West Belconnen Integrated Sustainable Transport Plan

Final Report

Riverview Projects (ACT) Pty Ltd

Prepared by

MRCagney Pty Ltd

23 June 2014

MRCagney

Document Information

Project Name	**West Belconnen Integrated Sustainable Transport Plan**
Document Name	Final Report
Client	Riverview Projects (ACT) Pty Ltd
Job Number	5192
Prepared by	MRCagney Pty Ltd Sydney

Quality Assurance Register

Issue	Description	Prepared by	Reviewed by	Authorised by	Date
1	First Draft Issue (partial)	BSW/TC/SB/MW	SB/BW	BW	30/5/14
2	Second Draft Issue (complete)	BSW/TC/SB/MW	SB/BW/AR	BW	10/6/14Public
3	Final Report - First Issue	BSW/SB/AR	SB/BW/AR	BW	20/6/14
4	Final Report – Second Issue	BSW/SB/AR	SB/BW/AR	BW	23/6/14

www.mrcagney.com

Contents

List of Figures

List of Tables

Disclaimer

The development parameters, (dwelling numbers, stages etc.) referred to in this report may vary over time. The figures contained herein are estimates; they represent a good approximation of likely development outcomes to a sufficient level of accuracy for the purposes of this report.

Executive Summary

The Vision for West Belconnen

In June 2013, the ACT Government announced an agreement with Riverview Projects (ACT) Pty Ltd to facilitate the planning and development of new suburbs adjacent to the existing suburb of Holt in the ACT over the next 30 to 40 years.

The project's vision is to develop West Belconnen as a 21st century garden suburb: an affordable, diverse community that builds on the legacy of Walter Burley Griffin. The project is committed to the principles of sustainable development, and is a registered Green Star – Communities PILOT project.

MRCagney has been appointed to prepare an Integrated Sustainable Transport Plan (ISTP) for West Belconnen, covering a range of issues including public transport, cycling, walking, parking, car share and next generation transport. This plan will guide future development to enable West Belconnen to become a showcase of best practices and innovation in Integrated Sustainable Transport.

The Project Site

The West Belconnen planning investigation area straddles the ACT/NSW border and is located approximately 13km from Civic, or 15km when travelling via the existing road network. The site is approximately 1,600 hectares in size. It is proposed to set aside about 580 hectares of the site which includes the Murrumbidgee River and Ginninderra Creek Corridors to be maintained and managed for conservation, bushfire protection and recreation space.

The project has the potential to deliver up to 11,500 dwellings and accommodate up to 30,000 people. Approximately 6,500 of these dwellings will be in the ACT and the remaining 5,000 will be adjacently located in NSW.

Key Stakeholders

Riverview Projects (ACT) Pty Ltd is the project manager for the planning of West Belconnen, acting on behalf of the ACT Government with respect to the ACT land, and on behalf of the landowners within the NSW section.

The ACT Land Development Agency (LDA) is the ACT Government's development agency with respect to the ACT lands.

The Development Schedule

Assuming the timely approval of planning applications, the first residential lots in West Belconnen are expected to be available for purchase in 2016. Current planning indicates that the development of West Belconnen will occur at an indicative rate of 300 dwellings per annum. At that rate, buildout would occur in 2054, giving the project a 40 year development horizon.

Anticipated population has been calculated at a rate of 2.6 persons per dwelling, resulting in population growth of 780 persons per annum.

Developing an Integrated Sustainable Transport Plan

The focus of the ISTP is to provide a variety of mobility options suitable for different people at different times. The overall intent is to provide genuine alternatives to driving a private motor vehicle as often as possible. This represents a significant challenge for a greenfield community such as West Belconnen, located at the fringe of the developed form of Canberra as:

- Most families will need to own and use a motor vehicle due to the inherent nature of modern family life - taking children to weekend sporting activities, travelling to the supermarket or for weekend trips away. Alternative sustainable modes of transport need to be attractive, safe and efficient in order to reduce both the *need* to travel by car, and the *desire* to travel by car.
- Typically, the market for residential property in an area like this will be focused on low density housing which often does not generate a population catchment of sufficient size to achieve high utilisation of public transport.
- It is essential to create the right mix of residential density, retail opportunities, education and jobs in close proximity to frequent and useful sustainable transport services in order to create a viable transport option.
- At a service level, one of the primary determinants of the success of a route is its frequency. High-frequency services that arrive often enough so that people do not need to consult a timetable allow greater freedom and begin to offer convenience of travel closer to what owning a car does. However, high frequency services in urban fringe communities are uncommon and this is typically because the community has not been designed to be supportive of such service.
- In an Australian context, public transport services are heavily subsidised and there is a limit to how much service the public purse can fund. To ensure that the limited funds can be invested in an effective way, the design and layout of a new community has a responsibility to maximise the potential for the public transport that might operate within it.

Planning the Public Transport Network

The Ultimate Network

At the time that West Belconnen achieves buildout, it will be served by the "Ultimate" bus network, consisting of two Frequent Local, all-day bus routes, and two Peak Express routes. Each route will pass key destinations such as schools and the retail centre before exiting and then travelling by the external road network to Kippax Centre, Belconnenand/or Canberra CBD. These routes will serve bus stops proposed for 27 locations throughout West Belconnen.

In combination, these routes will provide coverage to over 90% of the community, and provide 32 buses per hour travelling in the peak direction in the peak periods (i.e. outbound to Belconnen and Civic in the AM peak hour).

Staging Service Provision and Funding

There is a commitment to the early provision of public transport services to West Belconnen, beginning as soon as the first residents move in. This is imperative to reducing the dependency on the private vehicle. With this in mind and cognisant of the fact that buildout is forecast to occur in 2054, it is recommended to implement public transport services for West Belconnen over four stages. Interim bus service and solutions for the horizons of 2016 (first residents move in), 2021 and 2031 have been developed.

Early Years (2016): As the population will be less than 1000 it is difficult to provide a viable public transport network at this stage. It is recommended to operate a shuttle bus service either engaging a private operator to run the service, or to negotiate with the ACT Government to provide a shuttle bus. This service will primarily

focus on providing peak hour services enabling commuters and students to access Belconnen and Civic, via connections at Kippax.

Early Years (2018): In the third year of development, the population of West Belconnen will exceed 2,000 people. At this point, it is recommended that ACTION operate the service as part of their regular operations, and be funded by the ACT Government.

Interim Years (2021): The population is forecast to reach 4,680 and the retail centre is likely to be developed along with the road network from Parkwood Road and connecting through to Stockdill Drive. Minimum recommended service frequencies are 15 minutes in the peak periods, and 30 minutes outside of peak periods, in accordance with the *Transport for Canberra* policy.

Interim Years (2031): The population of West Belconnen is forecast to exceed 12,000 people in 2031. Most of the land within the western part of the ACT will have been developed. Route FWB31 would operate in a figure 8 pattern and would cross over itself at the West Belconnen retail centre and travel through the developed areas to the north and west. The service would start and end at Kippax. Route PEWB31 is a proposed peak only express service that would operate inbound to Civic in the AM peak, and outbound from Civic in the PM peak.

Public Transport Infrastructure

The report provides detailed guidance on key design elements required for a successful public transport system which include the following:

Local Bus Stops: The design specification for the stops will be in accordance with ACT design standards DS013-1 and DS013-2.

Bike and Ride: A necessary feature for supporting intermodal transport between bicycles and public transport is the provision of secure bicycle parking. Bike & Ride features can range from bike cages and bike lockers to more standard bike rails. The design chosen often relates to the site specific visibility and activity.

Mobility Hubs: There is an opportunity in West Belconnen to create mobility hubs around bus stops. This involves integrating three modes into the bus stop (bus, cycle, car share) through the provision of appropriate cycle storage facilities and car share spaces. It also may include a community cycle repair stations in appropriate locations. An ideal location for a mobility hub would be integrated at the retail centre.

Retail Centre Major Stop: The retail centre is the major destination for internal travel within West Belconnen. The two bus routes will cross over at this point and accordingly will need to be designed to fit the centre and needs of the users. Each stop should have a clear platform length of 50m.

Bus Termini: There are two bus terminus areas proposed for West Belconnen. The key requirements are the means to safely turn the bus, safely park for longer periods away from residential areas or entry points to commercial areas, toilet facilities and close to a place where the driver can purchase food and drink.

Bus Priority Measures: Additional information is required from the concurrent traffic modelling study to determine the need and the most appropriate design for priority. This will be more fully informed as the project progresses. This report provides guidance on different ways priority can be achieved depending on the particular circumstances.

Park and Ride: The layout of West Belconnen has been developed to maximise the number of persons who are able to walk to the proposed bus services. Park and Ride may be self-defeating if the facility encourages persons to drive rather than walk to a bus stop. However, a potential location adjacent to the proposed retail centre has been identified and may be advantageous in the early stages of development.

Bus Depot: Territory and Municipal Services (TaMS) are currently investigating options for the development of new depots in Canberra over the next 20 years. A bus depot site in West Belconnen could be required by 2031.

Active Transport Planning

Another integral element of the sustainable transport system is the provision of a well-integrated active transport network. Active travel (walking, cycling and other non-motorised forms of transport) is the most sustainable form of transport. Linking people to open space, public transport, education, shops and jobs via a quality network of walking and cycling routes has a number of positive economic, social, health and environmental benefits for communities.

The active transport network has been planned to ensure that all the developable areas of West Belconnen are within 15 minutes cycling distance of key internal destinations. The size of the developable area limits the ability to locate all residents within the walking catchment of all key attractors. However, the majority of residents are within walking distance of local facilities and public transport stops.

The Proposed Active Transport Network

The proposed active transport network identifies the primary on-road (transport) cycle network but physically segregated routes as well as the primary community routes catering for both recreation and transport routes. Secondary routes will be based on a street by street design analysis based on the principles outlined within the body of the report.

The success of the active transport network also depends on the ability of the users to access destinations beyond West Belconnen. In developing the active transport network a key focus was to identify key cycling connections to Kippax and external destinations beyond the site.

Active Transport Infrastructure and Design

The success of the active transport network is in the way that it is designed and integrated into the development area. The report provides detailed guidance the following key design elements:

Street Connectivity It is proposed to establish a grid-like street pattern which supports high levels of connectivity. Many researchers have found that higher levels of intersection density (i.e. more intersections), and smaller block sizes create a denser network of streets which reduces the distances people have to walk or cycle from their origin to their destination.

Establishing Priority: To acknowledge the contribution that active transport makes to the well-being of people and places, consideration needs to be given to the walking and cycling requirements of streets and places prior to other modes as shown below.

Road User Priority Framework (RUPF)

TRANSPORT MODE	COST	MOVEMENT EFFICIENCY	CONSIDERATION
Walking	LOW	HIGH	FIRST
Cycling			
Public Transport			
Private Vehicle	HIGH	LOW	LAST

Street Hierarchy: Recognising that land use influences how people use streets it is recommended that the street hierarchy of West Belconnen be divided into Main Streets, Mixed Use Streets and Living Streets. The characteristics of each of these street categories is discussed in detail within the body of the report.

Designing for the Whole Community: A well designed and utilised walking and cycling environment is one that can be safely enjoyed by all members of the new community regardless of their ability. This is commonly referred to as the 8 years to 80 years concept.

Safety: is a key determinant for the type of travel and the route. To achieve a safe active transport network consideration must be given to a range of factors, including visibility, lighting, surveillance and a higher usage rate.

Perceptions of safety: particularly around cycling significantly influence the choice of transport. The design of the infrastructure is important as users have a high level of sensitivity to perceived safety. Pedestrians and cyclists often feel unsafe on shared `community routes' due to conflicts and cyclists can feel unsafe sharing the road with motor vehicles. West Belconnen supports on-road but physically segregated routes as shown in Figure 5.8 within the body of the report. Where appropriate and to capitalise on the physical environment and the location of the transmission easements, it may also be possible to provide scenic `community routes' within West Belconnen.

Treatment of Intersections: Intersections present an elevated safety risk for cyclists navigating either on-road or off-road bike paths and for pedestrians crossing the street. However, the adoption of a variety of treatment methods can help alleviate potential safety hazards and are shown in detail within the report.

Integration with Bus Stops: Two main treatment options are recommended for West Belconnen, depending on the whether the bus stop in question is indented or otherwise.

Early implementation of the active transport network to a stage that encourages its use is critical to avoid over reliance on private vehicles. Integral to this will be the need to ensure that at detailed design stage the critical elements are incorporated to ensure that pedestrians and cyclists are invited into spaces and assume priority over other modes of transport where appropriate. The staging of development will play a key part in the provision of services and the timelines to delivering the active transport network.

Car Usage

Although it may not be possible to eliminate the use of the private motor vehicle, the report identifies a number of initiatives to be implemented within West Belconnen to reduce the use of the private car, and potentially reduce the need for a family to purchase a second car. The report discusses car share schemes and parking initiatives and also discusses electric vehicles. Key Recommendations are summarised below:

Car Share Schemes: provide cars available for hire by the hour in locations throughout the community, which are useful for persons who may need to use a car infrequently. In order to facilitate car share there is a need to provide car share spaces in appropriate locations. Secondly, a model needs to be developed in order to make car share available once residents move to West Belconnen in order to provide a viable alternative to a second car. This would be an innovative and challenging step and the report explores a number of possible models which could be used to implement the scheme at the outset.

Parking initiatives: the report recommends that a broader precinct-based approach to parking should be considered. It is known from experience that parking should not be supplied on a `per site' or `per street' basis. Maximum parking rates should be used to control travel demand, particularly in areas where the use of public transport, walking and cycling can easily be encouraged as an alternative to driving.

Electric Vehicles: An electric vehicle (EV) is any vehicle that uses electricity as energy for propulsion. Electric vehicles are becoming increasingly viable for use in Australian urban areas. Whilst it is difficult to predict what

the uptake rate of electric vehicles will be, it is assumed that the current trends in the improvement in the technology is likely to generate increasing demand for ownership amongst the general public.

In order to facilitate the opportunity for future residents or visitors to operate an electric vehicle within West Belconnen, the report provides guidance on ways to allow for EV charging in homes and within commercial car parks and how to design and locate car parking spaces and infrastructure in order to accommodate EV if required.

Green Travel Plans

The opportunity presented by a greenfield development such as West Belconnen, in relation to sustainable travel, is that residents moving to the area are already making a significant change to their lifestyle. It is the perfect time to encourage new residents to also change their transportation mode reliance, and this will be assisted if a comprehensive Green Travel Plan (GTP) is in place. Given the staged delivery of the West Belconnen community over several decades, it is recommended that a GTP be prepared, changing as precincts move from planning, to delivery, to full tenancy, and capturing both the changes in the structure of West Belconnen, and also the available transport service offering.

1 Introduction

1.1 West Belconnen

In June 2013, the ACT Government announced an agreement with Riverview Projects (ACT) Pty Ltd to facilitate the planning and development of new suburbs adjacent to the existing suburb of Holt in the ACT over the next 30 to 40 years.

The total site area is approximately 1,600 hectares and straddles the ACT/NSW border. The project has the potential to deliver up to 11,500 dwellings and accommodate up to 30,000 people. Approximately 6,500 of these dwellings will be in the ACT and the remaining 5,000 will be adjacently located in NSW.

The project's vision is to develop West Belconnen as a 21st century garden suburb: an affordable, diverse community that builds on the legacy of Walter Burley Griffin. The project is committed to the principles of sustainable development, and is a registered Green Star – Communities PILOT project.

As part of this commitment, it is essential to ensure that the West Belconnen development excels in achieving sustainable transport objectives and fulfils its potential to become a showcase of best practices and innovation in the field.

MRCagney has been appointed to prepare an Integrated Sustainable Transport Plan for West Belconnen, covering a range of issues including public transport, cycling, walking, parking and car share.

1.2 The Key Stakeholders

Riverview Projects (ACT) Pty Ltd is the project manager for the planning of West Belconnen, acting on behalf of the ACT Government with respect to the ACT land, and on behalf of the landowners within the NSW section.

The ACT Land Development Agency (LDA) is the ACT Government's development agency with respect to the ACT lands.

1.3 The Site

The West Belconnen planning investigation area crosses the ACT/NSW border. The site is about 1,600 hectares in size. Of this, about half of the site is likely to be available for possible future development.

In recognition of the iconic natural features of the site, it is proposed to set aside about 580 hectares which includes the Murrumbidgee River and Ginninderra Creek corridors to be maintained and managed for conservation, bushfire protection and recreation space.

The site consists of the individual land holdings:

- ACT Blocks 1605, 1606 & 1607
- NSW Blocks Lot 1, 2, 3 & 7.
- NSW Neighbours Lots 4, 5, 61, & 62.

The south-eastern corner of the site fronts Stockdill Drive and is a linear distance of approximately 13km from the Civic, or a journey of 15km on the existing road network. From the nearest major centre at Belconnen, the distances are 6km linearly and 7.5km via the road network.

The elongated site, depicted in Figure 1.1, extends north-west from its south-eastern corner for a distance of approximately 6km. The site is.

Figure 1.1: Aerial View of the West Belconnen Site

1.4 The Development Schedule

Assuming the timely approval of planning applications, the first residential lots in West Belconnen are expected to be available for purchase in 2016. Current planning indicates that the development of West Belconnen will occur at an indicative rate of 300 dwellings per annum. At that rate, buildout would occur in 2054, giving the project a 40 year development horizon.

Anticipated population has been calculated at a rate of 2.6 persons per dwelling, resulting in population growth of 780 persons per annum. The number of dwellings completed, and the population of West Belconnen at yearly intervals is presented in Table 1.1 below.

Table 1.1: Completed Dwellings and Resident Population by Year

Year	New Dwellings	Total Dwellings	New Population	Total Population
2016	300	300	780	780
2017	300	600	780	1,560
2018	300	900	780	2,340
2019	300	1,200	780	3,120
2020	300	1,500	780	3,900
2021	300	1,800	780	4,680
2022	300	2,100	780	5,460
2023	300	2,400	780	6,240
2024	300	2,700	780	7,020
2025	300	3,000	780	7,800
2026	300	3,300	780	8,580
2027	300	3,600	780	9,360
2028	300	3,900	780	10,140
2029	300	4,200	780	10,920
2030	300	4,500	780	11,700
2031	300	4,800	780	12,480
2032	300	5,100	780	13,260
2033	300	5,400	780	14,040
2034	300	5,700	780	14,820
2035	300	6,000	780	15,600
2036	300	6,300	780	16,380
2037	300	6,600	780	17,160
2038	300	6,900	780	17,940
2039	300	7,200	780	18,720
2040	300	7,500	780	19,500
2041	300	7,800	780	20,280
2042	300	8,100	780	21,060
2043	300	8,400	780	21,840
2044	300	8,700	780	22,620
2045	300	9,000	780	23,400
2046	300	9,300	780	24,180
2047	300	9,600	780	24,960
2048	300	9,900	780	25,740
2049	300	10,200	780	26,520
2050	300	10,500	780	27,300
2051	300	10,800	780	28,080
2052	300	11,100	780	28,860
2053	300	11,400	780	29,640
2054	100	11,500	260	29,900

2 Sustainable Transport Planning

In the context of planning urban communities such as West Belconnen, a successful sustainable transport plan can be defined as:

The provision of an integrated suite of initiatives that minimises the dependence of residents and businesses on the use of the private motor vehicle.

In a greenfield community such as West Belconnen, located at the fringe of the developed form of Canberra, this is a challenging task. Most families will need to own and use a motor vehicle due to the inherent nature of modern family life - taking children to weekend sporting activities, travelling to the supermarket or for weekend trips away. However, there is a genuine opportunity to influence how people choose to travel (i.e. bus, cycle, walk) and how frequently they travel. Providing viable and safe travel alternatives to the private vehicle, such as catching the bus to work or cycling to school, which are linked to key destinations (e.g. shops, gym, library, health centre, work) will allow people to make decisions about how often they use their vehicles. It may then be possible to influence decisions on whether to purchase a second car.

Therefore, in the context of West Belconnen, a sustainable transport strategy not only looks at how people travel but also where they need to go. It will need to provide a variety of mobility options suitable for different people at different times, all with the intent of providing genuinely useful and convenient alternatives to driving a private motor vehicle as often as possible.

2.1 Components of a Sustainable Transport System

Public transport, cycling and walking are traditionally understood as the key components of a sustainable transport network, and these will form critical elements in the mobility systems provided for West Belconnen. However, modern sustainable transport planning extends well beyond accommodating these three modes and needs to encompass wider policy approaches that will reduce both the *need* to travel by car, and the *desire* to travel by car.

We believe that the following elements need to be considered and incorporated into the planning for West Belconnen to develop a successful sustainable transport system:

- **Influencing land uses to reduce the need to travel and to reduce the distance travelled.** Mixed use development increases the opportunity for local access to goods and services within the neighbourhood. Higher density development increases this probability of finding friends, goods and services within a walkable area. Land use planning for high quality schools, childcare, shops, playgrounds and sporting facilities within the neighbourhood will reduce the total need for travel. Less unnecessary travel increases sustainability, social capital, and useful time.
- **Influencing urban form and road network structure to optimise public transport effectiveness.** It is critical to ensure that public transport services are able to follow direct and efficient paths between key internal destinations and external linkages. Public transport vehicles need to be able to travel along paths that are no longer than those that would be travelled by private cars. Roads intended for public transport services need to be planned as the first element of the local road network, forming the spine around which all other roads and streets must connect.
- **Ensuring that road formations for public transport routes provide adequate capacity and priority for public transport vehicles** to ensure efficient movement and separation from traffic congestion. This may include provisions for the possible future upgrade of bus routes to light rail.

- **Planning bus stop locations as an integrated part of the development of pedestrian and cycle networks**, and ensuring that the access paths to the stops are logical, legible and appealing. Stop locations also need to be planned so that pedestrians are able to safely cross roads when accessing stops on the far side.
- **Providing quality public transport facilities at town and local centres** that are located so that they can be efficiently accessed without circuitous movement patterns. This can include locating these facilities on key frontages or within active spaces that also provide high visibility, creating a sense of presence (rather than attempting to hide the facility around the back of a site, adjacent to a loading dock, as has been attempted in the past).
- **Developing appropriately located Park and Ride facilities**. Park and Ride is undoubtedly an attractive option for many users of public transport services although their role is sometimes misunderstood by public transport purists. Park and Ride allows people to use public transport for a significant part of their journey, but still have the convenience of their own motor vehicle to move between home and a public transport stop. The placement of park and ride facilities is crucial, as the sites need to be positioned towards the interface between the community and the surrounding road network, so that motorists naturally travel towards it. It must also be located adjacent to a bus route offering frequent services, and on a road capable of handling the traffic it would generate in the morning and afternoon periods.
- **Ensuring that stop and station infrastructure is provided at a high standard**, allowing the public transport system to have an identifiable presence within the local community and to create an image of a professional, safe and appealing service being provided.
- **Providing public transport services that meet the needs of the community as it develops.** Servicing a new and growing community is challenging, particularly in the early years. By most standard planning principles, low population and low density communities do not generate high public transport ridership, making it difficult to justify the provision of service levels that will be useful and thus attractive. This is a common conundrum - the desire to provide quality service has to be weighed against the cost of its provision. The key to success is to provide as much service as can be justified, preferably above minimum standards, and incrementally and regularly enhance that service as the community grows.
- **Integrating a range of bicycle facilities into public transport stops and stations,** and recognising the different needs of different cyclists. This can result in a range of bicycle facilities being provided from secure cages at major stations through to casual bike racks at local stops.
- **Planning for the operational needs of public transport services as an integrated part of precinct planning**. Facilities such as bus layovers and turnarounds are critical elements in a successful public transport system. Failure to adequately plan for them can significantly impact the efficiency and effectiveness of public transport services. However, these facilities can be fundamentally unappealing in an urban environment, but if planned from the outset so that the local urban form can better accommodate their needs, many potential issues can be negated or reduced.
- **Designing path networks that accommodate the needs of different users**. Much of the planning of bicycle paths in the past has failed to consider the different needs of different user groups. For example, regular cyclists who commute long distances often express a desire to travel in bike lanes provided on normal roads rather than use off road bicycle paths due to their desire to move swiftly and their increased confidence in negotiating traffic. However, casual cyclists including families with children generally prefer facilities fully separated from vehicular traffic. Path networks also need to accommodate the mobility needs of the different types of pedestrians including mothers with prams, people in wheelchairs and mobility scooters.
- **Providing for alternative fuel technologies**. Hybrid and electric motor vehicles are becoming commonplace and accommodating them is not particularly difficult. New houses can be pre-equipped with necessary charging points in the garages, and car parks at commercial and retail sites can also be equipped with these facilities. The Victorian Government's *Guidance on Land-Use Planning for Electric*

Vehicle Parking and Charging, 2012 provides a good example of how appropriate provision and design can be addressed at the policy level. It provides guidance on numbers of car parking spaces, design and location. The preference is to prioritise these spaces and locate them close to entry points of shopping centres or other buildings.

- **Providing for car share schemes**. Car share schemes position cars in a variety of locations throughout the community, allowing their use on-demand by members of that scheme. In many cases, the availability of a car share vehicle can dissuade a business from buying a vehicle, or households from buying a second vehicle if their need is only sporadic. Car share vehicles can be deployed in residential areas, business precincts and at public transport stations and can allow a reduction of parking space provision by up to 20 spaces per car share vehicle available. There is emerging evidence that some users of car share schemes later progress to using public transport as they become aware of the incremental cost of car usage.
- **Allowing the use of lower car parking rates.** One of the easiest ways to encourage private car usage is to provide ample and free parking at destinations, and to build homes with large multi-car garages. In recent years there has been a trend towards reducing parking rates, in acknowledgement of the negative aspects of providing excess parking. Parking rates should not be determined in isolation of a sustainable transport strategy. It is imperative that people are provided with viable and attractive transport alternatives to the private vehicle before applying reduced parking rates to assist to achieve the desired outcome of reduced car usage levels.
- **Developing Green Travel Plans for local residents and communities.** The provision of quality services and infrastructure are an important step, but an active effort needs to be made to inform and promote them so that residents and visitors are aware of them and use them. Green Travel Plans (GTP) are commonplace in the UK but have yet to be commonly adopted in Australia. Workplace Travel Plans are also an important tool for employers and workers to improve their wellbeing and commercial performance. Companies in NSW such as Optus have reported improved staff recruitment and retention.

