



mainroads  
WESTERN AUSTRALIA

# Transport Planning Assessment

## Glen Iris (Stage 1)

# Document Control

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# 1. Executive Summary

A transport planning assessment of Glen Iris has been undertaken by Main Roads through an iterative process in consideration of existing and proposed transport and land-use in order to coordinate key objectives for Greater Bunbury. Assessments have progressed in association with (and guided by) the Glen Iris Technical Working Group (GITWG), where outcomes of the process are detailed in this report. This work defines the ultimate road network, including key linkages accessing Glen Iris for inclusion in a Glen Iris District Structure Plan (GIDSP).

The GIDSP will identify long-term land use and identify a mechanism to protect land required for critical infrastructure through the Greater Bunbury Region Scheme (GBRS) to secure the future transport needs of the area. These assessments recognise the long-term vision for Glen Iris and surrounding areas which will service the movement of freight and people for a Greater Bunbury area population of 200,000, projected to occur beyond 2050, along with associated regional growth.

Access to and surrounding Glen Iris has remained a challenge for many years given several factors. Transport planning to address this has been challenging and protracted, where all options considered result in varying levels of impact. Given a range of complexities, the planning process has required significant coordination between agencies (through a working group arrangement), with targeted input from landholders, key businesses as well as other groups. Some of the key constraints surrounding Glen Iris include:

North – Forrest Highway, future fast rail, Preston River floodway relief area and Bunbury Port. The busy Bunbury Farmers Market is located adjacent to the Forrest Highway and Vittoria Road intersection.

West – The Preston River and Robertson Drive.

South – The Preston River, South Western Highway, and existing passenger rail.

East – A heavy freight corridor (Willinge Drive), industrial/commercial land uses and the Port freight rail line.

As a result, current and future access to Glen Iris is heavily constrained and limited to Vittoria Road and Alyxia Drive. In addition, surrounding areas are influenced by Greater Bunbury planning including potential future fast rail to Bunbury and adjacent to Forrest Highway, future public transport requirements, active transport corridors and, access to and expansion of the Bunbury Port. Significant future growth within Greater Bunbury is also anticipated to place pressure on key routes including Forest Highway and South Western Highway.

The transport planning process is intended to formulate transport solutions that can be staged in the short, medium and long-term. The recommendations detailed in this report address existing and future traffic as well as land use, road safety, pedestrian safety, and access, and provides a future network compatible with future land use and broader planning within Greater Bunbury. Providing the necessary infrastructure will ease existing congestion, improve safety outcomes, and unlock the development potential of Glen Iris.

It is acknowledged that not all stakeholders are supportive of all options, in particular landholders intersected by road access. Not implementing an appropriate solution will, over time, compound existing challenges within Glen Iris and Forrest Highway and constrain growth. Consultation and feedback provided to date has been incorporated into the planning and assessment processes where attempts have been made to avoid and minimise impacts wherever possible. Further opportunities for stakeholder input will be provided through the District Structure Plan advertising process.

Transport planning recommendations are summarised as follows:

- Construction of a roundabout at Vittoria Road and South Western Highway – Funded for construction  
Construction in progress and will address current and long-term safety and access constraints to the south.
- Provision of an additional northern access with Forrest Highway  
Addressing current and medium-term transport needs including easing pressure on the Vittoria Road and Forrest Highway intersection. In the long-term, and to maintain an effective Forrest Highway, the existing intersection is proposed to become a left-in and left-out only, subject to further stakeholder discussion with an existing adjacent business. Achieving this in the short and medium-term is not possible given existing business reliance on this access (further details provided in Section 6.1).
- Provision for an additional western access with Robertson Drive  
Addressing long-term demands, subject to the ultimate scale/intensity of Glen Iris land use and subject to detailed assessments; including Aboriginal heritage consultation and environmental approvals.

## 2. Introduction

### 2.1. Purpose of the Study

A transport planning assessment has been undertaken by Main Roads in collaboration with the Glen Iris Technical Working Group (GITWG) with the outcomes detailed in this report. This work defines the ultimate road network layout and associated land requirements for key linkages accessing Glen Iris for inclusion in a Glen Iris District Structure Plan (GIDSP). The GIDSP will identify long-term land use and identify a mechanism to protect land required for critical infrastructure through the Greater Bunbury Region Scheme (GBRS) to secure the future transport needs of the area. These assessments recognise the long-term vision for Glen Iris and surrounding areas which will service the movement of freight and people for a Greater Bunbury area population of 200,000, projected to occur beyond 2050, along with associated regional growth.

Progression of the Glen Iris District Structure Plan (GIDSP) is sponsored by the Bunbury Development Committee (BDC) and will be prepared and lodged through the City of Bunbury. Main Roads is providing technical transport planning input into the Glen Iris Technical Working Group and the broader District Structure Planning process.

### 2.2. Study Area

The study area includes the built-up areas of Greater Bunbury including:

- Existing major highways and main roads including Forrest Highway, the South Western Highway, Port Access Road (Willinge Drive), Bunbury Outer Ring Road and Robertson Drive;
- Existing passenger rail to the south, freight rail to the east and potential fast rail to the north;
- The Bunbury Central Business District (CBD) and associated developments;
- Existing and proposed developments and activity centres in the Shire of Harvey, Dardanup and Capel; and
- The Bunbury Port (managed by Southern Ports).

Bunbury is the regional capital of the South West Region of Western Australia and a growing regional city with population growth at an annual rate around 2% (2021, <http://www.population.net.au/bunbury-population/>). The Greater Bunbury Region includes the City of Bunbury and Shires of Harvey, Dardanup and Capel and is estimated to have a population of approximately 89,766 by end 2022 (2022, <http://www.population.net.au/bunbury-population/>) while the South West Region, which Bunbury acts as a hub, has a total population of around 130,000. The Glen Iris study area is detailed in the image below.

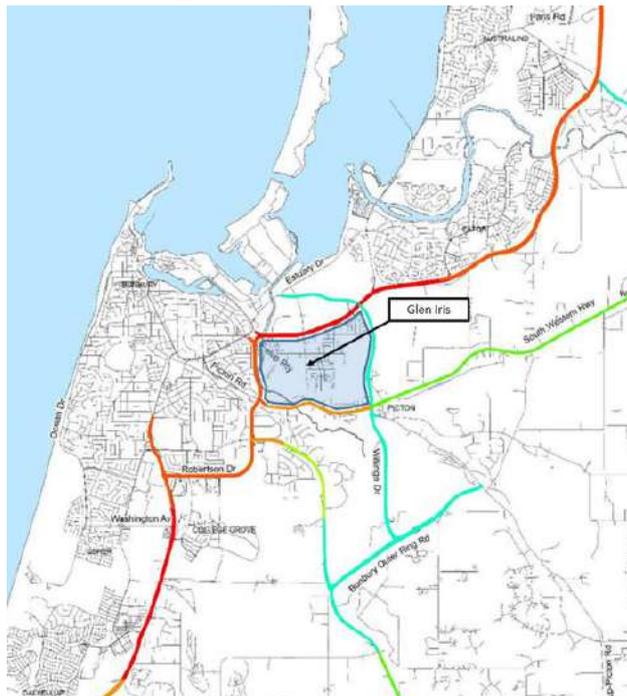


Figure 1 – Glen Iris Study Area

Other key features within the study area and surrounding Glen Iris are detailed in the image below.

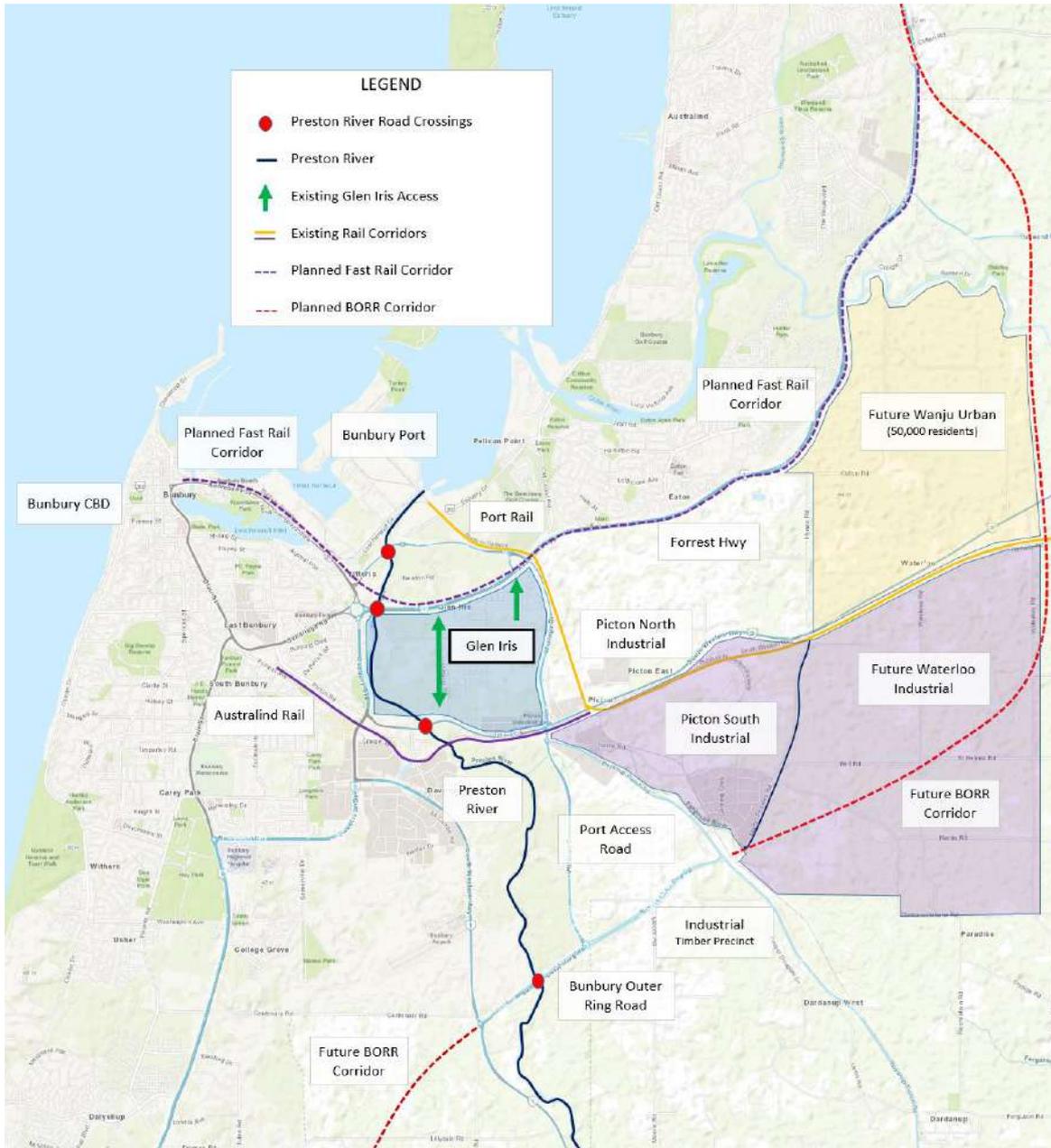


Figure 2 – Key Features Surrounding Glen Iris

Glen Iris is located centrally within Greater Bunbury and is surrounded by Forrest Highway, future fast rail and Bunbury Port to the north, the Preston River, Robertson Drive to the west, the Preston River, South Western Highway and passenger rail to the south and the Port Access Road (freight corridor), industrial/commercial land uses and Bunbury Port freight rail to the east. As a result, current and future access to Glen Iris is heavily constrained and limited to Vittoria Road (accessing Forrest Hwy and South Western Hwy) as well as Alyxia Drive (accessing Forrest Hwy). The three existing access points are shown in Figure 2 above with green arrows, where the major access to the north includes Bunbury Farmers Market abutting the intersection.

The Glen Iris District Structure Plan and resulting transport planning assessment has been split into two stages given a range of existing and proposed land uses as well as differing priorities and objectives. Staging has been split as follows:

Stage 1: Northern, central, and western portions. Portion includes existing residential development to the east of Vittoria Road and an isolated area abutting Forrest Hwy/Preston River (Riverlea Estate), existing rural land proposed for major urban development largely west of Vittoria Road, Commercial and Service Commercial

development abutting Vittoria Road including the successful (and nationally recognised) Bunbury Farmers Market, a number of public and private schools and the Preston River area including existing relief floodway systems; and

Stage 2: Eastern and south-eastern portions. Existing and future planned commercial/mixed use/industrial areas abutting Port Access Road and South Western Highway.

The image below highlights the District Structure Plan stage 1 and 2 areas.



Figure 3 – Glen Iris Staging Plan

**2.3. Problem Definition**

A summary of key problems requiring consideration are discussed below.

**2.3.1. Greater Bunbury**

Figure 1, the “Bunbury Geographie Sub-Regional Strategy” (January 2022, draft document November 2020) states the need to “Provide for the growth of the sub-region’s population to 200,000...” as well as a vision to “Recognise the broader aspiration for a population of 300,000 in the sub-region”. Whilst a significant portion of regional traffic will be carried by the proposed Bunbury Outer Ring Road (construction proposed 2021 to 2024), future long-term population growth up to 200,000 is largely focused through infill of existing residential areas and with major expansion of the footprint in the north-east portion of Greater Bunbury. Major increases in future population are anticipated to place significant local traffic demands on several key links including Forrest and South Western Highways. These highways are the main corridors linking the existing northern and eastern portions of Greater Bunbury to activity centres including Treendale, Eaton Fair, as well as central Bunbury and the Central Business District (CBD). Once future developments including Wanju (urban), Waterloo (industrial) areas progress and combine with extensive infill of existing areas, significant additional local traffic demands will be placed largely on Forrest and South Western Highways within Bunbury. Figure 4 below illustrates these future movement pressures. The built-up areas of Greater Bunbury straddle multiple Local Government Authority areas that will also require a carefully coordinated planning approach.

Strategic traffic modelling undertaken by Main Roads indicates with a doubling of the population in Greater Bunbury over the long-term, traffic is anticipated to roughly double even with BORR in place. This assumes existing low Public Transport usage (other than school bus usage) resulting in traffic increases, including:

- Forrest Highway (transitioning from 30,000vpd to 60-70,000vpd) providing the main spine connector for Greater Bunbury and is expected to carry large volumes of traffic between central Bunbury and Eaton, Treendale, Wanju and surrounding developments.
- South Western Highway (transitioning from around 10-13,000vpd to 30-40,000vpd) providing an important east-west link between future urban growth areas of Wanju, industrial areas including Waterloo and Picton and communities within central Bunbury.
- Estuary Drive anticipated to transition from 12,000vpd to more than 20,000vpd and providing an important alternative link between the northern communities of Australind, Kingstone and Eaton and central Bunbury.
- Koombana Drive anticipated to transition from 12,000vpd to more than 30,000 - 40,000vpd providing an important link from Eelup Roundabout (Robertson Dr, Forrest Hwy and Estuary Dr) into central Bunbury. Koombana Dr is an important alternative route into the CBD bypassing the built-up areas surrounding Sandridge Road and Blair Street. It should be noted, the reservation width of Koombana Drive is constrained and may become a critical issue in the future depending what infrastructure requirements are (refer Section 5.5.4 for further details).

The image below indicates the scale of future long-term traffic demand increases and critical links within Greater Bunbury.

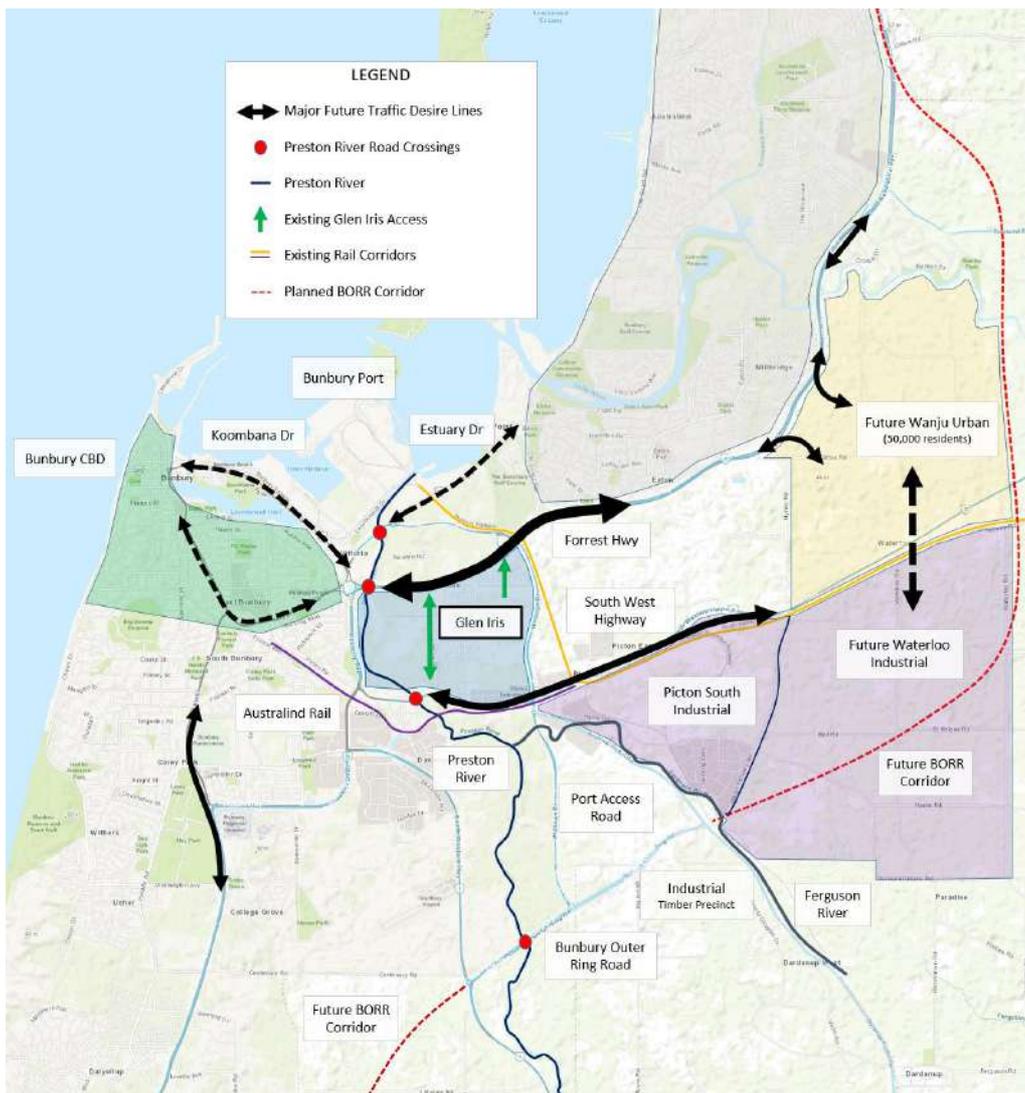


Figure 4 – Greater Bunbury Future Traffic Desire Lines (population of 200,000)

Current and future transport movement (Public Transport, commuter traffic, cyclists, and pedestrians) is constrained by several existing features within Greater Bunbury in turn influencing the accessibility of several future land development areas, overall community connectivity and general movement opportunities. These key constraining features include:

- The Preston River forms a barrier to transport movement with three existing bridge crossings (Estuary Dr, Forrest Hwy and South Western Hwy). As a result, these crossing points are required to accommodate future traffic demands unless additional river crossings are established.
- Existing and potential future rail corridors including the Australind, Bunbury Port freight rail and several other potential rail options under consideration. Rail corridors form a major barrier to vehicle and pedestrian movements as well as impact amenity in surrounding areas requiring carefully managed crossings and ideally bridging to maintain safety (and satisfy the Office of the National Rail Safety Regulator Policy – Level Crossings, Section 9.1 – 9.2, July 2019).
- Future Fast Rail (refer Figure 2) is currently planned to run within the Forrest Highway corridor and adjacent to Koombana Drive. It is understood this planning is currently under review (as of October 2021). Should this fast rail corridor be considered further, all road/pedestrian crossings should be planned to accommodate grade separation (bridging) to manage safety. The currently planned Fast Rail corridor complicates access to the Bunbury Port at Thompson Road and is anticipated to result in amenity impacts surrounding the rail corridor. Available width along sections of Koombana Drive is also limited.
- The Central Business District (CBD) of Bunbury is triangular or “wedge” shaped and surrounded by the ocean/harbour to the west and north and the Bunbury Port/inlet to the east. The resulting geography significantly limits access to and surrounding central Bunbury. Future long-term traffic growth is anticipated to place significant pressure on the limited existing transport links to/from the CBD.

In summary, planning for a Greater Bunbury of 200,000 population requires:

- Coordinated planning across multiple local government boundaries.
- Critical land-use and transport challenges to be identified and appropriately managed.
- Coordinated land use and transport planning (maintaining safe and effective transport links).
- In addition to above, encourage a focus on identification of environments suitable for the creation of “place” and suitable infrastructure/networks accommodating a safe and efficient “movement” function to better service communities (Movement and Place, Department of Transport).
- Promote active transport modes and Public Transport alternatives to relieve anticipated pressures on road networks, in particular the Forrest Hwy, South Western Hwy and existing links into the Bunbury CBD.

Planning to accommodate active transport modes in combination with future public/shared transport alternatives is particularly important if a future Greater Bunbury population reaches 200,000 and where a liveable and desirable amenity is envisaged. Development that encourages vehicle dependence is likely to result in extremely busy road links with the potential to severe communities, result in significant parking challenges (including within the CBD) as well as range of other less than ideal outcomes. Effective planning can maximise amenity, improve connectivity and lead to sustainable and vibrant communities.

### **2.3.2. Glen Iris**

Glen Iris is bounded by the Preston River to the west and south as well as the Port freight rail link to the east creating major constraints to access (refer Figure 4 above). It is also bounded by Forrest Hwy (north), South Western Hwy (south) and Willinge Dr (east) which are all classified as Primary Regional Roads in the Greater Bunbury Region Scheme (GBRS) and are managed by Main Roads WA. Whilst the Bunbury Outer Ring Road (BORR) will remove a large portion of regional traffic from Forrest Highway within Greater Bunbury, future population growth is anticipated to roughly double traffic on Forrest Hwy, forming the main spine road connecting several significant communities and activity centres within Greater Bunbury.

A floodway relief area is located within Glen Iris crossing Forrest Hwy halfway between the Preston River and Vittoria Rd intersection resulting in flooding and drainage requiring careful consideration for future residential and road infrastructure development.

Existing road access to Glen Iris is limited to two key links as detailed in Figure 5 below, where the primary connection is via Vittoria Road (approximately 8,000 – 10,000vpd) and Alyxia Dr (approximately 2,000vpd forming a secondary access). Alyxia Dr largely services residential development in the north-east portion of Glen Iris. As a result, the majority of traffic is drawn to and concentrated along Vittoria Rd given there are no other significant external connections nor connections in an east-west direction. Existing access to Glen Iris is significantly limited and heavily dependent on Vittoria Rd and its intersections to the north and south, where traffic movements are highly concentrated to Vittoria Road and in particular the intersections with Forrest and South Western Highways. The intersection with Forrest Highway is surrounded by the Bunbury Farmers Market and Grace Christian School that generate significant traffic demands. Land to the west of these areas is zoned Service Commercial which is anticipated to attract land uses that drive significant traffic demands. As a result, Vittoria Road adjacent to Forrest Highway is currently congested, where anticipated future land use will generate major traffic movements further placing pressure on this area. The Vittoria Road link also needs to perform the major access function for the broader Glen Iris area.

Pedestrian and cycling access are constrained by the busy surrounding road networks as well as the Preston River to the south and west. Pedestrian access surrounding Vittoria Rd can also prove challenging during busy periods, particularly surrounding Grace Christian School, and the Bunbury Farmers Market. Currently there is a signalised pedestrian crossing of Forrest Highway crossing the west-bound lanes, but no signalised control of the east-bound lanes. Pedestrian access to central Bunbury is via a footbridge over the Preston River also requiring an un-signalised crossing of the south-bound lanes of Robertson Drive (just south of Eelup Roundabout).

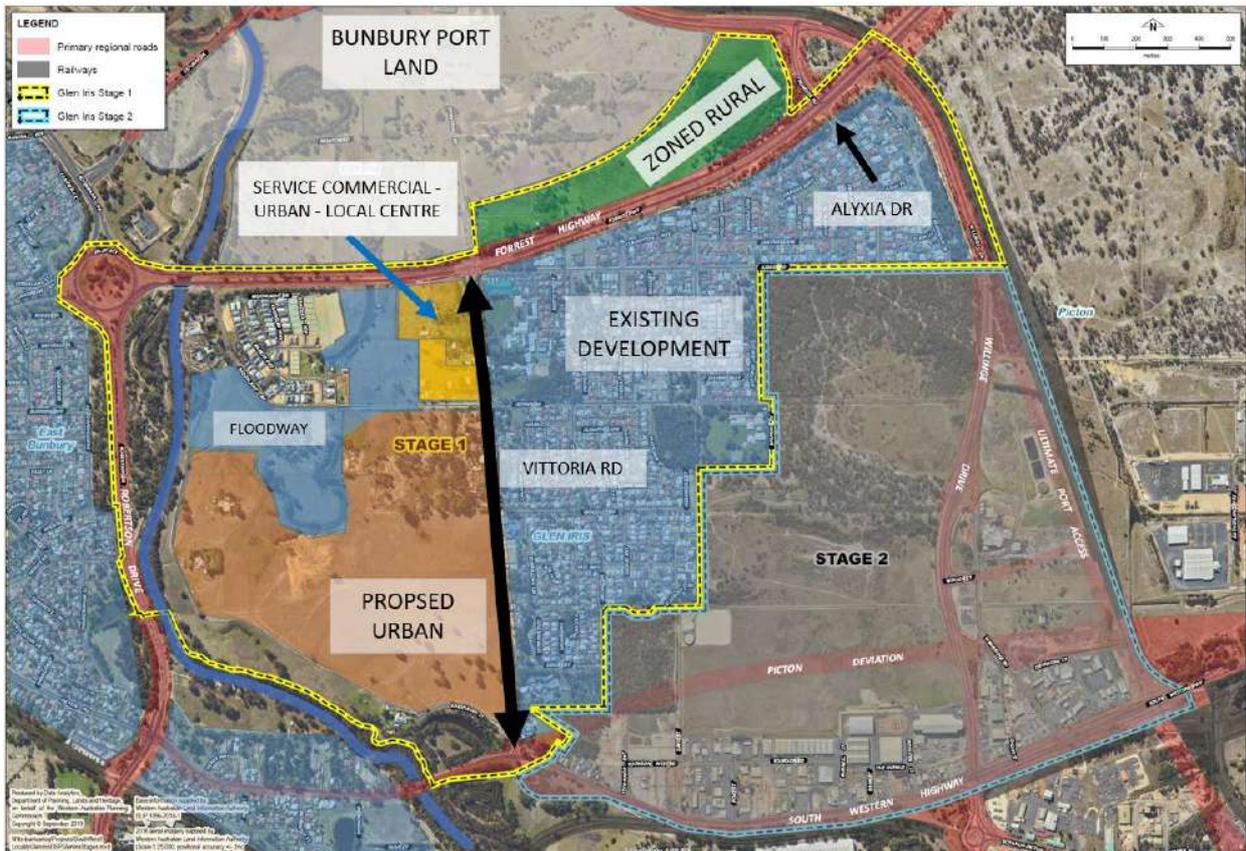


Figure 5 – Glen Iris Area

### 2.3.3. Vittoria Road

Vittoria Road is a 2-lane undivided road (single lane in each direction) and is managed by the City of Bunbury. It is centrally located within Glen Iris, forming the main access corridor for the area. It intersects with Forrest Highway to the north (currently approx. 30,000 vpd typical weekday) and South Western Highway to the south (currently approx. 13,000 vpd on a typical weekday). Vittoria Rd currently carries around 8,000 vpd on a typical weekday. All networks can attract significant additional traffic at peak holiday periods and long-weekends. Both intersections are under pressure from existing development from within Glen Iris as well as passing traffic, where Forrest Hwy and Vittoria Rd intersection is particularly vulnerable to congestion at peak times.

Existing businesses, several schools, existing residential areas, community facilities as well as other land uses gain access directly from Vittoria Rd. Its reservation width is generally 20-25m wide and contains multiple services including ATCO Gas pipes (high and medium pressure), overhead and underground power, street lighting, Telstra/optic fibre cables, sewage, water, large open and piped drainage systems as well as other infrastructure making improvements such as widening works challenging and expensive. Many of these services are concentrated within the northern portion of the road abutting Forrest Highway.

Vittoria Rd caters for a mix of direct property/business access, provision of broader Glen Iris access and a component of through traffic movement which often results in the link becoming congested, particularly surrounding Grace Christian School and the Bunbury Farmers Market. This congestion can spill out onto Forrest Hwy impacting the operation of the state highway network.

The general layout and positioning of Vittoria Rd is summarised in the image below.



Figure 6 - Vittoria Rd General Layout

The intersection of Vittoria Road with Forrest Hwy is heavily constrained by numerous surrounding services, the popular Bunbury Farmers Market access (60m set back from Forrest Hwy), a school 40 km/h zone located south of Forrest Hwy, several bus stops, and a pedestrian crossing. Many of these constraints contribute to the Vittoria Rd/Forrest Hwy intersection becoming congested at peak times and where traffic can spill out from Vittoria Road (and Bunbury Farmers Market) onto Forrest Hwy impacting traffic flow and creating safety challenges.

Future land development including zoning for a service commercial development opposite Bunbury Farmers Market and Grace Christian School as well as a Neighbourhood Centre are proposed to be accessed from Vittoria Road. These future developments are anticipated to place significant additional traffic demands on Vittoria Road,. As a result, traffic pressures surrounding Vittoria Road, Bunbury Farmers Market and Grace Christian School are expected to increase significantly in the future once further development proceeds. The combination of functions Vittoria Road provides is anticipated to compound traffic, pedestrian and safety pressures, particularly between Jeffrey Rd and Forrest Highway. Existing zoning over this section is summarised below.



Figure 7 – Forrest Hwy to Jeffrey Road Zoning

Key features of the Forrest Hwy to Jeffrey Road section of Vittoria Road includes:

- Existing Vittoria Rd/Forrest Hwy intersection is a 3-way signalled intersection that becomes congested at peak periods including at weekends, school pick up-drop off and when the Bunbury Farmers Market is busy.
- The Bunbury Farmers Market (BFM) is a very successful business attracting large numbers of patrons. At peak times the BFM access can become congested with traffic queueing out from the access towards Forrest Hwy, on occasion impacting highway traffic. There are several mechanisms contributing to this including the proximity of the BFM access to Forrest Hwy (60m set back from the highway) and constrained traffic circulation within the BFM site. The business can also attract large numbers of pedestrians at peak times, where off-site parking is utilised by staff/over-flow patrons resulting in pedestrian movements across and along Vittoria Rd (and at times surrounding the BFM driveway).
- Grace Christian School fronts a 350m section of Vittoria Rd and includes a 40km/h school zone between Forrest highway and Jeffrey Road, un-flagged pedestrian crossing, has several access points from Vittoria Rd as well as bus stops/pull off areas. School pick-up and drop off times can become busy with significant queues of traffic accessing the school and creating congestion on Vittoria Road (albeit over relatively short periods).
- Existing semi-rural/low density residential land is located along the western edge of Vittoria Rd. This precinct is zoned Service Commercial, Local Centre (R100) and Urban Development in Local Planning Scheme No. 8 as detailed in Figure 7 above. This land is opposite the BFM/Grace Christian School. At the time of preparing this report, BFM lease a portion of this land for staff parking (at peak times the public

have been observed also parking in this area). While much of this land is largely undeveloped semi-rural uses, future service commercial uses opposite BFM/school are expected to generate large traffic movements in/out of this precinct as well as attract additional pedestrian movements to the area contributing significantly to existing traffic pressures.

Further detail regarding existing traffic and pedestrian movements surrounding the Forrest Highway and Vittoria Road intersection are included in Appendix 1 - Glen Iris Traffic and Crash Summary.

Key features of South Western Highway and Vittoria Road Intersection includes:

- Two school sites are located at the southern end of Vittoria Rd however existing traffic access is primarily via a side road connection. A large proportion of school attendees appears to arrive/depart by bus avoiding may congestion at peak times.
- Two 40km/h school zones are in place adjacent to the schools.
- The existing intersection with South Western Hwy is a simple 'T' intersection with Kaeshagen Rd joining just to the north. Long traffic queues have been observed regularly approaching South Western Hwy at peak times.
- The Vittoria Road and South Western Hwy intersection is scheduled for major upgrade with construction of a roundabout proposed during 2022-23. This upgrade is anticipated to significantly improve access to/from South Western Hwy, better connect Kaeshagan Rd, improve safety and is consistent with long-term planning including upgrading South Western Hwy to a 4-lane divided road in the future.

## 2.4. Glen Iris Planning Objectives

The Bunbury Development Committee (BDC) has identified Glen Iris as one of the Committee's key project areas to resolve development constraints and improve liveability. In order to achieve these outcomes, it has been determined that there is a need for a District Structure Plan to be prepared to address the following issues:

- Vittoria Road/Forrest Highway traffic congestion/intersection function;
- Connection of the locality to the current and future regional road networks;
- Community need/facility provision;
- Open space needs and provision;
- District level flooding/drainage management;
- Neighbourhood centre location and potentially local centre provision; and
- Provision of housing diversity.

Further to above, other key planning objectives considered during the Glen Iris transport planning assessment includes:

- Support existing land uses within Glen Iris including established businesses, facilities, and communities.
- Facilitate safe and efficient access to support future development within Glen Iris in coordination with growth of Greater Bunbury through ensuring appropriate traffic distribution.
- Enhance safety and amenity on key roads within and surrounding Glen Iris by providing appropriate infrastructure for the traffic task.
- Create an efficient road and pedestrian network for the Glen Iris community by coordinating transport and land use planning.
- Minimise impacts as much as possible on affected communities, businesses, landholders, schools, and other stakeholders including consideration of all constraints and opportunities.
- Respect and enhance our environment and heritage.
- Balance local access/congestion with the needs for freight, public transport and regional traffic surrounding Glen Iris.

- Coordinate planning of Glen Iris with the Forrest Hwy including long-term access for the Bunbury Port and potential heavy rail considerations.
- Plan a well located vibrant community with a range of proposed land uses, community spaces and transport linkages.
- Promote a range of transport modes including public transport and active transport alternatives.
- Generate transport networks that provide flexibility for current and future land uses and staging of these.

## 2.5. Glen Iris Transport Planning Scope

The Glen Iris transport planning process is intended to identify existing and future transport challenges within and surrounding Glen Iris and identify suitable responses to support long-term community needs both within Glen Iris as well as within Greater Bunbury. Further assessment will follow this process including detailed network traffic modelling, environmental and Aboriginal heritage assessments.

## 2.6. Scope and Report Outline

This report summarises the transport planning assessment undertaken by Main Roads WA regarding the Glen Iris area and provides guidance to the preparation of the Glen Iris District Structure Plan. This transport planning work has been undertaken through an iterative process in consideration of existing and proposed future land use in order to coordinate key objectives for Greater Bunbury and Glen Iris. The review has progressed in association with (and guidance provided by) the Glen Iris District Structure Plan Working Group comprising of:

- City of Bunbury (CoB);
- Main Roads WA (MRWA);
- Department of Planning, Lands and Heritage (DPLH);
- Bunbury Development Committee (BDC); and
- Department of Water, Environment and Regulation (DWER).

Other key stakeholders involved at critical times includes:

- Public Transport Authority (PTA)
- Department of Communities (DoC)
- Southern Ports Authority (SPA)
- South West Development Commission (SWDC)

The focus assessments are intended to define the location and scale of suitable linkages to the surrounding road networks to facilitate safe and efficient movement of people. Where there is future transport infrastructure identified, it will require further detailed assessment, environmental and heritage assessment, prioritisation, funding and detailed design in addition to the work contained in this report.

## 2.7. Report Abbreviations

The following abbreviations are used in this report:

AHD	Australian Height Datum
AEP	Annual Exceedance Probability (of a flood – 1% chance of exceedance each year equates to a 1 in 100-year flood)
ASS	Acid Sulphate Soils
BDC	Bunbury Development Committee
BFM	Bunbury Farmers Market
BGC Land	Land Owned primarily by BGC on the north side of Forrest Hwy adjacent to Glen Iris (current at August 2021)
BORR	Bunbury Outer Ring Road

BTM	Bunbury Traffic Model
DA	Development Application
DBCA	Department of Biodiversity, Conservation and Attractions
DoS	Degree of Saturation (Traffic modelling term)
DoT	Department of Transport (of Western Australia)
DPLH	Department of Planning, Lands and Heritage
DSP	District Structure Plan
DWER	Department of Water and Environmental Regulation
EPA	Environmental Protection Authority
GBRS	Greater Bunbury Regional Scheme
GS	Grade Separation (bridging of side roads over/under Primary Regional Road)
ITS	Intelligent Transport Systems
KSI	Killed or Serious Injury (traffic crash statistics terminology)
LoS	Level of Service (Traffic modelling terminology)
LPS	Local Planning Scheme
LSP	Local Structure Plan
MRWA	Main Roads Western Australia (or Main Roads WA)
OSOM	Over Size – Over Mass
PRR	Primary Regional Road
PSP	Principal Shared Path
PTA	Public Transport Authority
RAV	Restricted Access Vehicle (Road classification terminology to describe heavy vehicle categories – the higher the RAV number, the larger the truck)
RUM Code	Road User Movement Code (used in traffic crash analysis, classifying crash type)
SIDRA	Signalised and un-signalised Intersection Design and Research Aid (Traffic modelling software)
SP	Structure Plan
SWH	South Western Highway
SWR	South West Region
TEC	Threatened Ecological Communities
UPDC	Ultimate Planning Design Concept
vpd	Vehicles Per Day (used in Strategic Traffic Modelling)
vph	Vehicles Per Hour (used in detailed Traffic Modelling – describing peak hour traffic in packages such as SIDRA)
WAPC	Western Australian Planning Commission

### 3. Planning Context

#### 3.1. Background

Bunbury is a strategically important regional City that has experienced above average growth in recent years, prompting further commercial activity and investment in infrastructure. The future planning for the Greater Bunbury area is based on population growth from approximately 84,000 to 200,000 which is projected to occur at some time beyond 2050. Bunbury is the fifth most productive regional city in Australia (\$151,000 per capita, Regional Australia Institute, 2017).

As the gateway to the south-west of Western Australia, Bunbury’s location, and function as a strategic freight centre drives the imperative for efficient and reliable access. The main economic drivers of the South West are manufacturing, mining and mineral processing (predominantly alumina, coal and mineral sands), tourism, construction, timber industry and agriculture/ viticulture which are predominantly reliant on road transport (South West Development Commission, 2018). Twelve per cent of the worlds exports of alumina is sourced through the Bunbury Port (via freight rail) making safe and efficient road and rail access to the port a critical feature.

The Glen Iris area is surrounded by the Forrest Highway (north), South Western Highway/Australind rail line (south), Preston River/Robertson Drive (west), Bunbury Port Access Road/Bunbury Port freight rail line (east) and is adjacent to the Bunbury Port (north). Many of the road networks adjacent to Glen Iris carry the largest volumes of traffic anywhere in the State outside of the Perth and Peel Regions. Whilst the Bunbury Outer Ring Road will cater for a significant proportion of heavy freight as well as regional, commuter and tourist traffic accessing the South West, heavy freight and general traffic will continue to grow on these internal major highways, Main Roads, and local distributor roads within Bunbury. These demands are driven by Bunbury’s existing and proposed commercial, residential, tourism and industrial land uses (and long-term planning for a doubling of the population).

Given Glen Iris’ location, transport planning associated with its development requires consideration of the surrounding constraints to effectively manage community amenity and access, traffic safety, pedestrian and cyclist safety as well as overall congestion within and surrounding Glen Iris.



Figure 8 - Glen Iris Locality, Access, and Surrounding Constraints (refer Figure 2 for Enlargement)

### 3.2. Literature Review

A review of relevant existing literature, planning and engineering documentation is included below:

#### 3.2.1. The Greater Bunbury Region Scheme (GBRS)

The Greater Bunbury Region Scheme (GBRS) has been in operation since November 2007 and provides the legal basis for land use planning in the Greater Bunbury region. This region stretches from Lake Preston in the north, Peppermint Grove Beach in the south, eastwards to Darling Scarp, and covers the City of Bunbury and the shires of Harvey, Dardanup and Capel. The scheme's purpose is to ensure that there is an adequate supply of commercial, residential and industrial land as well as conserving key environmental features to provide future growth. To plan for changing needs, the Greater Bunbury Region Scheme map is amended from time to time.

The image below identifies the current GBRS map within and surrounding Glen Iris.

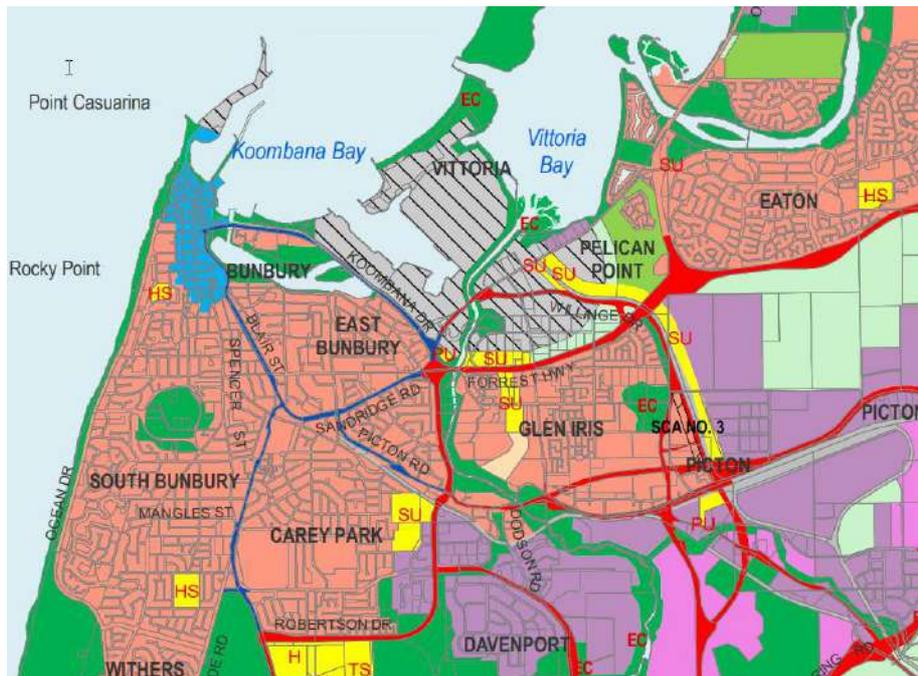


Figure 9 – Greater Bunbury Regional Scheme (GBRS)

The GBRS identifies a number of features within Glen Iris including:

- Future urban development extents (Urban and Urban Deferred);
- The Preston River floodway system/Public Purposes - Special Use land; and
- Regional open space.
- Primary Regional Road (PRR) networks shown in red surrounding Glen Iris

#### 3.2.2. The Greater Bunbury Strategy (2013)

The Greater Bunbury Strategy 2013 is in the process of being updated (refer section 3.2.3 below) and provides guidance on land use planning and infrastructure delivery to support a population growth from 83,600 (2011 census) to over 150,000 people, adequate for the short, medium and long terms. The strategy's vision is for an **'attractive, compact and well-connected city'**. Key infrastructure challenges identified in the strategy include:

- Protect and facilitate access to the Bunbury Port for direct access to international markets;
- Identify and facilitate appropriate opportunities for road and rail freight movement;
- Support the development of the Perth-Bunbury Fast Passenger Rail Service (currently under review by PTA), with a station in the Bunbury CBD.

Given the location of Glen Iris, many of these aspects require consideration.

### 3.2.3. Bunbury – Geographe Sub-Regional Strategy (January 2022)

The Bunbury-Geographe Sub-Regional Strategy (Jan 2022) has recently updated the Greater Bunbury Strategy 2013. The primary purpose of this updated strategy is to plan for and manage growth in the Bunbury-Geographe sub-region. It does this by:

- Establishing a vision to 2050 to guide land use planning, expressing an agreed aspiration for the future of the sub-region, in the context of the State Planning Framework
- Identifying strategic directions and actions required to implement the vision
- Reaffirming the status of Bunbury as the State’s second city
- Defining the sub-region’s settlement hierarchy
- Identifying future land requirements for urban, industrial, commercial and other purposes
- Directing the sequencing of future development to inform and support the preparation of amendments to the Greater Bunbury Region Scheme and local planning schemes
- Providing a strategic context for local governments in preparing, reviewing and implementing local planning frameworks
- Profiling the sub-region’s urban settlements, transport networks, economy, environment and utilities/services.

The strategy also aims to:

- Provide for the growth of the sub-region’s population to 200,000 by identifying sufficient residential and employment land to cater for this target population; and
- Recognise the broader aspiration for a population of 300,000 in the sub-region and respond to accelerated rates of growth by identifying additional residential and employment land, through regular monitoring and updating the Strategy as required.

The strategy recognises Bunbury “as the Regional City of the South West region, and the State’s second city”. It also identifies significant greenfields development within Glen Iris/Moorelands focussed largely on the areas west of Vittoria Rd as well as a site for a Neighbourhood Centre around the intersection of Jeffrey and Vittoria Roads.

### 3.2.4. City of Bunbury – Local Planning Scheme No. 8

The City of Bunbury Local Planning Scheme No. 8 is consistent with the GBRS and provides additional detail to guide land use and development within Glen Iris. It contains information about long-term planning and strategies and about how infrastructure and development will occur in the area. This includes the existing development of Riverlea abutting the Forrest Highway and Preston River. Figure 10 below details Local Planning Scheme No.8 within Glen Iris.

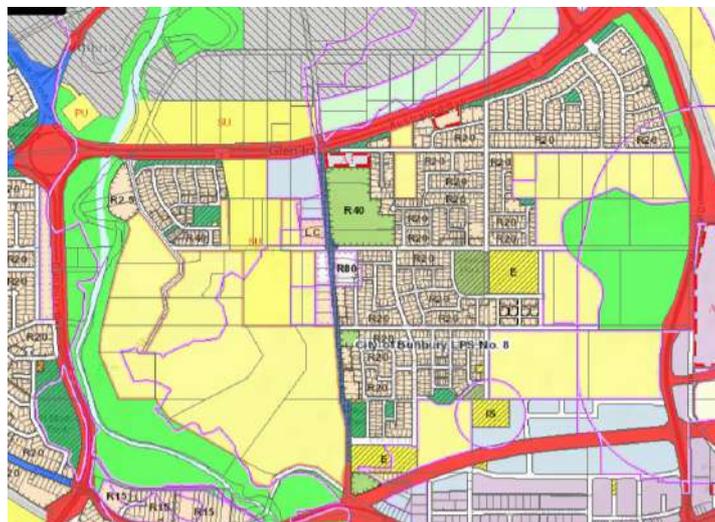


Figure 10 – City of Bunbury LPS No. 8 – Glen Iris

### 3.2.5. Bunbury – Wellington 2050 Cycling Strategy (2018)

The Bunbury-Wellington 050 Cycling Strategy (2018) is an overall strategy for the Bunbury – Wellington area with a high-level focus on current and future cycling routes and opportunities. The strategy identifies Estuary Drive as an existing primary cycling route and Forrest Hwy as a potential alternative route. The Estuary Drive connection may be influenced by Southern Ports Master Planning involving future expansion of the Bunbury Port (potentially impacting future cycling links through this area). In recent years intersection upgrades of Forrest Hwy including Eaton Drive, Thompson Road/Alyxia Drive and Vittoria Road include on road cycle lane facilities within the intersection cross-section.

### 3.2.6. Bike-It Bunbury

The City of Bunbury’s Bike-It Bunbury Website ([www.bunbury.wa.gov.au/Pages/Bike-It-Bunbury.aspx](http://www.bunbury.wa.gov.au/Pages/Bike-It-Bunbury.aspx)) includes references to a Future Shared Path along the southern edge of the Australind Bypass (Forrest Hwy) including past Glen Iris as well as along Jeffrey Rd within Glen Iris. The website also refers to the City of Bunbury Bicycle Plan (April 2010) which highlights Estuary and Koombana Drive as a key link for improvement. It is understood much of the improvement works identified in the plan along Estuary Drive and Koombana Drive have been implemented since 2010. The image below identifies current and future bicycle networks.

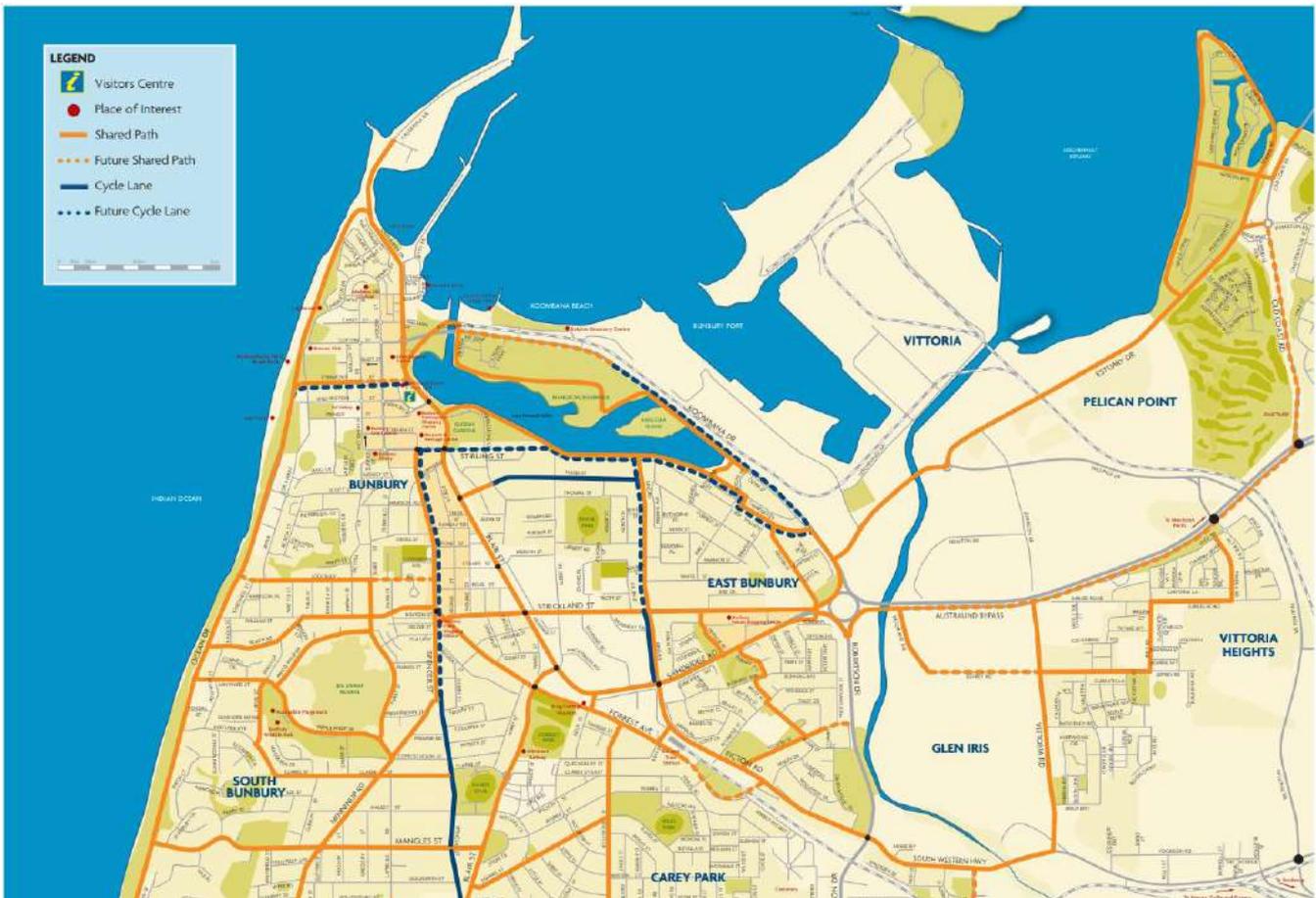


Figure 11 – Bike-It Bunbury Map of Existing and Future Bicycle Routes

### 3.2.7. Bunbury Port Inner Harbour Structure Plan (2009)

Southern Ports Authority released the Bunbury Port Inner Harbour Structure Plan in September 2009 to guide development and decision-making regarding development of the Bunbury inner harbour. This document includes a figure indicating the Preston River is intended to be realigned closer to Forrest Hwy and which severs the Estuary Drive road link. Since this time discussion has progressed with Southern Ports Authority to ensure an Estuary Drive link is maintained in some form to retain this strategically important route. While no formal documentation has been released, it is understood Southern Ports are considering several alternative port expansion options with a Master Planning process in progress as of 2020 (refer section 3.2.8 below).

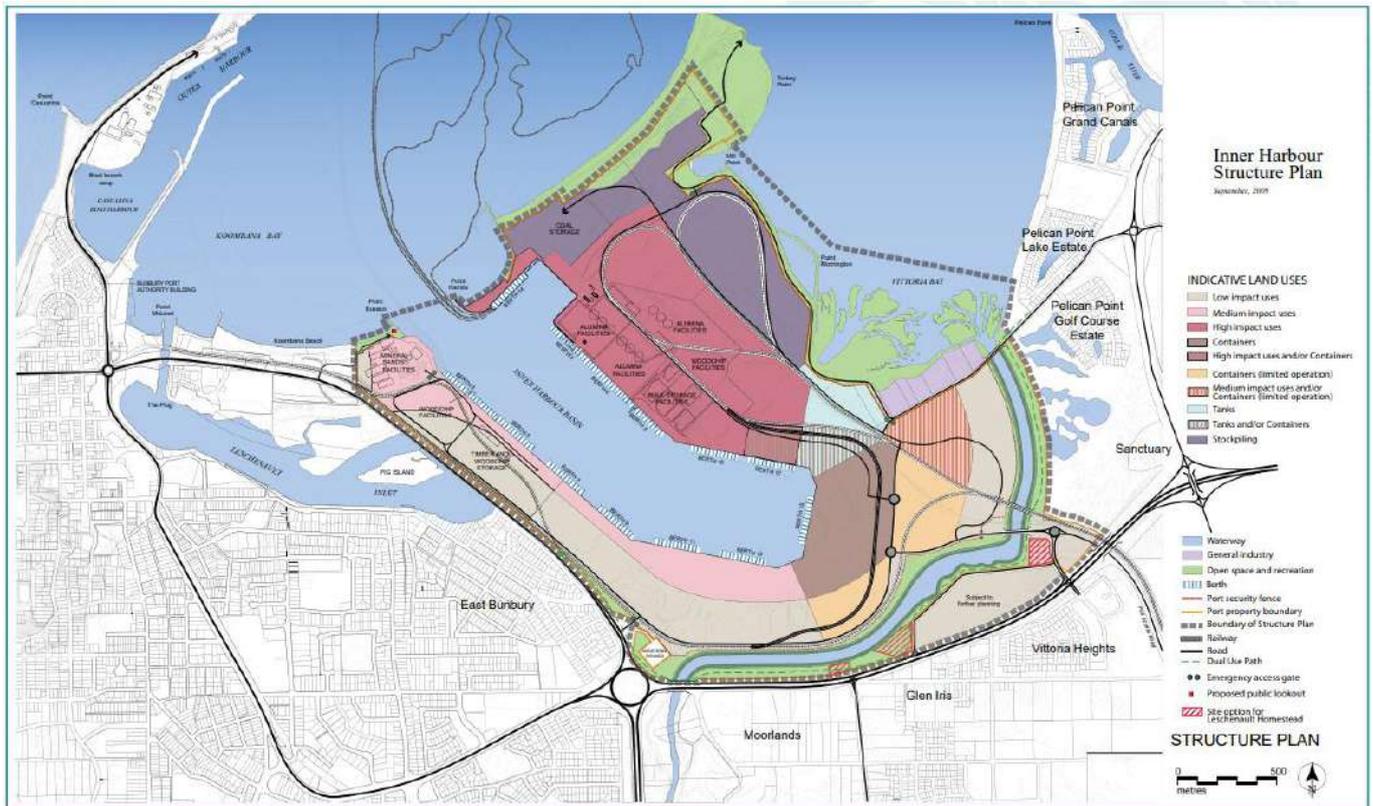


Figure 12 – Bunbury Port – Inner Harbour Structure Plan (2009) - Under Review

### 3.2.8. Port of Bunbury Master Plan (2020)

In 2020, South Ports Authority initiated “*The Port of Bunbury Master Planning Project which will take a long-term view of the Port’s planning and infrastructure requirements for the next 30 years*” (Southern Port Authority website [www.southernports.com.au/pob-mpp](http://www.southernports.com.au/pob-mpp)). Dialogue between Southern Ports Authority and various State agencies is ongoing regarding future Port development and road access, existing and future freight rail, other possible Public Transport options, potential corridors as well as maintaining Estuary Drive in some form within or around Bunbury Port. It is understood Master Planning by Southern Ports remains in progress at the time of writing this report and that future development and expansion of the port will result in significant increases in rail and road-based transport demands.

### 3.2.9. Glen Iris Structure Plan (October 2010)

An existing Glen Iris Structure Plan is in place largely covering areas already developed to the east of Vittoria Road and areas fronting Vittoria Road to the west. The Structure Plan does not address overall access to Glen Iris in consideration of the full extent of urban and commercial development. The Structure Plan is included below.

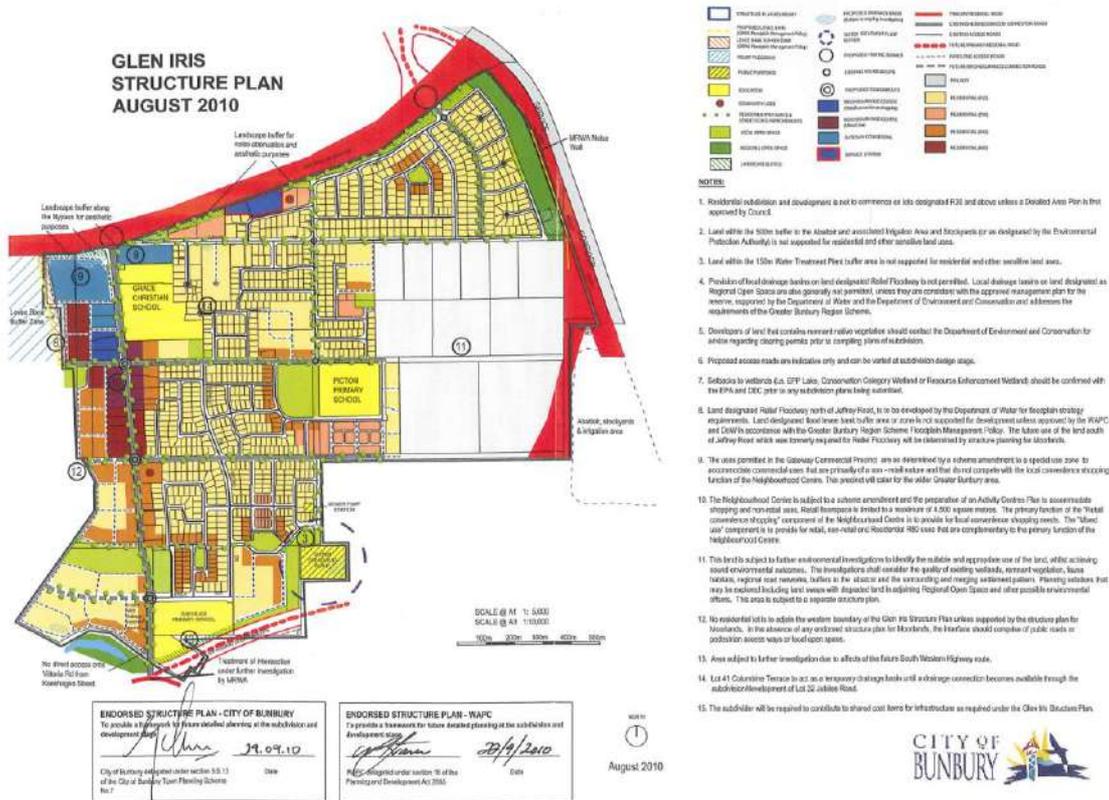


Figure 13 – Glen Iris Structure Plan (October 2010)

**3.2.10. Draft South Moorlands Local Structure Plan (October 2010)**

A draft South Moorlands Local Structure Plan was prepared several years ago focussing on a portion of the undeveloped land west of Vittoria Road, however this plan was not finalised. The draft plan doesn't address overall access to Glen Iris with the full extent of urban and commercial development in place. Relevant images are below.

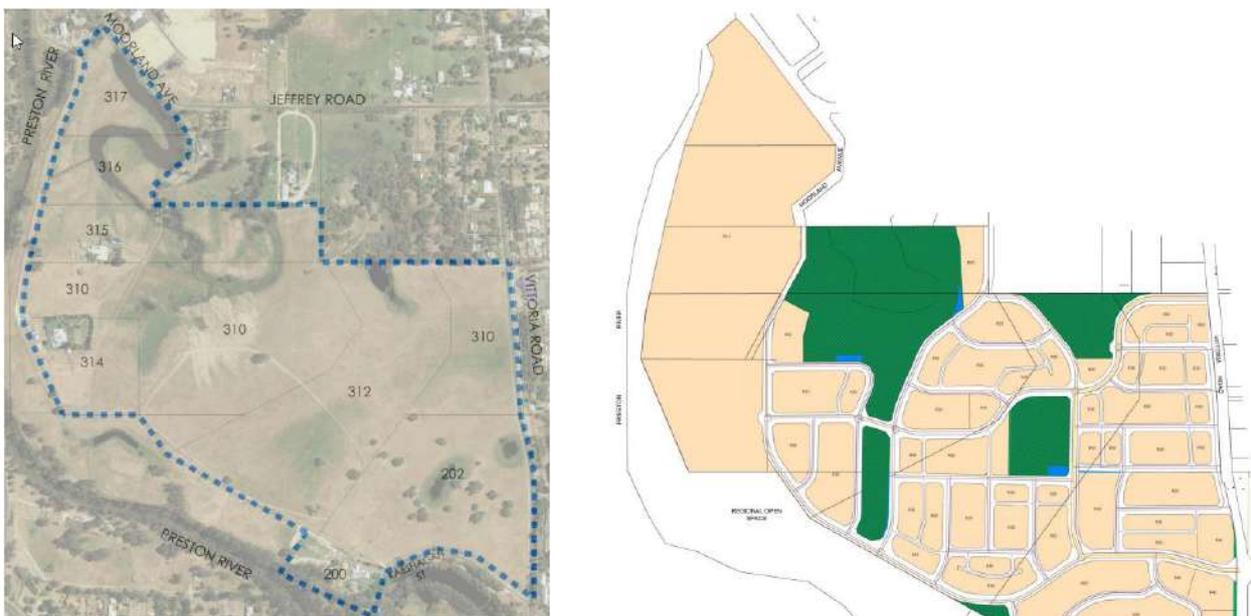


Figure 14 –Draft South Moorlands Local Structure Plan (not finalised)

### 3.2.11. Perth to Bunbury Fast Train Feasibility Study (2009)

In 2009 the Public Transport Authority (PTA) commissioned GHD to undertake a feasibility study of “fast rail” between Perth and Bunbury. This process resulted in the “*Perth to Bunbury Fast Train Feasibility Study*” report. Whilst this study is focussed at the feasibility level, it does include a planned heavy rail corridor following the Australind Bypass (now Forrest Hwy) corridor into Bunbury including passing Glen Iris on the northern side of Forrest Hwy and into Bunbury along Koombana Drive. In 2021 the Western Australian Government announced a \$3.4m commitment to further assess “faster rail” feasibility between Perth and Bunbury. It is understood these updated assessments may review past corridors identified and re-test where a potential rail station should be located. It is understood the current assessment will also consider a range of other public transport modes in addition to heavy rail with current assessments being led by the Public Transport Authority (PTA).

Should rail (or other major forms of public transport including light rail, tram, etc) be considered along Forrest Highway within Greater Bunbury, it will likely require full grade separation (bridging) of all side road connections with Forrest Hwy complicating several major intersections. The requirement to grade separate intersections may also be driven by long-term traffic and safety demands placed on the network (subject to extent of public transport take up and the rate and extent of land use intensification within Greater Bunbury).

### 3.2.12. Traffic Analysis and Concept Plans by Others

Over a period of 10-15 years several traffic assessments and concept plans have been prepared to address traffic constraints within Glen Iris and in particular Vittoria Road between Forrest Highway and Jeffrey Road. In general, these studies assumed the existing network layout would remain unchanged and largely focussed on existing road improvements and specific land parcels intended for development (the majority did not focus on Glen Iris as a whole/ultimate development). A selection of reports and assessments include the following:

- Uloth and Associates (January 2021) – Analysis and concept preparation prepared on behalf of the Bunbury Farmers Market. Sidra analysis undertaken in association with Main Roads WA to assess short and medium-term traffic performance of the Vittoria Road/Forrest Highway intersection and Bunbury Farmers Market access assuming a portion of additional development has occurred within Glen Iris. As part of this work Uloth and Associates also prepared possible concept plans for further consideration and which were included for information as part of a Development Application (DA) lodged with the City of Bunbury on behalf of the Bunbury Farmers Market in 2021. It is understood the submission has been placed on hold (as of October 2021).

