Creamery Road PSP

Review of NWGGA Bridges

Final

Prepared for: City of Greater Geelong

Date: 25th July 2024

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Revision	Description	Author	Date	Quality Check	Date	Independent Review	Date
A	Draft	T.Beckmans	03/07/2024	R.Humphreys	03/07/2024	A.Blackett	03/07/2024
B	Final	E.Marriott	23/07/2024	R.Humphreys	25/07/2024	A.Blackett	25/07/2024

Acknowledgment of Country

In the spirit of reconciliation, Stantec acknowledges the Traditional Custodians of country throughout Australia and their connections to land, sea and community. We pay our respect to their Elders past and present, and extend that respect to all Aboriginal and Torres Strait Islander peoples.

Limitations

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1. Introduction

1.1 Background

Stantec completed the designs and costings for three bridges across the Moorabool River within the Western Geelong Growth Area. These works assessed the ultimate or full build out scenario for the Western Geelong Growth Area.

Bridge projects identified were one crossing of the Moorabool River along the alignment of the Lynnburn Road extension (BR-01), one crossing of the Moorabool River along the alignment of the Clever and Creative Corridor (CCC) from the Midland Highway (BR-02), one crossing of the Moorabool River on the Church Street extension (BR-03), and an active travel bridge on Creamery Road crossing Geelong Ring Road (BR-04). Three (3) of these bridge projects are located within the Batesford South Precinct Structure Plan (PSP) (BR-01, BR-02 and BR-03), and one (1) adjacent to the Creamery Road PSP (BR-04).

An Opinion of Probable Costs (OPC) for the each of the new bridge projects was prepared based on detailed concept designs that determined earthworks quantities resultant from site-specific topography, retaining structures, constructional materials (in particular concrete and steel products) and river diversion requirements.

A summary of the respective costs for the bridges are summarised in Table 1-1.

Table 1-1 – Recommended Project Costs

Project ID	Value (excl. GST) (incl. Delivery) – P50	Value (excl. GST) (incl. Delivery) – P90
RD 01-01 (part of BR-01)	$ 76,805,700	$ 91,983,500
BR-01	$ 38,489,300	$ 48,129,700
BR-02	$ 201,520,900	$ 250,881,600
BR-03	$ 93,850,400	$ 117,809,700
BR-04	$ 2,029,300	$ 2,436,700

The City of Greater Geelong is seeking to understand the implication of the removal of a combination of items from the DCP.

1.2 Scope of Report

Stantec has been requested by the City of Greater Geelong (the City) to undertake a review of the Bridges to understand the implications of changes to their inclusion as global items in the Creamery Road DCP. Specifically, the City has requested Stantec to provide a scope that responds to the following:

- What are the implications for the removal of Bridge 02 (BR-02) from the DCP?
- What are the implications of the DCP in delivering an interim Bridge 1 (BR-01)?
- What are the implications for the removal of Bridge 03 (BR-03) from the DCP?
- What are the cost implications of the removal of the bridges from the DCP?

In undertaking this review, the report relies upon the work completed to date, including the Future Urban Structure (FUS) and supporting transport modelling, planning and engineering work completed by Stantec.

1.3 References

In preparing this report, reference has been made to a number of background documents and submissions including the following:

- City of Greater Geelong Planning Scheme
- Creamery Road Draft Precinct Structure Plan prepared by the City of Greater Geelong, December 2022
- NWGGA Framework Plan prepared by the City of Greater Geelong, 2019
- NWGGA, Movement and Access Report prepared by GTA Consultants, 2019
- Creamery Road PSP, Movement and Access Report prepared by Stantec, January 2023
- NWGGA Bridges, Design and Costings Report prepared by Stantec, January 2024
- other documents as nominated in the report.

2. Draft Developer Contributions Plan (DCP)

2.1 NWGGA Framework Plan

The NWGGA Framework Plan was prepared in 2019 and provides guidance on the delivery of the transport and land use elements for the two growth areas which will deliver an additional 110,000 residents to Geelong.

The Framework Plan was adopted into the Greater Geelong Planning Scheme through Amendment C395 which was approved and gazetted in May 2021. The two growth areas will have Nine Precinct Structure Plans (PSPs) to provide guidance in their urban form and delivery.

2.2 Bridges proposed within the DCP

The City of Greater Geelong (the City) is in the process of developing various Precinct Structure Plans (PSP) identified under the Northern and Western Geelong Growth Area (NWGGA) Framework Plan. As part of the planning process, three (3) of the bridge projects (BR-01, BR-02 and Br-03) have been identified as global items that would be funded under a Developer Contributions Plan (DCP), with BR-04 to be funded through the Creamery Road DCP.

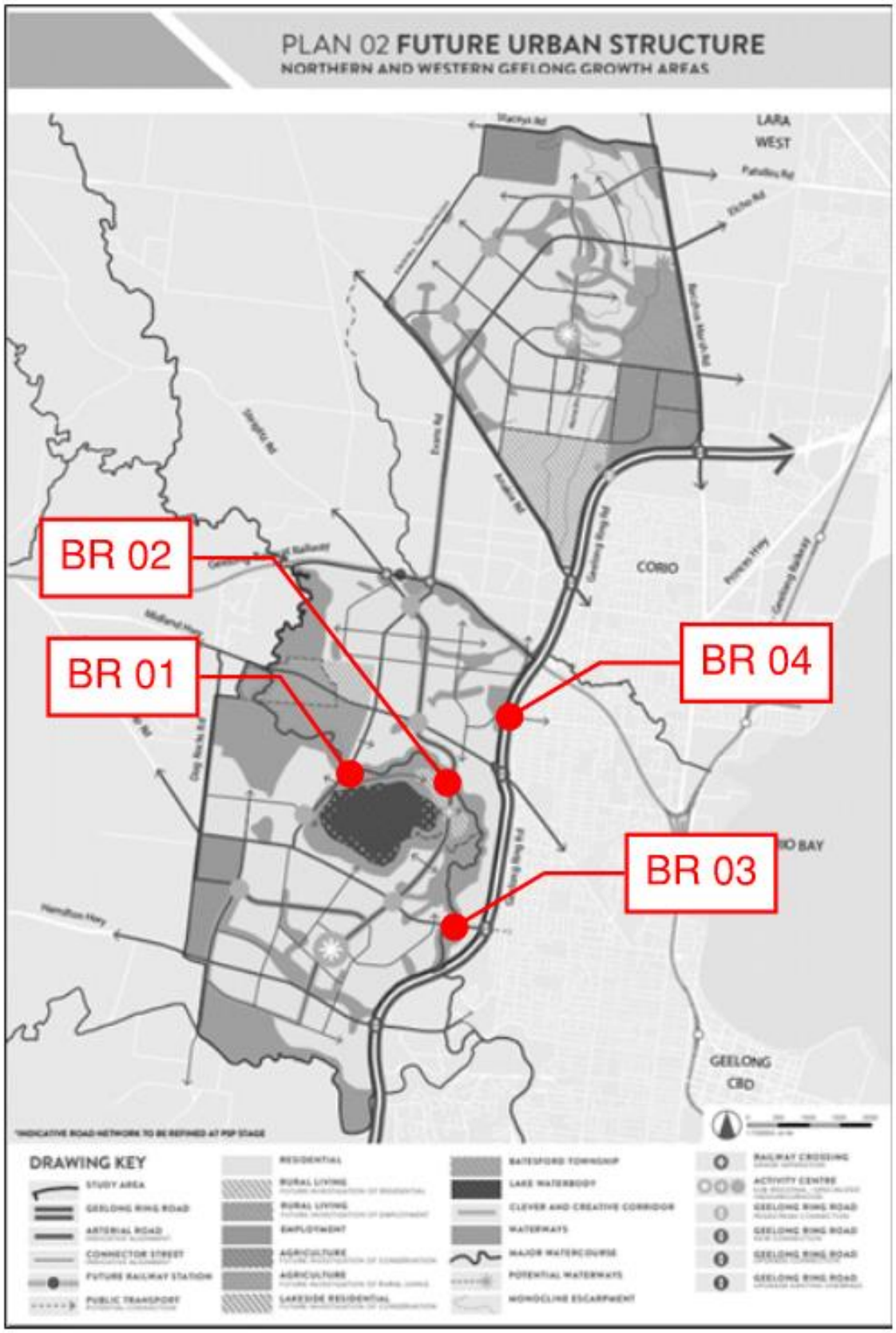
The bridge projects identified are:

- One crossing of the Moorabool River along the alignment of the Lynnburn Road extension (based on a four-lane Secondary Arterial road) identified throughout this Report BR 01
- One crossing of the Moorabool River along the alignment of the Clever and Creative Corridor (i.e. south of IN-06 on Midland Highway in the Creamery Road PSP) identified throughout this Report BR 02
- One crossing of the Moorabool River on the Church Street extension (based on a four-lane Secondary Arterial road) identified throughout this Report as BR 03
- An active travel bridge on Creamery Road crossing the Geelong Ring Road identified throughout this Report as BR 04

All of the bridge projects are located in the WGGA of which three (3) are located within the Batesford South PSP (BR 01, BR 02 and BR 03), and one (1) adjacent to the Creamery Road PSP (BR 04). This investigation focuses on the three road bridges (BR 01, BR 02 and BR 03) and does not consider changes to the active travel bridge (BR 04).

Figure 2.1 shows the bridge locations in the context of the NWGGA Future Urban Structure (FUS) as shown in the NWGGA Framework Plan. Note that some elements within the Framework Plan have been superseded based on further investigation and design development in relevant PSP areas.

Figure 2.1 – Bridge locations in the context of the Northern and Western Geelong Growth Area (imaged sourced from NWGGA Framework Plan amended by Stantec)



The Draft Development Contributions Plan (DCP) for Creamery Road is in preparation and identifies a range of items, including the transport infrastructure, required to support the PSP. The DCP is required as the development of the PSP, and the Western Growth Area, have triggered the cause or need for new or upgraded infrastructure.

The DCP for Creamery Road PSP will include a proportion of the costs of the bridge projects, based on an agreed method (likely traffic usage of the respective projects). This report will also identify any impacts that the removal of the bridges may have on the DCP prepared for Creamery Road.

3. Transport Modelling

3.1 Introduction

Traffic demand (usage) for the NWGGA transport network has been informed by Strategic transport modelling using the Victorian Integrated Transport Model (VITM). VITM modelling was undertaken for the 2051 design year, and in order to align with the strategic directions in the Framework Plan and the City's overall objective for sustainable transport mode shift, the model reflects a future scenario with greater focus on active and public transport investment rather than road capacity expansion.

The modelling has utilised the model prepared for the Geelong Growth Area Transport Infrastructure Strategy (GGATIS) which tested a combination of land uses, transport infrastructure items and design years. For this assignment, the "do different" modelling scenario has been adopted. In comparison to the other scenarios the "do different" scenario assumes a change in direction for the way in which people travel in Geelong. Specifically, investment is focused on measures that will create mode shift away from private vehicle to other modes, including public transport, walking and cycling.

Specifically, BR-03 in this scenario is modelled as a public transport link only, meaning that vehicles do not travel on it and does not include any access to the Geelong Ring Road.

3.2 Modelled Scenarios

The VITM future scenario described in Section 3.1 has been used to test and analyse changes to the network explored in this report. Specifically, the model has been used to test the following scenarios that involve changes to the Bridges:

1. Scenario 1 (SC01) which includes the removal of BR-02 from the network and an interim BR-01 (i.e. one lane in each direction), and
2. Scenario 1a (SC01a) which includes the removal of BR-02 from the network with BR-01 being delivered in full (i.e. two lanes in each direction)

Figure 3.1 and Figure 3.2 show the modelled network (number of lanes) for the Base Case and the removal BR-02 from the network for Scenario 1. Scenario 1a is essentially the same network as Scenario 1 except it has BR-01 with two lanes in each direction.

Figure 3.1 – Base Case Network (number of lanes)

Figure 3.2 – Scenario 1 Network (number of lanes)

As stated previously, the "do different" scenario includes a public transport link only at BR-03 (i.e. the Church Street extension) and does not include any vehicle access. As such, for the purposes of this exercise, BR-03 is shown with no lanes connecting Church Street across the freeway.

Full details of the modelled networks for each scenario are provided in Appendix A.