2.2 Transit Oriented Communities

2.2.1 Principles for Transit Oriented Communities

Urban density is the greatest indicator of the potential for public transport to be successful. In inner-city areas, urban planning aims to increase the density of development around public transport stations or along public transport routes. Often, this will be in the form of urban renewal projects aimed at leveraging the potential of land located adjacent to existing or proposed public transport corridors.

Achieving a high utilisation of public transport in a greenfield community located on the urban fringe is a significant challenge. Typically, the market for residential property in an area like this will be focused on low density housing and although small pockets of medium density development might be achievable, by and large West Belconnen will be typified as a low density residential community. This is further reinforced by the fact that only half of the overall site is available for development, due to the large areas of land set aside for environmental reserves in the Murrumbidgee River and Ginninderra Creek corridors, along with the substantial area of landfill in the centre of the site unable to be used for development.

Density is not the only factor which creates successful public transport outcomes but also the mix of land uses. It is essential to create the right mix of residential density, retail opportunities, education and jobs in close proximity to frequent and useful public transport services.

Whilst West Belconnen may exhibit low density development overall, the opportunity does exist to influence urban planning to maximise the number of people residing and working in close proximity to the public transport services, and in particular, the locations of every stop. If each stop is treated as a potential location for localised transit oriented development, with an intent to maximise local density close to the stop, higher density outcomes can be achieved in the locations where they matter the most.

This means that the development that does occur near public transport stops needs to consist of the highest trip generating land uses (denser dwelling types, retail centres), along with other uses for which close proximity to public transport stops is essential (such as retirement villages and schools).

Proximity alone will not be enough to ensure good outcomes, and needs to be supported by direct, legible and efficient pedestrian and bicycle access to the public transport service. This can be achieved by influencing the urban form of the community in terms of the location of the roads that public transport will use, stops, street network and path network. The overt provision of visible secure bike parking structures at generous rates and end of trip facilities such as change rooms and showers will enhance the legitimacy of cycling as a mode choice.

There also needs to be careful consideration of those areas of development that are not within the walkable catchment of a public transport stop. In West Belconnen, this will mostly occur in areas on the periphery of the development area, particularly the western edge where the undulating terrain near the river corridor limits development in some areas to long "fingers" of land leading towards the river. The impact of this on public transport accessibility can be mitigated in two ways. Firstly, any land outside the walkable catchment of the public transport system will be limited to lower density residential development, or other land uses that generate low transport demand. Secondly, the walking paths leading from these areas towards the nearest public transport stop need to be as straight and direct as possible, so that already long walk distances are not further increased by poor design.

At a service level, one of the primary determinants of the success of a route is its frequency. High-frequency services that come often enough that people do not need to consult a timetable allow greater freedom and begin to offer convenience of travel closer to what owning a car does. However, high frequency services in urban fringe communities are uncommon and this is typically because the community has not been designed to be supportive of such service.

In an Australian context, public transport services are heavily subsidised and there is a limit to how much service the public purse can fund. To ensure that the limited funds can be invested in an effective way, the design and layout of a new community has a responsibility to maximise the potential for the public transport that might operate within it.

The following example highlights how the layout of a new community can affect public transport outcomes.

Example

A hypothetical community of 10,000 people may be able to justify four bus services an hour, based on available government subsidy levels.

If the street network of that community is poorly planned from a public transport perspective with difficulty in routing buses close to where people live, four different bus routes might be required to achieve adequate coverage and each route would be operated once per hour. At such a low frequency, these routes would only be attractive to people who absolutely needed to use them and were able to plan their lifestyle around a bus timetable.

If a different street network was implemented, with development clustered around a single pre-planned public transport corridor, the entire community could be served by only one route, and it could be operated four times per hour. At this frequency, it becomes far more useful for a much larger number of people, always available within a short time from when somebody wishes to travel.

If a community like West Belconnen can be planned from the outset with the needs of the public transport system given a high priority in the planning process, a far more useful and attractive public transport offering can be provided for the same cost. Even if development has an averaged outcome of low density with pockets of higher density clustered at each stop, the focusing of services onto a small number of routes will achieve

outcomes rarely experienced in urban fringe development. In shaping the development of the community in this way, the outcome is a Transit Oriented Community.

2.2.2 Application to West Belconnen

The geography of West Belconnen fortuitously offers an opportunity to provide excellent public transport coverage through long continuous and relatively straight routes. Its elongated shape(approximately 6km by 3km), combined with the critical road link required for CBD travel (Drake Brockman Drive) at its south-eastern end provides the potential to achieve coverage of the community with only two bus routes to service the potential 30,000 residents. This ratio of one bus route per 15,000 residents is significant, given that the existing ACTION bus network operates on the basis of approximately one unique bus route per 5,000 residents.

This suggests that the bus routes provided in West Belconnen have the potential to be provided at three times the frequency of other typical suburban routes for the same level of subsidy per resident. Whilst the actual planning of Canberra's bus network follows more complicated business rules than this, the principle is sound, and if adopted on a citywide scale, would yield significantly better public transport outcomes.

To ensure that these outcomes are achieved, road network planning for West Belconnen has been undertaken in acknowledgement of the desirable locations for the bus routes to operate.

The proposed road network is shown in the Draft Structure Plan presented in Figure 2.1, in which the road network is shown in white and the transmission line easements are shown in green.

Figure 2.1: Draft West Belconnen Structure Plan

3 Public Transport Service Planning

3.1 General Approach

3.1.1 Planning Process

Planning for the West Belconnen bus network starts with developing the plan for the ultimate network, which consists of those services that will operate at buildout: when all development is complete and populated. By committing to a long-term plan from the early stages of development, the intention for the provision of public transport service into West Belconnen can be communicated to planners and prospective residents and business owners alike.

For planners, a committed service plan is something that can guide the development of each successive precinct over the coming decades, giving insight into the most appropriate locations for those uses for which public transport services bring the most value, such as pockets of dense residential development, businesses employing younger workers, schools or retirement villages / aged care facilities.

For prospective residents or business owners looking to locate themselves in West Belconnen, the service plan provides guidance about where and how much public transport service there will be in future years. This may help a family to select a new home based on close proximity to a bus service planned for five years in the future, when their currently-young children will be able to catch it to high school.

The ultimate network will also identify specific infrastructure requirements such as bus stop locations and bus terminus facilities. A committed plan provides planners with a better understanding of where and when this infrastructure will be required many years in advance.

With buildout forecast to occur in 2054, public transport services for West Belconnen will need to be implemented in a staged manner. An initial service offering will be gradually expanded in terms of coverage and frequency as each stage is completed. Development is planned to gradually spread from the south eastern periphery of the site moving northwards and westwards over time, with the final stages being the northernmost areas. Interim bus service and solutions for the horizons of 2016 (first residents move in), 2021 and 2031 have been developed.

3.1.2 Early Implementation of Services

As part of a focus on sustainable transport initiatives, there is a commitment to the early provision of public transport services to West Belconnen, beginning as soon as the first residents move in.

Without early implementation of public transport[1]:

- Residents develop a reliance on private vehicles.
- Households purchase a 2nd or 3rd car to cater for their transport needs.
- Density and design of developments is oriented towards private vehicles.
- Greater incentives will be required to encourage residents to utilise public transport once introduced.
- Residents without private vehicle access will be precluded from the community.

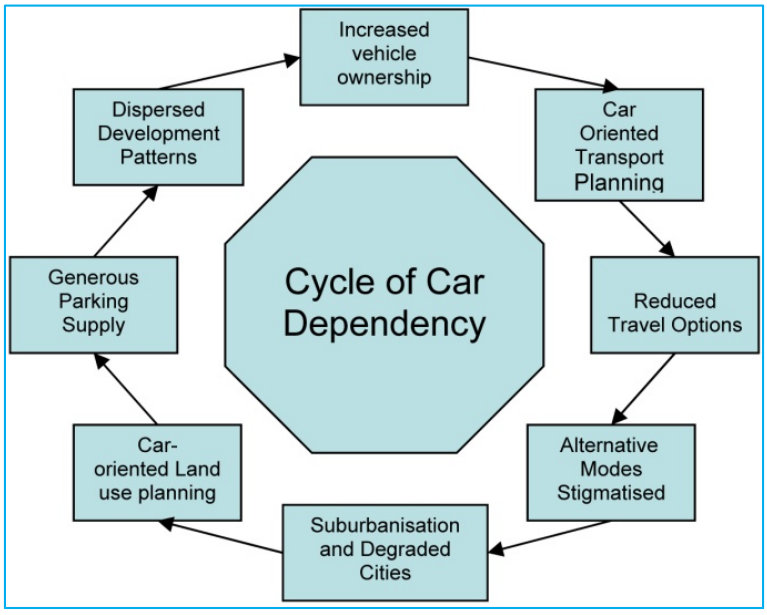
It is also implied that the absence of public transport provision into new residential areas often leads to high reliance on private vehicle usage, and reluctance to use public transport once the areas have matured, even if the public transport service levels increase.

[1] *Shaping Up Guidelines*, Queensland Transport

A study by Stanbridge, Lyons and Farthing[2], shows that residents moving to a new location meet two habitual factors that are required to change behaviour, these being a change to situational context and behaviour becoming more conscious and deliberate.

It is important at the early stage of the development that breaking the reliance on private vehicle use occurs. If the development is planned and designed with public or alternative transportation modes as the main form of transportation, it is much more likely to be able to reduce the dependency on the private vehicle.

Figure 3.1: Cycle of Car Dependency



The servicing strategy for West Belconnen includes staged implementation of public transport services from the time the first residents move in, indicatively 2016. A number of options exist for servicing in the earliest years.

3.1.3 Public Transport Mode

The public transport planning presented here has been undertaken on an assumption that public transport services will be provided by bus.

While this will certainly be true in the initial years, a degree of future-proofing is required in the design of the road network to accommodate the possible implementation of other public transport modes, such as light rail.

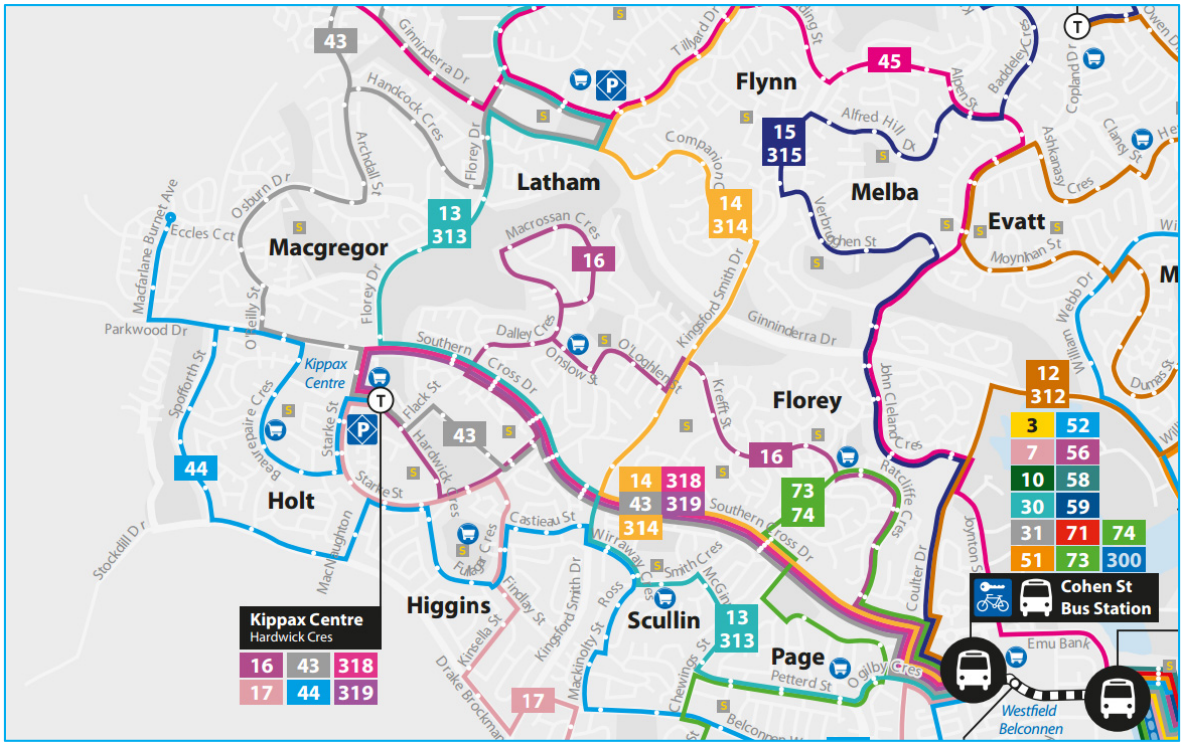
If light rail were to be implemented, it would most likely extend from Kippax Centre into West Belconnen via Parkwood Road. The most likely termination locations would be either the retail centre, or the northern end of the mixed-used precinct near the ACT/NSW border. Consequently, the design of Parkwood Road needs to provide adequate cross-sectional width for the possible future implementation of light rail.

[2] Stanbridge, Karen, Lyons, G and Farthing, S. 2005. Travel behaviour change and residential relocation. London : Department for Transport, 2005.

3.2 Existing Local Public Transport Services

A number of bus routes currently serve the suburban area to the east of West Belconnen. The existing ACTION local network is presented in Figure 3.2 below.

Figure 3.2: Current ACTION Local Bus Network



Source: http://www.action.act.gov.au/__data/assets/pdf_file/0008/330479/ACTION_BusMap2013_weekday.pdf

The most notable of the existing routes are the Blue Rapid services (Routes 313, 318 and 319) that travel from Kippax Centre to Belconnen via Southern Cross Drive, and continue to Civic and further destinations at a minimum of a 15 minute headways on weekdays.

Local bus Route 44 services Holt and West Macgregor, connecting them to Kippax Centre and then to Belconnen via an indirect suburban path. This route is a low frequency, hourly coverage service with minor improvements in frequency during peak periods.

Earlier consideration was given to whether an extension of Route 44 would be suitable for the early stages of West Belconnen. At the time, there was an expectation that early land releases would access Parkwood Drive, which would have provided a reasonably logical path for extending Route 44.

Current thinking suggests that early land releases will be located near Stockdill Drive. This location is far less logical as an extension of Route 44 as the additional deviation and travel time created would significantly impact the quality of service provided to existing passengers using the route. Additionally, the frequency of Route 44 is unattractively low.

To provide a more effective, useful and attractive service to West Belconnen, a staged implementation plan is presented in the following sections. This plan aims to provide dedicated services into the community that will evolve over time in response to the growing community's changing needs.

3.3 Long-Term Public Transport Service Plan

3.3.1 Ultimate Network Route Structure (at buildout)

3.3.1.1 All-Day Routes

It is proposed to service West Belconnen with two bus routes. In combination, these two routes will provide coverage to over 90% of the community. Each route will travel within the new West Belconnen area, passing key destinations such as schools and the retail centre, before exiting and then travelling by the external road network to Kippax Centre. These routes, presented in Figure 3.3, are as follows:

- FWB1. The route will commence at Ginninderra Falls travelling along Parkwood Road passing the mixed-use precinct and the retail centre before exiting West Belconnen onto Drake Brockman Drive which it will follow until McNaughton Street. The route will then travel along McNaughton Street to Kippax Centre. The route would be approximately 11.2km in length, and take approximately 24 to 27 minutes to travel from Ginninderra Falls to Kippax.
- FWB2. The route will commence on the eastern edge of West Belconnen near Ginninderra Drive. It will travel west through the community servicing the central and western areas before passing back alongside the retail centre. It will then exit West Belconnen on Parkwood Road, then travel along Southern Cross Drive to Kippax Centre. The route would be approximately 9.3km in length, and take approximately 22 to 25 minutes to travel from its terminus near Southern Cross Drive to Kippax.

Under the *Transport for Canberra* service hierarchy, the two routes would classify as Frequent Local. Each route will be provided at frequent service level, meaning a minimum frequency of 15 minutes in each direction at all times of day. Span of service will be from 0600 until 2100 as a minimum, seven days a week.

During peak periods, service frequency would be increased in accordance with demand. Initial transport modelling[3] suggests frequency of up to 6 minutes is feasible on each route.

On reaching Kippax Centre, buses could either:

- Terminate with passengers transferring to Blue Rapid services travelling to Belconnen and Civic; or
- Continue on to Civic via the Blue Rapid path, effectively adding to the Blue Rapid service frequency between Kippax and Civic. Estimated travel times to Belconnen and Civic are presented in Table 3.1.

Table 3.1: Estimated Travel Times from Route Termini in AM Peak Period (minutes)

Route	Starting Terminus	WB Retail Centre	Kippax	Belconnen	Civic
FWB1	Ginninderra Falls	17	27	40	64
FWB2	Southern Cross Drive	18	25	38	62

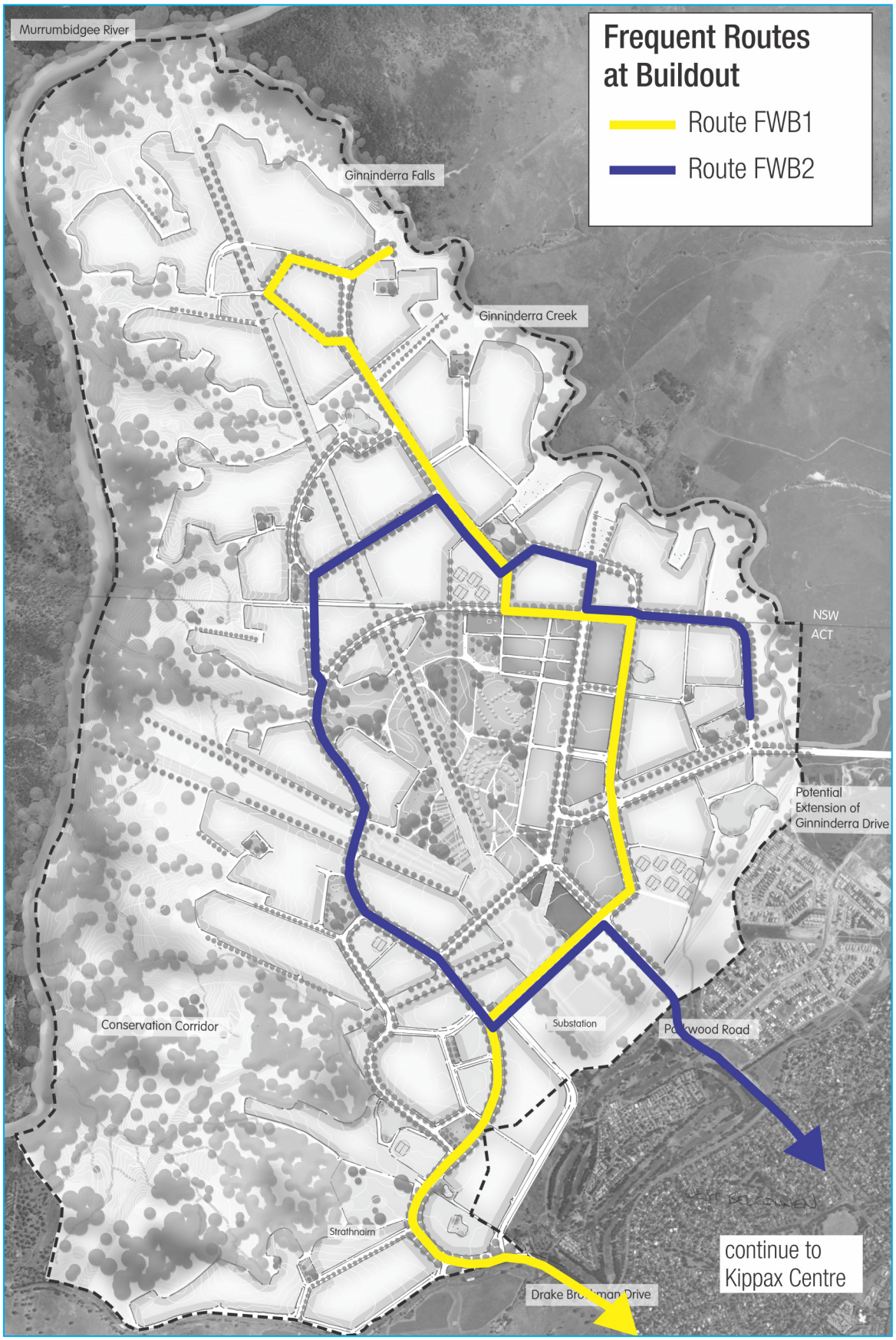
A combination of the two approaches could be used, with services in the peak continuing to Civic, but those in the off-peak terminating at Kippax.

The decision as to which approach to take will be determined in the coming years by ACTION based on uptake of the services provided and the overall operational framework planned for Canberra's bus network. For the purposes of planning West Belconnen as a community, either approach would yield an excellent outcome.

Initial and informal advice from representatives of ACTION and TaMS during the Planning Design Forum in November 2013, indicated that they were generally supportive of the network planning approach presented above.

[3] West Belconnen Summary Traffic Report, AECOM, June 2014.

Figure 3.3: Proposed Frequent Bus Routes (Ultimate Network – at buildout)



3.3.1.2 Peak Express Routes

Due to the very high demand in the peak periods to travel between West Belconnen and Civic, two additional peak express routes will be overlaid on top of the all-day routes. These routes, presented in Figure 3.4, are:

- PEWB1. This route will follow the same alignment as FWB1 within West Belconnen. Once it reaches Drake Brockman Drive, it will travel express to Civic via the fastest route available, most likely William Hovell Drive. The route would be approximately 24km in length, and take approximately 40 to 45 minutes to travel from Ginninderra Falls to Civic.
- PEWB2. Following the same initial alignment as FWB2, this route will not pass the retail centre, instead following the alignment of Route PEWB1 to travel to Drake Brockman Drive and then express to Civic via the fastest route available. The route would also be approximately 24km in length, taking approximately 40 to 45 minutes to travel to Civic.

The frequency of these routes will be determined based on demand, although initial strategic modelling suggests that a frequency of 10 minutes would be supportable. Inbound services in the AM peak would operate over a span of 60 to 120 minutes, with the first inbound service likely to depart West Belconnen before 0700.

3.3.1.3 Modelling Outcomes

Strategic transport modelling has been completed by AECOM in a complementary study[4], based on the Canberra Strategic Transport Model (CSTM) which is built in the EMME software platform. Modelling was completed for the AM peak hour, for the buildout land use scenario combined with the anticipated 2041 land uses and road network external to West Belconnen. This represents a bringing forward of the buildout of West Belconnen, but is an appropriate approach given the long-term horizons of this strategic assessment.

In the model, Routes FWB1 and FWB2 were both extended to travel from Kippax to Belconnen and Civic. Summary level results are presented in Table 3.2 and Table 3.3. Full details of the modelling process and outcomes are presented in the AECOM report.

Table 3.2: Forecast AM Peak Hour Bus Patronage Departing West Belconnen (buildout)

Route	Services per Hour (peak direction)	Forecast Patronage per Hour Departing WB
FWB1	10	447
FWB2	10	396
PEWB1	6	647
PEWB2	6	422
Total	**32**	**1,912**

These patronage forecasts at the route level suggest highly successful outcomes. Increased frequency on the peak express services may be viable, or the use of larger (articulated) buses may be necessary.