The concepts included amendments to the internal layout of the BFM carpark and several other on-site changes. Whilst the Sidra traffic analysis undertaken by Uloth and Associates suggests medium-term traffic could be catered for through the existing intersection and based on a number of intersection improvements, there was a focus on the intersection and BFM main access and where there was not final agreement on the extent of analysis associated with other existing accesses along Vittoria Road (further south of BFM main access), full implications of pedestrian movements, the influence of adjacent bus stops, implications of the school 40km/h zone and impacts of overflow parking at peak periods. This applies to all Sidra models including the Main Roads work. Subsequent to this work, Main Roads has continued further assessment and analysis of the Glen Iris network and Vittoria Road/Forrest Highway intersection assuming full development of Glen Iris (ultimate land-use) where the outcomes are summarised in this report.

- Opus International Consultants (June 2013) – Report prepared on behalf of the City of Bunbury with a broad focus on parts of Glen Iris. Also focused on summarising previous traffic assessments and the Service Commercial land on the west side of Vittoria Road (opposite the Bunbury Farmers Market and Grace Christian School). Provides assessment and comment on the internal Glen Iris local road network as well as the Vittoria Rd/Forrest Highway intersection. Assumes no major changes to the Glen Iris road network with most of the traffic utilising an upgraded Vittoria Road in the long-term. Challenges associated with utilising Vittoria Road alone for access to Glen Iris with future land development are noted in the report.
- Riley Consulting (May 2012) – Considers Service Commercial development adjacent to Vittoria Road/Forrest Highway (opposite Bunbury Farmers Market and Grace Christian School) including establishment of a ‘Masters’ store. The report requires a roundabout to be constructed at Vittoria Road/South Western Highway to accommodate the additional traffic. It is noted the ‘Masters’ development was not approved and did not proceed.
- Opus International Consultants (2011) – Focuses on a transport assessment of Moorlands Riverlea Estate for approximately 118 lots. This development is largely complete or in progress and is in the north-western portion of Glen Iris.

- Worley Parsons (2010) – Traffic report prepared with a focus on the “Gateway Precinct” and traffic demands allocated to Vittoria Road. Confirmed that traffic control signals are required at Vittoria/Road/Forrest Highway (resulting in traffic signals being installed at Vittoria/Forrest intersection).
- Riley Consulting (June 2018) – Largely related to a proposed urban development south of Jeffrey Rd (central Glen Iris) that is yet to be assessed/proceed.

The Opus report (June 2013) includes a schematic concept for Vittoria Road (refer Figure 15 below).

Whilst the concept as presented was considered at the time, it is unlikely to adequately cater for the predicted 20,000vpd to utilise Vittoria Road in the long-term based on full Glen Iris development. Several other Vittoria Road concept variants have been prepared based on a 2-lane road (single lane in each direction) for this section that is not anticipated to meet road capacity, pedestrian safety, and amenity requirements of this busy and growing area.



Figure 15 – Example Schematic Concept of Vittoria Road between Jeffrey Rd and Forrest Hwy (Opus 2013)

Uloth and Associates prepared several similar road concepts for Vittoria Road in addition to the proposed internal BFM site amendments (refer Figure 16 below). These Vittoria Road/Forrest Highway options have been considered as part of the Glen Iris Transport Planning Assessment.



Figure 16 – Uloth and Associates Example Concept (prepared on behalf of Bunbury Farmers Market 2021)

### 3.3. Existing Road Network

The road network within and surround Glen Iris is a mix of State Highways, Main Roads and local road networks including the following:

#### 3.3.1. Forrest Highway

Forrest Highway is managed by Main Roads and is part of the National Land Transport Network (jointly funded by the State and Federal Governments). It is generally a 4-lane road (dual carriageway) and currently carries around 30,000 – 32,000 vpd on a typical weekday between Old Coast Road and Eelup Roundabout with the section adjacent to Glen Iris being the busiest part of the Western Australian road network outside of Perth and Peel regions. It includes around 10% heavy vehicles, or equivalent to around 3,000vpd per day, however only a small percentage of these are the large RAV 7/36.5m vehicles (100 tonne). Forrest Highway surrounding Vittoria Road intersection can become congested and blocked at times given high volumes of traffic on Forrest Highway as well as constraints surrounding Vittoria Road. Typical Forrest highway traffic volumes are indicated in the image below.

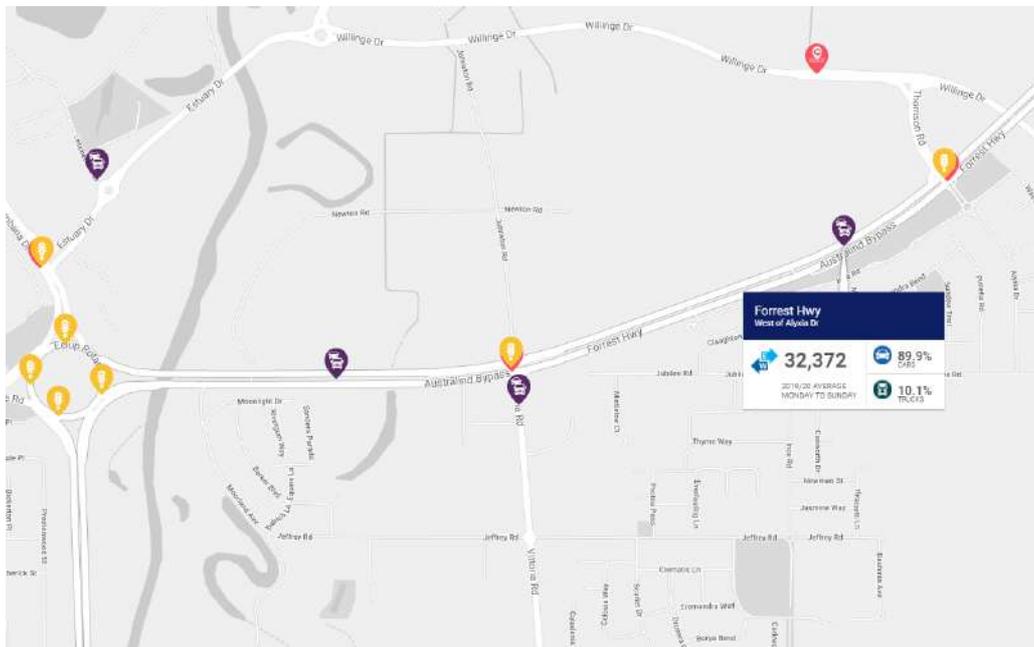


Figure 17 – Forrest Hwy Traffic Volumes (2019/20)

These traffic numbers can double at peak holiday periods. Forrest Highway (within Greater Bunbury) is largely a 4-lane dual carriageway road (2 lanes in each direction); with the route ultimately planned as a 6-lane highway (3-lanes in each direction). Given current traffic pressures, the sections of Forrest Highway surrounding Glen Iris are currently 6-lanes. Pedestrian and cycling crossing of Forrest Highway are currently limited to Alyxia Drive (traffic signal control) and Vittoria Road (partial traffic signal control – north bound lanes not controlled). Controlled crossings around Eelup Roundabout are also in place, however not directly across Forrest Highway.

Forrest Highway provides for both state, regional and local traffic movements and is a critical linkage into the Bunbury Port and between large areas of urban development and central Bunbury. The role of Forrest Highway is expected to change in the future once the Bunbury Outer Ring Road is constructed. Whilst the regional traffic component is expected to drop, substantial future urban development and regional population increases are expected to increase traffic pressure along Forrest Highway with traffic expect to double in the long term to approximately 60-70,000vpd. This will be particularly evident in the vicinity of Glen Iris given it is the busiest part of the South West road network. Should the Estuary Drive link be severed by the Bunbury Port, this would divert all traffic onto Forrest Highway and expected to overload the network. Future traffic predictions are discussed in Sections 5.2 and 5.3.

Long-term planning of Forrest Highway has provision for grade separation (bridging) of all side roads except for the Thompson Rd/Alyxia Drive and Vittoria Road intersections. Not planning for grade separation within this section will prove challenging from a traffic, safety and congestion perspective given this section of highway is the busiest part of the road network outside of Perth and Peel regions and is expected to become busier as Greater Bunbury develops. Existing development surrounding these intersections makes provision of future grade separation extremely challenging given the likely amenity and land impacts that would result within Glen Iris.

### 3.3.2. Estuary Drive

Estuary Drive is managed by the City of Bunbury and forms an important link between Eaton, Australind and central Bunbury including the CBD. It is an important alternative route into Bunbury in addition to Forrest Highway and carries between 12,000 and 15,000vpd on a typical weekday (refer to Figure 18 below). It is a 2-lane road (1-lane in each direction) with a Principal Shared Path (PSP) along the northern side of the carriageway and includes an at-grade rail crossing (Port freight line). A portion of Estuary Drive passes through land owned and operated by Southern Ports Authority. Previous planning by Southern Ports Authority indicates Estuary Drive may be severed in the future once the port is expanded (refer sections 3.2.7 and 3.2.8). Main Roads as well as other stakeholders are continuing to liaise with Southern Ports Authority to ensure the Estuary Drive linkage remains in some form to ensure traffic is not diverted onto Forrest Highway potentially overloading the network between Old Coast Road and Eelup Roundabout. Consideration of a fast rail linkage into Bunbury adjacent to Forrest Highway may compromise the connection of Estuary Drive with Koombana Drive (rail planning is currently under review – refer section 3.2.11).

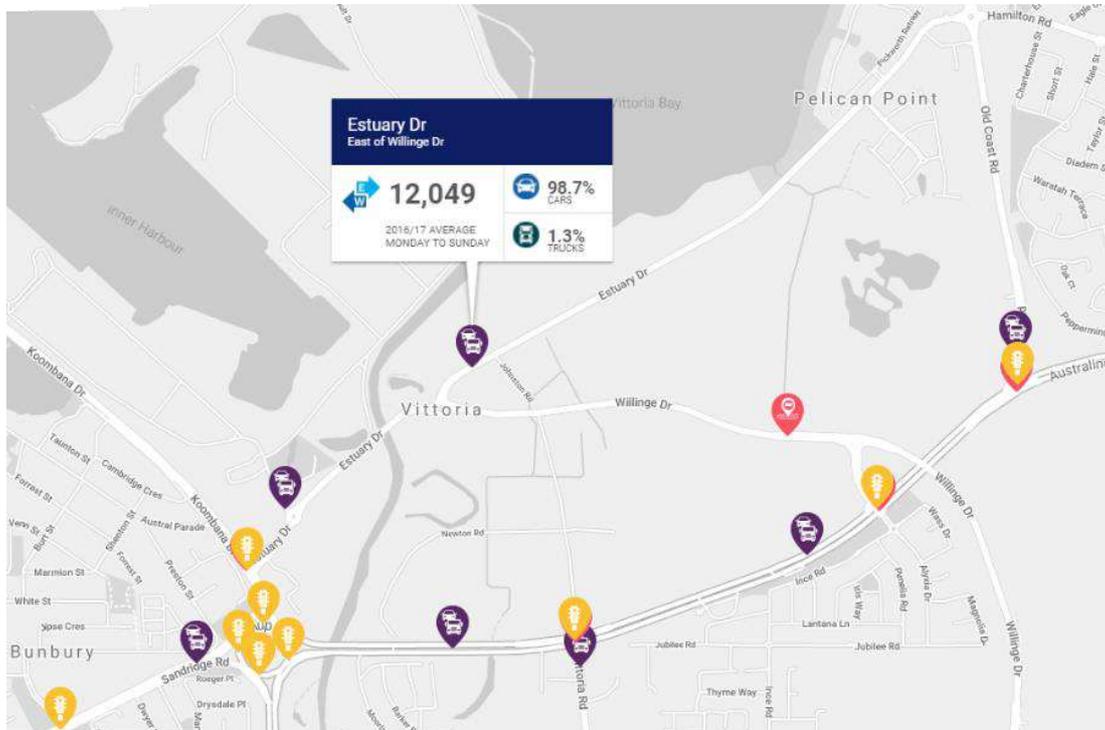


Figure 18 – Estuary Drive Traffic Volumes (2016/17)

### 3.3.3. Robertson Drive

Robertson Drive is managed by Main Roads and is part of the State road network and part of the RAV 7 heavy vehicle network (up to 36.5m and over 100 tonne vehicles). It is an important north-south link between Eelup Roundabout and Bussell Highway/South Western Highway and carries around 18,000vpd on a typical weekday (refer to Figure 19 below). It is a 4-lane road (2-lanes in each direction) and runs parallel to the Preston River located to the west of Glen Iris. With around 9% trucks this equates to around 1,600 trucks per day (although only a small portion of these are the large RAV 7 36.5m vehicles). Traffic numbers can be significantly higher at peak holiday periods; however, peak traffic is anticipated to flatten once BORR is open.

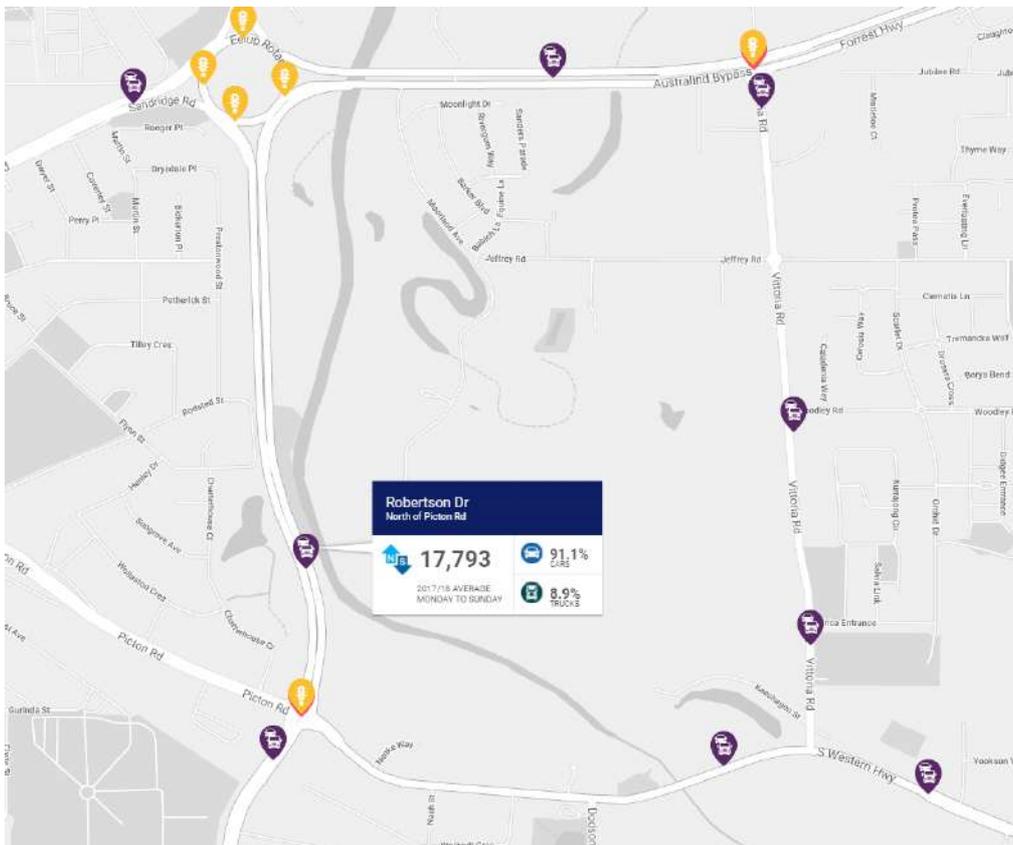


Figure 19 – Robertson Drive Traffic Volumes (2017/18)

### 3.3.4. South Western Highway

South Western Highway is managed by Main Roads and is part of the State road network and part of the RAV 4 heavy vehicle network (up to 27.5m and up to 87.5 tonne vehicle). It forms a critical east-west link between existing and future urban as well as industrial areas including Glen Iris, Picton and in the long-term the Waterloo industrial area and Wanju urban expansion area (further to the east). South Western Highway varies between 2-lanes and 4-lanes, however, is generally a 2-lane road past Glen Iris.

The role of South Western Highway is expected to become more important in the future as the adjacent industrial/urban land use develops to the east. Whilst there may be a small drop in regional traffic post BORR, substantial future urban and industrial development and regional population increases are expected to increase traffic pressure along South Western Highway with traffic expected to more than double in the long-term from around 10,000 to 14,000vpd currently to more than 35,000vpd past Glen Iris. The link currently carries a high proportion of heavy vehicles with around 15% or 2,000 truck movement per day. Heavy vehicle use of South Western Highway is expected to continue given adjacent industrial land uses. Typical South Western Highway traffic volumes are indicated in Figure 20 below.

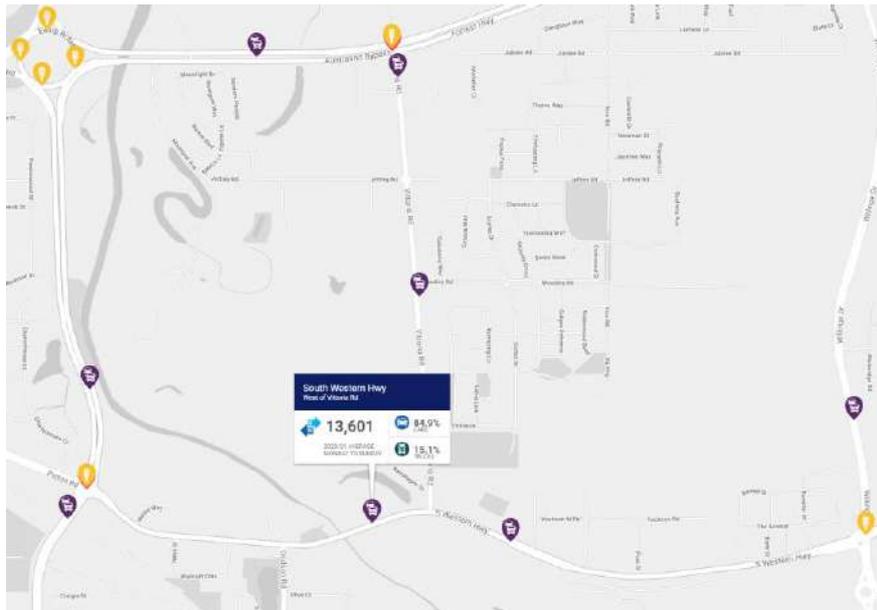


Figure 20 – South Western Highway Traffic Volumes (2020/21)

Long-term planning of South Western Highway includes provision for a busy 4-lane road (2-lanes in each direction) and a roundabout intersection at the Vittoria Road/South Western Highway intersection (proposed for construction in 2022-23). Given several factors including highway corridor width constraints adjacent to the PTA rail corridor, a realignment of the South Western Highway is provided for in the GBRs east of Vittoria Road and as indicated in the image below. This realignment is referred to as the “Picton Deviation”.



Figure 21 – GBRs Provision for a South Western Highway and Willinge Dr Realignment

**3.3.5. Port Access Road (Willinge Drive)**

The Port Access Road or Willinge Drive is managed by Main Roads and is part of the State road network. It forms a critical north-south link into the Bunbury Port from South Western Highway and the Bunbury Outer Ring Road as well as industrial areas including Glen Iris (east) and Picton. Willinge Drive is largely a 2-lane road (1-lane in each direction) except for several major intersections including South Western Highway and Bunbury Outer Ring Road where additional lanes are provided. Long-term planning for Willinge Drive allows for a 4-lane road once traffic demands warrant this.

The role of Willinge Drive is expected to become more important in the future once BORR is fully constructed which will reinforce its role as the major freight connection into the Bunbury Port facility for industrial traffic. It will also service significant extents of existing and proposed industrial development. This includes the existing timber hub located on Moore Road which at times can result in major truck movements delivering product to the Port when boats are being loaded. Typically, the timber hub can generate around 300 large truck movements per day (36.5m/100T vehicles) with much higher daily movements during peak times.

Whilst overall traffic volumes on Willinge Drive are currently relatively low (3,500vpd on Willinge Drive), the link is of strategic importance with significant heavy vehicle volumes. Currently the link carries around 36% of trucks which equates to more than 1,150 movements on an average weekday (or an average of 1 large truck every 30 seconds over a 10-hour day). Of this, a large proportion are RAV 7 vehicles (double road trains up to 36.5m/100T). The image below details existing traffic and truck percentage volumes.

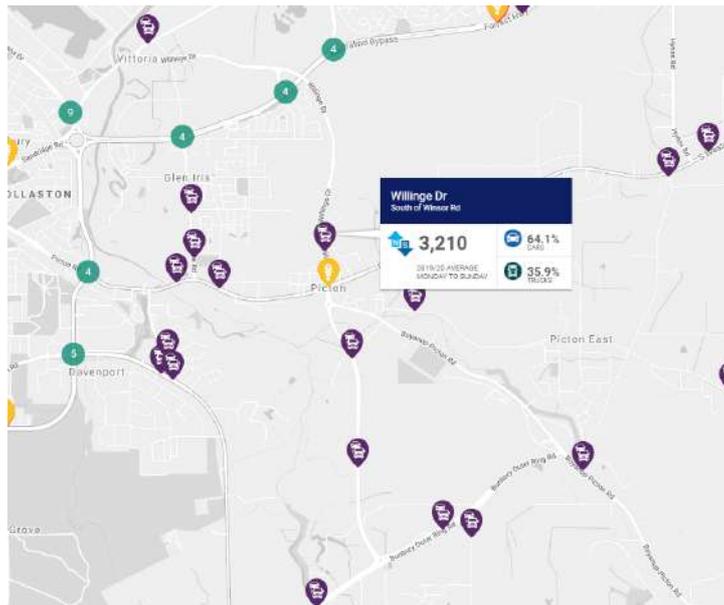


Figure 22 – Traffic Volumes on Willinge Dr (including 35% trucks)

Given the volume and size of these vehicles, efficiency and safety of this link is of critical importance to ensure the Bunbury Port and industries that rely on it remains competitive and to ensure road safety remains of utmost importance. It is expected truck volumes on Willinge Dr will increase once BORR is fully constructed and as Greater Bunbury develops. Given the industrial uses and heavy vehicle demands that may result, future traffic volume predictions vary between 7,000 and over 10,000, however are likely to at least double over the long-term (also likely to double truck volumes). Given the strategic nature, size and volume of heavy vehicles, local traffic connections and mixing light vehicle movements along Willinge Dr is strongly discouraged.

Ultimately Willinge Drive is proposed to terminate within the Bunbury Port. Possible future connections to Koombana Drive require further interaction with Southern Ports and is subject to their Master Planning and “Faster Rail” planning that is currently in progress through PTA.

### 3.3.6. Vittoria Road

Vittoria Road is a 2-lane undivided road (single lane in each direction) and is managed by the City of Bunbury. It is centrally located within Glen Iris, forming the main access corridor for the area. It intersects with Forrest Highway to the north (currently approx. 32,000 vpd typical weekday) and South Western Highway to the south (currently approx. 13,000vpd typical weekday) where Vittoria Rd currently carries around 7,500vpd on a typical weekday south of the Bunbury Farmers Market driveway and around 10,000-11,000vpd north of the BFM driveway. Figure 23 below details existing traffic on this link. Section 5.5.1.4 discusses future Vittoria Road traffic.

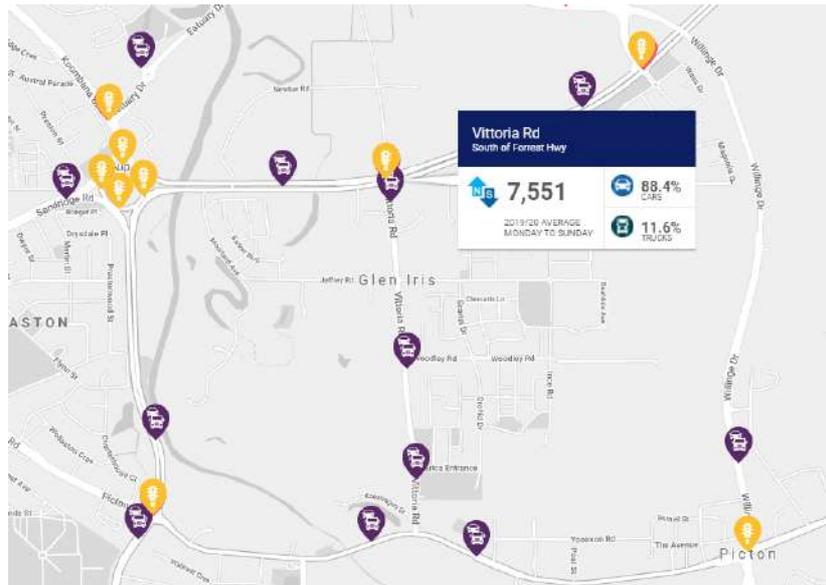


Figure 23 – Vittoria Road Traffic Volumes (South of BFM access)

The surrounding road network attracts significant peak traffic during holidays and long-weekends. Both highway intersections are under pressure from existing development within Glen Iris as well as passing traffic with Forrest Hwy/Vittoria Rd particularly vulnerable to congestion at peak times.

Existing businesses, several schools, existing residential areas, community facilities as well as other land uses gain access directly from Vittoria Rd. Its reservation width is generally 20-25m wide and contains multiple services making improvements such as widening works challenging and expensive.

Vittoria Rd caters for a mix of direct property/business access, provision of broader Glen Iris access and a component of through traffic movement which often results in this link becoming congested, particularly surrounding Grace Christian School and the Bunbury Farmers Market at peak times. The BFM access in particular is in close proximity to Forrest Highway and as a result this access can interact regularly with the function of the Vittoria Road/Forrest Hwy intersection. Congestion created within Glen Iris can spill out onto Forrest Hwy impacting the operation of the State road network.

The connection with South Western Highway is planned for upgrade in 2022-23 with a roundabout proposed at this site. A broad layout of this intersection is included in the image below.



Figure 24 – Proposed Vittoria Road/South Western Highway Roundabout

### 3.3.7. Vittoria Road and Forrest Highway Intersection

The Vittoria Road/Forrest Highway intersection is of particular interest given its existing layout, adjacent Bunbury Farmers Market driveway access and given the location of existing bus stops, school speed zone, surrounding services and other constraints surrounding the intersection. Figure 25 provides details of the existing intersection layout, traffic lanes, access points and school bus bay/school location. Land on the western side of Vittoria Road (described in Section 3.6) is zoned Service Commercial (the same zoning as the Bunbury Farmers Market). As a result, once full development occurs within Glen Iris, traffic volumes through this intersection are expected to increase substantially. This is further discussed in Section 5.1, Section 5.2 and 5.5.1.4.



Figure 25 – Vittoria Rd and Forrest Hwy Intersection

Given existing congestion and complexities associated with this area, between 28 November and 2 December 2019 (just prior to the COVID-19 pandemic), Main Roads arranged for a video survey of the intersection, with a focus on Vittoria Road/the adjacent access and interactions with Forrest Highway to enable further detailed analysis and modelling of the Vittoria Road/Forrest Highway intersection. This video survey broadly identified the

following regarding traffic volumes and traffic mix:

- Whilst Forrest Highway averages around 32,000vpd and 10% heavy vehicles, a relatively small percentage of heavy vehicles are RAV 4 and RAV 7 (around 150 per day between 27.5m to 36.5m and 87.5 to 107.5 tonne).
- Observed traffic volumes on Forrest Highway ranged between 32,000vpd and 46,700vpd during the video survey period.
- In the order of 5,000 vehicle movements per day enter/exit the adjacent driveway (total in and out);
- In the order of up to 300 vehicle movements per day enter/exit a driveway access on the west of Vittoria Road (total in and out utilising an unsealed carpark) near the Forrest Highway. Significantly greater traffic numbers have been observed at holiday peak times utilising the carpark to the west of Vittoria Road which appears to operate at peak times as a combination of staff parking and an overflow parking.
- A significant number of pedestrian movements were observed along or across Vittoria Rd in the vicinity of the Bunbury Farmers Market. Between 300 and 480 pedestrians crossed Vittoria Rd per day (a portion is likely to be BFM employees) and between 75 and 250 pedestrians crossed the BFM main driveway per day (heavily dependent on day of the week with weekend numbers representing peak movements). Peak pedestrian movements crossing the BFM main driveway have been observed parking externally to the BFM main carpark.

Traffic congestion at the Vittoria Road and Forrest Hwy intersection has been observed, largely during peak holiday/weekend periods and can include vehicles stacking back out of Vittoria Road and onto Forrest Highway influencing the operation and potentially safety of the intersection. Observations of this stacking generally involves slow or stopped vehicle movements. As a result, while this stacking is highly problematic and can result in risks it often occurs with stationary or slow-moving vehicles generally limiting the consequences of an incident. However, with the presence of, at times, large numbers of pedestrians walking between stationary or slow moving vehicles along Vittoria Road, this presents a significant safety risk around the existing intersection. As a result, ongoing dialogue between City of Bunbury, Main Roads and Bunbury Farmers Market continues to identify options to better manage these risks resulting from stacking and pedestrian movements.

Stacking back onto Forrest Highway has been observed through several triggers including:

- Internal traffic within Bunbury Farmers Market becoming congested and stacking back onto Vittoria Road and subsequently Forrest Highway.
- Traffic on Vittoria Road on occasion giving way to exiting and/or BFM entering vehicles leading to vehicles exiting Forrest Highway being delayed and on occasion stacking onto the Highway.
- Peak school traffic creating congestion with surrounding traffic, albeit over short periods.

With the opening of BORR around 2024, traffic volumes should reduce at peak holiday times on Forrest Highway past Glen Iris. However, it is anticipated once major development occurs within Glen Iris and Greater Bunbury, Forrest Highway traffic volumes are expected to increase higher than current figures. Stacking and safety issues discussed above are expected to compound if the Vittoria Road and Forrest Hwy issues are not adequately addressed.

### **3.3.8. Alyxia Drive and Forrest Highway Intersection**

The Alyxia Drive/Forrest Hwy intersection is a 4-way signalised intersection with Thompson Road forming the northern leg (providing access to Bunbury Port from Forrest Highway). Alyxia Drive itself is a local road that largely services a relatively small area of Glen Iris that is mostly developed (the north-eastern corner of Glen Iris). Alyxia Drive carries around 2,000vpd. It is expected as Glen Iris develops (including a potential urban development on land owned by WA Development abutting Jubilee Road) additional traffic will utilise Alyxia Drive to access Glen Iris, however long-term traffic volumes are not expected to be large.

Whilst there is connectivity from Alyxia Drive to Vittoria Road (via Jubilee Road and Ince Road), it's a relatively convoluted route and as a result this access provides relatively poor serviceability to the majority of Glen Iris. Figure 26 below details Alyxia Drive access and surrounding areas.

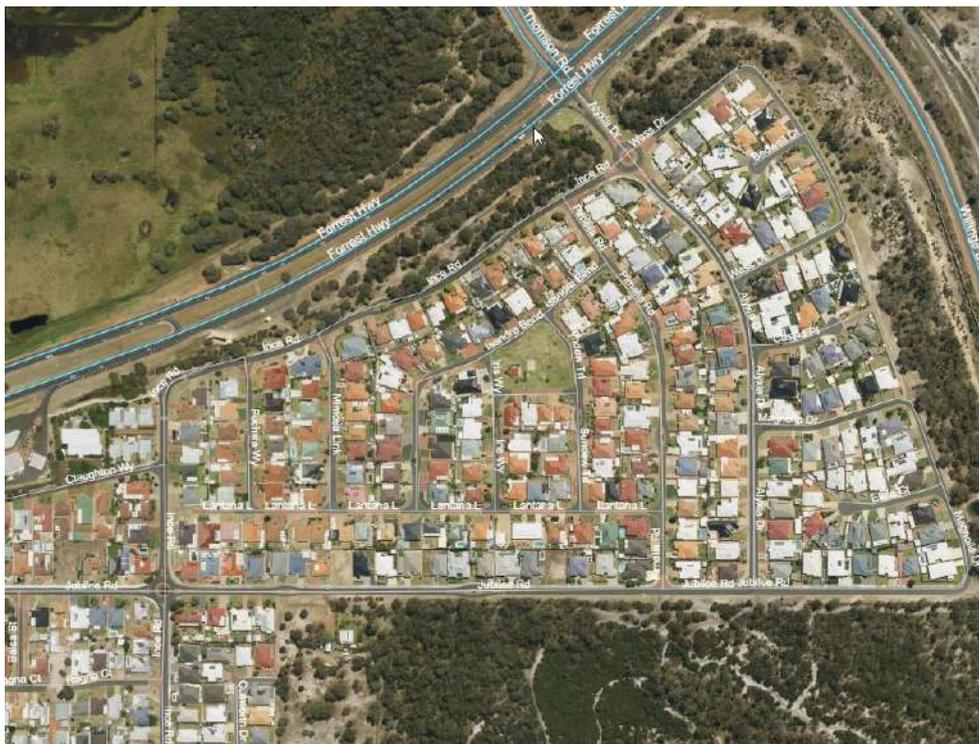


Figure 26 – Alyxia Drive Area (Forrest Highway and Thompson Road Intersection)



Figure 27 – Alyxia Drive Access - Local Planning Scheme No. 8

### 3.4. Restricted Access Vehicle (RAV) Network

The road network within and surround Glen Iris is a mix of State Highways, Main Roads, and local road networks. Figure 28 shows the existing Restricted Access Vehicle (RAV) network surrounding Glen Iris where Forrest Highway, Willinge Drive, and the northern section of Robertson Drive are part of the RAV 7 network, which allows for vehicles up to 36.5m in length and 107.5T. This network is shown below in pink.

South Western Highway and the northern access to Vittoria Rd form part of the RAV 4 network as well as Old Coast Road, Estuary Drive and Koombana Drive, allowing vehicles up to a 27.5m and 87.5T (B-Double). This network is shown below in blue.

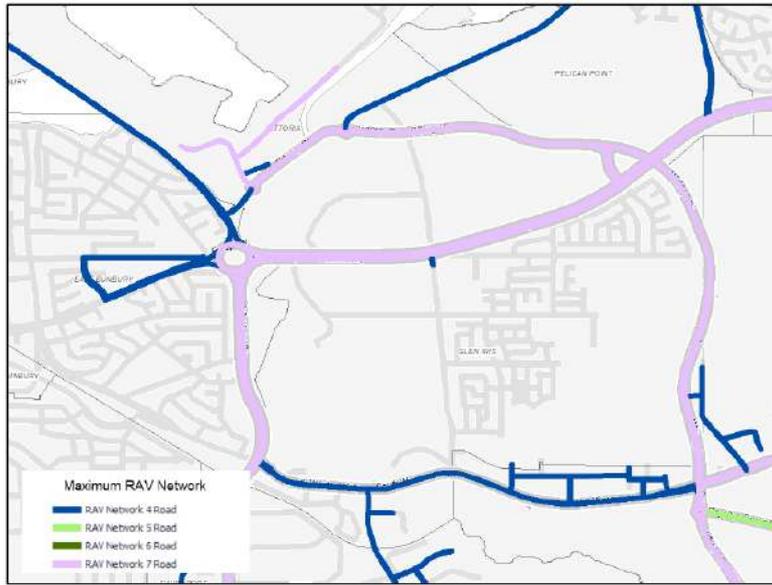


Figure 28 – Existing Restricted Access Vehicle (RAV) Network

Following the opening of the Bunbury Outer Ring Road (BORR), RAV access within Bunbury is not anticipated to alter largely given several existing businesses that require large vehicle access into the future. However, the majority of the RAV 7 and RAV 4 regional vehicle movements should be accommodated on the BORR and Willinge Drive, resulting in volumes of these large vehicles within Bunbury reducing.

### 3.5. Crash Analysis

Main Roads WA Assessment – January 2020. As part of the Transport Planning Assessment Main Roads have reviewed crash history data at several intersections and roads surrounding Glen Iris. Full details of Crash Analysis are available in Appendix 1. Key findings include:

- **Midblock Crashes**

Crashes of all severities (2014 – 2018) are over-represented on Forrest Highway around Glen Iris when compared to the South West Region average. Willinge Drive and Thomson Road are the only two State roads below the region average crash rate. The disparity between the roads analysed and the region average could be due to the range of road types in the region, which would include many low volume roads. When compared to the state-wide average Forrest Highway and Koombana Drive (adjacent to Eelup Rotary) are above the crash average.

There are relatively few Killed or Serious Injury (KSI) crashes on the roads assessed. South Western Highway and Forrest Highway each have one section higher than both the region and state KSI averages. The section of South Western Highway is Vittoria Road to Robertson Drive which runs past Glen Iris.

Around 80% of midblock crashes in the Glen Iris area are attributed to Same Direction movements, with 74.5% of these being Rear End collisions. 60% of KSI midblock crashes also same direction crashes although as noted above there are relatively low numbers of KSI crashes in comparison to other parts of the network. Side Swipes and Lane Changing are the next most common crash types. The sole fatality in the sample was the result of a head on collision (on South Western Hwy).

- **Intersection Crashes**

Intersection related crashes (2014 – 2018) make up 64% (244) of crashes within the study area. The worst intersection in terms of crash frequency is Eelup Rotary in which 85 collisions have occurred between mid-2014 to 2018. It should be noted the intersection carries a significant volume of traffic and where the crash rate has reduced following signalisation of this intersection in 2012.

Three intersections have been the site of a Killed or Seriously Injured (KSI) collision, being 1) Vittoria Road/Forrest Hwy, 2) Vittoria Road/South Western Hwy, and 3) Old Coast Road/Forrest Hwy. A summary of crash information is below where KSI sites have a red border.

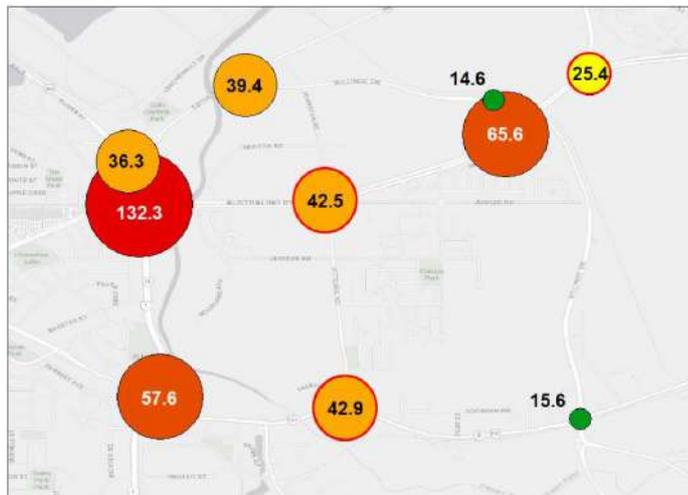


Figure 29 – Intersection Crash Rate (red border signifies a KSI has occurred)

It is noted that both intersections of Vittoria Road with Forest Highway and South Western Highway have KSI crash history within the last 5 years. Eelup Rotary has a significantly higher crash rate than the remaining intersections, being more than double that of the second highest intersection, Thomson Road/Forrest Highway. It should be noted the crash rate was significantly higher prior to signalisation of this intersection.

Similar to midblock crashes, collisions involving both vehicles from the same direction comprises 80% of all intersection crashes (196). 8% of the remaining collisions involved intersection vehicles from adjacent approaches. The individual road user movement of a rear end was the most common crash, representing 43% of all intersection crashes.

In addition to above, AD Bird Engineering was engaged (December 2020) to undertake an assessment of crash details surrounding the Forrest Highway and Vittoria Road intersection. Key findings of crash assessments include:

- Detailed crash data for the period 1 Jan 2015 to 31 Dec 2019 was used for the crash analysis. A collision diagram and ‘RUM’ (Road User Movement) code legend is provided at Appendix 2, which shows figuratively the location of reported crashes for which the vehicle movements can be determined. The collision diagram has been colour coded to indicate Killed or Seriously Injured crashes (Fatal or Hospitalisation severity) in red, while all other reported crashes are shown white on black. Crashes involving trucks (and buses) have a purple frequency star, motorcycle crashes have a blue frequency star, bicycle crashes have a green frequency star, while other crashes have a black frequency star with yellow surround. Where possible, the individual vehicle movement is indicated in the RUM code icon for these crashes.

- **Killed or Seriously Injured (KSI) Crash Summary**

There have been three hospitalisation crashes in the study area between 2015 and 2019 inclusive;

- A RUM 31 (Rear-end) crash between two light vehicles on Forrest Highway southbound, between the driveways of the Shell service station / information bay on Forrest Highway. This crash occurred in dry conditions during daylight hours.
- A RUM 77 (loss of control – right turn) crash involving a car turning right onto Forrest Highway from Vittoria Road. This crash occurred at night (early morning) in dry conditions. The vehicle collided with a traffic island.

- A RUM 34 (Same direction – U-turn) crash between a motorcycle and a car doing a U-turn. Both vehicles were originally proceeding south on Vittoria Road, at the driveway to the Bunbury Farmers Market. This crash occurred at dawn in dry conditions.

● **All Crashes Summary**

In addition to the KSI crashes listed above, there have been several non-KSI crashes within the study area between 2015 and 2019, with predominant crash types including;

Forrest Highway, between Vittoria Road and Alyxia Ave.

- Persistent RUM 31 (rear end) crashes occurring in the southbound lanes of Forrest Highway. These crashes predominantly occur during daylight hours on Fridays or between 11am and 1pm on Saturdays.
- Single RUM 47 driveway crashes (potentially right-angle crashes) at each of the driveways at the Shell service station.

Forrest Highway / Thomson Road / Alyxia Ave intersection

- RUM 31 (rear-end) crashes in the northbound and southbound lanes of Forrest Highway.
- Low numbers of right angle and side swipe crashes.

Forrest Highway / Vittoria Road intersection

- At least 15 RUM 31 (rear-end) crashes on the southbound lanes of Forrest Highway approaching the intersection. These crashes occur predominantly during daylight hours and in dry conditions.
- Several side swipe (RUM 35, 36 and 37) crashes in the southbound lanes of Forrest Highway.
- Low numbers of rear-end (RUM 31, 32 and 33) crashes for various movements at the intersection.

Vittoria Road / Jeffrey Road intersection

- Two run-off road hit pole (RUM 74 and 76) crashes, both of which occurred at night. At least one of these crashes occurred in wet weather and one occurred prior to the conversion of the intersection from a 4-way intersection under Stop control to a roundabout.
- Two right-angle (RUM 11 and 15) crashes, one of which (RUM 15) occurred prior to conversion of the intersection to a roundabout.

The image below provides a summary of crash history at Vittoria Road and Forrest Highway intersection.

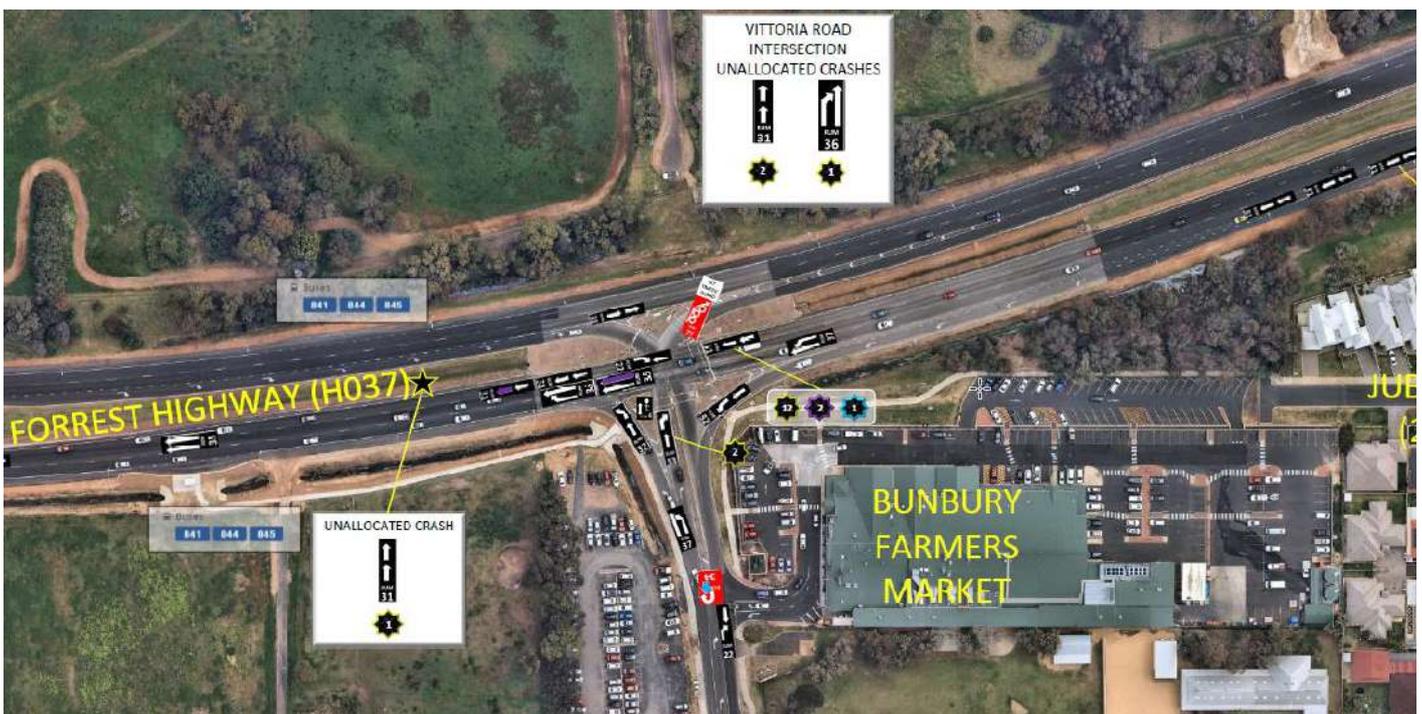


Figure 30 – Vittoria Road and Forrest Highway Crash History Summary (Red resresents Killed or Seriously Injured Crashes)

### 3.6. Existing and Future Land Use

Figure 1 of the “Bunbury Geographe Sub-Regional Strategy” (January 2022) states the need to:

*“Provide for the growth of the sub-region’s population to 200,000...” as well as a vision to “Recognise the broader aspiration for a population of 300,000 in the sub-region”.*

Whilst a significant portion of regional traffic will be carried by the proposed Bunbury Outer Ring Road (construction proposed 2021 - 2024), long-term population growth to 200,000 is largely focused through infill of existing residential areas and with major expansion of the footprint in the north-east portion of Greater Bunbury. This includes long-term development of areas including “Wanju” (1,200 ha urban development up to 45,000 residents in up to 18,500 dwellings) and “Waterloo” (1,350 ha industrial district). Long-term growth and development of the Bunbury Port located north of Forrest Highway and adjacent to Glen Iris is also expected to increase traffic demands in the area (refer section 3.2.8 of this report). Development extents for a population of 300,000 have not been identified (given this figure is an aspirational goal) where strategic traffic modelling (the Bunbury Traffic Model) is based on defined land use for a 200,000 population (refer Section 5.2).

A significant proportion of land within Greater Bunbury proposed for future population growth is located adjacent to either Forrest Highway or South Western Highway. As a result, significant additional traffic demands are anticipated on these links with a doubling and, in some cases, tripling of current volumes. These highways are the main corridors linking the existing northern and eastern portions of Greater Bunbury to activity centres including Treendale, Eaton Fair, as well as central Bunbury and the Central Business District (CBD) where both interact with the major access to Glen Iris (Vittoria Road). The image below highlights the future traffic desire lines based long-term land use growth and traffic pressures (200,000 population).

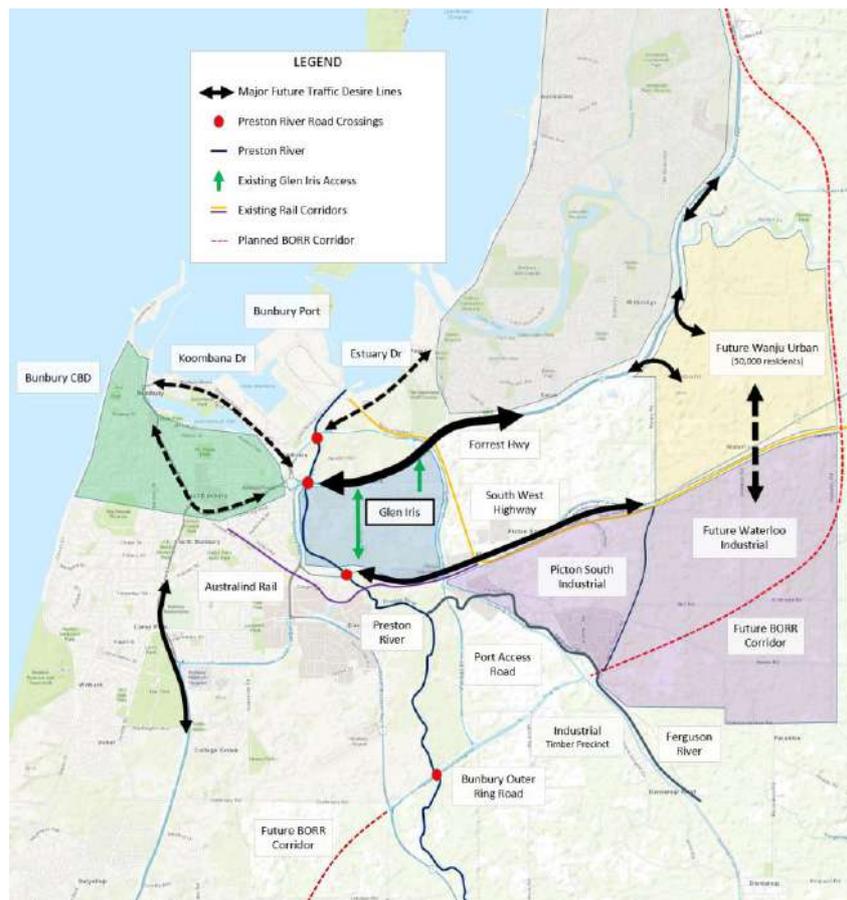


Figure 31 – Future Land Use Hotspots and Resulting Traffic Pressures

Southern Ports Authority have released a number of plans and strategies over preceding years to inform long-term development of the Bunbury Port with the general arrangements of the Bunbury Port Inner Harbour Structure Plan (September 2009) included in section 3.2.8 of this report. While no formal documentation has been released, it is understood Southern Ports are considering a number of alternative port expansion options with a Master Planning process in progress as of 2020.

Bunbury Port is located on land exceeding 350 ha where significant extents are currently used for low/very low intensity rural uses. Future development and expansion of the port (and surrounding undeveloped land) is anticipated to transition current land use towards port related/industrial activities increasing road and rail based transport within and surrounding the port facility. This includes increases in traffic demands on Forrest Highway, Willinge Drive and the surrounding road networks. These key highway links about the Glen Iris area.



Figure 32 – Southern Ports Authority Land Abutting Forrest Hwy

Existing access to Glen Iris is limited to two key links, where the primary connection is via Vittoria Road and Alyxia Dr. The majority of traffic is drawn to and concentrated along Vittoria Rd given there are no other significant external connections. As a result, access to Glen Iris is significantly limited and heavily dependent on Vittoria Rd and its intersections to the north and south where traffic movements are highly concentrated.

The intersection with Forrest Highway is surrounded by the Bunbury Farmers Market (Service Commercial zoning) and Grace Christian School that generate significant traffic demands adjacent to the intersection. Traffic accessing these sites can become congested and spill out onto Forrest Hwy impacting the operation of the State road network. Land to the west of Vittoria Road is zoned Service Commercial and anticipated to drive significant additional traffic demands in the short to medium-term. Combining these demands with Vittoria Roads' need to perform the major access to the broader Glen Iris area as well as accommodate increasing pedestrian movements around Vittoria Road is expected to compound existing congestion and safety challenges.



Figure 33 – Forrest Highway to Jeffrey Road – Existing Zoning

The image below identifies existing and future land uses surrounding Vittoria Road between Forrest Highway and Jeffrey Road in more detail.



Figure 34 – Existing Zoned Land Abutting Vittoria Road

A floodway relief area is located within Glen Iris crossing Forrest Hwy halfway between the Preston River and Vittoria Rd intersection resulting in flooding and drainage requiring careful consideration and creating constraints to development and access with Forrest Highway. Figure 35 below highlights the approximate extent of this floodway system within Glen Iris.

Existing rural land uses largely focussed to the west of Vittoria Road is expected to transition from a low to a higher intensity land use. The Glen Iris District Structure Plan process is contemplating a transition from undeveloped rural land to future residential of varying density anticipated to significantly increase traffic demands within Glen Iris. An approximation of the future residential (Proposed Urban) footprint is identified in the image below.

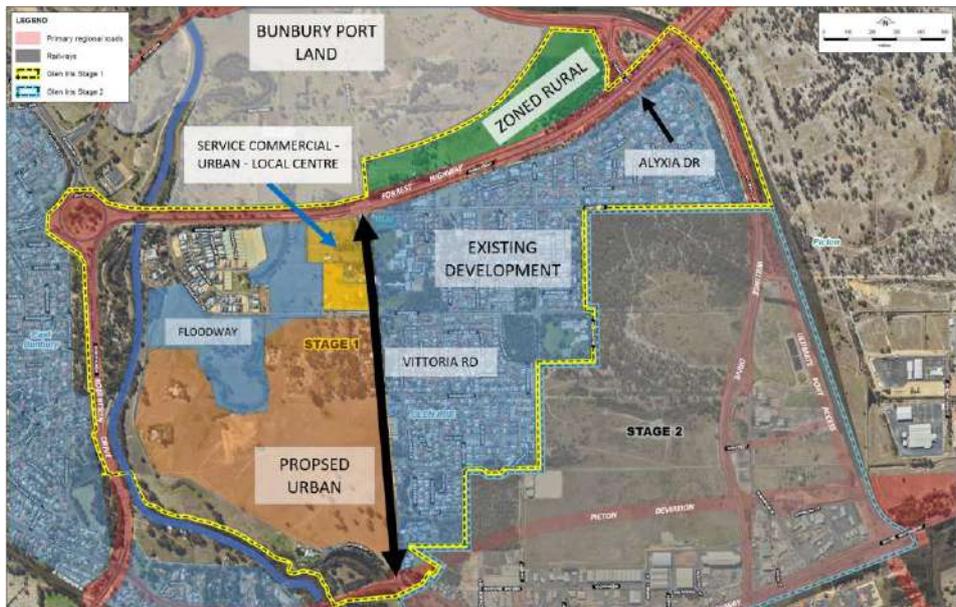


Figure 35 – Proposed Future Land Use

Dwelling numbers within Glen Iris are expected to increase by up to 2,000 dwellings (City of Bunbury, Local Housing Strategy, 2021), although this includes a portion of proposed development within Stage 2 of the Glen Iris District Structure Plan area (refer Section 3.3.8). Most dwelling increases are proposed west of Vittoria Road and could be in the order of 1,500 dwellings. The current District Structure Plan process provides for several housing densities including low, medium, and high-density expected to drive addition transport pressures. Dwelling numbers will be further reviewed as part of the DSP process and may exceed those detailed in this report.

### 3.7. Planned Transport Network

A number of major changes to the road network have been identified over many years in and around Greater Bunbury given increases in traffic, safety considerations, urban and industrial development, manufacturing and future port expansion, agriculture and mining pressures and general increases in heavy vehicle movements. A summary of planned changes to the road network of significance includes the following:

- Grade separation (bridging) of the Willinge Drive at the rail/South Western Highway intersection (including realignment through Picton) and included in the Greater Bunbury Region Scheme (refer Figure 36 below). Grade separation is a long-term planning proposal where delivery funds are not identified.
- Grade separation (bridging) of the South Western Highway with the rail to the Bunbury Port (including realignment of South Western Highway through Picton referred to as the “Picton Deviation”) and included in the Greater Bunbury Region Scheme (refer Figure 36 below). Grade separation is a long-term planning proposal where delivery funds are not identified.



Figure 36 – South Western Highway and Willinge Drive – Future Realignment (GBRS)

- The Bunbury Outer Ring Road (BORR) involves a 27km section of highway linking Forrest Highway with Bussell Highway and avoiding the built-up areas of Greater Bunbury. BORR is intended to cater for regional traffic as well as reduce heavy vehicle movements from Bunbury’s internal road network. At the time of preparing this report BORR is under construction with completion expected during 2024.
- Forrest and Bussell Highway Access Strategy. The existing Forrest and Bussell Highways perform a range of functions including accommodating high speed regional tourist, freight, and commuter traffic, providing direct property access, access for slow moving agricultural vehicles (including tractors between farms) and providing for local traffic movements within high-speed rural areas. This combination of high speed, turning and crossing local traffic is expected to compound safety and access challenges as traffic volumes increase in the future. Accommodating high and low speed functions for a range of small, medium, large, and agricultural vehicles is a challenging combination to manage.

A strategy is in development to achieve a long-term vision of grade separation (bridging) on the Forrest and Bussell Highways over a 140km length between Pinjarra Road and Sues Road (BORR makes up a central section of this network). The intention is to maintain a safe, high speed and efficient regional highway while maintaining community connectivity, providing for property access and permeability across the network. The strategy is intended to enable a transition to well-spaced strategic interchange connections (bridges), consolidated minor intersections/side roads and providing local road networks for local traffic movements (including direct property access from local roads where possible). Failure to achieve this long-term outcome will result in increasing delays and safety challenges for side road traffic, in particular trucks. Modelling suggests within 10-15 years general traffic volumes on Forrest and Bussell Highways may be similar to Friday and Sunday peaks making access to the highway increasingly difficult throughout the week. Grade separation of Forrest and Bussell Highways is a long-term planning proposal where delivery funds are not identified.

### **3.8. Public and Active Transport Modes**

The intention of the District Structure Plan is to promote public and active transport modes as far as possible. This includes public transport.

#### **3.8.1. Public Transport**

Limited public transport services currently operate in the Greater Bunbury area, reflecting a city, and more broadly a region, with significant car dependency (not uncommon in regional areas of Australia). While the existing bus services provide coverage to most of the urban dwelling areas of Bunbury (including Glen Iris), the frequency of services is typically 30 minutes, reflecting the relatively low density of urban land use which restricts the implementation of extensive public transport services. In general, an increase in density of existing urban development is likely to result in congestion pressures on the road networks as well as promote demand for public transport.

A number of school bus services use the Glen Iris road network with a number travelling to adjoining areas along Forrest Highway, South Western Highway as well as other major road links. These services link to existing schools within Glen Iris.

A number of bus stops are located within Glen Iris, including along Vittoria Road where patronage is anticipated to grow as development and land use increases.

#### **3.8.2. Cycling**

Cycling options are proposed both on and off road within Bunbury and Glen Iris. Refer sections 3.2.5 and 3.2.6 of this report for further details.

#### **3.8.3. Principal Shared Paths (PSP) and Pedestrians**

A Principal Shared Path network is provided within and surrounding Glen Iris. This network is managed by the City of Bunbury and is largely dealt with in the cycling sections 3.2.5 and 3.2.6 of this report.

Establishment of the PSP network within the existing developed areas of Glen Iris is largely complete except for several key sections including along Forrest Highway. Safe crossing locations outside of Glen Iris are limited by the busy surrounding road network and Preston River. Pedestrian movements on Vittoria Road between Jeffrey Road and Forrest Highway can, at peak times create access and safety challenges that requires further consideration as part of this planning review.

## 4. Constraints

Constraints assessment for specific access options are detailed in Section 5.3 of this report. A broader assessment of Glen Iris constraints is included below.

As an input into the District Structure Plan process, the following overall constraints are relevant to the transport planning review of Glen Iris. This transport planning assessment is focussed on traffic assessments, distribution and safety of community movements, a desktop assessment of impacts (included in this report) and identifies preferred solutions requiring further detailed analysis, assessment and where needed, site investigations.

Additional assessments may include, but are not limited to environmental and Aboriginal Heritage assessments, noise and amenity assessments, engineering constraints, waterways and geotechnical investigations, detailed service assessments, ground water and drainage, etc. Any required assessments will be undertaken prior to delivery of transport infrastructure either through the District Structure Plan (land use) process or separate Main Roads and Local Government processes.

### 4.1. Environmental

Existing environmental assets are summarised in the image below.

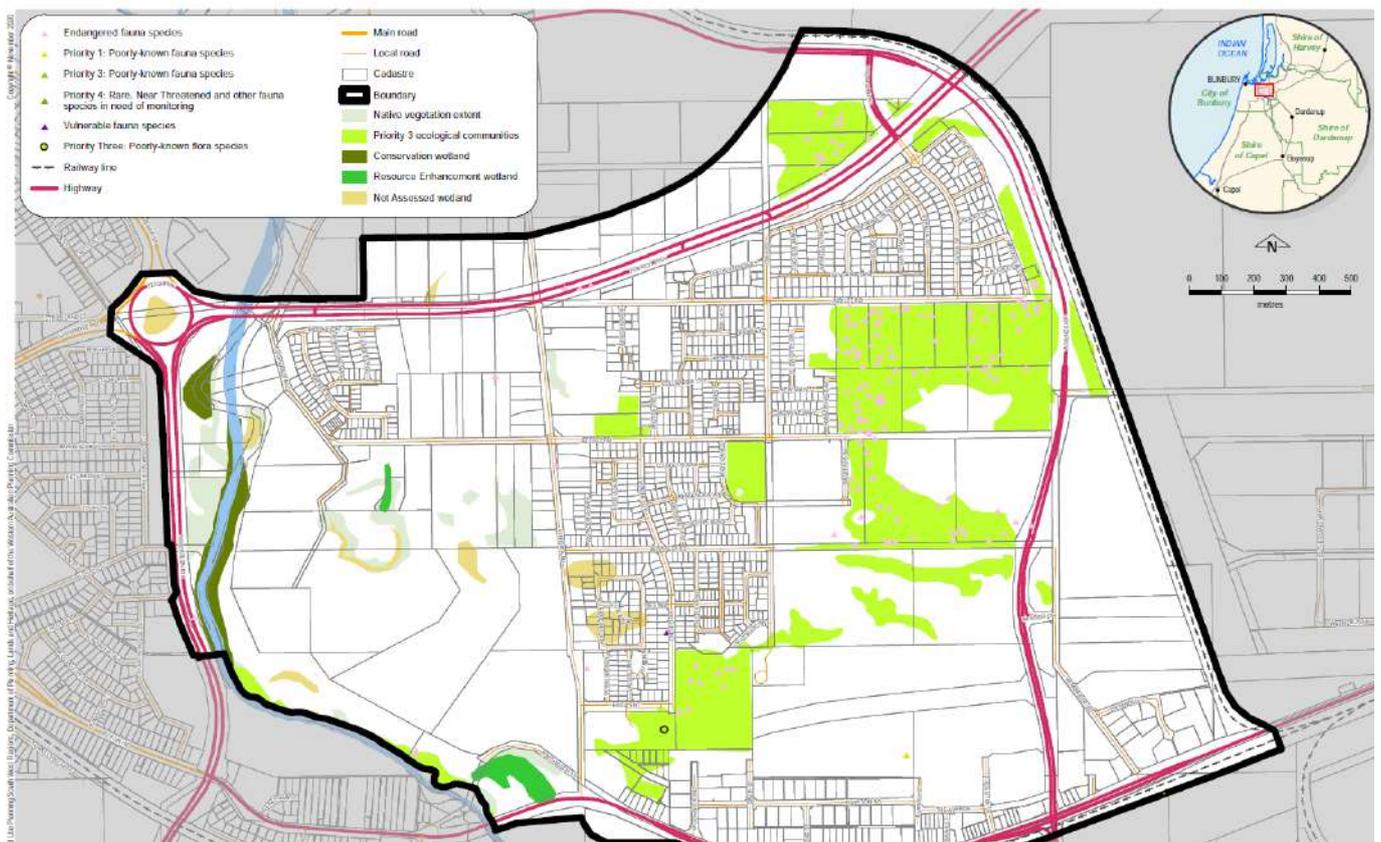


Figure 37 – Environmental Assets

Key constraints identified includes the Preston River and surrounding areas (western and south precincts of Glen Iris), Environmentally Sensitive Areas (particularly the Preston River), Threatened Ecological Communities (TEC), areas containing remnant native vegetation (including riparian vegetation associated with the Preston River), a range of isolate wetlands, the oxbow lake system associated with the Preston River, floodway relief (centrally located within Glen Iris) and several other features within Glen Iris.

## 4.2. Aboriginal Heritage

Registered Aboriginal Heritage assets are summarised in the image below.