3.3 Results

3.3.1 Daily Difference Plots

Daily difference plots have been prepared to show the impact of the removal of BR-02 from the network and the introduction of a single lane on BR-01. Links that are coloured red are those that have increased in volumes, whilst links that are blue decrease in volume. The thickness of the line denotes the quantum of change in demand.

Figure 3.3 to Figure 3.4 show the daily difference plots for the two scenarios.

Figure 3.3 – Removal of Ultimate BR-02 and interim BR-01 (Scenario 1) Daily Difference Plot

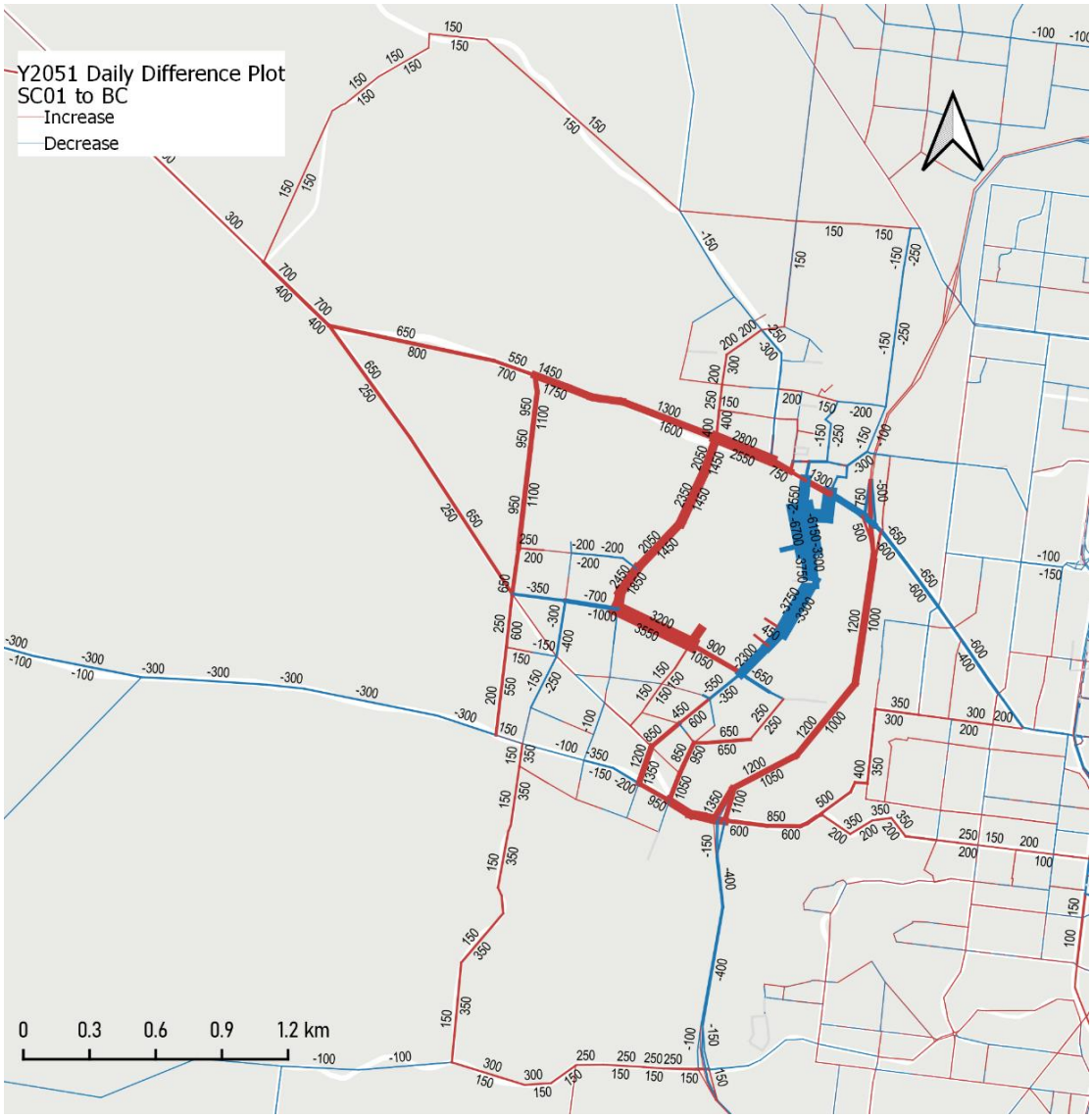
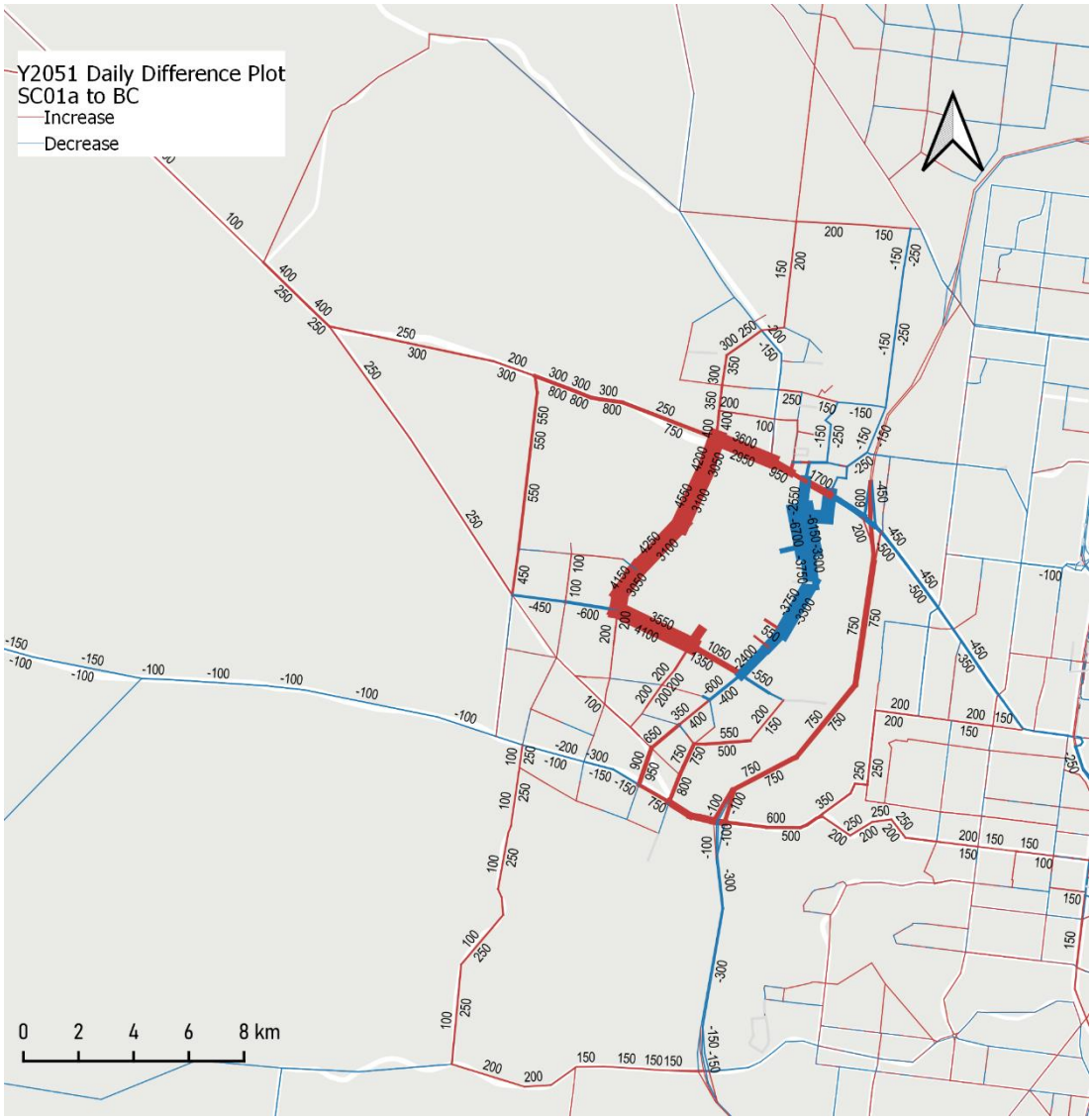


Figure 3.4 – Removal of Ultimate BR-02 (Scenario 1a) Daily Difference Plot



In addition to the plots the midblock volumes on key roads within and surrounding the NWGGA shown in Figure 3.4 has been undertaken with a summary of the results provided in Table 3-1.

Figure 3.5 – Location of Daily Volume Summaries

Table 3-1 – Daily Volume Summary (two way volumes) 2051

No.	Road Name	Base Case Volumes	Scenario 1 Volumes	Difference (BC-SC01)	Scenario 1a Volumes	Difference (BC-SC01a)
1	BR-01 at Moorabool River	19,318	23,158	+3,839	27,012	+7,694
2	Midland Highway West of Geelong – Ballan Road	44,531	49,911	+5,379	51,055	+6,523
3	Midland Highway Between Geelong – Ballan Road and the CCC	53,135	55,390	+2,255	56,071	+2,936
4	Midland Highway Between the CCC and GRR	59,580	56,660	-2,920	57,047	-2,533
5	Hamilton Highway East of Lynnburn Road	47,626	47,136	-490	47,195	-431
6	Hamilton Highway West of Geelong Ring Road	73,936	78,001	+4,065	77,012	+3,076
7	Geelong – Ballan Road North of Midland Highway	16,676	16,308	-367	16,526	-150
8	Creamery Road @ Geelong Ring Road	12,607	12,222	-385	12,340	-268
9	Lynnburn Road – north of Hamilton Highway	9,539	9,340	-199	9,565	+26
10	Clever and Creative Corridor – south of	9,505	8,625	-880	8,520	-985
11	Dog Rocks Road – south of Midland Highway	1,171	3,205	+2,034	1,785	+615
12	Geelong Ring Road – south of Midland Highway Interchange	82,382	84,617	+2,236	83,892	+1,510

The difference plots and Table 3-1 show the following:

- The removal of BR-02 will require approximately 13,000 trips to be redistributed to the network in 2051. This has resulted in increased traffic on BR-01 (in the order of 3,800 vehicles per day in Scenario 1 and 7,700 vehicles per day in Scenario 1a) and the Geelong Ring Road (in the order of 2,200 vehicles per day in Scenario 1 and 600 vehicles per day in Scenario 1a).
- Dog Rocks Road will also result in increased volumes as this is an alternate location to access the southern PSP's within the NWGGA due to the increased volumes on BR01. Notwithstanding, the overall daily volumes range between 2,000 and 3,000 vehicles per day which are considered suitable for a road of this nature.
- The Midland Highway between the CCC and Geelong Ring Road interchange shows a decrease in traffic as north-south traffic through the corridor is opting to stay on the Geelong Ring Road or Lynnburn Road.
- The largest increases in traffic on the Midland Highway will be west of Geelong – Ballan Road which will increase volumes by 5,380 vehicles per day (12%) in Scenario 1 and 6,500 vehicles per day (15%) in Scenario 1a. The additional volumes may have implications on the design of IN-05 and IN-06 within the Creamery Road DCP. These are expected to be moderate and will require intersection modelling to confirm.
- The Hamilton Highway will also experience increases of 4,000 vehicles per day (5%) in Scenario 1 and 3,000 vehicles per day (4%) in Scenario 1a as a result of vehicles seeking access to the Batesford South PSP, Macanns Road and Merrawarp PSP's. The higher increases in Scenario 1 is due to it having the interim BR-01 with one lane in each direction.
- The Geelong – Ballan Road volumes will marginally reduce (by less than 1%), and overall there will be minimal impacts on the volumes within the Creamery Road PSP.

3.3.2 Volume to Capacity Ratios

The volume to capacity plots for the base case and two scenarios have been prepared for the AM and PM peak periods in 2051 and are shown in Figure 3.6 to Figure 3.11. The volume to capacity ratio (VCR) (degree of saturation) is a good indicator as to the operation of the network at specific link locations. Plots for Scenario 1 and Scenario 2 are provided in Appendix B.

