Movement & Place Consulting

BALLARAT'S URBAN TRANSIT FUTURE

Background Paper
November 2019

Document Revision History

VERSION	DATE	DOCUMENT TYPE
Ballarat's Urban Transit Future	29 October 2019	Draft Report

Document Control Panel

	NAME	DATE	SIGNATURE
Prepared by	Lachlan Burke	14 May 2019	
Reviewed by	Knowles Tivendale	29 October 2019	
Approved by			

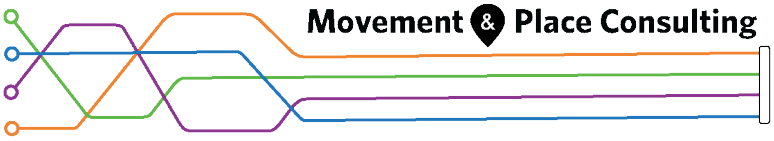
Addressee:
Attn: James Guy & Karl Sass
City of Ballarat
PO Box 655
BALLARAT VIC 3353
AUSTRALIA

Another Project By:
Movement & Place Pty Ltd
ACN: 625 377 595

Trading As:
Movement & Place Consulting
ABN: 85 375 284 892
PO BOX 8101, DANDENONG VIC 3175
info@movementandplace.com.au
www.movementandplace.com.au

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.

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.

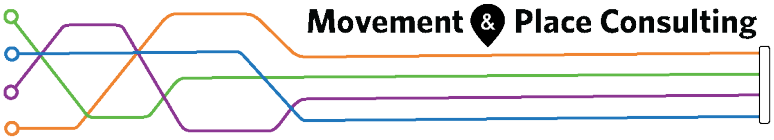


TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

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.

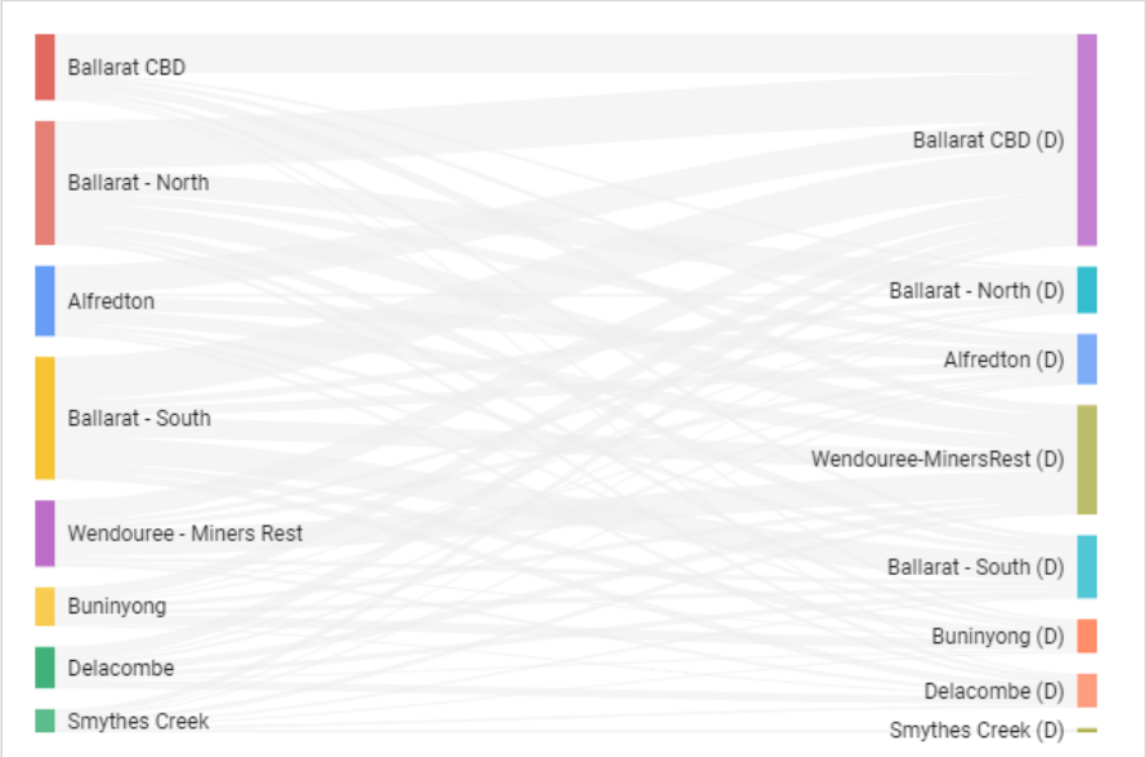
2. BACKGROUND

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

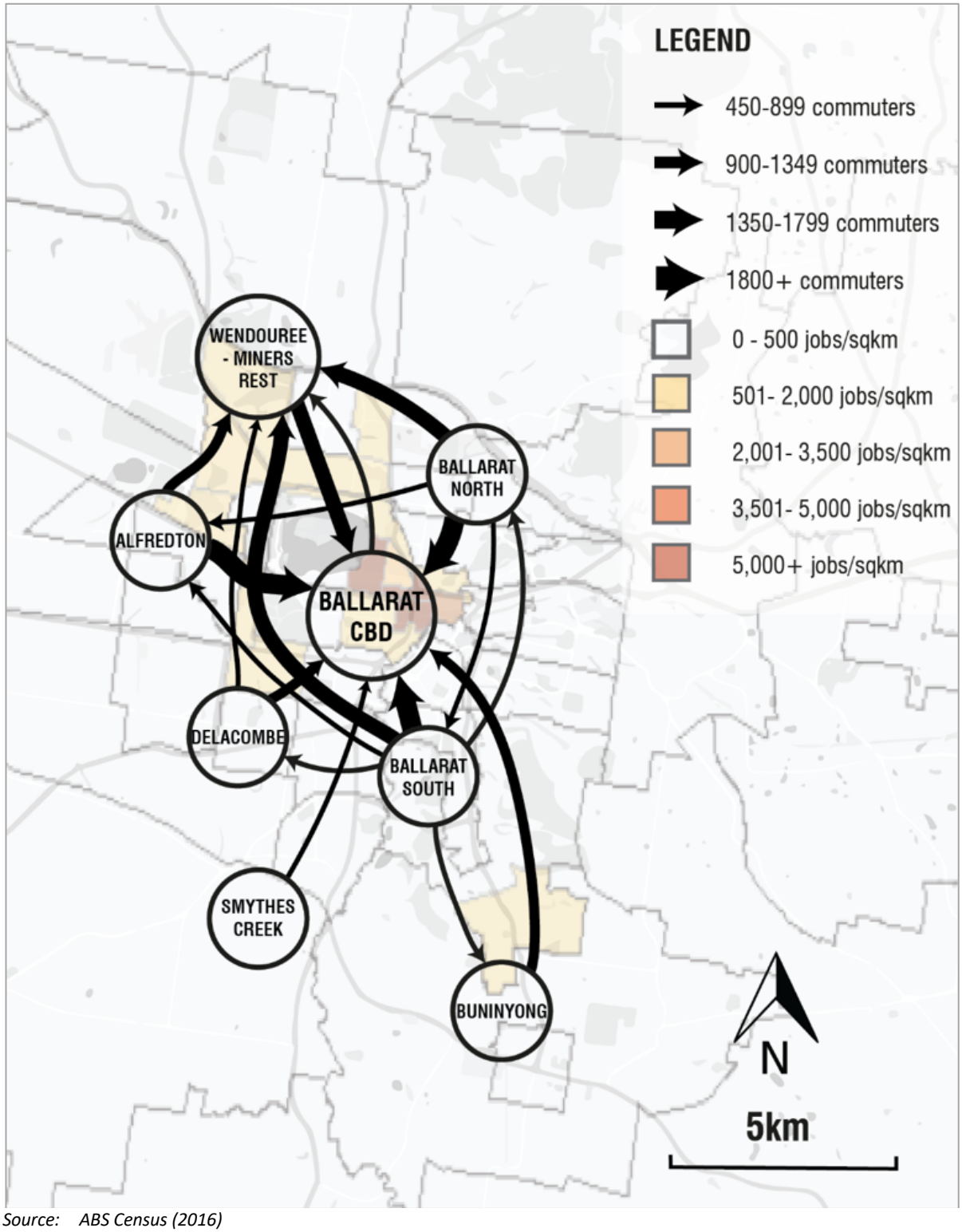


Source: ABS Census (2016)

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.

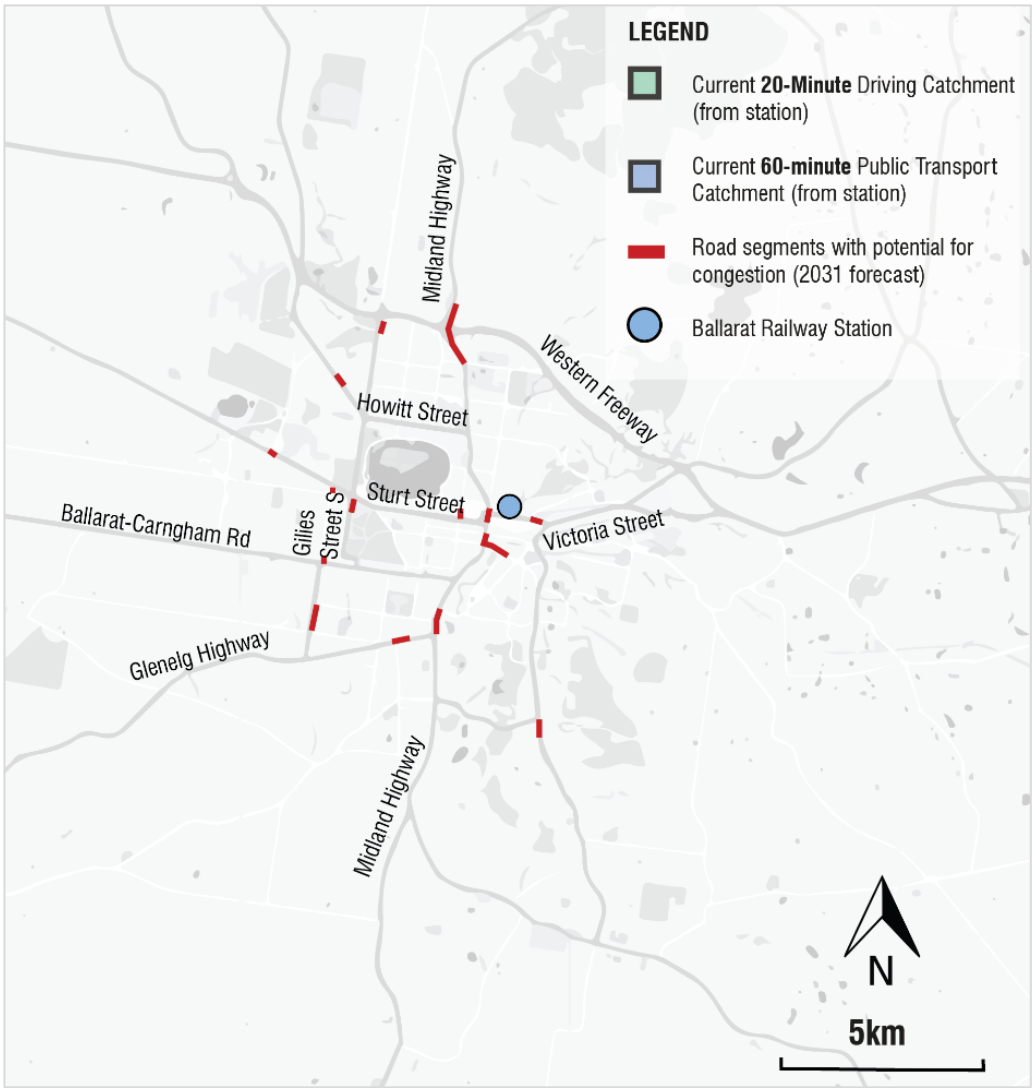
Note: Figures may not add up due to rounding

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 spaces[1].

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.