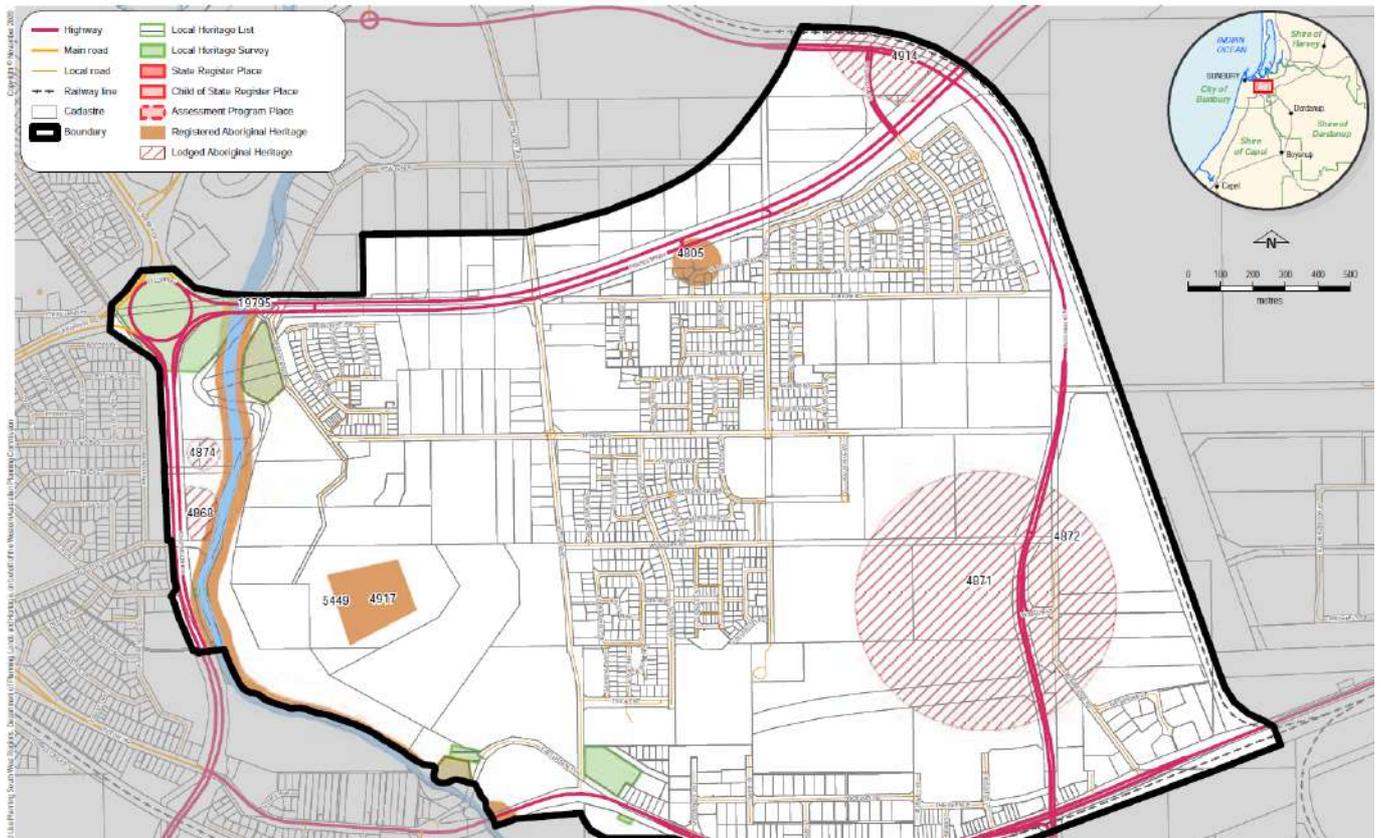


Figure 38 – Aboriginal Heritage Map

Registered constraints include the Preston River and surrounding areas (western and south precincts of Glen Iris), two “Lodged” sites located between the Preston River and Robertson Drive, a registered site adjacent to Forrest Highway (near the Shell Service Station), a registered site centrally located within Glen Iris and a “Lodged” area located to the east in the Glen Iris District Structure Plan, Stage 2 area. This latter site is not within the Glen Iris District Structure Plan, Stage 1 area, however, will be within Stage 2 (for future planning and assessment).

Any interactions or impacts to registered, lodged or potential Aboriginal Heritage sites requires further detailed assessment, consultation, and a range of subsequent processes to determine further details regarding a site and what can and cannot be undertaken in that area. This process requires consultation with Traditional Owners through a formal process.

### 4.3. Floodplains and Floodways

The existing floodplain policy is summarised in the image below.

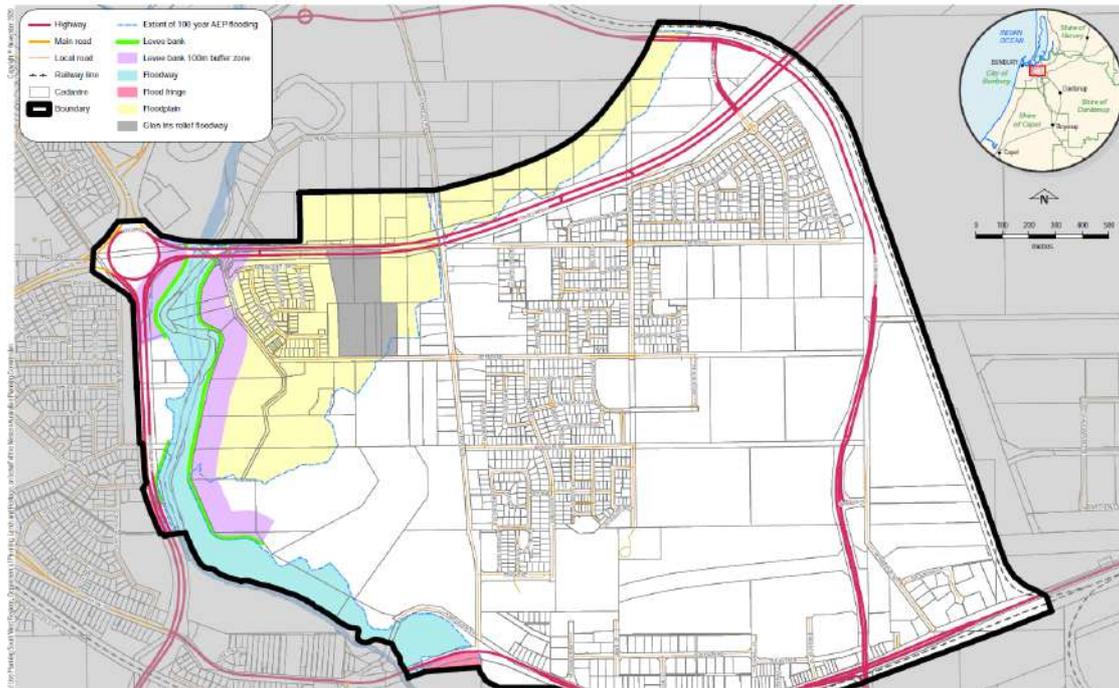


Figure 39 – Floodplain Policy Map

The existing floodplain policy identifies large areas of Glen Iris requiring further detailed assessment. Modelling of the Preston River and floodway relief system was undertaken, where these assessments identify floodway extent as detailed in Figure 40 below. Further analysis of flooding implications is discussed as part of option assessment in Sections 5.5.1.5 and 5.5.2.

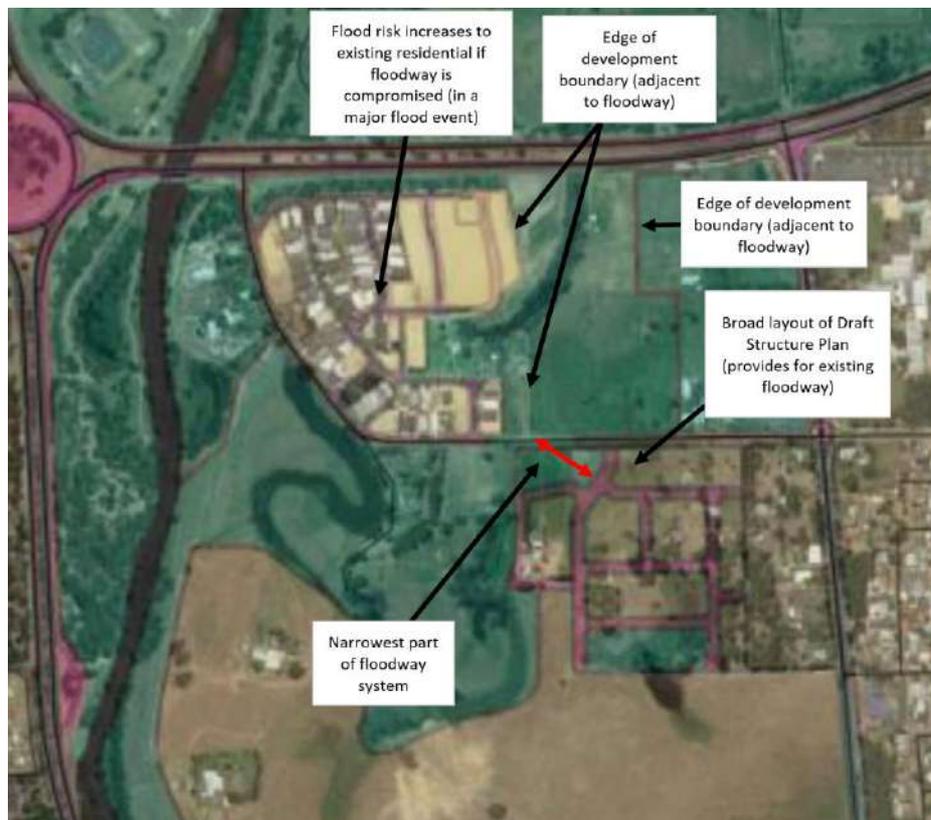


Figure 40 – Preston River Floodway System (1% AEP Flood with Levee Breach)

### 4.4. Soil and Landform

Soil and landform features are summarised in the image below.

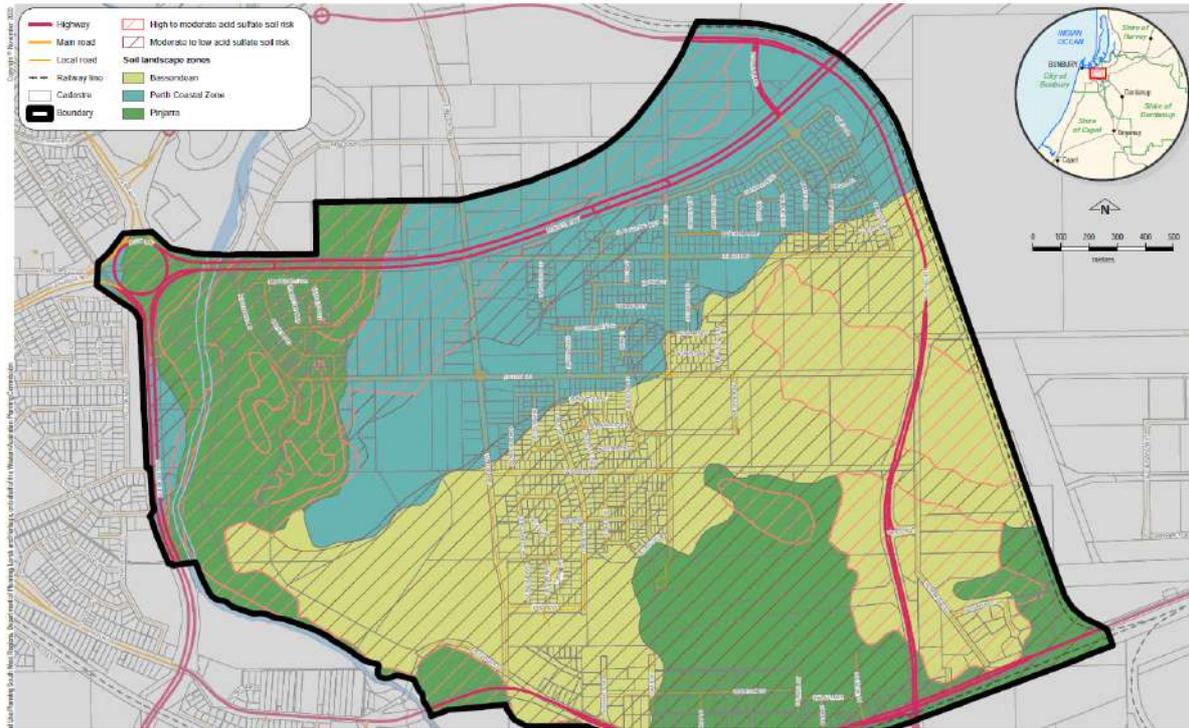


Figure 41 – Soil and Landform Map

Acid Sulphate Soil (ASS) risks are summarised in the image below:



Figure 42 – Glen Iris Acid Sulphate Soil (ASS) Risk Map

### 4.5. Services

Several significant services are located throughout Glen Iris with some of the key features detailed below and requiring further consideration regarding option assessment. High- and Low-Pressure Gas pipes are located surrounding the Vittoria Road corridor extending between Forrest Highway and South Western Highway.

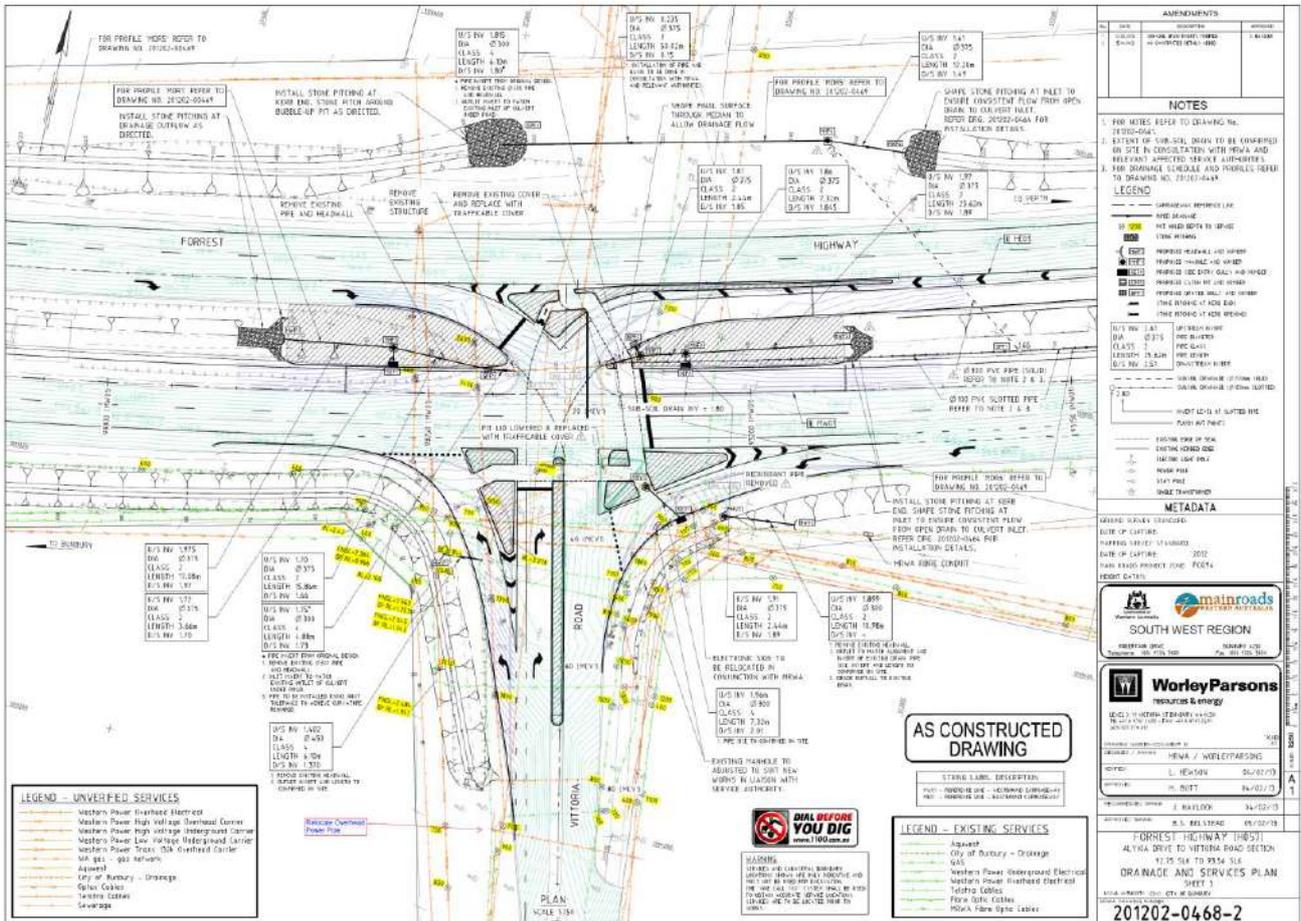


Figure 43 – Vittoria Road and Forrest Highway As-Constructed (Including Services)

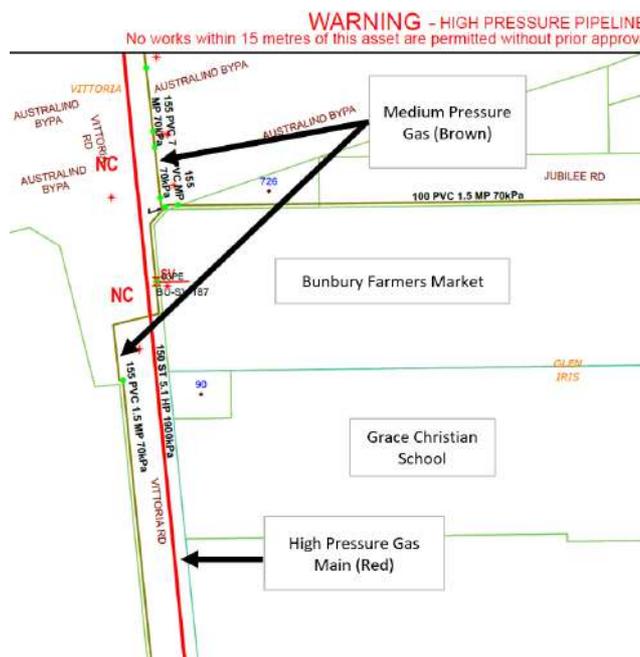


Figure 44 - High and Medium Pressure Gas Pipelines (Vittoria Road and Forrest Highway)



Figure 45 - City of Bunbury Storm Water Infrastructure (Vittoria Road and Forrest Highway)

## 5. Options Assessment

### 5.1. Context

Improved access to Glen Iris is a critical requirement to support a range of existing land uses and undeveloped land intended for future intensification (mainly west of Vittoria Road). Given Glen Iris is surrounded by Forrest Highway and South Western Highway, the Preston River, Robertson Drive, Willinge Drive and the Bunbury Port, options to address long-term access should not only consider requirements within Glen Iris, but also need to consider broader planning of Greater Bunbury, its major transport networks as well as current and future development of the Bunbury Port.

Future planning for rail within Greater Bunbury and long-term planning consistent with the Greater Bunbury Region Scheme provides the ability for Forrest Highway to be grade separated at key locations including at Raymond Road intersection, future access to the Wanju (residential) development, Eaton Drive and Old Coast Road. Planning to date has not provided the opportunity to grade separate (bridge) the intersections of Thomposon Road (and Alyxia Drive) or Vittoria Road, where these intersections are located on the busiest section of Forrest Highway.

Should provision be made for a future fast rail corridor into the Bunbury CBD, grade separation of Forrest Highway is a key consideration to facilitate this outcome (provide an uninterrupted corridor). It is highly desirable to plan access to the Bunbury Port and Glen Iris incorporating grade separation with Forrest Highway to maximise road safety and improve access to a very busy highway. However if this were proposed, considerable land and amenity impacts are anticipated within Glen Iris to accommodate the necessary bridges and road infrastructure.

Initial assessment of road options and early consultation with key stakeholders identified that while planning for grade separation (bridging) of Forrest Highway past Glen Iris is highly desirable from a transport, efficiency and safety perspective, the impacts to Glen Iris, existing communities and local business is considered too great and therefore not possible. By not planning grade separation of Forrest Highway (adjacent to Glen Iris), planning for fast/heavy rail into the Bunbury CBD is significantly more challenging. Therefore, planning for future public transport within Greater Bunbury needs to consider the inability to grade-separate Forrest Hwy past Glen Iris as a constraint. This may result in public transport options being limited to on-road facilities (including rapid transit buses, trackless trams, etc) rather than options requiring their own uninterrupted corridor separate to the road. Future heavy rail planning will be resolved by the Public Transport Authority (PTA) and is separate and in addition to this Glen Iris planning assessment.

### 5.2. Greater Bunbury Traffic Modelling

Main Roads first developed a South West area strategic traffic model in the early 2000's which included predicted traffic demands to 2031. This model was known as the Mandurah Dunsborough Traffic Model which has two sub-areas, one for Greater Bunbury and one covering the Busselton-Dunsborough townships.

In 2011 and following the release of the Draft Greater Bunbury Strategy, the Department of Planning (with input from other agencies including Main Roads) developed updated population and employment data for the Greater Bunbury area to reflect the planning outcomes included in the Greater Bunbury Strategy 2013. The traffic model identifies the population and employment in the Bunbury area for 2011 based on Census information, travel data based on survey information. The model included data for ultimate land development included in the Greater Bunbury Strategy (assuming all land identified for development has been built). The model also included a likely growth scenario to 2051 with a population of around 170,000 in the Greater Bunbury area.

Between 2016 and 2018 the Department of Planning Lands and Heritage and Main Roads further refined the population and employment data for Greater Bunbury including a 2041 and 2051 (ultimate) land use scenario reflecting updated planning for the proposed Wanju urban and Waterloo industrial areas. This updated land use is reflective of future additional development considered as part of the updated Bunbury – Geographe Sub-Regional Strategy (January 2022). This updated data includes Greater Bunbury population scenarios of 150,000 assumed in 2041 and 200,000 assuming all identified development is complete and assumed to occur beyond 2051 (ultimate build out). No land use data (and therefore no traffic modelling) has been provided for an aspirational long-term population of 300,000 referenced in the Bunbury – Geographe Sub-Regional Strategy.

The Bunbury Traffic Model (BTM) is a strategic model used to test various land use scenarios and resulting traffic demands and based on proposed road network layouts at the tested time horizon. Given the Bunbury Outer Ring Road (BORR) is a funded project and due for completion in 2024, future Glen Iris land-use and road network

scenarios tested assume the BORR is in place. As part of these Glen Iris assessments, the Bunbury Traffic Model has been used to understand the order of magnitude of medium and long-term traffic pressures surrounding and within Glen Iris with a summary of the key modelling outputs included below. These outputs compare key links with current, 2041 land use and 2051 land use (ultimate) scenarios.

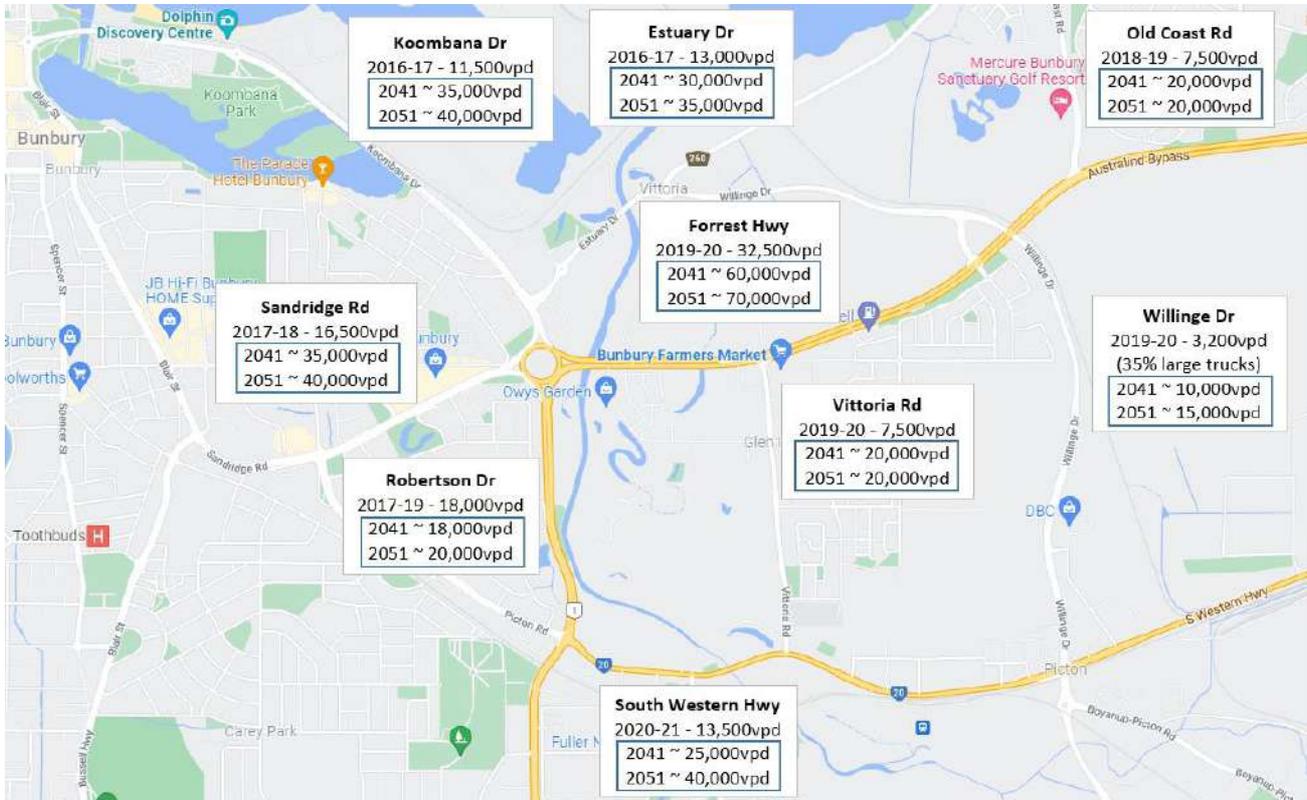


Figure 46 – Traffic Model Outputs (Current, 2041 and 2051+)

Strategic traffic modelling highlights areas of future traffic pressure based on anticipated long-term population and employment growth. The strategic model is a high level planning tool and is not meant to present detailed figures. Key transport links associated with Glen Iris that are anticipated to experience significant traffic increases includes:

Modelling identifies a doubling of existing traffic volumes in the long-term suggesting the following transport requirements:

- Forrest Hwy (6 lanes ultimately required).
- Vittoria Road (4 lanes ultimately required).
- Sandridge Road (4 lanes ultimately required).
- Old Coast Road (2 or potentially 4 lanes ultimately required – depending on several factors).

Modelling identifies a tripling of existing traffic volumes in the long-term suggesting the following transport requirements:

- South Western Hwy (4 lanes ultimately required noting a high proportion of trucks).
- Estuary Drive (4 lanes ultimately required, however achieving this may be challenging given surrounding constraints).
- Koombana Drive (4 lanes ultimately required, however achieving this may be challenging given surrounding constraints and reservation width restrictions in some sections).
- Willinge Dr (4 lanes ultimately given its strategic freight function and high proportion of large trucks/road trains 36.5m long and greater than 100 tonne).

Traffic figures in assessment section assume Estuary Dr remains open. Previously, Southern Ports have raised the possibility of Estuary Dr closing for port security reasons. Should this occur, around 30,000vpd would re-locate from Estuary Dr to Forrest Hwy as the next closest link. This shift of traffic is expected to overload Forrest Hwy, in

\* Modelling suggests Koombana Drive requires 4-lanes, pedestrian facilities and where current planning includes a Fast Rail corridor. This scale infrastructure doesn't appear to fit within the existing road corridor and where initial discussion confirms the corridor can't be easily widened.

particular Thompson Dr/Alyxia Dr, Vittoria Road and Eelup Rotary intersections resulting in significant congestion and a range of challenges. It is anticipated at-grade intersections would be unable to function effectively with 90,000vpd on Forrest Hwy. As a result maintaining an Estuary Drive connection either through or around the Bunbury Port is critical to the future effectiveness of the Greater Bunbury road network and community.

Many of the road links surrounding Glen Iris experience significant traffic growth over the following 20 year time horizon (to 2041). This is based on land use assumptions that infill and increases in development density occurs to central areas in the short to medium-term and where lower growth is projected beyond 2041 (eg central areas develop to their full potential more quickly than outer lying areas). The Vittoria Road link is a good example of this where almost all modelled traffic growth occurs before 2041 with traffic numbers growing from 7,500vpd (measured 2019-20) to in excess of 20,000vpd by 2041. New residential/employment areas such as Wanju and Waterloo are predicted to grow more substantially between 2041 and 2051 in the land use assumptions.

The strategic model assumes a low public transport uptake, based on current trends and typical of regional centres throughout Australia (mainly school bus and minor other bus users). The future traffic projections highlight the need for a combination of responses including road safety and capacity upgrades to the existing network, development that minimises private vehicle use, encourages use of public transport and promotes active transport opportunities including walking, cycling and other future personal/electric transport modes (electric wheelchair and mobility scooter use is on the increase). However, even with a significant shift to public and active transport in the future, road based traffic volumes are anticipated to be significant requiring adequate planning for future infrastructure.

Additional targeted traffic modelling is proposed to confirm details at critical intersections including Eelup Roundabout, Old Coast Road and Thompson Road/Alyxia Drive intersections, Robertson Dr/South Western Highway and Forrest Hwy/Vittoria Road. These targeted assessments will assess performance through networked modelled (detailed area modelling rather than single intersection modelling) to ensure appropriate infrastructure is provided for the safe and efficient operation of the surrounding state network.

### 5.3. Glen Iris Option Constraints

A range of transport options require consideration to improve access to Glen Iris and to support current and future land use. The following is a summary of constraints and opportunities to improve accessibility, safety and permeability to Glen Iris in coordination with critical planning for Greater Bunbury/surrounding state road networks.

#### 5.3.1. Northern Option Constraints (Accessing Forrest Highway)

Constraints to the north of Glen Iris are summarised in Figure 47 below. Generally traffic is attracted to Forrest Highway (via Vittoria Road) where an un-constrained northern access is a highly desirable outcome (providing required long-term capacity). Forrest Highway is currently a busy 6-lane route and anticipated to experience significant future growth. As a result, any access will need to provide efficient traffic movement and accommodate significant future traffic demands on both the Glen Iris connection and Forrest Highway. Constraints are further considered below:

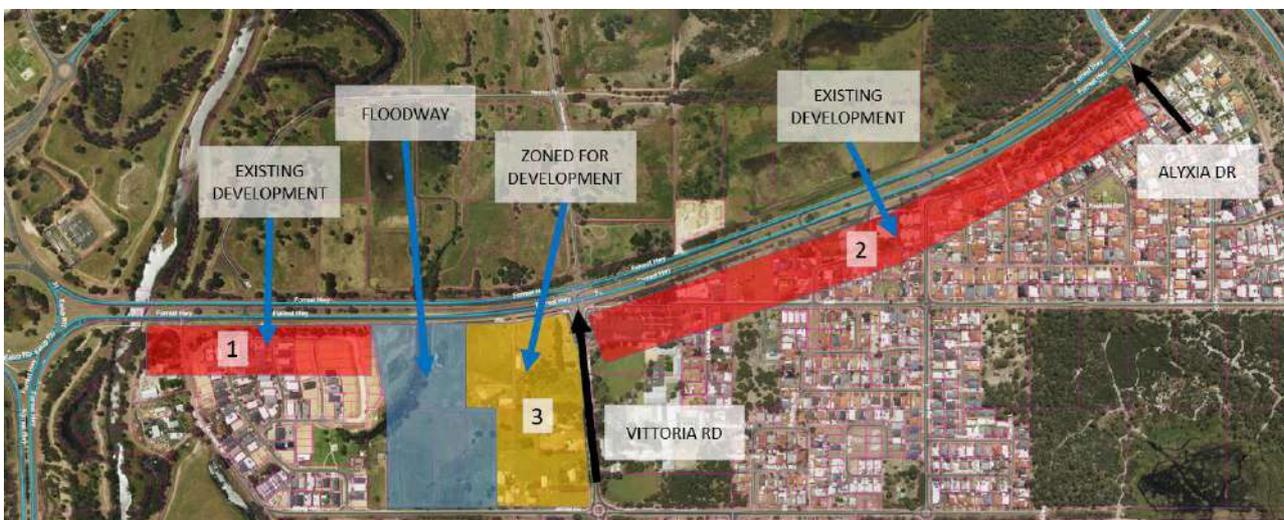


Figure 47 – Northern Constraints (Access to Forrest Hwy)

- Existing Vittoria Road and Forrest Highway Intersection is centrally located within Glen Iris and well positioned to service traffic demands. Improvements to the existing Vittoria Road intersection is constrained by a range of service including medium and high-pressure gas, power, optic fibre, water, large open drainage, and lighting complicating the ability to widen the intersection and provide the necessary traffic lanes. The Bunbury Farmers Market access is located approximately 60m from Forrest Highway when during peak periods, this access can impact on the operation of the intersection and highway. At times significant pedestrian numbers, school traffic including buses further complicates the safe and effective operation of the intersection. Future commercial development proposed on the western boundary of Vittoria Road as well as general Glen Iris development is anticipated to significantly increase traffic demands (more than double) placing significant pressure on this intersection, ultimately exceeding capacity. Whilst improvements to the intersection are anticipated to be complex, future use of Vittoria Road for the primary northern access to Glen Iris is viable and requires further consideration.
- Area labelled 1 – Contains existing residential development where a connection to Forrest Hwy would result in significant property and community impact. This area is offset to the west of Glen Iris where provision of a central access servicing current and future land use appears challenging. The area is near the busy Eelup Roundabout and the Preston River bridge complicating traffic issues. Provision of an additional northern Glen Iris access through Area 1 appears highly constrained and not viable.
- Area labelled 2 - Contains existing residential development where a connection to Forrest Hwy would result in significant property and community impact. This area is offset to the east of Glen Iris more aligning with existing development where provision of an access servicing future traffic demands is problematic. The area is near an existing service station accessed from Forrest Highway and relatively close to Thompson Road/Alyxia Drive intersection (providing access to Bunbury Port). Provision of an additional northern Glen Iris access through Area 2 appears highly constrained and not viable.
- Area labelled 3 – This land is zoned “Service Commercial” and contains low-density development where existing residential areas are focussed towards Vittoria and Jeffrey Roads. Large areas are currently used for rural purposes where a significant open drain runs along Forrest Highway between Vittoria Road and the floodway. This area is relatively central to the Glen Iris where provision of an access servicing current and future land use appears possible. The area is directly adjacent to the existing Vittoria Road intersection with Forrest Highway where coordination with this intersection appears challenging, however may not be impossible. Depending on the proximity, if an additional access were considered, turn movements at the existing Vittoria Road intersection requires restriction to maintain an effective Forrest Highway. However, it is acknowledged the Bunbury Farmers Market currently relies on the existing intersection for its main access to passing trade where restriction of movement is not currently possible. An access through area 3 would impact privately owned property zoned “Service Commercial” and land identified for a Local Neighbourhood Centre (refer section 3.6). Any access through this area would result in high property impacts where, depending on the extent of impact may affect the viability of land intended to provide the Glen Iris community services and a community hub. Provision of an additional Glen Iris road connection through Area 3 appears highly constrained and would result in privately owned property impacts, however, may be possible subject to further consideration.
- Floodway Area - Provides floodway relief for the Preston River system including a drain and culvert crossing under Forrest Highway. All land is currently owned by the state (not privately owned). The importance of this floodway relief system is acknowledged where passage of the 100-year flood is critical to surrounding residential development (should a levy bank breach be experienced). This area is relatively central to Glen Iris where provision of a centre access servicing current and future land use appears well aligned. Separation from the busy Eelup Roundabout requires careful consideration as well as the existing Preston River bridge. The area is adjacent to the existing Vittoria Road intersection with Forrest Highway where coordination with this intersection appears challenging, however may not be impossible. If an additional access were considered, turn movements at the existing Vittoria Road intersection requires restriction to maintain an effective Forrest Highway. However, it is acknowledged the Bunbury Farmers Market currently relies on the existing intersection for its main access to passing trade where restriction of movement is not currently possible. Provision of an additional northern Glen Iris access through the floodway area appears relatively un-constrained from a land use perspective, however, requires technical assessment to ensure the floodway operates to a suitable level and will be considered further.

In summary, access to the north appears possible via the existing Vittoria Road intersection, through area 3 or through the floodway relief area (or a combination of the latter two). Options will be further assessed in Section 5.5.

### 5.3.2. Western Option Constraints (Accessing Robertson Drive)

Constraints to the west of Glen Iris are summarised in Figure 48 below. All western options would require a bridge over the Preston River, also being a registered Aboriginal heritage site resulting in significant challenges. Modelling suggests minimal long-term traffic growth on Robertson Drive and as a result there appears an opportunity for Glen Iris to take up some of that available road capacity, particularly given Forrest and South Western Highways are expected to experience significant future traffic growth and congestion. A additional western access could also provide improved traffic distribution for Glen Iris (reducing reliance on north-south access) and significantly improve pedestrian/cycling access to existing services within Bunbury. Constrains are further discussed below:

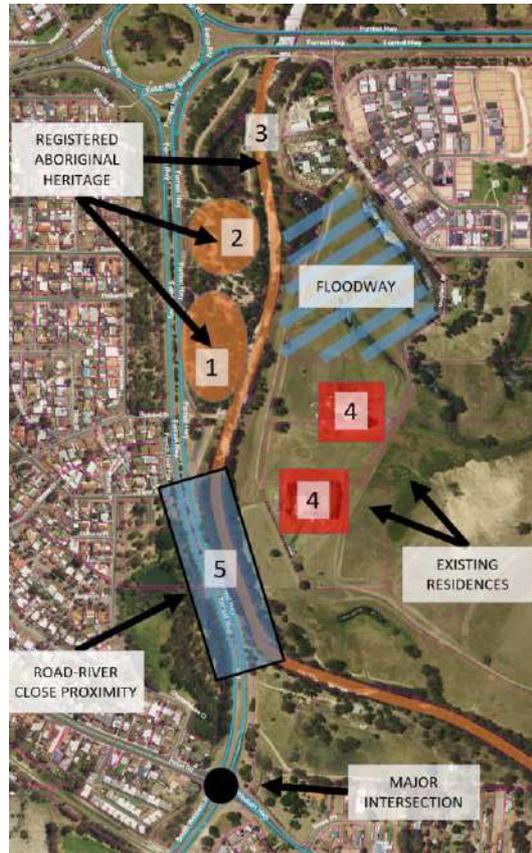


Figure 48 – Western Constraints (Access to Robertson Dr)

- Areas labelled 1 and 2 – Contains registered Aboriginal sites and are located on a high mound covered with well-established native vegetation. This area is offset to the north of Glen Iris where provision of a central access servicing current and future land use appears challenging. The area is near the busy Eelup Roundabout and the existing floodway relief system/existing waterways are located to the east of this area. Provision of an additional western Glen Iris access through Areas 1 and 2 appears highly constrained and not viable.
- Area labelled 3 – The Preston River is a registered Aboriginal heritage site. Any additional access to the west would need to bridge the river expected to result in impacts to the registered site. Provision of a new bridge crossing over the Preston River, whilst costly and potentially challenging may be possible and is subject to further consideration.
- Area between labels 1 and 5 – Two existing residential properties are located at labels 4 as identified above. Any potential western access should avoid or at least minimise impacts to these properties which could be considered as part of the internal road layout of the Glen Iris District Structure Plan. Regarding access surrounding Robertson Drive, the area between labels 1 and 5 would require a bridge over the Preston River on a section where the river is relatively straight (typically less complex than on river bends) and where the general area is relatively flat. Parts of this area are cleared, however some native vegetation is present including on the edge of the river (containing less vegetation than other sections of the river). The area is centrally located within Glen Iris and appears to align with the centroid of significant future residential development (refer section 3.2.10 – Draft South Moorelands Local Structure Plan, October 2010). This location is approximately mid-way between the busy intersections of Eelup

Roundabout and South Western Highway with approximately 650m spacing to both intersections. Given Robertson Drive is a 4-lane state road, maintaining adequate intersection spacing is a high priority to maintain the efficiency and safety of this link. The Preston River is offset from Robertson Drive approximately 75m in this area (relatively close, however an intersection appears viable). Should an additional intersection be proposed, the existing parking area accessible from Robertson Drive would likely require removal. Provision of an additional western access over the Preston River and between areas labelled 1 and 5 appears highly constrained and subject to Aboriginal heritage assessments and approvals, however, may be possible subject to further consideration.

- Area labelled 5 – This area highlights a section of the Preston River near the existing Robertson Drive, generally approximately 10-20m offset. Provision of a new intersection and bridge this close is not unviable, however would be highly complex and expensive. Positioning an intersection near a river is likely to result in greater impacts to the river and vegetation along its banks. There are other examples where intersections and rivers are close where challenges regarding guardrail, signage, and bridge width are experienced. An example is the Boyanup-Picton Road and Martin Pelusey Road intersection approximately 25m from the Ferguson River (noting the river and roads are of a lesser scale than in this instance). Area 5 is partly offset to the south of Glen Iris; however, the provision of a central access servicing current and future land use appears achievable. The area is near the busy South Western Highway intersection which is also near an existing rail crossing of Robertson Drive providing a further complication. Positioning an additional access near the South Western Highway intersection appears problematic and not desirable given current and future traffic can queue either side of this intersection, particularly should a train cross (typically 4 times per day). The southern portion of area 5 abuts a long sweeping bend on Robertson Drive further complicating any potential intersection. The Preston River also has a sweeping bend in this area (typically bridges are less complex on straight river sections compared to river bends). Provision of an additional western access through Area 5 appears highly constrained and not viable.

In summary, access to the west appears possible via the area between labels 1 and 5, however would impact the Preston River (registered Aboriginal site) and privately owned land. The District Structure Plan should further consider potential impacts to existing residential properties within the Glen Iris area with further assessed in Section 5.5.

**5.3.3. Southern Option Constraints (Accessing South Western Highway)**

Constraints to the south of Glen Iris are summarised in Figure 49 below. All southern options would require a bridge over the Preston River (registered Aboriginal site). Other wetlands, minor waterways, existing residential development and heavy vegetated areas are located to the south further complicating options. Modelling suggests significant long-term traffic growth on South Western Highway where congestion is likley to be experienced. The existing Vittoria Road-South Western Hwy intersection is planned for upgrade to a roundabout to improve capacity and safety. As a result, there appears little benefit in further investigating additional southern access options. Further Glen Iris planning will assume the use of the existing Vittoria Road and South Western Highway intersection being upgraded to a roundabout with no further assessment of additional southern access to SWH.

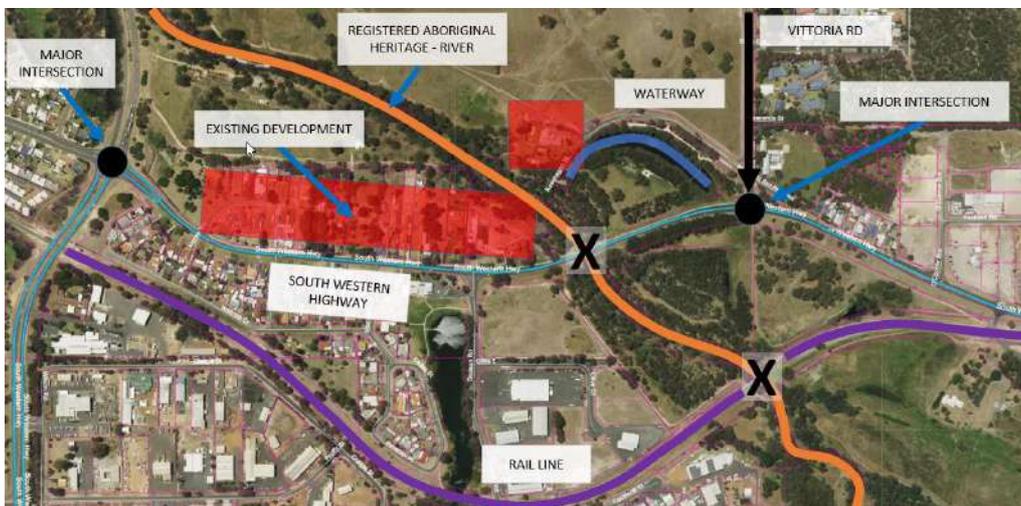


Figure 49 – Southern Constraints (Access to South Western Highway)

**5.3.4. Eastern Option Constraints (Accessing Willinge Drive)**

Constraints to the east of Glen Iris are summarised in Figure 50 below. Willinge Drive is located east of Glen Iris and is primarily intended for industrial and heavy vehicle access to Bunbury Port and adjacent land uses, including up to RAV 7 vehicles exceeding 100 tonne and 36.5m in length. Willinge Drive is the strategic freight link between the Bunbury Outer Ring Road and the Bunbury Port and while traffic volumes are not excessive, large trucks make up approximately 35% of current traffic reflecting the strategic nature of this link. This proportion of heavy vehicles equates to around 1,150 large trucks, or 1 truck every 30 seconds over a 10 hour day.

Modelling suggests moderate long-term traffic growth on Willinge Drive however given the make-up of traffic, directing residential traffic onto this link is seen as undesirable on safety and freight efficiency grounds. An eastern connection could improve Glen Iris’ traffic distribution and reduce reliance on north-south access, however future land-use (external to Glen Iris) suggests minor traffic demand from Glen Iris accessing services to the east. Encouraging pedestrian and cyclist movements onto Willinge Drive would result in a range of safety and amenity challenges as well as detract from the safe movement of heavy vehicles to and from the Bunbury Port. Providing an eastern access may encourage non-residential traffic to enter Glen Iris and travel through residential streets. Constrains are further discussed below:

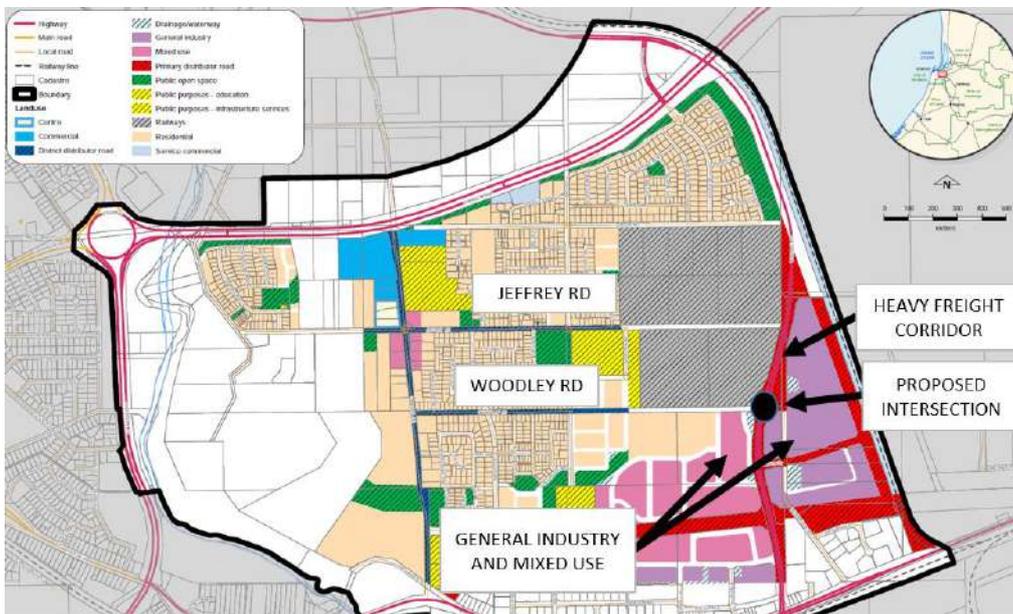


Figure 50 – Eastern Constraints (Access to Willinge Dr)

- An eastern extension of Jeffrey Road to meet Willinge Drive would sever “Regional Open Space”, impact native vegetation and a “Lodged” Aboriginal site and traverse low-lying areas as detailed below.

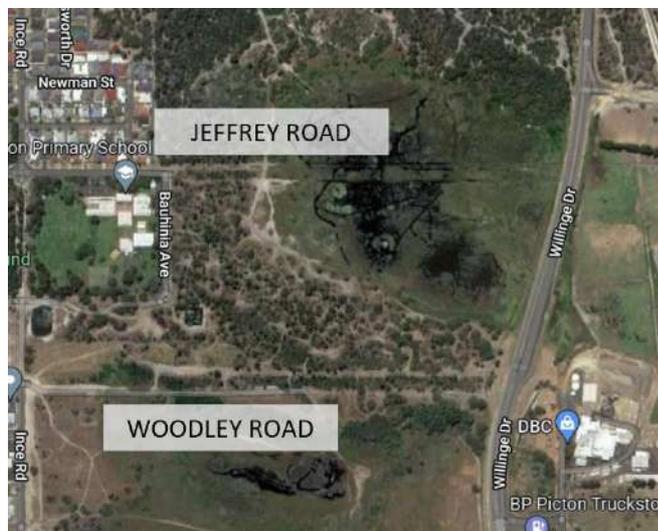


Figure 50(a) – Jeffrey and Woodley Road

Jeffrey Rd services a residential area where multiple direct property accesses are in place. Picton Primary School is located on Jeffrey Road including a school 40km/h zone. Connection of a residential street with proposed mixed use/industrial land uses and a heavy vehicle freight corridor has the potential to draw in non-residential vehicles result in an undesirable mix of traffic both on a residential street as well as on Willinge Drive. Access via Jeffrey Road appears highly constrained and would result in undesirable outcomes for the Glen Iris community, a primary school and for the operation of Willinge Drive. As a result, an extension of Jeffrey Road is considered not viable.

- The Local Planning Scheme (No.8) identifies connection of Woodley Road and Willinge Drive (refer Figure 50 above). Extension of Woodley Road would impact “Regional Open Space”, however given this is along the southern edge, there may be opportunities to adjust the corridor south to avoid or minimise impacts. Woodley Rd services a residential area where multiple direct property accesses are in place. Connection of a residential street with existing and proposed mixed use/industrial land uses and a heavy vehicle freight corridor has the potential to draw in non-residential vehicles and result in an undesirable mix of traffic both on a residential street as well as on Willinge Drive. Access via Woodley Road appears viable, however may result in undesirable outcomes for the Glen Iris community and for the operation of Willinge Drive as a strategic freight route.

In summary, an eastern additional access with Willinge Drive appears viable, however may result in undesirable outcomes for the Glen Iris community and for the operation of Willinge Drive. Further consideration is included in section 5.5.3 for potential eastern options, whether an access is warranted and how impacts could be managed.

#### 5.4. Options Shortlist

Further to Section 5.3, a summary of shortlisted access options is below. Further assessment is in Section 5.5.

1. Northern additional access of Glen Iris with Forrest Highway (existing/new access).
2. Potential additional western access with Robertson Drive (new access).
3. Potential additional eastern access with Willinge Drive (new access).

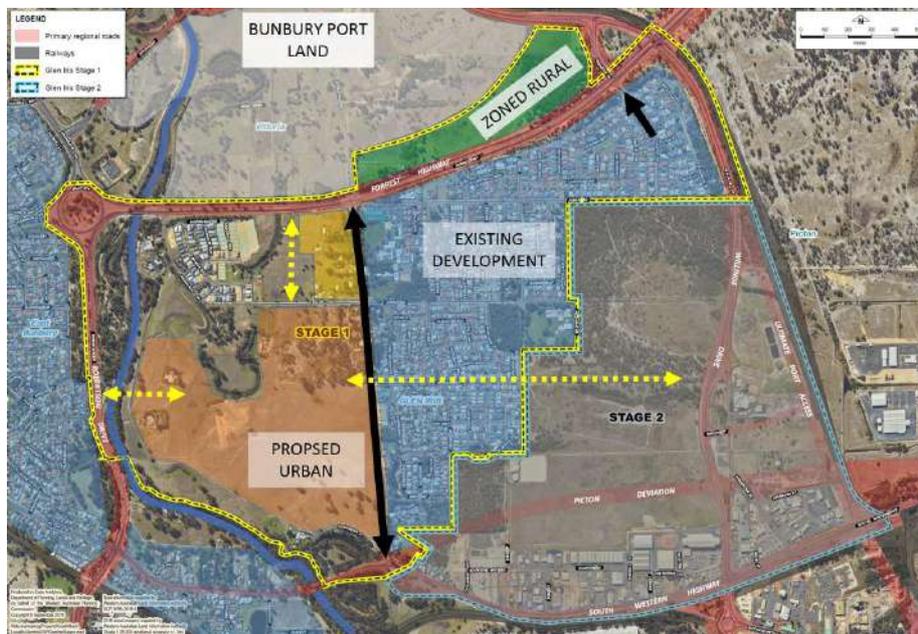


Figure 51 – Summary of Options Shortlisted (for further assessment)

A summary of options not requiring further consideration includes:

4. An additional southern access with South Western Hwy. The existing Vittoria Road/South Western Highway intersection is planned for major upgrade (roundabout) anticipated to accommodate long-term traffic demands. Provision of an additional southern access is not viable where further assessment is not warranted.

## 5.5. Assessment of Options

### 5.5.1. Northern Option Assessment (Accessing Forrest Highway)

#### 5.5.1.1. Grade Separation - Bridging (Accessing Forrest Highway)

Long-term traffic demands on Vittoria Road/Forrest Highway, planning for Fast Rail, strategic port access and a range of other issues justify consideration of a grade separated interchange for Glen Iris. Initial assessment of road options and early consultation with key stakeholders identified that while planning for side road grade separation (bridging) with Forrest Highway surrounding Bunbury Port/Glen Iris is highly desirable from a transport, efficiency and safety perspective, the impact to Glen Iris, existing communities and local business is considered too great. Section 5.1 provides further detail. As a result, consideration of a grade separated intersection arrangement with Forrest Highway servicing Glen Iris will not be considered further.

#### 5.5.1.2. Existing Alyxia Drive (Accessing Forrest Highway)

The existing Alyxia Drive/Forrest Hwy intersection is a 4-way signalised intersection with Thompson Road forming the northern leg (Bunbury Port access) and Alyxia Drive being a local road servicing the north-eastern area of Glen Iris. Alyxia Drive carries around 2,000vpd. It's expected as Glen Iris develops (including a potential urban development on WA Development land) additional traffic will utilise Alyxia Drive to access the surrounding area. Long-term traffic volumes are not expected to be large given most future development is proposed west of Vittoria Road. As a result, consideration of major changes to the Alyxia Drive access will not be considered as part of this planning.

#### 5.5.1.3. Existing Vittoria Road (Realignment of Forrest Highway)

Resulting from landholder discussion, an option was provided suggesting a relocation of Forrest Highway and extension of Vittoria Road as detailed in the image below in order to improve existing intersection restrictions.



Figure 52 – Image Provided During Consultation

At the time, a range of observations were made and discussed including the following summary:

- Relocation of Vittoria Rd/Forrest Hwy intersection north could be considered to relieve existing capacity constraints and provide for greater separation between the highway and busy/constrained sections of Vittoria Road.
- A significant length of the 6-lane Forrest Highway would require replacement, including the existing Preston River floodway. This replacement as well as the extension of Vittoria Road would require significant investment and impacts to traffic during construction.
- The arrangement results in the concentration of traffic on Vittoria Road (refer Sections 5.2 and 5.5.1.4 for traffic details).
- Significant land impacts are anticipated north of Forrest Hwy where around 50% is privately owned and 50% owned by Southern Ports. At the time of preparing this report, a Roadhouse is approved and under

construction north of Forrest Hwy (this development would require removal/relocation should the Forrest Hwy be realigned). A relocation would impact the planned Fast Rail corridor north of Forrest Hwy (refer Sections 5.1 and 3.2.11). The available land for future port operations would also be reduced.

Given potential costs and impacts, a relocation of Forrest Highway north and extension of Vittoria Road appears unviable and will not be considered further.

**5.5.1.4. Existing Vittoria Road (Accessing Forrest Highway)**

Details regarding the existing Forrest Highway/Vittoria Road intersection are included in Section 3.3.7. Further discussion of relevant analysis for this intersection is as follows:

Strategic Traffic Modelling

Strategic modelling confirms as Greater Bunbury grows, traffic on Forrest and South Western Highways grow significantly due to increasing land use throughout the metropolitan area (refer Section 5.2). Long-term traffic on Forrest Highway (assuming Estuary Drive remains connected) suggests volumes between 60,000vpd and 70,000vpd interacting with Vittoria Road traffic projected to be around 20,000vpd (or around 80,000-90,000 vehicle interactions per day). Traffic numbers of this scale justifies an interchange (bridging) which is not possible at this location (refer Section 5.1). The resulting at-grade intersection will need to be large and efficient, provide multiple lanes and is expected to be very busy. Options utilising the existing Vittoria Road intersection require major widening and infrastructure upgrades for it to function safely and effectively in the long-term.

The Bunbury Traffic Model (BTM), being a strategic model doesn't make full provision for specific and unusual land uses, including traffic generated by the Bunbury Farmers Market. Land uses that are unique are not well represented by a strategic modelling process (in the same way Ikea traffic demands in Perth far exceeds the "standard" service commercial traffic demands for a typical business of that land use). Existing counts confirm 7,500vpd on Vittoria Road south of BFM, however intersection data suggests traffic observed on Vittoria Road at the Forrest Hwy intersection is around 3,000vpd higher. As a result, existing traffic north of the BFM access is approximately 10,000vpd and up to 11,500vpd on a Friday (busiest day based on 2019 data). As a result, future traffic volumes will likely be several thousand vehicles per day (vpd) higher than what the strategic model suggests on Vittoria Road near to Forrest Hwy (potentially closer to 23,000 – 24,000vpd).

Setting the abovementioned clarifications aside, modelled traffic volumes are summarised below.

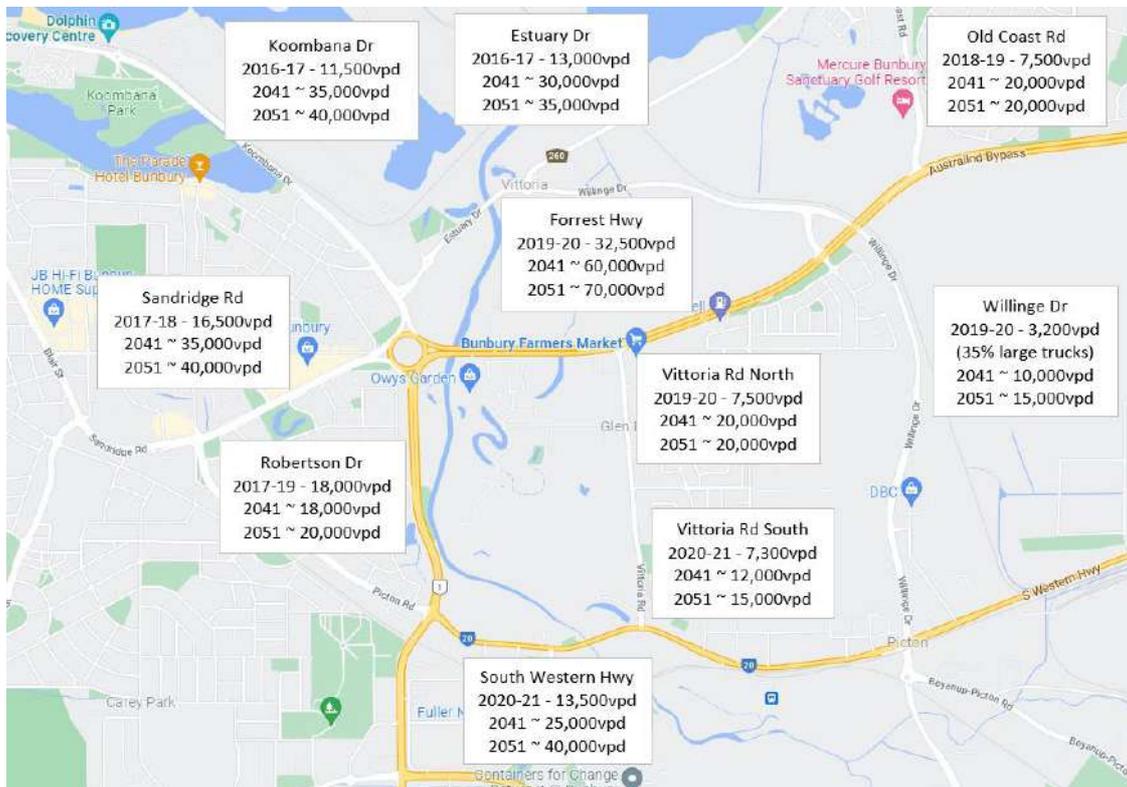


Figure 53 – Forecast 2041 and 2051+ Traffic – Existing Network

Typically, traffic volumes around 20,000vpd require a 4-lane road to provide the necessary capacity and safety. Given intense land use (existing and proposed) and multiple access points near the Forrest Highway intersection, the area is anticipated to be busy and congested even where 4-lanes are ultimately planned.

### Detailed Traffic Modelling

Detailed traffic modelling was undertaken during 2020 and 2021, with a focus to understand the capacity and upgrade options of the existing Vittoria Road/Forrest Highway Intersection. **Appendix 3** includes analysis in a **Traffic Assessment Report**. This analysis was undertaken utilising SIDRA (modelling software) and using predicted 2031 traffic volumes incorporating the following assumptions:

- Video survey data (obtained by Main Roads prior to COVID-19) was used to determine 2020 traffic volumes.
- Future traffic was calculated by applying a 2% growth factor to the 2020 values.
- The 2031 volumes for the Forrest Hwy and Vittoria Rd need to account for the introduction of the Bunbury Outer Ring Road (BORR). Firstly, a 2% growth factor was applied from 2020 to 2023. Secondly, the 2023 volumes were reduced by 25% to account for the upper limit of estimated traffic transfer from Forrest Hwy to BORR. It is possible this transfer could range between 15% and 25% and where this split differs depending which day of the week is assessed. An upper range transfer has been assumed (consistent with the Bunbury Traffic Model) and for the purpose of this modelling given days on/either side of weekends are often the busiest and most likely to be associated with a greater transfer of traffic to BORR. Finally, a 2% growth factor was applied to the amended 2023 volumes for the 2023 to 2031 timeframe.
- Traffic demands for a proposed Service Commercial development (west of Vittoria Road and opposite Bunbury Farmers Market) has been incorporated utilising predicted traffic demands and distribution assumptions provided by the developer at the time of modelling being undertaken (2020 and 2021).
- The Bunbury Farmers Market provided input into this process including exploring potential ways to improve traffic flow both entering and departing the BFM site and preparing their own SIDRA model.

The above process provides predicted 2031 traffic demands for the northern end of Vittoria Road and Forrest Highway. It should be noted, the 2031 traffic volumes identified through this process are less than those expected once Glen Iris fully develops where 2031 volumes on Vittoria Road are approximately 70% of ultimate traffic.

Modelling scenarios for the intersection (in isolation) were undertaken using the 2031 traffic including the following where the intent was to identify low-cost improvement options to address existing problems and facilitate further 'interim' development within Glen Iris:

#### Scenario 1: (Existing Intersection Layout and Unchanged BFM Access/Carpark Circulation):

- Forrest Hwy / Vittoria Rd – Existing Layout (2031).
- BFM Entrance – Existing Parking Layout (2031).
- Proposed Service Commercial Development Access (2031) – Full movement access.
- Roundabout at the school access on Vittoria Rd providing access for the school and additional access to the Service Commercial development to the west (2031).

Modelling of Scenario 1 indicates the intersection will exceed its capacity by 2031 due to increased traffic volumes at all approaches. As a result, utilising the existing intersection without improvement is not feasible.

#### Scenario 2: (Existing Intersection Layout and Amended BFM Access/Carpark Circulation)

- Forrest Hwy / Vittoria Rd – Existing Layout (2031).
- BFM Entrance – Left-in, Left-out and Right-in only, Refined BFM Internal Parking (2031).
- Proposed Service Commercial Development Access (2031) – Left-in and Left-out Only.
- Roundabout at the school access on Vittoria Rd providing access for the school and additional access to the Service Commercial development to the west (2031).

Modelling of Scenario 2 indicates while intersection capacity slightly increases with these amendments, capacity is expected to be exceeded by 2031. As a result, utilising the existing intersection without improvement, a modified BFM access and providing left-in, left-out access only to proposed Service Commercial development is not feasible.

Bunbury Farmers Market also prepared a SIDRA traffic model and tested several additional scenarios including moderate upgrades to the main Vittoria Road/Forrest Highway intersection. This modelling suggested capacity may be improved, potentially meeting the 2031 traffic demands. However, given surrounding constraints, even moderate upgrades to the intersection appears expensive and challenging (further discussed on the following pages). It should be noted in both scenarios 1 and 2 (and the BFM traffic modelling) this analysis doesn't thoroughly consider several real-world challenges likely to influence road and intersection capacity including safety and amenity, treatment of adjacent bus stops, verge parking and a school 40km/h zone throughout this area. All SIDRA models assume pedestrian movements will be via traffic signals and do not impact traffic flows, whereas observed behaviour suggests some pedestrians (mainly at peak times) walk amongst congested traffic and don't always cross at the signals. Traffic giving way to pedestrians at busy times has been observed at this site and whilst not being an unreasonable driver behaviour, does impact traffic flow, congestion and capacity and isn't considered by the modelling.

All traffic models tested assume internal improvements are made to the Bunbury Farmers Market car park to reduce queuing onto Vittoria Road (given existing challenges). If the improvements assumed in both the Main Roads and Uloth modelling are not implemented, congestion will be greater than that modelled in Scenario 1 and 2 (and in the BFM modelling). However, there are a range of assumptions that will influence these outcomes in practice including; 1) the impact of BORR on Forrest Highway peak traffic, 2) the impact of BORR on traffic wishing to access Bunbury Farmers Market, 3) how Bunbury Farmers Market manage staff and/or overflow parking in the medium and long-term, particularly if the area opposite is developed (and is no longer available to BFM), 4) whether pedestrian movements around the intersection remain, reduce, increase or otherwise change in the future, 5) what impact improvements to the Vittoria Road/South Wester Highway intersection will have on traffic distribution at Forrest Highway, and 6) whether Bunbury Farmers Market opens another store and whether that influences (reduces) traffic demands at the existing site during peak periods.