Figure 3.6 – Base Case AM Peak VCR Plot

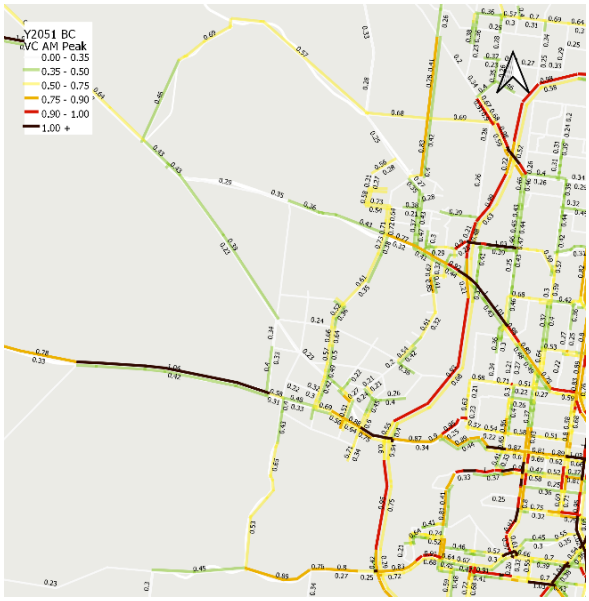


Figure 3.7 – Base Case PM Peak VCR Plot

Figure 3.8 – Scenario 1 AM Peak VCR Plot

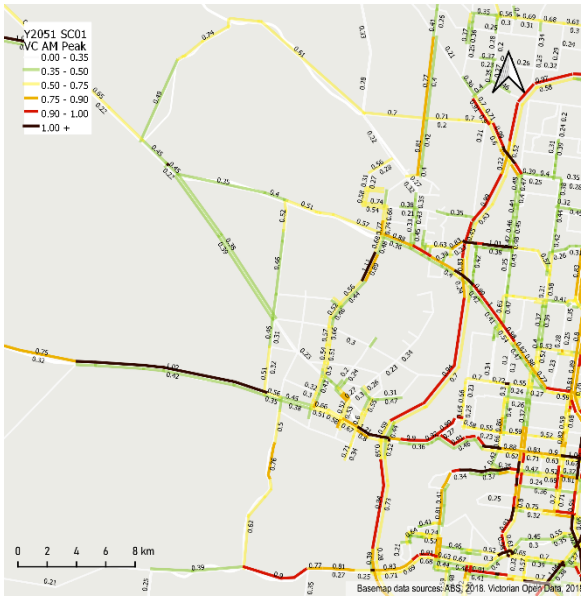
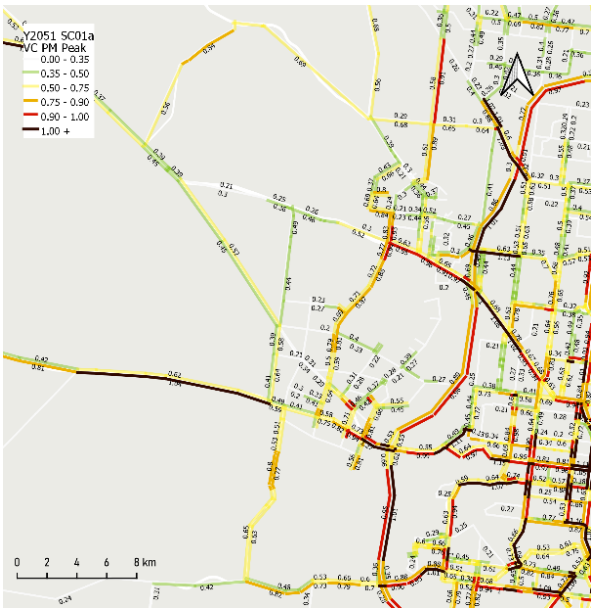


Figure 3.9 – Scenario 1 PM Peak VCR Plot

Figure 3.10 – Scenario 1a AM Peak VCR Plot

Figure 3.11 – Scenario 1a PM Peak VCR Plot



The volume to capacity plots illustrate the performance of the road network on respective links, with those having a ratio of greater than 0.9 (in red) approaching their theoretical capacities. Links that exceed their theoretical capacities are shown in black. The links that exceed 0.9 will result in a higher level of delay, with lower speeds and congestion, meaning that there will be a higher likelihood of peak spreading and changes to mode – something that is not common to Geelong motorists.

Key observations include:

- BR-01 will exceed its theoretical capacity in Scenario 1 with VCR values of more than 1.1 in both peak periods (this link does not exceed its theoretical capacity in the base case and Scenario 1a).
- The highest VCR values on the Geelong Ring Road between the Midland Highway and Hamilton Highway is expected to occur as part of Scenario 1, with VCR values above 0.9 in the northbound direction in the AM peak and both directions in the PM park, meaning that the freeway will experience increasingly poor flow, characterized by stop-and-go travel, long delays, and queued traffic.
- Within the McCanns Lane PSP there will be increased levels of traffic and congestion within its road network associated with Scenario 1, including on the Clever and Creative Corridor. However, these increases do not result in significantly higher levels of congestion associated with VCR values above 0.9, so can be managed.
- Hamilton Highway, which is forecast to have high levels of congestion in the Base Case, will have additional traffic and worse levels of congestion under both Scenarios 1 and 1a. Given the importance of Hamilton Highway for access to the PSP's, this congestion will impact on its level of accessibility and will need to be managed through the PSP stage.

The VITM is a link based model and as such represents mid block assessment performance. Intersection capacities and performance are not represented in VITM – these will be determined through the delivery stage of each respective DCP.

3.3.3 Interim Network Performance

An interim network has not been assessed using traffic modelling, which would typically require duplicated roads to be modelled as single lanes plus a reduced level of land use commensurate with 75% of development. This assumes that the overall interim network will be delivered by the respective DCP's for each PSP, and that the ultimate will be delivered by the state and/or others (It is noted that the State has not formally committed to any infrastructure upgrades, other than those identified in the Framework Plan).

With respect to an interim BR-01, based on the outcomes of Scenario 01, a reduction in volume/demand of more than 19% would be required for it to achieve an acceptable VCR of less than 0.9. Based on this, it would be safe to assume that it is possible that an interim BR-01 will be able to have a life-span of up to 75% of the delivery of the NWGGA (or 2041).

3.4 Can the network support the removal of BR-03?

This assessment is based on the 'do different' model which includes BR-03 as a public transport link only without access to the Geelong Ring Road. Previous modelling undertaken by Stantec in 2022 assessed BR-03 with vehicular traffic, using the "Do More" GGATIS Scenario (a scenario that focused on road capacity improvements to mitigate the demand), suggested that BR-03, immediately west of the Geelong Ring Road, could carry up to 20,130 vehicles per day. This scenario did not include a PT link to Church Street and included ramps directly onto the Geelong Ring Road for vehicles.

The modelling also identified that 53% of that traffic using BR-03 would be to and from the Batesford South, McCanns Lane and Merrawap Road PSP's and 43% of usage would be external to the growth areas (i.e. through traffic). This modelling demonstrates that it would play both a local and regional role in the network. Importantly it has the potential to reduce traffic volumes and congestion on the Hamilton Highway.

Whilst the demand suggests that it would play an important role in the context of the network, no detail on the arrangement that a potential connection to the Geelong Ring Road has been undertaken by the Department of Transport and Planning and as such the ability to deliver such a bridge requires more investigation.

Notwithstanding, the modelling undertaken as part of the "Do Different" scenario indicates that the network would be able to respond to its removal from the DCP.

3.5 Bridge project apportionment for BR-01

Select Link Analysis (SLA) within VITM has then been undertaken to determine the proportion of users travelling across BR-01 for the two latest modelled scenarios that were to or from the five PSPs in the West Growth Area (at direction of the City, as the PSP's in the North Growth Area have not been considered as they contribute a small proportion of the overall traffic volumes that use the bridges).

Table 3-2 summarises the level of usage of BR-01 under the two modelled scenarios for the users travelling to or from the five PSPs in the West Growth Area, noting the total internal volumes do not reflect all the traffic volumes that are anticipated to use the bridges, as the external trips (including those associated with the North Growth Area) have not been included.

Table 3-3 has been prepared to set out the differences in the percentage of usage between the previously modelled proportions and the latest two scenarios modelled.

Table 3-2 BR-01 daily traffic usage by each PSP for SC01 and SC01a

PSP	SC01		SC01a	
	Vehicles per Day	Level of Usage	Vehicles per Day	Level of Usage
Merrawap Road	302	2%	530	3%
McCanns Lane	2,623	15%	3,208	17%
Batesford South	9,754	58%	10,655	56%
Batesford North	2,204	13%	2,289	12%
Creamery Road	2,022	12%	2,263	12%
TOTAL (internal)	**16,905**	**100%**	**18,945**	**100%**

Table 3-3 BR-01 daily traffic usage difference between previous and latest two scenarios modelled

PSP	Previous vs SC01	Previous vs SC01a
Merrawap Road	1%	1%
McCanns Lane	2%	1%
Batesford South	-2%	-1%
Batesford North	1%	2%
Creamery Road	-3%	-3%

The modelling outputs demonstrate that if the proposed scenarios are implemented, there will be only minor changes of +/- 3% against the previous apportionment of the cost associated with BR-01 to the five PSP's that make up the Wester Grow Area.

3.6 Discussion

The strategic modelling within the "do different" scenario indicates that the removal of BR-02 will impact on the performance of the network, with higher traffic demand travelling through BR-01 resulting in reduced speeds, increased travel distances and travel times. Whilst the level of change in congestion varies across the network, delivering the network in its ultimate form will ensure that it has the ability to respond to the increases in traffic demand.

The congestion on an interim BR-01 within a single carriageway will increase to unacceptable levels by the full development of the NWGGA, meaning that the delivery of the second carriageway will be required sometime after 2041 (or 75% of development) and prior to the full development.

In terms of the bridge project apportionment for BR-01, the modelling indicates only minor changes of +/- 3% against the previous levels for the five PSP's that make up the Wester Grow Area.

Whilst the full delivery of BR-01 indicates that it will be able to operate at acceptable levels of VCR at full development, there will still be increases in traffic on and through the surrounding network within McCanns Lane and on the Hamilton Highway. Roads that increase include the Midland Highway (increases of up to 15% in some sections), the Hamilton Highway (up to 5%) and on the Geelong Ring Road (up to 3%). The increases on Midland Highway may impact intersections IN-05 and IN-06 within the Creamery Road DCP.

The removal of BR-02 will have the potential to reduce volumes through the Geelong Ring Road interchange on the Midland Highway as traffic accessing Batesford South and McCanns Lane from the Geelong Ring Road will be required to travel further access via the Hamilton Highway. The increases in traffic on the Geelong Ring Road, whilst relatively modest in percent terms, result in higher levels of VCR that will result in a higher likelihood of congestion and blockages on the network.

Whilst the Framework Plan identifies a range of infrastructure items that will need to be delivered by the State (and/or others) to support its growth, there is no commitment or planning completed to date. It is recommended that the State and/or others undertake further analysis to determine the optimum return on investment of network upgrades. This work should include consideration of:

- The cost and benefits of providing additional capacity on the Geelong Ring Road
- The cost and benefits of delivering BR-02
- The cost and benefits of delivering a new interchange with the Geelong Ring Road and BR-03, and
- The cost and benefit of delivering a new half-diamond freeway interchange on the west side of the Geelong Ring Road in direct proximity to Church Street, Hamlyn Heights.

The removal of BR-02 from the network may also impact on the timing of planned upgrades to the network by the State and/or others, such as the duplication of the Midland Highway. The impact will be determined on the rate of growth and the delivery of a network that supports it. Notwithstanding, these matters would typically be addressed as part of standard network planning practices completed by the DTP.

4. Transport Planning Discussion

4.1 Introduction

The discussion in this section focuses on the need for BR-02 and BR-03 to be included within the DCP. It is assumed that BR-01 will be included in the DCP in its interim state. It is important that the DCP includes the ability to deliver the bridges by setting aside the required land take in the DCP.

Maintaining the land to deliver the bridges is supported by a range of transport planning principles including:

1. Alignment with the Framework Plan.
2. Connectivity and accessibility for the future neighbourhoods within the Western Growth Area.
3. The need to provide network resilience.

These principles listed above have the potential to impact the liveability of the future residents of the Western Growth Area and are discussed in the following sub-sections.

4.2 Alignment with the Framework Plan

The Framework Plan has been prepared to guide the development of land use in the Northern and Western Geelong Growth Areas. From a transport perspective, a Movement and Access report was prepared (by Stantec) to assess the traffic and transport impacts associated with the land use uplift.

