

Ballarat Integrated Transport Action Plan

For a Compact and
Connected City



Technical Reference | June 2020



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Strategic Basis for the Action Plan

The City of Ballarat's Integrated Transport Action Plan is a major strategic approach to meeting the future transport needs in the context of a growing regional City. Underpinning this strategy is the strong partnerships with business, government, community organisations and other regional cities who are integral to our City's prosperity and liveability.

This plan will guide the type and level of transport infrastructure and services to be provided now and into the future, in addition to identifying the investment required to deliver the future transport needs of Ballarat. It's a tool that will be pivotal in achieving the City's vision.

The Integrated Transport Action Plan is a stand-alone document, however it is part of a broader suite of land use planning and development strategies which shape the urban form and settlement pattern of the City.

To realise the vision for truly seamless, reliable, connected transport network where services are regular, affordable and easy to use, there must be land use change which encourages people to live and work locally, within easy access to jobs, services and schools.



Figure 1 | Strategic Basis for the Integrated Transport Action Plan





Roles and Responsibilities: Transport

Who is Responsible for Transport?

City of Ballarat

The City of Ballarat manages, operates and funds certain aspects of the transport network, such as local roads and is responsible for the design, delivery and maintenance of most public spaces, including footpaths, streets, bicycle lanes and paths in parks and gardens.

The City of Ballarat is seeking to improve its transport advocacy program to work with the State Government on the provision of improved transport options across our city and region.

Victorian Government

The Victorian Government is responsible for most aspects of planning, building, managing and operating transport in Ballarat. This includes the public transport network, arterial roads and all traffic signals.

The City of Ballarat works closely with Victorian Government agencies, authorities and operators to gain approvals for projects, to advocate for change and influence positive outcomes.

Integrated Planning

The *Transport Integration Act 2010* (TIA) is Victoria's principal transport statute. Its core focus is integration and sustainability. It requires integrated planning of transport as a single system performing multiple tasks, rather than as separate transport modes. Planning is also required to consider the use of surrounding land and its intensity.

Under the TIA, integrated planning is the responsibility of all levels of government. The City of Ballarat and the Victorian Government are required to make decisions based on the TIA's objectives and principles. The objectives are to achieve:

- Social and economic inclusion
- Economic prosperity
- Environmental sustainability
- Integration of transport and land use
- Efficiency, coordination and reliability
- Safety, health and wellbeing.



Regional Context

Ballarat is a highly concentrated employment centre for the region, providing over 45,000 or 69% of the region's jobs. These jobs are predominantly located within the Ballarat CBD, West Employment Zone (BWEZ), Wendouree and Mt Helen. As job growth in the region continues, it is likely that employment numbers will increase in BWEZ.

In 2016, 81% of Ballarat's workforce lived in Ballarat. This meant that more than 7,000 people commuted to and from Ballarat for work from elsewhere in the Central Highlands region.

Approximately 3,000 of these commuters were from southern areas of the region with additional workers commuting from eastern areas, including Ballan, Bacchus Marsh and the western suburbs of Melbourne.

Clear data is not available but on the average day, it is anticipated that a further 15,000 people come from regional areas to Ballarat for other purposes such as shopping, education, health and recreation.

The Central Highlands Region is forecasted to grow by 30,000 by 2021. Based on the current 80/20 split between living and working in Ballarat, this means the number of regional commuters will increase significantly into the future.

As Melbourne continues to expand westward (towards Ballarat) the commute times from Melbourne's outer suburbs to Ballarat are reducing. In some circumstances, residents in outer suburbs e.g. Melton can access jobs and education in Ballarat quicker than they can access in the Melbourne CBD.

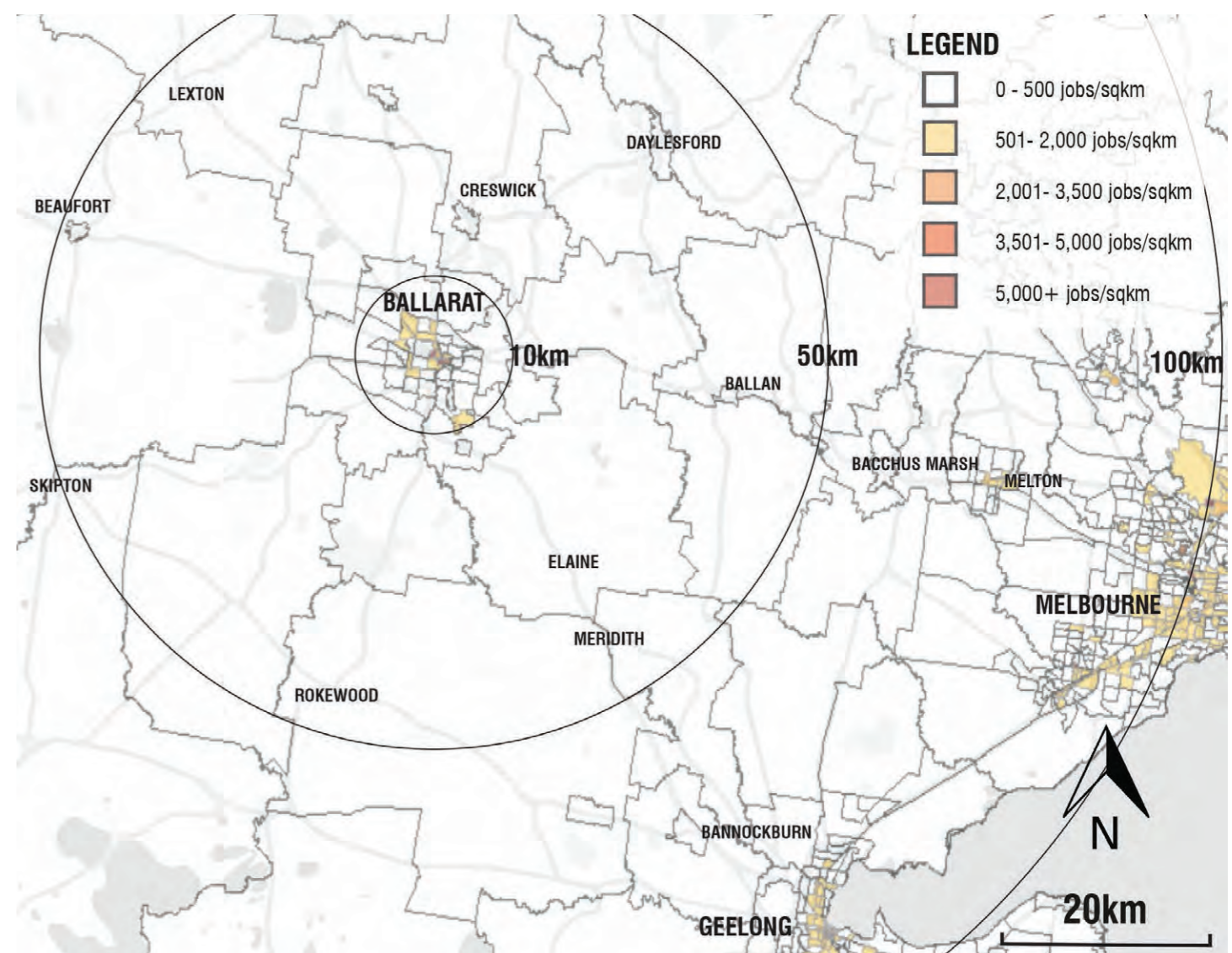


Figure 2 | Regional Context of Ballarat



Key Policy Alignment

Ballarat Municipal Health and Wellbeing Plan

Underpinned by extensive community consultation reflects the aspirations of the community for 2021. Key to the plan is the need to create supportive environments through promoting cycling and walking as a means of transport for early childhood services, schools and workplaces. The plan also seeks to encourage the use of cycling, walking and public transport to attend community events.

Ballarat Carbon Neutrality Action Plan 2019-2025

Identifies a number of sustainable transport-related actions, including opportunities for alternative/renewable fuel options to support public transport and the CBD Smarter Parking Plan, to support active transport modes across community, to work with the state government to improve public transport services and mode share in Ballarat, including transitioning to low emission busses and public transport.

Plan Melbourne

Provides a policy statement on continuing to invest in regional Victoria as a way to support housing and economic growth, enhance social and economic participation and grow strong, healthy communities. Key to Plan Melbourne's aspiration for regional Victoria is the creation of high quality freight and passenger transport connections and to facilitate the growth and competitiveness of the regions.

Central Highlands Regional Growth Plan

Provides a regional plan for Ballarat. The Plan highlights a number of future directions which include improving the capacity and functioning of the region's transport networks, to provide safe, reliable and resilient transport network, to consider technological advancements in the transport provision mix, and to develop integrated freight precincts and related networks.

Ballarat Strategy

Provides the strategic direction for the community and the Council into the future. The strategy proposes a long term future for a greener, more vibrant and connected Ballarat, and is underpinned by two key policy platforms for change: the '10 Minute City' and the 'City in the Landscape'. The Strategy presents clear policy directions for ensuring an integrated approach to connecting business and the community and outlines the plan for a more sustainable transport network.

Notes

A series of horizontal lines provided for taking notes.

Let's Talk About Transport

CITY OF
BALLARAT 



BALLARAT TRANSPORT OVERVIEW



THE BALLARAT INTEGRATED TRANSPORT PLAN

Let's Talk About Transport

BALLARAT TRANSPORT OVERVIEW

Ballarat's population is on track to reach 160,000 by 2040, so we need to future-proof the city's transport network and plan for the long term.

The Ballarat Integrated Transport Plan (BITP) is a long-term vision for Ballarat's transport system, ensuring all networks are efficient, sustainable and well-planned. This Transport Overview outlines the current transport situation and will inform the development of the BITP.

The plan is underpinned by the 10-Minute City principal of the Ballarat Strategy – council's long-term plan for the city to 2040.

The BITP will outline actions the City of Ballarat can take to improve the transport systems it owns or manages, including footpaths, bicycle infrastructure and local roads.

It will also recommend advocacy actions for improvements to parts of the transport system the state government owns or manages, including major roads, freeways and highways, bus services and train lines.



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1.0 OVERVIEW

A key principle of the Ballarat integrated transport discussion, is to ensure Ballarat remains easy to get to, from and around for local residents, visitors and freight. As Ballarat grows, pressures on existing transport networks will be apparent in terms of:

- traffic congestion
- increasing time and monetary costs to move around and access jobs, services and other daily needs
- Crowding on public transport such as Ballarat-Melbourne trains

Effective long-term integrated transport and land use planning is required to manage transport networks in a way that minimises the negative impacts of population and economic growth.

A sustainable transport system for Ballarat is fundamentally about giving the community more convenient options for how they move, considering their personal needs and circumstances. In dealing with a growing population, we are able to provide more options for people in creating frequent services, diverse routes and longer operating hours. In order to optimise the benefits of these opportunities, careful long-term planning for sustainable transport must begin now.

In order to achieve this, it is important to understand Ballarat's current transport situation. This is all about people's movements, at a regional and local level in accessing work, education, shopping, recreation and tourism opportunities.

The BITP also seeks to improve the efficiency of freight movements for businesses, making them more competitive in their industry.



2.0 REGIONAL CONTEXT

WITHIN THE CENTRAL HIGHLANDS REGION, BALLARAT PLAYS A CRITICAL ROLE AS THE PRIMARY ACTIVITY CENTRE. IT HOUSES ABOUT HALF THE POPULATION BUT PROVIDES NEARLY 70% OF ALL OF THE REGION'S EMPLOYMENT OPPORTUNITIES. THIS MEANS A SIGNIFICANT NUMBER OF PEOPLE COMMUTE TO AND FROM BALLARAT FROM OUTSIDE THE REGION.

As shown in figure 1, Ballarat is a highly concentrated employment centre for the region, providing over 45,000 or 69% of the region's jobs. These jobs are generally located around Ballarat CBD, West Employment Zone (BWEZ), Wendouree and in Mt Helen. As job growth in the region continues, it is likely that the BWEZ will increase its role in terms of the share of total employment.

In 2016, 81% of Ballarat's workforce lived in Ballarat. This meant that over 7,000 people commuted to and from Ballarat for work everyday from elsewhere in the region. Almost 3,000 of these commuters came mainly from southern parts of the region, near Rokewood, Meredith and Elaine. A substantial number also came from eastern parts, near Ballan and Bacchus Marsh. Clear data is not available but on the average day, it is anticipated that a further 15,000 people come from regional areas to Ballarat for other purposes such as for shopping, education, health or recreation. The Central Highlands Region is forecasted to grow by 30,000 by 2021. Based on the current 80/20 split between living and working in Ballarat, this will mean the number of regional commuters will significantly increase into the future.

As Melbourne continues to expand westward (towards Ballarat) the commute times from Melbourne's outer suburbs to Ballarat are reducing. Already, in some circumstances, residents in Melton can access jobs and education in Ballarat quicker and more reliably than they can access jobs or education in Melbourne CBD.

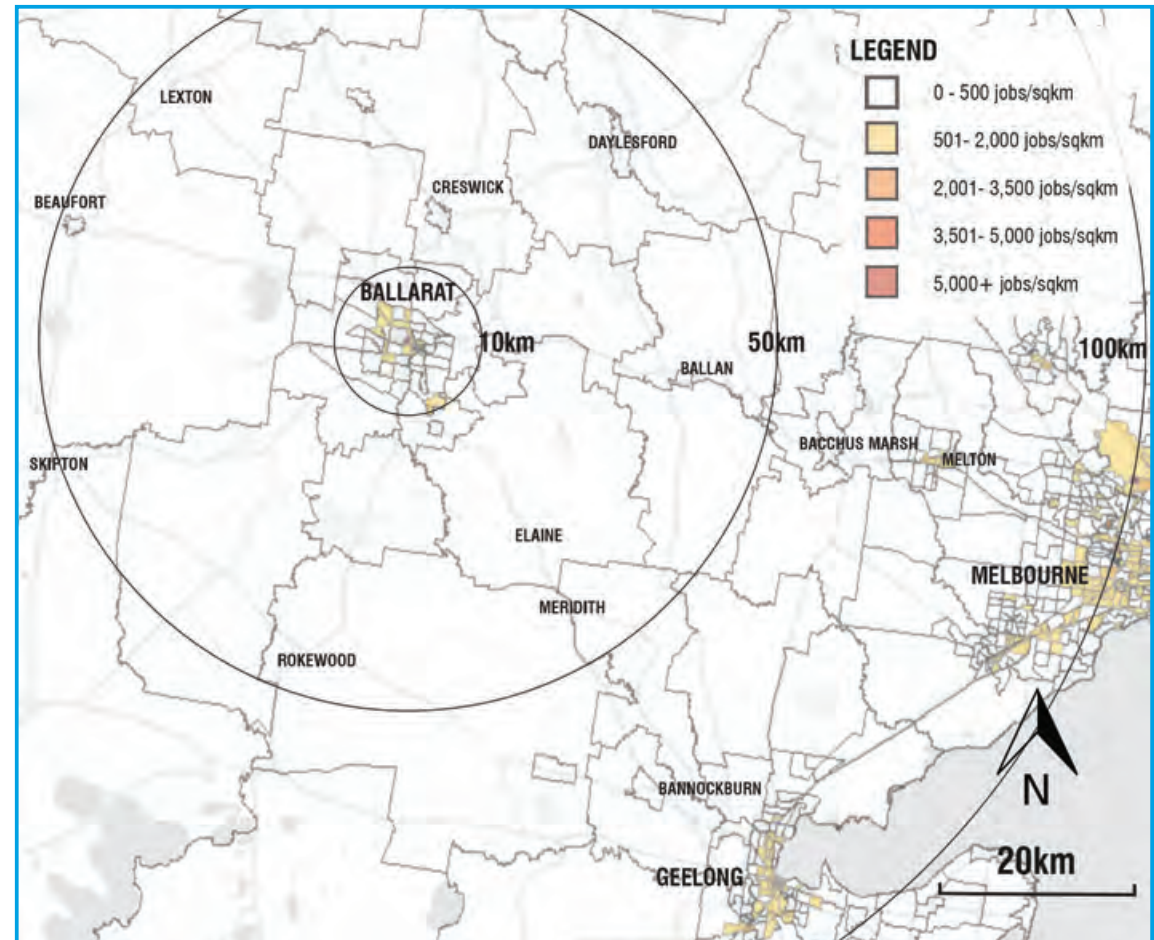


Fig.1
Place of work density by 'destination zone', showing a high density of places of work in Ballarat's CBD as well as in Wendouree to the West and Federation University, Mt Helen to the South.



2.1 GETTING TO AND FROM BALLARAT

IN 2016, 98% OF REGIONAL COMMUTERS DROVE, WHILE ONLY 2% CAUGHT PUBLIC TRANSPORT. THIS SPLIT IS DUE TO A LACK OF CHOICE COMMUTERS FACE WHEN TRAVELLING TO BALLARAT FOR WORK FROM ELSEWHERE IN THE REGION. THIS PLACES A LARGE AND EVER-INCREASING DEMAND ON ROAD INFRASTRUCTURE REGIONALLY AND LOCALLY.

It is highly cost-ineffective to continue to upgrade this infrastructure as growth accelerates, making the provision of better transport choices a necessity. In considering the region's substantial growth over the next decade, it is important to ensure travel costs including time remain low. In increasing the viability of public transport to Ballarat, costs for travellers are reduced as is pressure on local road congestion and parking infrastructure.

Currently, public transport to and from Ballarat is limited to regional links to other regional town centres. Most of these towns including: Beaufort, Ararat, Skipton, Elaine, Meredith, Creswick, Ballan, Bacchus Marsh and Melton take 60 minutes or less to get to and from by public transport. Most regional commuters live in rural locations requiring them to drive to stations in order to use this public transport.

There is a significantly larger catchment however, for those commuting by car to and from Ballarat within the same timeframe of 60 minutes. Considering the public transport commute from these locations is likely to be the same time or longer than a car, many choose to drive straight to work, rather than parking at a station and transferring to a train. In addition to this, as shown in Figure 2, These towns often have limited services, especially in the cases of Avoca, Skipton, Mayborough, Elaine, Meredith and Daylesford, which make the time for departure inflexible. In cases where there are only 1 daily service, there is the added difficulty in making the commute home. These factors of inflexible departure times, lack of return services and and equal or slower travel make driving to and from Ballarat far more attractive than public transport.

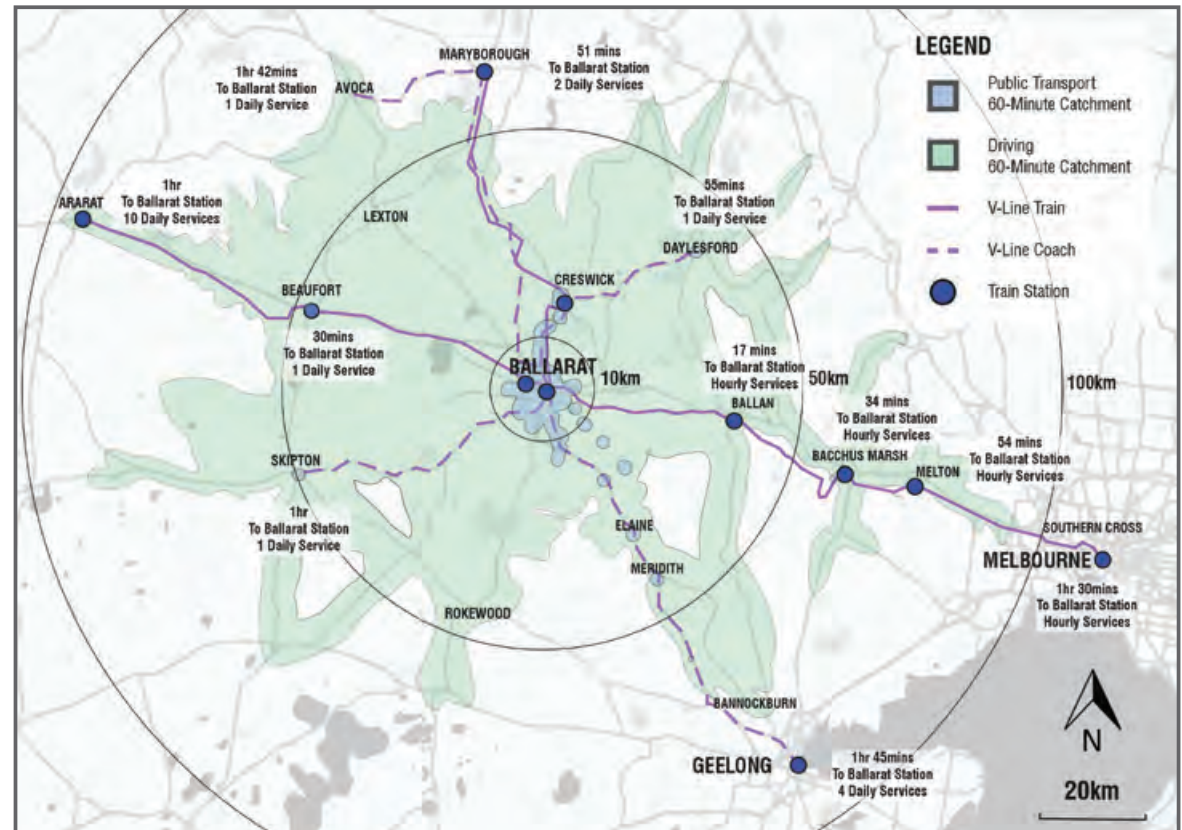


Fig.2
Regional transport map based on 60 minute catchments of car and public transport - showing high flexibility with car use against limited flexibility offered by public transport.

3.0 LOCAL SITUATION: TRAVEL & EMPLOYMENT WITHIN BALLARAT

BALLARAT PROVIDES NEARLY 40,000 JOBS FOR LOCAL RESIDENTS. EACH OF THESE JOBS, IS NOT ONLY A DESTINATION FOR A WORKER, BUT ALSO OFFERS A SERVICE SUCH AS EDUCATION, SHOPPING AND RECREATION WHICH PEOPLE ALSO NEED TO TRAVEL TO. STARTING WITH JOURNEYS TO WORK, WE CAN UNDERSTAND KEY TRAVEL PATTERNS WITHIN BALLARAT WE NEED TO PLAN FOR.

As figure 4 demonstrates, Ballarat CBD employs nearly 38% of locals, leaving 62% of the jobs in other suburbs. The suburb with the second highest number of jobs is Wendouree (inclusive of BWEZ) with 20%, while Ballarat North, Ballarat South and Alfredton each employ 10%. These patterns highlight key considerations in understanding traffic and planning for bus networks. Having a CBD-centric bus route network for example will ultimately make it more difficult for many residents to travel directly to their workplace using public transport, for example the approximately 1500 people from Ballarat South who travel to Wendouree.

Many people work in the same suburb as they live, especially locals to Ballarat CBD, which employs 60% of its own residents. This provides the most opportunities for providing ways for people to walk and cycle to work. Reducing car use for these people in particular will not only save them on fuel costs, but also for the cost of the car and its garage. In addition, encouraging this market segment to use alternative modes of transport also ensures congestion is eased for regional commuters and for local commuters travelling in from other suburbs.

Currently however, according to Victorian Integrated Transport Modelling, 91% of all trips, not just to work, are made by car. The remaining 9% is split between active (walking and cycling) (5%) and public (4%) modes of transport.

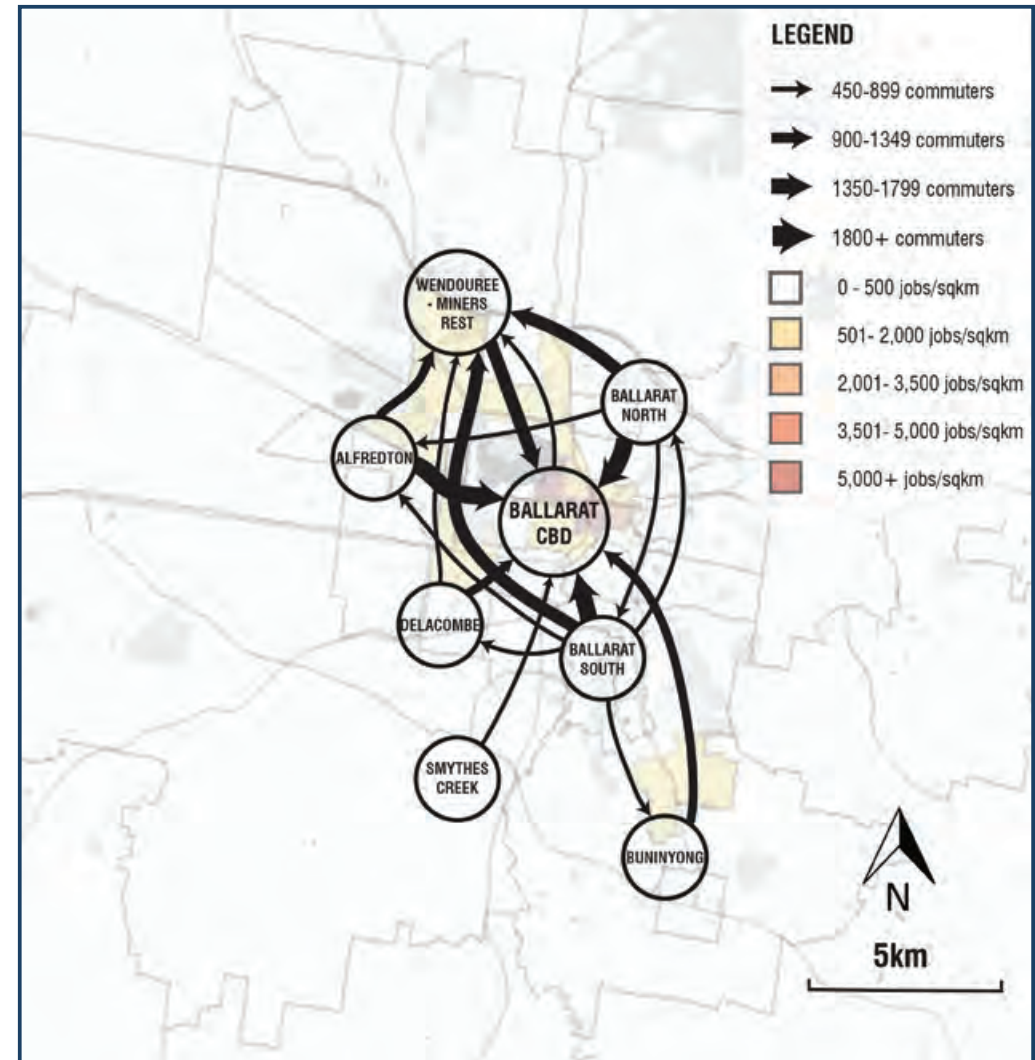


Fig.3
Work Trips Map by ABS Statistical Area 2 - ABS Census Data 2016



3.1 GETTING AROUND BALLARAT: DRIVING

AS BALLARAT GROWS AND FACES INCREASING LEVELS OF CONGESTION BOTH LOCALLY AND FROM ELSEWHERE IN THE REGION, DEVELOPING CHOICES FOR PEOPLE TRAVELLING LOCALLY BECOMES CRITICAL.

As the vast majority of locals and visitors continue to drive for most trips, the volume of cars on the road is set to increase. This increase is projected to cause congestion in many key streets and intersections by 2031. This will mean that despite continuing to pay car costs including fuel for the most direct journey possible, journey times will be longer for everyone. Road space, particularly in the heritage core of Ballarat is very difficult to expand, and alternative (more space efficient) transport options need to be provided for.

Currently, as figure 3 demonstrates, driving is far more flexible than the public transport alternative. This is because, not only does it allow people to depart whenever is convenient for them, but it is also possible to go significantly further in less time. As long as this is the case, driving will continue to be the dominant mode of transport.

Key considerations must therefore be made in planning for alternative transport options, with regard to where people travel, in ensuring they can make their trips between 10 and 20 minutes and in leaving when it is most convenient for them. When considering active transport in particular, trips must be useful, safe, comfortable and enjoyable.

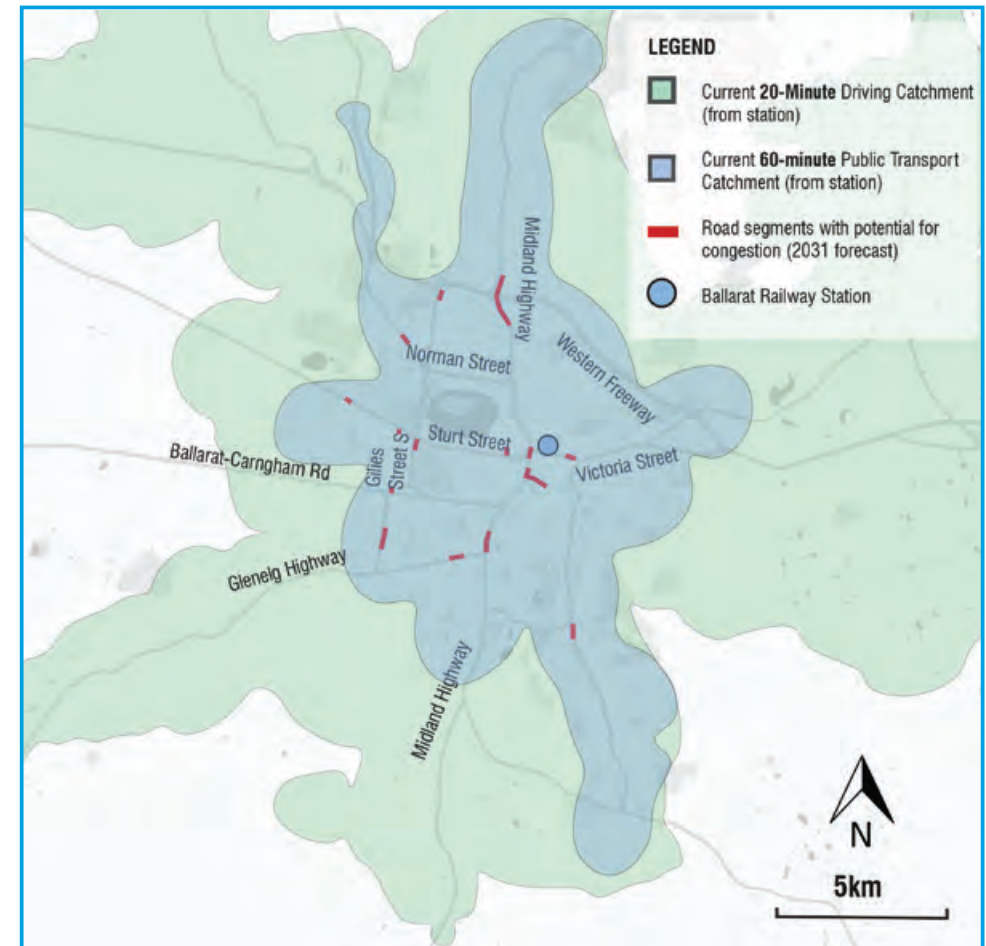


Fig.4
20 minutes by car or 60 minutes by public transport. Continued car use will lead to congested areas, making the public transport network quicker and more viable will be key to reducing this.

3.2 LIVING CLOSE TO WORK, SERVICES AND PUBLIC TRANSPORT OPTIONS

WHEN PEOPLE ARE HOUSED WITHIN 2KM TO SERVICES SUCH AS JOBS, SHOPS, SCHOOLS AND RECREATION THEY CAN MAKE SHORT TRIPS BY ACTIVE TRANSPORT (CYCLING AND WALKING). BEING LOCATED 400M FROM BUS STOPS AND TRAIN STATIONS ALLOWS FOR PEOPLE TO TRAVEL LONGER TRIPS BY PUBLIC TRANSPORT. ALL OF THESE TRIPS SHOULD TAKE 10 MINUTES.

Historically, Ballarat evolved as a network of suburbs based on 10 minute walking catchments to local shops and pubs (these can be seen as the pink areas on figure 5). Each walking catchment had its own local shopping area, and there was a high reliance on walking and bicycle riding for transport. As the geographic area of Ballarat has grown, the transport focus has shifted from active transport to motorised transport - firstly trams and then cars and (to a much lesser extent) buses.

This pattern of growth is set to continue, as areas for projected residential growth as shown in figure 5 as red continue to spread outside of both walking and existing public transport route catchments. This pushes demand for more transport infrastructure, particularly roads and bus routes as active transport becomes less viable due to the extensive distance people will have to walk or cycle. Given that it is less cost-effective to provide new public transport infrastructure for a lower concentration of people, these services will be minimal and inflexible, meaning people will be likely to drive.

The Ballarat Strategy identifies key existing and future public transport corridors for high frequency service (highlighted in the light orange on figure 5). Close access to frequent services provides opportunities for more flexible public transport options. Furthermore, ensuring that places of work and other services are also close to this transport, means that trips are direct. Finally, ensuring that these places are also within 2km to activity centres provides people access to shops and recreation opportunities enables people to walk and cycle.

Locating people in this way creates more transport opportunities which limit congestion. This ensures that people can access key areas of employment and services within 10 minutes, by walking to some, cycling to others and commuting by public transport for the rest.

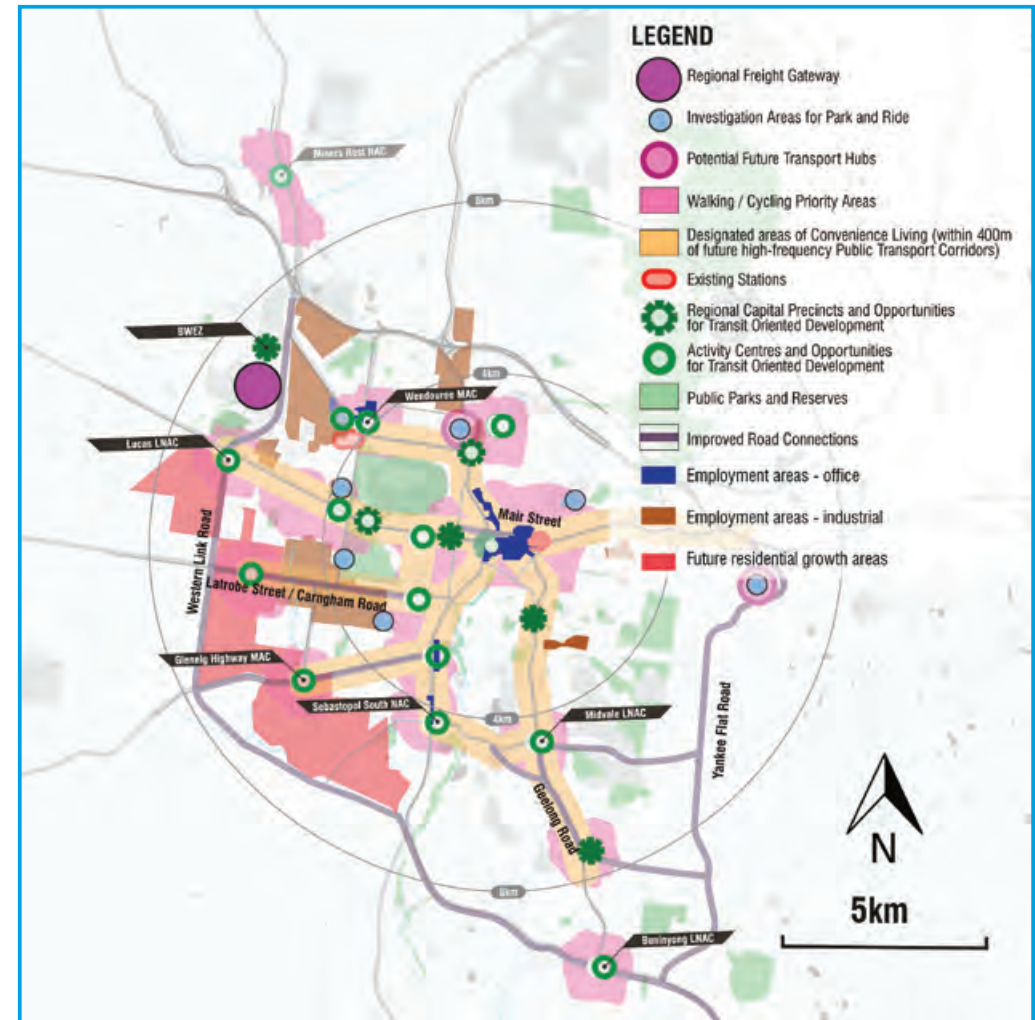


Fig.5

Future areas for residential and industrial growth are generally outside of walking distance to existing activity centres and areas for high frequency transport convenient living corridors as planned in the Ballarat Strategy.



3.3 GETTING AROUND BALLARAT: ACTIVE TRANSPORT

IN ADDITION TO REDUCING CONGESTION, OPTIMISING ACTIVE TRANSPORT AS A VIABLE TRANSPORT OPTION PROVIDES MANY BENEFITS INCLUDING: HEALTH AND WELLBEING, SOCIAL, FINANCIAL, ECONOMICAL AND ENVIRONMENTAL. THIS REQUIRES THE RIDE OR WALK TO BE USEFUL, SAFE, COMFORTABLE AND ENJOYABLE.

Infrastructure in Ballarat is improving to provide opportunities for people to walk and cycle not just for recreation, but as a mode of transport. Walking especially has seen comparatively little investment compared to other modes of transport. Providing accessible links which prioritise pedestrians and not cars within and between residential estates and industrial estates is key to this.

Cycling in Ballarat is also improving in a similar way. The Ballarat Cycling Action Plan (2017) has been developed to guide development of facilities for bicycle riders. The strategy is focussed on providing facilities that make bicycle riding for transport safer and more viable for all residents.

The 20 minute bicycle rider catchment from Ballarat Station currently covers much of Ballarat's existing urban area, but does not extend into the western growth areas of Delacombe or Lucas. These areas however, have planned routes which will be constructed in future. The Cycling Action Plan (2017) has recently been adopted by Council after significant Community consultation. Council is now determining the priority projects that will proceed.

It is estimated that with continued innovation and investment, active transport infrastructure initiatives are projected to change the current 91% car 5% active and 4% public transport mode split depending on distance.

- For 10 minute trips, the split is projected to change to 71% car 20% active and 4% public.
- For 15 minute trips the projected change is 76% car 15% active 4% public.
- For 25 minutes or more 86% car 9% active and 4% public (which is still an overall 5% increase in active transport).

This shift from cars to active transport not only means less cars congesting the road, but also a lowered environmental impact and benefits to health and wellbeing, personal finances and local business and economic vitality.

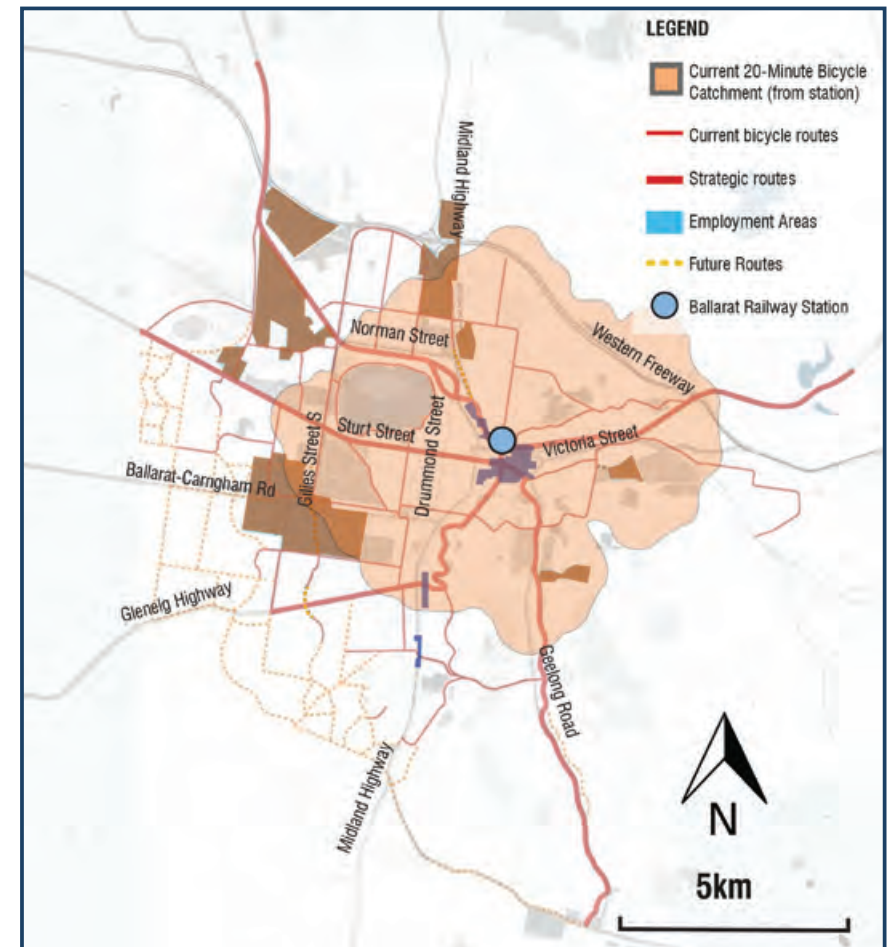


Fig.6
20 minute cycle catchment from Ballarat Station

3.4 GETTING AROUND BALLARAT: PUBLIC TRANSPORT

FOR LONGER TRIPS, INCREASING PUBLIC TRANSPORT'S VIABILITY AS AN OPTION CAN SIGNIFICANTLY REDUCE CONGESTION AND PEOPLE'S TRAVEL COSTS. HOWEVER, IN ORDER TO MAKE PUBLIC TRANSPORT MORE VIABLE, IT MUST BE FLEXIBLE, FAST AND CONVENIENT.

The Ballarat bus network has substantial room for improvement. In 2016 only 451 people or 1% of employed people caught the bus to work (ABS). Buses in Ballarat are overwhelmingly slower than they should be. This is because these routes are planned for the worst traffic conditions possible which results in buses needing to stop to avoid running ahead of schedule. Trimming this fat provides opportunities for this saved time to accommodate higher frequencies on some routes, or time for new routes altogether.

The current schedule is essentially a 'copy and paste' timetable, where all routes have almost exactly the same departure and arrival times at each major stop (all providing more journey time than necessary). The timing of services undermines the local network by scheduling many services through the CBD at the same time rather than spacing them out evenly to provide a 'Turn-up-and-Go' frequency in key corridors.

For example, seven buses operating from Ballarat Base Hospital to Ballarat Station combine to provide inconsistent wait times of 7 minutes for one bus, then 23 minutes for the next. This happens for every hour of every day. There is the potential to provide a bus every 8.5 minutes consistently, making the timetable easier to understand and giving passengers the assurance that when they miss a bus, the next is only 8.5 minutes away, rather than facing a potential 23 minutes wait. This is similar for people travelling from Mt Clear to Federation University, as they have four services an hour to choose from, but face a potential wait of 5 or 25 minutes for a bus, rather than an even 15 minute gap between services which is more dependable and allows more flexibility.

Ballarat's bus network is also highly CBD centric and as illustrated in figure 4, making cross-town travel difficult and slow as the travel demand patterns are more dispersed. This means there is a lack of direct connections into other key activity areas including BWEZ and local centres.

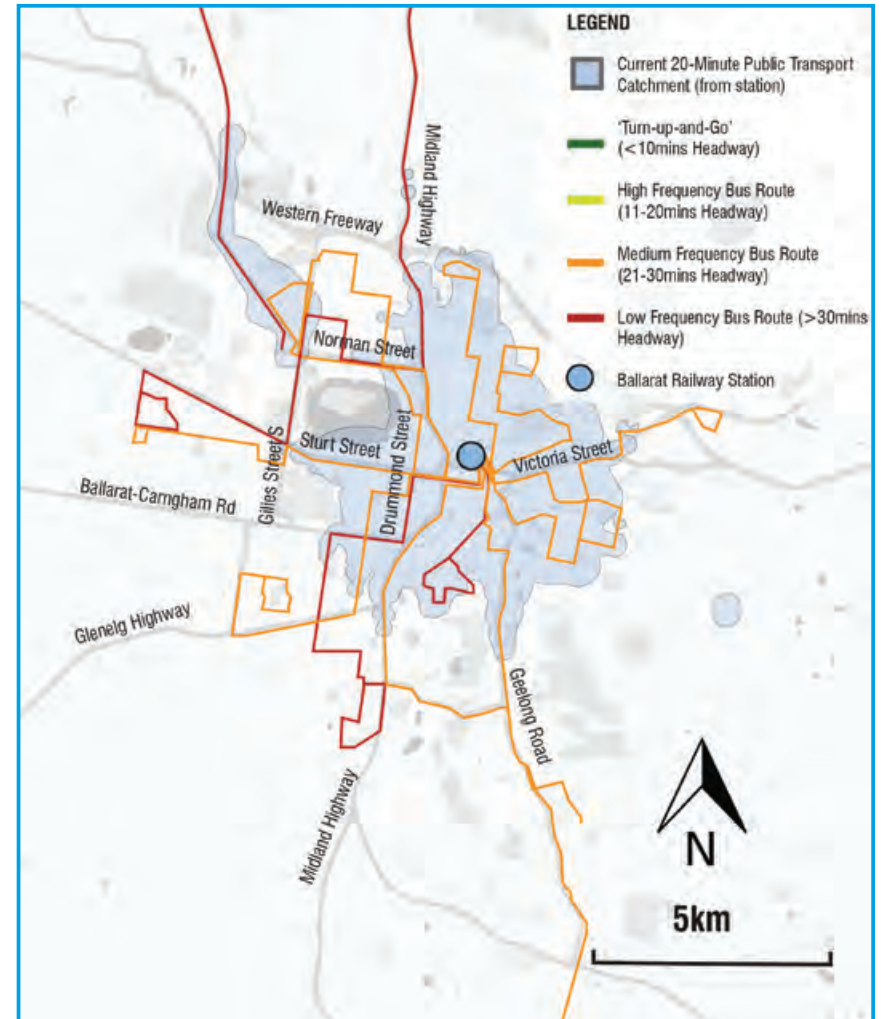


Fig.7
Ballarat's bus network and 20 minute travel time catchment from Ballarat Station



4.0 FREIGHT: MOVING GOODS IN AND OUT OF BALLARAT

FREIGHT MOVEMENTS ARE CRITICAL TO THE BALLARAT ECONOMY. THE ABILITY TO MOVE GOODS AROUND THE CITY EFFICIENTLY HAS A DIRECT IMPACT ON BUSINESS PRODUCTIVITY AND OUR ABILITY TO ATTRACT NEW INVESTMENT.

The movement of freight around and through Ballarat has a significant impact on our transport networks. The road network caters for a large number of movements, that are more dispersed and include an increasing number of home deliveries. Truck movements on Ballarat roads are increasing at around 5% per annum.

The rail network historically catered for the bulk of long distance freight movements to Ballarat, but has become less competitive as road freight costs have reduced and land uses have dispersed away from the rail infrastructure. There is an opportunity for the rail network to cater for freight movements to the Port of Geelong and Port of Melbourne with an intermodal facility planned for the Ballarat West Employment Zone (BWEZ) and rail freight shuttles to the Ports.

Ballarat's High Productivity Freight Vehicle (HPFV) Mass Network includes the Western Freeway and a small segment of Learmonth Road to access the Freeway from the Ballarat Link Road. The Ballarat Link Road will create a direct heavy vehicle route from the Western Freeway to the Glenelg and Midland Highways, and reduce heavy vehicle movements through central Ballarat.

Recent developments including the relocation of the Livestock Saleyards and development of the BWEZ are reducing some of these pressures and creating new pressures on the transport network. The HPFV network will need to continue to be expanded to facilitate the efficient movement of freight around the city.

The Murray Basin Rail Plan and other rail freight and port projects are expected to increase the mode share for rail freight, particularly over longer distances. To support this transition and transport more freight on rail, the BWEZ Master Plan has identified part of the precinct for the development of a freight and logistics hub. Future freight movements may rely on Ballarat Airport similar including fresh freight. The location of BWEZ next to the Ballarat Airport helps to focus future freight network infrastructure investments.

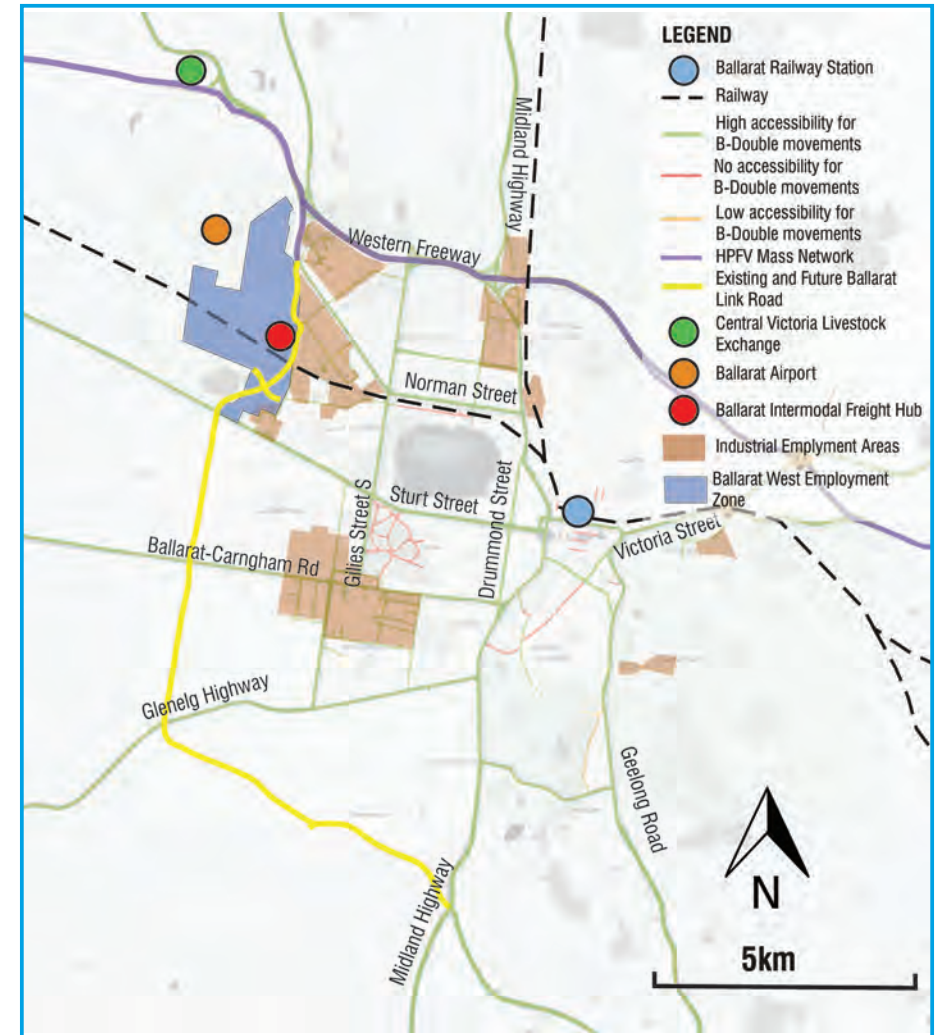


Fig.8
Key freight movement network and employment destinations

5.0 SUMMARY

Ballarat currently has a very high level of car dependency. Growth in population and geographic size of our urban area will have a direct and compounding affect on traffic congestion in Ballarat. To ensure traffic keeps flowing we will need to develop new strategies and plans that support people using other modes. A key first step is to ensure that public transport meets people's needs and active transport connections are safe and convenient. We will also need to revise our road network and provide more efficient road links while also considering locations where access might need to be limited.

Ballarat requires a transport network which has the capacity to effectively move goods and people as we grow. An essential element will be a more urbanised transport approach that reduces the need for motorised travel and gives our community viable, safe, efficient and cost saving alternatives to private car use. Achieving this requires a holistic view of the transport network that provides for most people using private vehicles, while also providing for when each of use would like to walk, ride a bicycle or catch public transport.

The Ballarat Integrated Transport Plan will explore the challenges and opportunities to improve all modes of transport. Community discussion will be informed by a series of brief mode-specific discussion papers, supported by background research papers.

Ballarat has an exciting future. We are in a good position to have long-term economic prosperity without the traffic congestion that prosperity typically brings. Achieving this growth without congestion will reduce the cost of living in Ballarat, and improve amenity and lifestyle for everyone in the community and provide productivity gains for business.. We will aim to provide more transport choices for you, your family and friends to get you all where you need to go.

Join the conversation and help develop the Ballarat Integrated Transport Plan:

<http://www.ballarat.vic.gov.au/city/city-strategy/integrated-transport-planning>







BALLARAT'S URBAN TRANSIT FUTURE

Background Paper
November 2019



Document Revision History

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This document has been commissioned by the City of Ballarat and was developed based on a range of sources in particular data provided by the Department of Transport.

Movement & Place Consulting does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by any third party on the content of this document.

Cover Photos: *Clockwise from top left – Route 11 at Ballarat Station, Little Bridge Street Interchange, Heritage Tram in Wendouree Parade & 7 buses laying over at Ballarat Station – courtesy of Movement & Place Consulting & creative commons.*

EXECUTIVE SUMMARY

This Background Paper has been commissioned by the City of Ballarat to explore the issues, challenges and opportunities for the urban transit network in the Ballarat region. This Background Paper will inform the Ballarat Integrated Transport Plan and provide Council with recommendations for action and advocacy to the State Government.

Ballarat has a long heritage of public transport use with the City of Ballarat commissioning a tram network in 1884. At its peak in 1937, the Ballarat tramway network was 24km, serving dense and active corridors with homes, shops and other services. The tram network operated for 85 years and was converted to a bus network in 1971 to meet the needs of Ballarat's outwardly growing community.

The bus network has evolved since then and now extends to Buninyong, Creswick and Miners Rest. Services are typically provided once or twice an hour. Patronage on Ballarat's public transport network has waned as car ownership and use has become more common. However, over 2,500 households in the City of Ballarat that do not own a car. For these households, the public transport system is an essential service.

Ballarat's bus network caters for only 4% of travel in the city, but plays an important role in reducing peak congestion, particularly around schools and activity centres such as the CBD and Wendouree. Ballarat's bus network carries over 120,000 passengers per month or over 1.5 million passengers per annum. In addition to the public bus network, there are over 30 urban school bus services each peak that remove thousands of car trips from our local road network.

This Background Paper summarises the existing situation, strategic policy direction and specific projects that are currently underway. It considers the population growth in Ballarat and surrounding centres (including Creswick) and highlights the role that the urban transit network can play to improve access, congestion and economic activity within Ballarat. The urban transit network aids Ballarat's economic and social prosperity for several reasons:

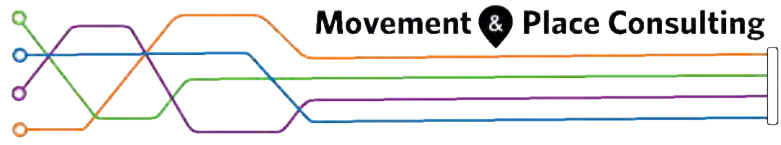
- It provides an affordable alternative to car use, which in turn improves:
 - Local economic activity, as around 70% of transport cost savings get spent locally
 - Traffic congestion, parking availability and road safety
 - Health and environmental outcomes
- Urban transit services improve access to education and employment for people who do not own a car or do not want to drive long distances for employment

Ballarat's urban transit network should be improved in order to better serve customer needs, increase service frequency, resolve bottlenecks and circuitous route alignments, travel times and reliability. If these goals are met, then patronage should also grow.

The population of Ballarat is currently growing at around 2% per annum and is expected to reach 160,000 by 2040. Over the past 15 years, population growth has generated modest patronage growth. Continued moderate patronage growth will continue as Ballarat's population continues to grow but offers the potential for a step change increase in patronage if better services are offered.

This background paper plans for that growth by proposing short, medium and long-term improvements to the infrastructure and urban transit service offerings in the region for Council. This includes service improvements in trunk corridors and to key destinations such as Federation University and new activity centres. Key improvement options put forward in this paper include:

- Faster services with improved directness and operations;
- High-frequency corridors with concentrated service levels where travel demands are highest;
- Ballarat-Geelong Rapid Transit service;
- New services to meet needs in Ballarat's growth areas; and



- Potential to evolve the bus network into an integrated bus and tram network in the long-term.

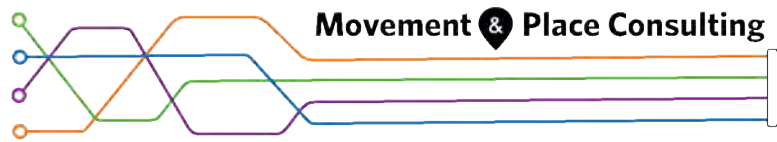


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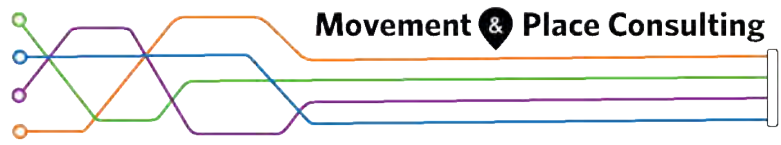


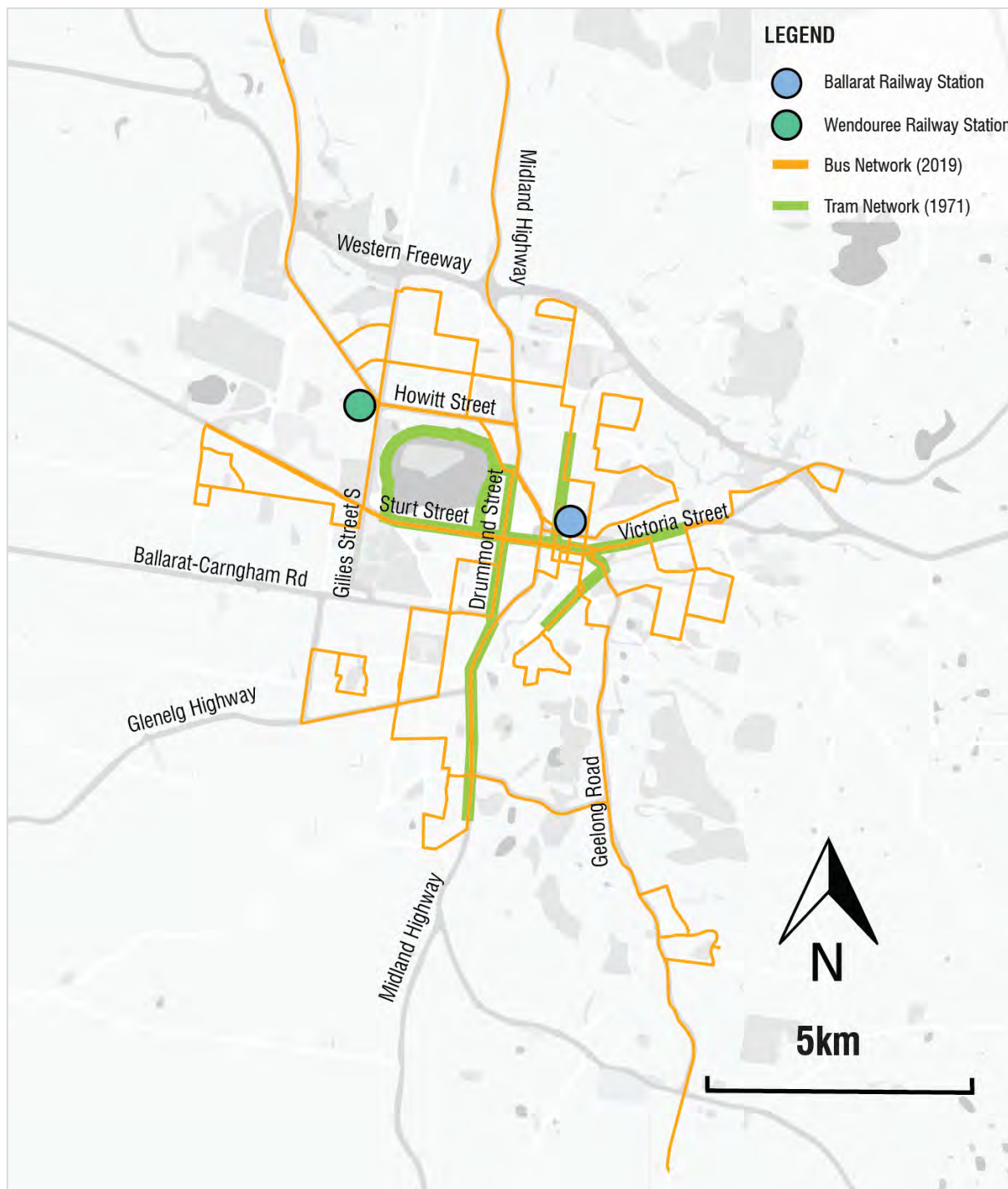
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1. INTRODUCTION

The Ballarat bus network has evolved from the original tram network and is now several times the size of that tram network at its peak as shown in Figure 1-1: below.

Figure 1-1: Ballarat's Bus and Tram Networks



Source: Movement & Place Consulting (M&PC) with Department of Transport & State Electricity Commission data

This report continues an ongoing discussion with the community about Ballarat's transport future, forming part of The Ballarat Integrated Transport Plan (BITP). The BITP features a series of short-read discussion papers and longer background papers regarding Ballarat's current transport situation as well as possible futures for each mode. This paper provides further reading for the Bus discussion paper, in looking at the current local transit network in more detail and exploring options for its improvement into the future. Most of these options such as network improvements and infrastructure improvements fall within the jurisdiction of the State Government, however, the Council has an active role to play in advocating for these changes. Therefore, there is a significant scope for collaboration between Council and DoT bodies such as VicRoads and PTV in achieving higher levels of integration between good land use planning and improvements to Ballarat's urban transit network.

A key principle of the BITP discussion is to ensure Ballarat remains easy to get to, from and around for local residents, employees and visitors. As Ballarat grows, pressures on existing transport networks will be apparent in terms of traffic congestion and increasing time to move around and access jobs, services and other daily needs.

Effective long-term integrated transport and land use planning is required to manage transport networks in a way that minimises the negative impacts of population and economic growth. A sustainable transport system for Ballarat is fundamentally about giving the community more convenient options for how they move, when considering their personal needs and circumstances. In dealing with a growing population, we are able to provide more options for people in creating frequent services, diverse routes and longer operating hours. In order to optimise the benefits of these opportunities, careful long-term planning for sustainable transport must begin now. A key role for Council will be in delivering on land use outcomes which support the urban transit network and advocating to DoT and PTV for service level and infrastructure improvements.

This document is also accompanied by two case studies of international local examples of transit improvements which Ballarat could follow – Curitiba's Bus Rapid Transit system and Canberra's Rapid Tram corridor. These improvements specifically deal with the creation of corridors of high frequency transport and integrated land use changes. These ensure home, work and other services such as shops and schools are close-by and easy to get to at any time of the day.

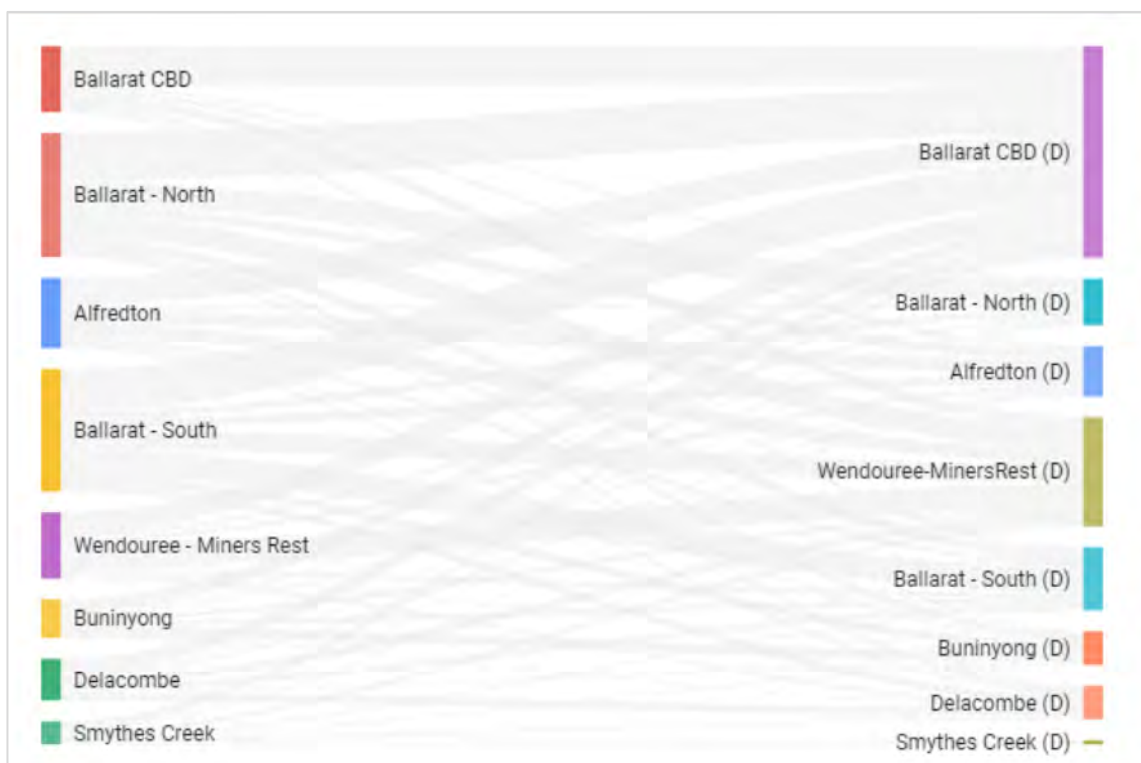
2. BACKGROUND

2.1 Population

There are currently over 100,000 people living in Ballarat and the population is expected to grow by about 60% to 160,000 by 2040. As Ballarat experiences accelerated population growth, there will be increasing transport challenges as more people need to use our roads. Maintaining access to employment, education, recreation and other services will be critical to our economic well-being and liveability.

It will not be possible to provide car access to everyone and achieve the current levels of service (minimal traffic congestion) on our roads. To maintain current levels of congestion (i.e. not have worsening traffic congestion), we will need some trips to be made by other modes (walking, bicycle riding and public transit). The majority of work trips in 2016 (62%) were made to destinations other than the CBD as shown in Figure 2-1 below.

Figure 2-1: Origins (left) and Destinations (right) of work trips

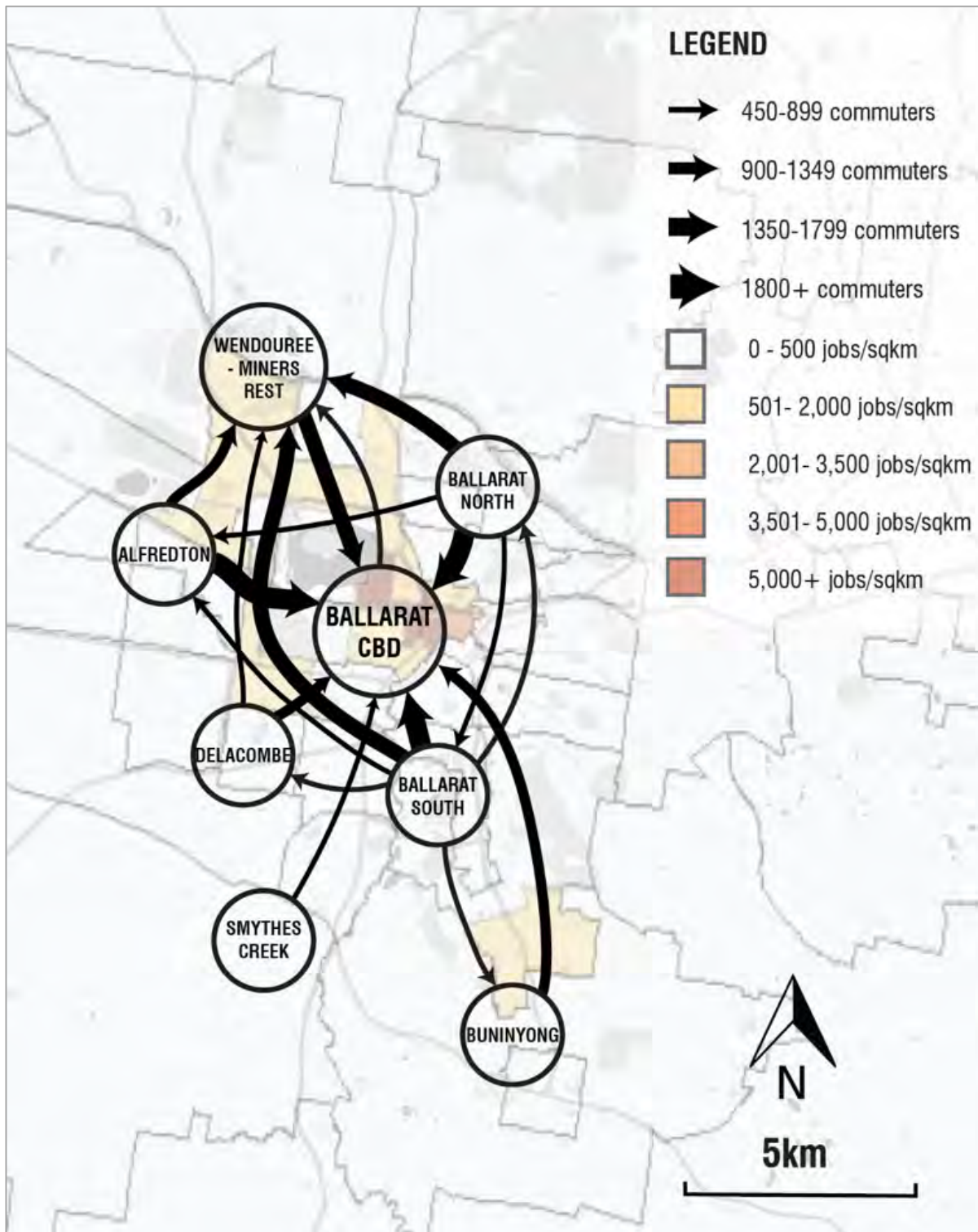


Source: ABS Census (2016)

The current network is primarily designed to link the suburbs with Ballarat Station via the CBD to access education, employment, local activities. However, the assumptions behind such a network design are now no longer relevant, for example:

- Dispersal of activity across the sub-urban area has led to a greater dispersal of trips to areas such as Wendouree, Lucas and Delacombe;
- Only 5% of train passengers access the train via bus (even with the best possible bus-train connections to every service); and
- Travel patterns for Journey to work are dispersed around Ballarat as shown in Figure 2-2 below.

Figure 2-2: Journeys to work – total by corridor



Source: ABS Census (2016)

Public transit is best placed to provide for trips that are in corridors of intensive activity where there are many people travelling in a similar direction at similar times. This dispersal of activity and the inability of the current bus network to provide for rapid journeys between more dispersed locations is partly to blame for the low number of people currently using the bus service. This is largely due to the bus network being

predominantly CBD-centric while trips patterns are more dispersed. For example, only 38% of trips to work are to the CBD.

2.2 Mode Share

Ballarat employs 70% of the workers of the Central Highlands Region, which currently means a further 6,000 people coming from areas outside of Ballarat into the city. The overwhelming majority (98%) of these people use the local road network and parking. With further regional growth expected, this will mean the number of regional commuters will also increase, placing further pressure on the road network and parking availability.

As shown in Table 2-1 below, 4% of all transport trips in Ballarat are made on the public transport network.

Table 2-1: Mode Share for All Trips

Mode	Percentage of Trips Made
Private Transport	91%
Public Transport	4%
Active Transport	5%
TOTAL	100%

Source: VITM (2014)

It is notable that the for journeys to work, public transport is currently less used as shown in Table 2-2 below. This suggests that the existing network is not meeting the community's needs with regard to journeys to work and could be improved to better meet these needs.

Table 2-2: Mode Share for Work Trips

Mode	Percentage of Trips Made
Private Transport	91%
Public Transport	2%
Active Transport	6%
TOTAL	100%

Source: ABS(2016); excludes those who worked from home or who did not state a mode of travel.

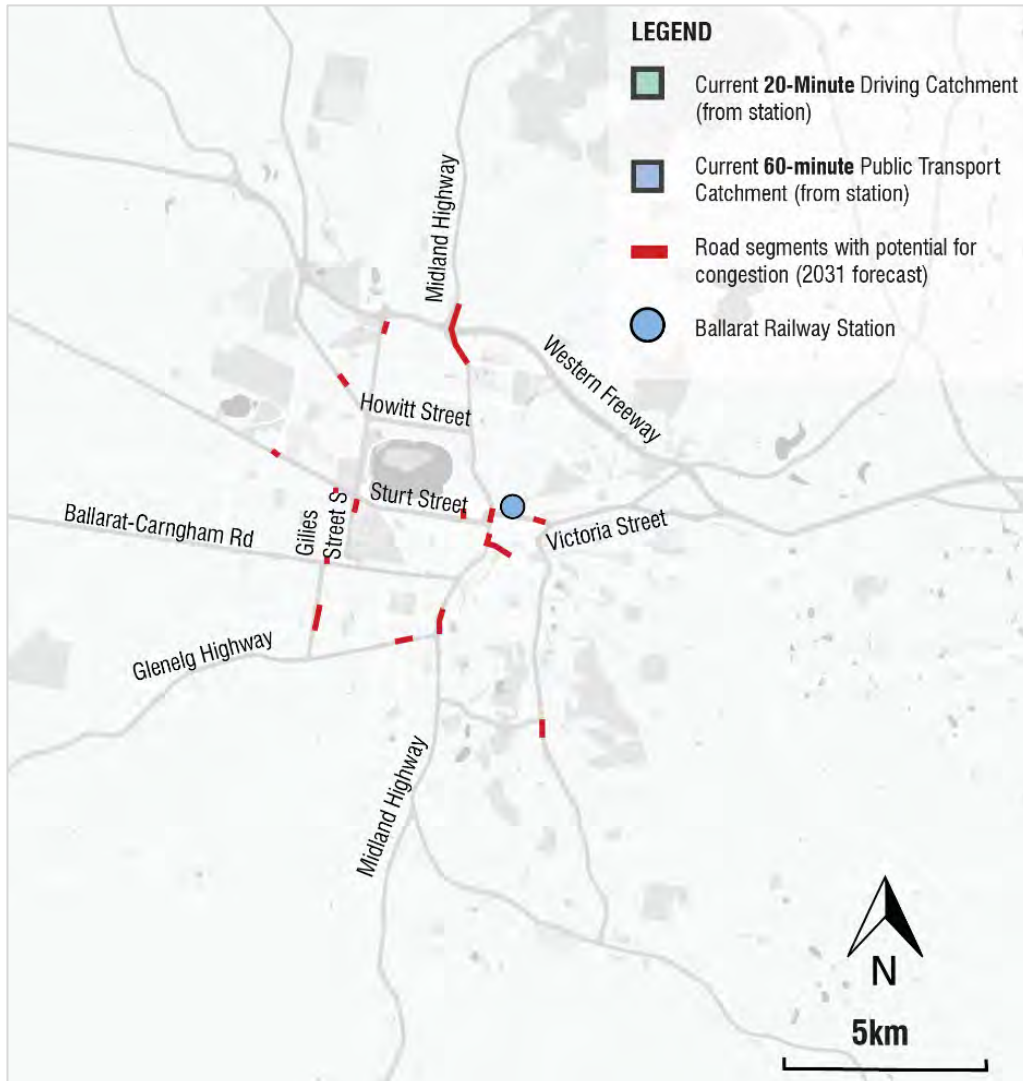
Note: Figures may not add up due to rounding

2.3 Congestion

Currently, 91% of local trips around Ballarat are made by car as highlighted in Table 2-1 above. If future growth follows this same mode split, traffic congestion at specific locations in Ballarat will increase. While these locations are relatively small in number and relatively contained to short segments of roadway, there will be a perception of levels of service on the road network getting worse over time.

The areas likely to experience growth in traffic congestion are shown in Figure 2-3 below. This highlights locations where drivers are likely to be delayed by a full traffic signal cycle when trying to traverse through the intersection during peak periods.

Figure 2-3: Congestion in Ballarat is likely to increase



Source: VITM (2014)

This map highlights that traffic congestion is unlikely to be a widespread problem in 2031 and congestion itself is unlikely to warrant significant new expenditure on urban transit services. However, there are two key issues that this congestion will cause:

- Many of the road segments likely to experience congestion are on key bus routes – and the congestion could delay the bus services; and
- Where traffic congestion occurs on main roads it will reduce regional productivity and potentially reduce safety outcomes.

Providing bus lanes and queue jump facilities (bus lanes and signals at signalised intersections) is proven to help reduce both those issues by ensuring buses are able to move efficiently past areas of congestion and providing an additional buffer between private vehicles and pedestrian spaces¹.

Providing bus priority at key locations will also help to ensure public transit travel around Ballarat is more responsive to the community's needs. Making it more responsive, will generate more patronage. Each additional passenger on the urban transit network is typically one less car on Ballarat's road network which directly reduces local traffic congestion.

2.4 State and Local Strategies

A range of State and local policies, strategic plans and projects are relevant to a discussion about *Ballarat's Future Urban Transit Network*. The following documents have been considered during preparation of this Report:

- *Plan Melbourne 2017-2050* (2016) the Metropolitan Planning Strategy which makes specific reference to growing regional centres such as Ballarat;
- *Central Highlands Regional Growth Plan* (2014) which highlights the ongoing strong growth occurring in Ballarat and specifies Ballarat as having a role as a regional centre;
- *Regional Network Development Plan* (2016) which includes improvements to Ballarat's local bus services as well as stops and interchanges in Ballarat;
- *The Ballarat Strategy 2040: Today, Tomorrow, Together – Section 4: Connected Ballarat* (2014) which identifies opportunities for improving Ballarat's transit network as it grows into the future; and
- *Victoria's Draft 30-Year Infrastructure Strategy* (2016) which recommends improvements to Ballarat's Local Bus Network over the next 7 years with similar methodology to the recently improved Bendigo network.

Plan Melbourne is the Metropolitan Planning Strategy which highlights the significance of Ballarat as a growing regional centre. It summarises the population and economic growth expected to occur in Ballarat as a result of its regional role. In addition to this, Outcome 7 specifies improvements to Ballarat's local transit system as part of the Regional Network Development Plan in order to "make it easier to live and do business in regional areas". In achieving this particular direction, the overall outcomes in optimising the current growth occurring in Ballarat and the wider region can be realised.

The Central Highlands Regional Growth Plan covers the municipal areas of Ararat, Ballarat, Hepburn, Moorabool and part of Golden Plains. It addresses a range of land uses including agriculture, tourism, environmental assets, commercial and residential. Checks and balances that need to be applied are recommended as well as infrastructure and services when considering future growth. It states as an objective that "We will maximize the growth potential of Victoria by developing a state of cities which delivers choice, opportunity and global competitiveness". Furthermore, it highlights Ballarat as the region's largest city and the dominant centre for employment.

Future directions outlined by the Plan include:

- Encourage local employment opportunities;
- Improve the capacity and functioning (including safety, reliability and resilience) of the region's transport networks;

¹ Goh, K & Currie, G et al; *Road Safety Benefits from Bus Priority* (2013)

- Provide social infrastructure that is well located and accessible in relation to residential development, public transport services, employment and educational opportunities; and
- Prioritise infrastructure investment that facilitates economic growth and urban development.

Victoria's Regional Network Development Plan holds improving the local bus services and facilities in regional towns and cities to be a strategic priority. The Plan aims to:

- Develop tailored public transport priorities and actions for each region that respond to changing local travel needs and support local infrastructure and services plans;
- Make better use of existing assets and infrastructure;
- Support the growing regional tourism industry; and
- Give communities across Victoria a say in planning for future public transport services in their region.

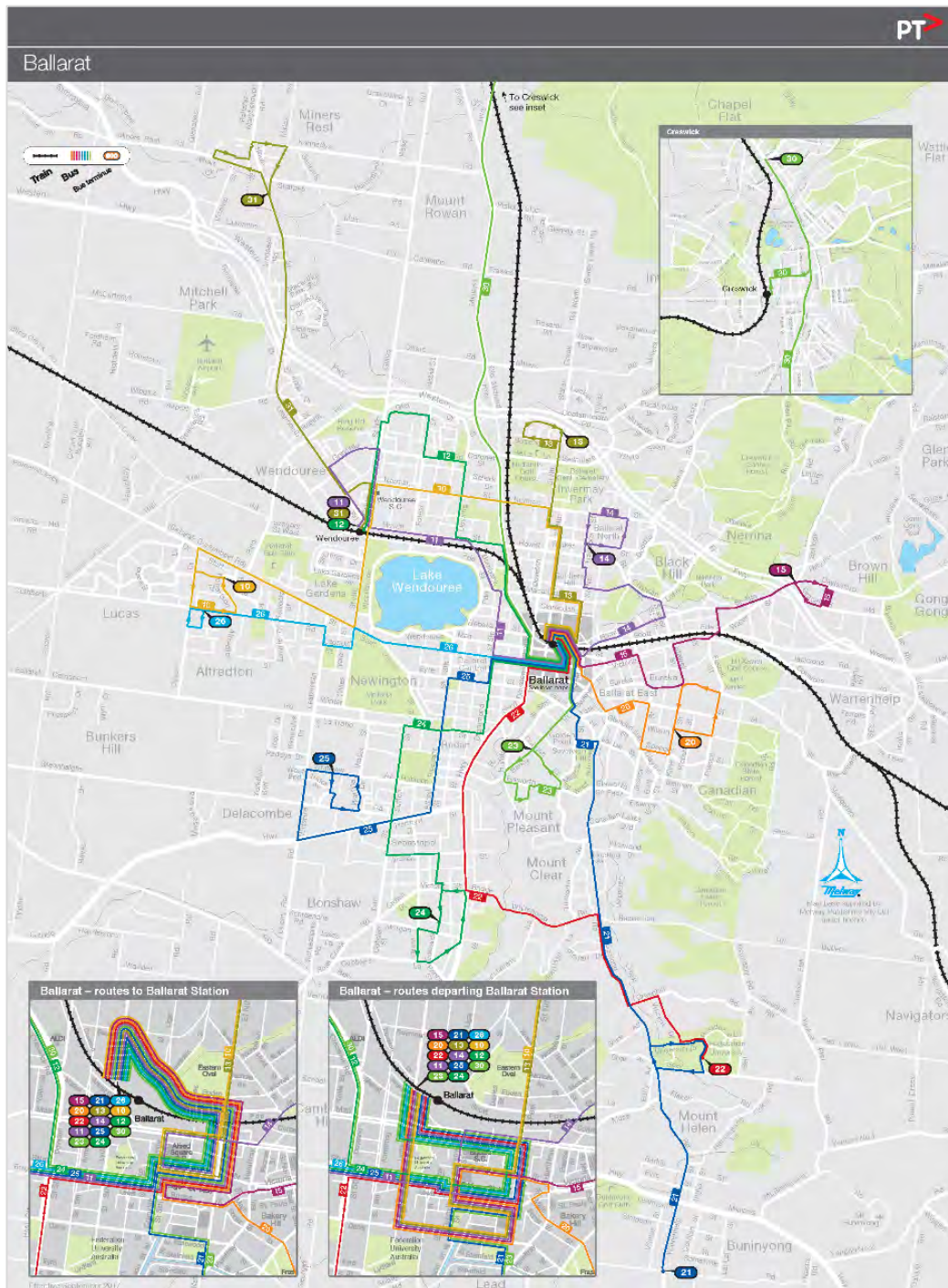
As part of this, specific reference is made to delivering improvements to the Ballarat bus network, following a review as well of bus stops and infrastructure over the next five years.

Victoria's Draft 30-Year Infrastructure Strategy also identifies Ballarat as a significant regional activity centre with considerable growth going into the future. Specifically, Direction 12.2.7 of the strategy identifies Ballarat as an important regional city requiring substantial improvement to its bus network which would likely involve the provision of additional buses, services and routes.

2.5 Existing Bus Network

Ballarat's bus network, consisting of 15 routes, is highly CBD centric as shown in Figure 2-4 below. A number of outlying areas and growing suburbs (such as Delacombe, Lucas, Invermay and Warrenheip) are beyond the existing network catchment.

Figure 2-4: Route Map of Ballarat's bus network



Source: DoT Local Area Maps

The dispersed travel patterns highlighted previously in this report are not met by the current network design. Specifically, to travel across town, between two suburbs such as Miners Rest and Delacombe a bus passenger needs to travel into the Ballarat CBD and out again. For example, there is no direct route that links South Ballarat (including Sebastopol) and Delacombe with Alfredton and Wendouree. This is particularly detrimental given the existing journey to work patterns and highlights a reduced level of utility provided to the Ballarat community by the bus service.

2.6 Existing Service Levels

The time between buses (headway) of routes during the weekday is moderate at best, even in peak times. The headway of each route is shown in Table 2-3 below.

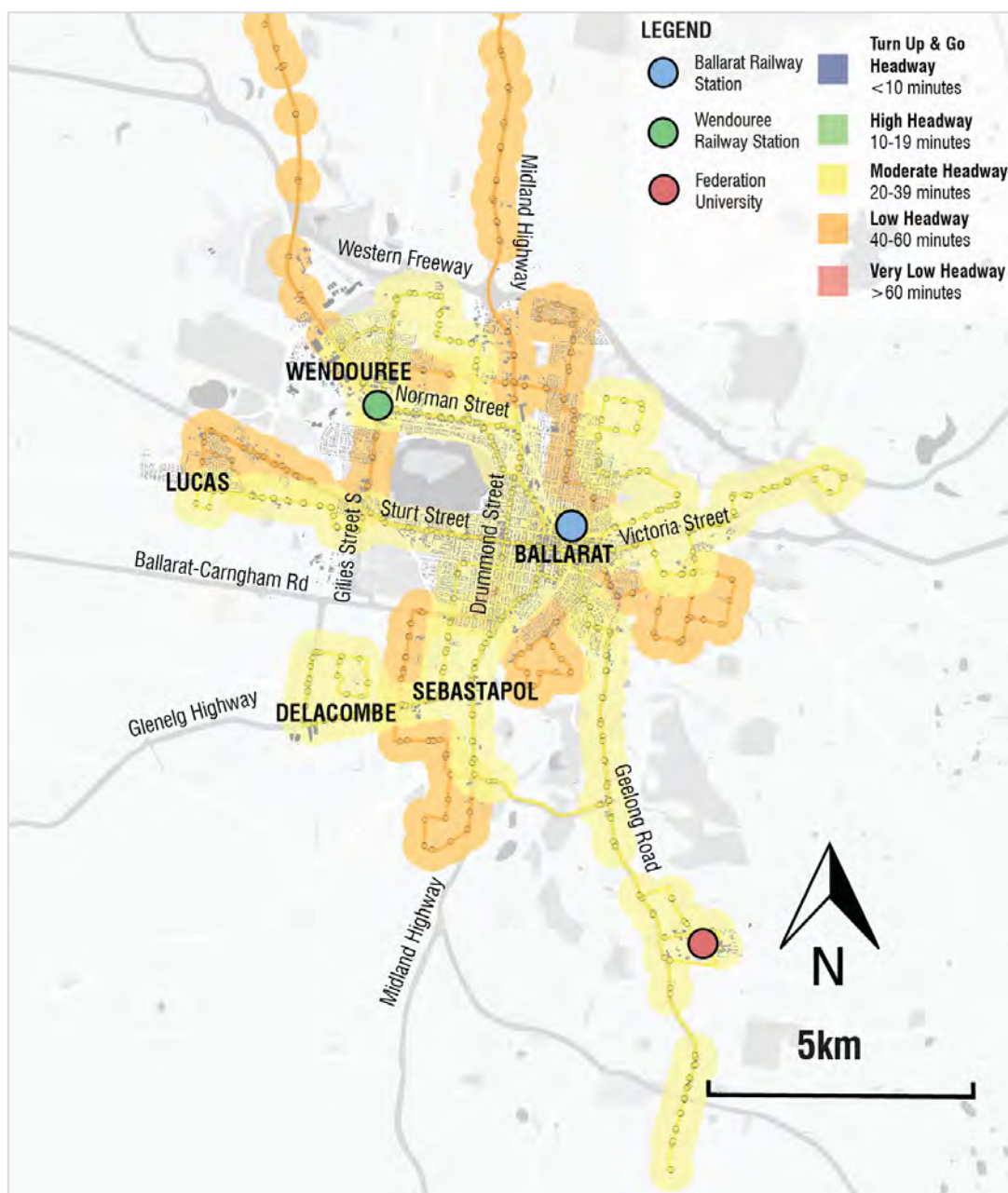
Table 2-3: Ballarat Routes

Route	Start	End	Headway (minutes)
10	Ballarat Station	Alfredton via Wendouree	60
11	Ballarat Station	Wendouree Station via Howitt Street	30
12	Ballarat Station	Wendouree Station via Forest St	30
13	Ballarat Station	Invermay Park	60
14	Ballarat Station	Black Hill	30
15	Ballarat Station	Brown Hill	30
20	Ballarat Station	Canadian	60
21	Ballarat Station	Buninyong via Federation University	30
22	Ballarat Station	Federation University via Sebastopol	30
23	Ballarat Station	Mount Pleasant	60
24	Ballarat Station	Sebastopol	60
25	Ballarat Station	Delacombe	30
26	Ballarat Station	Alfredton	30
30	Ballarat Station	Creswick	60
31	Wendouree Station	Miners Rest	60

Source: DoT Timetables

In some corridors multiple bus routes can combine and be off-set to reduce the headway between buses. These increased service frequencies are illustrated in Figure 2-5 below. Moderate headways are indicated in the yellow and signifies areas which are better serviced by public transport compared to other parts of Ballarat. These include key locations such as Ballarat's main activity area along Sturt Street, Ballarat Station, residential areas and down south to Buninyong.

Figure 2-5: Route Frequencies Map



Source: DoT Timetables with M&PC Analysis

2.7 Travel Times

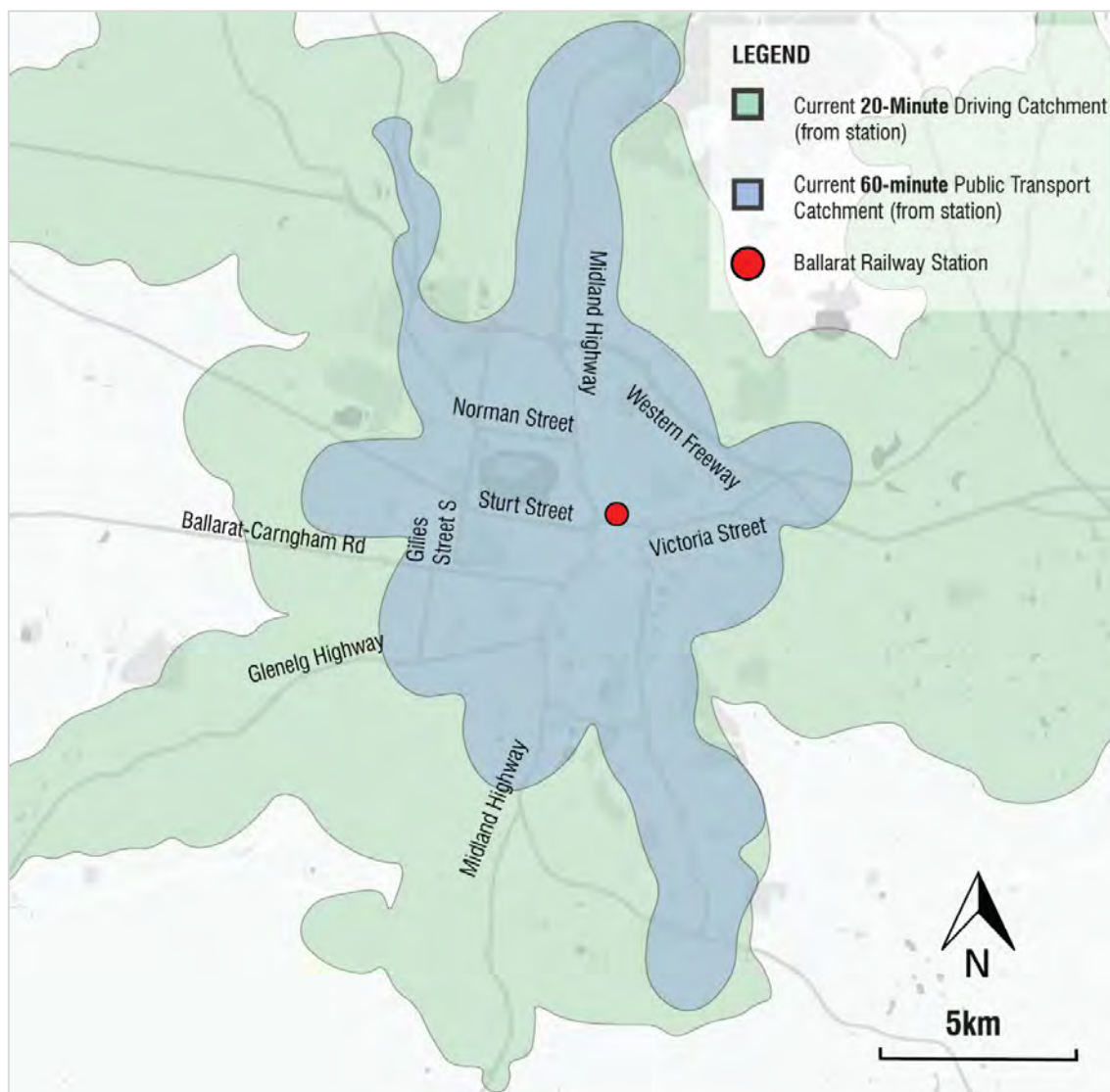
Buses in Ballarat are slower than they need to be, because the timetables have been written with the worst road traffic conditions in mind, so that the buses will very rarely be running late. This means that buses need to pause regularly (often for minutes at a time) at specific “time-points” to ensure that they do not leave the time-point early. These delays, built into the timetable, can be as much as 10 minutes between the start and finish of each route. If the timetables are based on the most likely traffic conditions, then travel times would improve by up to 30%.

Buses operating in a similar urban context, with similar congestion levels usually tend to have an average speed across the route of between 30-45 km/h (with highest speeds on those routes that use arterial roads and highways with higher speed limits). The bus network in Ballarat operates well below this, with average speeds lower than bus routes in metropolitan Melbourne. The resulting journey times were noted to be more than 26% longer in comparison. Trimming this contingency would not only make travel from one end of the route to the other quicker, but also provide opportunities for this saved time to be used on operating additional services.

The substantial contingency which is built into the timetable, is noted by the bus drivers with some services leaving CBD bus stops around 5 minutes later than scheduled (and arriving on-time at their destination). Regular passengers have developed an understanding of this, and it was frequently observed that regular passengers would arrive at the Myer bus stops around 6-7 minutes late for their timetabled service, which is a minute or two before the service actually arrives.

Generally, the poor performance of bus services contributes to a situation in which the bus is uncompetitive compared with the journey times made by private vehicle. Figure 2-6 shows how 60 minutes of travel by public transport will not take a passenger as far as they would expect to go in 20 minutes by car.

Figure 2-6: Comparative travel times



Source: Google Maps Travel Time API, 2019

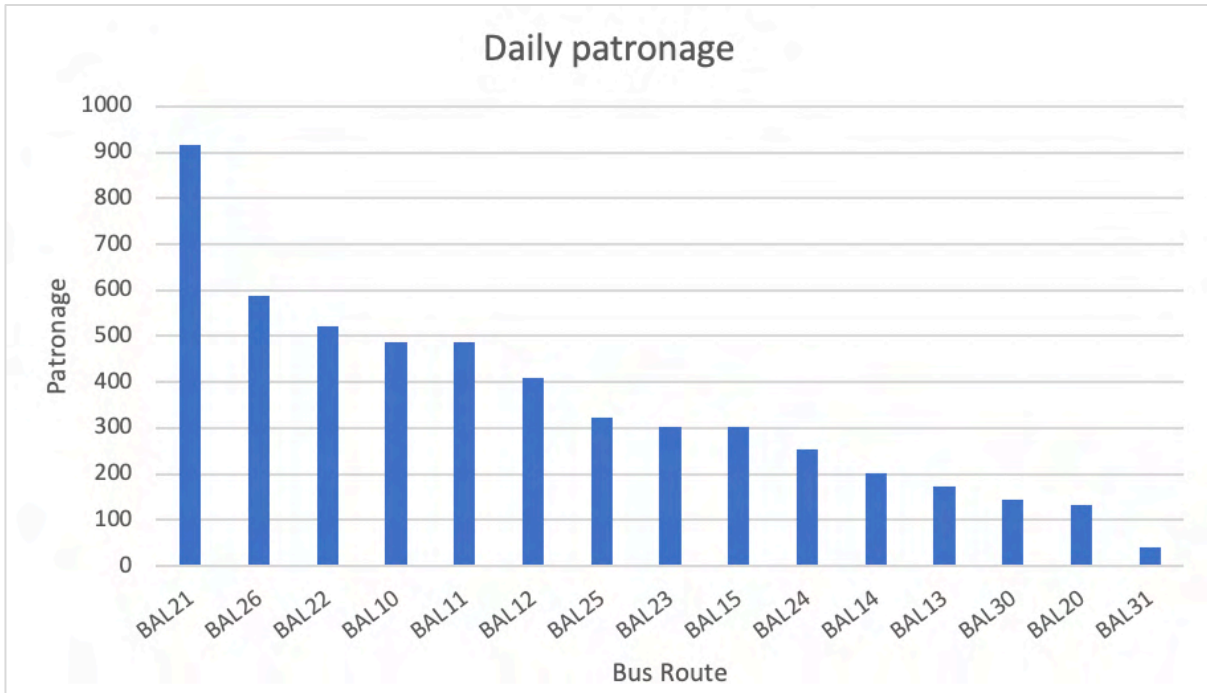
2.8 Patronage

Broadly, patronage levels across all Ballarat bus routes have increased from an average of 98 passengers per route per day in 2015 to 123 passengers per day in 2018.

