRANSPORT LINK PLAN
Cardno Shaping the Future REV A 15/05/2018

N

PROPOSED NEW SHARED PATH CONNECTION TO RAIL STATION (SUBJECT TO VICTRACK / TFV APPROVAL)

MEEK STREET

NEWRY DRIVE

GALLIVAN ROAD

BARRY ROAD

SAUER ROAD

PROPOSED ACCESS STREET

FORMALISE EXISTING SHARED PATH CONNECTION AT BARRY ROAD

PROVIDE FORMAL PEDESTRIAN CROSSING ON BARRY ROAD

FUTURE SHARED PATH CONNECTION TO RESIDENTIAL SUBDIVISIONS

PAYNE ROAD

PARKERS ROAD

PROPOSED BOULEVARD

LADD ROAD

FORMALISE EXISTING FOOT PATH CONNECTIONS AT BARRY ROAD

PROVIDE FORMAL PEDESTRIAN CROSSING ON BARRY ROAD

PROPOSED ACCESS STREET

PROPOSED ACCESS STREET

CONNECT TO EXISTING SHARED PATH TO STATION ROAD

SAUNDERS ROAD

MAGNET LANE

KEY

- 2.5m Proposed Internal Shared Path Link
- 2.5m Proposed External Shared Path Link
- 1.5m Proposed Internal Foot Path Link
- Pedestrian Interface with Car Park
- Existing Pedestrian Connection
- Proposed Pedestrian Crossing