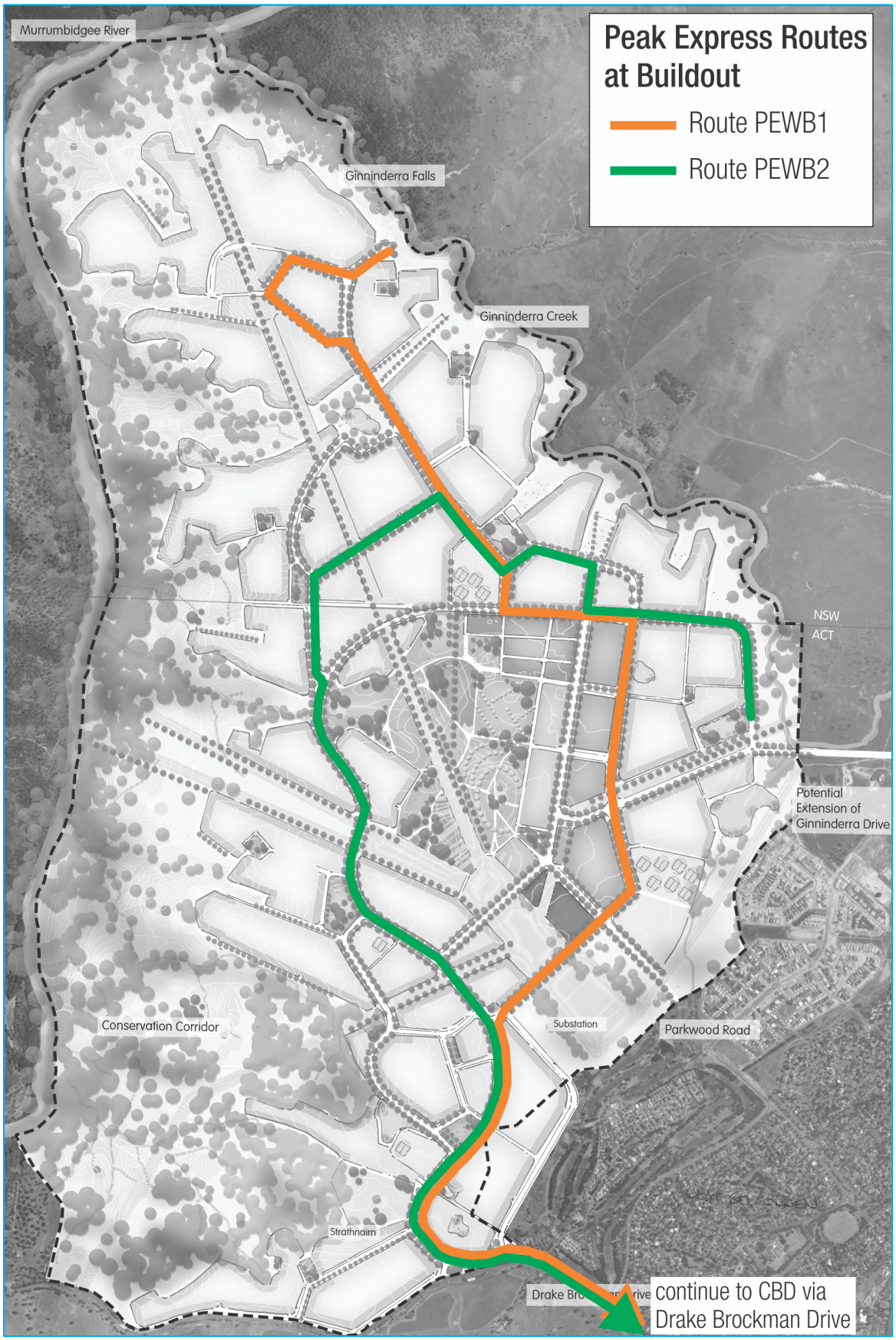
[4] West Belconnen Summary Traffic Report, AECOM, June 2014.

Table 3.3: Forecast AM Peak Hour Mode Shares for Motorised Modes Departing West Belconnen

Link	Vehicles per Hour	Car Passengers per Hour	Bus Passengers per Hour	PT Mode Share
Drake Brockman Drive	1,889	2,078	1,516	42%
Parkwood Road	845	930	396	30%
Ginninderra Drive	820	902	0*	0%
Total	**3,554**	**3,909**	**1,912**	**33%**

No services are proposed to travel on Ginninderra Drive. A lower frequency coverage route was tested in the model, travelling along Ginninderra Drive towards Charnwood and Gungahlin. Patronage response on this route was extremely poor, and too low to justify the route. The primary reason for this route not succeeding is that unlike the other bus routes which travel towards highly attractive destinations in Civic, Belconnen and Kippax, persons departing via Ginninderra Drive are travelling to a diverse range of destinations and no single bus route will be able to meet the needs of these people. Those persons would need to travel to either Kippax or Belconnen and transfer to other routes to reach their ultimate destination.

Figure 3.4: Proposed Peak Express Bus Routes (Ultimate Network – at buildout)



3.3.2 Bus Stop Locations

3.3.2.1 Requirements

The placement of local bus stops is critical, to ensure that maximum accessibility to services by residents and visitors can be achieved with the minimum number of stops (as increased numbers of stops result in slower journey times). Table 3.4 presents the rules and criteria contained within the ACT Estate Development Code.

Table 3.4: Rules and Criteria for Bus Stops - Section 2.2 of the ACT Estate Development Code (October 2013)

Rules	Criteria
R4 At least 90 per cent of dwellings proposed for the estate comply with at least one of the following: a) are within 500m of a bus stop on an existing or proposed coverage route. b) are within 800m of a bus stop on an existing or proposed frequent network.	C4 The location of bus stops achieves all of the following: a) a reasonable distance from all dwellings in the estate. b) reasonable way-finding. c) convenient access for users.
There is no applicable rule.	C5 Bus stops are provided in locations that achieve all of the following: a) passive surveillance from adjoining areas. b) minimal impacts on adjoining land uses. c) links with the path network. d) passenger convenience.
R6 Bus stops on coverage routes and frequent local service routes are located not less than 400m apart.	C6 Bus stops are located to achieve legibility and convenience for passengers.
R7 No bus stop is more than 100m from another bus stop serving buses travelling in the opposite direction on the same bus route.	C7 Bus stops are located to achieve legibility and convenience for passengers.

Rule 4 is worth noting as it acknowledges, at a policy level, that a higher effective catchment is achievable when frequent services are provided, reflecting a willingness to walk further to a more frequent service.

Rule 6 is arguably overly restrictive. A *minimum* stop spacing of 400m is quite high for an urban setting. It is suggested that this distance measure should be used as a guideline rather than a fixed rule, as the geographical and topological constraints that exist on a development site may require stops to be located closer than 400m in certain locations. If physical restrictions exist around where stops can be placed, not being permitted to place a stop less than 400m from the previous one may result in its location being further away, reducing the effective catchment of the bus system. It is more important to strategically position stops based on the adjacent urban form, with preferred locations being:

- Near cross streets (to maximise walkability).
- Adjacent parks (to minimise impact on adjoining property).
- At bends in the route (to maximise coverage).
- At major attractors (schools, retail centres).

These considerations are philosophically aligned to the intent of Criteria C6 in Table 3.4.

3.3.2.2 Proposed Stop Locations

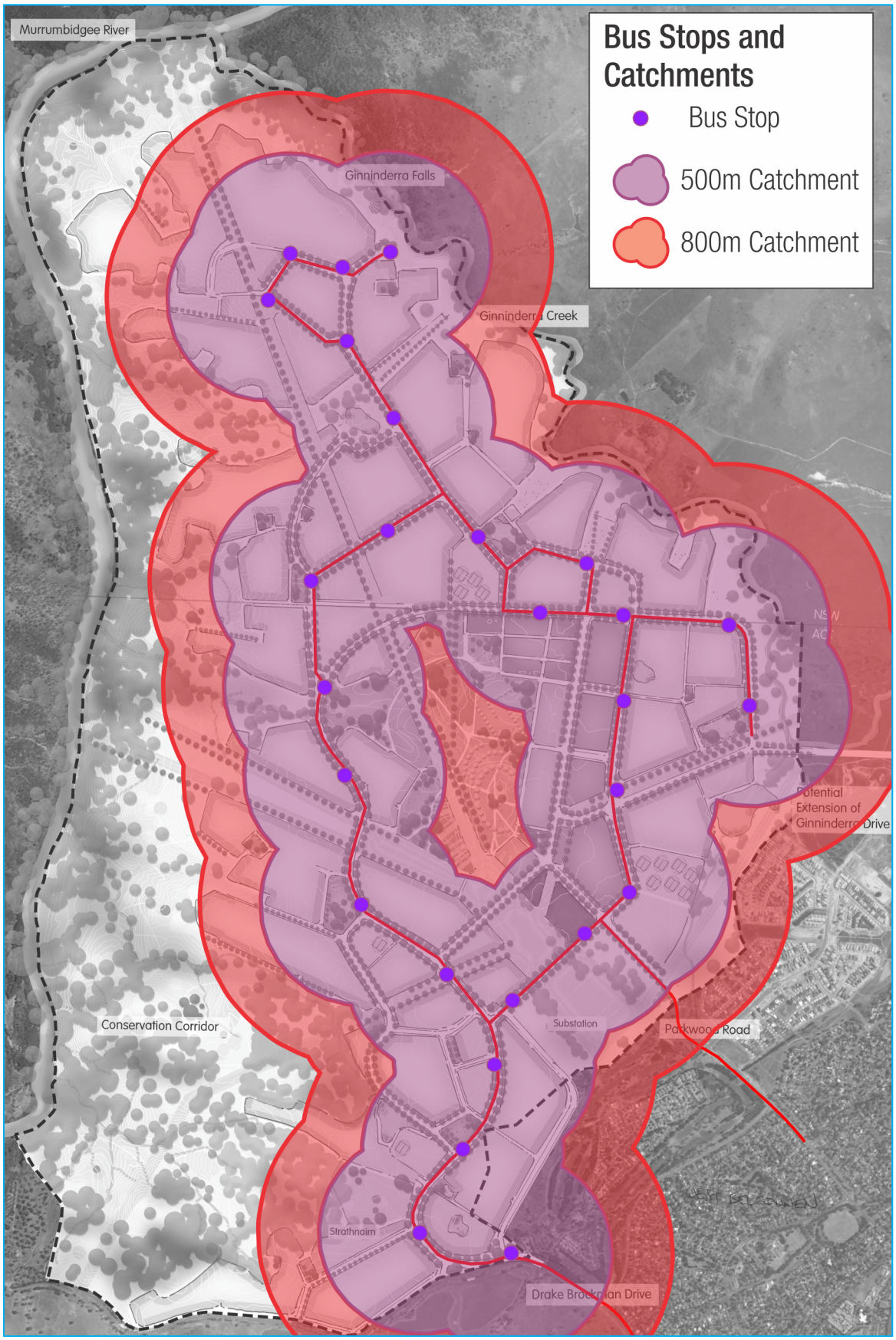
Bus stops are proposed to be provided at 27 locations throughout West Belconnen. These locations are presented in Figure 3.5, along with the 500m and 800m bus stop catchments. The majority of residents will be located within 500 metres of a bus stop.

The desire to use public transport is often dependent on the quality of the pedestrian and cycle environment to and from the bus stop.

Pedestrian routes to bus stops should be direct, provide facilities like shade and seating along the route for comfort, be generally wide and flat, incorporate pram ramps at the kerb edge and be visually permeable for safety (CPTED) reasons.

For cyclists, the provision of end of trip facilities such as bicycle parking (as outlined in Section 4.1.2.1) will be required.

Figure 3.5: Proposed Locations of Bus Stops and their Effective Catchment (Ultimate Network – at buildout)



3.4 Short-Term Servicing Strategy

The Ultimate Network presented in Section 3.3 is planned to operate in the final stages of the development of West Belconnen as it nears buildout. It relies upon the completion of the internal road network as far as Ginninderra Falls. However, bus services provided from the outset should be considered for the reasons outlined earlier in this report. Commercial viability in the very short term may be outweighed by the desire to prevent car dependency and multiple car ownership trends becoming established.

West Belconnen will be developed over a period of up to 40 years. Development is planned to commence in the southern precinct near Strathnairn House and gradually progress northwards through the site. Current planning suggests that development within the ACT portion of West Belconnen will be mostly complete before development commences within New South Wales with the exception of land in the vicinity of the Parkwood Eggs site (located in stage 29 as shown on Figure 6.11).

Based on staging and proposed land release information available to date (referred to in Section 6.11), interim bus service implementation plans have been developed and are presented here. In general terms, the likely staging of service implementation would be:

1. Initial shuttle services operating to/from Kippax.
2. Enhancement of shuttle service into a regular local ACTION bus route service, still focussed on Kippax.
3. The addition of peak express services direct to Civic (routed via William Hovell Drive).
4. Extension of the local services to Civic via Kippax as part of the Blue Rapid corridor.

3.4.1 Early Years (2016-2020)

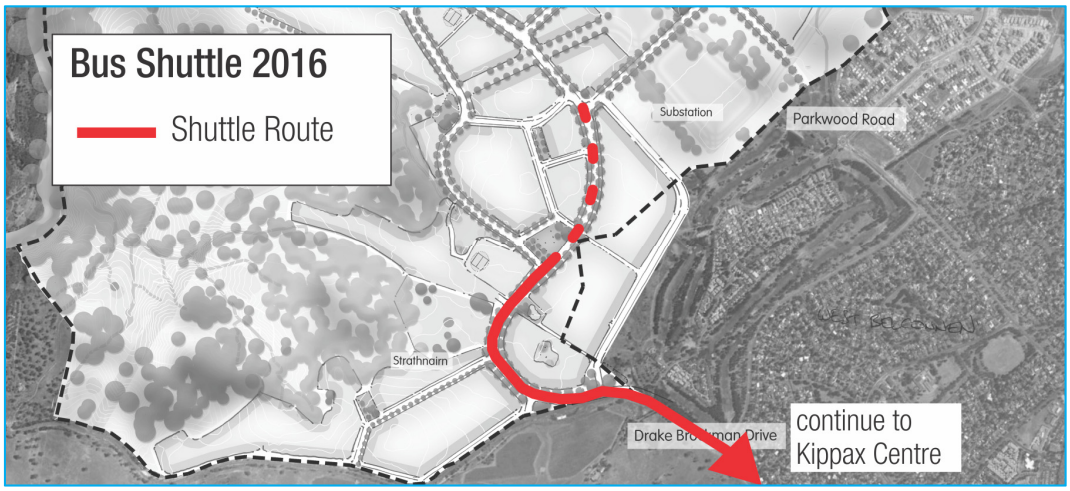
3.4.1.1 Shuttle Service

During the very first stages of West Belconnen's development, population will be very low, growing at 780 residents per annum. Construction of the road network will be in its early stages, providing limited connectivity. The intention for the early years is for a simple shuttle service to operate connecting to Kippax Centre and travelling as far in to West Belconnen as is possible at the time. The service would be extended regularly as the residential area expands and the road network grows.

Kippax provides a logical destination as passengers will be able to transfer to the Blue Rapid services that travel to Belconnen and Civic. On its way to Kippax Centre, the shuttle bus service will be routed along Starke Street and will travel past Kingsford Smith School.

Importantly, this initial shuttle route will follow the path of the future Route RWB1 presented in the Ultimate Network. It will grow into a more complete route over time, as presented in the staging plans for 2021 and 2031. Seeding this future route in this way establishes community expectations of the future transport service, and brings a sense of permanence to what will be an evolving bus route. It also allows bus stop infrastructure to be constructed to a high standard from the outset, in the knowledge that the bus stop locations will not change.

Figure 3.6: Bus Shuttle Route for Early Years



In the early years, the primary focus is on providing peak hour services enabling commuters and students to access Belconnen and Civic, via connections at Kippax. Proposed service frequencies are presented in Table 3.5 below. Operating as a shuttle, services would operate in both directions at all times as the vehicle needs to return to or from Kippax in the counter-peak direction anyway.

In the first year when the population is less than 1,000, it is difficult to justify services outside of the peak periods. Demand for the services would be very low and the cost per passenger carried most likely would be commercially unviable.

Table 3.5: Recommended Shuttle Service Frequencies (2016-2020)

Year	Population	Peak Frequency (0700 to 0830, 1700 to 1830)	Interpeak Frequency (0830 to 1700)	Services per Day per Direction
2016	780	30 minutes	-	8
2017	1,560	30 minutes	60 minutes	16
2018	2,340	30 minutes	60 minutes	16
2019	3,120	15 minutes	30 minutes	32
2020	3,900	15 minutes	30 minutes	32

3.4.1.2 Service Provision and Funding

3.4.1.2.1 Years One and Two

In the first one to two years in particular, the provision of regular ACTION bus services using full-size buses is not recommended, for three primary reasons:

- Patronage yield will be low, and the provision of full-size buses would result in them mostly running near to empty. The image of empty buses can trigger a psychological response that a bus service is unsuccessful, resulting in reduced acceptance and willingness to use it.
- With the road network still being constructed, there may be limited locations for buses to turnaround. The use of full-size buses may create operational difficulty.
- The ACT Government may be unwilling to fund services when the population is very small. Funding would be required to pay for ACTION bus services at commercial rates including the purchase of a full-size vehicle as the ACTION fleet is highly unlikely to have spare vehicles available.

Two primary options present themselves: engage a private operator to run the service, or to negotiate with the ACT Government to provide a more appropriate vehicle type.

The first option would involve the contracting of an alternative transport service provider be considered for the first one to two years. Organisations ranging from commercial operators through to not-for-profit entities would be able to provide the service using smaller vehicles, and most likely at a cheaper rate than ACTION. A local operator based in Kippax, Belconnen Community Services, has already expressed interest in providing the initial service and this is an option that should be investigated further.

The second option becomes viable if the ACT Government is willing to provide the service with the developer contributing to its cost, using vehicles of appropriate standard (size, age and DDA compliance). Given the known budgetary and fleet constraints that exist in the ACT at present, this may be difficult to negotiate, but discussions with the ACT Government should be held to at least explore the possibility. It may be possible that the smaller vehicles used by ACTION's Special Needs Transport unit would be suitable and available at the required times.

Given that demand will be relatively low these early years, it is recommended that the shuttle service be provided free of charge to West Belconnen residents and workers. Passengers transferring to ACTION services at Kippax would be required to pay a regular fare for their onward journey.

3.4.1.2.2 Years Three to Five

In the third year of development, the population of West Belconnen will exceed 2,000 people. At this point, it becomes appropriate for bus services to start being provided by ACTION as part of their regular operations, and funded by the ACT Government. ACTION may elect to use a small bus, although it is likely to be more operationally efficient for them to use their regular fleet.

It would be at the discretion of the ACT Government whether to charge a fare for the service. For passengers transferring to ACTION services at Kippax, they would be charged a fare on boarding their next service.

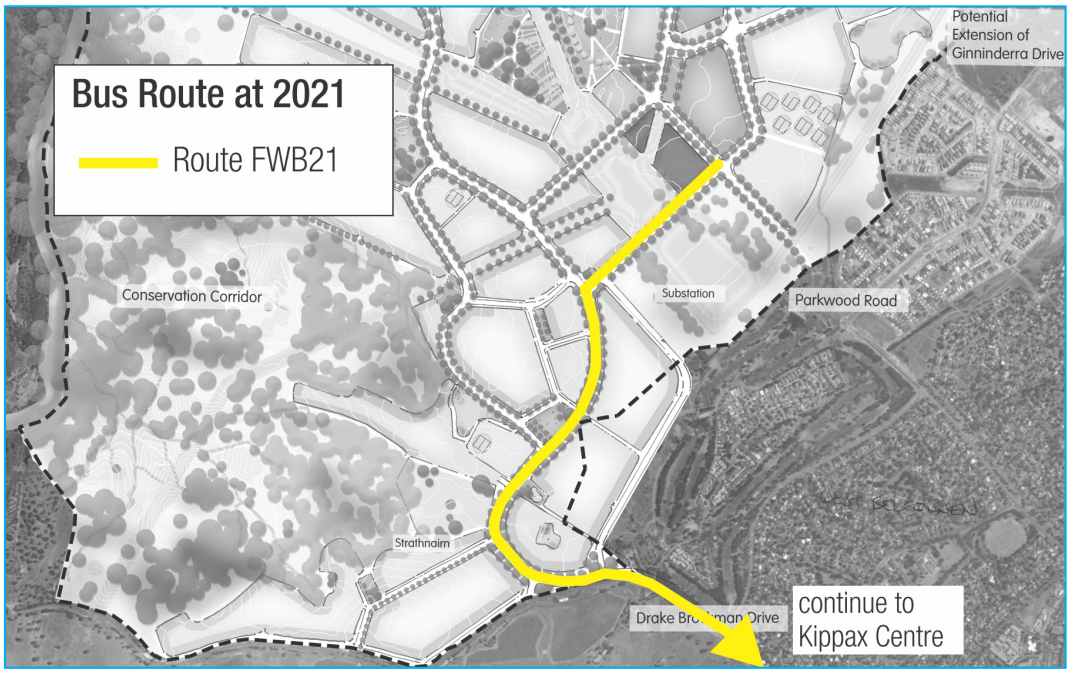
3.4.2 Interim Years (2021)

By 2021, population is forecast to reach 4,680. The retail centre is likely to have been developed along with the road network from Parkwood Road and connecting through to Stockdill Drive.

Figure 3.7 presents the proposed route that will operate in 2021, effectively an extension of the previous shuttle route.

Minimum recommended service frequencies are 15 minutes in the peak periods, and 30 minutes outside of peak periods, in accordance with the *Transport for Canberr*a policy.

Figure 3.7: Interim Bus Route for 2021



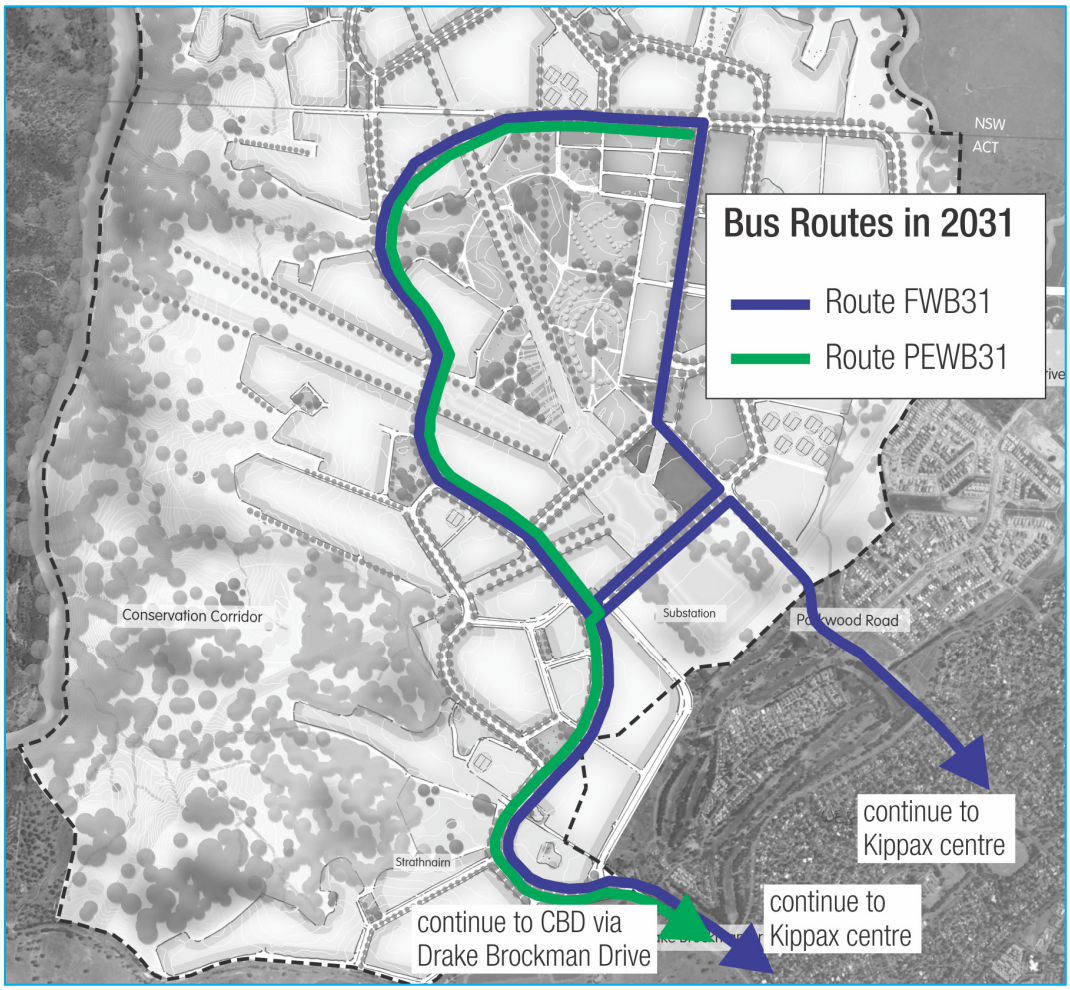
3.4.3 Interim Years (2031)

The population of West Belconnen is forecast to exceed 12,000 people in 2031. Most of the land within the western part of the ACT will have been developed.

Figure 3.8 presents a proposed bus servicing option for this year. Route FWB31 would operate in a figure 8 pattern, and would cross over itself at the West Belconnen retail centre and travel through the developed areas to the north and west. The service would start and end at Kippax and operate in both directions. Depending on patronage demand, it may be viable to continue the route through to Civic via the Blue Rapid alignment. Service frequency would be a minimum of 15 minutes in each direction, all day, with the route forming part of the Frequent Network.

Route PEWB31 is a proposed peak only express service that would operate inbound to Civic in the AM peak, and outbound from Civic in the PM peak. Service frequency would be based on demand.

Figure 3.8: Interim Bus Routes for 2031



4 Public Transport Infrastructure

4.1 Local Bus Stops

4.1.1 Bus Stop Standards

As discussed in Section 3.3.2, 27 pairs of bus stops will be required throughout West Belconnen. The design specification for the stops will be in accordance with ACT design standards DS013-1 and DS013-2.

Bus stops on the inbound direction of each bus route should be equipped with bus shelters. The ACT Government currently has a shelter procurement program that is delivering bus shelters to a high standard throughout the city. This standard of shelter will be adequate to West Belconnen, although deploying higher standard or customised shelters is also an option if budgets permit. Suggested improvements to the existing bus shelter designs are:

- Closing the gap between vertical panels and the roof, to prevent rain blowing into the shelter. Similarly, closing the gap between the vertical panels and the ground may yield similar benefits.
- Incorporating real-time passenger information displays at key locations, in accordance with the ACT's RTPI strategy.
- Ensuring adequate lighting levels, both within the shelter, and in the street, for passenger safety and to assist drivers in seeing waiting passengers at night.

The *ACT Major Bus Stops Feasibility Study* (2011) recommended a series of Major Stop shelter designs in locations with high volumes of passengers and/or in locations of higher visual impact. The selection of a specific style of stop will be dependent upon the volume of passengers using it.

Shelters will not usually be necessary in the outbound direction as most passengers are typically disembarking at the stops and not waiting. There may be locations which are exceptions to this, such as at schools, which need to be assessed individually.

Concrete hardstand should still be provided for DDA compliance and so that other passengers do not alight a bus directly onto a grassy or muddy surface.