Changes to similar networks in Victoria such as the SmartBus network, Doncaster Area Rapid Transit, and university shuttle connections have shown that network connectivity and travel times can have a significant impact on patronage. It is estimated that improvements to the network and travel times could achieve a 20% increase in patronage within 6 months (as occurred in Bendigo following the 2005 bus network review). This would require routes to be more direct, more frequent and faster. Further improvements to ensure the public transport network becomes a viable alternative to driving, over the medium and long-term would see patronage increase even more. For example, service improvements, branding and marketing has led to patronage increases of 80-110% on many SmartBus Routes over the first 24 months of operation.

The average daily patronage across all bus routes in Ballarat is shown in Figure 2-7 below. Route 21 has the highest daily patronage with 917 passenger trips. This route serves key destinations such as Buninyong, Federation University and Sovereign Hill. Similarly Route 22, which also serves Federation University via Sebastopol, also has a high level of patronage. Route 26 has the second patronage levels with over 500 passengers each weekday. Routes 10, 11 & 12 follow with roughly 450 daily passengers. These routes serve a dense activity area stretching from Wendouree, through Lake Gardens to Newington.

Figure 2-7: Route Patronage

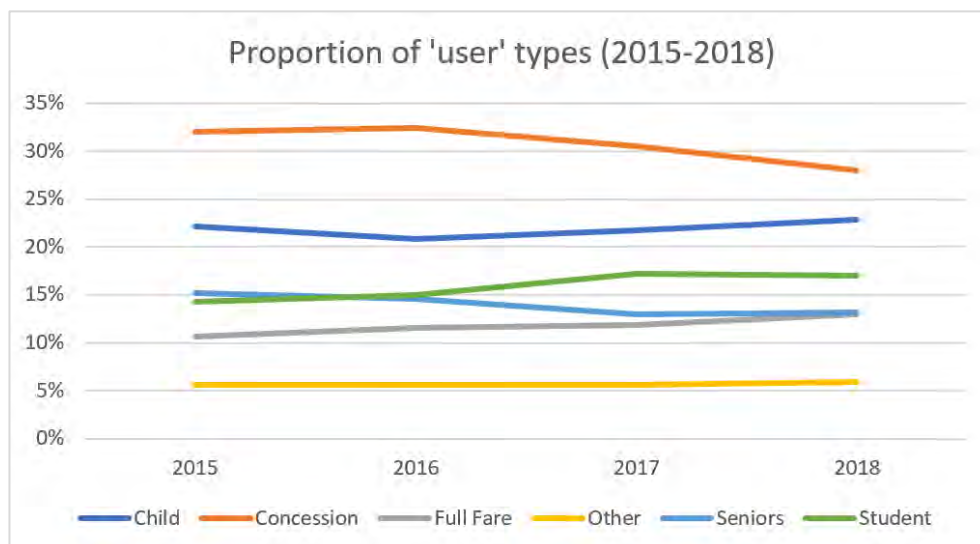


Source: DoT data with M&PC Analysis

The composition of bus users on routes servicing Ballarat are shown in Figure 2-8. While some user types have stayed relatively unchanged (children and other users), it can be seen the proportion of students and

full fare users using buses have increased. Inversely, the proportion of concession passengers has decreased.

Figure 2-8: Proportion of 'user' types



Source: DoT data with M&PC Analysis

3. BALLARAT'S URBAN TRANSIT NEEDS

Ballarat is a thriving regional municipality that has been earmarked by the State Government as a major centre of future growth. This intensification is typified by Ballarat's developing food scene with new restaurants and bars, the West Employment Zone supporting advanced manufacturing, tourism injecting over \$0.5B into the local economy and the expansion of the Ballarat sports precinct. The residential population is forecast to increase by more than 31% to 144,000 by 2036 in a municipality characterised by an urban core, outlying townships and well-established corridors of activity.

The City of Ballarat needs to plan for this growth while maintaining a distinct community identity that is true to its cultural heritage. The Ballarat Strategy – Today, Tomorrow, Together, outlines a plan for managing the growth, making specific reference to how public transport (urban transit) is critical to achieving a liveable Ballarat that meets the community's needs and provides real transport choices.

A key concept underlying the Strategy is the '10-minute city' which illustrates how families can achieve the majority of their daily needs within 10 minutes travel from their home. The Ballarat City Strategy states:

The '10 Minute City' concept in Ballarat reflects community aspirations to maintain existing levels of access to destinations and services even when the city grows over time. It supports the ability for all residents of Ballarat to be able to do more of their day to day shopping, accessing of services and business in local neighbourhood centres.

This '10 Minute City' is achieved through five objectives:

- *Compact city form* – provide Convenience Living Corridors within 200 meters of future frequent public transport corridors. Encourage infill development within 400 meters of public transport services;
- *Complete local neighbourhoods* – a focus on safe and convenient access to services with an urban form built for human scale travel (walking and cycling);
- *Land uses and precincts supporting jobs, productivity and efficiency* – renewal of key urban areas which provide social and economic benefit. Prioritisation of residential land use along public transport services;
- *High quality local connections* – provide alternative transport options to facilitate convenient movement of the community; and
- *Supporting the economic transition to the jobs of tomorrow* – accessibility to the jobs of tomorrow including the knowledge sector, advanced manufacturing and health services.

Interwoven into the Strategy is the importance placed on transport, particularly the urban transit needs of Ballarat.

3.1 Principles

Focusing on Ballarat's urban transit needs, several principals were defined to meet the objectives of the '10 Minute City'. These are outlined below.

Transport Choice

The mode share in Ballarat is heavily skewed towards private vehicle use. As the population grows, this will lead to issues such as congestion and a lack of car parking availability. Alternative modes will enable a large, diverse community to meet their daily mobility needs with a reduced reliance on the motor car. Accordingly, urban transit services need to be:

- Accessible;

- Affordable;
- Easy to use.

High Functioning Transit

Transit services need to be competitive with private modes of travel. Only then will it be a viable alternative, capable of shifting travel behaviour. Public transport services in Ballarat will need:

- Improved travel times (compared to alternatives);
- Improved frequency.

Responsive Built Form & Planning

Transport and land use are inextricably linked. Land use intensity and residential densification will result in greater levels of accessibility to public transport. The City of Ballarat will need to focus planning around:

- Convenience Living Corridors close to high-frequency transit services with mixed, high activity land use development;
- Infill development, densifying the urban core.

Thriving Local Economy

Prioritising urban transit provides dividends to the local economy. The literature indicates 72 percent of savings from not using a private vehicle directly benefit the local economy. Other benefits include:

- Local bus manufacturing and operating opportunities – including the innovative hydrogen powered bus fleet;
- Activity corridors enable high levels of business vitality.

3.2 Future Vision

Urban transit is an integral part of Ballarat's DNA, having first used horse-drawn tramways in 1887. During its peak Ballarat boasted the largest tramway network operating outside of any capital city in Australia. In 1971 this was replaced with buses as the sprawl of residential areas continued outwards from Ballarat. Looking to the future, Ballarat could leverage its history to help shape its urban transit future.

The Ballarat Strategy states:

There needs to be new and easier ways to travel between key tourist sites, for those visitors without their own car. Over the short-medium term Council will work with the tourism industry to develop new, convenient and logical ways to move between key tourist sites and the CBD.

The future could focus on providing a complimentary bus and tram transit network. The tram network could primarily focus on connecting key attractions through the heart of Ballarat. Visitors and locals could experience the rich history of Ballarat travelling in heritage vehicles, currently housed in the Tramway Museum and only operated on the short length of track remaining on Wendouree Parade. The business case could be built around the distinctive experience offered to tourists, potentially increasing visitor numbers and overnight stays. In contrast, the bus network would provide vital connections between residential, industrial and employment areas across Ballarat. Concentrated, high frequency bus services could operate along Convenience Living Corridors servicing the mobility needs of the community.

4. IMPROVEMENT OPTIONS

Developing a transit network which provides a viable alternative to private car travel in Ballarat requires careful long-term planning. The following section of the report outlines some options, that are conceptual. They are not planned in detail and are suggested as conceptual ideas to stimulate robust discussion amongst the community. The ideas have been categorised into stages to explore how improvements could be achieved over the next 20 years.

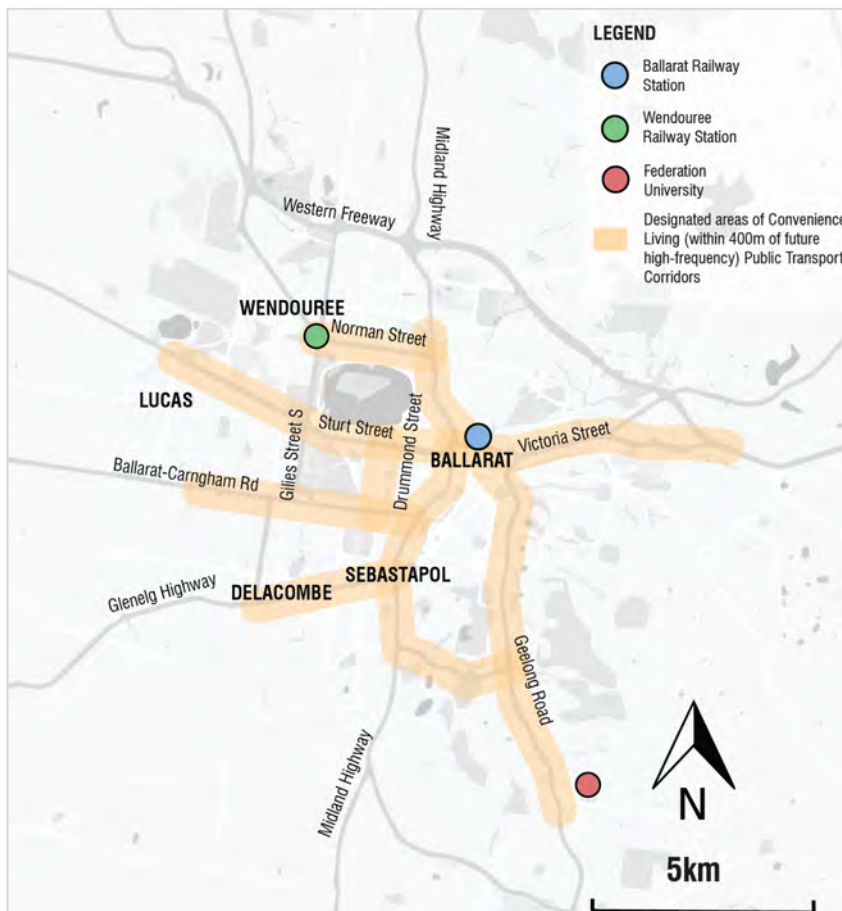
4.1 Stage 1 - Short term (by 2022)

In the following section, short term improvement options are specified. These represent quick wins to improve the transit services operating throughout Ballarat.

4.1.1 Plan for Highest Quality Services in Convenience Living Corridors

The Convenience Living Corridors, as outlined in *The Ballarat Strategy: Today, Tomorrow, Together*, can help the community prosper through additional population, jobs and services all within convenient access of new dwellings. The reasoning behind this approach to managing urban form is well-founded. The form of these convenience living corridors has been proven to increase land values more rapidly than in areas of sub-urban sprawl. This is because as more services are located in the corridor it becomes a nicer and more convenient place to live. To support this urban form the transit system needs to intensify along the Convenience Living Corridors as shown in Figure 4-1 below.

Figure 4-1: Convenience Living Corridors



Source: City of Ballarat with M&PC Analysis

Much like the Principal Public Transport Network (in metropolitan Melbourne), the emphasis for these corridors should be on the provision of high-quality public transport services, supporting the transport needs of an increasing population. This transformation of urban transit (bus) service levels along the Convenience Living Corridors could occur through a series of phases:

1. Align specific bus routes to the corridors (such as Route 21 to Buninyong on the Main Road-Geelong Road corridor)
2. Join cross-town routes so that they provide seamless service from one side of Ballarat to the other in specific corridors
3. Speed up running times and provide a service every 10 minutes from 6am-9pm
4. Support the service through various actions (bus priority at signals, eliminating time points, improved branding)
5. Improve bus stops along the corridor with higher amenity at every stop and off-board payment at busy stops

Not all corridors can be improved at the same time. Council should seek community feedback regarding which corridor should be the priority for improving bus services over the next five years. This clarity from the community would enable Council to make a specific budget pitch to the State well in advance of the next State election.

In addition, Council should seek to incorporate the Convenience Living Corridors into the Principal Public Transport Network (PPTN) recognised by the State government. Council should seek to incorporate the Ballarat PPTN into the Ballarat Planning Scheme in the same way that the metropolitan PPTN is incorporated into Planning Schemes.

4.1.2 Service Improvements With Existing Resources

Whilst no route runs more often than every 30 minutes, some routes travel along the same segments of the road network. Along these shared corridors, multiple routes serve the same transport catchments. This means that – if the timetables are complimentary – a more frequent bus service can be offered along these corridors. The current schedule does not co-ordinate routes to take this opportunity. Instead, all routes have almost exactly the same departure and arrival times at each major stop. This is most evident just after 10:00 AM each weekday, as a procession of seven buses operates in convoy from Curtis Street to Ballarat Station. They arrive to join three others; afterwards, ten buses can then be found laying-over around the Station (in Ararat Street and Lydiard Street North).

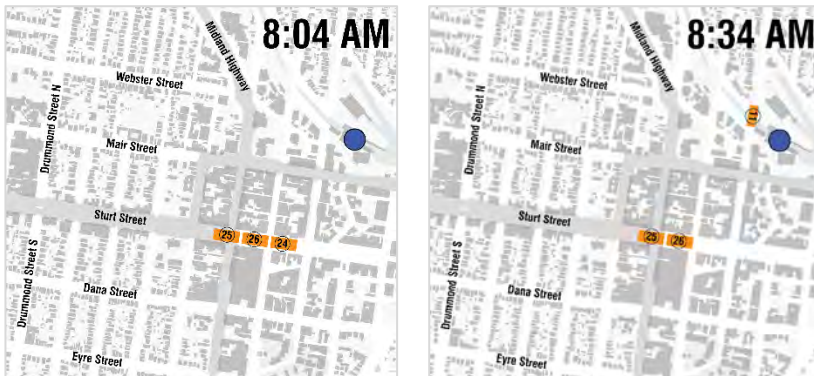
This timing of services undermines the local network by missing the opportunity to provide higher frequency services in key corridors (and reduce bus congestion associated with multiple services operating at the same time).

As an example, the seven buses operating from Ballarat Base Hospital to Ballarat Station combine to provide inconsistent wait times of seven minutes for one bus, then 23 minutes for the next. This happens for every hour of every day. If instead the services were evenly spaced, it could provide a service in the corridor every 9-10 minutes, making the timetable easier to understand and reducing wait times. Similarly, for people travelling from Mt Clear to Federation University, there are four services an hour to choose from. However, at present, there is a potential wait of up to 25 minutes for a bus, rather than a maximum of 15 minutes if services were evenly distributed across each hour.

This is illustrated in Figure 4-2 overleaf, highlighting that over the period of an hour, Routes 25, 26 and 24 are scheduled to tailgate one another to serve precisely the same catchment on Sturt Street at 8:04am. Then, 24 minutes later, Route 11 arrives, with 25, 26 arriving together 6 minutes after to serve the same catchment again. This means commuters have a choice to board one of three buses arriving at 8:04am, but

if they arrive at 8:05am, they will need to wait another 24 minutes for the next service bound for the station.

Figure 4-2: Comparative Timetabling Diagrams on Sturt St (eastbound)

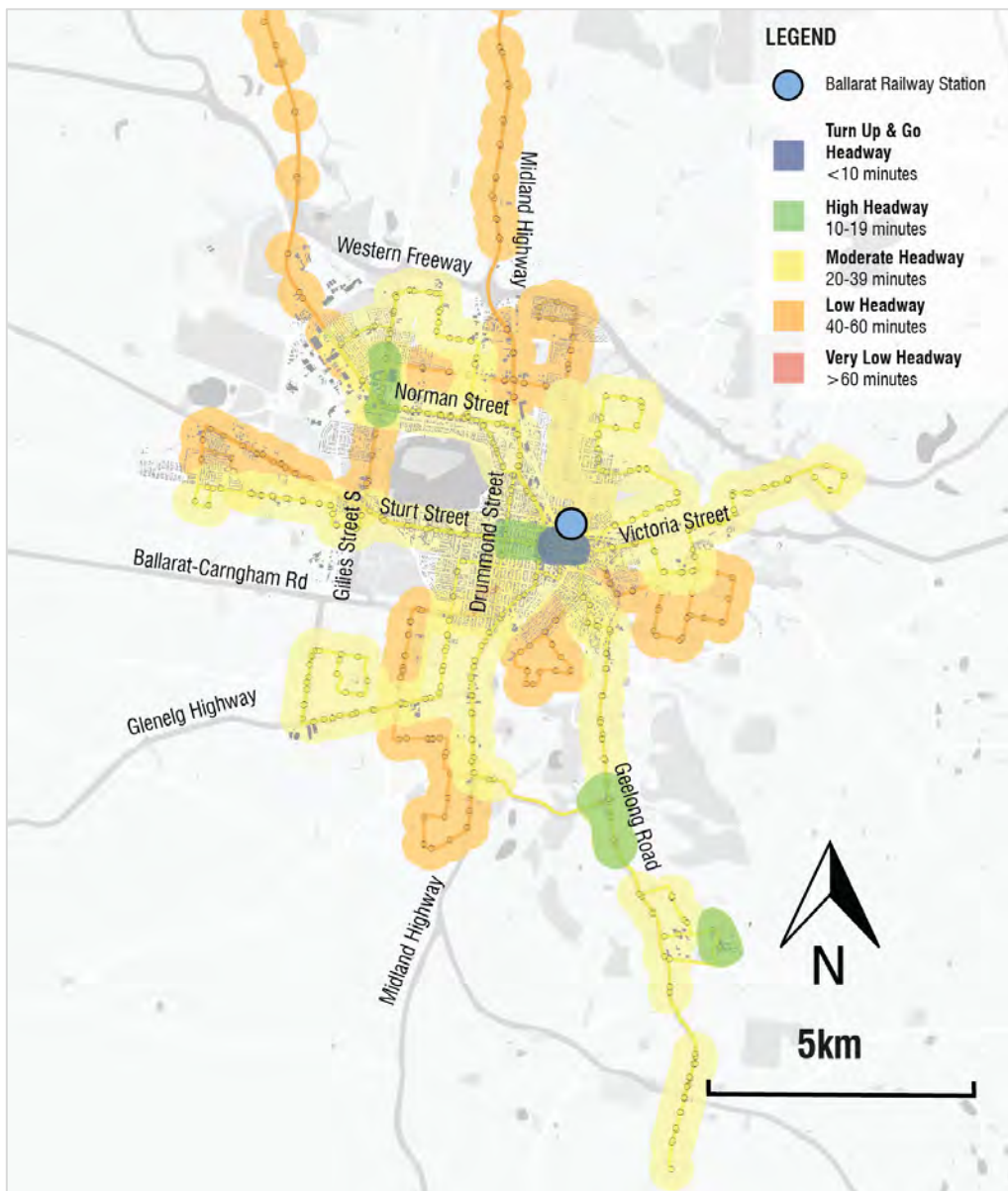


The current timetable makes transferring between bus services difficult and frustrating. This is despite the network design being so focussed on the CBD and train station that passengers are forced to transfer between services just to get from one side of the CBD to the other. The current network design has clearly been focussed on getting people to the station (and Melbourne) rather than meeting the needs of most Ballarat residents, by supporting urban travel within Ballarat.

The Ballarat community needs to decide if they want a bus service focussed on Ballarat trips or trips to Melbourne. Noting that only 5% of train passengers reach the station by bus, it seems that the bus network should focus on Ballarat based trips rather than having every service try to coordinate with trains.

We recommend that Ballarat bus services be offset from one another providing an even spacing of buses in any corridor with more than four services per hour. This would mean one bus every 10 minutes in the key section of Sturt Street – from the Ballarat Base Hospital to Bridge Mall (not 6 buses just once every hour). This will immediately increase the service level by 300% and significantly improve the attractiveness of bus connections in Sturt Street. Applying this principle to the Ballarat bus network will improve service frequency at no cost as shown in Figure 4-3 below.

Figure 4-3: Frequency improvement from more even headways



Source: PTV data with M&PC Analysis

A key priority for improving the network is for the community to highlight the cross-town routes that make the most sense. This is discussed below.

4.1.3 Connecting Ballarat’s Suburbs – Moving Beyond a CBD-direct/centred network

The Ballarat bus network is predominantly based on running services from the surrounding suburbs which then terminate in the CBD. Whilst there are some benefits to this approach (the CBD is clearly a strong trip attractor/generator, and the railway station is a good location for interchanges to take place), the fact that 62% of journeys to work are to suburbs elsewhere, emphasises that the network is not designed to meet Ballarat’s evolving travel patterns.

As seen in Figure 2-1, a cluster of activity stretches from Delacombe, Alfredton, Miners Rest to Lake Wendouree. At present, Route 10 is the only bus service connecting these non-CBD areas. The utility of

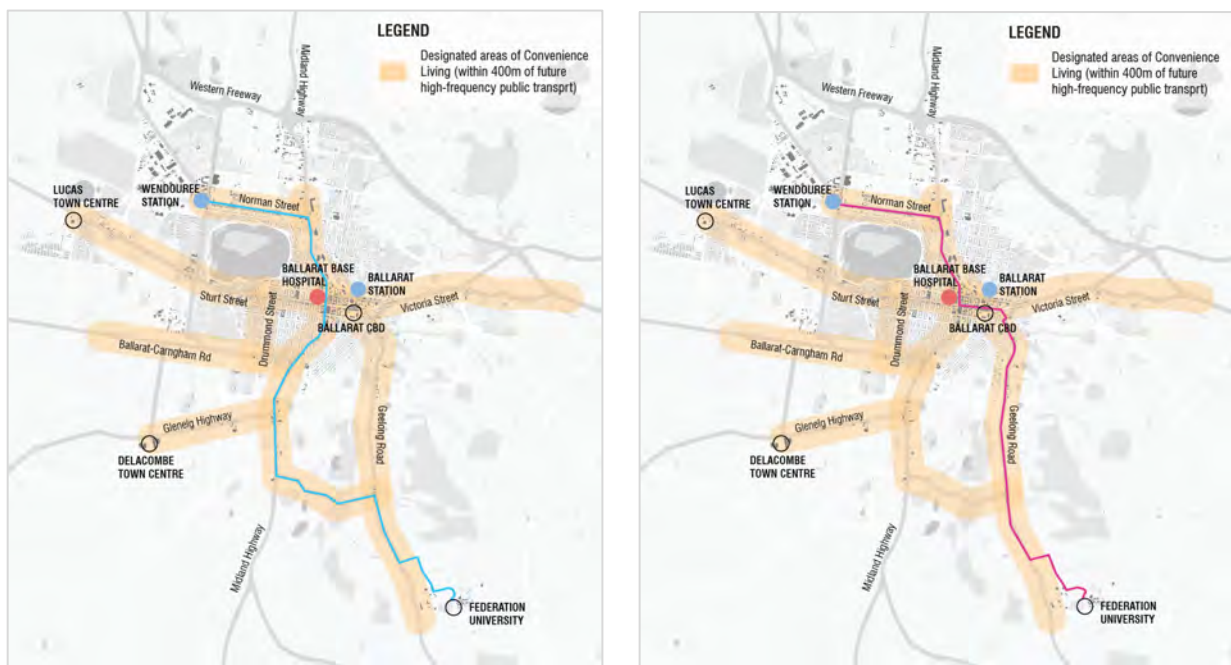
such a service to the community is noted to be high, indicated by the average daily patronage figure of 487 passengers. The most patronaged service, Route 21, caters for 917 daily passengers and provides access to another non-CBD employment and education corridor in Mount Clear and Buninyong.

Providing through access between Ballarat’s surrounding suburbs, without needing to interchange at Ballarat Station, is the key justification for the service route pairings suggested below. In exploring service pairings, the following aspects were considered:

- Higher intensity non-CBD areas such as Wendouree, Buninyong, Lake Gardens and Newington;
- Demand for non-CBD suburb to suburb work trips. Those particularly noted to be high were movements from Ballarat South to Wendouree, Alfredton to Wendouree and Ballarat North to Wendouree. Through running connecting these suburb pairings would enable customers to avoid the need to interchange.

Some conceptual ideas for how the cross-town routes could evolve and serve the Convenience Living Corridors are shown in Figure 4-4 below.

Figure 4-4: Potential Cross-Town Routes



**Cross-town Route Idea 1:
Wendouree-Sebastopol-Federation University**

**Cross-town Route Idea 2:
Wendouree-Main Road-Federation University**

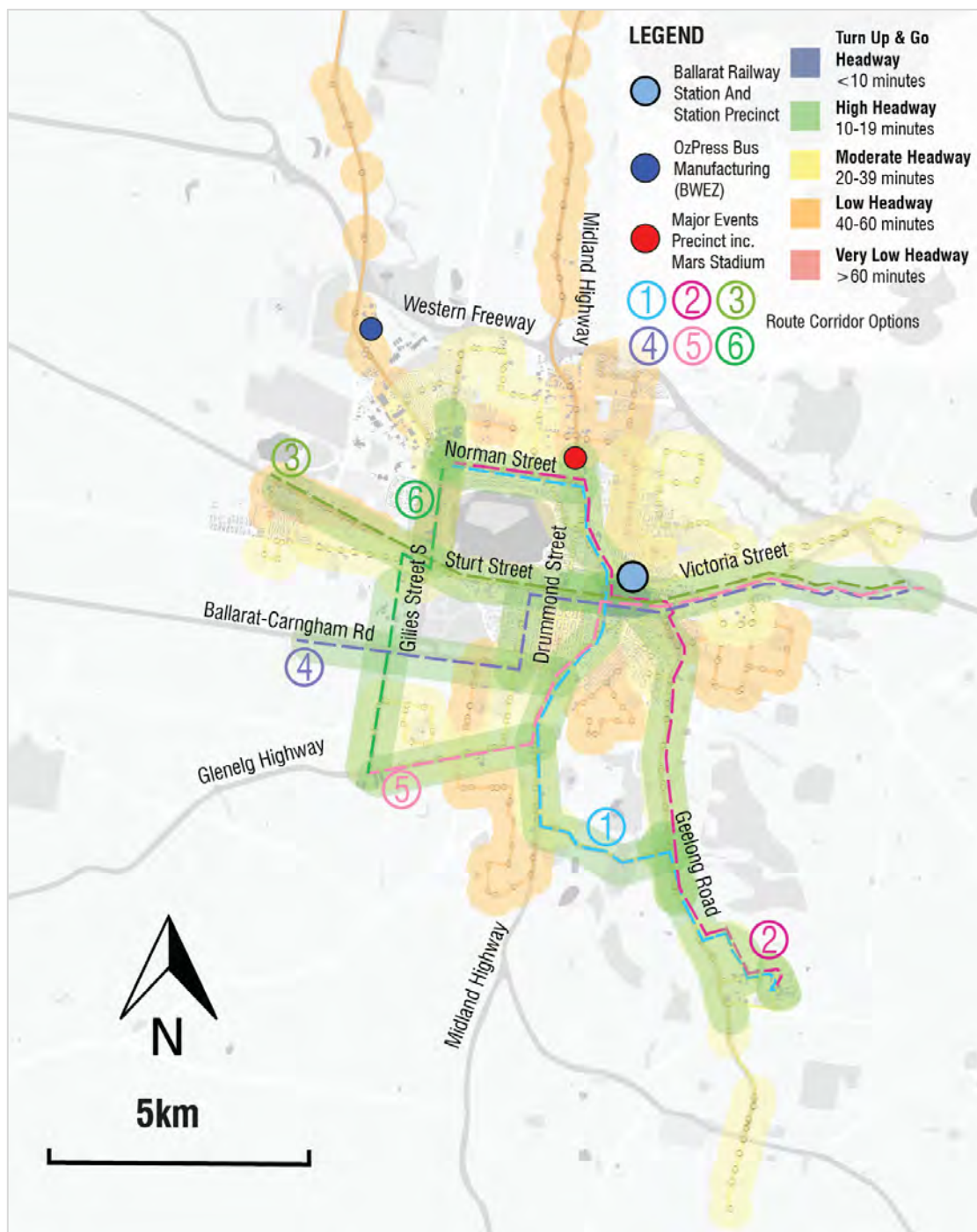
There are many options for key cross-town corridors. This background report does not analyse the potential of each or recommend a specific set of routes. Rather it recommends that the approach is important, and the community should decide which corridors make the most sense in terms of the trip patterns they could serve.

Community advocacy for public transport prioritisation along these corridors are vital for a successful outcome to be achieved. These will have immediate benefits for public transport users, road users and the general community of Ballarat.

The corridors shown above would not be the entire route (i.e. either option would be able to continue to Buninyong and Miners Rest). The options shown above highlight where the cross-town routes would align with Convenience Living Corridors.

The Ballarat community is well placed to determine which corridors are most likely to meet their transport needs, and the community should be asked to prioritise which corridors should be the focus of Council efforts. A suite of six cross-town route options for the community to consider is shown in Figure 4-5 below.

Figure 4-5: Cross-town route ideas



Source: PTV data with M&PC Analysis

The map above shows six potential cross-town corridors. Council should seek community feedback on the corridor connections and which corridor should be prioritised for improved transit service levels.

The route option ideas demonstrated are mostly combinations of existing routes, following on from options shown in Figure 4-4 with the CBD at the centre.

Option 6 however, proposes an alternative to existing routes as one that is not CBD-centric, but rather services existing employment and growth area along Gillies Street and Learmonth Street. This corridor would serve travel demands between Delacombe and Wendouree without requiring people to travel via Ballarat Station. Council should consider:

- Including this corridor on the Convenience Living Corridors map and including it in Ballarat's Principal Public Transport Network; and
- Advocating to State government for a direct bus connection from Wendouree to Delacombe, possibly by extending the existing Route 31 from Miners Rest through to Delacombe.

The community should be encouraged to think of other cross-town routes they would like to see evolve. However, for the purpose of the immediate consultation, Council should seek community feedback on which of the six corridors shown in Figure 4-6 should be the priority for Council action and advocacy.

Figure 4-6: Potential cross-town routes along Convenience Living Corridors



4.1.4 Servicing residential growth areas

Ballarat’s expanding population is estimated to reach 160,000 residents by 2040. To address this, in addition to planning for increased levels of residential and employment activity in the Convenience Living Corridors (CLCs), two growth areas are currently under consideration for the medium to long-term:

- The Northern Growth Investigation Area which is north of the Western Freeway at Mount Rowan; and
- The Western Growth Investigation Area which continues from the current growth front to the west of Ballarat CBD.

At present, Ballarat’s major growth front is to the west and is expected to accommodate the majority of the short and medium term greenfield residential expansion of the city. The *Ballarat West Precinct Structure Plan* identifies the proposed extent of development as shown in Figure 4-7 below.

Figure 4-7: Western growth area

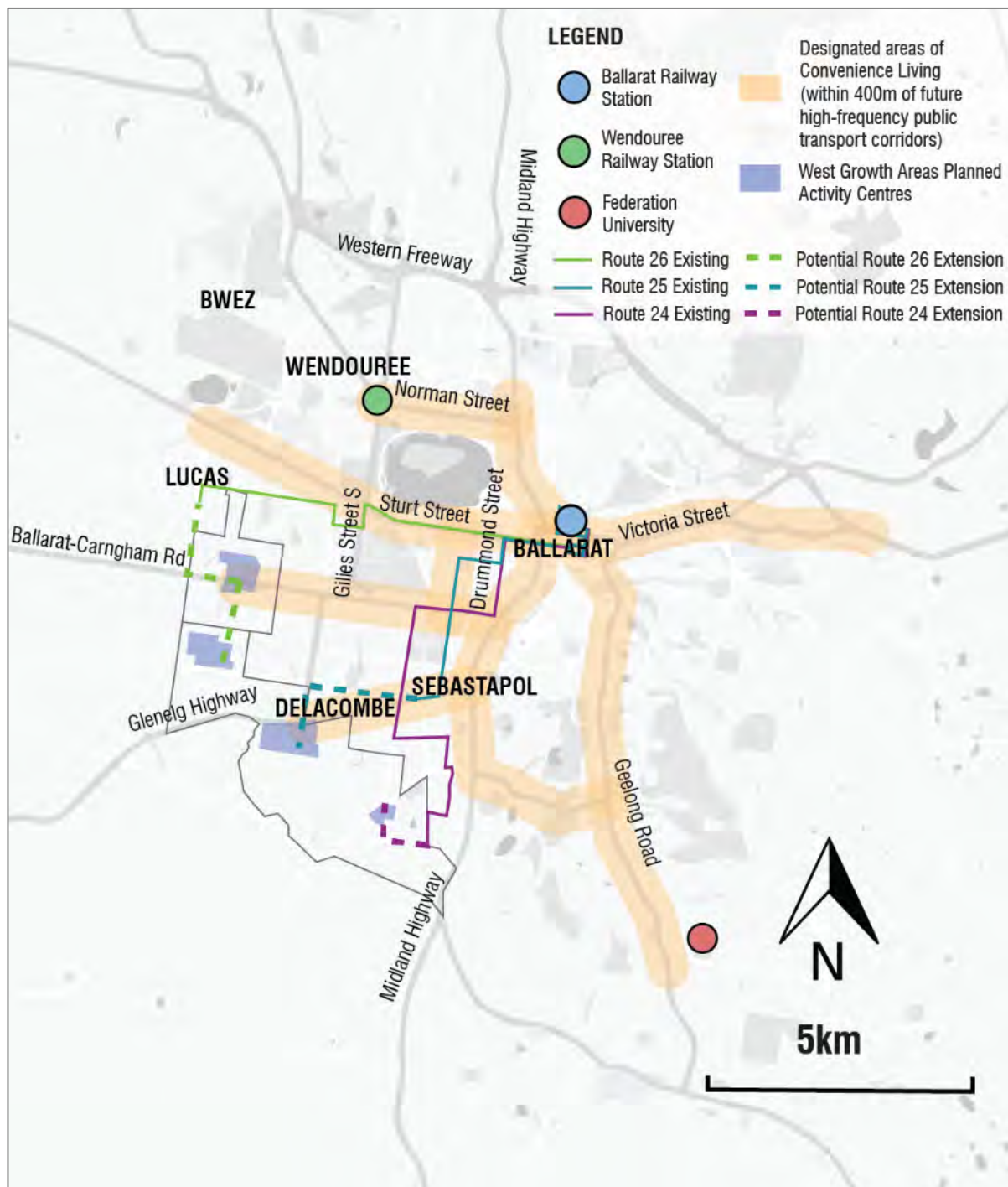


Source: *Ballarat West Precinct Structure Plan*

These areas are currently not served well by the public transport network. Residents living in these peripheries have no choice but to depend on private vehicular travel to access services and opportunities. Council should advocate the DoT for extra services connecting these areas into the urban transit network as well as key locations across Ballarat. Two suggested options for achieving this are roughly described as:

1. Extend existing routes such as 24, 25 and 26 as illustrated in **Error! Reference source not found.** below.

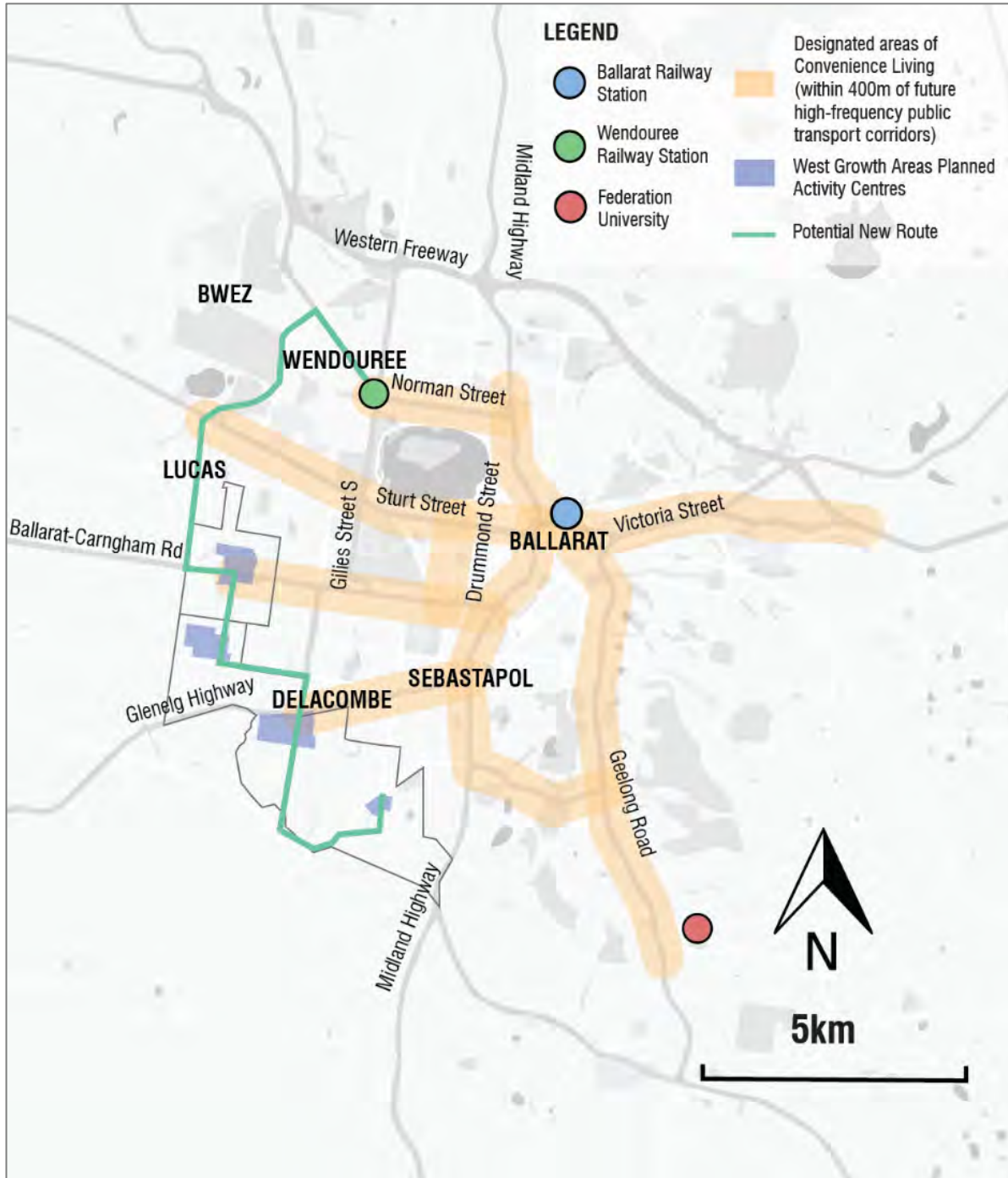
Figure 4-8: Potential New Alignment Comparison: Extensions of Existing routes or New Route



Source: M&PC Analysis

2. Establish a new route connecting the Western Growth areas to key activity centres such as the BWEZ and Wendouree Station as illustrated in Figure 4-9 below, aims to service the existing demand for trips to BWEZ from South Ballarat.

Figure 4-9: Potential New Alignment Comparison: Extensions of Existing routes or New Route



Source: M&PC Analysis

At present, the Western Growth area has sparse access to the public transport network. In designing a new route alignment, the focus was placed on connecting these growth areas to BWEZ and Wendouree Station. Furthermore, the proposed alignment

If poor service levels are provided along this route, patronage will likely be sparse. Land use planning schemes should advocate for higher residential and commercial activity along the growth corridor alignment. If this is achieved, service frequencies between 10-20 minutes will be more feasible.

4.1.5 Making routes simple and direct

Ideally, bus routes should follow a direct path between major destinations and operate in both directions. The alignment of routes should always consider the existing road design and terrain, as well as aim to service areas where there are more people. In addition, efficient spatial coverage of Ballarat should avoid routes coming in close contact of each other.

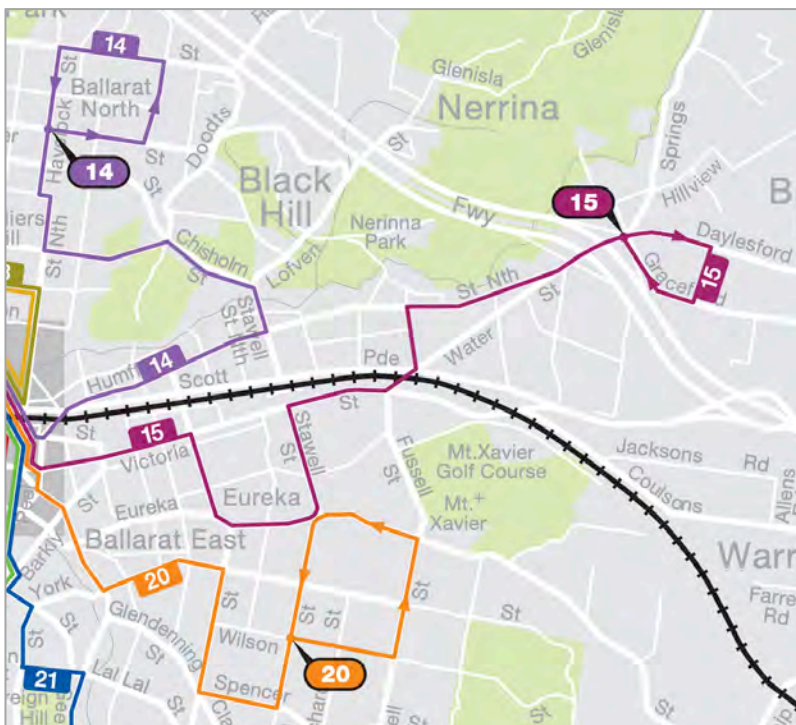
Based on these principles, there is significant scope for the network to be made:

- Quicker – more direct services;
- More efficient – either reduced service KMs or more service KMs for the same cost; and
- Simpler – easier for customers to understand.

As an example shown in Figure 4-10 below, the following changes (subject to a better understanding of existing customer demand) could reasonably be expected to improve the network whilst saving costs:

- The deviation of Route 15 away from Victoria Street is inefficient, as Route 20 provides for the same catchment area;
- Route 20 is inefficient in that it takes passengers around several local streets when a direct connection (as a pedestrian, cyclist or car driver would take) would be much faster. The same issue affects Route 14 in Ballarat North.

Figure 4-10: Inefficiencies in Route 15 and 20



Source: PTV

The two ideas above are just examples, and a full suite of ideas should result from a robust network review. Council should encourage the community to suggest improvements to make the network more efficient on the basis that moving buses through the city more quickly will enable more services to be provided across the whole network.

4.1.6 Improve Service Speed and reduce travel time variability

Based on our observations of each service in the timetable, the current network operates at a relatively low speed. There is significant redundancy built into the current timetables that ensures buses are almost always on time. This focus on operating on-time results in slow travel speeds, because all trips throughout the day operate at the worst possible speed that could still be achieved in the most congested peak-hour traffic conditions.

Journey times by bus in Ballarat, compared to bus services operating in a similar regional setting, are noted to be over 26% longer due to an average network speed similar to congested routes in Melbourne. This appears to have had a number of knock-on effects through the network:

- Drivers habitually depart their origin later than the timetable specifies, knowing that they can easily make up the time along the route;
- Passengers have adjusted to this situation and habitually arriving at some CBD bus stops 5 minutes later than the timetable specifies, knowing that the bus will not arrive/depart until then either; and
- Bus drivers often travel relatively slowly even on roads with higher speed limits, as they are required to wait at intermediate time points in the case they arrive early at these stops.

As a result, journey times are artificially inflated, making bus travel excessively uncompetitive against other modes of travel. The effects observed above can often happen on a single trip and highlights the need to tighten the timetables. In implementing a leaner timetable, there would be a reduction in the journey times, making transit use more attractive and efficient. An investigation of the travel times made by car in peak traffic conditions, along existing bus routes, identified significant potential travel time savings when compared to the allocated time on the bus timetables.

In addition, Council could work with the Department of Transport and Regional Roads Victoria to implement bus priority measures at a range of intersections (mostly signalised). These improvements will help buses move through intersections more quickly and will improve service speeds and punctuality. The key sections of the network where bus priority measures should be considered are those with the most frequent bus movements including:

- Intersections in Wendouree around Norman and Gillies Streets
- Along Sturt Street from Gillies Street to Princes Street
- Along Gillies Street from Wendouree to Alfredton
- Along Geelong Road through Mount Clear

Accounting for expected regular stops and passenger movements travel time savings from all these measures could add up significantly as shown in Figure 4-11 below.

Figure 4-11: Potential travel time savings



4.1.7 Improved Access to Bus Stops

Broadly bus stops across Ballarat have been improved over recent years to be more compliant with the Disability Standards for Accessible Public Transport (DSAPT). All urban transit services and stops must be fully compliant with the Disability Discrimination Act (DDA) by 31 December 2022.

There are a significant number of locations where access between the bus stop and the nearest footpath is not compliant (particularly in terms of slope or hard surfaces). A key challenge in some parts of the urban area is the heritage fabric, topography and depth of gutters.

The City should work with the community to identify the priority locations where bus stop access improvements are required.

Enhancing stop access to create larger stop catchments

For some customers, particularly the mobility impaired or those who have strollers, there can be some difficulties in boarding buses. This not only puts people at a disadvantage from an accessibility perspective but also has implications for slowing the bus and reducing the size of bus stop catchments. Typically, a 5-minute walking catchment is mapped as circles with a 400m radius from the stop.

However, as pedestrians who are elderly or have a disability become inhibited by topography or rough terrain, they are only able to make a portion of the expected 400m trip, limiting the catchment of the stop for some people. The Ballarat Walking Strategy identifies key gaps in active transport connections to bus stations which need to be addressed in order to optimise their catchments.

Council should advocate the DoT for DDA compliant bus stops across the network. Bus stops should be easy to use and provide basic infrastructure such as shelter from Ballarat's harsh weather conditions and seating. Comfortable seating is particularly essential immediately as the average wait time for services across Ballarat is 15-30 minutes. These recommendations are also outlined in the Ballarat Walking Strategy. Furthermore, the DoT should be advocated to by Council to ensure transfer locations are located optimally for passengers in terms of accessibility and comfort, for example at the Myer bus stop.

4.1.8 Building Awareness & Promotion

Council and the community can play a role regarding awareness and promotion of public transport, although the Department of Transport plays the greatest role – through advertising and making the network and services simple to understand.

The 2017 network and timetable changes made the services more difficult to understand and it is difficult to promote the services in their current form because they are so complex. Literally the marketing message is made more complicated by the complexity of the service offering. It is therefore recommended that Council only actively promote the bus network after a significant simplification of the service offering that leads to a clarity of message that can be easily communicated. Promoting a complex network that is difficult to understand risks creating a lasting impression of the network that gets embedded within the community.

Implementing improvements in one of the proposed high frequency corridors would provide a specific service that Council could promote and energise the community behind. Until the service is simplified and improved, Council would risk its own brand and trust with the community if they overly promoted the benefits of the current network.

Once the improvements have been made, Council and community members play an important role in highlighting benefits of the new service. This extends to promoting use of the service for those trips that it is designed to serve. The State government should be encouraged to think clearly about the intended users of each route, and design them accordingly, thus making the promotion of new routes clearer and more targeted.

Potential ways that the City of Ballarat can promote the future network include:

- Inclusion of information at Council service centres including libraries;
- Inclusion of public transport access information on Council websites with specific regard to key attractors (such as leisure centres, libraries and service locations);
- Inclusion of new improvements in Council newsletters;
- Support and coordination of a Commuter Club (a purchasing program that provides discounted travel) for all Businesses in Ballarat; and
- Facilitation of new bus stop locations where necessary and removal of bus bays, to enable buses easy access into the travel lane after stopping at each bus stop.

Council should work with DoT marketing personnel to create effective promotion tools that meet brand guidelines and provide consistent, clear and simple messages to potential travellers.

4.1.9 Precincts – major events/station

A growing Ballarat needs high public transport service provision levels to its major events precinct.

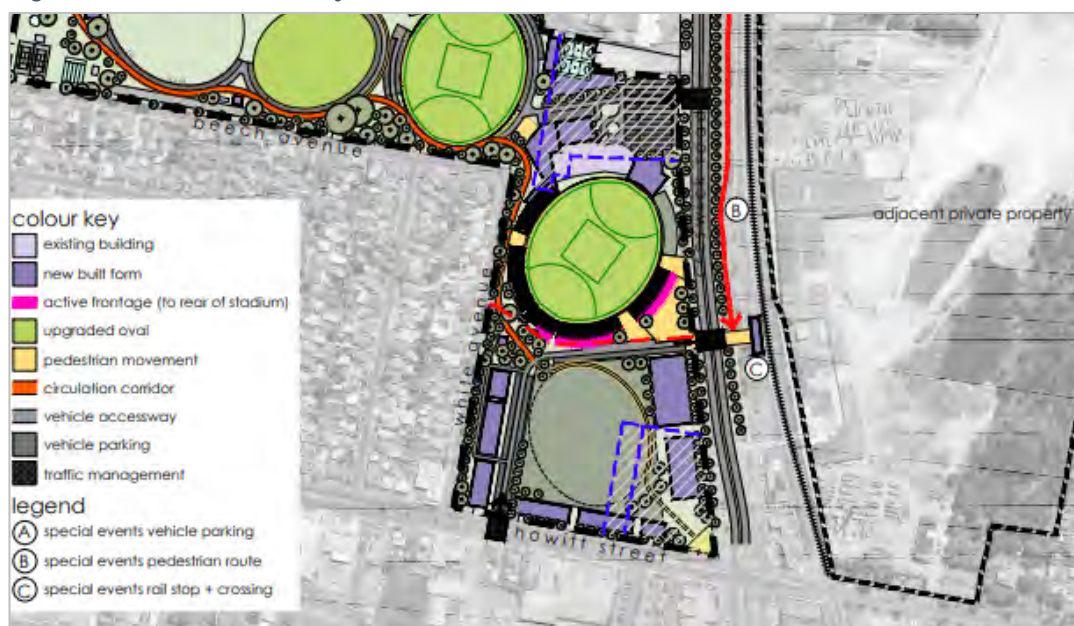
A Major Events Shuttle

Eureka (Mars) Stadium is located in the Ballarat Major Events Precinct and is the principal events stadium for the Ballarat region. It hosts a range of significant events including AFL matches, upcoming A-League matches and has a capacity for 11,000 people after a recent State government funded expansion in 2017. Further expansion of the precinct is envisaged with the Victorian government having already spent over \$30 million on Major Events Precinct projects. The Ballarat Strategy highlights the need for the “development of a new Special Events Rail Station along the eastern boundary adjacent precinct entry.”

Victoria’s Major Event Stadia Strategy supports ‘more venues and events in regional Victoria through infrastructure... to enhance liveability and amenity for regional Victorians’. Further it states that Victoria needs to ‘Improve accessibility to the major venues network by better integrating transport and venues through... investment targeted at transport infrastructure and services’.

The Ballarat Major Events Precinct Master Plan has been developed and identifies the site for a future railway station approximately 250m north of Howitt Street on the Maryborough line as shown in Figure 4-12 below.

Figure 4-12: Ballarat Major Events Precinct Master Plan



Source: Ballarat Major Events Precinct Master Plan

Premium public transport services are essential to ensuring that Eureka Stadium can play the role envisaged for it by the Victorian Government and its Major Event Stadia Strategy. There is simply no viable option to store thousands of additional cars in the precinct on the days that large events are held. Any additional car parking impacts the ability to increase economic activity within the precinct, and provision of the car parking may create significant congestion in the area on event days.

While urban transit is the only mode able to cater for the increased demands of large event days, currently Route 13 and 10 are the only bus services connecting the CBD to the sports precinct. Due to the CBD-centric network, other suburban areas do not have a direct connecting bus service to this precinct. While the planning for a railway station at the Major Events Precinct gets underway, in the interim major events will

need to be supported through a dedicated shuttle service that links key origins and large car parking facilities to the Major Events Precinct.

An express shuttle bus service operating between Wendouree Station, the Major Events Precinct, Ballarat Station and Sebastopol on Major Event days would significantly reduce traffic congestion and increase car parking availability for those that need to drive.

The DoT should investigate developing a high-quality bus terminus at Mars Stadium including high-quality (permanent and temporary) passenger waiting facilities for use during major events. Council has a role to advocate for these changes to ensure Mars Stadium is accessible by Public Transport.

Ballarat Station

Ballarat railway station opened in 1862 and has long been a focal point for the urban transit network providing for a bus interchange and enabling intermodal connectivity. Ballarat station has experienced significant increases in patronage (averaging 4.3% p.a. over the last 4 years²). A master plan has been prepared for Ballarat station which will improve access, introduce a range of new uses, a new bus interchange on the northern side of the station and additional car parking. The *Ballarat Station Precinct Redevelopment* includes a range of features (see: Figure 4-13)

- New bus interchange;
- Commuter car park with 405 spaces;
- Apartment Hotel with 77 rooms;
- Conference and events centre including a 300-seat theatrette and dining options and 150 car parking spaces; and
- Public plaza.

Figure 4-13: Ballarat Station Proposed Bus Interchange



Source: *The Courier* - Bus interchange design concept released by VicTrack

² Source: V/Line patronage data 2014-2018

School bus interchanges

There are two school bus interchanges in Ballarat, which has the largest school bus network of any regional city in Victoria. These are located in Melbourne Road and Morshead Park. Both locations could have improved amenity to make it a more pleasant experience for students. In particular Council and the Department of Transport could work together to provide more shade trees, shelter from Ballarat's harsh weather conditions and seating areas.

Wendouree Railway Station

Wendouree railway station is experiencing the most significant patronage growth of any station in the region (averaging 15.4% annually over the last four years³). In 2009, this station became Ballarat's second station on the modern line. In the press release which accompanied the opening, the following provisions were highlighted:

- Bike racks and lockers;
- Local bus route realignment and re-routing to connect to Wendouree; and
- 200 car spaces able to be increased readily to 500 spaces.

The City of Ballarat and Department of Transport is currently developing a Master Plan for the Wendouree Station Precinct. The draft Master Plan identifies a number of development opportunities, provides an action plan for infrastructure upgrades, and facilitates the delivery of projects including works at Wendouree Station as part of the Ballarat Line Upgrade.

The draft Master Plan envisages significant land use change in the Core precinct following a transit orientated development model. It includes an activity centre and residential development surrounding the station. The draft Master Plan identifies a number of priority opportunities, such as improving:

- Development opportunities for the revitalisation of the precinct including residential, retail and commercial opportunities;
- The function, usability and appearance of the precinct including a boulevard treatment of Learmonth Road; and
- Access and movement for pedestrians, cyclists, vehicles and buses through:
 - A new pedestrian plaza and direct access from Gregory Street West;
 - Future additional car parking;
 - Improved bus interchange to the north of the station; and
 - A future bus interchange south of the station.

The draft Master Plan is shown in

³ Source: V/Line patronage data 2014-2018

Figure 4-14 below.

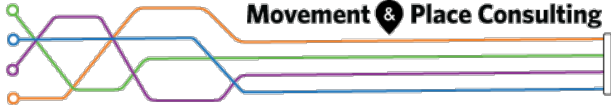
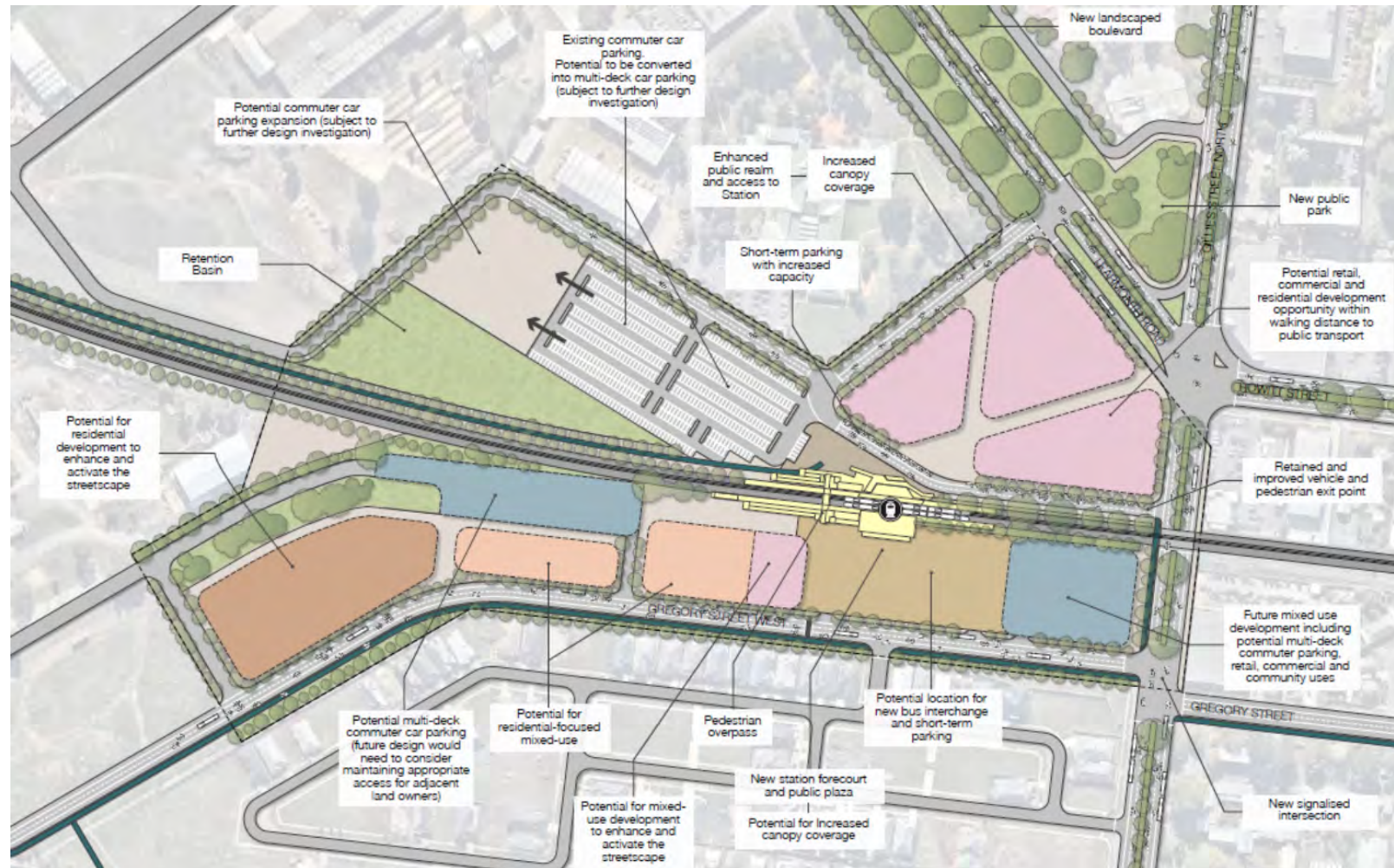


Figure 4-14: Wendouree Station Precinct Draft Master Plan



Source: MySay Ballarat Website – Wendouree Railway Station Precinct Master Plan

The redevelopment of Wendouree Station will increase the importance of this destination and will need to be served by multiple bus routes from all directions. Wendouree Station will provide a key link to the Ballarat West Employment Zone, requiring bus connections between these areas.

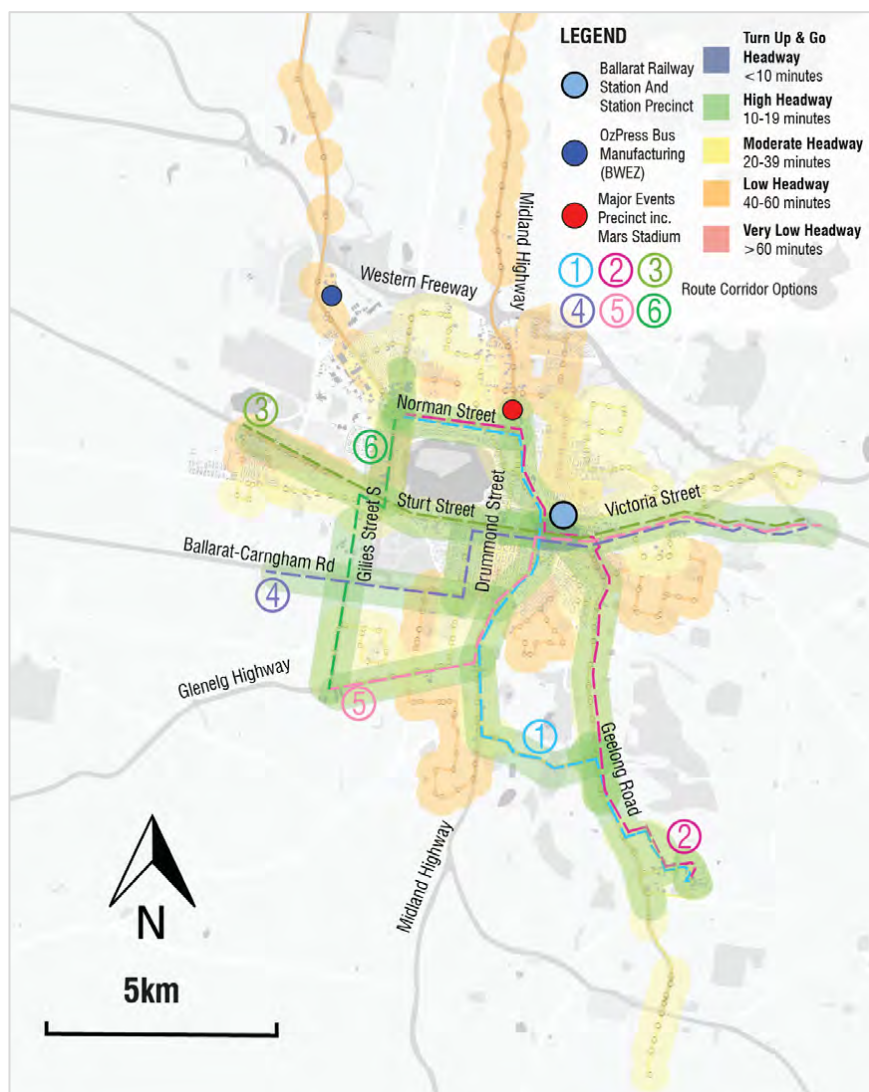
4.2 Stage 2 – Medium term (by 2030)

The medium-term actions, which aim to build on advocacy items outlined in Stage 1, are outlined below.

4.2.1 Focus services along Convenience Living Corridors

The Ballarat Strategy identifies prioritising intensification of activity along key Convenience Living Corridors (CLCs). These corridors are intended to be served by high frequency public transport services for the community to actively choose urban transit options over private car travel. Currently, the shortest headway times across the Ballarat bus network is 30 minutes. Service frequencies should be increased to every 10 minutes or higher along key patronaged corridors as shown in Figure 4-15 below.

Figure 4-15: Headway increases along proposed Convenience Living Corridors



This will result in an extensive network of the public transport service providing high headway times connecting residential areas, to the CBD and other intensive activity areas.

Along these Convenience Living Corridors, Passenger Information Display Systems (PIDS) should be rolled out at major bus stops. PIDS provide more accurate bus arrival times than those specified on the printed timetables, further increasing the reliability of bus services in Ballarat. Currently, the buses operating in Ballarat are equipped with real-time tracking, though information about their location and times of arrival are not yet visible to the public. Implementation of service level improvements and PIDS targeted along the Convenience Living Corridors may encourage more people to use public transport.

As indicated in Stage 1, the proposed pairing of Route 21 with 26 and Route 15 with 10, may provide an option for the initial alignment of a pilot Convenience Living Corridor. This will see key strategic roads such as Sturt Street, Victoria Street, Geelong Road and Creswick Road among the network to provide high frequency public transport services. Measures such as bus priority lanes and bus priority at signalised intersections can ensure on-time running and shorter headway times. Furthermore, land use intensification can be prioritised along these corridors which are well serviced by these bus routes. This will provide a real opportunity for the residents to use public transport services offering an alternative to the dependence on the car.

Building on the strategic direction of Stage 1, the activity corridors could be expanded to incorporate other bus routes and services, as outlined in Figure 4-6 previously. These options offer through routes, connecting residential, employment and service hubs across the city. It is anticipated connecting these key land use areas with increased levels of public transport services should result in greater choice for Ballarat's community.

4.2.2 Historic tram network servicing key tourist attractions

A possible option in the medium term would be to expand the tram network, focusing primarily on tourism. This urban transit option would leverage the rich history of Ballarat, while serving an important public transport need to connect key tourist attractions across the city. The proposed expansion of the tram route, currently limited to the western edge of Lake Wendouree, could mirror elements of the tram network operational in 1971. To achieve this, the proposed rollout is separated into two key phases.

As part of the first expansion phase, the tramline could be extended from Lake Wendouree to the Ballarat CBD. This will result in new tram tracks on Wendouree Parade from Carlton Street to Hamilton Street and along Sturt Street, terminating at Lydiard Street in the Ballarat CBD as shown in Figure 4-16.

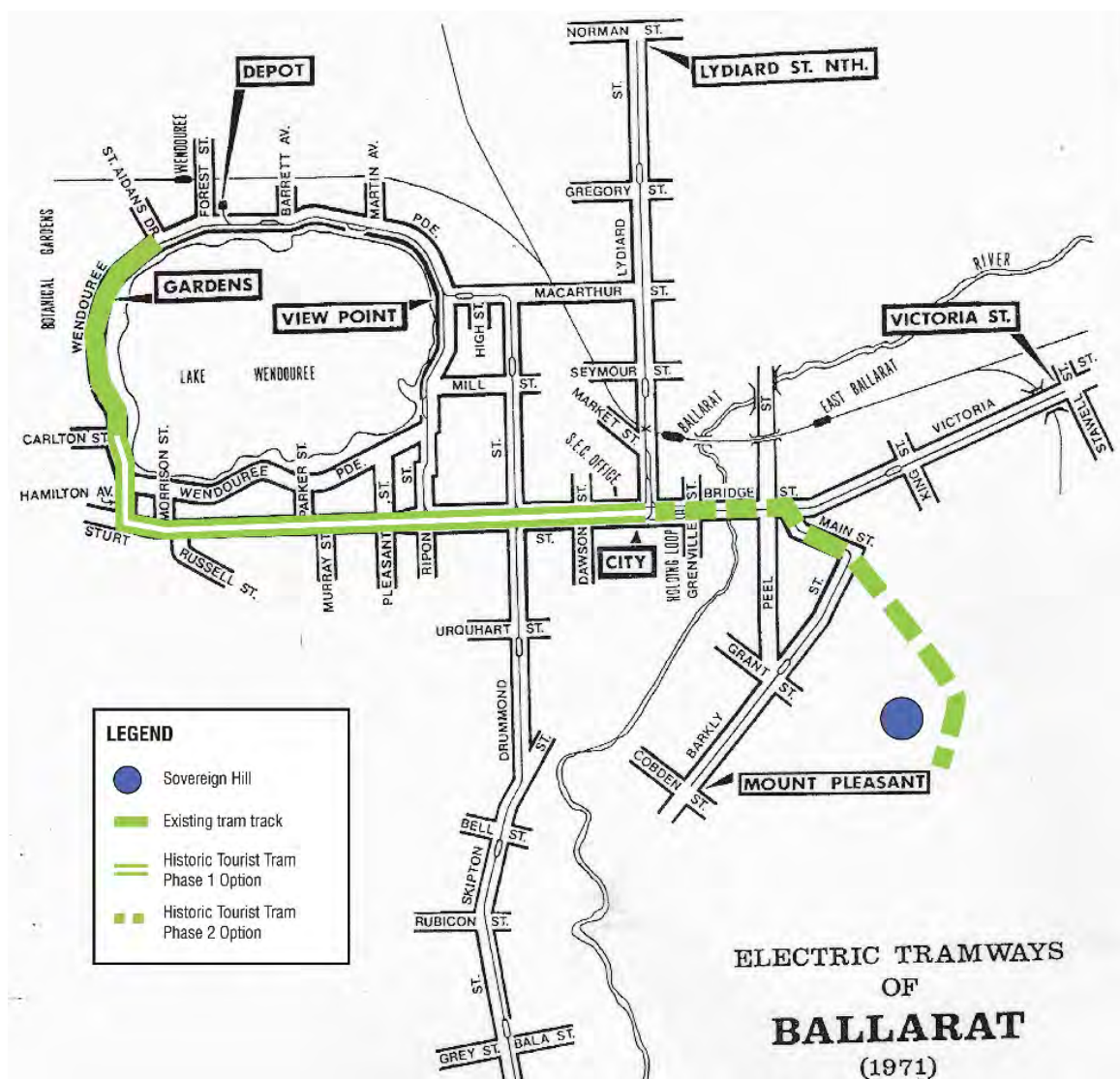
Sturt Street, the main thoroughfare of the city, has historically accommodated a tram service and could mark the fully-fledged return of the tram in Ballarat. This service will expose tourists and city dwellers to the Botanical Gardens and the Ex-Prisoners of War Memorial in Lake Wendouree to other services in the Ballarat City Centre such as the Art Gallery and Visitor Information Centre.

Phase 2 could then connect the tram line from the Ballarat CBD to Sovereign Hill along Sturt Street and Main Road. Extending the tram network to Sovereign Hill along Main Road would provide a new and easier way to travel between key tourist sites from Lake Wendouree to the Eureka Museum, Sovereign Hill Historical Park and the Gold Museum.

For the tram network advocacy item to gain the backing and funding from the State Government, the community will need to get behind and support the idea of running a larger heritage tram network in Ballarat.

A community led initiative will be invaluable in promoting the history of the tramway and its modern relevance in Ballarat. Community ownership through volunteer programs, much like the Friends of Sovereign Hill, will ensure viability of this proposal.

Figure 4-16: Potential Ballarat Heritage Tramway Extension



Source: Ballarat Tram Museum Collection Record

4.2.3 Achieving a '10 Minute City' in Ballarat

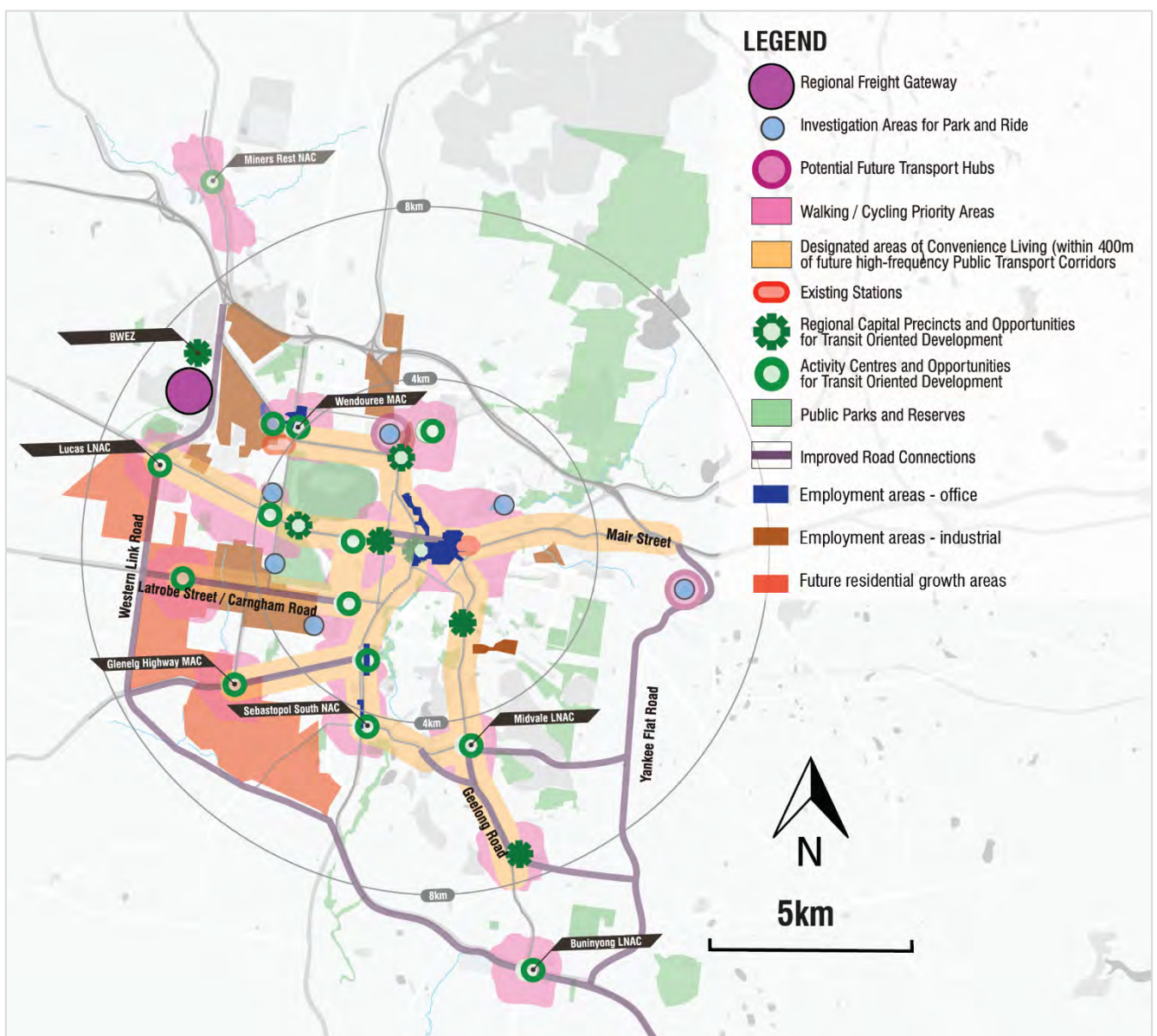
A key platform outlined in the Ballarat Strategy is the vision for a '10 Minute City'. Accessibility to local destinations and services need to be maintained as the city grows over time. Careful land use and transport planning decisions prioritising a compact urban form, promoting local neighbourhoods and encouraging sustainable transport is needed.

When people are housed within 2km of services such as jobs, shops, schools and recreation, it becomes more feasible to make short trips by active transport (cycling and walking). Historically, Ballarat evolved as a network of suburbs based on a 10-minute walking catchment to local shops and services (these can be seen as the 'walking and cycling priority areas' on Figure 4-17). Each walking catchment had its own local shopping area, and there was a high reliance on walking and bicycle riding for transport. As the geographic area of Ballarat has grown, the transport focus has since shifted from active transport to motorised transport - firstly trams and then cars and (to a much lesser extent) buses.

This pattern of growth is set to continue as areas for projected residential growth, shown in Figure 4-17, continue to spread beyond walking, cycling and existing public transport catchments. This pushes demand for more transport infrastructure, particularly roads and bus routes, as active transport options become less viable. Given that it is less cost-effective to provide new public transport infrastructure for a lower concentration of people, these services (even if provided) will be minimal and inflexible, meaning people will be likely to drive.

For urban transit to play a significant role in a growing Ballarat, land use planning has to reinforce the principals of a compact city. This will require densification and intensification of land use, primarily along the proposed Convenience Living Corridors where high frequency public transport services are anticipated to run (as highlighted in Figure 4-17). Locating people in this way creates more transport opportunities which limit congestion. This ensures that people can access key areas of employment and services within 10 minutes, by walking to some, cycling to others and commuting by public transport for the rest.

Figure 4-17: Achieving 10-minute neighbourhoods in an outwardly growing Ballarat



Source: *The Ballarat Strategy: Today, Tomorrow, Together*

4.3 Stage 3 – Long term (beyond 2030)

The long-term proposals aim to guide the urban transit needs of Ballarat beyond 2030.

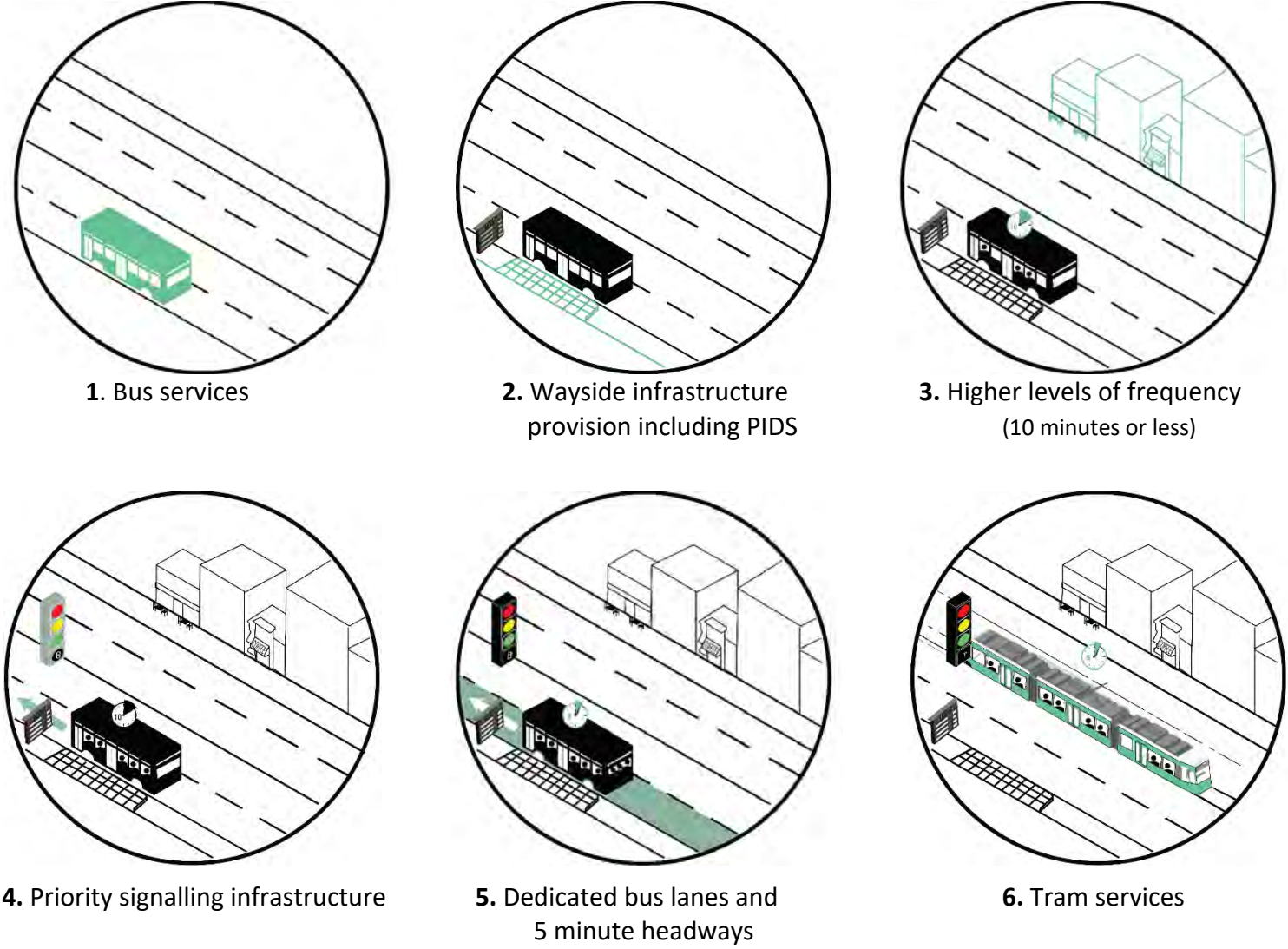
4.3.1 Higher frequency urban transit network serving Convenience living corridors

As Ballarat continues to grow, effective transport alternatives will be needed to cater for the movement of an increasing population. It is within this context, that there is scope for further tram network expansion along the key Convenience Living Corridors. The anticipated densification of the population along these corridors and heightened demand for urban transit services in these areas may tip to favour tram use as an option over bus services.

The Ballarat Strategy stipulates proactive measures will be taken to promote land use intensification along the corridors. Activation of these areas are expected to influence the urban transit composition in Ballarat over time. The progressive interaction of land use and transport, particularly in relation to urban transit, is outlined in Figure 4-18 overleaf and include:

1. An illustration of the current bus service levels. Headway times tend to be dispersed and patronage levels are relatively low.
2. To improve transit service levels Passenger Information Display Systems (PIDS) at major bus stops could be installed to provide more accurate bus arrival times than those specified on the printed timetables. Buses in Ballarat are currently equipped with real-time tracking, though information about their location and times of arrival are not yet visible to the public. Enabling for an increased reliability of bus services may encourage more people to use public transport.
3. As the corridors are densified with mixed land use development, public transport services provide a viable alternative to the car to access residential, commercial and other services. Due to an expected growth in demand, service frequencies are expected to increase. Services may run every 10 minutes or less.
4. The small headway times can lead to a growth in commuters using public transport services along these corridors. Due to an increase in the patronage level, prioritisation of bus movements within the road network may be justified. Measures to improve reliability and decrease transit travel time could be implemented through transit signal priority. Traffic signal timing will then be optimised to coordinate the movement of bus services through signalised intersections.
5. The reduction in delays associated with bus travel, due to signalised bus priority measures, will encourage further uptake of public transport modes. This increase in patronage will justify the need for bus priority lanes and more frequent services. Service levels tend to be high, as will reliability and reduced travel times. Operating in these conditions, and an increase in road congestion for cars, will encourage mode shift to public transport use. Over time, capacity will be reached, as commuter numbers increase.
6. Bus capacity constraints now become the bottleneck for increased transit services levels. Tram services could then be an alternative to increase the capacity to accommodate more passengers while freeing up bus services for other destinations, particularly important given Ballarat's expansion outwards. Trams are less energy intensive, able to move between 750 to 1300 passengers in each direction per hour, significantly more than bus services with a low headway.

Figure 4-18: Stages of transport and land use development along corridors



5. CONCLUSION

Since 1884, the urban transit network in Ballarat has been a key element of the city's fabric. The original tram connections were critical for economic activity, urban development along activity corridors, fostering employment opportunities and linking sub-regional communities. As the expansion of Ballarat continued, bus services were adopted to meet the transit needs of the community. These needs are in constant flux, leaving much room for improvement in Ballarat's current flagging bus network. Looking to the future, transformative change to the urban transit landscape is needed to evolve with and better serve a changing Ballarat.

This Background Paper has summarised the existing situation, strategic policy direction and specific projects that are currently underway. It has highlighted the role that the urban transit network can play to improve access, promote car parking availability, ease congestion and encourage economic activity within Ballarat. Examination of the current network service levels identified a host of short-term improvements which could bolster the efficiency and productivity of the public transport system operating in Ballarat. Key short-term improvement options put forward in this paper include:

- Faster services with improved directness;
- Journey time reductions through amendments to excessive timetable contingencies;
- Improving service levels with existing resources particularly in shared service corridors;
- Moving beyond a CBD-centric network by pairing routes which marry residential growth areas with job dense regions; and
- Providing bus services to the Major Events Precinct.

This background paper plans for forecast growth by proposing medium and long-term improvements to the infrastructure and urban transit services provided for in the region. This involves service improvements along Convenience Living Corridors and includes:

- Regional bus network expansion as Ballarat's significance grows being a key economic and service hub; and
- The potential to evolve the bus network into an integrated bus and light-rail network.

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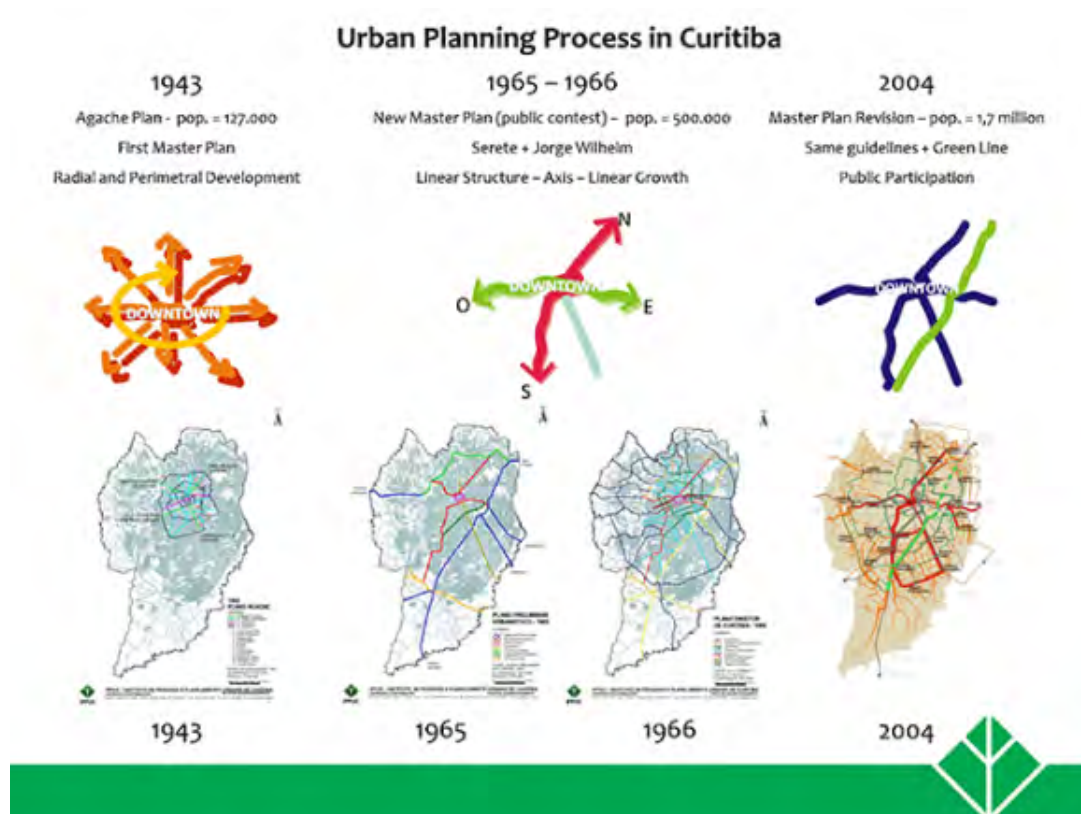
7. APPENDIX A: CASE STUDY – CURITIBA BRAZIL

Bus Rapid Transit and Local Economy Growth: Case Study Curitiba

The Bus Rapid Transit system in Curitiba, Brazil, is a notable example of a successfully implemented wholistic set of solutions which vastly improved the city’s economy. It is particularly relevant to Ballarat as it tackled the outwardly growing separation between employment & services (such as shopping, education, health and recreation) and housing.

Curitiba experienced a large population boom between the 1940s and 1960s where the city leaped from 120,000 people to 360,000 representing a 300% growth. This growth was largely radial, with housing continuing to expand outward, with the jobs and services fixed in the centre. This radial expansion made getting to work and services from one’s house increasingly difficult as distances grew between the house and work or services. The amount of daily congestion also increased as many people needed to travel to the same area.

Figure 7-1: History of growth patterns and urban planning in Curitiba



Source: [IPPUC](#)

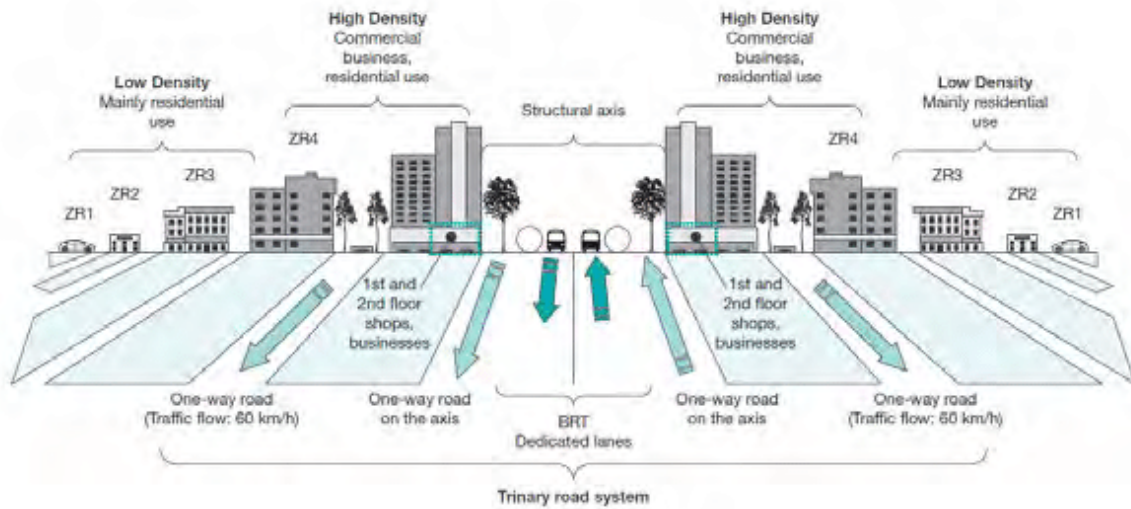
This difficulty in accessing work and services effectively slowed the economy. This demand for jobs in the economy however, demonstrated a threefold opportunity which the Bus Rapid Transit (BRT) system was able to meet:

- To provide transport and infrastructure jobs immediately
- To provide transport itself for higher mobility in accessing jobs and services

- Creating linear corridors for a mix of housing, jobs and different services, which could all be accessed with high frequency, direct and uncongested services.

The resulting BRT system was a spinal network with multiple long linear corridors that had bus exclusive lanes in the centre with private vehicles to the lanes on the outside.

Figure 7-2: Cross-section of BRT corridor



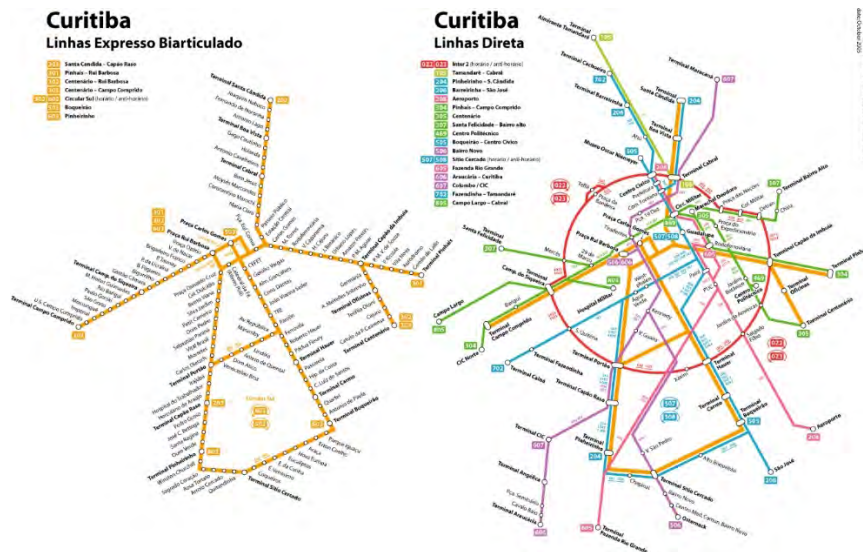
Source: [UN Habitat, 2013](#)

Figure 7-3: Cross-section of BRT corridor



Source: [University of Twente](#)

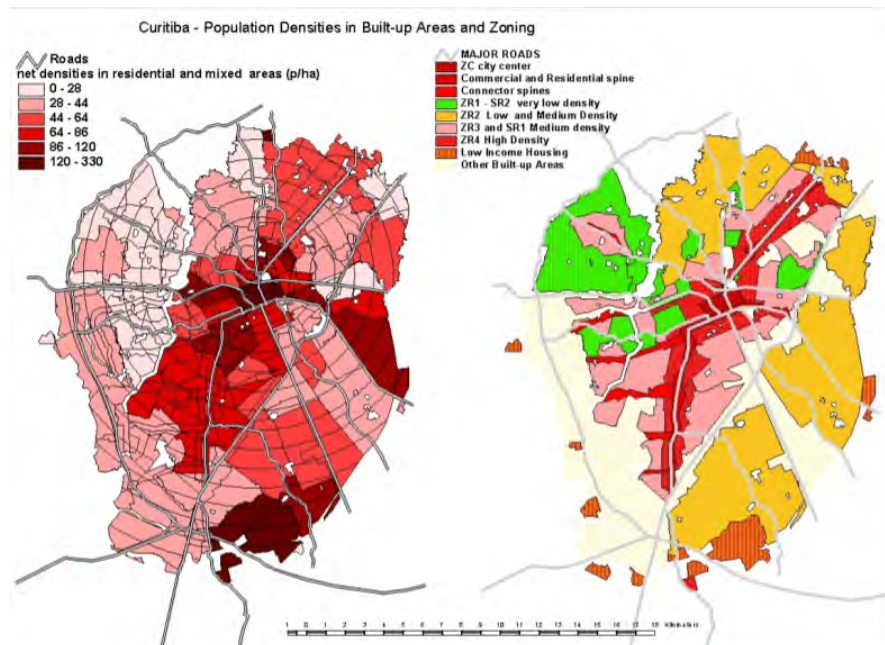
Figure 7-4: Network map of Bus Rapid Transit (left) and full bus network (right)



Source: *Rede Integrada de Transporte*

This network not only provided optimal access for the radially situated housing (particularly for the longer distance trips), but also induced the market for a high density of mixed uses along the corridors. Intensifying activity in these corridors provided affordable housing that is close to education, employment, goods and services.

Figure 7-5: Zoning map showing densities and land uses



Source: *ABCDE Conference*, Washington, Alan Bertaud

In effect, Curitiba's BRT network was able to achieve a 70% shift from car use to bus use which meant transport costs went down, due to less being spent on petrol and the local economy went up. This is because in addition to the other impacts of job growth, 72.7% of transport savings from less car use benefit the local economy.

More recently, Curitiba has decided to partner with Volvo to build Brazil's best buses. This has resulted in the development of a large bus manufacturing plant in the city, creating hundreds of jobs for bus manufacturing and operations. This partnership has also led to the development of more environmentally friendly buses which are a diesel-electric hybrid.

Ballarat has the opportunity to follow the Curitiba example of Bus Rapid Transit by building from the existing local bus manufacturing base. In doing so, it will be able to achieve more convenient services for people at all times of the day, meaning that they do not always have to drive. This has large potential to expand Ballarat's local economy, providing more access to services from public transport, increasing savings, job growth and also benefitting the environment.

Find out more here:

C40, 2019, [C40: Good Practice Guides: Curitiba - Bus Rapid Transit Modernisation](#)

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8. APPENDIX B: CASE STUDY – CANBERRA

The City of Ballarat has had a long association with trams. The city had an operational tramway network from 1887 which ceased in 1971 due to the inflexibility of the network to service an outwardly growing population after 84 years of operating. Since this, there has been an ongoing desire to see this network restored and modernised.

As a form of transit, tramway networks function best and are most viable when servicing smaller networks with high levels of mixed activity occurring. This is due to their ability to efficiently carry high volumes of passengers over short distances. Ballarat’s historical network at its peak serviced highly active corridors such as Sturt Street to Victoria Street as well as Doveton Street and Creswick Road.

This case study of Canberra’s tram network seeks to unpack a 100-year series of planning decisions to achieve low private vehicle dependency and high levels of local economic activity with high activity corridors serviced by a modern tram system.