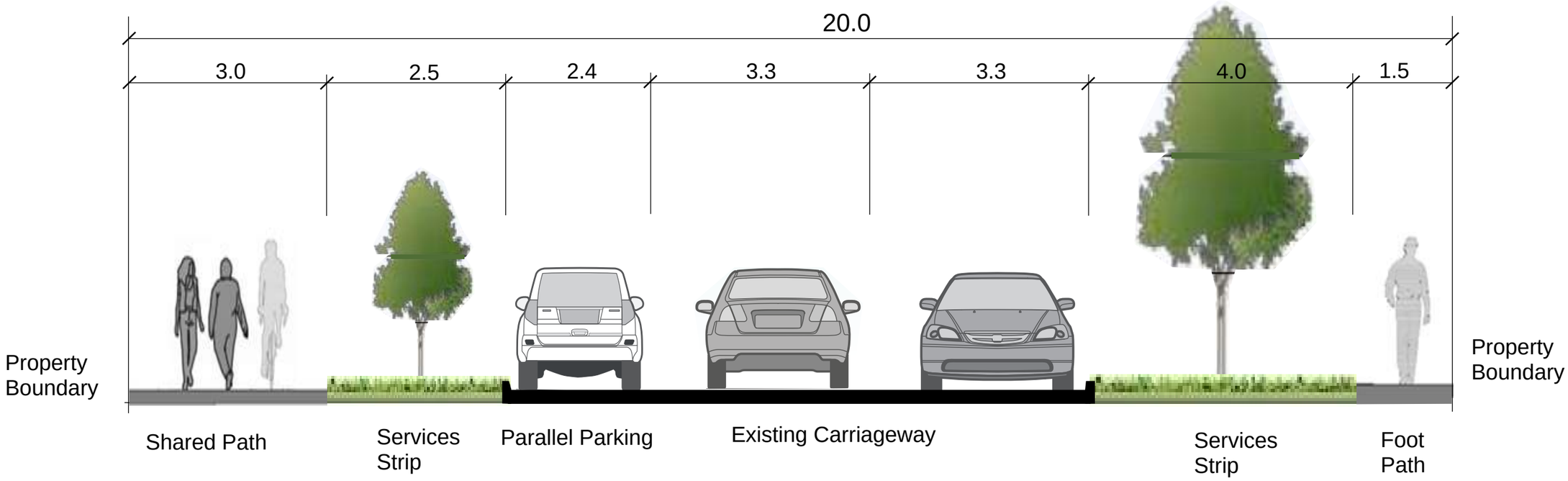
V171269 - GISBORNE BUSINESS PARK
FIGURE 3 - ACTIVE TRANSPORT LINK PLAN

Cardno Shaping the Future

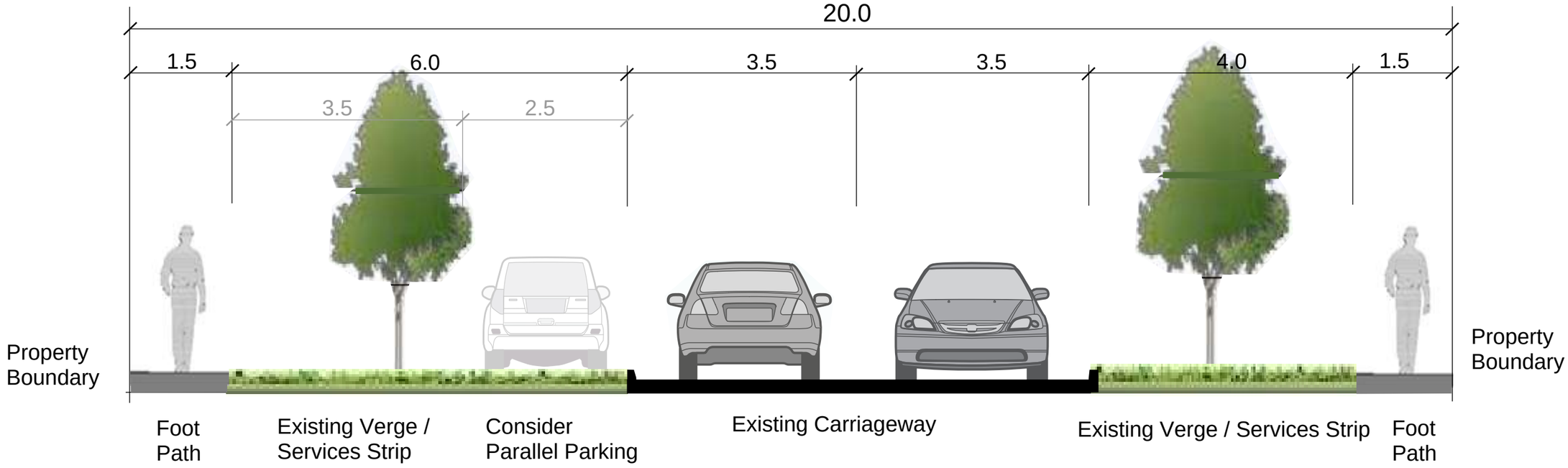
REV A 15/05/2018

N

EXISTING 20.0m ACCESS STREET CROSS SECTION IMPROVEMENT - MEEK STREET



EXISTING 20.0m ACCESS STREET CROSS SECTION IMPROVEMENT - NEWRY DRIVE



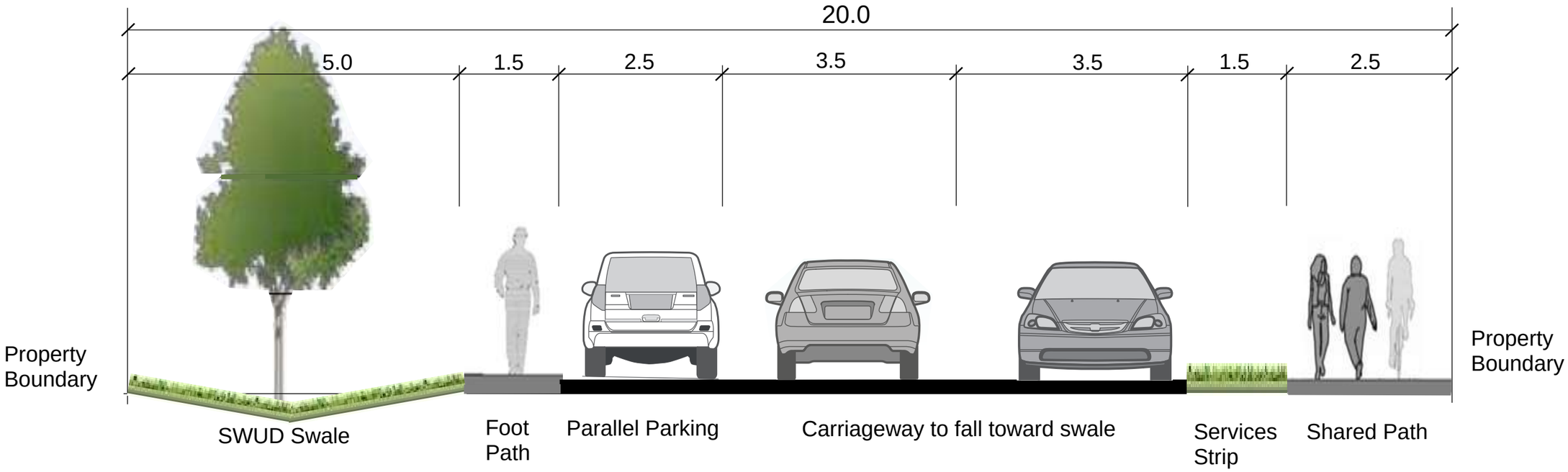
V171269 - GISBORNE BUSINESS PARK

FIGURE 4 - INDICATIVE 20m LOCAL ACCESS CROSS SECTIONS A

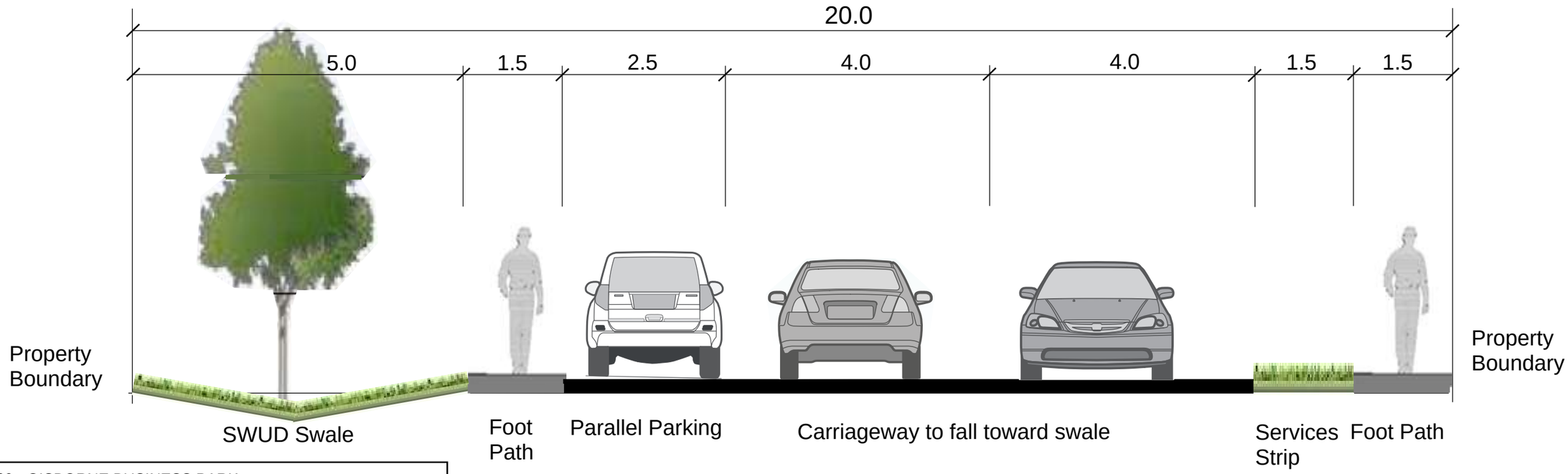
Cardno Shaping the Future

15-05-2018

EXISTING 20.0m ACCESS STREET CROSS SECTION IMPROVEMENT - GALLIVAN ROAD, LADD ROAD, SAYER ROAD, & PAYNE ROAD