4.1.2 Bike and Ride

4.1.2.1 Overview

A necessary feature for supporting intermodal transport between bicycles and public transport is the provision of secure bicycle parking. Bike and Ride features can range from bike cages and bike lockers to more standard bike rails. Typically, Bike and Ride facilities refer to a high level of security and weather protection that is designed for day-long storage. Bike and Ride facilities also include racks or other devices that are used to transport bicycles on public transport vehicles.

The images shown in Figure 4.1 depict a range of bicycle parking facilities used in Canberra and overseas.

The first image gives an indication of the scale of a secure bike cage, the physical footprint that it requires and the visual impact it can have.

The second image shows bicycle lockers that are common in many parts of Australia and New Zealand, including Canberra. Current ACT practice requires users to lease a locker on a 6 or 12 month term, rather than provide them on a casual basis. This means that they can spend most of the time empty, providing no benefit to other cyclists. These are only recommended at major station locations.

The third image depicts casual bicycle parking provided under a shelter structure, which is not commonly seen. The ACT Major Stops Study[5] recommended bus shelter designs that incorporated casual bicycle racks into an extension of the sheltered area of the stop (shown in Figure 4.2). Such an approach could be used in the design of light rail shelters, which ideally would extend the length of the vehicle (to be determined, but most likely in the range of 22m to 30m). This long shelter length suggests adequate space for casual bicycle parking may be available.

The fourth image depicts the corralling of bikes in the parking lane of a roadway, in preference to cluttering the kerb area.

Figure 4.1: Examples of Bicycle Storage Facilities

Bike Cage and Bike Rail, Canberra

Bike Lockers, Canberra

Off-street, high quality, covered parking, New York

On-street bike parking, `bike corrals' Portland, USA

[5] ACT Major Stops Study, McCormick Rankin Cagney, 2011.

Figure 4.2: Casual Bike Racks Integrated into Bus Shelter (Proposed Modification to Existing Shelter Design)

Bicycle parking security is often related to the site specific visibility and activity. Busy places offer a high level of natural surveillance and secure cycle facilities such as bike lockers and cages may not be required. An example of existing bike parking facilities in Civic is shown below in Figure 4.3.

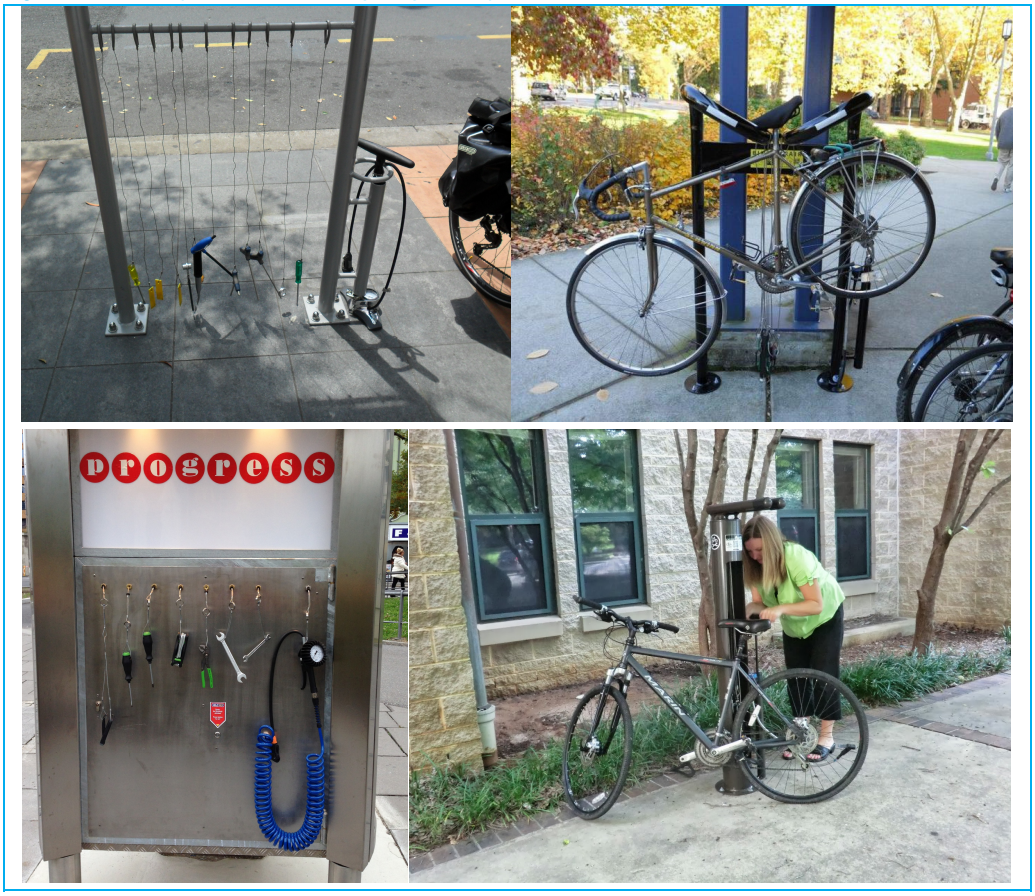
Figure 4.3: Bike Parking Facilities in Canberra CBD

4.1.3 Bus Stops as Mobility Hubs

There is the opportunity to use the bus stop locations throughout West Belconnen to integrate additional transport mode requirements in addition to bicycle storage facilities.

For cyclists, additional utility could be created through the incorporation on community cycle repair stations into selected bus stops. Repair stations are commonly placed in urban areas of high cyclist activity, and offer a range of tools for use in basic bicycle maintenance, sometimes include tyre pumps. The University of Canberra currently provides these facilities on-campus. Their integration with bus stops is uncommon, but a logical progression if bicycle storage is to be provided. Examples of community repair stations are presented in Figure 4.4. A logical location for these types of facilities would be at busier locations such as the retail centre, the mixed-use and employment precincts, and near schools.

Figure 4.4: Examples of Community Bicycle Repair Stations



Moving outside of the immediate bus stop location, car share spaces (discussed in Section 7.1) should logically be positioned near the bus stops. There are three main reasons for this:

- The bus stops are strategically located to be accessible for the surrounding catchment, meaning car share spaces located nearby would also be highly accessible.
- Persons who wish to ride a bicycle to a car share space will have access to bike storage facilities.
- With three modes now integrated into the bus stop (bus, cycle, car share), the stop begins to have a larger role in the local community, acting as a *mobility hub* providing a location for people to securely store their bicycle, catch public transport or access a car share car.

The mobility hub principle is being used in Sydney's new light rail project.

A mobility hub should ideally be incorporated into the design of the retail centre and considered in the design of other key destinations within West Belconnen.

Based on the number of car share spaces required per resident (refer Section 7.1) it is recommended that car share spaces are provided near all bus stops.

4.2 Major Stop at the Retail Centre

The retail centre is the major destination for internal travel within West Belconnen, with the only supermarket(s) proposed for the development. At the southern end of the proposed mixed use precinct along Parkwood Road, and adjacent to the proposed high school, the retail centre will be a hub of activity.

Consequently, the two local bus routes have been designed to pass through the retail centre creating a point where the two routes cross over. One of the peak express buses also passes this location.

The bus stops here will be the busiest in West Belconnen and need to be presented in a manner fitting for the centre. Demand to transfer between routes at this crossover point will likely be low, so the bus stops here can be provided as Major Stops rather than an interchange facility.

The stops will need to be constructed on the north-south road at the eastern end of the retail centre, as shown in Figure 4.5. Noting the high-frequency of bus services proposed, each stop should have a clear platform length of 50m.

If the proposed Park and Ride (shown in Figure 4.5 and discussed later in Section 4.5) is developed in the power transmission easement immediately to the west of the retail centre, it would be appropriate to integrate more significant bicycle facilities into the site including casual bike racks, a secure bike cage and individually leasable bike lockers. This would also be a logical location for car share spaces to be provided, thus creating the primary Mobility Hub for West Belconnen.

Figure 4.5: Location of Retail Centre Major Bus Stops and Park and Ride

4.3 Terminus and Turnaround Facilities

4.3.1 Requirements of a Terminus

At the end of a bus route, the driver of the bus will need to do one of two things; either immediately drive the bus to another location to start a new route or return to a depot, or park the bus for a short period prior to commencing the return journey of the route they just completed. In the case of West Belconnen where the routes are on the periphery of the Canberra urban fringe, the latter of these two would be more common.

A good terminus facility should provide the following:

- Appropriate means to safely turn the bus around, such as a roundabout or turn bulb.
- Somewhere to safely park the bus for a period of anywhere from a couple of minutes up to an hour. This will preferably be away from residences and entry points to commercial properties.
- Toilet facilities, which could range from dedicated secure toilets to which the driver has a key, public toilets in a park area, or in a commercial facility such as a shopping centre or sporting venue.
- Somewhere for a driver to purchase food or drink.

The first two of these items are essential. The latter two are highly desirable, though not essential, but their provision will improve the operational flexibility of the bus network.

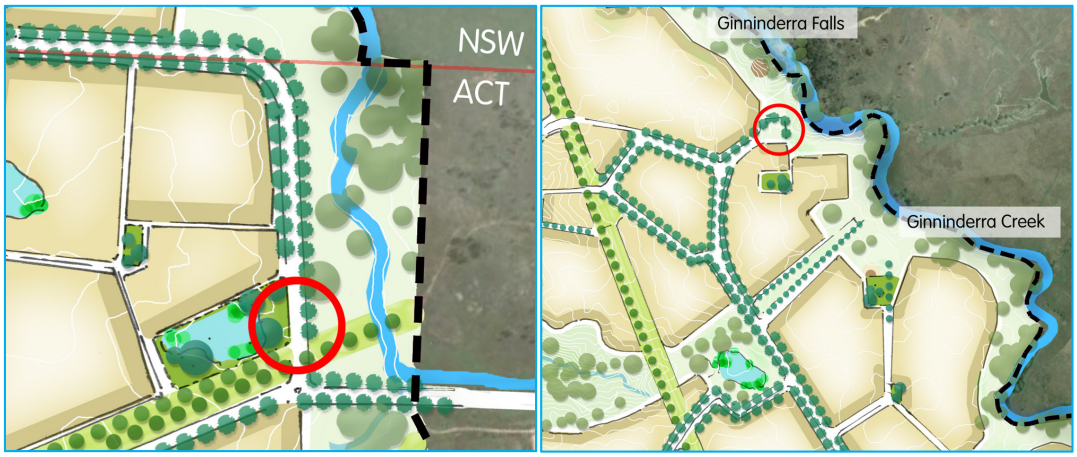
4.3.2 Terminus Locations in West Belconnen

In the final network design, two locations are proposed to be used as termini.

Routes FWB1 and PEWB1 will terminate at Ginninderra Falls. It is understood there is an intention to develop the Falls in a commercial manner to attract tourist and leisure visitors. In this instance, there would most likely be the provision of parking areas that would include spaces for buses and coaches. It is envisaged that this facility would be able to meet the needs of a route terminus.

Routes FWB2 and PEWB2 will terminate adjacent to the proposed completion of Ginninderra Drive, on a street on which the bus has just travelled. The routes are proposed to terminate at a location within the power transmission easement, and in an area with public parks to each side. Creating a space for a bus to turn around and park should be achievable. Depending on the nature of the parks, there may be the need to develop public toilets and if so, they should be located relatively close to the bus terminus.

Figure 4.6: Proposed Route Terminus Locations



4.4 Bus Priority Measures

The types of bus priority that may be appropriate in a development such as West Belconnen primarily consist of the following.

4.4.1 Bus-Only Roads in the Form of Green Links and Green Gates

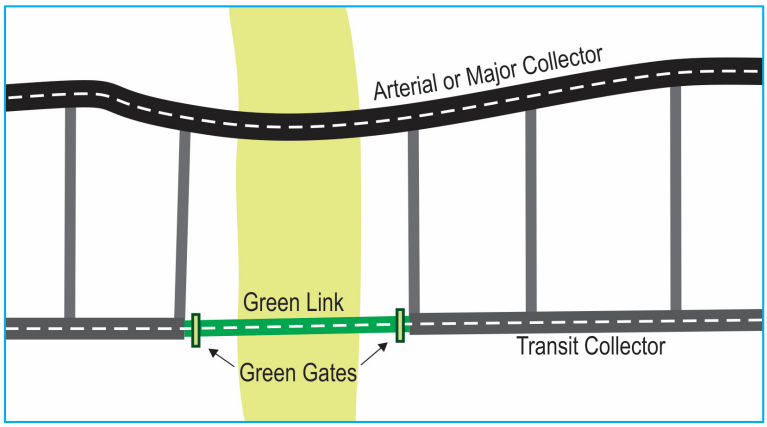
A green link is a section of road that only buses and emergency vehicles are permitted to travel on, with cycle lanes or separated paths usually provided alongside. A green gate is the entry treatment to a section of green link, typically containing a physical device that allows the passage of buses but makes it difficult or impossible for cars.

Green links allow a bus to proceed along a travel path that other traffic is unable to follow. This can be used to create a road network in which buses have priority i.e. they are able to travel between two points on a shorter path than other traffic.

A green link can be used as a section of a longer road to reduce demand for general traffic to travel along its length without impinging on bus movement. This will support the road hierarchy by forcing traffic onto parallel higher order roads. It will also reduce traffic volumes on the bus route, improving bus operating efficiency and creating an environment more amenable to pedestrian activity.

Potential locations for green links in West Belconnen could include those roads of minor collector standard or lower which traverse the power transmission easements.

Figure 4.7: Green Link Used to Prevent Local through Traffic on Lower Order Roads



4.4.2 Bus Lanes and Transit Lanes

Where buses travel on the regular road network, priority lanes in the form of transit lanes (T2 or T3) or full bus lanes may be appropriate. These lanes may be time restricted, allowing them to be used for other purposes outside of peak periods, such as kerbside parking.

To justify the provision of bus priority lanes, a combination of conditions must be met. The following are examples of such conditions, although not all necessarily must be met to justify bus lanes:

- Buses per hour. Typically 15-20 buses per hour are required to justify priority lanes.
- Passengers per hour. This may be expressed as the number of persons carried on buses in the lane, or as a relative proportion to the number of people carried in the adjacent lane.
- Reduced travel speed. Expressed as a percentage reduction in the speed of buses compared to free flow conditions.
- Impacted travel time reliability. Where travel speed reduction is consistent from day-to-day bus timetables can be adjusted in response allowing services to operate reliably. When speed reductions are irregular and unpredictable, on-time performance becomes unreliable and only the segregation of buses will adequately allow them to maintain reliable performance.

In combination, warrants such as these make the case that in order to justify dedicating lanes to public transport, those lanes must be carrying enough buses and people, and that those people will experience delay if required to travel in mixed traffic lanes.

In terms of West Belconnen, additional information is required from the concurrent traffic modelling study being undertaken by AECOM to determine whether bus or transit lanes are likely to be required. This will be more fully informed as the project progresses.

4.4.3 Signalised Intersection Treatments

At this stage, it is unknown whether intersections within West Belconnen will need to be signalised. If they do, bus priority may be required to ensure efficient movement of buses in congested conditions. Priority at signalised intersections can be achieved in the following ways:

- Bus Signals: Bus signals can be applied at a traffic signal where a bus lane is provided. A B-signal activates when the presence of a bus is detected in the bus lane, providing it with a head start over other traffic. If necessary, this can be used in unorthodox situations such as the hook turn at the intersection of Barry Drive and Kingsley Street in Turner.
- Bus Queue Jump Lanes: Queue jump lanes are short lengths of bus lane only provided at an intersection. These enable buses to avoid being caught in the queue of vehicles waiting at traffic lights. Depending on

the configuration of the intersection, buses might proceed either with a bus signal, or on the same green signal as other traffic.

- Signal Pre-emption: Signal pre-emption detects when a late bus is approaching a signalised intersection and manages the traffic lights appropriately. The system consists of detectors in the roads, which are linked to traffic lights. When a bus passes over a detector in the road, a message is sent ahead that a bus is on its way. If the lights are about to turn red they are instructed to stay green until the bus passes through. If the lights are already red, then the green phase is brought forward.

4.5 Park and Ride

Park and Ride facilities provide the most benefit when large numbers of people are unable to walk to a frequent bus service. For example, the new facility being developed in Gungahlin town centre will attract people from a wide area from the suburbs to the north and west, wishing to catch the high-frequency Red Rapid and the proposed Capital Metro Light Rail.

As discussed, the layout of West Belconnen has been developed to maximise the number of persons who are able to walk to the proposed bus services. The two all-day bus routes proposed for West Belconnen will operate at high-frequency, at no worse than 15 minutes all-day. In the peak periods, the addition of peak express services to Civic will result in buses more frequent than every five minutes throughout West Belconnen, offering travel to Kippax, Belconnen and Civic, along with intermediate destinations.

In a scenario like this, park and ride is of limited value in supporting public transport usage, and may be self-defeating if the facility encourages persons to drive rather than walk to a bus stop, instead of attracting persons who live too far from the stop to walk.

Another category of park and ride users is those people who wish to divert their journey between their home and where they catch a bus. This may be a person wishing to visit the gym or a supermarket on their way home from work. Based on the relatively limited level of commercial development that will occur in West Belconnen, if persons are intending to undertake such trips, their intermediate destination is more likely to be in a larger centre such as Kippax or Belconnen. Providing a park and ride facility within West Belconnen would not be of use to many of the people in this category, and likely to only benefit those travelling to the proposed retail centre on Parkwood Road. This may change if the retail facility on Parkwood Road evolves to a higher order facility over time.

Considering the points raised above, one location where a Park and Ride may be beneficial is adjacent to the proposed retail centre on a site located within the power transmission easement. Shown in Figure 4.8, the benefits of this site include:

- Located immediately opposite the retail centre, it would enable people to visit businesses in the centre before or after catching public transport.
- The site is close to the eastern periphery of West Belconnen, making it downstream in the direction of travel for over 80% of the ultimate population (i.e. people will naturally pass near the location as they travel out of West Belconnen).
- Both of the proposed frequent all-day bus routes, and one of the express peak-only bus routes, will pass the location.
- The interim bus routes proposed for 2021 and 2031 also pass the location.
- The land has limited other potential use, due to being located within the easement.
- At this location, a park and ride will have limited use outside of Monday to Friday commuter hours. The parking spaces may be able to act as overflow for the retail centre. Considering that peak times for retail are Thursday evening and Saturday morning, it may be possible to justify reduced parking in the retail centre on the basis that the spaces in the park and ride facility will be available at times of peak demand. This may achieve a higher development yield in the retail centre itself.

- In the earlier years of the development, park and ride may be more attractive for many residents, as bus services will be less frequent and may not be able to provide full geographic coverage due to partially completed road networks. Access to bus stops may also be more difficult if pedestrian and cycle paths yet to be completed.

Figure 4.8: Possible Location for Park and Ride

4.6 Bus Depot

4.6.1 ACTION Future Facilities Master Plan

Territory and Municipal Services (TaMS) are currently preparing the *ACTION Future Facilities Master Plan*. This study is investigating options for the development of bus new depots in Canberra over the next 20 years. New depots are needed to accommodate a growing bus fleet, and to alleviate capacity pressure at the existing depots. A greater diversity of depot locations will also generate operational cost savings by reducing the dead-running associated with buses driving between a depot and the start or end point of a bus route.

With most of the Greenfield development in Canberra to occur on the northern and western fringes of the city, depot facilities strategically located near these areas are required. The study considered all land available in Canberra and apply the following criteria to identify suitable potential depot sites:

- Site area of 1.5 ha or bigger.
- Appropriate land use zoning for a bus depot (sites zoned for industrial or transport purposes, or those that have the potential to be rezoned appropriately, although a change to the Territory Plan will be required).
- Appropriate adjacent land uses (located away from residential, education or other sensitive land uses).
- Suitable road access for buses (adequate road width, pavement strength, close proximity to the higher-order road network).
- Availability of site (current government ownership or freehold purchase potential, no current commitment for redevelopment).
- Environmental constraints, the site should not contain flora or fauna of significant value.
- Supporting topology. Ideally the site is reasonably flat and square/rectangular in shape.

The industrial precinct adjacent to Parkwood Road was identified as a potential location.

Initial study findings are that in the short term, the West Belconnen site will not be needed as two other locations in Canberra have been recommended as higher priorities. However, by 2031 the continuing growth of the ACTION bus fleet will again be placing pressure on the existing Belconnen depot. At that time, options for relocating part or all of the fleet to different locations may be required.

Preliminary assessment indicated that if a depot was developed at West Belconnen in 2031, it would be required to accommodate between 75 and 140 buses.

The *ACTION Future Facilities Master Plan* will be completed in mid-2014. If a site at West Belconnen forms part of the long-term strategy, a parcel of land of up to 2ha in size will be required.

It may be possible to locate part of the site within a power transmission easement, pending further advice from ACTION as to whether this creates any safety risks (noting the need to store large volumes of fuel on site). Less sensitive site components, such as staff car parking, should be able to be safely located within a power easement.

4.6.2 Benefits to West Belconnen

The development of a bus depot in West Belconnen would bring a number of benefits, to both the Government and the community.

From the perspective of the Government, bus depots can be difficult to establish, with limited sites offering appropriate road access and land zoning to support this use. Much of the land available in Canberra is located in Fyshwick and Hume, both of which are poorly located given the future growth of the bus network. Aside from Mitchell, West Belconnen offers the only potentially suitable land in the north of Canberra.

From the perspective of the community, having a bus depot located in the industrial precinct brings two primary benefits.

- A depot will generate employment. Typically, this is at a rate of approximately two persons per bus housed.
- Bus routes that start near a depot are provided at a higher efficiency (lower cost per kilometre) than those that start further away. Because of this, the cost of providing the West Belconnen public transport network will be lower if a depot is located within the development. As West Belconnen grows and requires increasing levels of public transport service, it may then be easier to justify the provision of these.

5 Active Transport Planning

5.1 Creating An Active Transport Network

5.1.1 Facilitating Active Travel

As highlighted in Section 2, a sustainable transport plan should address the mobility needs of all users at different times. Achieving a safe and efficient ultimate bus network, as discussed in Sections 3 and 4, is essential to the long term success of the sustainable transport system for West Belconnen. Another integral element of the sustainable transport system is the provision of a well-integrated active transport network. Active travel (walking, cycling and other non-motorised forms of transport) is the most sustainable form of transport.

Active travel includes utility trips, commuter trips and is also utilised for recreational purposes. The provision of a safe, attractive and well-connected active transport network which is integrated with an efficient public transport network provides the population with a safe and reliable alternative to the private vehicle. If it is well-considered, it can influence the frequency of use of the private vehicle and reduce the demand for a second car.

In planning for the West Belconnen Active Transport Network, consideration should be given to factors such as site topography and the distances people are prepared to walk or cycle. There are a number of key destinations within the development site. Each of these destinations will attract a different user, and so should be identified and planned for separately. More detail is provided in this section of the report. The final draft active transport plan has been incorporated into the draft Structure Plan shown previously in Figure 2.1.

5.1.2 The Benefits of Active Transport

Linking people to open space, public transport, education, shops and jobs via a quality network of walking and cycling routes has a number of positive benefits for communities. These include but are not limited to:

- *Economic Benefits*
  - Transport Efficiency – active transport can reduce the demand on the road system thereby reducing the need for road infrastructure reducing development and maintenance costs (an integrated multi-modal transport network in a greenfield development can reduce car dependence by up to 25%[6])
  - Parking Demand – active transport use can reduce the demand for very expensive parking
  - Land Use Efficiency – space requirements for active transport infrastructure to accommodate trips is less than that for private vehicles (pedestrian requires approximately $3m^2$, a cyclist $10m^2$ and a car travelling at 30kph requires $30m^2$ per km travelled) reducing land take and increasing the yield from land
  - Consumer Expenditure – active transport is low cost form of transport and can reduce the need for multiple car ownership in households reducing household transport expenditure and increasing disposable incomes
- *Environmental Benefits*
  - Emission Free Transport – active transport is free from greenhouse gas emissions and pollution
  - Noise Free Transport – active transport trips tend to replace private vehicle trips, reducing noise disturbances and discomfort
- *Social Benefits*
  - Increased Mobility – members of a community without full-time access to a motor vehicle are provided with a transport option to access services and facilities. When linked with public transport results in

[6] Heid, J 2004, *Greenfield Development Without Sprawl: The Role of Planned Communities*, Urban Land Institute, Washington, DC.

residents have greater access to retail and employment outside the centre resulting in higher levels of economic inclusion for all residents.

- Health Benefits – active transport increases the level of physical activity in communities, also supporting mental health and ageing populations
- Increased sense of community - the provision of a well- considered active transport network will encourage social interaction, community cohesion and increase liveability of areas. These factors can often have a positive influence over property values, business activity and can also help to reduce crime and other social problems in areas (Litman, 2003).

Therefore, delivering a high quality walking and cycling environment in any community should be of a high importance.