Figure 8-1: Canberra Tram



Source: [ABC](#)

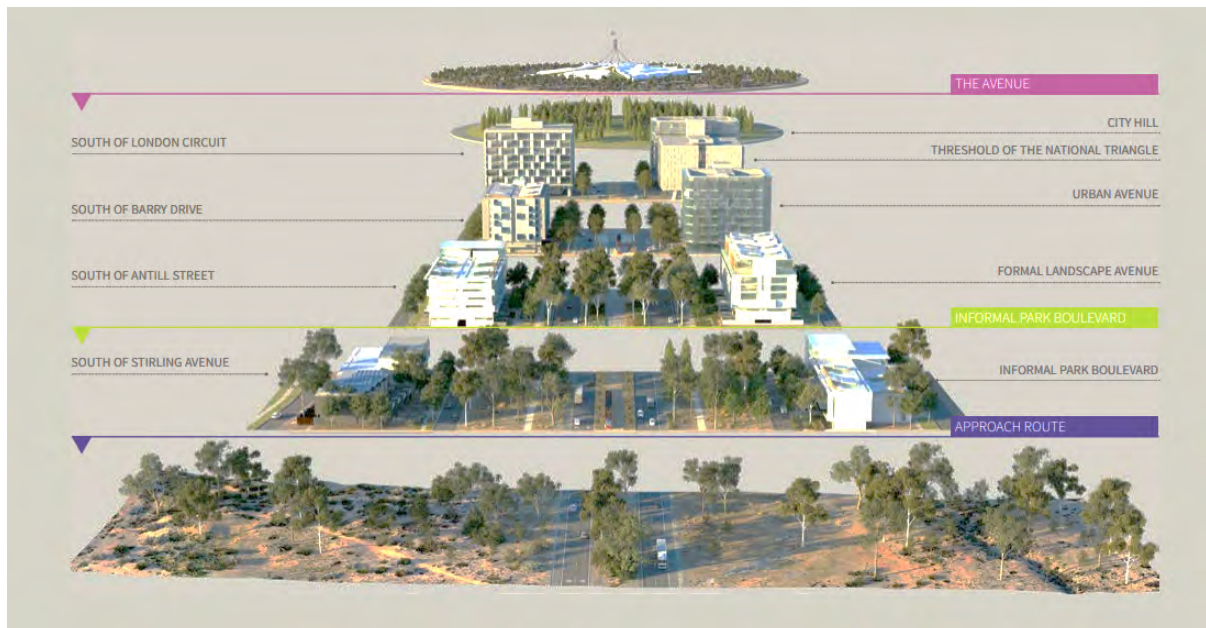
Background

Tram services were initially proposed in the master plan for the creation of Canberra. Despite the ‘hub and spoke’ nature of the city and flat topography (making it naturally suitable for the operation of trams), it was not adopted in the final city plans. This was largely due to the fact that Canberra had only really begun to be constructed in the 40s due to the depression and world wars. By then automobiles and buses were considered to be more viable than trams in being more flexible and cheaper, particularly in making large networks. With a bus network, the city also began spreading outward to the north and south in particular, deviating from the original intention of the plan in designing city centres and corridors.

50 years later, in the 90s, Canberra had a serious reconsideration of tram services as the city faced accelerating growth to combat traffic congestion. This was particularly the case on corridors such as Northbourne Ave, a 12km linear stretch between the outwardly expansive Gungahlin and city centre, which still had much of Canberra’s jobs and services. Key arguments against implementing a tram network at this stage was the lack of a critical mass of population and activity to warrant a larger, faster and high priority transport mode - the population of the city at this stage was almost 300,000.

The Northbourne corridor between the City Centre and Lyneham has always had high levels of service however and in the 2000s, Transport Canberra introduced two additional routes along the corridor all the way to Gungahlin. 200 and 250 were introduced as Red Rapid services (Fyshwick-Gungahlin), which arrived every 10 minutes along Northbourne at express stops along Northbourne Ave and Flemington Ave to Gungahlin with an average speed of 40km/h (faster than any current route in Ballarat). Similarly, the blue rapid services were introduced between Tuggeranong and Belconnen, another outwardly growing satellite community to the west. These rapid services were highly patronised, accounting for 39% of all trips across the whole network in 2018. This set up the opportunities for corridor intensity of activity, transport service frequency. Along Northbourne Ave, since the 1960s, development has consisted of dense commercial activity, hotels and hospitality, public services and diverse housing including student and affordable housing provision.

Figure 8-2: Urban Form and Corridor Character Areas

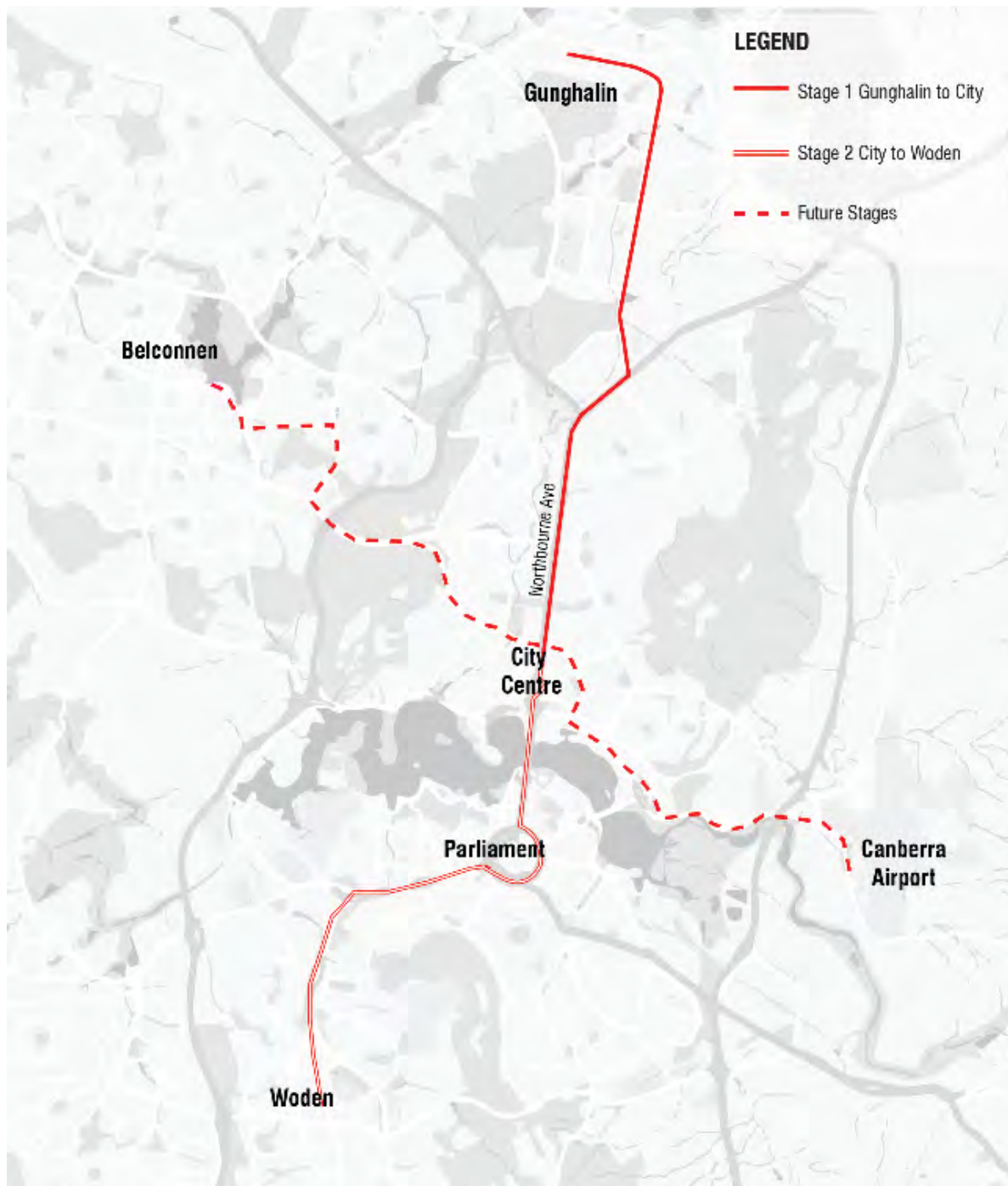


Source: NCA, City and Gateway Urban Design Framework, 2018

Following an election in 2012, Northbourne Ave was identified as a suitable tramway. This was because it was the corridor with the highest activity and potential for further growth over other high frequency corridors. In addition, it offered the opportunity to significantly enhance the service to Gungahlin which had historically low public transport ridership.

The launch of tram services redefined the urban landscape, forming the spine of the public transport network, the community was able to take full advantage of the high capacity high frequency tram routes. It further enabled for the reallocation of resources for people to catch public transport in more outwardly growing suburbs. With additional corridors targeted for tram services, the network will be able to even more efficiently provide for Canberra city-wide in future.

Figure 8-3: Canberra's Tram Network Plan



Source: [ACT Light Rail](#)

Figure 8-4: Possible Strategic Network in 2031



Source: [ACT Light Rail](#)

Why were tram services adopted in Canberra?

There were a number of key elements which led to the planning and adoption of trams as a solution in Canberra:

- *Transport effectiveness* – buses in Canberra were already highly patronised, and strategic planning for the city’s growth showed that the transport task was going to grow even more demanding. From a transport perspective, trams would be more effective at carrying the forecast increase in customers. It is less energy intensive, and one tram driver can carry around six times as many people as one bus driver
- *Integrated Planning for the future* – adoption of trams allows for integrated planning for Canberra’s future growth. In the first phase (CBD to Gungahlin), creation of a mixed use, high density corridor will ensure that the whole corridor is activated and that a cost-effective transport solution can be provided. The route choice was based on the identification of major activity centres and the most suitable corridors for a first phase of the network
- *Modular* - Canberra is planning to deliver each stage of the tram rollout every decade. Work has started on the next phase south to Woden. An east-west axis connecting Belconnen to the Airport will follow, with aspirations to connect other key suburbs including Fyshwick and Tuggeranong
- *Supportive of active modes* – The tram network will form part of the urban transit spine, encouraging commuters to use multimodal access/egress options. Canberra is connecting tram services to buses, building new park and ride facilities, upgrading key transport interchanges, improving walkability, and improving the urban landscape

Customer response

Canberra’s tram system is designed to be attractive to customers, with frequent services (every six minutes in the peak), as well as offering free wi-fi onboard and at stops. To encourage early adoption, travellers were a month’s worth of free public transport across both tram and the revised bus network when the system was opened.

The customer response has been significant, with patronage across the network is higher than ever. Weekend patronage is up 33% on equivalent periods year on year, and 6% higher across the network on weekdays.

Trams currently makes up 20% of all public transport trips. Along the Gungahlin corridor that it serves, there is strong evidence of a switch of modes from car to tram use.

Learnings for Ballarat

Given Ballarat’s rapid growth into the future, the example of Canberra demonstrates the necessity of long-term planning for the integration of rapid transport with land use planning. In particular, the example demonstrates the effectiveness of staging higher frequency of public transport and higher mixed-use activity and housing along corridors. This would leave Ballarat in the best possible position for a future with a thriving local economy, low congestion and that is better connected.

Find out more here:

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[ACT Government, Transport Canberra, 2019, *City to Gunghalin Light Rail Project Delivery Report*, June, 2019,](#)
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Connecting Ballarat

A proposal for
Direct, frequent buses
Connecting key destinations in Ballarat



Executive Summary

Ballarat's population has grown from 73,000 in 2001 to 100,000 today, and is expected to reach 160,000 by 2040. If Ballarat is to continue to be a vibrant, livable regional city it cannot remain dependant on cars for its transport needs - our environment, our communities and our local economy will need high-quality public transport to connect key destinations.

In late 2019, construction of the Ballarat Line Upgrade (BLU) project will be completed, after which it is anticipated Ballarat will have a 20 minute peak/40 minute off-peak V/Line rail service. This presents a challenge for coordinating buses, as it does not easily align with the existing 30/60 minute bus frequencies; however it also presents an opportunity to increase bus frequencies, to both maintain connectivity with train services and provide a more attractive service that can gain serious mode share for other trips.

The 2017 changes to Ballarat's bus network made great strides in straightening out bus routes in the suburbs, and providing a broadly more direct and rational network. This provides a good basis for further changes, which can address the problems in central Ballarat, where paths are still indirect, counterintuitive and inefficient. Connecting routes on the opposite sides of town in order to provide easier cross-town travel and a faster, more direct and more efficient path through the CBD, will mean a quicker, more legible and more attractive network for passengers; and more efficient use of driver time and taxpayer resources.

Now that the new network has been running for many months, it has become apparent that there are many inefficiencies in the timetables; most routes have excessive padding on their outer sections, which mean buses arrive at timing points early and have to sit idle for several minutes waiting for the timetable to catch up. This represents a significant and obvious waste of time for passengers, adding both to the reality and the negative perception of buses as a slow alternative to driving; and represents a significant waste of driver time and therefore taxpayer resources. Tightening up these timetables to more accurately reflect normal travel times would therefore be a win-win for passengers and taxpayers alike.

It is also apparent that the current span of hours does not meet the needs of Ballaratians – whether they are commuting by train to Melbourne, or going out for dinner, drinks or evening events in Ballarat itself. Most bus routes shut down around 7-7:30pm weeknights, which mean that shoulder-peak commuters from Melbourne will not have a bus available by the time they get back to Ballarat – this is a major contributor to parking pressures at Ballarat and Wendouree Stations. Similarly, people going out for dinner or to the movies in Ballarat will not have a bus to take them home when they're finished, which restricts access

to that night life and has negative impacts on Ballarat's economy. Extending the bus network's operating hours to run at the same frequencies until 9pm, and lower frequencies until 11pm, would help address all these issues, and increase patronage.

We recommend a comprehensive reform of Ballarat's bus network, to expand on improvements already delivered to buses, and capture the value of the current investment in rail. A network that is faster and more legible, and runs more frequently for a longer span of hours, will attract people out of their cars, increase fare revenue and have a transformative effect on the way people move around Ballarat.

We also recommend that any new buses procured to implement this plan be electric buses. Electric bus technology is now mature enough that buses have sufficient range for the rigours of revenue service, and are economically superior to diesel buses over the life cycle of the vehicle. They also reduce noise and particulates for the people living near them, and reduce greenhouse gases for the planet at large.

Ballarat is growing fast, and its transport network is experiencing growing pains. The City of Ballarat is making admirable attempts to better manage its parking assets, but many citizens respond to these attempts by pointing out that they currently have to drive, because the current bus network is not a viable alternative for them. The time is ripe for the government to improve the network, increase frequencies and span of hours, and provide people with a genuine alternative to driving. The travelling and voting public are crying out for these improvements, and we call on all political parties to hear their voices.

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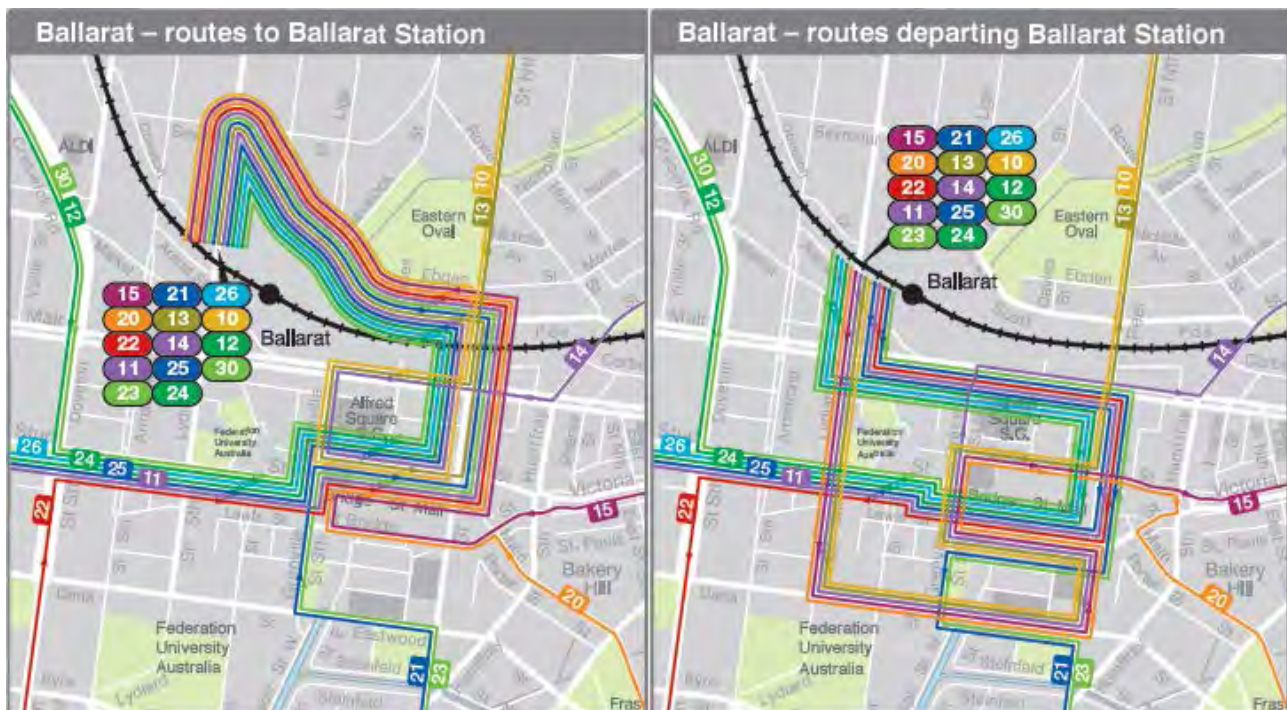
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The current network

The new bus network and timetables introduced in Ballarat in January 2017 has improved many aspects of the old system. Outside the CBD, most routes are much more direct, with routes straightened and large unidirectional loops eliminated. This helps facilitate a quicker journey that is more time-competitive with a car, and provides a much more legible network for casual users. Compared to the old system, many more routes run to higher frequencies and run on weekends, which makes the buses much more useful for a wider range of people and trips. However, these improvements have been let down by a few systemic issues.

The first main issue is that while routes are much straighter and more legible outside the CBD, the opposite is true within the CBD. Routes twist back on themselves in order to call at specific interchanges in a specific order, as shown below.



Current bus route paths through Ballarat CBD © PTV

PTV's rationale for these paths through the CBD, as communicated at consultation sessions prior to implementation, was that they would ensure all routes in central Ballarat called at Bridge Mall, and terminated or originated at Ballarat Station; and that they would allow for "simple instructions" for how to get somewhere (eg "To get a bus to the station, go to the Curtis Street Interchange"). The stated priority was legibility for casual users.

Experience since implementation has shown that the paths through the CBD have failed to deliver this legibility. Because they take a path that no sensible driver would take, they are

extremely counterintuitive to casual users. For example, in order to catch a bus heading to a southeastern part of Ballarat, one must catch a bus heading west along Little Bridge Street (which will soon twist back on itself). Similarly, if a person is at Bridge Mall and wants to head northwest to Ballarat Station, they must get on a bus heading east. This makes no sense to the casual user, and has caused considerable confusion amongst potential passengers.

In addition, this path through the CBD requires many more route-kilometres than a more direct path would; it requires more right-hand turns on busy intersections than a direct path would; and because all inbound routes call at Bridge Mall before arriving at the station, and all outbound routes call there after departing the station, a passenger interchanging between routes has to pass through Bridge Mall twice. All of these inefficiencies with the path through the CBD waste the time of passengers and drivers alike. Fixing them would make taking the bus quicker and more attractive to passengers, increasing mode share and fare revenue; it would also save the time of drivers (and therefore the resources of PTV and taxpayers, which can be diverted to increasing frequencies or span of hours).

The second main issue is with the timetable. Outside the CBD, there is excessive padding in the timetable; even in the worst traffic conditions during the peaks, the timetable dramatically overestimates how long it will take for a bus to travel between two points. It is common on all routes in the Ballarat network for the bus to need to sit idle at timing points, in many cases for several minutes, waiting for the timetable to catch up. This is a very apparent waste of passenger time, increasing both the reality and the perception of buses as slow alternatives to driving. It is also a significant waste of driver time; and given that driver wages are by far the largest ongoing expense of running a bus service, this represents a significant waste of taxpayer money. By trimming the fat from these sections of the timetable, these wasted resources could be diverted to increasing frequencies or extending hours of operation.

Case Study: Timetable padding

Prior to implementation of the new network in 2017, Route 10 was timetabled to take 11 minutes to travel between FedUni's Mt Helen campus and Sovereign Hill. Route 21, which replaced Route 10, allows 18 minutes to make the exact same trip – a 64% increase in estimated travel time.

In practice, it is very common for the bus to need to stop at timing points along the way, and sit idle for several minutes to wait for the timetable to catch up. Even a bus that leaves FedUni several minutes late will usually be able to catch up so easily that it still needs idle time at Sovereign Hill.

Given prior issues with punctuality, it was prudent to allow slightly more time in this section, however a 64% increase seems to have been wildly excessive.

There does, however, seem to be the opposite problem on the inner sections of routes; it is very common for buses to take several minutes longer than expected to get through the CBD, and indeed the padding in the outer sections may be partially designed to compensate for this while maintaining punctuality targets. In the absence of route reform that straightens out the paths through the CBD, comprehensive timetable reform would therefore require a mixture of cuts and expansions, depending on the section; but would nonetheless result in significant savings overall.

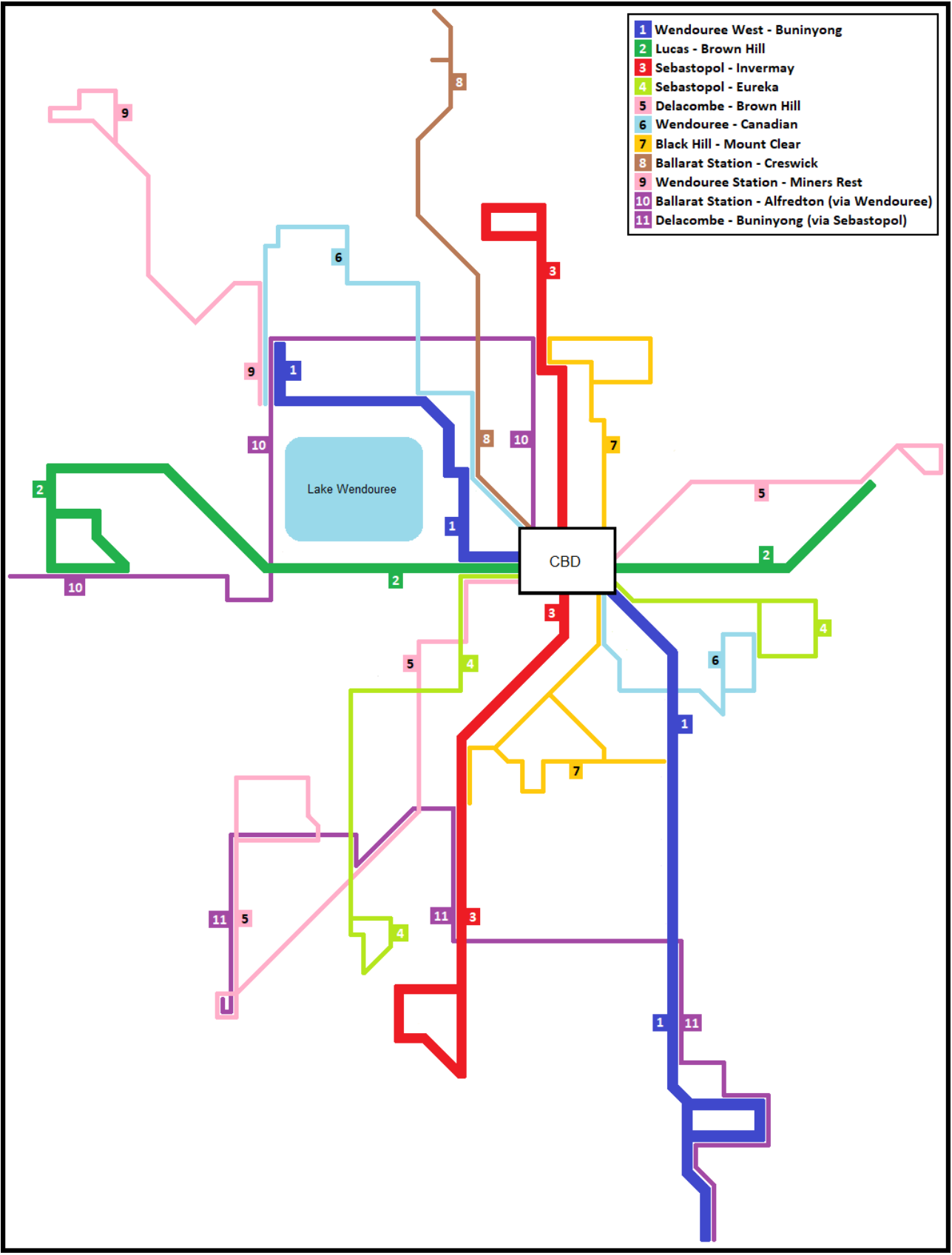
Case Study: Early, then late

Route 21 has many issues with timetable padding in its outer sections, but still commonly arrives at Ballarat Station late.

Students who catch the 3.16pm bus from FedUni expect to arrive at Ballarat Station at 3.45pm, in time to catch the 3.52pm train to Melbourne. This bus generally leaves FedUni a few minutes late, but because of excessive padding, tends to catch up to its timetable by Sovereign Hill, and needs to sit idle.

By the time it has gone through the relatively busier inner section of the route, with more frequent stops to drop off & pick up, and four signalled intersections, it has often lost several minutes. It is common for this bus to arrive at Ballarat Station just as the train leaves – meaning the students need to wait over an hour till the 5.15 coach, which gets them to Southern Cross 2 hours later than the train would have.

Proposal



The PTUA proposes a comprehensive reform of the Ballarat network. The central concept of this proposal is to link routes on opposite sides of town together, to provide longer cross-town routes – much like Melbourne's cross-town tram routes.

These cross-town routes would travel to Ballarat Station and Bridge Mall in the order that is most direct and convenient for that particular route, thus providing a more logical and more efficient path through the CBD.

PTV's stated priorities with the previous round of bus reforms were:

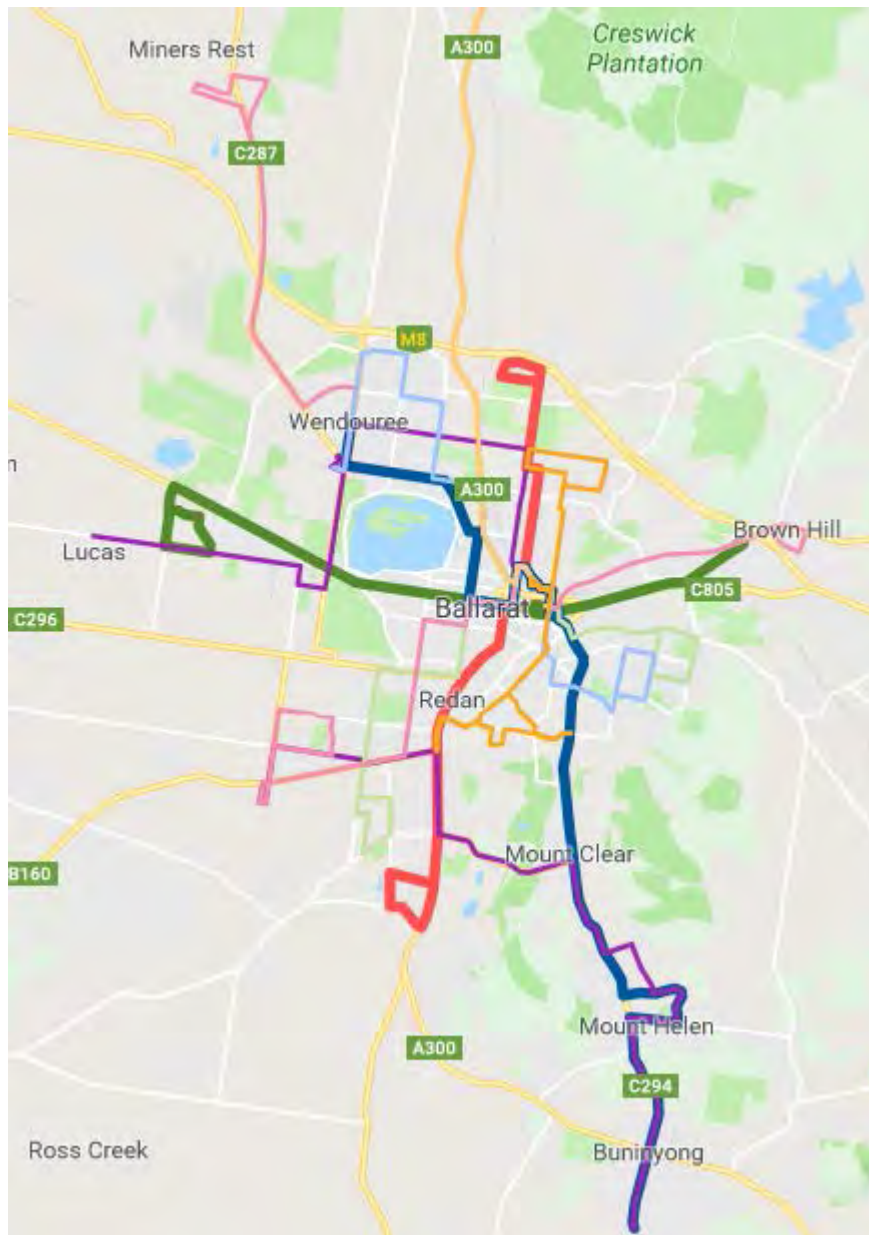
- a straighter and more efficient network
- a more legible network for casual users
- for buses to share common paths that would allow for traffic prioritisation
- maximum connectivity with Ballarat station
- increased connectivity with Wendouree station

The current network does go a long way to achieving these goals, and our proposal would retain its successes. But it also falls short in many ways, and our proposal seeks to address these issues.

In addition to linking routes together for improved paths through the CBD, we propose some changes to suburban sections of routes, to build on previous changes. These changes are broadly designed to make the routes straighter, more legible and more efficient, but in some cases this does mean reducing their coverage area. As such, the proposal includes a small number of additional routes, which can ensure these areas are still covered by the network.

It is proposed that the new network would run to higher frequencies than the current network – in part to ensure connectivity with trains is maintained, but also to allow for more freedom when travelling around Ballarat, particularly when changing between routes is required.

Proposed Routes

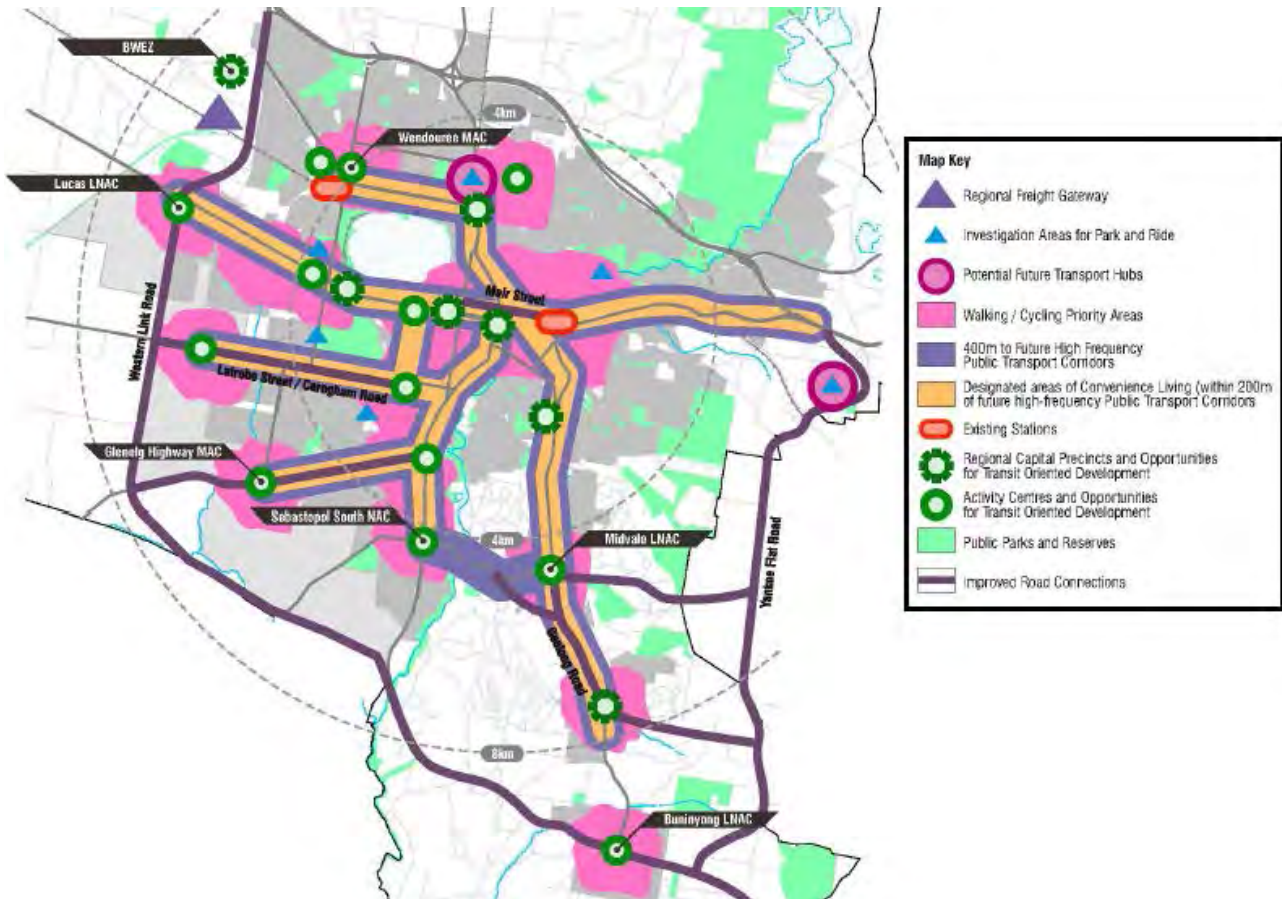


Find an interactive version of the map [here](#)

The proposal seeks to join routes on opposite sides of town, to allow for easier cross-town travel as well as a smoother path through the CBD. A key component of this would be to create three SmartBus routes, which would run to high frequencies and to a long span of hours, and would form the spine of a truly high-quality public transport network for Ballarat.

The cross-town routes, and particularly the SmartBus routes, would connect many important destinations to each other along a direct and sensible path, and provide a one-seat journey for many passengers. For those who do need to change buses, the speed and

efficiency of the routes will allow quicker journey times, as well as allowing higher frequencies than Ballarat has had up till now. This will keep bus travel relatively time-competitive even for two-seat journeys.

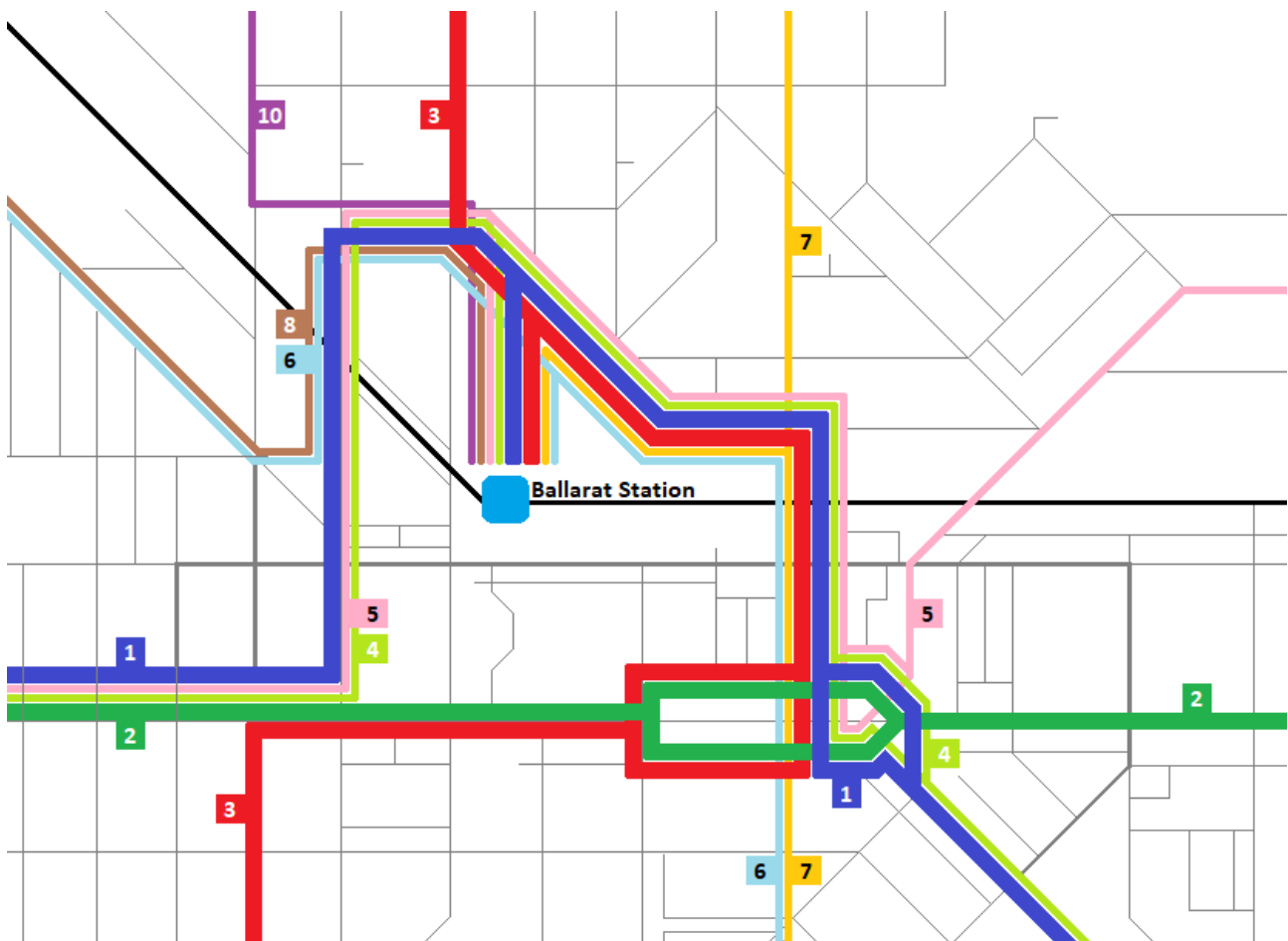


Proposed high-frequency public transport corridors the in Ballarat Strategy

The three SmartBus routes have been designed to broadly align with strategic high-frequency public transport corridors identified in the 2015 Ballarat Strategy, which is the City of Ballarat's overarching strategic document for 2040¹. With a fast, direct, and frequent service, and service hours stretching into the evenings, it should be possible to live along these corridors and not own a car – getting around by walking, cycling, and a turn-up-and-go public transport network. In the medium term, having these clearly high-quality public transport services will encourage investment in medium-density housing and commercial developments along these corridors, further increasing ridership and justifying higher frequencies. In the long term, if the urban form changes and patronage grows in the right way, these routes could ultimately form the basis of a returned light rail network for Ballarat.

1. <http://www.ballarat.vic.gov.au/pbs/city-strategy/ballarat-strategy.aspx>

Key features

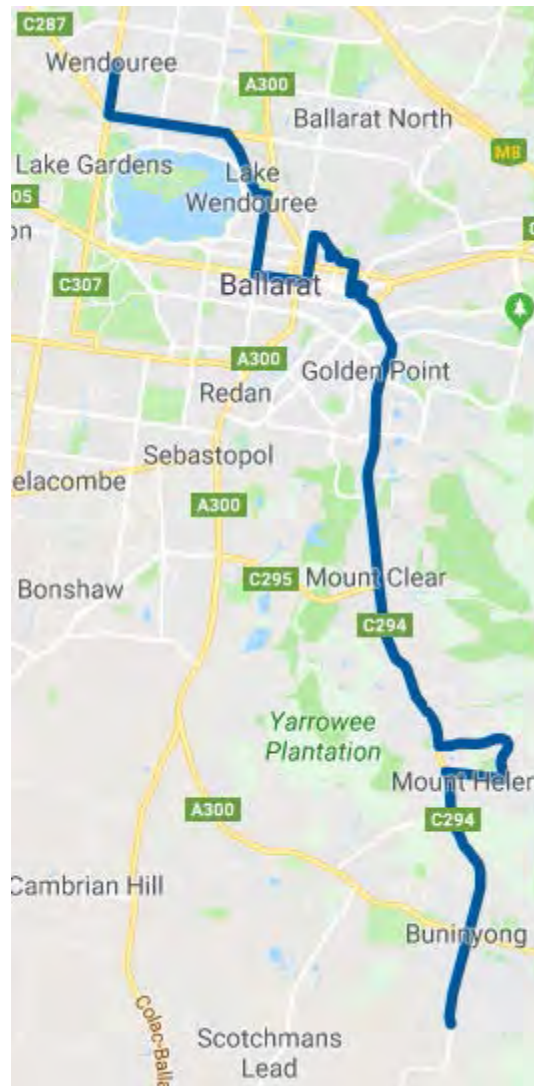


Detailed view of paths taken through the Ballarat CBD

Interchange will still be possible at Bridge Mall, and may be the preferred option for savvy users, but will require short walks between stops in many instances – for example, from Little Bridge Street Interchange to Curtis Street Interchange. Certainly, it is likely that the PTV Journey Planner, Google Maps and similar services, will suggest this for some trips; and wayfinding signage should be provided to facilitate this where possible. However, for casual users and those with limited mobility, Ballarat Station will be the primary interchange point. The station should have sufficient infrastructure in place to support this.

Route designs also emphasise connectivity in other parts of Ballarat, to provide for much more direct trips by minimising the need for people to take long trips into the CBD and back out again. For example, someone wishing to travel from Alfredton to one of the medical clinics in the 1100 block of Howitt Street could interchange at the corner of Gillies and Howitt Streets; someone travelling from Mount Pleasant to Mount Helen could interchange at Zagames.

1. Wendouree West to Buninyong, via Ballarat Station



The first SmartBus route would travel from the northwest to southeast corners of Ballarat, via most of its key activity centres. Broadly, this route would be a merger of the existing Route 11 (Ballarat Station – Wendouree Station via Howitt Street) and Route 21 (Ballarat Station – Buninyong via FedUni), with some tweaks in central Ballarat to provide for a route that is direct while serving key destinations.

The route is also designed such that a third route, the existing Route 31 (Wendouree Station – Miners Rest) could easily be merged into this at a future date. As more housing and other destinations are developed at Miners Rest, and when the northern section of Ballarat West Employment Zone (BWEZ) comes online, it will make sense for these areas to have a higher-quality service. The design of these routes allows them to be merged with minimal inconvenience.

The initial Wendouree-Buninyong route would serve the following key activity centres with high-quality public transport:

- Wendouree Station
- Stockland Wendouree
- Howitt Street Shopping Precinct
- Australian Catholic University
- Ballarat Hospital Precinct
- Sturt Street Shopping Precinct
- Ballarat Station
- Bridge Mall
- Sovereign Hill
- Midvale Shopping Centre
- Federation University Mount Helen Campus & Technology Park
- Warrenheip Street Buninyong

Services should run to a clockface time, at the highest frequency possible within budgetary constraints. The specific timings should be coordinated with class and shift times at FedUni and the Technology Park, which start and finish on the half hour. Given anticipated bus travel times, and walking times between campus and the Ballarat Hospital stop, this should naturally sync fairly well with class times at ACU.

As noted above, after the completion of the BLU project, train headways are expected to improve to a 20-minute peak/40-minute off-peak frequency. If buses are to run to a 20-minute frequency, it will be necessary to also try to coordinate the timetables with trains, to allow for suitable connections. If buses run to 10-minute frequencies or better, coordinating specific connections will become unnecessary; for any train, there will be an appropriate connecting bus.

2. Lucas to Brown Hill



This SmartBus route would act as the main east-west spine of the network. It would broadly be a merger of the existing Route 26 (Ballarat Station – Alfredton) and Route 15 (Ballarat Station – Brown Hill), with four main differences:

- this route would originate at Raymond Crescent, Brown Hill, with another route servicing the areas beyond the Western Freeway
- it would travel directly along Victoria Street, with another route servicing Eureka
- it would not deviate to Ballarat Station
- the Alfredton section of the route would follow Route 10's path along Sturt Street, rather than Route 26's path along Cuthberts Road

This would provide a fast, direct, efficient bus that could be extremely time-competitive with cars for the people who live near the corridor. If run at a high enough frequency, and for a long enough span of hours, this route could attract serious mode share.

Most other routes on the network have some component in the northern part of the city, so calling at Ballarat Station can be done in a way that does not require excessive deviation; the amount of deviation is small and the benefits to connectivity make the deviation worthwhile. This route, however, travels purely east-west along Sturt Street, several blocks to the south of the station, so it would require significant deviation to call at the station. This deviation may not act as a significant deterrent to someone travelling all the way from Newington to Ballarat East, but it would act as a significant deterrent to those making tram-style hop-on-hop-off trips up and down Sturt Street, which would be a sizeable proportion of the route's target market.

Passengers along this corridor who want to travel to the station can either walk approximately 400m from the corner of Lydiard and Sturt Streets; or interchange with another route at Bridge Mall or Sturt Street which would drop them at the station.

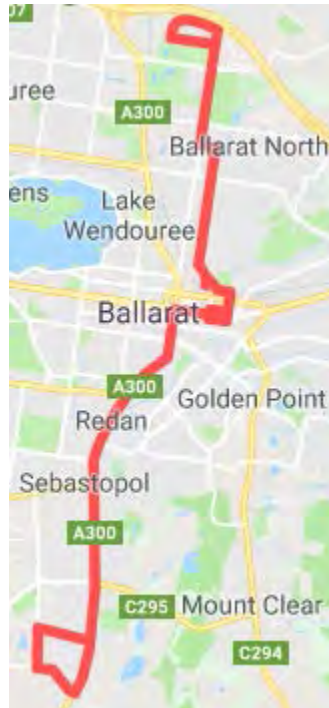
Case Study: City Circle Bus

In January-June 2016, City of Ballarat trialled a high-frequency bus along the Bridge Mall-Sturt Street corridor. The bus ran a constant loop from 8am-6pm and provided approximately a 10-minute frequency. It didn't use the low-floor myki-enabled buses of the PTV network, instead using a high-floor minibus, free to users.

Part of the rationale for the service was to act as a parking shuttle, reducing pressure on CBD parking. It was not successful in this; patronage was lowest in the 8-10am and 5-6pm periods, suggesting people were not using it for peak travel. Numbers were fairly steady from 10am-5pm, with a slight peak around lunchtime, indicating that the service was very popular and attractive for short trips up and down the retail and restaurant strip – but that the passengers had already driven or taken a PTV bus to the CBD.

These results suggest that a frequent bus along this corridor, better-integrated into the network and catering to several different trip types, would attract high patronage.

3. Sebastopol to Invermay, via Ballarat Station



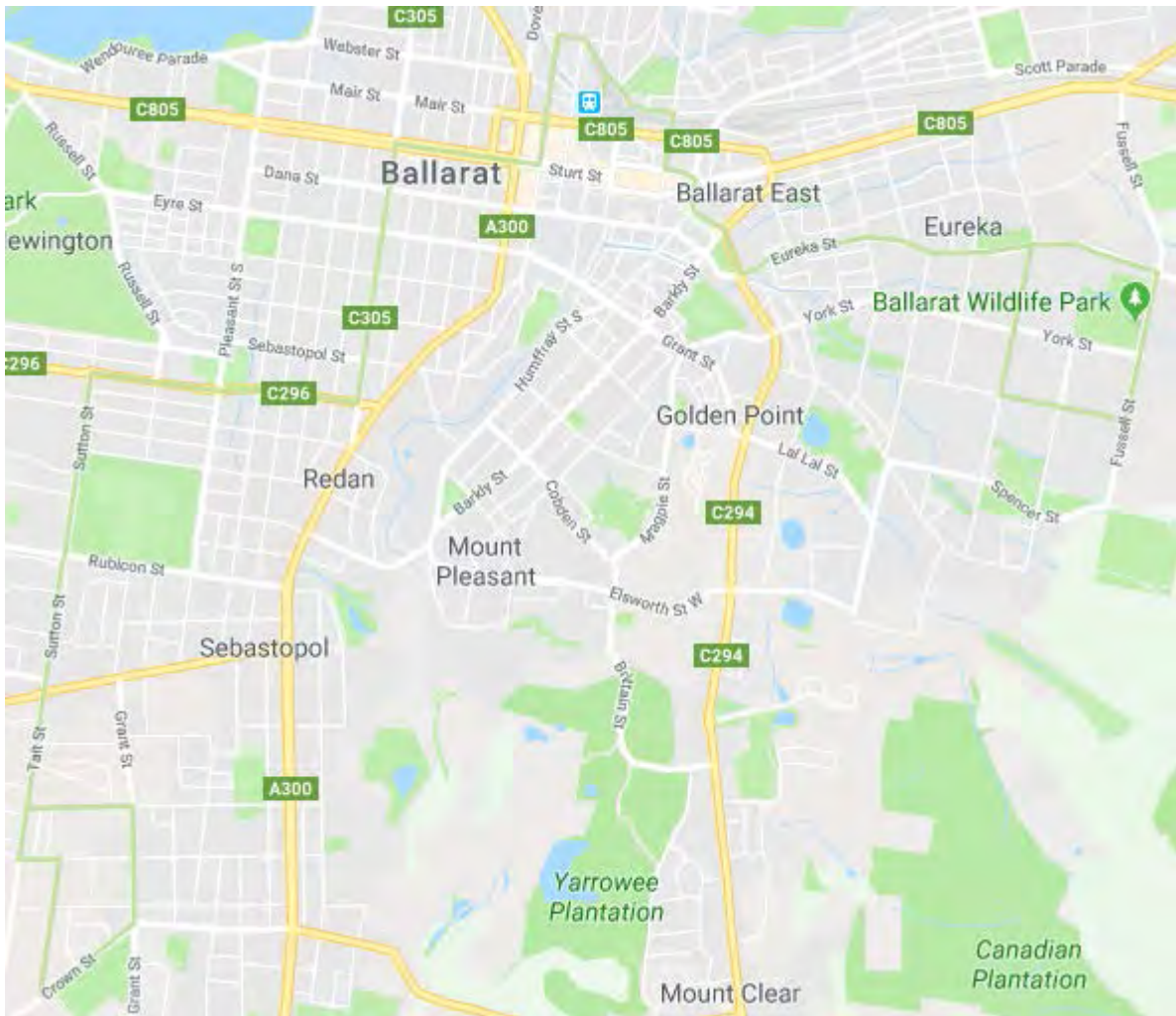
This route would combine aspects of the current Route 22 FedUni via Sebastopol with aspects of the former Route 2 Wendouree and Route 4 Invermay.

Despite many benefits in other areas of Ballarat, the current network serves Soldiers Hill very poorly. This is despite the area being well-suited to public transport, due to the prevalence of densely-packed terraces and an easily-walkable layout of streets. The Lydiard Street section of the former Route 2 Wendouree was reasonably well-patronised, but the existing routes through the area are circuitous and infrequent.

This reformed service would provide a fast, direct and frequent service for north-south travel via central Ballarat. It would serve key housing developments in southern Sebastopol; several supermarkets and shopping precincts along the Midland Highway; FedUni's SMB campus; Central Square and Bridge Mall; Ballarat Station; key terrace housing along Lydiard Street; Northway shopping precinct; and Invermay Park.

The route would not travel to FedUni, as the current Route 22 does; this function would be taken on by another, longer orbital route detailed below.

4. Sebastopol to Eureka, via Ballarat Station

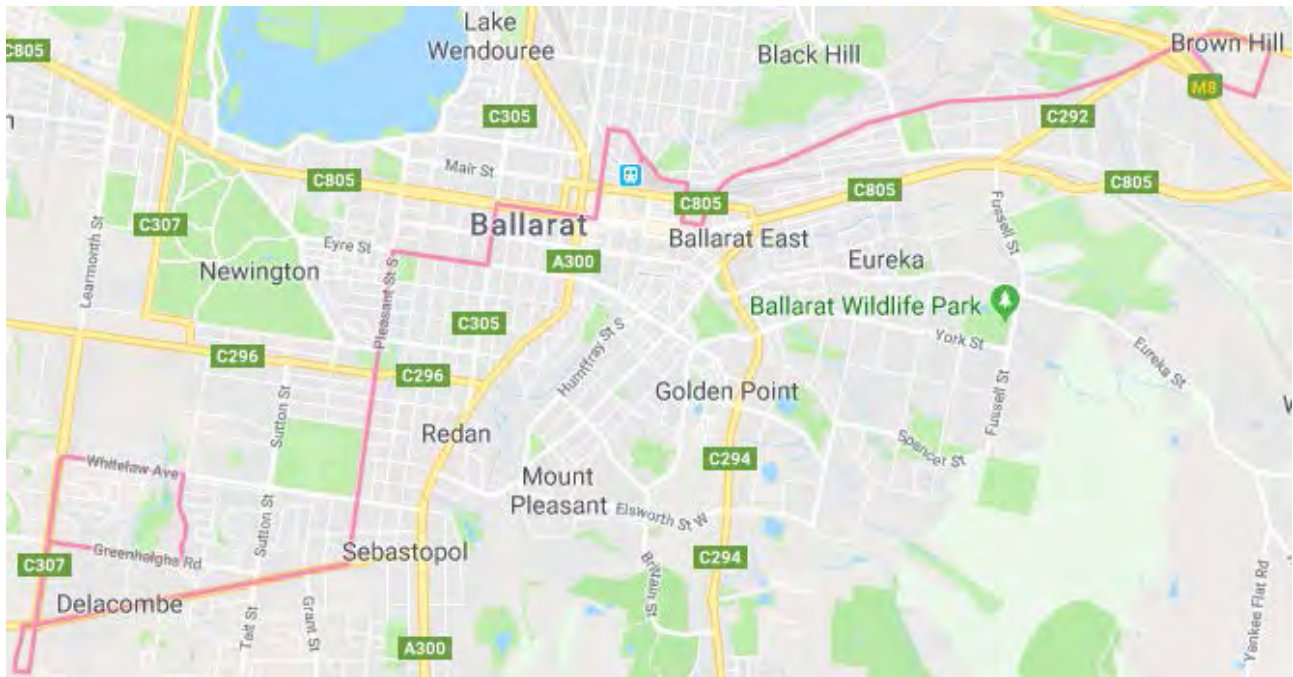


This route would largely merge the existing Route 24 Sebastopol with a newly-created route in Ballarat East. Under the recent reforms, Canadian lost most of its coverage, stranding many residents. The previously direct (albeit one-way) service along Victoria Street was also diverted to cover parts of Eureka; since we propose to straighten the route along Victoria Street, this route would travel along Eureka Street to compensate.

This route would service key housing areas throughout Sebastopol, Delacombe and Redan, with few changes from the successful existing route. After leaving Ballarat Station, the route would serve Bridge Mall & Main Road; the Eureka Centre; and Ballarat Wildlife Park. If and when a new station is opened at Warrenheip, this route could easily be extended along Eureka Street to connect with trains and other buses there.

Given the existing high patronage of Route 24, and the geographical areas it serves, this route is a leading candidate to become the fourth SmartBus route in the medium term.

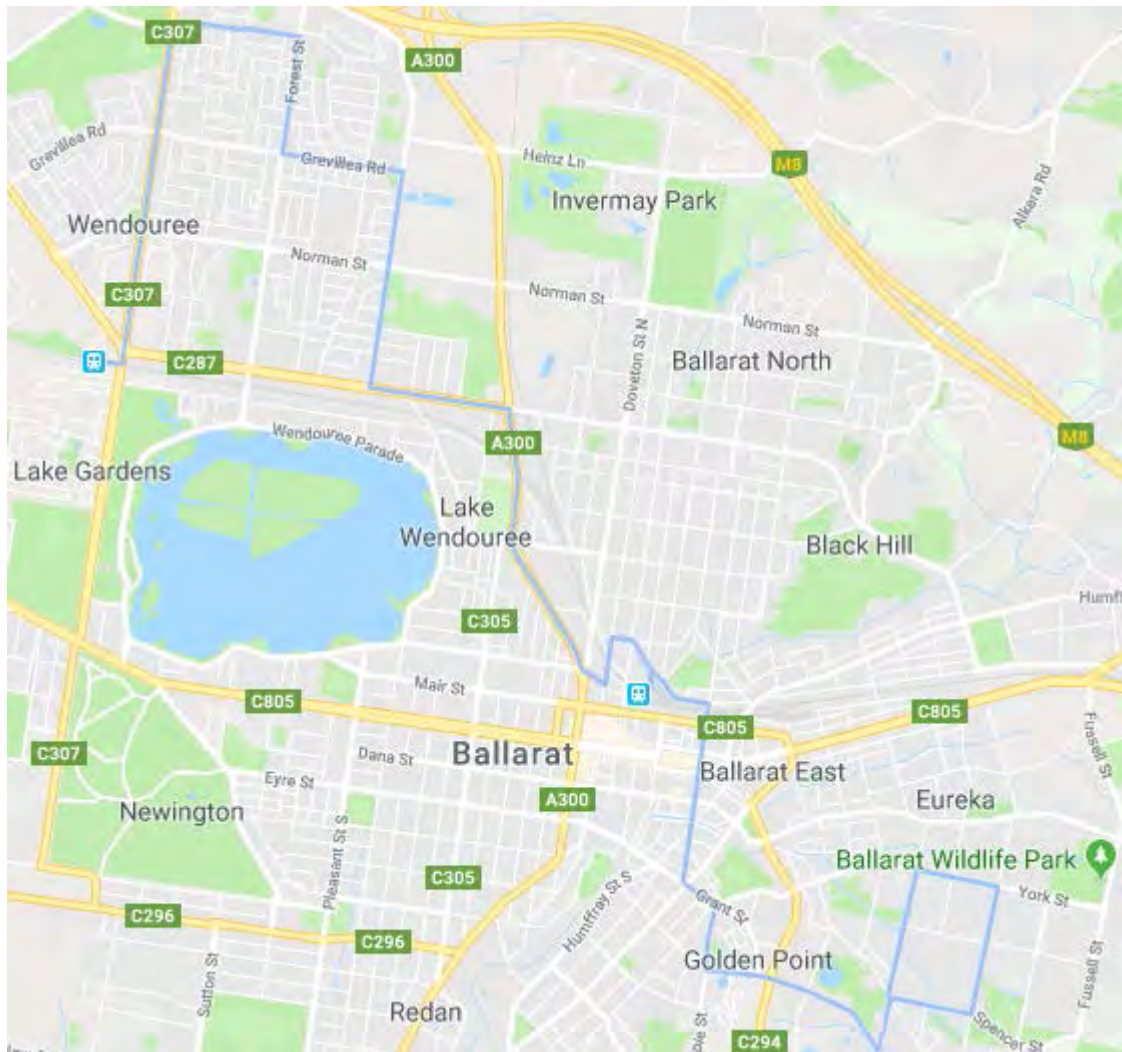
5. Delacombe to Brown Hill, via Ballarat Station



This route broadly combines the existing Route 25 Delacombe with aspects of Routes 14 Black Hill and Route 15 Brown Hill. It would serve Delacombe Town Centre; several aged care facilities and retirement villages; numerous sporting facilities on Pleasant Street; the La Trobe Street shopping precinct; Queen Elizabeth Centre; as well as many residential areas and smaller shopping precincts. It would also combine with other routes to increase capacity up and down Sturt Street, including the Hospital precinct.

This route is designed such that it can be extended as further housing developments are built in Brown Hill, beyond the Western Freeway.

6. Wendouree to Canadian, via Ballarat Station

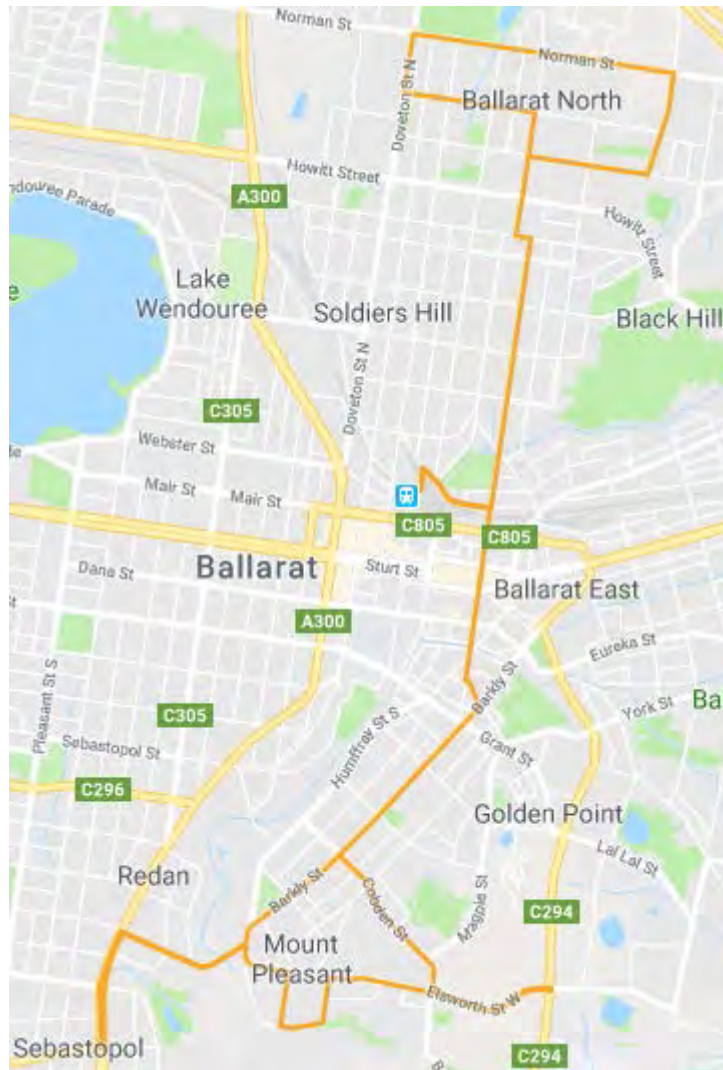


This route combines the very well-designed Route 12 Wendouree, with a newly-created route which borrows aspects of the existing Route 21 and the former Routes 8 & 9 (Eureka & Canadian). In doing so, it allows the new Buninyong route to take a more direct path along Main Road, as the former Route 10 used to.

While the last round of reforms absolutely did the right thing in getting rid of the large one-way loops of the former Routes 8 & 9, in doing so it removed coverage from areas that needed it. This reform would return coverage to these areas, in a fairly direct and efficient way that aligns with the spirit of the last round of reforms.

The route would serve Wendouree Station; Stockland Wendouree and adjacent Big Box retailers; residential northern Wendouree; the eastern end of Howitt Street precinct; Eureka Stadium; housing and retail along Creswick Road; the library & future GovHub; Ballarat Station; Bridge Mall; Sovereign Hill; and residential Canadian and Ballarat East.

7. Black Hill to Mount Clear via Ballarat Station



This route largely combines the old Route 5 Black Hill with the current Route 23 Mount Clear, to form a simple and direct north-south route covering largely residential areas.

The existing Route 14 Black Hill is very indirect and unattractive to riders (see Case Study: Faster to walk). A more direct route would be much quicker to operate, and use fewer resources than the current indirect one; and would be much more attractive to riders, increasing fare revenue.

At the northern end of the route, it would serve Northway shopping precinct, which would give quick and direct access to those who live in the area. It also allows for easy interchange with other routes at Northway.

The southern end of the route largely matches the time-honoured path Route 23 takes, however it does have two extensions to improve connectivity. It is proposed the route would have a short western extension to the Sebastopol shopping precinct, allowing access to these shops and for easy interchange with other routes; and it is proposed the route would have a short eastern extension to Zagames, to give access to the venue and interchange with other routes. These short extensions would only add a few minutes to the travel time for the route, but would massively increase the connectivity, and allow people who lived in the Mount Pleasant area to travel much further within a given period of time, by eliminating the need to head into the CBD and backtrack.

This route covers mostly residential areas and serves few key destinations, and has traditionally had relatively low patronage on the southern end. As such, it is anticipated it would be one of the lower-frequency routes on the network, at least initially.

Case Study: Faster to walk

The current Route 14 serving Black Hill is extremely indirect, going completely against the spirit of the reforms, and is therefore not attractive to anyone who has any alternative. The feedback we've received indicates that many regular bus users from Black Hill have abandoned the buses entirely, opting instead to drive

One former user who lives near Black Hill Primary School used to take the Route 5 Black Hill bus, which through-routed with the Route 10 Buninyong bus, which got him to his workplace. When the timetables changed so he no longer had a single-seat journey every time, this trip was still viable, so he stuck with the buses.

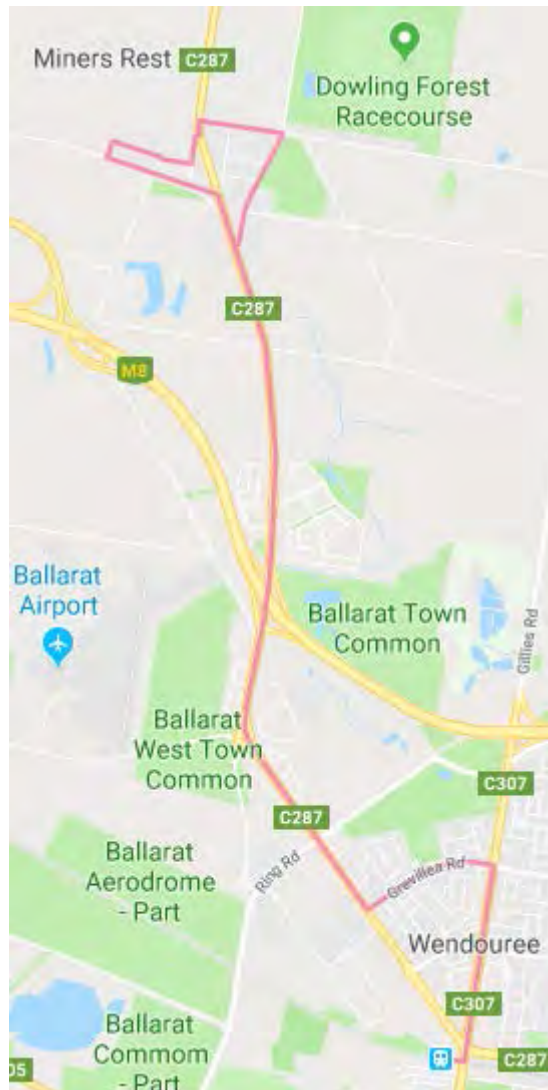
Under the new network, Black Hill's bus is so indirect it is unusable. This user noted that it would take him approximately 25 minutes to take the bus to Ballarat Station, whereas it takes only 20 minutes to walk there. This slow path, combined with the need to interchange, means the bus is no longer a viable option for him – so now he drives to work every day.

8. Ballarat Station to Creswick



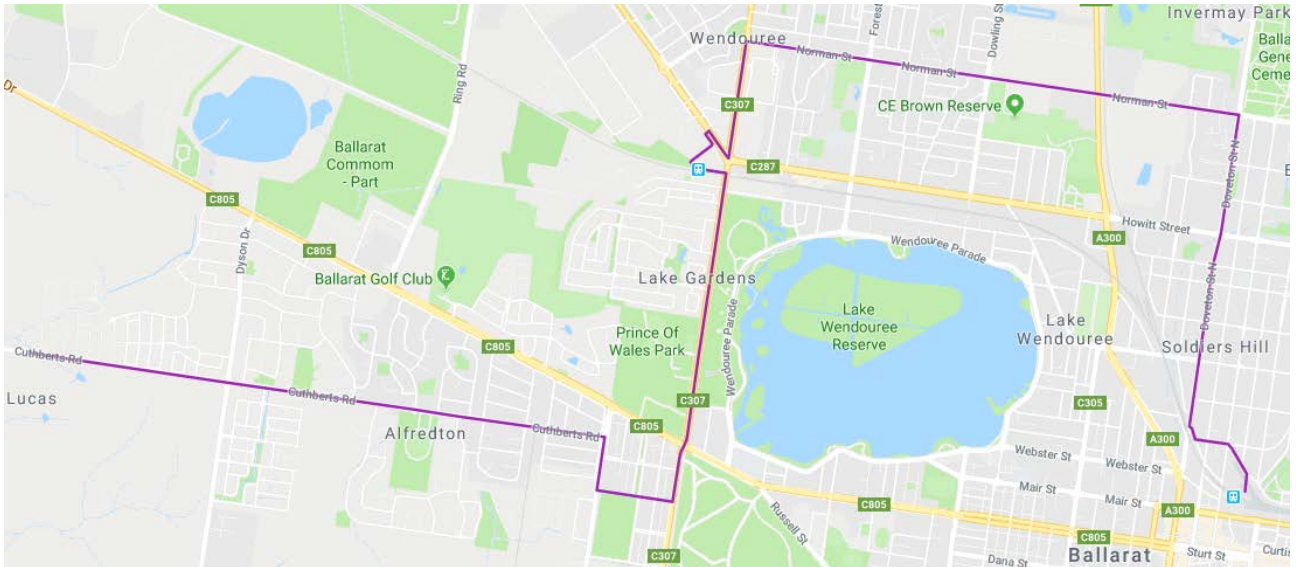
This route would not have a cross-town pair; it would largely remain the same as the existing Route 30 Creswick. It would terminate at Ballarat Station; travellers intending to go onto Bridge Mall or other destinations in the CBD will have a wide range of routes to take them there, and can therefore be assured they won't have to wait long for a connection.

9. Wendouree Station to Miners Rest



This route would largely follow the path of the existing Route 31 Miners Rest. It would not initially have a cross-town pair, but is designed to be easily incorporated into the Wendouree-Buninyong SmartBus route when the time comes.

10. Ballarat Station to Alfredton (via Wendouree)



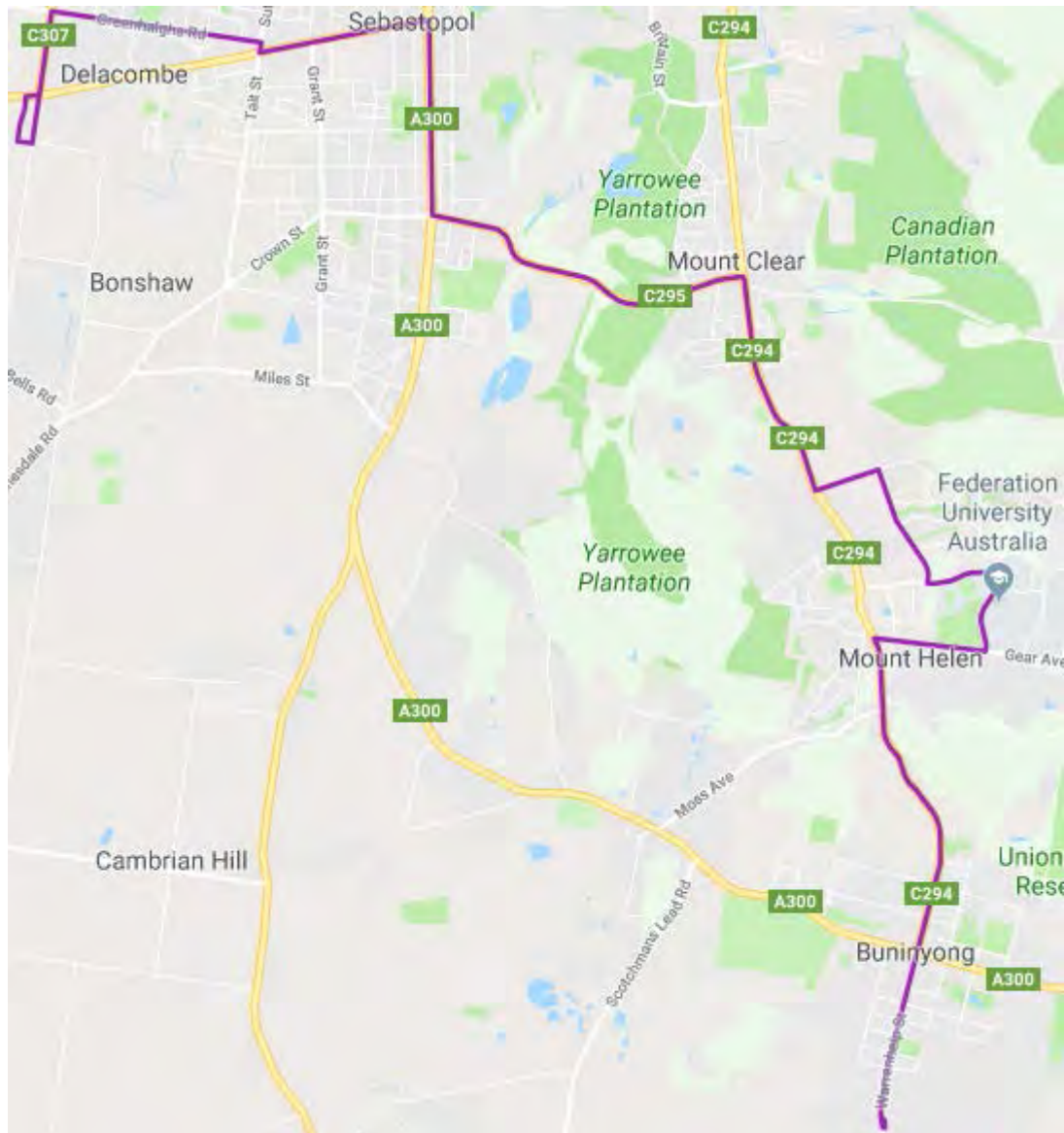
This route largely follows the same concept as the existing Route 10 Alfredton via Wendouree, but with a few tweaks:

- the Alfredton section is swapped with the Lucas-Brown Hill SmartBus route, so the SmartBus route can follow the main arterial
- the section through Soldiers Hill has been straightened out for a more efficient and attractive path

This route is designed to provide connectivity between the western suburbs and Wendouree, as well as providing a cross-town service between Ballarat North and northern Wendouree, and additional service from Ballarat North and Soldiers Hill to the CBD. It is not very attractive for people wishing to travel all the way from Alfredton to the CBD, because it is not designed to be – those wishing to travel to the CBD should either walk to the Route 2 SmartBus; or where this is impractical, interchange with the SmartBus at the corner of Gillies Street.

As such, it is essential that this route's timetable be aligned with train times at Wendouree Station, not at Ballarat Station.

11. Delacombe to Buninyong, via Sebastopol



This route combines aspects of the existing Route 22 FedUni via Sebastopol, with the former Route 19 Delacombe – Sebastopol West, to form a semi-orbital route that provides a direct path from the southwestern suburbs to the Mount Helen education and employment precinct, and connects with several other radial routes.

The current Route 22 does some of these things well, and others poorly. It serves the Sebastopol-CBD market very well, in concert with Routes 24 and 25, but the fact that it only skirts along Sebastopol's eastern edge means it has minimal catchment for those wishing to travel to Mount Helen. Those who live near Routes 24 and 25 must still travel all the way into the CBD before changing buses and travelling all the way back again. This proposed

route would alleviate this problem by providing a partial orbital route, that intersects with several radial routes for those who need to make multi-leg trips, while providing a direct service to Mount Helen for a much larger catchment of people. It also provides direct access to Delacombe Town Centre for the people of Mount Helen, Mount Clear and Sebastopol.

Another flaw with the current Route 22 is that it serves FedUni's campus, but not the adjacent Technology Park – despite travelling very close to it. The nearest bus stops are a long and fairly arduous walk from most of the workplaces in the Tech Park. The current timetabling of Route 22 also requires excessive idle time at FedUni itself, which is at least partially due to the need to align with class times (dropping students off a few minutes before the half-hour and picking them up a few minutes after the half-hour, and nothing to do in between). This idle time would be better spent in revenue service, so it is proposed that the bus does the FedUni-Buninyong leg to make better use of this time; give access to the Technology Park; and increase the frequency of buses to Buninyong.

Frequencies

During the main service hours of 7am-9pm, we propose that buses run to simple, easy-to-remember clockface times, that align as much as possible with both train times and with other key timings (such as shift and class times at universities and schools).

At the completion of the Ballarat Line Upgrade project, trains will run every 20 minutes in the peak, and every 40 minutes in the off-peak. 40 minute frequencies are not clockface times, and are both difficult to remember and difficult to coordinate with, so it is difficult to achieve this goal on all routes. Distinct from this bus proposal, we urge the government to commit to more track duplications which will allow a shift to 15/30 minute train frequencies as soon as possible; however in the meantime, the government must adjust bus frequencies to cope with the unusual train timings.

Within the main service hours, we propose a 3-tiered service:

- low-patronage routes should run at 40-minute headways, aligned with trains
- medium-patronage routes should run at 20-minute headways, such that every bus aligns with a train in the peaks, and every second bus aligns with a train outside the peaks
- high-patronage SmartBus routes should run at the maximum frequency the budget can allow; ideally 10-minute headways all day

Currently, buses run to much lower frequencies on weekends; some routes run only every 90 minutes, for example. It is currently unclear whether weekend train frequencies will be similar to weekday frequencies, or will remain hourly; but the same broad principles should apply. To make the bus network usable on weekends, bus frequencies need to be increased; and the frequencies and timings should allow connectivity with trains.

Outside the main service hours, from 5am-7am and 9pm-11pm, it is less necessary to have consistent, clockface frequencies. Patronage will be lower, and while some passengers will be getting around Ballarat, a large proportion will be commuters to and from Melbourne. As such, buses at these times should largely run to meet the trains, so that commuters can get to early services in the mornings, and home from later services in the evenings. Commuters will feel secure in leaving their cars at home, knowing that almost any train they catch home will have a connecting bus. Revellers and movie-goers within Ballarat will similarly know they'll have a service available, and can plan the end of their night accordingly.

Span of Hours



Ballarat bus at night (Creative Commons, [jayessaitch](#))

Currently, commuters who wish to catch the 5:21am train from Ballarat station (as many do), cannot take the bus to the station – there is no route that runs early enough for this train. Several routes do not run early enough to catch the next train at 6:15am either; all routes are running by the 6:44am train. The lack of early morning services is a key contributor to the parking lots at Ballarat and Wendouree stations filling up around 7am – many commuters catching trains before then have no choice but to drive.

Commuters who catch the 5:10pm or 5:50pm trains in the evening can be reasonably assured of being able to get a connecting bus home by the time they get back to Ballarat; but commuters who catch the 6:23pm train, or any train after it, will not have a bus available by the time they get back to Ballarat. This is a key contributor to parking pressures at Ballarat and Wendouree Stations; people who cannot rely on a bus will inevitably drive.

Similarly, Ballarat's night life is experiencing a boom, with a fantastic restaurant and wine bar culture developing, but people are unable to use buses to access it. While frequencies would understandably drop after the evening peak, a usable service in the evenings would allow passengers to catch later trains from Melbourne, or eat and socialise in central Ballarat, before taking the bus home.

Even setting aside the tram and train lines that run well into the evenings, hundreds of standard (non-SmartBus) bus routes in Melbourne run until at least 9pm on weeknights – even in relatively low-patronage outer-suburban contexts. It is not unreasonable for people in a regional city like Ballarat to expect a bus service that does the same.

We propose that all routes run to a frequent, clockface frequency from 7am to 9pm, 7 days a week; and that in the early mornings and evenings, routes “meet the trains”. That is, instead of running to a clockface frequency, they just run at times that coordinate with trains, whatever they may be; but from first service till 11pm, whenever a train is running, there needs to be a bus to meet it. At least initially, frequencies in the early mornings and late evenings do not have to be high, they simply need to be available – it just needs to be possible to get an early bus to the train, or a bus home after the movies. As more and more people start to use these buses, higher and more memorable frequencies can be introduced.

In most cases, people need a bus to be reliably available for both legs of their trip; if it's available in the morning but not the evening, or vice versa, they will give up and drive for both trips. It is therefore extremely important that both sides of this equation be addressed; but it is also true that doing so provides twice the benefit. By introducing services in the evening that attract new passengers, PTV receives both the fare for the outbound evening trip, and a corresponding fare earlier in the day for their inbound trip.

Procurement



Electric bus in Germany (Creative Commons, [Lord Alpha](#))

Implementing this plan could largely be done using existing assets, however the increase in frequencies is likely to require some procurement of new buses. We recommend that any new buses procured be electric battery-powered buses, rather than diesel buses.

Electric buses are being deployed internationally:

- A partnership between Siemens & Volvo has been introducing electric bus systems in Hamburg, Stockholm and Gothenburg.²
- In Luxembourg six Volvo buses and four ABB automatic e-bus chargers will be integrated into the country's urban public transport system by 2016.³
- Recent technological advancements show that battery longevity is no longer an issue: Proterra's new electric bus drove 258 miles on a single charge in a recent test⁴
- In 2015 Brightsun's all-electric bus travelled 1,018km from Melbourne to Sydney, setting a new world record for the greatest distance covered by an electric bus on one charge.⁵

2

[http://www.siemens.com/press/en/pressrelease/?press=en/pressrelease/2015/mobility/pr2015010104moen.htm&content\[\]=MO](http://www.siemens.com/press/en/pressrelease/?press=en/pressrelease/2015/mobility/pr2015010104moen.htm&content[]=MO)

3 <http://reneweconomy.com.au/2015/abb-microsoft-launch-robotic-fast-charger-for-electric-buses-55767>

4 <http://www.fastcoexist.com/3051475/meet-the-electric-bus-that-could-push-every-other-polluting-bus-off-the-road>

5 <http://reneweconomy.com.au/2015/australian-all-electric-bus-drives-into-record-books-1018km-on-one-charge-39659>

The move to electric buses would address many community concerns:

- eliminating noise, odour and diesel particulate pollution for those who live near where buses run, or idle at termini
- eliminating fumes for those walking or cycling near buses
- dramatically reducing greenhouse gas emissions, even on the existing Victorian electricity grid's mixture of renewable and non-renewable energy
- allowing a much easier transition to zero-emissions travel, as the proportion of renewable energy in Victoria's grid increases

As the results of the recent Parliament of Victoria Inquiry into Electric Vehicles showed⁶, an electric bus is cheaper over its life cycle than a diesel bus, but the split between upfront and ongoing costs represents a barrier to operators transitioning their fleets. Electric buses are significantly cheaper to run and maintain, but are more expensive to buy upfront. Similarly, while bus operators already have the infrastructure and workforce in place to fuel and maintain diesel buses, most would need to buy new plant and equipment, and either retrain existing workers or hire new workers, to maintain and charge electric buses.

There is therefore an important role for government to play in kick-starting the transition to electric bus fleets, taking a longer-term view of the community and environment's best interests. For example, the government could provide grants for the purchase of the buses or for retrofitting depots; or subsidise training to update the skills of bus maintenance workers. Building these electric buses locally could also provide a massive boost to job numbers and the local economy.

⁶ https://www.parliament.vic.gov.au/images/stories/committees/SCEI/Electric_Vehicles/EIC_58-13_Text_WEB.pdf

Supporting Evidence

Evidence clearly shows that well-planned bus services that connect places in a timely manner are rewarded with high levels of patronage on these services and the public transport network generally. In Melbourne, the strong patronage growth on the orbital SmartBus routes 901, 902 and 903⁷ are testimony to that fact, as is the success of the DART services 905, 906, 907 and 908 from Manningham to Melbourne CBD.

The 401 service, introduced in 2008, between North Melbourne railway station and the Melbourne University precinct in Carlton is also a major success⁸. The 401 service provides a convenient and efficient cross-linkage from the western and north-western suburbs direct to Melbourne University and other nearby destinations on the northern perimeter of the city, highlighting the value of strong bus connections between heavy rail stations and key destinations like Universities and hospitals.

Other success stories from bus improvements abound just in Melbourne:

- Recent reform to Brimbank's bus network, featuring more direct and frequent services, as well as better connections with trains and key local destinations, saw 10% patronage growth within the first six months.
- Williams Landing station in the rapidly growing City of Wyndham opened in 2013 with reconstructed route bus services, to Point Cook and Sanctuary Lakes (Routes 494, 495, 497) with peak hour headway between 10 and 20 minutes, witnessed significant patronage growth with the connecting bus services providing much of this growth.
- Bus improvements to 15 minute frequencies or better have generally demonstrated a 'patronage elasticity' greater than 1 - meaning 10% growth in route-kilometres provided leads to more than 10% growth in patronage. In the case of the 508 route from Moonee Ponds to Alphington, a doubling of Sunday frequencies led to a tripling in patronage.
- Route 601 connecting Huntingdale railway station with Monash University Clayton, Monday to Friday, with 4 minute headway for much of the day, is one of the most heavily utilised services in the Melbourne metropolitan area.

Furthermore, Geelong's new Route 1 (North Shore Station to Deakin University via Geelong City) has proven a great success in a similar environment to our proposal for Ballarat.

Access to Ballarat's CBD is currently a hot topic among residents. Council is currently

⁷ Bus patronage rose 29% in the three years from 2006 to 2009, a result attributable to the rollout of the orbital SmartBus routes in 2006 with 15-minute frequencies. Patronage grew twice as fast (4% versus 2% per year) on routes with full-time operation (7 days until at least 9pm) than on routes without evening or weekend services.

⁸ Most recent publicly available data shows annual patronage on route 401 grew from just under 2 million in 2010/11 to over 3.5 million in 2011/12.

considering the implementation of a new parking plan, and improvements to cycling and walking infrastructure are slowly being introduced. Significant state government investment at the Civic Hall and Ballarat Station Precinct will increase pressure on parking, and provide further impetus to increase public transport's mode share. The public is hungry for viable alternatives to driving, and improvements to public transport would be very well-received by the travelling and voting public.

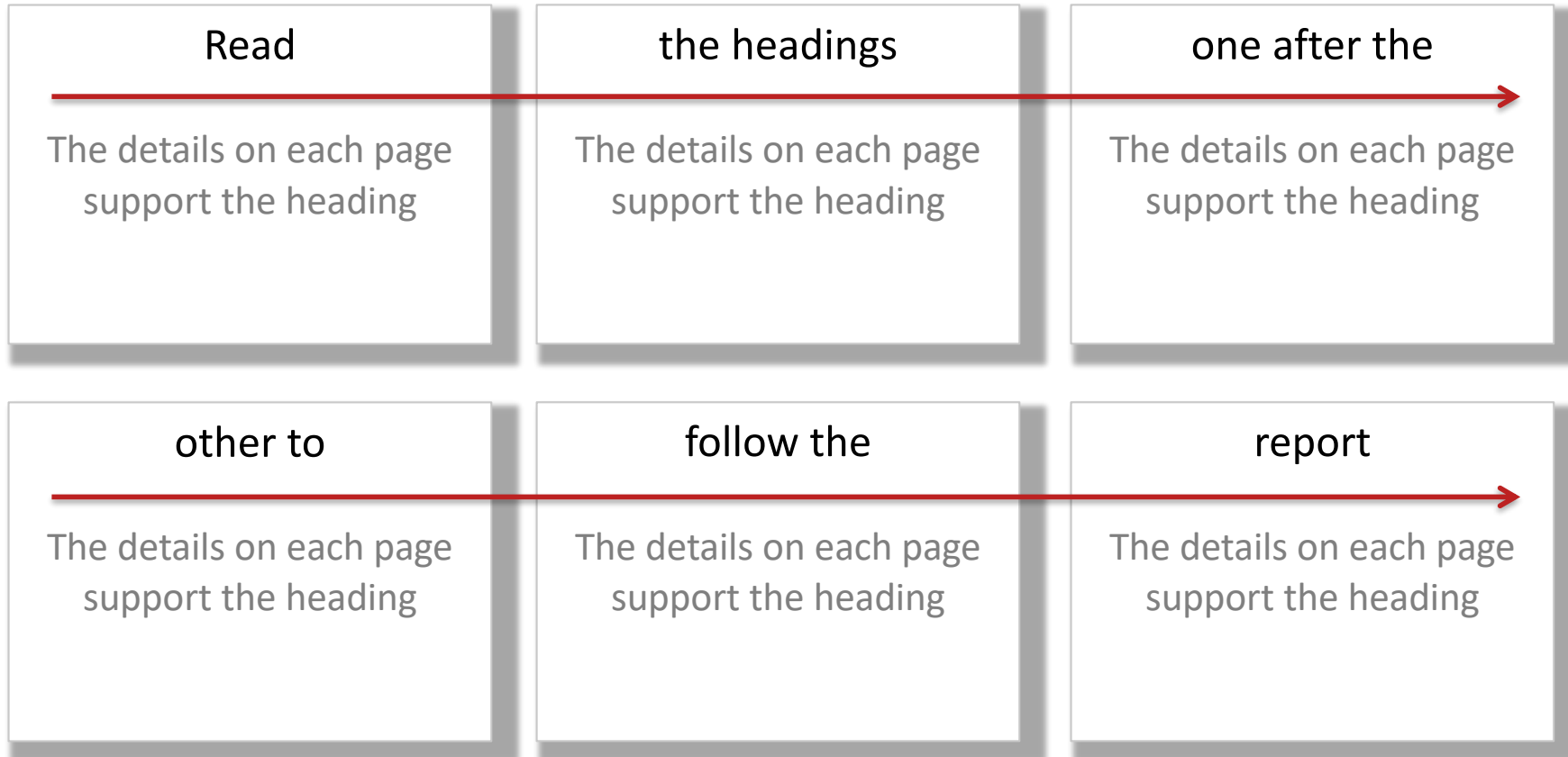
Public transport has enjoyed strong community support for a long time but real improvement in bus service quality over recent decades has been minimal. The huge success of V/Line passenger services, with immense year-on-year passenger growth, shows what happens when governments invest in providing serious, high-quality public transport – build it, and they will come. It is time for buses to receive the same approach as trains.



Ballarat Walking Framework – Evolution Roadmap



How to read this report



CONTENTS

1. Introduction
2. Preliminary Data Analysis
3. Recommendations



Ballarat seeks to create more opportunities for walking...

The study forms part of the wider strategic work around transport. The Walking Plan will be a key pillar of the Ballarat Integrated Transport Plan. The overall objective of this work is to maintain and enhance transport options to improve the quality of life, urban amenity and cost of living in Ballarat.

This report provides a framework for Council to develop a walking strategy for the municipality. The strategy would aim to improve walking for all residents (urban, sub-urban and rural) and for all types of walking recreation and as a mode of transport.

Walking as a mode of transport is another focus. As a transport mode walking has wider benefits in addition to public health, including reduced traffic and parking congestion, more vibrant economy and less pollution.

The City of Ballarat is seeking to create more opportunities for recreational walking. Recreational walking provides benefits for psychological and physical wellbeing.

Both recreational and transport walking can be supported together, and a holistic approach will get the best outcomes for the community.

Ballarat has seen a recent drop in walking as a mode of transport to work, which the stats below demonstrate:

- In 2011, 1,410 people (3.3%) walked to work
- In 2016, this reduced to 1,320 people (3%)
- Driving to work has increased by 2,436 from 2011-2016 with now 75% of the mode share

With these trends, Ballarat will suffer from increased traffic congestion and parking availability issues. The over-reliance on car travel creates physical barriers that further impact on walking (in terms of amenity & safety). This has a cumulative effect, causing more pedestrians to question their mode choice.

...in line with The Ballarat Strategy: Today, Tomorrow, Together

The Ballarat Strategy Section 4: *Connected Ballarat* (2015) outline objectives for achieving walkability.

Specific initiatives are focussed on creating opportunities which optimise increases in both recreational walking and walking as a mode share, including Initiatives:

- 4.2 (benchmarking)
- 4.6 (establishing a Neighbourhood Links Program)

Initiative 4.2 sets out clear ways of benchmarking for measuring modal shift - using modelling outputs from the Victorian Integrated Transport Model (VITM) from 2011 transport network data; as well as the 2011 Census data. This report explores the relevance of these benchmarking measures in light of new technology and approaches.

Initiative 4.6 outlines the need for community engagement in gathering anecdotal data to inform a 'Neighbourhood Links Program'. Similar programs that are currently underway include:

- *Active Ballarat*
- *Right to the Night*

The programs gather perspectives from members of the community relating to their walking experiences. However, they focus on particular facets of different types of walks -

- *Active Ballarat* focusses on walking for recreation & health
- *Right to the Night* focusses on personal security of pedestrians in the context of Ballarat's night-time economy

Within these foci, data on wider characteristics of walking is also being collected:

- Where people's destinations are
- What routes they use
- How often they walk to their destinations
- What times they walk
- Key barriers and risks impacting on walking

A holistic approach to walkability will ensure optimal outcomes

The ongoing work to improve walkability needs to be imbedded within an overarching *Walking Plan* with a clear, holistic direction.

The City of Melbourne's *Walking Plan 2014-2017* is one such strategic document that helps to guide an overall approach to improving walkability of the City. The *Walking Plan* sits within the strategic work to achieve *A Connected Melbourne*.

Melbourne's *Walking Plan* uses a range of pedestrian volume data in addition to anecdotal information from community engagement to estimate the important issues and links in the network. The analysis informs the planning, management and works needed to create better walking environments.

This achieves the following multi-faceted benefits:

- Financial – reducing travel costs including time incurred by dependency on other modes
- Economic – promoting street activity which increases business vitality
- Health-related – provides opportunities for improving physical and psychological wellbeing
- Environmental – reducing air and noise pollution associated with car use
- Social – providing more opportunities for social interactions at personal and community scales

Using a similar approach, Ballarat's *Walking Plan* should:

- Develop a Principal Pedestrian Network and hierarchy of pedestrian links
- Identify the various trips people make and key gaps in infrastructure which are evaluated against demand
- Identify and manage key risks related to expanding, improving and operating the pedestrian network – in order to create network that is safe, comfortable, interesting and accessible
- Recognise Ballarat's unique assets and challenges such as wide streets and extensive use of blue stone gutters
- Appropriately optimise links based on hierarchy of demand
- Focus on specific destinations that have the capacity to generate significant pedestrian demand
- Set clear measurable and achievable outputs
- Provide overarching direction and actionable steps to support key Initiatives in The Ballarat Strategy
- Continue to account for Ballarat's growing geographic area including the decentralisation of commercial activity and community infrastructure

Recent improvements include improved crossings and amenity...

Improved pedestrian crossings

- Around Lake Wendouree
- Across side streets along Sturt Street

Kerb outstands and median refuges along

- Armstrong Street
- Sturt Street

New footpaths along

- Sturt Street past Victoria Park
- Smythes Road, Delacombe

Lighting improvements have also been announced during the recent State election for paths around:

- Lake Wendouree
- Victoria Park

The Neighbourhood Links Program is working with local schools to identify improvements that can be made to encourage people to walk to school. Key to these improvements is the community involvement and providing priority and greater safety for pedestrians.



New Wombat Crossing across Wanliss Rd (at Sturt St)

Planning is well underway for other specific interventions...

The City of Ballarat is currently working with state government agencies and the local community to investigate improvement options in some areas of high or increasingly high intensity.

VicRoads has conducted a draft benefit cost analysis for a Ballarat Pedestrian Program (BPP). Findings from this analysis has demonstrated an overall Benefit Cost Ratio (BCR) of 3.3 for the following projects:

- A range of precinct based improvements to the:
 - Hospital Precinct
 - Main Rd, Bakery Hill Precinct
- Median pedestrian refuges along:
 - Doveton St from Sturt St to Mair St
 - Drummond St from Sturt St to Mair St
- Wombat crossings across:
 - Camp St (at Sturt St)
 - Humffray St (at Little Bridge)

While the various projects outlined in the VicRoads Pedestrian Program are welcomed, there is a lack of detail about how the sites were selected and what criteria were used to develop and refine the improvement options.

Council could develop an evidence-based framework for future improvements based on a prioritisation matrix such as that developed by the City of Darebin.



...including better paths in new & growing precincts

The structure planning for the fringe areas of Ballarat have all included much greater attention to high quality pedestrian infrastructure and links into their surrounding communities. Key examples of structure plans with proposed improvements to walking infrastructure include:

- *Ballarat West Structure Plan (2012)*; and
- *Miners Rest Township Plan (2018)*.

These plans point to well-evidenced approaches in improving pedestrian amenity in areas of intensity, as well as effective links to them.

Examples include:

- Enhanced footpath links in Ballarat West including for Sebastapol, Delacombe and Lucas;
- Pedestrian-friendly treatments including lighting, street furniture and commercial interfacing improvements in Ballarat West's Major Activity Centre; and
- Creating a high quality pedestrian mall in Miners Rest along Creek St with optimal landscaping and beautification.



Miners Rest Township Plan - Creek St Mall Artist Impression

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1. Introduction
- 2. Preliminary Data Analysis**
3. Recommendations



Council has robust information about the pedestrian network but...