EXISTING 20.0m ACCESS STREET CROSS SECTION IMPROVEMENT - PARKERS ROAD & APPROVED SUBDIVISION



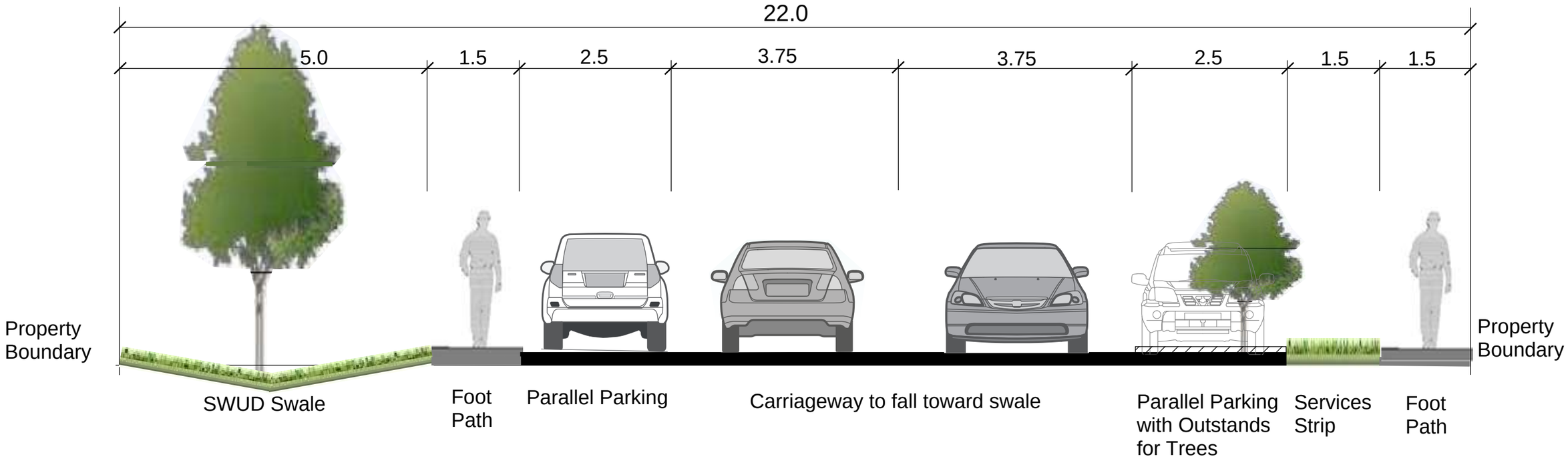
V171269 - GISBORNE BUSINESS PARK

FIGURE 5 - INDICATIVE 20m LOCAL ACCESS CROSS SECTIONS B

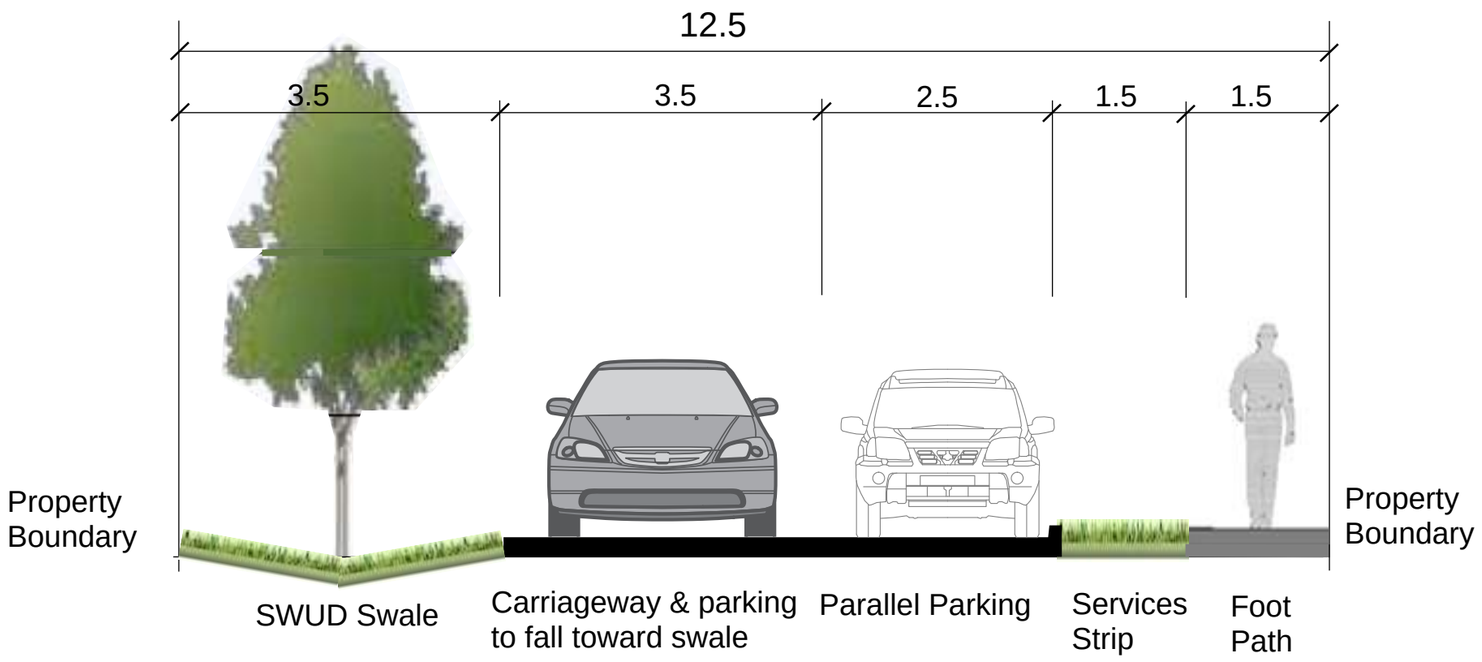
Cardno Shaping the Future

15-05-2018

INDICATIVE LOCAL 22.0m ACCESS STREET CROSS SECTION - PROPOSED EAST WEST LOCAL STREETS

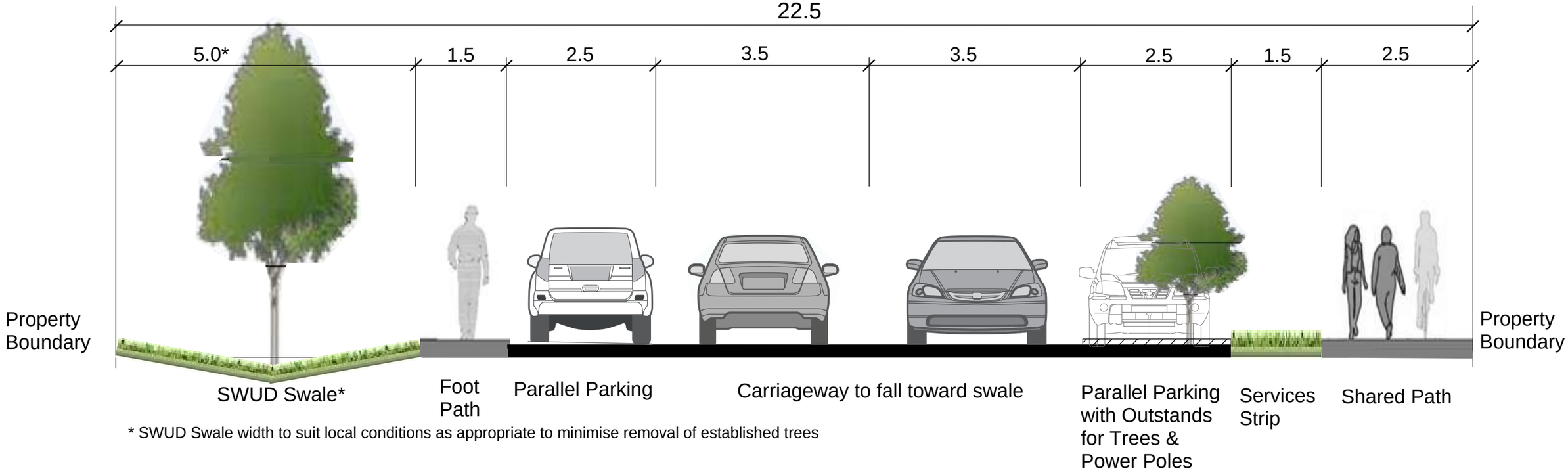


INDICATIVE LOCAL 12.5m SERVICE ROAD CROSS SECTION



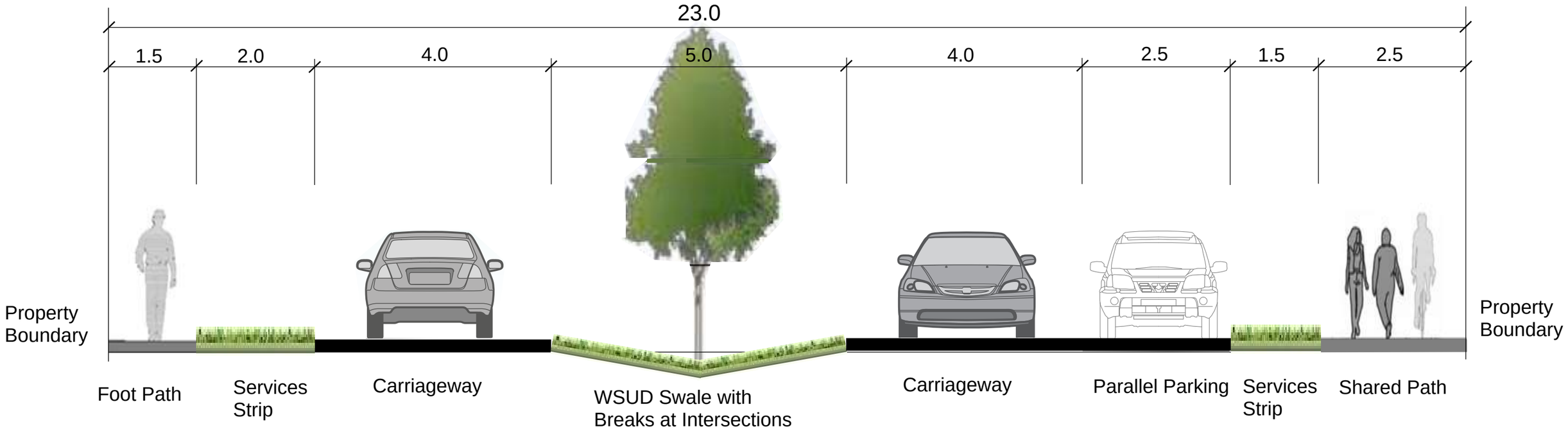
V171269 - GISBORNE BUSINESS PARK
FIGURE 6 - PROPOSED LOCAL ACCESS CROSS SECTIONS
Cardno Shaping the Future
15-05-2018