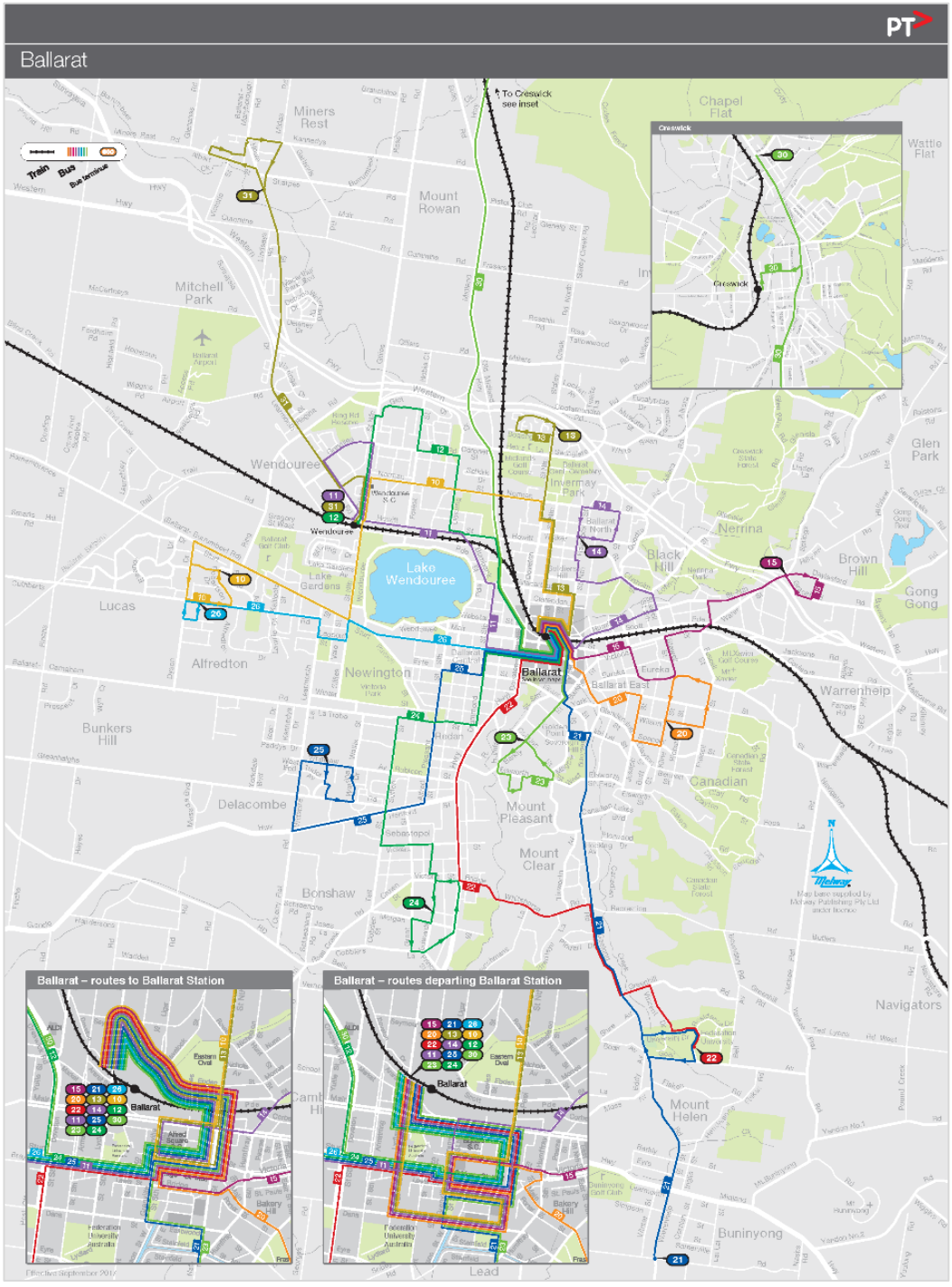
As part of this, specific reference is made to delivering improvements to the Ballarat bus network, following a review as well of bus stops and infrastructure over the next five years.

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.

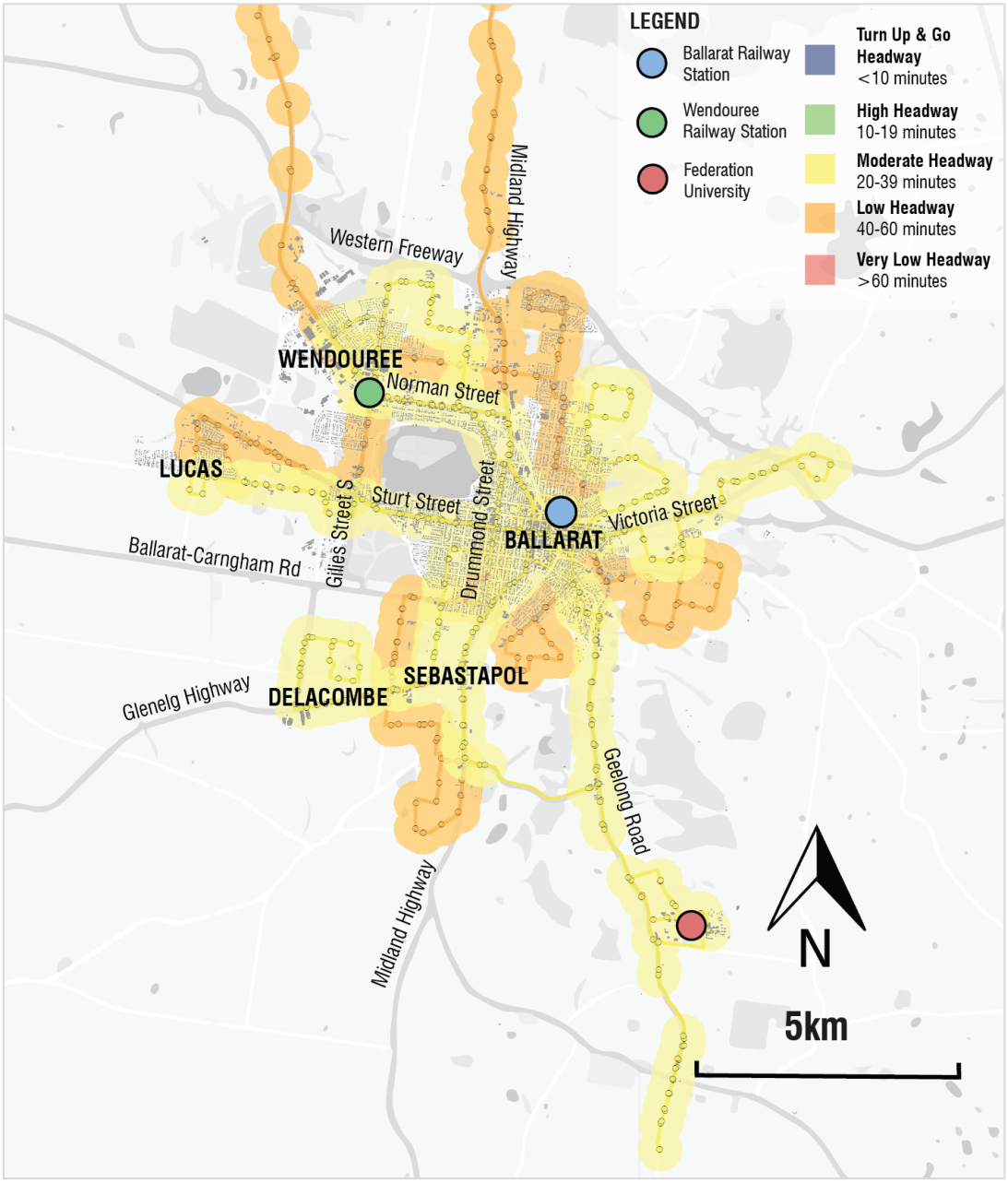
Table 2-3: Ballarat Routes

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

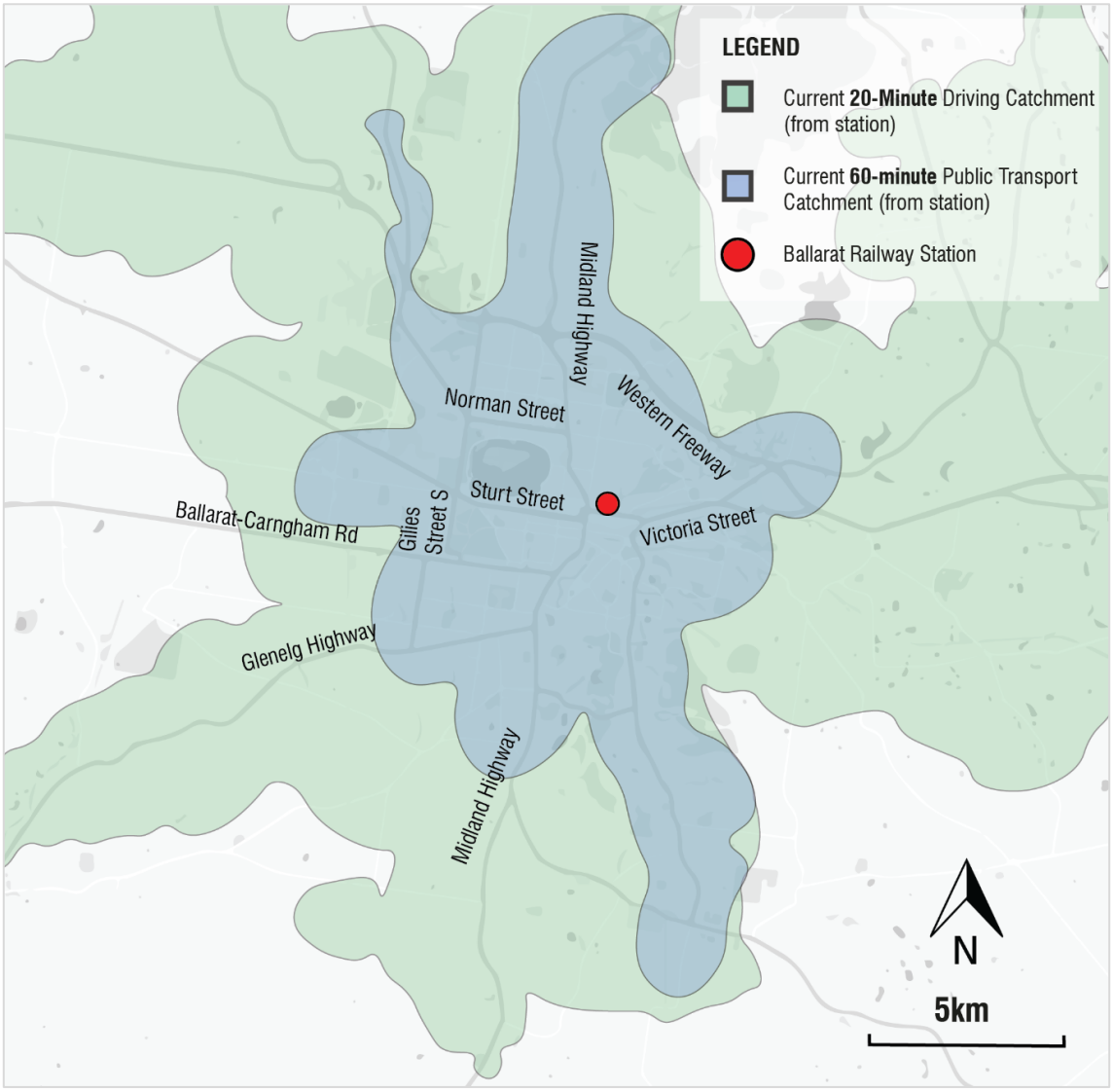
Buses in Ballarat are slower than they need to be, because the timetables have been written with the worst road traffic conditions in mind, so that the buses will very rarely be running late. This means that buses need to pause regularly (often for minutes at a time) at specific "*time-points*" to ensure 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 Ballart 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

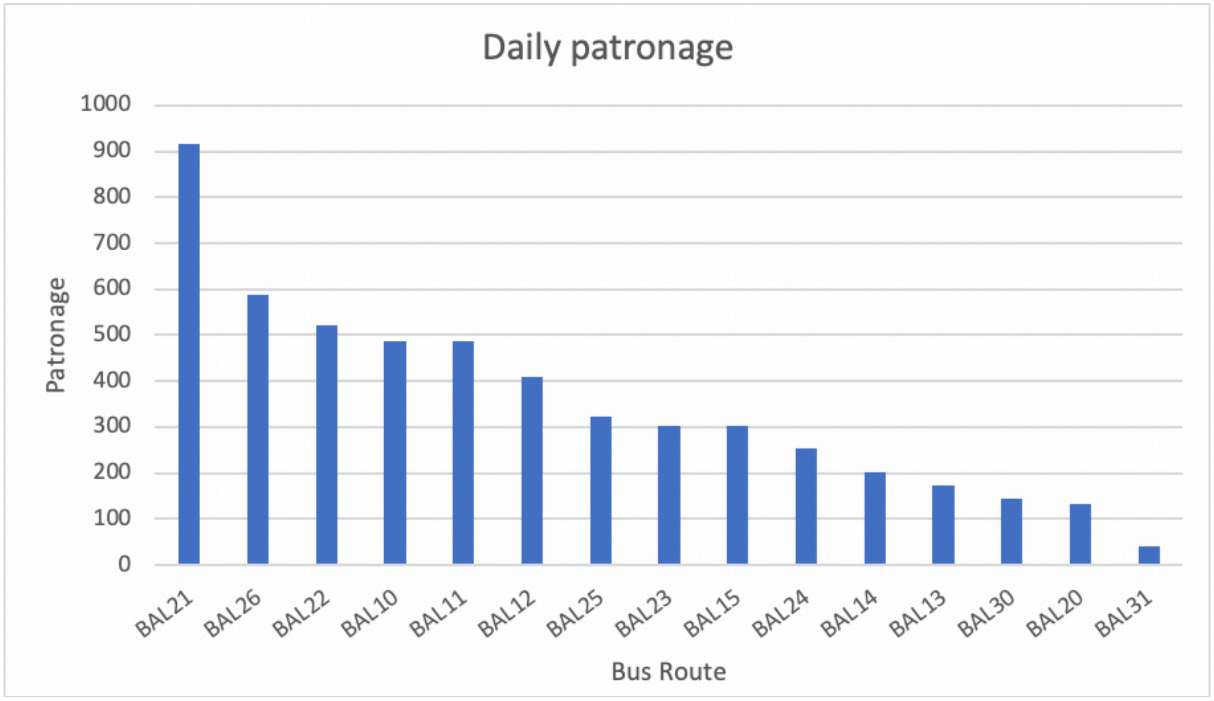
2.8 Patronage

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

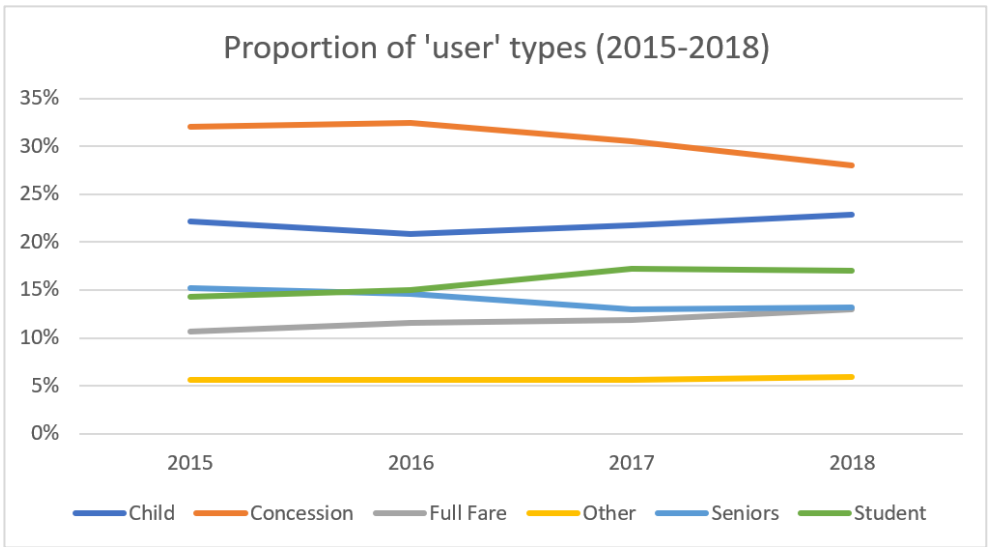


Source: DoT data with M&PC Analysis

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.