GIS Mapping files include:

- Footpath network
- Traffic control devices
- CrashStats (from VicRoads Open Data)
- Public Space Furniture (such as bus shelters, seats, water fountains)
- Tree canopy coverage

Gaps to consider

- Data regarding path quality
 - Construction material
 - Width
 - Surface quality
 - DDA compliance
 - Lighting & CCTV installations
 - Infrastructure life expectancy
 - Street furniture types and qualities
- Details of pedestrian priority at intersections
- Providing accurate data to third party mapping services such as Google & Apple Maps



...lacks adequate data regarding the trips people make

This report provides initial findings in identifying existing gaps in data around planning for walking. The analysis also includes initial identification of infrastructure gaps which should be more thoroughly analysed once the various datasets have been collated.

As this report provides a framework for creating an overarching walking plan, this analysis is provided at a preliminary stage.

There is significant work underway in evaluating community needs regarding personal security at night-time and recreational walking. This is highly important and should continue.

There is a pressing need to understand legislative compliance issues related to pedestrian networks, and this should be an additional focus in the short term.

The main data gaps identified include:

- What proportion of trips are completed by walking
 - Focus on journey purpose including to education, shopping, recreation and other service trips (health)
- What links are the most important in the network
- How does time of day and of year affect people's willingness to walk
- Level of compliance with Disability Discrimination Act requirements
- A methodological approach to identifying key physical barriers for pedestrians
- Understanding of how pedestrian environments contribute to business vitality
- Perceptions of walking comfort, safety and interest within neighbourhoods
- Actual and perceived pedestrian safety & security

Targets have been established to guide future investments

A range of targets have been established

- A target of 40% canopy coverage by 2040 will guide the long-term greening of the municipality
- Increase the proportion of people walking to work and education through the 10-minute city concept in the Ballarat Strategy
- Council will manage the transport network so as to promote sustainable transport alternatives, improve accessibility and inclusiveness, and benefit the walking economy

Initiative 4.2 of The Ballarat Strategy highlights the need to establish and collect a suite of transport data to monitor the transition to a more sustainable transport system. Careful consideration needs to be given to selecting the most appropriate data having due regard to:

- The cost of data collection (and the ability to maintain collection over a long time period)
- The value of insights that can be gained from the data
- Comparison with the benefits and costs of data that is being collected by others or already exists

Other targets or goals could be established, including:

- 100% of the urban street network kilometres will have a footpath on at least one side of the road by 2022
- 90% of the urban street kilometres will have footpaths on both sides of the road by 2022
- Where footpaths are unable to be provided on either side of the roadway, the roadway will be formally gazetted as a shared zone (making the roadway a footpath)

A footpath standard design guide should be developed and adopted to standardise future footpath design and provide clear benchmarks. Elements of the footpath design guide would include:

- Width of footpaths (2.0m is recommended)
- Construction material (concrete recommended with alternative high-quality finishes in commercial areas)
- DDA compliance design elements
- Priority treatments at various crossing & intersection types
- Lighting & CCTV expectations in specific areas

But there are major gaps in the footpath network...

The key gaps in the network are mostly located in residential estates to the fringe of Ballarat's suburbs. Some key areas include:

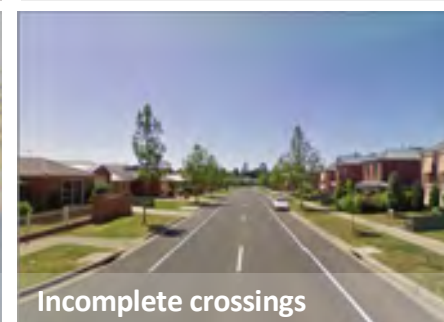
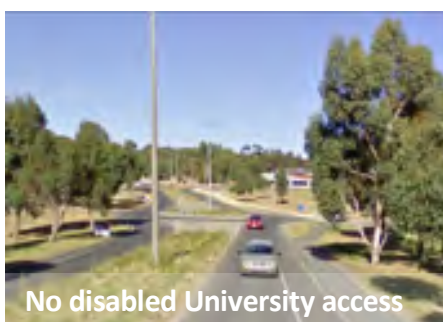
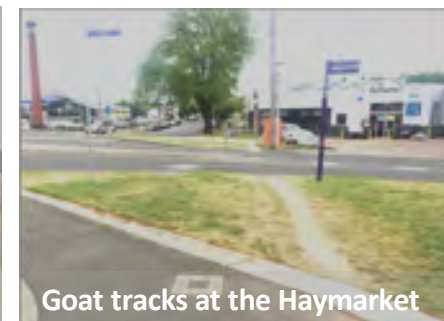
- Parts south of Greenhalghs Road, Delacombe
- Southern parts of Canadian
- Northern parts of Wendouree including
 - The area around Mount Rowan High School
 - Sports area including: basketball and badminton courts and swimming pool
- Parts south of Norman Street in Ballarat North including:
 - North Ballarat Sports Club and abutting reserves
- Parts north of Miners Rest including:
 - A lack of paths connecting to those around the Dowling Forest Racecourse and Miner's Rest Reserve
- South-eastern parts of Brown Hill, including around the:
 - Swimming pool
 - Wallaby Track access points
 - Some areas have footpath on one side only – particularly around the school

There is also a lack of footpaths in and around industrial areas. Some of these areas include:

- Eastern parts of Wendouree between Dowling Street and Midland Highway
- Western parts of Wendouree adjacent to Learmonth Road
- Southern parts of Miners Rest adjacent to Learmonth Road and Ring Road
- Southern parts of Canadian
- Northern parts of Delacombe, west of Sutton Street

Improvements to this network in residential areas will open walking up as an easier option for people 10 minutes away from key community infrastructure. In more industrial areas, it will ensure people become the priority in areas dominated by car parking, in ensuring their walk is safe when getting to and from work.

Poor streetscape designs affect industrial & residential estates



Improve accessibility for people with limited mobility

Over four million Australians live with some form of disability. The likelihood of living with disability increases with age. People with a disability value of safe, accessible and inclusive urban environments is growing as rates of disability increases. In Australia:

- 20% of the population has a disability of some kind
- 12% of the population aged under 65 has a disability
- Over half the population aged over 65 has disability
- Two in five people with disability are aged over 65
- 2.1 million Australians of working age (15 – 64 years) have disability.
- Over one third of Australia's 8.9 million households include a person with disability.

Research shows that as people age they are more likely to experience disabilities including:

- Deterioration in visual acuity
- Cognitive decline
- Reduced mobility
- Increased risk of tripping

The risks of serious injury from falls increases significantly for older seniors. In the ten-year period between 2004 and 2013, people aged 70 years and over represented 10 per cent of the population of Victoria but 33 per cent of all pedestrian fatalities.

The Commonwealth Disability Discrimination Act (DDA) requires everyone to take reasonable steps to provide access for people with a disability. DDA requirements are typically triggered when something is being changed or built. This means that:

- All new footpaths must be DDA compliant
- All new estates must be DDA compliant (amongst other things this means that the estate must have footpaths)
- All new buildings and car parking areas must be DDA compliant
- Parking regulations and street trading local laws must be enforced to ensure there is DDA compliant access along public streets

This high-level analysis found several instances of non-compliance with DDA requirements where there is scope to improve DDA performance. To resolve this Council should:

- Conduct a root & branch review of processes to ensure DDA compliance is factored into relevant Council actions
- Ensure that all designs approved by Council and all works conducted by Council are DDA compliant
- Commit significant resources to improving DDA compliance across the municipality through a staged plan of works to resolve the most critical issues in a systematic order

Council has a mobility map that needs to be kept up to date and should form part of an annual report card into the City's progress towards an inclusive pedestrian network.

Street furniture needs more even distribution across the network

DDA Compliance requires seating every 60 metres in areas of high pedestrian traffic. This does not mean there should be seats everywhere, rather the priority for providing additional seating should be focussed on high-activity pedestrian links.

Currently street furniture is concentrated in recreational areas and high intensity areas of the CBD. Although there is a lack of street furniture in other locations such as:

- Howitt St, Wendouree

Ballarat should also invest in furniture based on the user benefits as well as number of users. For example, bus stops in residential areas pose a particular issue for elderly passengers waiting for the bus, these people tend to benefit much more from seating availability but use the seat less frequently.

Given these considerations, future focus should be on:

- Bus stops that currently have no seating
- Strategic Links with high volumes of people moving along them (such as Howitt St, Wendouree)

Additionally, monitoring the condition of and features of public space furniture is critical. The existing data shows the geographical locations of existing furniture, but needs to also show:

- Furniture type (seat, water fountain, bins, planter boxes, public art, bike hoops)
- DDA compliant features of seats – namely having a seat back and handrails
- Furniture quality & condition
- Making 'interesting' places to walk through by encouraging elements of curiosity and exploration



Existing street furniture in Ballarat

Traffic control measures should ensure pedestrian priority in places of high intensity

The City of Ballarat should focus on increasing pedestrian priority in areas of intensity. This requires an appropriate hierarchy of treatments and a robust design guide that can easily be applied across the municipality. These treatments could include:

- Zebra crossings and wombat crossings that provide ultimate pedestrian priority
- Traffic signal settings that are always on for pedestrians and have short wait time for pedestrian phase call-ups
- Medians and refuge islands that provide some sense of pedestrian safety and make it easier to cross busy roads
- Shared zones that provide pedestrians with priority and slow traffic speeds
- Temporary closing roads to vehicles allows space for pedestrians and can assist in creating a place for the community to gather such as during weekday lunchtime or special events.

Examples of medium-high intensity places that require traffic control improvements include:

- Dana St Primary School environs to improve pedestrian priority from all directions
- Queen Elizabeth Centre environs including crossings across Eyre St and Dana St
- Signals along Doveton St, Lydiard St & Sturt should operate with cycle times and settings that minimise pedestrian delay
- Crossing of wide streets (such as Sturt St) can be made easier by narrowing the carriageways and minimising the walk distance from kerb to kerb
- Ballarat Base Hospital including Drummond Street and Mair Streets



Targeted interventions can help improve perceptions of safety...

Community members who participated in 'Right to the Night' identified over 150 places predominantly located within the CBD where they have walked that were of particular significance to them.

Over 75% of these were marked as 'unsafe spots' by participants, denoting negative perceptions and experiences. The most notable example of a safe place was Lydiard St Nth between Sturt St & Mair St.

The most unsafe places were often poorly lit, large supermarket car parks such as the Coles/Woolworths supermarket carpark in Lt Bridge St (with 18% of the total postings) and the Big W car park on Curtis St.

Key findings of the program demonstrate recurring features that differentiate safe places from un-safe places:

- Street lighting – which constituted the main physical environmental factor - contributing to over 40% of people's reasons in identifying 'safe' places
- Well-maintained and even decorated buildings
- Passive surveillance & levels of public activity
- Active surveillance and 'obvious' security

The study also recommends key interventions in areas consistently identified as being unsafe:

- The Little Bridge Street/Coles car park area –
 - Improving lighting
 - Redirecting buses to other locations
 - Increasing the police/security presence.
- Addressing overall issues such as:
 - Lighting
 - Improved footpaths
 - Litter problems.



...and recreation opportunities in all suburbs

Expansion of the pedestrian trail network to meet more local travel needs will make the trail network a much more intrinsic part of residents' lives.

Many residents like to walk with a purpose and reduce their walking if there is no purpose to the trip. Supplementing key trails such as the Eureka Trail with small links to improve access to key destinations will increase the relevance of these trails, encourage greater use and improve safety and health outcomes.

Maps of recreational trails should be uploaded into Google Maps and other online mapping services so that they are easy more visible and appear in web searches. Examples of these include

- Eureka Trail
- Yarrowee River Trails Network
- Connections to major recreation facilities such as Victoria Park, Lake Wendouree and various bushland reserves and plantations

Key elements of recreational walking include the ability to cross arterial roads and the amenity of walking in local streets.

These could be applied to make it easier to walk along street links, to cross roads or intersections or to make it a more pleasant experience to walk. Pedestrian amenities such as shade trees, seating and active frontages are provided in some areas but are lacking in most suburbs.

Council will manage the transport network so as to promote sustainable transport alternatives, improve accessibility and inclusiveness, and benefit the walking economy.



Canopy trees create significant amenity

These should be focussed on key community destinations

Key community destinations would include:

- Maternal Child Health Centres and Pre-schools
- Primary Schools
- Secondary schools
- University & TAFE campuses
- Local shops
- Community centres
- Hospitals and medical centres

This focus on key local destinations should aim to provide high quality pedestrian environments that can attract trips that may otherwise be made in a car.

The City could engage with the community to map the most important issues with the pedestrian network near these key destinations. This would be similar to the 'Right to the Night' mapping.

Council will encourage a pattern of land use that supports the viability of high-frequency public transport, and utilise the concept of the '10 Minute City' to support walking and cycling to key destinations and local neighbourhoods.

Council will work with schools and local communities to improve walking and cycling connections within 10 Minutes of key destinations, as part of a Neighbourhood Links Program.

In the short-term, pilot projects will be pursued with local schools to reduce the barriers to kids walking to and from school. Benefits of shifting car trips to active transport include:

- Increasing levels of physical activity (and associated physical, psychological and social health benefits)
- Helping children maintain healthy weight
- Reducing the environmental health damage caused by excessive car use (for example, air and noise pollution, global warming)
- Reducing inequalities in children's social and physical health associated with physical activity, obesity, and motor vehicle crash injuries.

Following review of the pilot program, it is expected the neighbourhood links program will be offered to all neighbourhood areas to improve the permeability and walkability of our neighbourhoods. Types of improvement would include providing basic facilities, amenity and safety improvements and priority improvements.

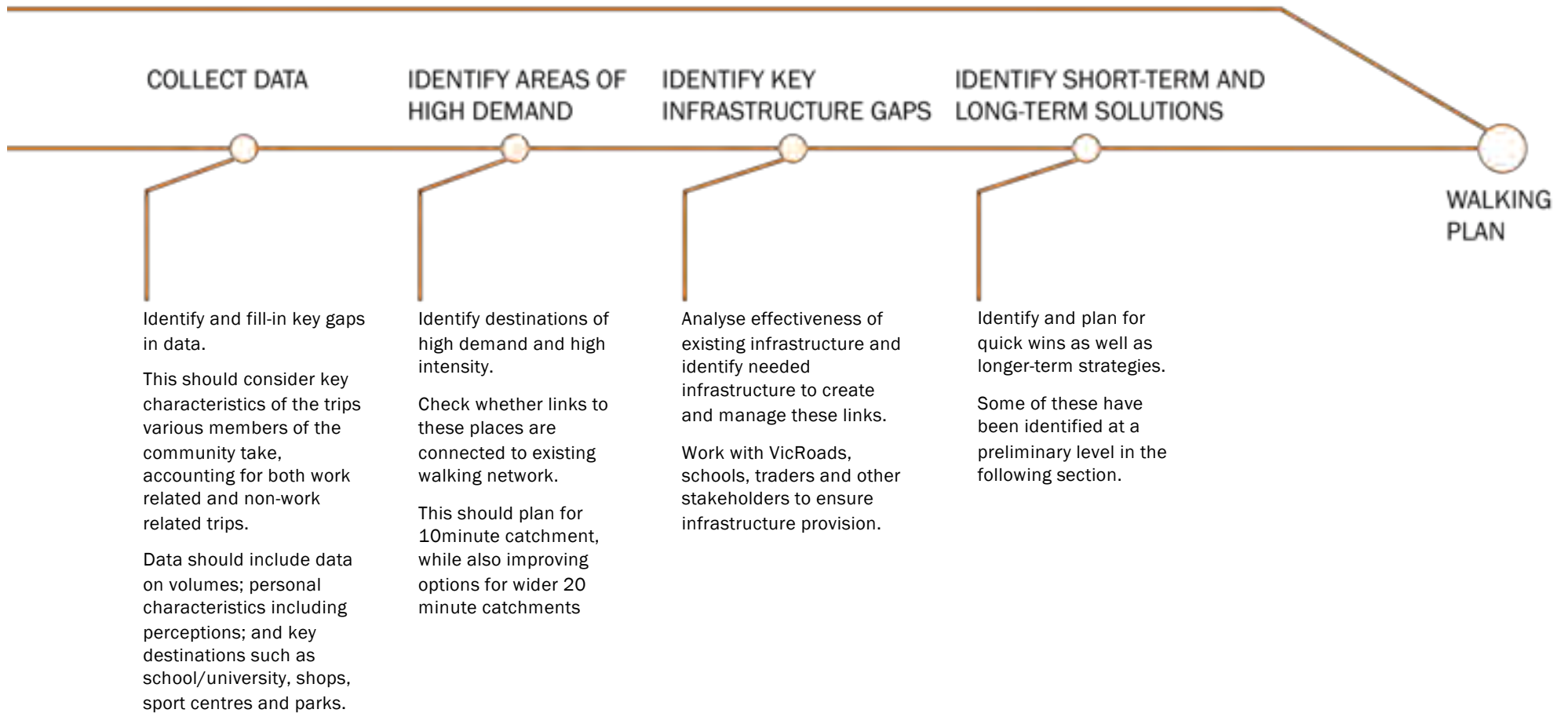
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Framework

ONGOING STAKEHOLDER AND COMMUNITY CONSULTATION



Improvement options include quick wins...

The investigation and consultations on accessibility issues on the Centre Road precinct has highlighted a range of problems and barriers to accessibility.

Recommendations are organised into those that are:

- Quick wins
- Short term actions
- Medium term actions
- Longer term actions

Quick Wins - within 12 months:

- Review and strengthen internal processes related to DDA compliance
- Hold training sessions for DDA compliance awareness
- Publicise findings and case studies of pilot projects from Neighbourhood Links Program
- Work with VicRoads to change traffic signals to reduce delays to pedestrians
- Introduce auto-on pedestrian phase for traffic signals in the Ballarat CBD
- Consider opportunities for community-led tactical initiatives such as parklets, street furniture and crossings
- Consult with the community to identify areas of need for improvements to the pedestrian network including with the Disability Advisory Committee & Peer Action Group

...and longer term initiatives

Short term actions – within 12 months

- Gather data on pedestrian volumes and characteristics of various walking trips
- Fill data gaps in evaluating current infrastructure
- Review and refine targets to specifically meet pedestrian needs
- Review and refine benchmarks to consider walking as a mode of transport
- Benchmark travel behaviour measures against 2011 figures, to monitor progress towards a less car dependent future

Medium Term Actions - 12 to 24 months:

- Review DDA compliance of infrastructure
- Review pedestrian trip data and identify and plan for areas of demand. Consider:
 - Footpath network
 - Crossings, including operational characteristics
 - Street furniture, particularly seats for bus stops
- Publicise findings from community engagement programs
- Review targets in improving walking infrastructure network – key considerations should be
- Review benchmarks
- Consider alternative funding models to increase funding for pedestrian infrastructure. This could include a co-contribution scheme to expand the walking network in specific areas

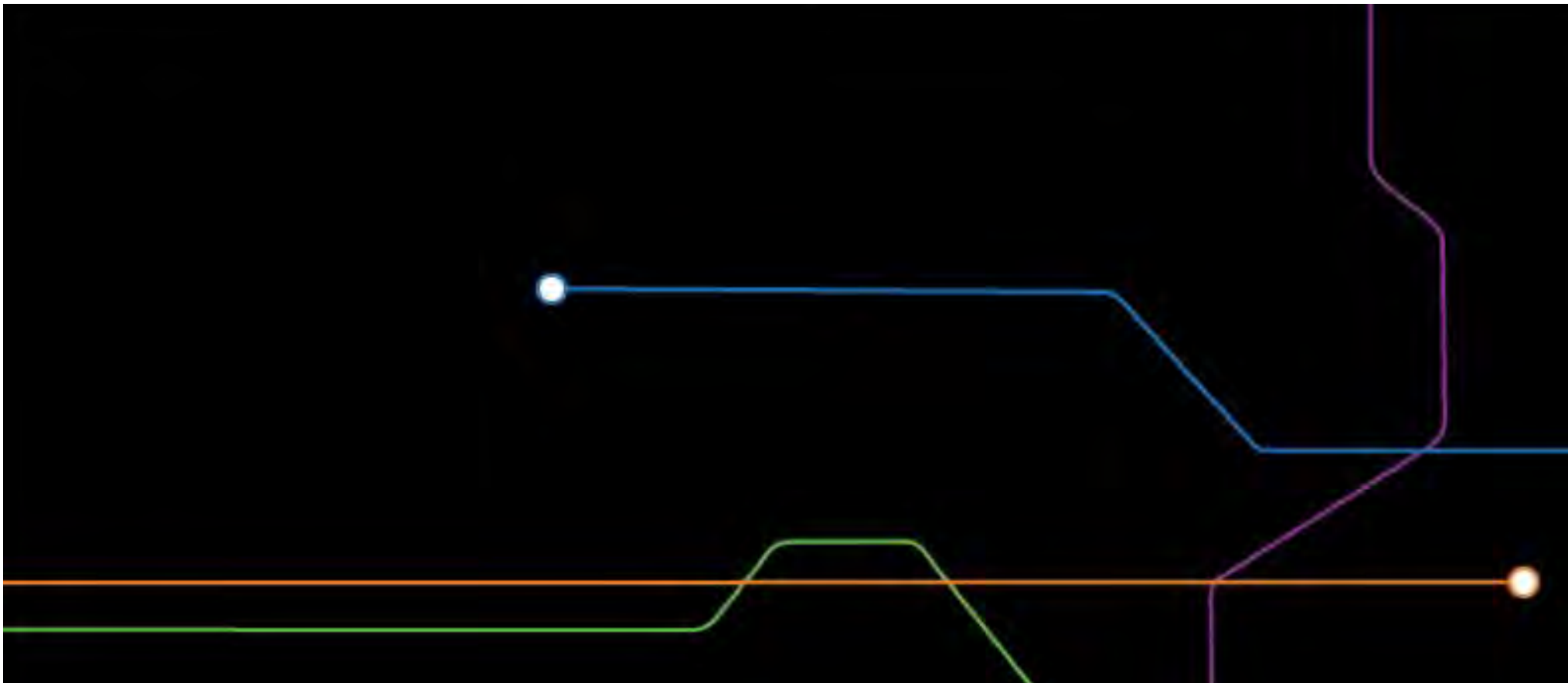
Longer term Actions 2 to 5 years:

- Increase infrastructure spending on pedestrian facilities with targeted & prioritised program to fill critical gaps
- Track progress towards long-term goals

This study is supported by a range of references

- City of Ballarat, The Ballarat Strategy Section 4: Connected Ballarat (2015).
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BALLARAT'S FUTURE RAIL NETWORK

Background Paper
3 June 2019



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This document has been commissioned by the City of Ballarat and was developed based on a range of sources in particular a discussion paper and background report prepared by AWTY Transport Consulting.

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Cover Photos: Ballarat Station, Commuter Parking Signage & Wendouree Station works – courtesy of Movement & Place Consulting & Regional Rail Revival Project

EXECUTIVE SUMMARY

This Heavy Rail Background Paper has been commissioned by the City of Ballarat to explore the issues, challenges and opportunities for the heavy rail network in the Ballarat region. This Background Paper will inform the Ballarat Integrated Transport Plan.

Ballarat has a long heritage of reliance of the railway since it was first connected from Ballarat to Geelong in 1862. Ballarat became a hub for railway activities in western Victoria including construction and maintenance workshops and expansive infrastructure required for efficient railway operations.

Railway use tended to decline from the 1970's until the early 2000's as the infrastructure and rolling-stock conditions gradually declined. Following completion of the Victorian government's Regional Fast Rail project in late 2005, patronage on the Ballarat line has surged. This patronage increase is arguably a result of faster and more reliable travel times, more comfortable rolling stock, more services and improved access via stations such as Wendouree. Passenger services have since been extended to Ararat and Maryborough providing a greater catchment for passengers travelling to and from Ballarat in three different directions.

This Background Paper summarises the existing situation, strategic policy direction and specific projects that are currently underway. It considers the population growth in Ballarat and surrounding centres (including Geelong) and highlights the role that heavy rail can play to improve access and economic activity within and between these centres. The heavy rail network is integral to Ballarat's economic and social prosperity for several reasons:

- Passenger services on the network provide an affordable alternative to car use, which in turn improves:
 - Local economic activity because 80% of transport cost savings get spent locally;
 - Road safety;
 - Health and environmental outcomes;
- Passenger services improve access to employment for people who do not own a car or do not want to drive long distances (employment options could be in Ballarat or elsewhere); and
- Freight services on the rail network reduce local traffic congestion and improve road safety.

There is a critical need to continue investing in Ballarat's passenger railway network to improve the network reach, access to stations, service levels (train frequency and capacity), travel times and reliability. Improvements to the region's freight network are more focussed on access terminals, and consistent timing of shuttle services to key locations such as the Port of Melbourne.

Ballarat is currently growing at around 2% per annum and is expected to have a population of at least 160,000 people by 2040. Over the past 15 years, population growth and passenger rail network and service upgrades have generated a significant growth in patronage. This patronage growth will continue as Ballarat's population continues to grow, and more passenger train services are added.

This background paper plans for that growth by proposing short, medium and long term improvements to the infrastructure and passenger rail service offerings in the region. This includes service improvements to key destinations including Ararat, Geelong, Maryborough and Melbourne. Key improvement options put forward in this paper include:

- Improved passenger rail connections to Melbourne;
- Improved access to Ballarat from Melbourne and regional destinations;
- Ballarat Metro rail service;
- New railway stations in growth areas and at Ballarat's Major Events Precinct; and
- Freight specific improvements that support economic activity and reduce road congestion.

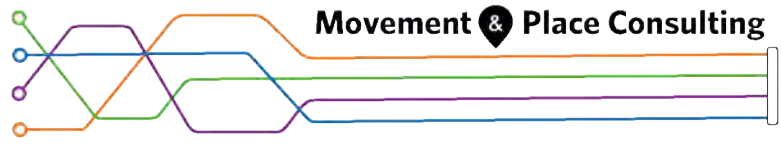


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1. INTRODUCTION

Victoria's population is expected to grow to over 7 million by 2050. This will place significant pressure on planners to provide amenity for urban and rural residential development. The challenge is further intensified by population growth in areas that lack services.

As a result, government policy places a priority on creating more jobs locally and reducing reliance on commuting to jobs and services in far-away places. In order to accomplish this, it is important to support the roles of Ballarat, Ararat and Bacchus Marsh as regional centres and provide the transportation infrastructure necessary to support thriving communities. *Plan Melbourne* echoes this policy goal emphasising the need to rebalance Victoria's population growth from Melbourne to rural and regional Victoria over the life of the strategy.

Transport strategies to serve Victoria's regions need to take a sub-region to sub-region focus to facilitate short work-based (and other) trips to places like Ballarat. At this sub-regional level Melbourne Airport, Geelong and Sunshine create sub-regional synergies for a rail network serving Ballarat.

It is essential that any strategy facilitate growth in three key elements to serve the Ballarat region more comprehensively over time:

- Growth in local jobs – more within the local region, followed by the adjacent sub-regions and regional catchments;
- Increased local access to high-quality education offerings – with more emphasis on an increase within the local regions and adjacent sub-regions and regional catchments; with
- Heavy rail support helping to boost investment in jobs and education access and boosting the community's confidence in the local economy.

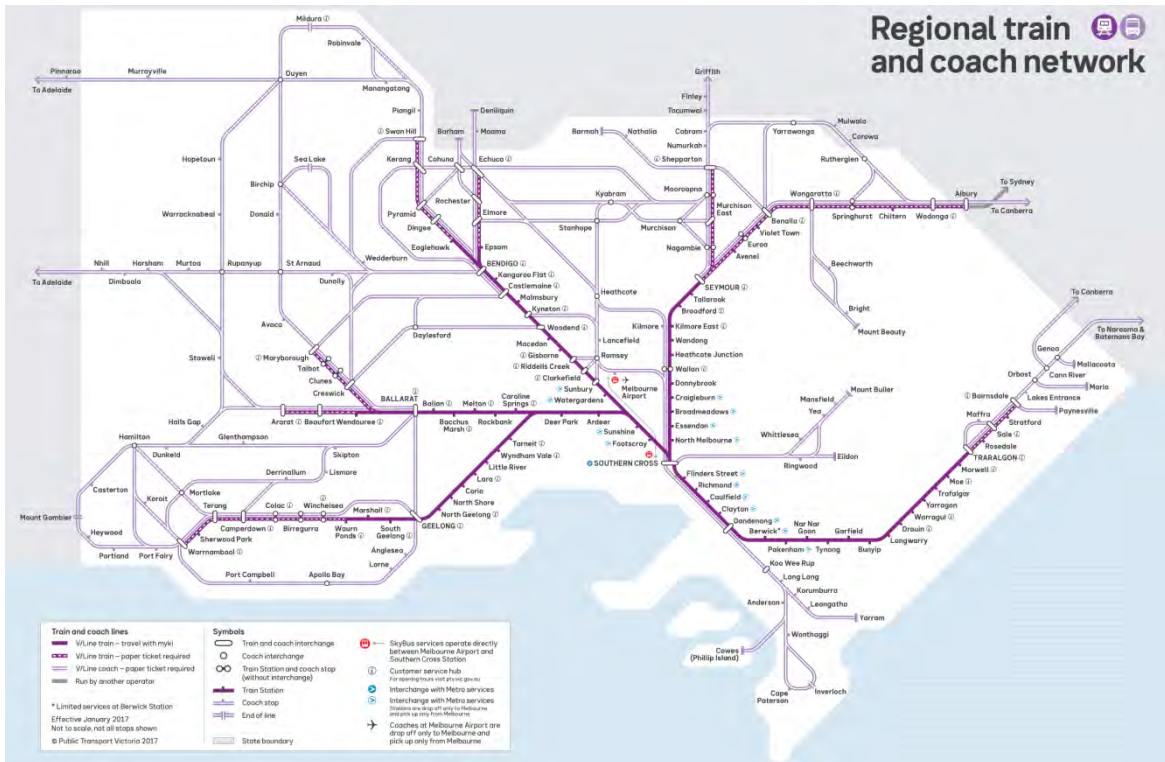
1.1 Existing Rail Network and Services

Ballarat lies at the confluence of four railway lines arriving from the north, south, east and west. Historically, there were nine railway lines radiating from Ballarat. Currently only three lines are used for passenger services and all four are currently used for freight. There are no passenger services currently operating on the Ballarat-Geelong Line. Freight tends to be confined to the two lines that form the Geelong-Ballarat-Maryborough corridor, but can be facilitated on the Ararat-Ballarat-Melbourne corridor if necessary.

There are 44 passenger train services between Ballarat and Melbourne each weekday (20 eastbound and 24 westbound). Nine of these services extend to/ from Ararat and four services extend to/from Maryborough each weekday.

The existing passenger rail and coach network is shown in Figure 1-1 below.

Figure 1-1: 2019 Regional Train and V/Line Coach Network



Source: PTV Website

The Western Line is double track from Southern Cross Station to Caroline Springs where it becomes single track with crossing loops. These loops are currently located at various intermediate locations and facilitate more frequent bi-directional movements along the line. The Regional Rail Revival – Ballarat Line Upgrade includes a range of works including duplication of track to Melton and additional passing loops to increase capacity and improve reliability along the line.

From Ballarat junction, single tracks continue to Ararat in the west and Maryborough in the north. A single track from Geelong in the south joins the railway corridor at Warrenheip and continues to Ballarat.

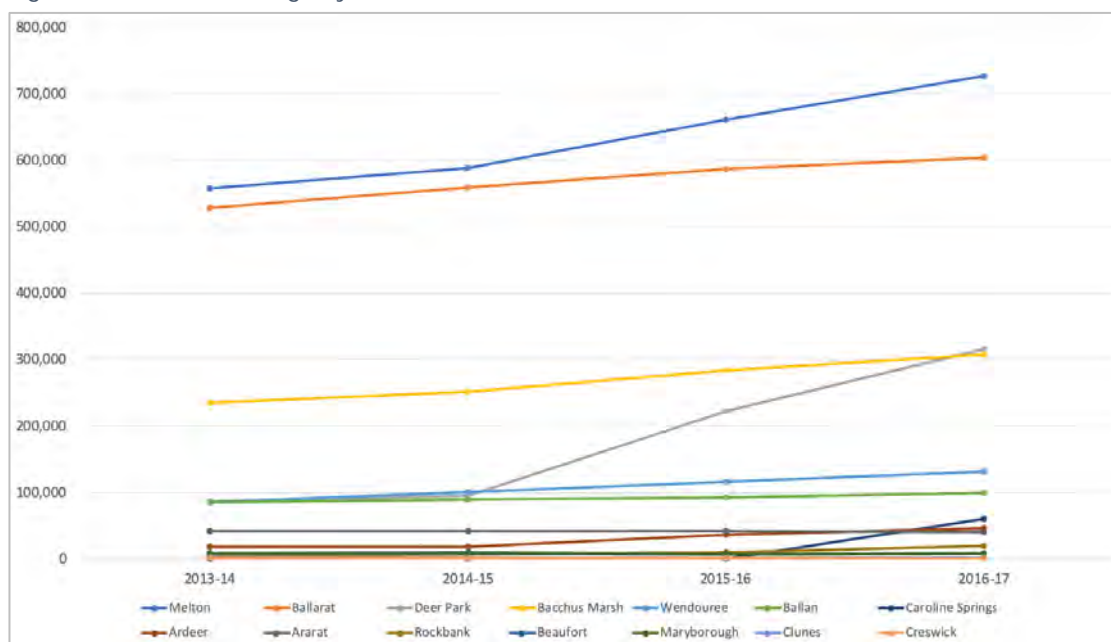
The signal system from Melbourne to Ballarat uses relatively new Optic Fibre with bells and boom gates at level crossings and the Train Protection Warning System (TPWS). Train control from Ballarat to Ararat and Maryborough uses the staff and ticket system (a manual safe-working system).

1.2 Patronage

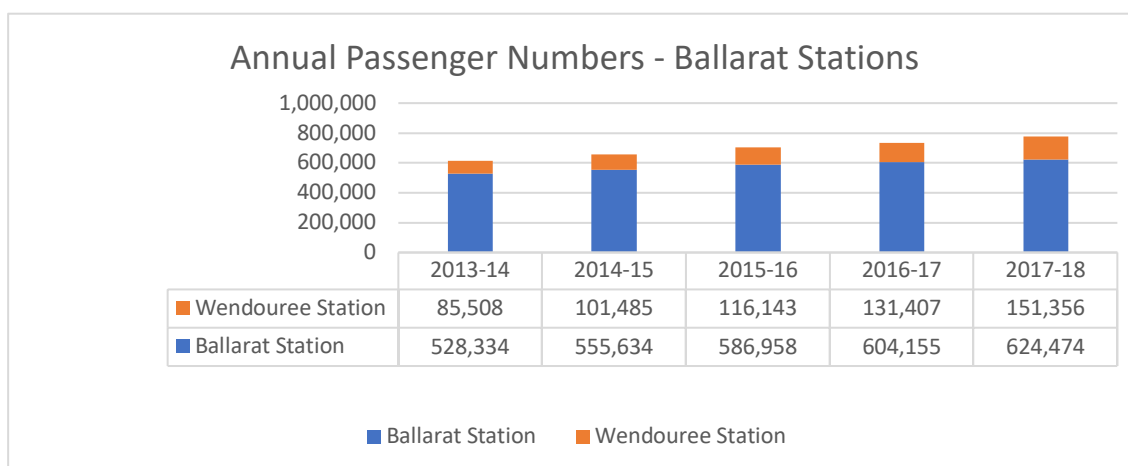
Ballarat commuters are increasingly choosing to catch the train with patronage growing even faster than the rate of population growth. In 2016 930 Ballarat residents caught the train to work, 117 more than in 2011 (a 14.4% increase over 5 years). In 2011 1.9% of workers caught the train to work, rising to 2.1% in 2016.

Ballarat based patronage growth is principally from Ballarat residents commuting from Ballarat and Wendouree stations to destinations in Melbourne. Population growth is also increasing patronage growth on the Western line at Bacchus March, Melton and other destinations in the metropolitan area. Melton, Ballarat and Bacchus March stations respectively the highest levels of patronage on the Western line (excluding Southern Cross) and all are experiencing strong growth in patronage.

Figure 1-2: Patronage by Station



Ballarat station is experiencing significant increases in patronage averaging 4.3% p.a over the last 4 years. Although starting from a lower base than Ballarat station, Wendouree station is experiencing significant patronage growth averaging 15.4% annually between and 2013-14 and 2017-18. Significant future patronage growth at Wendouree station is expected due to the substantial population growth within the catchment of Wendouree station on Ballarat’s western and northern fringes.



Source: Department of Transport

Based on historical growth trends, the stations in Ballarat are expected to generate over 800,000 passenger boardings in 2019 and the Victorian Integrated Transport Model predicts over 1 million passenger boardings at Ballarat by 2021. With strategic improvements to infrastructure and services a sustained growth in market share can be expected. The forecast is for 2.3% of journey to work trips to be by train in 2021. Expansion of the rail network could also increase this percentage – particularly if passenger services are provided to Geelong, this extension alone is forecast in the *Regional Rail Revival Report* to add over 250,000 passenger boardings to Ballarat Stations each year.

2. BACKGROUND

2.1 State and Local Strategies

A range of State and local policies, strategic plans and projects are relevant to a discussion about *Ballarat's Future Rail Network*. The following documents have been considered during preparation of this Report:

1. *Plan Melbourne 2017-2050* (2016) the Metropolitan Planning Strategy which makes specific reference to growing regional centres such as Ballarat
2. *Central Highlands Regional Growth Plan* (2014) supports creation of a "State of Cities"
3. *Regional Rail Revival – Ballarat Line Upgrade* (2016-2019)
4. *The Western Rail Plan*, Victorian State Government (2018)
5. *Connecting Regional Victoria*, Victoria's Regional Network Development Plan (May 2016)
6. *The Murray Basin Rail Project* documents and website (2014-2019)
7. *Regional Rail Revival: Geelong-Ballarat-Bendigo* study (2013).
8. Moorabool Shire Council's *Heavy Rail Development Plan*
9. The Rail Futures Institute's *InterCity* report, July 2016
10. *Grampians and Barwon South West Region Passenger Services Cost and Feasibility Study* (2017)
11. The Rail Freight Alliance's (RFA) *Policy Statement* (2018).

A summary of key elements of the strategies is provided below.

Plan Melbourne is the Metropolitan Planning Strategy which includes a specific direction to *improve connections between cities and regions*. It summarises the population and economic growth expected to occur in Ballarat and similar regional cities such as Bendigo and Geelong.

The essence of this Plan is to facilitate complementary regional and metropolitan growth. Some growth will occur organically within the home region and inevitably, some will occur further from the local boundaries. The development of two key areas in Plan Melbourne will complement Ballarat's growth – Sunshine and the Airport as a larger development cluster about half the distance to Melbourne than the CBD; and Geelong. Geelong and Ballarat can work together exploring economic synergies achieved through creation of better fundamental rail connectivity between the two cities.

Both the Sunshine National Employment Cluster and the Airport, along with Geelong are very accessible to Ballarat. Ballarat equally can grow from strengthened linkages to Geelong.

Direct investment in Ballarat (and by extension Geelong) and improving connections will both serve as catalysts for strong economic and community development of the Greater Ballarat region.

The Central Highlands Regional Growth Plan covers the municipal areas of Ararat, Ballarat, Hepburn, Moorabool and part of Golden Plains. It addresses a range of land uses including agriculture, tourism, environmental assets, commercial and residential. Checks and balances that need to be applied are recommended as well as infrastructure and services when considering future growth. It states as an objective that "We will maximize the growth potential of Victoria by developing a state of cities which delivers choice, opportunity and global competitiveness".

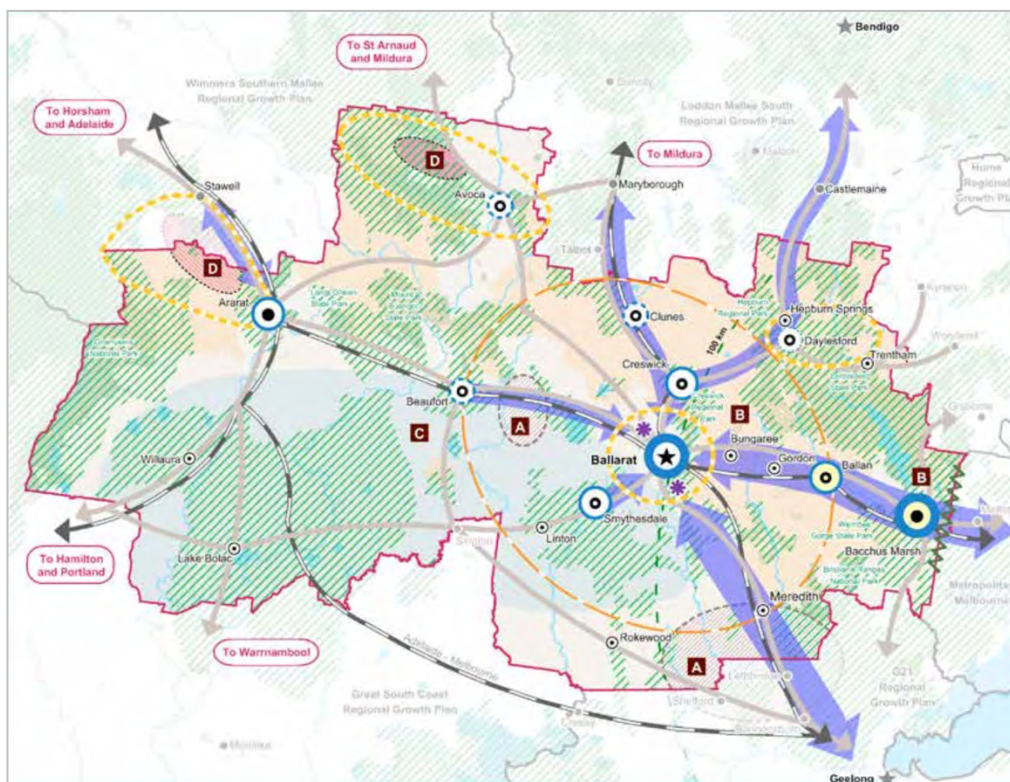
The transport network is focused around the Western Highway and rail corridors linking Melbourne to Adelaide and Melbourne to Ararat. Future directions outlined by the Plan include:

- Improve the capacity and functioning (including safety, reliability and resilience) of the region's transport networks;
- Ensure access and connectivity between settlements within and external to the region;

- Provide social infrastructure that is well located and accessible in relation to residential development, public transport services, employment and educational opportunities; and
- Prioritise infrastructure investment that facilitates economic growth and urban development.

The physical layout of the region, settlements, land uses and transport corridors is depicted in the Regional Growth Map in Figure 2-1 below.

Figure 2-1: Regional Growth Plan



Source: Central Highlands Regional Growth Plan

Victoria's Regional Network Development Plan states:

More people are travelling between regional towns and cities for work. Across regional Victoria, a growing number of people are travelling outside traditional business hours. For example, young people need public transport in the evenings and weekends to access work, study and social opportunities. Providing these connections is critical to retaining young people in regional areas.

The Plan aims to:

- Deliver a better public transport network across regional Victoria, with new connections, more trains, better stations and improved bus and coach services;
- Develop tailored public transport priorities and actions for each region that respond to changing local travel needs and support local infrastructure and services plans;
- Make better use of existing assets and infrastructure;
- Guide future planning for and investment in the freight and passenger rail network, with a focus on encouraging economic development and job creation;

- Support the growing regional tourism industry; and
- Give communities across Victoria a say in planning for future public transport services in their region.

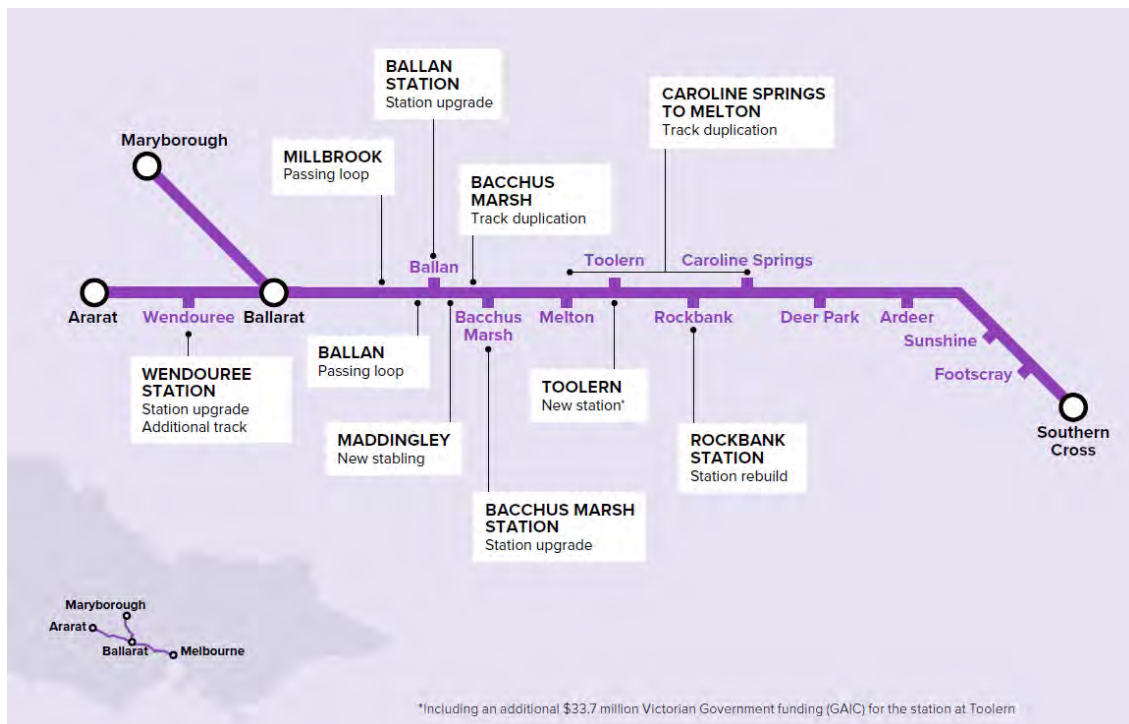
Improving the rail network serving Ballarat and the surrounding regions is critical to achieving the State government’s strategic objectives. Critical elements that have not been understood in the State plans to date include the need to provide more than on train line to Geelong and the need to better connect Victoria’s second and third largest cities through *better use of existing assets and infrastructure*.

The *Ballarat Line Upgrade* is a specific plan of upgrade works to improve service frequency, travel times and reliability in the western corridor. The upgrade includes:

- Additional services to/from Maryborough and Melbourne to Ballarat each day;
- Extra car parking spaces at Ballarat and Wendouree stations;
- Investigation of the need for extra stations at Ballarat; and
- Improved safety at regional level crossings.

A schematic of the upgrade works is shown in Figure 2-2 below.

Figure 2-2: Ballarat Line Upgrade



Source: *Regional Rail Revival Project – Ballarat Line Upgrade*

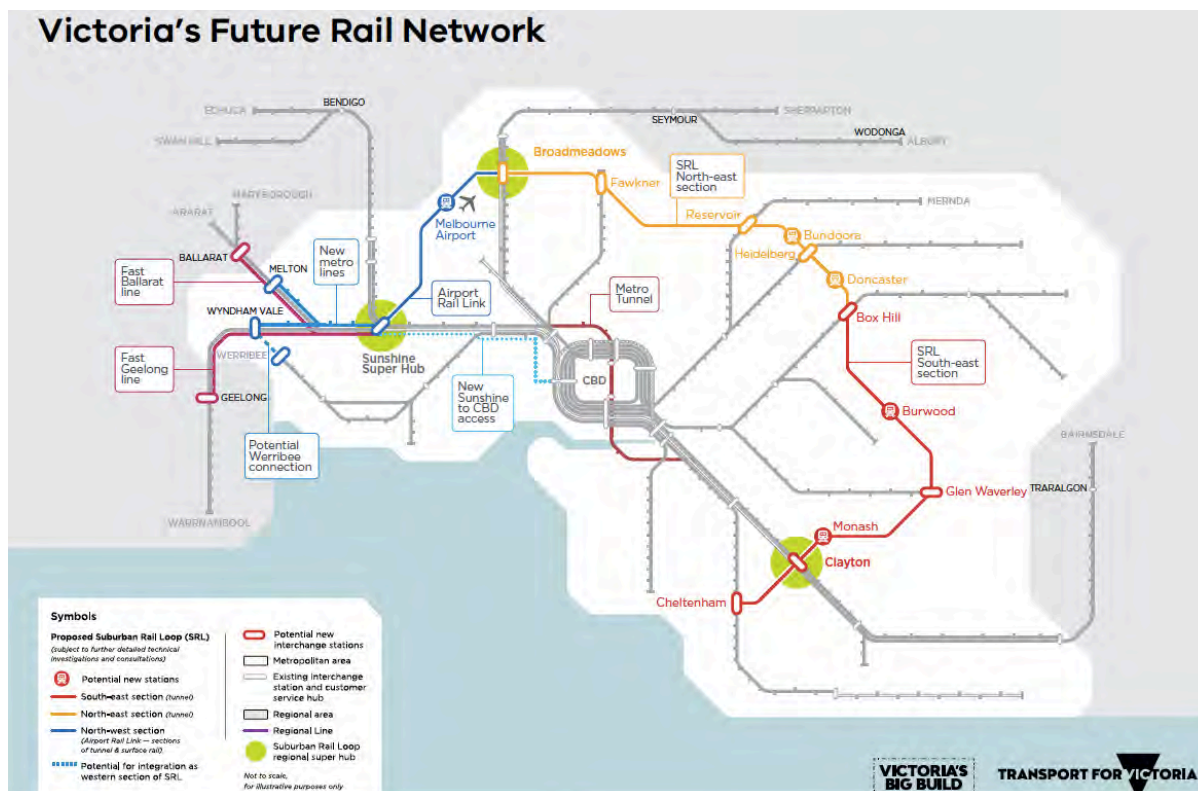
The Western Rail Plan is a long term strategic document that highlights how metropolitan passengers will be catered for with new electrified lines and regional services will be made faster and more reliable. The Western Rail Plan lays the groundwork for Victoria’s high capacity train network servicing growing regional centres. There are three primary projects which include:

- Two new electrified metro rail lines through the western suburbs to growth areas in Melton and Wyndham Vale;

- Increased track capacity between Sunshine and the CBD to cater for faster and more frequent metro and regional trains; and
- Major investment in the Geelong and Ballarat lines to run trains faster than 160km/h. This will include exploration of electrification of these lines and new, fast electric regional trains.

The Western Rail Plan forms a part of Victoria’s Future Rail Network as shown in Figure 2-3 below.

Figure 2-3: Victoria’s Future Rail Network



Source: Western Rail Plan website

Critically, none of the current plans and strategies recognise that the Ballarat-Geelong rail corridor previously had very successful passenger services and the corridor is still suitable for passenger services. The Geelong corridor also previously had two tracks for its full length, more capacity than has ever been provided in the Ballarat-Melbourne corridor.

Currently this infrastructure is not being put to best use and as a result there are several thousand people driving between Ballarat and Geelong every day, many of whom would prefer to catch the train.

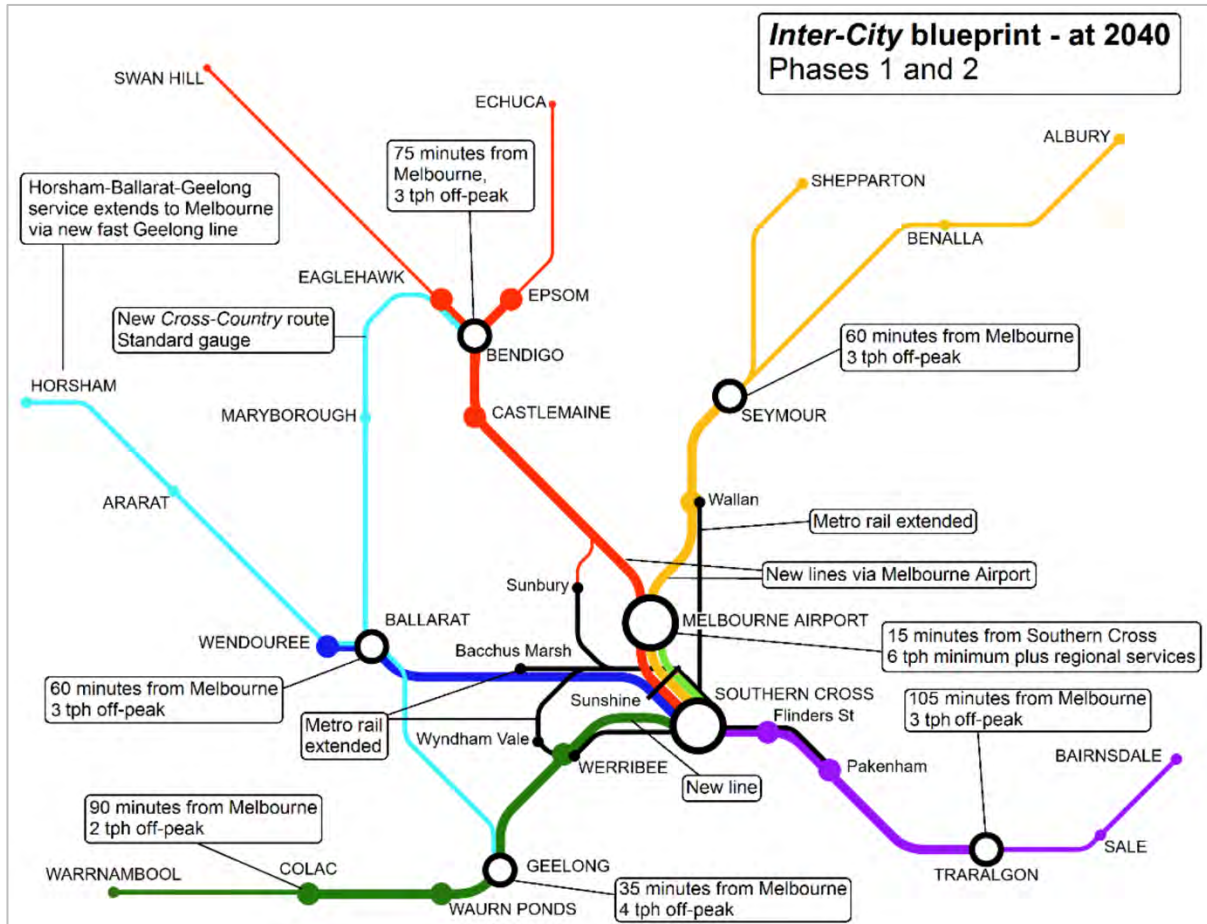
Rail Futures Institute in its *Introducing InterCity* report highlights strategic initiatives which could facilitate the growth of a more viable State of Cities. Key planks in its 'Blueprint' at 2040 proposed include specific creation of stronger, faster, clearer regional linkages specifically including:

- Stronger regional routes to Ballarat (Wendouree) with a clear focus on a Sunshine hub (also linked to the Airport);
- Stronger region-to-region links to Geelong and Bendigo and sub-regional linkages to Ararat and Horsham (and places in-between); and

- Other improvements include the track quadruplications, electrification of key tracks and provision of long passing loops removing current track constraints.

The long-term map envisaged for Victoria's rail network is shown in Figure 2-4 below.

Figure 2-4: InterCity Victoria's Envisaged 2040 Rail Network



Source: Rail Futures Institute, *Introducing InterCity* (2016)

The network above provides a truly ambitious network and level of service that could reduce the need for car ownership and use related to some trips, particularly commuting.

3. IMPROVEMENT OPTIONS

The rail network around Ballarat historically consisted of nine lines all with passenger services. This was scaled back to just two passenger lines in the mid 1990's – one to Melbourne and one to Geelong. Passenger services on the Geelong line ceased and there was only one passenger line (Ballarat to Melbourne) until 2004 when the Ararat line was reopened for passenger service. Since that time, passenger volumes through Ballarat have continued to increase faster than the population growth due to:

- Expansion of the network (to Maryborough);
- New or significantly improved stations (such as Beaufort and Wendouree); and
- Improved travel time reliability (provided by new track and signalling infrastructure).

To achieve State government objectives for the regions, significant new investment is required, not just to connection regional cities to Melbourne but to connect them to each other. This will require significant investment, without which the development of regional cities will be constrained, while metropolitan Melbourne continues to strain under the pressure of much more rapid growth.

The improvement options listed below are as much about growth pressures in metropolitan Melbourne as they are about improving transport, accessibility, lifestyle and economic development in Ballarat and surrounding regional cities and towns.

Improving transport and accessibility to Ballarat (and its surrounds) will reduce pressures in the metropolitan region and its more monocentric growth being concentrated in and around the CBD: specifically, congestion can be reduced and some outer areas growth (argued as being less economically attractive) can be avoided. As important, land value can be held and intensified into key policy areas whilst avoiding reduction in value of agricultural offerings on productive farming land.

3.1 Network

Getting the network right is of critical importance because without a robust network, services cannot be provided. State Government documents make specific references to expanding Victoria's rail network, making better use of existing infrastructure and connecting regions and regional cities with rail services. Plan Melbourne includes Direction 7.2 (Improve connections between cities and regions) with justification that "*strong links, both within the regions to major hub destinations as well as back to Melbourne, make it easier to live and do business in regional areas.*" A range of other statements highlight government's commitment to investigating all options that improve rail network connections between regional towns and cities.

Connecting Regional Victoria

The rail network has historically connected regional towns and cities in Victoria. Expansion of the network around Ballarat over the past 15 years has shown there is a role for train services to improve access for people in regional cities and towns and provide confidence for future investment in those towns. Strengthening Victoria's regional railway network is essential to improving the performance of the regions and securing the investment required to strengthen their economies.

The Victorian Government undertook a *Regional Rail Revival* study between 2011 and 2013. The project considered the feasibility of returning passenger rail services on the 250km of lines between Geelong, Ballarat and Bendigo via Maryborough and Castlemaine. A *Project Feasibility Summary Report* was released in April 2013. The report surmised that due to the substantial cost of rebuilding track in the Maryborough to Castlemaine corridor, the project as a whole would not currently provide enough benefit

to the community relative to the project cost. This study report (summary) lacked detail regarding some important considerations, including:

- Consideration of the Geelong-Ballarat section upgrade as a potential stand-alone project;
- The ability to reduce road network upgrade costs was not included (although additional road upgrades would be required if the rail upgrade does not proceed);
- The rail maintenance costs that have been avoided over recent years (resulting in diminished track capacity) should have been invested. This previous saving to government (from reduced maintenance) was ignored and leads to a higher amount of investment required for the future upgrade; and
- The impact on other policy initiatives that now elevate the importance of regions to the overall economy was not considered. For example, there are significant savings and benefits for the higher education, tourism, migrant settlement and housing affordability programs that flow from improved public transport links in Victoria's regions.

If the report had taken these factors into account, it seems likely that a positive story could be told about how reinstating passenger train services on the Ballarat to Geelong rail corridor would benefit Victoria's economy.

Ballarat to Geelong Connectivity

The *Regional Rail Revival* study found that minor upgrades to the existing line between Geelong and Ballarat could provide for a passenger rail service operating speed of 130km/h on most of the line. These relatively low cost works would have a much more reasonable benefit-cost ratio than the entire Bendigo-Geelong project. The cost of this and other works through the Geelong Freight yards would come to \$250-320M (2012). While the benefit cost ratio of the whole project was found to be low, the cost of the Ballarat to Geelong upgrade is only 30% of the overall cost, and it would generate 70% of the project benefits. The benefit cost ratio of the Ballarat-Geelong section is therefore much more favourable than the whole project.

Connectivity between Ballarat and Geelong has been recognised by the State Government as an important factor that supports or undermines the future economic potential of both cities and their regions. It is therefore a critical weakness that public transport services between the two cities consists of four services per weekday in each direction (49 services per week) compared with 8 services per weekday in each direction to Ararat (111 per week). For reference Geelong has 20 times the population of Ararat but only half the service levels to Ballarat.

The rail connection between Ballarat and Geelong is also important for key Victorian strategies including the Education State. Ballarat has two universities and Geelong has a large presence of Deakin University. There are many regional students who grow up in one of those cities and enrol in tertiary education in the other.

The connection to Geelong provides one coach in each direction that meets the needs of a traditional working day in Geelong, but does not provide any services timed to the needs of a traditional working day in Ballarat. Patronage estimates show that an increased level of services would be used by the public. Modelling of train patronage in the Ballarat-Geelong corridor shows that from day one, trains would attract a very similar level of patronage per train to the services on the Traralgon corridor (around 180 passengers per train).

Trains from Ballarat to Geelong can also continue to Melbourne. For many decades, Ballarat to Melbourne trains routinely used the Geelong track to provide counter peak services and improve reliability of peak direction trains on the Ballarat Melbourne track via Bacchus Marsh. Due to the operating speeds possible on each track, the trip via Geelong was not much longer than other services in the timetable. The lack of this option in the current timetable directly impacts on people wishing to travel back to Melbourne from

Ballarat between 4 and 6pm on any weekday. There are no trains during that time, and the only alternative is a road coach departing at 5:15pm. This road coach arrives into Melbourne at 7:15pm, taking more time than the train would need to travel from Ballarat to Melbourne via Geelong.

In summary, utilising the existing railway track between Ballarat and Geelong could cater for high speed services that attract a significant number of people and provide greater flexibility and reliability on the main Ballarat-Melbourne corridor. Such services would have a positive impact on the economies of both cities and their regions and reinforce State government efforts to create a State of several significant cities. It would also improve safety on the rural roads linking the cities.

Other network links

A range of other rail network extensions could be considered, and have been proposed or mooted by others. These include reinstating passenger services on existing freight tracks to Stawell, Horsham, Dunolly and St Arnaud. With the exception of Dunolly (which has been mentioned as worth investigating in State government studies), there is limited evidence regarding the potential cost of these extensions and their likely passenger demands.

These connections should be considered by the Ballarat community with regard to prioritising the service connections they would most like to see evolve and improve in future.

3.2 Services

The quality of the rail network will be judged based on the number of services provided each day at times when the community needs them to be provided. Service improvements need to be targeted to make rail more viable as a transport alternative to private transport for regional travel (for a wide variety of trip purposes and travel times). Providing a standard level of service across the network is an important tool for communication and marketing.

The benefits from higher service levels include safety and traffic congestion along with local financial and economic benefits that flow from reducing household transport costs.

Improving service levels requires the following:

- Improving Frequency and Reliability;
- Improving Service Speed through better track conditions and better rolling stock fleet options (more flexible rolling stock in terms of passenger loads and interoperability under relevant line conditions) and maintenance regimes pertaining to track and rolling stock; and
- Providing alternatives linkages that will assist services recovery if services were lost on other current rail services.

Improving Frequency and Reliability

Regional rail services have been subject to significant service cuts and closures until the Regional Fast Rail project in 2005 reversed the decline in regional rail patronage. The passenger rail service between Ballarat and Melbourne is experiencing significant passenger growth that has been continuing for most of the past 15 years. This patronage growth is causing service capacity constraints with overcrowding on the trains and on the track in terms of reliability (as more and longer trains are added to cope with patronage growth).

Service Frequency and Span

The attractiveness and viability of the train network as an option to meet a range of transport needs depends on service frequency and span. Previous State government transport strategies have referred to minimum service standards related to frequency and span. The suggested minimum service standards for regional connections into Ballarat such as train and coach services include:

- Service Span of 15 hours (from 6am-9pm); and
- Service frequency of at least one service per hour in each direction.

Application of these service levels would need to take into account:

- Differentiation between modes (with regard to passenger perceptions);
- Modal integration along transport corridors;
- Common service types and common vehicle types along connected corridors that could respond to the demand; and
- Service frequencies required to provide flexibility in arrival and departure times similar to that provided with a car.

The Ballarat community should discuss and agree a position on service level expectations that will meet the needs of the local area and surrounding region. This discussion should note that service levels dictate how helpful the railway track can be to its community, and that a railway with very minimal services highlights an inefficient use of the fixed asset.

Reliability

The Ballarat Line Upgrade project is currently duplicating the track from Caroline Springs to Melton. This will leave a single line track from Melton to Ballarat with crossing loops at various locations to increase the bi-directional capacity of the track. Under the current timetable this would still have 34 service crossings a day, where one train has to physically stop in a crossing loop to allow the oncoming train to pass. This arrangement can have a significant impact on service reliability.

When additional Inter-Regional services from Bacchus Marsh to Melbourne are introduced, it is likely that further track duplication will be necessary to maintain service reliability.

Ultimately, full track duplication is required in order to operate a reliable railway with services in both directions. The finite limitation of each timetabled iteration of service for each track duplication level should be clearly modelled (if not already) and understood. This could help understand the constraints and opportunities to invest in additional track duplication.

As the metropolitan segment of the western railway line becomes busier, there will be a need for increased train capacity and services to those areas. The Western Rail Plan is investigating those issues and may result in the need for additional track capacity to ensure that service reliability and high speeds for regional services can be maintained. The Ballarat community are highly likely to support any initiatives focussed on reducing train travel times and improving service reliability.

Improve Service Speed

Service speed is the most important element of a train service in order to boost patronage. Trains on the Ballarat Line have been much faster historically than they are today, in part due to the capacity constraints impacting on reliability and passing loops dictating where trains can cross.

In addition, sufficient rolling stock is necessary, and of sufficient capacity to run the levels of service required. There needs to be a clear rolling stock cascade program which is underpinned by best for service units operating on lines based on their optimal deployment.

However, there are a range of other factors that can be resolved to improve the speed of rail services in the corridor. Particular attention should be given to the service scheduling process. The current train timetable has several inconsistencies that seem on first glance to be making the train services significantly slower. One example is the additional minutes that are added into the timetable for almost every train service as it passes through Ballarat. Typically, each service has a two minute layover at Ballarat Station to allow time for boarding and alighting and potential crew changes. However, this is unnecessary addition

to the travel time. At least one service in the timetable has the train arriving and departing at the same time (as happens at most stations) and many trains have been observed arriving and departing Ballarat in less than one minute (particularly if they are running late).

In 2004 the fastest train from Ballarat to Melbourne took 87 minutes. In 2006 the timetable boasted a Ballarat-Melbourne flagship service taking 64 minutes in each direction. The current timetable's best service time between Ballarat and Southern Cross is 73 minutes and many services often take as high as 92 minutes to traverse the 115-kilometre journey. By 2021 it is reasonable to expect a flagship Ballarat-Melbourne service taking no more than **60 minutes** in each direction. The Western Rail Plan is investigating the potential for higher operating speeds and could develop a plan for even shorter travel time. The direct line from Ballarat to Melbourne is constrained by hilly terrain as well as the multiple passing loops that need to be traversed.

Travel time variability

Of particular annoyance to passengers is the delay that occurs on most services (particularly those travelling through to Ararat or Maryborough). Trains arriving at Ballarat are typically scheduled to pause for several minutes. The time delay varies significantly and without any clear reason. The current timetable shows only one service that is not delayed at Ballarat. All other services are delayed by a seemingly random amount of time between one and twenty minutes.

For example, the 5:41pm arrival from Ararat each weekday waits at Ballarat Station for 20 minutes before continuing to Melbourne (enough time for the train to travel from Ballarat to Ballan). The delay may relate to the lack of passing loops between Ballarat and Ballan, but it still raises the question regarding why the train left its origin (Ararat) so early in the first place. The logic for including such variable delays and building them into the timetable (forcing them onto passengers) is unclear.

In 2004 each train service took 82-103 minutes to travel from Melbourne to Ballarat. In 2019 the variability has increased to 73-106 minutes. The variability in travel times has increased from 26% to 66% and reduces confidence in the service schedule. If travel times to Wendouree were considered, the 20 minute delay at Ballarat would increase variability even more. While sometimes the delay is partly due to the need to join or separate two trains, it remains a delay that is not appreciated by the passengers and causes some of them to drive rather than catch the train.

Restore and Upgrade Regional Rail Services

There is significant scope to reopen selected railway lines that had been closed or improve regional connections to attract an increased share of the overall transport task. Ballarat is a key regional destination for services and employment, attracting a large number of the commuters from surrounding regions and increasingly Melbourne's outer west. Of any location in Victoria, the focus for reintroduction of passenger services should be on the Ballarat-Geelong corridor in recognition of the strategic value of this link between the two regions and in recognition of the large number of car trips between the two centres that could be substituted using frequent rail-based trips.

Transport for Victoria has commissioned standard gauge version of the VLocity for use on the North East line to Albury/ Wodonga. The Murray Basin Rail project involves placing a standard gauge connection between Ballarat and Gheringhap. The commissioning of a standard gauge VLocity could enable the running a passenger rail service between Ballarat and Geelong at significantly lower cost than identified in a previous analysis.

There are numerous townships between Ballarat and Geelong that could also be served by such a passenger train corridor. Towns such as Meredith could benefit from an operational railway station and the Golden Plains populations of Bannockburn and Batesford.

The use of standard gauge track for passenger services could also enable passenger trains currently terminating at Maryborough to be extended to Dunolly, St Arnaud and Donald as mentioned in the Rail Futures InterCity Report.

Significant towns not included in either the Ballarat-Horsham or the Geelong-Ballarat-Bendigo Cross-Country connections could be complemented by Cross-Country coach-link services. Coach-based services can match or nearly match train-based frequency at train terminus or key interchange points. These will assist towns like Daylesford.

It is important the government be asked to update the Geelong-Ballarat-Bendigo Project Feasibility study in a manner that introduces a better contextualisation of the true economic benefit of these new options over a range of investment options.

Ballarat Metro Rail Service

Ballarat-based Metro Rail Services can be introduced similar to the initiative introduced into Bendigo and investigated for Geelong. The majority of rail commuters are currently using the train to access destinations in Melbourne. Rail trips originating and terminating between Wendouree and Ballarat stations and vice versa are currently low in frequency and could be increased in line with increased services offerings both in the Melbourne direction and in the Horsham direction. In between these times, complementary bus services could plug service gaps to provide a travel frequency more becoming of metro-based services.

This could be promoted for a short time using a range of Public Transport incentives. Timetabling and infrastructure currently aren't designed to specifically facilitate this type of travel. However, anecdotal evidence suggests commuters are already doing this trip which takes approximately 8 minutes between stations. Travel is principally from Wendouree station to Ballarat Station to access employment and services in the Ballarat CBD.

To facilitate this, track should be duplicated between Ballarat and Wendouree stations to accommodate an increase in movements and to accommodate a greater number of movements in both east-west directions.

Planning for Level Crossing Removals

Increased rail traffic within and through Ballarat could lead to increased disruption to local traffic at level crossings. It is considered prudent for the City of Ballarat, the community and transport authorities to plan for future grade separations at key locations and consider how future projects might facilitate the grade separations over time. If well-planned, level crossing removals can generate a range of benefits for the surrounding community related to transport amenity, social inclusion and perceptions of safety.

The most significant benefit of level crossing removal projects in Ballarat is likely to be the way such projects facilitate and stimulate economic development on sites that are close to the level crossing and would otherwise be left vacant.

It is noted that Ballarat already has seven grade separated crossings of the railway corridor in the urban area. These are concentrated in the east of Ballarat where the number of train services are highest. The Level Crossing Removal Project has published a *Site Prioritisation Framework* for assessing level crossing removal projects and testing the priority that should be allocated based on evidence of safety, congestion at place making at each level crossing. It is unlikely that any of the remaining level crossings in Ballarat would meet the criteria for prioritisation under this framework in the short term. This is mainly due to the number of trains and vehicles using each crossing.

A high-level analysis using this framework would help the Ballarat community understand and decide the priority between potential level-crossing removal locations such as Burnbank Street, Creswick Road, Gillies Street North, Macarthur Street and other potential locations.

3.3 Access and Stations

Enhancing station access to create larger station catchments

Railways of their very nature encourage larger-scale passenger movements for significant population centres like Ballarat. Efficient passenger movements can induce large patronage increases especially via network and service improvements. Providing enhanced access points can help distribute the city's transport load. Key points across the city become best service points by offering best localised access and bring more people into community with each other.

Best 'last mile' access adds to high amenity offering of the best cities. This is evident across many rail-based urban communities. Moreover, last mile access and increased amenity increases localised land value offerings and attracts better quality commercial offerings. In essence, good rail services and high quality urban environments surrounding the station go hand-in-glove with each other.

Enhancing access at key points across the city, enhanced local amenity and land use access ranks highly with best value land use solutions. Nowhere more is this evident than around stations and their precincts supported by natural station catchments.

There are currently a number of projects underway already to provide increased access and amenities to stations and station precincts. These include station master plans for Ballarat and Wendouree stations. Further growth of the rail network also presents opportunities to upgrade or build new stations at Warrenheip, the major events precinct and in future growth areas with rail connections such as Beaufort and Creswick.

These are all ideal places to also provide for interchange between all modes (bus, bicycle, pedestrian and car). Improvements also must include provision for marginalised individuals and groups such as the aged and people with disabilities. PTV's access policy should be fully implemented at every juncture in these areas, but there is not more urgent opportunity than where major urban upgrades occur within the active station precincts.

Ballarat Station

Ballarat railway station opened in 1862 and is of significant historical importance. Ballarat station is experiencing significant increases in patronage (averaging 4.3% p.a over the last 4 years¹). A master plan has been prepared for Ballarat station which will improve access, introduce a range of new uses, a new bus interchange on the northern side of the station and additional car parking. The *Ballarat Station Precinct Redevelopment* includes a range of features:

- New bus interchange
- Commuter car park with 405 spaces
- Apartment Hotel with 77 rooms
- Conference and events centre including a 300-seat theatre and dining options and 150 car parking spaces
- Public plaza

¹ Source: V/Line patronage data 2014-2018

A render of the proposed development (now under construction) is shown in Figure 3-1 below.

Figure 3-1: Ballarat Station Precinct Redevelopment



Source: *Regional Development Victoria website*

A key issue for the Ballarat station is the lack of DDA compliance. Current access between platform 1 and 2 is via stairs which remains a substantial barrier for people with limited mobility. In addition, the platform height does not enable easy access to the carriages. The big step between the carriages and platform is problematic for many passengers. These issues should be addressed as a priority.

Wendouree Railway Station

Wendouree railway station is experiencing the most significant patronage growth of any station in the region (averaging 15.4% annually over the last 4 years²). In 2009, this station became Ballarat's second station on the modern line. In the press release which accompanied the opening, the following provisions were highlighted:

- Bike racks and lockers;
- Local bus route realignment and re-routing to connect to Wendouree; and
- 200 car spaces able to be increased readily to 500 spaces.

The City of Ballarat and Department of Transport is currently developing a Master Plan for the Wendouree Station Precinct. The draft Master Plan identifies a number of development opportunities, provides an action plan for infrastructure upgrades, and facilitates the delivery of projects including works at Wendouree Station as part of the Ballarat Line Upgrade.

The draft Master Plan envisages significant land use change in the Core precinct following a transit orientated development model. It includes an activity centre and residential development surrounding the station. The draft Master Plan identifies a number of priority opportunities, such as improving:

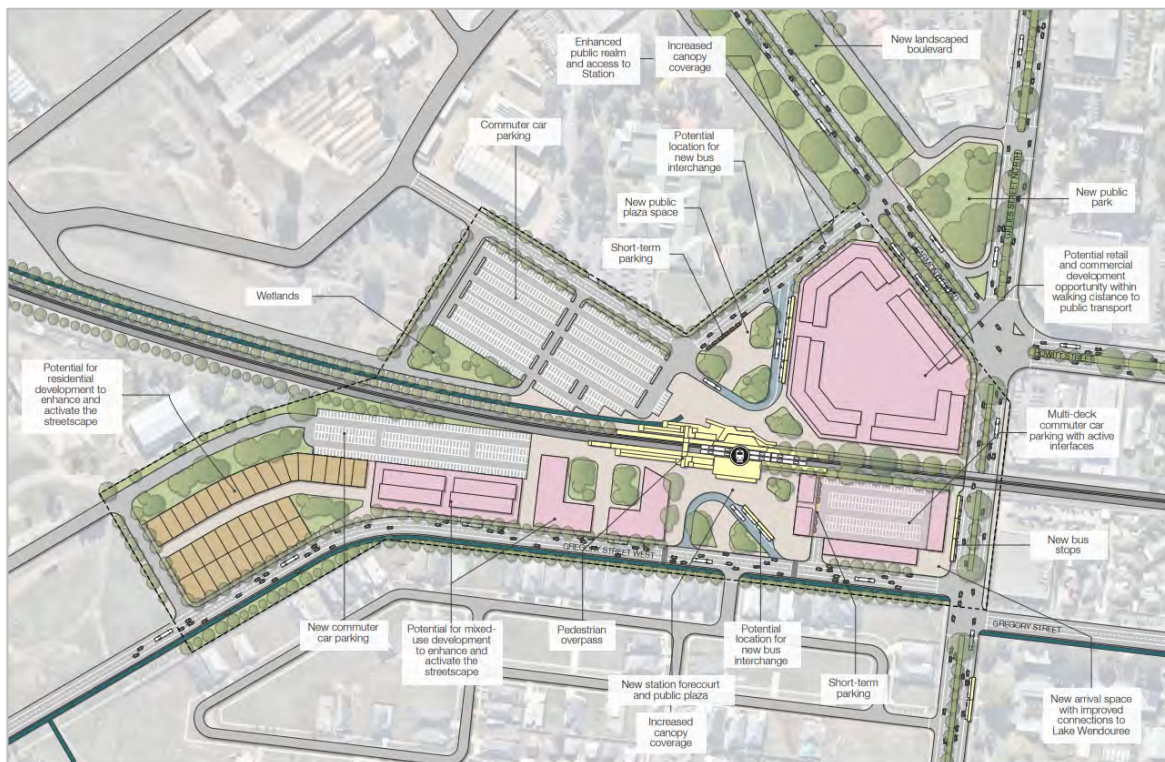
- Development opportunities for the revitalisation of the precinct including residential, retail and commercial opportunities;
- The function, usability and appearance of the precinct including a boulevard treatment of Learmonth Road;
- Access and movement for pedestrians, cyclists, vehicles and buses through:
 - A new pedestrian plaza and direct access from Gregory Street West;

² Source: *V/Line patronage data 2014-2018*

- Future additional car parking;
- Improved bus interchange to the north of the station; and
- A future bus interchange south of the station.

The draft Master Plan is shown in Figure 3-2 below.

Figure 3-2: Wendouree Station Precinct Draft Master Plan



Source: *Regional Development Victoria website*

Warrenheip Station

Warrenheip is located at the junction of the Melbourne and Geelong railway lines, eight kilometres from central Ballarat. The station was opened in 1873 and closed to passengers in 1981 as part of a state wide rationalisation of the rail network. The station could play an ideal park and ride role. The catchment of the station is likely to include a vast part of Ballarat and surrounding areas – due to its proximity to the Woodman’s Hill Freeway interchange. The proximity of the freeway and speed of trains through Ballarat means that residents in suburbs such as Delacombe (to the south west) and Miners Rest (to the north) could shorten their overall journey time by driving to Warrenheip – rather than driving to Wendouree or Ballarat.

Warrenheip also has a large amount of unencumbered space suitable for a park and ride facility. This would reduce the congestion around new mixed use facilities being developed at Ballarat and Wendouree Stations. A new Warrenheip station could also become a gateway station for Ballarat from Melbourne and Geelong, as part of a restored Geelong passenger rail connection, including a transfer point that would reduce the journey time from Ballarat to Geelong by train.

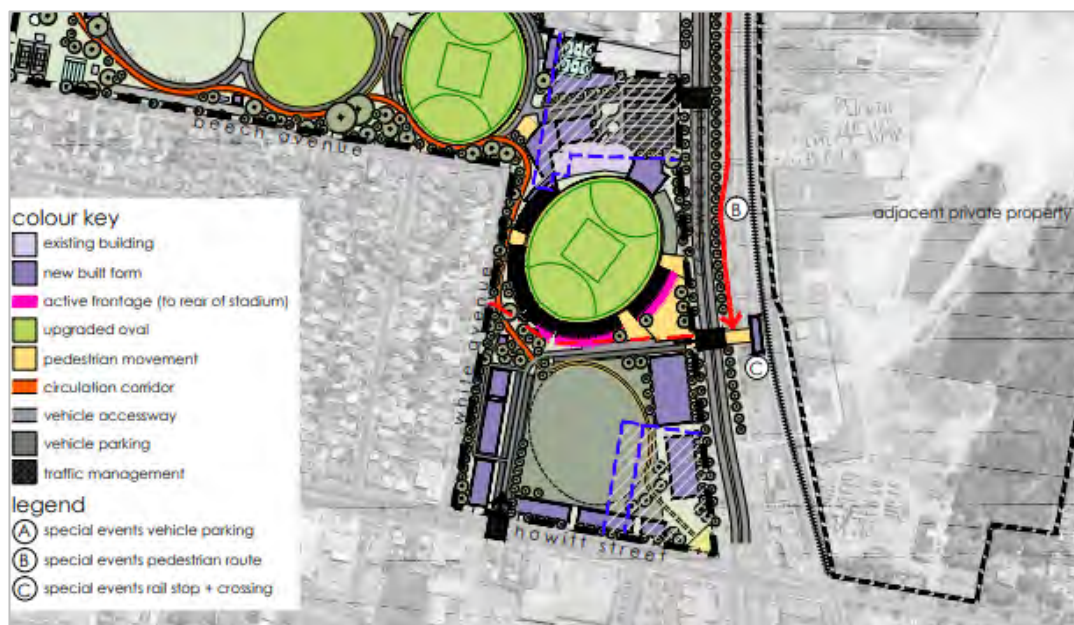
A Major Events Precinct station

Eureka (Mars) Stadium is located in the Ballarat Major Events Precinct and is the principal events stadium for the Ballarat region. It hosts a range of significant events including AFL matches and has a capacity for 11,000 people after a recent State government funded expansion in 2017. Further expansion of the precinct is envisaged with the Victorian government having already spent over \$30 million on Major Events Precinct projects. The Ballarat Strategy highlights the need for the “development of a new Special Events Rail Station along the eastern boundary adjacent precinct entry.”

Victoria’s Major Event Stadia Strategy supports ‘more venues and events in regional Victoria through infrastructure... to enhance liveability and amenity for regional Victorians’. Further it states that Victoria needs to ‘Improve accessibility to the major venues network by better integrating transport and venues through... investment targeted at transport infrastructure and services’.

The Ballarat Major Events Precinct Master Plan has been developed and identifies the site for a future railway station approximately 250m north of Howitt Street on the Maryborough line as shown in Figure 3-3 below.

Figure 3-3: Ballarat Major Events Precinct Master Plan



Source: Ballarat Major Events Precinct Master Plan

This new railway station is essential to ensuring that Eureka Stadium can play the role envisaged for it by the Victorian Government and its Major Event Stadia Strategy. It should be a priority infrastructure project for the region to reduce the need for people to drive to major events and reduce the pressure that major events place on the local road network in the area, minimising the negative impacts felt by the surrounding community.

As a park and ride station this location would have some usage provided that the number of train services at the station matched that in Ballarat. For comparison, there is more existing urban activity and catchment area at this location than there is at the new Epsom Station recently built in the north of Bendigo. This location has the advantage of also providing for trips from Melbourne (Footscray in particular) to Ballarat by train for the AFL games that are scheduled at Eureka Stadium.

A park and ride station in this area, with the close proximity of the Western Freeway and large amounts of relatively unused car parking (that is required for the football matches) would have similar success to other

park and ride locations if frequent train services are provided. This would reduce congestion on the Western Freeway and improve availability of parking at the existing Ballarat and Wendouree Stations. There would also be scope to expand the range of activities in the precinct similar to that envisaged through the Wendouree Station Precinct Master Plan.

Growth Area Rail Connections

Ballarat's major growth front is to the west and is expected to accommodate the majority of the short and medium term greenfield residential expansion of the city. The *Ballarat Long Term Growth Options Investigation* is a feasibility study to determine which (if any) of the three Growth Investigation Areas (GIAs) had the ability to accommodate future residential development. The project investigated the environmental, economic, physical and community infrastructure constraints and opportunities of each of the three GIAs.

The Ballarat Strategy identifies several long-term greenfield investigation areas to be considered for their long-term development potential. A decision on which, if any, of these options is preferred, and in what order or form they may or may not take has not yet been made by Council. If opportunities arise, railway stations north of the Western Freeway on the Maryborough line, or west of Ballarat on the Ararat line should be considered as part of future Precinct Structure Planning.

Such stations could form part of the Ballarat Metro rail connection into Ballarat and Wendouree Stations, as well as connections to Melbourne and Geelong. Any future long-term greenfield growth should be assessed for possible rail connections at an early stage as part of integrated land use and transport planning.

3.4 Freight

In 2012, freight volumes between Melbourne and Ballarat constitute around 125 freight vehicle movements per day between the two cities. This is expected to grow to 195 freight vehicle movements per day by 2030. As the freight tasks grows, there is increased potential to use rail for freight movements.

Significant efficiencies can be gained from reducing freight transportation on roads and finding ways to connect seamlessly with key ports in Geelong and Bay West. An Intermodal Freight Hub has also been proposed to be located west of Wendouree Station. Finally, passengers and freight separation will further streamline efficiencies. High-quality access to the rail network has the potential to reduce freight costs for business and improve their competitive advantage. This is a significant issue for BWEZ, as high-quality access typically requires a railway siding extending into the business premises. The arrangement of lots and protection of land with direct railway frontage will be an important consideration as BWEZ develops.

Passenger-Freight Rail Separation Project

The project seeks to separate freight and passenger trains in the core of Ballarat's rail network, to provide faster and more reliable freight paths from the Murray Basin region to ports and reduce the potential for delays to passenger trains. The project will:

- Separate freight and passenger rail pathways through the Ballarat station precinct - separating broad gauge passenger services from standard gauge freight service
- Cater for a minimum of 42 weekly return freight paths from the Murray Basin region through Ballarat with the ability to increase to 65 if required via the Ararat and Maryborough loop
- Upgrade old signalling systems
- Improve line speed for freight services within the Ballarat precinct through improved track geometry and the removal of congestion points; and
- Provide for the future uplift of passenger services including:
 - a fifth weekday passenger service to Ararat

- future additional services to Maryborough
- potential future passenger services to Dunolly.

The topic of track gauge has the potential to distract from the needs of the Ballarat community. In short, the Ballarat community need two things from the heavy rail network:

- Fast, frequent and reliable passenger services
- Freight services that reduce the need for truck movements through Ballarat

It is of little consequence to the Ballarat community what gauge the train uses to provide either freight or passenger services. However, in planning the track geometry and signalling systems the Ballarat community should require that any track can be used for passenger services.

Getting Freight onto Rail

Victoria's current freight ports currently focus on the Ports of Melbourne, Geelong, Hastings and Portland. Rail access to various ports for Ballarat-based businesses is critical to reducing the amount of trucks on local roads. Reducing truck traffic requires a coordinated approach to providing freight rail services between Ballarat and the State's ports.

Infrastructure Victoria has identified Bay West as the future site for Melbourne's second major container port. It will be important that Bay West be provided with high-quality freight rail access. Improving rail freight access to all key ports could be an important strategic advantage for Ballarat-based businesses.

A waste to energy plant is proposed for Ballarat West Employment Zone south of the railway line opposite the proposed Intermodal Freight Hub. It is envisioned that a Waste to Energy plant would be able to accept waste from western areas of metropolitan Melbourne and via rail. This is of significant interest given the recent application of multi-national bans on accepting Australian waste and recycling material.

BWEZ Intermodal Freight Hub

The Intermodal Freight Hub proposed for Ballarat West Employment Zone (BWEZ) will help to reduce heavy vehicle traffic on the road and has the potential to reduce freight costs for local businesses. The Intermodal Freight Hub is located west of Wendouree Station and currently only has a broad-gauge railway line servicing the site. Depending on the changes that get made to the Ballarat-Geelong corridor, there may need to be commensurate changes to the Wendouree corridor so as to retain the ability for freight trains to reach the BWEZ.

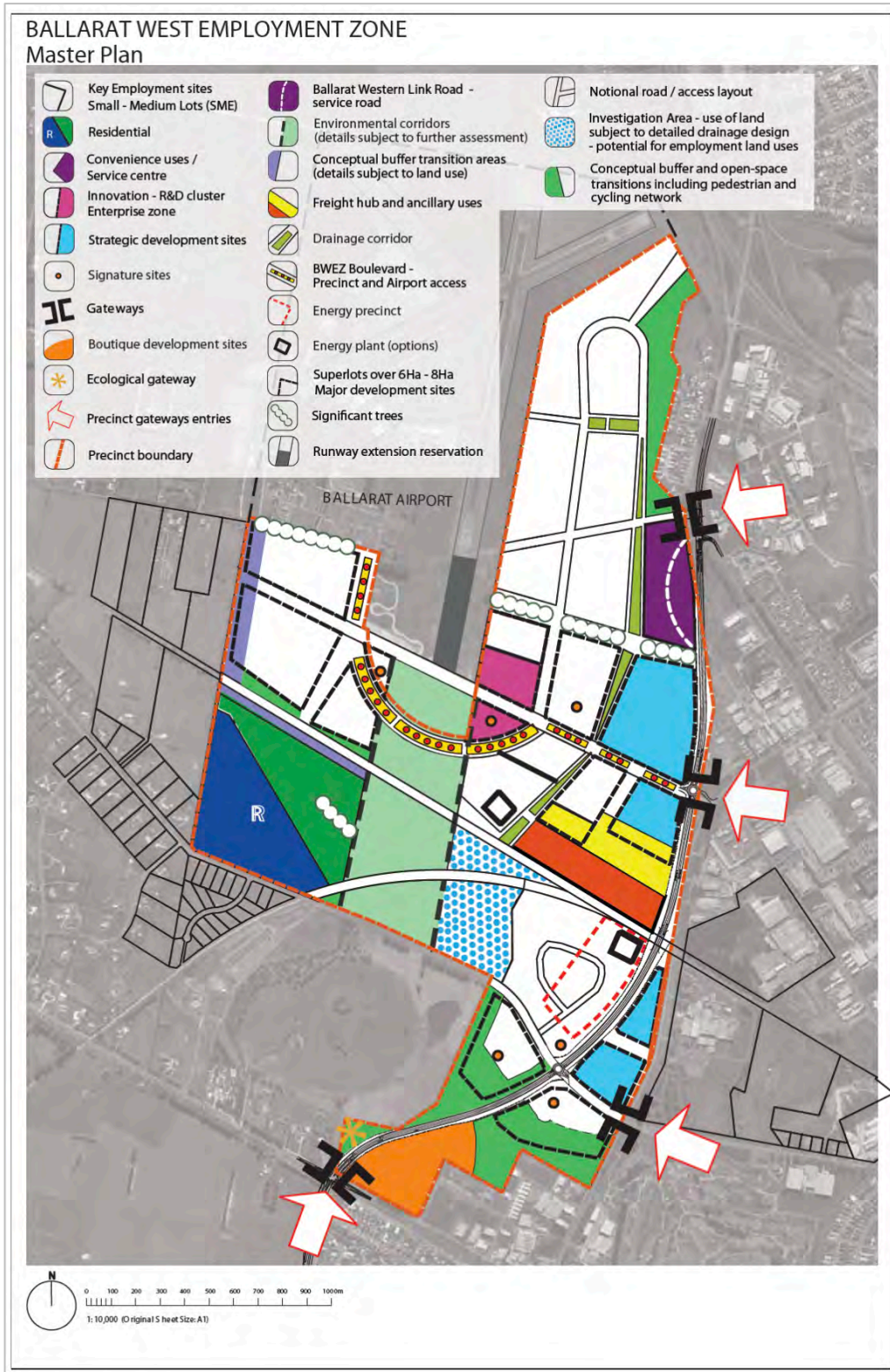
To enhance the capability of the Intermodal Freight Hub and provide direct access to the Port of Geelong, a standard gauge freight line should be constructed from the future Intermodal Freight Hub at BWEZ to connect with the Murry Basin Rail project. The 3.5km link could be provided in the existing corridor from the North Ballarat junction to the Intermodal Freight Hub. This will allow standard gauge freight trains to access the Port of Geelong. Due to constraints in the Wendouree Station precinct, the potential for dual gauge would need to be explored.

The long-held intention of the BWEZ freight hub is to be the Western gateway to the Metropolitan Freight Terminal Network, with freight trains to act as a port shuttle. The Ballarat Freight Hub—Proposal Summary noted:

A feasibility study was undertaken in 2009/2010 to evaluate and recommend the most appropriate physical location to develop an Intermodal Freight Hub that will service current and future freight needs for Ballarat and the Region. The study determined that there would be insufficient demand for balanced rail freight services to support that component of the Freight Hub until approximately 2030. The strategy using a dedicated port rail shuttle is consistent with the intent of the Victorian Freight Futures strategy.

The location of the BWEZ Freight Hub is shown by the orange and yellow in Figure 3-4 below.

Figure 3-4: Ballarat West Employment Zone Freight Hub



Source: Ballarat Planning Schemem (Ballarat West Employment Zone Master Plan)

The relocation of anchor tenants to the BWEZ freight hub including CHS Broadbent has resulted in demand for rail freight access being significantly ahead of projections and could be sufficient to make the rail component of the Intermodal Freight Hub viable in the near future. In this regard Regional Development Victoria has stated:

While it was initially envisaged that the freight hub would evolve from being road based only to road and rail over the long term, the establishment of Broadbent Grain (on BWEZ land immediately adjacent to the BIFH) and its significant freight demand (at least 300,000 tonnes of export containerised grain per annum initially) has meant that operator respondents to the EOI have envisaged a rail based solution from the outset, shipping by rail direct to the Port of Melbourne. Other potential rail freight loads are also being identified.

Other interest in rail operations at BWEZ is also being identified, although the BIFH is not reliant on these proposals going ahead to be viable.

In addition, the City of Ballarat has signed a non-binding heads of agreement with Malaysian Resources Corporation Berhad (MRCB) for the completion of a feasibility study into a waste to energy plant at BWEZ. The concept includes processing up to 400,000 tonnes of waste per annum. Ballarat's current waste load is less than 10% of this total, so it is expected that 90% of the waste would arrive by rail. If the project proceeds, the facility will need dedicated rails sidings on the southern side of the rail corridor.

3.5 Innovation

Ballarat has an established rail industry including Alstom, Bombardier and UGL Ballarat. The presence of three rail companies in Ballarat is part of the historical legacy from the time when Ballarat was a central node on the network, with cheaper land options than central Melbourne. These sites compliment other installations that rail companies have in Newport, Dandenong and West Melbourne. There are a range of innovations that these global companies are developing. The Ballarat community (including Council, Federation University and others) should seek to understand how they can collaborate with the heavy rail industry to leverage more local skills into the rail sector.

For example, Alstom have developed a hydrogen fuelled train (the Coradia iLint) which commenced passenger service in September 2018 in Germany. The train has a range of up to 1,000km and a top speed of 140km/h. There are a range of innovations that the Ballarat community could work with railway companies to bring to fruition. Key to facilitating such collaborations will be identifying the particular strengths that the Ballarat business and education communities can bring to the railway engineering sector and building collaborative partnerships between the various organisations.

This would provide Ballarat with several advantages:

- Enhancing the innovation and industrial sectors that Ballarat is already known for;
- Providing opportunities to pilot new innovations within the local market;
- Helping to establish Ballarat as an innovation and leadership city in Victoria.

The City of Ballarat should investigate the ways in which various organisations can collaborate regarding rail innovation.

3.6 Heritage Rail and Tourism

Steamrail operates heritage passenger rail services across Victoria and operates several services in Ballarat over two-days in conjunction with Ballarat Heritage weekend. In 2019, these passenger services will be the only passenger services on the Ballarat-Geelong corridor (the shuttles are travelling between Ballarat and Lal Lal).

Steamrail Victoria utilise some existing storage at Bombardier's Ballarat East Depot. There seems to be a range of opportunities to expand tourism related heritage rail passenger services in the Ballarat Region. This is in part due to the number of railway corridors and actual tracks that remain in the region, coupled with a vibrant and active railway engineering industry (making access to railway expertise and machinery easier than in other places).

The Ballarat community should investigate the potential to enhance Steamrail Victoria presence in Ballarat. This could be in the form of promoting volunteer opportunities, engaging with relevant community groups, collaborating with industry partners (across all industries including tourism, rail engineering and food) or finding interesting sites to operate heritage services to on a regular basis. For example, operating heritage services to Creswick could link in with various events held in either Ballarat or Creswick and provide a more consistent and efficient approach to operating steam trains in the Ballarat area.

Combined with a new station at the Major Events Precinct, Steamrail could also help achieve objectives of the State Major Events Stadia Strategy and Tourism Strategies through provision of a steam passenger service to Eureka Stadium.

4. CONCLUSION

Since 1862, the railway network around Ballarat has been integral to the economic development of the city. The railway connections have been critical for economic activity, fostering employment opportunities and linking to sub-regional communities.