INDICATIVE 22.5m CONNECTOR ROAD CROSS SECTION - BARRY ROAD NORTH & SOUTH OPTION 1



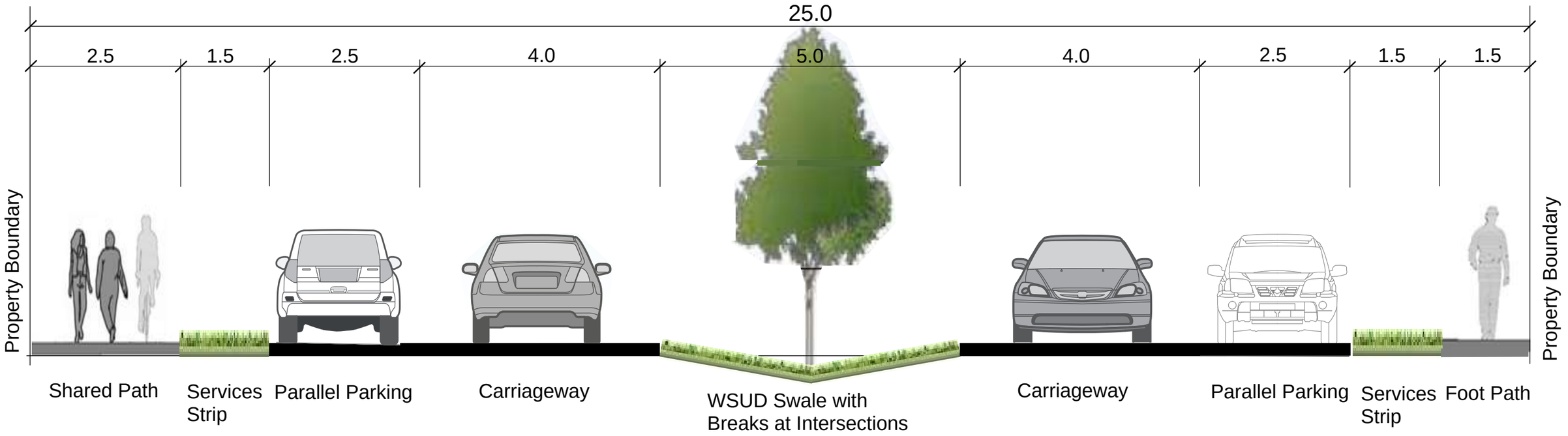
* SWUD Swale width to suit local conditions as appropriate to minimise removal of established trees

INDICATIVE 23m CONNECTOR ROAD CROSS SECTION - BARRY ROAD SOUTH BOULEVARD OPTION 2



V171269 - GISBORNE BUSINESS PARK
FIGURE 7 - INDICATIVE BARRY ROAD CROSS SECTION OPTIONS
Cardno Shaping the Future
15-05-2018

INDICATIVE 25.0m CONNECTOR ROAD CROSS SECTION - PROPOSED BOULEVARD



V171269 - GISBORNE BUSINESS PARK
FIGURE 8 - INDICATIVE 25m CONNECTOR BOULEVARD CROSS SECTION
Cardno Shaping the Future
15-05-2018

APPENDIX

G

GISBORNE CAR PARKING PRECINCT PLAN

Car Parking Precinct Plan

Gisborne Town Centre Urban Design Framework

V180578

Prepared for

Ethos Urban

11 March 2020

Cardno

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Approved By:

Matthew Mudge
Associate Transport Planner

Date Approved 11/03/2020

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D01	01/11/2019	Draft	TM	MM
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F01	11/03/2020	Final	TM	MM

Table of Contents

Tables

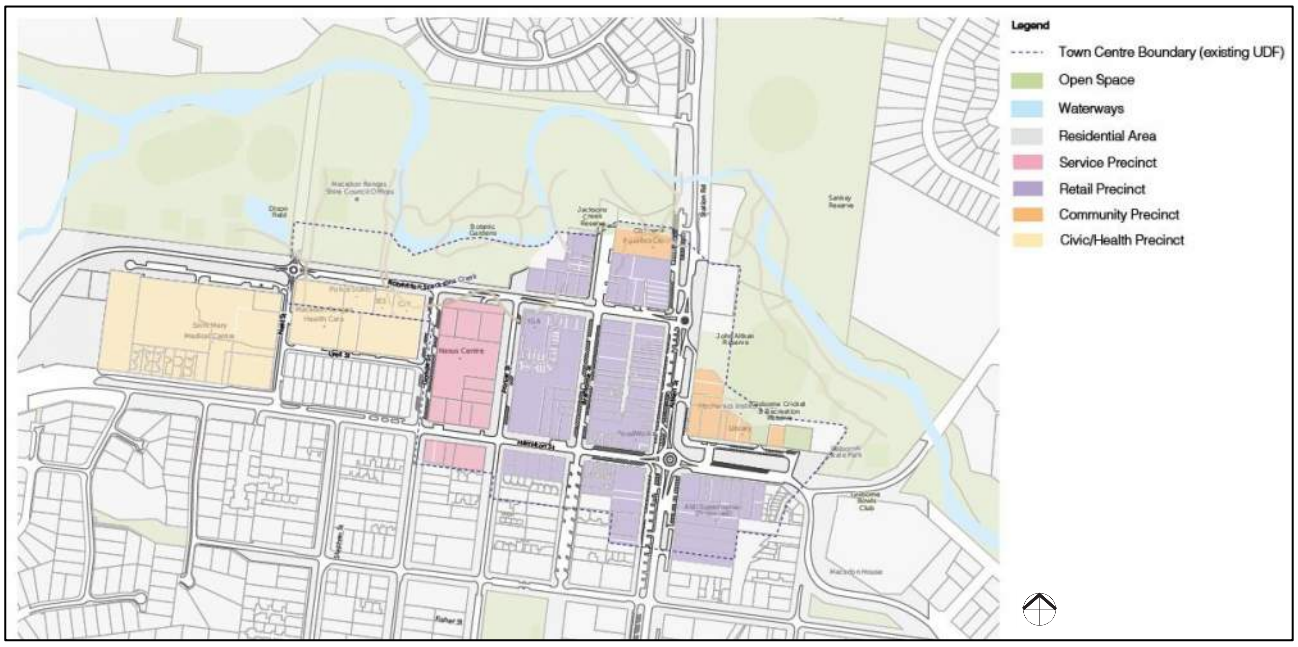
Figures

1 Introduction

Cardno has been engaged by Ethos Urban to prepare a Car Parking Precinct Plan to support and inform their Gisborne Town Centre Urban Design Framework (UDF) for the Gisborne Futures project.

Figure 1-1 illustrates the land use areas which have been considered within the following assessment, which is the land generally within the existing UDF boundary, including the westernmost civic/health precinct.