A range of unknowns and a spectrum of possible land use and traffic generation outcomes at the time of preparing this report makes detailed traffic modelling of this area challenging. Models prepared by multiple parties are likely to differ slightly given the range and extent of assumptions needing inclusion. However, Main Roads modelling to date has taken a realistic view of future development based on advice from all parties providing what is believed to be a reasonable estimate of future traffic. Further detailed modelling will refine assumptions as more information becomes available.

Land Use

Section 3.6 discusses current and future land use highlighting that in the short to medium-term, intense land uses will be located on both sides of Vittoria Road near Forrest Highway. The image below identifies current land zoning where Service Commercial land uses typically generate significant traffic demands (examples include Bunbury Farmers Market, Bunbury Homemaker Centre and commercial businesses lining Sandridge Road).



Figure 54 – Forrest Highway to Jeffrey Road Zoning

Traffic modelling discussed above identifies that if the existing Vittoria Road intersection remains the primary Glen Iris access, in the short-term, significant intersection upgrades will be required at Vittoria Rd/Forrest Hwy and Vittoria Road itself ultimately requires a 4-lane road carrying more than 20,000vpd. Accommodating a 4-lane road will require widening of the existing reserve expected to impact land to the west of Vittoria Road (north of Jeffrey Road). It is also noted multiple services will need accommodation in the road further widening land requirements. The approach to achieving a 4-lane road south of Jeffrey Road is not clear but would result in significant land impacts. Accommodating road infrastructure of this scale is likely to impact the amenity and function of the area, particularly north of Jeffrey Road when intense land use is proposed and the most significant traffic volumes are anticipated. Implications of a road between service commercial developments and a school includes pedestrian movement and safety challenges (including difficulty crossing 4-lanes and providing adequate median width for cyclists and prams), school access within the 40km/h zone, school and PTA buses stopping/navigating the area, challenges accessing current land uses and future development west of Vittoria Road, and general Glen Iris traffic needing to pass through a congested area (travel to/from home).

The Department of Planning, Lands and Heritage (DPLH) document “Liveable Neighbourhoods 2009” (and Draft Liveable Neighbourhoods 2015) highlights the desirable balance between “Movement” and “Place” where the purpose of these documents involves:

*“Liveable Neighbourhoods is a Western Australian Planning Commission (WAPC) operational policy that guides the structure planning and subdivision for greenfield and large brownfield (urban infill) sites.”*

This document highlights the desire to separate roads intended to carry large volumes of traffic (providing the “Movement” function) from areas intended for people to effectively use available spaces and create a sense of community (a sense of “Place”). The creation of a sense of place central to Glen Iris and aligned with a range of services and suitable land uses appears challenging where a busy and aggressive 4-lane road separates the activity centre, particularly given this includes an adjacent school. Liveable Neighbourhoods, Fact Sheet 4 is included in **Appendix 4** and provides examples how “Movement” and “Place” can be effectively managed. The Fact Sheet illustrates potential land use and transport planning outcomes to strive for and highlights challenges to avoid through effective planning.

### Constraints

Widening of the existing Vittoria Road/Forrest Highway intersection is constrained by a range of existing services summarised in Table 1 below:

Service	Located West of Vittoria Rd	Located East of Vittoria Rd	Comments
High Pressure Gas		Yes	Major Constraint
Medium Pressure Gas	Yes	Yes	Crosses Vittoria Rd within intersection – Major Constraint
Underground Drainage	Yes	Yes	Throughout intersection
Open Drainage	Yes		Large open drain to west along Forrest Hwy
Optic Fibre/NBN	Yes		Copper and Optic Fibre
Aquest Water Pipes	Yes		
Water Corp Pipes		Yes	
Western Power	Yes	Yes	Underground and overhead
Road Lighting	Yes	Yes	
Traffic Signals	Yes	Yes	Underground wires, fibre, control box, poles

Table 1 – Existing Vittoria Road and Forrest Highway Services

Extensive services are located within and surrounding the intersection including medium and high-pressure gas on both sides of Vittoria Road. Protection/relocation of gas services is typically expensive (relocation of the same gas service at Vittoria Road/South Western Highway is estimated to cost in the order of \$1,000,000).

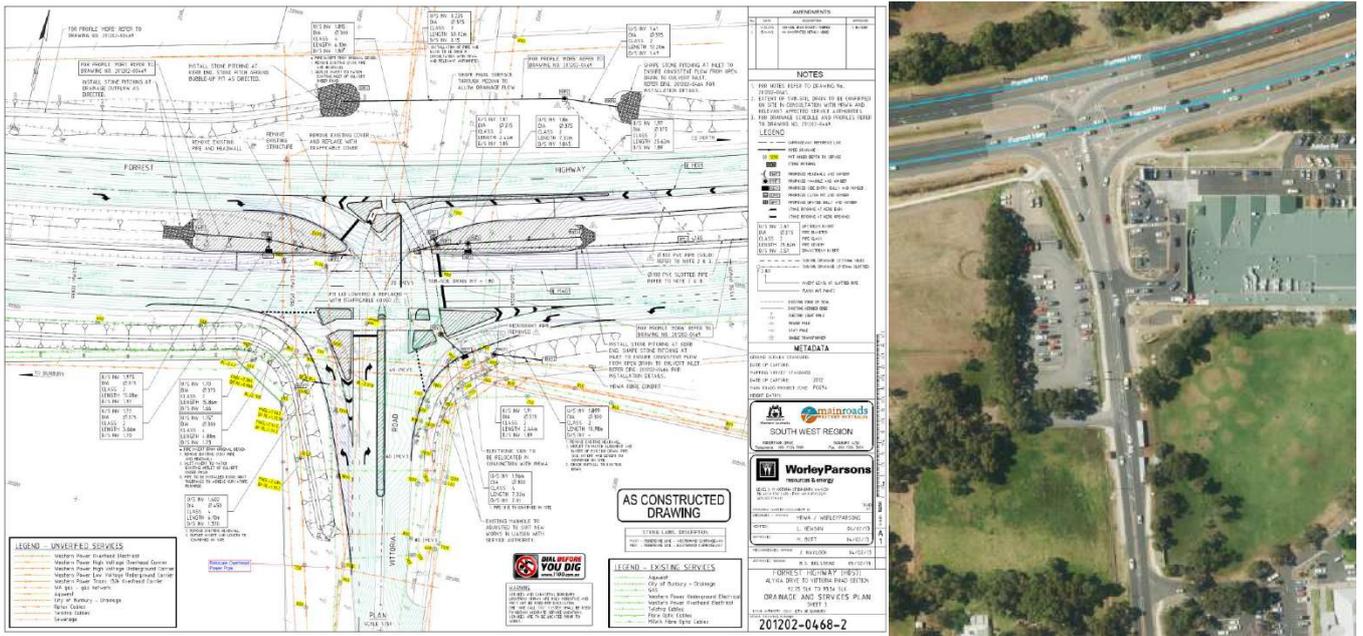


Figure 55 – Summary of General Vittoria Road Service and Constraints

In addition to constraints, major upgrades and widening of the intersection is anticipated to be expensive and complex given the range of challenges, including:

- Working under traffic at a busy and constrained intersection (refer sections 2.3.3 and 3.3.7).
- Maintaining traffic access from the Forrest Highway (to Glen Iris), to Bunbury Farmers Market during construction, including at peak periods.
- Maintaining access during construction for school traffic and buses (including adjacent bus stops).
- Managing pedestrian movements throughout the site associated with the school, bus stops and the Bunbury Farmers Market during construction.

Section 3.5 details a crash assessment of the existing intersection where two Killer or Seriously Injured crash types have been experienced in the last 5 years, at the intersection of Vittoria Road and Forrest Highway

Vittoria Rd

Details regarding Vittoria Road and its interactions with adjacent land uses is detailed above.

### Upgrade Options and Potential Costs

Managing traffic during construction appears challenging and likely resulting in prolonged and slow construction processes. As a result of the constraints and challenges, a minor widening of the intersection is expected to be expensive where initial estimates to provide an additional lane on the Vittoria Road leg of the intersection is in the order of \$10-12m. These improvements come close to addressing 2031 road capacity requirements, however, will likely result in pedestrian and safety challenges that required further consideration (particularly where new development is proposed). Further intersection upgrades to satisfy medium and long-term traffic are likely to be significantly more expensive. The need to widen Vittoria Road to 4-lanes south of the Forrest Highway intersection would be in addition to the required works detailed above.

It is anticipated short to medium-term costs to upgrade the intersection may be approximately 60-70% of the cost to establish a new unconstrained intersection to the west (refer Section 5.5.1.5). A significant proportion of the costs associated with existing intersection involves service protection and relocation, management of traffic and building infrastructure within a highly constrained area whilst maintaining business access to the BFM.

### Existing Vittoria Road (Accessing Forrest Highway) - Summary

Upgrades to the existing Vittoria Road/Forrest Highway intersection may be possible to provide the required medium-term intersection capacity, however, achieving long-term capacity appears challenging given the following:

- Existing and proposed access near Forest Highway will continue to constrain intersection capacity and result in queuing back around Forrest Highway. Future traffic growth will compound this problem.
- Management of high traffic volumes and growing pedestrian movements associated with a school and adjacent commercial development is likely to result in a range of safety, amenity, and access challenges.
- Upgrade solutions may not be value for money and may last 10-15 years (depending on development timing). Long-term upgrades are anticipated to come at additional cost, are expensive and complex. Moderate upgrades to the intersection will have significant impacts to services and land with resulting high upfront costs.
- Solutions relying on the existing intersection appear less consistent with Liveable Neighbourhoods than other potential options with the intent to achieve a sense of “Place” for the Glen Iris community. A focus on Vittoria Road may detract from the intent of the Glen Iris District Structure Plan.
- Access to the broader Glen Iris area is centrally provided, however will need to pass through a 40km/h school zone as well as a busy and congested area where a KSI crash history exists.

#### **5.5.1.5. Additional Northern Access (with Forrest Highway)**

Given the range of challenges associated with the existing Vittoria Road/Forrest Highway intersection, alternative options to access Forrest Highway have been assessed. Early in this process, it was observed that an existing “floodway” area is located approximately 200m west of the Vittoria Road intersection where this land is owned by the State. As a result, an opportunity to establish an alternative access to the north that is not heavily constrained by services, avoids adjacent business access and would draw future traffic pressures away from the focal point of Glen Iris and a school may be possible. Provision of an additional northern access may assist to manage future pedestrian movements and safety if future Glen Iris traffic was transferred away from already busy areas.

If a new access were established, the existing Vittoria Road connection to Forrest Highway should either be closed or become left-in/left-out only or become fully closed. Locating two signalised intersection within 200m on a busy 6-lane highway is highly undesirable from an efficiency and operation perspective. However, consultation confirmed that closure/reduction of access to the existing intersection is not currently possible given an established business relies on this access for passing trade. Whilst this is not desirable for the performance of the Forrest Highway and may impact long-term operation of this road servicing Greater Bunbury, options assessment has been undertaken based on this assumption in the short and medium-term. As a result, the following assessments assume the existing intersection layout remains full movement (unchanged) and where there is a need for the signals/phasing to be coordinated with an additional full movement access.

Wherever a new road/intersection is proposed, impacts to landholders and other residents will always result. As a result, assessment of the viability, potential impacts and planning implications of a potential access requires consideration and are summarised as follows:

**Strategic Traffic Modelling**

Strategic modelling confirms as Greater Bunbury grows, traffic on Forrest and South Western Highways grows significantly due to increasing land use throughout the metropolitan area (refer Section 5.2). Long-term traffic on Forrest Highway (assuming Estuary Drive remains connected) suggests volumes between 60,000vpd and 70,000vpd interacting with Vittoria Road traffic projected to be around 20,000vpd Traffic numbers of this scale justify an interchange (bridging) which is not possible at this location (refer Section 5.1). The resulting at-grade intersection will need to be large and efficient, provide multiple lanes and is expected to be very busy. Options utilising a new access/intersection 200m west of Vittoria Road require assessment to provide a safe and effective interim and long-term solution.

The Bunbury Traffic Model (BTM), being a strategic model is not as effective at assessing details as it is assessing overall network volumes and likely pressure areas. As a result, the strategic model has limited use assessing an adjacent link to Vittoria Road. As a result, for the purpose of analysis, similar traffic volumes to that modelled on Vittoria Road have been assumed to transfer to a new access to ensure any new intersection can cope with the worst-case long-term traffic that may utilise it. Modelled traffic volumes are summarised below.

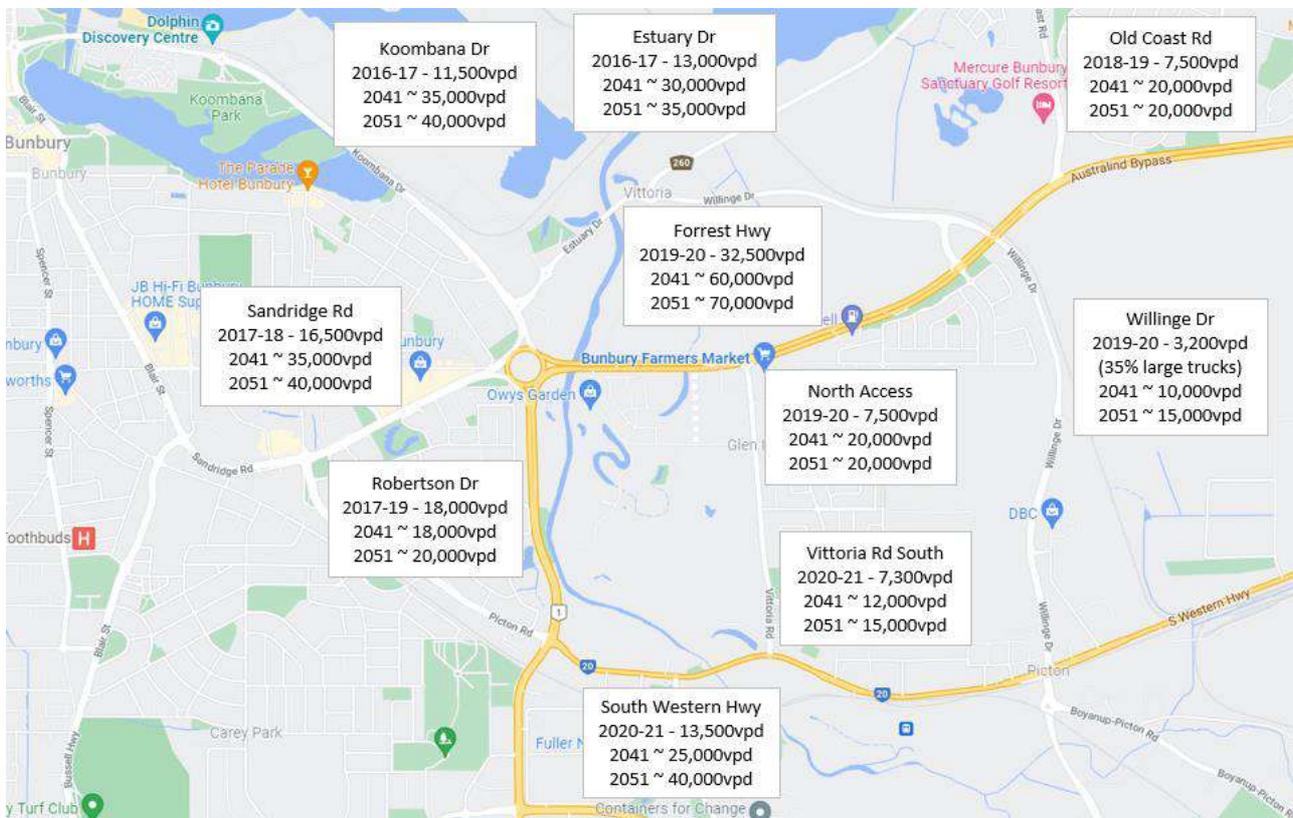


Figure 56 – Forecast 2041 and 2051+ Traffic – Additional Northern Connection

Typically, traffic volumes around 20,000vpd require a 4-lane road to provide the necessary capacity and safety where subject to land impacts, a new access could provide this with greater flexibility than other options. However, access for the school, BFM and into the Service Commercial area will require further assessment.

**Detailed Traffic Modelling**

Detailed traffic modelling was undertaken during 2020 and 2021, with a focus to understand the capacity and upgrade options of the existing Vittoria Road/Forrest Highway Intersection and an additional access to the west. **Appendix 3** includes further details in the **Traffic Assessment Report**. Details regarding traffic volume assumptions within this modelling are included in Detailed Traffic Modelling Section 5.5.1.4 above. Predicted 2031 traffic demands for the northern access to Glen Iris are around 70% of ultimate traffic based on full Glen Iris development.

Modelling scenarios for the existing Vittoria Road intersection networked with a new intersection linked to the west were undertaken using the 2031 traffic including the following where the intent was to identify first stage (minimum) new intersection requirements and to confirm if the existing Vittoria Road intersection could perform adequately (in

parallel) based on the existing layout (with no improvements). The following modelling scenarios were tested:

Scenario 3: (Existing Vittoria Intersection, Amended BFM Access/Carpark and New Intersection – Simplified Distribution)

- A traffic demand scenario was based on a simplified re-distribution of traffic with a new western access to Glen Iris and the existing intersection. At the calibration stage of assessment, it was determined this approach was over simplified and doesn't adequately represent realistic future modelling outcomes. As a result, modelling of Scenario 3 with a simplified traffic distribution was abandoned and not adopted.

Scenario 4: (Existing Vittoria Intersection, Amended BFM Access/Carpark and New Intersection Fully Networked)

- Forrest Hwy / Vittoria Rd – Existing Layout (2031).
- Forrest Hwy / New Intersection – Proposed First Stage Layout (2-lane road with single auxiliary turn lanes)
- BFM Entrance – Left-in, Left-out and Right-in only, Refined BFM Internal Parking (2031).
- Proposed Service Commercial Development Access (2031) – Left in-Left out access (LILO).
- Roundabout at the school access on Vittoria Rd providing access for the school, additional access to the Service Commercial development and a potential link with a proposed new intersection to the west (2031).

Modelling of Scenario 4 indicates that an additional intersection working in parallel to the existing, whilst not desirable for the performance of the Forrest Highway will relieve pressure on Vittoria Road and the existing intersection with Forrest Highway. With a redistribution of traffic in 2031 predicted by Scenario 4, the existing Vittoria Road intersection operates favourably during the midday peak and in the AM peak period. In the PM peak period, the intersection is expected to continue operating near capacity where the Degree of Saturation exceeds 0.90, suggesting a Level of Service "E" for several key intersection movements (refer **Appendix 3**). Ideally as the existing intersection approaches capacity, traffic may choose to avoid the area, instead utilising the new, unconstrained intersection to the west easing pressure at the existing location. Ideally the right turn movements would be restricted at the existing intersection to optimise traffic flows and better manage congestion around Vittoria Road and Forrest Highway, however currently, this is not possible. Ongoing engagement with key businesses should continue to explore effective ways to manage congestion queuing and safety in the future. This includes where future traffic congestion impacts the operation of Forrest Highway as suggested by this traffic modelling and observed on occasion at the site.

Further detailed modelling of the Forrest Highway, Glen Iris connections, Eelup Roundabout and Thompson Road/Alyxia Drive are proposed as part of ongoing technical assessments and subject to final outcomes of the Glen Iris District Structure Plan process. However, based on similar intersections in Perth where significant traffic interacts, it is anticipated a multi-lane connection with Forrest Highway will be better placed to accommodate long-term traffic demands accessing Glen Iris from Forrest Highway. It should also be noted that given grade separation is not possible in this location, any large and efficient at-grade intersection accommodating very high traffic volumes will ultimately experience congestion and delays if those traffic numbers are realised (eg Glen Iris and Greater Bunbury realise their full development potential).

All traffic models tested assume internal improvements are made to the Bunbury Farmers Market car park to reduce queuing onto Vittoria Road (given existing challenges). If the improvements assumed in the Main Roads modelling are not implemented, congestion will be greater than that modelled in Scenario 4. However, there are a range of assumptions that will influence these outcomes in practice including; 1) the impact of BORR on Forrest Highway peak traffic, 2) the impact of BORR on traffic wishing to access Bunbury Farmers Market, 3) how Bunbury Farmers Market manage staff and/or overflow parking in the medium and long-term, particularly if the area opposite is developed (and is no longer available to BFM), 4) whether pedestrian movements around the intersection remain, reduce, increase or otherwise change in the future, 5) what impact improvements to the Vittoria Road/South Wester Highway intersection will have on traffic distribution at Forrest Highway, and 6) whether Bunbury Farmers Market opens another store and whether that influences (reduces) traffic demands at the existing site during peak periods.

Land Use

Section 3.6 discusses current and future land use highlighting that in the short to medium-term, intense land uses will be located on both sides of Vittoria Road near Forrest Highway. Figure 57 below identifies current land zoning where Service Commercial land uses typically generate significant traffic demands (eg Bunbury Farmers Market, Bunbury Homemaker Centre and commercial businesses lining Sandridge Road).



Figure 57 – Forrest Highway to Jeffrey Road Zoning

Several options have been considered for long-term access to Glen Iris including:

- Option 1 – Upgrades to the existing Vittoria Road (detailed in Section 5.5.1.4 above)
- Option 2 – An additional northern access fully within the floodway system (land owned by the State)
- Option 3 – An additional northern access partly within the floodway and partly within privately owned land (zoned Service Commercial)

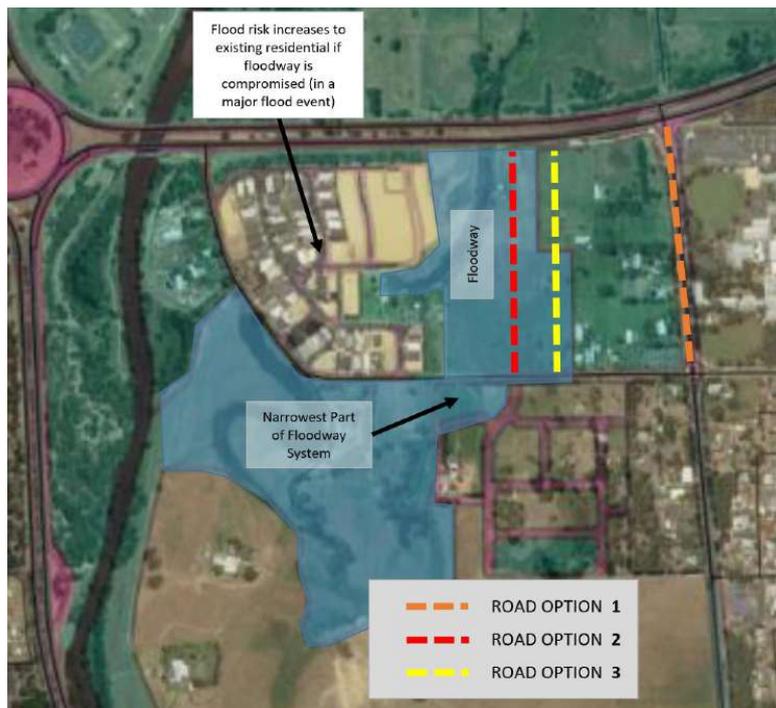


Figure 58 – Northern Access Options Considered

Details in relation to the floodway constraints are covered below in the “Constraints” section.

The above traffic modelling confirms providing an additional 4-lane northern access would avoid widening of the existing Vittoria Road reserve and intersection with Forrest Highway ensuring that long-term pressure on Vittoria Road is reduced. However, providing an additional access would effectively transfer most impacts to another location that otherwise wouldn't experience large increases in traffic. In relation to land use, these impacts could be transferred to areas less developed than surrounding the existing Vittoria Road corridor and appear to impact land proposed for future development. It should be noted several residential properties may be impacted by an additional northern access and its connection to Jeffrey Road requiring further engagement with residents. The most impacted of these property owners have already provided input with further opportunity during the Glen Iris District Structure Plan advertising process.

Accommodating road infrastructure of this scale away from the community focal area surrounding Vittoria Road has the potential to improve amenity and function of the area, particularly north of Jeffrey Road. Removing a major local route from between service commercial developments and a school could provide greater opportunity for pedestrian movement, promoting a quieter area surrounding a Neighbourhood Centre and improving overall safety and amenity, where (for example) wider useable verges, wider medians, and 2-lane road could be accommodated. This arrangement may compliment the school access and aligns with the 40km/h zone, school and PTA buses stopping/navigating the area. However, it should be noted the scale of development proposed to the west of Vittoria Road is likely to attract significant traffic which may be easier to manage with the main “Movement” function separated to the west.

The section on page 59 (above) explains the objectives of the Department of Planning, Lands and Heritage (DPLH) document “Liveable Neighbourhoods 2009” (and Draft Liveable Neighbourhoods 2015). The creation of a sense of place for Glen Iris including a range of services and suitable land uses appears more aligned with maintaining a 2-lane road along Vittoria Road (past the proposed Activity Centre), particularly given this includes an adjacent school. Providing the “Movement” function separate to this area and surrounded by a floodway has the potential to minimise pedestrian desire lines across the “Movement” link while better connecting the main activity centre and school across a low order local road (albeit busy given surrounding land uses). Liveable Neighbourhoods, Fact Sheet 4 is included in **Appendix 4**.

Constraints

T establishment of a potential additional northern access is constrained by the Preston River relief floodway located west of land zoned Service Commercial. The image below identifies the floodway area and other surrounding features:



Figure 59 – Existing Land Uses – Preston River Floodway Relief

Given land north of Jeffrey Road and impacted by the floodway is primarily owned by the State, initial investigations highlighted an additional northern access footprint located in this land would have the least impact on landholders. However, given the floodway’s importance, technical assessments of the floodway function, capacity and potential impacts of a road interacting with it requires assessment to ensure any existing flood risks within Glen Iris are appropriately managed and not made worse. The image below identifies Option 2 (red dashed line) where ideally an additional northern access would be located.

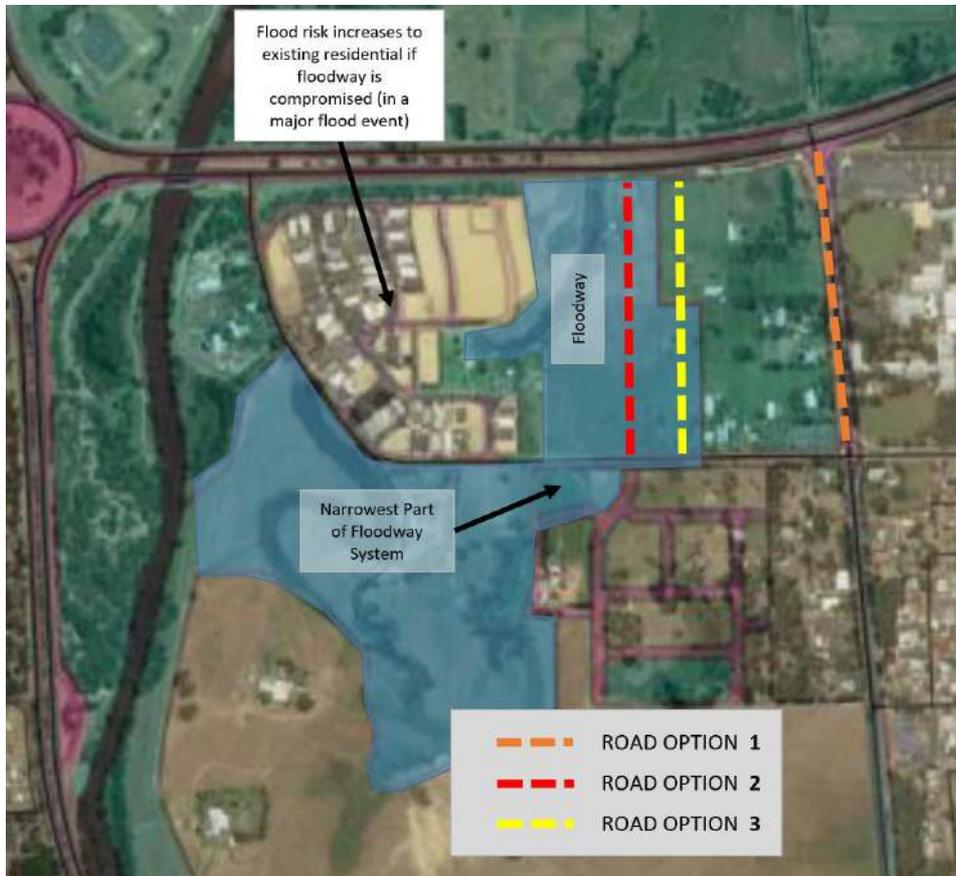


Figure 60 – Northern Access Options Considered

Advisian was engaged to undertake floodway modelling assessments given their past involvement in modelling for several Glen Iris land holders and Southern Ports as part of potential Bunbury Port development. During these assessments, it was confirmed the purpose of the Special Control Area (floodway relief for the Lower Preston River) identified in the City of Bunbury’s Local Planning Scheme is:

*“To minimise the potential for flood damage resulting from decisions relating to land use and development on defined river floodplains.”*

In addition, the objectives of the Special Control Area are:

- (a) To identify land within the Scheme area at risk of being affected by flooding consistent with the Greater Bunbury Region Scheme – Floodplain Management Policy.*
- (b) To assist in the protection of life, property, and community infrastructure from flood hazard.*
- (c) To assist the natural flood carrying capacity of floodplains by enduring any use or development maintains the free passage and temporary storage of flood waters, and*
- (d) To protect water quality and waterways as natural resources in accordance with Statement of Planning Policy No.*

To assess the worst-case flood event and therefore appropriately manage flood risks, the modelling assumed a breach in the Preston River eastern levee bank, upstream of Forrest Highway, resulting in breakout flows from the 1% Annual Exceedance Probability (AEP) event (100-year flood) to pass through this area, including via the Glen Iris relief floodway. This scenario was test with existing and future sea level rise assumptions.

Floodway modelling established that provision of a road link fully within the floodway relief area (Option 2 in Figure 60 above) would increase flood impacts to surrounding areas in the tested flood event and, increasing flood risks to existing residential properties. Assessment in consultation with DWER confirmed this is not unacceptable). Discussion at the time also considered options to provide a road at floodway-level height to avoid impacting the floodway operation, however this scenario was not considered viable given the need for road drainage and other infrastructure associated with a major 4-lane road and intersection with Forrest Highway, including signage, lighting, traffic islands and traffic signals (traffic lights). As a result, road access options fully within the floodway relief area were confirmed as not viable.

A potential road access corridor was adjusted east and re-tested until the point was found where a raised 4-lane road and intersection with Forest Highway would not impact the flood performance for the tested event. Figure 60 above includes Option 3 (yellow dashed line) identifying the approximate location where flood impacts can be managed. Figure 61 below highlights the location and layout of a road footprint that is located within the floodway in the southern extent, however, impacts privately owned land adjacent to Forrest Highway to the north. Floodway modelling confirmed these private land impacts cannot be avoided based on an additional northern access west of the existing Vittoria Road intersection. Impacts require further consideration and engagement with the landholder.



Figure 61 – Footprint of Road Option that Maintains Floodway Performance

To achieve this outcome, several key features of this options are critical, including:

- The western edge of the road embankment cannot move further west without further detailed floodway model assessment. To balance floodway objectives and minimise land impacts, the road median width has been limited where ideally storage of cross vehicle movements should be avoided (subject to any potential Local Link Road connection and discussed further in “Vittoria Road and Other Connections” below).
- A proposed roundabout can be accommodated at the intersection with Jeffrey Road; however, the western leg of the roundabout must be constructed as a floodway to maintain hydraulic performance.
- A mound within the central portion of the relief floodway (between Jeffrey Road and Forrest Highway) requires flattening to optimise floodway performance. It’s assumed implementation would be at the time access road construction (required to counter-balance the road partially placed within the floodway).

A further option was investigated involving increasing the box-culvert capacity under the Forrest Highway to improve floodway performance, however while technically feasible, initial estimates of cost to achieve this, (management of traffic, major drainage works under a 6-lane highway) were deemed high significant and not cost effective. If further floodway improvement is required, other options including Preston River levee bank improvements should be considered if major investment is warranted. As a result, increasing culvert capacity under Forrest Highway is not considered viable (or necessary) at this stage based on the road configuration tested.

These assessments also confirmed that an additional northern access partially interacting with the Preston River floodway relief is feasible as identified in Figure 61 above.

Existing services likely impacted by an additional northern access with Forrest Highway are anticipated to include the following in Table 2:

Service	Located at Forrest Hwy	Located at Jeffrey Rd	Comments
High Pressure Gas			
Medium Pressure Gas			
Underground Drainage			
Open Drainage	Yes	Yes	Works within and around the floodway. Large open drain along Forrest Hwy
Optic Fibre/NBN	Yes	Yes	
Aquest Water Pipes		Yes	
Water Corp Pipes			
Western Power	Yes	Yes	Underground and overhead
Road Lighting			
Traffic Signals			

Table 2 – Additional Access (West of Vittoria Road) Services

There are several services located adjacent to Forrest Highway and Jeffrey Road, however, initial assessment of impacts appears manageable. A large open drain along the southern edge of Forrest Highway would require relocation resulting in significant land impacts. An alternative to relocation is piping with box culverts, however this would require the addition of detention basins at each end to compensate for the loss of storage in the large open drain system. For the purposes of the DSP land use, the installation of culverts and detention basins has been assumed.

In addition to constraints, constructing a major intersection with Forrest Highway is anticipated to be expensive and complex given the range of challenges, with the following to be further considered:

- Working under traffic interfacing with a busy multi-lane highway. It is noted most of the work is in a greenfield area (undeveloped paddocks), however connections with Forrest Highway will require management of high volumes of traffic. Connection with Jeffrey Road will require management of local traffic during construction.
- Constructing a road and intersections adjacent to a floodway will increase challenges and costs.
- Maintaining traffic access to Glen Iris will be via the existing Vittoria Road intersection ensuring access to the area is maintained during construction.
- Maintaining access to the school, buses/bus stops and adjacent businesses including the successful Bunbury Farmers Market will be maintained via Vittoria Road.
- Managing pedestrian movements throughout the site associated with the school, bus stops and the Bunbury Farmers Market will be maintained via Vittoria Road.

Vittoria Rd and Other Connections

Further to above, provision of an additional northern access to Forrest Highway has the potential to relieve pressure on the existing Vittoria Road and intersection. Ideally, right turn movements at the existing Vittoria Road/Forrest Highway intersection should be restricted, further relieving pressure on the intersection, link and potentially reducing the likelihood of queuing around the intersection. It is also noted restricting right turn movements at the Vittoria Road/Forrest Highway intersection is not currently possible (noted above).

The Activity Centre area (including the proposed Neighbourhood Centre) would benefit from an additional local road between a 4-lane access with Forrest Highway and Vittoria Road (2-lane). A potential local link road is identified below (white dashed link) in Figure 62 below. Provision of a local link road may provide benefits in improving local traffic distribution within and surrounding the Activity Centre, providing an alternative access to the school and in reducing traffic pressures past the school and more generally on Vittoria Road by providing a more direct access to the Activity Centre from a 4-lane access with Forrest Highway Improving this access may promote traffic to use an access west of Vittoria Road.

However, should this local link road be considered, the intersection with Forrest Highway access (shown in yellow below) is constrained given centre median storage is limited. The reasons for this include:

- Limiting privately owned land impacts.
- Managing floodway impacts.
- A local road intersection manages safety and access with a Forrest Hwy access intended to carry large volumes of traffic.

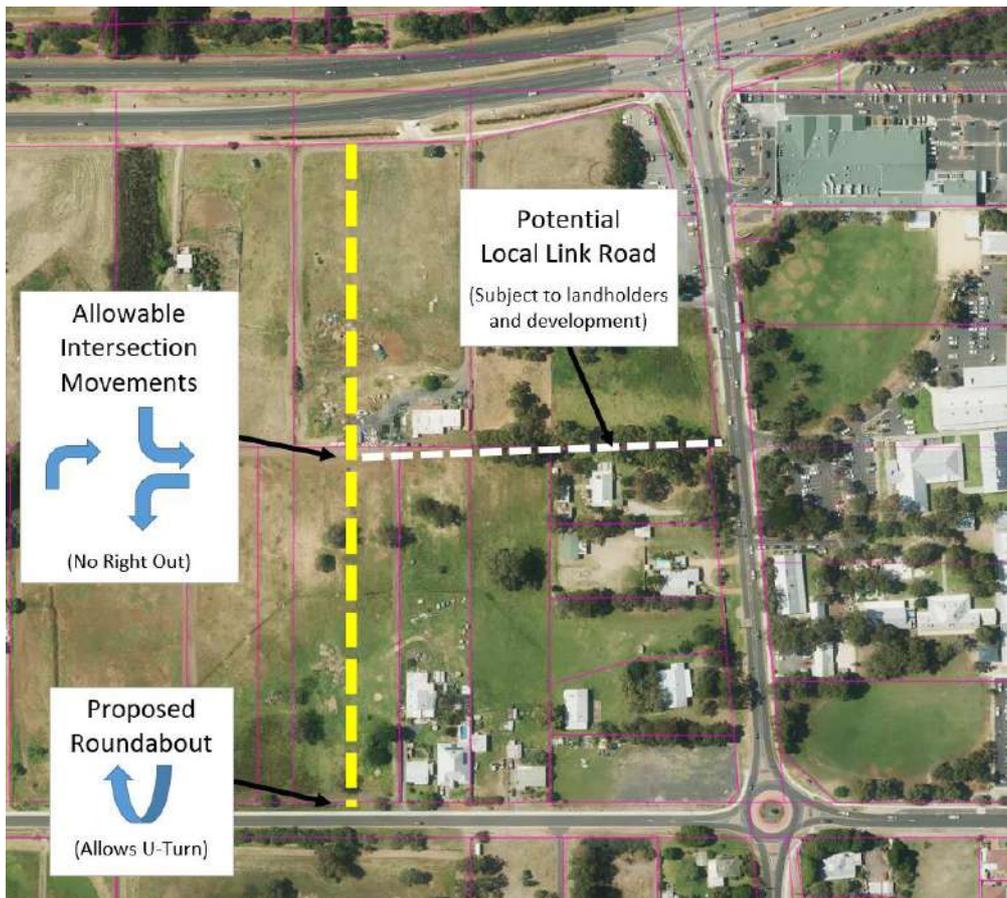


Figure 62 – Potential Local Link Road – Allowable Intersection Movements

As a result, movements to be provided at this intersection are shown above (subject to further detailed assessment), including left-in, left-out and right-in. The right-out movement (white link to yellow road movement) is not provided for, however a Jeffrey Road roundabout 180m to the south provides opportunity for a left-out and U-turn back to Forrest Highway. The image includes a potential local link road corridor and the intersection with a Forrest Hwy access. It should be noted, any local link road identified above is subject to further detailed planning and landholder involvement.

A potential 'interim driveway' to the western boundary of Lot 18, Forrest Highway may be required to maintain legal access to this property should an additional intersection be provided with Forrest Highway (obliterating the current Lot 18 legal access with Forrest Highway). If required, the 'interim driveway' is to be as far south as possible and as agreed with Main Roads WA. This driveway can remain in place until a Local Link Road is in place, at which time the 'interim driveway' will be removed and access to Lot 18 will be via the local road. No other driveway or intersection access will be permitted to the additional northern access (identified in yellow in Figure 62 above) to ensure this proposed access for Glen Iris remains effective in the long-term as traffic pressures increase substantially.

### Upgrade Options and Potential Costs

Impacts to landholders intersected by a potential new Forrest Highway access is a key constraint that requires further consultation with those most impacted. Efforts to avoid land impacts have been made. Where impacts are unavoidable, further efforts have been made to minimise them as far as possible.

Managing traffic during construction appears challenging with Forrest Highway, however other areas are largely with a greenfield site where construction issues appear manageable. Work on or adjacent to the highway will require detailed traffic management. Technical challenges of building within the floodway are likely, however modelling confirms these issues and potential floodway impacts are manageable. Most pedestrian movements are focused on Vittoria Road ensuring separation of major movements from an additional northern access. Land use abutting the corridor to the west is floodway with a relatively an area of residential further west ensuring pedestrian movements around and across a potential 4-lane road is relatively minor.

Initial estimates suggest construction of a 2-lane staged additional northern access, Forrest Highway intersection and a link to Jeffrey Road are in the order of \$15 - \$20m and would provide for traffic growth past 2031. A new access can be more easily designed to efficiently provide for further upgrades of additional traffic lanes in a cost-effective way (when warranted). Initial estimates suggest establishing an additional access with Forrest Highway is around 30-40% more costly than upgrading the existing Vittoria Road/Forrest highway intersection (anticipated to approach capacity around 2031 and require expensive further expansion in the future). Refer Section 5.5.1.4 for further details.

### Additional Northern Access (with Forrest Highway) - Summary

Establishment of an additional northern access with Forrest Highway approximately 200m west of Vittoria Road appears viable to provide the required medium and long-term intersection capacity for Glen Iris. Key opportunities and challenges include:

- Results in privately owned land impacts requiring further discussion and negotiation with those most impacted should this solution be adopted.
- An additional access is unconstrained and provides significant capacity and safety benefits while minimising the risk of further queuing from Vittoria Road onto Forrest Highway.
- Management of high traffic volumes and growing pedestrian movements associated with a school and adjacent commercial development can be separated from general Glen Iris traffic, where traffic growth should be encouraged through the additional intersection. It is noted traffic destined for Bunbury Farmers Market is likely to continue using the existing intersection where some of the existing intersection challenges may remain.
- Establishment costs appear to provide value for money and cater for traffic well past 2031. Staging and long-term upgrades of an additional access appear relatively simple and cost effective (improvements to be implemented when needed). Impacts to surrounding services appears manageable.
- In the long-term, the existing Vittoria Road intersection with Forrest Highway is proposed to become left-in and left-out only with Forrest Highway, subject to stakeholder consultation with an existing adjacent business. Achieving this in the short and medium-term is not possible given business access reliance.
- Solutions providing an additional access with Forrest Highway catering for a significant "Movement" component appear consistent with Liveable Neighbourhoods and more aligned than other options. Creation of a sense of "Place" for the community appears to be a viable outcome with a focus on access separated from Vittoria Road having the potential to add to the intent of the Glen Iris District Structure Plan and the creation of useable spaces for the community.
- Major access to the broader Glen Iris area will be separate from a 40km/h school zone as well as a busy commercial area.

### 5.5.2. Western Option Assessment (Accessing Robertson Drive)

Long-term traffic growth on Forrest and South Western Highways, as well as future growth within Glen Iris highlights the benefits of providing improved traffic distribution and is likely to provide a range of community and safety benefits as well as ensure the area remains accessible in the future. Further to Section 5.3.2, an additional western access with Robertson Drive appears feasible and subject to further consideration.

Whilst options to improve access to the north have the potential to provide increases in capacity and safety, an additional western access provides greater future flexibility to accommodate a range of land use intensities as well as improve vehicle and pedestrian/active/cycling distribution. Further consideration of this is below.

#### Strategic Traffic Modelling

Strategic modelling confirms as Greater Bunbury grows, traffic on Forrest and South Western Highways grows significantly due to increasing land use throughout the metropolitan area (refer Section 5.2). Traffic growth of Robertson Drive is relatively low with moderate growth in the long-term. Figure 63 identifies the potential traffic distribution where an additional western access is provided.

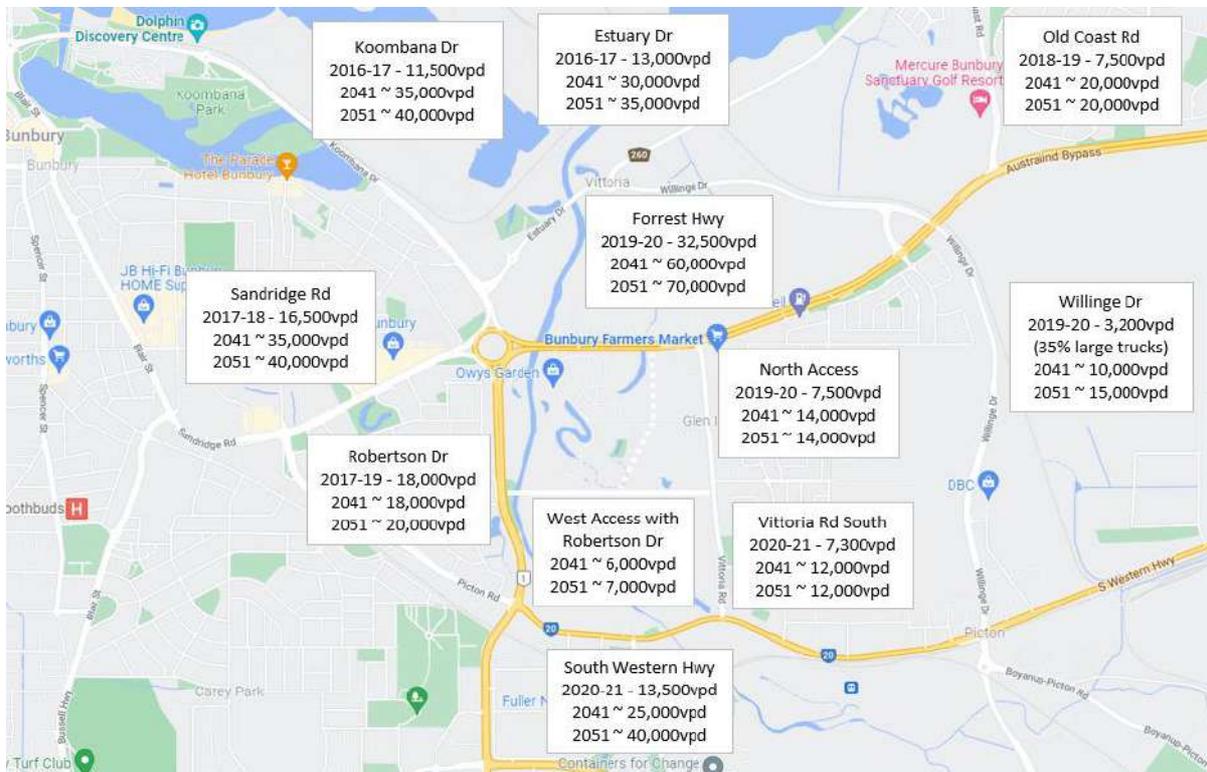


Figure 63 – Forecast 2041 and 2051+ Traffic – Additional Western Access

Modelling suggests a western access will attract around 7,000vpd, however this may depend on the delivered scale of development in the areas west of Vittoria Road. This additional access relieves pressure on other access points with a reduction in traffic to the north of around 6,000vpd, negligible reduction of traffic to the south in 2041 and a small decrease in southern traffic in 2051 (once Glen Iris and surrounding areas are fully built out). Modelling confirms an additional western access will improve traffic distribution within Glen Iris and divert some traffic away from the busy Forrest Highway intersection. This benefit is seen as desirable, benefiting the Glen Iris community and reducing reliance on Forrest Highway (under increasing pressure).

#### Land Use

Land use comprises of the Preston River, located within “Regional Open Space” and privately owned land currently zoned “Urban Development” in the City of Bunbury LPS, No 8. The general area between the Preston River and Vittoria Road is proposed for future urban development and where a Draft South Moorelands Local Structure Plan was prepared in 2010 (refer Section 3.2.10). Two existing rural-residential properties are in the area where a

western access could be viable. Feedback from these landholders confirmed their strong opposition to the establishment of any western access that impacts their properties and existing amenity. Future traffic demands and the capacity warrants for an additional western access are, at least in part driven by the scale and density of proposed land use within the Draft South Moorelands Local Structure Plan. As a result, the owners of this land (including the residential properties) have some level of control as to this scale of land use and whether a western access will be required in the long-term. However, it should be noted traffic capacity is not the only benefit of providing an additional western access for Glen Iris. Property holders and the community will have further opportunities for comment on the District Structure Plan as part of the advertising process.

### Constraints

Further to constraints detailed in Section 5.3.2, the existing Preston River is a registered Aboriginal site where a bridge over the river is expected to result in impacts. Potential bridge details and progression of this option is subject to Aboriginal heritage assessments and approvals. Environmental impact also requires consideration given likely clearing of native vegetation around the river and other potential sensitivities. Provision of a new bridge crossing over the Preston River appears costly however unavoidable if a western access is considered (noting Glen Iris constraints make all additional access challenging, impactful and costly).

Advisian was engaged to provide advice on the viability and general arrangements of a bridge structure could that be considered. **Appendix 5** includes details of this assessment confirming a potential bridge would need to span both the Preston River and levee banks (east of the River) to ensure hydraulic performance from the 1% Annual Exceedance Probability (AEP) event passes along the Preston River without impacting backwater or existing flood characteristics. This scenario was tested with existing and future sea level rise assumptions confirming a bridge is feasible. Provision of a bridge approximately 75m from Robertson Drive would require further detailed assessment to ensure road and structural/waterways requirements are resolved.

Spacing between two existing rural-residential properties measures around 140m. Given the general area is zoned Urban Deferred and is intended for future urban development, a western access between these properties appears feasible (but noting the owners opposition). The road network presented in the Draft South Moorelands Local Structure Plan appears compatible with the addition of a western access to Robertson Drive requiring some amendment. There may be other ways a western access could be connected into Glen Iris, however the river crossing and intersection location with Robertson Drive appears fixed based on a range of constraints explored in Section 5.3.2. It should be recognised, the intent of the western access is to link with the centroid of future development west of Vittoria Road to improve traffic distribution.

There are several services located along Robertson Drive as well as a drainage basin in the area, however, initial assessment of impacts to these appears manageable (refinement of the drainage basin appears possible to accommodate an intersection).

In addition to constraints, constructing a major intersection with Robertson Drive and a bridge over the Preston River is likely a long-term prospect and is anticipated to be expensive and challenging given the following:

- Working under traffic interfacing with a multi-lane highway and building a bridge will be complex. It is noted most of the work is in a greenfield area (undeveloped paddocks), however connections with Robertson Drive will require management of traffic with the river adjacent. Any potential connection through private property requires further detailed assessment and consultation, with the next step being the District Structure Plan advertising process.
- Maintaining access to Glen Iris will be via intersections with Vittoria Road and Forrest/South Western Highways.
- Maintaining access to properties and existing land uses appears manageable given the sparse existing development. Minimal pedestrian movements are likely in this area given much of it is rural land use.
- Aboriginal heritage and environmental impacts required further detailed assessment.

### Western Option Assessment (Accessing Robertson Drive) - Summary

Establishment of an additional western access with Robertson Drive appears feasible subject to subsequent processes, including Aboriginal heritage assessment. An additional western access appears to provide a range of potential long-term opportunities and challenges including:

- Results in privately owned land impacts requiring further detailed discussion with those most impacted should this solution be adopted. Existing land uses are primarily rural with future urban planned.
- An additional access provides improved traffic distribution as well as as pedestrian/cyclist and active transport opportunities.
- Establishing a bridge over the Preston River and a new intersection with Robertson Drive will come at a high cost, however provides significant improvement to the accessibility of Glen Iris.
- Impacts to surrounding services appears manageable.
- A western access for the Glen Iris area will draw some traffic pressures away for the busy Forrest Highway as well as relieve long-term pressures around schools located in the north and south and assessed from Vittoria Road (including 40km/h school zones).

### **5.5.3. Eastern Option Assessment (Accessing Willinge Drive)**

Long-term traffic growth on Forrest and South Western Highways, as well as future growth within Glen Iris highlights the benefits of providing improved traffic distribution within Glen Iris. Further to Section 5.3.4, an additional eastern access with Willinge Drive appears feasible and subject to further consideration as detailed below.

#### Strategic Traffic Modelling

Strategic modelling suggests the addition of an eastern access with Willinge Drive (extension of Woodley Road as detailed in Section 5.3.4) will attract around 2,000vpd indicating an eastern access provides limited traffic distribution benefit. In addition, linking Woodley Road, being a residential street, local traffic and potentially pedestrians/cyclists with a strategic freight corridor is anticipated to result in undesirable outcomes and potentially drawing in external traffic into Glen Iris. The potential for rat-running is also possible if an eastern access were in place linking to a western access to Robertson Drive.

#### Land Use

Land to the east of Vittoria Road comprises existing residential and direct property access along Woodley Road. Land further to the east is zoned “Urban Development” and “Regional Open Space” in the City of Bunbury LPS, No 8. Areas surrounding the Regional Open Space hold environmental value, extensive native vegetation, some areas are low lying and drainage is a key consideration. A “Lodged” Aboriginal site is located in this area. Land adjacent to Willinge Drive in the surrounding area (to the south and east) is zoned “Light Industrial, “Industrial Development” and “Service Commercial” in the LSP. Providing a link between a residential area, heavy freight corridor and land zoned for industrial and commercial uses is likely to encourage a challenging traffic mix for both the existing residential precinct within Glen Iris and land uses/roads more aligned with industry and heavy freight.

#### Constraints

Several services are located along Willinge Drive, however, impacts to these appear manageable. Woodley Road is a residential street with multiple direct property access and other local road intersections. Directing a mix of external/industrial traffic along this route (albeit relatively small volumes) will result in challenges associated with safety, amenity, and an undesirable traffic mix.

In the past, Main Roads has prepared concept options for a future intersection of Woodley Road and Willinge Drive confirming that an intersection is feasible. However, the intent of this connection was to service future development/industrial land uses surrounding Willinge Drive rather than providing a continuous connection with residential areas within Glen Iris. Further consideration of access along Willinge Drive will be the subject of assessment as part of the Glen Iris Stage 2 District Structure Planning process.

Eastern Option Assessment (Accessing Willinge Drive) - Summary

Establishment of an additional eastern access with Willinge Drive whilst feasible, will result in a range of outcomes, including:

- Provides minimal benefits in traffic distribution for Glen Iris.
- Is anticipated to encourage a mix of residential, industrial and commercial traffic onto Woodley Road, being a residential street resulting in safety and amenity implications.
- Is anticipated to encourage residential traffic, pedestrians and cyclists onto Willinge Drive, where this link is a major freight corridor to Bunbury Port. A continuous connection with Glen Iris may undermine safety and freight efficiency on this strategic port road.
- Impacts to surrounding services appears manageable.
- Access to Willinge Drive will be the subject of assessment as part of the Glen iris Stage 2 District Structure Planning process.

Further to above, it appears possible to maintain the built form of Woodley Road, the surrounding residential community whilst servicing industrial and commercial land uses along Willinge Drive through the provision of an eastern road that is severed. Severing this link will ensure that residential and industrial traffic do not unnecessarily mix.

Assessments in Section 5.5.2 (Western Access Assessment) confirm that an additional western access with Robertson Drive provides adequate long-term traffic distribution and flexibility to cater for a range of land use intensities within Glen Iris. As a result, it is recommended that the following network be adopted where there is no continuous link between Glen Iris and Willinge Drive. Severing this link appears to maintain suitable access for the Glen Iris District Structure Plan Stage 1 area and where access to Willinge Drive for commercial and industrial related traffic will be further considered as part of Stage 2 assessments.



Figure 64 – Woodley Road Arrangement (Not Continuously Connected with Willinge Drive)

### 5.5.4. Pedestrian/Cycling and Active Transport Network

Further to Sections 5.5.1 to 5.5.3 (above), pedestrian and active transport network opportunities may be further considered and coordinated with broader cycling and pedestrian movement strategies as detailed in the image below and highlighted with dashed green arrows.



Figure 65 – Pedestrian and Cycle (Active) Transport Network

#### Forrest Highway

The existing crossing of Forrest Highway and Vittoria Road intersection is represented in the image below, where there is currently no signal controlled crossing of the east-bound lanes on Forrest Highway, shown in red (east-bound traffic bypasses the traffic signals). Traffic signals control other critical pedestrian crossing movements.

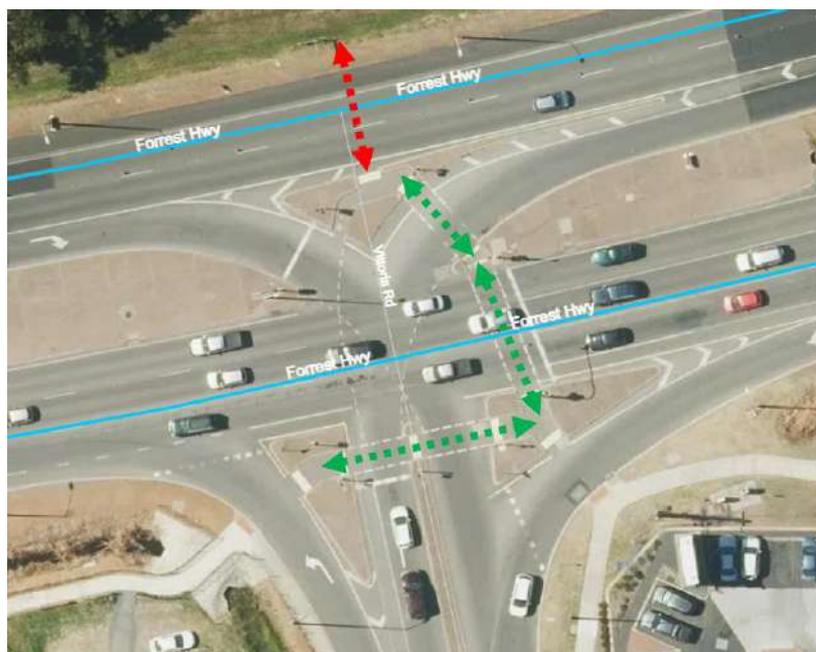


Figure 66 – Existing Forrest Hwy Signalised/Non-Signalised Crossings

Further to Section 5.5.4 above, a proposed intersection west of Vittoria Road (additional northern access) provides opportunity for a fully signalised pedestrian crossing of Forrest Highway improving active transport access, safety and connectivity outside of Glen Iris. The image below highlights other similar intersections where pedestrian crossings are fully controlled at traffic signals.

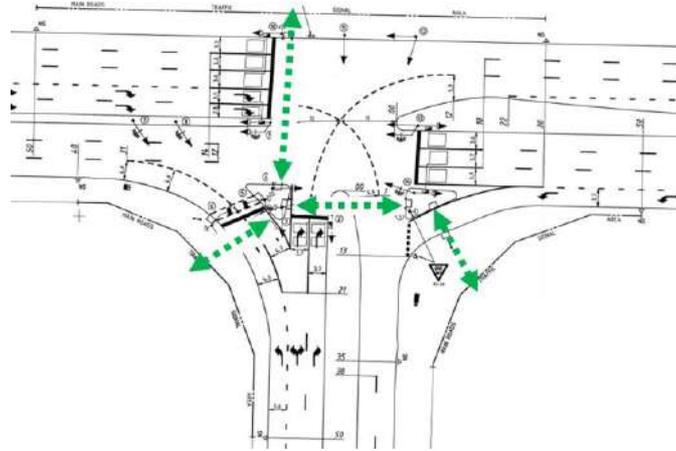


Figure 67 – Example of Fully Signalised Pedestrian Crossing of Forrest Highway

External to Glen Iris, connection to central Bunbury and other surrounding services and shops, either requires an additional pedestrian bridge over the Preston River (north side of Forrest Highway) or alternative connections further north to Estuary Dr where there appears a range of potential opportunities to accommodate improved pedestrian connectivity (along the Preston River, utilising Newton Road, Johnston Road, or combinations of these options). Existing pedestrian facilities on the north side of Estuary Dr provides a pedestrian path over the Preston River, a signalised (protected) crossing of Koombana Dr and further existing connections to central Bunbury via Austral Parade/East Bunbury foreshore or via Koombana Drive. Pedestrian connection to the Eaton area is also available along Estuary Drive. Figure 67 above includes several options to connect Glen Iris to the broader area and should be the subject for further consideration.

Robertson Drive

The existing crossing of Robertson Drive at the Eelup Roundabout is represented in the image below, where currently, there is no signalised crossing of the south-bound exit traffic lanes, shown in red (also noting a left slip lane from Forrest Highway to Robertson Drive is not signal controlled). Traffic signals control the north-bound traffic lanes (approaching Eelup), including a signalised pedestrian crossing shown below in green.



Figure 68 – Existing Robertson Drive Signalised/Non-Signalised Crossings

Further to Section 5.5.4 above, a potential new intersection with Robertson Drive provides opportunity for a fully signalised pedestrian crossing improving active transport access, safety, and connectivity outside of Glen Iris. It should be noted improved pedestrian access will only be achieved if traffic signals are utilised. The image below highlights other similar intersections where pedestrian crossings are fully protected (shown in green).

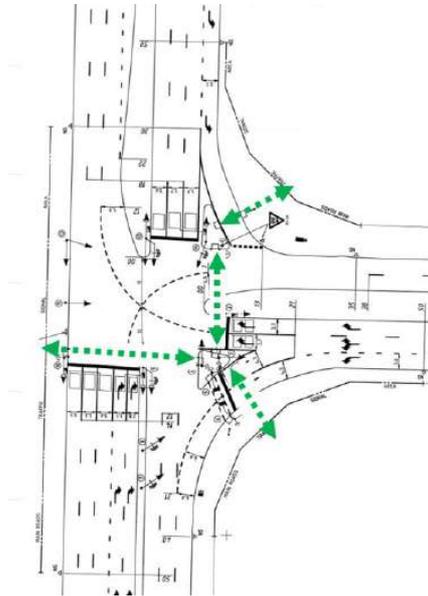


Figure 69 – Example of Fully Signalised Pedestrian Crossing of Robertson Drive

Should a roundabout intersection be proposed at this site, protection of pedestrian movements are more challenging given the need to cross multiple traffic lanes in a relatively aggressive road environment without traffic signals. This can be particularly challenging for children, the elderly and the disabled (or those just enjoying a leisurely walk).

External to Glen Iris, connection to central Bunbury and other surrounding services and shops, either requires an additional pedestrian link north, on the west side of Robertson Drive (separated from fast-moving traffic) or to the west as currently detailed in the Bunbury Cycle plan (refer Figure 11 above and Sections 3.2.5 and 3.2.6).

It should be noted, existing width limitations along Koombana Drive complicate future network requirements where it's anticipated a 4-lane road, pedestrian facilities and a Fast Rail corridor will not fit within the existing reservation. Koombana Drive is surrounding by the Bunbury Port (including a heavy rail corridor directly adjacent to the road reserve to the north-east) and the environmentally sensitive inlet (to the south-west). Broader rail, road and active transport planning will need to consider these potentially competing issues given the space limitations and long-term traffic/transport demands anticipated to access central Bunbury (refer Section 5.2).

**5.6. Consultation**

A range of consultation activities have been undertaken as part of the Glen Iris District Structure Plan process and are summarised below. Consultation is an important planning step to assist in making informed decisions.

Transport planning has been undertaken by Main Roads through an iterative process in consideration of existing and proposed Glen Iris land uses in association with (and guidance provided by) the Glen Iris District Structure Plan Working Group comprising of:

- City of Bunbury (CoB);
- Main Roads WA (MRWA);
- Department of Planning, Lands and Heritage (DPLH);
- Bunbury Development Committee (BDC); and
- Department of Water, Environment and Regulation (DWER).

Other key stakeholders involved at critical times during the planning work includes:

- Public Transport Authority (PTA)
- Department of Communities (DoC)
- Southern Ports Authority (SPA)
- South West Development Commission (SWDC)

Targeted consultation undertaken is summarised below, however it is acknowledged not all stakeholders are supportive of all options. The Glen Iris District Structure Plan process is intended to provide all interested parties access to this process and the ability to provide formal advice and feedback into it.

- Landholders within Glen Iris potentially intersected by an additional northern and western road have been consulted to varying degrees as part of the transport planning process. Landholders understandably oppose road options that intersect their properties. Issues raised included land impacts, amenity/noise, sentimental values, additional traffic, lifestyle, and land value implications with a range of other potential issues raised. It is acknowledged new roads can result in significant landholder impacts. Where this is the case, and impacts cannot be avoided, they are minimised wherever possible with further work required.
- The Bunbury Farmers Market (BFM) – Consultation has progressed over several years acknowledging this business employs over 400 people and provides an important service to the Bunbury, the region and Perth community. BFM strongly support the continued use of the existing Vittoria Road/Forrest Hwy intersection to maintain business access with a focus on Forrest Highway and high volumes of customers. Strong opposition to any downgrade or closure of the existing Vittoria Road/Forrest Highway intersection has been confirmed. A range of options, traffic modelling and considerations to improve access and safety surrounding BFM has been discussed including along Vittoria Road and Forrest Highway. Maintaining access to this business is a key objective of the planning study.
- Alternative Options Identified During Consultation – A range of alternative options have been suggested by various individuals including a relocation of Forrest Hwy north to “free up” capacity at the existing Vittoria Rd/Forrest Hwy intersection, consideration of a new link with Forrest Hwy to be located fully within the Preston River floodway, consideration of an additional southern link road (instead of a western link road) and a request for a western link to be relocated further north (around Jeffrey Rd) or further south (closer to South Wester Highway). Sections 5.1 – 5.5 of this report explores a range of constraints and assists to respond to why suggested alternative options have not been considered further.
- Service Commercial Land – Consultation regarding a potential service commercial development on the south-west corner of Vittoria Road and Forrest Highway was undertaken. Discussion included scale of development, layout, traffic generation, traffic modelling and access, including from Vittoria Road.