The importance of passenger and freight rail services is again increasing as the population in Ballarat and other centres including Melbourne increases. Having efficient public transport connections between regional towns and cities is essential to Victoria's future economic prosperity. For Ballarat these connections increase economic activity, access to education and employment, facilitate community connections and improve transport safety.

Passenger growth on Ballarat rail services has been high over the past 5 years, and is expected to continue to grow rapidly as population and traffic congestion grow. Over 1 million passenger boardings are expected at Ballarat stations in 2021 and this is expected to grow to over 1.7 million boardings per year by 2041.

The Ballarat community should continue investing in rail infrastructure and services with a focus on:

- Restoring passenger services between Ballarat and Geelong;
- Increasing the frequency, reliability and span of services;
- Improving access to services with additional stations and high amenity precincts around all stations;
- Provision of intermodal freight facilities at Ballarat West Employment Zone; and
- Innovation in railway technology and celebration of Ballarat's railway heritage.

The community should also note the railway improvements closer to Melbourne such as track duplication and electrification serve to significantly improve the future services provided to Ballarat. In essence, travel times will become more reliable, and services will be less congested than otherwise following improvements along other parts of the network.

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Victorian Integrated Transport Model - City of Ballarat

Phase 4: Preferred Scenario



Victorian Integrated Transport Model - City of Ballarat

Phase 4: Preferred Scenario

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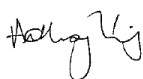
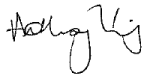
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Executive Summary

The Department of Economic Development, Jobs, Transport and Resources (DEDJTR) engaged AECOM to develop the Victorian Integrated Transport Model for the City of Ballarat (VITM_COB). The model allows DEDJTR to forecast traffic volumes and public transport (PT) patronage across the transport network under a range of transport and land use scenarios.

The purpose of this study is to develop the Victorian Integrated Transport Model (VITM) to represent the City of Ballarat area and use the model to provide planning advice and testing of a number of land use and transport scenarios to derive a preferred land use and transport scenario for The Ballarat Strategy.

The study includes four phases:

- Phase 1: Current year model development and validation
- Phase 2: Future year model development
- Phase 3: Advice on managing the impacts of growth and scenario testing
- Phase 4: Preferred scenario and reporting.

As part of this study, the following reports have been prepared:

- Inception Report
- Model Development and Validation Report
- Future Year Model Development Report
- Phase 3A Investigation Report
- Phase 3B Scenario Testing Report
- Phase 4 Preferred Scenario and Reporting (i.e. this report).

This report summarises the development of the VITM_COB and the model validation for the 2013 base year. Overall the model meets the validation criteria defined by DEDJTR, and is considered fit for the purpose of modelling future land use and transport network scenarios. The development of demographic data and the transport networks for future base years: 2021, 2031 and 2041 were then presented. The investigation of opportunities for network enhancement and land use development during Phase 3A, and the development and testing of eight transport and land use scenarios during Phase 3B were briefly discussed. As a result of modelling during Phase 3B, the 7th scenario – High Infill was identified to provide the best performance in terms of highest PT mode share and lowest length of congested road. Subsequently, the Project Reference Group has developed a Preferred Scenario which is based on the High Infill scenario, but with more population allocated to the CBD area to encourage less car travel by reducing the distance between housing and employment opportunities.

The remainder of this report describes a variety of measures for the three planning years (2021, 2031 and 2041) of the Preferred Scenario which include:

- population distribution
- transport network
- assumed parking cost
- percentage of active (walking and cycling) transport modes
- highway traffic volumes (AM peak)
- volume over capacity ratios (V/C ratios) for roads (AM peak)
- bus and train passenger loadings (AM peak)
- boardings and train stations (AM peak)
- comparisons of the above measures against the 2013 base.

The model results show that the road network generally is expected to continue to perform satisfactorily due to the well planned network in which the traffic growth would distribute over the whole road network rather than overload

a particular corridor. This was achieved with the proposed road network improvements in pace with the land use development of the Preferred Scenario. While some segments of the network would approach capacity, the overall network is projected to continue to operate under capacity in the long term. There are only three localised junctions/interchanges with V/C ratio above one in 2041, which indicates this section of road is operating over the designed capacity. The network performance could be further improved by widening the approaches of respective junctions in due time.

The PT mode share is projected to increase significantly over the years from 2.1 percent (2013), to 3.1 percent (2021), 3.6 percent (2031) and 4 percent (2041). This is due predominately to the proposed bus network improvements and moderate increase of car parking cost in the CBD. However, in order to achieve PT share of four percent or higher from a very low base, the PT network and services in reality would need to be continuously improved in terms of speed, frequency and coverage – particularly for new developments in outer areas.

The active mode share in the Preferred Scenario was assumed to increase from nine percent today to 20 percent for trips with distance less than two kilometres and to 15 percent for trips with distance between two and six kilometres. This assumption would certainly contribute to the reduction of car travel and highway traffic congestion. In order to achieve this mode share target, apart from critically integrating land use and transport, the responsible authorities would need to consider innovative approaches to improve pedestrian and cyclist amenities to attract new users and encourage mode shift.

1.0 Introduction

The City of Ballarat (COB) is developing a long term land use and infrastructure strategy for the municipality over the next 30 years, titled *Today Tomorrow Together: The Ballarat Strategy*. It will set the overarching framework for how the city will grow and develop into the future. The strategy will be based on integrated land use and transport planning, and will broadly require:

- Assessment of various areas of Ballarat for growth from a transport perspective; this assessment is then used in the development of growth options.
- Scenario testing of growth options to identify the transport advantages and disadvantages of each option; this will guide the selection of the preferred option.
- Documentation of a single preferred option that will be released in the draft *Ballarat Strategy*, including identification of key transport priorities.

The purpose of this study is to develop the Victorian Integrated Transport Model (VITM) to represent the COB area and use the model to provide planning advice and testing of a number of land use and transport scenarios to derive a preferred land use and transport scenario for *The Ballarat Strategy*.

The study includes four phases:

- Phase 1: Current year model development and validation
- Phase 2: Future year model development
- Phase 3: Advice on managing the impacts of growth and scenario testing
- Phase 4: Preferred scenario and reporting.

As part of this study, the following reports have been prepared:

- Inception Report
- Model Development and Validation Report
- Future Year Model Development Report
- Phase 3A Investigation Report
- Phase 3B Scenario Testing Report

The purpose of this report is to summarise the methodology and assumptions used to develop the 2013 base, key validation results, and present the modelling results of the preferred land use and transport scenario provided by the Project Reference Group for 2021, 2031 and 2041.

2.0 Model structure and network development

2.1 Model platform

Cube Voyager software was the platform used for developing the Victorian Integrated Transport Model for the City of Ballarat area (VITM_COB). Cube Voyager brings together the latest in strategic modelling technologies for forecasting personal travel. Cube Voyager uses a modular and script-based structure allowing the incorporation of any model methodology.

2.2 Study area

The model study area is shown in Figure 1 and Figure 2 and comprises predominantly the Ballarat Local Government Area (LGA). Note that the model area includes the whole of Victoria. However, the zones surrounding the study area were modelled in lower resolution to reduce processing time. The zone system is further described in Section 2.4.

The model zone system is flexible, allowing the study area to be expanded in future.

2.3 Base year

In consultation with the Victorian Department of Economic Development, Jobs, Transport and Resources (DEDJTR), the base year of the model was set as 2013 to be consistent with the main input data which is the 2013 demographic data for the COB. This is also the year which the traffic and passenger counts were collected for the validation of the model.

2.4 Zone system

The VITM has a total of 6823 zones which cover the whole state of Victoria. This zone system is aggregated to form the zone system for the VITM_COB which includes:

- 353 zones in the study area, covering the COB
- 546 zones for the Melbourne Statistical Division
- 763 zones for the remainder of Victoria.

In total, VITM_COB has 1662 zones. The 353 zones for the study area were developed using the following general principles, and also in consultation with the COB, DEDJTR and VicRoads:

- Each zone contains relatively homogeneous land uses (i.e. residential, commercial or industrial)
- Zone boundaries follow natural boundaries where possible (i.e. rivers, railways, major roads)
- Zone boundaries approximately align with ABS Census Mesh Block boundaries (since demographic data is generally available at this level).
- Mesh Block zone boundaries in growth areas such as Alfredton were disaggregated based on proposed planning information.

Figure 1 VITM_COB study area and internal zoning system for Ballarat and surrounding areas

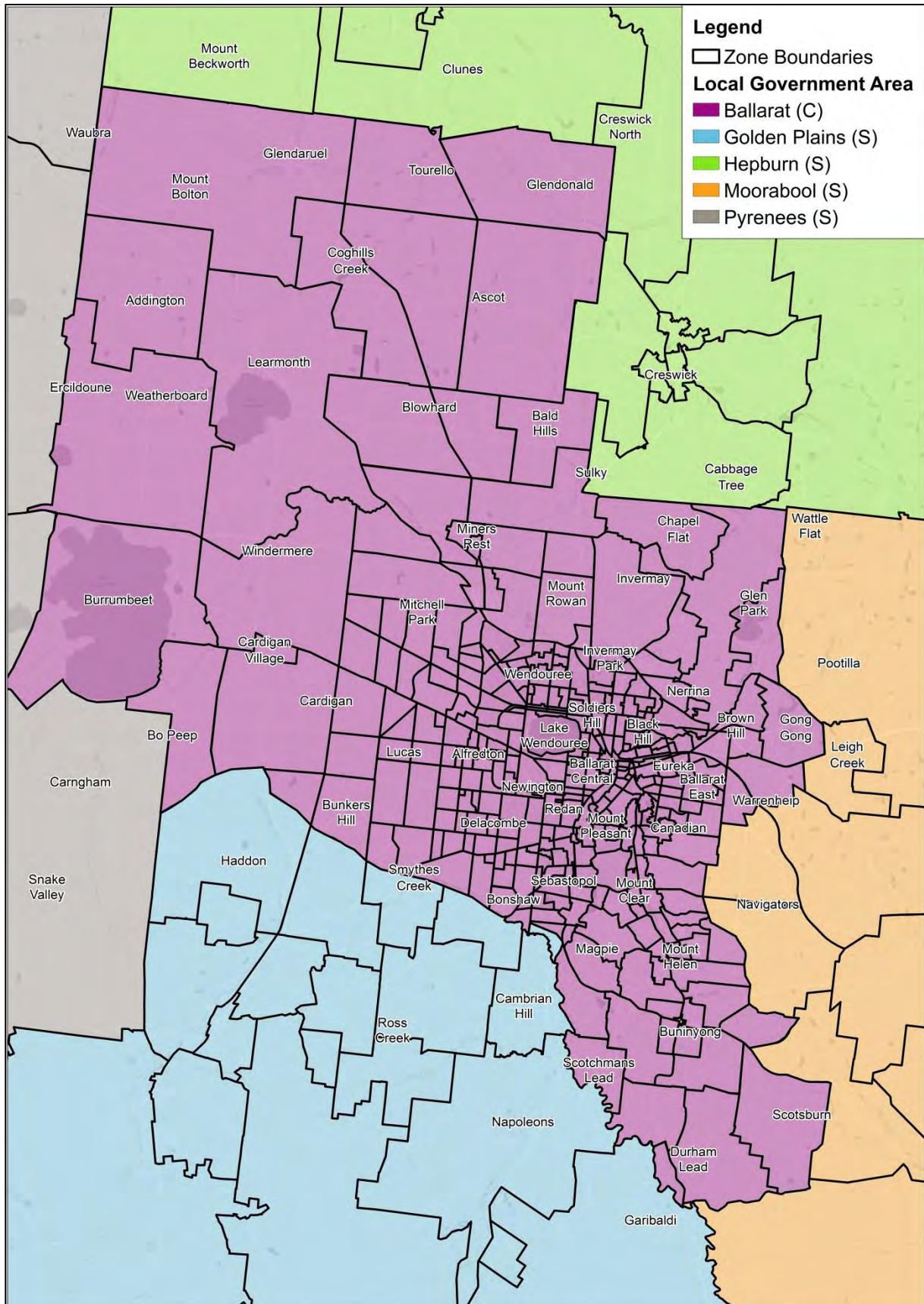
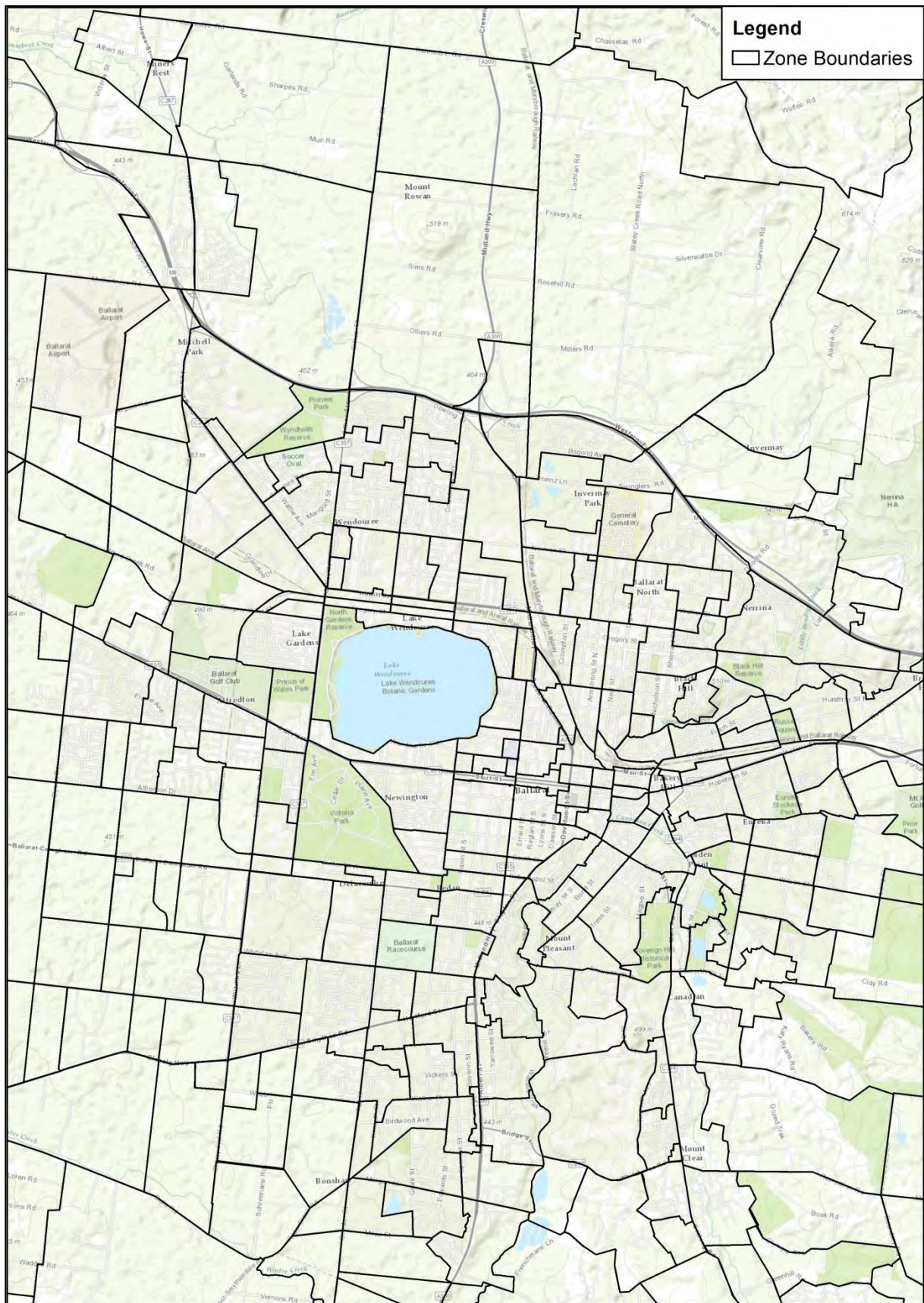


Figure 2 VITM_COB internal zoning system for Ballarat metropolitan area



2.5 Base year network development

The base year (2013) road network was developed from the existing VITM network and revised based on communications with VicRoads, DEDJTR and the COB. The transport network consists of two principal elements:

- **Nodes** represent zones and road intersections, or points where a change in characteristics occurs. For public transport (PT), nodes represent stops or stations.
- **Links** represent road, transit and walk segments, and include parameters such as length, hierarchy or classification, capacity, free-flow speed and travel time function or speed flow relationship. Links are always bound by a node at either end.

The approach for modelling links on the road network is discussed below.

Road hierarchy

The following road classifications were adopted:

- **Freeway and highway:** the national road network connecting cities and towns. Higher speed and capacity than any other classification.
- **Primary and major arterial:** primary inter-urban roads with limited intersections. Roads may be dual or single carriageway and access may be by grade separated or at-grade junctions.
- **Sub-arterial:** secondary urban and inter-urban roads with limited junctions. Roads may be dual or single carriageway and access mostly at-grade junctions.
- **Local / collector:** local access and connecting local roads to arterial roads.

Within each classification, roads are further classified as divided, undivided or ramp carriageways which affects the road capacity. Rural or urban environments can also have an impact, for example a rural road would usually have a higher capacity than an urban road of the same functionality.

Capacity

The road capacity is defined as the maximum traffic flow during a given time period. Capacity is allocated to each link depending on the road hierarchy, carriageway type, free flow speed (the average speed of the road during low traffic conditions) and number of traffic lanes.

Speed limit and posted speed factor

The posted speed factor assigns the free-flow speed of a road as a proportion of the posted speed limit taking into account traffic controls and environmental factors. The free flow speeds were coded into the base year network based on communications with VicRoads.

Speed flow relationship

Speed flow curves are used to adjust travel speeds on a road depending on the amount of traffic using the road; as traffic volume goes up, travel speed goes down. Different road types have different speed-flow curves (known as Akcelik curves), consistent with the VITM. The delay parameter (J_A) defines the shape of the curve. J_A values range from 0.4 for low impedance roads (such as freeway) to 1.6 for high impedance roads (such as local roads).

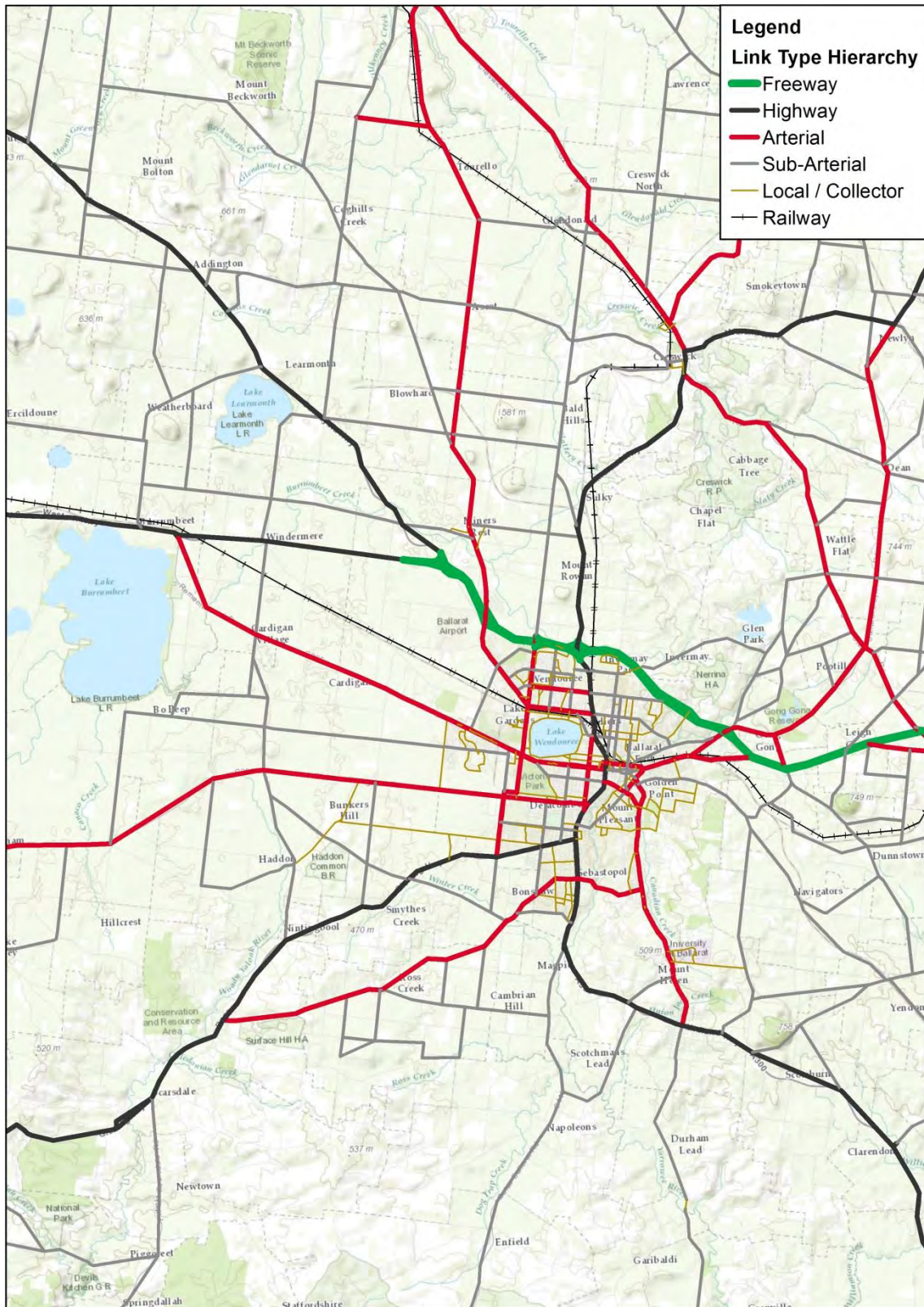
Each link in the model is assigned a link class, which is a combination of the factors described above. Table 1 below shows the link classes and associated parameters used in the VITM and the VITM_COB.

Table 1 VITM and VITM_COB link class and speed flow parameters

Link Class	Description	Environment and Impedance	J_A	Posted Speed Factor	Lane Capacity (per hour)
1	Centroid Connector	Inner and Outer	0.0	1.00	20,000
2	Local/Collector	Inner, High, Parking and Shopping	1.6	0.60	600
3	Local/Collector	Inner, Low and Clear	1.5	0.65	700
4	Local/Collector	Outer, High, Parking and Shopping	1.6	0.65	700
5	Local/Collector	Outer, Low and Clear	1.4	0.70	800
6	Secondary	Inner, High, Parking and Shopping	1.6	0.60	650
7	Secondary	Inner, Low and Clear	1.3	0.65	800
8	Secondary	Outer, High, Parking and Shopping	1.5	0.65	750
9	Secondary	Outer, Low and Clear	1.2	0.70	850
10	Primary Undivided	Inner, High and Parking and Shopping	1.4	0.60	750
11	Primary Undivided	Inner, Low and Clear	1.1	0.65	850
12	Primary Undivided	Outer, High, Parking and Shopping	1.3	0.65	800
13	Primary Undivided	Outer, Low and Clear	1.0	0.70	900
14	Primary Divided	Inner, High, Parking and Shopping	1.2	0.70	850
15	Primary Divided	Inner, Low and Clear	0.9	0.75	950
16	Primary Divided	Outer, High, Parking and Shopping	1.0	0.75	900
17	Primary Divided	Outer, Low and Clear	0.7	0.80	1,000
18	Freeway	Inner and High,	0.4	0.95	1,800
19	Freeway	Outer and Low,	0.4	0.95	2,000
20	Ramp	Inner and Outer	0.4	0.75	1,800
21	Level crossing	Inner	1.6	0.50	900
22	Level crossing	Outer	1.6	0.50	900
23	CBD	Inner	1.6	0.45	500
24	Rural Lane	For metropolitan area	1.6	0.70	600
25	Terminal	Inner and Outer	0.4	0.05	10,000
26	Freeway	Rural	0.4	0.95	2,000
27	Highway Undivided	Rural	0.4	0.85	1,350
28	Highway Divided	Rural	0.3	0.90	1,500
29	Arterial Undivided	Rural	0.8	0.80	1,200
30	Arterial Divided	Rural	0.7	0.80	1,300
31	Sub-arterial Undivided	Rural	0.9	0.80	1,100
32	Sub-arterial Divided	Rural	0.8	0.80	1,200
33	Local/Collector Undivided	Rural	1.0	0.70	900
34	Local/Collector Divided	Rural	0.9	0.70	1,000

Figure 3 show the base year road network in the VITM_COB and how it corresponds to the link classifications described above.

Figure 3 VITM_COB base year study area road network

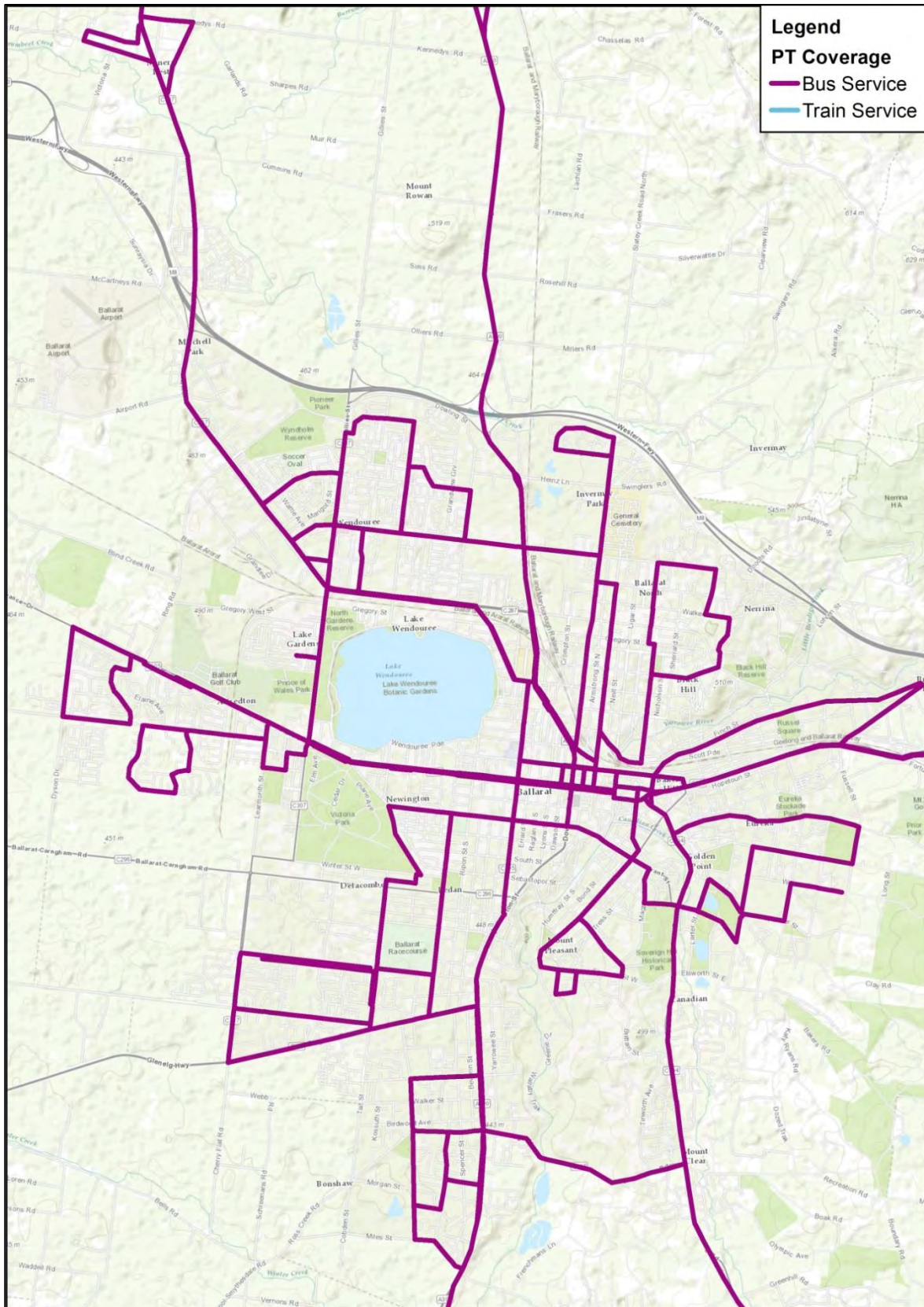


2.6 Public transport network and services

A total of 57 bus routes and 6 rail services were coded into the VITM_COB network to represent the PT services of Ballarat and surrounding areas. Each service was reviewed to check the correct routing, headway¹ and stops were adopted. Figure 4 show the coverage of bus and train services within the Ballarat study area.

¹ Headway refers to the scheduled intervals between services.

Figure 4 VITM_COB internal base year public transport service coverage²



² The 2013 base year model assumed a bus service on Mair Street, which had low frequency and patronage.

2.7 Development of zonal demographic data

2.7.1 Key input data

Demographic data is an input to the model for the purpose of trip generation. The demographic data adopted for the model at the zonal level has the same structure as the metropolitan Melbourne version of the VITM.

Demographic data required for the **trip production** component of the model includes:

- i) Population categorised by 6 age groups:
 - a) Aged 0-4
 - b) Aged 5-11
 - c) Aged 12-17
 - d) Aged 18-25
 - e) Aged 26-64
 - f) Aged 65+
- ii) Number of households
- iii) Dependants
 - a) Dependants (0-4)
 - b) Dependants (5-11)
 - c) Dependants (12-17)
 - d) Dependants (18-25)
 - e) Dependants (25-64)
 - f) Retirees (65+)

Demographic data required for the **trip attraction** component of the model includes:

- i) Employment categorised by two types:
 - a) Total
 - b) Retail
- ii) Enrolments categorised by:
 - a) Kindergarten/primary school enrolments
 - b) Secondary school enrolments
 - c) Tertiary institution enrolments which include Universities and TAFE.

2.7.2 Development of zonal demographic data

The base year demographic data for the study area was developed using data from various sources as shown below:

- Demographic data for the VITM compiled by SGS Economics and Planning during 2011/12 for DEDJTR.
- Population forecasts for the COB developed by .id Pty Ltd.
- Employment by destination zone derived from the ABS Journey to Work data and provided by DEDJTR.
- 2011 ABS Census employment data at SA2 level (area representative of gazetted suburbs in metropolitan and regional areas).
- Planning scheme maps, and various land use strategy reports for the COB.

The population data developed by SGS Economics and Planning for 196 zones within the study area was disaggregated into 353 transport zones. The disaggregation process was undertaken by applying specific

proportions to each of the 196 SGS zones. The zone proportions were derived separately for population, employment and school enrolments using the latest planning scheme maps.

The population and household data for the 353 zones was then adjusted to match the 2013 population forecast totals prepared by .id Pty Ltd. The .id data broke Ballarat into 18 reporting areas.

The employment data were taken initially from the ABS Journey to Work data at the destination zone level provided by the DEDJTR. There were 48 destination zones within the COB, which were disaggregated into 353 zones using proportions derived from the planning scheme. This zonal employment was then adjusted to match the 2011 ABS community profile employment totals at SA2 level. It was not necessary to adjust the 2011 employment to a 2013 total, as the trip attraction data is used to distribute trips. The number of trips is determined by the 2013 demographics in the trip production model.

School enrolment data from SGS was reviewed and corrected where applicable using planning scheme maps, the VicRoads Country Street Directory and information provided by the COB. Table 2 shows the 2011 employment data at an SA2 level and into two categories: Retail and Wholesale, and Total. The data was taken from the ABS website.

Table 3 shows the base year input data for the study area, summarised by the 18 .id reporting areas. The boundaries of the .id reporting areas are shown in Figure 5.

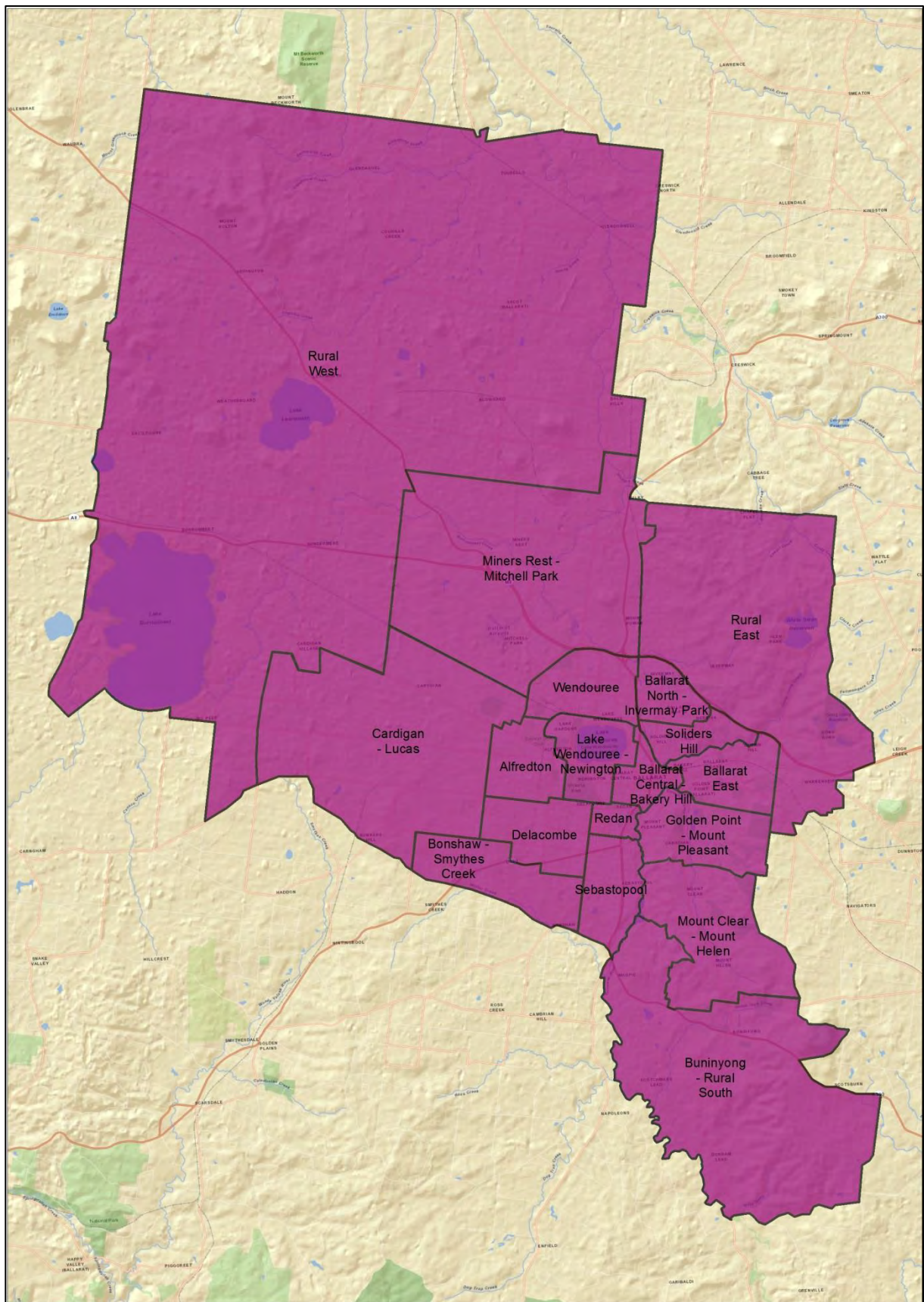
Table 2 2011 employment data by SA2 (Source: ABS 2011 Census)

SA2	Retail and Wholesale	Total
Ballarat Central	2,557	15,302
Ballarat North	530	3,670
Ballarat South	961	4,586
Delacombe	384	2,259
Alfredton	475	2,579
Miners Rest	1,388	8,195
Buninyong	90	2,579
Other	0	156
Total	6,385	39,326

Table 3 2013 demographic, employment and enrolment data by .id reporting areas

Area	Population	Households	Total Employment	Retail Employment	Enrolments
Alfredton	7,864	2,873	2,346	475	503
Ballarat Central - Bakery Hill	5,923	2,583	12,353	2,491	6,522
Ballarat East	8,346	3,666	1,616	177	1,371
Ballarat North - Invermay Park	5,908	2,422	805	87	369
Bonshaw - Smythes Creek	573	180	19	0	0
Buninyong - Rural South	4,179	1,547	648	82	602
Cardigan - Lucas	1,296	345	119	0	0
Delacombe	5,527	2,060	2,273	384	255
Golden Point - Mount Pleasant	7,741	3,129	1,541	0	365
Lake Wendouree - Newington	6,361	2,551	2,592	0	5,273
Miners Rest - Mitchell Park	4,019	1,419	1,759	0	220
Mount Clear - Mount Helen	6,406	2,205	2,345	90	7,963
Redan	3,061	1,504	661	149	752
Rural East	2,726	931	328	0	132
Rural West	1,964	777	210	0	0
Sebastopol	9,828	4,312	1,976	740	1,707
Soldiers Hill	5,772	2,391	580	133	562
Wendouree	10,898	4,777	7,154	1,587	2,322
Total Study Area	98,393	39,672	39,326	6,395	28,918

Figure 5 .id reporting area boundaries



2.8 Demand modelling

This section documents the model outputs for the trip generation, trip distribution and mode choice models of the VITM_COB.

2.8.1 Trip generation

The trip generation model estimates the total number of trips produced and attracted by each zone based on the input demographic data. The trip production of a household is a function of factors such as household size, number of workers, and car availability.

Table 4 shows a comparison of average total daily trip productions, regional populations and daily motorised trip production rates for Ballarat, Melbourne and other Victorian regions. Data from the VITM_COB is validated against VISTA07. VISTA is an ongoing survey of travel and activity administered by DEDJTR. The geographic coverage of the survey includes Melbourne, Ballarat and selected regional centres. VISTA07 data was collected during 2007/08 and the data was used to derive the model parameters used in the metropolitan component of the VITM.

Table 4 Daily trip production data (motorised trips, 2013)

Region	VITM_COB			VISTA07*		
	Trip production	Population (2013)	Trip Rate (trips per person)	Trip production	Population (2007)	Trip Rate (trips per person)
Melbourne	13,063,200	4,149,600	3.15	9,883,000	3,593,200	2.75
Ballarat	363,200	98,800	3.68	265,500	85,200	3.12
Geelong	808,100	224,500	3.60	619,700	197,500	3.14
Bendigo	391,500	108,300	3.62	292,000	93,300	3.13
Rest of Victoria	3,818,100	1,056,800	3.61	362,900	126,400	2.87
Total	18,444,100	5,637,900	3.27	11,423,013	4,095,500	2.79

* Average weekday

The above trip production data represents two-way trip ends for motorised modes. Key reasons for why the VITM trip rates are higher than the VISTA trip rates include:

- The VISTA data for Ballarat includes only travel within Ballarat by Ballarat residents, while the VITM trip rates include additional trips made within Ballarat by non-residents (e.g. commuters who travel from Creswick for work and then make other work or social trips in Ballarat).
- The VITM trip rates also include a factor to account for the absence of light commercial vehicles in the VITM trip generation parameters. VISTA doesn't include commercial vehicle trips; hence the VITM trip rates derived from VISTA don't include commercial vehicle travel. A heavy commercial vehicle (HCV) module within the VITM generates HCV trips. However, there is no light commercial vehicle (LCV) module because of a lack of available data to calibrate it. Hence the number of motorised trips created in the trip generation module is increased by 15 percent to account for LCV trips. The VITM trip rate shown above includes the LCV adjustment (but not the HCV).

Please note that the Ballarat, Geelong and Bendigo regions in Table 4 cover the entire LGA, whereas Melbourne refers to the whole Melbourne Statistical Division. The Rest of Victoria in VISTA07 includes only the cities of Shepparton and Latrobe, but the model includes the complete remainder of Victoria.

2.8.2 Trip distribution

The VITM_COB trip distribution model is used to distribute motorised person trips. It is based on a gravity model in which the number of trips between two zones i and j is proportional to the total trip productions at i (P_i), attractions at j (A_j), and a cost deterrence function between i and j . Cost deterrence function parameters are calibrated to improve the match between the modelled distribution of person trips and the observed distribution.

Figure 6 compares the estimated VITM_COB and observed VISTA trip length distribution for total motorised trips from Ballarat. The DEDJTR validation guidelines state that the modelled trip length distribution should be assessed against professional judgement. The DEDJTR transport modelling team indicated the VITM_COB and

VISTA trip distribution correspondence is satisfactory for the purpose of strategic modelling. The DEDJTR validation guidelines state that the combined modelled average trip length should be within 5 percent of the VISTA trip length. The VITM_COB model achieves this target with the modelled average trip length of 5.5 km being within 5 percent of the VISTA trip length of 5.4 km³.

Figure 6 Comparison of trip length distribution for all motorised trips from Ballarat

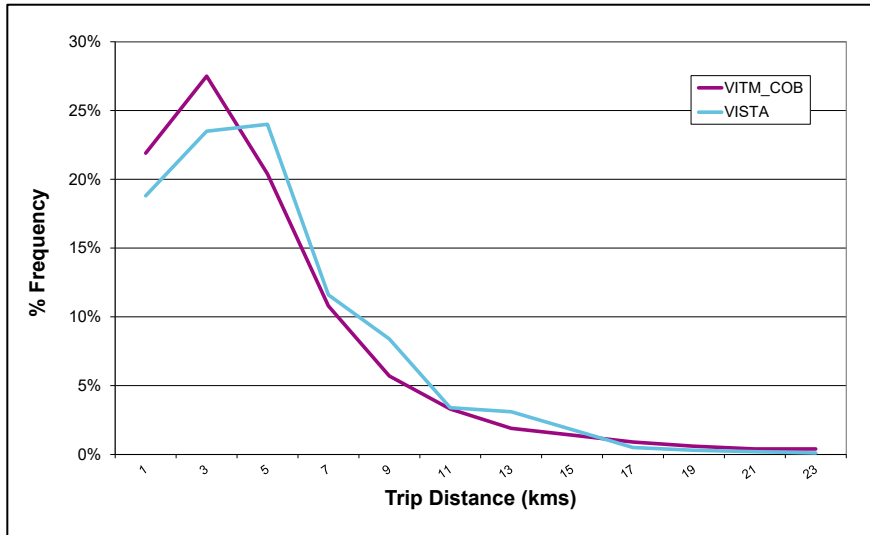


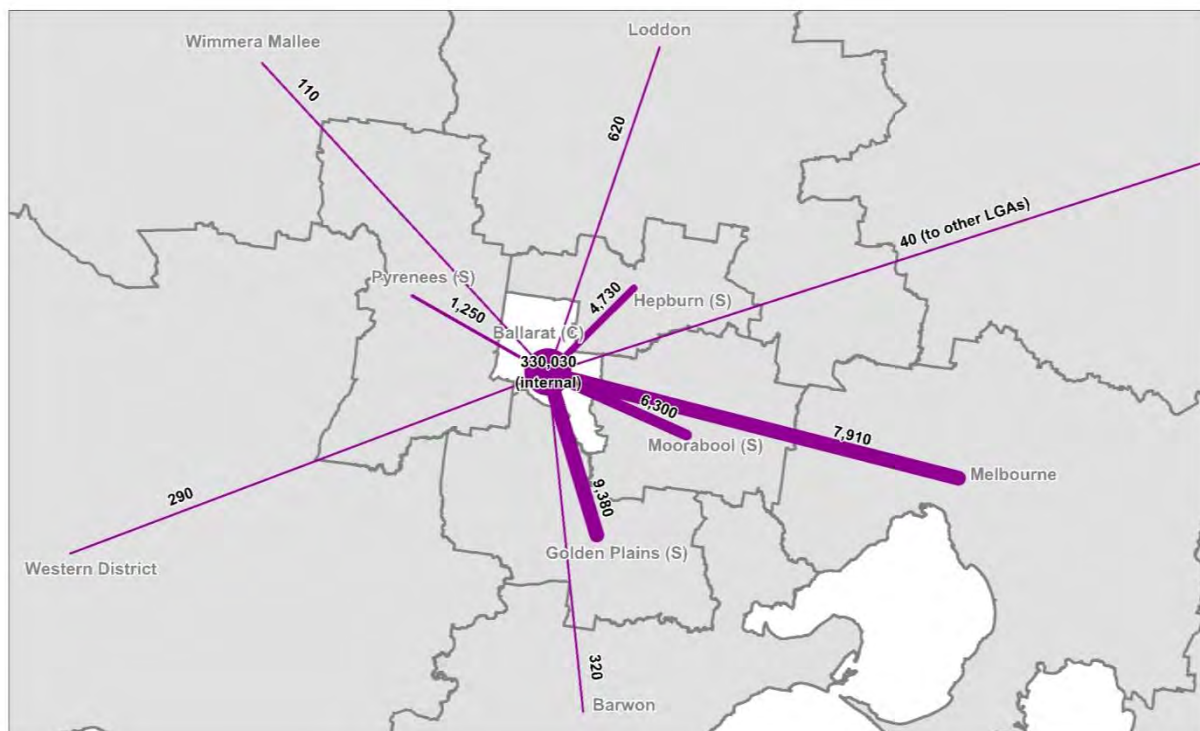
Figure 7 shows the modelled distribution of motorised trips from Ballarat to neighbouring LGAs and other regions. As discussed, the vast majority of trips are contained within Ballarat. As expected, there are high proportions of trips that travel to Melbourne and neighbouring LGAs. Golden Plains, Moorabool and Hepburn attracted the majority of neighbouring trips, with Pyrenees, Loddon and Barwon attracting a smaller proportion,

There is no observed data to validate the movements shown in Figure 7 against reality⁴. Instead the information is provided to give an understanding of the trip distribution patterns being produced by the VITM_COB. It is expected that VicRoads and Council staff will be able to assess whether the patterns shown are reasonable when measured against local knowledge.

³ Derived using the VITM trip distance matrix

⁴ The ABS JTW data cannot be compared to Figure 7 because it only provides information for journey to work trips. Because VISTA is a household travel survey that is run for the Ballarat LGA, and not surrounding LGAs, it cannot accurately report trip movements between Ballarat and adjacent LGAs

Figure 7 Distribution of modelled daily car and public transport trips from Ballarat to external LGAs



VISTA data can be used to establish the percentage of trips generated by Ballarat residents that have a destination within Ballarat. VISTA reports that 94 percent of resident trips are internal to Ballarat. This compares with the 92 percent of all trips (including non-Ballarat residents) produced by the VITM.

VISTA reports 3 percent of the Ballarat resident trips going to Melbourne, and 3 percent going to the rest of Victoria. The level of trip containment from the model is close to that of the VISTA data. This compares to 2.2 percent of VITM_COB trips going to Melbourne and 6.4 percent to the rest of Victoria.

The patterns in VISTA and the VITM_COB are not directly comparable because one refers to Ballarat resident trips (VISTA) and one to both resident and non-resident trips (VITM_COB). Given the difference, the travel patterns in VITM_COB are replicating the available observed data well.

The Model Development and Validation Report provides further information on the comparison of modelled trip length by trip purpose for trips from Ballarat, and distribution of motorised trips travelling within Ballarat LGA by origin and destination SLA against the observed VISTA trip distribution.

2.8.3 Mode choice

After the model assigns trips between an origin-destination pair in the trip distribution, a mode choice model divides trips into car and PT modes. The PT mode here includes train, tram and public bus.

Table 5 shows a comparison between the modelled and observed VISTA mode shares for private vehicle and PT travel segments for person trips within Ballarat. The mode choice model matches the observed data well, although it slightly overestimates PT travel.

The desired validation criterion in the DEDJTR Validation Guidelines for Melbourne wide mode share is:

- the percentage deviation in modelled mode share should be within +/- 5 percent of the VISTA model share

The VITM_COB meets this criterion for car mode share (the deviation is 0.3 percent). The PT deviation is -20.0 percent. The criterion is not considered to be applicable for Ballarat PT travel because the measure is coming off

such a low base. DEDJTR have advised they consider the VITM_COB mode choice robust for the purposes of strategic modelling.

Table 5 Comparison between VITM_COB and VISTA07 daily mode share for all motorised trips from Ballarat

Mode	VITM_COB	VISTA
Car	98.2%	98.5%
Public Transport	1.8%	1.5%

2.8.4 Commercial vehicles

The existing VITM has a freight movement model that estimates commercial vehicle trips for Melbourne, but not the rest of Victoria.

The development of a commercial vehicle model for the COB was not included in the scope of this study. A proper process would require a substantial budget for data collection and model development. For the benefit of this study, a reasonable approach based on AECOM experiences on the development of similar models throughout Australia was adopted. Consequently, an abridged commercial vehicle model was developed in VITM_COB to estimate the truck trips from/ to and through the COB and surrounding areas. The consideration of commercial vehicles increases the accuracy of the model.

The modelling process for commercial vehicles includes trip generation, trip distribution, time period choice and assignment. The assignment was undertaken simultaneously with the non-commercial trips.

The definition of a commercial vehicle is a rigid or articulated truck. The model was developed with initial parameters from interstate models and then calibrated to represent local traffic conditions. A description of the commercial vehicle model development is given below. The commercial vehicle trip production was generated using trip generation rates, which are then multiplied by employment data at an individual zone level. The trip attractions are assumed to equal the trip productions. The daily trip production/attraction rate (i.e. commercial vehicle trips produced per employee) is shown in Table 6.

Table 6 Daily commercial vehicle trip generation rates

Employment type	Trip generation rate (vehicle trips/job)
Total Employment	0.34

The base year trip distribution was undertaken using a gravity model with a Gamma deterrence function, and the highway generalised cost from the initial highway assignment. The parameters, α and β used in the function, are shown in Table 7. These parameters were calibrated so that the model produced an average trip length the same as that of Melbourne's heavy vehicle movements⁵.

Table 7 Trip distribution parameters

Trip distribution parameter	Value
α	-0.8
B	-0.013

The commercial vehicle matrix produced by the gravity model was then adjusted to improve the match to observed traffic counts using the Cube Analyst matrix estimation program.

The daily commercial vehicle matrix was then split into the four time periods using time period factors derived from traffic counts. The factors are shown in Table 8 below.

⁵ The assumption can be revised when HCV trip distribution data is available for Ballarat

Table 8 Time period factors for commercial vehicles

Time Period	Factor
Am-peak (2 hour)	0.159
Inter-peak (6 hour)	0.441
Pm-peak (3 hour)	0.199
Off-peak (13 hour)	0.202

Overall, the model described above produces approximately 13,000 daily commercial vehicle trips within the Ballarat LGA in the 2013 base year.

2.9 Model validation

The model validation is undertaken to assess how well the model replicates actual travel patterns in the base year. The validation compares model results and observed data for weekday total vehicle volumes and PT boardings.

The validation criteria and checks for daily and peak period traffic volumes were based on recommendations in the DEDJTR's *Guidelines for Strategic Transport Model Development: Calibration, Reasonableness Checks, Validation and Sensitivity Testing* (September 2010), which are based on international standards.

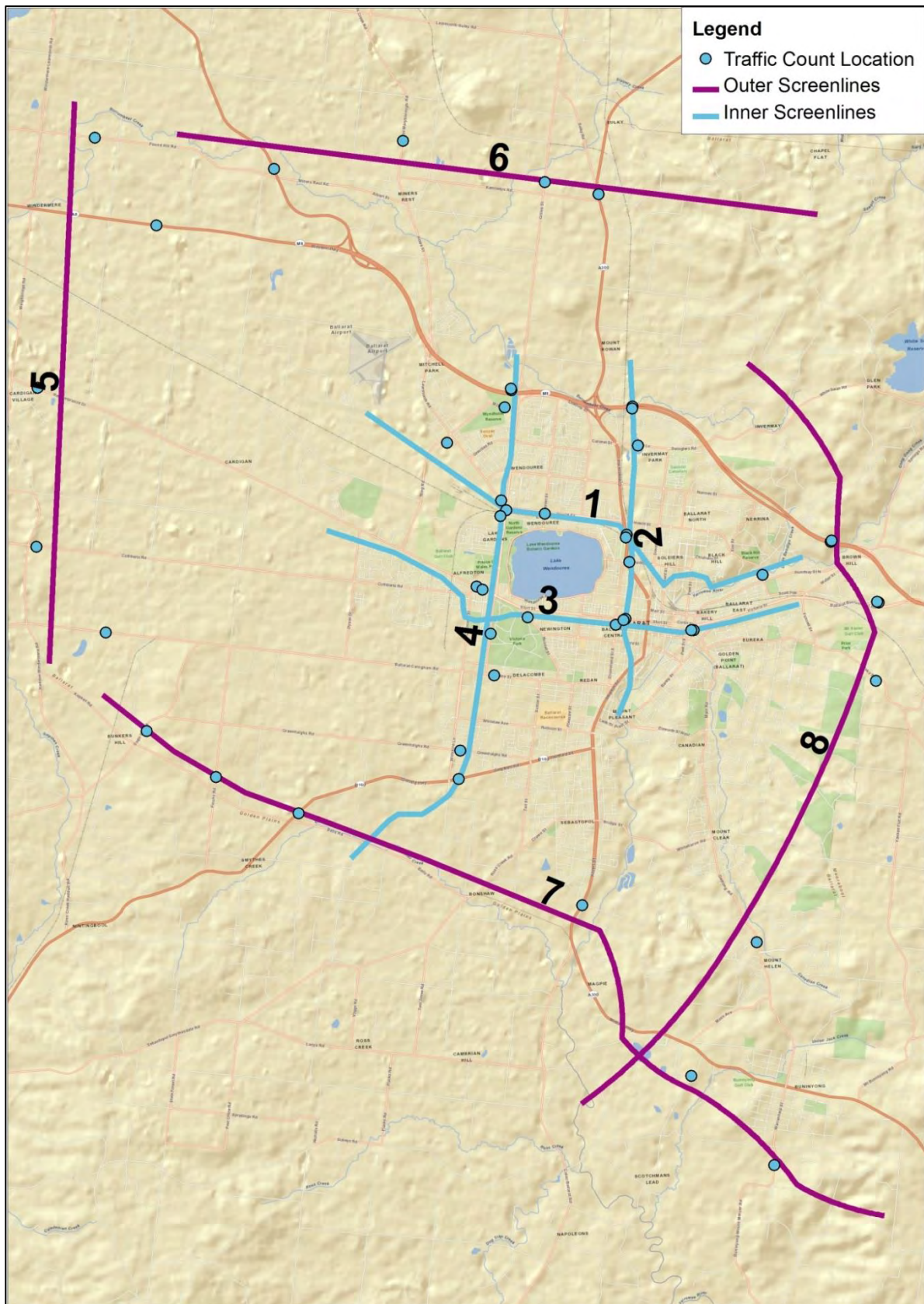
2.9.1 Highway validation

The validation criteria and checks that were undertaken for the highway component of the model included comparisons of observed and modelled traffic volumes for road corridors (screenlines) as well as traffic volumes for individual road links.

2.9.1.1 Comparison of observed and modelled traffic volumes by screenlines

Screenlines are imaginary lines which cross a number of roads in a traffic corridor and provide a summary of the traffic movements through the area. This form of comparison allows for the representation of the total traffic volumes through the corridor. A total of 8 screenlines were adopted for model validation purposes for the VITM_COB, as shown in Figure 8.

Figure 8 Traffic screenlines adopted for model validation



To satisfy the DEDJTR validation criteria, the percentage difference between the observed and modelled screenline traffic volumes needs to be within the values bounded by the two curves shown in Figure 9 for daily volumes. The traffic volumes used in Figure 9 are one way and include cars and commercial vehicles. A comparison for the AM peak and PM peak volumes is included in the Model Development and Validation Report. The difference between the observed and modelled one-way screenline traffic volumes satisfy the validation criteria for all cases for daily and peak period volumes.

Figure 9 Comparison of observed and modelled one-way daily screenline traffic volumes (total vehicles, 2013)

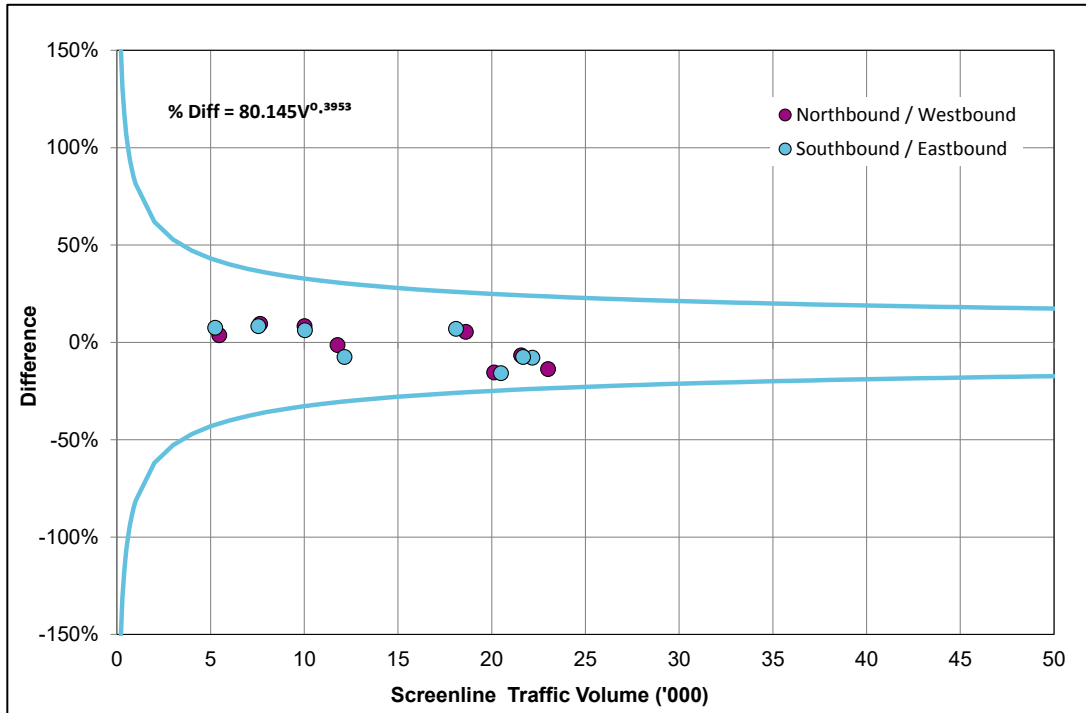


Table 9 provides a comparison of total daily traffic volumes for each screenline. Modelled traffic across six of the eight screenlines is within 10 percent of observed data, a good level of correspondence. East-west traffic movements across screenlines two and four are low by approximately 10 percent and 15 percent respectively. While further work can improve the validation of these movements, the model is deemed fit-for-purpose to test the future year scenarios.

Table 9 Comparison of observed and modelled daily screenline traffic volumes (total vehicles, 2013)

Screenline	Both Directions			North/West Bound Direction			South/East Bound Direction		
	Obs.	Mod.	% Diff.	Obs.	Mod.	% Diff.	Obs.	Mod.	% Diff.
1	43,760	40,546	-7.3%	21,578	20,127	-6.7%	22,182	20,419	-7.9%
2	44,704	39,880	-10.8%	23,020	19,842	-13.8%	21,684	20,038	-7.6%
3	23,936	22,842	-4.6%	11,782	11,611	-1.5%	12,154	11,231	-7.6%
4	40,644	34,257	-15.7%	20,142	17,016	-15.5%	20,502	17,241	-15.9%
5	10,724	11,308	5.4%	5,473	5,669	3.6%	5,251	5,639	7.4%
6	15,218	16,563	8.8%	7,657	8,380	9.4%	7,560	8,183	8.2%
7	20,064	21,513	7.2%	10,025	10,853	8.3%	10,040	10,660	6.2%
8	36,734	38,972	6.1%	18,632	19,621	5.3%	18,102	19,350	6.9%
Total	235,784	225,880	-4.2%	118,309	113,119	-4.4%	117,475	112,761	-4.0%

2.9.1.2 Comparison of observed and modelled traffic volumes for individual road links

A scatter plot of the observed and modelled traffic volumes for individual road links needs to have a line of best fit with a slope of between 0.9 and 1.1, and a statistical correlation (R^2) greater than or equal to 0.85 to satisfy the DEDJTR validation criteria. A total of 64 observed weekday traffic count locations within the study area were compared against the equivalent modelled volumes. Figure 10 shows a scatter plot of the daily observed and modelled one-way traffic volumes for total vehicles on individual road links. The slope of the line of best fit for daily traffic volumes is 0.96 and the statistical correlation (R^2) is 0.96, which satisfying both validation criteria. The criteria for the slope of the line of best fit and the statistical correlation are also met for both of the peak periods.

Figure 10 Observed and modelled daily one-way traffic volumes (total vehicles, 2013)

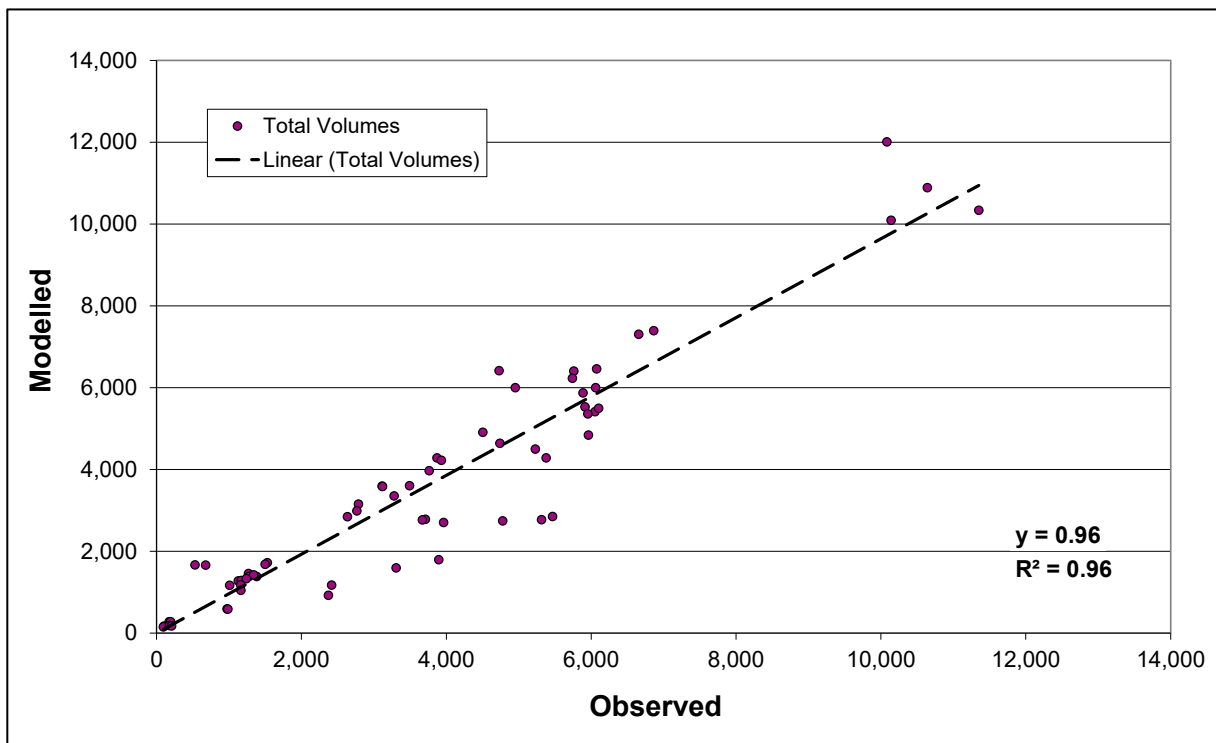


Table 10 provides a summary of the validation criteria discussed above. The table includes a comparison of observed and modelled traffic volumes for individual road links for the daily and peak periods. Validation criteria have been satisfied for all periods.

Table 10 Summary of individual road link validation results

Criteria	Target	Daily	Am-peak	Pm-peak
Slope of Best Fit	0.9 – 1.1	0.96	1.10	1.00
R^2	>90%	0.96	0.90	0.95

A detailed comparison between the modelled and observed traffic volumes by individual links for the daily, AM peak and PM peak periods is presented in the Model Development and Validation Report

2.9.2 Percent root mean square error

The percentage difference between the observed and modelled traffic volumes (defined by the Percent Root Mean Square Error, %RMSE) provides another indication of the model validation for daily traffic. %RMSE is defined as follows:

$$\%RMSE = 100N \frac{\sqrt{\sum_{a=1}^N (M_a - C_a)^2 / (N - 1)}}{\sum_{a=1}^N C_a} \tag{7}$$

where N = number of count/modelled link pairs
 M_a = modelled 1-way volume on link a
 C_a = surveyed average 1-way volume on link a

The overall daily %RMSE should be less than 30 percent to satisfy the validation criteria. Table 11 shows the %RMSE statistic for daily total vehicles. The overall %RMSE is 24 percent, which satisfies the validation criteria of 30 percent.

Please note that the %RMSE for individual bins of traffic volume are provided for information as an indication of where the model could be further improved, and not as an indication of the model not satisfying the validation criteria. Strategic models find it difficult to reduce the difference between modelled and observed traffic volumes for low volumes sites (<1000 vehicles/day) for a variety of reasons, including the presence of features such as speed humps and stop signs. These treatments can impact on the use of the streets but are not represented in the models.

Table 11 % RMSE statistic for daily total vehicles, 2013

1-way traffic volume	Number of directional sites	Sum of observed traffic volumes (10 ³)	Sum of (modelled – observed traffic volumes) ² * 10 ⁶	%RMSE Modelled
< 1,000	10	4	3	130
1,000 - 2,000	12	15	0	10
2,000 - 5,000	22	80	24	29
5,000 - 10,000	16	94	19	19
10,000+	4	42	5	12
All	64	236	50	24

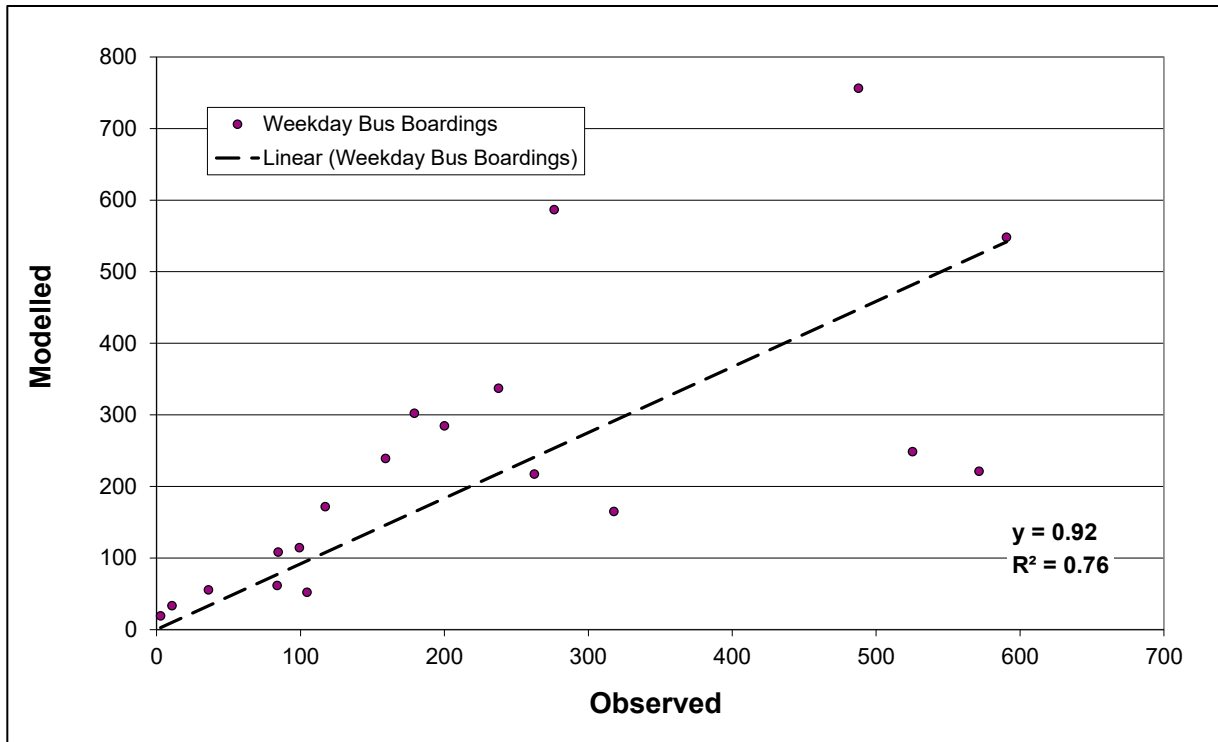
2.10 Public transport validation

Note that the PT mode in VITM_COB includes train, tram and public buses (but not school bus services or coaches). Therefore all bus passenger loadings discussed in this section include town public bus services only.

Validation criteria for a scatter plot of observed and modelled boardings requires a line of best fit with a slope of between 0.9 and 1.1, and a statistical correlation (R²) greater than or equal to 0.75 for buses and 0.85 for trains. In addition, modelled boardings should be within ±25% of observed boardings by service type.

Figure 11 shows a scatter plot of the daily observed and modelled **bus boardings by route**. The slope of the line of best fit is 0.92 and the statistical correlation (R²) is 0.76, satisfying both the R² criteria and the slope of best fit criteria.

Figure 11 Observed and modelled daily bus boardings by route, 2013 (average weekday)



A comparison of the daily observed and modelled bus boardings by route is tabulated in Table 12. The modelled bus boarding across all Ballarat bus routes is within 5 percent of the observed boardings. While there is significant variation at a route level, it was decided not to attempt to improve the route level validation because of uncertainty around the accuracy of the observed bus boardings. DEDJTR have indicated they will work with PTV to improve the quality of the bus data for future work⁶.

⁶ Validating a strategic model like the VITM_COB to bus routes with boardings as low as 3 passengers/ day may not yield results which can provide meaningful analysis.

Table 12 Comparison of daily bus boardings by route, 2013

Route	Observed	Modelled	% Difference
Wendouree West - Ballarat City	591	548	7.3%
Wendouree - Ballarat City	525	248	52.8%
Creswick - Ballarat City	200	285	-42.5%
Invermay - Ballarat City	85	108	-27.1%
Black Hill - Ballarat City	572	221	61.4%
Wendouree SC – Webbcona	36	55	-52.8%
Brown Hill - Ballarat City	318	165	48.1%
Ballarat Station – Eureka	84	61	27.4%
Ballarat Station – Canadian	105	52	50.5%
Buninyong - Ballarat Station	488	756	-54.9%
Mount Pleasant - Ballarat City	99	114	-15.2%
Sebastopol - Ballarat City	276	587	-112.7%
Delacombe - Ballarat City	238	337	-41.6%
Delacombe - Ballarat City	117	172	-47.0%
Sturt Street West - Ballarat City	263	217	17.5%
Lake Gardens - Ballarat City	159	239	-50.3%
Wendouree - Miners Rest	11	33	-200.0%
Alfredton - Ballarat City	179	302	-68.7%
Delacombe – Sebastopol	3	19	-533.3%
Total	4,347	4,521	-4.0%

Figure 12 shows a scatter plot of the daily observed and modelled train boardings by station for stations located within the Ballarat model study area. The slope of the line of best fit is 1.10 and the statistical correlation (R^2) is 0.99, which satisfy the DEDJTR validation criteria.

Figure 12 Observed and modelled daily train boardings by station, 2013

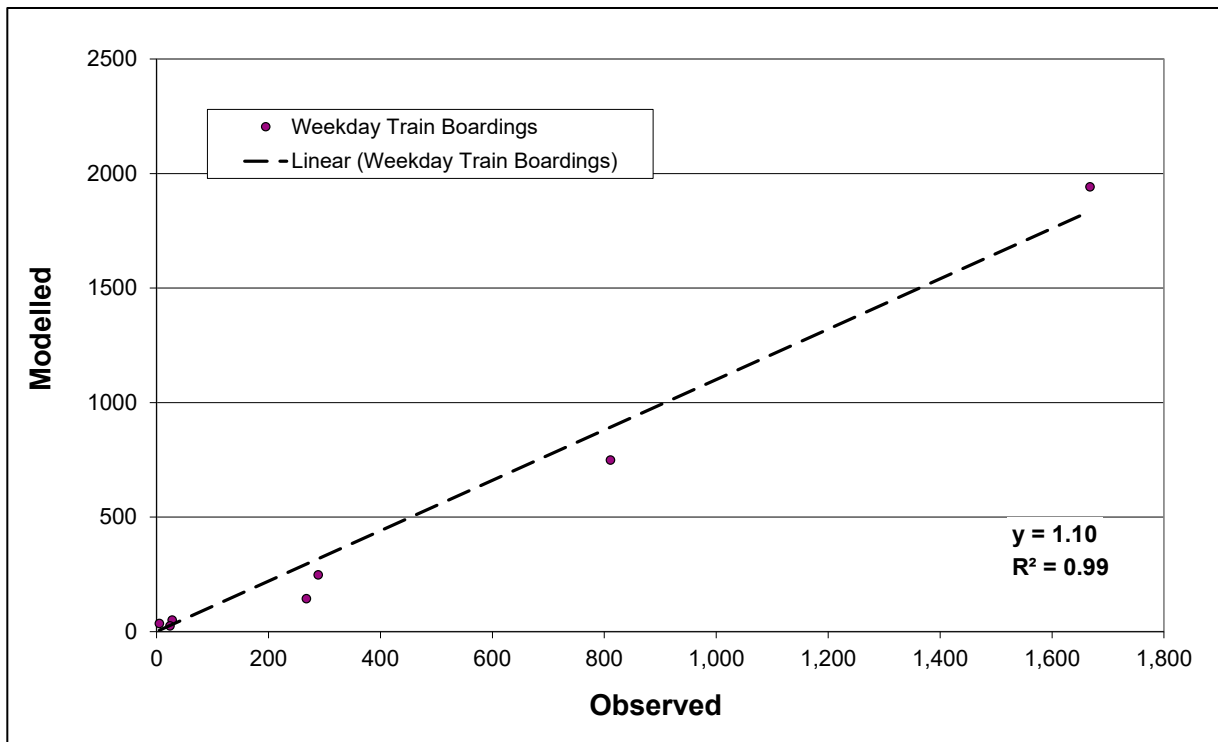


Table 13 shows a comparison of the daily boardings for each station in and surrounding the Ballarat model study area. The DEDJTR Validation guidelines do not specify criteria for train boardings at individual stations. The criteria for metropolitan lines is +/- 25 percent. Given the criteria for train lines the results are considered satisfactory, with the largest percentage differences occurring at stations with low boardings (Creswick and Beaufort).

Table 13 Comparison of daily station boardings, 2013

Station	Observed	Modelled	% Difference
Bacchus Marsh	811	748	7.8%
Ballan	268	143	46.6%
Ballarat	1,668	1,942	-16.4%
Beaufort	28	50	-78.6%
Creswick	5	35	-600.0%
Maryborough	24	24	0.0%
Wendouree	289	247	14.5%
Total	3,093	3,189	-3.1%

Table 14 shows a summary of the PT model results, demonstrating that all validation criteria have been met.

Table 14 Public transport validation results

Criteria	Target	Bus	Train
Slope of Best Fit	0.9 – 1.1	0.92	1.10
R ²	>0.75 Bus, >0.85 Train	0.76	0.99

The validation of modelled highway volumes against traffic counts is considered to be the most important element of the model validation, because the car traffic accounts for 98 percent of observed travel demand in Ballarat. The highway validation was satisfactory at three levels: screenline, scatter plot and RMSE.

While PT accounts for only 2 percent of motorised travel in Ballarat, the modelled daily bus boardings validated well against the observed bus boardings at a network level. There were differences at a route level, but concerns over the quality of observed data meant no additional work was undertaken to achieve a better route level validation. The modelled daily train boardings validated well against the observed boardings across the stations contained within the Ballarat model. There were variations at the individual station level, but these occurred at stations with low patronage.

Overall, the model has met the validation criteria defined by DEDJTR for both highway and PT. The satisfactory validation results mean the VITM_COB is fit for the purpose of modelling future year land use and transport network scenarios at a strategic level.

3.0 Future year model development

3.1 Future year demographics

This section presents the development of future year demographic data for Phase 2 and Phase 3 of the study that provide the foundation for the development of the preferred land use for Phase 4. In particular, the estimated employment and educational enrolments were used through three phases: 2, 3 and 4.

3.1.1 Methodology

Demographic data provides information required for both the trip production and trip attraction components of the model.

Table 15 Future year model inputs drawn from demographic projections

Trip production data	Trip attraction data
- Population categorised by 6 age groups	- Educational enrolments
- Number of households	- Jobs at wholesale and retail employment sites
- Dependants categorised by 6 age groups	- Jobs at other employment sites

The development of demographic data in terms of population, employment and enrolments is discussed in the following sections.

A key focus of this analysis has been to appropriately distribute the future population, employment and school enrolments spatially within the COB to reflect planned land uses. Accordingly, a number of analytical refinements were applied to data provided by state agencies and Council to achieve this objective.

3.1.2 Future population

The approach to estimating population at the zonal level for the COB for future years was consistent with that used to refine the 2013 population, detailed in the *Victorian Integrated Transport Model for the City of Ballarat – Future Year Model Development Report*.

The demographic data provided by DEDJTR was used as a starting point with the following adjustments:

- The total projected population for COB in 2021 and 2031 was based on the DEDJTR data prepared by SGS Economics. These were consistent with the Victoria in Future 2012 by the Department of Environment, Land, Water and Planning. For 2041, the total population was taken from the SGS forecast.
- The total population for 2021 and 2031 was distributed to the defined small areas (shown in Figure 5) using the COB prepared by .id. The population for the small areas for 2041 was estimated by applying the .id 2021-31 growth rate for each small area, subject to an overall LGA total controlled by the 2041 SGS forecast.
- The distribution of population from the .id small areas to transport zones was based on the SGS zonal population split into VITM_COB zones using the proportion of residential area allocated to each transport zone in future, which were determined by using various data sources including the Planning Scheme maps, Ballarat West Precinct Structure Plan, and Alfredton West Precinct Structure Plan. Table 16 provides a summary of the projected future population and the respective growth rates by the .id small area.

The majority of population growth is forecast to occur in the Ballarat West areas such as Alfredton, Bonshaw-Smythes Creek, Delacombe, and Cardigan-Lucas-Bunkers Hill. This is consistent with the Ballarat West Structure Plan.

The growth of households in 2021-31 and 2031-41 is forecast to outstrip growth in population for the same period, implying a trend towards persons per household decreasing in the future. Details of household projections are provided in the *Future Year Model Development Report*.

Table 16 Future year population by .id small area

.id small area	Population				Annual growth		
	2013	2021	2031	2041	2013-21	2021-31	2031-41
Alfredton	7,864	11,250	12,244	13,186	4.6%	0.9%	0.7%
Ballarat Central - Bakery Hill	5,923	5,950	5,936	5,914	0.1%	0.0%	0.0%
Ballarat East - Brown Hill (West) - Eureka	8,346	8,851	9,008	9,154	0.7%	0.2%	0.2%
Ballarat North - Invermay Park	5,908	6,125	6,183	6,231	0.5%	0.1%	0.1%
Bonshaw - Smythes Creek	573	866	2,929	4,714	5.3%	13.0%	4.9%
Buninyong - Rural South	4,179	4,217	4,256	4,289	0.1%	0.1%	0.1%
Cardigan - Lucas - Bunkers Hill	1,296	3,167	8,984	14,170	11.8%	11.0%	4.7%
Delacombe	5,527	8,645	11,715	14,488	5.7%	3.1%	2.1%
Golden Point - Mount Pleasant – Canadian	7,741	8,355	8,759	9,170	1.0%	0.5%	0.5%
Lake Wendouree - Newington - Lake Garden	6,361	6,239	6,167	6,086	-0.2%	-0.1%	-0.1%
Miners Rest - Mitchell Park	4,019	5,343	5,972	6,738	3.6%	1.1%	1.2%
Mount Clear - Mount Helen	6,406	6,969	7,542	8,130	1.9%	0.8%	0.8%
Redan	3,061	3,129	3,155	3,177	0.3%	0.1%	0.1%
Rural East	2,726	3,613	4,505	5,317	3.6%	2.2%	1.7%
Rural West	1,964	2,005	2,026	2,045	0.3%	0.1%	0.1%
Sebastopol	9,828	11,935	12,384	12,969	2.5%	0.4%	0.5%
Soldiers Hill - Black Hill - Nerrina (South)	5,772	5,880	5,917	5,946	0.2%	0.1%	0.0%
Wendouree	10,898	11,006	11,204	11,389	0.1%	0.2%	0.2%
Total (City of Ballarat)	98,393	113,544	128,886	143,115	1.9%	1.3%	1.1%

3.1.3 Future employment

The VITM model has two employment categories, retail and total employment. However, to refine the spatial distribution of employment, employment forecasts were disaggregated into a number of additional categories, including industrial, retail, hospital, and education.

The future employment forecast for the COB at transport zone level was developed using a top down approach as described below:

- 1) Adopt the DEDJTR (or SGS Economics data) control total for the LGA.
- 2) Estimate the 2011 employment by category using the 2011 Census data at SA2 level, and project to the SGS LGA total.
- 3) Estimate the future employment by category from the 2011 employment data and also other data sources.
- 4) Distribute the future employment by category into transport zones.
- 5) Add the employment by category at transport zones into two categories: retail and other.

The employment classification used in the data was based on the 2006 Australian and New Zealand Standard Industrial Classification (ANZSIC), which includes 19 divisions. This classification was further aggregated into five distinct categories: Industrial, Retail, Health care, Education and Other to allow SGS data to be comparable to other available data sources. The detailed aggregation was discussed in the *Future Year Model Development report*. The refined employment projections are summarised in Table 17 below.

Table 17 Adjusted future employment by category for City of Ballarat

Employment Category	Employment				Annual growth		
	2011	2021	2031	2041	2011-21	2021-31	2031-41
Industrial	12,206	13,923	15,749	17,397	1.3%	1.2%	1.0%
Retail	8,174	9,486	10,901	12,404	1.5%	1.4%	1.3%
Health care	6,584	8,744	11,413	14,327	2.9%	2.7%	2.3%
Education	4,018	4,826	5,713	6,500	1.8%	1.7%	1.3%
Other	19,360	23,659	27,123	27,677	2.0%	1.4%	0.2%
Total	50,342	60,639	70,899	78,306	1.9%	1.6%	1.0%

3.1.4 School enrolments

School enrolments for primary, secondary and tertiary institutions were developed from the 2011 base. School enrolment was checked to ensure that schools and tertiary institutions were located in the correct zones, and also to take into account comments from COB. The future growth of school enrolments was based on the SGS Economics forecast, with additional enrolments to reflect proposed new schools shown in the Alfredton West and Ballarat West Precinct Structure Plans.

The total additional school enrolment was estimated to be in proportion with the population growth. For example, primary school enrolment would grow in line with the population of the age group 5-11, while the secondary school enrolment would grow in the same proportion with the population of the age 12-17. The following enrolment by school was estimated for 7 primary schools and 1 secondary school in the Alfredton and Ballarat West precincts in 2041:

- 350 enrolments per primary school
- 1500 enrolments per secondary school.

Enrolments for intermediate years were scaled down in proportion with the population growth.

Table 18 provides a summary of total educational enrolments by future years and the corresponding annual growth. Please note that enrolments for proposed new schools were added to allow the model to distribute school trips to new school locations. However this does not lead to additional school trips because the total production of school trips for Ballarat LGA is controlled by the “population by age” groups.

Table 18 Summary of educational enrolments

Educational level	School Enrolment				Annual growth		
	2011	2021	2031	2041	2011-21	2021-31	2031-41
Primary	9,077	11,531	12,552	13,002	2.4%	0.9%	0.4%
Secondary	9,980	10,800	12,651	13,248	0.8%	1.6%	0.5%
Tertiary	9,861	10,322	11,204	12,056	0.5%	0.8%	0.7%
Total	28,918	32,654	36,407	38,306	1.2%	1.1%	0.5%

In order to represent the demographic data in spatial form, Figure 13 and Figure 14 show how the total population and total employment are forecast to be distributed to 2041.

Figure 13 Distribution of total population in the study area in 2041

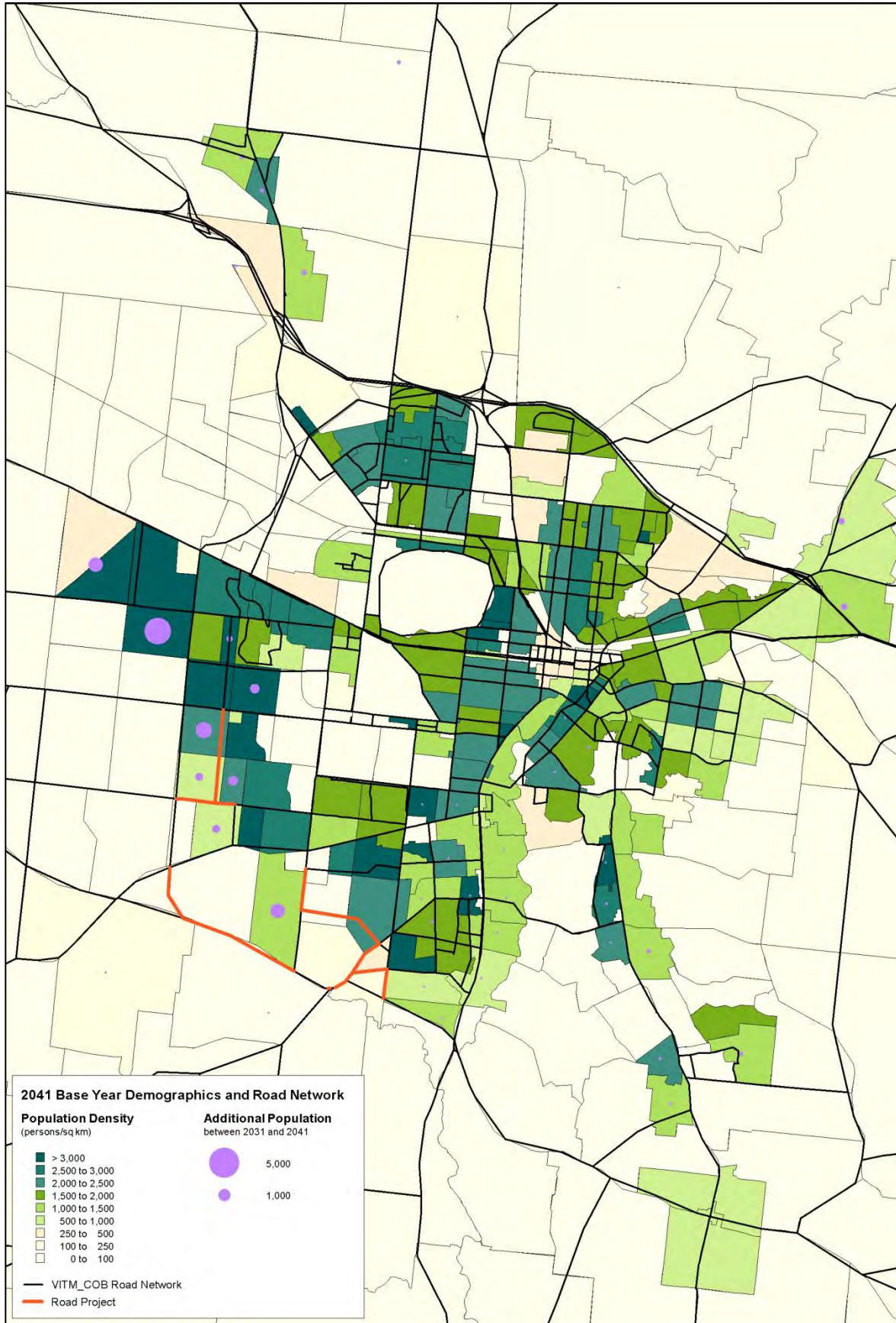
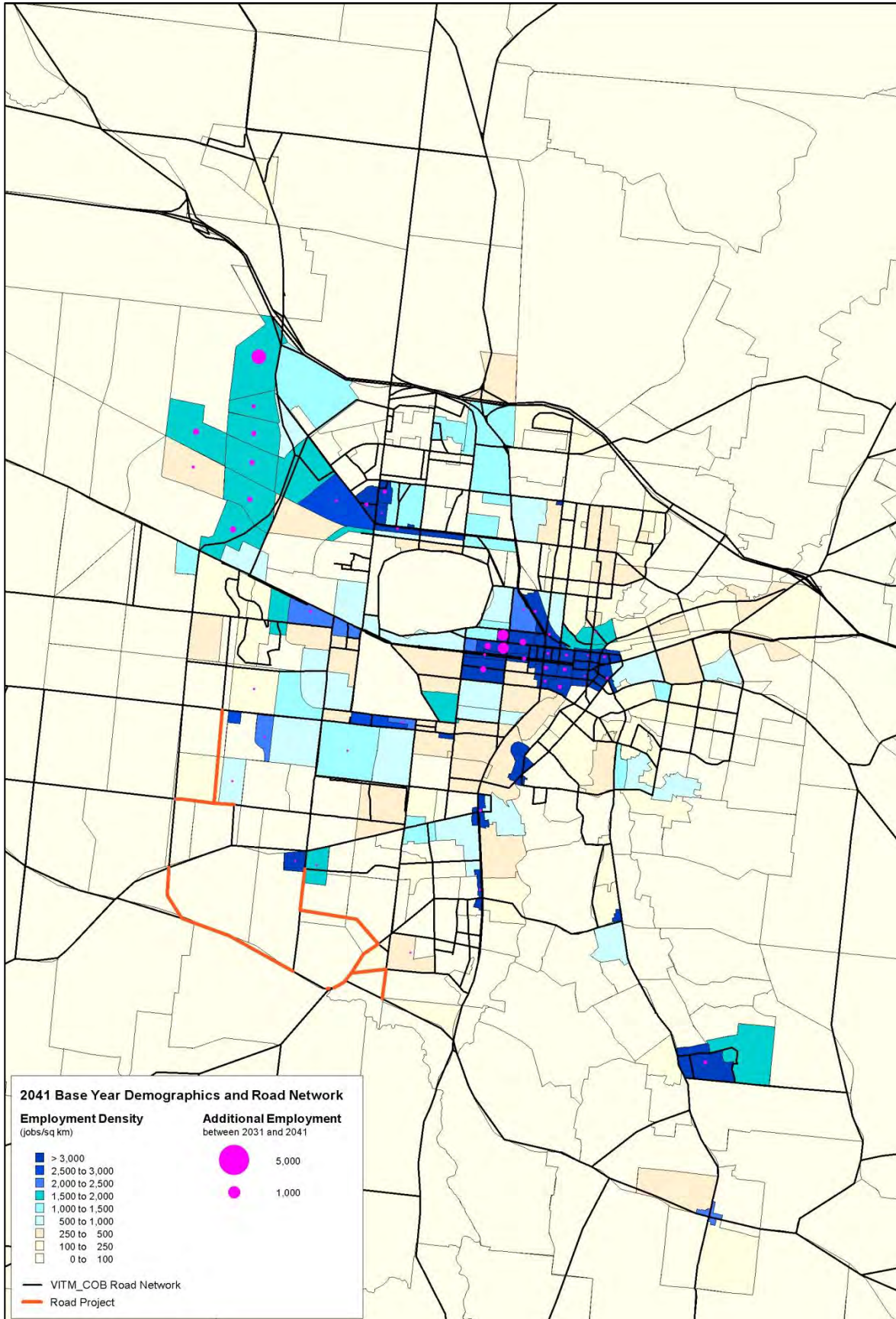


Figure 14 Distribution of total employment in the study area in 2041



3.2 Future year transport network development

The base year transport network was updated to reflect anticipated changes in future years based on information provided by DEDJTR, VicRoads, PTV and COB. All network changes in future years were coded into a master network. Links in the master network could then be turned on or off depending on the year being modelled.

3.2.1 Road network development

The changes made to the future year road networks are proposals that are likely to be implemented in response to anticipated traffic growth and capacity requirements within the study area. However they are not necessarily part of any planned or committed implementation. They were incorporated as a future base network for modelling purposes.

The principal changes are related to the urban growth area of Ballarat West and include additional network links (i.e. new roads such as the Western Link Road) as well as changes to existing network links (e.g. increased capacity, changed speed limits, new roundabouts and traffic signals). The additional network links are drawn from the relevant structure plans and advice from Council and VicRoads. Other changes include planned upgrades to the eastern freeway approaches to Ballarat.

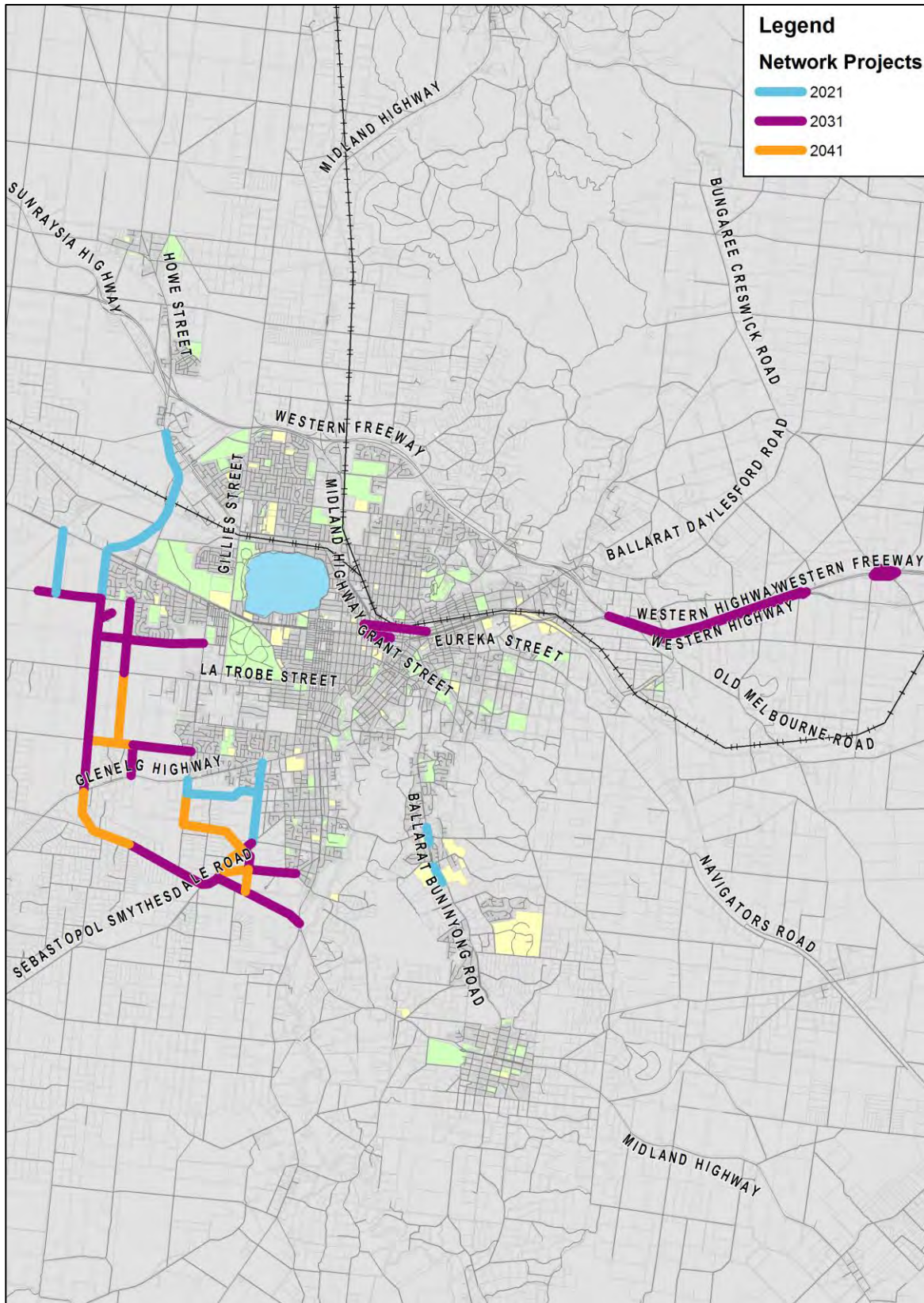
Table 19 below and Figure 15 show anticipated road network improvements for the COB by 2021, 2031 and 2041.