Figure 1-1 Gisborne Town Centre



1.1 Objectives

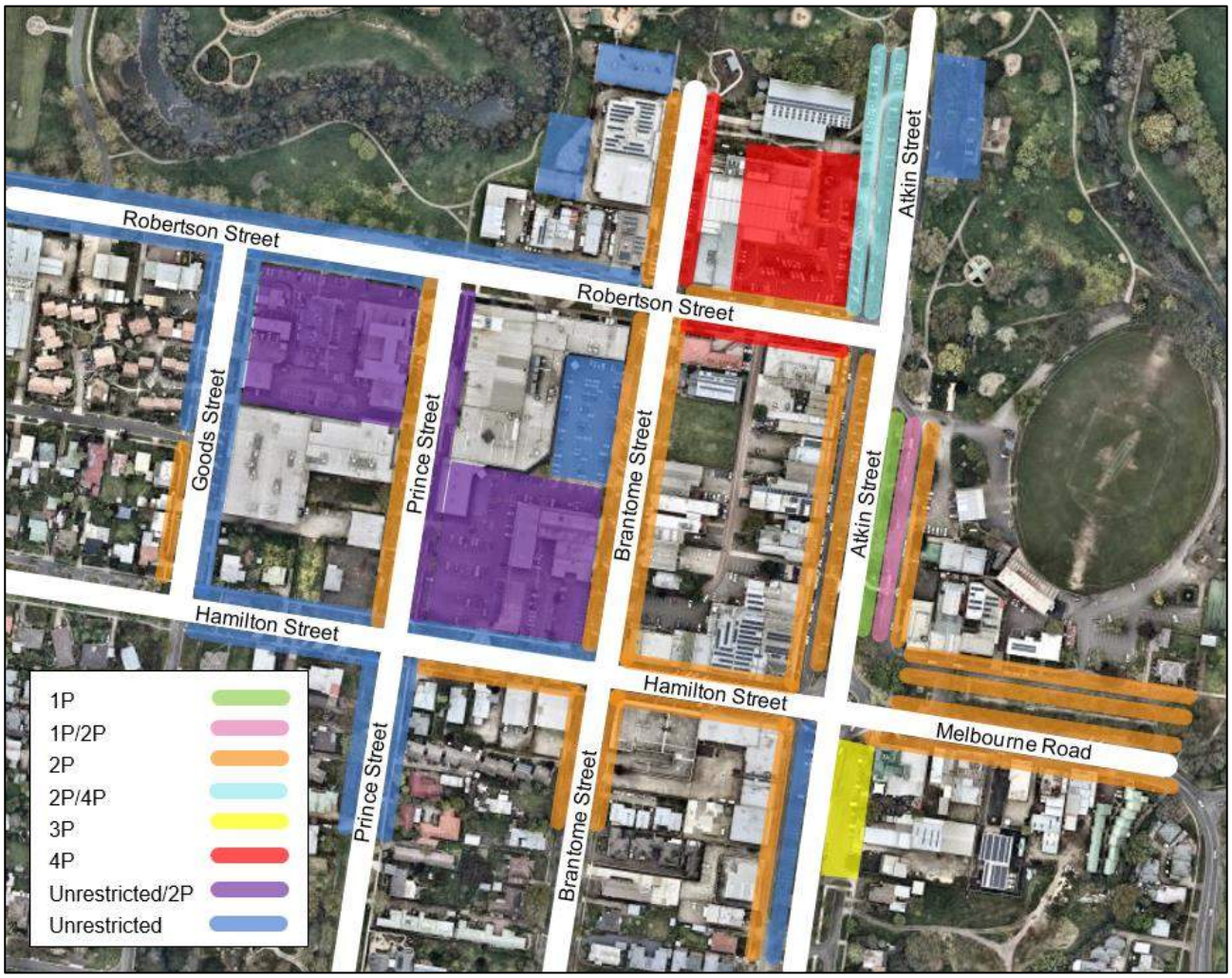
The car parking precinct plan aims to achieve the following key objectives:

- An analysis and review of current parking characteristics and key parking facilities within the UDF area, including:
  - Car parking supply;
  - Car parking demand;
  - Existing distribution of parking; and
  - Existing constraints and opportunities.
- Provide recommendations to best manage the available parking resources within the Gisborne Town Centre via both supply and demand measures, to accommodate the current and future demand for car parking.

2 Existing Car Parking Supply

Cardno commissioned Nationwide Traffic Surveys P/L to undertake parking occupancy surveys on Thursday 11th October 2018 and Saturday 13th October 2018 between 7am – 7pm to determine existing parking restrictions and level of demand within Gisborne Town Centre. Figure 2-1 illustrates the predominant time restrictions of the car parking that was surveyed.

Figure 2-1 Time restrictions of Surveyed Car Parking



Within the Gisborne UDF area, a mix of on and off-street car parking is available with both restricted and unrestricted parking. Table 2-1 quantifies the number of car parking spaces associated with that illustrated in Figure 2-1.

Table 2-1 Summary of Car Parking Provision within Gisborne Town Centre

Type	On-Street	Off-Street	Total	% Provision
Unrestricted	202	446	648	45%
Disabled	19	16	35	2.4%
4P	49	0	49	3.4%
3P	0	25	25	1.7%
2P	450	150	600	42%
1P	14	0	14	1%
1/2P	4	0	4	0.3%
1/4P	3	0	3	0.2%
Bus Zone	7	0	7	0.5%
Loading Zone	3	0	3	0.2%
No Standing	2	0	2	0.1%
Other	4	42	46	3.2%
Total	757	679	1,436	100%

Currently there are 1,436 existing car spaces within Gisborne Town Centre for use by commercial employees, visitors and residents which includes 757 on-street and 679 off-street car spaces.

Existing parking supply within Gisborne Town Centre is predominately either unrestricted parking or two-hour parking, accounting for 45% and 42% respectively of on-street and off-street parking spaces. Unrestricted parking spaces are provided predominantly off-street, whilst two-hour parking spaces are located predominantly on-street.

It is also noted that whilst not surveyed, there is additional roof-top car parking on the corner of Brantome Street and Hamilton Street, with approximately 53 parking spaces provided. There is also capacity for additional on-street car parking further south of the surveyed car parks on Brantome Street and Prince Street, south of Hamilton Street. Based on aerial imagery and observations, these car parking areas are unrestricted and underutilised.

3 Existing Car Parking Demand

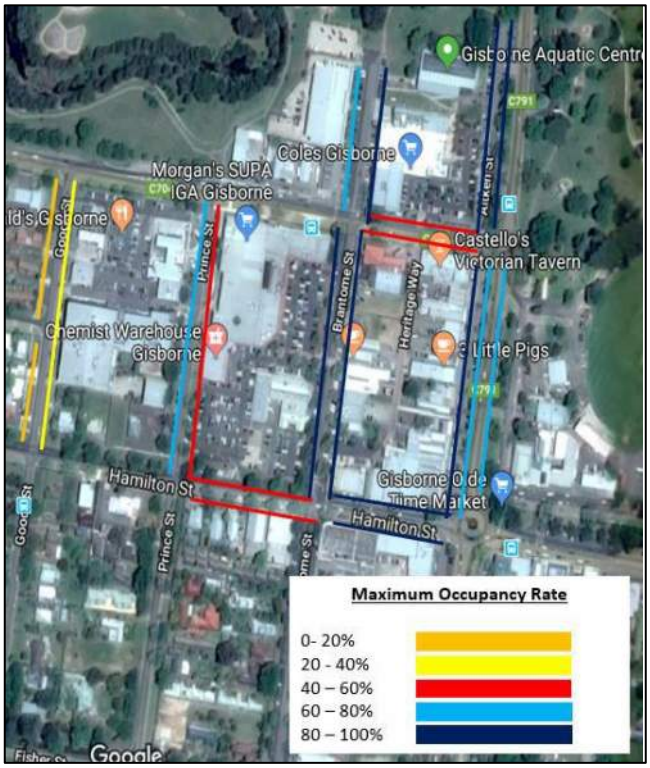
3.1 On-Street Car Parking

3.1.1 Car Parking Occupancy

Figure 3-1 and Figure 3-2 summarise the car parking occupancy rates for key on-street locations within the Gisborne Town Centre between 7am-7pm on each of the survey days.