5.2 Factors Influencing Planning

5.2.1 Site Topography

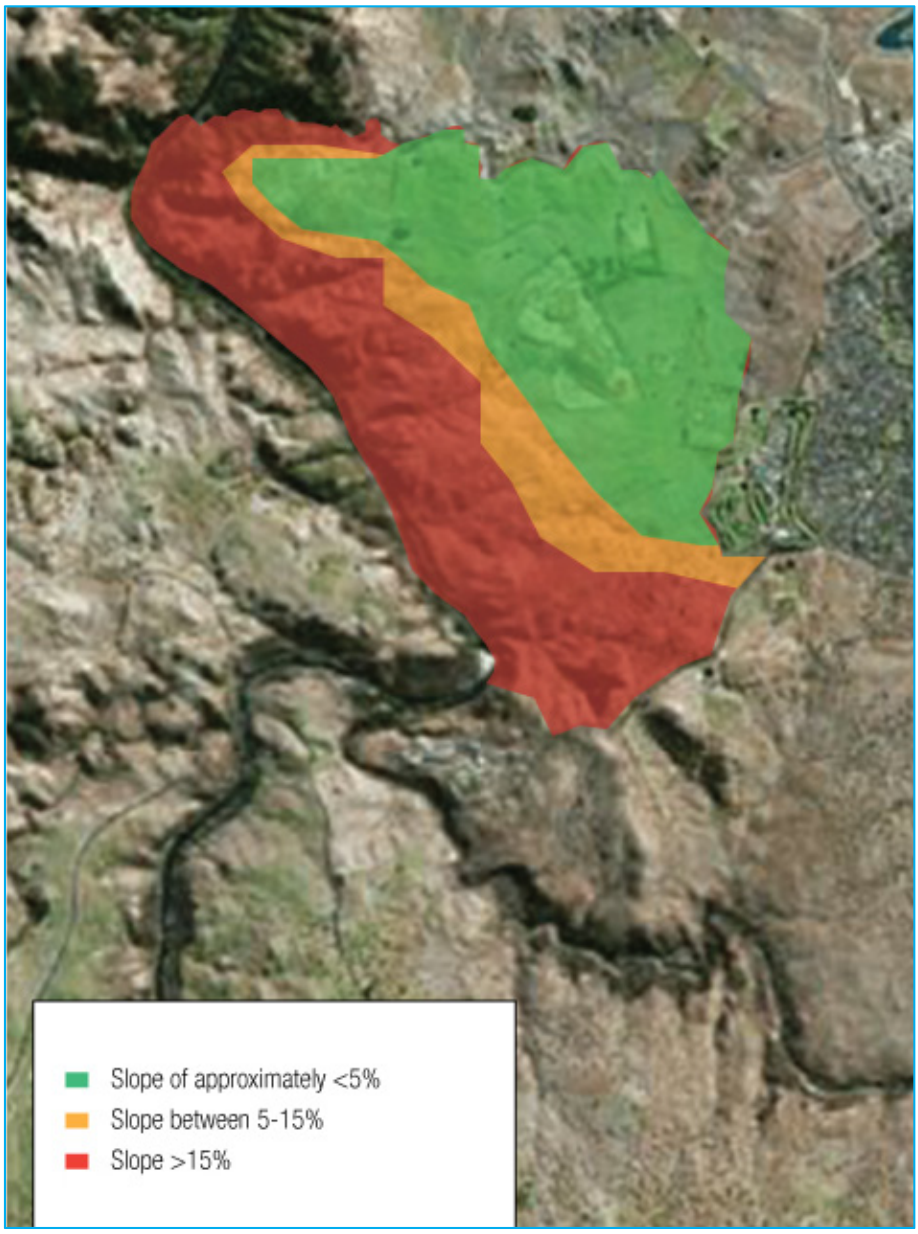
Site topography is a key factor when making a decision about how to travel. Typically without dependency on external conditions such as weather, active transport users will take the easiest, safest, most direct and attractive route. To the south and west of the main transmission line, which divides the site, the grade increases to over 15% as shown in Figure 5.1. The land shown in green to the north and eastern side of the transmission line is mostly flat to slightly undulating. Table 5.1 below outlines possible opportunities and constraints faced in the development of a complete and permeable active transport network in West Belconnen.

Table 5.1: Opportunities and Constraints in Developing the Active Transport Network

Opportunities	Constraints
Generally flat area north and eastern sides of transmission line	Steep slope on south and western side of transmission line
Greenfield development, no existing infrastructure in place, opportunities to influence street and building design to create safe interactive streets	Number of connections required to connect to south and western sides of transmission line
Direct route leading to edge of mixed use area along the transmission lines	Paths through residential, low visibility areas
New development allows a focus on providing a high quality network to help change the mode of choice for new residents	

While the slopes may provide more experienced riders with opportunities for recreation mountain biking, typically utility cyclists and pedestrians will prefer routes on the flat. To encourage residents living on the higher slopes to walk or cycle to local destinations a higher concentration of path connections to the routes located on the flat parts of the site were identified within the draft network in order to reduce distances travelled on the steeper side of the site.

Figure 5.1: Slope Analysis of West Belconnen



5.2.2 How Far Will People Travel?

Walking and cycling is best suited for trips under 15 minutes in duration (approximately 1.2km walking or 4.5km cycling). Generally, people are only prepared to walk approximately 500m, however this is a fluid concept and the distance depends upon the quality of the walking environment, key factors include:

- Levels of activation and relative safety
- Traffic volumes
- Topography
- Route directness
- An individual's personal preferences and fitness

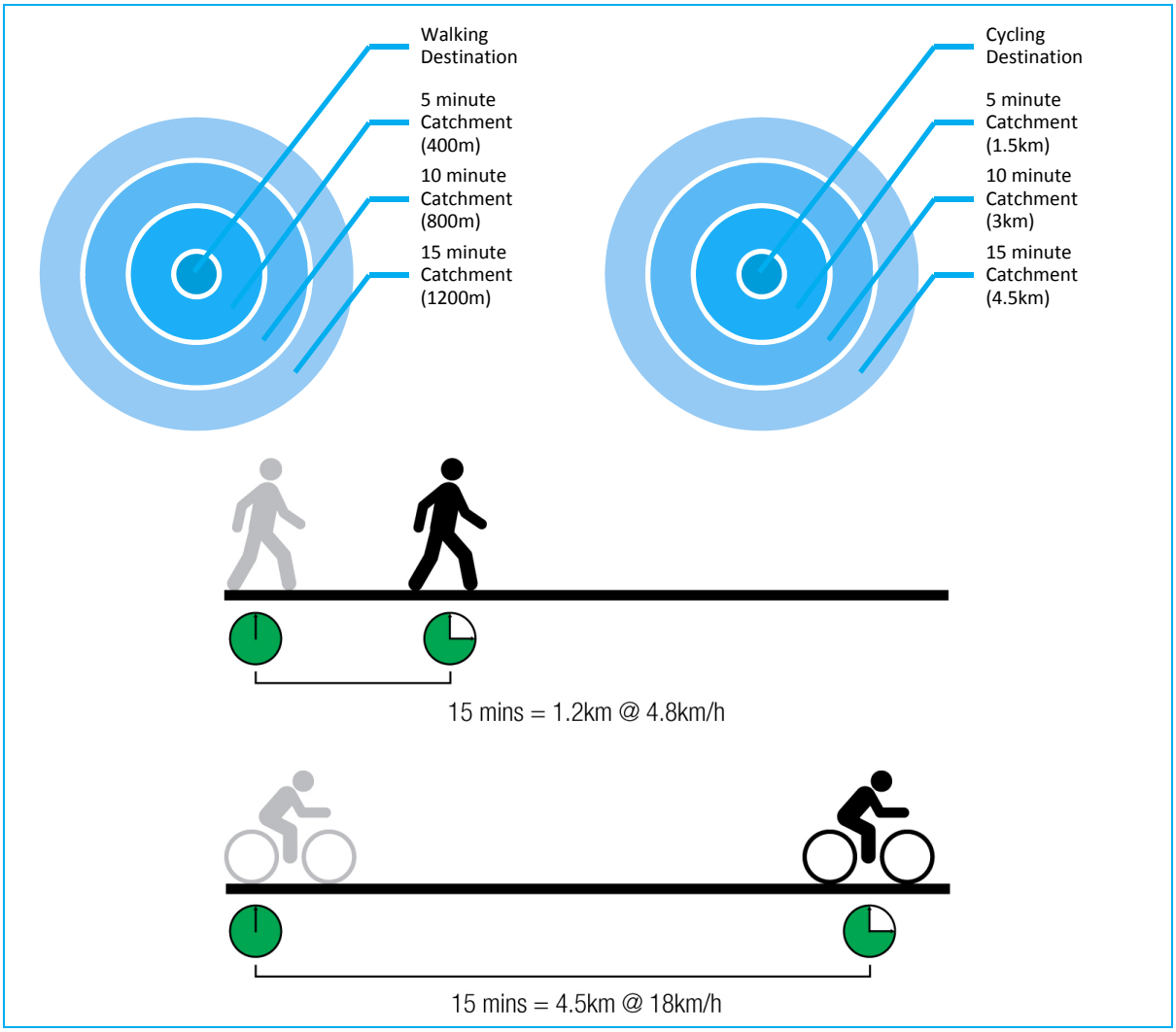
The higher quality the walk, the longer someone is prepared to walk. Similarly, a number of factors also influence the distance people are prepared to cycle and the type of cycle infrastructure they use.

The propensity to cycle is generally influenced by:

- Network legibility.
- Network cohesiveness.
- Route topography.
- Route directness.
- Integration with other modes.
- Provision of supporting infrastructure (e.g. end of trip facilities).
- The safety/perceived safety of cycling and cycling infrastructure to different individuals.

The following figure provides an overview of the typical walking and cycling catchments and approximate travel times.

Figure 5.2: Typical Walking and Cycling Catchments



5.2.3 Integrating Land Use and Active Transport

As discussed in Section 2.2 land use plays a major contributing role to the type of transport used within a community. In order to encourage the use of the active transport network it is critical that land uses are sited to ensure that maximum accessibility by residents and visitors can be achieved.

In order to inform the development of the structure plan the walking and cycling catchments identified in Figure 5.2 were placed over the proposed location of key attractors (retail/employment, education and open space areas) within West Belconnen.

Applying these catchments it was identified that all the developable areas are within a 15 minute cycling distance of key internal destinations. The size of the developable area limits the ability to locate all residents within the walking catchment of all key attractors. However, the majority of residents are within walking distance of local facilities and public transport stops.

The success of the active transport network also depends on the ability of the users to access destinations beyond West Belconnen. In developing the active transport network a key focus was to identify key cycling connections to Kippax and external destinations beyond the site. These connections are identified in Section 5.4.

5.2.3.1 Mixed Use Centre and Employment Areas

Figure 5.3 and Figure 5.4 below show the catchment area for walking and cycling respectively, from the retail and mixed use area/employment area, plotted for 5 mins, 10 mins and 15 mins travel time.

Figure 5.3 highlights the walking catchment around the town centre which roughly corresponds to the 5 minute cycling distance as show in Figure 5.4. The principles for transit oriented development as outlined in Section 2 will need to be applied to the walking and cycling catchment of the retail centre. This is the major destination within West Belconnen and will accommodate a number of high traffic generating uses. The two all-day bus routes will travel through the site.

A successful active transport network will introduce greater numbers of people walking and cycling into the area which will make a positive contribution to a safe, attractive, comfortable and vibrant urban space. Land use will need to be planned around the sustainable transport network in order to maximise accessibility, and this includes considering access needs throughout the planning process, right down to building designs that locate major entry points within the shortest possible walking distance to public transport stops, for example.

This is a critical point: site and building layouts tend to be less constrained in their planning than the transport network, so key elements of the transport network such as bus stops and bicycle paths need to be considered as immutable infrastructure. Urban planning then needs to accept and adapt to the fixed constraints and opportunities created.

Figure 5.4 demonstrates that the future residential population will be within cycling distance of the mixed use town centre and employment areas with the majority located within 10 minute cycling distance. The design of the cycle network will be critical to encourage all users of varying abilities to access the centre on bike. Typically, commuter cyclists prefer direct routes that offer higher travel speeds. As most commuter cyclists are adults of a higher skill level, provision of on-road, segregated lanes are the recommended form of infrastructure. Section 4.1.2 provides photographic examples of bike storage facilities.

It will be necessary to integrate bike storage facilities into the design of the town centre as it represents a major destination for internal travel within the development site. As discussed in Section 4.2, a major Bike and Ride facility could feasibly developed in the power transmission easement immediately adjacent to the retail centre. However, given the geographical size of the retail centre and wider town centre, additional facilities will be needed at dispersed locations throughout the precinct.

Public facilities should be located in high activity areas (in order to allow for natural surveillance), be well lit and secure. Larger buildings will be required to include secure, on-site bicycle facilities for staff.

Figure 5.3: Walking Catchments of Mixed Use Centre of West Belconnen

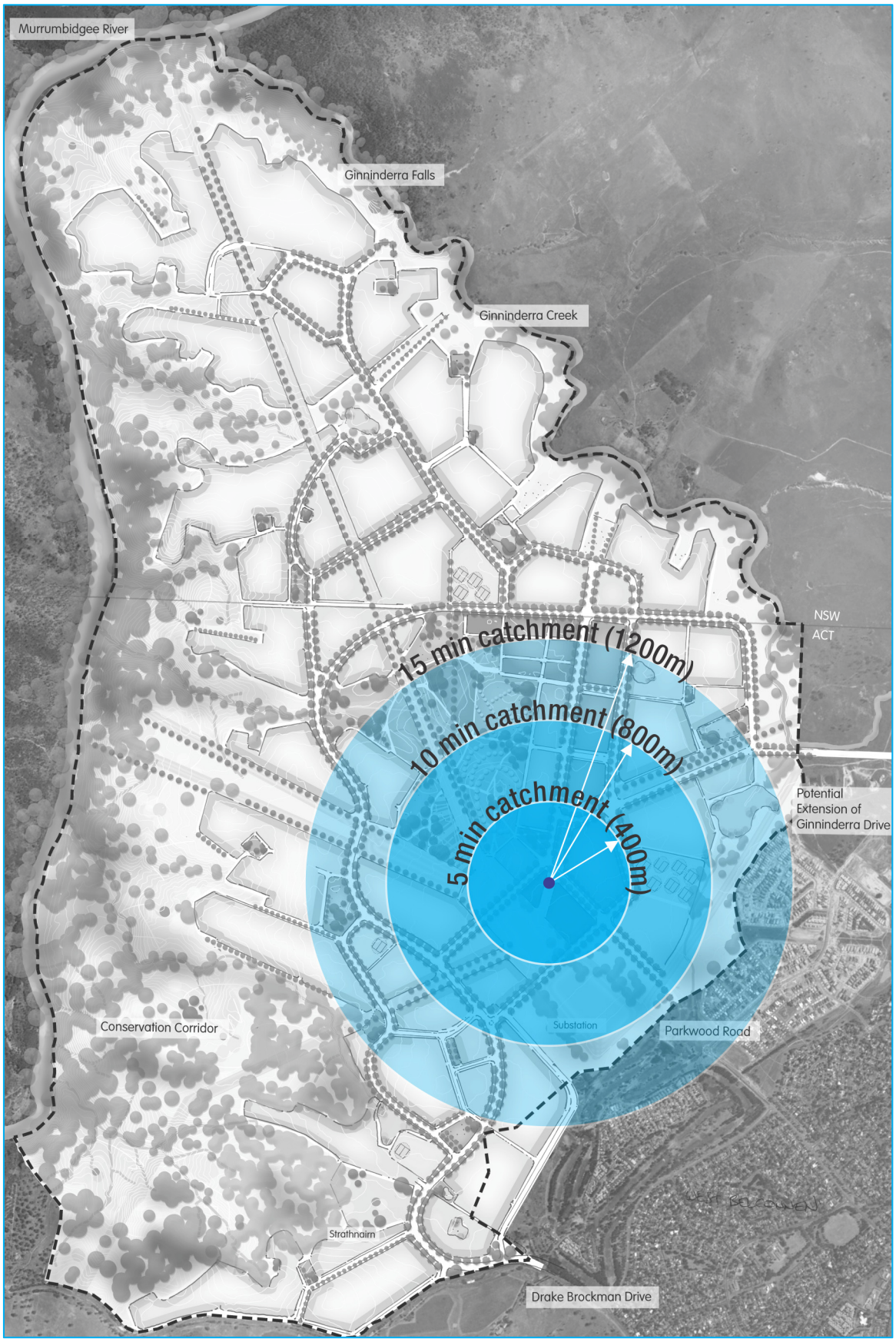


Figure 5.4: Cycling Catchments of Mixed Use Centre of West Belconnen

5.2.3.2 Education and Community Facilities

Locating local facilities within residential neighbourhoods fosters social interaction and provides a mix of trip purposes within walking distance of the home thereby discouraging car use for shorter trips. Therefore the placement of the five education and community nodes are critical to the success of the active transport network. Details about the types of schools or community facilities are currently not available. By clustering high trip generating activities within close proximity of bus stops and by locating them on high quality pedestrian and cycle routes will improve the efficiency and viability of the sustainable transport system.

On-road segregated networks provide both of these requirements and should be considered as the primary option for connections to these areas. Off-road networks, particularly in low trafficked or low vision areas, such as through parks with few people; offer a concept of being safer than on-road networks, primarily due to the potential conflict between cars and cyclists. However, the safety issue is different from the security issue. By creating a segregated on-road network, the potential conflicts between cyclists and vehicles are reduced, and the security along the routes is increased.

The figures below show the walking and cycling catchment areas from the five education and community hubs within the site. The majority of residents will be within walking distance of their local facilities and all residents will be within cycling distance of these facilities.

Figure 5.5: Walking and Cycling Catchment Areas from the Internal Education and Community Hubs: Part 1

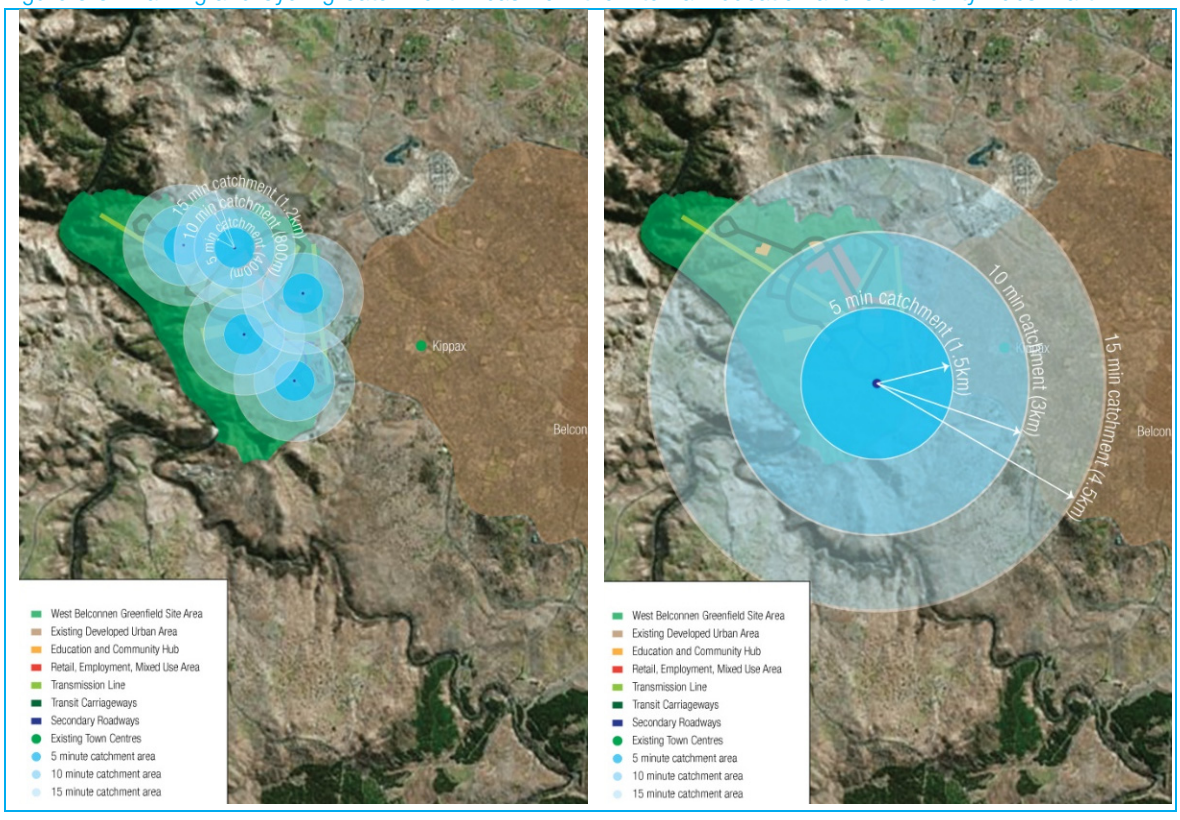


Figure 5.6: Walking and Cycling Catchment Areas from the Internal Education and Community Hubs: Part 2

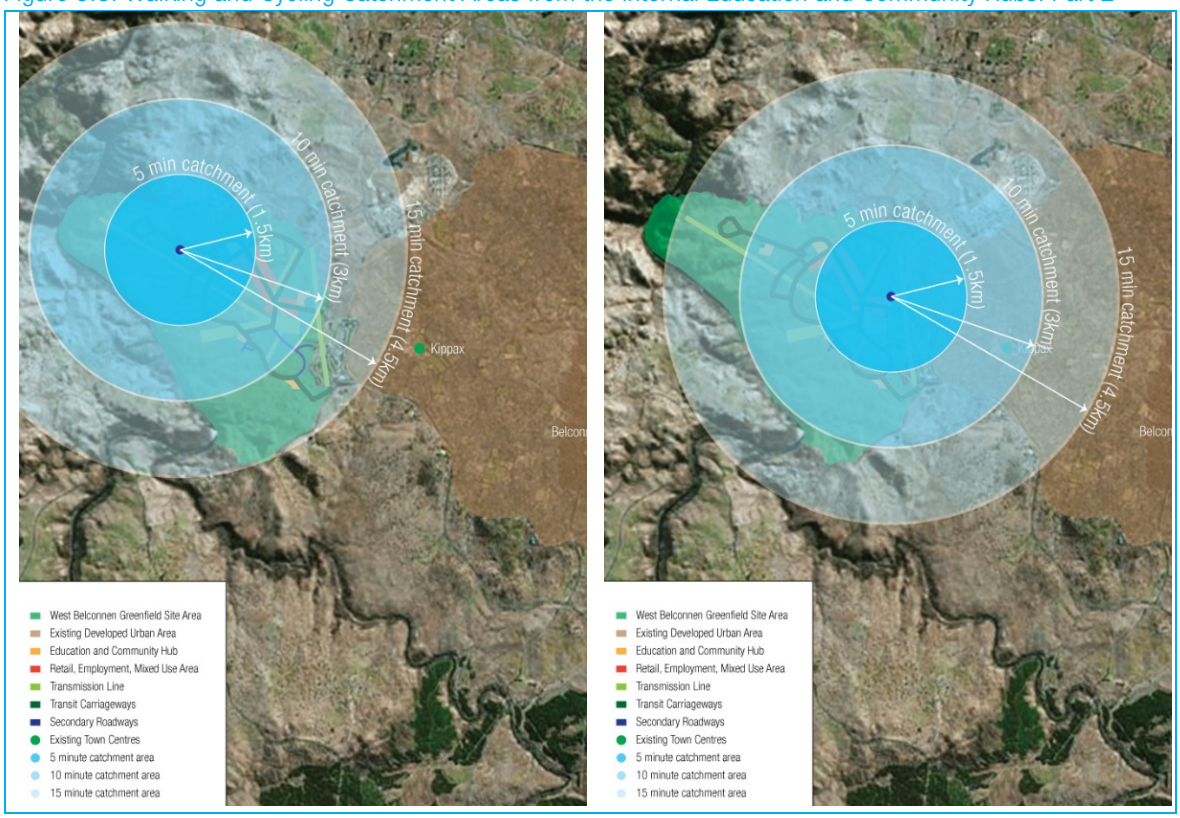
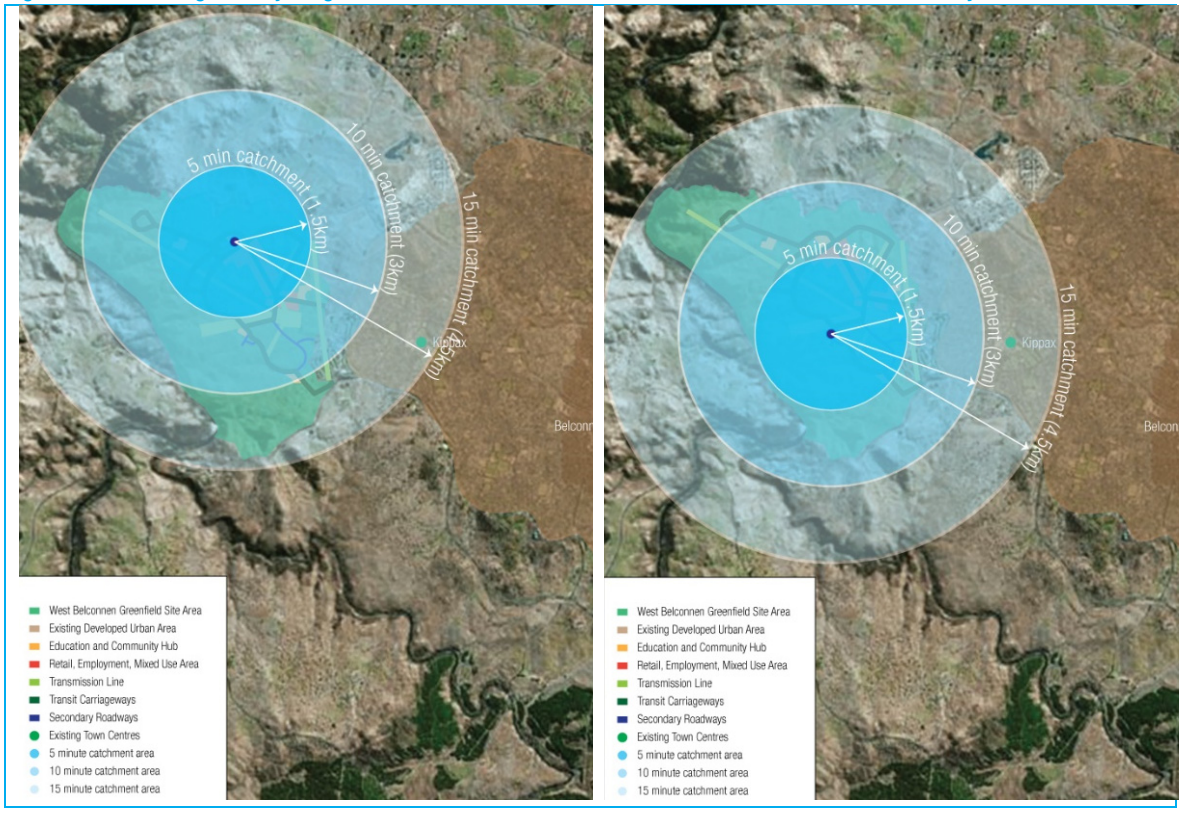


Figure 5.7: Walking and Cycling Catchment Areas from the Internal Education and Community Hubs: Part 3



5.2.3.3 Open Space and Recreation

Figure 2.1 outlined the Draft West Belconnen Structure Plan and highlights the significant areas of open space within the development site. These open space areas will provide for a wide range of recreational need as well as providing a conservation function. The conservation corridor forms the boundary of the site and large areas of open space are to be located in the centre of the site adjacent to the town centre. Smaller parks are clustered near local facilities and are located near proposed bus stops. There is potential to incorporate cycling and pedestrian routes within the transmission line easement which traverse the length of the site and intersect portion of the conservation area to the west.