Table 19 Modelled road network improvements

Year	Type	Description
2021	New road	Western Link Road Stage 1 – Western Freeway to Boulevard Drive. Interim two lane with service road cross-section
	Upgrade	Cherry Flat Rd from rural road to urban 60km 2-lane 'link' between Webb Rd to Wiltshire Lane (by 2021)
	Upgrade	Tait Street upgraded to 60km 2-lane with service roads and turning lanes from Ross Creek Rd to Glenelg Hwy (by 2021)
	New road	Ascot Gardens Drive and Webb Road now form a through connection from Tait St to Cherry Flat Rd. Urban 60km 2-lane 'link' (by 2021)
	Upgrade	Geelong Road <ul style="list-style-type: none"> At Mt Clear - Sebastopol Rd: Four lane cross section north south from ~230m south of roundabout to ~130m north of roundabout Additional shared lane and signal improvement at Recreation Road At Damascus College entrance: 5 lane cross section 200m south to 80m north, extended right turn lane On demand signals at Olympic Ave Speed limit 60km/h (change the road segment from rural to urban classification – effectively reduce its speed reduction factor)
2031	New road	Western Link Road Stages 2, 3 and 5: <ul style="list-style-type: none"> Cuthberts Rd to Ballarat - Carngham Rd (Stage 2), Carngham Rd to Glenelg Hwy (Stage 3), Cherry Flat Rd to Midland Hwy (Stage 5) Urban 60km 2-lane
	New road	New North-South Link road in Ballarat West Precinct Structure Plan: <ul style="list-style-type: none"> Cuthberts Rd to Ballarat – Carngham Rd Greenhalghs Rd to Glenelg Hwy Urban 60km 2-lane
	Upgrade	CBD roads plan: <ul style="list-style-type: none"> Sturt Street 2 lanes east of Doveton St. Mair Street 4 lanes from Dawson to Princes St.
	Upgrade	Western Highway between Leigh Creek and Woodmans Hill. Upgrade to freeway and interchange, 2 lanes each direction and 110 km/h

	Upgrade	Cuthberts Road from rural road to urban 60km 2-lane in whole Alfredton West Precinct Structure Plan area
	New road	New east-west collector south of Alfredton Drive constructed from Western Link Road to Learmonth Street, urban 60km 2-lane
	New road	Cuzens Road completed from Dyson Drive to Western Link Road, urban 60km 2-lane collector
	Upgrade	Miles Street from rural road to urban 60km 2-lane collector
	Upgrade	Greenhalghs Road from rural road to urban 60km 2-lane link from new North-South Link Road to Wiltshire Lane
	Upgrade	Cobden Street upgrade and realignment from Ross Creek Rd to Miles Street, Urban 60km 2-lane link
	Upgrade	Ross Creek Rd from rural road to urban 60km 2-lane link from re-aligned Cobden Street to Tait Street
2041	New road	Western Link Road Stage 4: <ul style="list-style-type: none"> • Glenelg Hwy to Cherry Flat Rd • Urban 60km 2-lane
	New road	New North-South Link road completed: <ul style="list-style-type: none"> • Ballarat – Carngham Rd to Greenhalghs Rd (now runs whole way from Cuthberts to Glenelg Hwy) • Urban 60km 2-lane
	Upgrade	Cherry Flat Rd from rural road to urban 60km 2-lane link between Webb Rd and Schreenans Rd
	Upgrade and new	Schreenans Rd upgraded and extended from Cherry Flat Rd to Ross Creek Rd, where it connects with re-aligned Cobden Street, urban 60km 2-lane link
	Upgrade	Greenhalghs Road from rural road to urban 60km 2-lane link from Western Link Road to new North-South Link Road
	Upgrade	Cobblers Lane from rural road to urban 60km 2-lane collector
	Upgrade	Ross Creek Rd from rural road to urban 60km 2-lane link from re-aligned Cobden Street to Bells Road
	New	Re-aligned Cobden Street extended from Miles Street to Bells Road, urban 60km 2-lane link

Figure 15 Anticipated future road network (base case)



3.2.2 Public transport network development

3.2.2.1 Bus services

The bus services for future years 2021, 2031 and 2041 were developed by AECOM, extending existing services to cover the population growth area in Ballarat West, in line with the proposed road network development. The proposed bus routing was to link the population growth areas to the Ballarat CBD, Ballarat West Employment Zone, and also to neighbourhood activity centres. The approach taken was conservative, making simple extensions to existing routes. In practice a more extensive network review may be warranted to efficiently meet PT needs in the growth areas.

For the future base years, the frequency for these bus services was assumed to be unchanged. The proposed networks are shown in Figure 16 and the assumed service frequencies are shown in Table 20.

Table 20 Assumed bus service frequencies for VITM_COB future years

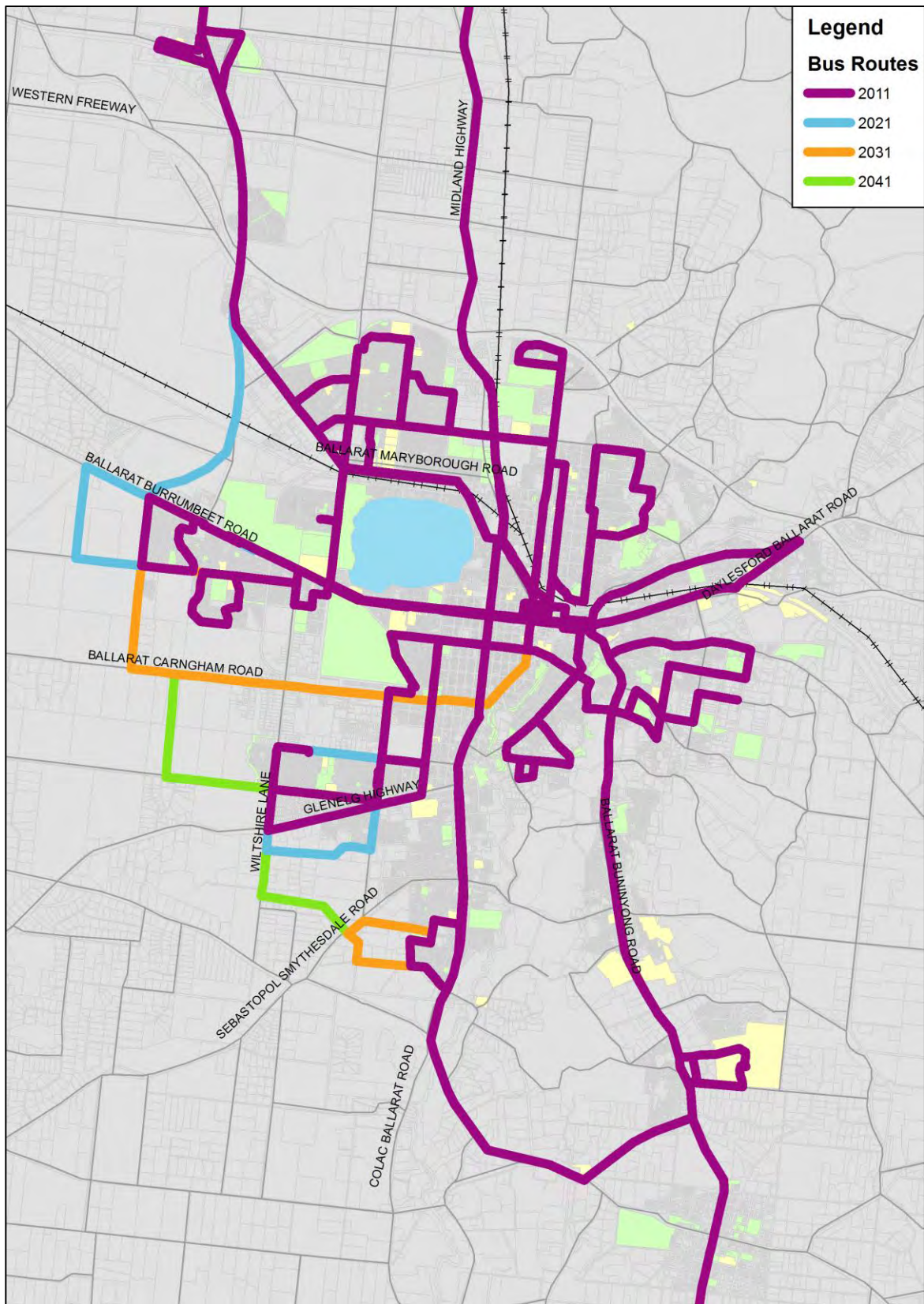
Route	Service Headway (minutes) – All Years – In/Out			
	AM	IP	PM	OP
1. Wendouree West ⁷	40/40	30/30	30/36	60/51
2. Wendouree	24/30	30/30	36/30	72/90
3. Creswick	120/120	90/90	60/45	120/180
4. Invermay	60/60	60/60	60/60	120/360
5. Black Hill	30/40	30/30	30/30	120/72
6. Webbcona	120/120	60/60	90/90	0/0
7. Brown Hill	40/30	30/30	30/30	360/120
8. Eureka	60/60	60/60	60/60	180/180
9. Canadian	120/60	60/60	60/60	90/120
10. Buninyong	30/24	30/30	30/30	60/72
11. Mt Pleasant	30/30	30/30	36/36	360/360
12. Sebastopol	40/30	33/30	36/36	60/60
13. Delacombe via Pleasant Street	60/60	60/60	60/60	120/180
14. Delacombe via Sutton Street	60/60	60/60	60/60	120/120
15. Sturt St West	40/40	60/60	60/60	90/90
16. Lake Gardens	60/60	60/60	60/60	180/180
17. Miners Rest	120/120	51/51	60/60	180/180
18. Alfredton	60/60	60/60	60/60	180/180
19. Delacombe to Sebastopol West	0/0	72/180	0/0	0/0
20. Carngham Road ⁸	60/60	60/60	60/60	180/180
21. Bonshaw Creek ⁹	60/60	60/60	60/60	180/180

⁷ From 2021 this route is extended to Alfredton via BWEZ, and from 2041 to Bonshaw Creek forming an orbital route.

⁸ The Carngham Road route is in 2031 and 2041 only

⁹ The Bonshaw Creek route is in 2041 only

Figure 16 Proposed future bus network (base case)¹⁰



¹⁰ The bus services in 2011 and 2013 were assumed to be the same.

3.2.3 Rail services

DEDJTR provided information on how rail services to, from and through Ballarat are assumed to change in the future. The headways for each time period for the rail lines intersecting the study area in future years were coded into the future year models for modelling purposes. The train frequencies for the Southern Cross to Ballarat service based on a two hour period are shown in Figure 17. Similarly the train frequencies for the Southern Cross to Wendouree service are shown in Figure 18. Please note that the figures below include the services through Ballarat, i.e. Melbourne to Maryborough and Melbourne to Ararat services; and the 2013 services were assumed to be the same as those in 2011.

Figure 17 Southern Cross to Ballarat rail services

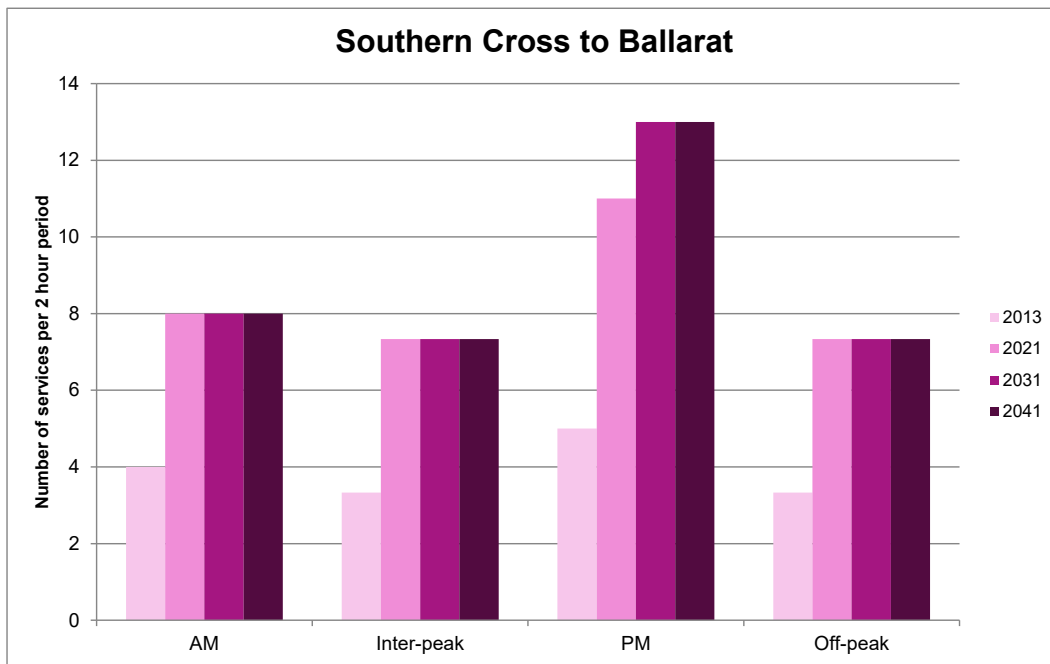
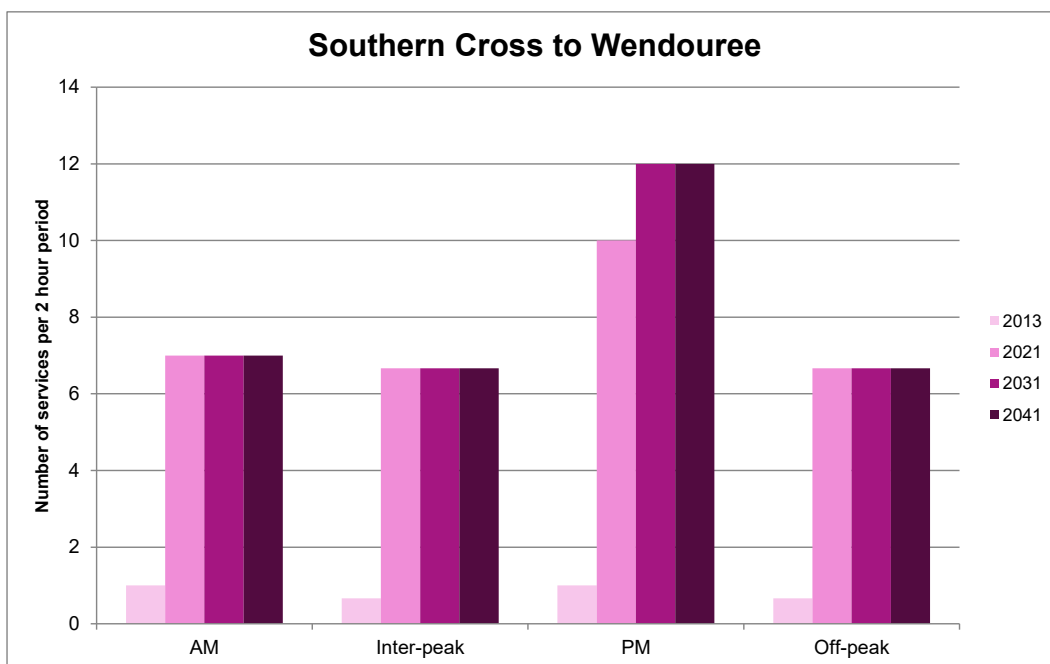


Figure 18 Southern Cross to Wendouree rail services



The above pattern for AM, Inter-peak, PM and Off-peak periods are reversed to be the pattern for PM, Inter-peak, AM and Off-peak respectively for the opposite direction.

3.3 Modelling results

The modelling results of the future years 2021, 2031 and 2041 were presented in *the Future Year Model Development Report*. In particular, the 2041 base modelling results were further used during Phase 3A to identify problem areas, impact of growth on accessibility to employment and services, opportunities for network enhancement and for other transport and land use integration actions. The investigation results were documented in the *Phase 3A Investigation Report*, which the Reference Group has considered to develop transport and land use scenarios for testing during Phase 3B.

Eight scenarios that have been developed and tested are:

- 2041 Base Case
- Transport PT
- Transport Orbital Connections
- Transport Walk and Cycle
- Integrated Transport and Land Use - Eastern Growth
- Integrated Transport and Land Use - Northern Growth
- Integrated Transport and Land Use - High Infill
- Integrated Transport and Land Use – Southern Growth.

The first four transport scenarios used a land use specification based on Victoria in Future 2011 (VIF11). The modelling results show that each scenario would perform well in the direction of transport improvements proposed for that scenario. The PT scenario has the best PT mode share at 4.1 percent. The Orbital Connections scenario provides the highest mean highway speeds of 53km/h. The Walking and Cycling mode share scenario would provide the lowest length of congested road (4km) when compared against other scenarios.

The last four integrated transport and land use scenarios assumed a land use specification based on Victoria In Future 2014 (VIF14) which has higher population and employment than the Base Case. When comparing among the last four scenarios, the modelling results shows that the High Infill scenario would be the best in terms of achieving both the PT and highway network performance. This scenario had the highest PT mode share of 4.1 percent, the highest bus speed of 21km/h and the lowest length of congested road (12km).

The detailed results of Phase 3B were presented to the Reference Group and documented in the *Phase 3B Scenario Testing Report*.

Subsequently, considering the modelling results, the Reference Group has drawn features of the above eight scenarios to combine into a preferred scenario for Ballarat.

The following chapters will present the network, land use and other transport factors that were assumed in the preferred scenario.

4.0 Preferred scenario

4.1 Land-use distribution

The 2041 population for the Preferred Scenario was developed by the Reference Group. The total population in 2041 was assumed at 162,570 based on VIF2014 and worked by SGS (Ballarat Housing Needs Assessment (Update) Sept 2014).

The population distribution to each transport zone according to 6 categories and the rationale are shown in Table 21 below.

Table 21 2041 Population distribution by sector

Category	Revised Population #'s	Rationale
CBD	Aspirational estimate of residential population	Aligns with renewal policy, CBD Strategy and available land supply
Convenience Living Corridors – South	Original 2041 estimate +50%	Policy position - Ballarat Strategy
Growth – North	New growth area - 12 dwellings / ha, 2 people per dwelling, 50% build out by 2040	Median assumptions regarding future development, high uncertainty
Growth - Warrenheip	Original 2041 estimate +50%	Median assumptions regarding future development (minimal change), %^ change is on very low initial numbers
Ballarat West (UGZ)	PSP plan and current staging	PSP plan and current staging
Remainder	Original 2041 estimate -7% (to balance)	Balance total population to VIF2014

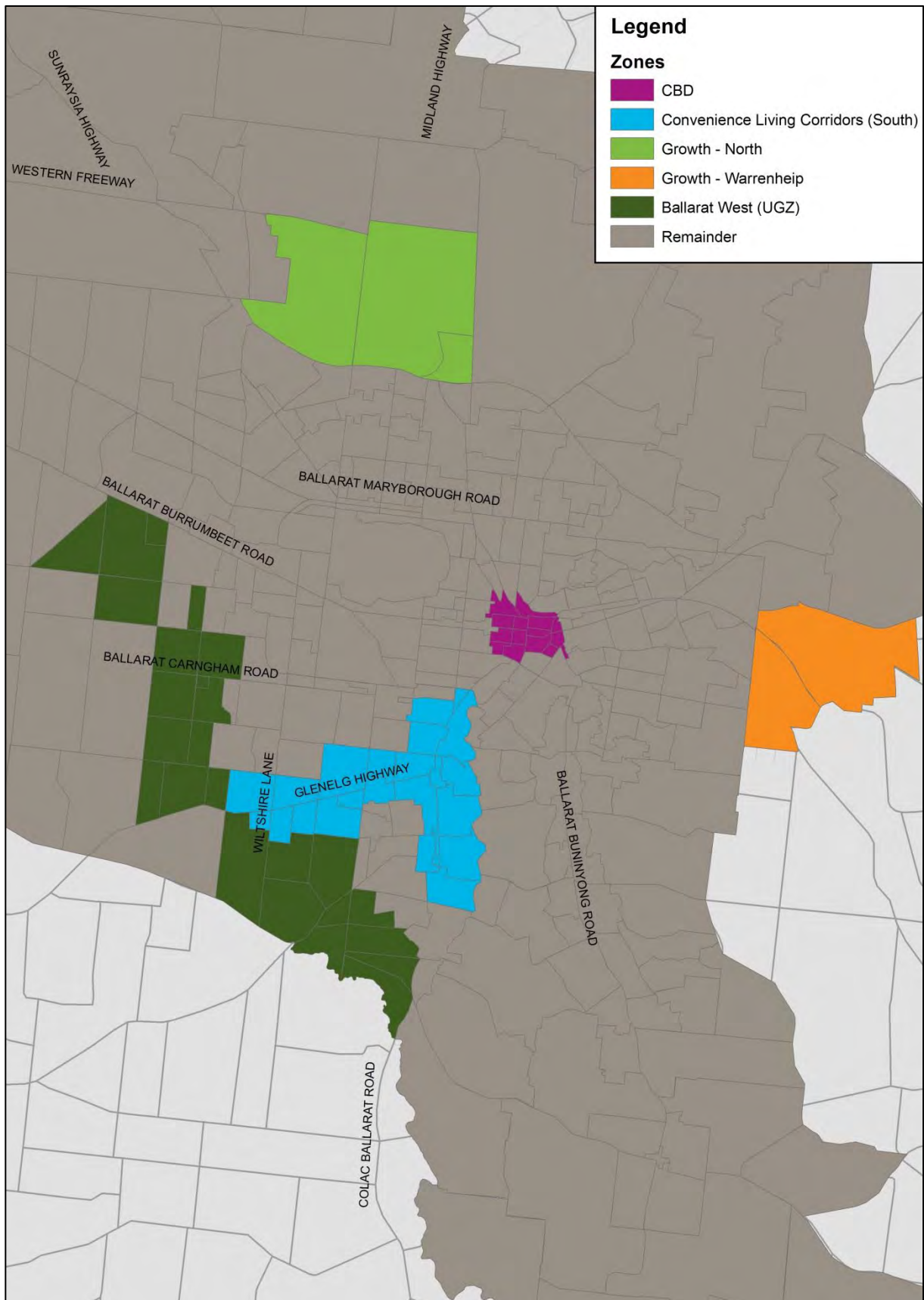
The population distribution for 2021 and 2031 for modelling purpose was assumed the same as that for 2041. It was estimated by firstly interpolating between 2013 and 2041 and then by scaling up the growth areas such as CBD, Growth North, and Ballarat West so that the total population for 2021 and 2031 would meet the VIF 2014 forecast for the COB.

Table 22 Future year population distribution by sector

ID	Sector	Population				Growth Rate		
		2,013	2021	2,031	2,041	2013-21	2021-31	2031-41
1	CBD	574	2,200	3,725	4,125	1.183	1.054	1.010
2	Convenience South	10,086	12,413	16,091	20,857	1.026	1.026	1.026
3	Growth - North	543	2,329	4,542	5,795	1.200	1.069	1.025
4	Growth - Warrenheip	553	703	947	1,276	1.030	1.030	1.030
5	Ballarat West (UGZ)	2,955	13,650	29,176	40,794	1.211	1.079	1.034
6	Remainder	83,694	85,374	87,521	89,723	1.002	1.002	1.002
Total		98,405	116,669	142,002	162,570	1.022	1.020	1.014

Figure 19 illustrates the sectors used in the population distribution.

Figure 19 Population sectors used for population distribution



The employment distribution remains largely unchanged as presented in Section 3.1.3, except that three zones in Miners Rest (Northern Growth) and two zones in Warrenheip were redistributed slightly to match with the revised population. The only change to employment distribution is shown in the table below.

Table 23 2041 updated employment

Zone	Area	2041 Base		2041 Update	
		Population	Employment	Population	Employment
4630	Miners Rest	589	71	3360	209
5756	Miners Rest	0	202	2400	167
5846	Miners Rest	35	4	35	8
4588	Rural East	318	143	638	25
5796	Rural East	318	14	638	25

The school enrolment distribution was unchanged as presented in Section 3.1.4

4.2 Highway network

Table 24 shows the proposed network improvements which are incremental and additional to the future year base cases (Table 19). The proposed road improvements in Table 24 would override those in Table 19 if there are differences. For example, Mair Street was assumed to be upgraded in the base model for 2031, however in the Preferred Scenario the Project Reference Group scheduled the Mair Street upgrade for 2021.

Table 24 Proposed road network improvements for the Preferred Scenario

Year	Proposed road network improvements
2021	• Western Link Road to Remembrance Drive
	• Western Link Road to Carngham Road
	• Gregory Street West re-opening two lanes 60 k/hr
	• Mair Street two lanes each way 60 km/h – Dawson to Humffray Street
	• Sturt Street one lane each way 40 km/h Dawson to Humffray Street
	• Upgrade Recreation Road from Ballarat-Buninyong Road through to Yankee Flat Road to one lane each way 60 km/h
	• Upgrade Gear Ave from Ballarat-Buninyong Road through to Yankee Flat Road to one lane each way 60 Km/h
2031	• Western Link Road Carngham Road to Glenelg Highway
	• Western Link Road Cherry Flat Road to Midland Highway
	• Upgrade Yankee Flat Road, one lane each way 80 km/h with connections to Tech Park
2041	• Western Link Road Glenelg Highway to Cherry Flat Road
	• Upgrade Recreation Road from Ballarat-Buninyong Road through to Yankee Flat Road to one lane each way 80 km/h
	• Upgrade Gear Ave from Ballarat-Buninyong Road through to Yankee Flat Road to one lane each way 80 Km/h
	• Upgrade Yankee Flat Road, two lane/two way 80 km/h with connections to Tech Park; and full Eastern Bypass two lanes each way 100 km/h

4.3 Public transport network

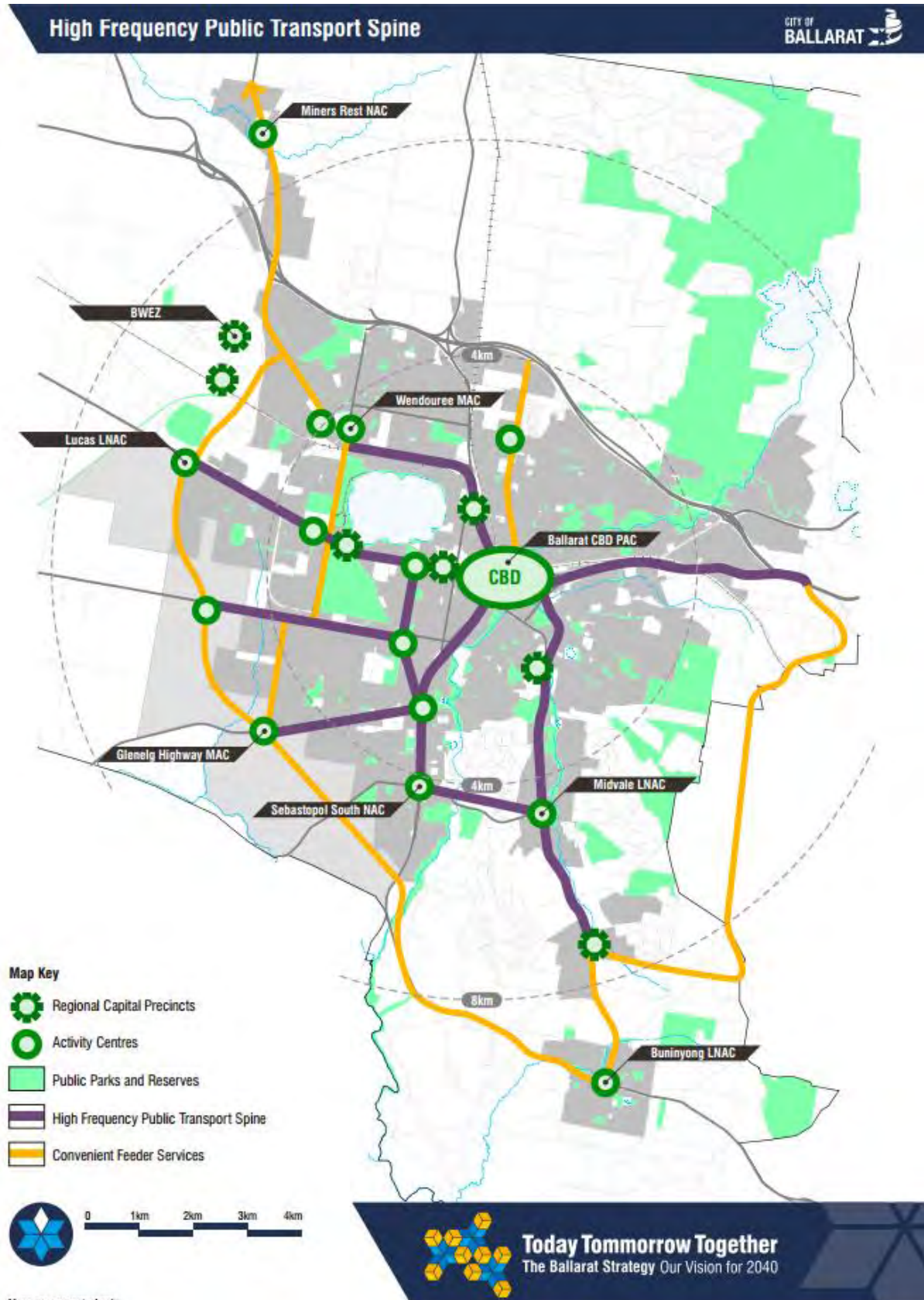
PT network is similar to the Scenario 2 – PT Development of Phase 3B except that the headway for the spine services would be changed from five to 10 minutes.

The radial or high frequency spine (purple colour) routes would have 10 minute headway for all time periods and be covered by the following routes:

- Route 1 to Wendouree
- Route 15 to Sturt St West
- Route 13 to Delacombe
- Route 12 to Sebastopol, extended to Mount Clear
- Route 10 to Mount Helen
- Route 20 to Carngham Road

The convenient feeder services (yellow colour) were coded in and have 15 minute headway for all time periods. Figure 20 shows the proposed alignment of spine and convenient feeder services.

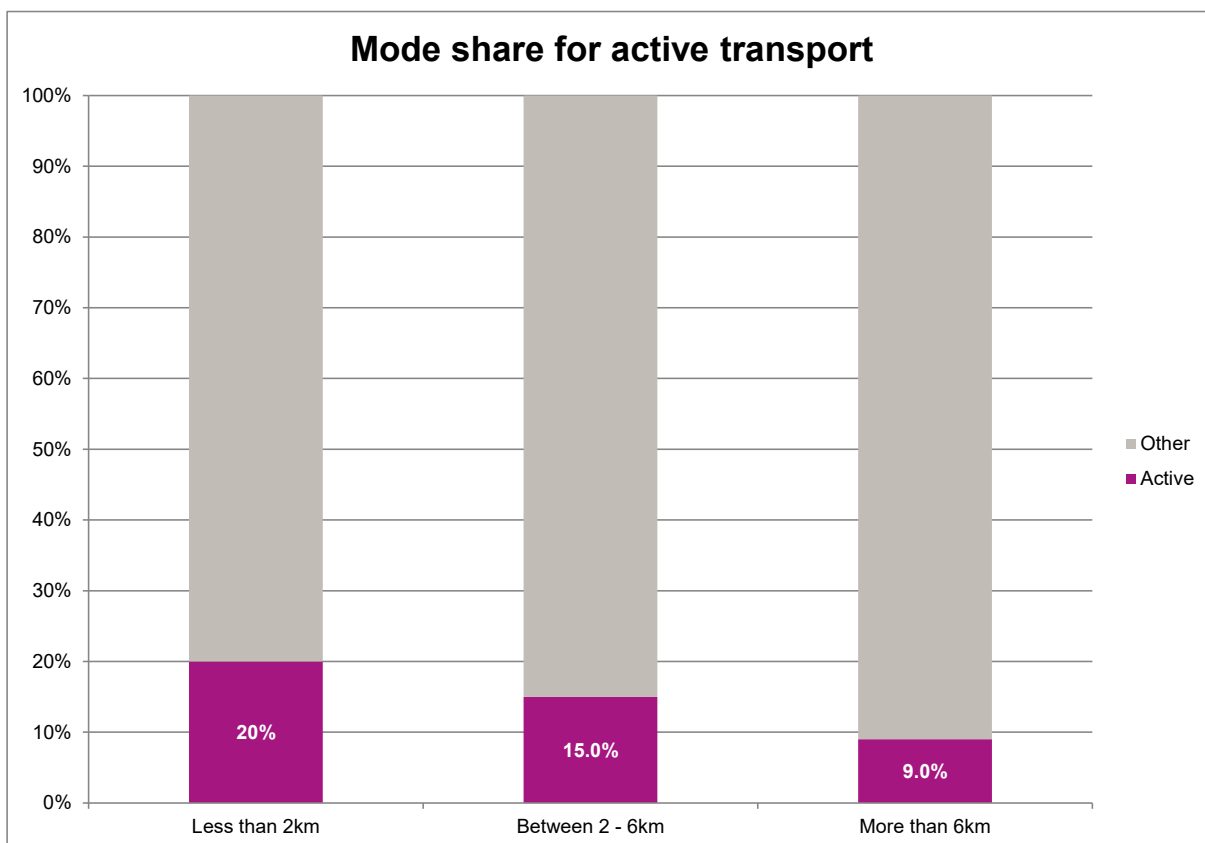
Figure 20 High frequency public transport spine (Source: City of Ballarat)



4.4 Walking and cycling mode share

The COB has envisaged a higher and sustainable walking and cycling mode share for the city. The VITM model does not separate walking and cycling, but combines them into one single mode: active mode. At the present, the walking and cycling for Ballarat takes about nine percent of the total trips. Based on a discussion with the COB, the following assumptions seen in Figure 21 were adopted for modelling purpose.

Figure 21 Mode share for active transport



4.5 Parking costs

The COB suggested all model runs for Phase 4 to include an increased generalised car parking cost for Ballarat CBD to encourage motorists to shift to PT for trips with destinations in the CBD. The generalised cost could reflect a relative reduction in parking supply over time, or an increase in cost for motorists.

The DEDJTR suggested an increase in parking cost at three percent per annum considering 1.5 percent per year for inner Melbourne. Given the 2011 model does not include parking costs, modelled parking costs in future years should only include the incremental change in parking cost rather than the full cost. The tables below show the suggested values by DEDJTR.

The daily parking cost is applicable for home based work (HBW) trips, while the short term parking cost for other trip purposes such as shopping, social, visiting, business trips of which the average duration is about two hours.

Table 25 Incremental parking costs for Ballarat CBD for modelling

Actual Parking Cost - Increasing by 3% compound average growth rate					
	2011	2015	2021	2031	2041
Daily	\$5.33	\$6.00	\$7.16	\$9.63	\$12.94
Short term	\$3.20	\$3.60	\$4.30	\$5.78	\$7.76
Incremental Parking Cost to be applied in the VITM					
Daily	\$0.00	\$0.67	\$1.16	\$2.47	\$3.31
Short term	\$0.00	\$0.40	\$0.70	\$1.48	\$1.98
Incremental Parking Cost in minutes (value of time = \$10.87)					
Daily	0.00	3.70	6.40	13.63	18.27
Short term	0.00	2.21	3.86	8.17	10.93

5.0 Modelling results

The following sections present the modelling results for each planning year, 2021, 2031 and 2041. They are discussed in order of the performance of the highway network in terms of traffic volume and the performance of PT in terms of bus passenger loads and train boardings by station. Where appropriate, the future year volumes will be compared against the 2013 base to indicate the growth of travel demand over the years. The overall network performance for three planning years will be summarised into one table for comparison at the end.

5.1 2021 modelling results

Figure 22 and Figure 23, Figure 24 and Figure 25, and Figure 26 and Figure 27 show the modelled one way daily vehicle volumes, the differences in vehicle volumes between 2021 and the 2013 base, and the AM-peak two hour volume over capacity (V/C) ratios for the 2021 preferred scenario respectively.

Figure 22 and Figure 23 show that:

- Western Freeway between Learmonth Road and Victoria Street would carry one way daily traffic volume in the range of 4,300 to 8,300 vehicles
- Victoria Street/Sturt Street would carry 7,200 to 13,800 vehicles per direction per day
- Midland Highway would carry 5,900 to 13,600 vehicles per direction per day
- Geelong Road between Mt Helen and Grant Street would carry 5,200 to 7,900 vehicles per direction per day
- Gillies Street between Winter Street and Western Freeway would carry 4,900 to 9,700 vehicles
- Western Link Road between Ballarat Carngham Road and Western Freeway would carry 2,700 to 4,100 vehicles

Figure 24 and Figure 25 show that the traffic volumes have increased significantly (over 1,000 vehicle per direction per day) on Western Freeway, Western Link Road, Ballarat Carngham Road, Glenelg Highway, Midland Highway and Victoria Street generated by the Ballarat West development, and the relative attraction of the CBD.

Figure 26 and Figure 27 indicate that there are V/C ratios of above 0.8 at:

- Midland Highway at the interchange with Western Freeway
- Eyre/Grant Street between Doveton Street South and Humffray Street South
- Other localised locations.

The remainder of the road transport network is generally projected to remain below capacity.

The limited road congestion shown by the model represents the performance of the supply of future road network in relation to the travel demand generated by future population and employment. Nevertheless, it is possible that there will be some short term congestion issues (e.g. less than half an hour) that are not reflected by the 2-hour AM peak period of the model.

Figure 28, Figure 29 and Figure 30 show one way weekday bus passenger volumes for the 2021, and the differences between 2021 volumes and the 2013 base case. It is indicated that the corridors to Mount Helen, Sebastopol, Wendouree, BWEZ and Alfredton would have the strongest PT demand in the future with an average combined volume of 50 to 1,000 passengers per day. The segment of Sturt Street between Drummond Street and Midland Highway would carry the maximum combined passenger loading of 1,050 passengers per day, because most radial bus routes to Ballarat centre converge at this location.

Figure 32 shows the one way weekday train load in 2021. Figure 33 and Figure 34 exhibit daily passenger boardings by access mode at Ballarat and Wendouree railway stations, and the difference between 2021 and the 2013 base. When compared against the 2013 base, the total boardings per day at Ballarat Station would increase significantly from 2,400 passengers (2013) to 3,800. Similarly, the total boardings per day at Wendouree Station would increase from 300 passengers (2013) to 1,400.

Figure 22 Total one-way vehicle modelled daily volumes - 2021

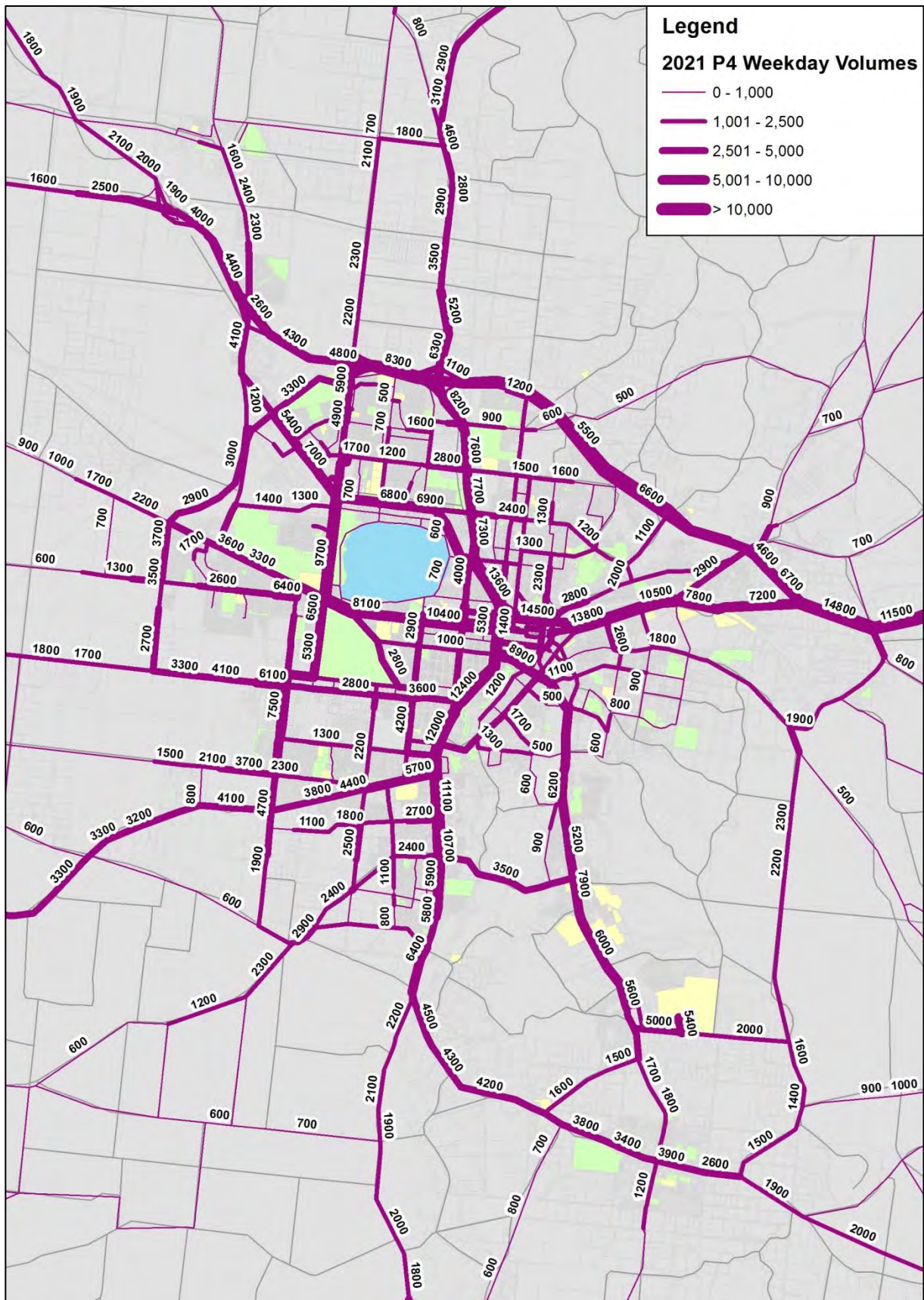


Figure 23 Total one-way vehicle modelled daily volumes (CBD) – 2021

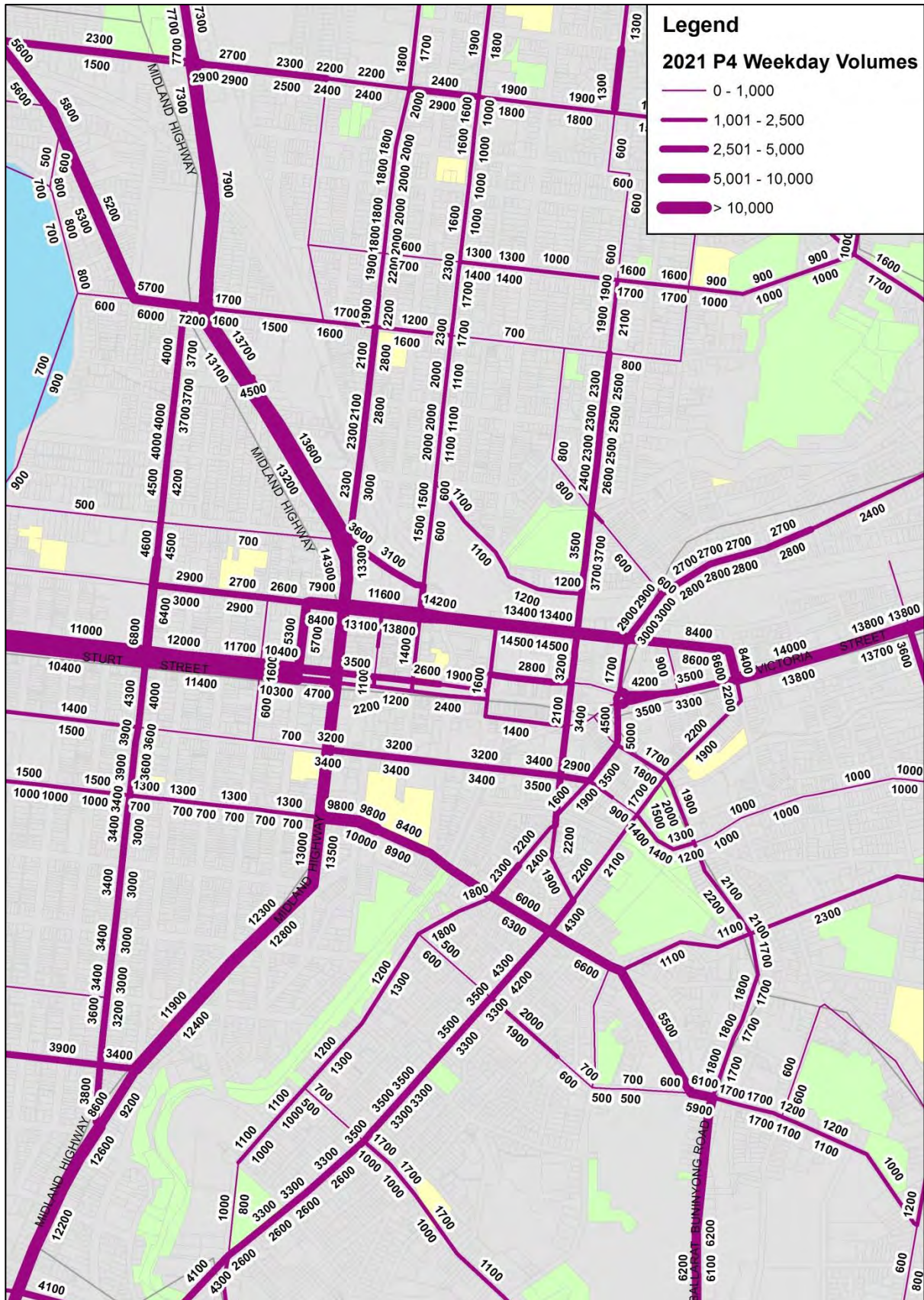


Figure 24 Total one-way vehicle daily volume differences between 2021 and base year (2013)

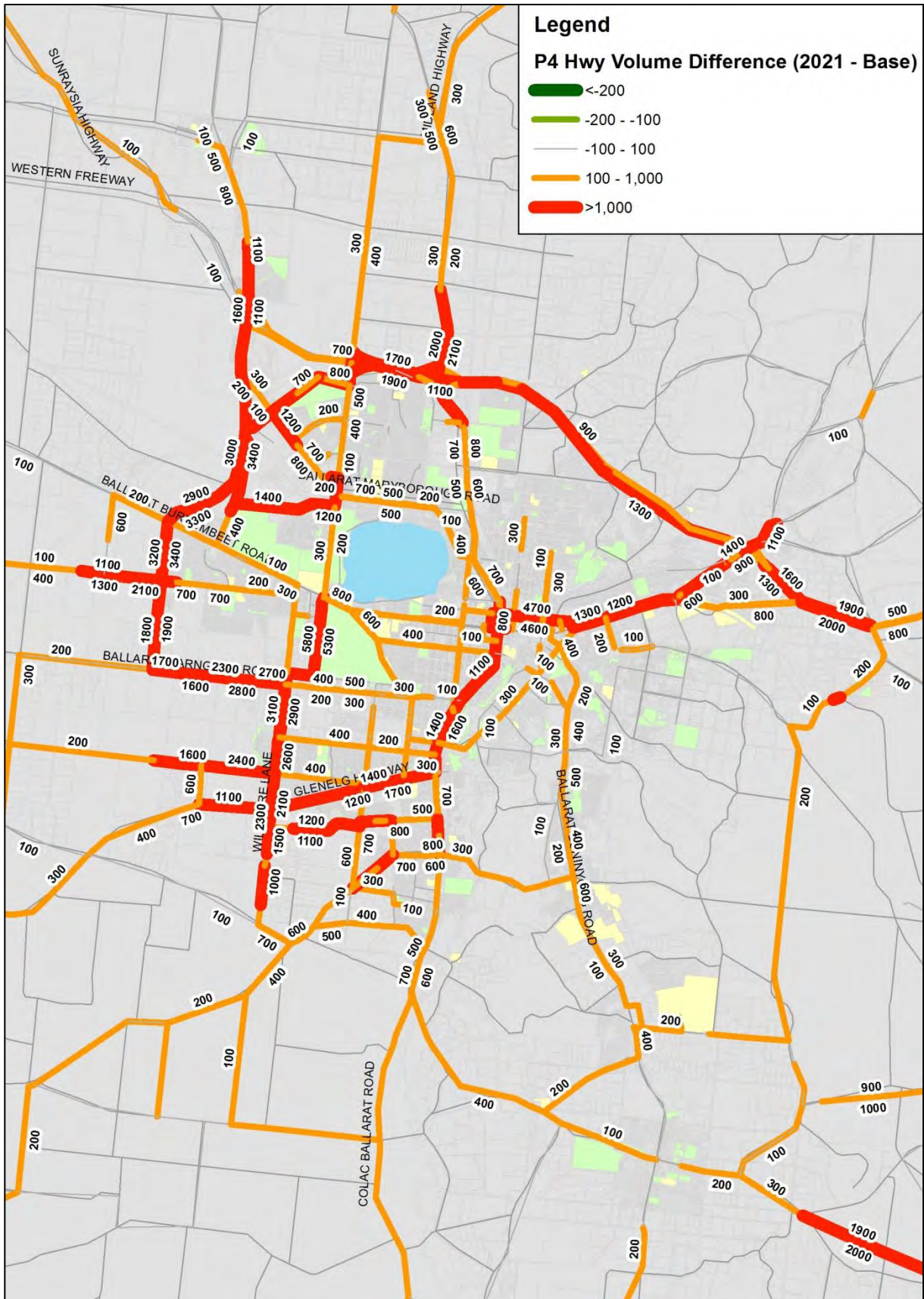


Figure 25 Total one-way vehicle daily volume differences between 2021 and base year (2013) - CBD

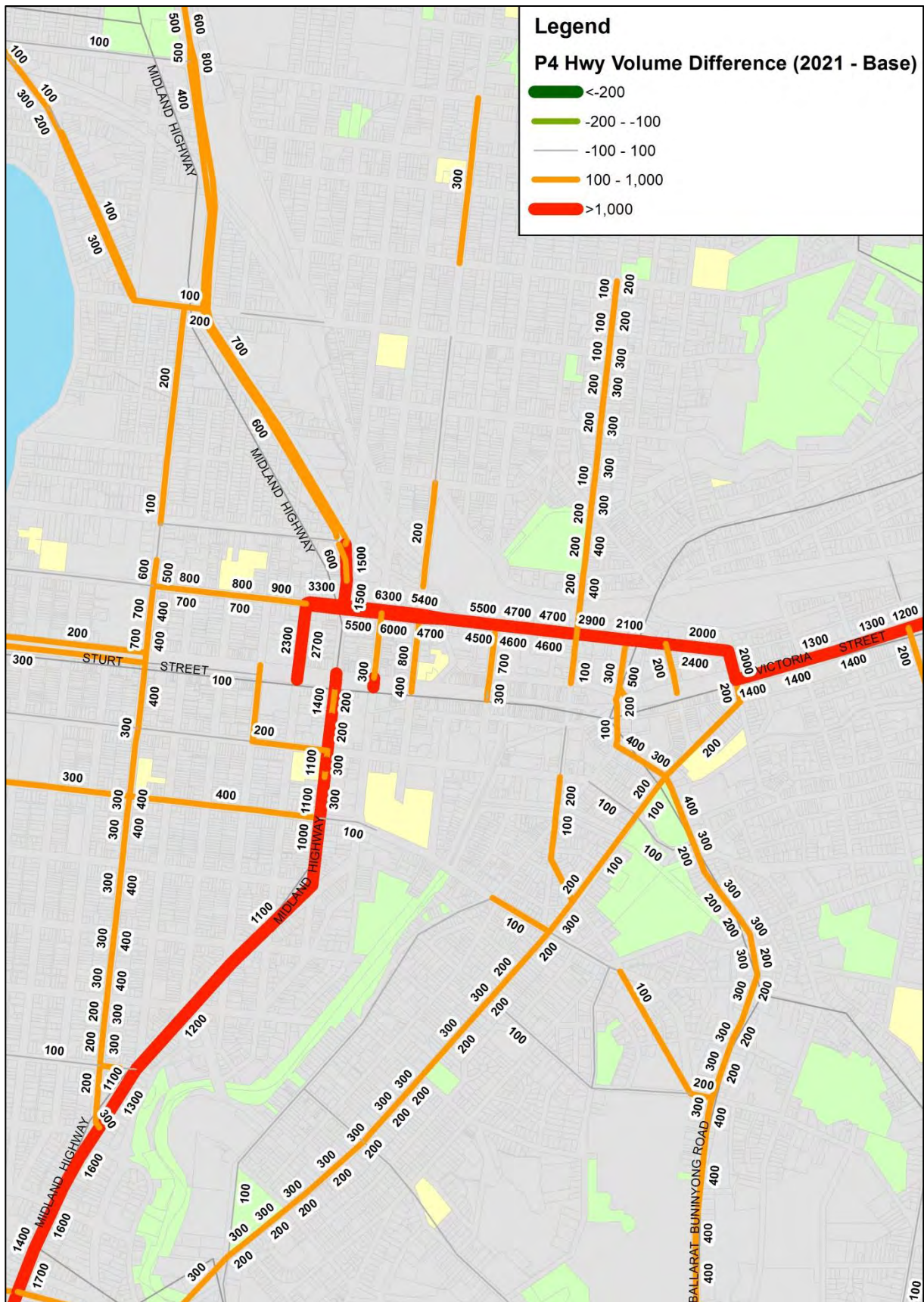


Figure 26 AM-peak 2 hour volume over capacity ratios - 2021

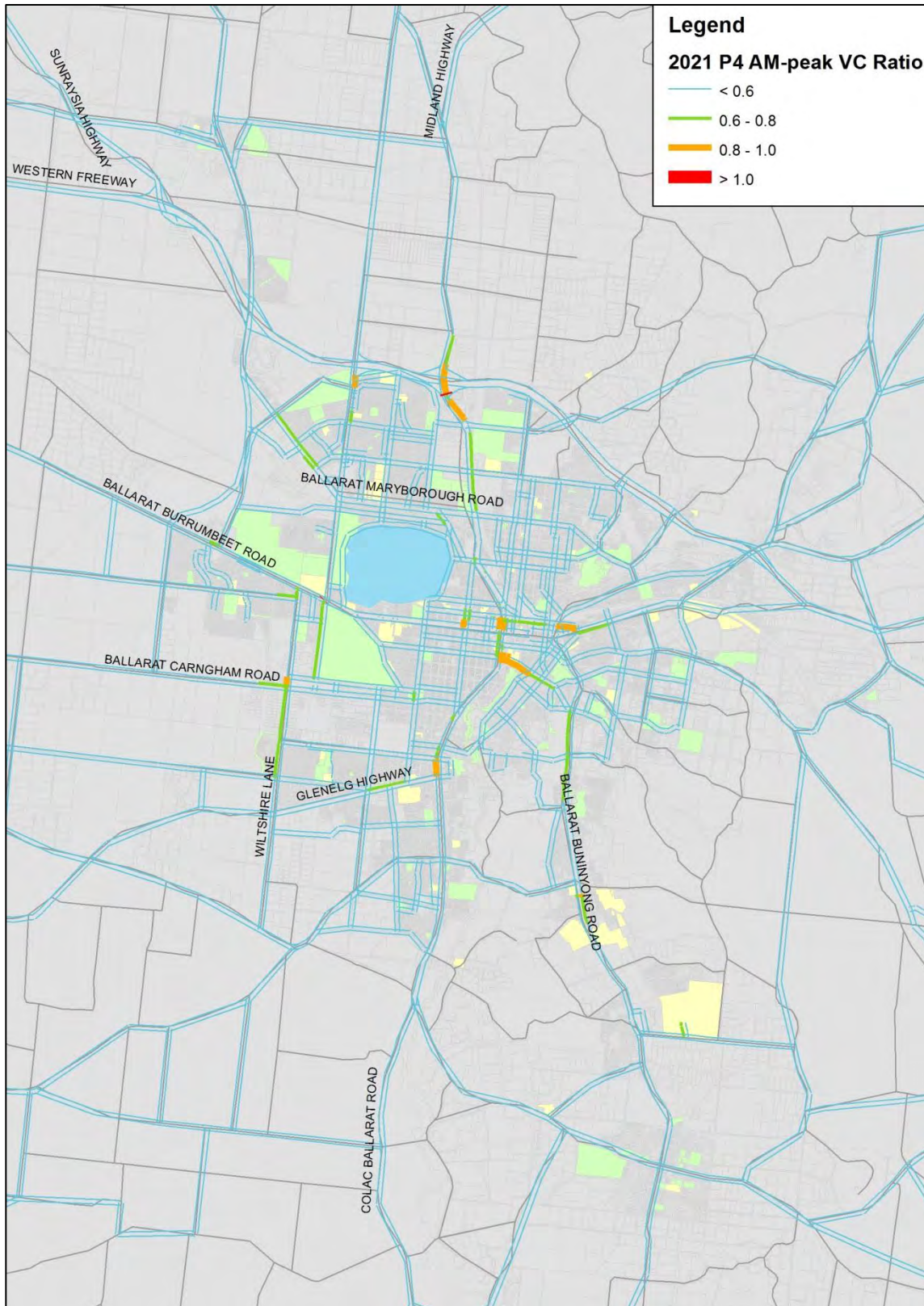


Figure 27 AM-peak 2 hour volume over capacity ratios (CBD) - 2021

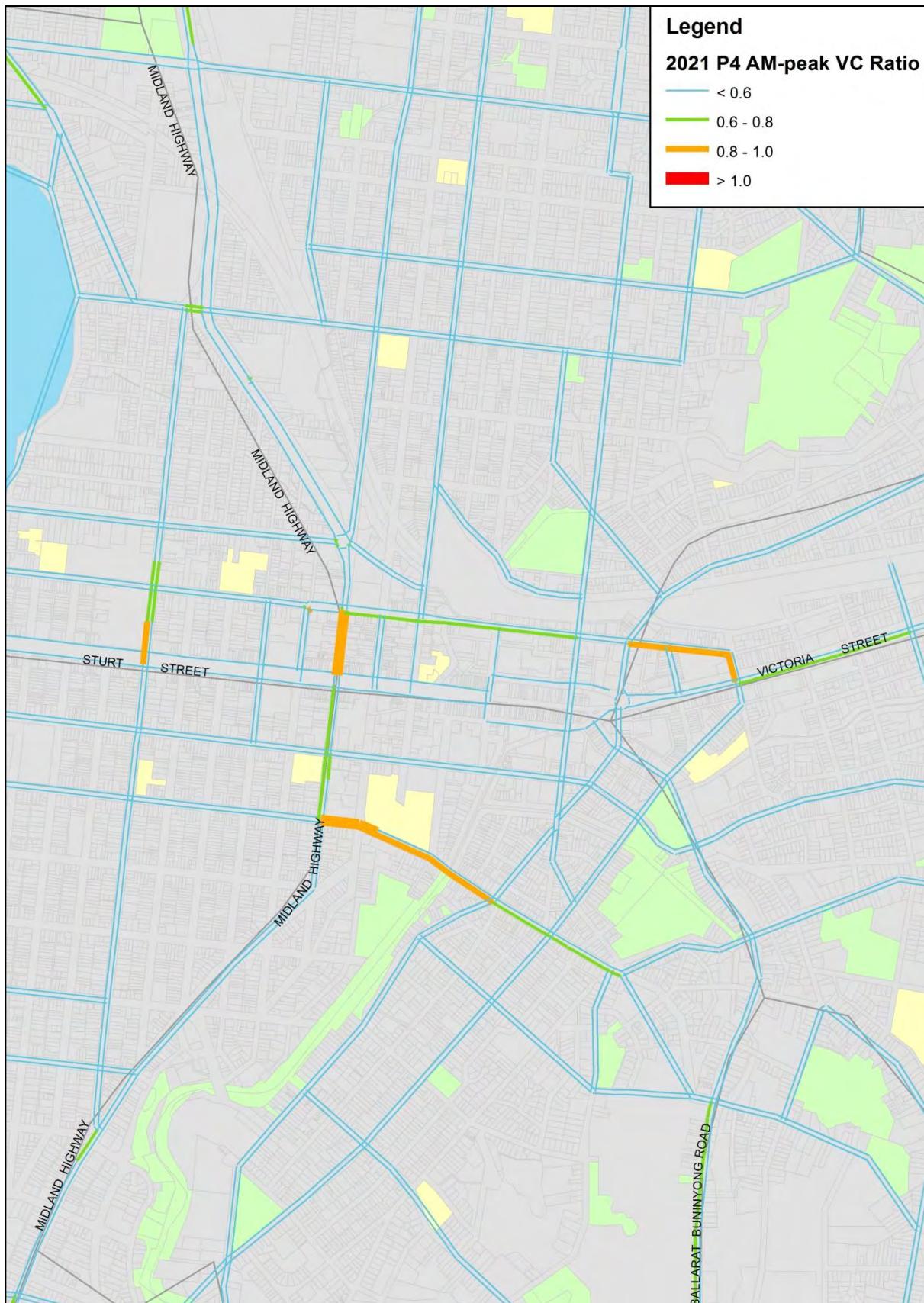


Figure 28 One-way weekday bus patronage – 2021

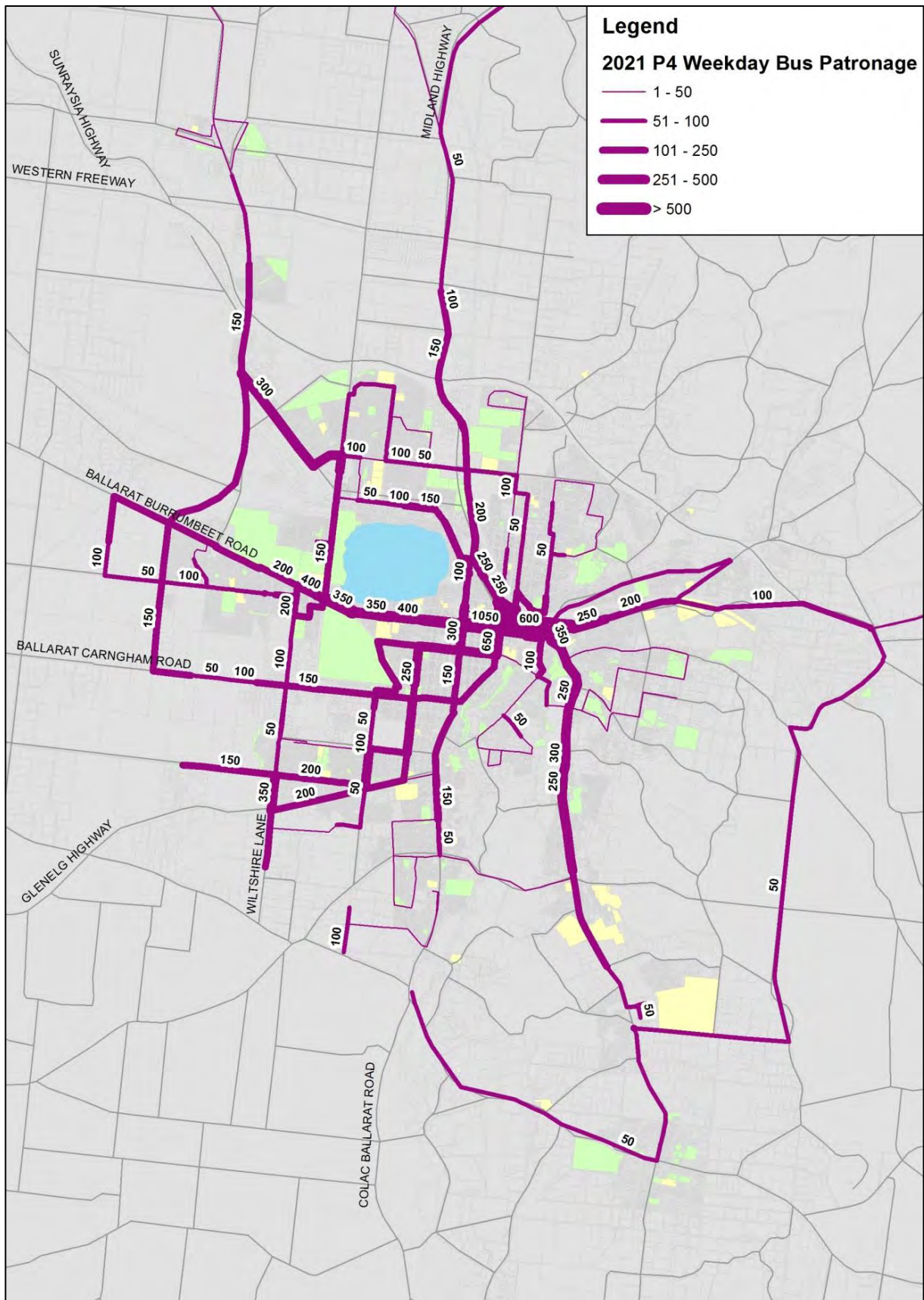


Figure 29 One-way weekday bus patronage (CBD) – 2021

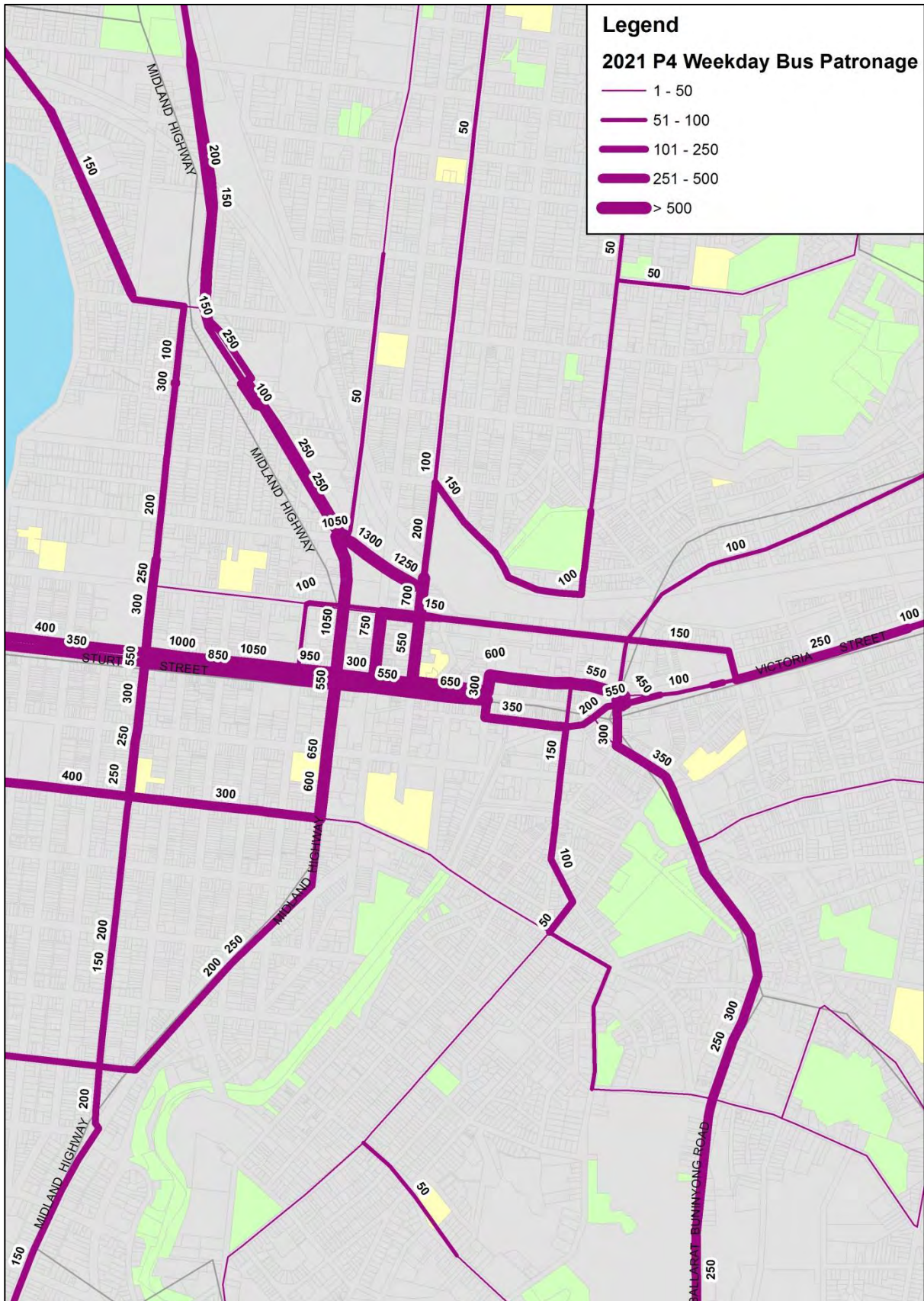


Figure 30 Daily bus load differences between 2021 and base year (2013)

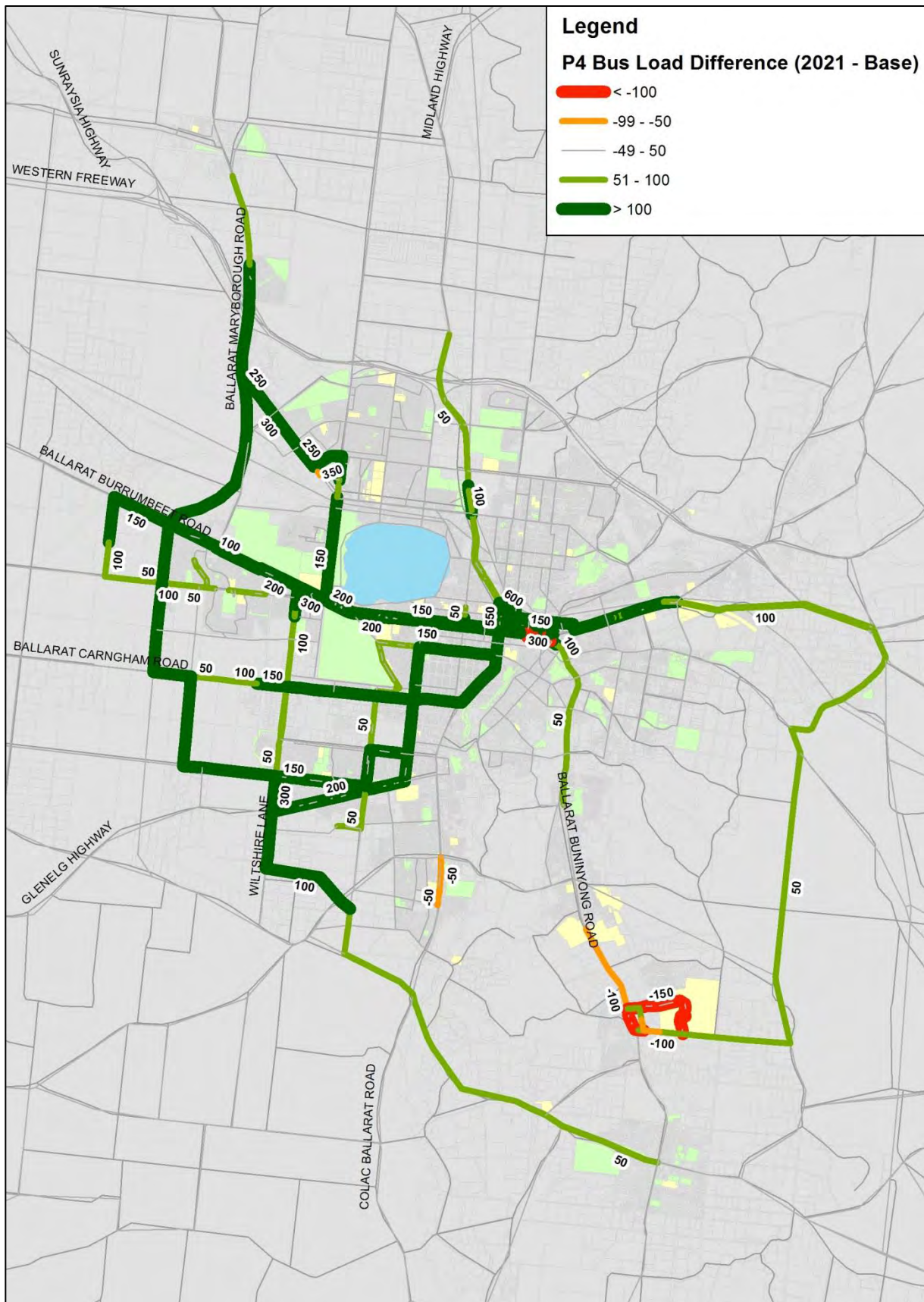


Figure 31 Daily bus load differences between 2021 and base year (2013) - CBD

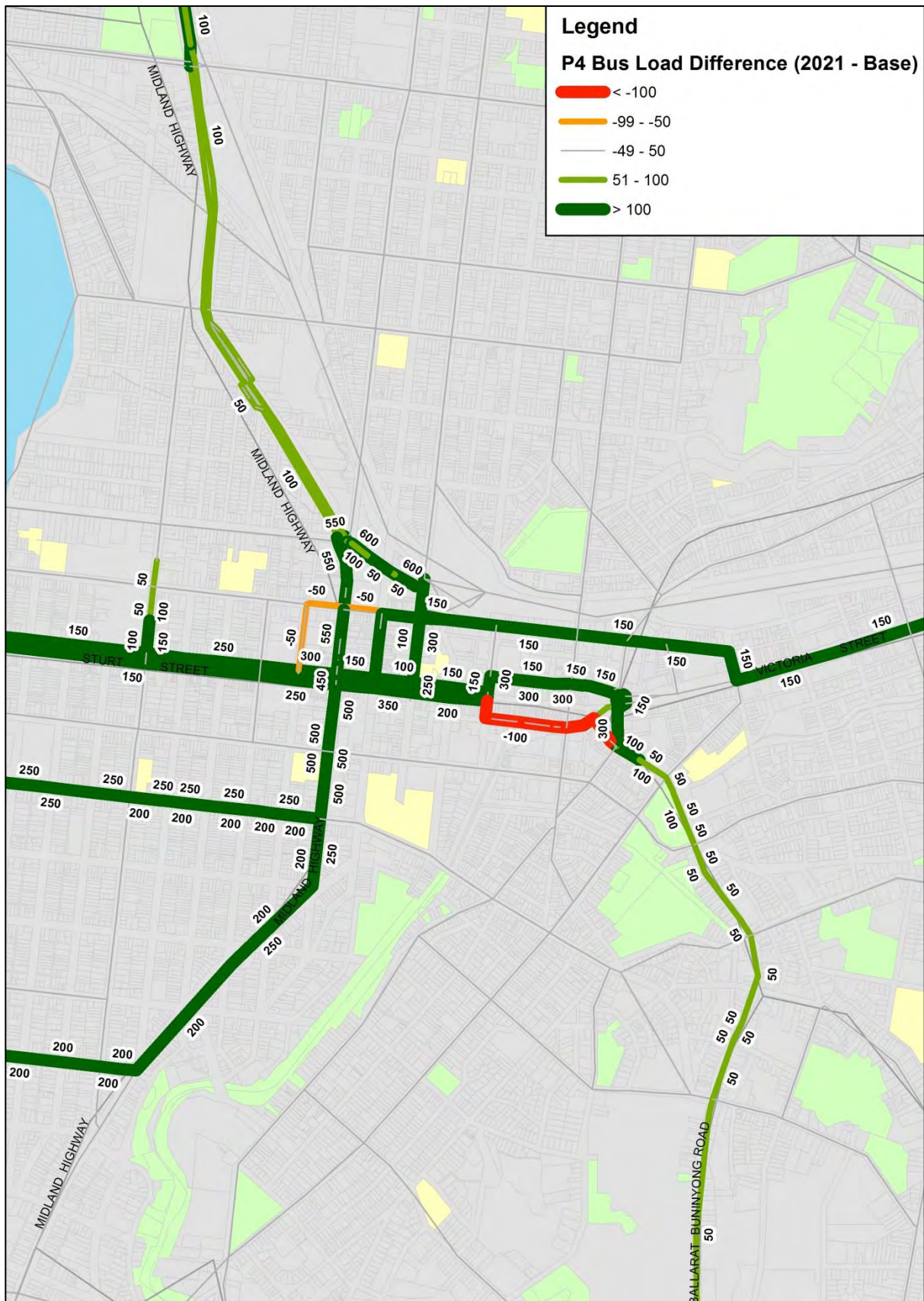


Figure 32 One-way weekday train patronage - 2021

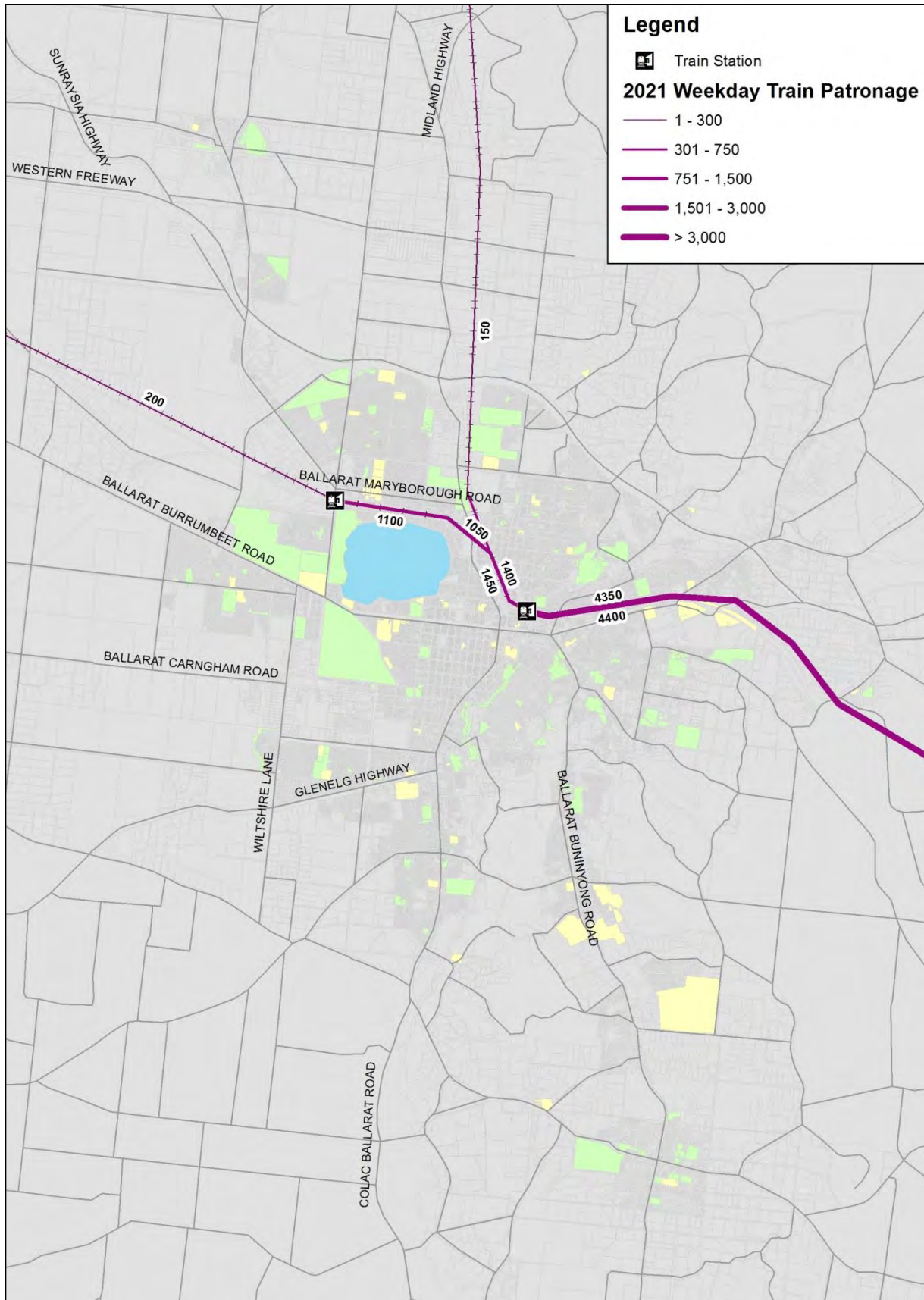


Figure 33 Weekday station boardings by access mode in 2021

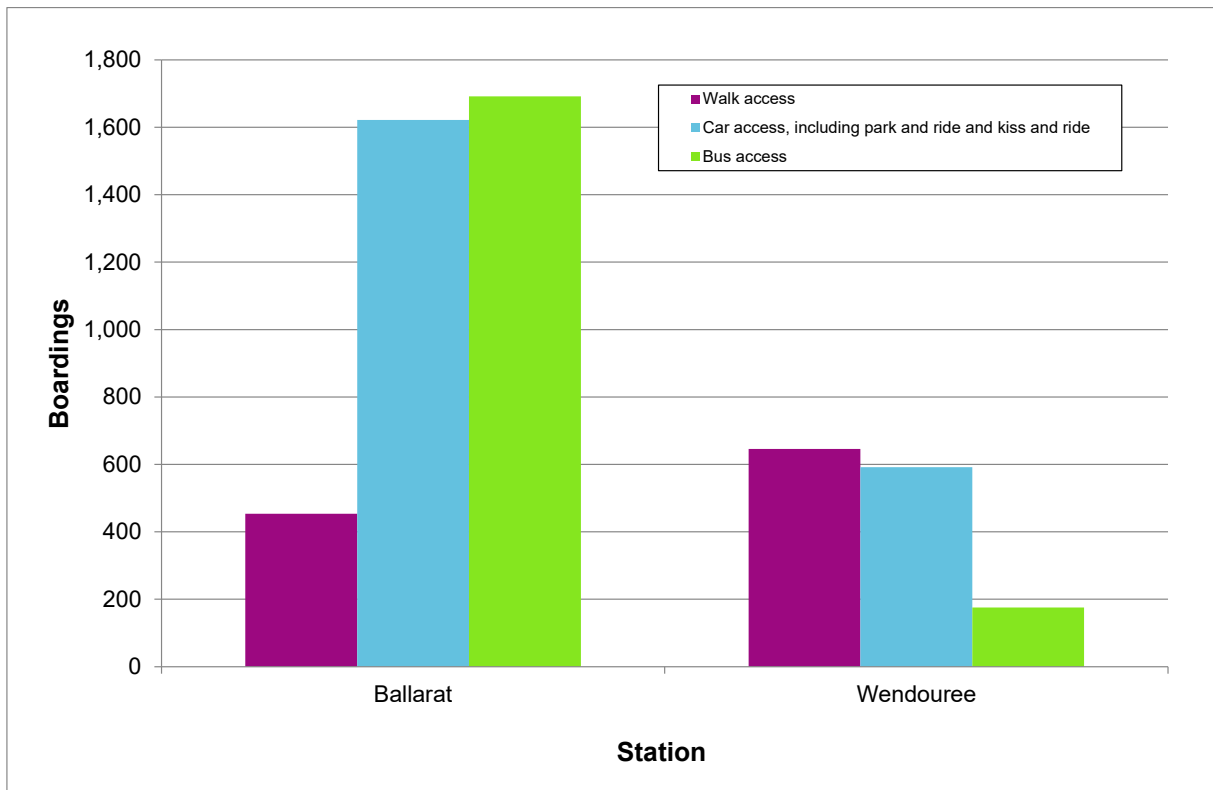
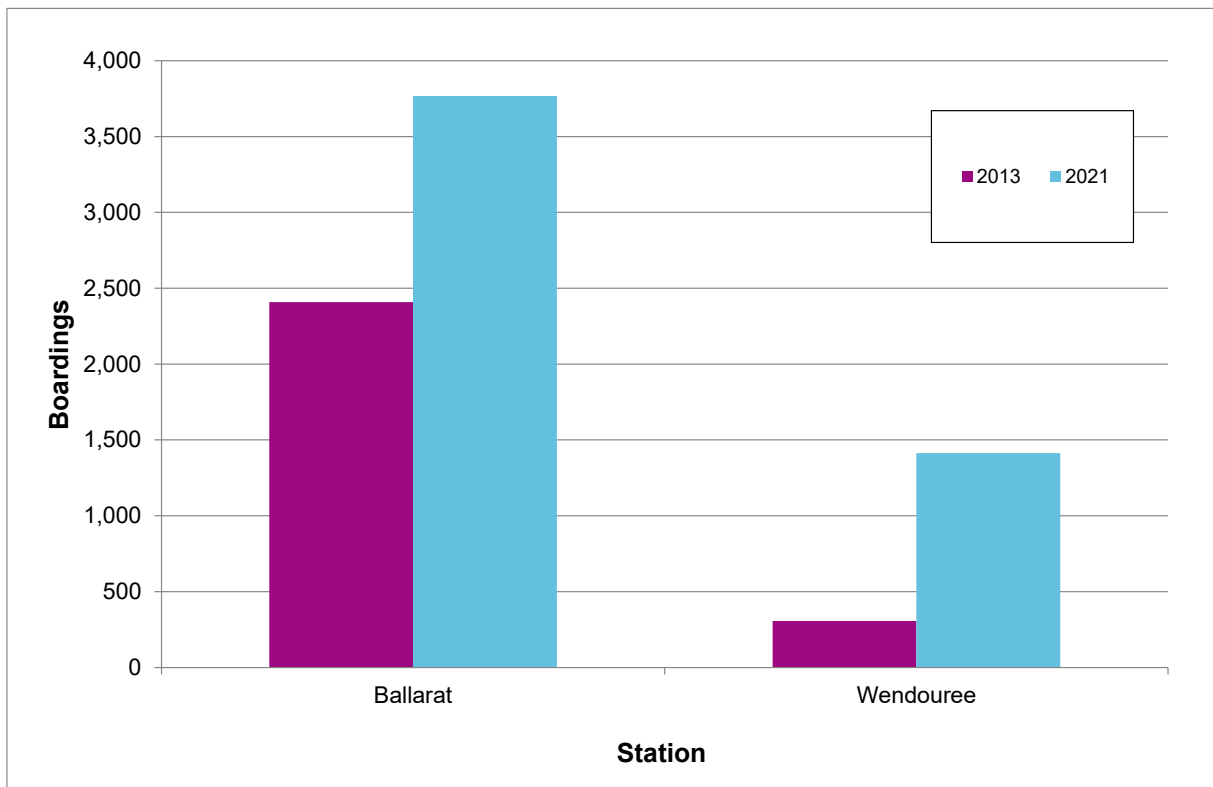


Figure 34 Comparison of total weekday station boardings between 2021 and 2013



5.2 2031 modelling results

In 2031, the PT network and services would be the same as 2021, but the highway network would be further improved with Western Link Road extended from Ballarat-Carngham Road to Glenelg Highway and from Cherry Flat Road to Midland Highway. Yankee Flat Road would be upgraded to one lane each way and 80 km/h with connection to Tech Park.

Figure 35 and Figure 36, Figure 37 and Figure 38, and Figure 39 and Figure 40 show the modelled one way daily vehicle volumes, the differences of vehicle volumes between 2031 and the 2013 base, and the AM-peak two hour V/C ratios for the 2031 preferred scenario respectively.

Figure 35 and Figure 36 show that:

- Western Freeway between Learmonth Road and Victoria Street would carry one way daily traffic volume in the range of 4,500 to 9,500 vehicles
- Victoria Street/Sturt Street would carry 8,300 to 15,400 vehicles per direction per day
- Midland Highway would carry 5,600 to 14,800 vehicles per direction per day
- Geelong Road between Mt Helen and Grant Street would carry 4,500 to 5,900 vehicles per direction per day
- Gillies Street between Winter Street and Western Freeway would carry 7,600 to 11,200 vehicles
- Western Link Road between Glenelg Highway and Western Freeway would carry 1,300 to 6,800 vehicles
- Upgraded Yankee Flat Road would carry about 2600 vehicles

When compared to 2013, Figure 37 and Figure 38 show that traffic has increased significantly (over 1,000 vehicles per direction per day) into many roads in the inner areas such as Ballarat-Maryborough Road, Sturt Street, Gilles Street and Midland Highway. Figure 39 and Figure 40 show the V/C ratios for the AM peak period. When compared to 2021, the congestion has extended further to other locations as below:

- Glenelg Highway near Sutton Street,
- Wiltshire Lane north of Greenhalghs Road
- Geelong Road south of Whitehorse Road

Apart from a few areas of localised traffic congestion ($V/C > 0.8$) as shown above, the city's road network would generally operate under capacity.

Figure 41 and Figure 43 show one way weekday bus passenger volumes, and the differences between 2031 and the 2013 volumes. It is indicated that the corridors to Mount Helen, Sebastopol, Wendouree, BWEZ and Alfredton will have the strongest PT demand in the future with an average combined volume of 50 to 1,150 passengers per day. The segment of Sturt Street between Drummond Street and Midland Highway would carry the maximum combined passenger loading of 1,150 passengers per day. Passenger loadings increase in the direction toward CBD where bus services converge to serve the employment there.

Figure 45, Figure 46 and Figure 47 exhibit one way weekday train loading, daily boardings by access mode at Ballarat and Wendouree railway stations, and the difference of total boardings between 2031 and the 2013 base respectively. When compared against the 2013 base, the total boardings per day at Ballarat Station would increase significantly from 2,400 passengers (2013) to 5,200 in 2031. Similarly, the total boardings per day at Wendouree Station would increase from 300 passengers (2013) to 2,100.