Figure 3-1 Parking Occupancy, Thursday (on-street)

Figure 3-2 Parking Occupancy, Saturday (on-street)



The following comments are made regarding Figure 3-1 (on-street car parking, Thursday):

- The maximum occupancy rate was nearing capacity (80% - 100%) only on the west side of Brantome Street (between Hamilton Street and Robertson Street) and on the east side of the Aitken Street service road (north of Robertson Street). This is likely due to their proximity to the supermarkets;
- Aitken Street, Goode Street and Prince Street through the central core of the town had maximum occupancy levels between 40% - 80%, indicating that there is still capacity in central areas; and
- The maximum occupancy rate along the north side of Hamilton Street was the lowest, at 0% - 40%. A possible explanation for this is that the angle of the car parks only allows eastbound parking access.

The following comments are made regarding Figure 3-2 (on-street car parking, Saturday):

- The eastern portion of the town centre had the highest maximum occupancy levels, likely due to the retail land uses being more prevalent in these areas. Brantome Street and Aitken Street generally had the highest maximum occupancy levels;
- West of Brantome Street, the maximum occupancy rate was notably lower, typically ranging from 0% - 60%.

3.1.2 Car Parking Duration of Stay

A summary of the duration of stay for on-street car parking is provided in Table 3-1, numbered in accordance with Figure 3-3.

Figure 3-3 On-Street Parking Segments

Table 3-1 Duration of Stay (on-street)

Car Park Area	Parking Restriction	Duration of Stay (Thursday)		Duration of Stay (Saturday)	
		≤ 1 hour	> 1 hour	≤ 1 hour	> 1 hour
1	2P	43%	57%	3%	97%
	4P	22%	78%	7%	93%
2	2P	51%	49%	n/a	n/a
	Unrestricted	39%	61%	57%	43%
3	2P	45%	55%	82%	18%
	Unrestricted	68%	32%	80%	20%
4	2P	31%	69%	47%	53%
	1P	100%	0%	42%	58%

Key points from this summary are as follows:

- Parking around Area 1 had a low turnover on the Saturday, with less than 10% of vehicles staying for shorter than one hour;
- Parking at the western end of the town centre Area 2 had a steady turnover rate for both two-hour limited and unrestricted parking;
- Parking in the central portion of the town centre Area 3 which includes both sides of Brantome Street, experienced high turnover on the weekend for both two-hour limited and unrestricted parking;
- Parking at the eastern end of the town centre Area 4 had a fairly steady turnover on the Saturday. The data also indicates that people generally look to maximise their stay within the two-hour limited parking on the weekday.

3.2 Off-Street Car Parking

3.2.1 Car Parking Occupancy

Figure 3-4 and Figure 3-5 summarise the car parking occupancy rates for key off-street locations within the town centre between 7am-7pm on each of the survey days.

Figure 3-4 Parking Occupancy, Thursday (off-street)

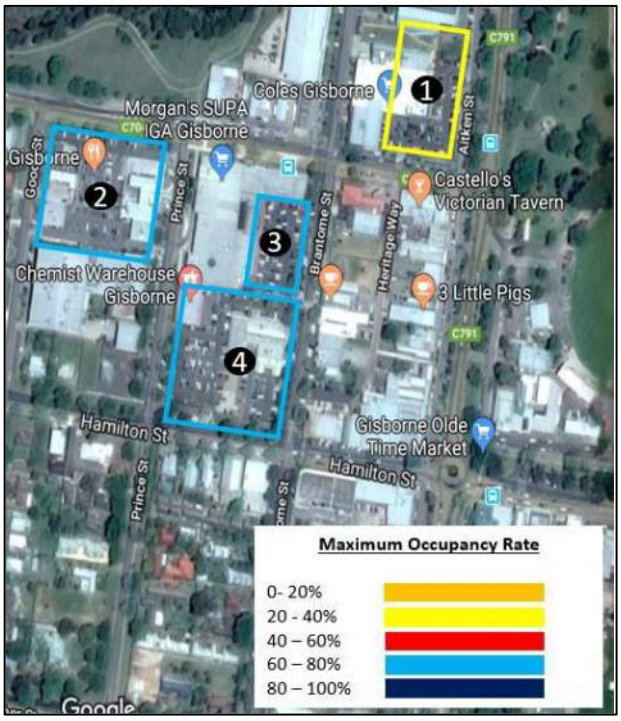
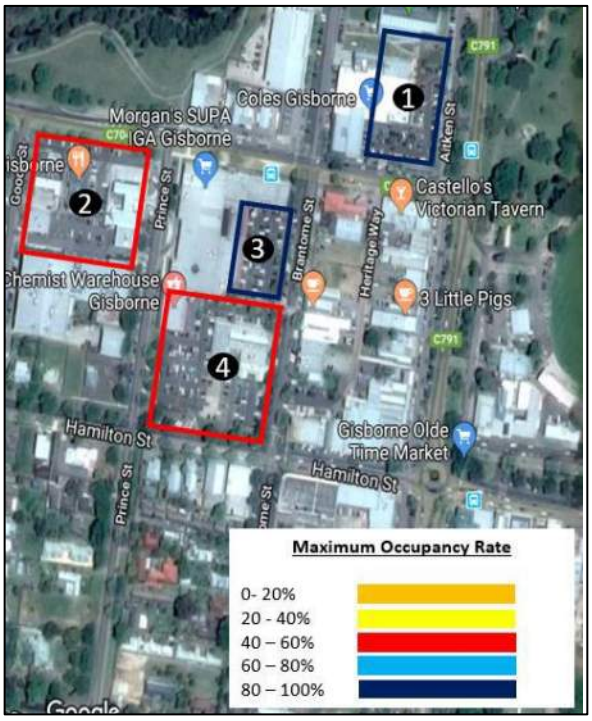


Figure 3-5 Parking Occupancy, Saturday (off-street)



The following comments are made regarding Figure 3-4 (off-street car parking, Thursday):

- The Coles car park (ref. 1) had a low maximum occupancy rate of up to only 40%; and
- All of the other off-street car parks had a maximum occupancy rate of 60% - 80%.

The following comments are made regarding Figure 3-5 (off-street car parking, Saturday):

- The McDonalds (ref. 2) and Chemist Warehouse (ref. 4) car parks had a maximum occupancy rate of 40% - 60%, lower than that recorded on the weekday; and
- The Coles (ref. 1) and IGA (ref. 3) car parks had the highest maximum occupancy rates of 80% - 100%.

3.2.2 Car Parking Duration of Stay

A summary of the duration of stay is provided in Table 3-2, numbered accordingly with Figure 3-4 and Figure 3-5.