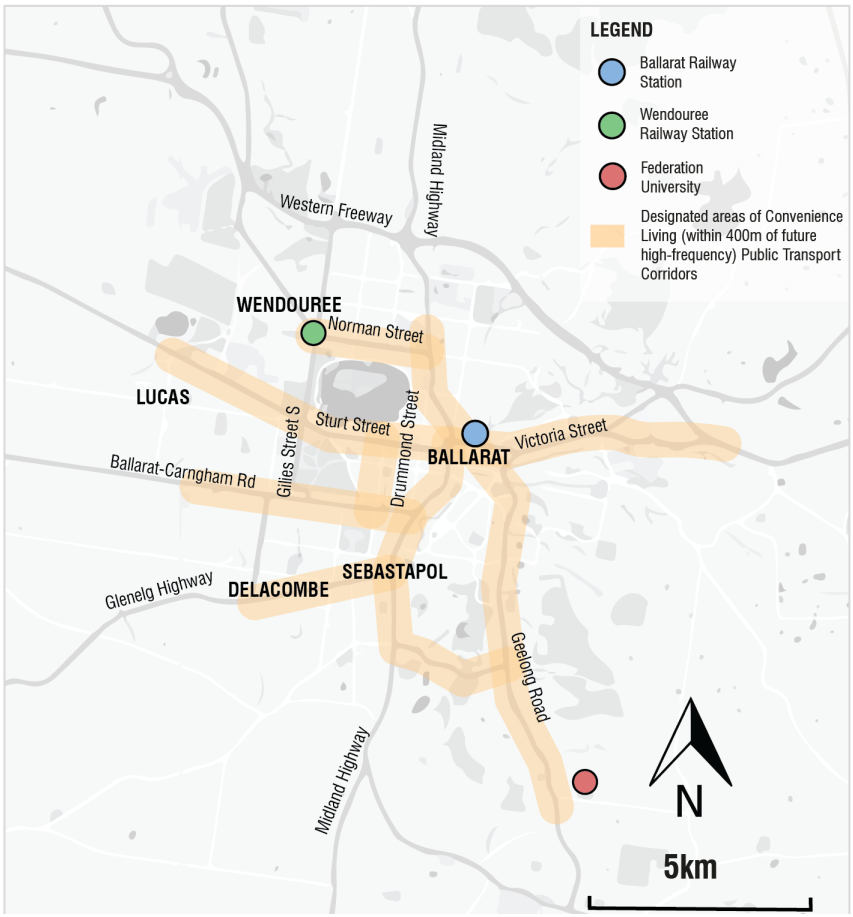
4.1 Stage 1 - Short term (by 2022)

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 that 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).

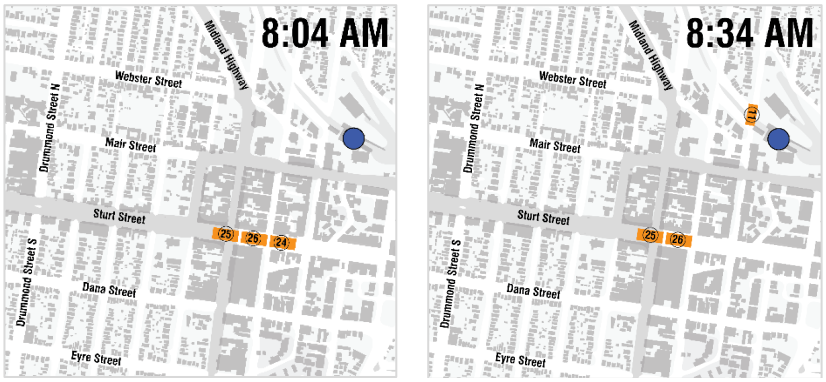
This timing of services undermines the local network by missing the opportunity to provide higher frequency services in key corridors (and reduce bus congestion associated with multiple services operating at the same time).

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)

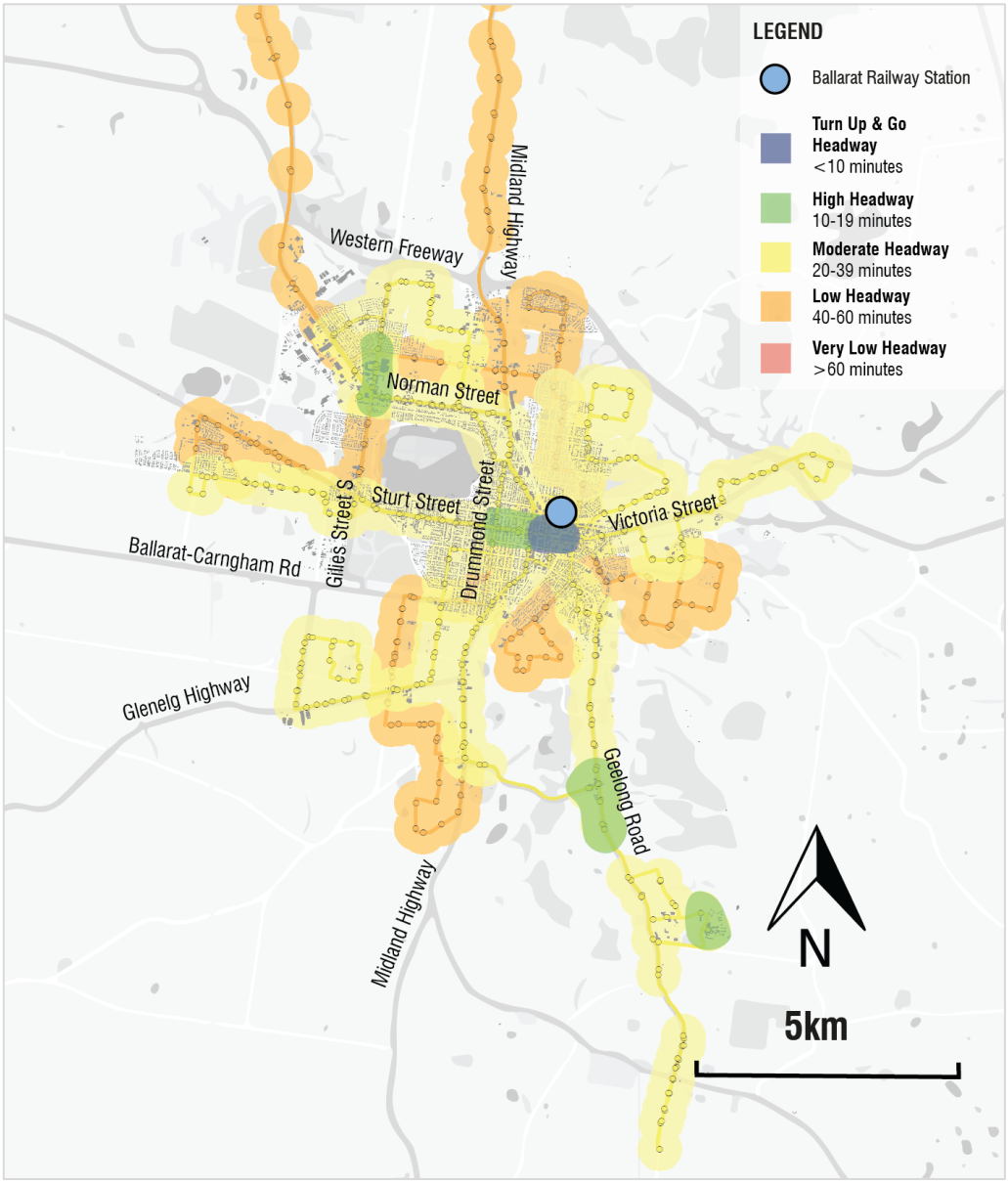


The current timetable makes transferring between bus services difficult and frustrating. This is despite the network design being so focussed on the CBD and train station that passengers are forced to transfer between services just to get from one side of the CBD to the other. The current network design 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

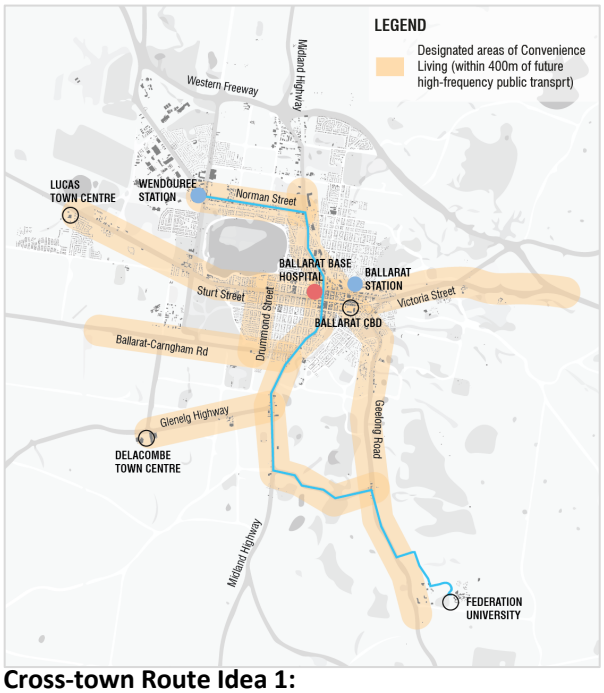
such a service to the community is noted to be high, indicated by the average daily patronage figure of 487 passengers. The most patronaged service, Route 21, caters for 917 daily passengers and provides access to another non-CBD employment and education corridor in Mount Clear and Buninyong.

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:

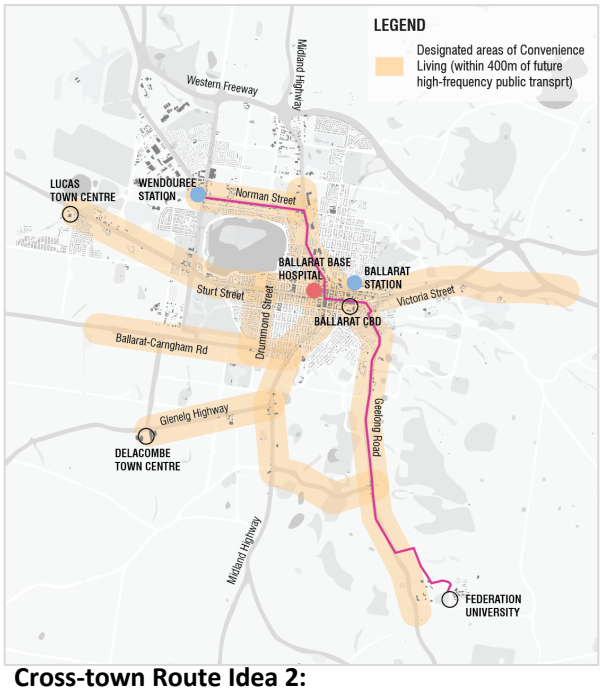
- Higher intensity non-CBD areas such as Wendouree, Buninyong, Lake Gardens and Newington;
- Demand for non-CBD suburb to suburb work trips. Those particularly noted to be high were movements from Ballarat South to Wendouree, Alfredton to Wendouree and Ballarat North to Wendouree. Through running connecting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