As part of the District Structure Plan process, the following broader consultation was undertaken:

- Community Workshop, Monday 24 August 2020 – Community consultation identifying existing challenges and issues and to encourage input from the Glen Iris community. Key transport issues discussed included safety and congestion at the Forrest Highway/Vittoria Road intersection, school traffic, buses and bus stops, speeding and rat-running through local streets. A range of potential options were discussed including existing road upgrades, traffic calming and additional (new) accesses to Glen Iris all of which would be further considered through the planning process.
- Community Drop-in Workshop, Saturday 17 October 2020 – Community drop-in session where similar issues raised to the 24 August 2020 session (above). There was the opportunity to discuss specific issues, concerns, and potential opportunities one-on-one.

All feedback provided to date has been considered during the planning and assessment processes to assist with making informed decisions. There will be further opportunities for stakeholder input during the formal District Structure Plan advertising process.

# 6. Recommended Ultimate Transport Network

## 6.1. Ultimate Network

The image below summarises the ultimate recommended network for adoption in the Glen Iris District Structure Plan, Stage 1.

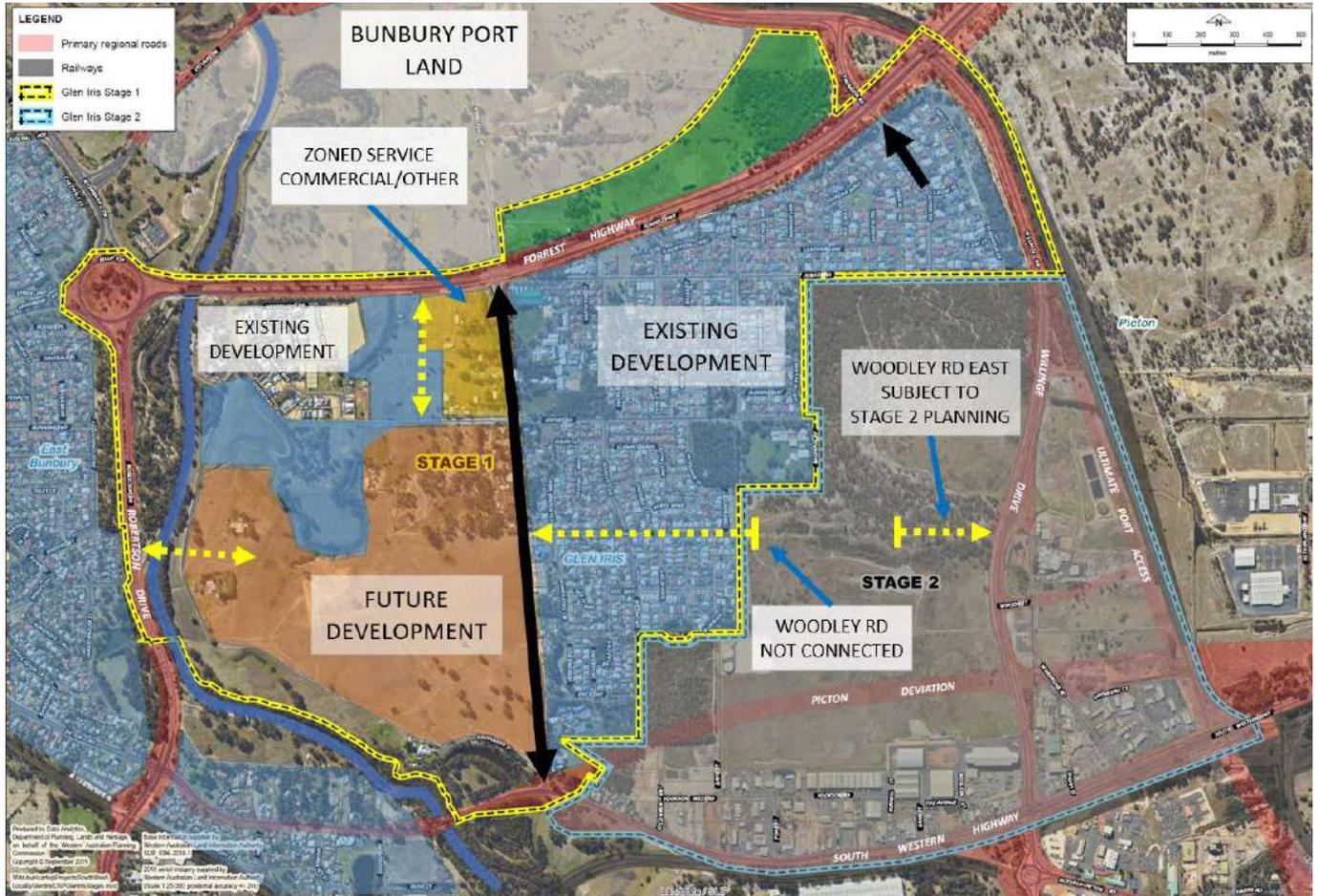


Figure 70 – Ultimate Recommended Glen Iris (Stage 1) Network

### Northern Access with Forrest Highway

Long-term traffic demands on Forrest Highway, planning for future Fast Rail, strategic port access and a range of other aspects justify consideration of a grade separated interchange for the Glen Iris access. However early consultation confirmed that while planning for side road grade separation is highly desirable (from a transport, efficiency and safety perspective), the impacts to Glen Iris, existing communities and local businesses is considered too great. Section 5.1 provides further detail.

Long-term traffic volumes accessing Glen Iris via Alyxia Drive are not expected to grow significantly given most future development within Glen Iris is proposed west of Vittoria Road. As a result, no significant changes are proposed to the Alyxia Drive access with Forrest Highway.

Upgrades to the existing 2-lane Vittoria Road/Forrest Highway intersection, providing for medium-term intersection capacity is **not recommended** given, provision of the necessary infrastructure to meeting long-term traffic demands results in a range of challenges, including:

- The location of numerous surrounding services (including gas) and other constraints complicate upgrade options and make solutions expensive.

- Adjacent driveways are anticipated to continue creating congestion and queuing around Forrest Highway compounded by additional traffic.
- High traffic volumes complicate the opportunity for major intersection upgrades in a tight and constrained area, including school traffic. Traffic disruptions and pedestrian interactions during a drawn-out and complex construction process are expected to be significant.
- Encouraging significant future traffic into an already busy area and past a school is undesirable and less aligned with Liveable Neighbourhoods intent to achieve a sense of “Place” for the Glen Iris community.
- Medium-term challenges are anticipated regarding pedestrian movement and safety, particularly around the school 40km/h zone, busy commercial developments, and bus stop areas where further congestion can be expected.
- Results in high-cost solutions compared to other options available.

Given an existing business is reliant on the Vittoria Road/Forrest Highway intersection, the existing intersection is proposed to remain full movement in the short and medium-term. Any reduction in access with Forrest Highway is not currently possible. A range of changes and improvements along Vittoria Road will be required to manage future traffic and safety. Ultimately a left-in and left-out only of Vittoria Road intersection with Forrest Highway proposed to facilitate a safe and efficient Forrest Highway in the long-term. Implementing this change will be subject to further stakeholder (BFM) discussion and is not possible in the short and medium-term. An ultimate reduction in access at the Vittoria Road and Forrest Highway intersection would require a roundabout at the BFM access to facilitate traffic movements including to accommodate a school bus turn-around along Vittoria Road.

Establishment of an additional 4-lane northern access with Forrest Highway (approximately 200m west of Vittoria Road) **is recommended** consistent with Figure 70 (and Figure 61) above, to address existing intersection congestion and safety challenges and provide the required long-term access to enable Glen Iris to development. Key considerations regarding this additional access includes:

- Provision of a major unconstrained access significantly improves road capacity and safety for the broader Glen Iris community while minimising the risk of queuing around Forrest Highway.
- Provides an access to the broader Glen Iris area separated from a 40km/h school zone as well as a busy commercial area.
- Eases pressure on the existing Vittoria Road intersection, encouraging traffic away from a 40km/h school zone and surrounding service commercial land use (existing and future). Traffic destined for Bunbury Farmers Market is expected to continue using the existing intersection where some congestion challenges may remain.
- Separating high traffic volumes and growing pedestrian movements associated with a school and adjacent commercial development is seen as desirable.
- Establishment costs appear to provide value for money, result in manageable service impacts and cater for long-term traffic. Constructing a new link ensures traffic continues to utilise Vittoria Road during construction with minimal disruption to Glen Iris, schools, and Bunbury Farmers Market traffic. Staging and future upgrades to this access appear simpler and more cost effective than other alternatives.
- A new Forrest Highway access will cater for a significant “Movement” component separate to community spaces and is more aligned with Liveable Neighbourhoods promoting a sense of “Place” surrounding Vittoria Road (including the Neighbourhood Centre).
- Management of floodway and drainage impacts appears feasible however to achieve this, results in privately owned land being impacted and additional traffic being diverted to some areas. Management of these impacts will require further consultation to minimise them as far as practicable.

The general arrangement of an additional northern access with Forrest Highway are identified below in Figure 71.

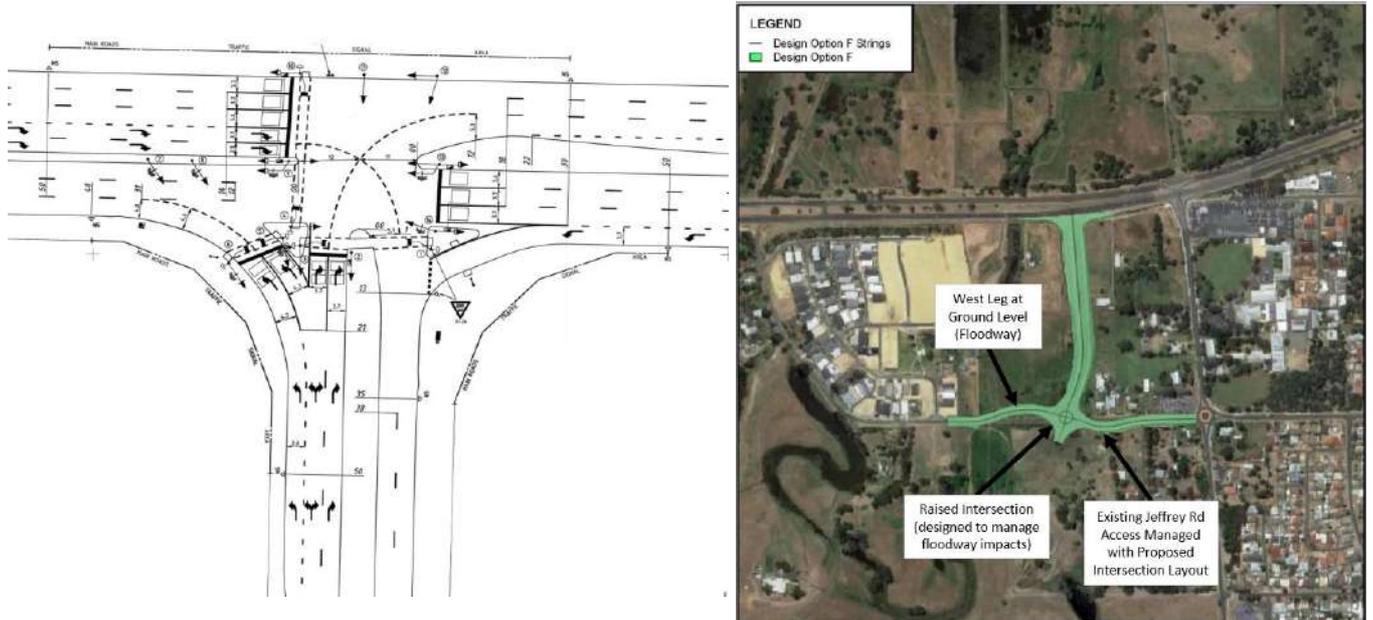


Figure 71 – General Arrangement of Additional 4-Lane Northern Access with Forrest Hwy

The Activity Centre precinct (including the proposed Neighbourhood Centre) would benefit from an additional local link road between a new access to Forrest Highway and Vittoria Road with a potential local link road identified below in white in Figure 72, providing improved local traffic distribution, an alternative access to the school and may reduce traffic past the school. Lot 18, Forrest Highway may require an ‘interim driveway’ to the new access (yellow dashed line below) which will require removal once a Local Link Road is in place (further details on pages 69 and 70). Intersection movements between the new northern access and a potential Local Link Road will be limited as detailed below and further discussed on page 69.

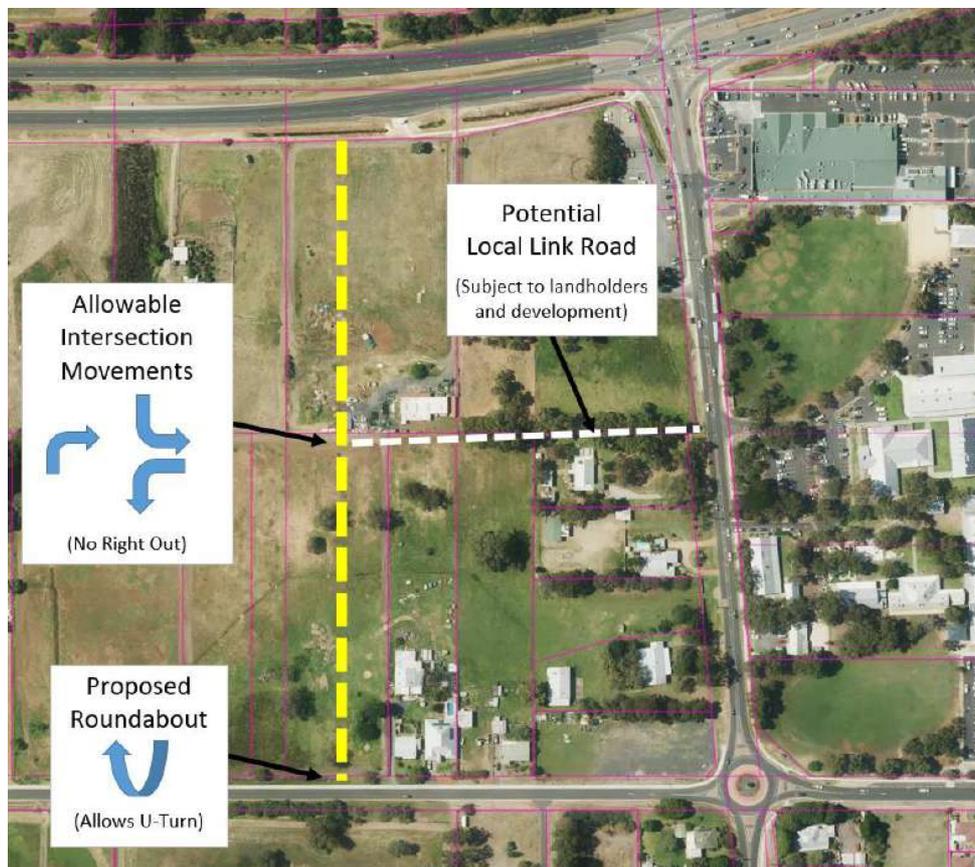


Figure 72 – Potential Local Link Road – Intersection Turn Movements (subject to further detailed assessment)

### Western Access with Robertson Drive

Establishment of an additional western access with Robertson Drive, **is recommended** as a long-term solution subject to several subsequent processes, including Aboriginal heritage and environmental assessments. Key considerations regarding this additional access includes:

- Improve traffic distribution as well as as pedestrian/cyclist and active transport connections to the surrounding areas.
- Establishing a bridge over the Preston River and a new intersection with Robertson Drive will come at a high cost, would impact a registered Aboriginal site (the river), however provides significant improvement to the accessibility of Glen Iris.
- A western access for the Glen Iris area will draw some traffic pressures away for the busy Forrest Highway as well as relieve long-term pressures around schools located on Vittoria Road (including 40km/h school zones).
- Management of river flooding impacts around the Preston River appear manageable based on floodway modelling.
- Results in privately owned land impacts including amenity impacts for two residences where the existing land uses are primarily rural. Future land uses involve residential development. Management of these impacts will require further consultation and minimise them as far as practicable.

### Eastern Access with Willinge Drive

Establishment of an additional eastern access with Willinge Drive whilst feasible, will result in a range of undesirable outcomes and is therefore **not recommended**. The existing Woodley Road should remain separate to any future access roads connecting with Willinge Drive with the following considerations relevant:

- Modelling confirms an additional eastern access with Robertson Drive provides minimal traffic distribution improvement for Glen Iris. An additional western access with Robertson Drive, whilst challenging is more effective at improving traffic distribution, connection with external areas and improved pedestrian/cyclist connectivity.
- A continuous eastern access is anticipated to encourage a mix of residential, industrial and commercial traffic onto Woodley Road, being a residential street resulting in undesirable safety and amenity implications.
- A continuous eastern access is anticipated to encourage residential traffic, pedestrians and cyclists onto Willinge Drive, where this link is a major freight corridor to Bunbury Port. A continuous connection with Glen Iris is anticipated to undermine safety and freight efficiency on this strategic port link.
- Future access to Willinge Drive will be the subject of assessment as part of the Glen Iris District Structure Planning, Stage 2 planning process.

### Pedestrian Network

Establishment of a suitable pedestrian, cycling and active transport network similar to Figure 73 below, will ensure access to services, shops, and other facilities external to Glen Iris are available to a range of community members. The overall network requires further consideration, however, should ensure pedestrians have access to a signalised crossing of busy surrounding roads and crossing opportunities over the Preston River via a pedestrian access path. The network includes several options to connect Glen Iris to the broader area which should be the subject for further consideration and future planning.

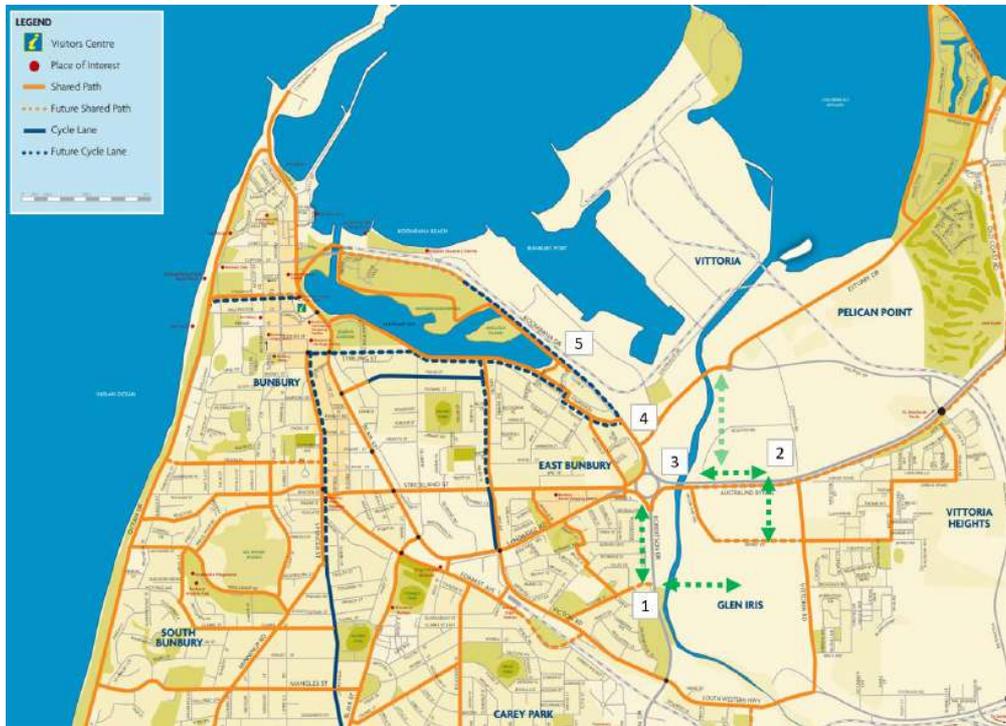


Figure 73 – Pedestrian and Cycle (Active) Transport Network

## 6.2. Internal Glen Iris Road Network

The following provision has been made of key networks within Glen Iris:

Road	Section	Requirements
Vittoria Road	Forrest Hwy to Jeffrey Road (2-Lane)	<p>Neighbourhood Connector Road - Provision for a 2-lane road</p> <p>No on-street parking or additional pedestrian crossings within 200m of Forrest Highway.</p> <p>Driveway access to Vittoria Road will be limited wherever possible.</p> <p>Removal of the “right out” turn movement from Bunbury Farmers Market access onto Vittoria Road proposed once a roundabout at the Grace Christian School main access is operational (enabling a U-tune movement for BFM traffic bound for Forrest Highway). A roundabout at this location also provides access to the school and future development west of Vittoria Road.</p> <p>A continuous centre kerbed median is required between the Bunbury Farmers Market access and the Grace Christian School main access (restricting uncontrolled vehicle turn movements).</p> <p>Provision for a roundabout at Bunbury Farmers Market entrance if, in the long-term Vittoria Road/Forrest Highway intersection transitions to a left-in and left-out only with Forrest Highway. This arrangement is subject discussion with a key existing business. Restriction of turn movements at Vittoria Road/Forrest Highway intersection is not possible in the short and medium-term given business reliance on this access.</p>
Vittoria Road	Jeffrey Road to South Western Hwy (2-Lane)	<p>Neighbourhood Connector Road - Provision for a 2-lane road</p> <p>Limit direct property access as far as practicable.</p> <p>A Boulevard arrangement is desirable</p>
Additional Northern Access (200m west of Vittoria Road)	Forrest Hwy to Jeffrey Road (4-Lane)	<p>Integrator Arterial Road - Provision for a 4-lane road</p> <p>No direct property access (except for an interim access to Lot 18, Forrest Highway further detailed in Section 5.5.1.5 – Vittoria Road and Other Connections)</p> <p>No on-street parking</p>
Additional Northern Access and Additional Western Access	Jeffrey Road to Robertson Drive (4-Lane)	<p>Integrator Arterial Road - Provision for a 4-lane road</p> <p>No direct property access.</p> <p>No on-street parking</p>

Table 3 – Internal Road Network

### 6.3. Staging of the Network

Staging for the Glen Iris road network is recommended as follows and read in conjunction with Figure 74 below:

0. Vittoria Road/South Western Highway roundabout – funded and construction in progress (as of January 2022).
1. Additional northern access with Forrest Highway (2-lanes) linking with Jeffrey Road. Additional signalised intersection requires coordination with existing Vittoria Road signalised intersection.

Should further commercial development proceed west of Vittoria Road (between Jeffrey Road and Forrest Highway) and depending on the scale of those developments, other amendments to Vittoria Road may be required including alterations to the Bunbury Farmers Market access (remove right-out turn movement), construction of a roundabout at Grace Christian School, associated median installation and channelisation of traffic and provision for pedestrian movements surrounding Vittoria Road. Further detailed planning and development approvals will confirm required details.

2. Upgrade additional northern access with Forrest Highway (from 2 to 4-lanes). Additional traffic lanes provided to increase road capacity.
3. Additional western access with Robertson Drive (2-lanes).
4. Upgrade additional western access with Robertson Drive (from 2 lanes to 4-lanes). Additional traffic lanes provided to increase road capacity should land use traffic demands warrant this.
5. Existing Vittoria Road turn movements to be restricted to left-in and left-out only with Forrest Highway. This change is not possible in the short and medium-term and is subject to further stakeholder consultation.

The image below provides further details regarding the staging arrangements.

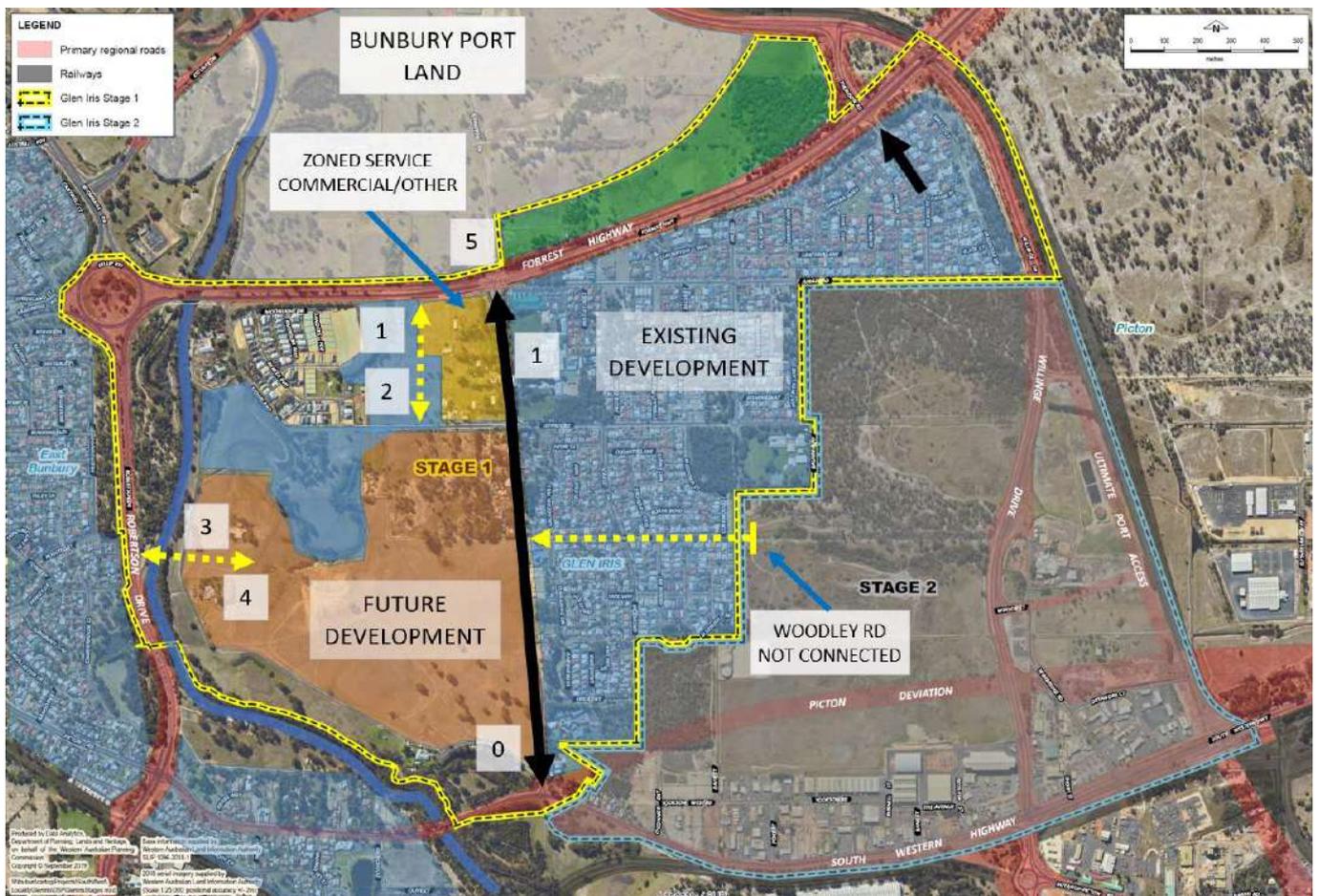


Figure 74 – Glen Iris Access Staging

Staging details are included in Table 4 below:

Infrastructure	Key Elements	Timing/Trigger	Notes
SWH – Vittoria Road Roundabout	<ul style="list-style-type: none"> <li>Roundabout</li> <li>Safe and convenient Glen Iris access/egress</li> </ul>	<ul style="list-style-type: none"> <li>State Government funded project (Main Roads) – Scheduled for completion 2023-24</li> </ul>	<ul style="list-style-type: none"> <li>Construction in progress (March 2022)</li> </ul>
Establish additional northern access road intersecting with Forrest Highway  (Stage 1)	<ul style="list-style-type: none"> <li>Additional northern intersection west of Vittoria Road</li> <li>New 2-lane road link between Forrest Highway and Jeffrey Road (plus auxiliary/turn lanes/pedestrian facilities)</li> <li>Primary Regional Road (within 180m of Forrest Highway)</li> <li>No on-street parking</li> </ul>	<ul style="list-style-type: none"> <li>Required to support additional development within Glen Iris. Trigger of development generating 50vph in any peak period (cumulative of existing land use traffic demands as of March 2022).</li> <li>Subject to identification of construction funding (including public/private-contributions)</li> </ul>	<ul style="list-style-type: none"> <li>Ultimately Liveable Neighbourhoods Integrator A (4-lanes without on-street parking)</li> <li>Ultimately no direct property access to this link (Lot 18, Forrest Hwy may require interim access).</li> <li>An east-west Local Link Road may be required to access service commercial development and link to Vittoria Rd. For Local Link Road details refer Sections 5.5.1.5 and 6.1).</li> </ul>
Upgrade additional northern access road intersecting with Forrest Highway  (Stage 2)	<ul style="list-style-type: none"> <li>Upgrade additional access road west of Vittoria Road from 2-lanes to 4-lanes between Forrest Highway and Jeffrey Road</li> </ul>	<ul style="list-style-type: none"> <li>Required once 2-lane link west of Vittoria Road reaches 12,000vpd or 1,200vph in any peak</li> </ul>	<ul style="list-style-type: none"> <li>Liveable Neighbourhoods Integrator A (4-lanes without on-street parking)</li> </ul>
Establish additional western access road intersecting with Robertson Drive	<ul style="list-style-type: none"> <li>Proposed western access intersecting with Robertson Drive</li> <li>Proposed 2-lane road accessing Glen Iris (plus auxiliary/turn lanes/pedestrian facilities)</li> <li>Requires a bridge over the Preston River (subject to Aboriginal heritage and environmental processes)</li> <li>No on-street parking</li> </ul>	<ul style="list-style-type: none"> <li>Required once traffic accessing Glen Iris from Forrest Highway (excluding via Alyxia Drive) reaches 22,000vpd or 2,200vph in any peak</li> <li>Subject to identification of construction funding (including public/private contributions)</li> </ul>	<ul style="list-style-type: none"> <li>Ultimately Liveable Neighbourhoods Integrator B (4-lanes without on-street parking)</li> <li>Staging increases from 2-lanes to 4-lanes are subject to land use traffic demand warrants within Glen Iris</li> </ul>

(continued next page)

Infrastructure	Key Elements	Timing/Trigger	Notes
<p>Conversion of existing Forrest Highway and Vittoria Road intersection</p>	<ul style="list-style-type: none"> <li>Conversion of existing intersection to a left-in and left-out only with Forrest Highway</li> </ul>	<ul style="list-style-type: none"> <li>Subject to full establishment of the new northern access road intersecting Forrest Highway (west of Vittoria Road)</li> <li>Subject to stakeholder consultation with an adjacent existing business within Glen Iris. Refer Section 6.1 for further details</li> </ul>	<ul style="list-style-type: none"> <li>Suitable turn-around facilities to be provided at the northern end of Vittoria Road (roundabout at BFM access) to accommodate school bus movements as well as other traffic movements</li> </ul>

Table 4 – Staging Details

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## **8. Appendices**

## **8.1. Appendix 1 – Glen Iris – Traffic and Crash Summary (January 2020)**

Refer attached document.



**mainroads**  
WESTERN AUSTRALIA

# Glen Iris

## Traffic and Crash Summary

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# 1. Study Area

The suburb of Glen Iris, situated east of the Bunbury CBD, is an area of high urban development comprised predominantly of residential development with strong connections to the State Road network. *Figure 1* shows the study area and the surrounding roads for which the traffic and crash data is summarised in this report. There are no Network Performance Sites (24/7 permanent traffic counts) in this area so data is derived from short term sampling of the network (adjusted to remove the influence of seasonal variation). As data collection has occurred in different years growth factors have been applied where required to make the data comparable. This study is centred on the intersection of Forrest Highway and Vittoria Road due to the complexities created by surrounding land uses and the high volume of traffic. A video survey was undertaken to assist with this review between (including) Thursday 28 November 2019 and Monday 2 December 2019.

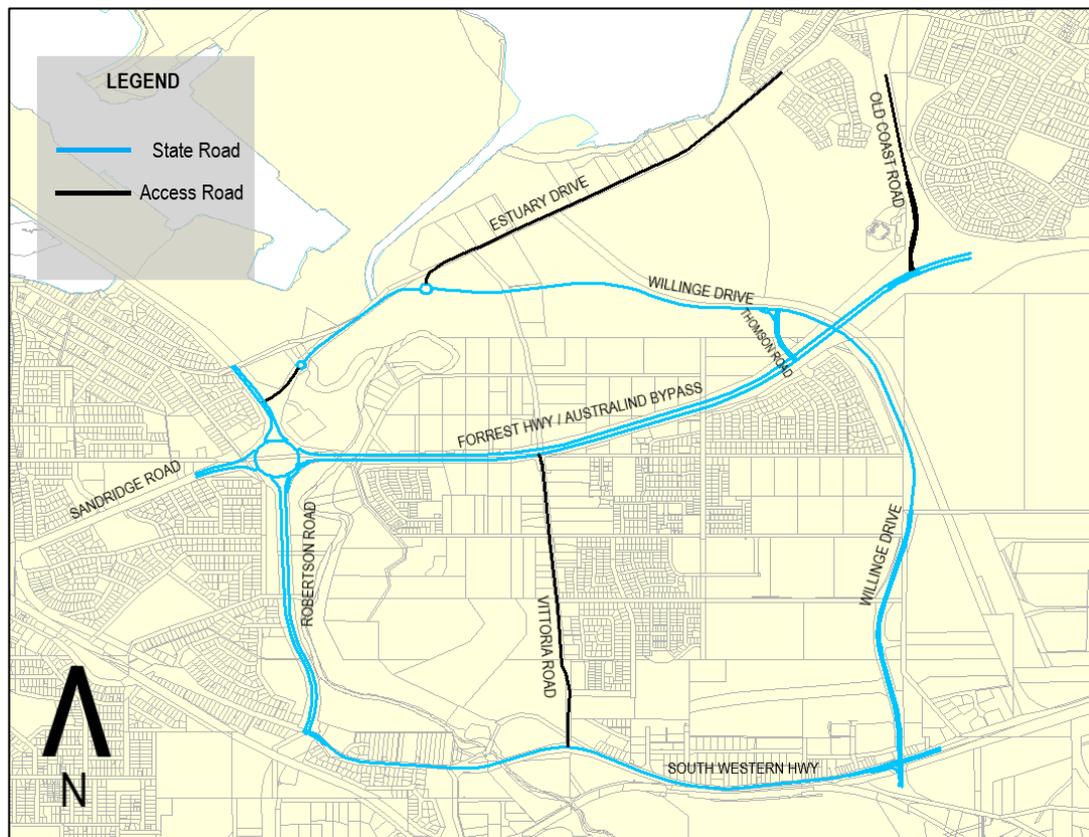


Figure 1: Glen Iris Study Area and significant roads.

## 2. Traffic Data

### 2.1. Traffic Volume

Traffic volumes on Forrest Highway are significantly higher than those on the surrounding network, with volumes exceeding 32,000 vehicles per day (annual average daily traffic or AADT). This more than double the volume of South Western Highway, the state road bordering the southern boundary of Glen Iris. Recent counts indicate that Vittoria Road traffic volumes are approaching 8,000 vehicles per day (average daily traffic, ADT).

ROAD	LOCATION	YEAR	ALL VEHICLES	HEAVY VEHICLES (%)
Forrest Highway	East of Old Coast Road	2017	23254	2232 (9.6)
Forrest Highway	East of Vittoria Road	2019	32372	3270 (10.1)
Forrest Highway	West of Vittoria Road	2019	31505	3056 (9.7)
Koombana Drive	North of Eelup Rotary	2017	10205	510 (5.0)
Robertson Drive	North of Picton Road	2013	16853	1719 (10.2)
South Western Highway	West of Vittoria Road	2019	13033	2150 (16.5)
South Western Highway	East of Vittoria Road	2018	9634	1541 (16.0)
Thomson Drive	South of Estuary Drive	2013	1985	413 (20.8)
Willinge Drive	West of Thomson Road	2017	2424	533 (22.0)
Willinge Drive	North of South Western Highway	2019	3210	1152 (35.9)
Estuary Drive	East of Koombana Drive	2017	14576	437 (3.0)
Estuary Drive	East of Willinge Drive	2016	12049	157 (1.3)
Old Coast Road	North of Forrest Highway	2016	7894	268 (3.4)
Vittoria Road	South of Forrest Highway	2019	7551	876 (11.6)
Vittoria Road	S of Erica Entrance	2018	7006	511 (7.3)

Figure 2: Traffic Volumes in Glen Iris and surrounds. Data is seasonally adjusted and represents the average daily traffic (AADT) for the year shown.

### 2.2. Heavy Vehicles

Forrest Highway is a RAV 7 (Restricted Access Vehicles) classification, which permits vehicles up to 36.5m length and 107.5T mass to travel with no additional conditions. Other RAV 7 network in the area are Willinge Dr, which connects to Bunbury Port, and Robertson Dr to Light Industrial areas in Davenport (southeast of Bunbury CBD). Vittoria Road is RAV 4 (27.5m length and 87.5T mass) up to the access to the Bunbury Farmers Market. South Western Highway is RAV 7 to Willinge Dr where it reduces to RAV 4 past Glen Iris.

Although permits allow vehicles on Forrest Highway up to 36.5m length the majority of vehicles are cars with heavy vehicles making up only around 10% of traffic. Of these heavy vehicles most are Class 3 which are typified by two axles vehicles over 3.2m length (such as small trucks and buses). Vittoria Road follows a similar pattern.

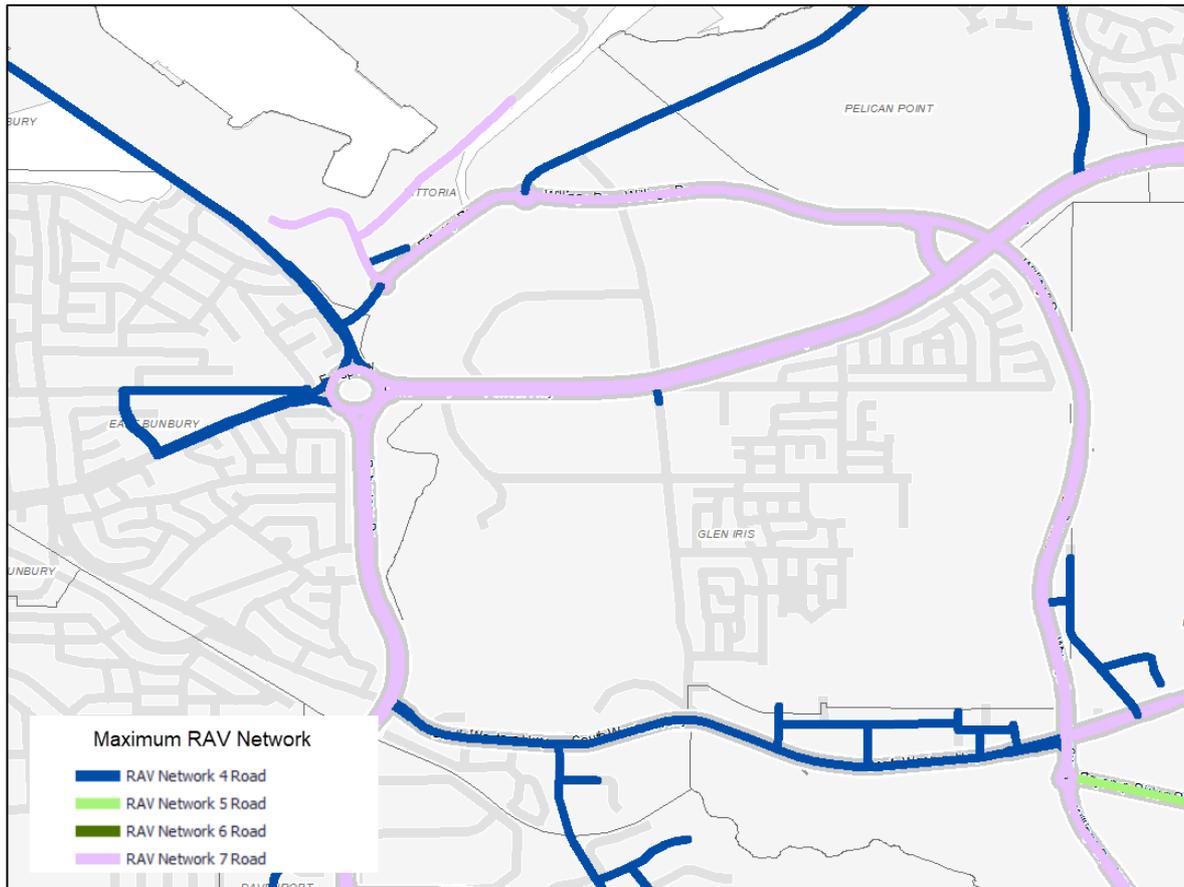


Figure 3: Maximum RAV Network

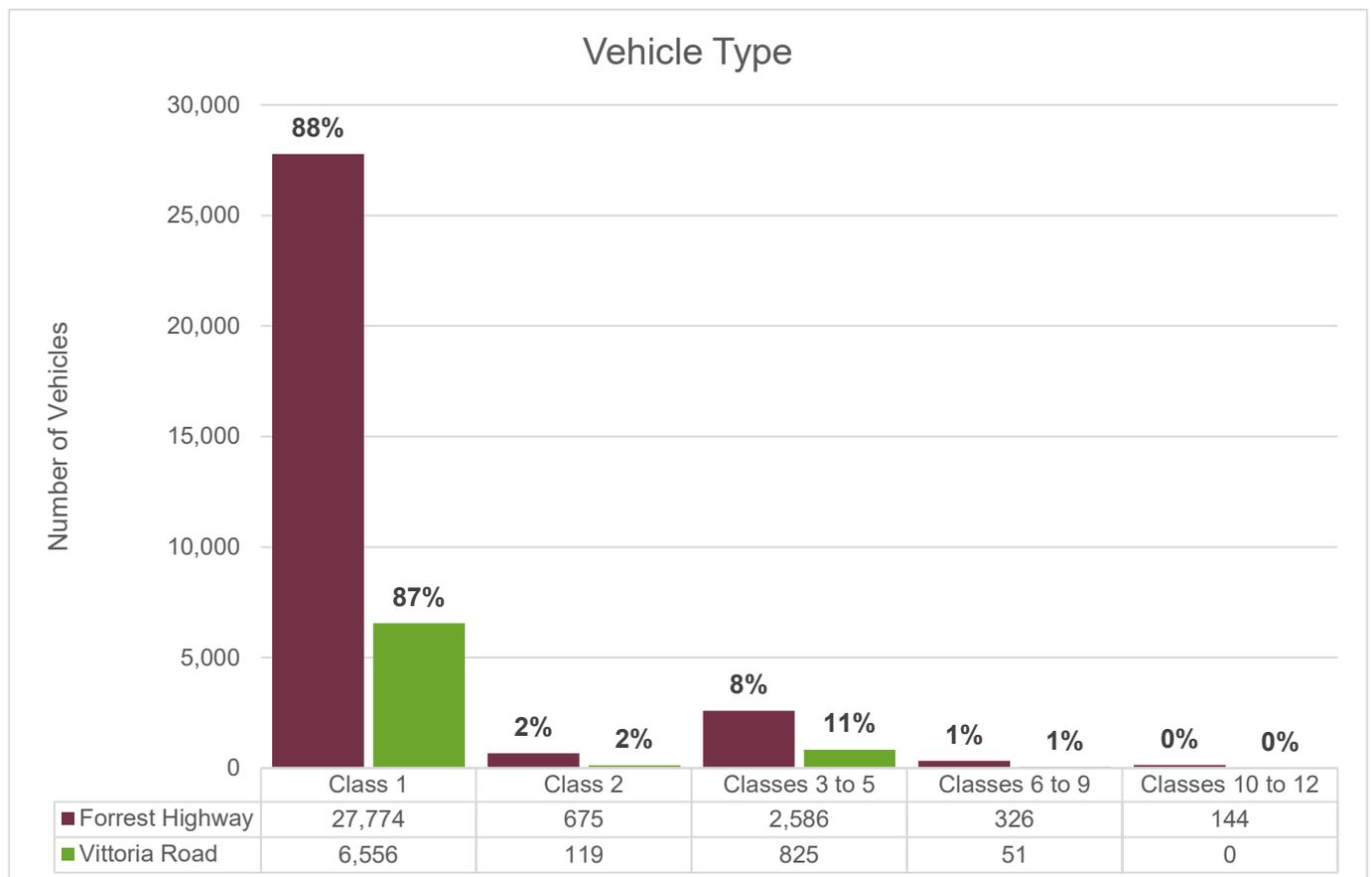


Figure 4: Distribution of vehicle types on Forrest Hwy and Vitoria Rd

### 2.3. Speed Limits

Forrest Highway is high speed network up to the approach to Eelup Rotary with the intersection at Vittoria Road posted at 80km/h and 70km/h on the side road (Vittoria Road). South Western Highway operates at 70km/h past Vittoria Road. There are no conditional speed restrictions placed over any of the RAV network in the area.

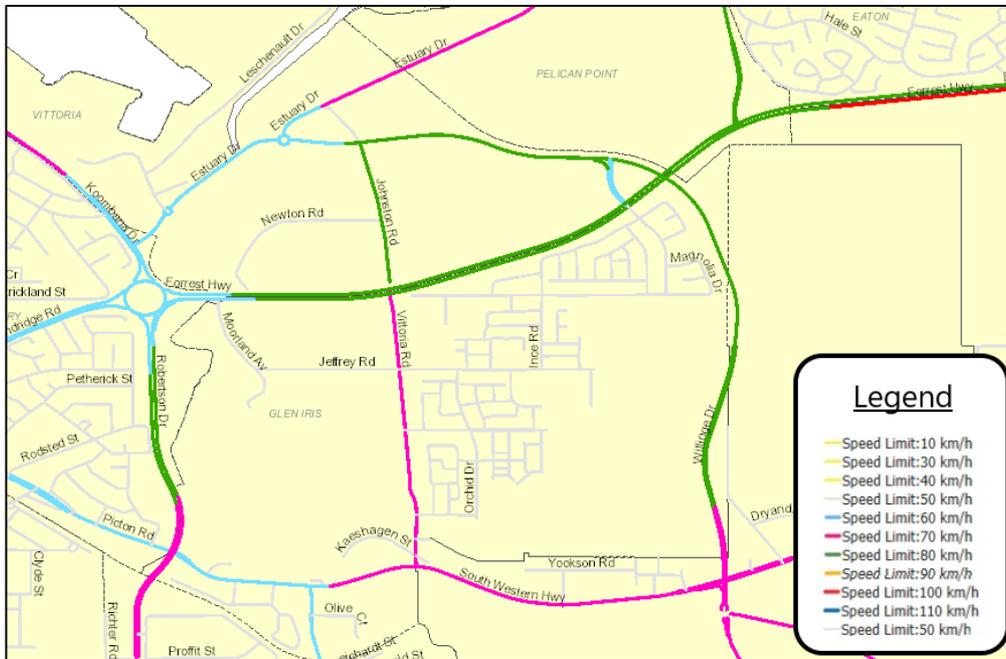


Figure 5: Posted Speed Limits

Speed compliance appears to be an issue on Forrest Highway with significant proportions of vehicles travelling over the speed limit across all hours. The majority of speeding vehicles are doing less than 10km/h above the speed limit and travelling eastbound (as you'd expect since westbound through lanes are constrained by the signals). The highest volume of speeding occurs during the day and the highest proportion, at 67%, occurs off peak when travel is less influenced by other vehicles, signals etc.

		Forrest Highway east of Vittoria Rd																							
Hour		00:00	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Eastbound	Total Volume	49	33	49	56	110	267	366	566	826	1002	1195	1309	1292	1230	1318	1408	1465	1341	734	503	381	299	171	92
	% Speeding	53.1	57.6	63.3	64.3	62.7	67.4	62	53.9	47.6	47.5	47.4	46.1	49.6	53.5	52.2	53.4	53.2	52.7	60.6	49.5	47.8	46.8	48	48.9
	Vol Speeding	26	19	31	36	69	180	227	305	393	476	566	604	641	658	688	752	779	707	445	249	182	140	82	45
	Vol speeding less than 10km/h	24	17	26	32	61	158	207	289	379	452	541	572	606	614	647	710	739	676	415	238	173	133	77	42
	Vol speeding by 10 to 20km/h	2	2	4	4	7	21	18	15	13	23	24	31	33	42	39	40	38	28	26	10	8	6	3	2
	Vol speeding by 20 to 30km/h			1		1	1	2	1	1	1	1	1	2	2	2	2	2	2	2	3	1	1	1	1
	Vol speeding by 30 to 45km/h																			1					1
Vol speeding more than 45km/h																					1				
Hour		00:00	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Westbound	Total Volume	70	50	42	42	126	400	694	1109	1453	1169	1173	1221	1203	1078	1114	1177	1079	958	709	495	396	277	169	106
	% Speeding	35.7	38	40.5	35.7	37.3	43	34.4	22.7	14.5	16.9	16.8	15.2	16	17.9	16.9	16.5	20.3	25.9	29.2	23.6	21.7	27.1	27.8	34
	Vol Speeding	25	19	17	15	47	172	239	252	210	198	197	186	193	193	188	194	219	248	207	117	86	75	47	36
	Vol speeding less than 10km/h	23	18	15	13	42	155	223	245	206	192	191	183	188	187	184	188	213	241	198	113	82	71	44	33
	Vol speeding by 10 to 20km/h	2	1	2	2	4	15	13	7	4	6	6	3	4	5	4	6	6	7	9	3	4	4	3	3
	Vol speeding by 20 to 30km/h					1	2	2							1	1									
	Vol speeding by 30 to 45km/h																								
Vol speeding more than 45km/h								1																	
Hour		00:00	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Combined	Total Volume	119	83	91	98	236	667	1060	1675	2279	2171	2368	2530	2495	2308	2432	2585	2544	2299	1443	998	777	576	340	198
	% Speeding	42.9	45.8	52.7	52	49.2	52.8	44	33.3	26.5	31	32.2	31.2	33.4	36.9	36	36.6	39.2	41.5	45.2	36.7	34.5	37.3	37.9	40.9
	Vol Speeding	51	38	48	51	116	352	466	557	603	674	763	790	834	851	876	946	998	955	652	366	268	215	129	81
	Vol speeding less than 10km/h	47	35	41	45	103	313	430	534	585	644	732	755	794	801	831	898	952	917	613	351	255	204	121	75
	Vol speeding by 10 to 20km/h	4	3	6	6	11	36	31	22	17	29	30	34	37	47	43	46	44	35	35	13	12	10	6	5
	Vol speeding by 20 to 30km/h			1		2	3	4	1	1	1	1	1	3	3	2	2	2	2	3	2	1	1	1	1
	Vol speeding by 30 to 45km/h																			1					1
Vol speeding more than 45km/h								1																	

Figure 6: Example of speed compliance on Forrest Highway (November - December 2019)

## 3. Crash History

This report provides a brief analysis of the crashes that have occurred within Glen Iris summarising the comparative crash history as well as describing trends in road user movements.

A crash rate allows for a more meaningful comparison between road sections by adjusting for differences in exposure (traffic volume, length of road). The crash rate can be applied to both midblock and intersection crashes. Statistics compared are all crashes (any severity) and KSI (Killed or Seriously Injured).

### 3.1. Midblock Crashes

*Figure 7* displays the Crash Rate and KSI Crash Rate of each road within the study area. Crashes of all severities are over-represented on Forrest Highway when compared to the South West region average. Willinge Drive and Thomson Road are the only two roads below the region average crash rate. The disparity between the roads analysed and the region average could be due to the range of road types in the region, which would include a large number of low volume roads. When compared to the state-wide average Forrest Highway and Koombana Drive are still above average.

There are very few KSI crashes on the roads assessed (only one crash resulted in a Fatality). South Western Highway and Forrest Highway each have one section higher than both the region and state KSI averages. The section of South Western Highway is Vittoria Road to Robertson Drive which runs past Glen Iris.

*Figure 8* displays the crash frequencies by road user movement (RUM) within the study area. 80% of midblock crashes in the Glen Iris area are attributed to Same Direction movements, with 74.5% of these being Rear End collisions. 60% of KSI midblock crashes also same direction crashes although as noted above there are very low numbers of KSI crashes. Side Swipes and Lane Changing are the next most common crash types. The sole fatality in the sample was the result of a head on collision (on South Western Hwy).

Start Intersection	End Intersection	SLK Start	SLK End	Length (KM)	2018 Traffic	No. Crashes	No. KSI Crashes	Crash Rate (100MVKT)	KSI Crash Rate (100MVKT)
<b>STATE ROADS</b>									
<b>Forrest Highway</b>									
Old Coast Road	Thomson Road	91.3	92.0	0.7	23,720	8	1	26.7	3.3
Thomson Road	Vittoria Road	92.0	93.2	1.2	31,720	26	1	36.5	1.4
Vittoria Road	Eelup Rotary	93.2	94.3	1.1	30,875	15	0	25.1	0.0
<b>Koombana Drive</b>									
Eelup Rotary	Estuary Drive	0.0	0.2	0.2	10,410	2	0	47.0	0.0
<b>Robertson Drive</b>									
Eelup Rotary	South Western Highway	94.3	95.7	1.4	18,600	10	1	21.7	2.2
<b>South Western Highway</b>									
Willinge Drive	Vittoria Road	150.4	151.9	1.5	9,630	7	0	26.4	0.0
Vittoria Road	Robertson Drive	151.9	153.1	1.2	12,780	5	1	17.6	3.5
<b>Thomson Road</b>									
Willinge Drive	Forrest Highway	0.0	0.3	0.3	2,190	0	0	0.0	0.0
<b>Willinge Drive</b>									
Estuary Rotary	Thomson Road	0.7	2.2	1.5	2,470	0	0	0.0	0.0
Thomson Road	South Western Highway	2.2	4.9	2.7	3,150	1	0	6.5	0.0
<b>LOCAL ROADS</b>									
<b>Estuary Drive</b>									
Koombana Drive	Estuary Rotary	0.0	1.0	0.9	14,870	6	0	23.5	0.0
Estuary Rotary	Old Coast Road	1.0	3.5	2.5	12,540	50	1	88.1	1.8
<b>Old Coast Road</b>									
Estuary Drive	Forrest Highway	0.7	2.0	1.4	8,050	1	0	4.9	0.0
<b>Vittoria Road</b>									
Forrest Highway	South Western Highway	0.0	1.6	1.6	7,400	6	0	28.5	0.0

2014-2018 Crash Rate Average Comparison Table		
State Roads		
Region	All Crash	KSI
South West	18.9	2.6
State-Wide	32.5	2.4
Local Roads		
Region	All Crash	KSI
South West	61.6	5.8
State-Wide	85	4.7

Figure 7: Midblock crash rate comparison (2014-2018). AADT have been growth factored to a base year of 2018 for comparative purposes. The growth factor used is 2% based on historical growth on Forrest Highway.

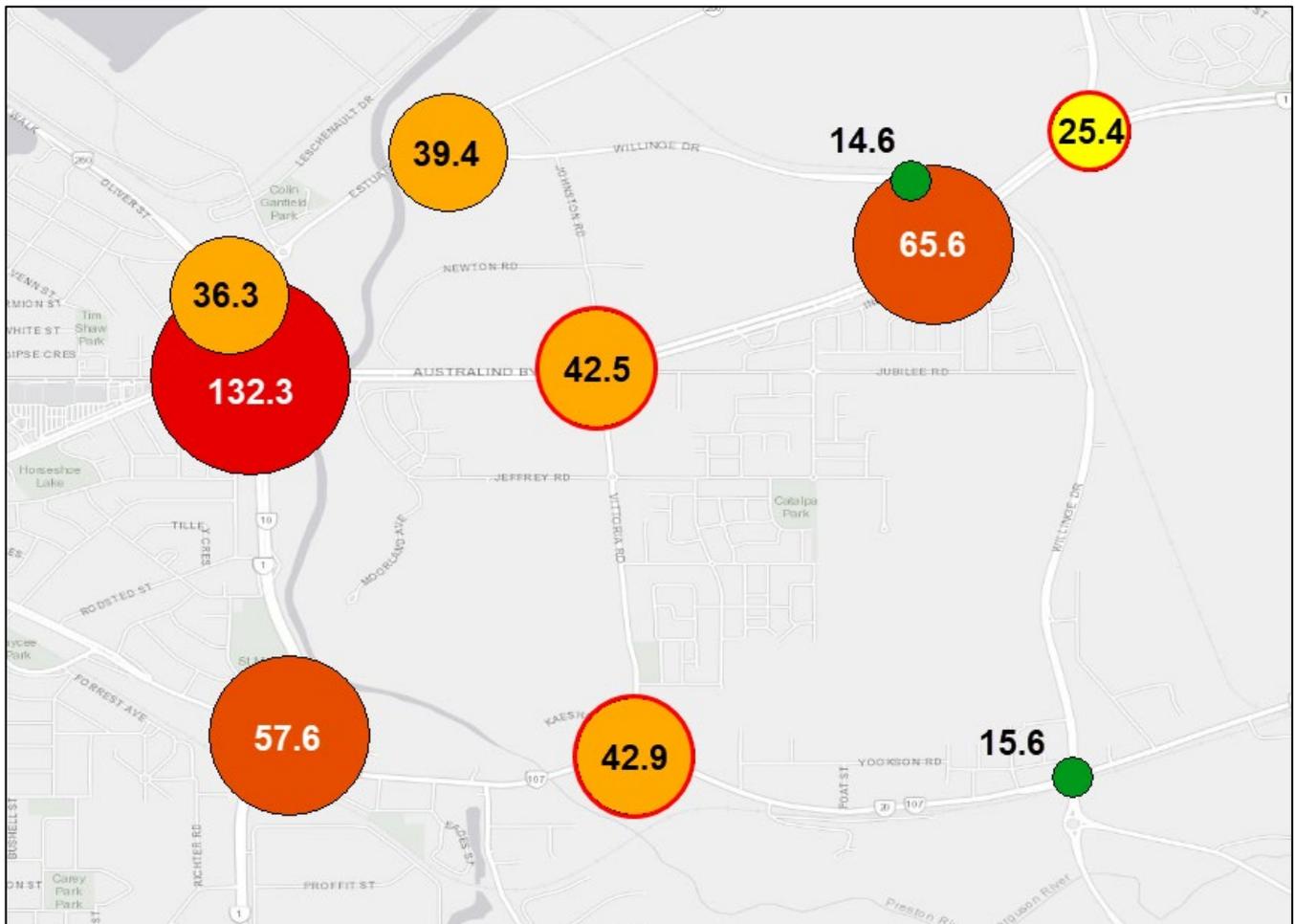
Road User Movement		Vehicles from Opposing Directions		Vehicles from One Direction			Manoeuvring			Overtaking		Off Path, On Straight		Off Path, On Curve		Total		
		21 Side Swipe Head On	22 Thru-right	31 Rear End	33 Right Right	34 U Turn	35 Lane Side Swipe	36 Lane Change Right	37 Lane Change Left	45 Reversing	47 Leaving Driveway	48 Loading Bay	51 Head On	50 Other	71 Off Carriageway to Left		72 Left Off Carriageway Into Object/Vehicle	74 Right Off Carriageway Into Object/Vehicle
FORREST HIGHWAY	Eelup Rotary to Vittoria Rd	Fatal Hospital Medical PDO Major PDO Minor Total	6 3 9			1 2 3	1 1 1		1 1 1									8 8 15
	Vittoria Rd to Thomson Rd	Fatal Hospital Medical PDO Major PDO Minor Total	1 2 12 2 17	1		1 1 2	1 1 1	1 1 2		1 1			1 1					1 2 18 5 26
	Thomson Rd to Old Coast Rd	Fatal Hospital Medical PDO Major PDO Minor Total	1 4 5			1 1		1					1					
SOUTH WESTERN HIGHWAY	Robertson Dr to Vittoria Rd	Fatal Hospital Medical PDO Major PDO Minor Total	1 1 1			1 1					1 1			1 1				1 0 3 1 5
	Vittoria Rd to Willinge Dr	Fatal Hospital Medical PDO Major PDO Minor Total	1 1 1 3			1 1		1		1 1				1 1				1 5 1 7
VITTORIA ROAD	Forrest Hwy to South Western Hwy	Fatal Hospital Medical PDO Major PDO Minor Total	1 1			2 2			2 2			1 1						4 2 6
ROBERTSON DRIVE	Eelup to South Western Highway	Fatal Hospital Medical PDO Major PDO Minor Total	1 2 2 1 6			1 1 1	1 2	2 1										1 2 5 2 10
Total by Road User Movement (% Total)			1 1 41 3 1 8 6 3 1 3 1 1 1 1 3 1															77

Figure 8: Number of crashes by Road User Movement (2014-2018)

### 3.2. Intersection Crashes

Intersection related crashes make up 64% (244) of crashes within the study area. The worst intersection in terms of crash frequency is Eelup Rotary in which 85 collisions have occurred between mid-2014 to 2018<sup>1</sup>. Only three intersections Forrest Highway/Old Coast Road, Forrest Highway/Vittoria Road and South Western Highway/Willinge Drive have been the site of a KSI collision, these are indicated in *Figure 9* with a red border.

*Figure 9* displays the intersection crash rate comparison for the study area. There is no available state and regional average for Intersection crash rates to provide a regional context. Eelup Rotary has a significantly higher crash rate than the remaining intersections, being more than double that of the second highest intersection, Thomson Road/Forrest Highway.



*Figure 9: Intersection crash rates. Symbols indicate proportional different in number of crashes per 100M vehicles entering the intersection. A red border shows intersections where a KSI crash has occurred.*

*Figure 10* show the intersection crash frequencies for the study area. Similar to midblock crashes, collisions involving both vehicles from the same direction comprises 80% of all intersection crashes (196). 8% of the remaining collisions involved intersection vehicles from adjacent approaches. The individual road user movement of a rear end was the most common crash, representing 43% of all intersection crashes. See *5.1 Appendix 1 – Road User Movement Diagrams* for a visualisation of movements at each intersection.

<sup>1</sup> Eelup Rotary crash statistics are calculated from July 2014, due to the signalisation of the Rotary prior to this. Crash Rate has been adjusted to account for this

Figure 10: Intersection Crash Frequencies Categorised by Road User Movements. 2014 - 2018

Road User Movement (RUM)	FORREST HWY - OLD COAST ROAD 3 SLK: 91.32						FORREST HWY - THOMSON RD & ALYXIA DRIVE 2 SLK: 92						FORREST HWY - VITTORIA ROAD 1 SLK: 93.23						EELUP ROTARY - FORREST HWY & KOOMBANA & ROBERTSON 7 SLK: 94.29 (FORREST HWY)						ROBERTSON ROAD - SOUTHWEST HWY & PICTON 6 SLK: 93.23						
	Fatal	Hospital	Medical	PDO Major	PDO Minor	Total	Fatal	Hospital	Medical	PDO Major	PDO Minor	Total	Fatal	Hospital	Medical	PDO Major	PDO Minor	Total	Fatal	Hospital	Medical	PDO Major	PDO Minor	Total	Fatal	Hospital	Medical	PDO Major	PDO Minor	Total	
	<b>Pedestrian on Foot</b>																														
1 Near Side																															
4 Playing, Working, Lying, Standing on Carriageway															1			1													
<b>Intersection Vehicles from Adjacent Approaches</b>																															
11 Thru-Thru			1			1				1		1															1	1		2	
12 Right-Thru																															
13 Left-Thru																															
14 Thru-Right										1		1																			
17 Thru-Left																						1	1	2							
10 Other																						1		1			1			1	
<b>Vehicles from Opposing Direction</b>																															
22 Thru-right				1		1				1		1															1	5		6	
<b>Vehicles from One Direction</b>																															
31 Rear End			1	4	1	6			5	14	3	22			2	14	3	19			1	3	24	7	35			2	5	6	13
32 Left Rear				1		1									1		3	4			2		8	2	12			1	6	2	9
33 Right Right				2		2			1	1		2				1	1	2					1		1				2		2
35 Lane Side Swipe																															
36 Lane Change Right					1	1					1	2				1		1											1	1	2
37 Lane Change Left																															
38 Right Turn S/S																															
39 Left Turn S/S																						6	3	9							
<b>Manoeuvring</b>																															
45 Reversing										1		1											1		1						
40 Other										1		1																			
<b>Off Straight, On Straight</b>																															
72 Left Off Carriageway into Object/Vehicle										1		1																	1		1
74 Right Off Carriageway into Object/Vehicle																															
75 Out of Control on Carriageway																															
76 Left Turn																															
77 Right Turn															1			1													
<b>Off Path, On Curve</b>																															
84 Off Left Bend into Object/Vehicle																															
<b>Passengers and Misc</b>																															
90 Other			1			1																									
<b>TOTALS</b>		1	2	8	2	13			6	24	5	35		1	4	16	8	29			7	51	26	85			6	22	9	37	

Road User Movement (RUM)	SOUTH WESTERN HIGHWAY - VITTORIA RD 5 SLK: 151.9						SOUTH WESTERN HIGHWAY - WILLINGE DR 4 SLK: 150.42						WILLINGE DRIVE - THOMSON RD 10 SLK: 2.19						ESTUARY ROTARY - ESTUARY DR & WILLINGE DR 9 SLK: 0.98 (ESTUARY DR)						KOOMBANA DRIVE - ESTUARY DR 8 SLK: 0.21						Total by Road User Movement (% Total)	
	Fatal	Hospital	Medical	PDO Major	PDO Minor	Total	Fatal	Hospital	Medical	PDO Major	PDO Minor	Total	Fatal	Hospital	Medical	PDO Major	PDO Minor	Total	Fatal	Hospital	Medical	PDO Major	PDO Minor	Total	Fatal	Hospital	Medical	PDO Major	PDO Minor	Total	Total	%
	<b>Pedestrian on Foot</b>																															
1 Near Side																															1	0.82%
4 Playing, Working, Lying, Standing on Carriageway																															1	
<b>Intersection Vehicles from Adjacent Approaches</b>																																
11 Thru-Thru										1		1																			5	
12 Right-Thru				1		1																									1	
13 Left-Thru																											1			1	1	
14 Thru-Right		1		4		5																									6	
17 Thru-Left																															2	
10 Other			1			1				1		1																			5	
<b>Vehicles from Opposing Direction</b>																																
22 Thru-right																											1	1	1	3	11	4.51%
<b>Vehicles from One Direction</b>																																
31 Rear End				1		1			1	2		3			1	2		3			1	1	1	3			1	1	1	3	105	
32 Left Rear															3	2	1	6									3	1	4	4	36	
33 Right Right				4	1	5																									16	
35 Lane Side Swipe																											1	1	2	2	5	
36 Lane Change Right																															11	
37 Lane Change Left																															12	
38 Right Turn S/S																															2	
39 Left Turn S/S																															9	
<b>Manoeuvring</b>																																
45 Reversing																															2	
40 Other																															1	
<b>Off Straight, On Straight</b>																																
72 Left Off Carriageway into Object/Vehicle																1	1													3		
74 Right Off Carriageway into Object/Vehicle																																
75 Out of Control on Carriageway																															1	
76 Left Turn																															4	
77 Right Turn																															2	
<b>Off Path, On Curve</b>																																
84 Off Left Bend into Object/Vehicle																															1	0.41%
<b>Passengers and Misc</b>																																
90 Other																															1	0.41%
<b>TOTALS</b>		1	1	10	1	13			1	3	5	5				1	1	1			4	6	1	11			2	9	4	15	244	

## 4. Bunbury Farmers Market

Bunbury Farmers Market (BFM) is located off Vittoria Road, approximately 60 metres south of the Forrest Highway (edge line) and Vittoria Road intersection (40m from Forrest Highway left-turn lane hold line). *Figure 11*: Location of Bunbury Farmers Market in relation to the intersection of Forrest Hwy and Vittoria Rd.