Table 3-2 Duration of Stay (off-street)

Car Park Area	Parking Restriction	Duration of Stay (Thursday)		Duration of Stay (Saturday)	
		≤ 1 hour	> 1 hour	≤ 1 hour	> 1 hour
1	2P	38%	62%	20%	80%
2	2P	39%	61%	88%	12%
	Unrestricted	43%	57%	99%	1%
3	Unrestricted	11%	89%	90%	10%
4	2P	38%	63%	70%	30%
	Unrestricted	31%	69%	92%	8%

Key points for this summary are as follows:

- The car park Area 1 has a two-hour parking restriction, with 62% of vehicles staying for over one hour on Thursday and 80% staying for over one hour on Saturday;
- The McDonalds car park Area 2 provides both two-hour limited parking and unrestricted parking. On Thursday, both two-hour and unrestricted parking had duration of stay rates of 57% and 61% respectively, for stays of over one hour. On Saturday however, a majority of vehicles stay for less than one hour in both two-hour and unrestricted parking, at rates of 88% and 99% respectively. This suggests that people use this car park for multi-purpose trips on a weekday, or staff parking in the unrestricted spaces, whilst more specific trips are expected on a Saturday;
- The IGA car park Area 3 provides unrestricted parking, with a majority (89%) of vehicles parked for over one hour, whilst only 10% were parked for over one hour on the Saturday, illustrating a significant difference in parking patterns between the weekday and the weekend. This is likely due to staff parking and multi-purpose trips on a weekday;
- The Chemist Warehouse car park Area 4 provides both two-hour and unrestricted parking, with a high turnover rate on the Saturday and a relatively low turnover rate on the Thursday; and
- Overall, given the availability of unrestricted parking within the off-road car parks, it is expected that the lower turnover rates on the weekday are due to staff parking and multi-purpose trips.

3.3 Car Parking Summary

In summary, the existing car parking supplies in the Gisborne Town Centre exceed the peak demands generated by all existing uses within the town centre.

Key themes from the parking surveys undertaken to inform this Car Parking Assessment include the following:

- The average occupancy rate for all on-street parking in the town centre is 37% on a weekday and 31% on a Saturday;
- The peak occupancy rate for all on-street parking in the town centre is 61% on a weekday and 59% on a Saturday;
- The average occupancy rate for all off-street parking in the town centre is 42% on a weekday and 26% on a Saturday;
- The peak occupancy rate for all off-street parking in the town centre is 67% on a weekday and 59% on a Saturday;
- The peak occupancy rate for all on-street parking with a 2P restriction or shorter is 67% on a weekday and 72% on a Saturday; and
- The peak occupancy rate for all on-street parking with either a 4P restriction or no restriction is 53% on a weekday and 38% on a Saturday.

The above findings indicate that when car parking demand within the Gisborne Town Centre is at its highest, approximately 1 in 3 public parking spaces, in both on- and off-street locations, remain vacant. From a total surveyed supply of 1,436 car parking spaces, this translates to approximately 474 vacant car parking spaces during peak occupancy. This represents an under-utilisation of this existing infrastructure.

The average car parking demand across the day for both on- and off-street locations is within the range of 26% - 42% for both the weekday and Saturday, indicating significant car parking capacity outside of peak times.

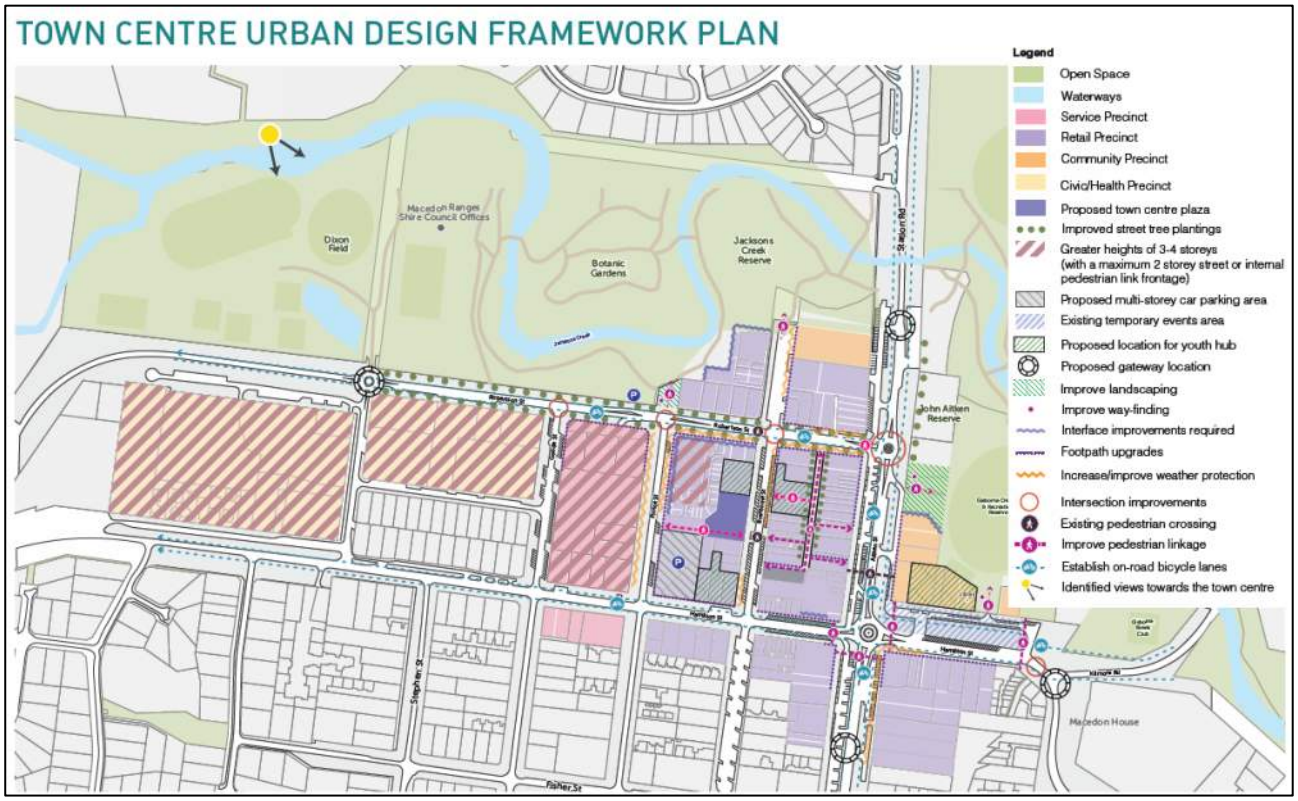
Over half of the on-street parking in the town centre is 2P restricted, with minimal provision of car parking with any shorter time restrictions. The peak demand for 2P restricted car parking is generally consistent with the overall on-street car parking occupancy trend. The peak demand for longer term parking (4P or unrestricted) is 53% on a weekday and 38% on a Saturday. The higher demand for 2P parking is likely due to this shorter-term parking being located in the more central locations of the town centre.

4 Proposed Future Land Uses

4.1 Town Centre UDF Area

A Draft UDF has been developed by Ethos Urban, which identifies future land uses and built form guidelines within the town centre. The following is a summary of the key proposals identified within Figure 4-1 which would be expected to impact car parking provision and patterns.

Figure 4-1 Town Centre UDF, prepared by Ethos Urban



- Development of civic/health precincts west of Goode Street, with greater heights of 3-4 storeys;
- Intensification of the service precinct bound by Goode, Hamilton, Prince and Robertson Streets, by encouraging building heights of 3-4 storeys;
- Greater building heights of up to 3-4 storeys in the northwest portion of the retail precinct fronting Prince and Robertson Streets;
- Potential multi-storey car park on the northeast corner of Prince and Hamilton Streets;
- Additional areas of built form and a town centre plaza along Brantome Street within existing car parking areas or undeveloped land;
- A proposed youth hub on the northeast corner of Aitken Street and Hamilton Street;
- Acknowledgement of the ongoing role that the Gisborne Olde Time Market plays within the ‘existing temporary events area’; and
- Improvements to the streetscape and pedestrian access on Heritage Way, including providing increased active frontages.

The UDF identifies the surface car park of the Gisborne Village Shopping Centre as a potential development site. Should this site be developed for higher intensity it is recommended that a multi-deck car park be included as part of the development proposal to make up for the reduction in available car parking spaces. Any future car parking structure should be sleeved with active uses.