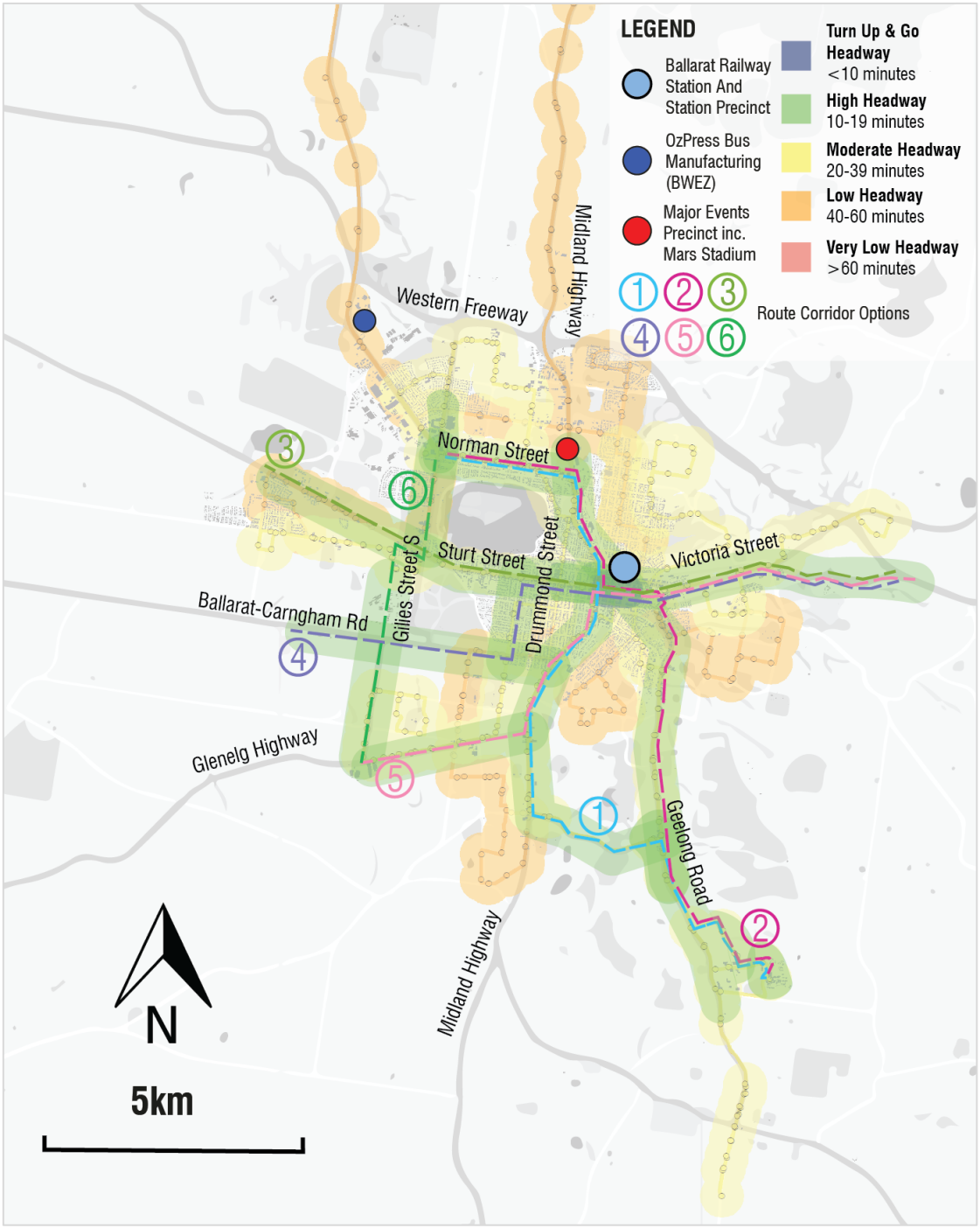
There are many options for key cross-town corridors. This background report does not analyse the potential of each or recommend a specific set of routes. Rather it recommends that the approach is important, and the community should decide which corridors make the most sense in terms of the trip patterns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

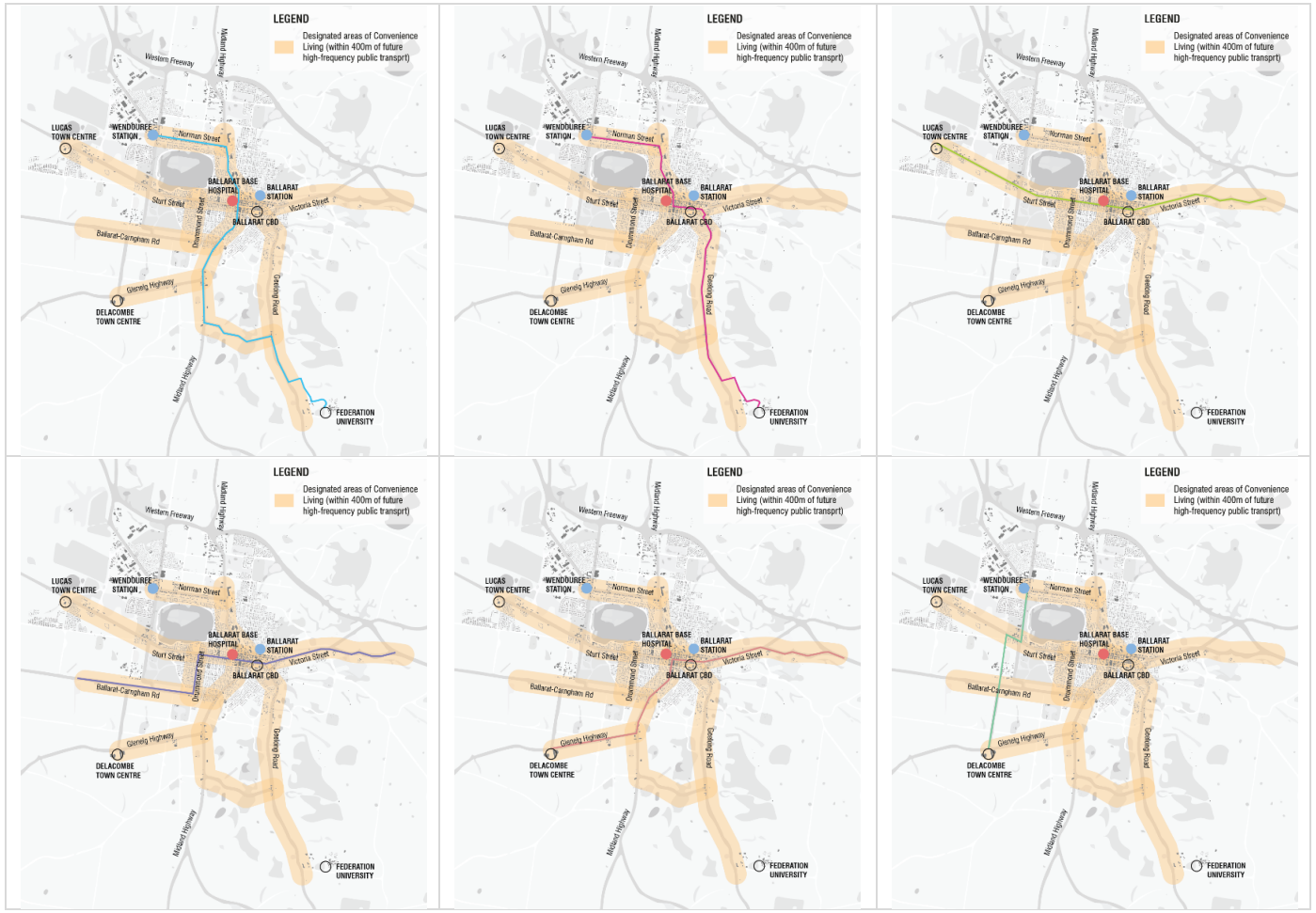
The route option ideas demonstrated are mostly combinations of existing routes, following on from options shown in Figure 4-4 with the CBD at the centre.

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



Movement & Place Consulting

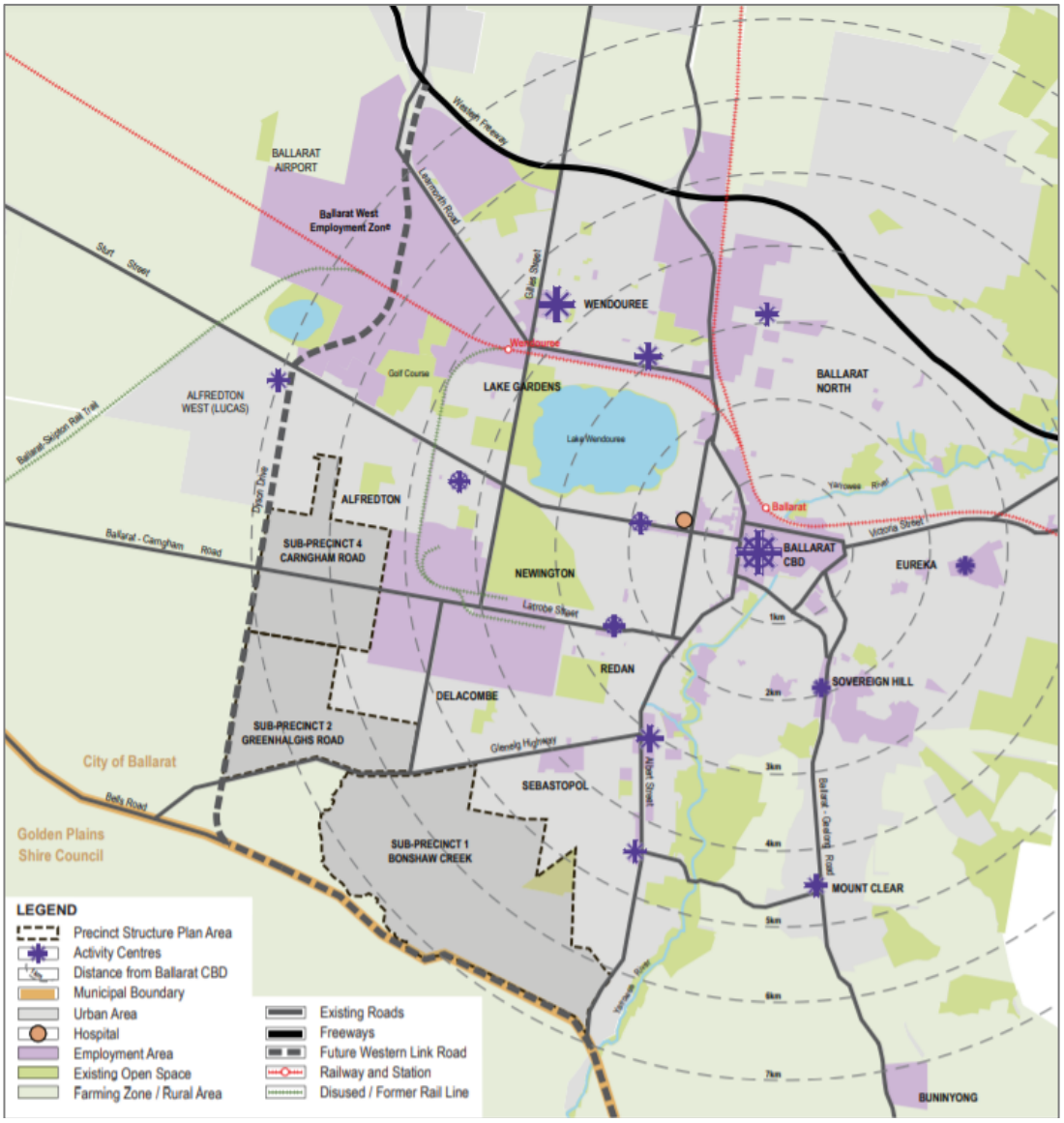
4.1.4 Servicing residential growth areas

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

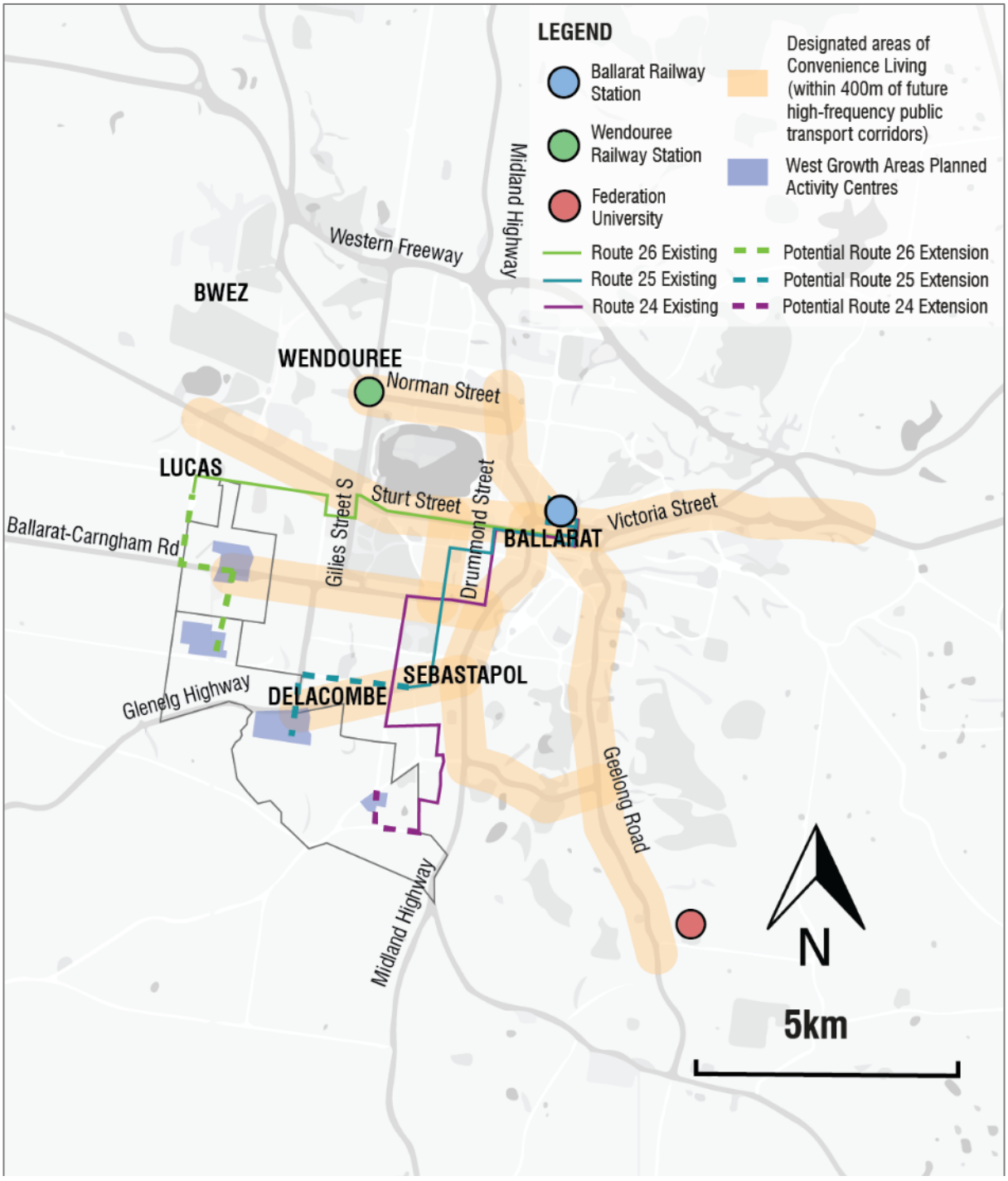


Source: Ballarat West Precinct Structure Plan

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.