The report identified that at full development of the growth areas there will be changes in traffic volumes at the key Geelong Ring Road interchanges servicing the NWGGA, including the Midland Highway and Hamilton Highway. These changes would require the State and/or others to investigate upgrades that are also identified within the Framework Plan.

Plan 37 of the Framework Plan provides an overview of the transport network and has been reproduced in Figure 4.1.

Figure 4.1 – Integrated Transport Network Plan (reproduced from the NWGGA Framework Plan)

Removing BR-02 from the DCP will have a range of implications to the connectivity of the transport network, including:

- Limiting the role and function of the CCC. A re-routed CCC will be required to travel along the Midland Highway and the east-west arterial south of the Quarry. Such re-routing will require careful consideration and an understanding of the benefits of a dedicated public transport corridor that does not provide a direct link between key destinations.
- The role and function of the north south arterial through Batesford South PSP (i.e. the Lynnburn Road extension): Reallocation of public transport priority from the CCC to this road will impact on its ability to function as an arterial road and traffic route.
- The ability for Midland Highway to accommodate re-routing of the CCC: It is anticipated that the Midland Highway in its ultimate form will include provision for dedicated public transport lanes in each direction which may be able to accommodate a re-routed CCC.

As such, removal of BR-02 bridge from the DCP would result in a movement network that does not achieve the objectives of the NWGGA Framework Plan and as such it will ultimately be required.

As stated previously, the DTP will be required to investigate the type of connection required for the Geelong Ring Road and Church Street at BR-03 to confirm the form of connection and whether or not it will provide PT and vehicular connectivity. These investigations will not impact on the ability of NWGGA to meet the objectives of the Framework Plan.

4.3 Connectivity and accessibility

Connectivity and accessibility can refer to a number of things but from a transport perspective it refers to the ease of reaching goods, services, activities and destinations. As it relates to the Western Growth Area, access should not be defined only about connectivity but can also consider other modes for travel (e.g., jogging, walking, cycling and leisure). There are a number of ways that accessibility is measured.

Should BR-02 be removed from the DCP, a cost effective alternative could be provided via the delivery of an active travel path bridge. Active travel bridges can play a crucial role in enhancing accessibility and safety:

- Separating foot and wheel traffic from vehicular traffic reduce the risk of accidents and provide a secure passage for all people. This can also lead to healthier lifestyles.
- Active travel bridges can relieve traffic congestion and could play a role in connecting residents to schools, workplaces, parks, healthcare services, and other destinations.
- Inclusive Design for accessibility of land uses on both sides of the river.

Whilst traffic modelling is a good tool to assist in determining whether or not the road capacity is suitable for people connecting / accessing their destinations, it is important that functioning and accessible networks have an ability to do this via other modes as this will enable users with choice (especially those without cars and/or licences) and more sustainable outcomes.

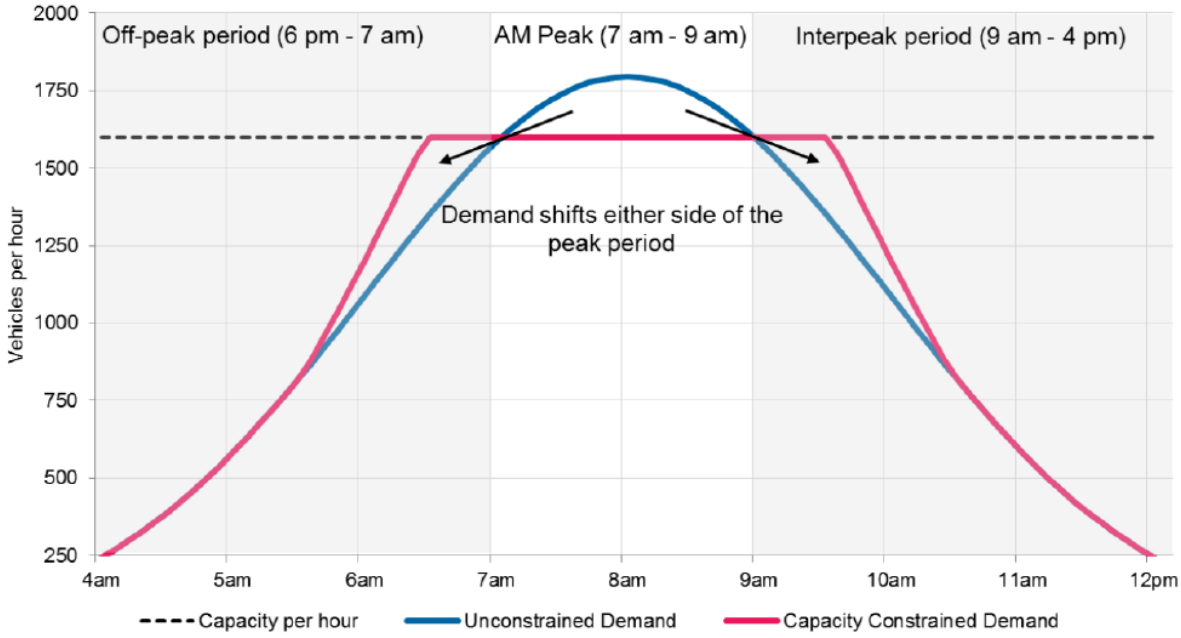
Providing an active travel bridge in lieu of BR-02 and BR-03 will have the benefit not only providing connectivity for residents north and south of the Moorabool River, but will result in people using more sustainable modes of travel, thus achieving the objectives of a clever and creative city.

4.4 Network Resilience

A characteristic of travel in Geelong is a short peak period that typically lasts for 30-45minutes. As road network congestion increases as part of a growing Geelong (population expected to double by 2051), existing motorists will be required to change their travel patterns, this will result in trip reprogramming (travel at a different time), trip substitution (use an alternate mode) or trip redistribution (use an alternate route), this is known as peak spreading.

The phenomenon of peak spreading describes a dynamic process whereby the pattern of demand changes over time from one where there is heavy peaking, to one where the demand spreads out over a longer period. Typically, this results in the peak period lengthening, either side of the highest peak flow as in Figure 4.2. Because of the constraints of road capacity, peak spreading is one way of accommodating increasing traffic volumes.

Figure 4.2 – Graphical representation of peak spreading



Peak spreading can be viewed as either a natural market correction that limits the need to provide extra road capacity, or it can be considered as an indication of a failure of the system, as peak spreading can typically result in delays for people and goods.

The transport modelling undertaken for the NWGGA does not consider a peak profile, rather it includes a two hour 'flat' profile that averages out the demand. In this instance, whilst the overall performance of BR-01 in Scenario 1a (i.e. as a two-lane bridge) shows the network can respond to these changes, it could have the potential to underestimate the likely level of congestion in the network.

In terms of network resilience, the increased congestion will have an impact on the ability for public transport and emergency services vehicles to reliably travel between locations in the Growth Area's. Strong transport networks have resilience when its system has the ability to recover from disruptions and return to normal operational levels as quickly as possible. A network which has the ability to provide multiple locations of connection points will enhance cohesion for travel within the NWGGA.

4.5 Other considerations

Removing BR-02, and to a lesser extent BR-03, from the DCP should also receive input from the City's Urban Planners to understand the impact on land use and liveability for residents of Batesford South PSP. Ultimately, the increased level of congestion expected on the network will result in a range of outcomes, including:

1. Poor levels of accessibility for residents with longer distances and travel times required to access shops, schools and jobs
2. The potential to impact on property values and sales as residents may not chose to live there due to the challenges in access and travel times
3. Continuation of low Public Transport usage for residents of Geelong, continuing a trend observed in many parts of Geelong, and
4. More on road investment on the arterial network for the Hamilton Highway, the Midland Highway (west of the NWGGA) and through the existing areas of Fyansford.

These considerations will need to be addressed as part of the PSP planning process and/or broader transport strategy for the ultimate delivery of the network and supporting services.

5. Design and Costing Review

5.1 Interim Road Carriageway and Bridge Location

A review of Stantec's Final Concept Designs dated 7 July 2023 has been undertaken to determine a recommended interim road carriageway for RD 01 and bridge location for BR-01. The results of this review are summarised in Table 5-1 below, providing a comparison between the implications on the overall road and bridge length, alignment geometry, earthworks and retaining walls by choosing either the left (eastern) or right (western) side of the current proposed road reserve.

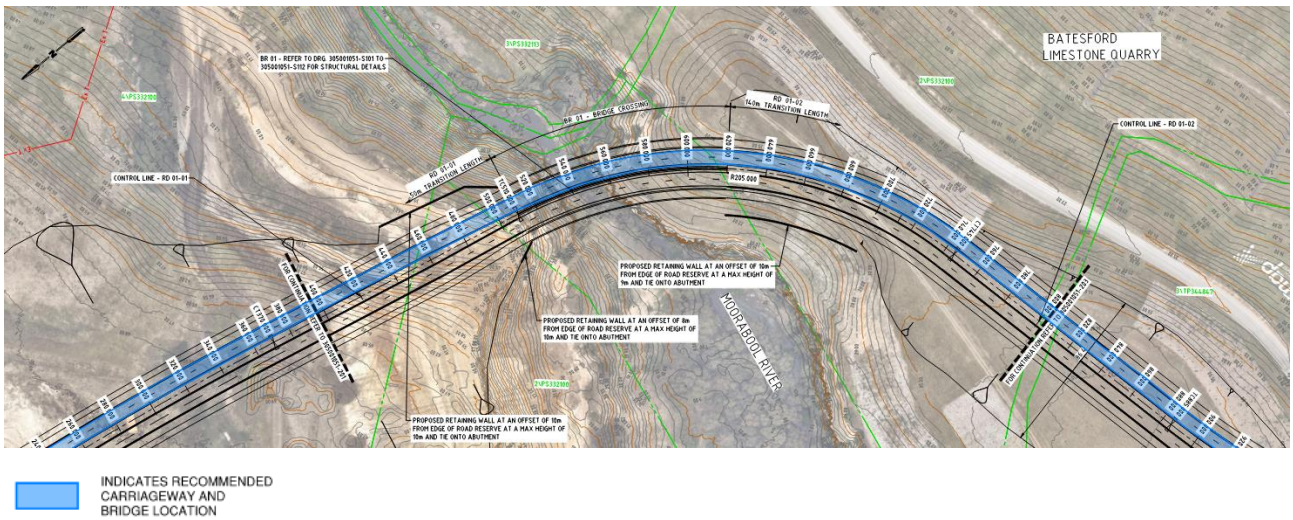
Note the below considers left and right by order of increasing chainage as shown on Stantec's Final Concept Designs dated 7 July 2023 i.e. going north to south, left side being eastern side and right side being western side.

Table 5-1 – Interim Road Carriageway (RD 01) and Bridge Location (BR-01) Considerations

Item	Left Side	Right Side	Comment
Length of Road (to centreline of carriageway)	1,010 m	1,010 m	No change.
Length of Bridge (to centreline of carriageway)	113 m	107 m	Right side will have slightly shorter bridge length and less infrastructure.
Geometry	• Increased radius leading to more generous curve. • Improved performance for vehicles and path users needing to slow down less.	• Decreased radius leading to tighter curve. • Decreased performance for vehicles and path users needing to slow down more. • May need to consider greater superelevation.	Left side provides improved performance and safety for vehicles and path users by increased curve radius.
Earthworks	• Greater volume of earthworks (cut) removed from CH 0 to CH 440. • Great volume of earthworks (cut) removed from CH 700 to CH 920. • Greater volume of earthworks (fill) removed from CH 950 to CH 1120.	• Less volume of earthworks (cut) removed from CH 0 to 440. • Less volume of earthworks (cut) removed from CH 700 to CH 920.	Overall, left side provides a greater reduction in earthworks volumes based on the site topography and various design requirements. It is noted however that right side still produces a noteworthy reduction in overall earthworks volumes, albeit less than left side.
Retaining Walls	Assumed retaining walls would need to be installed as per ultimate condition.	Assumed retaining walls would need to be installed as per ultimate condition.	Assumption made on the basis that the additional cost to remove interim and reconstruct ultimate walls could be at least in the order of $8.5M (based on current costings by WT Partnership).

Based on the considerations and comments made in Table 5-1 above, it is recommended that the left side (eastern) be chosen for the interim road carriageway for RD 01 and bridge location for BR-01 (as indicated in Figure 5.1 below).