By locating public open space on the bus route and connecting the spaces via a series of safe, permeable and attractive `community routes' and on-road cycling routes will link the wider open space network. Incorporating the open space network in the design of the active transport network addresses both the needs of the recreational cyclist and improves the attractiveness and quality of the transport network.

The design of the cycling route will need to cater for both categories of recreational cyclist including those of lower skill levels who cycle as a family or group activity, or professional cyclists, who either ride on the roadway, or use off-road, mountain bike style tracks. There is a proposed mountain bike track shown in Figure 2.1 that navigates along the Murrumbidgee River, through the steep slopes and mountains that also wind around the river.

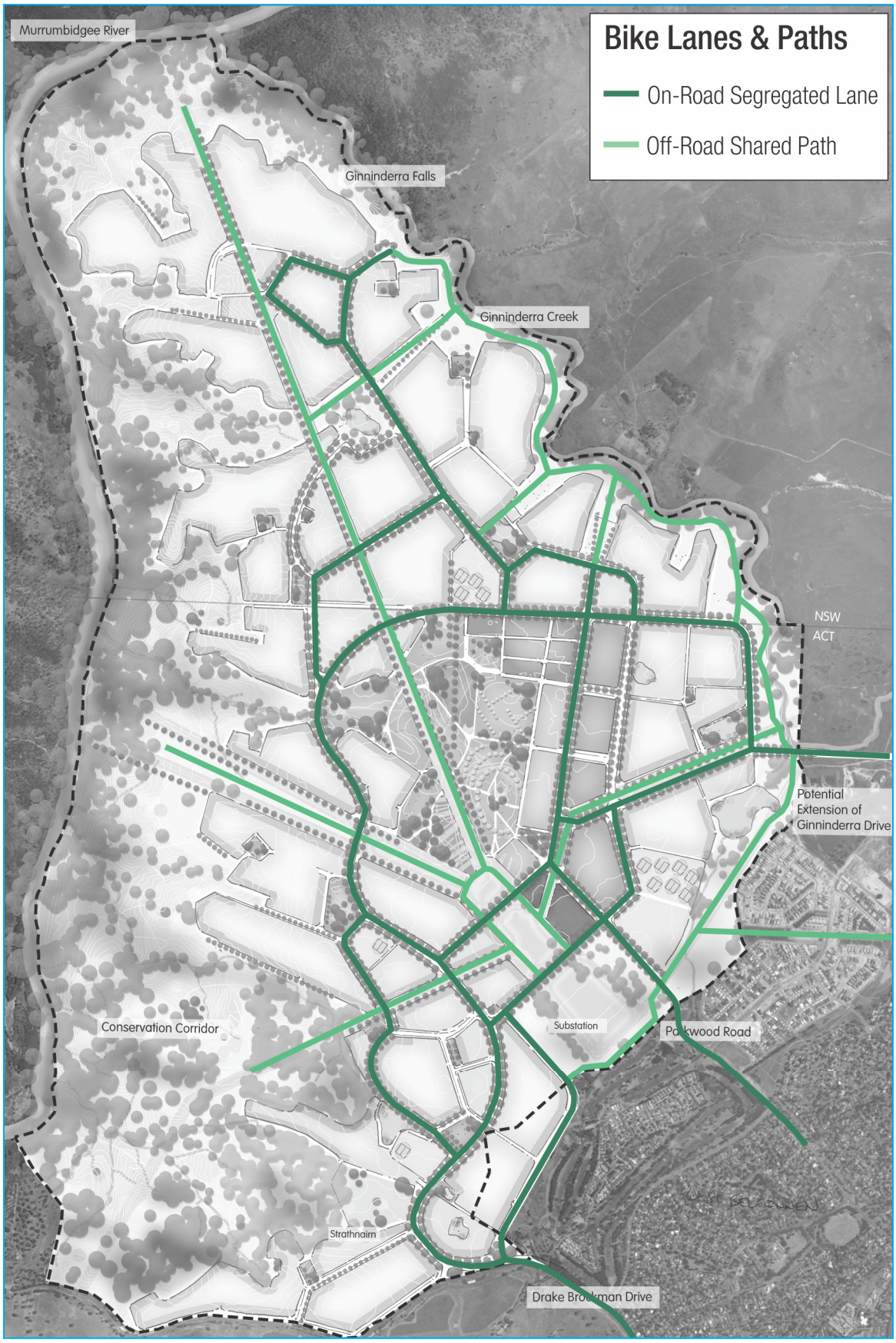
5.3 The Proposed Active Transport Network

Figure 5.9 (on the following page) presents the primary on-road (transport) cycle network as well as the primary community routes catering for both recreation and transport routes. Secondary routes will be based on a street by street design analysis based on the principles outlined in Section 6 with a preference for routes within the street corridor (although possibly segregated from traffic. An indicative cross section for the primary cycle routes within the street reserve is shown in Figure 5.8.

Figure 5.8: One-Way Cycle Tracks on Two Lane Undivided Roads with Parking (left) and without Parking (right).

As a detailed design of the internal street network is not currently available, it is proposed that in order to supply an active network that will encourage users, connections to the proposed network should be given priority in the design of the street network.

Figure 5.9: Proposed Cycle Lanes and Connections

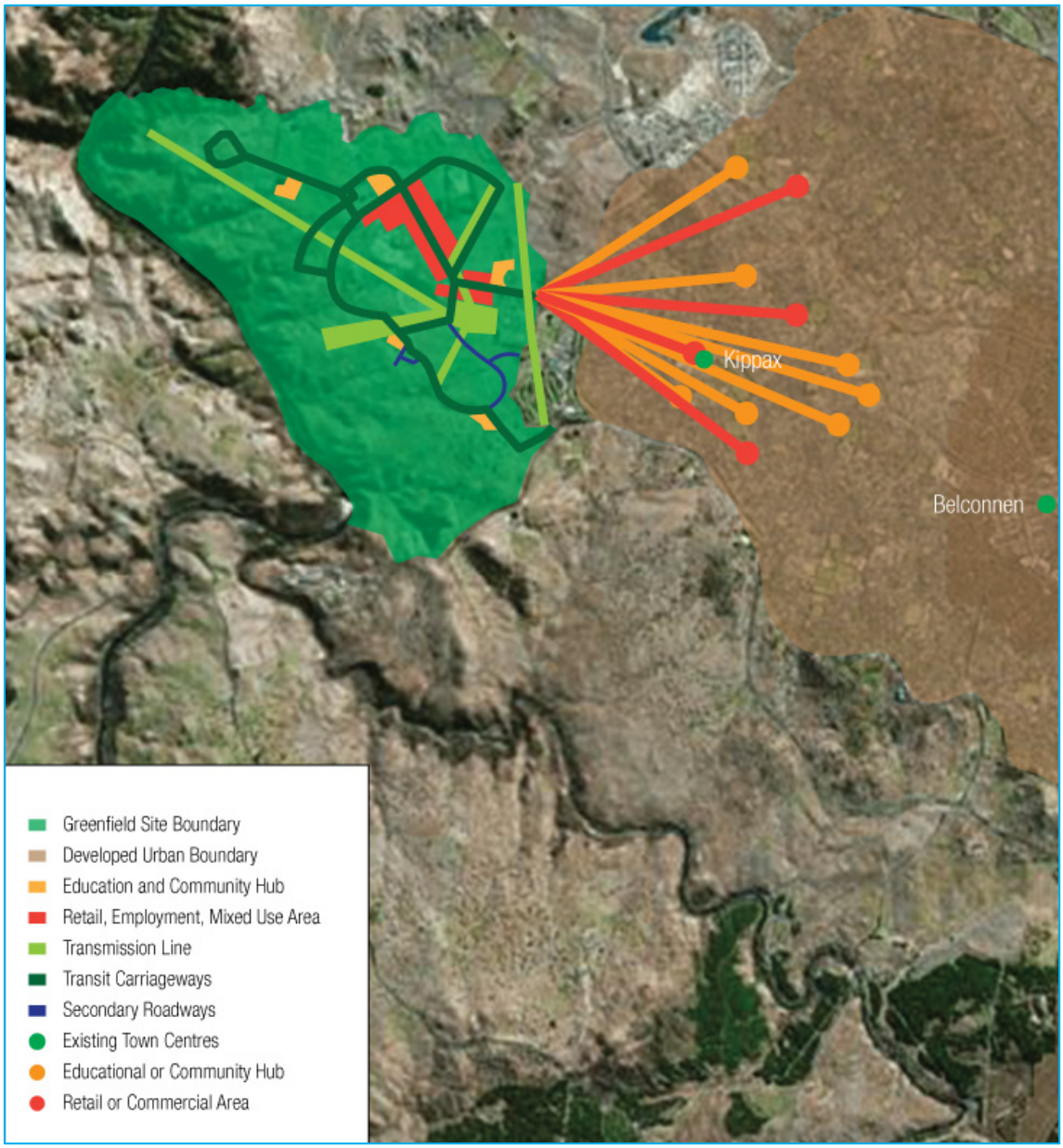


5.4 Integration with the Existing Community

In order for cyclists to be able to access external destinations, connection to the existing external cycling network will be required. There are three possible locations for external connections from the site, Drake Brockman Drive, Ginninderra Drive and Parkwood Road, which becomes Southern Cross Drive, which has trails and dedicated cycling lanes to Belconnen.

Currently, the strategic cycling network in Canberra is under review. An ideal time to implement possible connections on Ginninderra Drive, Drake Brockman Drive and Parkwood Road will be during the development of West Belconnen. By connecting to Parkwood Road, a direct route can easily be established to the surrounding major centres. A connection on Drake Brockman Road would also enable connection to the Canberra CBD area with a direct on-road route, suitable for commuters.

Figure 5.10: Key Destinations External to the Site, within 15 mins Cycling Time from Edge of Site



6 Active Transport Infrastructure and Design

6.1 Setting the Standards

The proposed active transport network will be designed to provide transport choice to key destinations and facilitate linked trips within the development site. It will maximise resident's access to a wide variety of activities and links them to the wider community via the public transport network or good cycling connections to key attractors beyond the site.

The focus of this section of the report is to provide guidance on how to design the active transport network for West Belconnen. A general aim is to encourage all users, regardless of age and ability and recognises that design is influenced by land use.

Inclusion of appropriate cycle and pedestrian facilities within the road hierarchy will result in the provision of active transport infrastructure throughout West Belconnen.

Generally, pedestrian and cyclist facilities will be accommodated on the street network where bicycles can mix with traffic, be visually or physically separated. However, due to the nature and location of this development opportunities exist to provide additional links not accessible by vehicles. It is considered advantageous to provide these off road links for both recreation and transport, which is common throughout the ACT.

6.2 Street Connectivity

The draft structure plan provides an indicative outline of the proposed street network which has been largely dictated by the requirements of the public transport network. It is proposed to establish a grid-like street pattern which supports high levels of connectivity. Street connectivity is an important indicator of the walkability of an area. There are many ways to quantify street connectivity including intersection density and block length and density.

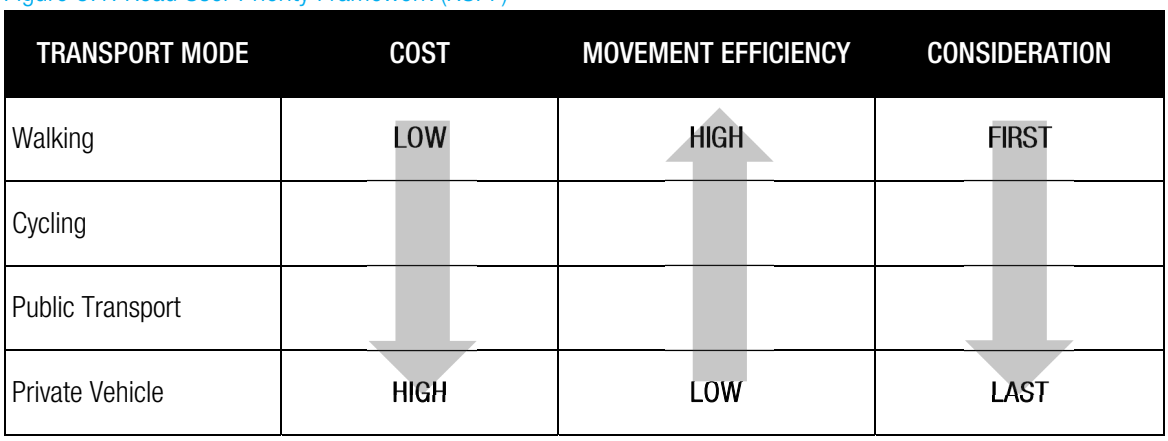
Well-connected pedestrian and cycling networks that enable people to get directly to their destination while also fostering social interaction on the street are key to creating more walkable, safer and sociable neighbourhoods. However, if an area experiences high traffic volumes, congestion and streets become difficult to traverse this will influence perceptions of safety and therefore the desire to walk or cycle.

Many researchers have found that higher levels of intersection density (i.e. more intersections), and smaller block sizes create a denser network of streets which reduces the distances people have to walk or cycle from their origin to their destination. This leads to higher likelihoods of travel by sustainable modes. Schlossberg et al. (2006) used a student travel mode to school survey to show that higher intersection densities increased students' likelihood of walking by up to five times. Research from Ozbil et al. (2009) highlights the importance of street connectivity for public transport users, specifically at the 800m distance from public transport facilities, in increasing the likelihood of public transport use. These factors need to be given due consideration in the more detailed design of the movement structure for the development site.

6.3 Establishing Priority

The key to providing an environment that is conducive to walking and cycling is delivering streets that are good walking and cycling streets. To deliver such streets and to acknowledge the contribution that active transport makes to the well-being of people and places, consideration needs to be given to the walking and cycling requirements of streets and places prior to other modes as shown in Figure 6.1.

Figure 6.1: Road User Priority Framework (RUPF)



Noting that West Belconnen is to be developed as greenfield site, an excellent opportunity exists to implement a transport system wholly based on this road user priority framework, without the usual constraints present at other sites that have developed with private motor vehicle transport as the foremost concern.

6.4 Creating a Street Hierarchy

Recognising that land use influences how people use streets it is proposed to divide the street hierarchy of West Belconnen into Main Streets, Mixed Use Streets and Living Streets.

6.4.1 Main Streets

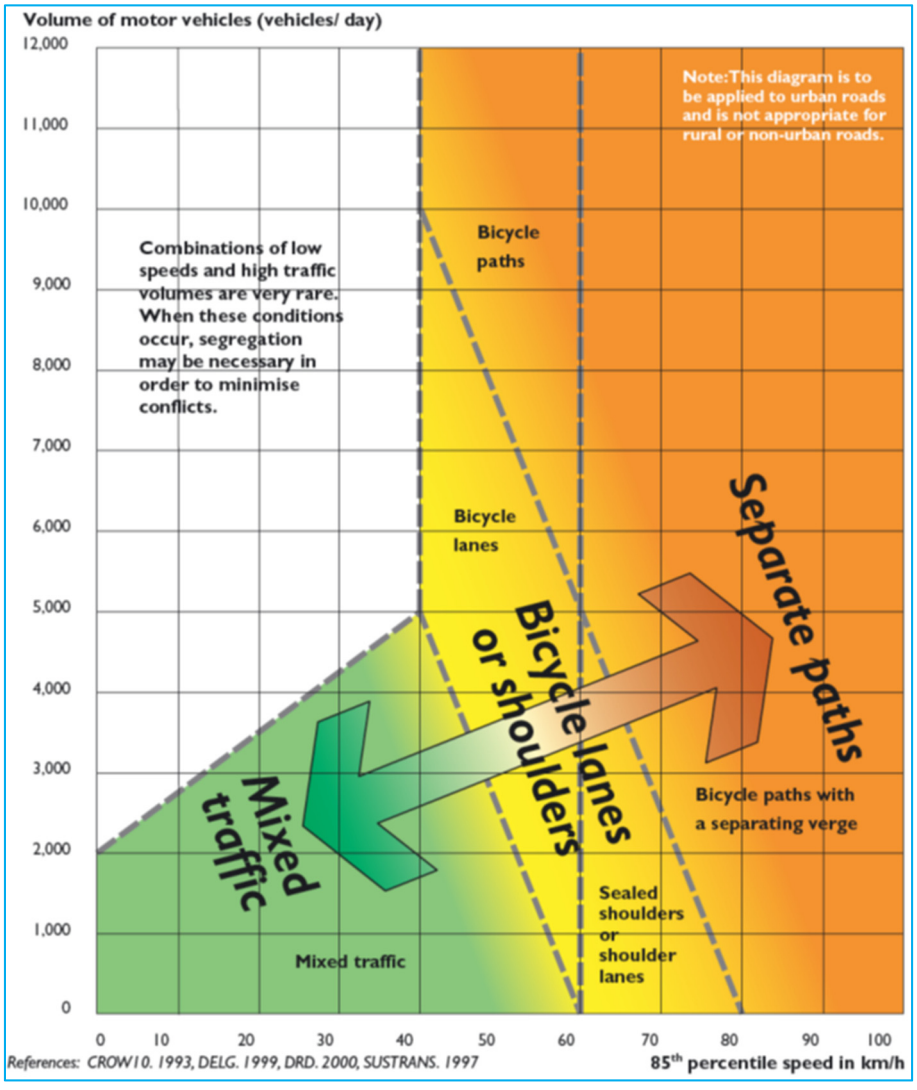
Main streets will attract vital activity to West Belconnen. They will accommodate a mix of land uses including retail, employment, leisure, and related activities. They will be highly active streets throughout the day and into the evening.

Main streets occur equally in small towns, suburban locations and at the centres of cities. For larger centres, more than one street at any location will be a main street. Multiple main streets might occur in parallel or at right angles, or both. Main streets do not have a predominant residential community, and importantly, maintaining residential amenity in these streets may not be a priority. Main streets are crucial to the development of active, sustainable communities. These guidelines aim to establish the balance between historic community, economic values and the transport role of the streets. Main streets should be the centres and nodes of our communities. They can be considered as the 'front door' to quality places.

Bicycles will have to be separated from traffic in these environments, due to the volume of traffic and also due to bus traffic. Generally, we consider the Austroads guidelines on separation as outlined in the ACT Strategic Cycle network to be appropriate and we will be using these as a guide, however we think that a more conservative approach is required to encourage cyclists not to cycle on the footpath interrupting the important pedestrian traffic in main streets. We will also be using the alternative cycle track design placing parked cars between traffic and cyclists as an effective method of separation.

Figure 6.2: Separated Bicycle Lane in Cairns and Sydney

Figure 6.3: Austroads Guidelines for Separation of Bike Paths

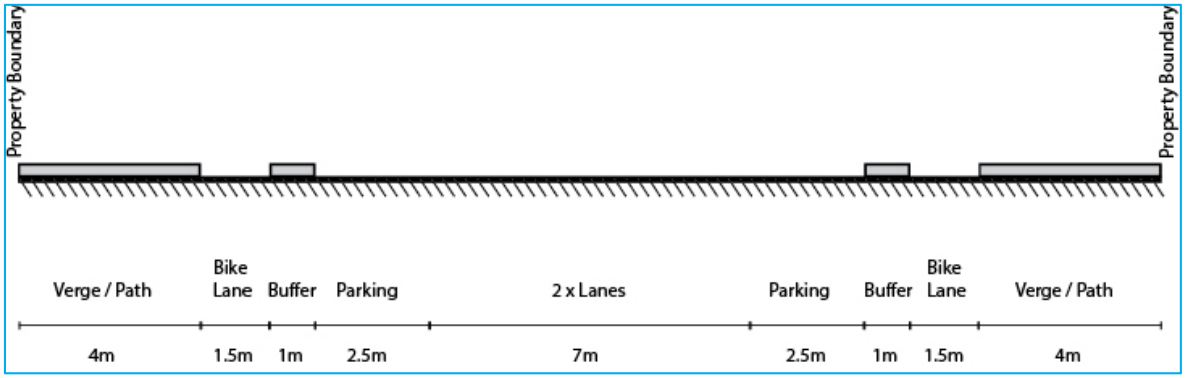


6.4.2 Mixed Use Streets

Mixed-use streets contain a mix of residential and commercial uses, as well as occasional shops, services and community facilities. The key difference between these streets and main streets is their residential component. Mixed use streets, while containing a wider variety of uses than living streets, must still be designed to accommodate the needs, and protect the amenity of residents. They will, by nature, commonly have more traffic, more pedestrian activity and more public transport than living streets and this must be dealt with in a manner that delivers a street character which provides a great living environment, as well as a viable commercial and retail opportunity.

From a bicycle and pedestrian perspective it is best to keep all but the youngest (<8yo) off the pedestrian path and make provision for cyclists on road either through visual or physical separation. The section below shows a possible example of how a mixed use street with a bicycle track would work.

Figure 6.4: Possible Mixed-Use Street Cross Section (28m) with Bicycle Track



6.4.3 Living Streets

Living Streets are just that; streets where people live. The term residential street is not used for this type because it implies the street contains and only houses. Residential streets become dormitory and isolated from the community. Streets servicing only one use are not the streets these guidelines aspire to create.

Streets for living service predominantly homes, but on an incidental scale they have many other uses too: shops, schools, community halls and parks, to name a few. They may also contain offices, universities, hospitals and other uses, but this is not their focus. They are places for being active, meeting people, walking, cycling, going to work, going to school and going shopping. All these activities can originate in a street for living. Streets for living can be in areas of detached housing or in high density areas with high rise units. They can be located anywhere within in a village, a town or a city.

The key principle for designing streets for living is to maintain safety, amenity and convenience for residents, including children and the elderly. Due to their generally low traffic volumes and low speeds most cyclists in living streets can mix with traffic. There are no high density living streets in West Belconnen that are likely to require any form of separation.

6.5 Designing for the Whole Community

A well designed and utilised walking and cycling environment is one that can be safely enjoyed by all members of the new community regardless of their ability. This is commonly referred to as the 8 years to 80 years concept. Future detailed design of the active transport network will need to ensure that the broad range of ability and likely needs within the community are addressed. This applies to both pedestrians and cyclists.

The *ACT Strategic Cycle Network Plan Preliminary Options Report* and the NSW *Guidelines for Walking* identify seven cyclist categories and specifies the typical needs that must be met in order to accommodate each cyclist type (refer to Table 6.1 below).

Table 6.1: Cyclist Types and Requirements – ACT Strategic Cycle Network Plan Preliminary Options Report and NSW Guidelines for Walking.

Cyclist	Needs/Types of Trips
Commuters (experienced)	These cyclists are often undertaking longer trips, will choose quickest route even if there are safety risks.
Commuters (inexperienced)	Novice riders attempting a cycle commute may not be very confident and may prefer to stick to off-road paths or on-road paths with a high degree of separation from general traffic.
Primary school children	School trips are generally short and localised. They need to be safe and off-road whenever possible (an off-road network cannot physically be provided from every school child's home to their school).
Secondary school children	Can be very confident and able to ride longer distances, but are still best served by off-road and local street routes.
Recreational cyclists	These cyclists may like to take scenic trips at a leisurely pace, most likely to use the shared path network.
Sporting cyclists	Are most interested in speed and distance, should be discouraged from using shared paths.
Short utility trip cyclists	These cyclists are undertaking short trips to meet every day needs, mostly in and around their local neighbourhood.

These categories have formed the basis of a condensed categorisation of cyclist types for West Belconnen, as outlined in Table 6.2. This provides a clear context for creating cycling environments that are tailored to the types of trips forecast on each link in West Belconnen.

Table 6.2: Different Types of Cyclists and their Requirements (Adapted for West Belconnen)

Type of Cyclist	Requirements
Vulnerable – Inexperienced adults, elderly and children	Novice riders attempting a cycle commute may not be very confident and may prefer to stick to off-road paths or on-road paths with a high degree of separation from general traffic. School trips are generally short and localised. They need to be safe and off-road whenever possible (an off-road network cannot physically be provided from every school child's home to their school).
Confident Commuter and Sporting Cyclists	Are most interested in speed and distance and should be discouraged from using shared paths. These cyclists are often undertaking longer trips and will choose the quickest route even if there are safety risks.
Recreational	These cyclists may like to take scenic trips at a leisurely pace and are most likely to use the shared path network.
Local Trips – variety of ages and experience	These cyclists are undertaking short trips to meet every day needs, mostly in and around their local neighbourhood.