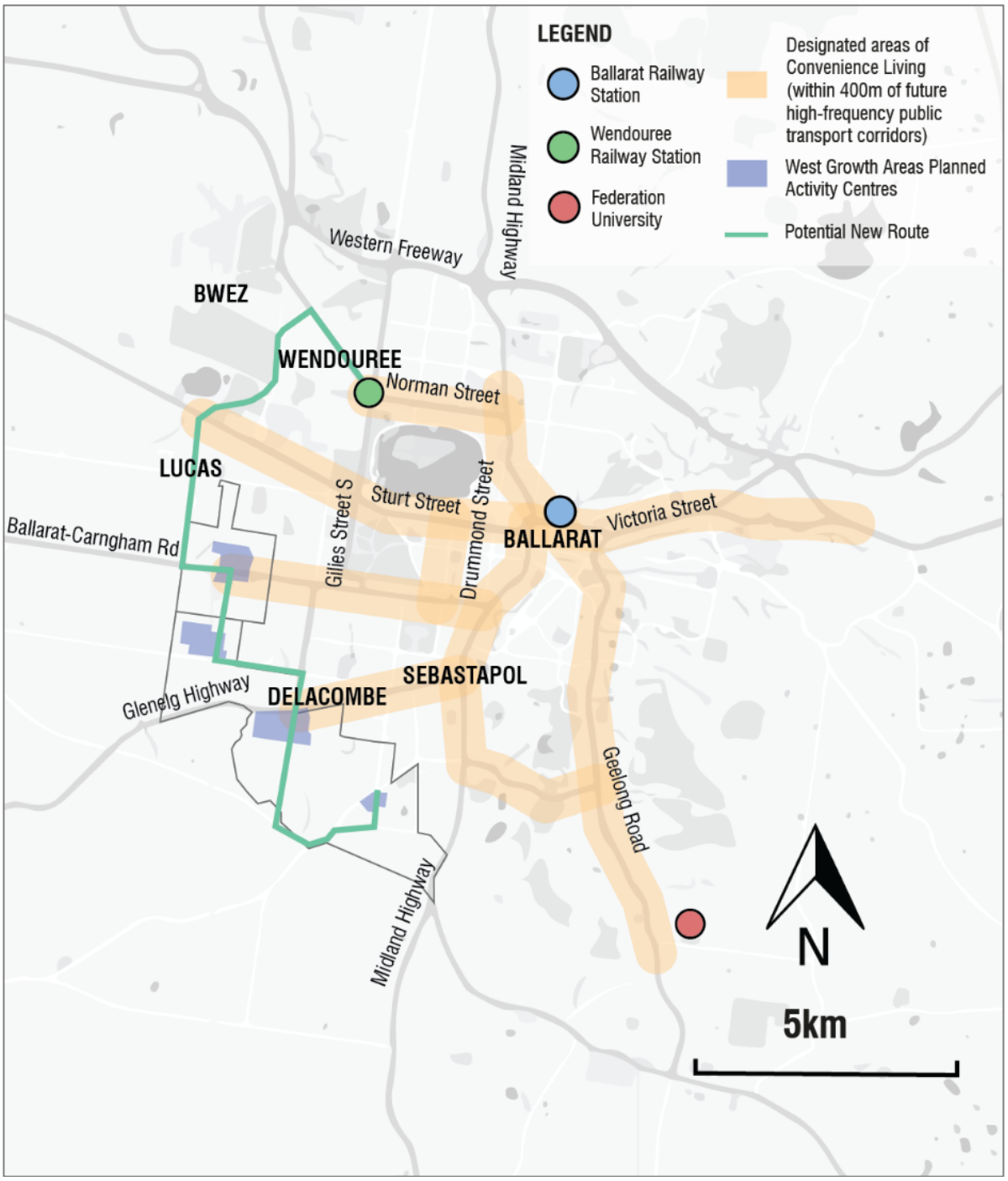
Figure 4-8: Potential New Alignment Comparison: Extensions of Existing routes or New Route



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.

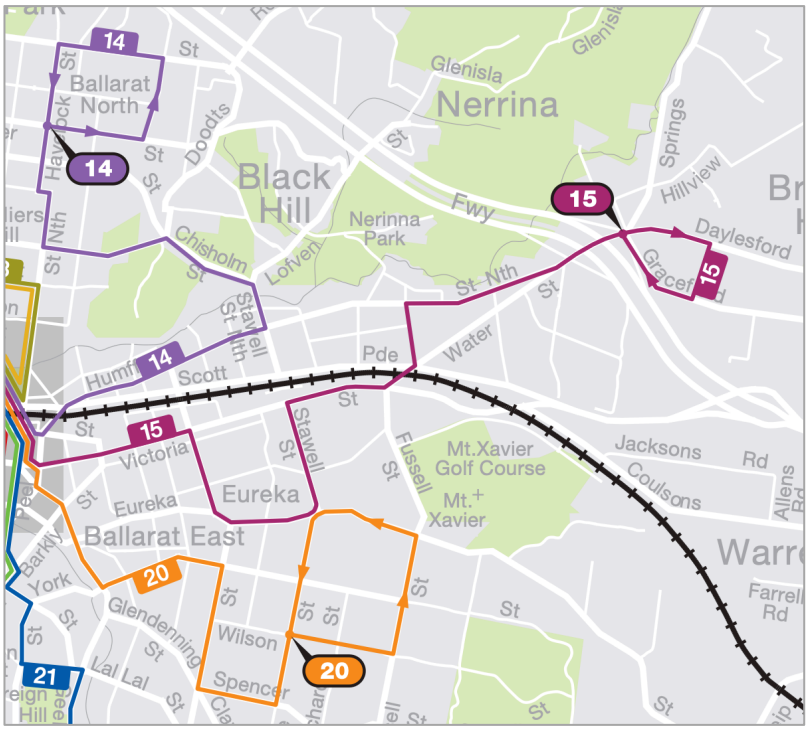
Based on these principles, there is significant scope for the network to be made:

- 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.

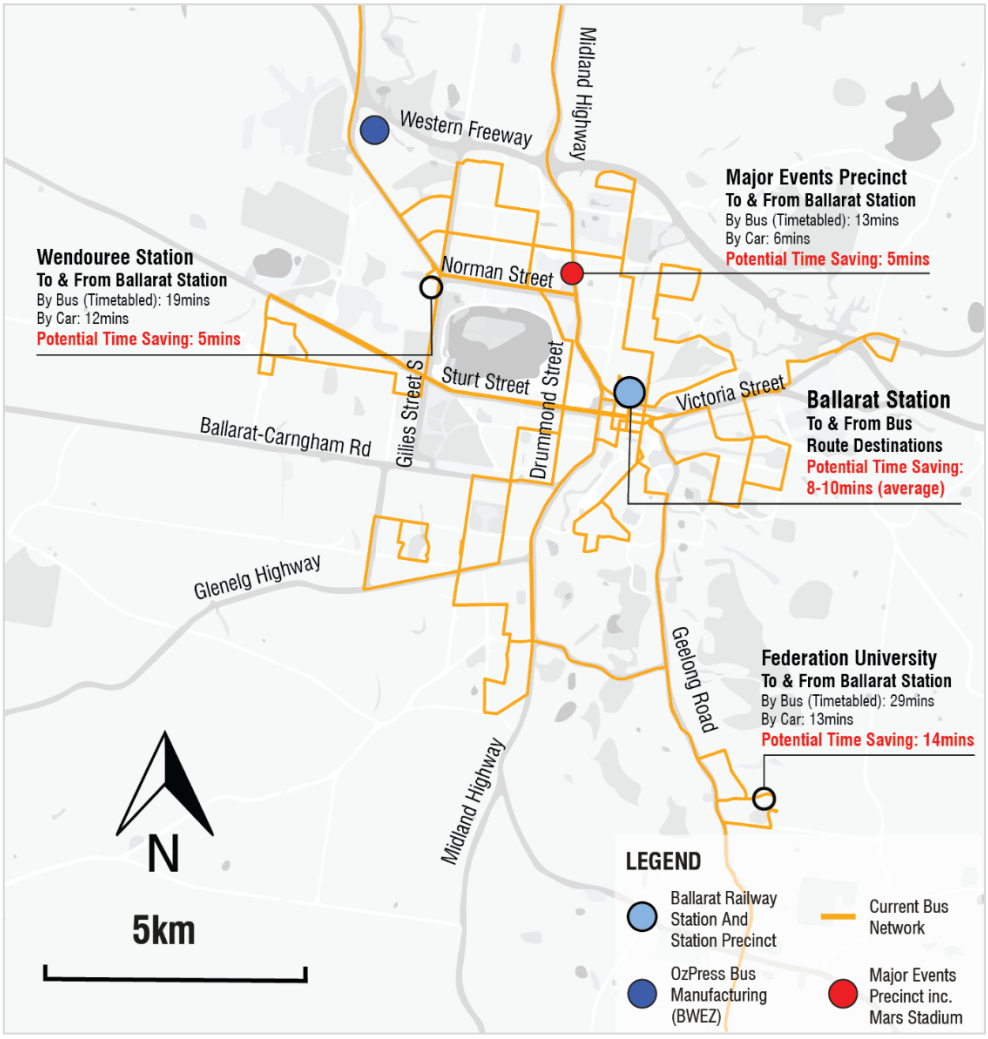
As a result, journey times are artificially inflated, making bus travel excessively uncompetitive against other modes of travel. The effects observed above can often happen on a single trip and highlights the need to tighten the timetables. In implementing a leaner timetable, there would be a reduction 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.

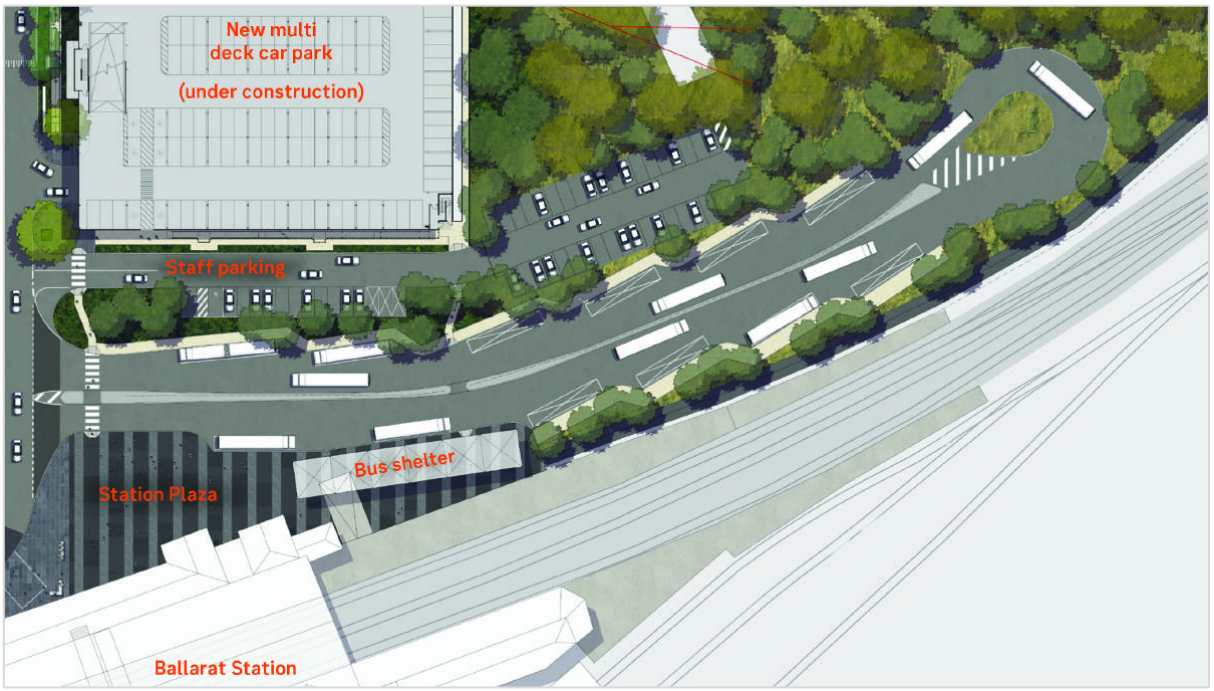
The DoT should investigate developing a high-quality bus terminus at Mars Stadium including high-quality (permanent and temporary) passenger waiting facilities for use during major events. Council has a role to advocate for these changes to ensure Mars Stadium is accessible by Public Transport.