Figure 35 Total one-way vehicle modelled daily volumes - 2031

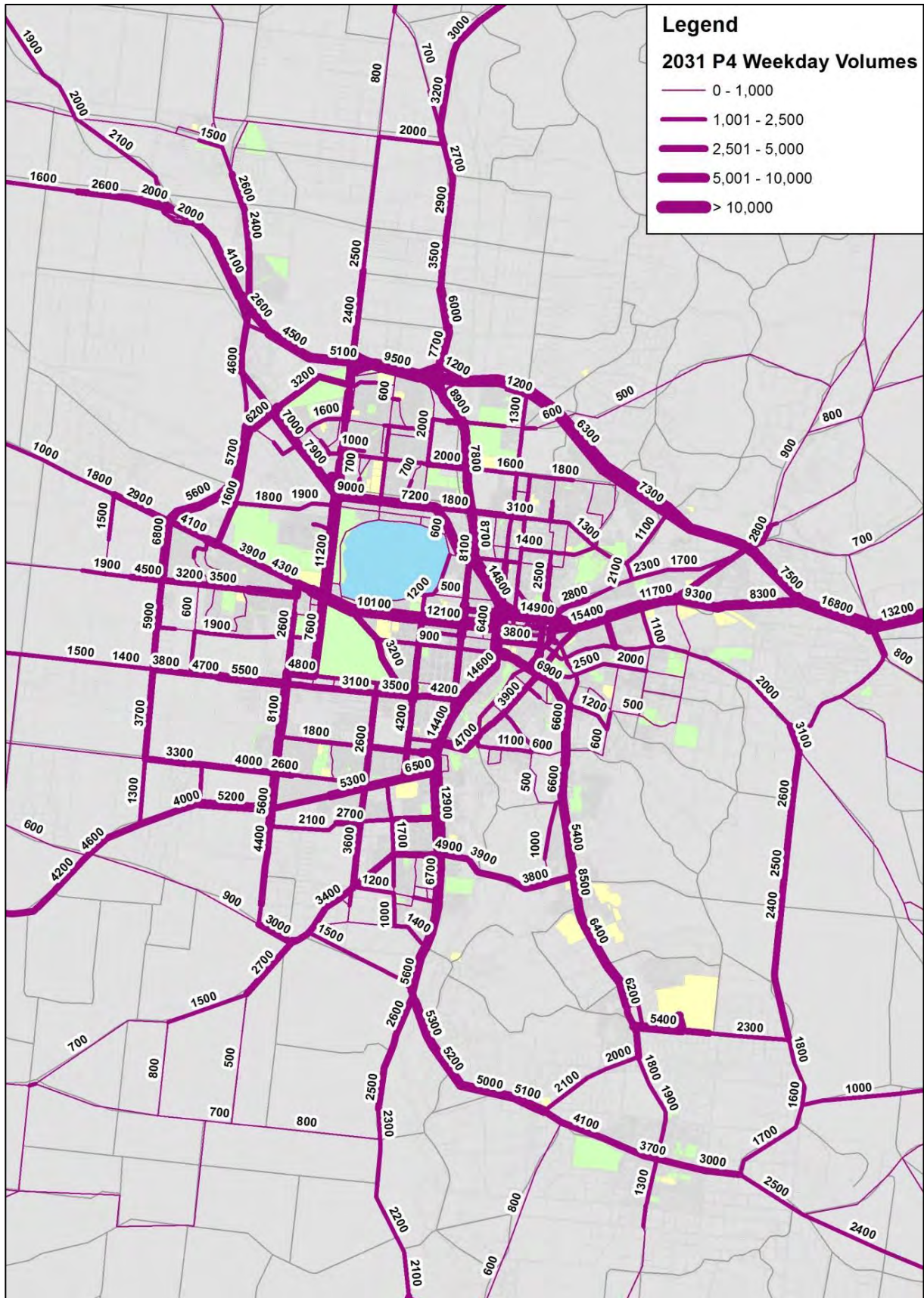


Figure 36 Total one-way vehicle modelled daily volumes (CBD) - 2031



Figure 37 Total one-way vehicle daily volume differences between 2031 and base year (2013)

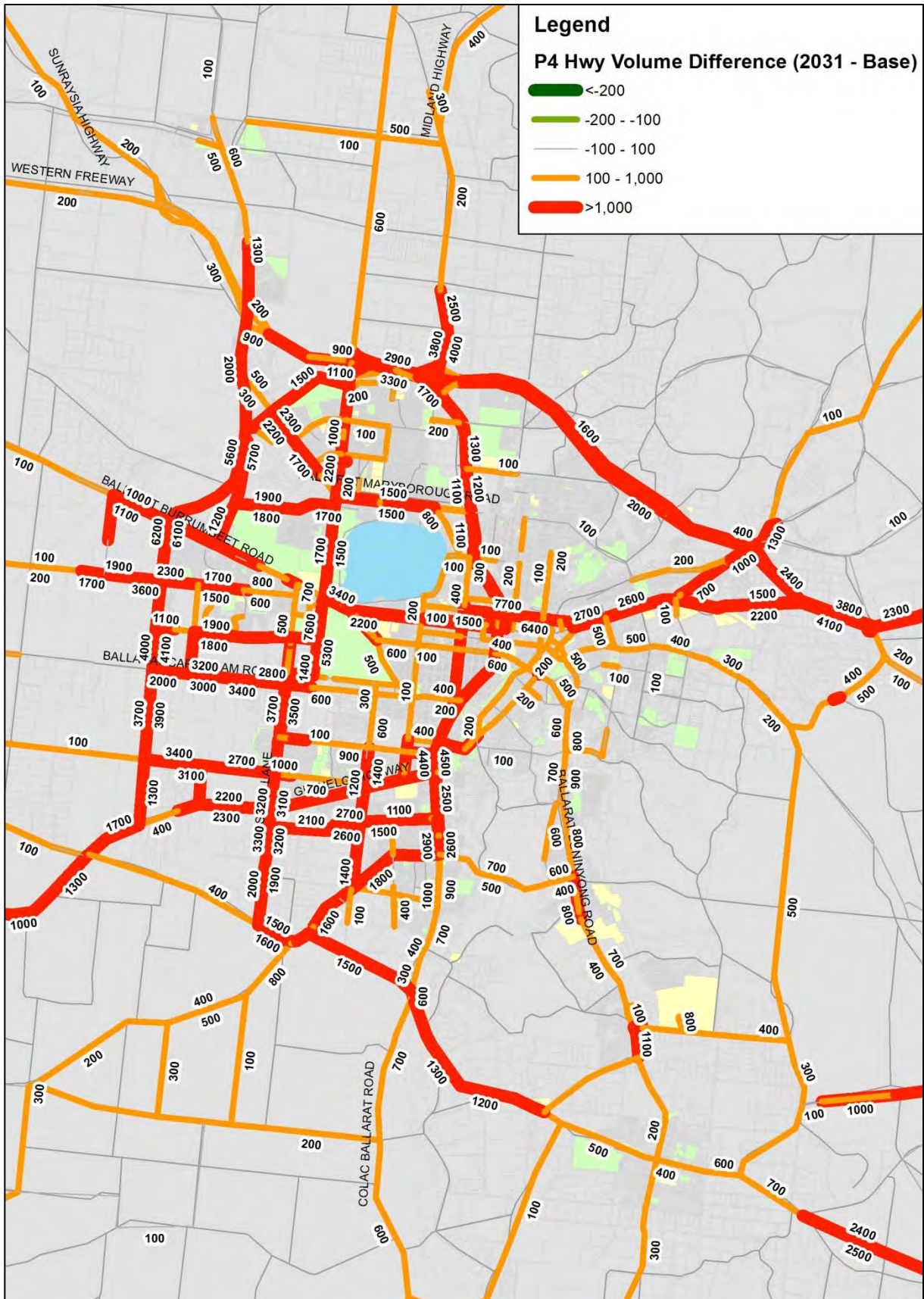


Figure 38 Total one-way vehicle daily volume differences between 2031 and base year (2013) - CBD

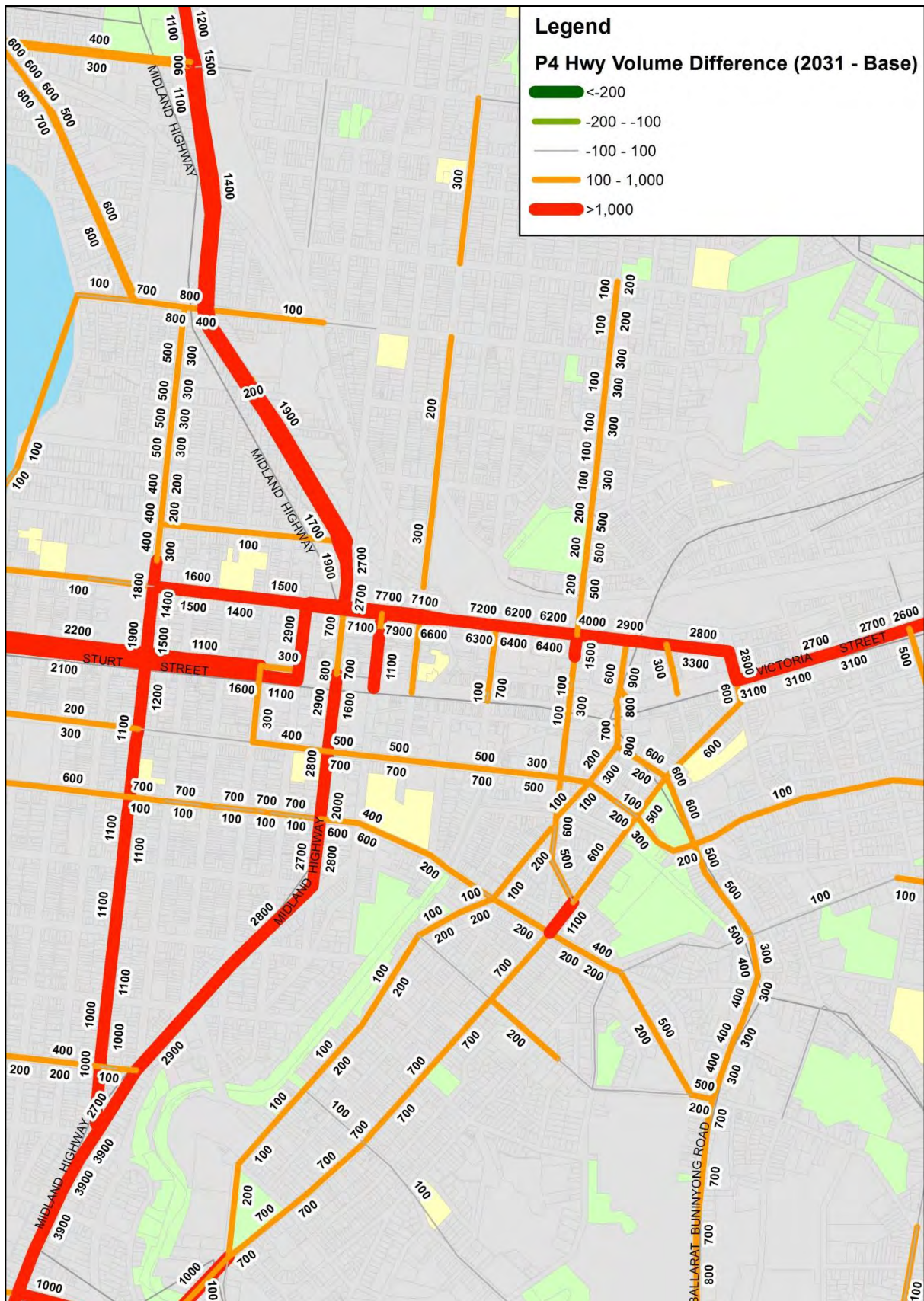


Figure 39 AM-peak 2 hour volume over capacity ratios – 2031

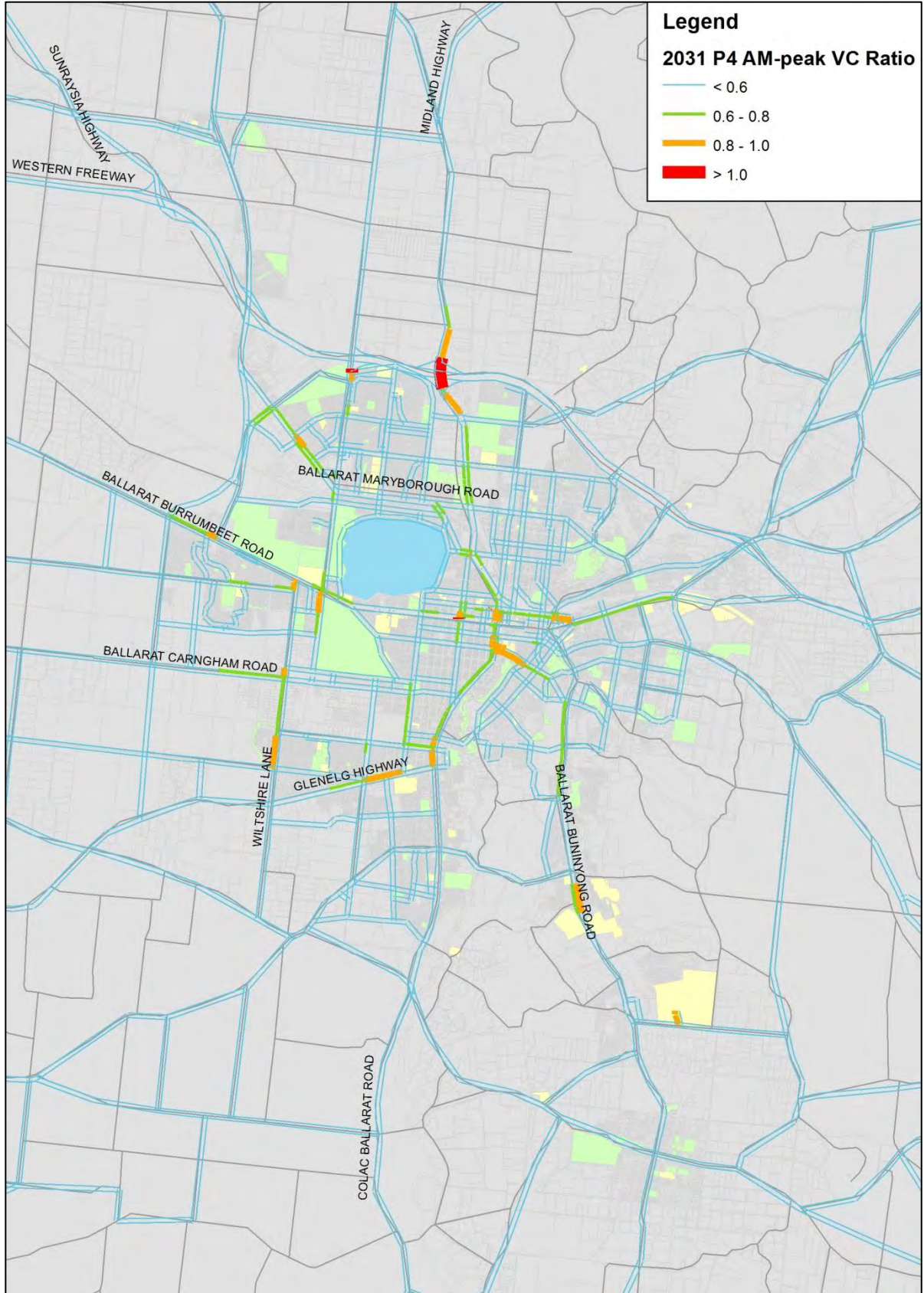


Figure 40 AM-peak 2 hour volume over capacity ratios (CBD) – 2031

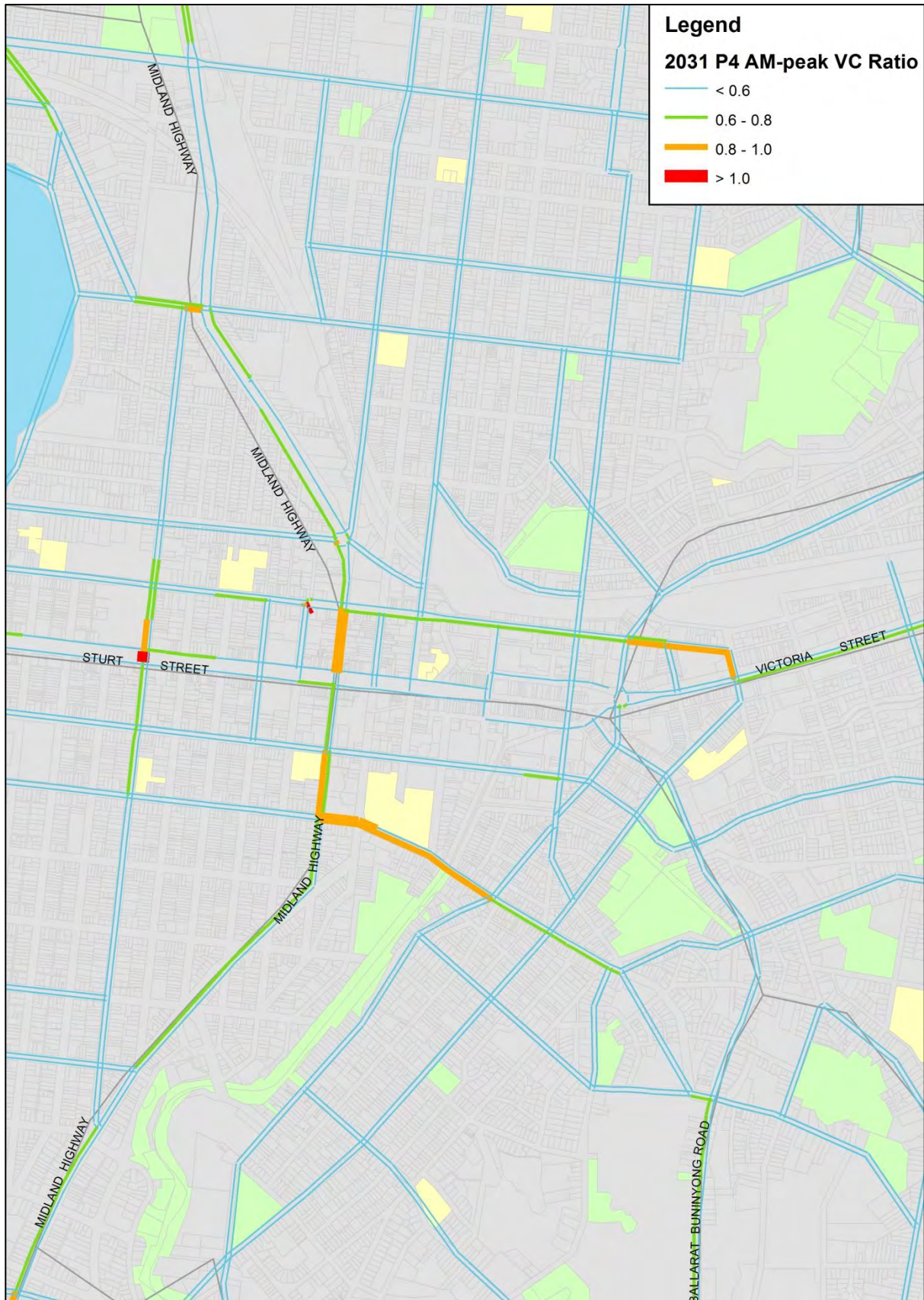


Figure 41 One-way weekday bus patronage – 2031

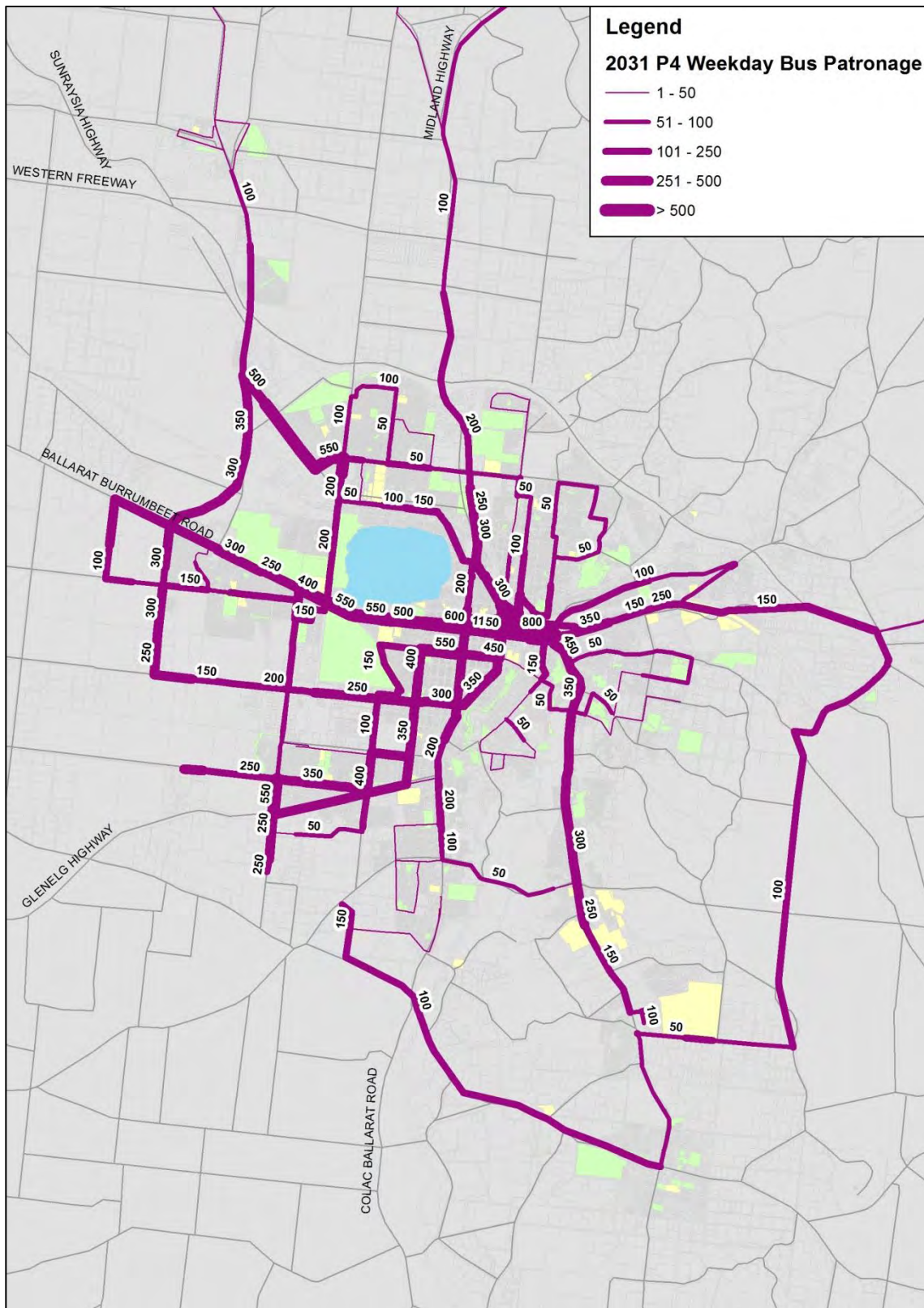


Figure 42 One-way weekday bus patronage (CBD) – 2031

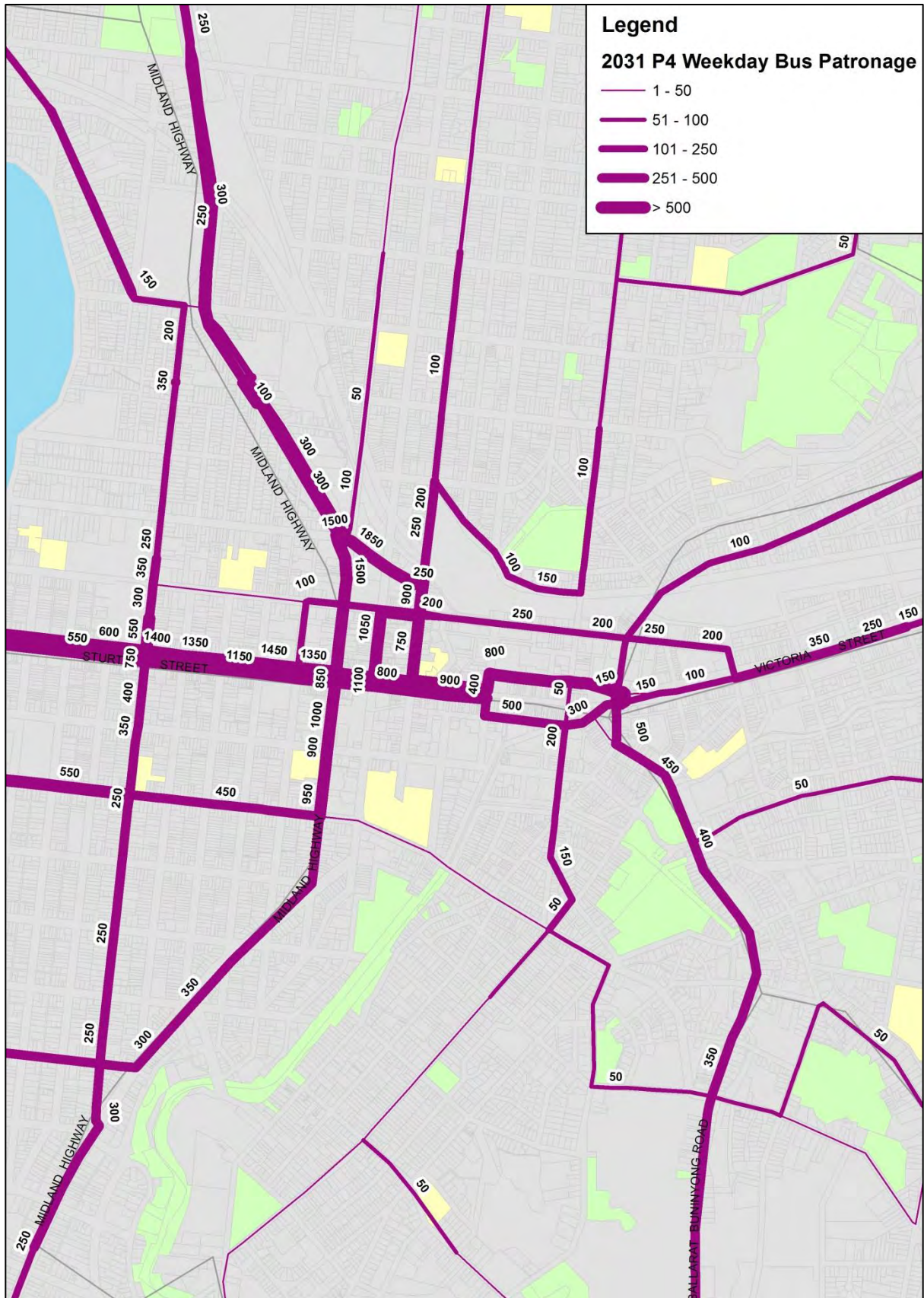


Figure 43 Daily bus load differences between 2031 and base year (2013)

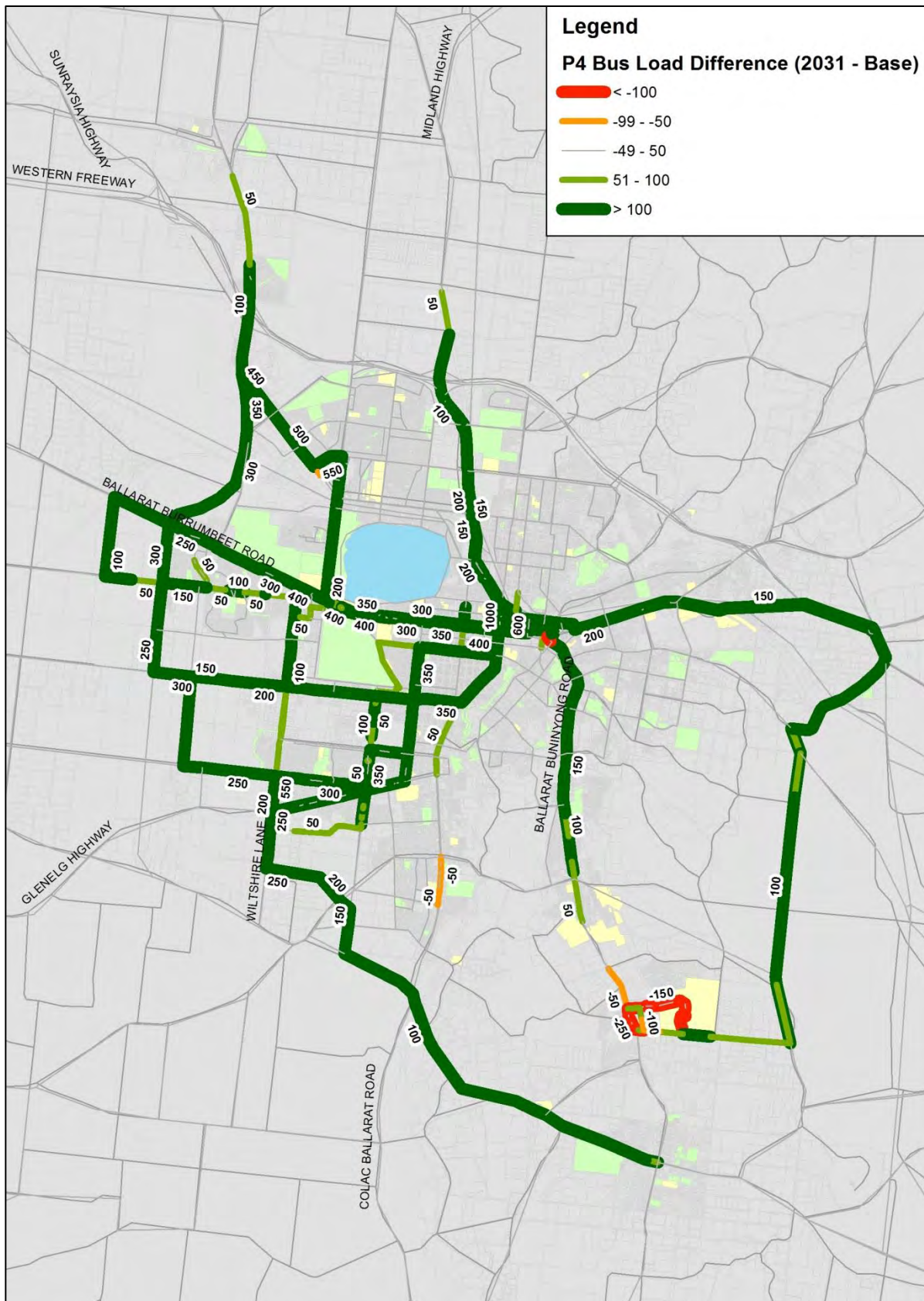


Figure 44 Daily bus load differences between 2031 and base year (2013) - CBD

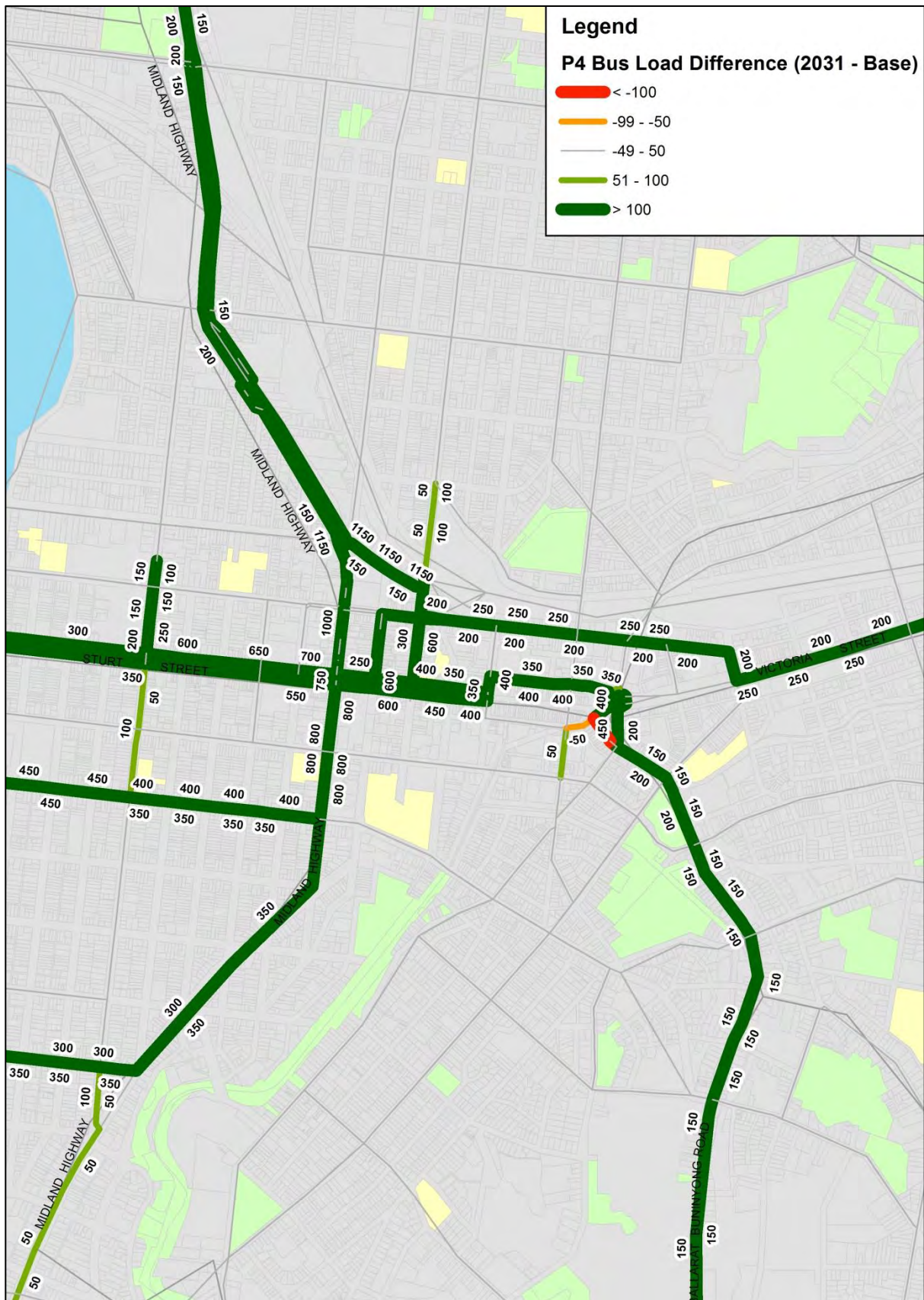


Figure 45 One-way weekday train patronage - 2031

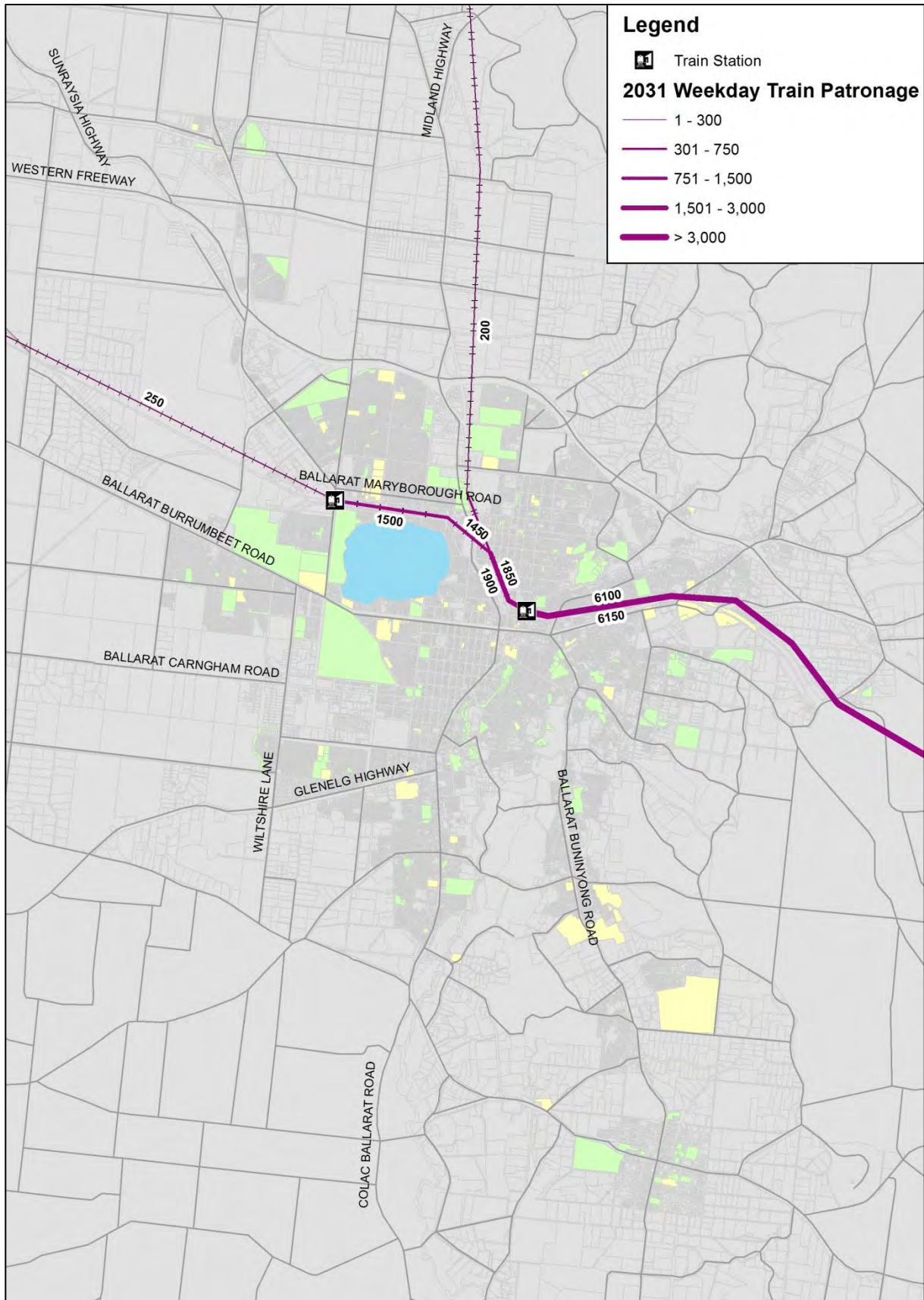


Figure 46 Weekday station boardings by access mode in 2031

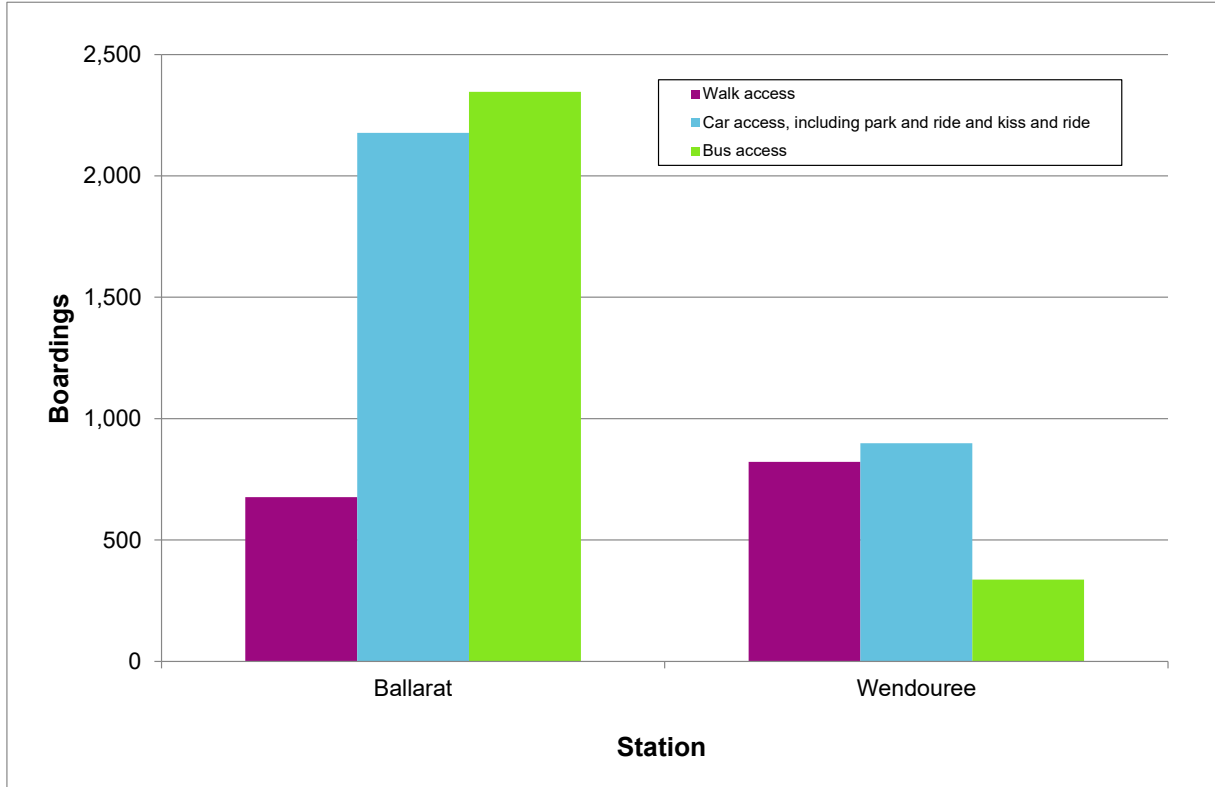
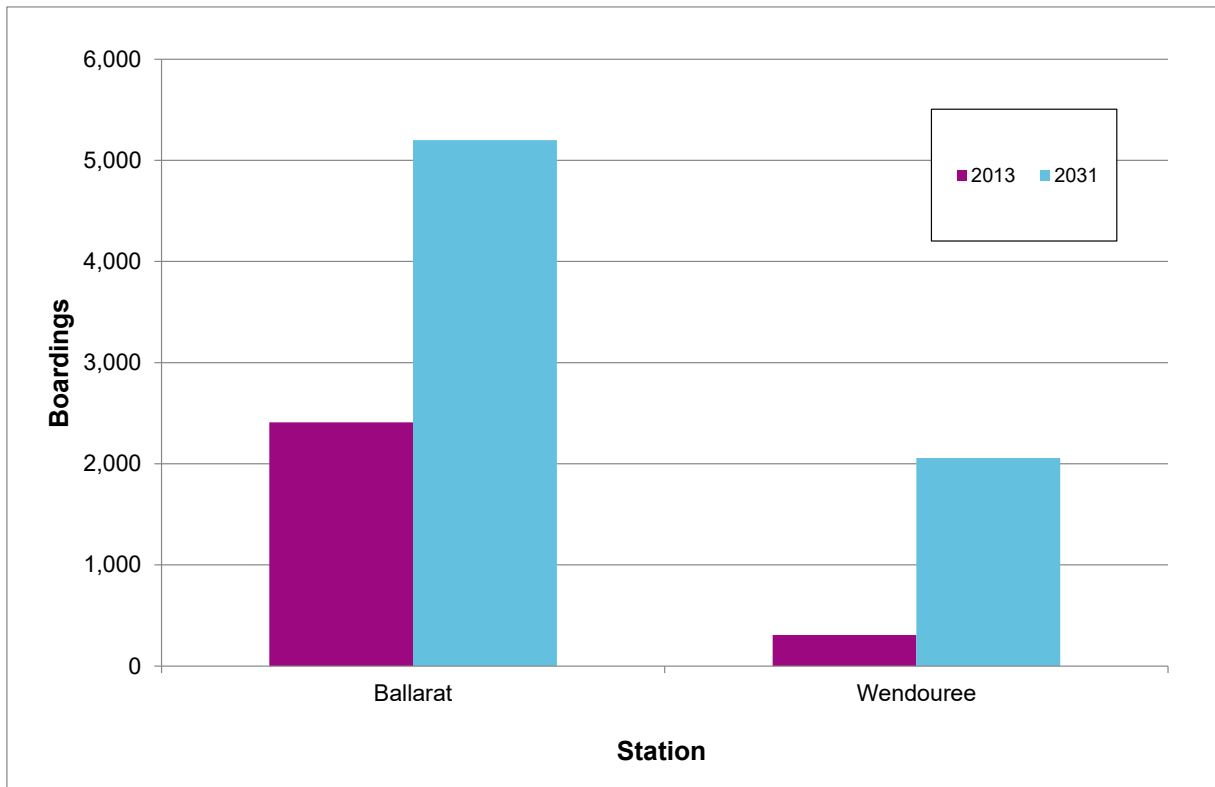


Figure 47 Comparison of total weekday station boardings between 2031 and 2013



5.3 2041 modelling results

In 2041, the PT network and services were assumed to be the same as those of 2021 and 2031. The highway network would be further improved with Western Link Road extended all the way from Western Freeway in the north to Midland Highway in the south. Recreation Road and Gear Avenue would be upgraded from 60km/h to 80km/h, and a full Eastern Bypass would be included.

Figure 48 and Figure 49, Figure 50 and Figure 51, and Figure 52 and Figure 53 show the modelled one way daily vehicle volumes, the differences of vehicle volumes between 2041 and the 2013 base, and the AM-peak 2 hour V/C ratios for the 2041 preferred scenario respectively.

Figure 48 and Figure 49 show that:

- Western Freeway between Learmonth Road and Victoria Street would carry one way daily traffic volume in the range of 5,200 to 13,000 vehicles
- Victoria Street/Sturt Street would carry 8,800 to 15,200 vehicles per direction per day
- Mair Street would carry to 4,000 to 16,200 vehicles per direction per day
- Midland Highway would carry 5,400 to 15,800 vehicles per direction per day
- Geelong Road between Mt Helen and Grant Street would carry 5,500 to 7,800 vehicles per direction per day
- Gillies Street between Winter Street and Western Freeway would carry 5,500 to 12,200 vehicles
- Western Link Road between Glenelg Highway and Western Freeway would carry 2,000 to 9,200 vehicles
- Upgraded Yankee Flat Road would carry about 1,000-3,000 vehicles
- Eastern Bypass would carry about 1,000-1,600 vehicles.

When compared to 2013, Figure 50 and Figure 51 show that traffic has increased significantly (over 1,000 vehicles per direction per day) into almost all arterial roads. This indicates that the proposed road network has been designed well to cater for the growth of population and employment by distributing traffic over the whole network rather than just a few corridors. In particular, the increase of traffic on Eastern Bypass indicates that it is useful to provide connection between the population growths at Warrenheip to Tech Park employment centre.

Figure 52 and Figure 53 show the V/C ratios for the AM peak period. The pattern of traffic congestion (V/C >0.8) is similar to 2031 with longer length of congested roads. There are three locations with V/C above one:

- Midland Highway at the interchange with Western Freeway
- Gillies Street north of Ring Road
- Drummond Street South on its approach to Sturt Street.

Apart from the above locations, the city's road network would generally operate under capacity.

Figure 54 and Figure 56 show one way weekday bus passenger volumes, and the differences between 2041 and the 2013 volumes. It is indicated that the PT network is now well connected serving the population growth areas. The segment of Sturt Street between Drummond Street and Midland Highway would carry the maximum combined passenger loading of 1,550 passengers per day. Passenger volume increases in the direction toward CBD as bus services converging into CBD area to serve the employment there.

Figure 58, Figure 59 and Figure 60 exhibit one way daily train loading passenger volumes, daily boardings by access mode at Ballarat and Wendouree railway stations, and the differences of total boardings between 2041 and the 2013 base respectively. When compared against the 2013 base, the total boardings per day at Ballarat Station would increase significantly from 2,400 passengers (2013) to 6,600. Similarly, the total boardings per day at Wendouree Station would increase from 300 passengers (2013) to 2,600.

Figure 48 Total one-way vehicle modelled daily volumes - 2041

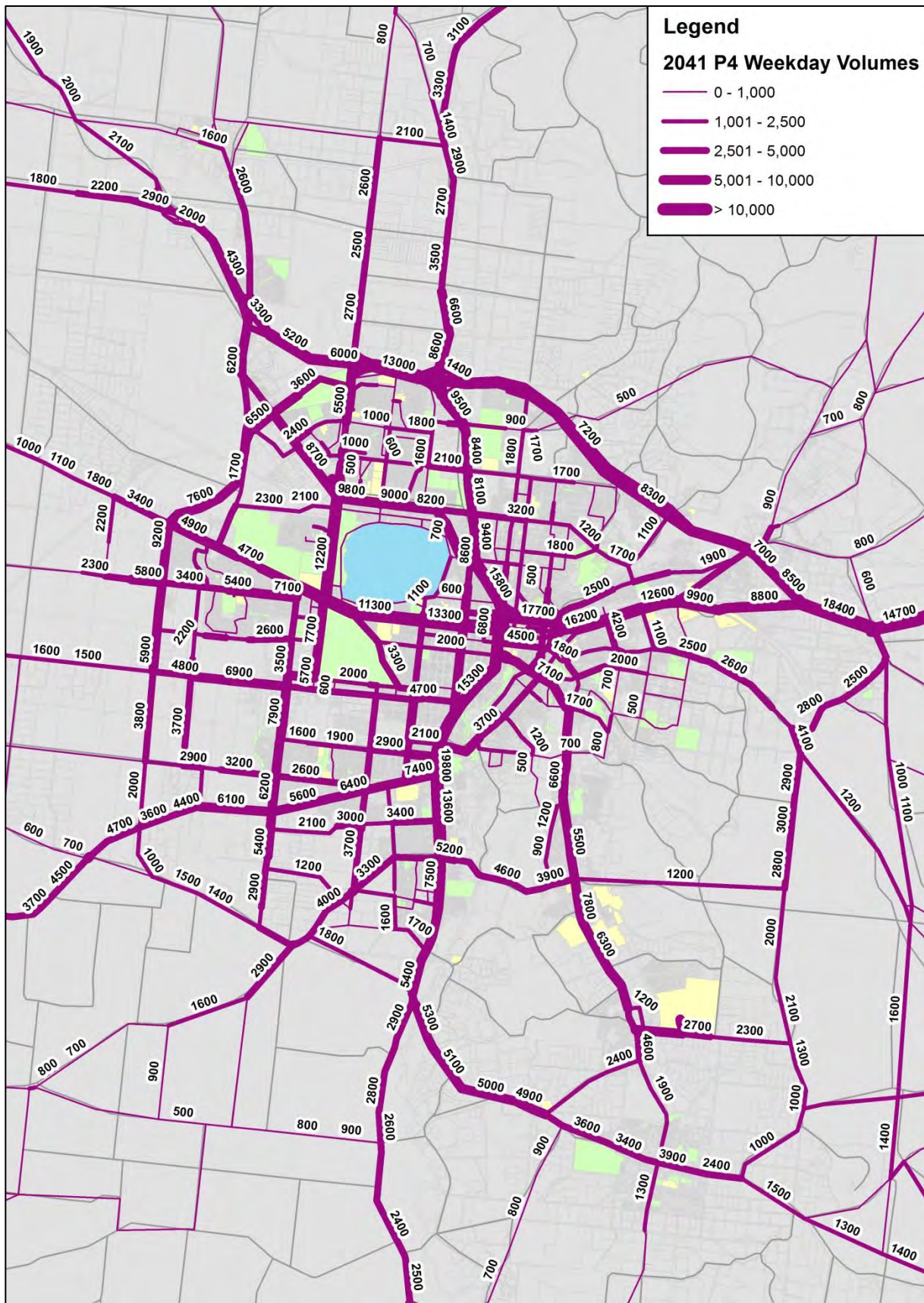


Figure 49 Total one-way vehicle modelled daily volumes (CBD) - 2041



Figure 51 Total one-way vehicle daily volume differences between 2041 and base year (2013) - CBD

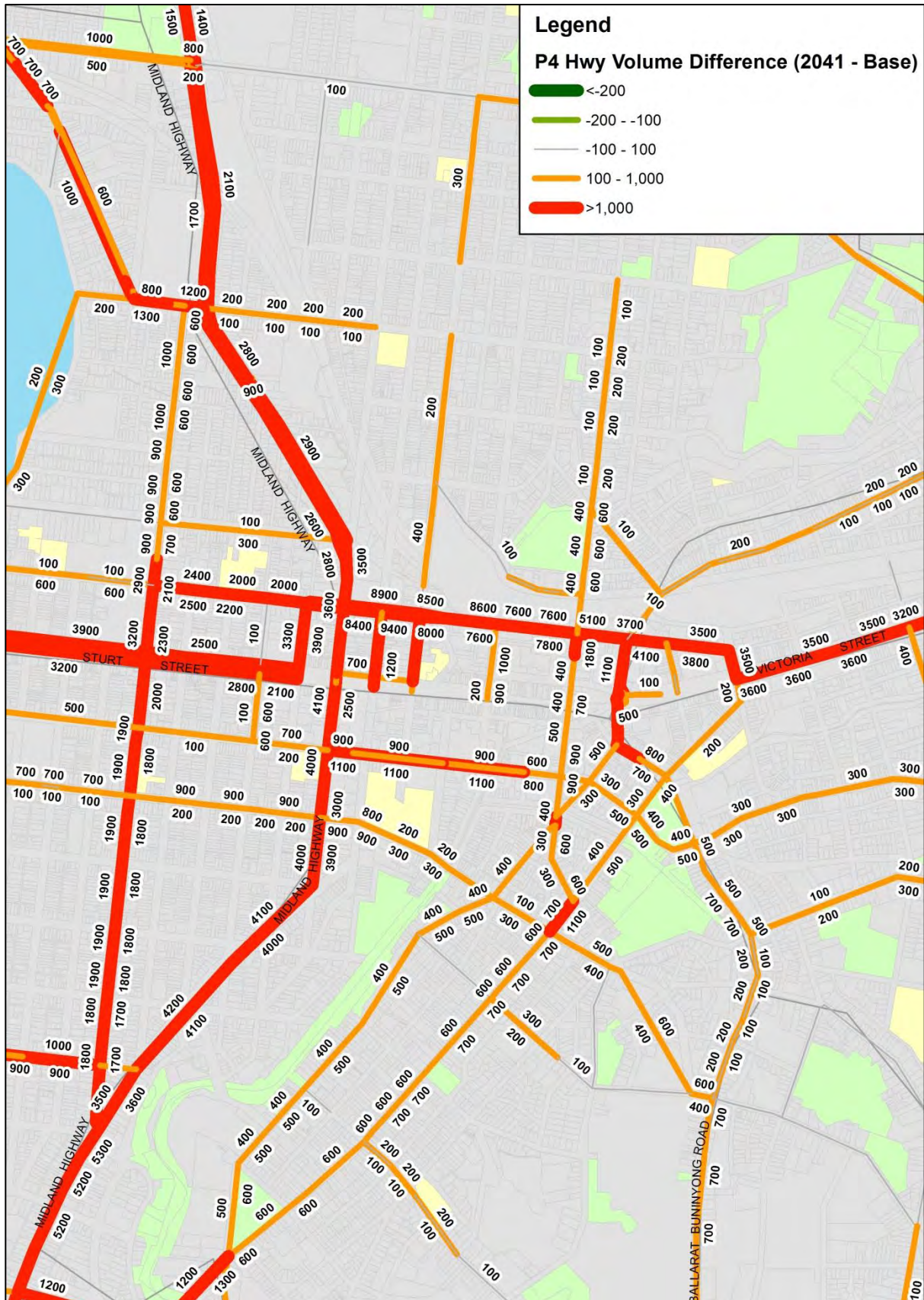


Figure 52 AM-peak 2 hour volume over capacity ratios - 2041

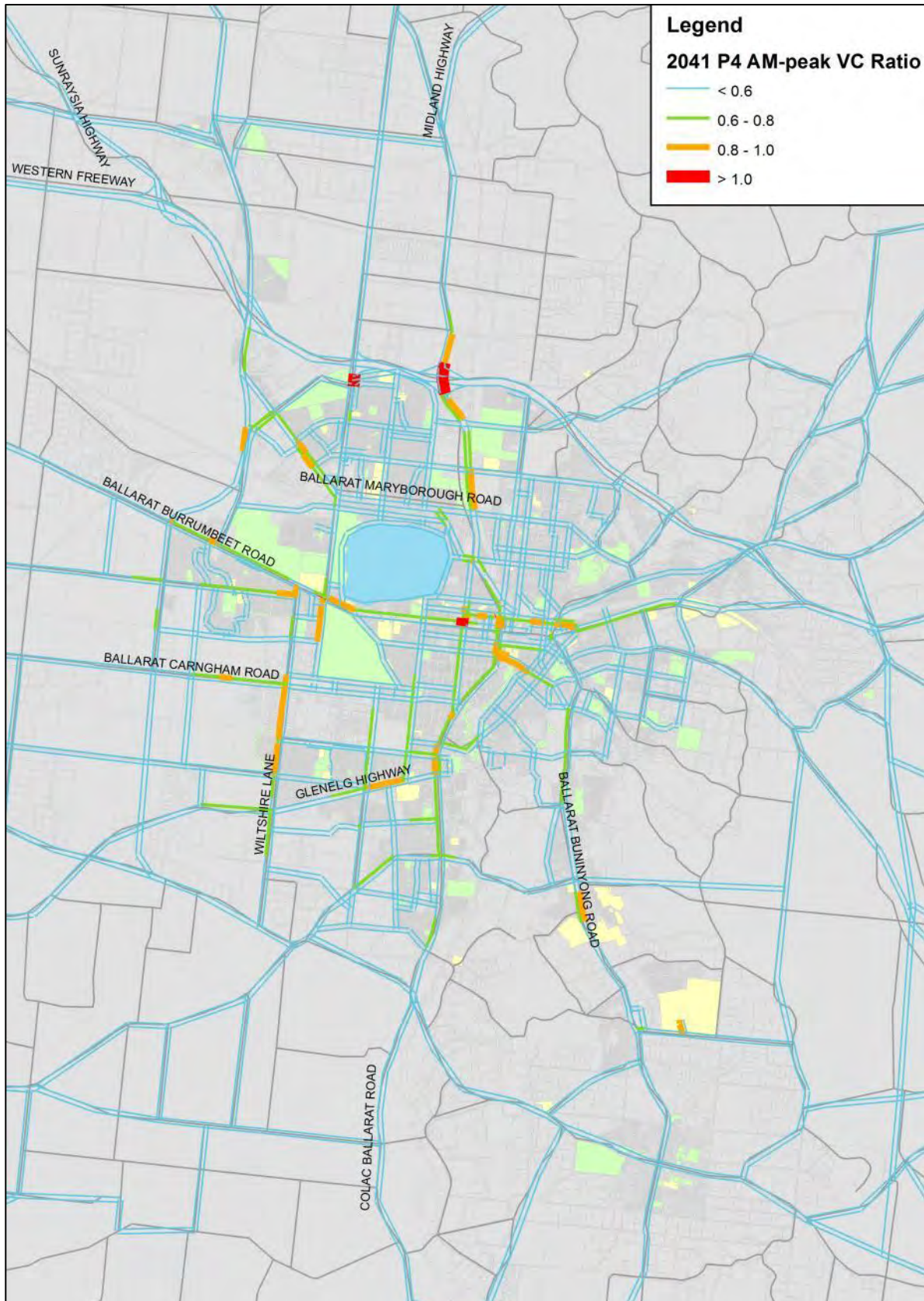


Figure 53 AM-peak 2 hour volume over capacity ratios (CBD) - 2041

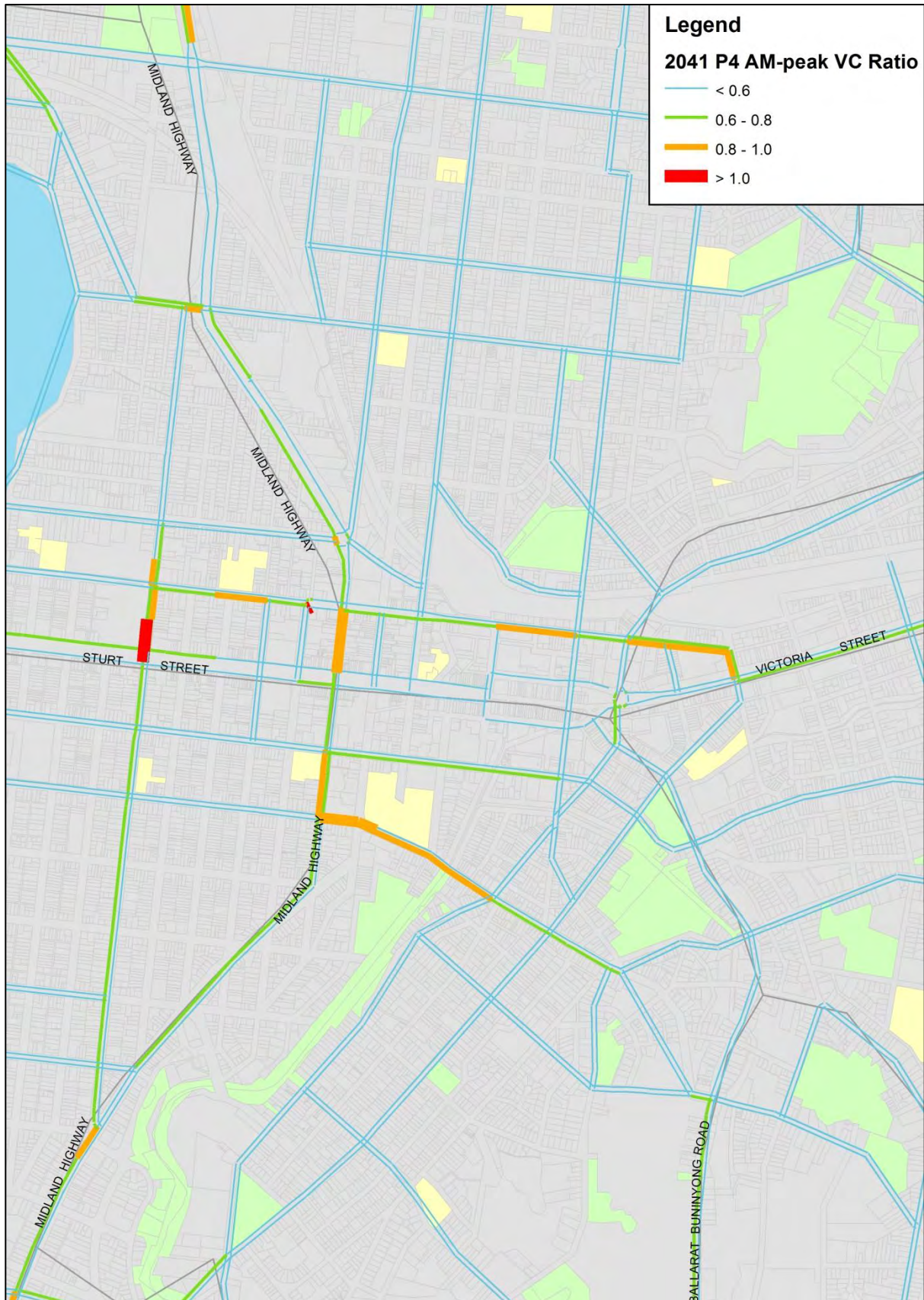


Figure 54 One-way weekday bus patronage – 2041

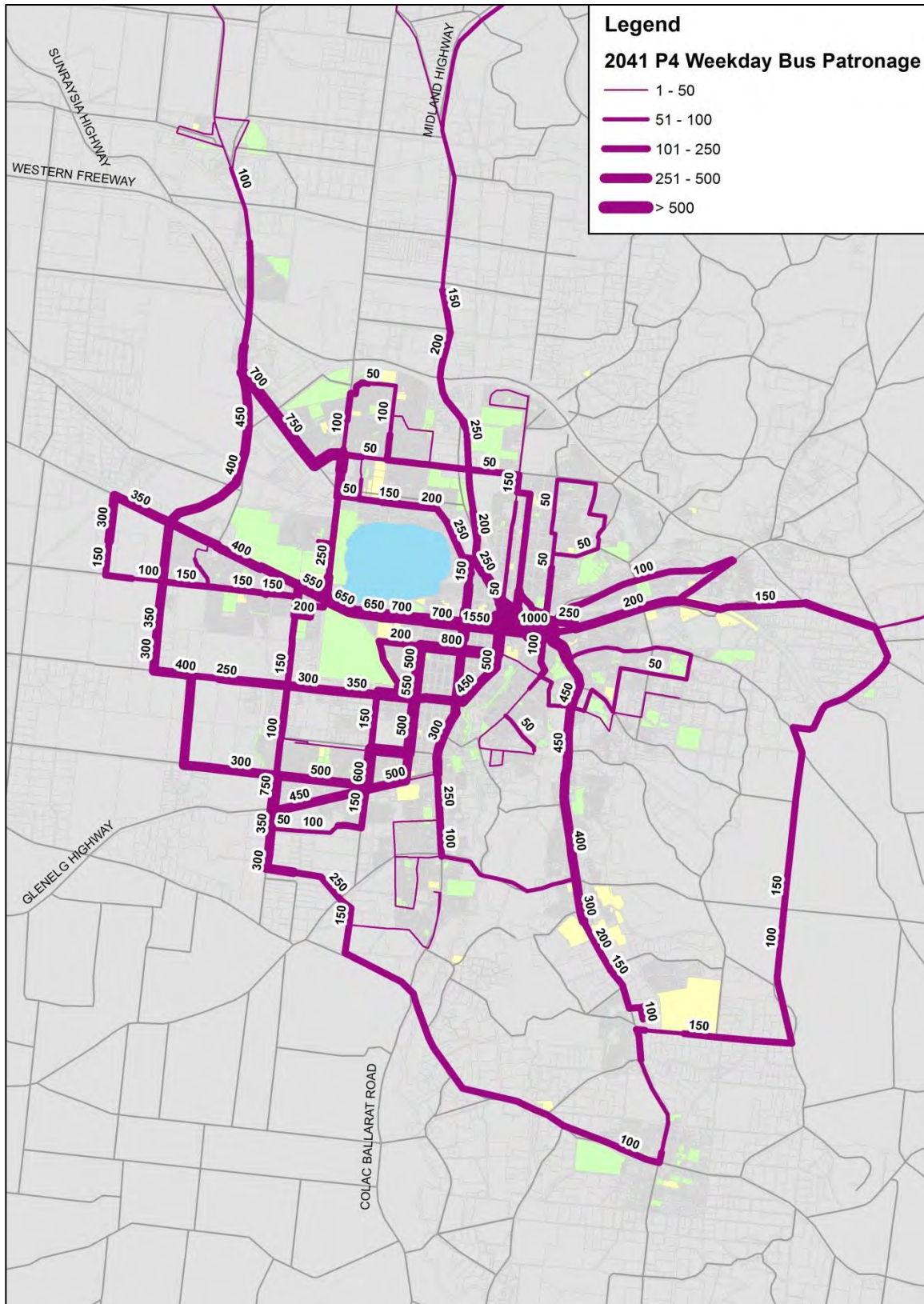


Figure 55 One-way weekday bus patronage (CBD) – 2041

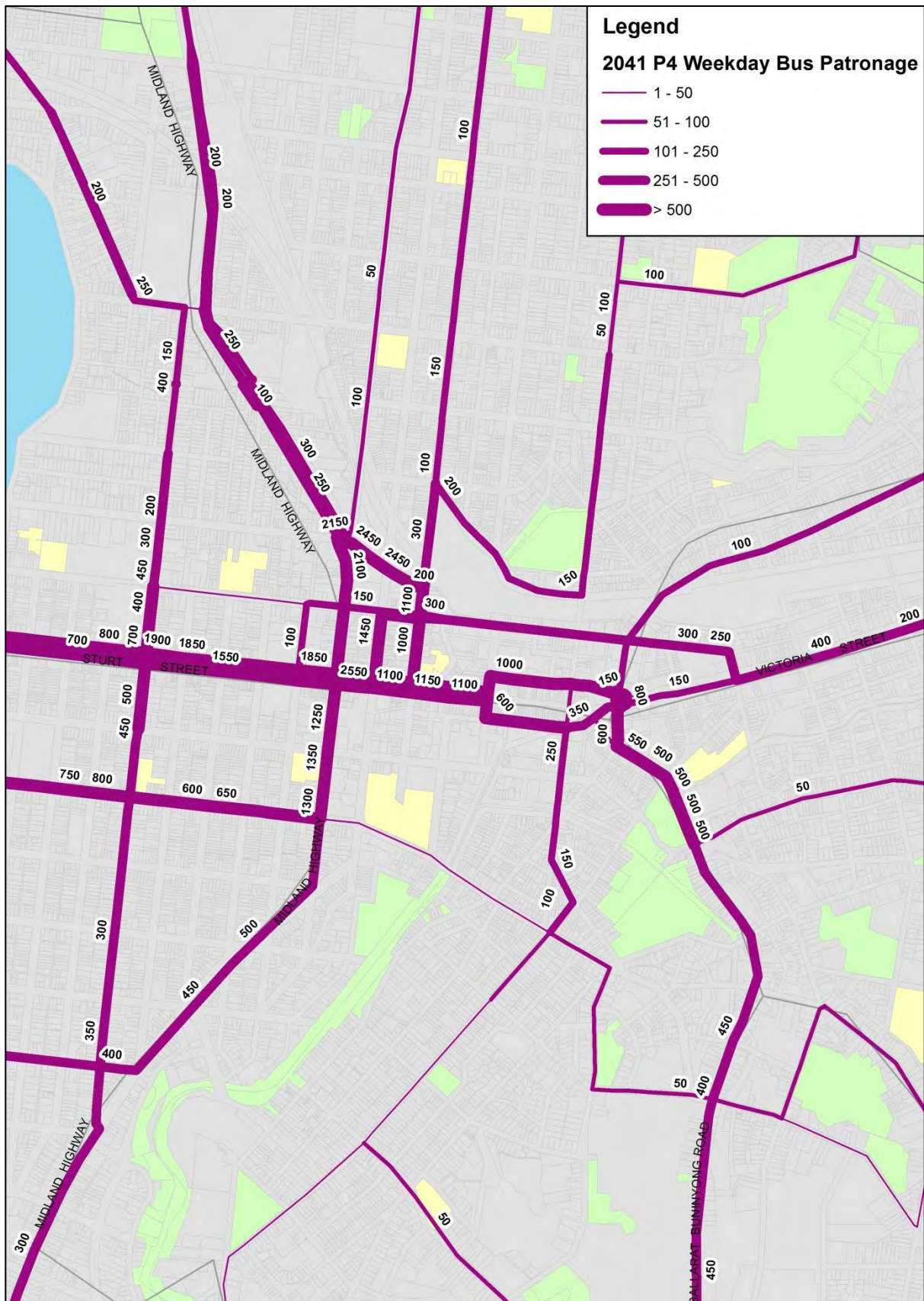


Figure 56 Daily bus load differences between 2041 and base year (2013)

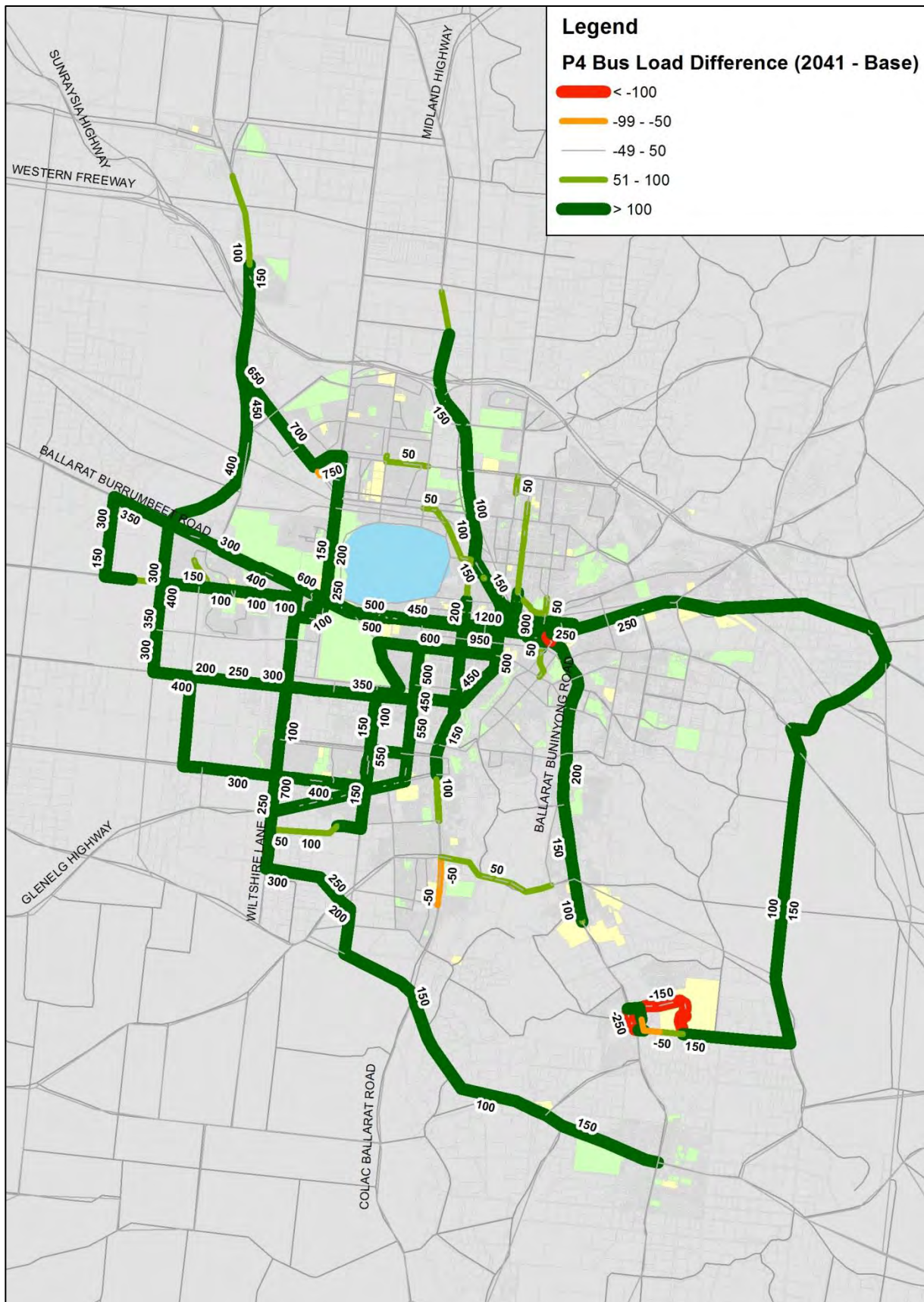


Figure 57 Daily bus load differences between 2041 and base year (2013) - CBD

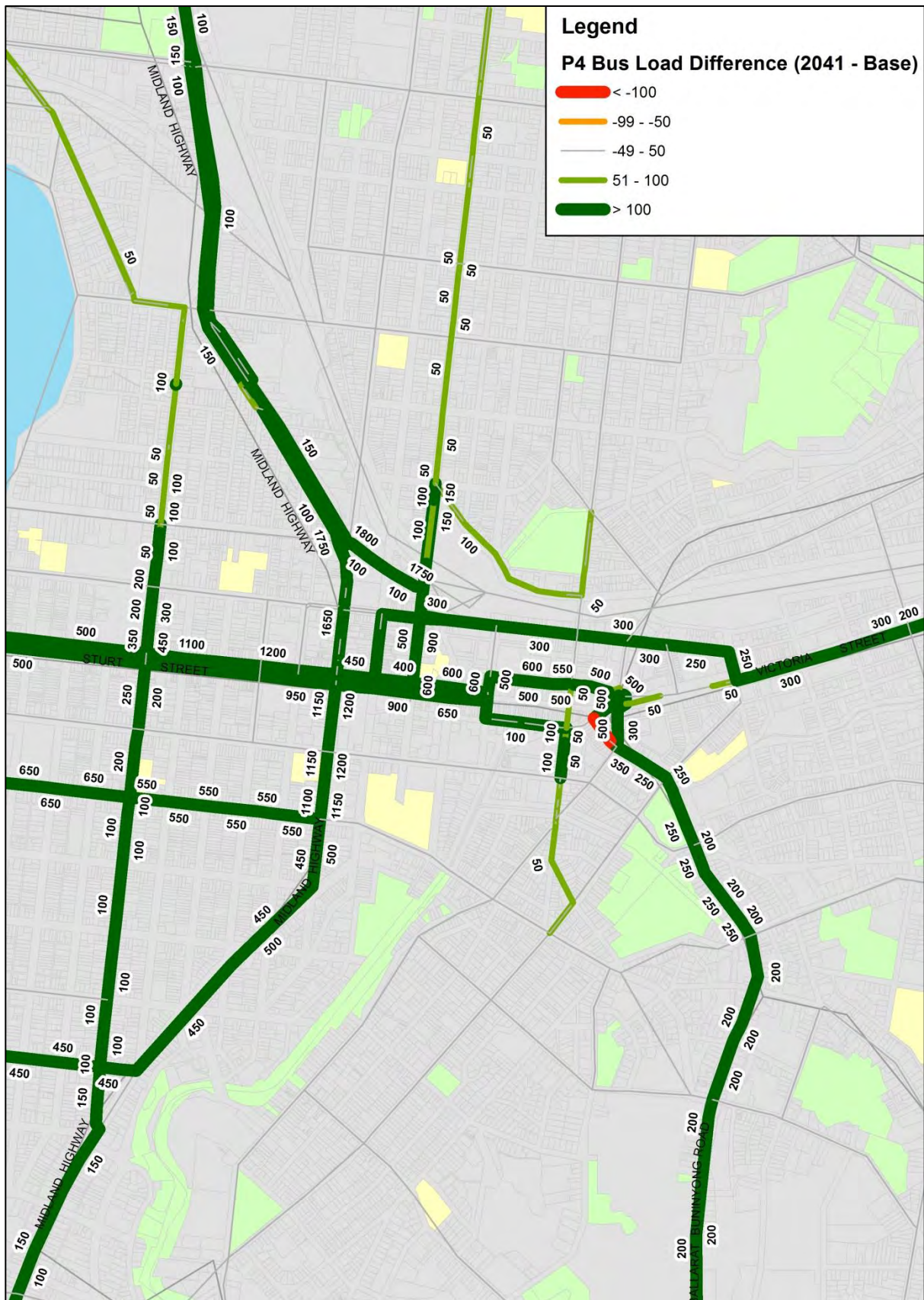


Figure 58 One-way weekday train patronage – 2041

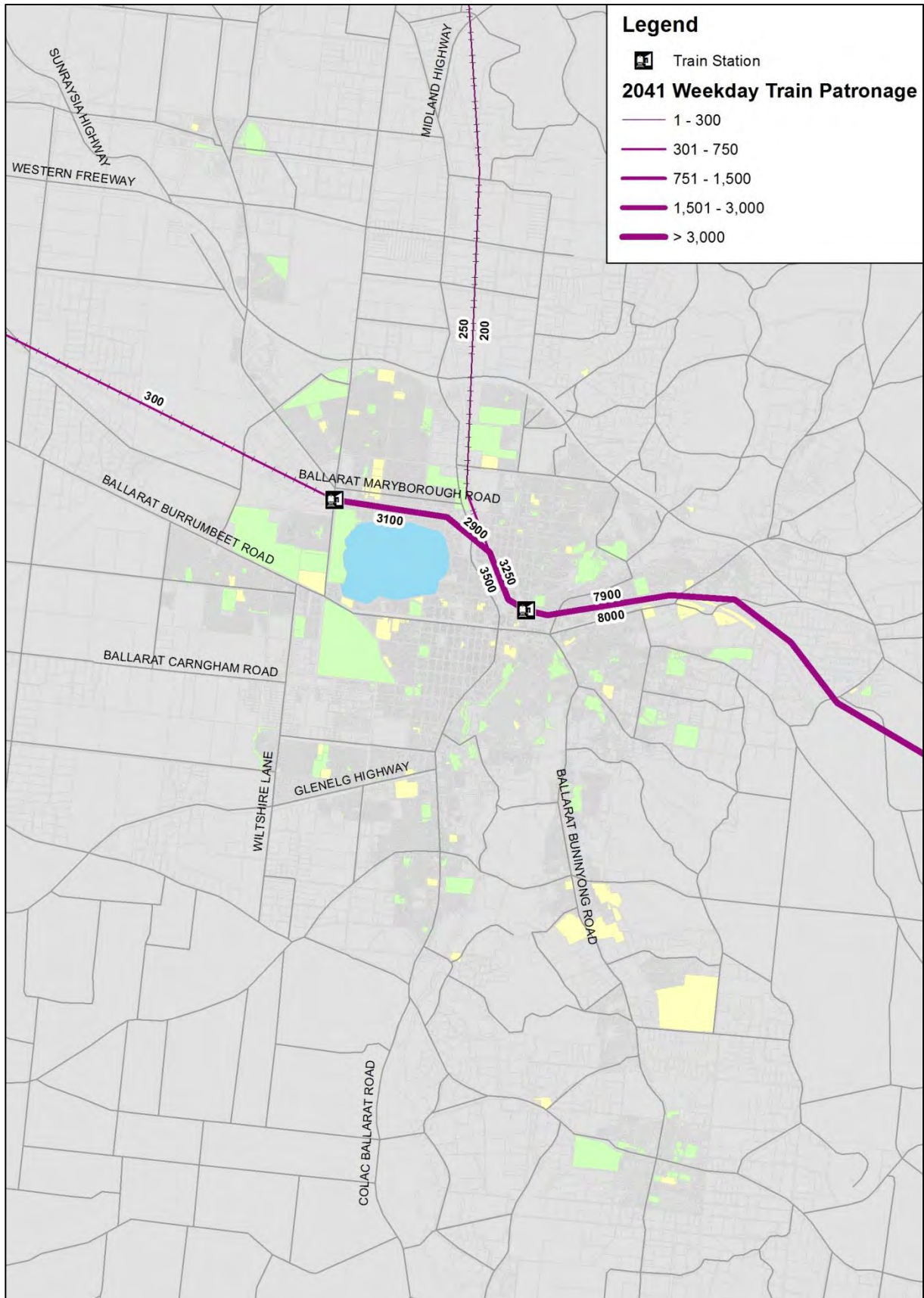


Figure 59 Weekday station boardings by access mode in 2041

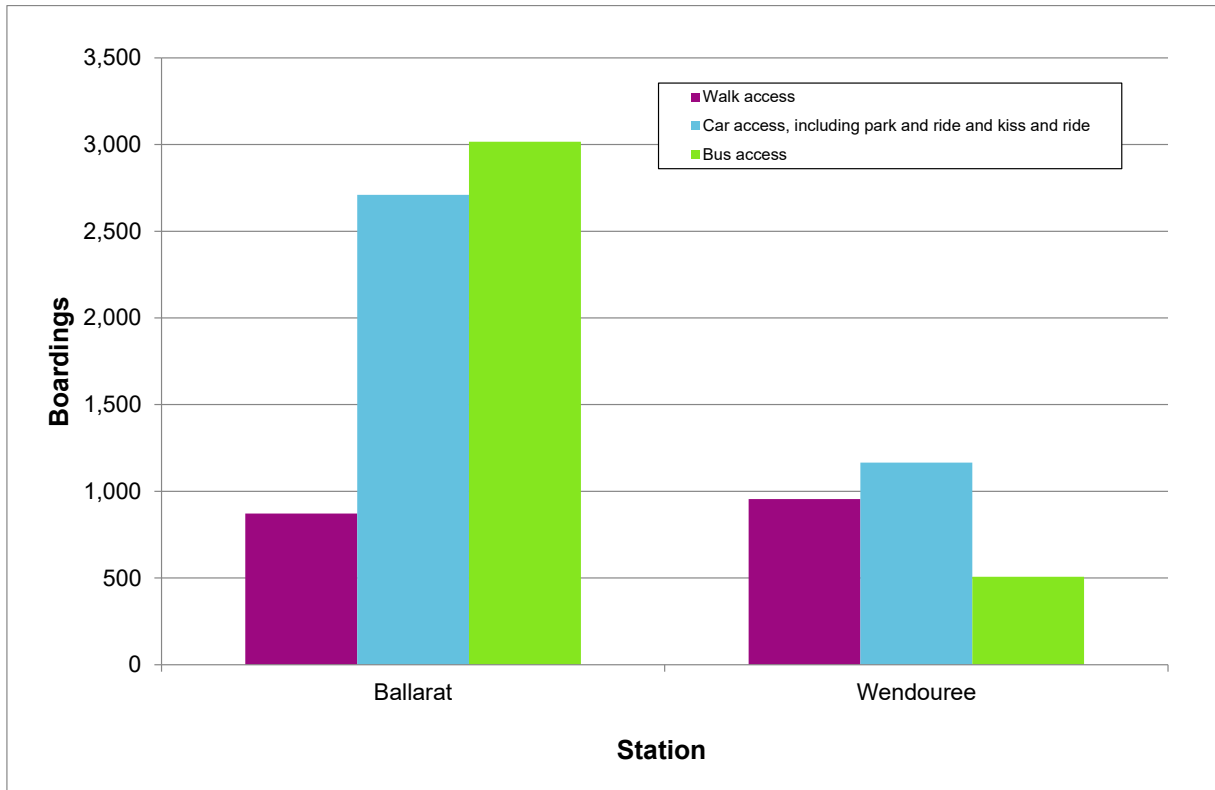
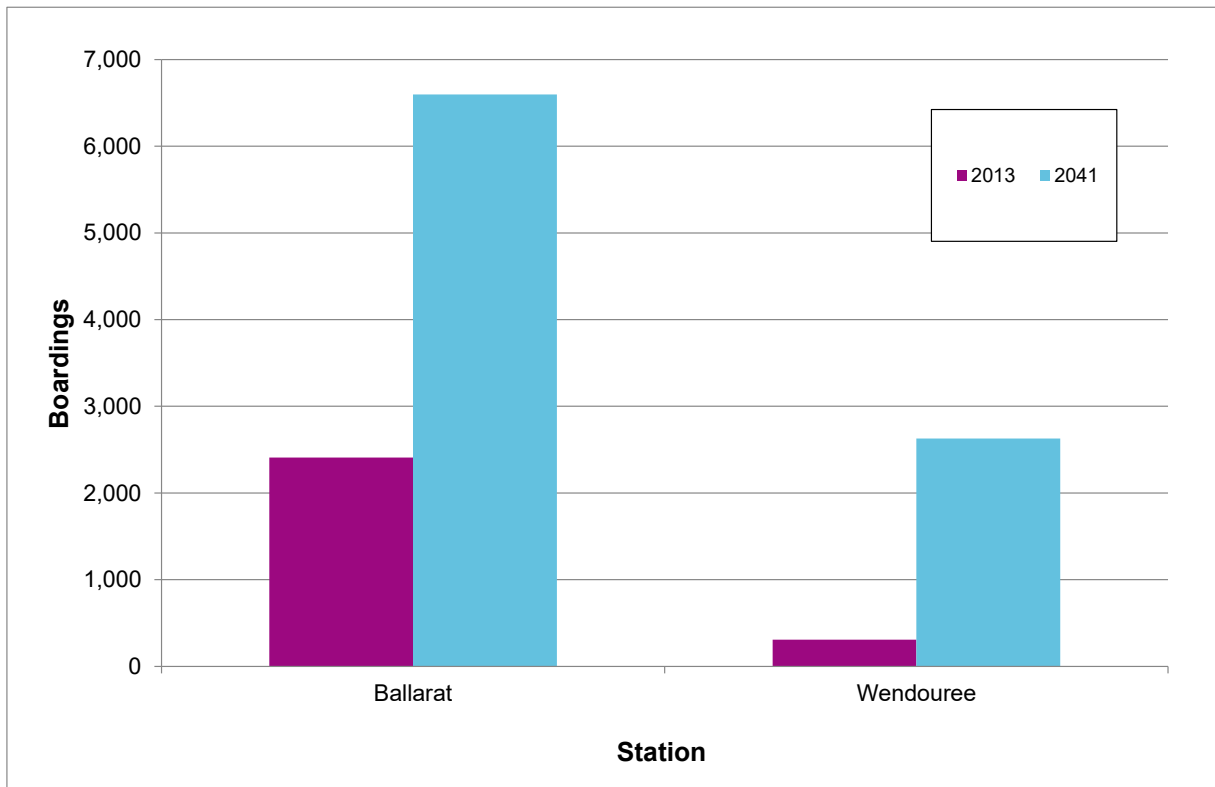


Figure 60 Comparison of total weekday station boardings between 2041 and 2013



5.4 Overall network performance

Table 26 shows the overall network performance for the COB network in terms of supply side, demand statistics, highway network performance statistics and PT performance statistics for the daily trips for the 2013 base and the Preferred Scenario through the three planning years. Please note that the network performance indicators shown in the table represent all trip components of Ballarat which include trips originating from, destined for and passing through Ballarat. General observations can be drawn from this table as follows:

- The private vehicle trips grow from 295,304 in 2013 to 446,109 in 2041 (or by 51 percent), whereas the PT trips grow from 8,833 to 27,081 (or 207 percent or three times). This would be due to the increase of vehicle operating costs in real term, parking cost in the CBD, and improvements of PT services. Similarly, the PT mode share has grown steadily from 2.1 percent (2013), to 3.1 percent (2021), 3.6 percent (2031), and 4 percent (2041).
- In terms of highway network performance, the vehicle-kilometres travelled (VKT) and vehicle-hours travelled (VHT) increase in similar percentages to that of private vehicle trips. But the length of congested road (km) has increased at faster rate from 2.2 km (2013), to 3.8km (2021), 8.1km (2031) and 13km (2041). The mean trip length remains unchanged, but the mean trip speed has declined marginally but steadily from 50.3 km/hr (2013) to 47.7 km/hr (2041).
- In terms of PT network performance, the PT passenger km has increased from 63,284 in 2013 to 227,612 in 2041, representing a growth of 3.6 times over the period despite the modest growth of bus route coverage (from 316 km to 407 km or 29 percent). The average PT trip length in terms of travel distance and time would also increase from 7.2kms and 9.7mins (in 2013) to 8.4kms and 12 mins (in 2041). This increase represents the expansion of PT services into the population growth in outer areas such as Ballarat West.

Table 26 Overall network performance for trips originating from, destined for or passing through Ballarat (Daily)

Key Performance Indicators		Preferred Scenario				% Diff. (2041-Base) /Base
		Base 2013	2021	2031	2041	
Supply Side Inputs	Road length (km)	1,389	1,399	1,419	1,436	3%
	Lane length (km)	1,493	1,507	1,528	1,545	3%
Demand statistics	Private vehicle trips	295,304	328,307	393,500	446,109	51%
	Private vehicle person trips	410,547	481,785	577,227	653,281	59%
	Public transport trips	8,833	15,250	21,368	27,081	207%
	PT mode share	2.10%	3.10%	3.60%	4.00%	89%
Highway Statistics	VKT	1,991,857	2,284,264	2,635,925	2,896,520	45%
	VHT	39,601	45,611	54,006	60,692	53%
	Length of congested road (km)	2.2	3.8	8.1	13	495%
	Mean trip distance (km)	6.7	7	6.7	6.5	-4%
	Mean trip time (min)	8	8.3	8.2	8.2	1%
	Mean trips speed (km/h)	50.3	50.1	48.8	47.7	-5%
Public Transport Statistics	PT Passenger (km)	63,284	129,388	179,863	227,612	260%
	PT Passenger (hrs)	1,424	2,964	4,227	5,427	281%
	Bus Boardings (in Ballarat)	5,543	10,822	15,187	19,153	246%
	Bus Passenger (km)	19,265	42,649	60,838	76,772	299%
	Bus Passenger (hrs)	935.07	2,000	2,905	3,751	301%
	Bus Route Coverage (km)	316	407	406	407	29%
	Train Boardings (in Ballarat)	2,715	5,317	7,434	9,439	248%
	Train Passenger (km)	44,020	86,739	119,025	150,840	243%
	Train Passenger (hrs)	489	964	1,323	1,676	243%
	Train Coverage (km)	97	100	100	100	3%
	Average PT Trip in (km)	7.2	8.5	8.4	8.4	17%
	Average PT Trip in (mins)	9.7	11.7	11.9	12	24%
	Average PT Speed (km/h)	44.4	43.6	42.5	41.9	-6%
	Average Bus Speed (km/h)	20.6	21.3	20.9	20.5	-1%
	Average Train Speed (km/h)	90	90	90	90	0%

Please note that while the average bus passenger speed and average train speed remain steady at 20.5km/h and 90km/h respectively in 2041, the average PT speed has reduced from 44.4km/h (2013) to 41.9km/h (2041). This reduction just reflects the increase of bus passenger share of PT mode in which the bus operates at lower speed than rail, thus the average PT passenger speed would reduce. It does not represent the decline of PT services.

6.0 Conclusions

This report summarises the development of the Victorian Integrated Transport Model for the City of Ballarat area and the model validation for the 2013 base year. Overall the model met the validation criteria defined by DEDJTR, and indicated that it is fit for the purpose of testing future land use and transport network scenarios. The report also presents the development of demographic data and the transport networks for future base years: 2021, 2031 and 2041. The 2041 base modelling results were then used to investigate opportunities for network enhancement and land use development during Phase 3A, and subsequently to develop and test eight transport and land use scenarios during Phase 3B. The modelling of Phase 3B indicated that the 7th scenario – High Infill would provide the best performance in terms of highest PT mode share and lowest length of congested road.

Consequently, COB has developed a Preferred Scenario which is mostly based on the High Infill scenario with an allocation of population to the CBD area to encourage less car travel by reducing the distance between housing and employment opportunities. In addition, the preferred scenario also includes other transport initiatives such as encouraging walk and cycling for short distance trips, increasing car parking cost in the CBD, and improving the PT and highway networks.

The remainder of this report describes the population distribution for the Preferred Scenario in 2021, 2031 and 2041 as well as the transport network, the assumption of parking costs and percentages of active mode. Also presented were the modelling results for 2021, 2031 and 2041 in terms of highway traffic volumes, V/C ratios for the AM peak period, bus and train passenger loadings, boardings at train station and comparisons against the 2013 base.

The model results show that the road network generally is expected to continue to perform satisfactorily due to the well planned network in which the traffic growth would distribute over the whole road network rather than overload a particular corridor. This is achieved with the proposed road network improvements over time as presented in Section 4.2. While some segments of the network would approach capacity, the overall network is projected to continue to operate under capacity in the long term. There are only three localised junctions/interchanges with V/C ratio above one in 2041. The network performance could be further improved by widening the approaches of respective junctions in due time.

The PT mode share is projected to increase significantly over the years with a proposed bus network improvement as shown in Section 4.3, and moderate increase of car parking cost in the CBD. In order to achieve PT share of four percent or higher from a very low base, the PT network and services would need to be continuously improved in terms of speed, frequency and coverage particularly for new developments in outer areas.

The walking and cycling mode share in this Preferred Scenario was assumed to increase from nine percent in 2013 to 20 percent for trips with distance less than two kilometres and 15 percent for trips with distance between two and six kilometres by 2041. The increase of active mode share would contribute to the reduction of highway traffic congestion. In order to achieve this mode share target, apart from critically integrating land use and transport, the responsible authorities would need to consider innovative approaches to improve pedestrian and cyclist amenities to attract new users and encourage mode shift.



► Ballarat Cycling Action Plan ► 2017 ► 2025



► **Volume 1**
March 2017



Foreword

The Cycling Plan at a glance

- The Cycling Action Plan establishes a Ballarat Bicycle Network that focusses investment on linking destinations and providing continuous and safe cycling routes
- The plan aims to identify and create safe, predominantly off-road or quieter routes which are suitable for families and children or individuals considering
- Where possible, the approach encourages cycling projects to achieve health, economic, amenity and safety improvements (in addition to transport) through integrated designs which include tree planting, traffic calming, quality urban design and finishes, and improvements for pedestrians, wayfinding and accessibility.
- The plan prioritises delivery of safe and continuous routes (which will have the greatest impact on increasing the number of everyday cyclists) in preference to supporting individual projects across the city.
- The measure of success is more people cycling.

Priority Projects

- **Rail Corridor Cycleway** - Separated, protected off-road trail alongside the rail corridor connecting Wendouree Train Station to Ballarat Train Station, and connecting through to the existing "Bunny Trail" to M.A.D.E.
- **Sturt Greenway** – A safe, separated cycling connection along the Sturt Street corridor, linking the CBD with Lake Wendouree and Victoria Park, as a major tourism and commuter opportunity.
- **Missing Links** – Safe, separated connection through the CBD, linking Ballarat Station to existing Yarrowee River and Canadian Creek trails.
- **Western Access** – Safe, legible cycling route from the Ballarat West Growth Area to the CBD, including safety improvements across major roads and linking existing off-road and shared paths.
- **Signage and Wayfinding** – Design and implement distinct route signage to give confidence to navigate the Ballarat Bicycle Network.



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Part 1 - Riding a bike in Ballarat

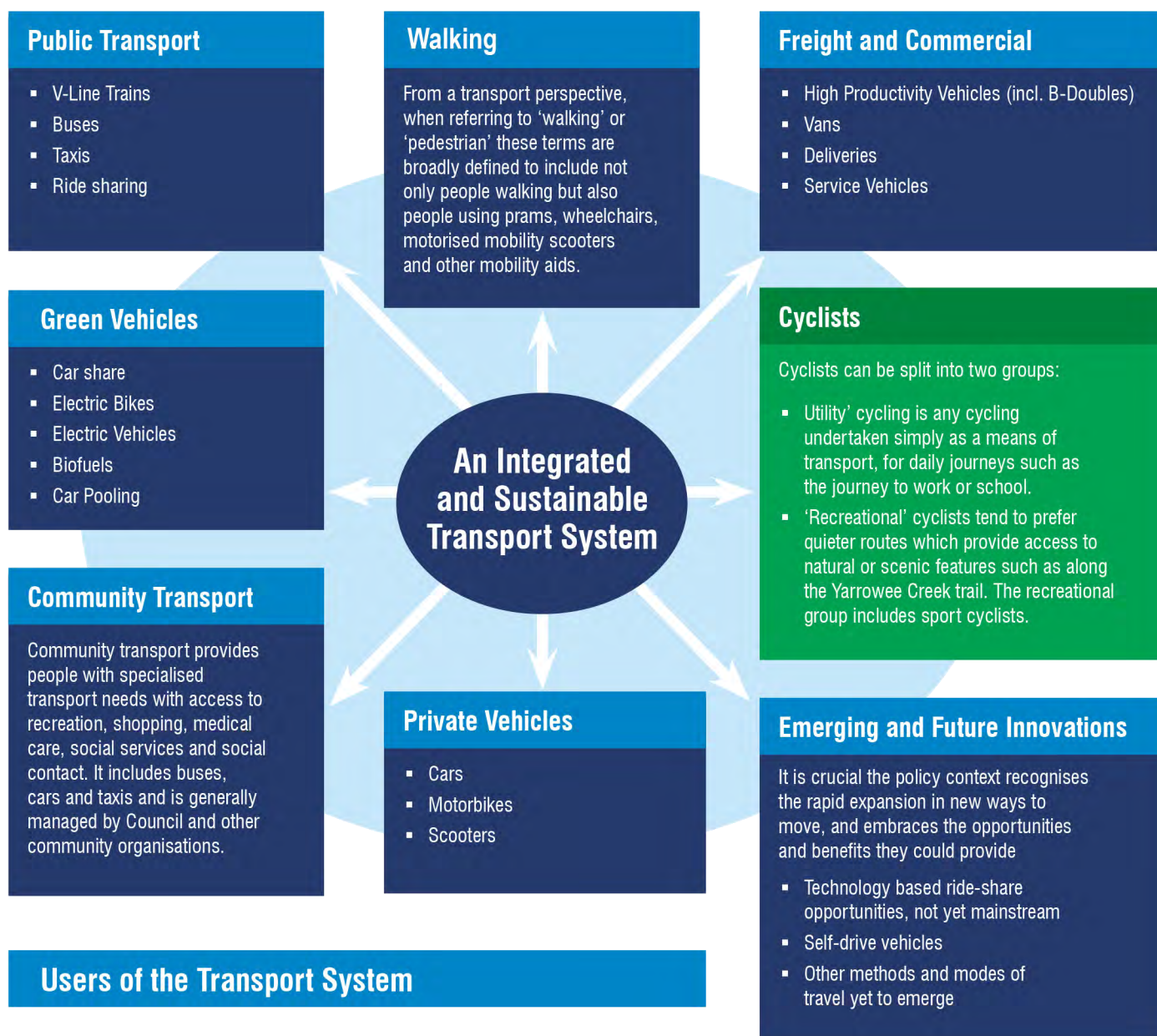
Encouraging more people to ride their bikes is a key aspect of transitioning Ballarat towards a more sustainable and equitable future. It is critical to maintaining the lifestyle and accessibility so valued by the Ballarat community. With the population forecast to increase from 100,000 to 160,000 by 2040, the option of cycling will become an increasingly vital mode of mainstream transport for residents and visitors seeking to avoid increasing congestion and the financial costs of running and parking a private vehicle.

While a number of people already choose to ride a bike, either to commute to work, for sport or for pleasure, there is significant room for improvement. Making Ballarat a more attractive and enjoyable place for cyclists is about planning carefully to improve our cycling infrastructure. It also involves raising awareness of the many benefits of cycling and motivating people regardless of gender, age or ability or to get on their bikes more often.

This Cycling Action Plan is one of a suite of mode-specific action plans that together will help to transition Ballarat to a more sustainable future. This plan is fundamentally about making Ballarat a better place to ride a bike, outlining practical steps to be delivered over the short, medium and long term and embedding cycling as a fundamental mode of transport within an integrated transport system for Ballarat.



Figure 1: An Integrated and Sustainable Transport System





1.1 What cycling can do for Ballarat

An improved cycling network and increased community awareness will benefit Ballarat in many ways.

Easier Local Living as Part of a '10 Minute City'

Better, safer and more easy to follow cycling networks will enable the community to replace an increasing proportion of short trips by car (particularly to schools and local shopping centres), with cycling. Removing physical barriers and changing perceptions will make cycling increasingly attractive to people of all ages, abilities and financial circumstances.

Improved Health and Wellbeing

Australia is amongst the most obese nations and this high level of obesity contributes to an increasing rate of diseases such as diabetes, cardiovascular disease, various cancers and osteoarthritis. Physical inactivity has been estimated to cost the Australian healthcare system \$1.5billion annually, with the total financial cost of obesity in Australia in 2008 estimated to be \$8.3billion. Our sedentary lifestyles are now being referred to as the 'new smoking'.

Council has a role to play in improving the health of the community by enabling and encouraging people to take up cycle and to be more physically active.

Research has shown that cycling contributes positively to building social connections between people.¹ This increase in social interaction within the community results in much improved personal relationships and overall community health, contributing to improved mental wellbeing by reducing feelings of stress, anxiety and depression.

Increased Prosperity

Businesses and the wider community also benefit economically from more people cycling. Cyclists tend to spend longer at local shops, with research from the National Heart Foundation concluding that people accessing shopping areas by bike and foot spend more money than those who drive.² A more sustainable transport system also means that Governments, and consequently ratepayers, benefit from reduced infrastructure costs for the construction and maintenance of roads. Individuals also benefit from the ability to have access to cheaper transport. The RACV estimated the annual cost of owning a medium sized car (such as a Toyota Camry) in 2014 was around \$11,000. The ability to access daily needs on bike can significantly support the family budget.³

¹ Crane, M., Rissel, Ch., Standen, C. and Greaves, S. (2014), 'Associations between the frequency of cycling and the domains of quality of life', *Human Promotion Journal of Australia*, 25: 182-185.

² Heart Foundation (2011), *Good for Business: The Benefits of Making Streets More Walking and Cycling Friendly*, National Heart Foundation of Australia.

³ RACV (2016), 'RACV's car owning and operating costs guide'. Available from: <http://www.racv.com.au/wps/wcm/connect/racv/internet/primary/my+car/Operating+Costs>



Transport Efficiency

Without intervention, congestion will continue to worsen in Ballarat as the population grows. Increases in congestion will motivate the community to make different choices about which mode of transport offers the most efficient option for a particular trip. The car may not be the most convenient or preferred option for some trips and cycling may provide a quick and cost-effective alternative. It is often argued that cycling is a slower method of transport than motor vehicles. However, vehicle speeds in peak hour traffic are often the same (or lower) than cycling speeds.

Enabling people to choose modes which make less of a contribution to congestion, such as cycling, also benefits other transport users through more efficient use of the network as more road space remains available for businesses and freight users to run their businesses and support the economy.