Figure 5.1 – Recommended interim road carriageway for RD 01 and bridge location for BR-01 (image sourced from Stantec's Final Concept Design drawings dated 21 July 2023)



5.2 Bridge Infrastructure Removal

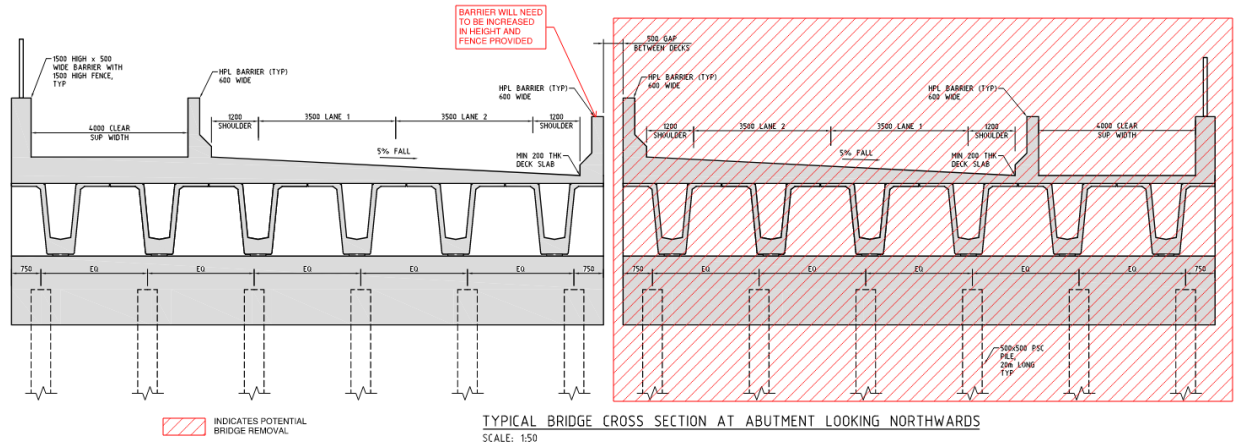
The current concept design for bridge BR 01 consists of two (2) independent structures or decks constructed side by side, therefore removal of one (1) of these bridge structures / decks is possible and can be accommodated without major impact on the other. Design updates would be required to replicate the barrier and fence arrangement to the inside of the interim single bridge structure / deck (refer Figure 5.2 below) though these are considered to be minor.

Whilst it is acknowledged that an interim treatment for BR-01 is being considered to explore cost saving opportunities in the interim, it is noted that there are several efficiencies that could be considered to save future costs in ultimate conditions. These could include:

- Driving all precast rake piles at the time of interim bridge construction and applying caps. This could save on remobilisation of plant and machinery, reconstruction of waterway diversion, material transport to site and avoid potential for future access limitations due to the interim bridge.
- Construction of ultimate bridge substructure from piles to the headstock. Savings would be as per the above for piles.
- Construction of the ultimate abutment on both sides of the bridge, including wing walls. This would remove the need to demolish interim bridge wingwalls and save on future costs due to additional shoring structures need to stabilise the interim bridge when building the ultimate.

One or all of the above efficiencies could be implemented to produce future cost savings, however it is acknowledged that these will lead to greater interim costs.

Figure 5.2 – Interim Bridge BR-01 Infrastructure Removal (image sourced from Stantec's Final Concept Design drawings dated 21 July 2023)



5.3 Road Infrastructure Removal

5.3.1 Carriageway and Shared User Path

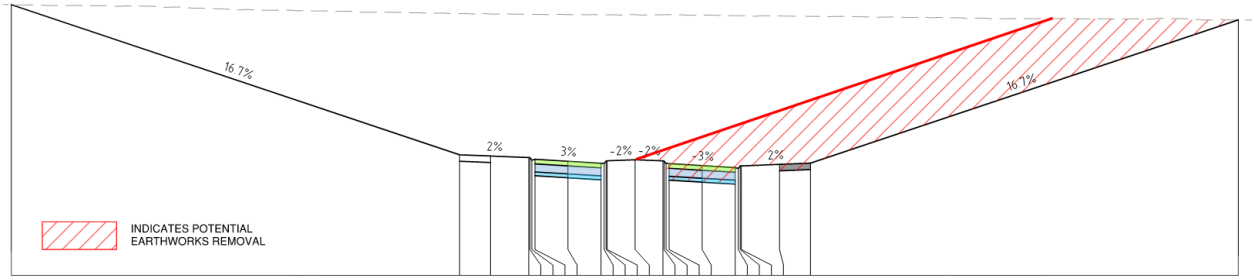
Implementing an interim treatment for road RD 01 will allow for the removal of a 6.6 m wide carriageway and reduction in quantity of the following civil items:

- Pavement including subgrade preparation and treatment.
- Concrete works including kerb and channel and shared user paths - it is noted that by removal of a bridge, shared user paths on both sides of the road reserve will no longer be required given there would no longer be a connection for paths on both sides.
- Drainage including pipes, pits and subsoil.
- Street lighting
- Landscaping
- Signage and line marking
- Tree / vegetation removal.

5.3.2 Change in Earthworks

Providing an interim treatment of reduced width on road RD 01 would result in a large reduction in the volume of required earthworks, as Figure 5.3 shows. This is most notably the reduced cut from CH 0 to CH 440 and CH 700 to 920, and reduced fill from CH 950 to 1120. Assuming an interim cross section width of 17 m plus earthworks batters, it is estimated that this could be in the order of 120,000 m^3 reduction in cut and 10,000 m^3 reduction in fill (subject to further investigation and design during future project stages).

Figure 5.3 – Interim Road RD 01 Change in Earthworks (image sourced from Stantec's Final Concept Design drawings dated 21 July 2023)



5.4 Potential Change in Cost

Table 5-2 summarises the reductions in cost (P50 and P90) that could be made by providing an interim single road carriageway for RD 01 and single bridge for BR-01. Items not stated specifically are assumed to be unaffected by the interim change to the current concept design.

Table 5-2 – Potential Cost Reductions for Interim RD 01 and BR-01

Area	Group	Potential Quantity Change (from current concept design)	Potential P50 Cost Change ($) (from current concept design) – excl. GST excl. Delivery	Potential P90 Cost Change ($) (from current concept design) – excl. GST excl. Delivery
Road (RD 01)	Earthworks (cut)	- 120,000 m^3	- $ 9,600,000	- $ 11,400,000
	Earthworks (fill)	- 10,000 m^3	- $ 650,000	- $ 760,000
	Pavement	- 6,500 m^2	- $ 1,500,000	- $ 1,600,000
	Concrete Works	- 2000 m (kerb and channel) - 3,000 m^2 (of shared user path)	- $ 720,000	- $ 830,000
	Drainage	- 1,200 m (drainage pipe) - 10 (pits) - 2020 m (subsoil drainage)	- $ 1,200,000	- $ 1,400,000
	Street Lighting	Expect quantity to remain unchanged and rate to reduce based on lower level of lighting required.	- $ 100,000	- $ 110,000
	Signage and Line marking	Expect signage and line marking allowance could reduce by half.	- $ 50,000	- $ 53,000
	Landscaping	Expect rate could reduce by a third.	- $ 130,000	- $ 140,000
	Tree / vegetation removal	Expect quantity could reduce by a third.	- $ 15,000	- $ 17,000
		Road Potential Cost Change Total	**- $ 13,965,000**	**- $ 16,310,000**
Bridge	Earthworks	Expect quantities to reduce by half.	- $ 75,000	- $ 85,000
	Foundation		- $ 3,700,000	- $ 4,650,000
	In-situ Piers		- $ 1,890,000	- $ 2,400,000
	Precast RC Beams		- $ 3,000,000	- $ 4,000,000
	In-situ RC Decking		- $ 1,500,000	- $ 1,800,000
	Bearings and Expansion Joints		- $ 255,000	- $ 300,000
	Barriers		- $ 1,070,000	- $ 1,200,000
	Civil Works (Rock Beaching only)		- $ 375,000	- $ 480,000
	Other		- $ 315,000	- $ 375,000
		Bridge Potential Cost Change Total	**- $ 12,180,000**	**- $ 15,290,000**
		Overall Potential Cost Change Total	**- $ 26,145,000**	**- $ 31,600,000**

The items, values and figures presented in Table 5-2 are based on Opinion of Probable Cost (OPC) estimates developed by WT Partnership dated 14 November 2023. These are approximate only and subject to further investigation and confirmation during future project stages.

5.5 Other Considerations

Further considerations that could lead to lower interim costs include the following:

- Provision of interim retaining walls – the commentary included in this Report assumes that retaining walls are constructed in their ultimate location however there may be cost reductions in the interim by providing walls that support the interim carriageway construction only. This would result in shorter lengths of wall at reduced heights with lower supporting earthworks. As mentioned in Table 5-1 any interim retaining walls would need to be removed and ultimate walls constructed to support ultimate carriageway construction thereby increasing future costs.
- Exploring alternative waterway diversion treatments – the current costings assume a cast in-situ reinforced concrete water channel will be constructed to divert water in the Moorabool River and allow construction of the bridge without water encroachment. Alternative treatments that may have lower costs could include sheet piling or earthen diversions as temporary isolation barriers. It is noted that the actual waterway diversion treatment will be subject to water catchment and environmental authority requirements and approvals.

6. Summary

This report has considered whether an interim bridge for BR-01 and the removal of BR-02 from the DCP can be supported. Based on a review of the transport modelling and the discussion presented within this report, Table 6.1 summarises the recommendations.

Table 6-1 – Recommendations

No.	Recommendation	Rationale
1	BR-01 be included in the DCP as an interim bridge, consisting of one lane in each direction.	A preliminary assessment suggests that an interim bridge should be able to support up to 75% of development of the NWGGA.
2	BR-01 is required to be delivered in its ultimate configuration (i.e. with two lanes in each direction) prior to the full delivery of NWGGA.	Modelling shows the interim bridge for BR-01 will fail in 2051 (i.e. at full development of the NWGGA), with DoS levels of greater than 1.2. A two-lane bridge for BR-01 will operate with acceptable levels, with VCR values of less than 1.0 in 2051.
3	BR-02 can be removed from the DCP.	Modelling suggests that network can respond to the removal of the bridge.
4	The land for BR-02 should be included in the DCP to protect the ability for the bridge to be delivered by the State and/or others.	Protecting the land for the bridge to be constructed will safeguard the ability for the bridge to be delivered by the State and/or others.
5	An active travel bridge should be included in the DCP in lieu of BR-02.	Providing an active travel bridge will ensure that communities within Batesford South are connected, reduce car travel and encourage mode shift.
6	BR-03 can be removed from the DCP.	The modelling assumes BR-03 will be delivered as a public transport link only. The modelling also shows that the network is able to function with vehicles using BR-03. The inclusion of BR-03 is linked to the outcome of the work DTP is required to undertaken at the Geelong Ring Road Interchange.
7	The land for BR-03 should be included in the DCP to protect the ability for the bridge to be delivered by the State and/or others.	Protecting the land for the bridge to be constructed will safeguard the ability for a public transport bridge to be delivered by the State and/or others.

These recommendations and their implications to movement and access within the NWGGA should be considered carefully. Particularly as these will have implications in the ability to deliver a functioning transport network that can support the communities within the NWGGA.

Removing BR-02 from the DCP will mean that its delivery will be the responsibility of the State (and/or others). A wholistic approach will be required from the State and/or others when considering its delivery, as the cost of its delivery would likely be a viable alternative to upgrading the Geelong Ring Road. Notwithstanding, these are matters for the State and/or others to consider.

From a design and costing perspective, the removal of one of the spans of BR-01 and BR-02 from the DCP will have the following implications:

1. The removal of one span from BR-01 and two traffic lanes from RD 01 will have the potential to save in the order of $31,600,000 (P90) from the DCP. This is due to the need to still undertake a high volume of earthworks for a single carriageway.
2. The removal of BR-02 will remove $250,881,600 (P90) from the DCP. It is noted that the cost of the land should be included within an updated DCP to allow the delivery of the bridge by the State and/or others.
3. There is an opportunity to reconfigure IN-06 (Midland Highway / CCC) and reduce its cost, as the fourth leg of the intersection would not be required.
4. The analysis also identified that there would be limited impact on the traffic volumes within the Creamery Road PSP, indicating there would be minimal changes to the designs completed. Notwithstanding, updated analysis of IN-05 and IN-06 is recommended for the finalisation of the Creamery Road DCP.