Pedestrians are a slightly different but much broader user group. Almost everybody is a pedestrian at some stage in their journey no matter what the origin or destination, making this a very important user group. Like cyclists, they do of course have some vulnerability, as relative to car traffic, they are slow and unprotected. Pedestrians are susceptible to the influences of weather, grade and distance. Its important future networks do not aggravate these vulnerabilities.

6.6 Safety

6.6.1 Safety by Design

Safety is a key issue in determining the type of travel and the route. To achieve a safe active transport network consideration must be given to a range of factors, including visibility, lighting, surveillance and a higher usage rate. Other factors that will influence a pedestrian's route preference are maintenance, slope and material used in making the paths. The pavements should be sufficiently flat, wide, non-slip in wet weather and maintained to prevent accidents occurring.

By creating a network of attractive active transport paths, more users are encouraged to use the network, at more times throughout the day. This in turn will increase the safety of the path. It is important to create an active transport network that is usable by all residents of the area, not just focusing on a specific set of users, i.e. Commuters, recreational users etc.

Figure 6.7: Safe, Highly Visible, Attractive Walking Path

To ensure cycling is widely used and accepted, it is important to demonstrate to cyclists that they are welcome in the space. Spaces and streets should be designed to invite and welcome cyclists as legitimate modes of transport rather than offer them an indirect “backroom” alternative away from casual surveillance and the destinations to which people want to have access. Routes need to be:

- Safe (and perceived to be safe);
- Direct; and
- Legible.

6.6.2 Perceptions of Safety

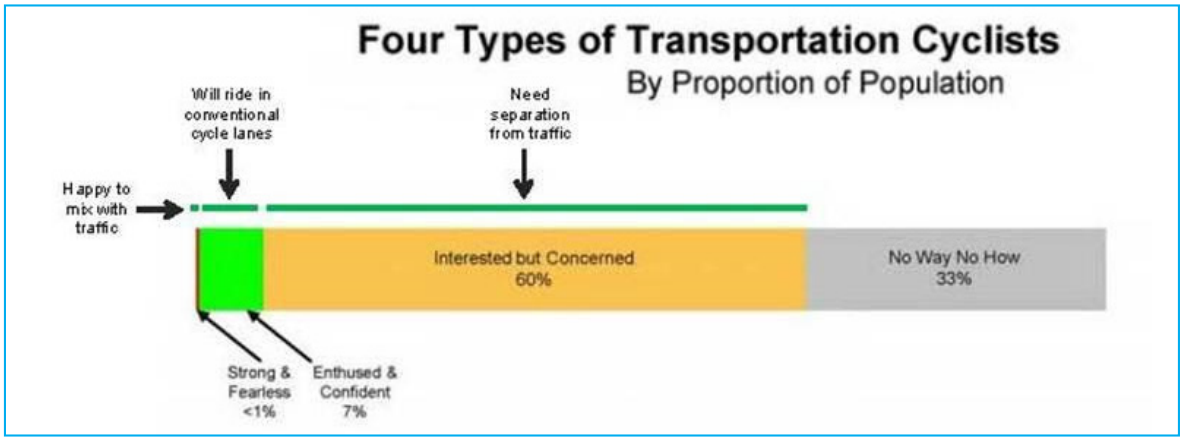
Perceptions of safety (real or otherwise) significantly influence the choice of transport.

There will be a significant number of potential cyclists in West Belconnen, however they perceive they require certain types of infrastructure to be safe. As highlighted in Table 6.2, different users have different requirements and one factor that influences this is perceptions of safety. The assurances of planners and designers regarding safety is of no consequence or value to the 60% of the population whose decision to ride depends on their *perception* of a safe route.

The example below is from Portland Oregon, arguable the Unites States' most enthusiastic cycling city. Despite this, users have a high level of sensitivity to perceived safety. In this regard cycling lanes and cycling tracks are

important (refer Figure 6.5). They are an overt invitation for cyclists to be part of the movement network. They get to share the same direct legible network as the car traffic and enjoy the resulting casual surveillance and access to land use as a result.

Figure 6.5: Cyclists Requirements for Cycle Lane Separation



Ref: http://www.portlandoregon.gov/transportation/article/158497

Canberra enjoys a relatively free flowing and high speed car traffic network and this has to a certain extent resulted in the proliferation of so called “community routes” or an off road network. This completely separates the vehicle network from the cycling network. While this has some advantages in some locations, it generally relegates cycling as a secondary use, with less direct routes, less casual surveillance, some wayfinding risk and less access to land uses along their journey. The other issue with the community routes is that they interfere with the very important pedestrian movement. West Belconnen supports on-road but physically segregated routes, as shown previously in Figure 5.8. Where appropriate, and to capitalise on the physical environment and the location of the transmission easements, it may also be possible to provide scenic `community routes' within West Belconnen.

6.7 Off Road Walking and Cycling Paths

The ACT has a relatively extensive network of “community route” infrastructure that is shared by bicycles and pedestrians and is not on the road pavement, and may or may not be in the road reserve. This arrangement may be extended in West Belconnen. The most significant design considerations for off-road paths are as follows:

- Segregated walking/cycling paths, or combined paths; and
- Sealed versus unsealed paths.

In both cases, the most pertinent consideration is the forecast volume of cyclists and pedestrians. Where volumes are suitably low, unsealed combined paths provide a perfectly sufficient level of comfort and perceived safety for pedestrians and cyclist. However, noting the high accident rates present on shared paths where high traffic volumes are present, careful consideration of the warrants for segregation is required. It should also be reiterated that such considerations should be cognisant of the types of users expected to use such paths, and the specific needs of these users, as outlined in Table 6.2.

6.8 Treatment of Intersections

Intersections present an elevated safety risk for cyclists navigating either on-road or off-road bike paths, however the adoption of a variety of treatment methods can help alleviate potential safety hazards.

Interactions between cycling and pedestrian lanes with road intersections is based on the ACT Government's *Design Standards for Infrastructure – Pedestrian and Cycling Facilities* guide, and the *NSW Bicycle Guidelines* document.

In West Belconnen, we particularly intend to avoid intersection treatments that specifically do not enable quality safe movement for cyclists and pedestrians. In particular we will avoid where possible roundabouts particularly multi-lane roundabouts, and left turn slip lanes.

Other treatments that create difficult conditions for cyclists and pedestrians such as large street corner radii will also be avoided.

Figure 6.6: NSW Bicycle Guidelines Figure 7.12 – Bicycle Crossing at a Signalised Intersection

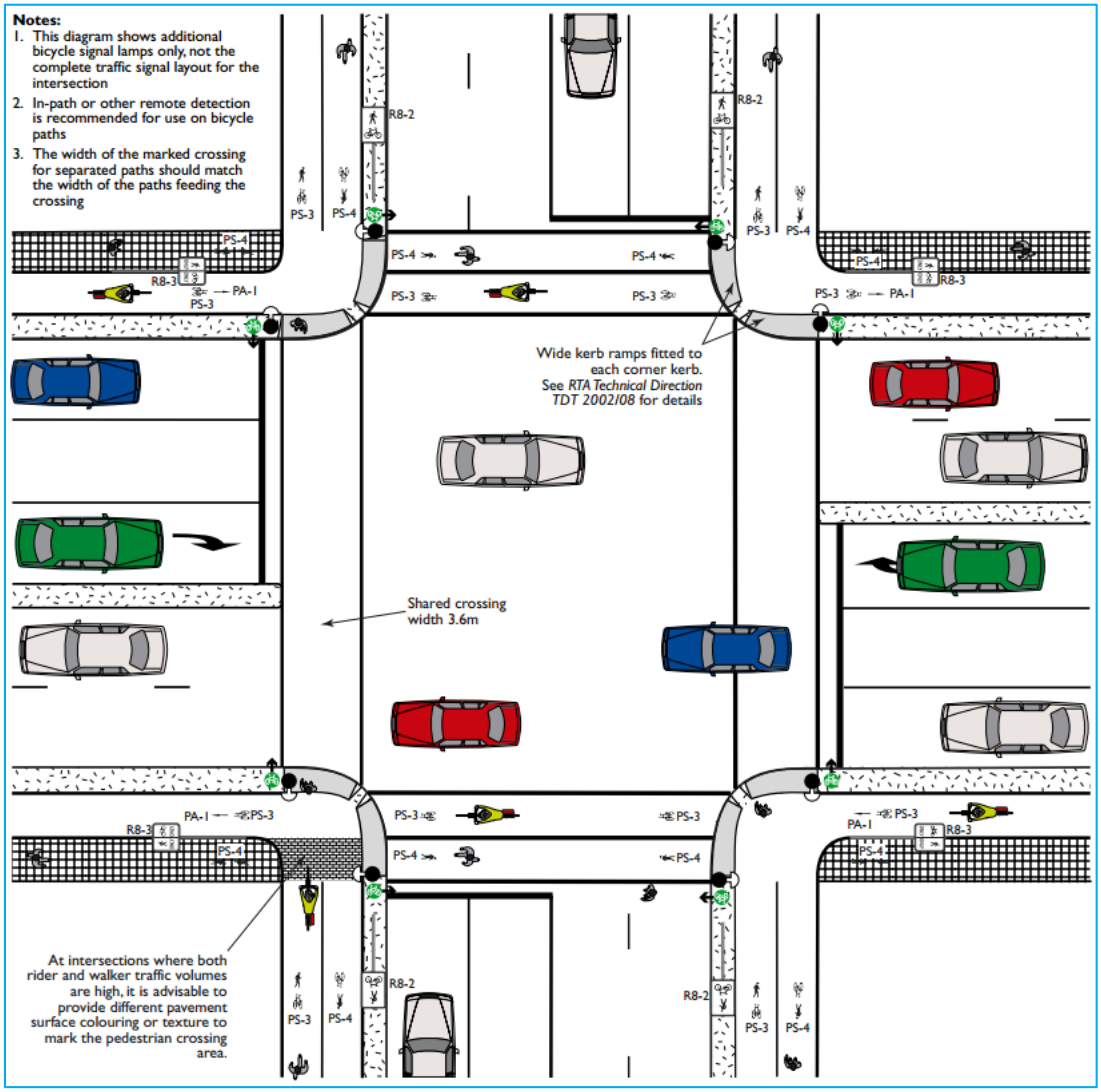


Figure 6.7: 'Dutch Intersection' Treatment

6.9 Integration with Bus Stops

Treatment methods for bicycle path interactions with bus stops in West Belconnen has been considered based on *NSW Bicycle Guidelines*. The major principle guiding bus stop treatments is the removal of conflict points, primarily with buses, but also with bus passengers. Two main treatment options are recommended for West Belconnen, depending on the whether the bus stop in question is indented or otherwise, as outlined in Figure 6.8 and Figure 6.9 below. Figure 6.10 shows a bicycle lane at a bus stop in suburban Sydney. This demonstrates an undesirable treatment option which should be avoided in West Belconnen, given that this design creates two conflict points between cyclists and buses when buses enter and exit the indented stop.

Figure 6.8: NSW Bicycle Guidelines Figure 5.6 - Bicycle and Bus Lanes Adjacent to a Bus Stop

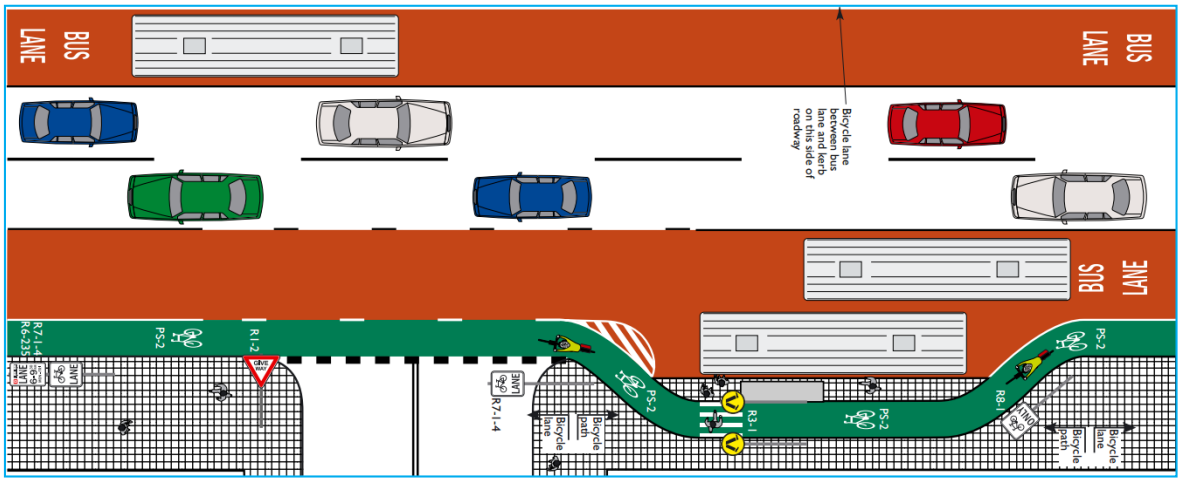


Figure 6.9: NSW Bicycle Guidelines Figure 5.5 – Bicycle Lanes and Bus Lanes

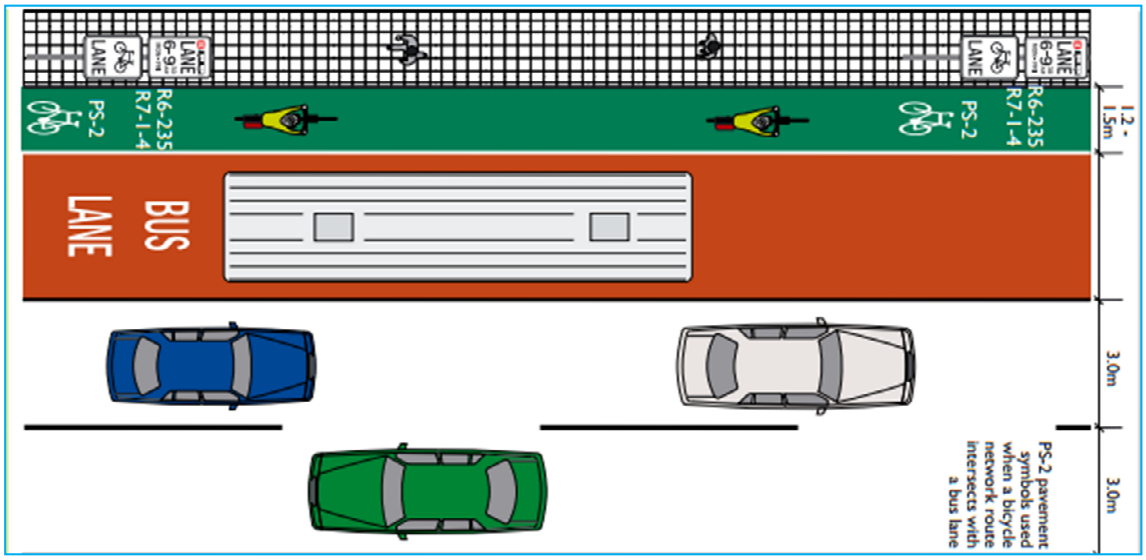


Figure 6.10: On-road Bike Lane. Sunnyholt Road, Blacktown

6.10 Site Specific Detailed Design

In order to guide site specific detailed design of the active transport network, the following considerations are presented and should be addressed:

- Maintain grid network pattern with a high density of connections to maximise network legibility and connectivity.
- Ensure that design of new development and streets establishes priority for pedestrians and cyclists particularly around high traffic generating land uses.
- Casual surveillance improves real and perceived safety on paths. Consider the following:
  - Location of off-road paths.
  - Lighting.
  - Minimise visual barriers.
  - Provide rest stops in suitable locations.
  - Active edge treatments.
  - Shade and shelter.

- Provision of cycle parking at key destinations such as public transport stops, rest stops, key attractors etc. is crucial in order to foster an environment conducive to active transport use.
- Adequate wayfinding signage must be provided.
- Footpaths typically should be provided on both sides of all streets.
- Walking and cycling routes must be maintained to a high standard to ensure continuous, accessible paths of travel.
- High quality lighting along routes where night use is expected must be provided, consistent with Crime Prevention Through Environmental Design (CEPTD) Principles;
- Walking and cycling routes should be linked to local destination and activity centres, such as major work and retail centres, schools, parks, residential areas, and public transport stops via the most direct and convenient routes possible to encourage commuting by active forms of transport.
- Route continuity through local streets is essential, linking footpaths with shared paths and providing safe access through road closures and cul-de-sacs.
- Clear, legible and safe connections may be achieved through the use of signage, landscaping, lighting and active edge treatments.
- Expanses of ground level blank walls along street frontages, and large driveways and entrances to car parks are avoided.
- Footpaths have ramps at all kerb corners and tactile ground indicator tiles.
- Street furniture is attractive but does not obstruct footpaths. Blind spots are avoided and footpaths are of adequate width and grade.
- Creation of stimulating and attractive routes will encourage active transport use.
- Walking and cycling routes may be designed around local landmarks and points of interest to encourage active transport use.
- Reduce vehicle speeds in residential areas, shopping streets and around schools.

In addition to the consideration outlined above, eight key principles advocated by Danish architect and urbanist Jan Gehl are recommended to guide detailed design in West Belconnen. Gehl focuses on returning cities to people through walking and cycling and urban quality, and has undertaken many studies in Australian cities, including Adelaide. Key recommendations from Gehl to enhance walking and cycling in Australian cities are:

1. Locate cycle paths between parking lanes and footpaths.
2. Providing wide footpaths clear of obstacles.
3. Providing bicycle lanes on a raised level.
4. Avoiding guard rails for freedom of movement for pedestrians.
5. Give pedestrians and bike riders priority over side streets.
6. Eliminate slip lanes to improve walkability of neighbourhoods.
7. Use parallel parking rather than angle parking.
8. Provide active built edges.

6.11 Staging of Delivery

As highlighted in Section 3, buildout is forecast to occur in 2054 and accordingly active transport infrastructure and facilities will need to be implemented in a staged manner. Development is planned to gradually spread from the south-eastern periphery of the site moving northwards and westwards over time. The final stage will be development of the northernmost areas.

Early implementation of the active transport network to a stage that encourages its use is critical to avoid over reliance on private vehicles. Integral to this will be the need to ensure that at detailed design stage the critical elements are incorporated to ensure that pedestrians and cyclists are invited into spaces and assume priority

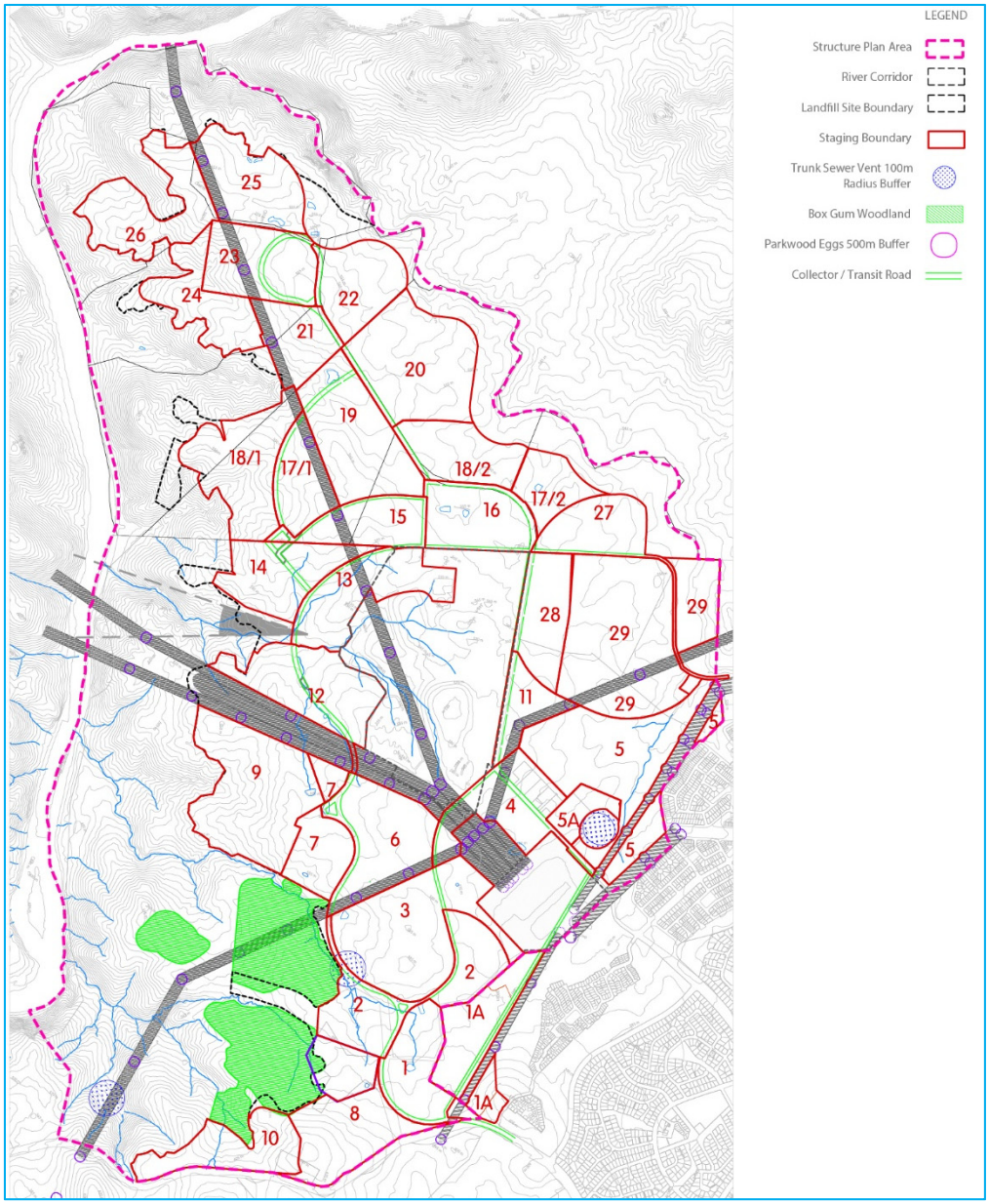
over other modes of transport where appropriate. The staging of development will play a key part in the provision of services and the timelines to delivering the active transport network.

Figure 6.11 shows the proposed staging of the development, showing that the initial phases of the project will focus on developing the areas closest to the site boundary to the south, providing the ability to create links to surrounding destinations and the Canberra CBD in the initial phase of the project.

As the project continues, the mixed land use area will be developed, creating the internal key destinations of the site. In this phase of the project, it is important that the internal active transport network be complete to a stage that encourages residents to use alternative modes of transport.

Staging the development this way will also provide an opportunity to encourage residents to change their transport modes when they are changing their address. This is often the best way to encourage alternative transport usage, as the user is changing one part of their lives; it is easier to change their reliance on private vehicles at the same time.

Figure 6.11: West Belconnen Delivery Staging



7 Car Usage

As discussed in Sections 2 and 3, although it may not be possible to eliminate the use of the private motor vehicle, a number of initiatives can be implemented to reduce the use of the private car, and potentially reduce the need for a family to purchase a second car.

To achieve this objective, two car-based initiatives are presented below. Car share schemes provide cars available for hire by the hour in locations throughout the community, which are useful for persons who may need to use a car infrequently. Parking initiatives aim to discourage car ownership by limiting the availability of parking spaces, which also affects the financial outcome of community development by freeing land that may have been unnecessarily allocated to parking.

7.1 Car Share

7.1.1 Commercial Car Share Schemes

There are a number of different models of car share scheme implemented around the world, however discussion here is limited to commercial car share schemes currently in operation in Australia, such as those provided by GoGet and Hertz 24/7.

Car sharing is a service that provides members with access to a fleet of vehicles, usually on an hourly basis. With most car sharing services, members pay an annual membership fee and then an hourly fee to reserve the car which includes the car rental, fuel, parking and insurance. The reservation is normally handled online or through smartphones, and as soon as the commencement time of the booking is reached the member can unlock their booked car using a smart card. The car normally needs to be returned to the same location, and there may be limited flexibility with extending the booking, which are potential limitations of the service.

Car sharing can often substitute for car ownership in denser urban environments that have good public transport and cycling alternatives. In less dense communities, it can help families avoid the need for multiple cars. When located near to businesses, car share vehicles can be extremely popular as a way for small to medium-sized businesses to avoid needing to own a vehicle, and for larger businesses to reduce their fleet size by supplementing it with car share vehicles as needed.

Car sharing is now well established in a number of European, North American and Australasian cities, and has shown to reduce car ownership significantly[7]. At the same time, shared cars tend to have significantly higher utilisation rates and fuel efficiency. In Australia, car share schemes are growing significantly in Sydney and Melbourne, though are still in their infancy in other cities. Commercial car share is yet to be implemented in Canberra, but operators are currently monitoring draft policy being prepared by ESDD which would create a more viable local market.

7.1.2 Case Study - GoGet

Australia's largest operator is GoGet, who operate a fleet of over 1,400 cars and have over 45,000 members, located across four cities and 75 suburbs. The fleet that they deploy in each area varies depending on the needs and demographics of the local community. Whilst most of their fleet consists of small four-cylinder vehicles, they also offer prestige European vehicles, station wagons, people movers, vans and utes.

[7] Martin et al. (2010) "Impact of Carsharing on Household Vehicle Holdings: Results from North American Shared-Use Vehicle Survey". Transportation Research Record No. 2143 pp 150-158.

The demographic profile of their membership depicts a relatively youthful, educated and well remunerated section of the population. There may be a correlation between acceptance of the use of car share and having an understanding and appreciation of the environmental and economic benefits of not owning their own car.