BFM as a land use is a high traffic generator, attracting visitors from the local Bunbury area and the wider region. Prior to Bunbury Farmers Market, the land was used as a Garden Centre, generating a significantly smaller amount of traffic. This high traffic flow conflicts heavily with the close proximity of the single lot access off Vittoria Road, instigating several issues across to the local network. Anecdotally, these issues concern traffic congestion through the Forrest Highway intersection, high risk pedestrian environments, illegal traffic movements to avoid build-up, and poor exit options from BFM. A video survey of this intersection was captured in November 2019 and, at the time of writing this report, is being analysed to provide an objective assessment of intersection performance and network interactions.



*Figure 11: Location of Bunbury Farmers Market in relation to the intersection of Forrest Hwy and Vittoria Rd.*

### 4.1. Traffic Volumes

The intersection of Bunbury Farmers Market and Vittoria Road experiences high traffic flows. The access to BFM has around 5000 vehicles per entering/exiting during business hours (refer to 5.2 Appendix 2 – Turn Movement Counts (Bunbury Farmers Market Access) for details). The survey captured movements from Thursday to Monday (inclusive) during indicative business hours 6AM to 8PM (though the site operates 24 hours only the retail period was captured). The video survey was captured on a typical weekend where it is noted traffic volumes on Forrest Highway and accessing BFM can increase considerably at peak holiday and long weekend periods.

Of the surveyed days Friday was the peak day with 5600 vehicles movements and Saturday had the lowest number of movements at 4910. The highest peak periods occurred on Sunday around midday and 3pm. As would be expect weekend trading is more condensed with less activity in the early morning and evening. Friday also carries high hourly volumes, close to those of Sunday but has more movements in the morning or evening, which coincide with the typical commuter peak periods.

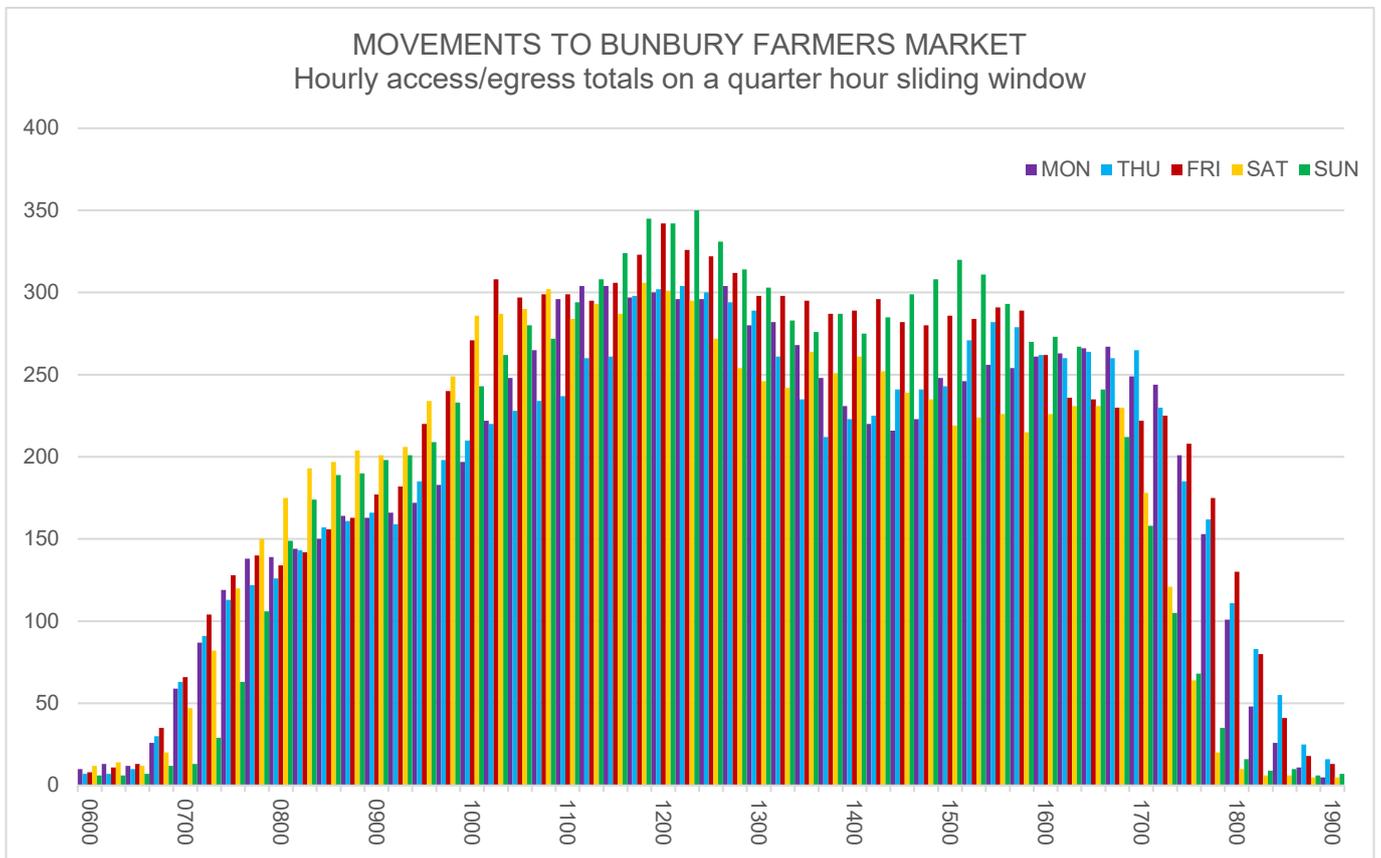


Figure 12: Hourly movements at BFM access. A quarter hour sliding window is used to demonstrate the trends whilst reflecting the hourly scale.

Forrest Highway / Vittoria Road					
Day	Total Volume	AM Peak Time	AM Peak Volume	PM Peak Time	PM Peak Volume
Thursday	41,298	7:45 - 8:45	4,550	14:45 - 15:45	3,619
Friday	46,748	11:00 - 12:00	3,459	15:15 - 16:15	4,060
Saturday	34651	11:30 - 12:30	3,525	11:30 - 12:30	3,525
Sunday	32375	11:30 - 12:30	3,487	11:30 - 12:30	3,487
Monday	39,165	8:00 - 9:00	3,237	15:15 - 16:15	3,268

Vittoria Road / Bunbury Farmers Market					
Day	Total Volume	AM Peak Time	AM Peak Volume	PM Peak Time	PM Peak Volume
Thursday	12,044	8:00 - 9:00	1,100	15:00 - 16:00	1,284
Friday	12710	11:00 - 12:00	1,134	14:00 - 15:00	1391
Saturday	9518	10:45 - 11:45	1,042	12:00 - 13:00	1059
Sunday	9699	11:00 - 12:00	1,174	12:00 - 13:00	1134
Monday	11784	8:00 - 9:00	1,039	15:00 - 16:00	1240

Figure 13: Traffic Volumes for the two 'in-focus' intersections. Note: Data coloured red indicates the highest of its category within the data set.

### 4.2. Pedestrian Activity

The Bunbury Farmers Market have recently constructed a car park on the land opposite the market to provide staff parking. The vehicle access to this is approximately 60m south of BFM access. On site observations suggest this carpark is for the public during peak periods (when BFM staff appear to park in an adjacent school). This has in turn created higher volumes of pedestrian activity across Vittoria Road. There is a bus stop on Forrest Highway near the intersection but there are a relatively low number of services per day so very little pedestrian traffic utilises the Forrest Highway crossings. Figure 14: Pedestrian Traffic Volumes for the Bunbury Farmers Market and Vittoria Road Intersection. shows the daily pedestrian volumes.



	Thursday	Friday	Saturday	Sunday	Monday	Total
<b>South</b>	19	29	13	19	35	115
<b>East</b>	76	109	90	249	116	640
<b>North</b>	285	332	407	464	295	1783
<b>TOTAL</b>	380	470	510	732	446	2538

Figure 14: Pedestrian Traffic Volumes for the Bunbury Farmers Market and Vittoria Road Intersection.

# 5. Appendices

## 5.1. Appendix 1 – Road User Movement Diagrams

Refer to D20#489017 - Appendix 1 - Glen Iris Crash RUM Summary



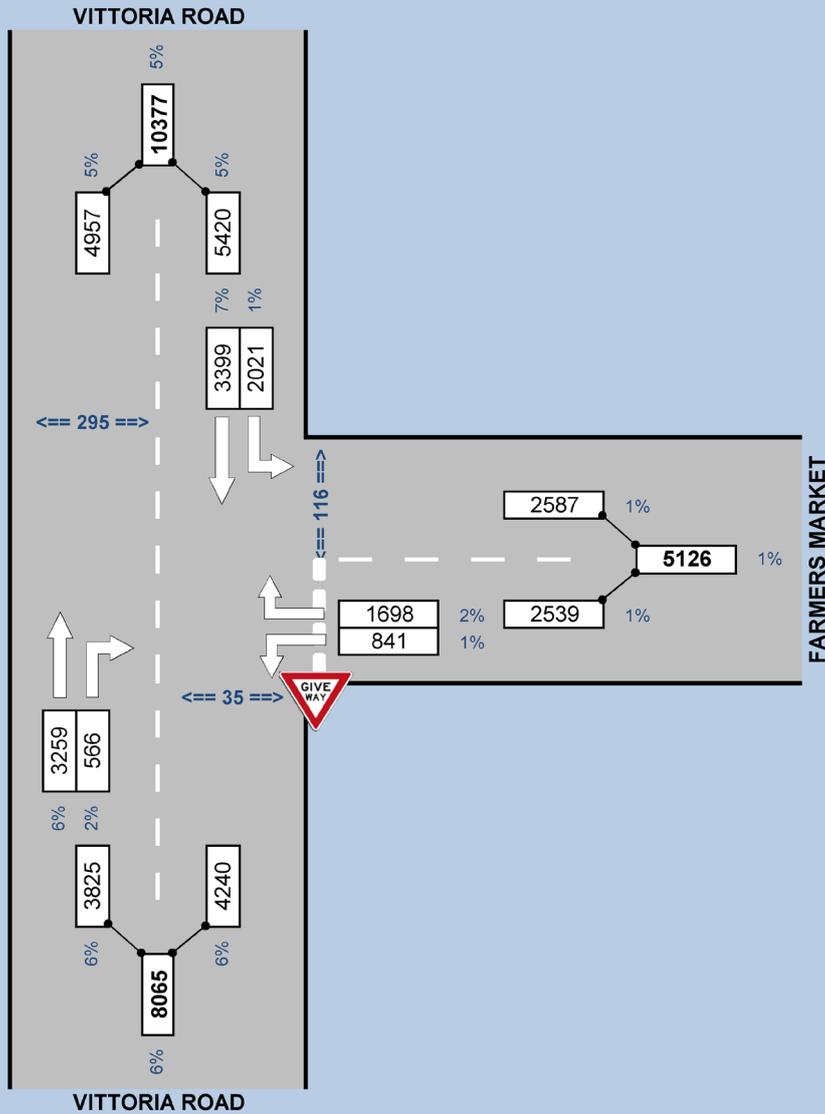
### 5.2. Appendix 2 – Turn Movement Counts (Bunbury Farmers Market Access)

**Project :** Glen Iris Planning Study **Date :** Mon 2nd December 2019  
**Intersection:** Vittoria Rd / Farmers Market **Weather :** Fine



**Survey Time: 14 Hour Totals (0600 - 2000)**

All Vehicles  
 (% Heavy Vehicles)



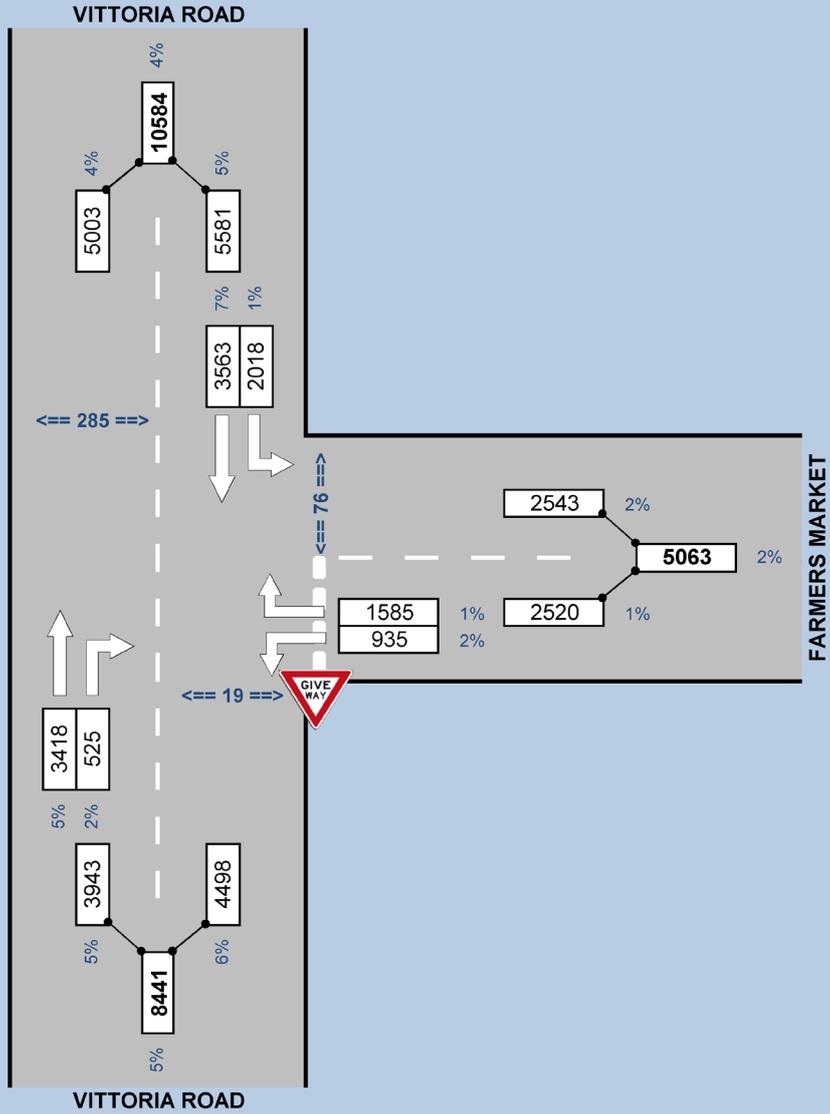
© Surveytech Australia 1300 10 10 66

Project : Glen Iris Planning Study Date : Thu 28th November 2019  
 Intersection: Vittoria Rd / Farmers Market Weather : Fine



**Survey Time: 14 Hour Totals (0600 - 2000)**

All Vehicles  
 (% Heavy Vehicles)

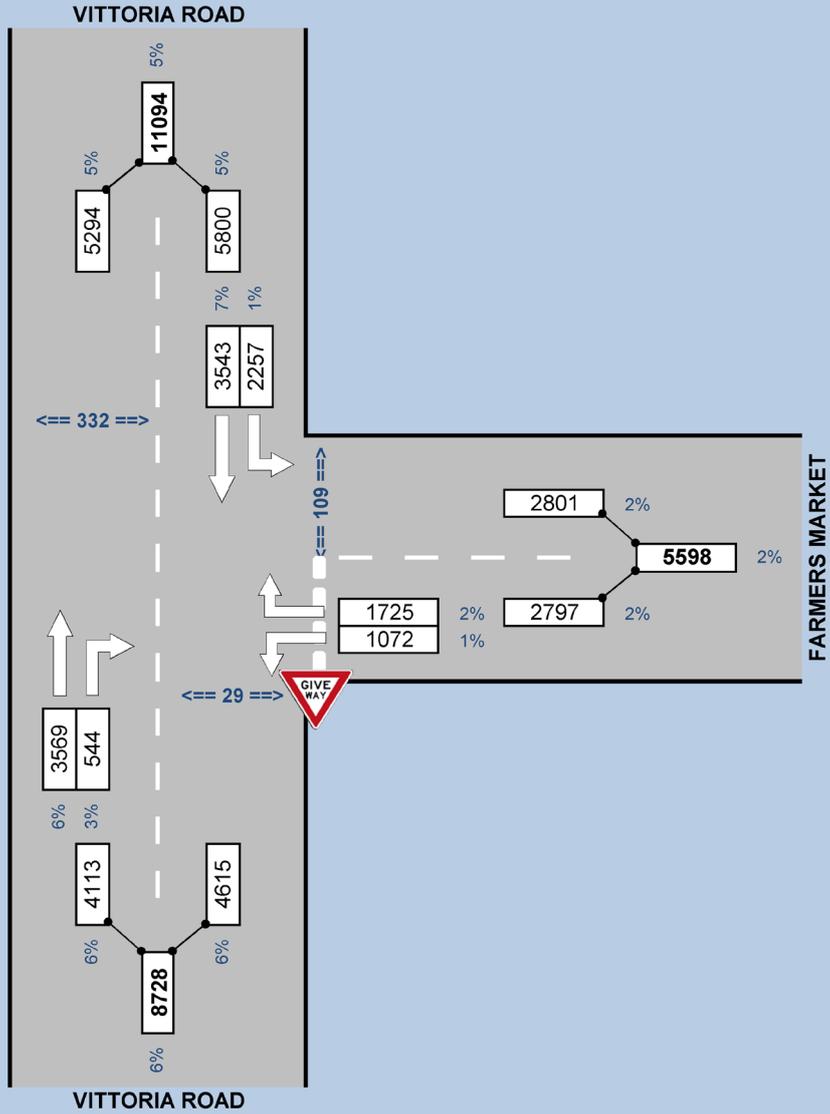


Project : Glen Iris Planning Study Date : Fri 29th November 2019  
 Intersection: Vittoria Rd / Farmers Market Weather : Fine



**Survey Time: 14 Hour Totals (0600 - 2000)**

All Vehicles  
 (% Heavy Vehicles)

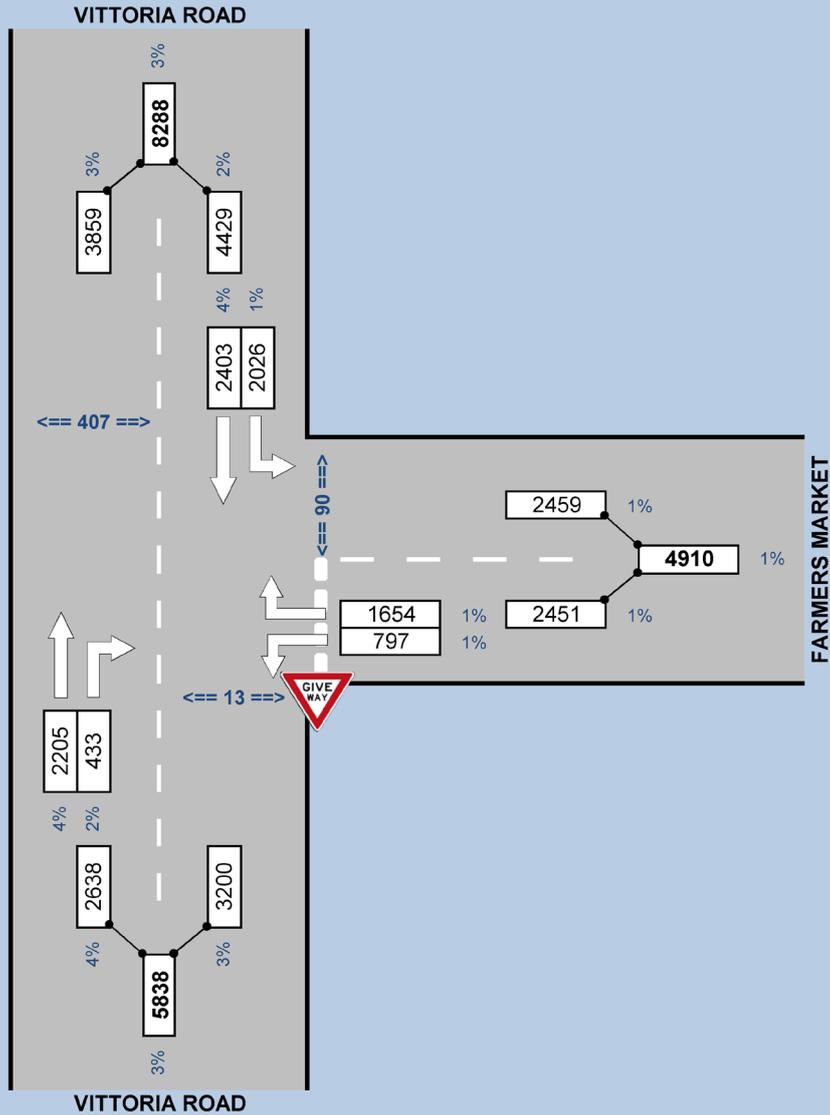


Project : Glen Iris Planning Study Date : Sat 30th November 2019  
 Intersection: Vittoria Rd / Farmers Market Weather : Fine



**Survey Time: 14 Hour Totals (0600 - 2000)**

All Vehicles  
 (% Heavy Vehicles)

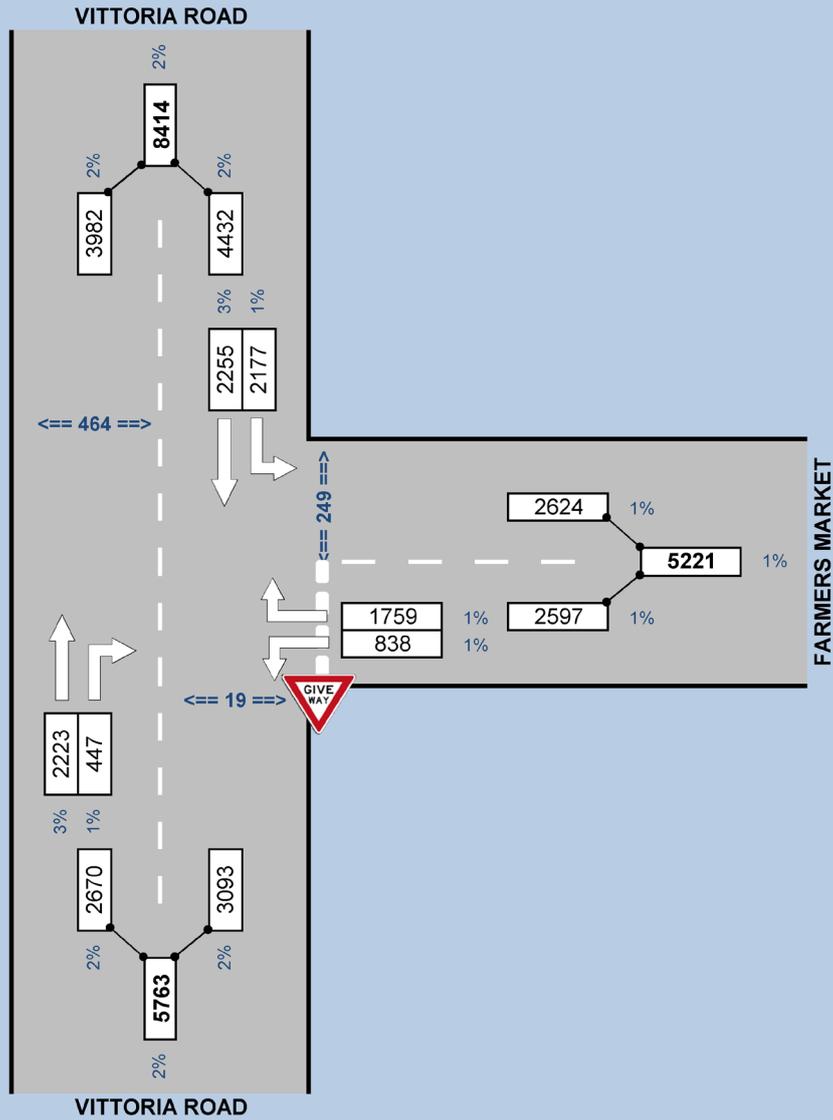


Project : Glen Iris Planning Study Date : Sun 1st December 2019  
 Intersection: Vittoria Rd / Farmers Market Weather : Fine



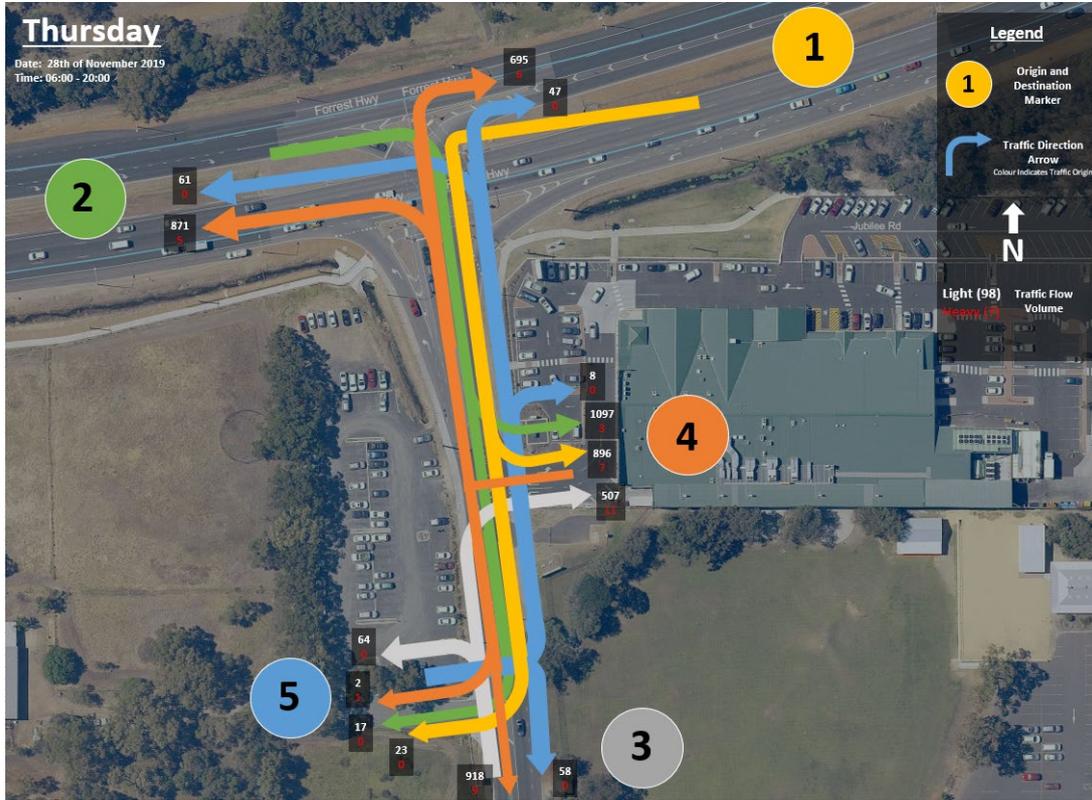
**Survey Time: 14 Hour Totals (0600 - 2000)**

All Vehicles  
 (% Heavy Vehicles)

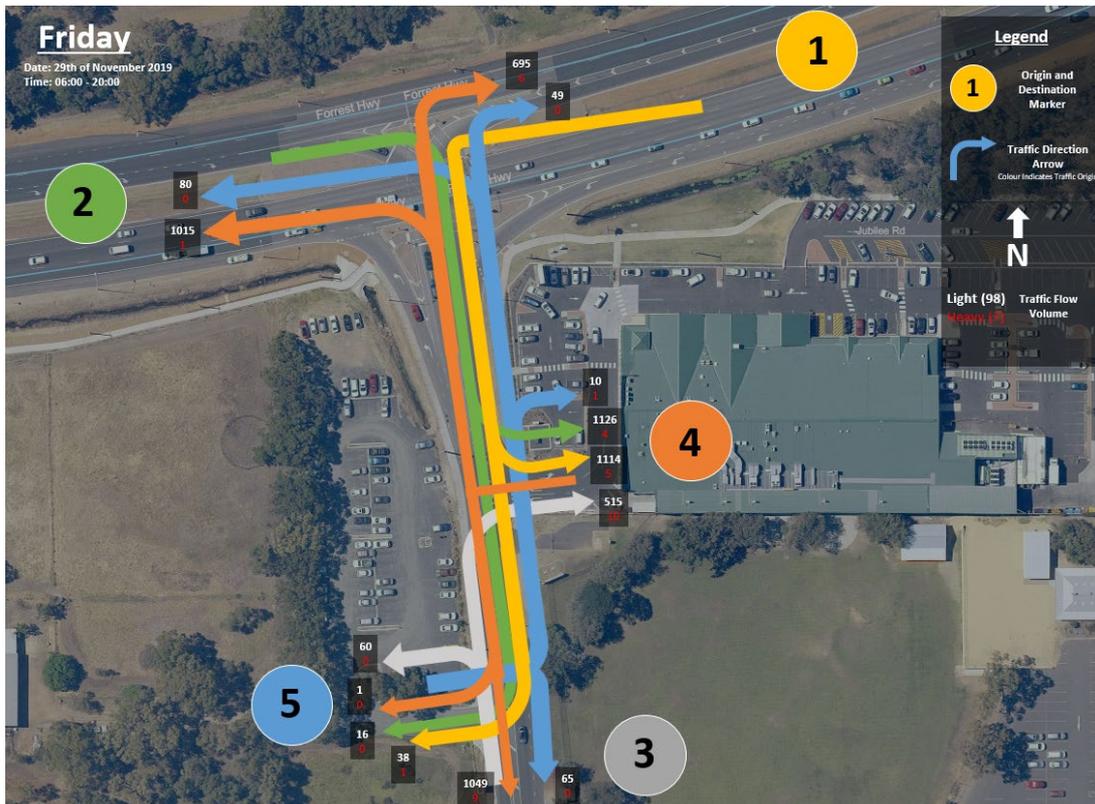


### 5.3. Appendix 3 – Origin and Destination Visualisations

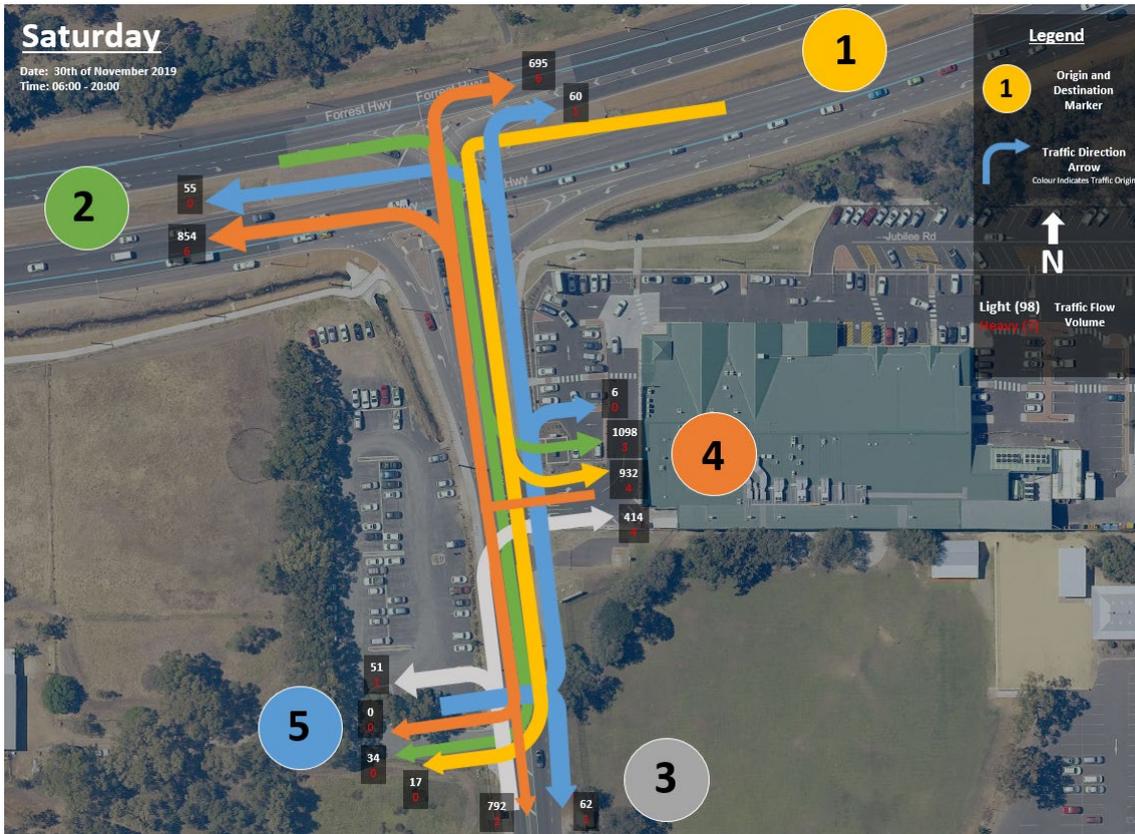
Thursday 14hr Volume



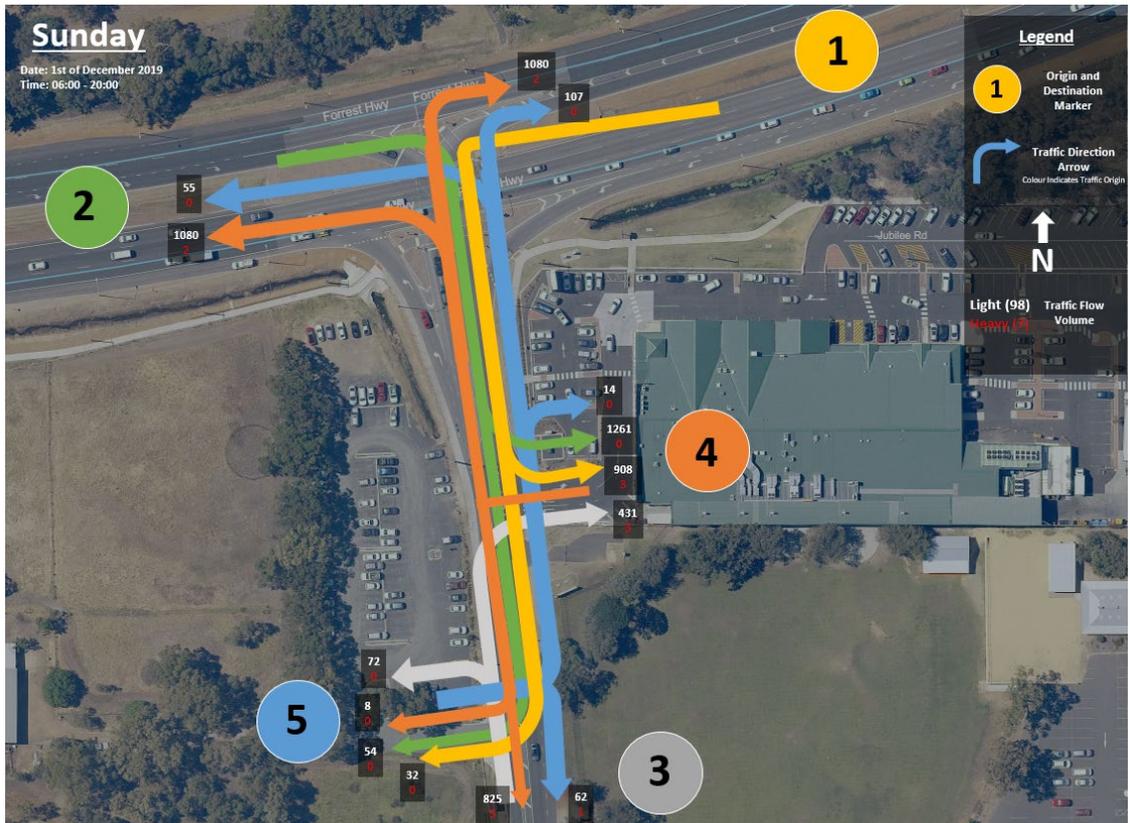
Friday 14hr Volume



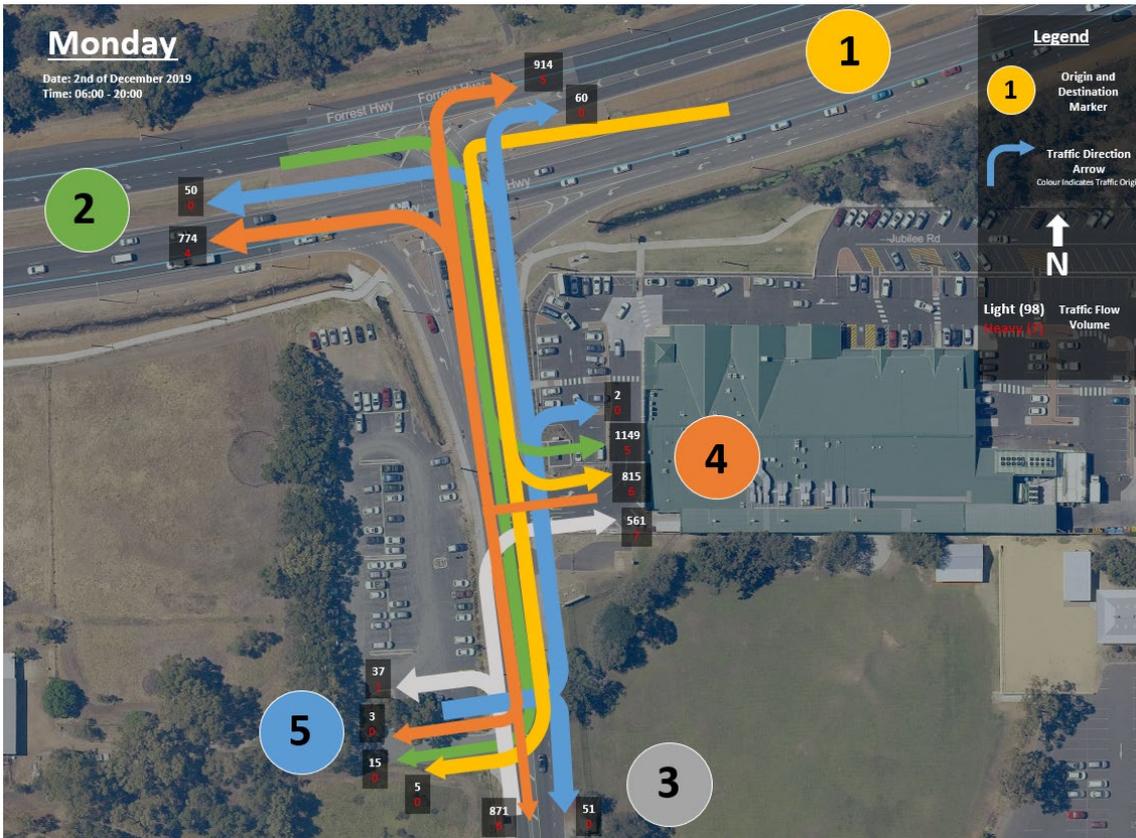
Saturday 14hr Volume



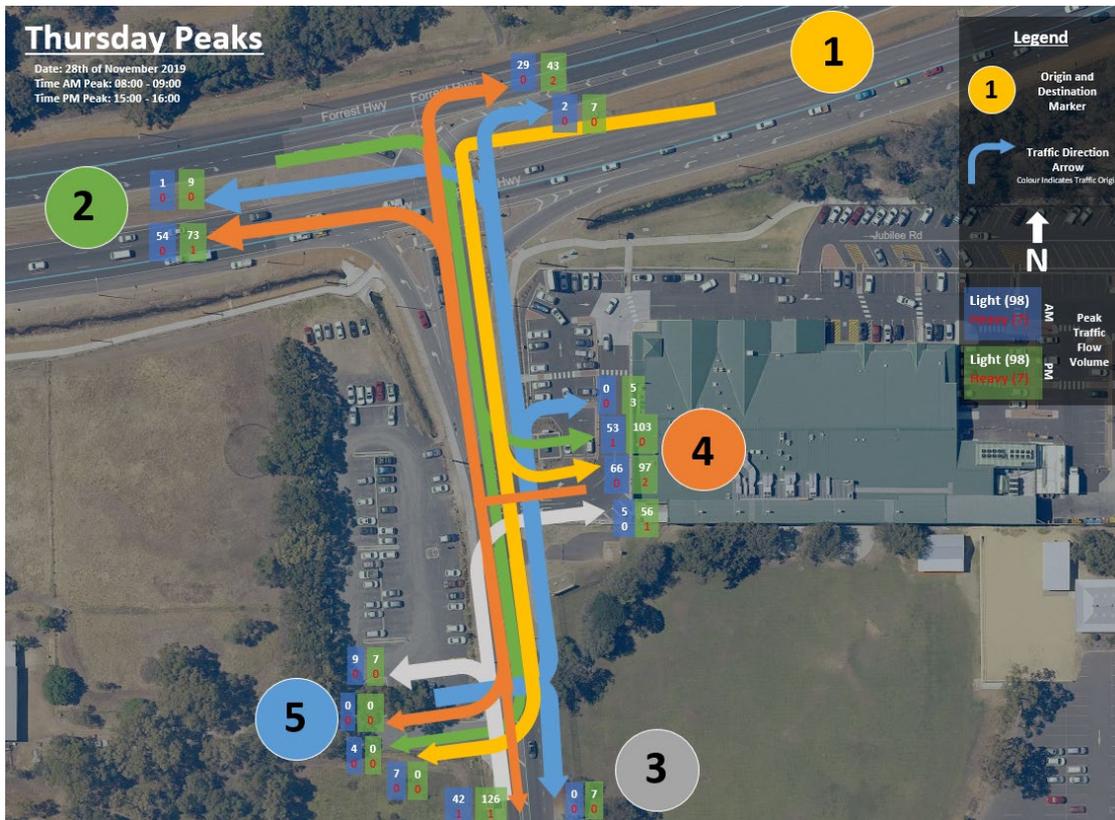
Sunday 14hr Volume



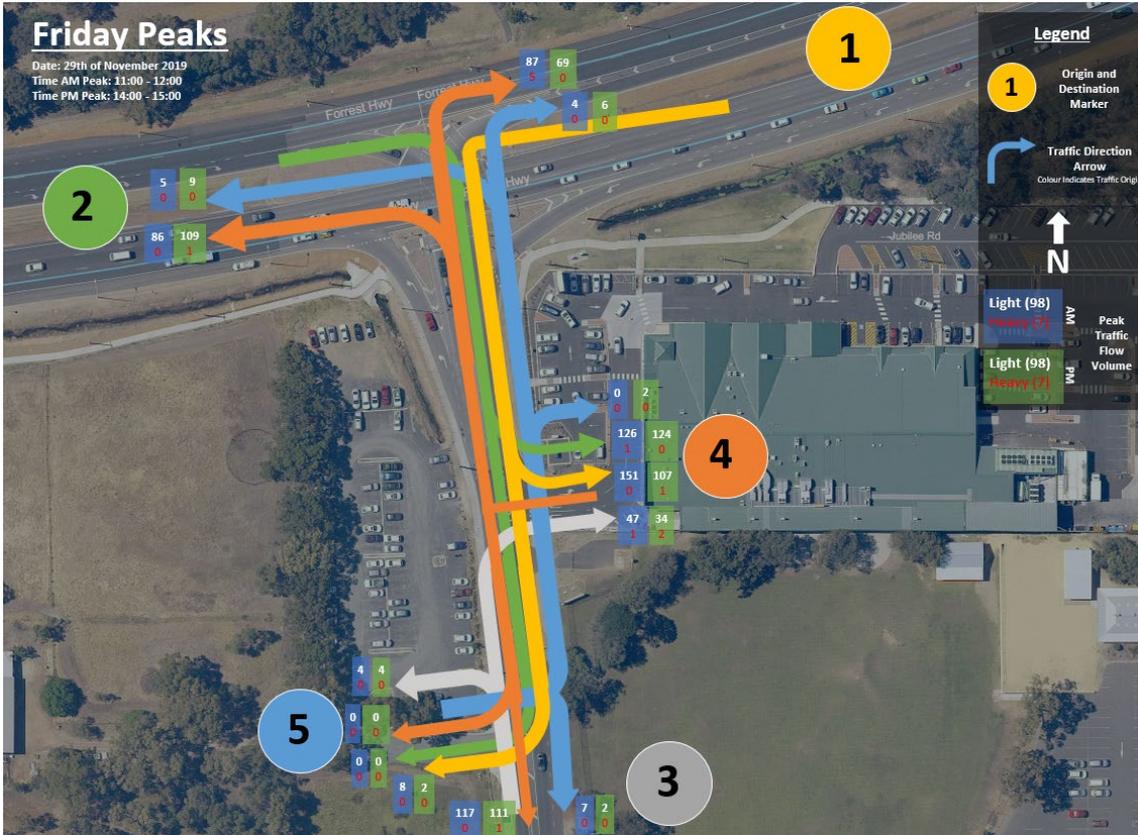
Monday 14hr Volume



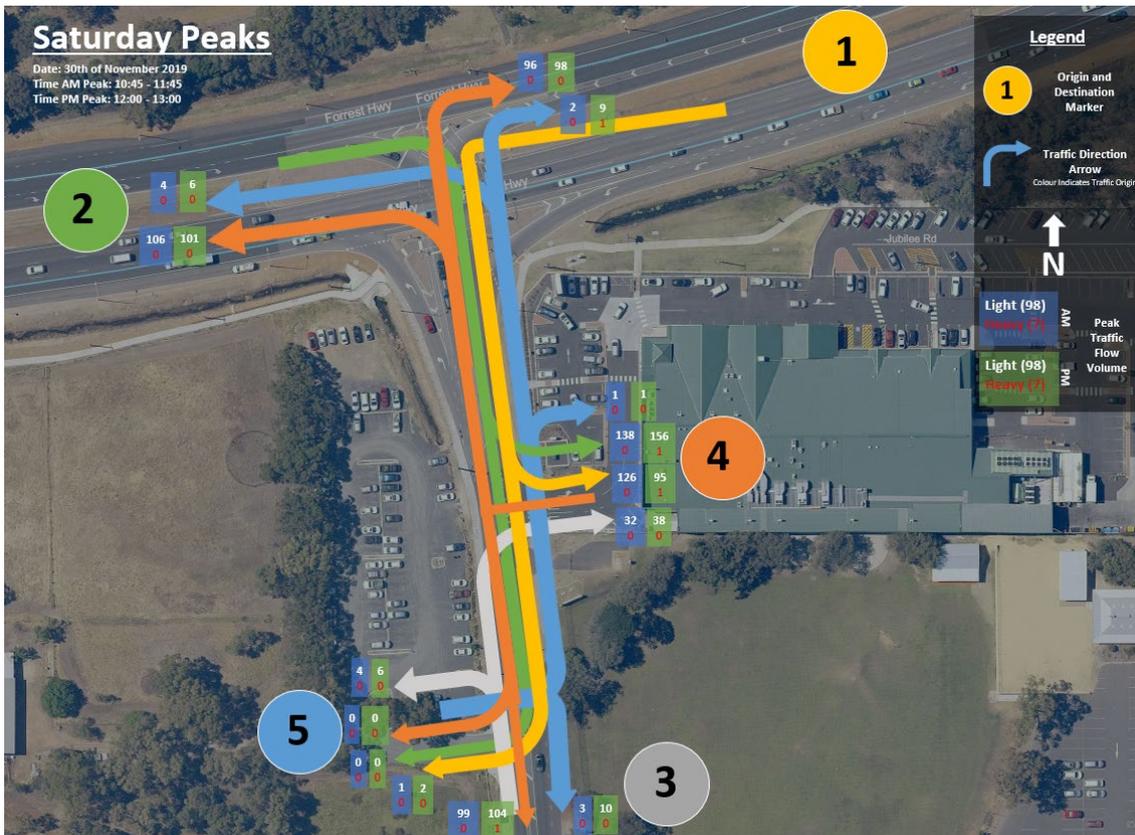
Thursday Peak Hour Volume



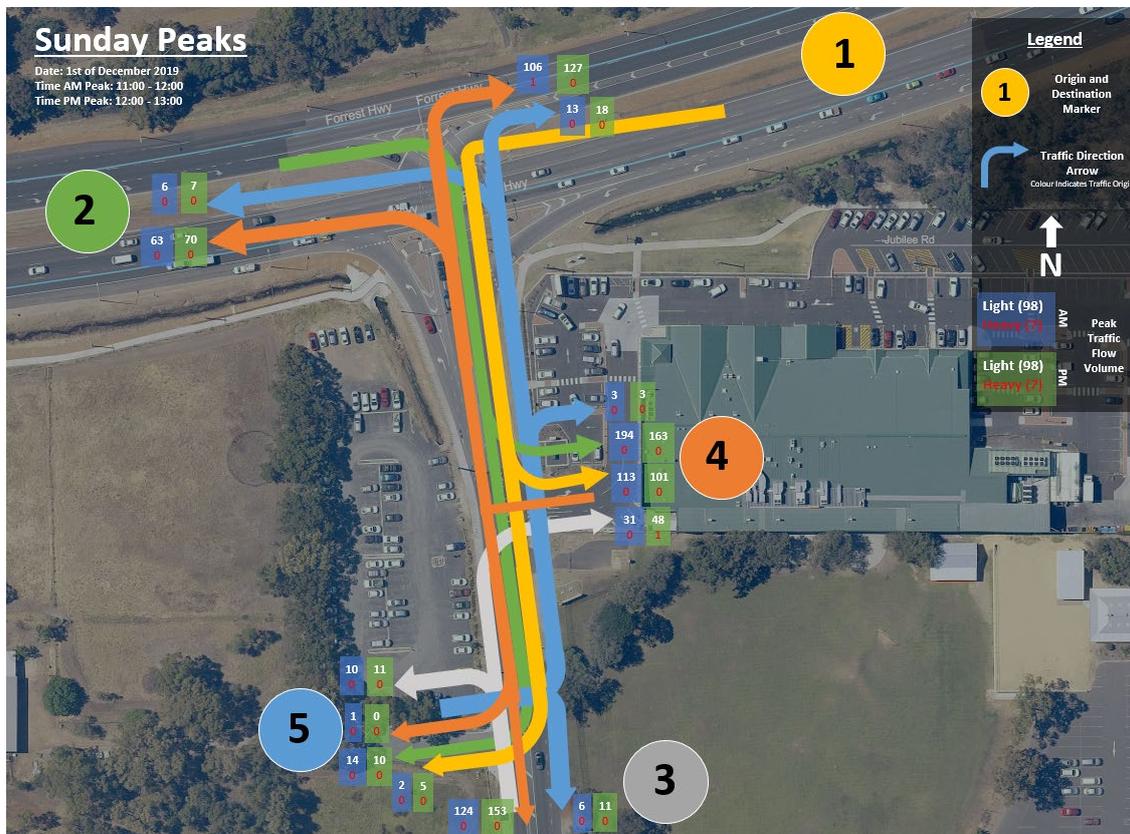
Friday Peak Hour Volume



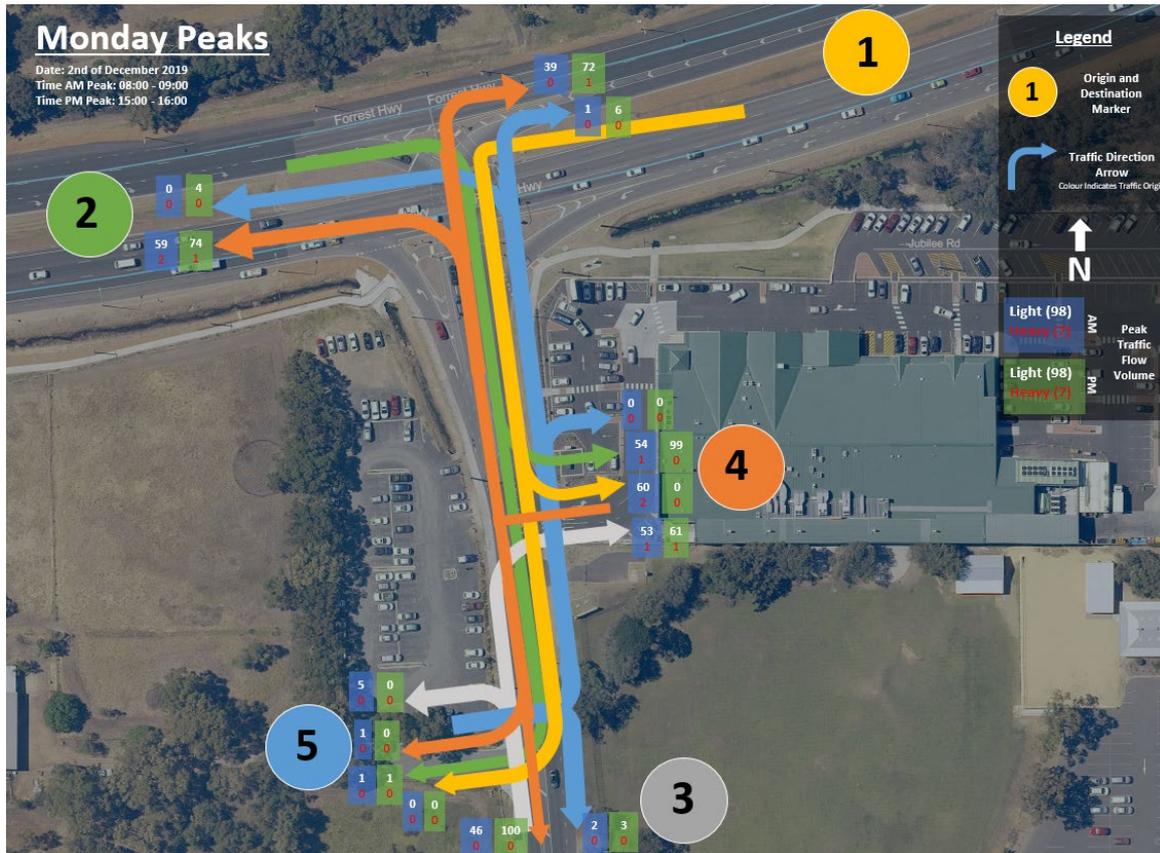
Saturday Peak Hour Volume



Sunday Peak Hour Volume



Monday Peak Hour Volume



## 8.2. Appendix 2 – AD Bird Engineering Crash Analysis (December 2020)

### 1.2.8 Historic Crash data

It is noted that at the time of extracting the crash data for this report some of the 2015 hospitalisation crashes may not yet be included in the crash data. If it is subsequently found that some crashes are missing, then the crash data should be reassessed to identify and possible trends in crash history or specific locations where crashes are occurring.

Detailed crash data for the period 1 Jan 2015 to 31 Dec 2019 was used for the crash analysis in this road safety audit.

A collision diagram is provided at Appendix D2 which shows figuratively the location of reported crashes for which the vehicle movements can be determined, together with the RUM code legend at Appendix D1. The collision diagram has been colour coded to indicate Killed or Serious Injury crashes (Fatal or Hospitalisation severity) in red, while all other reported crashes are shown white on black. Crashes involving trucks (and buses) have a purple frequency star, motorcycle crashes have a blue frequency star, bicycle crashes have a green frequency star, while other crashes have a black frequency star with yellow surround. Where possible, the individual vehicle movement is indicated in the RUM code icon for these crashes.

#### 1.2.8.1 Crash summary

##### Killed or Serious Injury (KSI) crashes

There have been three hospitalisation crashes in the study area between 2015 and 2019 inclusive;

- A RUM 31 (Rear-end) crash between two light vehicles on Forrest Highway southbound, between the driveways of the Shell service station / Real Homestyle Kitchen premises on Forrest Highway. This crash occurred in dry conditions during daylight hours.
- A RUM 77 (loss of control – right turn) crash involving a car turning right onto Forrest Highway from Vittoria Road. This crash occurred at night (early morning) in dry conditions. The vehicle collided with a traffic island.
- A RUM 34 (Same direction – U-turn) crash between a motorcycle and a car doing a U-turn. Both vehicles were originally proceeding south on Vittoria Road, at the driveway to the Bunbury Farmers Market. This crash occurred at dawn in dry conditions.

##### All crashes

In addition to the KSI crashes listed above, there have been several non-KSI crashes within the study area between 2015 and 2019, with predominant crash types including;

##### Forrest Highway, between Vittoria Road and Alyxia Ave

- Persistent RUM 31 (rear end) crashes occurring in the southbound lanes of Forrest Highway. These crashes predominantly occur during daylight hours on Fridays or between 11am and 1pm on Saturdays.

- Single RUM 47 driveway crashes (potentially right angle crashes) at each of the driveways at the Shell service station / Real Homestyle Kitchen premises.

**Forrest Highway / Thomson Road / Alyxia Ave intersection**

- RUM 31 (rear-end) crashes in the northbound and southbound lanes of Forrest Highway.
- Low numbers of right angle and side swipe crashes.

**Forrest Highway / Vittoria Road intersection**

- At least 15 RUM 31 (rear-end) crashes on the northern approach of Forrest Highway to the intersection. These crashes occur predominantly during daylight hours and in dry conditions.
- Several side swipe (RUM 35, 36 and 37) crashes in the southbound lanes of Forrest Highway.
- Low numbers of rear-end (RUM 31, 32 and 33) crashes for various movements at the intersection.

**Vittoria Road / Jeffrey Road intersection**

- Two run off road hit pole (RUM 74 and 76) crashes, both of which occurred at night. At least one of these crashes occurred in wet weather and one occurred prior to the conversion of the intersection from a 4-way intersection under Stop control to a roundabout.
- Two right-angle (RUM 11 and 15) crashes, one of which (RUM 15) occurred prior to conversion of the intersection to a roundabout.

## 2015 to 2019 crash information

## Road User Movement (RUM) codes used in collision diagrams

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# Crash Factor Matrix

## ROAD USE MOVEMENT (RUM) CODES

	0	1	2	3	4	5	6	7	8	9
	PEDESTRIAN on foot, in toy/pram	INTERSECTION vehicles from adjacent approaches	VEHICLES FROM OPPOSING DIRECTIONS	VEHICLES FROM ONE DIRECTION	MANOEUVRING	OVERTAKING	ON PATH	OFF STRAIGHT, ON STRAIGHT	OFF PATH, ON CURVE	PASSENGERS AND MISCELLANEOUS
1	NEAR SIDE 1	THRU-THRU 11	SIDE SWIPE HEAD ON 21	REAR END 31		HEAD ON 51	PARKED 61	OFF CARRIAGEWAY TO LEFT 71	OFF CARRIAGEWAY RIGHT BEND 81	FELL INFROM VEHICLE 91
2	EMERGING 2	RIGHT-THRU 12	THRU-RIGHT 22	LEFT REAR 32	LEAVING PARKING 42	OUT OF CONTROL 52	DOUBLE PARKED 62	LEFT OFF CARRIAGEWAY INTO OBJECT/VEHICLE 72	OFF RIGHT BEND INTO OBJECT/VEHICLE 82	LOAD STRUCK VEHICLE 92
3	FAR SIDE 3	LEFT-THRU 13	RIGHT LEFT 23	RIGHT REAR 33	PARKING 43	PULLING OUT 53	ACCIDENT OR BROKEN DOWN 63	OFF CARRIAGEWAY TO RIGHT 73	OFF CARRIAGEWAY LEFT BEND 83	STRUCK TRAIN 93
4	PLAYING, WORKING LYING, STANDING ON CARRIAGEWAY 4	THRU-RIGHT 14	RIGHT RIGHT 24	U TURN 34	PARKING VEHICLES ONLY 44	CUTTING IN 54	CAR DOOR 64	RIGHT OFF CARRIAGEWAY INTO OBJECT/VEHICLE 74	OFF LEFT BEND INTO OBJECT/VEHICLE 84	STRUCK RAILWAY XING FURNITURE 94
5	WALKING WITH TRAFFIC 5	RIGHT-RIGHT 15	THRU LEFT 25	LANE SIDE SWIPE 35	REVERSING 45	PULLING OUT REAR END 55	PERMANENT OBSTRUCTION 65	OUT OF CONTROL ON CARRIAGEWAY 75	OUT OF CONTROL ON CARRIAGEWAY 85	ANIMAL OFF CARRIAGEWAY 95
6	FACING TRAFFIC 6	LEFT-RIGHT 16	LEFT LEFT 26	LANE CHANGE RIGHT 36	REVERSING INTO FIXED OBJECT 46	O.T.-RT 56	TEMPORARY ROADWORKS 66	LEFT TURN 76		PARKED CAR RAN AWAY 96
7	DRIVEWAY 7	THRU-LEFT 17	U TURN 27	LANE CHANGE LEFT 37	LEAVING DRIVEWAY 47		TEMPORARY OBJECT ON CARRIAGEWAY 67	HIGH TURN 77		VEHICLE MOVEMENTS NOT KNOWN 97
8	ON FOOTWAY 8	RIGHT-LEFT 18		RIGHT TURN S/S 38	LOADING BAY 48					
9	STRUCK WHILE BOARDING OR ALIGHTING 9	LEFT-LEFT 19		LEFT TURN S/S 39	FROM FOOTWAY 49		ON CARRIAGEWAY 69			
	OTHER 98	OTHER 10	OTHER 20	OTHER 30	OTHER 40	OTHER 50	OTHER 60 (MISSILE/ FLYING OBJECT)	OTHER 70	OTHER 80	OTHER 90

FORREST HIGHWAY - PRESTON RIVER TO ALYXIA DRIVE  
 VITTORIA ROAD - FORREST HIGHWAY TO JEFFREY ROAD  
 COLLISION DIAGRAM  
 2015 TO 2019 REPORTED CRASHES



Crash locations shown indicatively

Intended to be plotted at A0 size.

Nearmap image date: 15 Sep 2020

FORREST HIGHWAY - PRESTON RIVER TO ALYXIA DRIVE  
 VITTORIA ROAD - FORREST HIGHWAY TO JEFFREY ROAD  
 COLLISION DIAGRAM  
 2015 TO 2019 REPORTED CRASHES



Crash locations shown indicatively

Intended to be plotted at A0 size.

Nearmap image date: 15 Sep 2020

### **8.3. Appendix 3 – Traffic Assessment Report (May 2021)**

Refer attached document



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WESTERN AUSTRALIA

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Western Australia.*

# Traffic Assessment Report

## Glen Iris Development

*An assessment of the impact of traffic growth at the  
intersection of Forrest Hwy & Vittoria Rd, Bunbury.*

Printed copies are uncontrolled unless marked otherwise.  
This report is for Main Roads WA internal use only.