A possible updated DCP is summarised in Table 6.2.

Table 6-2 – Amended Project Costs

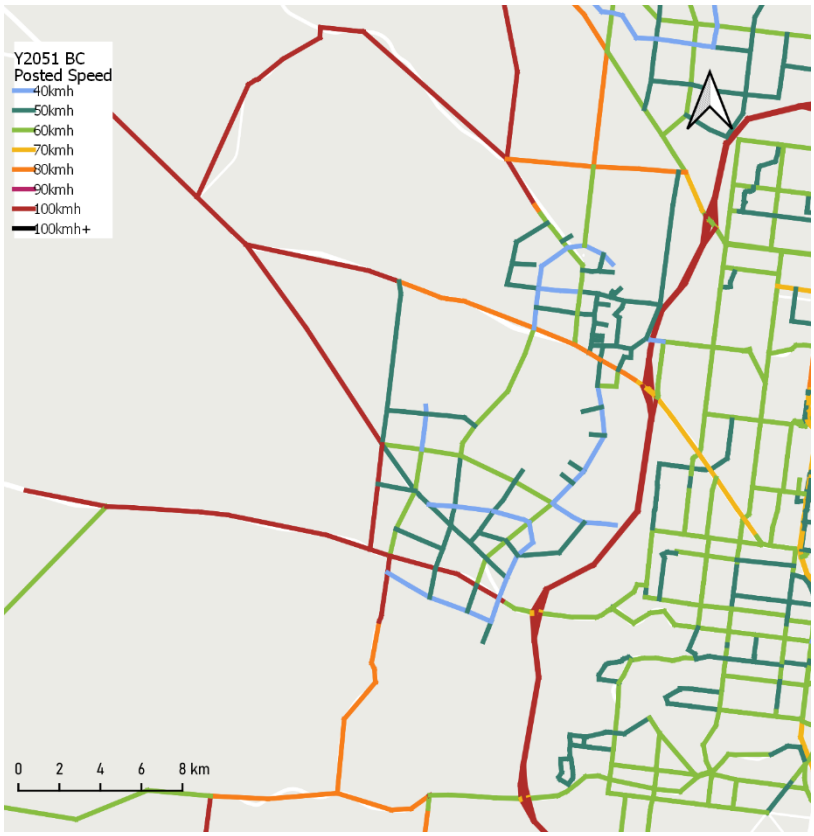
Project ID	Value (excl. GST) (incl. Delivery) – P50	Value (excl. GST) (incl. Delivery) – P90	Value (excl. GST) (incl. Delivery) – P50	Value (excl. GST) (incl. Delivery) – P90
	Full delivery of DCP items		Partial delivery of DCP items[1][2]	
RD 01-01 (part of BR-01)	$ 76,805,700	$ 91,983,500	$62,840,700	$75,673,500
BR-01	$ 38,489,300	$ 48,129,700	$26,309,300	$32,839,700
BR-02	$ 201,520,900	$ 250,881,600	-	-
BR-03	$ 93,850,400	$ 117,809,700	-	-
BR-04	$ 2,029,300	$ 2,436,700	$ 2,029,300	$ 2,436,700
Total	**$412,695,600**	**$511,241,200**	**$91,179,300**	**$110,949,900**

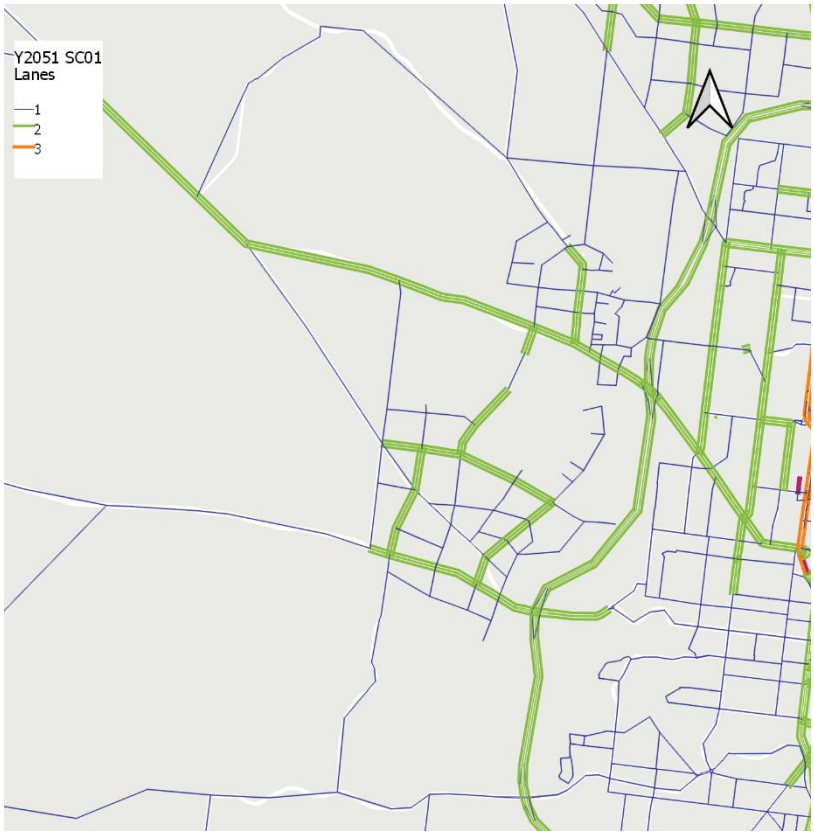
[1] Does not include recommended pedestrian bridges in lieu of BR-02 and BR-03.
[2] Cost is based on concept sketches and does not include a 3D design and earthworks quantities.

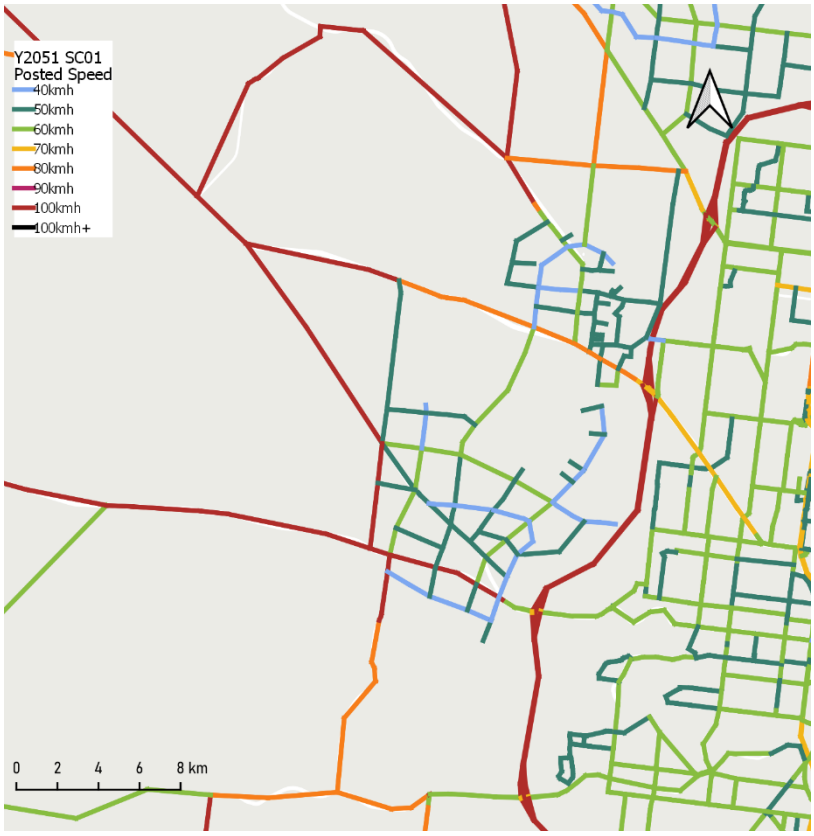
In summary, the inclusion of an interim BR-01 and the removal of BR-02 and BR-03 from the DCP can be supported on traffic and transport grounds, noting that BR-02 at a minimum is considered essential for an efficient network when the full development of NWGGA is delivered.

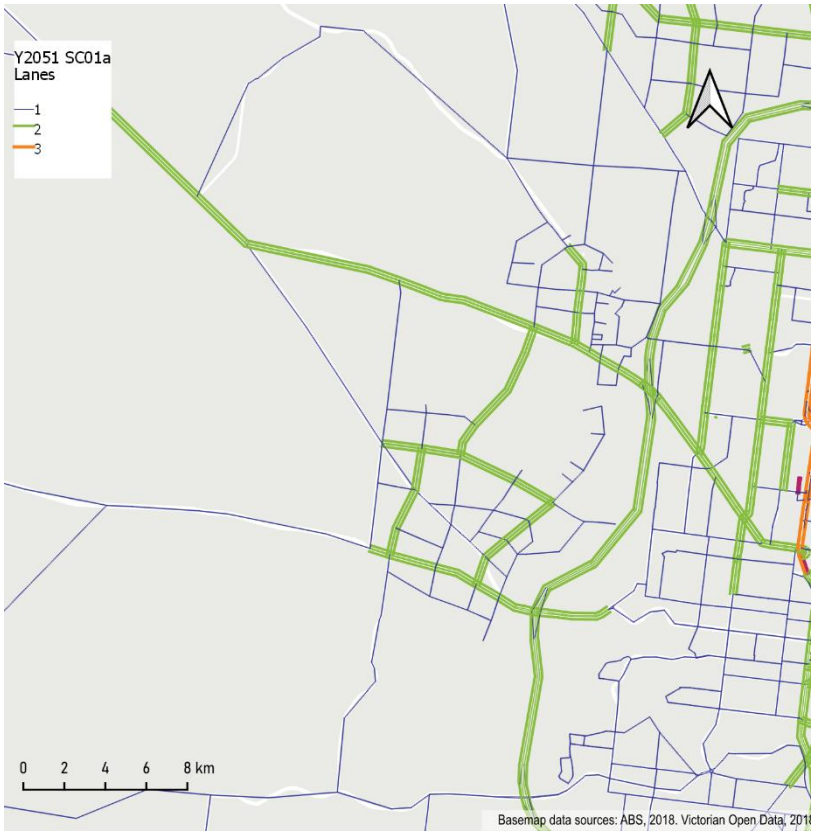
Appendix A. Network Inputs

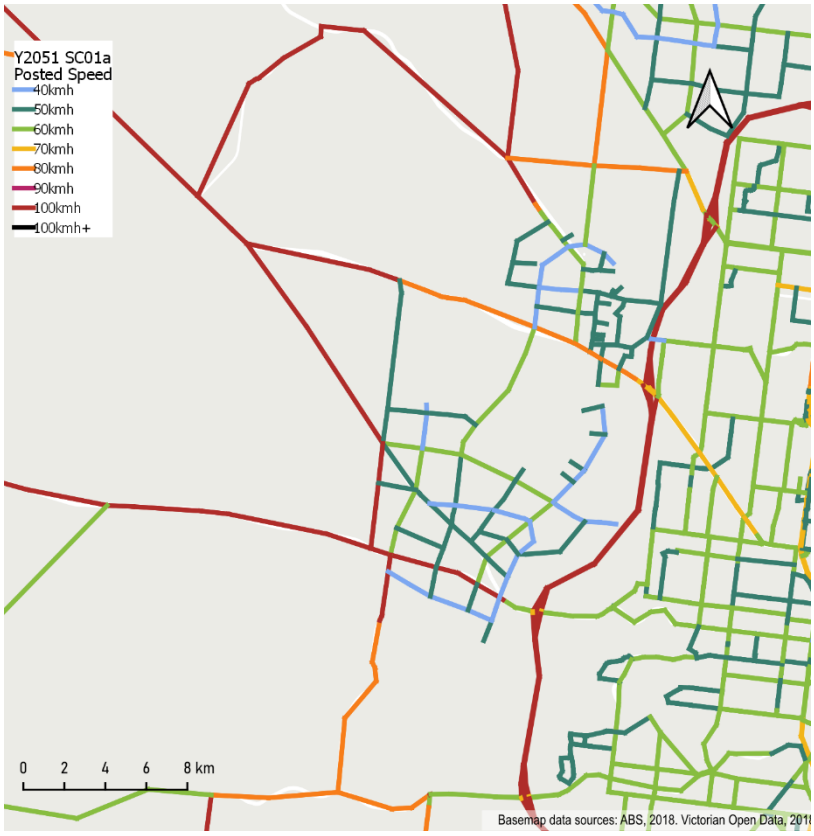

Y2051 BC
Lanes
1
2
3
0 0.3 0.6 0.9 1.2 km


Y2051 BC
Posted Speed
40kmh
50kmh
60kmh
70kmh
80kmh
90kmh
100kmh
100kmh+
0 2 4 6 8 km