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 years[2]). 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 years[3]). 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:

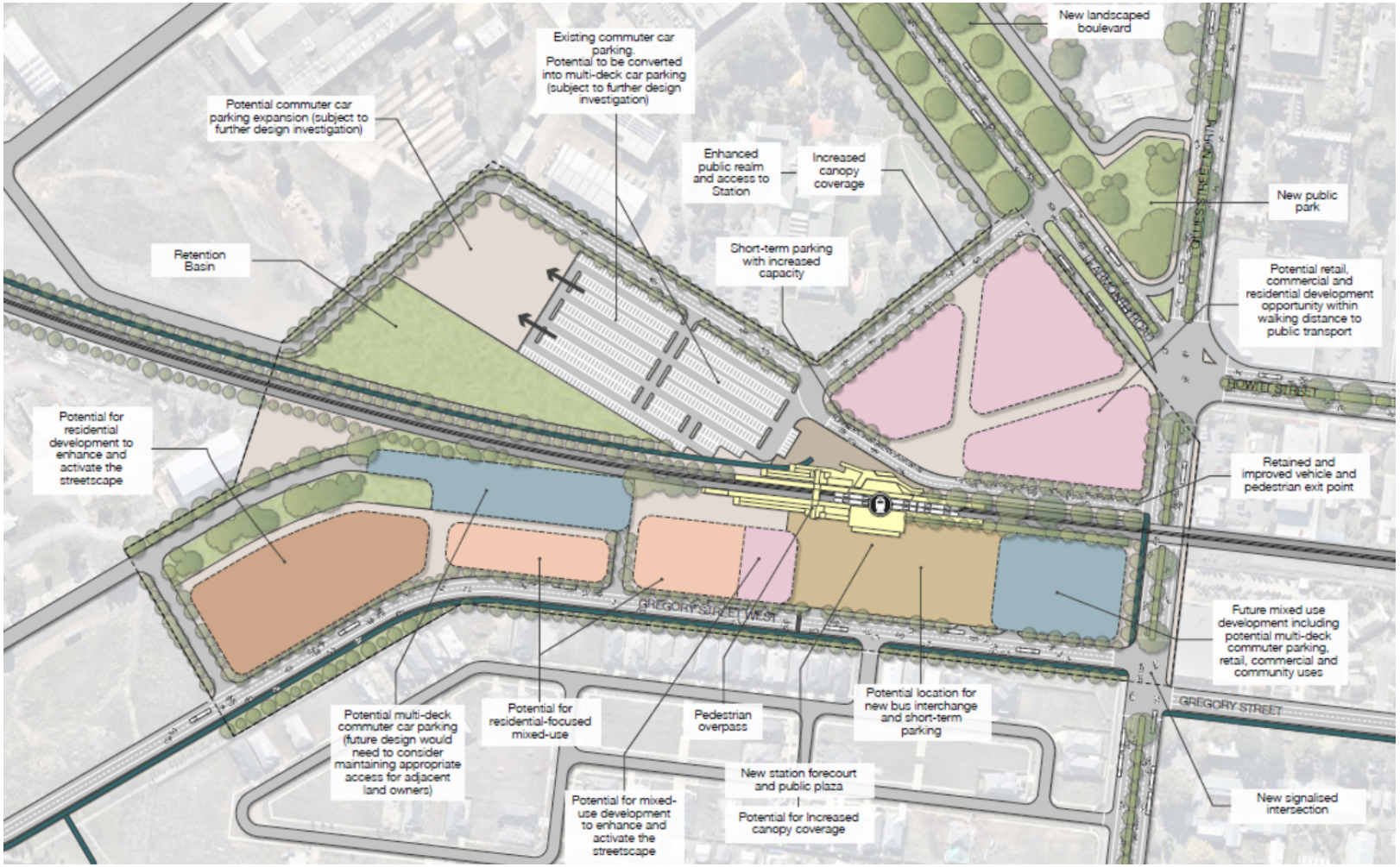
- Development opportunities for the revitalisation of the precinct including residential, retail and commercial opportunities;
- The function, usability and appearance of the precinct including a boulevard treatment of Learmonth Road; and
- Access and movement for pedestrians, cyclists, vehicles and 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.

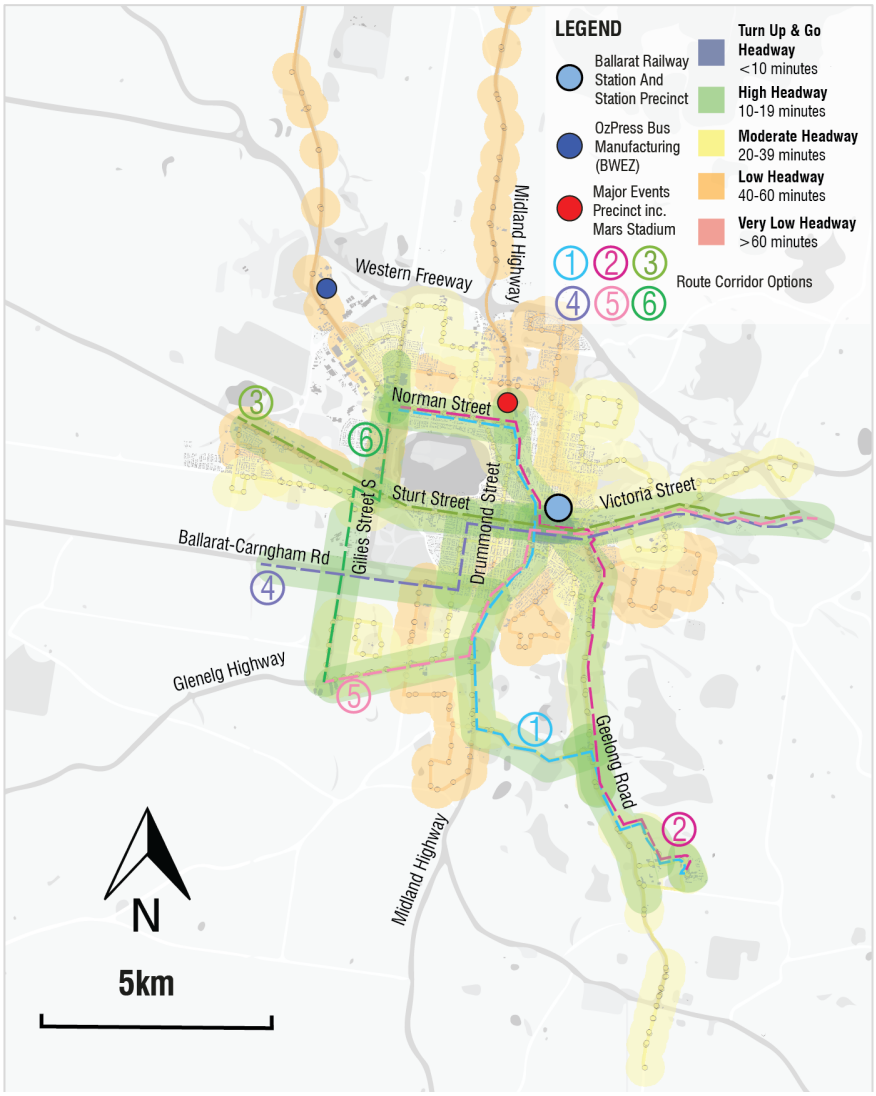
4.2 Stage 2 – Medium term (by 2030)

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.

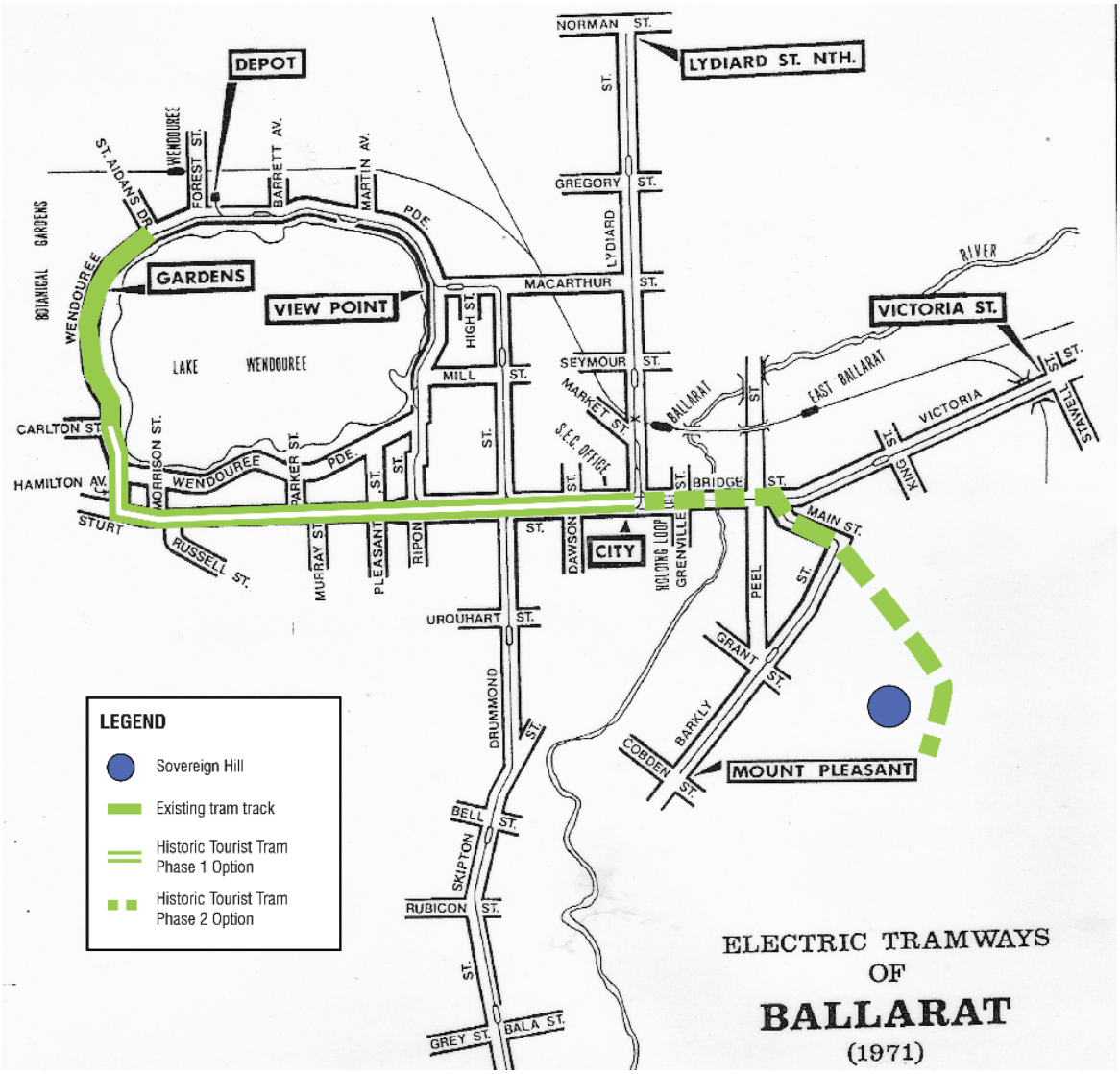
Sturt Street, the main thoroughfare of the city, has historically accommodated a tram service and could mark the fully-fledged return of the tram in Ballarat. This service will expose tourists and city dwellers to the Botanical Gardens and the Ex-Prisoners of War Memorial in Lake Wendouree to other services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

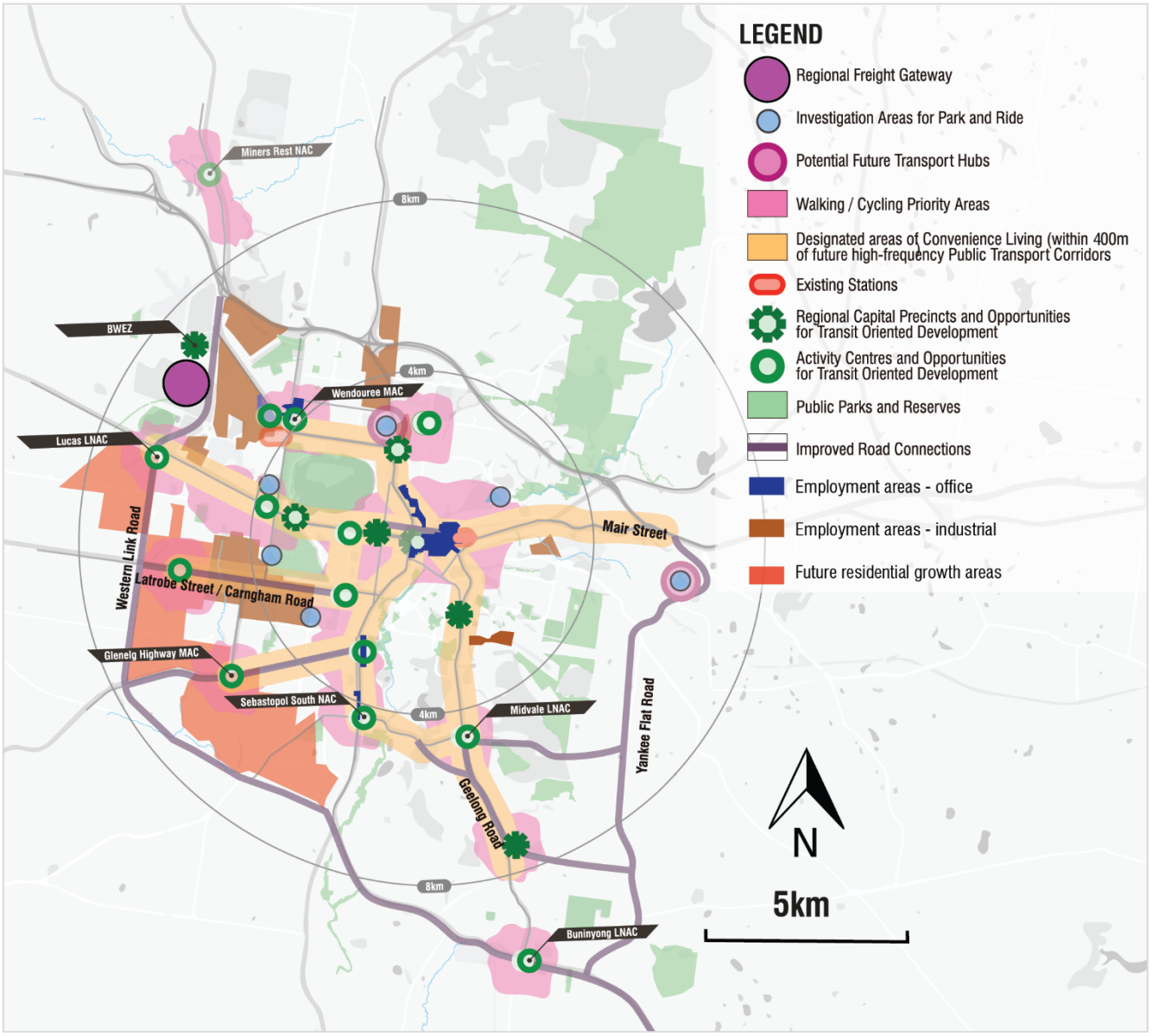
A key platform outlined in the Ballarat Strategy is the vision for a '10 Minute City'. Accessibility to local destinations and services need to be maintained as the city grows over time. Careful land use and transport planning decisions prioritising a compact urban form, promoting local neighbourhoods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

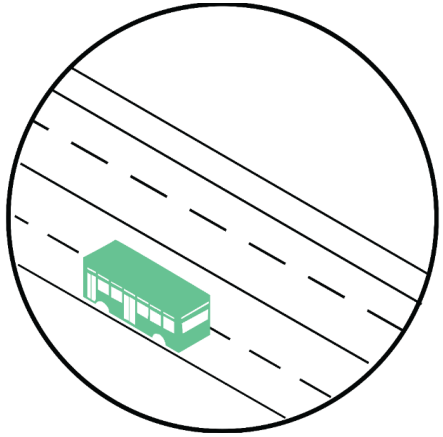
4.3.1 Higher frequency urban transit network serving Convenience living corridors

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.