**May 2021**

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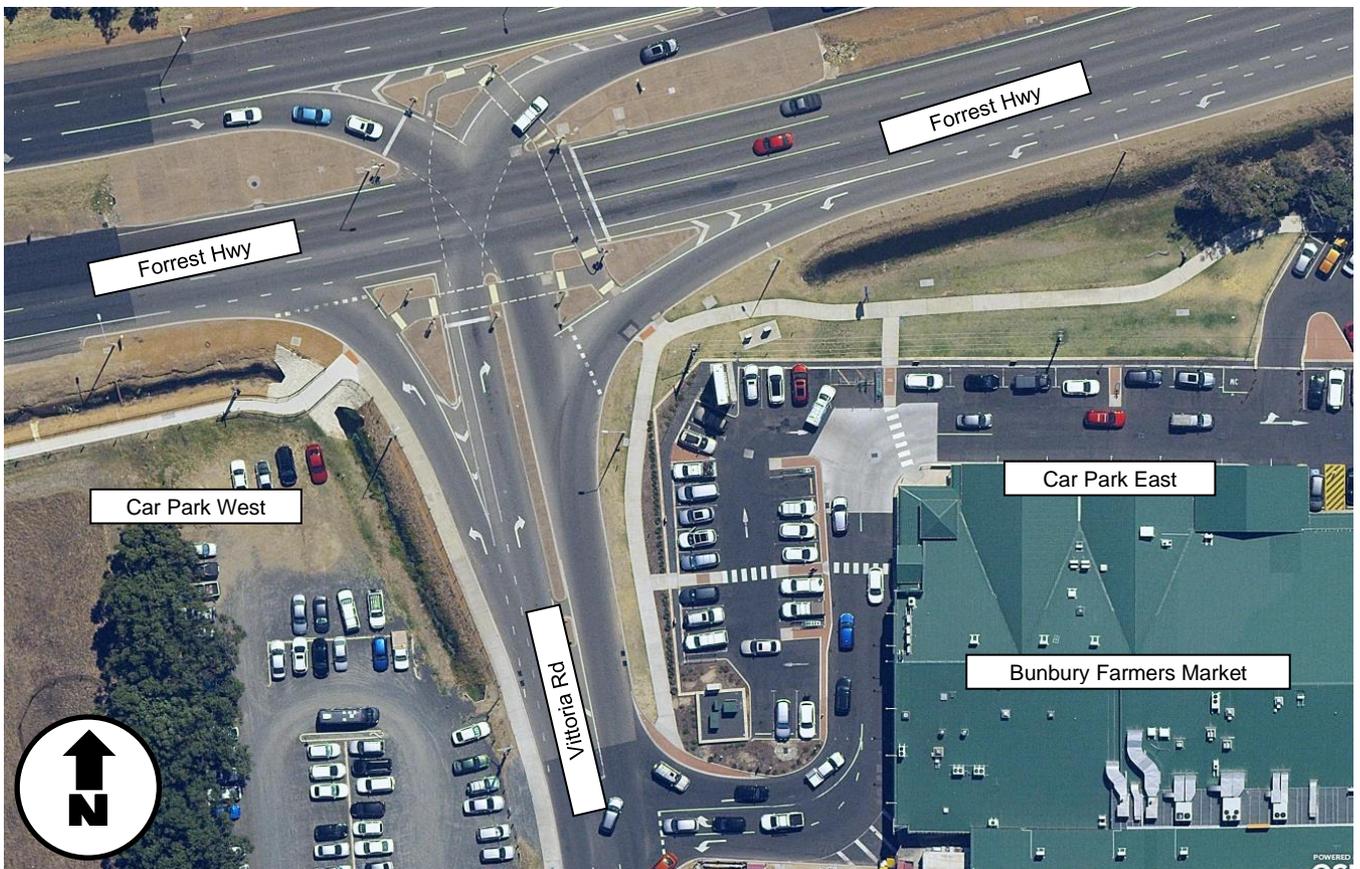


# 1 SCOPE

This assessment looks at the impact of future traffic growth on the Forrest Highway (Hwy) and Vittoria Road (Rd) intersection. The Bunbury Farmers Market (BFM) is located at the south-east corner of Forrest Hwy / Vittoria Road Rd intersection, and a new development by Erceg is proposed at the south-west corner of this intersection. In 2019, Bunbury’s population increased by 2.96% and is set to increase in the near future (Population Australia, 2020). Bunbury and its surrounding regions are on track to develop into a conurbation. The population growth has led to an increase in traffic in Western Australia’s South West Region. A known issue at this intersection is congestion around midday. BFM’s popularity attracts a high volume of traffic, ultimately causing stacking issues when vehicles want to enter the car park. Stacking currently extends back on to Forrest Hwy causing driver frustration, extended delays and safety issues.

In the past, numerous modelling assessments have been undertaken for this intersection. A recent study (D20#982512) assessed the short-term impact on this intersection if the traffic flow and parking arrangement within BFM was improved.

This report outlines the results of further modelling undertaken for this intersection and its surrounds using 2031 projected traffic volumes. Figure 1 illustrates the existing layout. Three scenarios, as outlined in Section 2 have been modelled as part of this study.



*Figure 1: Forrest Hwy & Vittoria Rd – Existing Layout. Source: ImageNow 2020*

## 2 SCENARIOS

This report outlines the modelling undertaken on three scenarios as shown in Table 1 below.

Video survey data was used to determine 2020 traffic volumes. Projected volumes for 2031 were calculated as follows based on instruction from the Project Manager:

- The 2031 volumes were calculated by applying a 2% growth factor to the 2020 values.
- The 2031 volumes for the Forrest Hwy and Vittoria Rd site accounted for the introduction of the Bunbury Outer Ring Road (BORR). Firstly, a 2% growth factor from 2020 to 2023 was applied. Secondly, the 2023 volumes were reduced by 25%. Finally, a 2% growth factor from 2023 to 2031 was applied on the reduced 2023 volumes.
- The impact of the Glen Iris development by Erceg has been incorporated into the projected 2031 volumes.
- Redistributed volumes for Scenario 4 was provided by the Project Manager for direct input into the model.

Table 1 lists the details of the model layouts and options.

*Table 1: Models and Options*

<b>Model</b>	<b>Description</b>
Scenario #1	<ul style="list-style-type: none"> <li>• Forrest Hwy / Vittoria Rd – Existing Layout (2031).</li> <li>• BFM Entrance – Existing Parking Layout (2031).</li> <li>• Erceg Development Access (2031) – Full movements.</li> <li>• Roundabout at the school access on Vittoria Rd to provide link to Vittoria Rd from the new intersection (2031).</li> </ul>
Scenario #2	<ul style="list-style-type: none"> <li>• Forrest Hwy / Vittoria Rd – Existing Layout (2031).</li> <li>• BFM Entrance – Right Turn Out Banned, Refined Parking (2031).</li> <li>• Erceg Development Access (2031) – Left in Left Out.</li> <li>• Roundabout at the school access on Vittoria Rd to provide link to Vittoria Rd from the new intersection (2031).</li> </ul>
Scenario #4	<ul style="list-style-type: none"> <li>• Forrest Hwy / New Rd – Proposed Layout (2031).</li> <li>• Forrest Hwy / Vittoria Rd – Existing Layout (2031).</li> <li>• BFM Entrance – Right Turn Out Banned, Refined Parking (2031).</li> <li>• Erceg Development Access (2031) – Left in Left Out.</li> <li>• Roundabout at the school access on Vittoria Rd to provide link to Vittoria Rd from the new intersection (2031).</li> </ul>

<b>Model</b>	<b>Description</b>

### 3 MODEL ASSUMPTIONS AND CALIBRATION

Assumptions and calibration used for the SIDRA traffic models are as follows:

- **SCENARIO 1**

- Forrest Hwy / Vittoria Rd – Existing Layout
  - Forrest Hwy Eastbound through movement has no impact on the intersections performance. It was not included in the model.
  - The north-west leg was modelled using a basic saturation flow of 1800 tcu/hour.
- BFM Entrance – Existing Layout, Existing Parking
  - No assumptions.
  - Capacity adjustment was undertaken by calibrating observations from the video footage with the theoretical values generated by SIDRA.
    - A capacity reduction of 96% was applied to the right-turn lane on the southern leg
    - A capacity reduction of 20% and 40% was applied to the left-turn and right-turn lanes respectively on the eastern leg.
    - A capacity reduction of 67% was applied to the left-turn lane on the northern leg.
  - To enable SIDRA to demonstrate the stacking issue seen on site, the left-turn lane had to be modelled as a slip lane under stop control. Whilst this is not in situ, it needed to be modelled as such.
- Erceg Development Access & Roundabout
  - No assumptions and calibrations.

- **SCENARIO 2**

- Scenario 2 adopted the same layout as Scenario 1 with the following exceptions.
  - It was assumed that a refined car park layout with improved circulation within the parking lot would reduce the vehicle stacking currently being experienced, reduce delays and hence improve safety at the BFM entrance. An example of a refined car park arrangement that provides better circulation and movement of traffic was provided in a previous study (D20#982512)
- The assumption was that capacity would be vastly but not completely improved. Hence the following adjustments were applied:
  - A capacity reduction of 20% to the right-turn lane on the southern leg
  - A capacity reduction of 0% and 20% to the left-turn and right -turn lanes respectively on the eastern leg.
  - A capacity reduction of 40% to the left-turn lane on the northern leg.

- **SCENARIO 4**

- Scenario 4 adopted the same layout as Scenario 2, with the same assumptions. It is assumed that there is a redistribution of traffic volumes due to the addition of a new signalized intersection west of Forrest Hwy / Vittoria Rd.

## 4 MODEL OUTPUT NOTES

The intersections have been assessed based on the Degree of Saturation (DOS), Level of Service (LOS) and critical queue length.

The DOS is a measure of the capacity of an intersection and a DOS greater than 100% indicates the intersection is over capacity. The desired DOS for various intersections are:

- Signalised intersections: 90%
- Roundabouts: 85%
- Stop/Give-Way Control: 80%

The LOS indicates the average delay that a vehicle will experience at an intersection. There are six LOS grades ranging from A (Good) to F (Poor). Table 2 shows the average delay (d) in seconds for each grade. Generally, the desired LOS is '**D**' or better.

*Table 2: Level of Service Definitions based on Delay only (for Vehicles).*

Level of Service	Control delay per vehicle in seconds (d)		
	Signals	Roundabouts	Sign Control
<b>A</b>	$d \leq 10$	$d \leq 10$	$d \leq 10$
<b>B</b>	$10 < d \leq 20$	$10 < d \leq 20$	$10 < d \leq 15$
<b>C</b>	$20 < d \leq 35$	$20 < d \leq 35$	$15 < d \leq 25$
<b>D</b>	$35 < d \leq 55$	$35 < d \leq 50$	$25 < d \leq 35$
<b>E</b>	$55 < d \leq 80$	$50 < d \leq 70$	$35 < d \leq 50$
<b>F</b>	$80 < d$	$70 < d$	$50 < d$

The critical queue length indicates the extent of the backlog (in metres) caused by delayed vehicles. It helps assess whether the queued traffic in a turning pocket will encroach into the through lane.

## 5 SCENARIO #1

### 5.1 Existing Layout

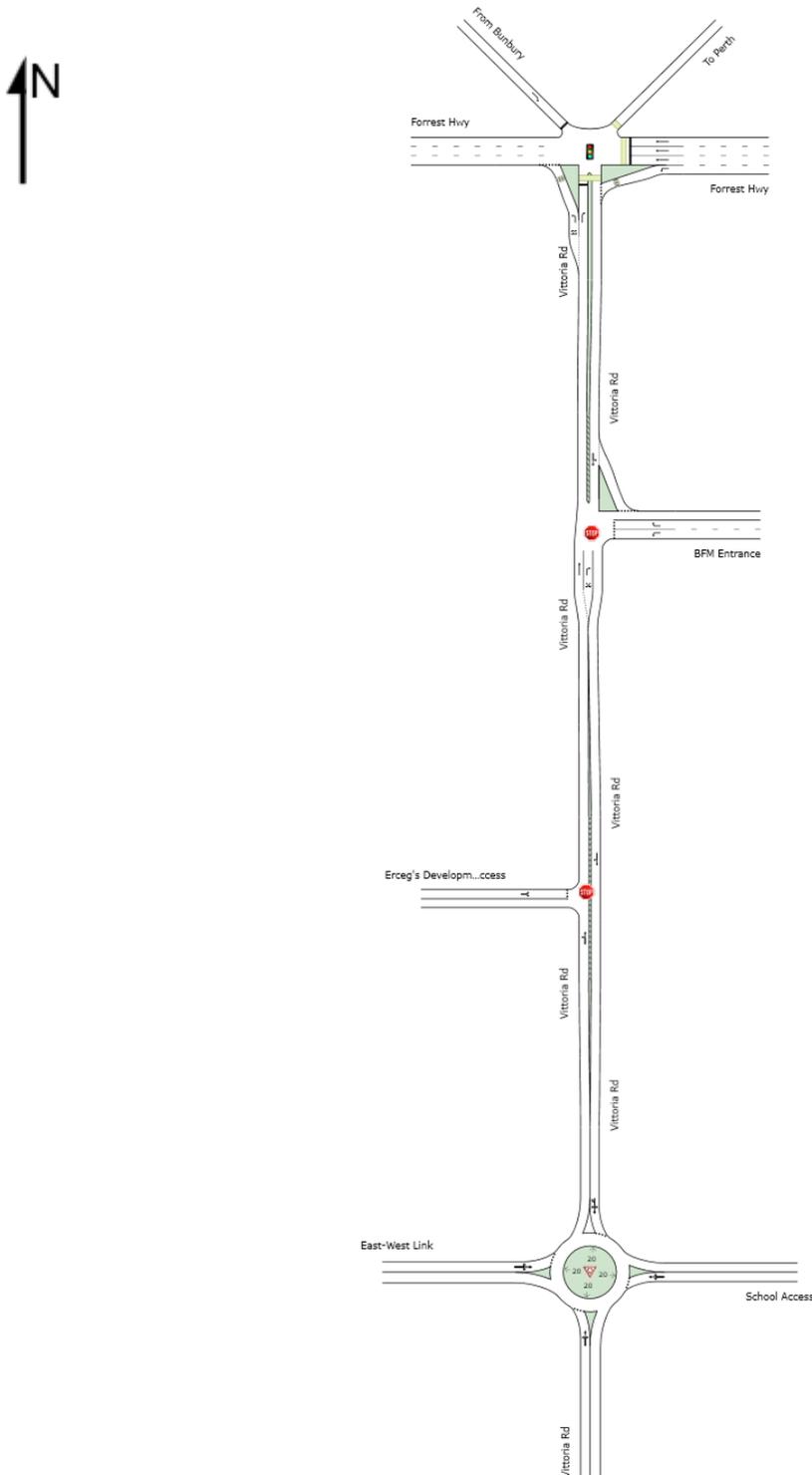


Figure 2: Scenario 1 Model Layout from SIDRA.  
(Layout pictures are schematic functional drawings reflecting input data. They are not design drawings).

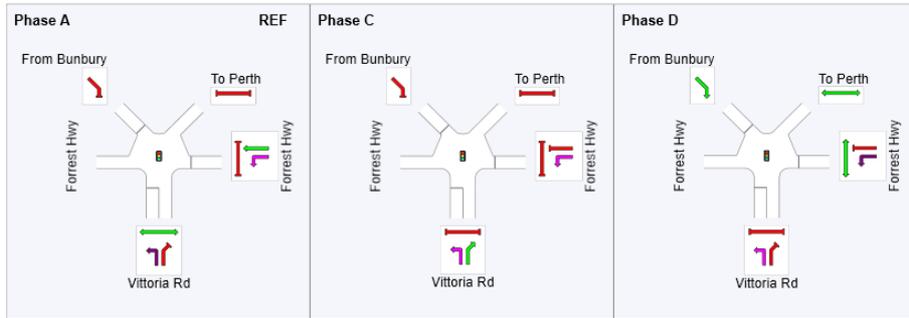


Figure 3: Scenario 1 Model Phasing from SIDRA

## 5.2 Mid-Day Peak - Results of all intersections in the model

 Site: [Midday 2031 - Scenario 1 - Forrest Hwy / Vittoria Rd - Existing Layout (Site Folder: Scenario 1)]

 Network: [Midday 2031 - Scenario 1 (Network Folder: Scenario 1)]

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Vittoria Rd														
1	L2	364	13.6	339	14.5	0.323	12.4	LOS B	4.6	37.5	0.37	0.70	0.37	45.4
3a	R1	368	13.6	342	14.5	* 1.175	243.7	LOS F	8.5	70.0	1.00	1.45	2.21	7.4
Approach		732	13.6	681 <sup>N1</sup>	14.5	1.175	128.7	LOS F	8.5	70.0	0.69	1.08	1.30	12.7
East: Forrest Hwy														
4	L2	447	17.5	447	17.5	1.103	161.4	LOS F	38.1	326.9	1.00	1.16	1.93	8.4
5	T1	1356	14.0	1356	14.0	* 1.179	240.3	LOS F	41.5	344.6	1.00	1.62	2.18	12.4
Approach		1803	14.9	1803	14.9	1.179	220.7	LOS F	41.5	344.6	1.00	1.51	2.12	11.6
NorthWest: From Bunbury														
29a	R1	376	17.0	376	17.0	* 1.178	254.4	LOS F	37.2	314.4	1.00	1.41	2.24	3.0
Approach		376	17.0	376	17.0	1.178	254.4	LOS F	37.2	314.4	1.00	1.41	2.24	3.0
All Vehicles		2911	14.8	2860 <sup>N1</sup>	15.1	1.179	203.2	LOS F	41.5	344.6	0.93	1.39	1.94	10.5

 Site: [Midday 2031 - Scenario 1 - BFM Entrance - Existing Layout, Existing Parking (Site Folder: Scenario 1)]

 Network: [Midday 2031 - Scenario 1 (Network Folder: Scenario 1)]

Site Category: - Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Vittoria Rd														
2	T1	551	13.6	551	13.6	0.345	0.7	LOSA	7.2	59.0	0.12	0.00	0.14	58.4
3	R2	64	7.1	64	7.1	1.525	501.9	LOS F	5.9	44.5	1.00	8.46	22.55	0.7
Approach		615	12.9	615	12.9	1.525	52.9	NA	7.2	59.0	0.21	0.88	2.47	4.7
East: BFM Entrance														
4	L2	150	0.0	150	0.0	0.185	4.4	LOSA	0.3	2.1	0.54	0.58	0.54	15.8
6	R2	181	1.8	181	1.8	1.387	387.9	LOS F	14.5	103.4	1.00	6.55	13.15	0.3
Approach		331	1.0	331	1.0	1.387	214.1	LOS F	14.5	103.4	0.79	3.85	7.43	0.6
North: Vittoria Rd														
7	L2	285	0.8	272	0.8	1.481	442.6	LOS F	8.8	70.0	1.00	1.52	6.14	0.9
8	T1	537	17.0	512	17.0	1.481	435.8	LOS F	8.8	70.0	1.00	1.52	6.14	0.7
Approach		822	11.4	784 <sup>N1</sup>	11.4	1.481	438.1	NA	8.8	70.0	1.00	1.52	6.14	0.8
All Vehicles		1768	10.0	1730 <sup>N1</sup>	10.2	1.525	258.3	NA	14.5	103.4	0.68	1.74	5.08	1.1

**STOP** Site: [Midday 2031 - Scenario 1 - Erceg's Development Access (Site Folder: Scenario 1)] **Network:** [Midday 2031 - Scenario 1 (Network Folder: Scenario 1)]

Site Category: - Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Vittoria Rd														
1	L2	26	7.1	26	7.1	0.265	5.1	LOS A	5.1	41.3	0.00	0.04	0.00	37.3
2	T1	408	13.6	408	13.6	0.265	0.0	LOS A	5.1	41.3	0.00	0.04	0.00	65.3
Approach		434	13.2	434	13.2	0.265	0.3	NA	5.1	41.3	0.00	0.04	0.00	61.5
North: Vittoria Rd														
8	T1	445	17.0	322	15.1	0.354	1.6	LOS A	0.8	6.3	0.45	0.29	0.51	34.9
9	R2	243	0.8	180	0.7	0.354	6.7	LOS A	0.8	6.3	0.45	0.29	0.51	35.1
Approach		688	11.3	502 <sup>N1</sup>	9.9	0.354	3.4	NA	0.8	6.3	0.45	0.29	0.51	35.0
West: Erceg's Development Access														
10	L2	207	1.8	207	1.8	0.491	5.3	LOS A	2.6	18.4	0.52	0.78	0.72	15.4
12	R2	30	0.0	30	0.0	0.491	11.2	LOS B	2.6	18.4	0.52	0.78	0.72	15.4
Approach		237	1.6	237	1.6	0.491	6.1	LOS A	2.6	18.4	0.52	0.78	0.72	15.4
All Vehicles		1359	10.2	1172 <sup>N1</sup>	11.8	0.491	2.8	NA	5.1	41.3	0.30	0.29	0.36	35.6

**STOP** Site: [Midday 2031 - Scenario 1 - New Road to Vittoria Rd - Eastern Roundabout (Site Folder: Scenario 1)] **Network:** [Midday 2031 - Scenario 1 (Network Folder: Scenario 1)]

Site Category: - Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Vittoria Rd														
1	L2	150	7.1	150	7.1	0.636	5.3	LOS A	1.5	11.5	0.32	0.49	0.32	45.0
2	T1	413	13.6	413	13.6	0.636	5.7	LOS A	1.5	11.5	0.32	0.49	0.32	43.8
3	R2	25	7.1	25	7.1	0.636	11.1	LOS B	1.5	11.5	0.32	0.49	0.32	39.8
Approach		588	11.7	588	11.7	0.636	5.8	LOS A	1.5	11.5	0.32	0.49	0.32	44.1
East: School Access														
4	L2	25	7.1	25	7.1	0.100	3.2	LOS A	0.2	1.4	0.62	0.47	0.62	33.9
5	T1	15	7.1	15	7.1	0.100	3.2	LOS A	0.2	1.4	0.62	0.47	0.62	32.9
6	R2	25	7.1	25	7.1	0.100	3.2	LOS A	0.2	1.4	0.62	0.47	0.62	14.8
Approach		65	7.1	65	7.1	0.100	3.2	LOS A	0.2	1.4	0.62	0.47	0.62	29.4
North: Vittoria Rd														
7	L2	25	17.0	19	15.2	0.328	6.0	LOS A	0.9	7.4	0.49	0.55	0.49	30.2
8	T1	425	17.0	316	15.2	0.328	5.2	LOS A	0.9	7.4	0.49	0.55	0.49	45.9
9	R2	25	17.0	19	15.2	0.328	9.8	LOS A	0.9	7.4	0.49	0.55	0.49	41.7
9u	U	1	14.2	1	12.7	0.328	11.7	LOS B	0.9	7.4	0.49	0.55	0.49	33.2
Approach		476	17.0	354 <sup>N1</sup>	15.2	0.328	5.5	LOS A	0.9	7.4	0.49	0.55	0.49	45.1
West: East-West Link														
10	L2	20	7.1	20	7.1	0.203	5.9	LOS A	0.4	3.2	0.61	0.73	0.61	32.3
11	T1	8	7.1	8	7.1	0.203	9.1	LOS A	0.4	3.2	0.61	0.73	0.61	30.8
12	R2	133	7.1	133	7.1	0.203	10.3	LOS B	0.4	3.2	0.61	0.73	0.61	40.6
Approach		161	7.1	161	7.1	0.203	9.7	LOS A	0.4	3.2	0.61	0.73	0.61	39.4
All Vehicles		1290	12.8	1168 <sup>N1</sup>	14.2	0.636	6.1	LOS A	1.5	11.5	0.43	0.54	0.43	42.7

\* Critical Movement (Signal Timing)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

### 5.3 AM Peak - Results of all intersections in the model

**Site:** [AM 2031 - Scenario 1 - Forrest Hwy / Vittoria Rd - Existing Layout (Site Folder: Scenario 1)]

**Network:** [AM 2031 - Scenario 1 (Network Folder: Scenario 1)]

Site Category: (None)  
 Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Vittoria Rd														
1	L2	369	12.7	369	12.7	0.417	15.5	LOS B	5.1	41.3	0.57	0.79	0.57	43.2
3a	R1	191	12.7	191	12.7	*0.772	52.7	LOS D	6.0	48.5	1.00	0.91	1.18	24.7
Approach		560	12.7	560	12.7	0.772	28.1	LOS C	6.0	48.5	0.72	0.83	0.78	34.5
East: Forrest Hwy														
4	L2	419	17.8	419	17.8	0.813	31.5	LOS C	14.9	126.2	0.79	0.95	0.94	34.5
5	T1	1479	11.8	1479	11.8	*0.810	36.2	LOS D	14.6	117.1	0.97	0.92	1.07	44.6
Approach		1898	13.1	1898	13.1	0.813	35.1	LOS D	14.9	126.2	0.93	0.93	1.04	43.0
NorthWest: From Bunbury														
29a	R1	188	17.8	188	17.8	*0.786	49.3	LOS D	6.7	56.6	0.97	0.95	1.20	13.7
Approach		188	17.8	188	17.8	0.786	49.3	LOS D	6.7	56.6	0.97	0.95	1.20	13.7
All Vehicles		2646	13.4	2646	13.4	0.813	34.7	LOS C	14.9	126.2	0.89	0.91	1.00	39.7

**Site:** [AM 2031 - Scenario 1 - BFM Entrance - Existing Layout, Existing Parking (Site Folder: Scenario 1)]

**Network:** [AM 2031 - Scenario 1 (Network Folder: Scenario 1)]

Site Category: -  
 Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Vittoria Rd														
2	T1	462	12.7	462	12.7	0.335	0.8	LOSA	0.3	2.2	0.13	0.00	0.15	57.6
3	R2	71	10.6	71	10.6	1.757	702.6	LOS F	7.5	59.0	1.00	11.27	30.53	0.5
Approach		533	12.4	533	12.4	1.757	94.3	NA	7.5	59.0	0.24	1.50	4.20	2.8
East: BFM Entrance														
4	L2	53	0.0	53	0.0	0.066	4.0	LOSA	0.1	0.6	0.49	0.54	0.49	16.5
6	R2	98	4.4	98	4.4	0.632	27.3	LOS D	0.7	5.3	0.85	1.16	1.37	4.1
Approach		151	2.9	151	2.9	0.632	19.1	LOS C	0.7	5.3	0.73	0.94	1.07	5.7
North: Vittoria Rd														
7	L2	118	2.1	118	2.1	1.157	156.2	LOS F	8.5	70.0	1.00	0.51	3.44	2.5
8	T1	489	17.8	489	17.8	1.157	145.4	LOS F	8.5	70.0	1.00	0.51	3.44	2.0
Approach		607	14.7	607	14.7	1.157	147.5	NA	8.5	70.0	1.00	0.51	3.44	2.1
All Vehicles		1291	12.4	1291	12.4	1.757	110.5	NA	8.5	70.0	0.66	0.97	3.48	2.4

**STOP** Site: [AM 2031 - Scenario 1 - Erceg's Development Access (Site Folder: Scenario 1)]

Network: [AM 2031 - Scenario 1 (Network Folder: Scenario 1)]

Site Category: -  
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Vittoria Rd														
1	L2	16	10.6	16	10.6	0.289	5.1	LOSA	0.6	4.8	0.00	0.02	0.00	37.5
2	T1	460	12.7	460	12.7	0.289	0.0	LOSA	0.6	4.8	0.00	0.02	0.00	67.3
Approach		476	12.6	476	12.6	0.289	0.2	NA	0.6	4.8	0.00	0.02	0.00	64.9
North: Vittoria Rd														
8	T1	456	17.8	401	17.5	0.321	0.8	LOSA	0.4	3.3	0.24	0.12	0.27	45.7
9	R2	86	2.1	76	2.1	0.321	7.0	LOSA	0.4	3.3	0.24	0.12	0.27	41.2
Approach		542	15.3	476 <sup>N1</sup>	15.1	0.321	1.8	NA	0.4	3.3	0.24	0.12	0.27	44.6
West: Erceg's Development Access														
10	L2	73	4.4	73	4.4	0.177	4.0	LOSA	0.1	1.0	0.50	0.61	0.50	17.6
12	R2	8	0.0	8	0.0	0.177	9.1	LOSA	0.1	1.0	0.50	0.61	0.50	17.6
Approach		81	4.0	81	4.0	0.177	4.5	LOSA	0.1	1.0	0.50	0.61	0.50	17.6
All Vehicles		1099	13.3	1033 <sup>N1</sup>	14.2	0.321	1.3	NA	0.6	4.8	0.15	0.11	0.16	48.8

Site: [AM 2031 - Scenario 1 - New Road to Vittoria Rd - Eastern Roundabout (Site Folder: Scenario 1)]

Network: [AM 2031 - Scenario 1 (Network Folder: Scenario 1)]

Site Category: -  
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Vittoria Rd														
1	L2	55	10.6	55	10.6	0.568	6.5	LOSA	2.0	15.6	0.62	0.61	0.62	41.8
2	T1	452	12.7	452	12.7	0.568	6.9	LOSA	2.0	15.6	0.62	0.61	0.62	39.4
3	R2	103	10.6	103	10.6	0.568	12.4	LOS B	2.0	15.6	0.62	0.61	0.62	36.5
Approach		610	12.2	610	12.2	0.568	7.8	LOSA	2.0	15.6	0.62	0.61	0.62	39.2
East: School Access														
4	L2	103	10.6	103	10.6	0.313	3.2	LOSA	0.8	6.2	0.67	0.55	0.67	33.2
5	T1	52	10.6	52	10.6	0.313	3.2	LOSA	0.8	6.2	0.67	0.55	0.67	32.2
6	R2	103	10.6	103	10.6	0.313	3.2	LOSA	0.8	6.2	0.67	0.55	0.67	14.7
Approach		258	10.6	258	10.6	0.313	3.2	LOSA	0.8	6.2	0.67	0.55	0.67	28.7
North: Vittoria Rd														
7	L2	103	17.8	91	17.5	0.388	6.3	LOSA	1.1	9.2	0.53	0.58	0.53	29.6
8	T1	352	17.8	310	17.5	0.388	5.5	LOSA	1.1	9.2	0.53	0.58	0.53	45.1
9	R2	9	17.8	8	17.5	0.388	10.1	LOS B	1.1	9.2	0.53	0.58	0.53	40.8
9u	U	1	10.6	1	10.4	0.388	11.9	LOS B	1.1	9.2	0.53	0.58	0.53	32.4
Approach		465	17.8	410 <sup>N1</sup>	17.5	0.388	5.8	LOSA	1.1	9.2	0.53	0.58	0.53	42.6
West: East-West Link														
10	L2	24	10.6	24	10.6	0.157	7.5	LOSA	0.4	2.9	0.74	0.79	0.74	30.8
11	T1	14	10.6	14	10.6	0.157	10.8	LOS B	0.4	2.9	0.74	0.79	0.74	29.5
12	R2	66	10.6	66	10.6	0.157	11.9	LOS B	0.4	2.9	0.74	0.79	0.74	39.0
Approach		104	10.6	104	10.6	0.157	10.8	LOS B	0.4	2.9	0.74	0.79	0.74	36.4
All Vehicles		1437	13.6	1382 <sup>N1</sup>	14.1	0.568	6.6	LOSA	2.0	15.6	0.61	0.61	0.61	38.1

\* Critical Movement (Signal Timing)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

## 5.4 PM Peak - Results of all intersections in the model

 Site: [PM 2031 - Scenario 1 - Forrest Hwy / Vittoria Rd - Existing Layout (Site Folder: Scenario 1)]

 Network: [PM 2031 - Scenario 1 (Network Folder: Scenario 1)]

Site Category: (None)  
 Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Vittoria Rd														
1	L2	405	9.4	380	9.9	0.348	11.9	LOS B	4.9	38.0	0.37	0.70	0.37	47.4
3a	R1	429	9.4	403	9.9	* 1.253	307.5	LOS F	9.0	70.0	1.00	1.58	2.47	6.0
Approach		834	9.4	783 <sup>N1</sup>	9.9	1.253	164.0	LOS F	9.0	70.0	0.69	1.16	1.45	10.5
East: Forrest Hwy														
4	L2	390	14.4	390	14.4	0.926	83.0	LOS F	29.2	239.4	1.00	1.10	1.31	17.7
5	T1	1383	13.9	1383	13.9	* 1.268	314.1	LOS F	48.5	399.3	1.00	1.80	2.49	9.8
Approach		1773	14.0	1773	14.0	1.268	263.2	LOS F	48.5	399.3	1.00	1.64	2.23	10.4
NorthWest: From Bunbury														
29a	R1	416	14.4	416	14.4	* 1.266	326.7	LOS F	46.5	380.8	1.00	1.53	2.53	2.3
Approach		416	14.4	416	14.4	1.266	326.7	LOS F	46.5	380.8	1.00	1.53	2.53	2.3
All Vehicles		3023	12.8	2972 <sup>N1</sup>	13.0	1.268	246.0	LOS F	48.5	399.3	0.92	1.50	2.07	9.0

 Site: [PM 2031 - Scenario 1 - BFM Entrance - Existing Layout, Existing Parking (Site Folder: Scenario 1)]

 Network: [PM 2031 - Scenario 1 (Network Folder: Scenario 1)]

Site Category: -  
 Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Vittoria Rd														
2	T1	680	9.4	680	9.4	0.409	0.9	LOSA	7.6	59.0	0.13	0.00	0.17	56.4
3	R2	87	4.6	87	4.6	2.045	960.4	LOS F	8.0	59.0	1.00	12.40	33.78	0.4
Approach		767	8.9	767	8.9	2.045	109.7	NA	8.0	59.0	0.23	1.41	3.98	2.4
East: BFM Entrance														
4	L2	154	2.6	154	2.6	0.194	4.4	LOSA	0.3	2.2	0.54	0.59	0.54	15.7
6	R2	154	1.3	154	1.3	1.494	487.0	LOS F	14.4	102.4	1.00	6.33	13.13	0.3
Approach		308	2.0	308	2.0	1.494	245.7	LOS F	14.4	102.4	0.77	3.46	6.83	0.5
North: Vittoria Rd														
7	L2	246	1.3	227	1.3	1.398	369.3	LOS F	8.9	70.0	1.00	1.56	6.97	1.1
8	T1	560	14.4	517	14.4	1.398	361.8	LOS F	8.9	70.0	1.00	1.56	6.97	0.8
Approach		806	10.4	744 <sup>N1</sup>	10.4	1.398	364.1	NA	8.9	70.0	1.00	1.56	6.97	0.9
All Vehicles		1881	8.4	1819 <sup>N1</sup>	8.7	2.045	236.8	NA	14.4	102.4	0.64	1.82	5.69	1.1

**Site:** [PM 2031 - Scenario 1 - Erceg's Development Access (Site Folder: Scenario 1)]

**Network:** [PM 2031 - Scenario 1 (Network Folder: Scenario 1)]

Site Category: -  
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Vittoria Rd														
1	L2	19	4.6	19	4.6	0.339	5.1	LOSA	10.6	82.0	0.00	0.02	0.00	37.8
2	T1	559	9.4	559	9.4	0.339	0.0	LOSA	10.6	82.0	0.00	0.02	0.00	67.3
Approach		578	9.2	578	9.2	0.339	0.2	NA	10.6	82.0	0.00	0.02	0.00	64.9
North: Vittoria Rd														
8	T1	487	14.4	358	13.2	0.395	2.6	LOSA	1.0	8.1	0.50	0.29	0.66	30.9
9	R2	227	1.3	169	1.2	0.395	8.3	LOSA	1.0	8.1	0.50	0.29	0.66	32.3
Approach		714	10.2	527 <sup>N1</sup>	9.3	0.395	4.4	NA	1.0	8.1	0.50	0.29	0.66	31.5
West: Erceg's Development Access														
10	L2	208	1.3	208	1.3	0.589	7.8	LOSA	4.9	34.7	0.60	0.96	0.99	12.7
12	R2	26	2.6	26	2.6	0.589	15.8	LOS C	4.9	34.7	0.60	0.96	0.99	12.7
Approach		234	1.4	234	1.4	0.589	8.7	LOSA	4.9	34.7	0.60	0.96	0.99	12.7
All Vehicles		1526	8.5	1339 <sup>N1</sup>	9.7	0.589	3.3	NA	10.6	82.0	0.30	0.29	0.43	34.5

**Site:** [PM 2031 - Scenario 1 - New Road to Vittoria Rd - Eastern Roundabout (Site Folder: Scenario 1)]

**Network:** [PM 2031 - Scenario 1 (Network Folder: Scenario 1)]

Site Category: -  
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Vittoria Rd														
1	L2	150	4.6	150	4.6	1.076	87.5	LOS F	25.1	187.6	1.00	1.71	3.06	13.2
2	T1	550	9.4	550	9.4	1.076	88.0	LOS F	25.1	187.6	1.00	1.71	3.06	8.0
3	R2	75	4.6	75	4.6	1.076	93.3	LOS F	25.1	187.6	1.00	1.71	3.06	8.4
Approach		775	8.0	775	8.0	1.076	88.4	LOS F	25.1	187.6	1.00	1.71	3.06	9.2
East: School Access														
4	L2	75	4.6	75	4.6	0.319	3.5	LOSA	0.6	4.2	0.68	0.58	0.68	34.0
5	T1	37	4.6	37	4.6	0.319	3.5	LOSA	0.6	4.2	0.68	0.58	0.68	32.9
6	R2	75	4.6	75	4.6	0.319	3.5	LOSA	0.6	4.2	0.68	0.58	0.68	14.4
Approach		187	4.6	187	4.6	0.319	3.5	LOSA	0.6	4.2	0.68	0.58	0.68	29.0
North: Vittoria Rd														
7	L2	75	14.4	56	13.3	0.382	6.6	LOSA	1.1	8.9	0.58	0.62	0.58	29.2
8	T1	413	14.4	310	13.3	0.382	5.8	LOSA	1.1	8.9	0.58	0.62	0.58	45.3
9	R2	25	14.4	19	13.3	0.382	10.4	LOS B	1.1	8.9	0.58	0.62	0.58	41.3
9u	U	1	9.2	1	8.4	0.382	12.2	LOS B	1.1	8.9	0.58	0.62	0.58	31.8
Approach		514	14.4	386 <sup>N1</sup>	13.3	0.382	6.1	LOSA	1.1	8.9	0.58	0.62	0.58	43.5
West: East-West Link														
10	L2	28	4.6	28	4.6	0.334	7.5	LOSA	0.8	5.8	0.83	0.86	0.83	30.5
11	T1	14	4.6	14	4.6	0.334	10.8	LOS B	0.8	5.8	0.83	0.86	0.83	29.3
12	R2	141	4.6	141	4.6	0.334	11.9	LOS B	0.8	5.8	0.83	0.86	0.83	39.4
Approach		183	4.6	183	4.6	0.334	11.1	LOS B	0.8	5.8	0.83	0.86	0.83	37.7
All Vehicles		1659	9.2	1531 <sup>N1</sup>	10.0	1.076	48.1	LOS D	25.1	187.6	0.84	1.19	1.88	15.0

\* Critical Movement (Signal Timing)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

## 6 SCENARIO #2

### 6.1 Refined Parking and Right Turn Out Banned at BFM

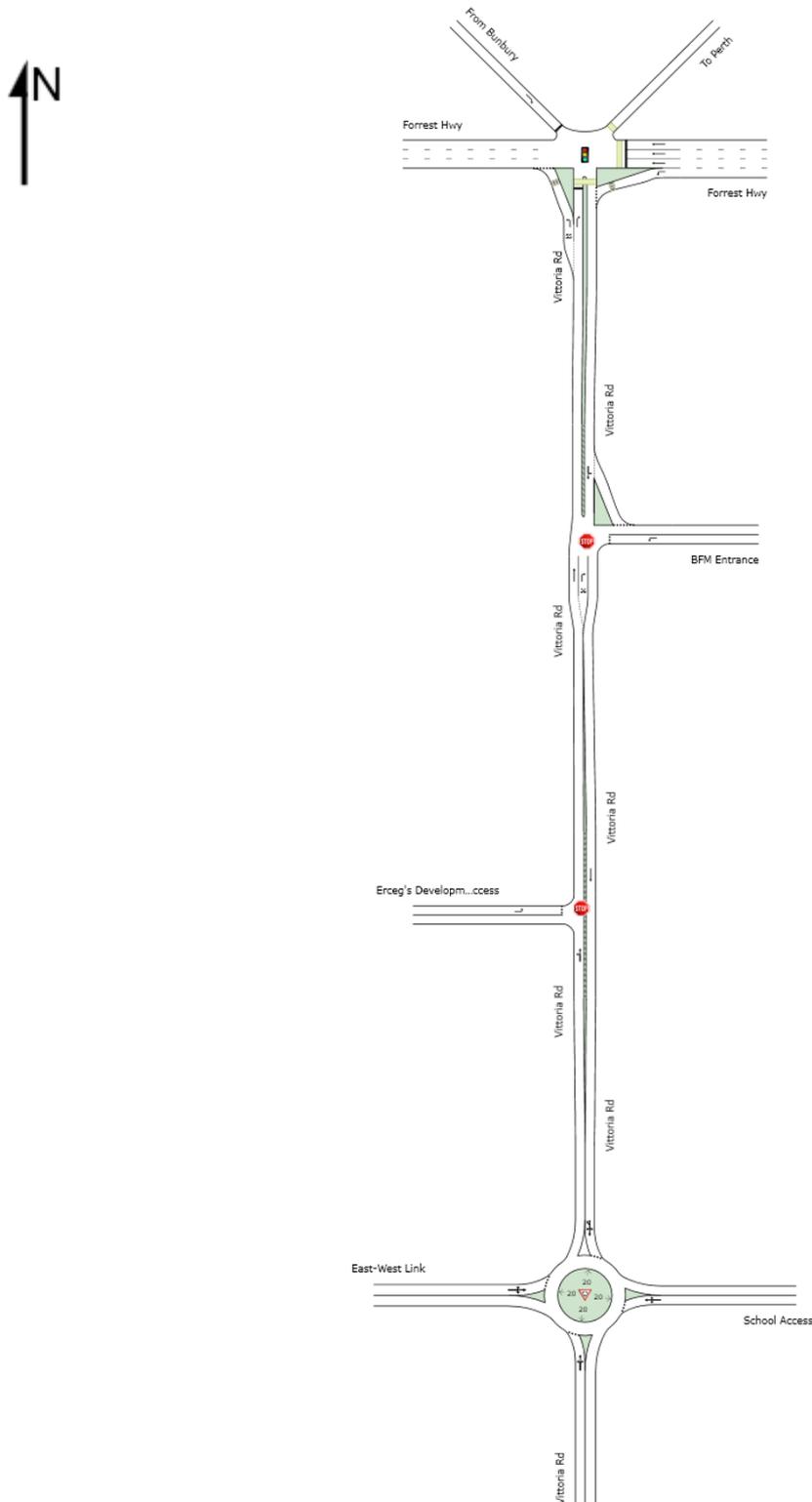


Figure 4: Scenario 2 Model Layout from SIDRA.  
(Layout pictures are schematic functional drawings reflecting input data. They are not design drawings).

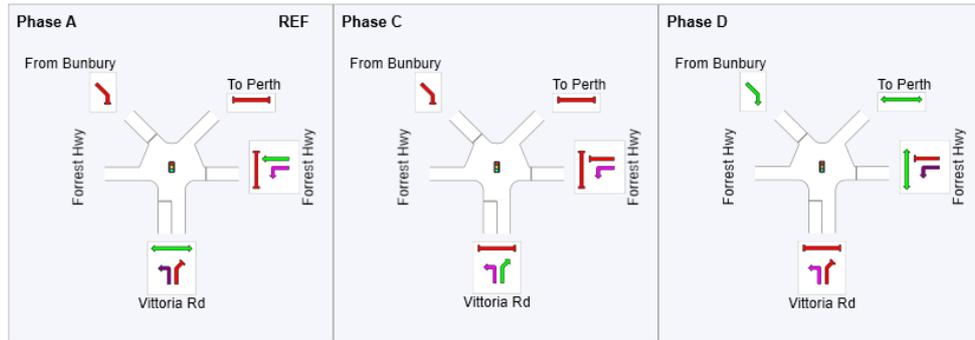


Figure 5: Scenario 2 Model Phasing from SIDRA

## 6.2 Mid-Day Peak - Results of all intersections in the model

 Site: [Midday 2031 - Scenario 2 - Forrest Hwy / Vittoria Rd - Existing Layout (Site Folder: Scenario 2)]

 Network: [Midday 2031 - Scenario 2 (Network Folder: Scenario 2)]

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[ Total veh/h ]	[ HV % ]	[ Total veh/h ]	[ HV % ]				[ Veh. veh ]	[ Dist ] m				
South: Vittoria Rd														
1	L2	454	13.6	377	13.4	0.354	12.3	LOS B	5.0	40.3	0.38	0.71	0.38	45.8
3a	R1	459	13.6	381	13.4	* 1.210	272.0	LOS F	8.6	70.0	1.00	1.51	2.32	6.7
Approach		913	13.6	758 <sup>N1</sup>	13.4	1.210	142.9	LOS F	8.6	70.0	0.69	1.11	1.36	11.7
East: Forrest Hwy														
4	L2	447	17.5	447	17.5	1.077	141.6	LOS F	28.2	242.2	1.00	1.13	1.83	9.3
5	T1	1356	14.0	1356	14.0	* 1.215	269.8	LOS F	44.0	365.4	1.00	1.69	2.31	11.2
Approach		1803	14.9	1803	14.9	1.215	238.0	LOS F	44.0	365.4	1.00	1.55	2.19	10.8
NorthWest: From Bunbury														
29a	R1	376	17.0	376	17.0	* 1.216	285.8	LOS F	39.3	332.0	1.00	1.46	2.37	2.7
Approach		376	17.0	376	17.0	1.216	285.8	LOS F	39.3	332.0	1.00	1.46	2.37	2.7
All Vehicles		3092	14.8	2937 <sup>N1</sup>	15.5	1.216	219.6	LOS F	44.0	365.4	0.92	1.43	2.00	9.8

 Site: [Midday 2031 - Scenario 2 - BFM Entrance - Right Turn Out Banned, Refined Parking (Site Folder: Scenario 2)]

 Network: [Midday 2031 - Scenario 2 (Network Folder: Scenario 2)]

Site Category: -  
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[ Total veh/h ]	[ HV % ]	[ Total veh/h ]	[ HV % ]				[ Veh. veh ]	[ Dist ] m				
South: Vittoria Rd														
2	T1	913	13.6	744	13.4	0.435	0.0	LOSA	7.3	59.0	0.00	0.00	0.00	69.6
3	R2	82	7.1	67	6.9	0.084	6.5	LOSA	0.1	1.0	0.56	0.69	0.56	24.9
Approach		995	13.1	811 <sup>N1</sup>	12.8	0.435	0.6	NA	7.3	59.0	0.05	0.06	0.05	58.1
East: BFM Entrance														
4	L2	331	0.0	331	0.0	0.345	5.3	LOSA	7.3	51.0	0.61	0.74	0.70	14.3
Approach		331	0.0	331	0.0	0.345	5.3	LOSA	7.3	51.0	0.61	0.74	0.70	14.3
North: Vittoria Rd														
7	L2	285	0.8	285	0.8	0.855	5.8	LOSA	8.8	70.0	0.12	0.21	0.14	30.3
8	T1	537	17.0	537	17.0	0.855	0.7	LOSA	8.8	70.0	0.12	0.21	0.14	43.5
Approach		822	11.4	822	11.4	0.855	2.5	NA	8.8	70.0	0.12	0.21	0.14	36.9
All Vehicles		2148	10.4	1964 <sup>N1</sup>	11.4	0.855	2.2	NA	8.8	70.0	0.17	0.24	0.19	36.9

**Site:** [Midday 2031 - Scenario 2 - Erceg's Development Access - Left In Left Out] **Network:** [Midday 2031 - Scenario 2 (Site Folder: Scenario 2)] **(Network Folder: Scenario 2)]**

Site Category: -  
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Vittoria Rd														
1	L2	269	7.1	201	7.0	0.481	5.1	LOSA	3.0	23.8	0.00	0.16	0.00	34.5
2	T1	788	13.6	588	13.5	0.481	0.0	LOSA	3.0	23.8	0.00	0.16	0.00	54.2
Approach		1057	11.9	788 <sup>N1</sup>	11.9	0.481	1.3	NA	3.0	23.8	0.00	0.16	0.00	45.7
North: Vittoria Rd														
8	T1	1050	17.0	1050	17.0	0.665	0.1	LOSA	7.0	59.0	0.00	0.00	0.00	68.9
Approach		1050	17.0	1050	17.0	0.665	0.1	NA	7.0	59.0	0.00	0.00	0.00	68.9
West: Erceg's Development Access														
10	L2	207	1.8	207	1.8	0.499	6.9	LOSA	1.1	7.5	0.59	0.87	0.84	14.5
Approach		207	1.8	207	1.8	0.499	6.9	LOSA	1.1	7.5	0.59	0.87	0.84	14.5
All Vehicles		2314	13.3	2045 <sup>N1</sup>	15.1	0.665	1.2	NA	7.0	59.0	0.06	0.15	0.08	45.8

**Site:** [Midday 2031 - Scenario 2 - New Road to Vittoria Rd - Eastern Roundabout] **Network:** [Midday 2031 - Scenario 2 (Site Folder: Scenario 2)] **(Network Folder: Scenario 2)]**

Site Category: -  
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Vittoria Rd														
1	L2	150	7.1	150	7.1	1.498	465.3	LOS F	72.2	555.5	1.00	6.81	15.68	3.1
2	T1	612	13.6	612	13.6	1.498	465.9	LOS F	72.2	555.5	1.00	6.81	15.68	1.7
3	R2	25	7.1	25	7.1	1.498	471.1	LOS F	72.2	555.5	1.00	6.81	15.68	1.8
Approach		787	12.2	787	12.2	1.498	465.9	LOS F	72.2	555.5	1.00	6.81	15.68	1.9
East: School Access														
4	L2	25	7.1	25	7.1	0.266	12.2	LOS B	0.6	4.8	1.00	0.98	1.00	25.2
5	T1	15	7.1	15	7.1	0.266	12.2	LOS B	0.6	4.8	1.00	0.98	1.00	24.7
6	R2	25	7.1	25	7.1	0.266	12.2	LOS B	0.6	4.8	1.00	0.98	1.00	8.5
Approach		65	7.1	65	7.1	0.266	12.2	LOS B	0.6	4.8	1.00	0.98	1.00	20.5
North: Vittoria Rd														
7	L2	25	17.0	25	17.0	1.194	189.5	LOS F	10.0	82.0	1.00	3.11	5.79	2.6
8	T1	606	17.0	606	17.0	1.194	188.7	LOS F	10.0	82.0	1.00	3.11	5.79	5.5
9	R2	25	17.0	25	17.0	1.194	193.3	LOS F	10.0	82.0	1.00	3.11	5.79	5.5
9u	U	446	14.2	446	14.2	1.194	195.3	LOS F	10.0	82.0	1.00	3.11	5.79	2.3
Approach		1102	15.9	1102	15.9	1.194	191.5	LOS F	10.0	82.0	1.00	3.11	5.79	4.2
West: East-West Link														
10	L2	20	7.1	20	7.1	0.316	10.1	LOS B	0.8	5.9	0.87	0.92	0.87	27.9
11	T1	8	7.1	8	7.1	0.316	13.3	LOS B	0.8	5.9	0.87	0.92	0.87	27.1
12	R2	133	7.1	133	7.1	0.316	14.5	LOS B	0.8	5.9	0.87	0.92	0.87	36.6
Approach		161	7.1	161	7.1	0.316	13.9	LOS B	0.8	5.9	0.87	0.92	0.87	35.4
All Vehicles		2115	13.5	2115	13.5	1.498	274.6	LOS F	72.2	555.5	0.99	4.26	8.95	3.2

\* Critical Movement (Signal Timing)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

### 6.3 AM Peak - Results of all intersections in the model

 Site: [AM 2031 - Scenario 2 - Forrest Hwy / Vittoria Rd - Existing Layout (Site Folder: Scenario 2)]

 Network: [AM 2031 - Scenario 2 (Network Folder: Scenario 2)]

Site Category: (None)  
 Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h ]	[ HV % ]	[ Total veh/h ]	[ HV % ]				[ Veh. veh ]	[ Dist ] m				
South: Vittoria Rd														
1	L2	418	12.7	418	12.7	0.509	17.9	LOS B	6.6	53.3	0.67	0.85	0.67	41.2
3a	R1	240	12.7	240	12.7	*0.662	43.3	LOS D	6.8	54.6	0.97	0.84	0.99	27.8
Approach		658	12.7	658	12.7	0.662	27.2	LOS C	6.8	54.6	0.78	0.84	0.79	35.0
East: Forrest Hwy														
4	L2	419	17.8	419	17.8	0.348	10.3	LOS B	3.1	26.6	0.33	0.69	0.33	56.1
5	T1	1479	11.8	1479	11.8	*0.691	26.2	LOS C	12.2	97.9	0.88	0.78	0.88	50.8
Approach		1898	13.1	1898	13.1	0.691	22.7	LOS C	12.2	97.9	0.76	0.76	0.76	51.4
NorthWest: From Bunbury														
29a	R1	188	17.8	188	17.8	*0.663	49.0	LOS D	5.5	46.3	0.98	0.84	1.02	13.8
Approach		188	17.8	188	17.8	0.663	49.0	LOS D	5.5	46.3	0.98	0.84	1.02	13.8
All Vehicles		2744	13.3	2744	13.3	0.691	25.6	LOS C	12.2	97.9	0.78	0.79	0.79	45.2

 Site: [AM 2031 - Scenario 2 - BFM Entrance - Right Turn Out Banned, Refined Parking (Site Folder: Scenario 2)]

 Network: [AM 2031 - Scenario 2 (Network Folder: Scenario 2)]

Site Category: -  
 Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h ]	[ HV % ]	[ Total veh/h ]	[ HV % ]				[ Veh. veh ]	[ Dist ] m				
South: Vittoria Rd														
2	T1	658	12.7	658	12.7	0.523	0.0	LOSA	0.0	0.0	0.00	0.00	0.00	69.2
3	R2	57	10.6	57	10.6	0.071	6.3	LOSA	0.1	0.8	0.53	0.68	0.53	25.3
Approach		715	12.5	715	12.5	0.523	0.5	NA	0.1	0.8	0.04	0.05	0.04	58.5
East: BFM Entrance														
4	L2	53	0.0	53	0.0	0.053	4.0	LOSA	0.1	0.6	0.49	0.53	0.49	16.5
Approach		53	0.0	53	0.0	0.053	4.0	LOSA	0.1	0.6	0.49	0.53	0.49	16.5
North: Vittoria Rd														
7	L2	118	2.1	118	2.1	0.635	5.1	LOSA	0.3	2.7	0.06	0.12	0.06	33.5
8	T1	489	17.8	489	17.8	0.635	0.1	LOSA	0.3	2.7	0.06	0.12	0.06	53.9
Approach		607	14.7	607	14.7	0.635	1.1	NA	0.3	2.7	0.06	0.12	0.06	47.1
All Vehicles		1375	13.0	1375	13.0	0.635	0.9	NA	0.3	2.7	0.07	0.10	0.07	49.9

**Site: [AM 2031 - Scenario 2 - Erceg's Development Access - Left In Left Out (Site Folder: Scenario 2)]**

**Network: [AM 2031 - Scenario 2 (Network Folder: Scenario 2)]**

Site Category: -  
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Vittoria Rd														
1	L2	102	10.6	102	10.6	0.454	5.1	LOSA	0.0	0.0	0.00	0.08	0.00	36.0
2	T1	642	12.7	642	12.7	0.454	0.0	LOSA	0.0	0.0	0.00	0.08	0.00	60.6
Approach		744	12.4	744	12.4	0.454	0.7	NA	0.0	0.0	0.00	0.08	0.00	53.8
North: Vittoria Rd														
8	T1	640	17.8	640	17.8	0.405	0.0	LOSA	0.0	0.0	0.00	0.00	0.00	69.6
Approach		640	17.8	640	17.8	0.405	0.0	NA	0.0	0.0	0.00	0.00	0.00	69.6
West: Erceg's Development Access														
10	L2	73	4.4	73	4.4	0.098	5.4	LOSA	0.1	1.0	0.57	0.68	0.57	16.3
Approach		73	4.4	73	4.4	0.098	5.4	LOSA	0.1	1.0	0.57	0.68	0.57	16.3
All Vehicles		1457	14.4	1457	14.4	0.454	0.7	NA	0.1	1.0	0.03	0.08	0.03	54.3

**Site: [AM 2031 - Scenario 2 - New Road to Vittoria Rd - Eastern Roundabout (Site Folder: Scenario 2)]**

**Network: [AM 2031 - Scenario 2 (Network Folder: Scenario 2)]**

Site Category: -  
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Vittoria Rd														
1	L2	55	10.6	55	10.6	0.770	14.2	LOS B	4.6	35.6	0.96	1.00	1.30	35.8
2	T1	536	12.7	536	12.7	0.770	14.6	LOS B	4.6	35.6	0.96	1.00	1.30	30.3
3	R2	103	10.6	103	10.6	0.770	20.0	LOS C	4.6	35.6	0.96	1.00	1.30	29.1
Approach		694	12.2	694	12.2	0.770	15.4	LOS B	4.6	35.6	0.96	1.00	1.30	30.8
East: School Access														
4	L2	103	10.6	103	10.6	0.405	6.0	LOSA	1.2	9.2	0.86	0.83	0.88	30.1
5	T1	52	10.6	52	10.6	0.405	6.0	LOSA	1.2	9.2	0.86	0.83	0.88	29.3
6	R2	103	10.6	103	10.6	0.405	6.1	LOSA	1.2	9.2	0.86	0.83	0.88	12.0
Approach		258	10.6	258	10.6	0.405	6.0	LOSA	1.2	9.2	0.86	0.83	0.88	25.3
North: Vittoria Rd														
7	L2	103	17.8	103	17.8	0.608	6.8	LOSA	2.4	19.2	0.69	0.66	0.69	26.7
8	T1	352	17.8	352	17.8	0.608	6.0	LOSA	2.4	19.2	0.69	0.66	0.69	41.2
9	R2	9	17.8	9	17.8	0.608	10.6	LOS B	2.4	19.2	0.69	0.66	0.69	37.7
9u	U	194	10.6	194	10.6	0.608	12.4	LOS B	2.4	19.2	0.69	0.66	0.69	28.3
Approach		658	15.7	658	15.7	0.608	8.1	LOSA	2.4	19.2	0.69	0.66	0.69	36.6
West: East-West Link														
10	L2	24	10.6	24	10.6	0.235	11.5	LOS B	0.6	4.9	0.91	0.92	0.91	26.9
11	T1	14	10.6	14	10.6	0.235	14.8	LOS B	0.6	4.9	0.91	0.92	0.91	26.2
12	R2	66	10.6	66	10.6	0.235	15.9	LOS B	0.6	4.9	0.91	0.92	0.91	35.4
Approach		104	10.6	104	10.6	0.235	14.7	LOS B	0.6	4.9	0.91	0.92	0.91	32.8
All Vehicles		1714	13.2	1714	13.2	0.770	11.1	LOS B	4.6	35.6	0.84	0.84	0.98	32.1

\* Critical Movement (Signal Timing)

**N1** Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

## 6.4 PM Peak - Results of all intersections in the model

 Site: [PM 2031 - Scenario 2 - Forrest Hwy / Vittoria Rd - Existing Layout (Site Folder: Scenario 2)]

 Network: [PM 2031 - Scenario 2 (Network Folder: Scenario 2)]

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 150 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Vittoria Rd														
1	L2	482	9.4	381	9.0	0.383	16.9	LOS B	6.3	48.8	0.47	0.76	0.47	43.0
3a	R1	506	9.4	400	9.0	* 1.072	164.0	LOS F	9.0	70.0	1.00	1.26	1.80	10.6
Approach		988	9.4	780 <sup>N1</sup>	9.0	1.072	92.3	LOS F	9.0	70.0	0.74	1.02	1.15	16.8
East: Forrest Hwy														
4	L2	390	14.4	390	14.4	0.369	19.5	LOS B	6.5	53.0	0.47	0.78	0.47	44.1
5	T1	1383	13.9	1383	13.9	* 0.944	82.5	LOS F	25.2	207.1	1.00	1.09	1.30	28.5
Approach		1773	14.0	1773	14.0	0.944	68.7	LOS E	25.2	207.1	0.88	1.02	1.12	29.8
NorthWest: From Bunbury														
29a	R1	416	14.4	416	14.4	* 0.943	90.9	LOS F	23.0	188.7	1.00	1.01	1.32	8.0
Approach		416	14.4	416	14.4	0.943	90.9	LOS F	23.0	188.7	1.00	1.01	1.32	8.0
All Vehicles		3177	12.6	2969 <sup>N1</sup>	13.5	1.072	78.0	LOS E	25.2	207.1	0.86	1.02	1.16	23.3

 Site: [PM 2031 - Scenario 2 - Erceg's Development Access - Left In Left Out (Site Folder: Scenario 2)]

 Network: [PM 2031 - Scenario 2 (Network Folder: Scenario 2)]

Site Category: -  
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Vittoria Rd														
1	L2	246	4.6	172	4.4	0.451	5.1	LOSA	5.7	43.9	0.00	0.14	0.00	35.1
2	T1	854	9.4	597	9.1	0.451	0.0	LOSA	5.7	43.9	0.00	0.14	0.00	55.9
Approach		1100	8.3	770 <sup>N1</sup>	8.0	0.451	1.2	NA	5.7	43.9	0.00	0.14	0.00	47.7
North: Vittoria Rd														
8	T1	868	14.4	868	14.4	0.534	0.0	LOSA	7.2	59.0	0.00	0.00	0.00	69.4
Approach		868	14.4	868	14.4	0.534	0.0	NA	7.2	59.0	0.00	0.00	0.00	69.4
West: Erceg's Development Access														
10	L2	208	1.3	208	1.3	0.496	6.8	LOSA	2.0	14.2	0.58	0.86	0.83	14.6
Approach		208	1.3	208	1.3	0.496	6.8	LOSA	2.0	14.2	0.58	0.86	0.83	14.6
All Vehicles		2176	10.1	1846 <sup>N1</sup>	11.9	0.534	1.3	NA	7.2	59.0	0.07	0.15	0.09	45.7

**Site:** [PM 2031 - Scenario 2 - BFM Entrance - Right Turn Out Banned, Refined Parking (Site Folder: Scenario 2)]

**Network:** [PM 2031 - Scenario 2 (Network Folder: Scenario 2)]

Site Category: -  
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h ]	[ HV % ]	[ Total veh/h ]	[ HV % ]				[ Veh. veh ]	[ Dist ] m				
South: Vittoria Rd														
2	T1	988	9.4	765	9.0	0.427	0.0	LOSA	7.6	59.0	0.00	0.00	0.00	69.6
3	R2	74	4.6	57	4.4	0.072	6.6	LOSA	0.1	0.8	0.56	0.69	0.56	24.9
Approach		1062	9.1	822 <sup>N1</sup>	8.7	0.427	0.5	NA	7.6	59.0	0.04	0.05	0.04	59.6
East: BFM Entrance														
4	L2	154	2.6	154	2.6	0.166	4.7	LOSA	0.3	2.2	0.56	0.62	0.56	15.3
Approach		154	2.6	154	2.6	0.166	4.7	LOSA	0.3	2.2	0.56	0.62	0.56	15.3
North: Vittoria Rd														
7	L2	246	1.3	246	1.3	0.826	5.2	LOSA	0.8	6.2	0.10	0.18	0.10	32.0
8	T1	560	14.4	560	14.4	0.826	0.1	LOSA	0.8	6.2	0.10	0.18	0.10	48.5
Approach		806	10.4	806	10.4	0.826	1.7	NA	0.8	6.2	0.10	0.18	0.10	40.9
All Vehicles		2022	9.1	1782 <sup>N1</sup>	10.3	0.826	1.4	NA	7.6	59.0	0.11	0.16	0.11	43.3

**Site:** [PM 2031 - Scenario 2 - New Road to Vittoria Rd - Eastern Roundabout (Site Folder: Scenario 2)]

**Network:** [PM 2031 - Scenario 2 (Network Folder: Scenario 2)]

Site Category: -  
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h ]	[ HV % ]	[ Total veh/h ]	[ HV % ]				[ Veh. veh ]	[ Dist ] m				
South: Vittoria Rd														
1	L2	150	4.6	150	4.6	1.957	874.5	LOS F	118.9	889.4	1.00	9.79	22.96	1.7
2	T1	691	9.4	691	9.4	1.957	875.0	LOS F	118.9	889.4	1.00	9.79	22.96	0.9
3	R2	75	4.6	75	4.6	1.957	880.3	LOS F	118.9	889.4	1.00	9.79	22.96	1.0
Approach		916	8.2	916	8.2	1.957	875.4	LOS F	118.9	889.4	1.00	9.79	22.96	1.0
East: School Access														
4	L2	75	4.6	75	4.6	0.621	18.2	LOS B	1.7	12.4	1.00	1.37	1.40	21.7
5	T1	37	4.6	37	4.6	0.621	18.2	LOS B	1.7	12.4	1.00	1.37	1.40	21.4
6	R2	75	4.6	75	4.6	0.621	18.2	LOS B	1.7	12.4	1.00	1.37	1.40	6.6
Approach		187	4.6	187	4.6	0.621	18.2	LOS B	1.7	12.4	1.00	1.37	1.40	17.0
North: Vittoria Rd														
7	L2	75	14.4	74	14.4	1.322	303.2	LOS F	10.3	82.0	1.00	4.73	8.99	1.7
8	T1	567	14.4	562	14.4	1.322	302.4	LOS F	10.3	82.0	1.00	4.73	8.99	3.5
9	R2	25	14.4	25	14.4	1.322	307.0	LOS F	10.3	82.0	1.00	4.73	8.99	3.6
9u	U	401	9.2	398	9.2	1.322	308.8	LOS F	10.3	82.0	1.00	4.73	8.99	1.4
Approach		1068	12.4	1060 <sup>N1</sup>	12.4	1.322	305.0	LOS F	10.3	82.0	1.00	4.73	8.99	2.6
West: East-West Link														
10	L2	28	4.6	28	4.6	0.342	8.9	LOSA	0.8	5.8	0.84	0.89	0.84	29.1
11	T1	14	4.6	14	4.6	0.342	12.1	LOS B	0.8	5.8	0.84	0.89	0.84	28.1
12	R2	141	4.6	141	4.6	0.342	13.3	LOS B	0.8	5.8	0.84	0.89	0.84	38.1
Approach		183	4.6	183	4.6	0.342	12.5	LOS B	0.8	5.8	0.84	0.89	0.84	36.3
All Vehicles		2354	9.6	2346 <sup>N1</sup>	9.6	1.957	482.1	LOS F	118.9	889.4	0.99	6.14	13.20	1.8

\* Critical Movement (Signal Timing)

<sup>N1</sup> Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

## 7 SCENARIO #4

### 7.1 Additional Signalized Intersection to the West Resulting in Redistributed Volumes

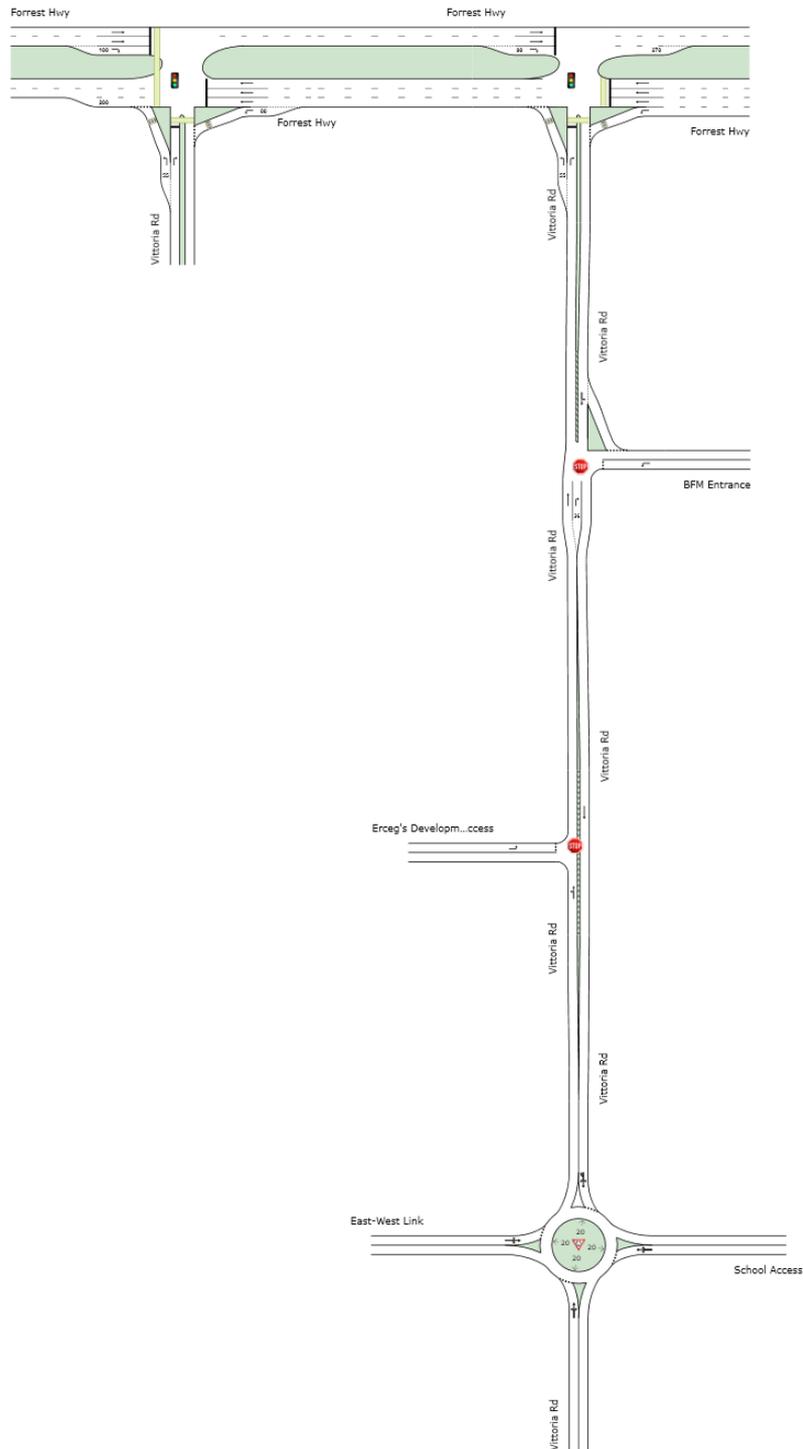


Figure 6: Scenario 4 Model Layout from SIDRA.  
(Layout pictures are schematic functional drawings reflecting input data. They are not design drawings).