Y2051 SC01
Lanes
1
2
3


Y2051 SC01
Posted Speed
40kmh
50kmh
60kmh
70kmh
80kmh
90kmh
100kmh
100kmh+
0 2 4 6 8 km


Y2051 SC01a
Lanes
1
2
3
0 2 4 6 8 km
Basemap data sources: ABS, 2018. Victorian Open Data, 201

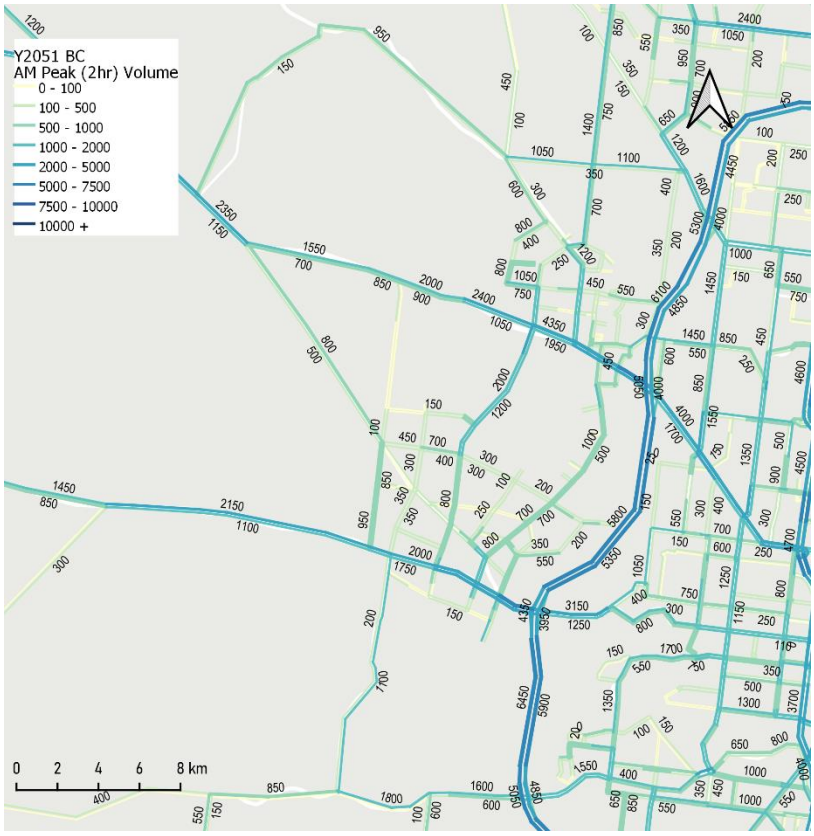

Y2051 SC01a
Posted Speed
40kmh
50kmh
60kmh
70kmh
80kmh
90kmh
100kmh
100kmh+
0 2 4 6 8 km
Basemap data sources: ABS, 2018. Victorian Open Data, 201

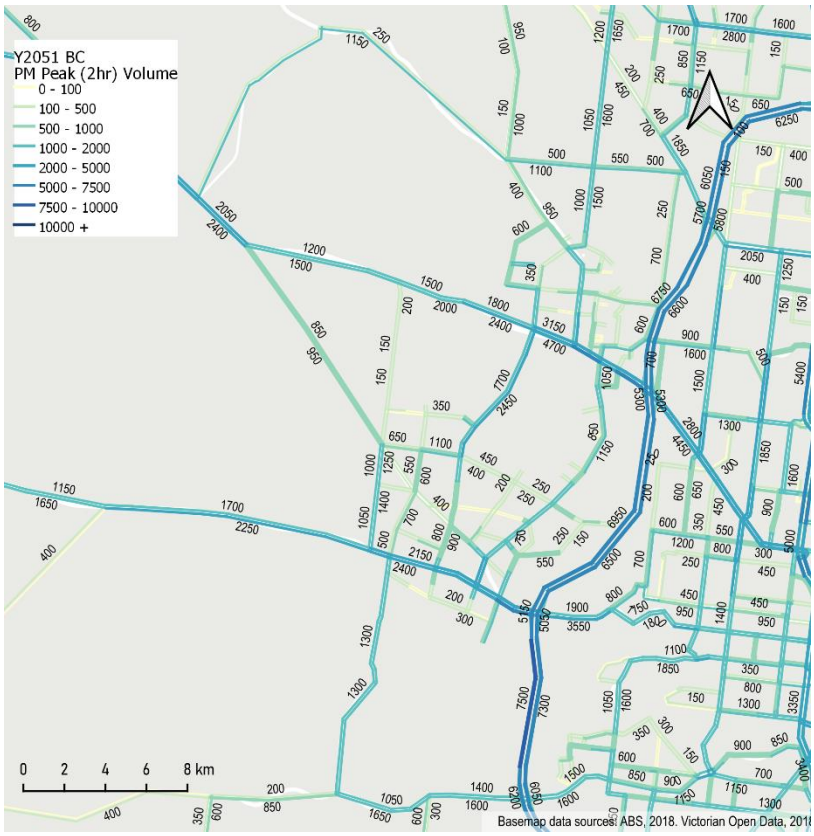
Appendix B. Volume to Capacity Plots

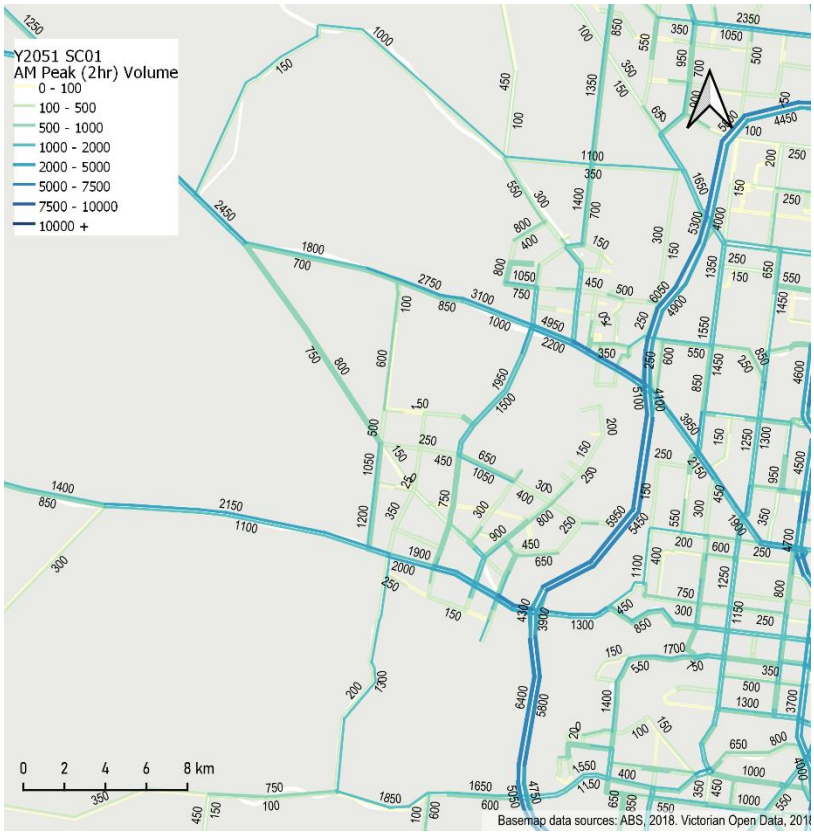

Y2051 BC
Daily Volume
0 - 100
100 - 500
500 - 1000
1000 - 2000
2000 - 5000
5000 - 7500
7500 - 10000
10000 +
0 0.3 0.6 0.9 1.2 km

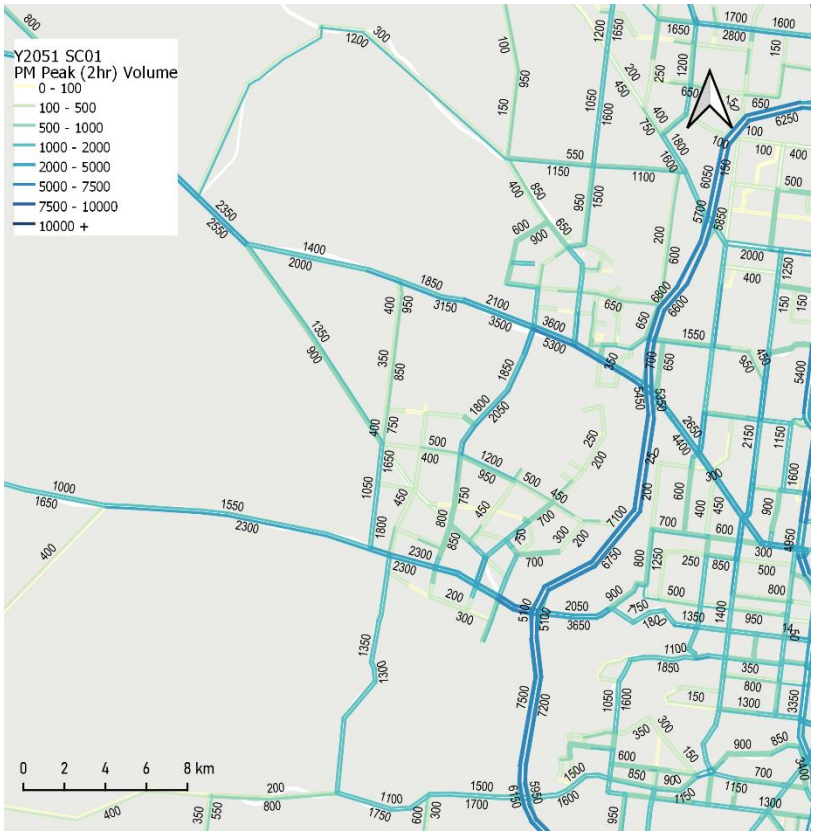

Y2051 SC01
Daily Volume
0 - 100
100 - 500
500 - 1000
1000 - 2000
2000 - 5000
5000 - 7500
7500 - 10000
10000 +
0 2 4 6 8 km

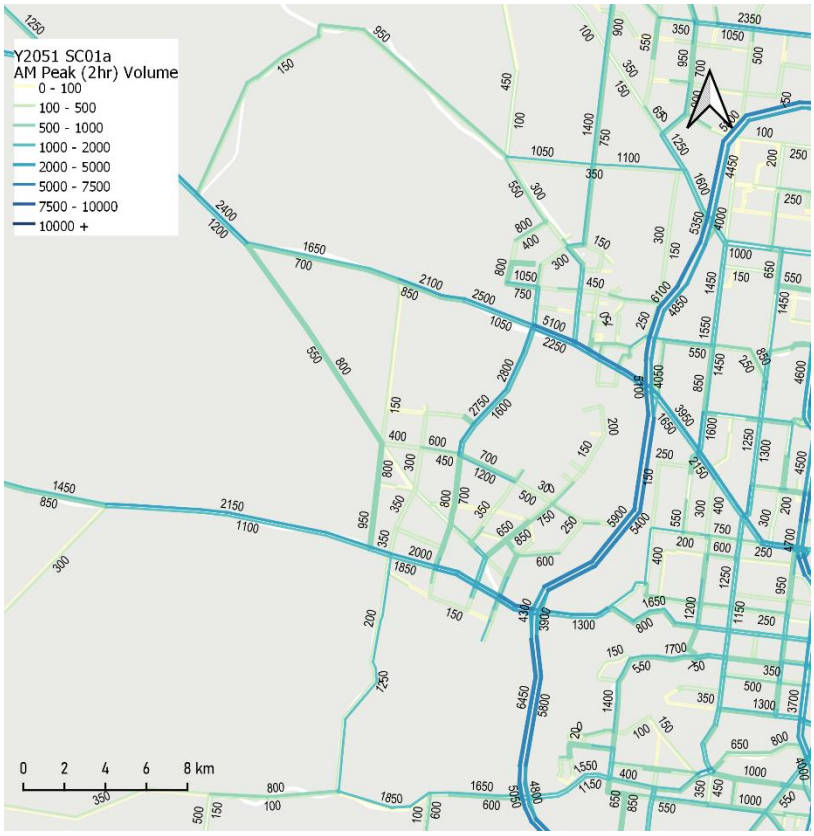

Y2051 SC01a
Daily Volume
0 - 100
100 - 500
500 - 1000
1000 - 2000
2000 - 5000
5000 - 7500
7500 - 10000
10000 +