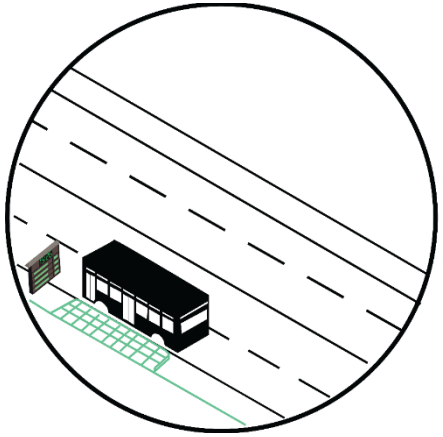
The Ballarat Strategy stipulates proactive measures will be taken to promote land use intensification along the corridors. Activation of these areas are expected to influence the urban transit composition in Ballarat over time. The progressive interaction of land use and transport, particularly in relation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

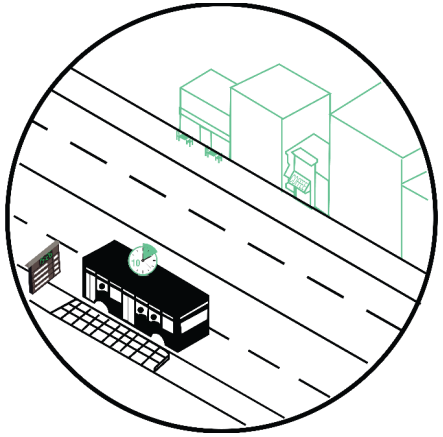
Figure 4-18: Stages of transport and land use development along corridors



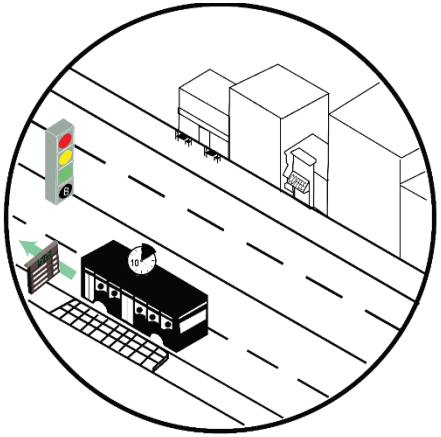
1. Bus services



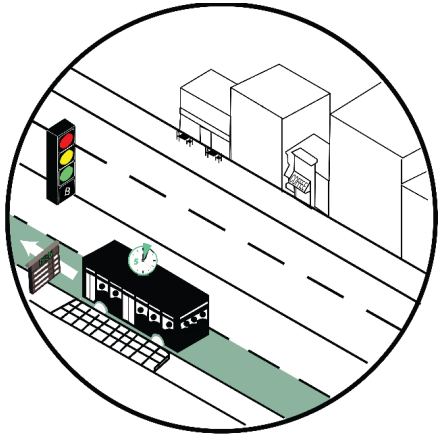
2. Wayside infrastructure provision including PIDS



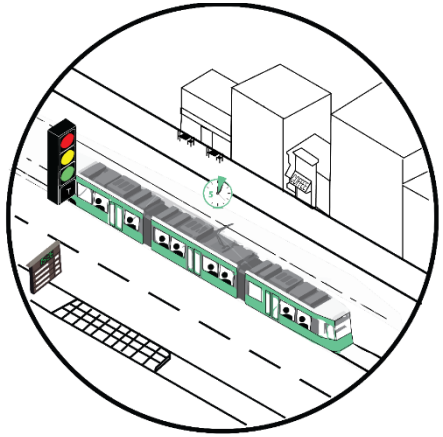
3. Higher levels of frequency (10 minutes or less)



4. Priority signalling infrastructure



5. Dedicated bus lanes and 5 minute headways



6. Tram services

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.

6. REFERENCES

City of Ballarat, SJB et al, 2014, *Ballarat Station Precinct Master Plan*, April 2014

City of Ballarat, 2015, *The Ballarat Strategy: Today, Tomorrow Together*, July 2015

City of Ballarat & Transport for Victoria (Victorian Government), SJB et al, 2019, *Wendouree Railway Station Precinct Draft Master Plan*, March 2019

Central Highlands Councils, 2010, *Central Highlands Regional Strategic Plan*, June 2010

Central Highlands Councils, 2014, *Central Highlands Regional Growth Plan – Background Report*, April 2014

Central Highlands Councils, 2014, *Central Highlands Regional Transport Strategy*, December 2014

Currie, G., & Loader, C. 2009, Exploring bus transfer behaviour in metropolitan Melbourne. Proceedings of the 32nd Australasian transport research forum (ATRF)

Department of Economic Development, Jobs, Transport and Resources (Victorian Government), 2016, *Connecting Regional Victoria, Victoria's Regional Network Development Plan*, May 2016

Department of Economic Development, Jobs, Transport and Resources (Victorian Government), 2016, *Victorian Visitor Economy Strategy*, July 2016

Department of Environment, Land, Water & Planning (Victorian Government), 2016, *Plan Melbourne 2017-2050*, 2016

Department of Health and Human Services (Victorian Government), 2018, *Home Ground Advantage Victoria's Major Stadia Strategy*, April 2018

Department of Transport, Planning and Local Infrastructure (Victorian Government), 2014, *Central Highlands Regional Growth Plan*, May 2014

Department of Transport, Planning and Local Infrastructure (Victorian Government), 2014, *Victorian Integrated Transport Model - City of Ballarat: Phase 3A Investigation*, July 2014

Infrastructure Victoria, 2016, *Victoria's Draft 30-Year Infrastructure Strategy*, December, 2016

Public Transport Users Association, 2018, *Connecting Ballarat*, October 2018

Public Transport Victoria, 2019, *Regional Bus and Train Timetables*, 2019

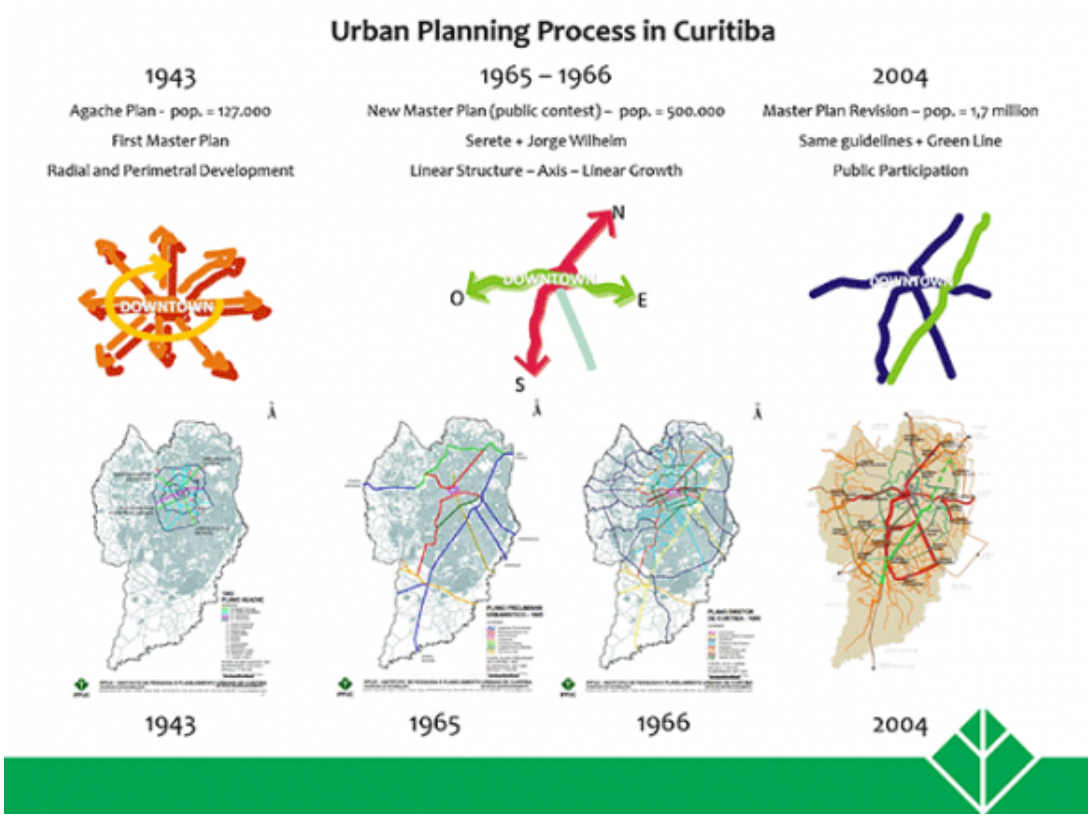
7. APPENDIX A: CASE STUDY – CURITIBA BRAZIL

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*

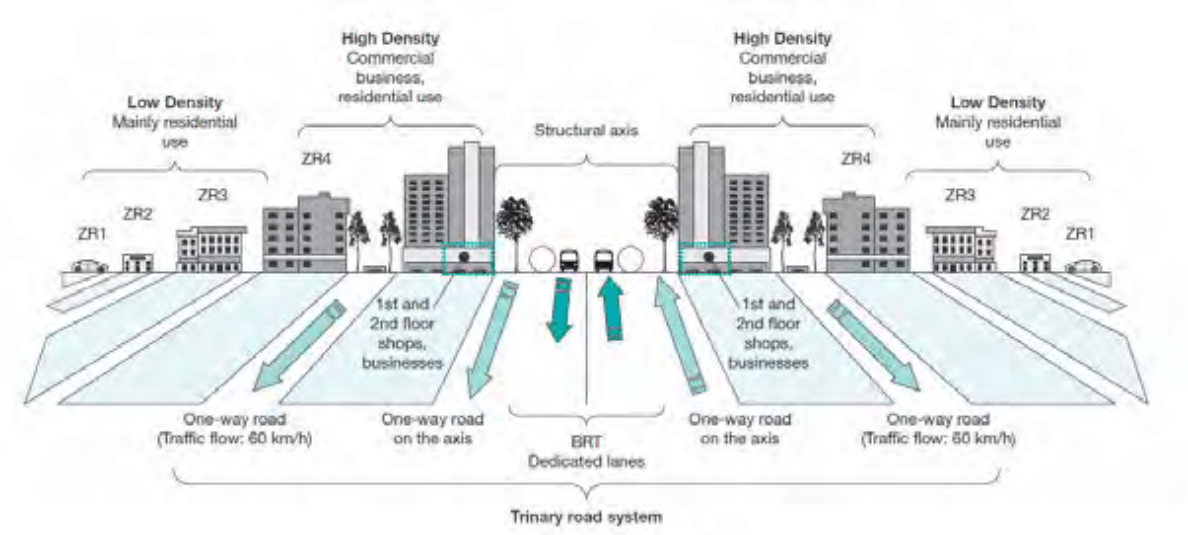
This difficulty in accessing work and services effectively slowed the economy. This demand for jobs in the economy however, demonstrated a threefold opportunity which the Bus Rapid Transit (BRT) system was able to meet:

- 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

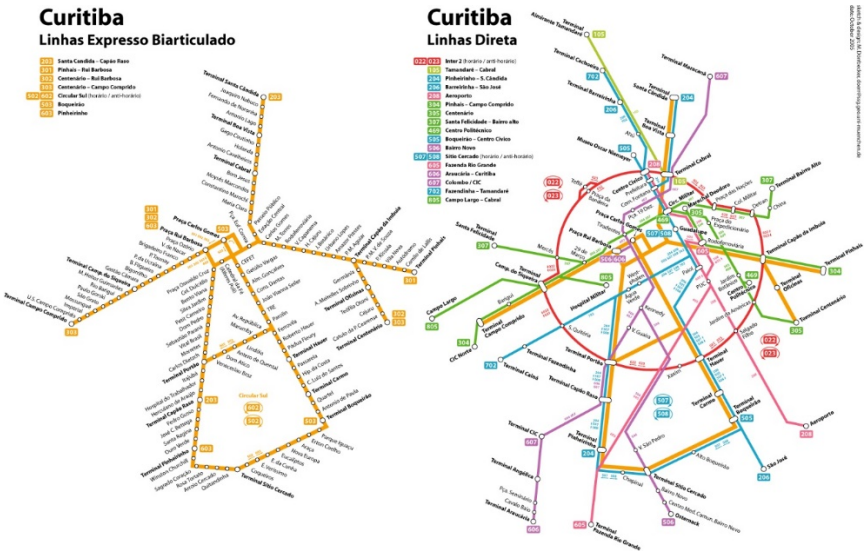


Source: *UN Habitat*, 2013

Figure 7-3: Cross-section of BRT corridor

Source: *University of Twente*

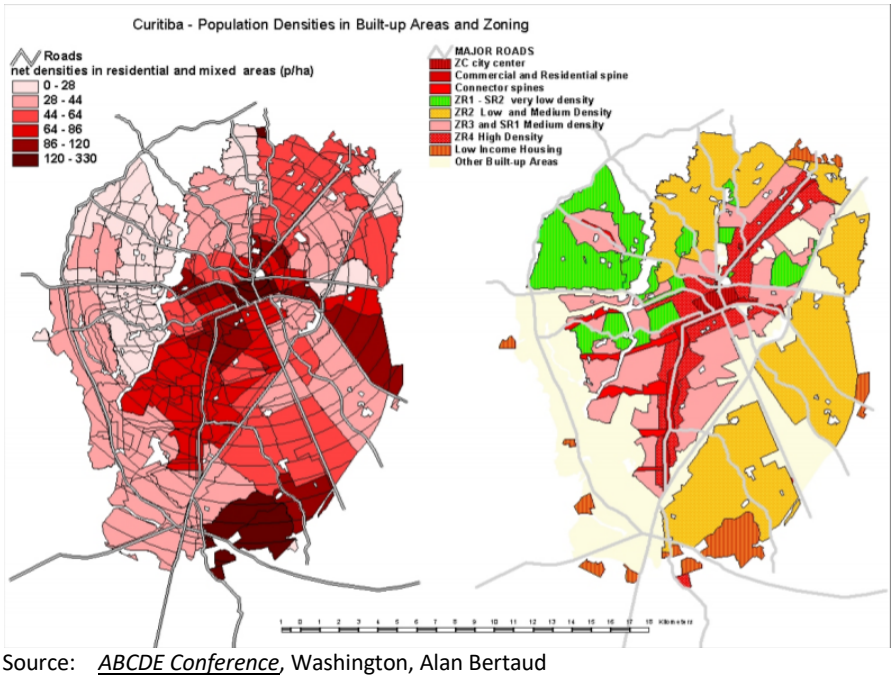
Figure 7-4: Network map of Bus Rapid Transit (left) and full bus network (right)



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***

CityMetric, John Ellege, 2016, ***What is Bus Rapid Transit – and why doesn't every city want one?***

Development Asia, 2016, ***What the World's First Bus Rapid Transit System Can Teach Us***

Reimagine, Joseph Goodman, Melissa Laube and Judith Schwenk, 2007, **Curitiba Bus System is Model for Rapid Transit**

Automotive World, 2016**,** **Curitiba, Brazil receives first Volvo electric hybrid bus**

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

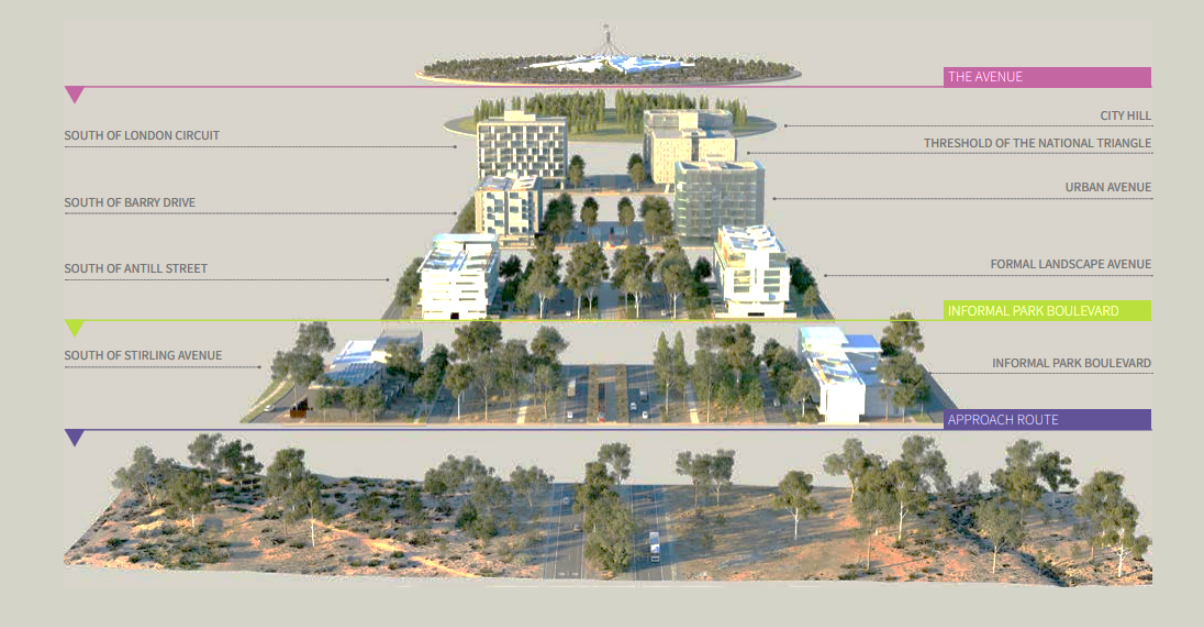
Background

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 began 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

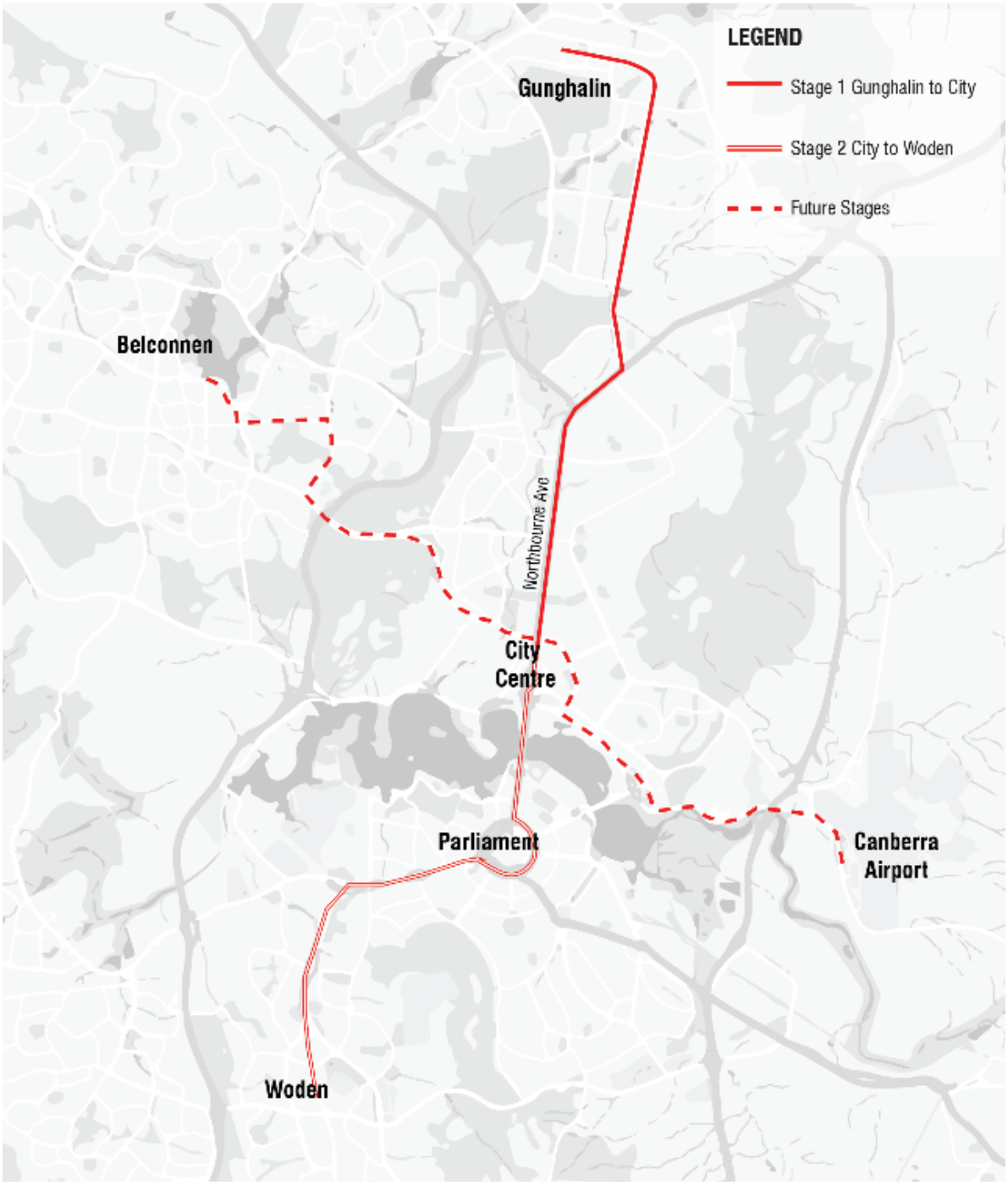


Source: NCA, City and Gateway Urban Design Framework, 2018

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.

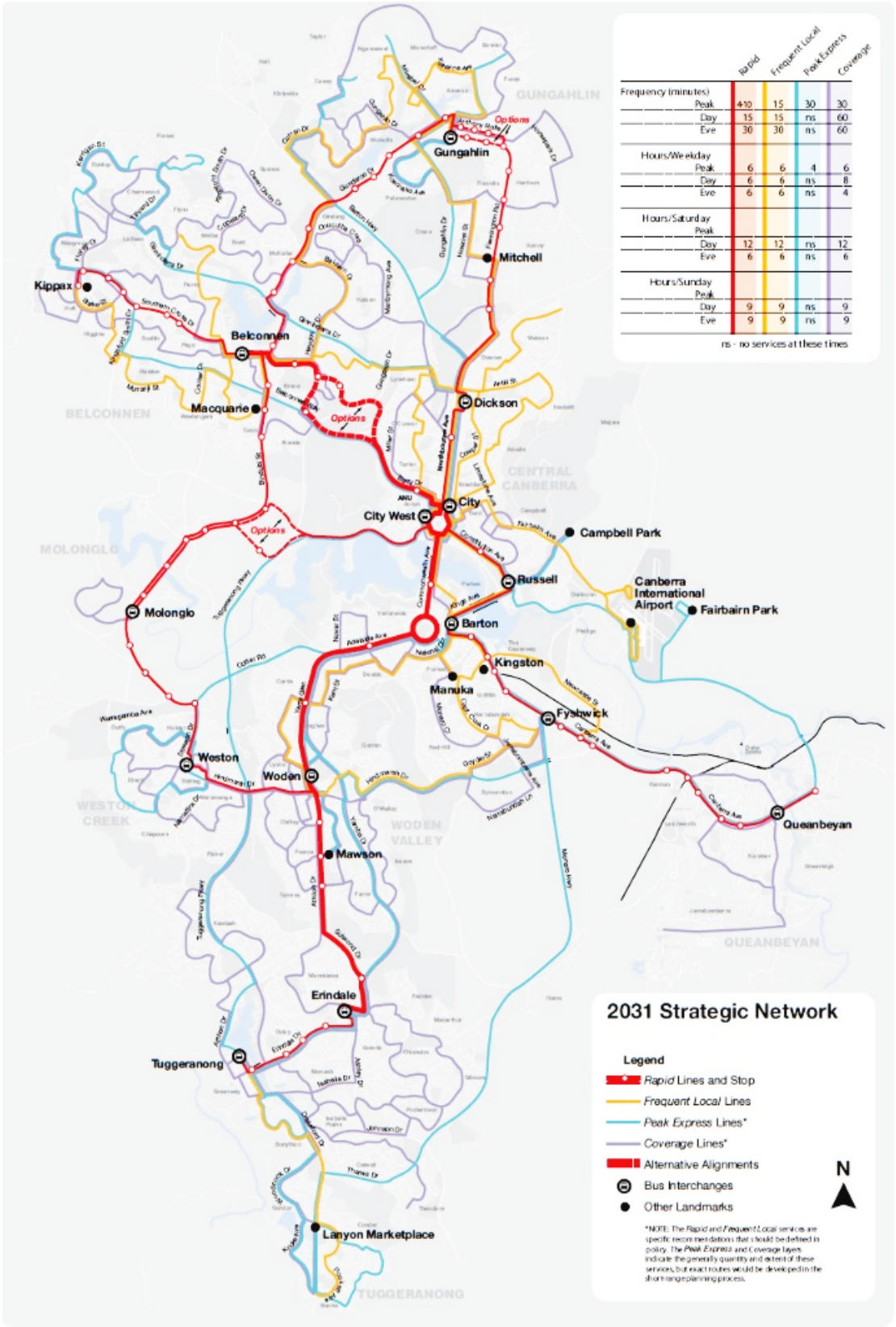
The launch of tram services redefined the urban landscape, forming the spine of the public transport network, the community was able to take full advantage of the high capacity high frequency tram routes. It further enabled for the reallocation of resources for people to catch public transport in more 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:

Australian Government, 2018, ***City And Gateway Urban Design Framework***, December, 2018,
ACT Government, Transport Canberra, 2019, ***How we Deliver Light Rail***,
ACT Government, Transport Canberra, 2019, ***City to Gunghalin Light Rail Project Delivery Report***, June, 2019,
Goh, K & Currie, G et al; 2013, Road Safety Benefits from Bus Priority – An Empirical Study, published in Transportation Research Record: Journal of the Transportation Research Board, No. 2352, Transportation Research Board of the National Academies, Washington, D.C., 2013, pp. 41–49.

Riot Act!, 2019, ***Millionth Passenger Boards Light Rail Amid Growing Uptake of Public Transport***, July, 2019,
ACT Government, Transport Canberra, 2019, ***Transport Canberra Light Rail Network Report***,