Figure 7: Scenario 4 Model Phasing from SIDRA

## 7.2 Mid-Day Peak - Results of all intersections in the model

Site: [Midday 2031 - Scenario 4 - Forrest Hwy / New Rd - Proposed Layout] Network: [Midday 2031 - Scenario 4 (Site Folder: Scenario 4)] (Network Folder: Scenario 4)]

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 100 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[ Total veh/h ]	HV %	[ Total veh/h ]	HV %				[ Veh. veh ]	Dist ] m				
South: Vittoria Rd														
1	L2	259	13.6	259	13.6	0.297	9.1	LOSA	3.0	24.2	0.45	0.70	0.45	49.3
3	R2	118	13.6	118	13.6	*0.677	54.7	LOS D	3.7	29.8	1.00	0.84	1.11	5.4
Approach		377	13.6	377	13.6	0.677	23.3	LOS C	3.7	29.8	0.62	0.75	0.66	32.3
East: Forrest Hwy														
4	L2	232	17.5	232	17.5	0.225	8.3	LOSA	0.7	6.0	0.12	0.63	0.12	36.6
5	T1	1404	14.0	1404	14.0	*0.710	5.2	LOSA	6.4	53.0	0.30	0.27	0.30	68.3
Approach		1636	14.5	1636	14.5	0.710	5.7	LOSA	6.4	53.0	0.28	0.32	0.28	65.2
West: Forrest Hwy														
11	T1	1487	14.0	1487	14.0	0.571	5.0	LOSA	9.0	74.7	0.45	0.41	0.45	51.6
12	R2	368	13.6	368	13.6	*0.708	38.9	LOS D	9.9	80.9	0.94	0.86	0.96	27.6
Approach		1856	13.9	1856	13.9	0.708	11.7	LOS B	9.9	80.9	0.54	0.50	0.55	43.3
All Vehicles		3869	14.1	3869	14.1	0.710	10.3	LOS B	9.9	80.9	0.44	0.45	0.44	49.5

Site: [Midday 2031 - Scenario 4 - Forrest Hwy / Vittoria Rd - Existing Layout] Network: [Midday 2031 - Scenario 4 (Site Folder: Scenario 4)] (Network Folder: Scenario 4)]

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 100 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[ Total veh/h ]	HV %	[ Total veh/h ]	HV %				[ Veh. veh ]	Dist ] m				
South: Vittoria Rd														
1	L2	205	13.6	205	13.6	0.252	14.0	LOS B	3.1	25.0	0.55	0.72	0.55	17.9
3	R2	318	13.6	318	13.6	*0.760	41.6	LOS D	8.6	70.0	0.93	0.88	1.03	26.9
Approach		523	13.6	523	13.6	0.760	30.8	LOS C	8.6	70.0	0.78	0.82	0.84	25.7
East: Forrest Hwy														
4	L2	267	17.5	267	17.5	0.214	9.3	LOSA	1.4	12.4	0.25	0.66	0.25	57.8
5	T1	1588	14.0	1588	14.0	*0.782	30.7	LOS C	14.6	121.0	0.94	0.87	0.99	34.3
Approach		1855	14.5	1855	14.5	0.782	27.6	LOS C	14.6	121.0	0.84	0.84	0.88	36.5
West: Forrest Hwy														
11	T1	1359	14.0	1359	14.0	0.457	0.8	LOSA	2.9	24.4	0.26	0.17	0.26	58.2
12	R2	151	13.6	151	13.6	*0.772	50.9	LOS D	4.6	37.3	0.99	0.85	1.10	9.0
Approach		1509	14.0	1509	14.0	0.772	5.8	LOSA	4.6	37.3	0.34	0.24	0.35	51.2
All Vehicles		3887	14.2	3887	14.2	0.782	19.6	LOS B	14.6	121.0	0.64	0.60	0.67	39.8

**STOP Site: [Midday 2031 - Scenario 4 - BFM Entrance - Right Turn Out Banned, Refined Parking (Site Folder: Scenario 4)]**    **Network: [Midday 2031 - Scenario 4 (Network Folder: Scenario 4)]**

Site Category: -  
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[ Total veh/h ]	[ HV % ]	[ Total veh/h ]	[ HV % ]				[ Veh. veh ]	[ Dist ] m				
South: Vittoria Rd														
2	T1	425	13.6	425	13.6	0.248	0.0	LOSA	0.4	3.0	0.00	0.00	0.00	69.8
3	R2	82	7.1	82	7.1	0.066	4.4	LOSA	0.1	0.8	0.25	0.55	0.25	28.9
Approach		507	12.5	507	12.5	0.248	0.7	NA	0.4	3.0	0.04	0.09	0.04	53.9
East: BFM Entrance														
4	L2	331	0.0	331	0.0	0.225	2.4	LOSA	0.5	3.3	0.27	0.37	0.27	18.8
Approach		331	0.0	331	0.0	0.225	2.4	LOSA	0.5	3.3	0.27	0.37	0.27	18.8
North: Vittoria Rd														
7	L2	285	0.8	285	0.8	0.434	5.2	LOSA	0.5	3.4	0.17	0.40	0.17	28.0
8	T1	124	17.0	124	17.0	0.434	0.3	LOSA	0.5	3.4	0.17	0.40	0.17	37.0
Approach		409	5.7	409	5.7	0.434	3.7	NA	0.5	3.4	0.17	0.40	0.17	29.8
All Vehicles		1247	7.0	1247	7.0	0.434	2.1	NA	0.5	3.4	0.14	0.26	0.14	32.8

**STOP Site: [Midday 2031 - Scenario 4 - Erceg's Development Access - Left In Left Out (Site Folder: Scenario 4)]**    **Network: [Midday 2031 - Scenario 4 (Network Folder: Scenario 4)]**

Site Category: -  
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[ Total veh/h ]	[ HV % ]	[ Total veh/h ]	[ HV % ]				[ Veh. veh ]	[ Dist ] m				
South: Vittoria Rd														
1	L2	97	7.1	97	7.1	0.203	5.1	LOSA	0.0	0.0	0.00	0.18	0.00	34.2
2	T1	236	13.6	236	13.6	0.203	0.0	LOSA	0.0	0.0	0.00	0.18	0.00	52.9
Approach		333	11.7	333	11.7	0.203	1.5	NA	0.0	0.0	0.00	0.18	0.00	44.0
North: Vittoria Rd														
8	T1	455	17.0	455	17.0	0.288	0.0	LOSA	0.0	0.0	0.00	0.00	0.00	69.8
Approach		455	17.0	455	17.0	0.288	0.0	NA	0.0	0.0	0.00	0.00	0.00	69.8
West: Erceg's Development Access														
10	L2	39	1.8	39	1.8	0.030	2.8	LOSA	0.0	0.3	0.32	0.40	0.32	19.9
Approach		39	1.8	39	1.8	0.030	2.8	LOSA	0.0	0.3	0.32	0.40	0.32	19.9
All Vehicles		827	14.2	827	14.2	0.288	0.7	NA	0.0	0.3	0.02	0.09	0.02	50.8

Site: [Midday 2031 - Scenario 4 - New Road to Vittoria Rd - Eastern Roundabout (Site Folder: Scenario 4)]

Network: [Midday 2031 - Scenario 4 (Network Folder: Scenario 4)]

Site Category: - Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Vittoria Rd														
1	L2	65	7.1	65	7.1	0.452	7.9	LOSA	1.4	10.4	0.72	0.73	0.72	42.1
2	T1	308	13.6	308	13.6	0.452	8.5	LOSA	1.4	10.4	0.72	0.73	0.72	38.8
3	R2	25	7.1	25	7.1	0.452	13.8	LOS B	1.4	10.4	0.72	0.73	0.72	36.0
Approach		398	12.1	398	12.1	0.452	8.7	LOSA	1.4	10.4	0.72	0.73	0.72	39.5
East: School Access														
4	L2	25	7.1	25	7.1	0.092	4.3	LOSA	0.2	1.7	0.71	0.57	0.71	32.5
5	T1	15	7.1	15	7.1	0.092	4.3	LOSA	0.2	1.7	0.71	0.57	0.71	31.6
6	R2	25	7.1	25	7.1	0.092	4.3	LOSA	0.2	1.7	0.71	0.57	0.71	13.5
Approach		65	7.1	65	7.1	0.092	4.3	LOSA	0.2	1.7	0.71	0.57	0.71	27.9
North: Vittoria Rd														
7	L2	25	17.0	25	17.0	0.446	6.3	LOSA	1.5	12.2	0.58	0.66	0.58	26.2
8	T1	153	17.0	153	17.0	0.446	5.6	LOSA	1.5	12.2	0.58	0.66	0.58	40.0
9	R2	45	17.0	45	17.0	0.446	10.2	LOS B	1.5	12.2	0.58	0.66	0.58	37.0
9u	U	244	14.2	244	14.2	0.446	12.1	LOS B	1.5	12.2	0.58	0.66	0.58	27.5
Approach		467	15.5	467	15.5	0.446	9.4	LOSA	1.5	12.2	0.58	0.66	0.58	34.0
West: East-West Link														
10	L2	1	7.1	1	7.1	0.223	7.8	LOSA	0.6	4.2	0.75	0.81	0.75	29.8
11	T1	15	7.1	15	7.1	0.223	11.1	LOS B	0.6	4.2	0.75	0.81	0.75	28.7
12	R2	140	7.1	140	7.1	0.223	12.2	LOS B	0.6	4.2	0.75	0.81	0.75	38.3
Approach		156	7.1	156	7.1	0.223	12.1	LOS B	0.6	4.2	0.75	0.81	0.75	37.5
All Vehicles		1086	12.6	1086	12.6	0.452	9.2	LOSA	1.5	12.2	0.66	0.70	0.66	36.3

\* Critical Movement (Signal Timing)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

### 7.3 AM Peak - Results of all intersections in the model

 Site: [AM 2031 - Scenario 4 - Forrest Hwy / New Rd - Proposed Layout (Site Folder: Scenario 4)]

 Network: [AM 2031 - Scenario 4 (Network Folder: Scenario 4)]

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 110 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[ Total veh/h ]	HV %	[ Total veh/h ]	HV %				[ Veh. veh ]	Dist ] m				
South: Vittoria Rd														
1	L2	305	12.7	305	12.7	0.411	14.4	LOS B	6.0	48.7	0.68	0.83	0.68	44.4
3	R2	76	12.7	76	12.7	*0.475	57.8	LOS E	2.5	20.0	0.99	0.77	0.99	5.2
Approach		381	12.7	381	12.7	0.475	23.0	LOS C	6.0	48.7	0.74	0.81	0.74	34.8
East: Forrest Hwy														
4	L2	272	17.8	272	17.8	0.235	7.8	LOS A	0.7	5.9	0.10	0.62	0.10	37.4
5	T1	1632	11.8	1632	11.8	*0.637	4.5	LOS A	6.7	54.1	0.23	0.20	0.23	70.1
Approach		1904	12.7	1904	12.7	0.637	5.0	LOS A	6.7	54.1	0.21	0.26	0.21	66.9
West: Forrest Hwy														
11	T1	876	11.8	876	11.8	0.318	3.4	LOS A	3.9	31.7	0.30	0.27	0.30	54.1
12	R2	260	12.7	260	12.7	*0.646	46.5	LOS D	7.8	62.9	0.95	0.83	0.95	25.1
Approach		1136	12.0	1136	12.0	0.646	13.3	LOS B	7.8	62.9	0.45	0.40	0.45	41.8
All Vehicles		3421	12.4	3421	12.4	0.646	9.7	LOS A	7.8	62.9	0.35	0.37	0.35	52.2

 Site: [AM 2031 - Scenario 4 - Forrest Hwy / Vittoria Rd - Existing Layout (Site Folder: Scenario 4)]

 Network: [AM 2031 - Scenario 4 (Network Folder: Scenario 4)]

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 110 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[ Total veh/h ]	HV %	[ Total veh/h ]	HV %				[ Veh. veh ]	Dist ] m				
South: Vittoria Rd														
1	L2	234	12.7	234	12.7	0.312	18.0	LOS B	4.4	35.5	0.63	0.78	0.63	14.8
3	R2	322	12.7	322	12.7	*0.736	40.6	LOS D	8.7	70.0	0.90	0.85	0.95	27.2
Approach		556	12.7	556	12.7	0.736	31.1	LOS C	8.7	70.0	0.79	0.82	0.82	25.0
East: Forrest Hwy														
4	L2	279	17.8	279	17.8	0.207	8.4	LOS A	1.0	8.3	0.17	0.65	0.17	59.4
5	T1	1751	11.8	1751	11.8	*0.738	26.4	LOS C	15.7	126.4	0.88	0.79	0.88	37.3
Approach		2030	12.6	2030	12.6	0.738	24.0	LOS C	15.7	126.4	0.79	0.77	0.79	39.4
West: Forrest Hwy														
11	T1	841	11.8	841	11.8	0.271	0.5	LOS A	1.0	8.0	0.14	0.09	0.14	59.0
12	R2	62	12.7	62	12.7	*0.695	60.6	LOS E	2.1	17.2	0.99	0.77	1.04	7.8
Approach		903	11.9	903	11.9	0.695	4.6	LOS A	2.1	17.2	0.20	0.14	0.20	53.1
All Vehicles		3489	12.4	3489	12.4	0.738	20.1	LOS C	15.7	126.4	0.63	0.62	0.64	39.8

**STOP Site: [AM 2031 - Scenario 4 - BFM Entrance - Right Turn Out Banned, Refined Parking (Site Folder: Scenario 4)]**

**Network: [AM 2031 - Scenario 4 (Network Folder: Scenario 4)]**

Site Category: -  
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Vittoria Rd														
2	T1	483	12.7	483	12.7	0.280	0.0	LOSA	0.7	5.4	0.00	0.00	0.00	69.8
3	R2	57	10.6	57	10.6	0.052	4.8	LOSA	0.1	0.6	0.34	0.57	0.34	28.3
Approach		540	12.5	540	12.5	0.280	0.5	NA	0.7	5.4	0.04	0.06	0.04	57.9
East: BFM Entrance														
4	L2	151	0.0	151	0.0	0.113	2.7	LOSA	0.2	1.4	0.33	0.41	0.33	18.2
Approach		151	0.0	151	0.0	0.113	2.7	LOSA	0.2	1.4	0.33	0.41	0.33	18.2
North: Vittoria Rd														
7	L2	118	2.1	118	2.1	0.352	5.1	LOSA	0.3	2.0	0.10	0.20	0.10	31.4
8	T1	220	17.8	220	17.8	0.352	0.1	LOSA	0.3	2.0	0.10	0.20	0.10	46.7
Approach		338	12.3	338	12.3	0.352	1.8	NA	0.3	2.0	0.10	0.20	0.10	38.9
All Vehicles		1029	10.6	1029	10.6	0.352	1.3	NA	0.7	5.4	0.10	0.16	0.10	42.1

**STOP Site: [AM 2031 - Scenario 4 - Erceg's Development Access - Left In Left Out (Site Folder: Scenario 4)]**

**Network: [AM 2031 - Scenario 4 (Network Folder: Scenario 4)]**

Site Category: -  
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Vittoria Rd														
1	L2	48	10.6	48	10.6	0.282	5.1	LOSA	0.0	0.0	0.00	0.06	0.00	36.5
2	T1	414	12.7	414	12.7	0.282	0.0	LOSA	0.0	0.0	0.00	0.06	0.00	62.7
Approach		462	12.5	462	12.5	0.282	0.5	NA	0.0	0.0	0.00	0.06	0.00	57.0
North: Vittoria Rd														
8	T1	371	17.8	371	17.8	0.235	0.0	LOSA	0.0	0.0	0.00	0.00	0.00	69.8
Approach		371	17.8	371	17.8	0.235	0.0	NA	0.0	0.0	0.00	0.00	0.00	69.8
West: Erceg's Development Access														
10	L2	20	4.4	20	4.4	0.019	3.6	LOSA	0.0	0.2	0.44	0.48	0.44	18.9
Approach		20	4.4	20	4.4	0.019	3.6	LOSA	0.0	0.2	0.44	0.48	0.44	18.9
All Vehicles		853	14.6	853	14.6	0.282	0.4	NA	0.0	0.2	0.01	0.05	0.01	59.1

Site: [AM 2031 - Scenario 4 - New Road to Vittoria Rd - Eastern Roundabout  
(Site Folder: Scenario 4)]

Network: [AM 2031 - Scenario 4  
(Network Folder: Scenario 4)]

Site Category: -  
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Vittoria Rd														
1	L2	32	10.6	32	10.6	0.515	7.8	LOSA	1.6	12.5	0.70	0.72	0.70	41.0
2	T1	359	12.7	359	12.7	0.515	8.1	LOSA	1.6	12.5	0.70	0.72	0.70	38.0
3	R2	103	10.6	103	10.6	0.515	13.6	LOS B	1.6	12.5	0.70	0.72	0.70	35.4
Approach		494	12.1	494	12.1	0.515	9.3	LOSA	1.6	12.5	0.70	0.72	0.70	37.7
East: School Access														
4	L2	103	10.6	103	10.6	0.293	2.8	LOSA	0.8	6.0	0.64	0.51	0.64	33.7
5	T1	52	10.6	52	10.6	0.293	2.8	LOSA	0.8	6.0	0.64	0.51	0.64	32.6
6	R2	103	10.6	103	10.6	0.293	2.9	LOSA	0.8	6.0	0.64	0.51	0.64	15.2
Approach		258	10.6	258	10.6	0.293	2.8	LOSA	0.8	6.0	0.64	0.51	0.64	29.2
North: Vittoria Rd														
7	L2	103	17.8	103	17.8	0.381	6.7	LOSA	1.1	8.9	0.58	0.67	0.58	26.7
8	T1	140	17.8	140	17.8	0.381	6.0	LOSA	1.1	8.9	0.58	0.67	0.58	41.3
9	R2	23	17.8	23	17.8	0.381	10.5	LOS B	1.1	8.9	0.58	0.67	0.58	37.8
9u	U	112	10.6	112	10.6	0.381	12.3	LOS B	1.1	8.9	0.58	0.67	0.58	28.3
Approach		378	15.7	378	15.7	0.381	8.3	LOSA	1.1	8.9	0.58	0.67	0.58	34.9
West: East-West Link														
10	L2	1	10.6	1	10.6	0.200	8.5	LOSA	0.5	3.9	0.79	0.83	0.79	29.2
11	T1	52	10.6	52	10.6	0.200	11.8	LOS B	0.5	3.9	0.79	0.83	0.79	28.2
12	R2	72	10.6	72	10.6	0.200	13.0	LOS B	0.5	3.9	0.79	0.83	0.79	37.5
Approach		125	10.6	125	10.6	0.200	12.4	LOS B	0.5	3.9	0.79	0.83	0.79	34.0
All Vehicles		1255	12.7	1255	12.7	0.515	8.0	LOSA	1.6	12.5	0.66	0.67	0.66	34.8

\* Critical Movement (Signal Timing)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

## 7.4 PM Peak - Results of all intersections in the model

**Site:** [PM 2031 - Scenario 4 - Forrest Hwy / New Rd - Proposed Layout (Site Folder: Scenario 4)]

**Network:** [PM 2031 - Scenario 4 (Network Folder: Scenario 4)]

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 110 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[ Total veh/h ]	[ HV % ]	[ Total veh/h ]	[ HV % ]				[ Veh. veh ]	[ Dist ] m				
South: Vittoria Rd														
1	L2	346	9.4	346	9.4	0.385	13.8	LOS B	5.4	42.1	0.56	0.78	0.56	45.9
3	R2	149	9.4	149	9.4	*0.764	60.6	LOS E	5.2	40.4	1.00	0.89	1.18	5.0
Approach		495	9.4	495	9.4	0.764	27.9	LOS C	5.4	42.1	0.69	0.81	0.75	30.3
East: Forrest Hwy														
4	L2	205	14.4	205	14.4	0.201	9.0	LOS A	0.8	6.5	0.14	0.63	0.14	35.5
5	T1	1496	13.9	1496	13.9	*0.785	7.1	LOS A	10.0	82.6	0.36	0.33	0.37	65.0
Approach		1701	14.0	1701	14.0	0.785	7.3	LOS A	10.0	82.6	0.33	0.36	0.34	62.7
West: Forrest Hwy														
11	T1	1804	13.9	1804	13.9	0.696	6.4	LOS A	14.6	119.9	0.53	0.49	0.53	49.7
12	R2	454	9.4	454	9.4	*0.773	42.6	LOS D	13.9	108.2	0.96	0.89	1.01	26.4
Approach		2258	13.0	2258	13.0	0.773	13.7	LOS B	14.6	119.9	0.61	0.57	0.62	41.5
All Vehicles		4454	13.0	4454	13.0	0.785	12.8	LOS B	14.6	119.9	0.51	0.52	0.53	46.5

**Site:** [PM 2031 - Scenario 4 - Forrest Hwy / Vittoria Rd - Existing Layout (Site Folder: Scenario 4)]

**Network:** [PM 2031 - Scenario 4 (Network Folder: Scenario 4)]

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 110 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[ Total veh/h ]	[ HV % ]	[ Total veh/h ]	[ HV % ]				[ Veh. veh ]	[ Dist ] m				
South: Vittoria Rd														
1	L2	258	9.4	258	9.4	0.313	16.2	LOS B	3.9	30.0	0.52	0.74	0.52	16.1
3	R2	483	9.4	483	9.4	*0.930	62.2	LOS E	9.0	70.0	0.90	1.01	1.27	21.6
Approach		741	9.4	741	9.4	0.930	46.2	LOS D	9.0	70.0	0.77	0.92	1.01	21.0
East: Forrest Hwy														
4	L2	286	14.4	286	14.4	0.211	8.7	LOS A	1.3	10.5	0.20	0.65	0.20	58.8
5	T1	1588	13.9	1588	13.9	*0.925	58.2	LOS E	22.0	181.1	1.00	1.10	1.32	22.7
Approach		1874	14.0	1874	14.0	0.925	50.7	LOS D	22.0	181.1	0.88	1.03	1.15	25.1
West: Forrest Hwy														
11	T1	1727	13.9	1727	13.9	0.569	0.8	LOS A	3.2	26.1	0.24	0.15	0.24	58.3
12	R2	129	9.4	129	9.4	*0.931	75.1	LOS E	5.1	39.2	1.00	1.02	1.51	6.4
Approach		1857	13.6	1857	13.6	0.931	6.0	LOS A	5.1	39.2	0.29	0.21	0.33	51.2
All Vehicles		4472	13.1	4472	13.1	0.931	31.4	LOS C	22.0	181.1	0.62	0.67	0.78	32.0

**STOP Site: [PM 2031 - Scenario 4 - BFM Entrance - Right Turn Out Banned, Refined Parking (Site Folder: Scenario 4)]**

**Network: [PM 2031 - Scenario 4 (Network Folder: Scenario 4)]**

Site Category: -  
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[ Total veh/h ]	[ HV % ]	[ Total veh/h ]	[ HV % ]				[ Veh. veh ]	[ Dist ] m				
South: Vittoria Rd														
2	T1	643	9.4	643	9.4	0.360	0.0	LOSA	7.6	59.0	0.00	0.00	0.00	69.7
3	R2	74	4.6	74	4.6	0.061	4.5	LOSA	0.1	0.7	0.29	0.55	0.29	28.7
Approach		717	8.9	717	8.9	0.360	0.5	NA	7.6	59.0	0.03	0.06	0.03	58.4
East: BFM Entrance														
4	L2	308	2.6	308	2.6	0.220	2.6	LOSA	0.4	3.2	0.31	0.39	0.31	18.4
Approach		308	2.6	308	2.6	0.220	2.6	LOSA	0.4	3.2	0.31	0.39	0.31	18.4
North: Vittoria Rd														
7	L2	246	1.3	246	1.3	0.428	5.2	LOSA	0.4	3.3	0.16	0.35	0.16	28.8
8	T1	163	14.4	163	14.4	0.428	0.2	LOSA	0.4	3.3	0.16	0.35	0.16	39.2
Approach		409	6.5	409	6.5	0.428	3.2	NA	0.4	3.3	0.16	0.35	0.16	31.7
All Vehicles		1434	6.9	1434	6.9	0.428	1.7	NA	7.6	59.0	0.13	0.21	0.13	36.7

**STOP Site: [PM 2031 - Scenario 4 - Erceg's Development Access - Left In Left Out (Site Folder: Scenario 4)]**

**Network: [PM 2031 - Scenario 4 (Network Folder: Scenario 4)]**

Site Category: -  
Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[ Total veh/h ]	[ HV % ]	[ Total veh/h ]	[ HV % ]				[ Veh. veh ]	[ Dist ] m				
South: Vittoria Rd														
1	L2	97	4.6	97	4.6	0.328	5.1	LOSA	0.3	2.6	0.00	0.11	0.00	35.8
2	T1	462	9.4	462	9.4	0.328	0.0	LOSA	0.3	2.6	0.00	0.11	0.00	58.6
Approach		559	8.6	559	8.6	0.328	0.9	NA	0.3	2.6	0.00	0.11	0.00	51.1
North: Vittoria Rd														
8	T1	471	14.4	471	14.4	0.290	0.0	LOSA	0.0	0.0	0.00	0.00	0.00	69.8
Approach		471	14.4	471	14.4	0.290	0.0	NA	0.0	0.0	0.00	0.00	0.00	69.8
West: Erceg's Development Access														
10	L2	39	1.3	39	1.3	0.077	3.8	LOSA	0.1	0.4	0.46	0.55	0.46	18.8
Approach		39	1.3	39	1.3	0.077	3.8	LOSA	0.1	0.4	0.46	0.55	0.46	18.8
All Vehicles		1069	10.9	1069	10.9	0.328	0.6	NA	0.3	2.6	0.02	0.08	0.02	54.2

Site: [PM 2031 - Scenario 4 - New Road to Vittoria Rd - Eastern Roundabout  
(Site Folder: Scenario 4)]

Network: [PM 2031 - Scenario 4  
(Network Folder: Scenario 4)]

Site Category: -  
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: Vittoria Rd														
1	L2	65	4.6	65	4.6	0.749	13.6	LOS B	3.9	29.2	0.92	0.99	1.25	36.9
2	T1	484	9.4	484	9.4	0.749	14.2	LOS B	3.9	29.2	0.92	0.99	1.25	30.8
3	R2	75	4.6	75	4.6	0.749	19.5	LOS B	3.9	29.2	0.92	0.99	1.25	29.5
Approach		624	8.3	624	8.3	0.749	14.8	LOS B	3.9	29.2	0.92	0.99	1.25	31.6
East: School Access														
4	L2	75	4.6	75	4.6	0.257	4.3	LOSA	0.7	4.8	0.74	0.64	0.74	33.0
5	T1	37	4.6	37	4.6	0.257	4.3	LOSA	0.7	4.8	0.74	0.64	0.74	32.0
6	R2	75	4.6	75	4.6	0.257	4.3	LOSA	0.7	4.8	0.74	0.64	0.74	13.6
Approach		187	4.6	187	4.6	0.257	4.3	LOSA	0.7	4.8	0.74	0.64	0.74	28.0
North: Vittoria Rd														
7	L2	75	14.4	75	14.4	0.509	7.1	LOSA	1.6	13.0	0.68	0.72	0.68	25.5
8	T1	135	14.4	135	14.4	0.509	6.3	LOSA	1.6	13.0	0.68	0.72	0.68	39.8
9	R2	45	14.4	45	14.4	0.509	10.9	LOS B	1.6	13.0	0.68	0.72	0.68	36.9
9u	U	227	9.2	227	9.2	0.509	12.7	LOS B	1.6	13.0	0.68	0.72	0.68	26.6
Approach		482	11.9	482	11.9	0.509	9.9	LOSA	1.6	13.0	0.68	0.72	0.68	32.6
West: East-West Link														
10	L2	1	4.6	1	4.6	0.354	11.2	LOS B	1.0	7.5	0.93	0.95	0.93	26.7
11	T1	37	4.6	37	4.6	0.354	14.5	LOS B	1.0	7.5	0.93	0.95	0.93	26.0
12	R2	140	4.6	140	4.6	0.354	15.6	LOS B	1.0	7.5	0.93	0.95	0.93	35.7
Approach		178	4.6	178	4.6	0.354	15.4	LOS B	1.0	7.5	0.93	0.95	0.93	33.9
All Vehicles		1471	8.6	1471	8.6	0.749	11.9	LOS B	3.9	29.2	0.82	0.85	0.96	31.9

\* Critical Movement (Signal Timing)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

## 8 FINDINGS

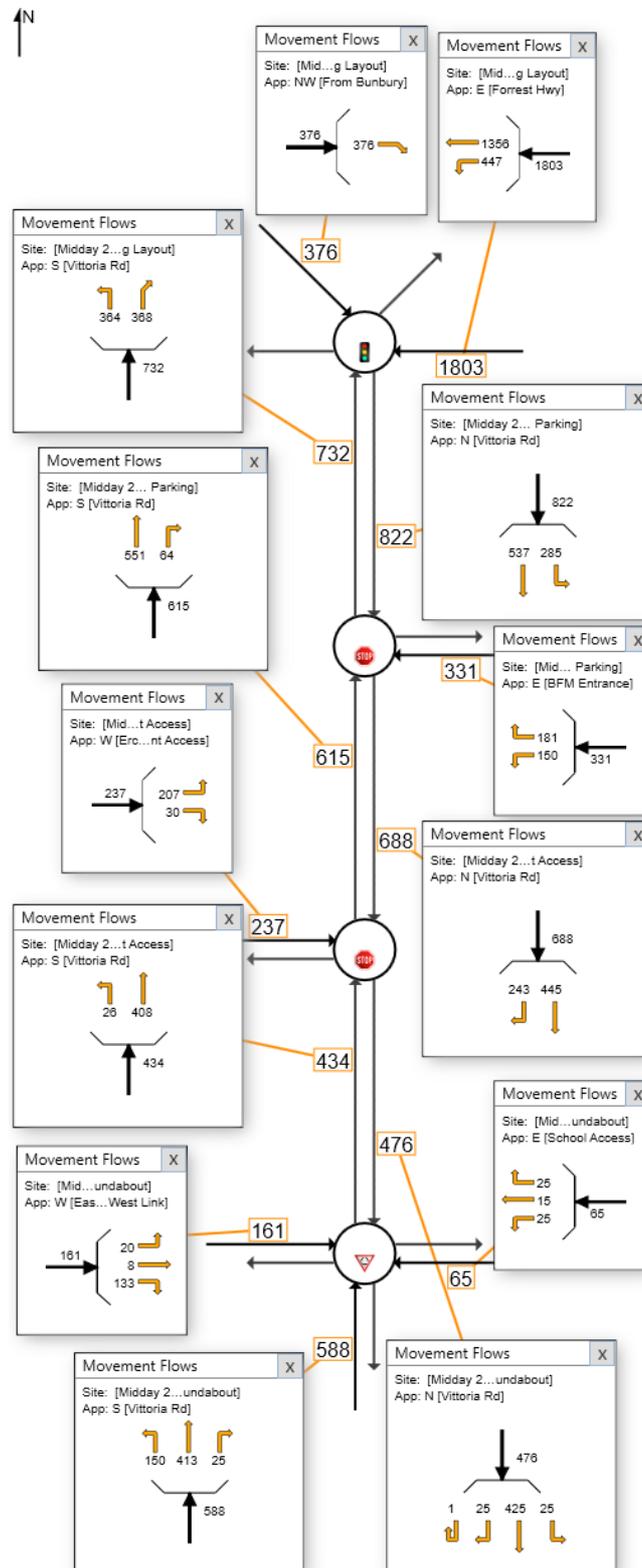
The intersection of Forrest Hwy and Vittoria Rd was the focus of this study.

- Scenario 1 indicates this intersection will exceed its capacity by 2031 due to increased volumes at all approaches.
- Scenario 2 improves the intersection slightly, but it is expected to be just over capacity by 2031.
- The redistribution of traffic in 2031 predicted by Scenario 4 results in the intersection operating favourably during the midday peak and in the AM peak period. In the PM peak period, the intersection is expected to continue operate albeit with little spare capacity.

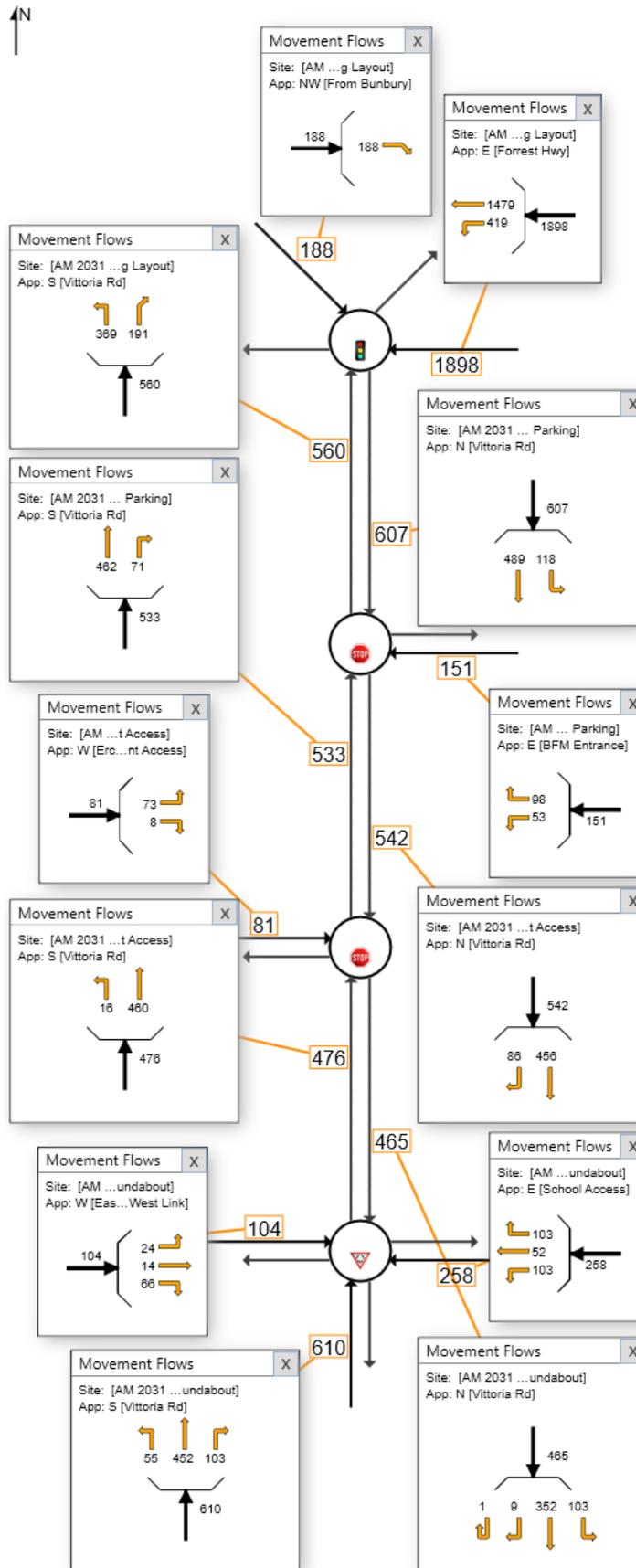
## 9 APPENDICES

### 9.1 Appendix A – Network Flows

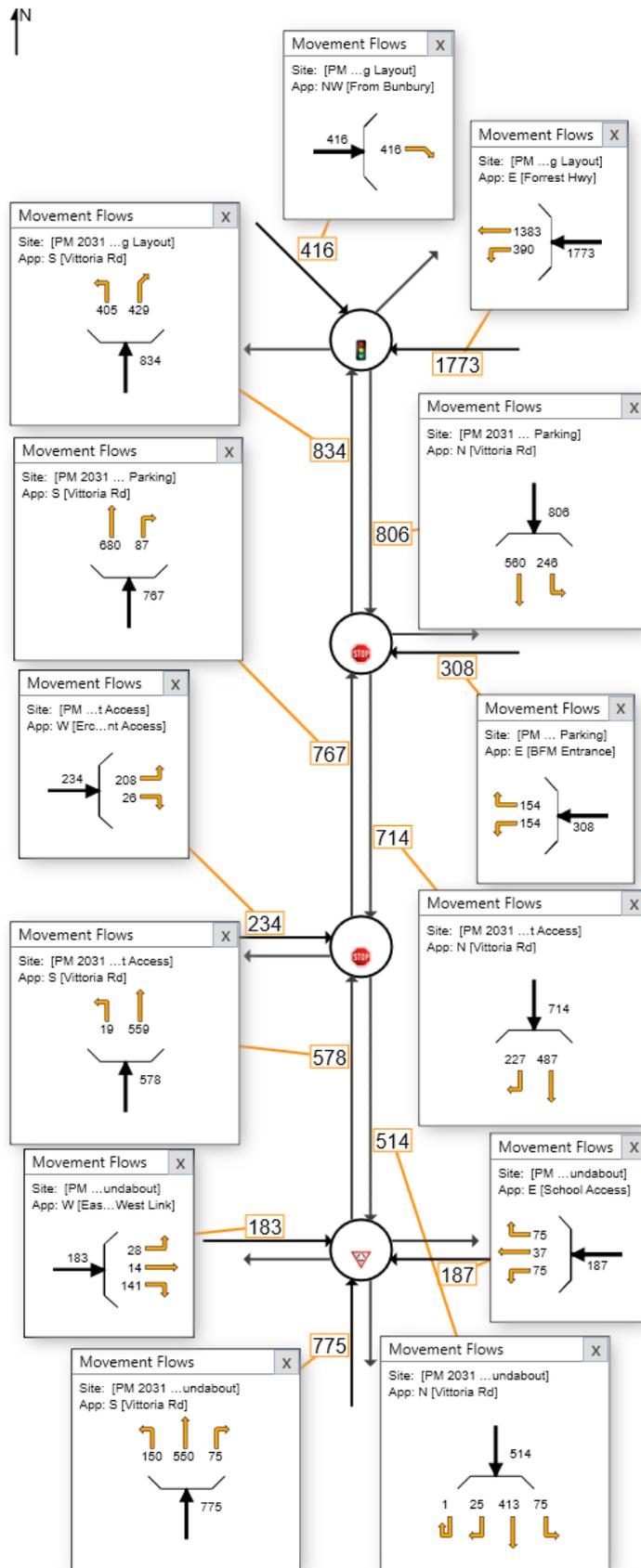
#### 9.1.1 Mid-Day Peak 2031 – Scenario 1



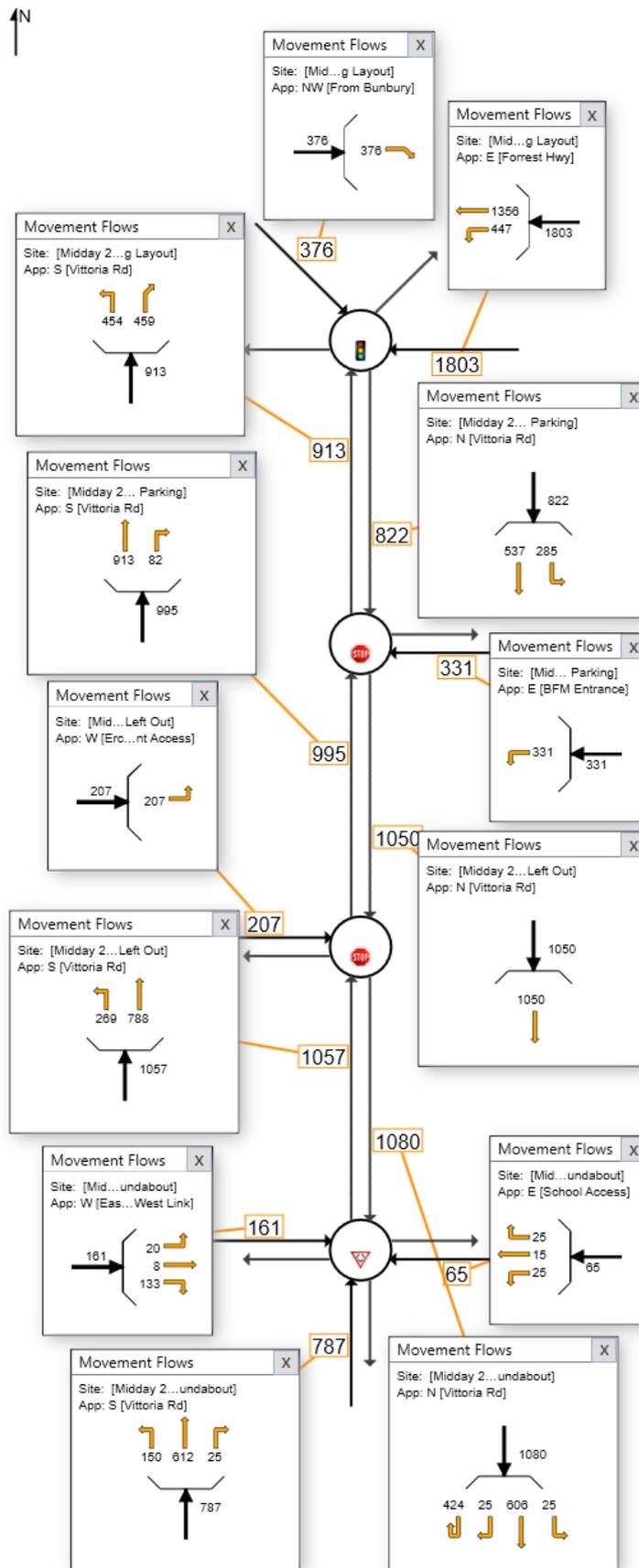
### 9.1.2 AM Peak 2031 – Scenario 1



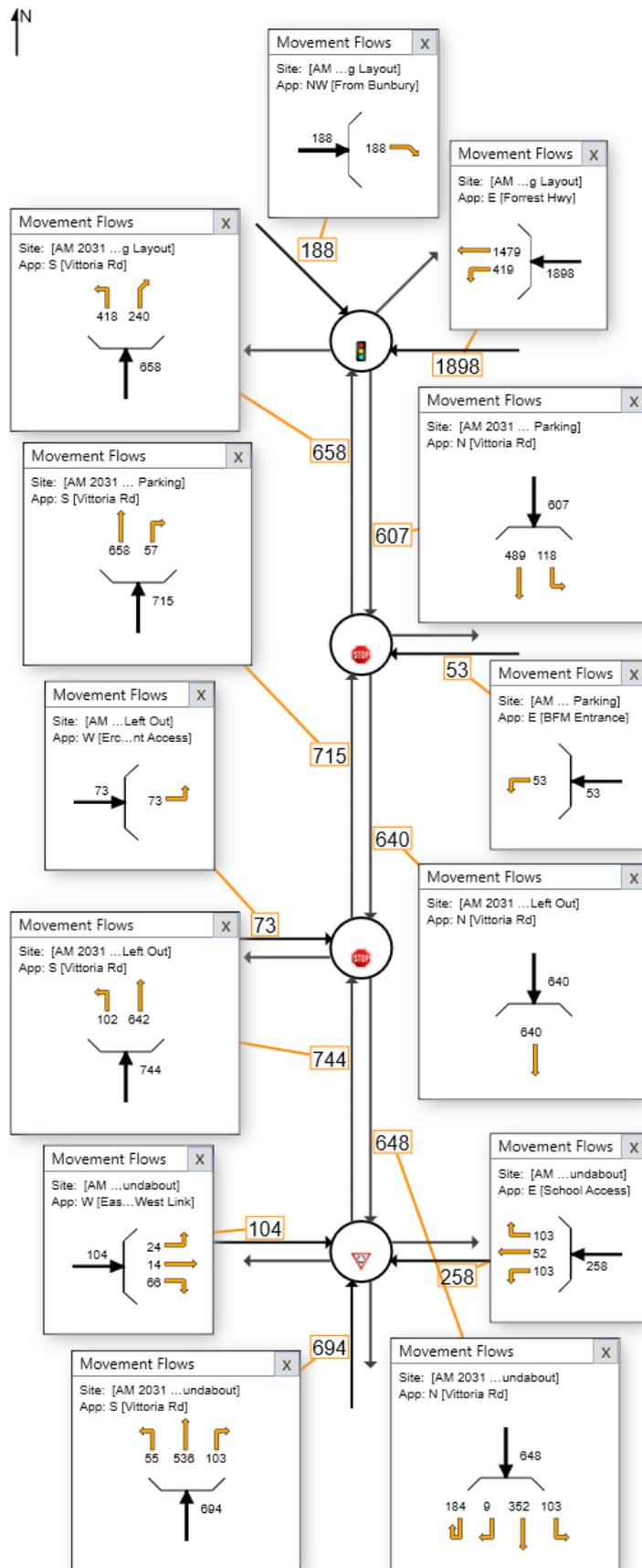
### 9.1.3 PM Peak 2031 – Scenario 1



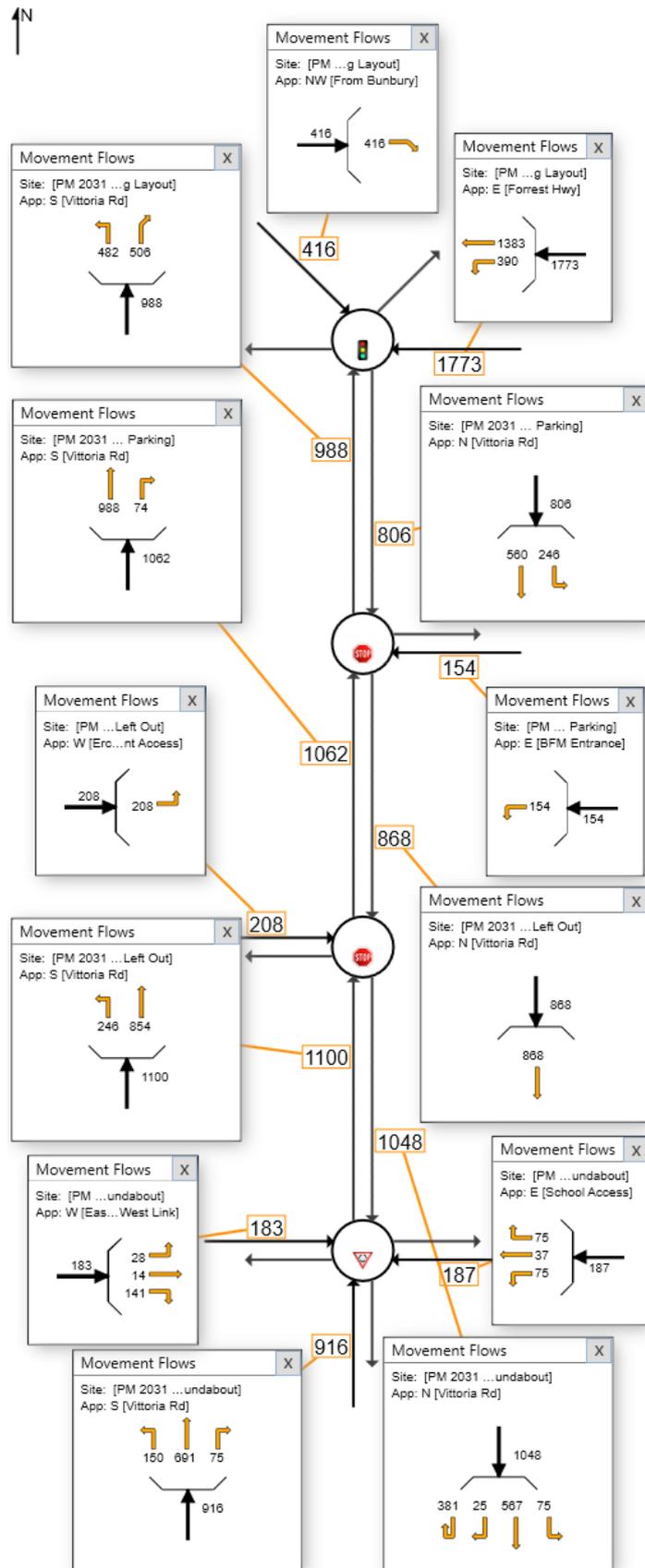
### 9.1.4 Mid-Day Peak 2031 – Scenario 2



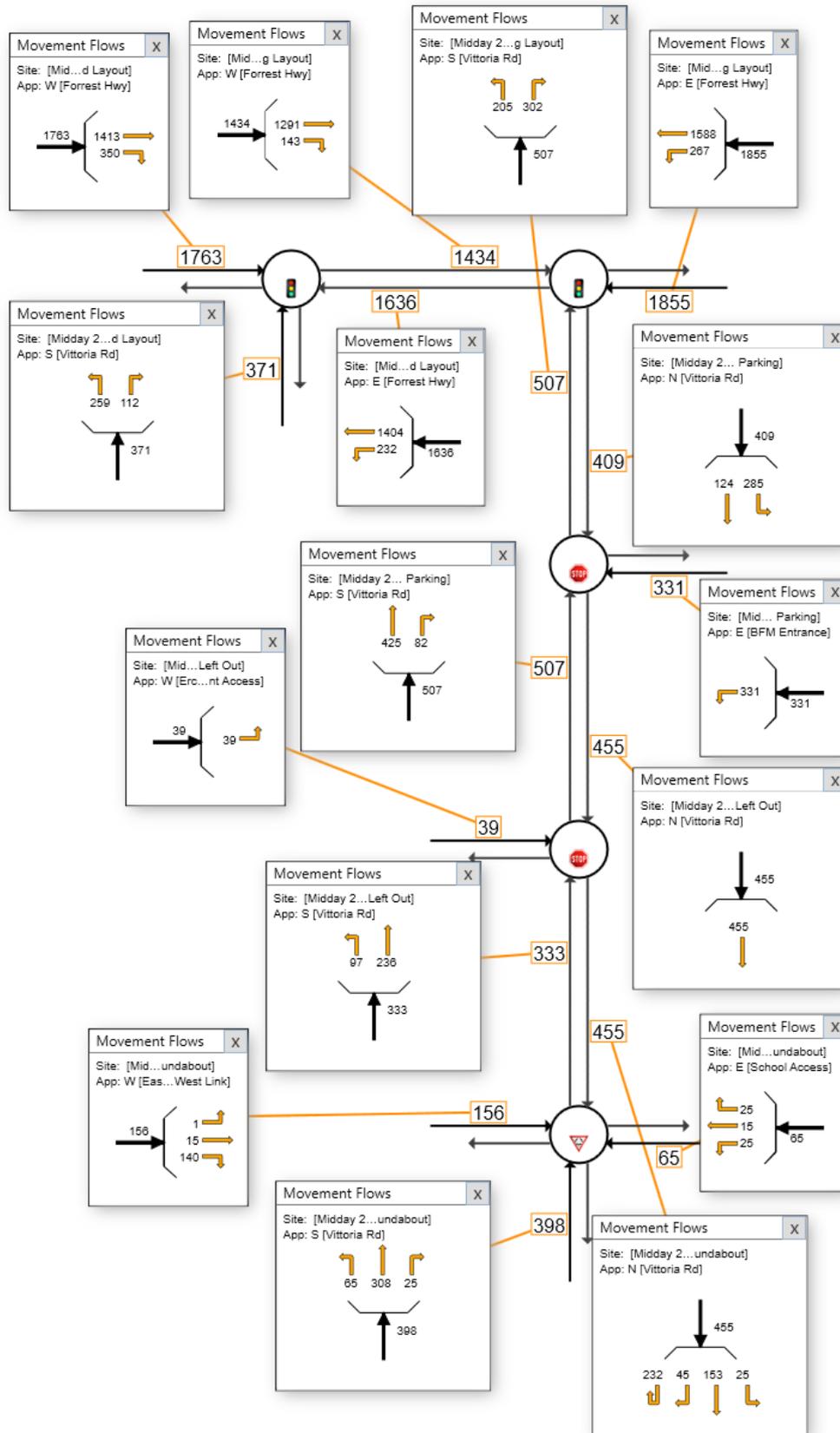
### 9.1.5 AM Peak 2031 – Scenario 2



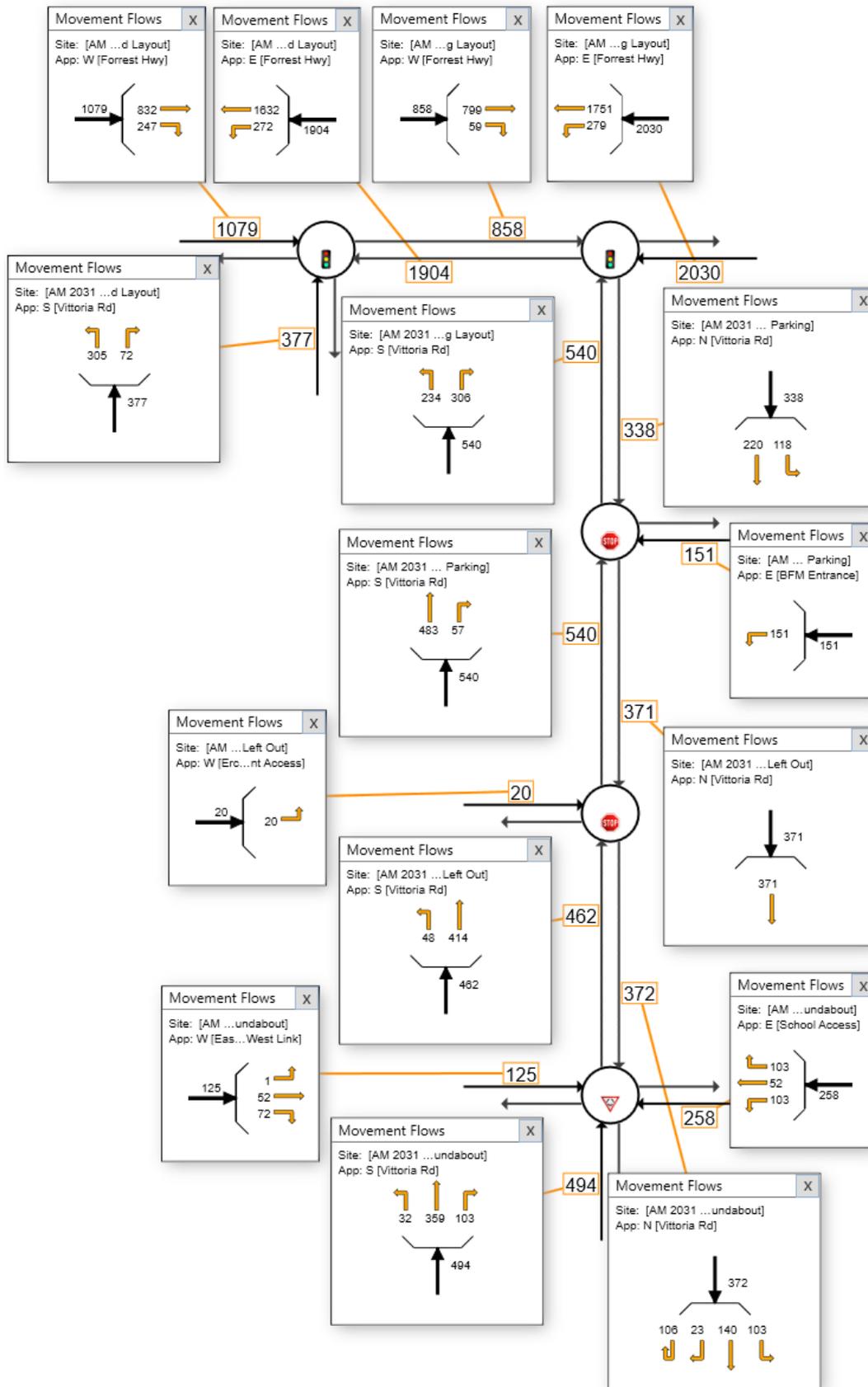
### 9.1.6 PM Peak 2031 – Scenario 2



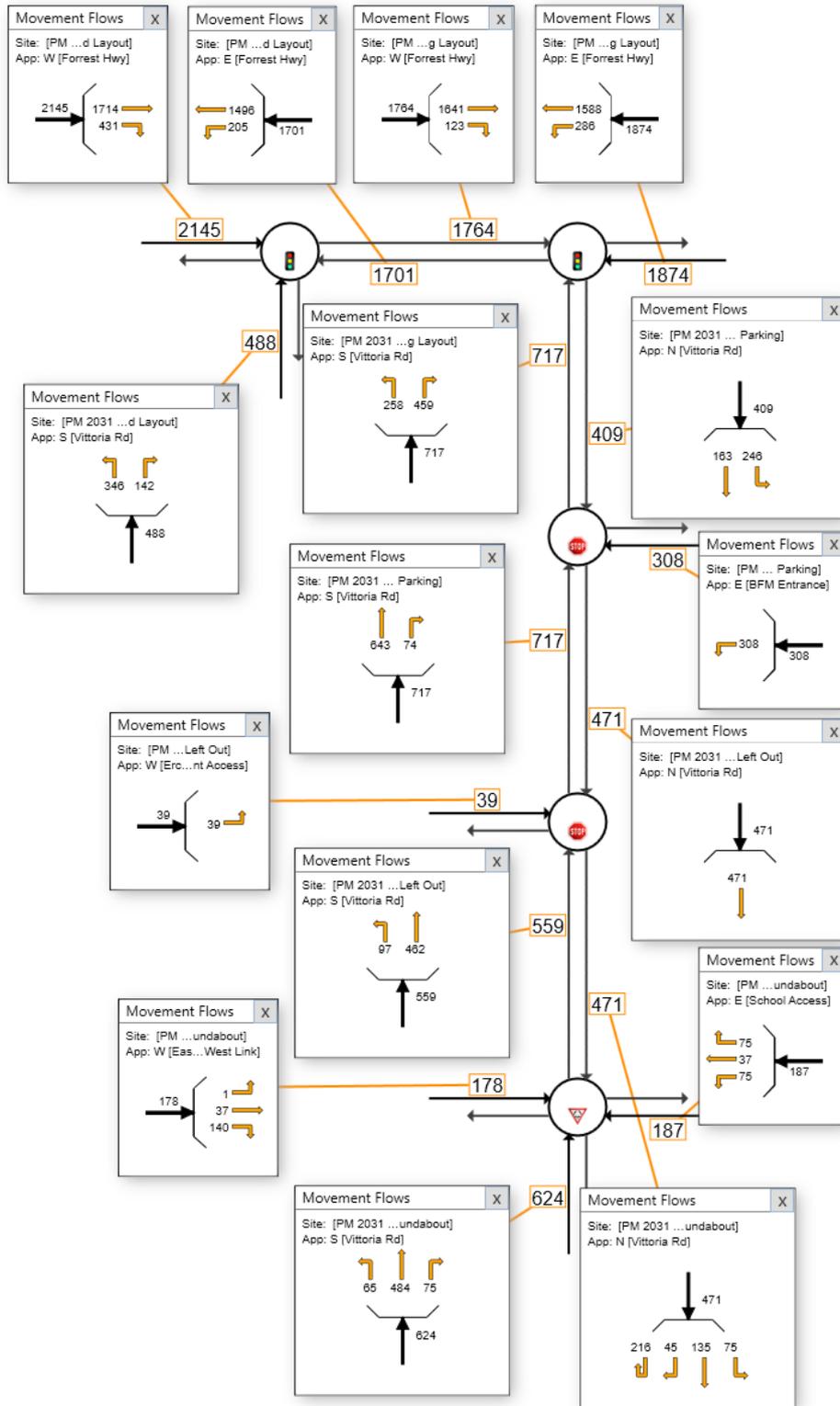
### 9.1.7 Mid-Day Peak 2031 – Scenario 4



### 9.1.8 AM Peak 2031 – Scenario 4



### 9.1.9 PM Peak 2031 – Scenario 4



----- END OF REPORT -----

## 8.4. Appendix 4 – Movement and Place



Department of  
Transport

# Movement and Place



## FACT SHEET 4

# ROADS AND STREETS

Roads and streets are complex environments that perform multiple functions. Some roads are designed to minimise travel time and keep people and goods moving as quickly and efficiently as possible. Others are destinations where people are encouraged to meet and spend time.

What if one road has both roles? The function of a road or street can change several times as you move along that road or street. A street will operate differently as you travel through an activity centre when compared to the same street operating in an unconstrained environment outside of a centre.

For example the area near the corner of Oxford and Newcastle Streets has cafes and shops that encourage people to meet and spend time. Vehicle traffic is one lane in each direction, with reduced speed and there is provision made for walking by broad footpaths shaded by awnings. It differs from the Oxford Street near the corner of Galwey Street, where emphasis is on efficient movement, mainly by car, bicycle or walking to access the businesses or residences in this location.

Another factor influencing the function of a street is the time of day and the time of week or year. A street may be a popular destination in the evening but function to move traffic during the morning and afternoon peak periods.

This complex relationship means that we need to carefully consider the way we use our roads and streets, recognise their placemaking activities and the choices we make when we choose to travel.



## **8.5. Appendix 5 – Glen Iris Floodway Modelling Report (November 2021)**

Refer attached document