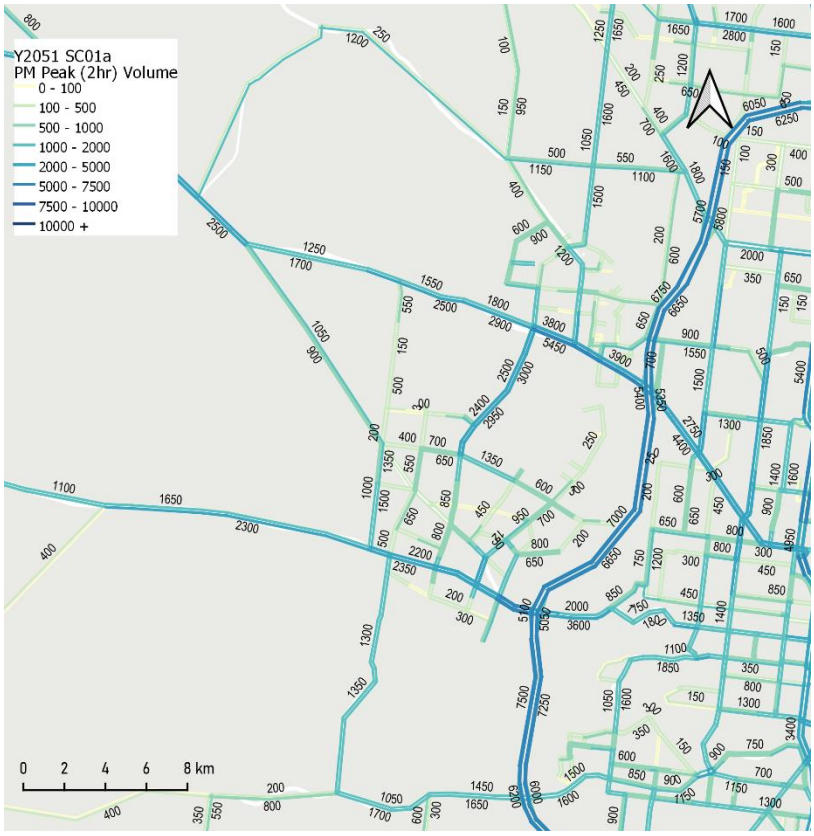

Y2051 BC
AM Peak (2hr) Volume
0 - 100
100 - 500
500 - 1000
1000 - 2000
2000 - 5000
5000 - 7500
7500 - 10000
10000 +
0 2 4 6 8 km

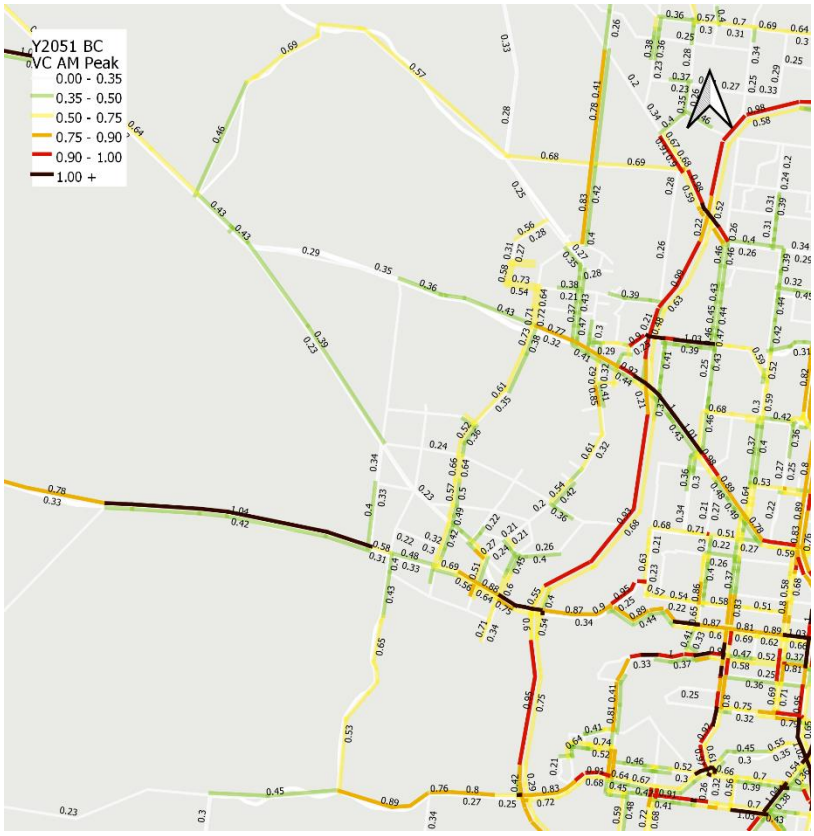

Y2051 BC
PM Peak (2hr) Volume
0 - 100
100 - 500
500 - 1000
1000 - 2000
2000 - 5000
5000 - 7500
7500 - 10000
10000 +
0 2 4 6 8 km
Basemap data sources: ABS, 2018. Victorian Open Data, 201

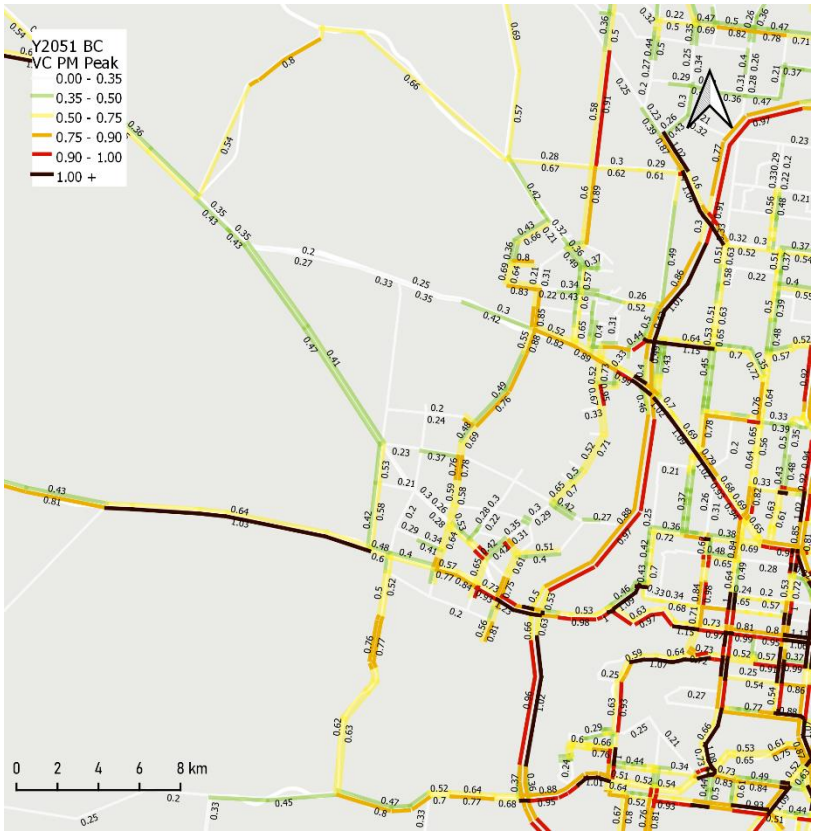

Y2051 SC01
AM Peak (2hr) Volume
0 - 100
100 - 500
500 - 1000
1000 - 2000
2000 - 5000
5000 - 7500
7500 - 10000
10000 +
0 2 4 6 8 km
Basemap data sources: ABS, 2018. Victorian Open Data, 201


Y2051 SC01
PM Peak (2hr) Volume
0 - 100
100 - 500
500 - 1000
1000 - 2000
2000 - 5000
5000 - 7500
7500 - 10000
10000 +
0 2 4 6 8 km


Y2051 SC01a
AM Peak (2hr) Volume
0 - 100
100 - 500
500 - 1000
1000 - 2000
2000 - 5000
5000 - 7500
7500 - 10000
10000 +
0 2 4 6 8 km


Y2051 SC01a
PM Peak (2hr) Volume
0 - 100
100 - 500
500 - 1000
1000 - 2000
2000 - 5000
5000 - 7500
7500 - 10000
10000 +
0 2 4 6 8 km

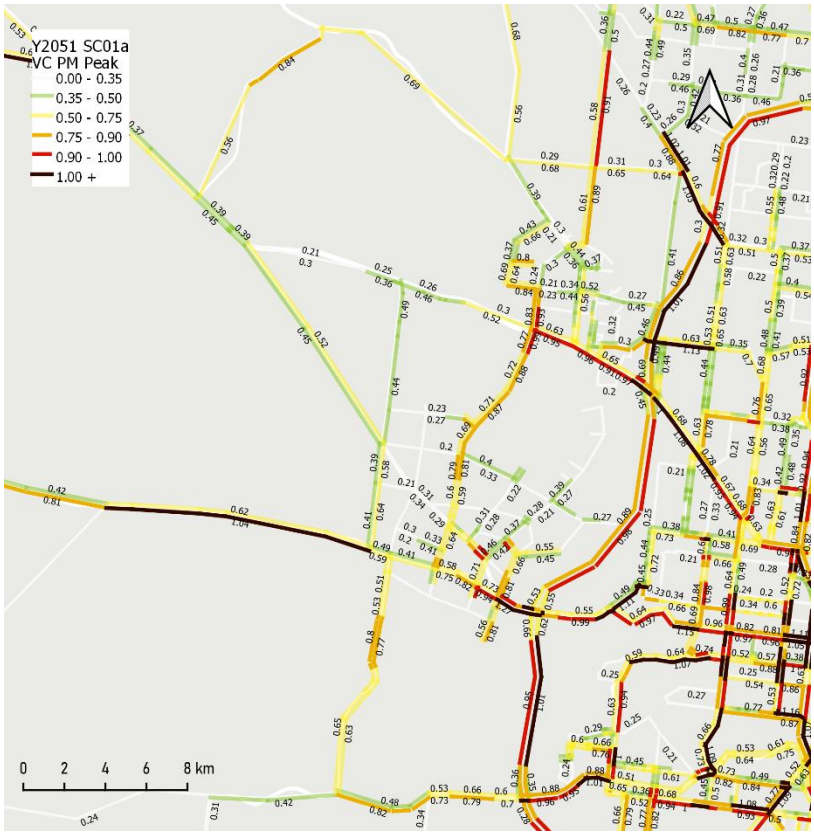

Y2051 BC
VC AM Peak
0.00 - 0.35
0.35 - 0.50
0.50 - 0.75
0.75 - 0.90
0.90 - 1.00
1.00 +


Y2051 BC
VC PM Peak
0.00 - 0.35
0.35 - 0.50
0.50 - 0.75
0.75 - 0.90
0.90 - 1.00
1.00 +
0 2 4 6 8 km


Y2051 SC01
VC AM Peak
0.00 - 0.35
0.35 - 0.50
0.50 - 0.75
0.75 - 0.90
0.90 - 1.00
1.00 +
0 2 4 6 8 km
Basemap data sources: ABS, 2018. Victorian Open Data, 2018


Y2051 SC01
VC PM Peak
0.00 - 0.35
0.35 - 0.50
0.50 - 0.75
0.75 - 0.90
0.90 - 1.00
1.00 +
0 2 4 6 8 km
Basemap data sources: ABS, 2018. Victorian Open Data, 2018


Y2051 SC01a
VC AM Peak
0.00 - 0.35
0.35 - 0.50
0.50 - 0.75
0.75 - 0.90
0.90 - 1.00
1.00 +
0 2 4 6 8 km


Y2051 SC01a
VC PM Peak
0.00 - 0.35
0.35 - 0.50
0.50 - 0.75
0.75 - 0.90
0.90 - 1.00
1.00 +
0 2 4 6 8 km

w

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