Safer Travel

Encouraging safer travel by drivers and cyclists, and reducing the total number of vehicle trips, can reduce the number of accidents. Slower vehicle speeds and safer street environments can reduce the severity of injuries when crashes do occur. Integrated land use and transport projects, focused on people and the triple bottom line, can achieve much safer travel in Ballarat.

Reduced Greenhouse Gases and Energy Use from Transport

Greenhouse gas emissions are the main source of air pollution, and they are causing atmospheric changes. These changes are now being directly linked to global warming, changes in rainfall patterns, rising sea levels and increasing frequency of natural disasters. It is estimated that 17% of Victorian greenhouse gas emissions are transport related. Cars contribute 80% of that total. Increasing the number of people who ride their bikes to service their daily needs will directly contribute to Ballarat's response to the climate change challenge.



1.2 Riding today?

Across Australia, more people are cycling than ever before with over half of Australian households owning one or more bicycles.⁴ As a recreational pursuit, cycling is the fourth most popular activity, behind walking, gym, and golf.⁵

A significant barrier to determining the rates of cycling within Ballarat, and monitoring progress towards a more cycle-friendly city, is the current lack and poor quality of data available. The Australian Bureau of Statistics (ABS) publishes some relevant data relating to method of travel to work and rates of car ownership, however these statistics are limited, and exclude large sections of the population who may cycle for non-work related purposes. Bicycle Network's Super Tuesday and Super Sunday counts provide an additional data source, allowing local governments to participate in undertaking commuter and recreational bike counts in their Municipality.

Taking these limitations into consideration, there are a number of key statistics that can be used to give a broad indication of the prevalence of cycling.

ABS Census data from 2001 to 2011 shows that while the number of people cycling as their primary method of travel to work or full-time study increased between 2001 and 2006, the total mode share remained stable. Between 2006 and 2011 both the number and share of people travelling by bike to work or full-time study decreased, with only 0.9% of Ballarat residents choosing to commute by bike (just 387 people) (Table 1). This is comparable with other regional cities in Victoria (Table 2). There is also a significant gender gap in rates of cycling to work in Ballarat, with more than eight times the number of males choosing to ride their bikes to work than females. This is significantly higher than the national average which sees three times as many men choosing to commute to work than women.⁶

Table 1: Mode of travel to work – One mode

	2001	%	2006	%	2011	%
Car as Driver						
Males	12,422	37	13,840	36.8	15,561	36.8
Females	9,880	30	11,400	30.4	13,225	31.3
Total	22,302	67	25,240	67	28,786	68.1
Bicycle						
Males	358	1.1	401	1.1	334	0.8
Females	37	0.1	51	0.1	53	0.1
Total	395	1.2	452	1.2	387	0.9
Overall Total	33,302		37,537		42,290	

⁴ AustRoads (2010), *National Cycling Strategy 2011-2016: Gearing up for Active and Sustainable Communities*, Sydney: AustRoads.

⁵ Australian Bureau of Statistics (ABS) (2013), 'Participation in Sport and Physical Recreation'. Available from: <http://www.abs.gov.au/ausstats/abs@.nsf/mf/4177.0>

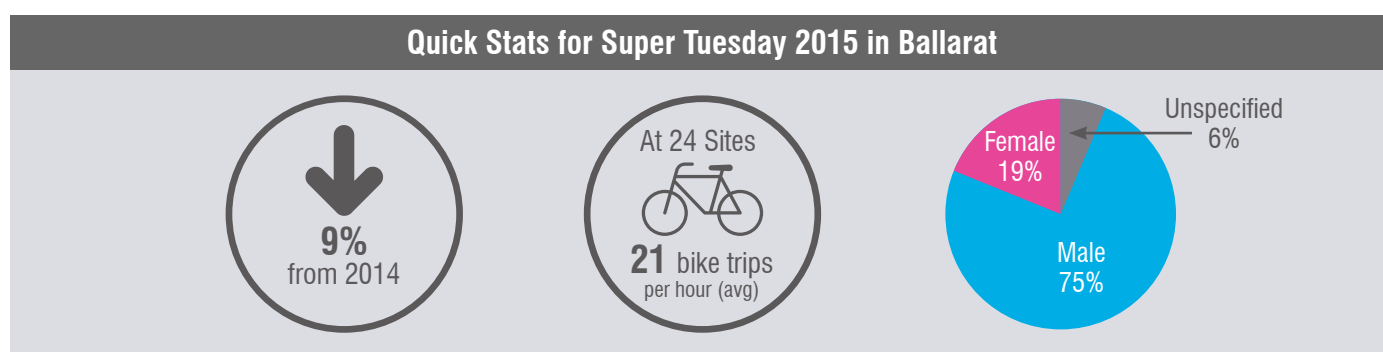
⁶ AustRoads (2010), *National Cycling Strategy 2011-2016: Gearing up for Active and Sustainable Communities*, Sydney: AustRoads.

Table 2: Mode of travel to work – Regional Centres (Total)

	Ballarat	%	Bendigo	%	Geelong	%
Bicycle	387	0.9	420	0.9	901	0.9
Total Trips	42,290		45,741		95,403	

The Super Tuesday Bike Commuter Count measures the number and gender of bicycle commuters once a year. Bicycle Network recruits volunteers to visually observe and record people using bicycles. The counts have been conducted in Ballarat from 2011 to 2015. The 2015 (Figure 2) results have shown a 9% decrease in the number of commuter cyclists from 2014, with females accounting for just 19% of all riders (below the average national female ridership of 23%).

Figure 2: Super Tuesday – 2015 Results⁷



Super Sunday recreation counts are used to determine the recreational usage of the Municipality’s shared path network by monitoring the numbers of all users including cyclists, walkers, runners and dogs. A total of 610 bike movements were recorded in the most recent count conducted in 2014, representing a 35% increase in the number of recreational cyclists from the year before.⁸ While these results are encouraging, transitioning Ballarat to a more sustainable, bike friendly-city will require the community to take up cycling as an everyday activity, not only as a weekend past time.

Research has indicated a number of reasons that many people may be hesitant to cycle to work or study:⁹

- Too far (33%)
- Not fit enough (6%)
- Do not consider cycling for transport (7%)
- It’s not safe (13%)
- No facilities (3%)
- Don’t own a bicycle (18%)

While both the ABS data and Super Tuesday counts show a decline in the proportion of people choosing to ride to work over other modes, particularly the private car, there is significant potential for Ballarat to increase rates of everyday ridership. The size of Ballarat and the high number of residents that live within close proximity to their place of work means that, by addressing many of the key barriers identified above, more people could be encouraged to choose to ride their bike to more places more often.

⁷ & ⁸ Bicycle Network (2015), Super Tuesday Bike Commuter Count – Victoria, Melbourne: Bicycle Network.
⁹ Australian Bureau of Statistics ABS (2009), *Environmental issues: Waste Management and Transport Use*.
 Available from: <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4602.0.55.002Main+Features1Mar%202009>



Part 2 - Cycling as mainstream mode of transport

This Cycling Action Plan provides specific projects and actions to integrate bicycle riding into Ballarat's integrated transport system. It builds on and replaces the currently adopted *Ballarat Bicycle Strategy (2014 - 2019)* by expanding the current focus on recreational and trail related projects to consider cycling as an important transport mode in its own right. This aligns with the policy direction in Council's long term plan for managing growth and change over the next 25 years *Today, Tomorrow, Together: the Ballarat Strategy (2015)*.

This new plan intentionally focuses investment and effort on the everyday bicycle user, seeking to increase the current stagnant rate of growth in cycling across the Municipality. It also enables cycling to be fully integrated with other modal plans currently under development for roads and freight, walking and public transport. Everyday cycling needs to be a mainstream transport option for Ballarat's future.

2.1 Local planning within the bigger picture

This plan is part of a wider effort to increase bike riding across Australia and Victoria; striving to complement and implement the goals of plans and strategies at the national, state and local levels to foster an effective and integrated approach to increasing the rates of cycling.

Victorian Transport Integration Act 2010 makes it clear that our transport system must be integrated and economically, socially and environmentally sustainable. The Transport Integration Act utilises a principles-based approach which focuses on a general requirement to "have regard to" the broad policy framework when making decisions, exercising powers or performing functions related to the transport system. It seeks to use an aspirational framework to drive change and achieve integrated transport and land use planning outcomes, and identifies the role of transport in affecting and influencing broader societal outcomes.

The core focus of the **National Cycling Strategy 2011-2016** is to realise a step-change in the attitudes to cycling and in the numbers of riders in the short term, with a goal to double the number of people cycling over a five year period. The Strategy includes six clear priorities and objectives whose underpinning actions include marketing and education programs to promote cycling as a viable commuting and recreational option, encouraging the provision of end-of-trip facilities, and ensuring that state and local land use planning and infrastructure strategies take into account active transport needs.

The State Government's **Victorian Cycling Strategy** sets standards for bike riding policies and guides future investment in bike riding infrastructure development programs and activities, with an aim to promote cycling as a viable and attractive alternative transport option to cars.

The **VicRoads SmartRoads Strategy** aims to better manage the use of Victoria's road network by assigning priority to different modes of transport at particular times of the day. The strategy includes an aim to support and encourage higher occupancy and sustainable travel modes through allocation of road space, signal priority and information for road users to make smarter travel choices.

2.2 The Role of Council in making it happen

In Ballarat, Council has most influence over integrated land use planning, road space allocation in local streets and parking. These components are where Council has direct powers to invest and manage infrastructure and shape planning outcomes.

In terms of implementing this cycling strategy, Council has direct responsibility for certain components.

- Some capital works projects including new and upgraded cycling trails
- Behaviour change and programs, including support for schools programs
- Coordinating stakeholder input and aspirations
- Partnering with other government and non-government stakeholders to influence change

The State Government has primary responsibility for public transport and declared roads. Council will work collaboratively with the State Government to support improvements to cycling infrastructure on roads which it administers and to support the better integration of cycling and public transport connections. In some cases Council can influence decision-making, in other circumstances multiple levels of Government and the private sector can contribute financially to benefit the Municipality.

2.3 What this plan seeks to achieve locally

This new Cycling Action Plan 2017–2025 seeks to directly implement the range of existing policy on cycling, through practical, local priorities - focusing on improving bike riding infrastructure and networks across Ballarat while seeking to motivate more people to ride more often and to more places.

Success for this plan means achieving the following goals:

- ✓ **Goal 1:** Partner with the community to develop a user-focused cycling network, as a game changing enabler to growth in bike riding
- ✓ **Goal 2:** Manage cycling networks as a mainstream transport mode, linked to public transport and walking networks
- ✓ **Goal 3:** Change travel behaviour to increase bike riding, particularly focusing on those groups not currently cycling
- ✓ **Goal 4:** Build an everyday bike riding culture in Ballarat so that it is seen as a legitimate use of the road with mutual respect between riders and drivers
- ✓ **Goal 5:** Support sport, recreational, fitness and other special interest cycling



Part 3 - Action Plan for encouraging bike riding

The goals of this Action Plan will be achieved by prioritising investment, effort and encouragement of the following:

- 1 ➤ Define and establish a cohesive network of cycling routes between destinations, targeted at novice or everyday riders (known as the Ballarat Bicycle Network)
- 2 ➤ Partner with VicRoads and the State Government to deliver key cycling routes within the BBN as premiere quality connections (known as Strategic Cycling Corridors)
- 3 ➤ Continue to improve the entire road network for cyclists
- 4 ➤ Improve the network of recreational off-road trails
- 5 ➤ Provide enjoyable, educational and safe cycling circuits linking key tourist sites and visitor destinations with key locations such as the Ballarat Station and the CBD.
- 6 ➤ Provide for bike riding at origins and destinations
- 7 ➤ Improve integration across sustainable transport modes
- 8 ➤ Educate the community around bike riding
- 9 ➤ Ensure bike riders have adequate information
- 10 ➤ Advocate and collaborate with key stakeholders for bike riding improvements
- 11 ➤ Improve guidance for scoping and prioritising cycling projects
Promote and raise the profile of bike riding
- 12 ➤ Improve the monitoring and reporting of bike riding levels in Ballarat

Strategy 1: Define and establish a cohesive network of cycling routes between destinations, targeted at novice or everyday riders (known as the Ballarat Bicycle Network)

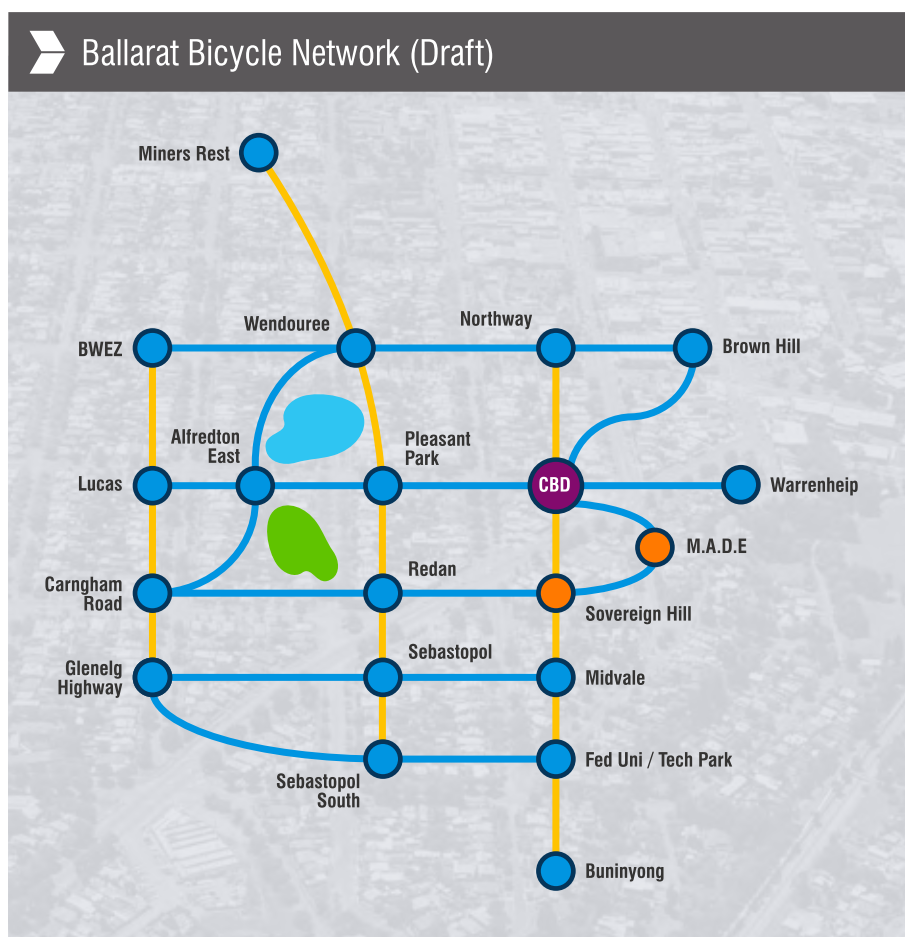
Many people are deterred from cycling for both recreation and transport as a result of concerns for personal safety and a lack of continuity in cycling infrastructure

There are currently a number of ‘cycling networks’ that have been defined across Ballarat by various groups and levels of government. These various existing networks are generally presented as guides for types of infrastructure available, and are not currently considered in an integrated way. While an infrastructure-based approach is highly useful for Agencies investing in cycling facilities, this approach is largely irrelevant to actual cyclists using those networks, who simply want to be able to follow a safe, legible and convenient cycling connection to their destination with confidence.

To maximise the opportunities for Ballarat to partner with the State Government for cycling funding, it is crucial for there to be consistency in network routes and priorities.

Through a user-focussed approach, the Ballarat Bicycle Network (BBN), which this plan seeks to implement, will fully integrate State, local and regional cycling networks so that funding opportunities provide maximum benefit to everyday cycling users. The BBN routes have been developed with significant input from cyclists and other interested stakeholders, and specifically link activity centres together using a destination-based approach.

Strategically, the BBN proposes to link centres as shown:



Details of rates and infrastructure recommendations are outlined in Volume 2: BBN Technical Report



CBD Connections

The central business district of Ballarat is an important destination for many cyclists. Establishing strong, connected routes both within the CBD and with the outer BBN will be a key priority. There are several opportunities to partner cycling infrastructure with quality urban design to create safer, more accessible and enjoyable access routes within the CBD. For private businesses, getting a greater proportion of patrons, visitors and staff to cycle in the area means easier, cheaper and more flexible opportunities for on-site parking and accessibility. More people cycling to the CBD also makes more car parking spaces available for those who want to drive. The needs of cyclists and pedestrians will be prioritised when considering design opportunities along the noted CBD connections.

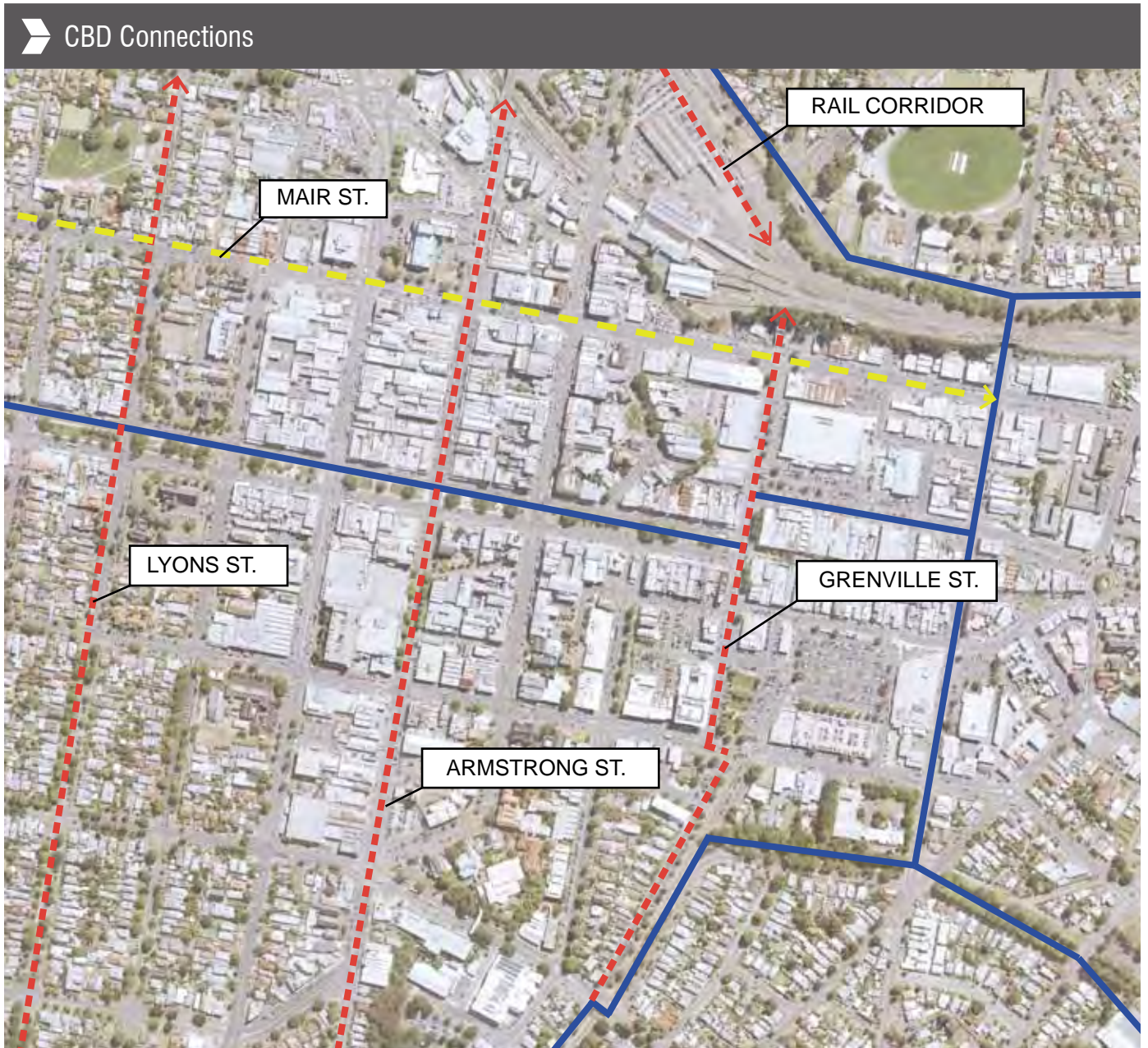
Developing more north to south routes will increase the range of opportunities for a greater number of people, and therefore strengthen the existing BBN. This will provide multiple connections between key locations such as the Ballarat Railway Station, Bridge Mall, and Sturt Street shopping precincts.




Design options for CBD access routes include:

- Slower vehicle speeds
- Tree planting opportunities
- Minimising crossing points and conflict areas with turning vehicles
- Pedestrian crossing improvements, which also benefit cyclists
- Avoiding new roundabouts
- Clear and legible wayfinding and road markings

Exploring opportunities for separation, where possible.





-  Future CBD Connections
-  BBN Route
-  Future Development to be determined by VicRoads



Applying strategic network to a defined cycle network

Bicycle routes are considered for the first time in Ballarat as crucial parts of a multi-modal integrated transport network – intentionally planned and delivered to maximise benefits for the community. The previous focus on sport and recreational riding has been expanded to a more holistic view of riding a bike in Ballarat being a safe, convenient and low-cost transport alternative.

Planning for routes has occurred as would be expected for other mainstream transport modes, with routes identified to ensure appropriate accessibility, connectivity, continuity and logic. Routes have been assessed against the following criteria, and then field tested with cycling stakeholders:

- Provides direct connections between Activity Centres across the Municipality
- Connects with cycle networks already planned for in Precinct Structure Plans for Ballarat West and Alfredton West (Lucas) growth areas
- Maximises coverage and accessibility (more than 90% of urban homes within 500m of a route), providing excellent levels of local access
- Is a short-term option to create a connection, even if there is a preferred longer-term opportunity
- Utilises existing off-road opportunities where possible, including public land along creek and stream reserves, rail trails, existing shared use paths, road-side paths and public parks, reserves and sports fields

Route choice may include more circuitous routes where an alternative less direct route provides:

- A safer option
- Access to a key bicycle friendly destination
- Greater use of existing infrastructure
- Greater potential to attract new cyclists, not currently riding
- Practically more achievable over the short-term

Actions

1.1 Focus cycling investment in improving cycling conditions along Ballarat Bicycle Network

Strategy 2: Partner with VicRoads and the State Government to deliver key cycling routes within the BBN as premiere quality connections (known as Strategic Cycling Corridors)

The Victorian Government has emphasised its commitment to supporting and encouraging cycling as an everyday activity, recognising the role cycling can play in responding to a range of challenges, such as contributing to healthier communities and environment, stimulating economic growth and creating better places to live. As such, the State Government has committed to partnering with local Councils to identify and develop Strategic Cycling Corridors (SCCs).

Strategic Cycling Corridors are a concept used for bicycle network planning over recent years in metropolitan Melbourne. Identification of SCCs originated as part of the initiative to 'Support Walking and Cycling in Central Melbourne', identified in the State Government's strategic plan for Melbourne, Plan Melbourne. This initiative is now being extended to regional cities.

SCC's are corridors that cater for the highest, or potentially highest, cycling volumes. Investment in these corridors will be managed by VicRoads, and prioritised on the basis of those corridors that achieve greatest benefits to cyclists and the whole community.

In Ballarat, VicRoads and City of Ballarat have worked in partnership to identify the following routes as Strategic Cycling Corridors.

These Strategic Cycling Corridor include key connections such as:

- Connections of Miners Rest to Wendouree Station
- Opportunities to link Wendouree railway Station to Ballarat Station (CBD) by the existing rail corridor (or Gregory St as an alternative)
- To connect through the Ballarat Station precinct, linking Lydiard St to the existing off-road bike trail from Humffray St to M.A.D.E (Bunny Trail), (over the Peel St viaduct)
- Ballarat Station through the CBD to connect to the Yarrowee Creek trail to Buninyong
- Sturt St connection linking Lucas to CBD and through to Brown Hill

Note: Actual alignments are indicative only and subject to more detailed investigation.

Actions

- 2.1** Continue to work in partnership with VicRoads and other State Government Agencies to deliver quality cycling connections along the components of the BBN which are recognised by the State Government as Strategic Cycling Corridors (SCC)



Ballarat Strategic Cycling Corridors



Strategy 3: Continue to improve the entire road network for cyclists

While the existing on-road bike network across Ballarat includes significant components of marked bike lanes, Bicycle Boxes and other provisions, there can be a lack of continuity of infrastructure with lanes starting and finishing abruptly, inconsistent surfacing treatments, the presence of obstacles, and a lack of bicycle-friendly infrastructure at junctions and intersections. Ensuring the on-road bike network is safe and accessible for all bike riders is extremely important.

While the BBN will remain the priority for Council funding and advocacy, the implementation and improvement of cycling facilities across the entirety of the road network within the Municipality will be considered as upgrades to road infrastructure and open spaces are undertaken, in line with current Council policy. This can include installation of formal bike lanes, widening existing bike lanes, tightening adjacent entry/ exits at intersecting streets to reduce turning speeds of motorists, installing physical separation treatments, improved crossing points and installing green pavement and vibrational edge line treatments. As roads are progressively improved, missing connections and inconsistencies across the network will gradually reduce.

The prevalence of roundabouts in Ballarat are a concern for some cyclists, as often roundabouts are designed with flared entries and wide circulatory carriageways that encourage higher traffic speeds and reduce the presence of cyclists. Well-designed roundabouts are a safe traffic management opportunity appropriate for a range of situations. However, the concerns of cyclists are recognised and the specific needs of this group will continue to be considered when weighing up the requirements of all road users. On routes with higher cyclist numbers, particularly the BBN, greater weight will be given to the needs of cyclists.

As council continues to upgrade its cycling infrastructure it will be critical that other sustainable transport options are not hampered by new development. For instance, ensuring roads designated for buses are still bus capable and consistent with the Public Transport Guidelines for land use and development will need to be considered.

Actions

- 3.1** When upgrading, resurfacing or re-line marking roads across Ballarat, assess the potential for bike lanes as part of the project scope. Where appropriate, include other measures to improve conditions for cycling as part of core business, even when not on a defined cycling route
- 3.2** Implement where possible Bicycle Boxes at signalised intersections
- 3.3** Utilise ongoing works to the road network as opportunities to provide more seamless and integrated cycling facilities as part of the road network. This includes limiting construction of barriers for cyclist such as pits and electrical boxes
- 3.4** Consider all road users when designing roundabouts and other infrastructure



➤ Strategy 4: Improve the network of recreational off-road trails

Off-road trails, particularly along the Yarrowee River and Canadian Creeks, are significant community assets for Ballarat, providing safe and scenic cycling routes for both residents and visitors alike to experience many of Ballarat's attractions and natural features.

Ongoing investment continues to occur in these trails; however, there are opportunities for improvement. Current surface quality varies along Ballarat's off-road trails, with granitic sand paths particularly prone to water damage in some locations. Lighting and passive surveillance are also limited, and vegetation management, wayfinding and interpretational signage could be further improved. The quality and upkeep of these routes is particularly important as they are often used by safety-conscious cyclists who may be less likely to use on-road cycling facilities.

In many areas, both cyclists and pedestrians use these off-road routes. As the population grows and use of these routes increases, continuing improvements to the off-road network will be important for ensuring that they remain well-maintained, safe and accessible for all users.

Inclusion of existing off-road trails within the BBN will enable the full integration of these paths as part of the overall bike network in Ballarat, and recognise the need for seamless integration of on-road and off-road facilities. Users accessing off-road trails will often arrive or depart those trails along the remaining network.

There are also a range of linear reserves across Ballarat not yet accessible to pedestrians and cyclists, which are worthy of further investigation. As identified in the Ballarat Strategy (2015), the extensive drainage network of channels has the potential to provide for new cycling and pedestrian connections. Drainage lines, in as yet undeveloped areas of the municipality, could include future cycling connections as part of their development plans, and rail corridors and other publicly owned land corridors should also be considered. The BBN identifies some of these connections, but linear corridors should continue to be considered for walking and cycling links as new opportunities arise.

➤ Actions

- 4.1 Improve the quality of off-road shared path infrastructure by improving lighting, regular maintenance and vegetation trimming, particularly along the Yarrowee River and Canadian Creek Trails
- 4.2 Fully integrate the trail network into the BBN, so that off-road, trail and on-road sections of bike network are seamlessly connected for riders
- 4.3 Pursue new cycling connections as part of future development proposals, providing continuity to linear corridors along stream and drainage lines, disused railway corridors and other relevant opportunities
- 4.4 Where possible connect popular mountain bike and recreational trails with the existing BBN network. These include Scott St trail, Warrenheip Creek trail, Pennyweight Creek trail, Eureka st cycle route and Canadian Regional Park trails

Strategy 5: Provide enjoyable, educational and safe cycling circuits linking key tourist sites and visitor destinations with the Ballarat Station and the CBD.

The overarching Ballarat Strategy (2015) has identified the need to improve the overall visitor experience in Ballarat and improve connections between key sites. The implementation of Visitor Cycling Links offers the potential to do this. The concept involves defining, upgrading where required, and promoting cycling links from the Ballarat CBD/ Visitor Information Centre/ Ballarat Railway Station to key destinations, such as Sovereign Hill.

Case Study: The Eureka Link

A day trip to Sovereign Hill could involve a leisurely 15 minute ride from the existing Bunny Rail Trail to M.A.D.E. Following this trail, visitors experience the site of the Eureka Stockade, and become familiar with the landscape, architecture and character of Ballarat East as the location of this historical milestone. A further 10 minute ride on quiet streets and trails leads to Sovereign Hill. After a half-day at this key destination, a leisurely 15 minute ride back to the CBD completes the journey. This cycling link could be undertaken by school groups as part of an expanded educational experience of Ballarat, and would provide new and convenient transport option for those without a car, or who have travelled to Ballarat by train.

Case Study: Lakes and Gardens Circuit

Similarly, defined and safe connections from the CBD to Lake Wendouree and Victoria Park would provide visitors without a car to experience some of Ballarat's greatest natural and cultural attractions. Following a morning on the Eureka Link, the Lakes and Gardens Circuit could enable those visitors to also experience the Botanical Gardens and the War Memorial. Instead of visiting just one of Ballarat's key attractions as part of a day-trip, visitors have the potential to experience four or five.

The implementation of a Bike Share scheme in conjunction with the new 'Visitor Cycling Links' has the potential to contribute significantly to the overall visitor experience of Ballarat. The opportunity to arrive in Ballarat by train, jump on a bike and experience the best that Ballarat has to offer is an exciting opportunity. Bikes could be made available at key points in the CBD and at key tourist destinations. Proper branding and promotion of this program would help to promote Ballarat as a progressive and contemporary visitor destination. The addition of interpretive information would help to inform visitors of the story of Ballarat, providing context and interest at each of Ballarat's key historic locations.

Actions

- 5.1** Investigate with key stakeholders the opportunities for safe and logical connections linking key visitor destinations (refer Figure 1 for BBN connections linking key sites)
- 5.2** Implement a tourist focused Bike Share scheme, with docking stations provided at key points within the CBD, and at key visitor attractions
- 5.3** Provide accessible and visually appealing interpretive information at key visitor destinations



➤ **Strategy 6: Provide for bike riding at origins and destinations**

The presence of bike parking which is visible, secure and easy to access is an important component of a cycle friendly city. Well-located and widely distributed bicycle parking can attract increased bike riding for all types of trips. Currently, Council and private businesses provide a range of bike parking options. In addition, passive storage locations such as street furniture, fences and similar points of attachment are regularly utilised by current cyclists.

Council will aim to provide bike parking throughout Ballarat in all public locations where the need is identified. This will ensure easy access for bike riders to a variety of destinations, increasing the usefulness of the bike as an everyday form of transport.

Developments will continue to be encouraged to include end-of-trip facilities and bicycle parking as part of their project plans. At current usage levels, it is not viable for Council to offer high-end end-of-trip facilities for cyclists. Once there is sufficient demand, Council should investigate public end-of-trip facilities, as are provided in other higher demand situations such as occurs in Brisbane CBD.

➤ **Actions**

- 6.1 Continue to provide bike parking at key locations (identified in collaboration with the community)
- 6.2 Consider provision of bike parking for community events and festivals
- 6.3 Engage with developers to continue to encourage end-of-trip
- 6.4 Monitor demand, with a long-term view to considering public end-of-trip facilities

Strategy 7: Improve integration across sustainable transport modes

Part of encouraging people to ride their bike is to provide an integrated network of choice. This includes allowing people to mix modes of transport effectively and conveniently.

The implementation of a Bike and Ride scheme in Ballarat could contribute significantly to integrating bike and bus travel, and has the potential to increase both cycling rates and public transport use. By providing bike racks on buses (with no additional fare charges for customers), barriers faced by people wishing to ride or take public transport (such as distance, weather and dangerous routes) may be reduced. A trial of such a scheme is currently being undertaken in Moreland, Bendigo and on connections between Cowes and Wonthaggi routes. Ballarat will engage with Public Transport Victoria (PTV) to be a part of future considerations to extend the service.

The Department of Economic Development, Jobs, Transport and Resources DEDJTR is already highly supportive of implementing bicycle infrastructure at transport stops. Implementing this approach in Ballarat will require a detailed assessment of existing transport stops, outlining their capacity to include bicycle infrastructure and the demand for or frequency that they would be used.

Consideration should also be given to the needs of various modes together at the planning and design stage of all development to increase the effectiveness of an integrated sustainable transport system and to ensure the cost-effective use of resources.

Actions

- 7.1** In partnership with PTV, trial a Bike and Ride scheme or similar initiatives to improve integration with public transport in Ballarat
- 7.2** Consider the needs of pedestrians and bike riders together when improving bike infrastructure
- 7.3** Work with public agencies to ensure adequate bike space is provided for bike infrastructure when installing new or upgrading existing transport stop



➤ Strategy 8: Educate the community around bike riding

Communities with high levels of bike riding are healthier, more connected, consume less energy, produce less emissions and experience less congestion than those with low levels of bike riding.

Further education is needed to encourage more people to ride bikes. A key priority of Council in increasing the number of everyday cyclists on Ballarat will be to target cultural change within the Municipality by educating the community around the many benefits of cycling and encouraging safe and respectful sharing of roads between all road users.

Education and awareness programs have significant potential to provide residents with important bike riding skills and an understanding of how to safely interact with others using shared on and off-road facilities. Such programs may take the form of practical courses on bicycle maintenance, defensive riding or the wider distribution of TravelSmart maps to all residents. Safe Cycling programs targeted at school aged children can be very effective in educating students about safe cycling and in encouraging more children to ride to school.

Promoting cycling is integral to raising the community's awareness of cycling as a means of everyday transport, as well as a fun and easy option for sport and recreation. In particular, research has shown that a number of groups, such as females and children, are far less likely to cycle regularly and campaigns should focus on these underrepresented groups to achieve maximum impact.¹⁰

A major barrier to people cycling is a lack of appropriate facilities at their workplaces. To help counter this, Council, will work with local employers to encourage the development of cycle-friendly workplaces, specifically through the provision of bike parking spaces, showers and lockers.

There are also many world-wide movements (for example, Cyclovia) which aim to provide opportunities for the community to reclaim roads and streets for people and sustainable transport. Ballarat will be proactive and flexible in trialling community led initiatives to increase physical activity and cycling awareness.

➤ Actions

- 8.1 Liaise with State Government, NGO and other local government partners to participate in campaigns to highlight the benefits of increased physical activity, including bike riding
- 8.2 Be proactive and flexible in trialling community led initiatives to increase physical activity and cycling awareness
- 8.3 Work with local employers to encourage the provision of cycling facilities, such as bike storage, showers and lockers, in workplaces
- 8.4 Raise awareness of on-road cycling to all road users.
- 8.5 Establish a comprehensive, and fully enveloping social marketing program, with particular emphasis placed on encouraging underrepresented groups to ride their bikes
- 8.6 Continue support for promotional events such as Ride to School and Ride to Work days, and initiatives such as the 1 in 5 promotion currently being implement in City of Greater Bendigo

¹⁰ Gerrard, J., Rose, G. and Lo, S. (2008), 'Promoting transportation cycling for women: The role of bicycle infrastructure', Preventative Medicine, 46: 55-59.

Strategy 9: Ensure bike riders have adequate information

To increase the convenience of bike riding for all users, people need to know where they are, the best route to their destination and how long the journey will take.

Dedicated way finding bike signage, much like traditional road signage for motorists, will provide greater certainty and reassurance for people riding bikes in Ballarat. The destination basis to the BBN is an important new approach to managing a more user focused and convenient network.

Wayfinding signage will direct people to important local and regional attractions and community facilities such as key shopping strips, schools, parks and other attractions. With cycling to be managed as an integrated part of the transport network, bicycle related signage will be integrated with information on other modes, interchange opportunities, trip durations and other relevant information as would be expected for car drivers, walkers or public transport users.

Maps with greater detail and information can complement way-finding signage and should be distributed in various formats, including electronically and via mobile phone formats. Ensuring the community is up to date with the most relevant information both locally and in a wider context will ensure they have the capacity to plan for multi-modal journeys. It is also important that both signage and maps are accessible to people of all abilities, and as such a variety of sources of information, which are sensitive to the needs of all people, will be made available.

Actions

- 9.1** Implement a clear way finding system, which includes trip times and lengths, so that all cyclists can navigate the cycling network to key destinations with ease and confidence regardless of individual riding experience or knowledge of Ballarat
- 9.2** Make Council's webpage a one-stop-shop for all cycling information
- 9.3** Promote established long-distance and sporting routes, including to Lake Burrumbeet and Lake Learmonth, and the Buninyong Road Nationals – as well as those routes already defined by Ballarat Regional Tourism, previous Council strategic documents and relevant cycling clubs and routes



➤ Strategy 10: Advocate and collaborate with key stakeholders for bike riding improvements

Achieving the goals of this Bike Plan requires advocacy to, collaboration with, and funding from Council partners. Introducing secure bike parking facilities at public transport stops and stations, for example, and improving bike infrastructure on major arterial roads across Ballarat will require funding and input from the State Government and public transport operators as the owners and managers of these assets.

City of Ballarat has a leadership role to play in engaging with key stakeholders, interest groups and keen cycling advocates to engage them in the implementation of this plan.

➤ Actions

- 10.1** Advocate to the State Government and its agencies for improved bike infrastructure, expansion to the Melbourne Bike Share Scheme to Ballarat as a tourist focused opportunity, and partnerships to deliver education, training and other cultural and information-based cycling initiatives
- 10.2** Collaborate with neighbouring municipalities, Ballarat Regional Tourism, Parks Vic and community groups to promote bicycle tourism and Ballarat as a key cycling destination
- 10.3** Secure ongoing funding and sponsorship from the State Government and other external organisations to deliver strategies and actions identified in this Bike Plan
- 10.4** Upgrade and enhance mountain bike tracks, facilities and infrastructure
- 10.5** Recognise the importance of the Buninyong Road Nationals Cycling route in Buninyong and pursue extended funding opportunities for ongoing improvements

Strategy 11: Improve guidance for scoping and prioritising cycling projects

This strategy is to be used in everyday decision-making, as well as influencing funding and prioritisation of projects through the Council Plan. Projects implemented to achieve the goals of this Cycling Action Plan will be selected by Council using specific criteria to ensure our efforts deliver the greatest benefit to Ballarat given available budgets.

The following assessment matrix will be used internally when scoping and deciding on cycling related projects¹¹:

Attract – Does the project make bike riding more attractive?

- Projects must enhance bike riding in Ballarat so more people ride their bike, in place of making trips by other travel options such as driving a car

Encourage – Does the project encourage people to ride their bike more?

- Projects must encourage people of all ages and abilities to ride more often. This includes catering for children and groups that are less mobile, such as the elderly

Links to policies – Is the project consistent with Council's strategies and plans and does it link to State and Federal government policies?

- Projects need to deliver on Council's policy directions and be in line with State and Federal government policies

Strengthen networks – Does it connect with Council's strategic walking network (under development) and key destinations?

- Projects are not isolated from other routes but form part of our identified network that connects popular destinations together. Those located along the BBN create even greater benefits for both people walking and bike riders through reinforcing direct and continuous routes

Public transport – Is the project making a better link to public transport stops and stations nearby?

- Projects located near public transport stops and Ballarat and Wendouree stations help make it more convenient to use bus, and train services to get around

Safety – Does the project make cycling safer or increase the perceived safety of bike riding?

- All projects must make it safer for people to ride their bikes. Projects that do not improve safety will not be supported

Transport impacts – Does the project affect other parts of the transport network?

- Projects need to improve the overall movement of people and goods on our network of streets, roads and public transport routes to best use the limited space we have

¹¹ Adapted from: City of Port Phillip (2014), Get on Your Bike and Go: Make Bike Riding Better in Port Phillip



Community support – Does the community support the project?

- Projects that attract the support of the community, or are identified by the community as needing to be implemented

Community awareness – Does the project increase awareness of bike riding?

- Projects that raise awareness of the benefits and barriers of bike riding and its profile amongst our community positively influence how people choose to travel

Community benefits – Does the project benefit our community?

- Projects need to deliver benefits to the community in the particular location as well as contribute to benefits for the wider Ballarat community

The use of this assessment matrix will enable better prioritisation, project scoping and coordination across Council when delivering actions of this Cycling Action Plan. The result will be more seamless and cost effective.

➤ Actions

- 11.1** Utilise the cycling project assessment framework to help guide the scoping, design and delivery of projects for maximum benefit

➤ Strategy 12: Improve the monitoring and reporting of bike riding levels across Ballarat

Comprehensive information on bike riding across Ballarat is essential to planning new bike initiatives. City of Ballarat currently uses data collected by Bicycle Victoria's Super Tuesday and Super Sunday counts at a limited number of locations largely used by bike and recreational commuters. This provides valuable baseline data, collected as an annual time-series. While these are helpful, we must find new ways to assess the numbers, experiences and needs of all bike riders. These include school children and older residents bike riding for local trips, as well as recreational riders.

In partnership with community, stakeholder, NGO and other Government partners, City of Ballarat will continue building our knowledge of how many people are bike riding across Ballarat, where they are going, why they are bike riding and how to best improve bike riding across the municipality. This will help us prioritise the work of Council to inform the development of future policies and work programs.

➤ Actions

- 12.1** Develop a survey program that collects comprehensive annual bike count data
- 12.2** Investigate the possibility for an interactive website for receiving, storing and developing community information and ideas about ways to improve bike facilities and infrastructure

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▶ **Ballarat Cycling Action Plan** ▶ 2017 ▶ 2025



▶ Ballarat Cycling Action Plan ▶ 2017 ▶ 2025

SECTION

4

Connected Ballarat

Integrate transport and land use planning to link people to each other, jobs, services and goods to markets.



Connected Ballarat

A key principle of the Ballarat Strategy, identified through Ballarat Imagine, is to ensure Ballarat remains easy to around. It is fundamental to what Ballarat is today and an attribute the community are keen to retain into the future.

The situation in Australia over the last 50 years has been that as a city grows, traffic congestion worsens and it becomes increasingly costly and time consuming to move around and access jobs, services and other daily needs. Effective long-term integrated transport and land use planning is required to avoid this outcome. With a population of approximately 160,000 people in Ballarat by 2040 there is a clear need to pursue a more sustainable transport system, which better manages transport demand.

A sustainable transport system for Ballarat is fundamentally about giving the community more convenient options for how they move, considering their personal needs and circumstances. The Strategy provides alternative transport outcomes to support a growing population and addresses concerns related to increased congestion, rising fuel prices and environmental impacts. Whilst private cars provide the highest levels of mobility, transitioning to a more sustainable transport system which achieves a greater balance between cars and other modes such as walking, cycling and public transport will help address these challenges.

To achieve this, the Strategy includes:

- Consideration of transport impacts when making important growth decisions such as which areas should grow the fastest
- Integration of different modes of transport into the structure and fabric of the city as it grows through strong and strategic integrated land use and transport planning
- Making public transport more attractive
- Planning for flexible and scalable transport networks that can develop over time as demand grows and technology changes
- Protecting land for key infrastructure such as road upgrades and high frequency public transport corridors
- Ongoing monitoring and management of the road network for efficiency
- Managing the cost and provision of parking in key centres.

Investments in roads can have widespread benefits for the city, and will remain important for Ballarat over the long-term. The current investments in the Ballarat Western Link Road project, for example, are important for leveraging the benefits of the entire Ballarat West Employment Zone. Improving access to Federation University campus and Technology Park at Mount Helen also offers the potential for significant growth and investment in these centres.

The following are the key policy directions proposed for ensuring an integrated approach to connecting business and the community.

The Plan for Change Towards 2040

A More Sustainable Transport Network

Build a Less Car-dependent Community with a More Sustainable Transport System

- 4.1 – Transition Ballarat towards a more sustainable transport system
- 4.2 – Benchmark travel behaviour measures against 2011 figures, to monitor progress towards a less car dependent future

Ensure Land Use Supports the Viability of Frequent Public Transport

- 4.3 – Work in partnership with Public Transport Victoria to shape the land use pattern of Ballarat so it can best support high frequency public transport
- 4.4 – Make better land use decisions around areas with the potential for transit oriented development

Support a High Quality Walking and Cycling Network to Improve Local Accessibility

- 4.5 – Partner with the community to develop a user focussed cycling network, as a game-changing enabler to growth in cycling
- 4.6 – Work with schools and local communities to improve walking and cycling connections within 10 Minutes of key destinations, as part of a Neighbourhood Links Program

Plan for Future Transport Capacity and Demand

- 4.7 – Complete the Western Link Road from the Western Freeway to the Midland Highway
- 4.8 – Investigate the need for new road connections as part of local area planning for townships and communities
- 4.9 – Investigate pilot opportunities to introduce a network of park and ride stations in Ballarat
- 4.10 – Focus on people rather than cars in managing supply and demand of car-parking

Make Better Use of Existing Transport Infrastructure and Network Capacity

- 4.11 – Partner with the State Government to better manage our transport networks and support greater efficiency and reduced costs of meeting demand

Support Improved Connections within the Region and To Other Key Jobs and Business Markets

- 4.12 – Advocate and collaborate to deliver key regional transport priorities
- 4.13 – Partner with State Government and other stakeholders to improve regional bus connections
- 4.14 – Monitor demand for direct air capacity and investigate long-term opportunities for a Ballarat Airport with passenger and freight services

Improve the Efficiency of Moving Freight

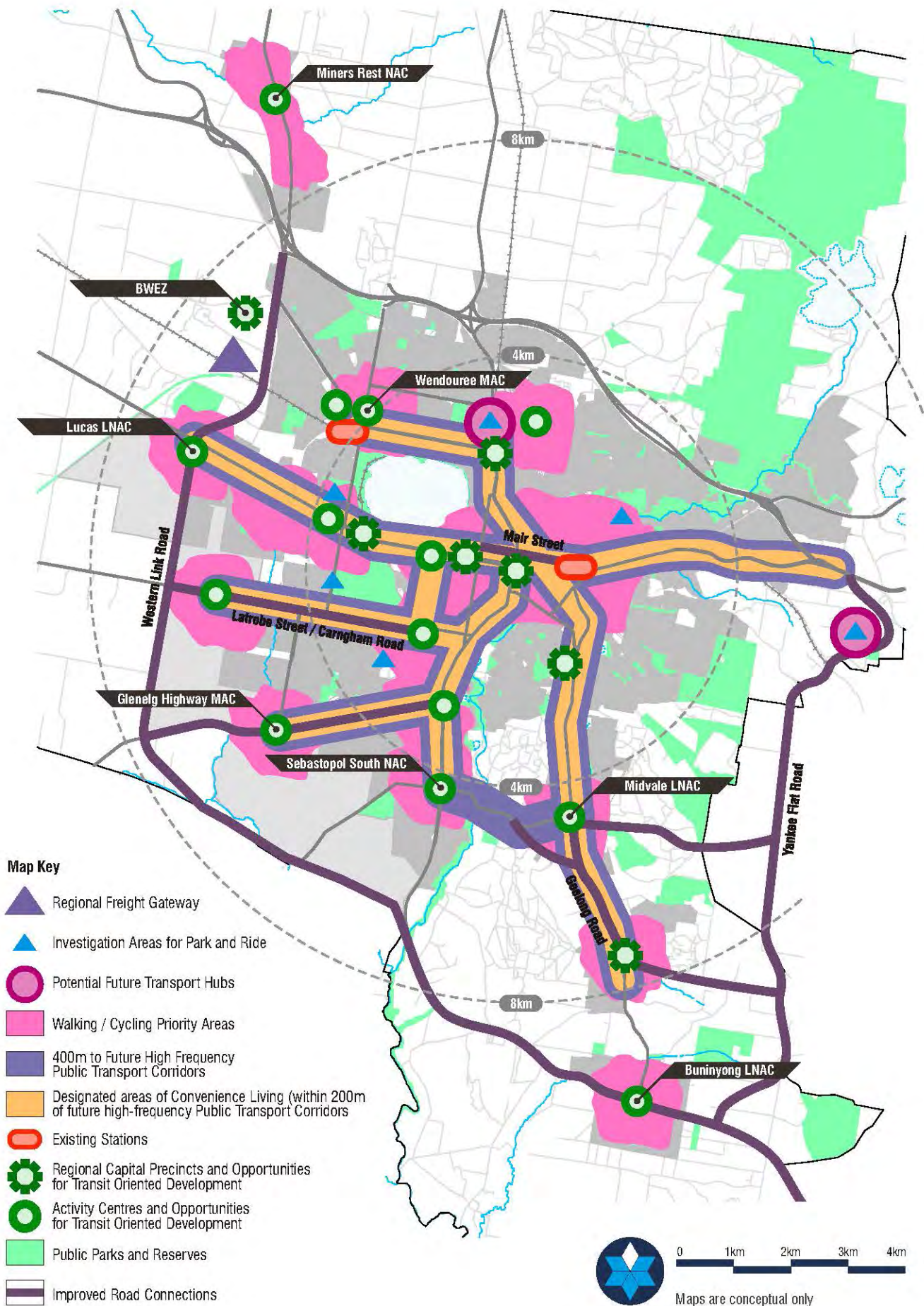
- 4.15 – Improve the efficiency of supply chains by delivering Ballarat's developing regional transport gateway (Ballarat West freight hub)
- 4.16 – Encourage freight intensive developments to locate in areas appropriately serviced by identified strategic freight corridors

A More Sustainable Transport Network

Ballarat needs a more sustainable transport system, which will be more resilient to the challenges of an additional 60,000 people by 2040. Those extra people will all want to move across Ballarat the way the current population does. The status quo isn't an option.



Figure 13 Towards a More Sustainable Transport System



Build a Less Car-dependent Community with a More Sustainable Transport System



Initiative 4.1 – Transition Ballarat towards a more sustainable transport system

Even in 2040, Ballarat is expected to experience only moderate congestion in comparative terms. By Ballarat standards, however, the traffic situation will be much worse if current trends continue. This is something the community clearly outlined through Ballarat Imagine they didn't want to occur. There will be issues with congestion, pollution and socio-economic impacts of the rising cost of fuel, capacity issues of road space and parking, and ongoing contribution to climate change. Ballarat needs to transition towards a more sustainable transport system in our growing city.

Sustainable transport is about providing options on how to travel

Sustainable transport systems enable people to move, connect and access destinations in a manner that considers the environmental, social and economic sustainability of travel choices. They don't just move people, they also support connections which provide environmental, social and economic benefits. Such a system encourages less reliance on the private car to meet daily needs, by increasing the attractiveness of other transport options, such as walking, cycling and public transport. Sustainable transport systems recognise that there are often alternatives to the car which are cheaper and more convenient to use for certain trips.

A sustainable transport system for Ballarat is fundamentally about giving the community alternative convenient options regarding how they move, considering their personal needs and circumstances. Whilst private cars provide the highest levels of mobility, transitioning to a more sustainable transport system which achieves a greater balance between cars and other modes such as walking, cycling and public transport will help address key challenges. By adopting key principles to guide decision-making, and developing a suite of Action Plans, Council will be proactive in responding to the transport needs of a growing population.

Transport decision-making will be guided by the following key principles:

- 1 People first approach to priority:** Council will manage the transport network so as to promote sustainable transport alternatives, improve accessibility and inclusiveness, and benefit the walking economy.
- 2 User friendly streets and grid network:** Council will consider streets as places where people live, work and play and provide access for all users as part of a safe, integrated and efficient transport system.
- 3 A better public transport system:** Council will collaborate with key Agencies and stakeholders to improve public transport access, connectivity and convenience within, across and from Ballarat.
- 4 Improve integration of land use and transport to deliver wide-ranging community benefits:** Council will encourage a pattern of land use that supports the viability of high-frequency public transport, and utilise the concept of the '10 Minute City' to support walking and cycling to key destinations and local neighbourhoods.
- 5 Consider economic value when prioritising network efficiency:** Council will prioritise uses on certain key corridors to maximise supply chain efficiencies and economic activity, in alignment with the Ballarat's Road User Hierarchy. Key freight routes, for example, will be prioritised for business and commercial uses.
- 6 Promote cultural change towards more sustainable transport choices:** Council will promote, educate and provide leadership on supporting walking, cycling and public transport initiatives to encourage change in perceptions and travel behaviour.
- 7 Embrace technology and innovation as an enabler of better transport choice and accessibility:** Council will be open, proactive and flexible in supporting new and emerging ways to move – including technologies and business models for transport not yet mainstream, but offer the potential to benefit the community and better connect Ballarat.

Specific projects and programs will be identified through the development of Action Plans. Community engagement and advocacy will be an integral part of the long-term transition.

Initiative 4.2 – Benchmark travel behaviour measures against 2011 figures, to monitor progress towards a less car dependent future

In 2011, the Census indicated only 3% of Ballarat workers travel to work on public transport. Excluding commuters on the train, only 1% caught the bus, around 1% cycled, 3% walked. Almost 74% of people drove to work. The majority were the sole occupant of the car.

If the community grows whilst maintaining this same level of car dependence, the car will become an increasingly less viable or convenient travel option for everyday needs. It is important walking and cycling are promoted in the short and long term as legitimate and supported modes of transport in Ballarat to support the required longer-term transition. One car for every person driving to work is not a realistic option in 2040.

To assist with decision-making over the next 25 years, and to remain focused on the need for a shift in travel behaviour, key transport benchmarks will be used to monitor progress towards a more sustainable transport future. Benchmarks will initially be based on modelling outputs from the Victorian Integrated Transport Model (VITM) of the 2011 transport network, and 2011 Census data. Although limited in scope at this stage (particularly related rates of walking and cycling), they offer a useful starting point for future refinement. Key benchmarks include:

Transport Element	Current Situation (2 Hour weekday morning peak)	Benchmark for 2040*
Public Transport Mode-share	~9,200 total or 2.2% of all trips	Increases in the raw number of trips using Public Transport (PT) will be a positive measure. If the population grows at a faster rate than PT, then the percentage would reduce in the context of more total trips.
Average Bus Speed	21kmh	If bus routing continues to become more direct, this can be a useful measure of whether buses require priority at congested locations.
Average Train Speed	90kmh	Increased speed would be indicative of more express services to Melbourne or infrastructure improvements to improve passing opportunities
Average PT Trip Length	7.7km	Reductions in trip length could indicate the '10 Minute City' is enabling more tasks to be accessed locally. Increases could indicate PT becoming more convenient and popular for longer-trips. More detailed analysis required to accompany this measure.
Average PT Trip Time	10 Minutes	Similar to length of PT trips, requires detailed analysis of other factors to determine why the time varies. Reduced PT times could indicate faster and more direct routes, or shorter trips.
Length of Congested Road	2km	Current figures are very low, reflecting a road network which is easy to get around at all but peak school periods in defined locations. An increase in congestion is not necessarily a bad thing, as it can encourage and promote alternative transport choices.

*Note: Values and benchmarks will change as improved transport data becomes available.

Critical to identifying success is the collection of robust transport data for Ballarat. The Sustainable Transport Strategy (refer **Initiative 4.1**) will identify how this data could be collected, and the benchmarks will be reviewed and updated as new data becomes available. The 2016 ABS Census will be of particular interest, and non-motorised counts of walking and cycling a priority for collection.

Implementation

Key Actions

Short – medium term

- Develop transport action plans to guide the transition to a more sustainable transport system

Long term

- As the population grows deliver a long-term transition away from car dependency, so by 2040 key transport metrics are at 2015 levels or better

Supporting Actions

Ongoing

- Establish and collect a suite of transport data to monitor the transition to a more sustainable transport system

Further Information

- Ballarat Sustainable Transport Strategy 2015 – 2025: Discussion Paper (February 2015)

Ensure Land Use Supports the Viability of Frequent Public Transport



Initiative 4.3 – Work in Partnership with Public Transport Victoria to shape the land use pattern of Ballarat so it can best support high frequency public transport

The bus network in Ballarat provides an important social service to the community. Its current route structure services a wide geographic catchment, but its timetabling and route choice limits its attractiveness to a relatively small cohort in the community. Given the relatively cheap cost of parking, most people in Ballarat choose to use a private car for their day-to-day needs if they are able. Those who rely on the public transport system indicate its frequency and convenience falls short of their expectations, and far short of offering a viable alternative to the car.

Ballarat Needs a High Frequency Public Transport Network between Key Centres

Council officers are working with Public Transport Victoria to develop high frequency public transport corridors across Ballarat, implemented in stages over the next 20-25 years. The proposed approach seeks to support land use change which makes such a network viable over the long-term. Ultimately, the network could support bus services between key nodes, supported by a system of feeder bus routes from more suburban destinations. The concept would remove the need for a timetable on key routes, providing confidence to the community that they can just walk up to a bus stop and a service will be just a few minutes away. Similarly, interchanging in this model is seamless as the frequency provides for minimal time spent waiting for a connecting service. Better co-ordination of timetables between bus and train services further improves the convenience of public transport.

The information depicted in **Figure 13** Towards a more sustainable transport is not intended to demonstrate the actual bus routes, which is ultimately to be determined by Public Transport Victoria. The corridors are indicative of the land use change which will support higher frequency public transport over the long-term.

The Role of Land-use

The State Government funds and manages the provision of public transport in Ballarat. However, Council decision-making can have a significant influence over the viability of the public transport services that can be provided. By supporting more infill development and higher density housing around activity centres and along key public transport corridors, the number of people potentially using the services can be significantly increased. This improves the viability of providing additional services, and brings forward the time at which the new services could be justified. Similarly, encouraging growth of commercial and office developments in clusters helps support greater patronage to justify a high frequency public transport link to a specific location.

As outlined in **Initiative 3.2**, City of Ballarat will support more housing developments within 400m metres of public transport and walking distance of local activity centres, and actively support development in 'convenience living corridors' within 200m of the long-term high frequency Public Transport corridors. This land use intervention seeks to increase the number of people potentially accessing public transport, so over time it becomes increasingly frequent and progressively more convenient.

Support for Transit Oriented Development (TODs) (**Initiative 4.4**) is intended to similarly support the viability of high frequency corridors over the long-term.

Initiative 4.4 – Make better land use decisions around areas with the potential for transit oriented development

Several key transport interchanges exist within Ballarat, including rail and bus interchanges at the Ballarat and Wendouree Activity centres. These centres provide important rail and bus interchanges and are key access points to the wider public transport network. To capitalise on the high connectivity at these locations, planning controls which encourage a greater intensity and diversity of use at these centres will support them to become attractive destinations. Intensifying land uses around hubs, with a focus on access by public transport, is commonly referred to as Transit Oriented Development, and opportunities for this type of development will be pursued.

Public transport supports these destinations by providing access to a larger pool of potential employees and customers for firms. Enhancing the attractiveness of activity centres as destinations to visit will assist in increasing patronage, including demand during off peak times and in the contra-peak direction. This additional demand will help to support frequency improvements in both peak and off peak times. It's a two way proposition, requiring both investments in public transport services and the centres themselves.

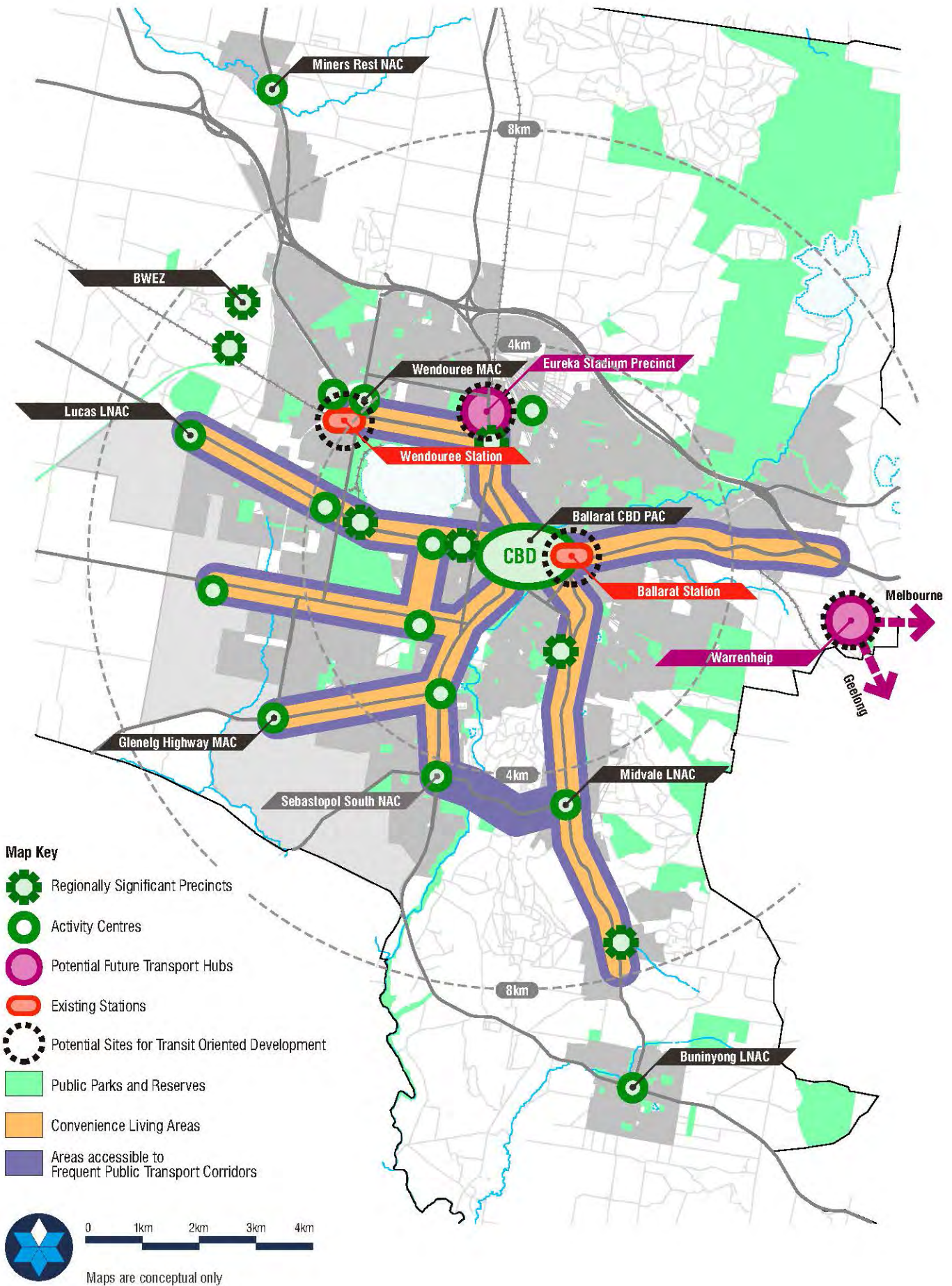
It is proposed for there to be more extensive use of Residential Growth Zone within the catchment of public transport hubs such as Wendouree Activity Centre and railway station and areas identified for convenience living (**Initiative 3.2**) as well as in the CBD and inner city fringe. Zoning which encourages residential growth in areas where public transport is best placed to provide high levels of service and access is supported by PTV.

Long-term TOD Opportunities

Transit Oriented Development (TOD) will be encouraged in all Activity Centres. Better integration of developments, built form and transport services benefits everyone. In terms of new centres for TOD, there is the potential for urban growth in Warrenheip (refer **Initiative 3.9**) and around the proposed Selkirk Precinct near Eureka Stadium (refer **Initiative 1.5**) provide future opportunities for railway stations in these locations. The viability of new rail stations would require a clear and robust land use response to drive demand. They are considered important long-term opportunities.

Over the medium – term, game day and major event rail access could be provided to Eureka Stadium in advance of wider urban renewal and regeneration.

Figure 14 Transit Oriented Development



Implementation

Linked Initiatives

- Initiative 1.2 – Undertake structure planning for local activity centres, to maximise their ability to develop and diversify
- Initiative 1.3 – Recognise all regionally significant economic precincts in the Ballarat Planning Scheme, and commit to local area planning for each to determine their long-term future
- Initiative 1.5 – Pursue urban renewal in key locations
- Initiative 3.2 – Promote infill development in ‘strategic infill corridors’
- Initiative 3.7 – Assess the merits of new greenfield opportunities in accordance with established criteria

Key Actions

Short – medium term

- Recognise the long-term aspiration for high frequency public transport connections in the revised Local Planning Policy Framework of the Ballarat Planning Scheme

Supporting Actions

Ongoing

- Continue to work in partnership with Public Transport Victoria and other key stakeholders to improve the convenience, legibility and frequency services of public transport

Further Information

- Public Transport Victoria submission to Ballarat Planning Scheme Amendment C177: Reformed Residential Zones 2014

Support a High Quality Walking and Cycling Network to Improve Local Accessibility



Initiative 4.5 – Partner with the community to develop a user focussed cycling network, as a game-changing enabler to growth in cycling

Ballarat is relatively easy to get around by walking and cycling, however, few people choose to commute this way to get to work and school. Most journeys of these types are for recreation. Cycling and walking need to become mainstream modes of transport, not just for recreation, but for daily life. Supporting community led initiatives is important to facilitate a changing cycling culture.

There is significant opportunity to support much greater participation through higher quality walking and cycling networks to local destinations such as shops, services, sports grounds and schools. There is scope to add value to the existing Ballarat Cycling Strategy and Principal Bicycle Network, developed in collaboration between Council and VicRoads. Opportunities include:

- Provision of high quality cycle paths, tracks and trails as well as highly walkable routes between key nodes such as schools, employment hubs and activity centres
- Development of a user focussed Ballarat Bicycle Network through the development of a sustainable transport strategy
- Increase the activation around the Lake Wendouree Precinct through the introduction of a bike share scheme for recreational users. When visitors are coming to the area, it could be a great opportunity to increase the visitor experience and enable visitors to ride around the Lake and see the Botanical Gardens, Ex-Prisoner of War Memorial and Victoria Park.

Specific actions will be developed as part of the Ballarat Sustainable Transport Strategy.

Initiative 4.6 – Work with schools and local communities to improve walking and cycling connections within 10 minutes of key destinations, as part of a neighbourhood links program

Neighbourhood links are safe, convenient and logical connections between local places. The approach identifies opportunities to improve the safety and amenity of quiet local streets to make it easier to access day-to-day destinations. The objective is to improve the permeability of our neighbourhoods, and encourage people to access neighbourhood centres, parks, schools, natural areas and other key community destinations, by walking, cycling or wheelchair.

These links are generally targeted to people living within 10 minutes of their destination by walking or cycling, where the use of a car to access the site is unnecessary. As a greater range of services are provided in local suburban activity centres, the number of people walking to these locations should be maximised; these locations could benefit from the neighbourhood links approach.

Neighbourhood Links are Community Driven

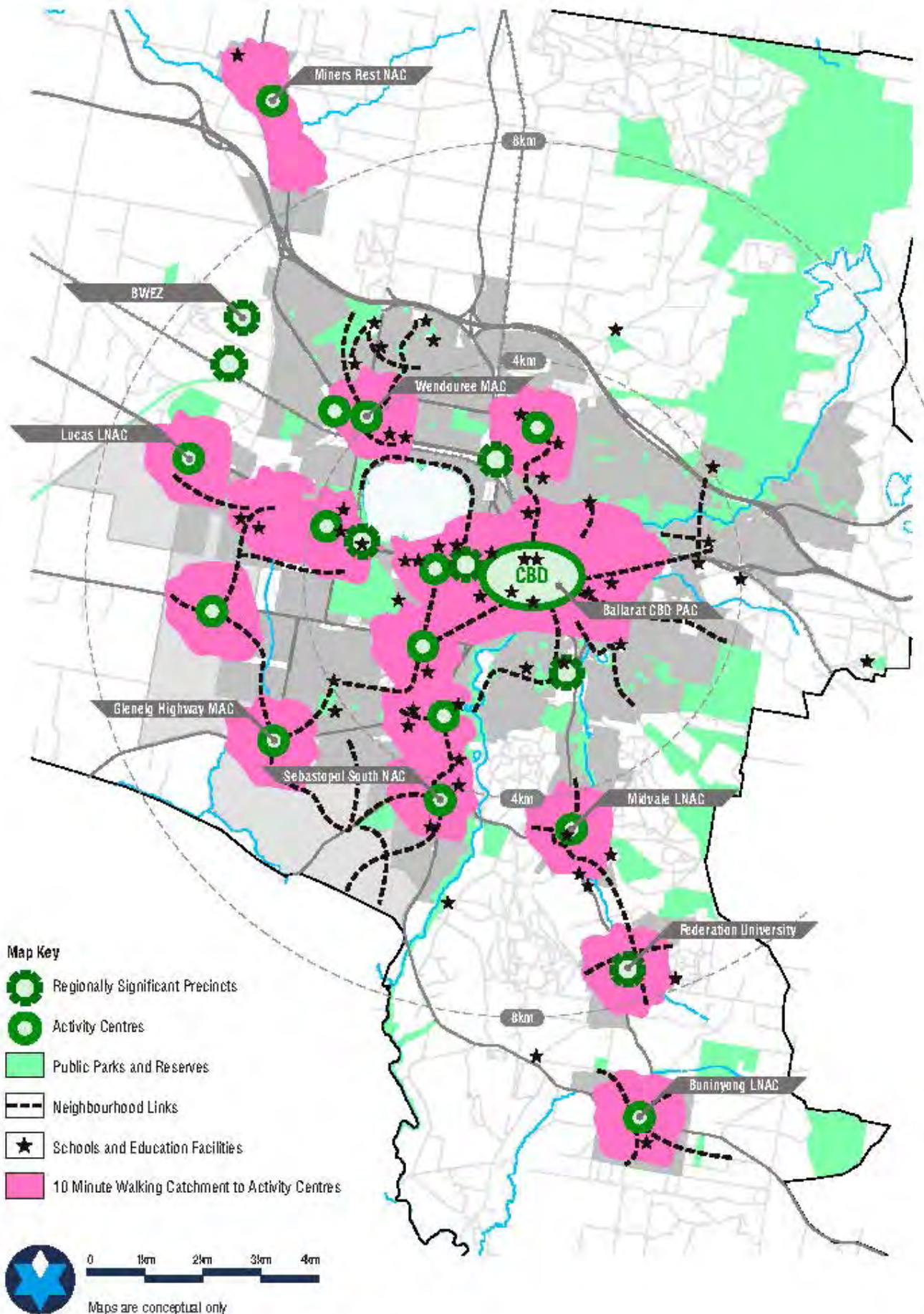
Fundamental to the neighbourhood links program is that it is community driven. Rather than being a program run by Council to make specific changes to local neighbourhoods, it is an opportunity for local organisations, stakeholders and communities to partner with Council to improve accessibility to local destinations. The ideas, priorities and initiatives are expected to be jointly developed and delivered.

In the short-term, pilot projects will be pursued with local schools to reduce the barriers to kids walking to and from school. Benefits of shifting car trips to active transport can support a range of benefits, and improve children's health by:

- Increasing levels of physical activity (and associated physical, psychological and social health benefits)
- Helping children maintain healthy weight
- Reducing the environmental health damage caused by excessive car use (for example, air and noise pollution, global warming)
- Reducing inequalities in children's social and physical health associated with physical activity, obesity, and motor vehicle crash injuries.

Following review of the pilot program, it is expected the neighbourhood links program will be offered to all neighbourhood areas to improve the permeability and walkability of our neighbourhoods.

Figure 15 Neighbourhood Links



Implementation

Linked Initiatives

- Initiative 1.2 – Undertake structure planning for local activity centres, to maximise their ability to develop and diversify
- Initiative 1.3 – Recognise all regionally significant economic precincts in the Ballarat Planning Scheme, and commit to local area planning for each to determine their long-term future
- Initiative 1.4 – Work with schools and universities to expand and better integrate their campuses with the urban fabric
- Initiative 2.1 – Work towards all urban residents being able to access most of their daily needs within 10 minutes' walk or cycling from home
- Initiative 2.3 – Place greater emphasis on people at the centre of infrastructure design in public places
- Initiative 2.4 – Require new greenfield developments to be designed to promote physical activity and provide for complete neighbourhoods
- Initiative 5.9 – Ensure all urban residents of Ballarat are within a 10 minute walk of appropriate open space, and rural residents can access open space areas

Key Actions

Short – medium term

- Progress a user focussed cycling network for Ballarat through the development of the Ballarat Sustainable Transport Strategy
- Undertaken pilot projects to implement a Neighbourhood Links program that improves walking and cycling opportunities from homes to key local destinations

Further Information

- Cycling into the Future 2013 – 2023
- Life Between Buildings: Using Public Space, Gehl Architects (2011)



Initiative 4.7 – Complete the Western Link Road from the Western Freeway to the Midland Highway

The Ballarat Western Link Road (BWLR) is approximately 16 kilometres long and will ultimately link the Western Freeway to the Midland Highway. It will provide an important road link between the City of Ballarat and its surrounding areas. Importantly, it will serve new developments in the Ballarat West Employment Zone (BWEZ), Airport precinct and residential developments in Ballarat West.

As a regionally significant project which is needed to realise the proposed 9,000 jobs in the BWEZ, external funding will be required to complete the full connection between Western Freeway to Midland Highway. City of Ballarat will continue to work in partnership with the State and Federal Government's to complete this important regional project.



Initiative 4.8 – Investigate the need for new road connections as part of local area planning for townships and communities

Where possible, existing road infrastructure will be better utilised in preference to building new connections. It is a better way of managing the transport network.

Case Study

Options for Management on the Geelong Road Corridor

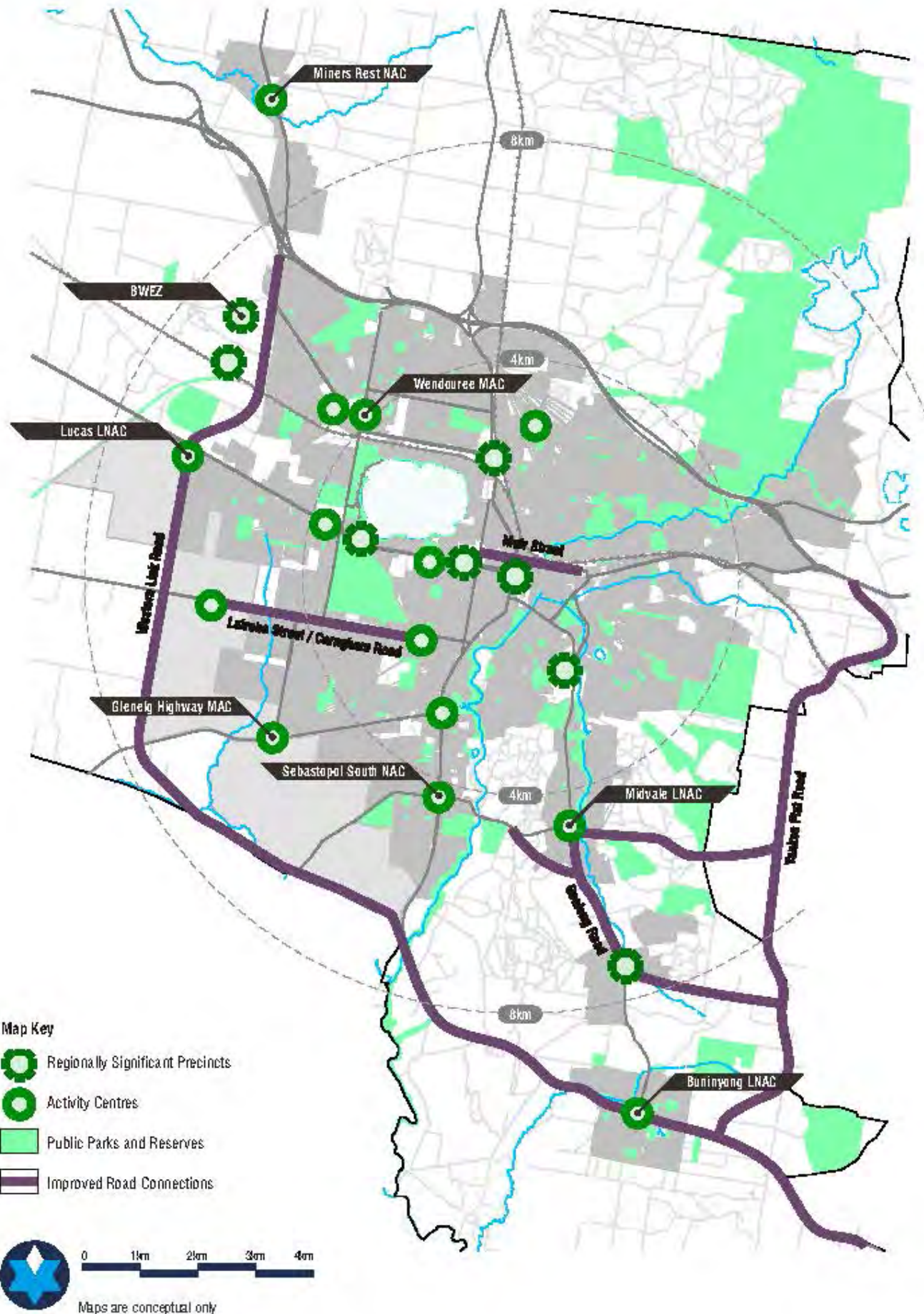
Geelong Road is regularly identified by residents as being a key transport route which already experiences congestion during peak periods, largely associated with school drop-off and pick-up.

Over the long-term, widening of the Geelong Road corridor has been suggested by some residents as a potential solution, but it may not be the best option for transport and amenity in this part of Ballarat. Wider roads often create physical and social barriers in the community, and can shift transport congestion rather than solve the problem. In this case, long-term opportunities to disperse traffic by linking Mt Clear with Sebastopol and better connections to Yankee Flat Road are all potential opportunities. Similarly, public transport priority on the corridor, a new transport hub at Warrenheip (refer Initiative 4.4), and opportunities to improve walking and cycling access to schools and shopping areas (refer Initiative 4.6) could all be important part of managing this corridor over the long-term. Ultimately, a range of travel demand, road management and accessibility options could be used to best manage transport on this corridor, whilst improving rather than degrading the character and values of the area.



There will be specific locations and situations which require consideration of additional linkages. Specifically, there are key long-term opportunities to improve road connections to Geelong and Bendigo, consider bypass options for Buninyong and improve road linkages east of the city between Mount Helen and the Western Freeway. These are additional to the need to complete all planned stages of the Ballarat Western Link Road.

Figure 16 Improved Road Connections



Initiative 4.9 – Investigate pilot opportunities to introduce a network of park and ride stations in Ballarat

Parking is a significant issue in Ballarat. People like to drive, and expect a parking space immediately outside their destination. Even in 2015, this is usually possible. However, areas such as the Health and Hospitals Precinct in Mair Street are starting to show this is not possible in high-demand areas during peak periods.

Park-and-ride opportunities could help alleviate some of the parking issues in key destinations. Towards 2040, Ballarat will be increasingly serviced by a network of park-and-ride stations, ensuring affordable and convenient parking continues to be available for those who need to drive. This has significant potential to be introduced in the following locations:

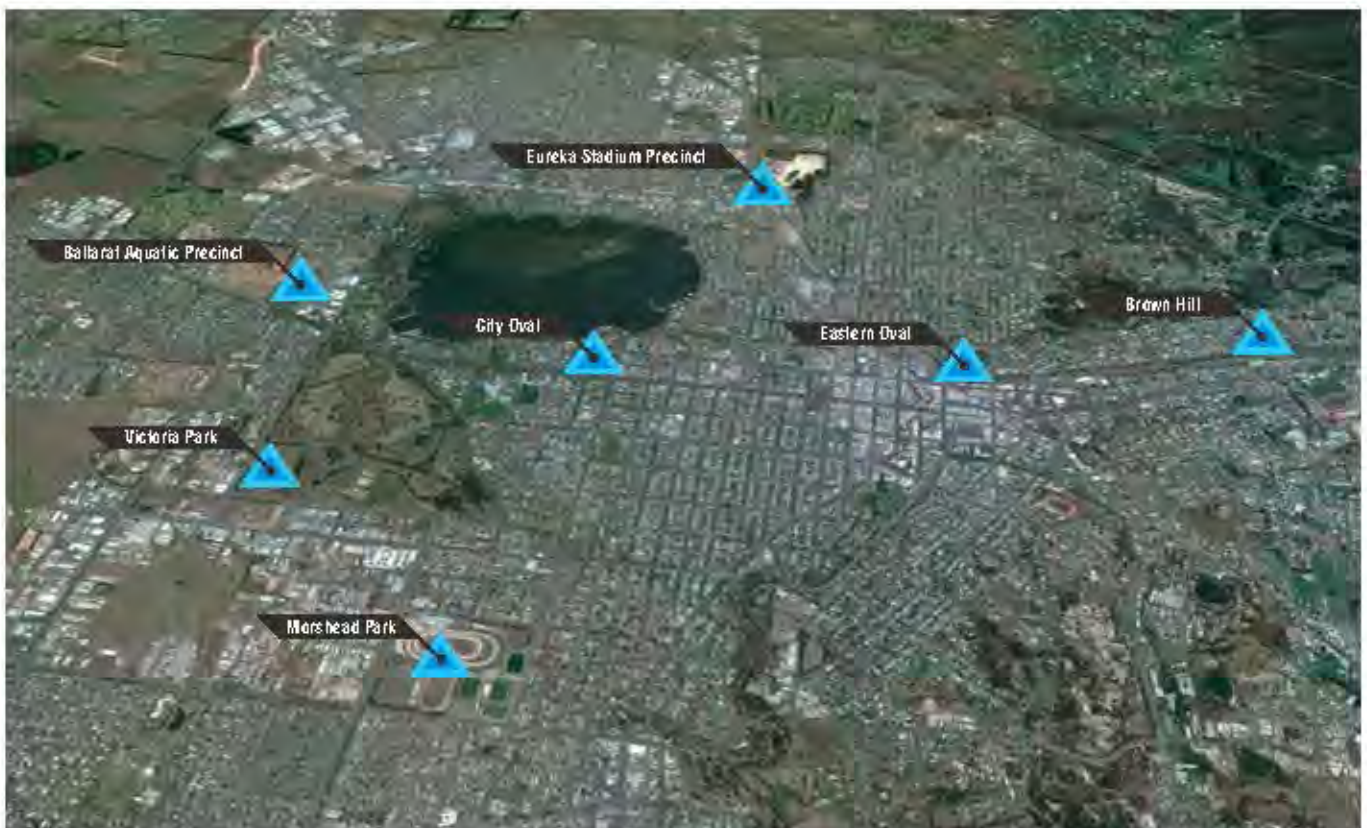
- Around sporting and major event facilities, where large areas of parking across the city are underutilised during peak parking demand times (during daytime hours during the working week)
- Servicing the health and hospitals precinct, CBD and key tourist sites.

This type of approach is common-place in Europe and similar services operate in other regional cities.

Although multi-storey parking is an aspiration for the CBD area, at up to \$25,000 per car space, they are very expensive options to construct. For many areas outside of the CBD, this kind of expenditure will be difficult to justify, even beyond the next 25 years. Opportunities for park-and-ride provide a more economical option for all involved, as parking rates can be minimised in park-and-ride locations.

Council will also continue to work with Public Transport Victoria to investigate opportunities for regional park-and-ride facilities outside the city, to reduce the current strain and future challenges of park and ride commuter parking at Ballarat and Wendouree Rail Stations. Feeder bus services will need to be responsible for a significant increase in trips to these stations, than the current car based access.

Figure 17 Potential Park and Ride Stations



Initiative 4.10 – Focus on people rather than cars in managing supply and demand of car-parking

In a more populous city, parking spaces are expected to become an increasingly scarce commodity. Ongoing development and growth of the CBD is likely to come with increasing pressure on car-parking. This pressure will arise from some traders and community members keen for the replacement of on-street parking with higher amenity pedestrian spaces, and from other traders and community members keen for additional parking to make it easier to access the area.

The Ballarat CBD Parking Strategy (2011) identifies actions for long-term parking management such as:

- Improve/ extend existing off-street public and private car park sites to increase capacity and efficiency
- Encourage visitors to the CBD to use off-street car parks through improvements to their design and operation
- Relocate long-term car parking for commuters and residents to the fringes of the CBD to provide more short-term car parking spaces in the retail and activity areas
- Consider reduced car parking rates or parking permits for new residential development within the CBD to encourage inner city living
- Ensure an adequate number of disabled car parking bays are provided throughout the CBD in convenient locations, and advocate for parking for shoppers with prams
- Improve the usability of car parking payment systems
- Allow for reduced on-street car parking in some areas, for the benefit of an improved pedestrian environment. This will be balanced by the provision of car parking elsewhere in the CBD and the benefits of increased street activity (with more people walking past and potentially dropping into shops, cafés etc.).

Despite this, by 2040 it is unlikely there will be parking space for everyone – busy areas such as the CBD and hospitals have finite space for off-street parking. Recognising this, there needs to be proactive review of parking policies to better manage parking over the long-term. Future reviews of parking policy should consider a paradigm shift to consider first the needs of people, and options for satisfying these needs, and then the implications of these initiatives on car storage.

Specifically, future parking policy reviews will need to consider:

- Park-and-ride, public transport and other transport options will provide alternatives to the car
- Options for parking permits for residential areas, limiting parking to residents only
- Introducing scaled pricing for parking permits so additional permits become increasingly expensive
- Introducing planning controls in certain areas so all new dwellings constructed after a certain date will be required to provide sufficient off-street parking
- Significantly reducing the parking rates which apply to certain new developments, where these are to occur in areas well provided with walking, cycling or public transport access.

Over the long-term, a combination of better provision of off-street car-parking, integrated with a comprehensive suite of demand management approaches (likely to include time and demand based pricing mechanisms) will be used to better manage access to key destinations. This would align with best practice approaches in other cities that also face congestion challenges.

Implementation

Linked Initiatives

Initiative 1.6 – Accelerate implementation of the recommendations of the CBD Strategy: Making Ballarat Central

Key Actions

Short – medium term

- Partner with the State and Federal Governments to deliver all stages of the Ballarat Western Link Road
- Partner with the State Government to investigate the long-term potential for road connections, including Buninyong bypass, Yankee Flat Road to Geelong Road and Mount Clear/Mount Helen to Sebastopol
- Investigate pilot opportunities to trial park-and-ride facilities in Ballarat
- Review Ballarat's parking policies. The review will support a transition from car-based planning to a more holistic people-focused transport network and consider both supply and demand management

Supporting Actions

Ongoing

- Continue implementation of the recommendations of the Ballarat CBD Parking Strategy 2011
- Pursue external funding opportunities to assist in provision of additional off-street car-parking, as identified in the Ballarat Regional Capital Plan 2014

Further Information

- Ballarat Road Transport Strategy 2007
- Ballarat Regional Capital Plan 2014
- CBD Strategy: Making Ballarat Central 2011
- Ballarat CBD Parking Strategy 2011

Make Better Use of Existing Transport Infrastructure and Network Capacity



Initiative 4.11 – Partner with the State Government to better manage our transport networks and support greater efficiency and reduced costs of meeting demand

There are many ways to provide more transport with the existing transport infrastructure and services, with little extra cost. The biggest opportunity for Ballarat lies in public transport. Our buses are often half empty and far more people could be moved for the same cost. There are many ways – small and large – that other cities have increased public transport use, including:

- Using detailed analysis of patronage data to better match services to what the community wants
- Creating cultural change in attitudes to public transport use
- Bus priority at traffic lights
- Introducing a bus tracker system to better inform commuters of the next available service
- Providing improved Wi-Fi and other digital initiatives to make the journey more productive.

Technology also provides solutions to getting more use of existing infrastructure, such as:

- Reviewing traffic signal phasing on key routes to increase capacity for the busiest direction
- Dynamic signalling on the railway network to reduce the need for new physical infrastructure to increase capacity
- Encouraging new opportunities for ride-sharing, such as Uber
- Capturing and sharing more transport data – data is often a key input for new technologies.

City of Ballarat will continue to partner with the State Government to embrace technology, as a way to better inform transport users and improve overall management of the transport network.

Implementation

Key Actions

Ongoing

- Partner with the State Government to increase take-up of existing public transport services
- Assist the State Government to improve the efficiency and capacity of our existing roads and public transport network through the use of new technology

Support Improved Connections within the Region and to other Key Jobs and Business Markets



Initiative 4.12 – Advocate and collaborate to deliver key regional transport priorities

The Central Highlands Regional Transport Strategy (2014) and Central Highlands Regional Growth Plan (2014) both provide guidance on a suite of agreed regional infrastructure priorities, including:

- Provision of enhanced rail connections between Melbourne, Ballarat and Ararat, with the extension of suburban services to peri-urban areas
- Western Highway duplication to Stawell, including bypasses of Beaufort and Ararat and upgrade of the highway to freeway standard between Leigh Creek and Woodmans Hill
- Provision of Ballarat Western Link Road Stages 2 and 3
- Investigate upgrading the Western Highway from Ballarat (Ballarat Western Link Road) to the Port of Melbourne for High Productivity Freight Vehicles (Mass)
- Development of the Ballarat Freight Hub
- Enhanced opportunities for rail freight movement through improvements to the Mildura – Geelong railway line.

Particularly for rail access to Ballarat, forecast rapid growth in rail patronage along the Ballarat Rail Corridor will necessitate further capacity increases over and above those recently delivered through the Regional Rail Link. In order to provide this capacity, there will be the need for construction of additional passing loops and partial duplication of the corridor, particularly between Deer Park and Melton.

Case Study

Melton Duplication

The Melton Duplication Project is vital to enhancing capacity and reliability on the Ballarat corridor. This project will reduce delays to V/Line services by removing bottlenecks where trains cannot pass each other through duplication of the busiest section of the corridor. As a result of this project, V/Line Ballarat and Wendouree users will benefit from more frequent, resilient and reliable journeys. In particular, it will provide capacity on the line to maximise the frequency and reliability of services. PTV is actively investigating and planning for additional passing loops along the corridor at strategic locations such as Rowsley to improve rail services for Ballarat users. This type of investment will be critical to ensure Ballarat remains connected and competitive over the long-term.

City of Ballarat will continue to collaborate with regional and state partners to deliver these key priorities that are so vital for the future of Ballarat and the Central Highlands Region more generally.

Initiative 4.13 – Partner with State Government and other stakeholders to improve regional bus connections

The existing bus services to Geelong and Bendigo are not frequent enough for convenient commuting and/or business purposes. As each regional centre continues to grow and support more regional jobs, connections between these centres, needs to significantly improve. By 2040, it should be as convenient to catch public transport between these regional centres as it is to Melbourne.

V/Line coach services within the Western District will continue to provide access for residents to health facilities and social services, influenced by demand levels. These services provide additional travel options for the residents and students to access employment and key health and education facilities in the district. The provision of additional demand growth along these corridors will support the continuation of these routes and for PTV to provide frequency and accessibility enhancements along these routes.

The timing and scope of these service upgrades is dependent on government funding and long-term demand. However, there is a role for Council to continue to work with PTV to increase the frequency and convenience of connections. In addition, City of Ballarat will seek opportunities to partner with neighbouring shires to support the viability of new and improved connections.

Initiative 4.14 – Monitor demand for direct air capacity and investigate long-term opportunities for a Ballarat airport with passenger and freight services

Ballarat is well serviced by the Ballarat Aerodrome. A Master Plan exists to secure its future, and its interfaces are well planned as part of the Ballarat West Employment Zone (BWEZ) Master Plan. As an aerodrome, its future is well supported.

However, over the next 25 years, the limitations on the current aerodrome will become more pronounced. Historical housing developments to the east of the site limit its use for 24/7 operations. It already has a curfew of 11pm for the flight school. As a long-term piece of strategic infrastructure, it is constrained for a major upgrade to freight and passenger based regional airport.

Whilst passenger flights are unlikely over the short-medium term given the proximity of Ballarat to the Melbourne International Airport at Tullamarine, and domestic airport at Avalon, it is realistic over the longer term to see benefits in Ballarat having direct air capacity. As we future proof the city, and seek to make it resilient to an unknown future, we must consider now the future for air servicing. Given the way the world is progressing, with new technologies improving the efficiency of flight, and thus reducing its costs, and the increasing demand for quick movement of goods and services to market, Ballarat needs to think about its long-term aviation needs.



Council will continue to monitor the long-term potential for a new Ballarat airport, which would be unconstrained and enable the city to be responsive to changing future demands. Detailed investigation of a site for a new regional airport would be undertaken, if required, in conjunction with key regional stakeholders.

Implementation

Linked Initiatives

Initiative 1.17 – Seek to leverage the benefits of existing regional scale infrastructure

Initiative 1.18 – Continue to advocate and collaborate to deliver key regional infrastructure priorities

Key Actions

Short – medium term

- Collaborate with the State Government to increase the frequency of train services to Melbourne, and provide more frequent and convenient public transport connections to key regional destinations such as Geelong and Bendigo
- Support delivery of key regional transport priorities identified in the Central Highlands Regional Transport Strategy (2014) and Central Highlands Regional Growth Plan (2014)

Supporting Actions

Ongoing

- Monitor changing long-term market demands for an unencumbered Ballarat airport

Long term

- In partnership with key regional stakeholders, investigate potential sites for a full scale regional airport offering freight and passenger services, and put planning controls in place to ensure such a facility remains unencumbered over the long-term

Further Information

- Central Highlands Regional Transport Strategy 2014
- Central Highlands Regional Growth Plan 2014
- Ballarat Airport Master Plan 2013-2033

Improve the Efficiency of Moving Freight



Initiative 4.15 – Improve the efficiency of supply chains by delivering Ballarat’s developing regional transport gateway (Ballarat West freight hub)

The movement of freight is essential to the Ballarat economy. Freight is necessary both for consumers and businesses seeking goods, and for manufacturing and production businesses which produce goods for market. The efficiency of accessing markets and receiving goods has a big impact on the competitiveness of doing business from and with Ballarat. The greater the efficiency, the more competitive businesses can be, ultimately resulting in more jobs and greater productivity.

There are some key land use opportunities that maximise efficiency of freight movement, particularly co-location of industries proximate to the established transport gateways at the Ballarat West Freight Hub and Ballarat Airport precincts. The current investments in the Ballarat Western Link Road project are important for leveraging the benefits of the entire Ballarat West Employment Zone.



Initiative 4.16 – Encourage freight intensive developments to locate in areas appropriately serviced by identified strategic freight corridors

Further investment along defined freight routes and through key freight gateways will be crucial into the future. Given the shape of Ballarat, new orbital road connections to better link Geelong and areas to the south and south east of the city to the inter-state rail and road networks will be crucial and requires consideration of preparatory work for these linkages.

It is fundamentally important the Ballarat West Employment Zone Master Plan is fully implemented, including support for intensive freight dependent industries to co-locate in areas with the appropriate access to the strategic freight network.

Improvements to intermodal freight and the establishment of new advanced manufacturing precincts, with excellent road and rail connections will help to capture and process food and fibre that is grown across the region and transported through the municipality.

Implementation

Linked Initiatives

Initiative 1.15 – Continue to facilitate the delivery of the Ballarat West Employment Zone and Freight Hub

Initiative 4.7 – Complete the Western Link Road from the Western Freeway to the Midland Highway

Supporting Actions

Short – medium term

- Identify and protect long-term rail freight intermodal sites that can come on line once the Ballarat West Freight Hub is fully utilised

Further Information

- Ballarat West Intermodal Freight Hub
- Ballarat West Employment Zone Master Plan 2012

Community Engagement

Council invites submissions about the Ballarat Integrated Transport Action Plan to inform its finalisation.

Submissions must be sent to
City of Ballarat, PO Box 655
Ballarat VIC 3353,
or via email to
strategicplanning@ballarat.vic.gov.au.

For more information, visit
[mysay.ballarat.vic.gov.au/
integratedtransport](http://mysay.ballarat.vic.gov.au/integratedtransport)



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