Whilst not occurring in the within the UDF area, it is relevant to note that Neighbourhood Activity Centres are proposed to be developed both north and south of the town centre over the short to long term period. By

providing alternative commercial and retail areas outside of the town centre, this will assist to alleviate demand for town centre car parking in the future.

4.2 Macedon Ranges Shire Planning Scheme Parking Rates

4.2.1 Car Parking

Table 4-1 outlines the car parking space requirements under Clause 52.06 of the Macedon Ranges Planning Scheme of most relevance to the proposed land uses within the town centre. It is noted that only 'column A' rates are listed, as there is no Principal Public Transport Network (ie. 'column B' rate) or Parking Overlay under the Macedon Ranges Planning Scheme.

Table 4-1 Relevant Clause 52.06 Car Parking Rates

Use	Rate Column A	Car Parking Measure
Office	3.5	To each 100 sq m of net floor area
Shop	4.0	To each 100 sq m of leasable floor area
Food & Drink Premises	4.0	To each 100 sq m of leasable floor area
Medical Centre	5	To the first person providing health services plus
	3	To every other person providing health services
Place of Assembly	0.3	To each patron permitted

4.2.2 Bicycle Parking

Table 4-2 outlines the bicycle parking space rate requirements under Clause 52.34 of the Macedon Ranges Planning Scheme.

Table 4-2 Relevant Clause 52.34 Bicycle Parking Space Rates

Use	Employee/Resident	Visitor/Shopper/Student
Office	1 to each 300 sq m of net floor area if the net floor area exceeds 1000 sq m	1 to each 1000 sq m of net floor area if the net floor area exceeds 1000 sq m
Shop	1 to each 600 sq m of leasable floor area if the leasable floor area exceeds 1000 sq metres	1 to each 500 sq m of leasable floor area if the leasable floor area exceeds 1000 sq metres
Retail Premises	1 to each 300 sq m of leasable floor area	1 to each 500 sq m of leasable floor area
Medical Centre	1 to each 8 practitioners	1 to each 4 practitioners
Place of Assembly	1 to each 1500 sq m of net floor area	2 plus 1 to each 1500 sq m of net floor area

4.2.3 Planning Scheme Considerations

- The planning scheme requires that car parking spaces are to be delivered on-site by the developer.
- Reductions on car parking requirements may be negotiated between the developer and Council
- Any request for a reduction must be must be accompanied by a Car Parking Demand Assessment Report.
- Consideration may be given to the hours of operation and use, and whether car parking spaces may be shared between uses.
- Car parking supply and demand will require ongoing monitoring to ensure supply remains adequate in the town centre.
- If it becomes evident that car parking demand is not met by supply then a detailed Car Parking Plan may be required, and it may be necessary to formalise changes to the car parking rates required by the planning scheme through a Car Parking Overlay.
- A Car Parking Overlay may also include provision for developers to contribute to public car parking infrastructure as an offset to on-site parking, particularly for constrained sites where meeting car parking requirements may be prohibitive to the future development of the site.

4.3 Community Input & Response

Feedback gathered by Ethos Urban throughout the public consultation process for the Gisborne Futures project to date has revealed the following key themes in relation to Gisborne Town Centre car parking:

- Many respondents raise concerns in relation to car parking in the town centre, including access, safety, the need for additional car parks and additional temporary parking spaces on market days;
- Not all new developments (commercial or residential) are providing adequate parking for their residents/staff/patrons;
- A high number of respondents raised concerns with the lack of existing parking availability and traffic congestion in and around the town centre and how this will be further impacted as the population increases; and
- Participants also noted the need for local shops in the New Gisborne and South Gisborne to alleviate traffic congestion and parking pressures on the town centre.

5 Improved Parking Management / Utilisation

The following recommendations are made to guide improved management and utilisation of existing car parking in anticipation of future development, with the timeframe of these measures based on short (up to 5 years), medium (5 to 10 years) and long term (10 years and over).

5.1 Short Term Measures

- Based on duration of stay surveys, it appears that unrestricted off-street parking is being used as staff parking. If off-street parking supply becomes problematic, consider introducing time-limited parking within these areas. Given the lower occupancy rates in some areas of unrestricted parking, staff could be encouraged to park in these locations, further away from the commercial and retail areas; and
- Additional or improved wayfinding signage could be provided to direct vehicles to underutilised car parking areas, such as on and off-street parking south of Hamilton Street, which is still relatively close to key town centre land uses. An example of such underutilised car parking is on Brantome and Aitken Streets and the roof-top car park on the corner of Hamilton and Brantome Streets. Currently the off-street car parking in this location is not clearly signed, both in terms of wayfinding and car park entry signage.

5.2 Medium Term Measures

- Any new development should ensure that there is no reduction in the number of spaces. This is particularly relevant in instances where built form is proposed to replace existing car parking spaces;
- There is potential to provide additional formalised on-street car parking along Brantome and Aitken Streets, south of Hamilton Street, if required;
- There is potential to provide additional formalised on-street car parking along Robertson Street, between Brantome and Goode Streets;
- It is noted that a range of improved pedestrian and cyclist infrastructure is proposed to be implemented within the Gisborne Town Centre. When this infrastructure is provided, it will assist in alleviating car parking demand by providing alternative access options; and
- The unrestricted off-street car park at the northeastern extent of the UDF area, located on the east side of Aitken Street, is under-utilised based on survey data. It is noted however that safe pedestrian crossing facilities are not in place to provide accessibility to the town centre. The use of this car park could be maximised by providing safe pedestrian crossing features, which may be provided as part of the proposed upgrade of the Robertson Street and Aitken Street intersection. The timing of this proposed upgrade is not currently known.

5.3 Long Term Measures

- A multideck car park above and/or below ground may be a long term measure to address future parking supply, however any multideck structure must be designed to provide active street frontages at the ground floor and allow for future adaptable re-use of the building;
- New development within the Town Centre should consider roof-top or underground car parking provision; and
- It is noted that various Neighbourhood Activity Centres are proposed outside of the town centre, which will be developed over a period of time. The establishment of these Neighbourhood Activity Centres will assist in reducing car parking demand in the town centre, by providing alternative destinations for goods and services. This is likely to help reduce short stay parking demand as residential development increases.

6 Summary

This report quantifies the supply, utilisation and availability of public parking in the Gisborne Town Centre, and provides advice on parking related issues that will need to be addressed as future development occurs in the Gisborne Town Centre UDF area.

Conclusions made from our analysis of the parking surveys discussed in this report are:

- The Gisborne Town Centre contains predominantly two-hour limited and unrestricted parking. Off-street parking provides a higher proportion of unrestricted parking, whilst on-street provides a higher proportion of two-hour limited parking;
- It appears that unrestricted off-street parking is being used for commercial employee parking and multi-purpose trips. Employees should be encouraged to seek alternative unrestricted parking in areas where there is significant customer demand;
- Current peak demand suggests an approximate vacancy rate of 1 in 3 spaces, equating to around 474 car parking spaces;
- There is potentially significant civic/health precinct growth proposed, however this is slightly removed from the car parking which has been identified within the town centre. On this basis, future development in this area should be 'self-sufficient' in terms of providing adequate levels of car parking off-street; and
- A range of measures are proposed in Section 5 to assist in the management and utilisation of car parking, with priorities categorised based on short, medium and long term timeframes.

About Cardno

Cardno is a professional infrastructure and environmental services company, with expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno's team includes leading professionals who plan, design, manage and deliver sustainable projects and community programs. Cardno is an international company listed on the Australian Securities Exchange [ASX:CDD].

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