Table 7.1: Characteristics of GoGet Members

Characteristic	Percentage of Members
Aged between 25 & 44	73%
University educated	81%
Earn over $100,000 per annum (individual, not household)	40%

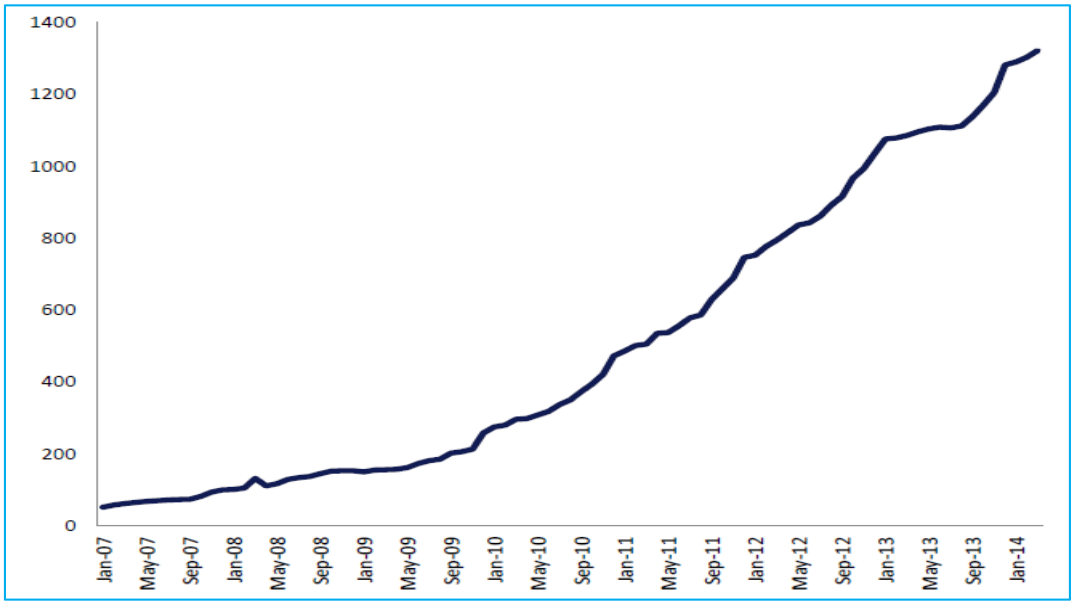
The most successful area for implementation for GoGet is in the City of Sydney, where 12% of households are now car share members, yet car share vehicles represent less than 1% of the vehicles registered within the area. Statistics relating to their members in the City of Sydney are shown in Table 7.2.

Table 7.2: Characteristics of GoGet Members in City of Sydney

Characteristic	Percentage of Members
Have parking on site available, but do not use	44%
Own a car, and use GoGet as a second car	23%
Deferred the purchase of a second car	61%
Drive to work	7%
View themselves as `Members for Life'	40%

Figure 7.1 shows the significant growth of the GoGet fleet since 2007. This is a reflection of the growing acceptance of car share schemes by Australians as an alternative to owning a car.

Figure 7.1: GoGet Fleet Growth since 2007



7.1.3 Car Sharing and Other Transportation Modes

Car sharing is sometimes called the "missing link" in the package of alternatives to the private car. Members often use some combination of public transport, walking and cycling for a majority of their daily travel needs, but have access to a car whenever they need it. The highest uptake rates have been in areas of limited parking supply and good public transport supply.

Car share also compliments taxis (which are often better suited for one-way trips and provide an alternative for people who cannot drive) and rental cars (which might be cheaper for longer journeys).

The availability of light commercial vehicles such as a vans and utes opens up opportunities for different types of users, such as those wishing to avoid expensive delivery fees when purchasing a piece of furniture. In a growing community such as West Belconnen where every household will go through the process of relocation, the availability of these types of vehicles may be highly appreciated by some residents.

7.1.4 Infrastructure Requirements for Car Share

One of the most appealing aspects of car share is the very low cost of implementation in terms of infrastructure. All that is required is a single parking space, provided primarily on-street but also provided in the car park areas of businesses or residential developments. If a car share scheme proves to be commercially unviable at a given location, the car share space is simply converted back to a regular parking space.

7.1.5 Car Share in Greenfield Communities

The greatest success stories for car share have been in inner-city urban areas, and there are relatively few examples of implementation in greenfield communities throughout the world to date. While the same strategies that work for urban cores may not work in the suburbs, it would be wrong to write-off suburbs entirely.

Greenfield development has an advantage in that there is the opportunity to start from a clean slate. Sustainable transport plans for greenfield developments can help keep car ownership low and allow for public transport and car sharing to be viable alternatives. A suburb that has an attractive walking and biking environment, and where commuters find public transport to be a viable alternative to reach their workplaces has the potential for car-sharing to succeed. While it would be difficult to expect households even in such suburbs to eliminate car usage completely, there is a strong case to be made for such households to reduce the number of cars they own and delay the decision to purchase a new car or replace an existing car.

For households that manage to commute using public transport, there is a reduced incentive to maintain multiple cars for the occasional time when multiple cars are needed. And this is a niche that car-sharing can easily fill.

Car sharing takes the capital cost of owning a car and converts it into an hourly cost. However, people who already own cars often only see the marginal cost of using their car, which is significantly lower than using a car-sharing service. Therefore, the key to the success of car sharing is low car ownership rates, which can be achieved in a greenfield development (even if it is in the suburbs) by providing households with good transport alternatives (public transport, car sharing etc.) from the very beginning and not allowing a culture of high car ownership to take root.

In summary, the following observations suggest that successful implementation in West Belconnen may be possible:

- Key determinants of success are limited parking supply and good public transport supply. Unlike most greenfield communities, West Belconnen is planned to have both of these.
- Implementation of car share in new residential complexes has proven highly successful, when integrated into the planning from the outset, so that new residents are aware of the availability of car share at the time they purchase. This then allows them to consider whether they need to own a car, or whether they need a second parking space.

- The `mobility hub' concept presented in Section 4.1.3 would provide car share spaces in strategically located positions throughout the community, designed to maximise the residential catchment around each. Given that car share users also tend to be regular users of public transport, the close proximity of the two may create subtle cross-promotion.
- The emergence of driverless vehicles as transportation trend in the next 20 years, could see car share vehicles and taxis merge. Rather than book a car share vehicle or taxi, a person would book a driverless taxi. The car share spaces that are provided would still be necessary as the holding locations for driverless taxis when not in use.

7.1.6 Practical Steps for Implementation in West Belconnen

There are two components of car share that need to be managed in the development of West Belconnen, infrastructure and service delivery.

The infrastructure aspect is relatively easy to manage, as all that is needed is car parking spaces in strategic locations, allocated for the use of car share vehicles only. As discussed, one option would be to co-locate these with bus stops. Other appropriate locations would be in the retail precinct, and the mixed-use precinct.

Service delivery is the more complex component, and will require a commercial car share operator to be willing to establish operations in West Belconnen. This may present some challenge, as the provision of car share in a greenfield community in Australia is an innovative step.

Preliminary discussions with GoGet highlighted a number of possibilities, and also provided insight into previous deployments in residential areas. The key consideration for commercial operator is whether the deployment of a car share vehicle at any given location will be commercially viable.

The annual cost of providing a car share vehicle including servicing is $18,000. If revenue generated by the vehicle falls short of this mark, subsidy from third parties such as government or developers would enable the service to be provided. As the service becomes more popular and better utilised in future years, the level of subsidy would drop.

Instead of simply providing a cash sum to the operator to make up for revenue shortfall, the funds could alternatively be provided to the operator who would then in turn provide residents with memberships that included credit. For example, if $10,000 in subsidy was required per vehicle per annum, and each vehicle served 400 households, a $25 credit voucher could be provided to each household. This would provide a strong encouragement for people to at least try the service. Overall, this creates a win-win situation as the subsidising entity would pay no more than they otherwise would have, the operator receives the same amount of funds, but the residents receive credit to encourage them to use the service provided.

The provision of information and marketing materials to both prospective and existing residents is critical, and this is seen as a reason for failure in previous implementations. The provision of a free membership to each household would be one way of raising awareness of the service.

In the Bowden redevelopment just outside the Adelaide CBD, GoGet has provided branded vehicles at the sales office which are used to drive prospective residents around the community. As a result, for most people their first tour of their prospective new home is in a car share vehicle. From the perspective of the developer, they now have a company vehicle that is provided by third-party operator and is fully maintained.

The provision of minivans and utes in the earliest stages of West Belconnen are expected to be highly popular as people regularly need to move large objects such as furniture. This could be many people's first introduction to the use of a car share vehicle.

7.2 Parking

7.2.1 Introduction

Parking for motor vehicles is an important land use consideration for development design. Well designed and managed parking can have a positive effect on place quality, whatever its location. Conversely, poorly designed or managed parking can be detrimental to places. Parking supply in streets must be balanced with off-street provision. Parking, particularly for commercial and mixed-use areas, should be considered as an integrated proposition. Parking should be supplied in the right amount, in the right place and at the right price – keeping in mind that the right price might be zero. Most importantly we know from experience that parking should not be supplied on a “per site” or “per street” basis.

As part of an overall solution, parking can even be centrally provided, either privately or publicly owned. Centrally located and controlled parking facilitates enable people the freedom not to have to use their vehicles for short trips and instead, walk. Driving rather than walking to destinations reduces the footpath population and increases traffic volumes. This is the opposite to the desired outcome of an active vital place.

7.2.2 Design Objectives for Parking

The applicable key objectives in locating and designing parking in streets to enable the achievement of a vital sustainable community are:

- To avoid obstructing other users.
- To balance on-street and off-street parking supply.
- To design parking that is accessible and not obstructive to users.
- To make parking aesthetically acceptable.
- To use parking to separate users.
- To manage parking turnover to improve - and not detract from - street vibrancy.
- To manage short-term users to avoid impacts on other users.
- To recognise that all drivers become a pedestrian as soon as they alight from their vehicle.

7.2.3 On-Street Parking

On-street parking can be an important tool for creating street activity. It provides a 'natural' barrier, both physically and mentally, between the moving traffic section of the street and the genuine useable community space. Motor vehicles, coming and going, and their occupants leaving and returning to vehicles also stimulate activity. On-street parking can be uncontrolled, or it can be controlled by time limits, with or without charge.

Figure 7.2: On Street Parking Restricted to One Side of Street

Where on-street parking is controlled, the usual time limit periods for on-street parking are 5 minutes, 15 minutes, 30 minutes, 1 hour, 2 hours and 4 hours. Generally, the applications for these limits are as follows:

- 5-minute parking is suited to very high arrival rate areas and provides a drop-off/pick-up opportunity for establishments such as cinemas, post offices and hotels.
- 15-minute parking is for high-turnover convenience parking outside establishments such as banks, post offices, convenience stores and newsagents.
- 30-minute parking is applicable to local shops relying on a high level of convenience; however 30-minute parking does allow patrons to go to more than one destination.
- 1-hour parking is a common and appropriate general restriction in many locations, particularly convenience shopping areas. It allows up to six turnovers in a business day, more if the space is available in peak hour. It also lets patrons visit several destinations, while only using one parking space.
- 2-hour parking is commonly used in centre-fringe areas, where on-street parking supply is limited and where resident and worker parking on-street is not appropriate.
- 4-hour parking is for use in areas where residents and workers are discouraged to park on-street. It can be used as a tool to encourage use of public transport to a destination.

Specific time limits are the most familiar solution to inducing this type of parking turnover, however graduated charging regimes may also be an effective mechanism to induce the right levels of turnover. There are other components to on-street parking that must be considered in street design. These include commercial access and loading, waste collection and taxis.

7.2.3.1 Commercial loading/delivery

Commercial loading/delivery zones are short-term parking zones provided to allow the pickup/ delivery of goods. Modern planning regulations often require loading to be provided offsite for all sites individually, however it is sometimes more efficient to let this be managed from the kerbside. This promotes more efficient use of land and allows more flexibility for development.

Loading zones (and similar short-term pick-up and drop-off areas) should be provided in convenient locations in business and industrial areas where there is a regular demand for loading and unloading of goods. Preferably, these zones should be located at one end of a section of parking, with a clear length for vehicles to drive-in or

leave directly without having to accommodate the length of the vehicle plus a length for opening the rear tray or door.

7.2.3.2 Waste collection

On-street motor vehicle parking can interfere with waste removal operations as rubbish bins placed at the kerbside or in service areas are rendered inaccessible. Some ways to overcome this issue include:

- the waste collection process can be carried out manually and/or in periods of low parking demand.
- parking restrictions can be applied (e.g. `no stopping' or `no parking') in specific hours, on waste collection days or more generally in specific high turnover areas.

7.2.3.3 Taxis

On-street taxi stands will be placed at a convenient location in the Main Street parallel to the kerb with taxis facing in the same direction as the general flow of traffic so that waiting taxis can enter at the back of the queue and progressively move forward, with passengers entering the front taxi first.

The length of a taxi stand will be a minimum of (5.4 n +1.0) metres, where n is the number of taxis to be accommodated. We are anticipating that we will be able to accommodate 2 to 3 taxis in the Main Street Village area.

7.2.3.4 Standards for on-street parking

In West Belconnen, we generally support the parking standards described in detail in AS2890, Australian Standards for Off-street Parking. However due to the lower speed environments associated with some of our streets it is considered the maximum width for on-street parking spaces is 2.5 m. Wider spaces (up to 2.8 m) may be appropriate in some road environments with higher speeds and more emphasis on efficient traffic movement, but are not necessary in a street environment.

7.2.3.5 Motorcycles and motor scooters

Motorcycle and motor scooter parking zones may be provided in groups at on-street locations according to demand (e.g. in the main street and village).

Figure 7.3: Motorcycle Parking Accommodated in Undersized Bay On-Street

7.2.4 Off-Street Parking

Off-street parking is a significant traffic generating land use which has a very important role in travel demand and hence in the design of streets. Maximum parking rates, rather than minimum, provide an excellent opportunity to control travel demand, particularly in areas where the use of public transport, walking and cycling can easily be encouraged as an alternative to driving. The rates presented in Table 7.3 indicate appropriate maximum parking rates for different uses and locations. These rates have been derived for these guidelines from a review of the parking rates from planning schemes throughout Australia as well as proposed rates from research on urban mixed-use development areas. We believe it is highly preferable for larger developments such as West Belconnen, to take a broader precinct-based approach with more generic provisions. The benefit is to discourage many short discrete trips around centres, from and to individual parking locations, and encouraging a park once and walk type behaviour.

Table 7.3: Off-Street Parking Rates

	Residential	Non-Residential
Main Street/Village/Village Edge	Max 1 space per dwelling	Max 1 space per 75m^2 GFA
Bungalow/Eco	Max 2 spaces per dwelling	Max 1 space per 50m^2 GFA

7.2.4.1 Parking for urban mixed-use areas

Parking is one of the most challenging aspects of development in both urban and suburban areas. Typical suburban developments, where 50 to 75 % of the site is devoted to surface parking, result in land use densities that are too low to support a public transport service. By creating a more limited parking supply, and moving parking from surface parking lots to on-street parking and centralised parking developments, residents, shoppers and employees are encouraged to use public transport to get to centres and walk within centres. In general, the supply of parking should discourage driving as a preferred mode, and most certainly discourage driving within a centre to access the mix of uses.

Three fundamental components should be considered for parking, those of supply, location and design. Parking supply needs to be sufficient to meet vehicle needs which cannot be satisfied by public transport or active modes. In more urban areas with established office markets and high quality public transport service, office parking ratios are lower than conventional ratios for say regional towns. In emerging markets, office or commercial development requires access to conventional ratios but mechanisms to reduce supply as the market matures should be considered. Depending on the mix of uses shared parking between uses or a parking management district can reduce the need for parking by 25 % over conventional ratios.

Parking facilities should be located so that buildings, not parked cars, are the dominant visual feature. As well as being integrated within the development, the design of parking needs to relate to the streetscape, circulation routes, and pedestrians.

7.2.5 Parking Summary

Key guidelines to maximise the positive influence of parking (on and off-street) on streets:

- Parking is an important land use that impacts place character and function.
- Parking management is an effective tool to influence street character and activity.
- AS2890 is an appropriate standard for on-street parking, although 2.5 m is a preferred maximum space width for streets.
- Angle parking is undesirable.
- Off-street parking over-supply has a significant impact on mode of travel and on-street pedestrian activity.

- Considering off-street parking on a shared precinct basis rather than a development by development basis can have a positive influence on pedestrian activity.

7.3 Electric Vehicles

7.3.1 Overview

An electric vehicle (EV) is any vehicle that uses electricity as energy for propulsion. EVs provide a range of benefits when compared to conventional ICE vehicles[8]:

- Operating cost savings, due to the lower costs of electricity relative to liquid fuels, and the higher efficiency and lower maintenance costs of electric drivetrains.
- Greenhouse gas emissions reductions, particularly when run on renewable energy.
- Air quality improvements for populated areas due to the zero emissions at the source (emissions still may occur at the location of energy generation).
- Traffic noise reductions.
- Local employment benefits through the use of domestically-produced electricity in place of imported oil.

Electric vehicles are becoming increasingly viable for use in Australian urban areas. Whilst it is difficult to predict what the uptake rate of electric vehicles will be, it is assumed that the current trends in the improvement in the technology is likely to generate increasing demand for ownership amongst the general public.

There are several types of EVs, as follows:

- Hybrid-Electric Vehicles (HEVs) that use liquid fuel (petrol) as their sole external energy source, but supplement this with electrical energy captured from the braking system and stored in batteries. The Toyota Prius is the best known example of a HEV.
- Plug-in Hybrid-Electric Vehicles (PHEVs) source both electrical energy and liquid fuel from external sources.
- Battery Electric Vehicles (BEVs) use electrical energy as their sole energy source.

Much of the guidance presented here is sourced from the Victorian Government's *Guidance on Land-use Planning for Electric Vehicle Parking and Charging, 2012*. This is the most comprehensive guidance document on the subject of electric vehicles in Australia.

7.3.2 Infrastructure Requirements

HEVs have no specific infrastructure requirements, but PHEVs and BEVs both do, and this infrastructure will need to be provided in West Belconnen. Fortunately, the provision of this charging infrastructure is relatively straightforward.

Such infrastructure can be provided at a home or a business using dedicated charging outlets or electric vehicle service equipment (known as `EV chargers'). They can also be charged at public charging stations, which are increasing in number in Australia's major cities and larger regional towns.

All EVs that are delivered into the Australian market can and will be able to charge from conventional power outlets. This means that an electrical outlet needs to be located to allow for an EV charging cable to be easily and safely connected to the vehicle.

The next generation of EVs are expected to be able to draw 32 Amp for faster charging times. For this reason most charging circuits that are being installed for EVs are specified for this future-case scenario. For fleet and

[8] United States Department of Energy 2012, www.afdc.energy.gov/fuels/electricity_benefits.html (viewed June 2014)

public charging locations it is preferable that sites be provisioned to use three-phase supply if available (this is separate to `quick-charging', which is explained further below).

Most EVs also contain the ability to charge significantly more rapidly using high-current, three-phase power delivered through quick-chargers. This quick-charging capability exists alongside the standard charging described above, and uses dedicated equipment. Although standard charging at up to 32 Amp should be sufficient for homes, corporate fleet and public parking locations, quick-chargers should be considered for locations along travel corridors as would be supported by retail fuel outlets for conventional vehicles.

As is the case with electrical appliance plugs, plug designs for EVs vary based on the country of manufacture. These differences are due to communications functionality, safety performance and the characteristics of electricity networks. Currently there is no Australian standard relating to charging connectors and the lack of standards and regulatory frameworks for EV components, recharging and network access has led to a certain extent to market uncertainty.

As the plug design variations are seen predominantly at the vehicle-end of the charging cable/plug, future-proofing infrastructure simply requires the installation of a charging circuit that can be connected to the charging plug of choice, when required.

The two most commonly available types are:

- IEC62196 Type 1 (used in US and Japan - SAE J1772) –restricted to single phase power. Chargers of this type are installed at the University of Canberra.
- IEC62196 Type 2 (used in Europe – Mennekes VDE-AR-E 2623-2-2) – can be used on single or three-phase power

Figure 7.4: Type 1 and Type 2 EV Charger Plugs

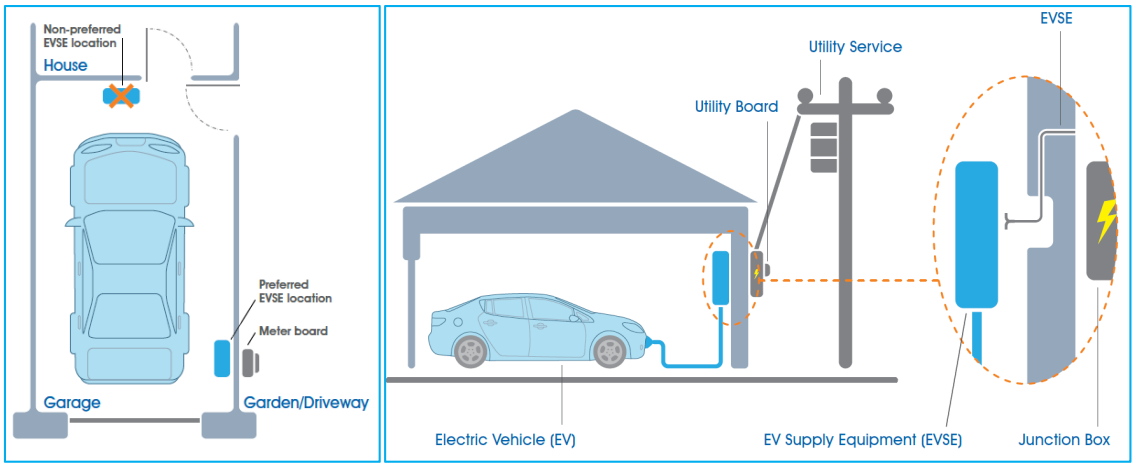
Much in the same way that petrol bowsers once had one hose that was equipped with an unleaded nozzle, and one with a regular nozzle, an electric car charging station could offer multiple plug types.

7.3.3 Policy for Providing Home Charging Equipment

To pre-emptively equip every household with an EV charging device would be costly and potentially wasteful if residents choose not to buy an electric vehicle.

A more appropriate policy would be to equip the parking space(s) in each home with a specified location where a charging device could be installed, in the garage or an external location able to charge an EV parked in the driveway. This location would need to have appropriate electrical wiring installed, ready for the future installation of a charging unit. As shown in Figure 7.5, the ideal location is as close to the dwelling's electrical meter board as possible and away from the pedestrian entryway.

Figure 7.5: Preferred Locations for EVSE in a Residential Property



Source: Guidance on Land-use Planning for Electric Vehicle Parking and Charging, State Government Victoria, 2012

7.3.4 Policy for Providing Charging Equipment in Business and Retail Locations

Guidelines in Victoria[9] recommend that all greenfield public parking facilities with at least 100 parking spaces are to designate a baseline allocation of two per cent of car spaces for the installation of an Electric Vehicle Supply Equipment (EVSE) circuit in support of the installation of EVSE. If the decision is made to delay the installation of EVSE, the EVSE circuit can be capped in readiness for later deployment.

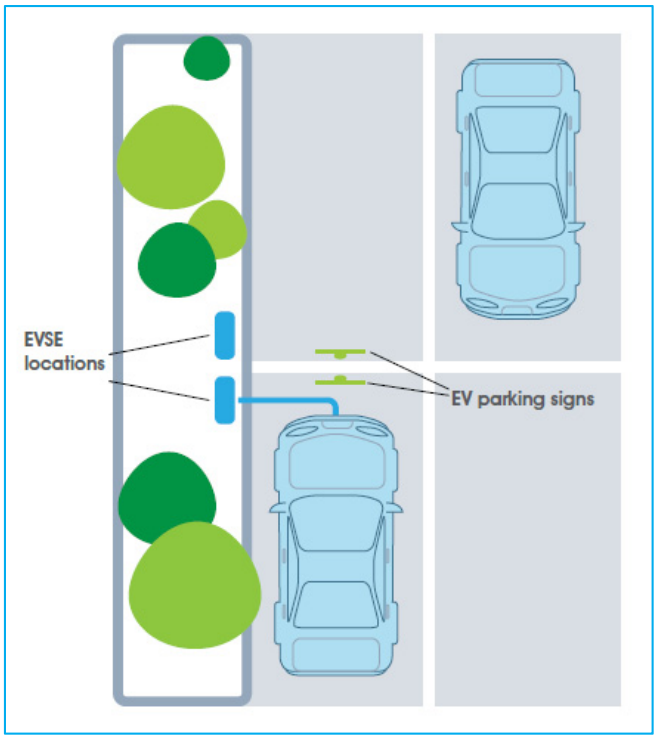
The two percent ratio is recommended to be gradually increased to 10% as EV uptake increases with time. This means that the future locations of EV spaces need to be considered when designing parking areas. In commercial and retail locations, EV spaces should ideally:

- Be designed so that the placement of the EVSE does not infringe upon the minimum car parking space dimensions. EV spaces will typically have the same dimensions as regular car spaces, except when disabled parking is required.
- Be designed so that the placement of the EVSE minimises the risk of pedestrians tripping. To this end, the EVSE should be installed in close proximity to the parking space. All possible charging cable routes to the vehicle should avoid walkways. Preferred locations include wall-mounts on the perimeter of commercial car-parks, or on pillars adjacent to guard-rails that create a deterrent for through-traffic.
- Be designed so that there is minimal risk to the EVSE through driver error or vandal attacks. Locating the EVSE away from high-probability accident zones, and using wheel-stops, bollards and barriers are examples of measures to protect the EVSE from vehicle impacts. Locating the EVSE away from natural blind-spots will reduce the probability of criminal damage.
- Be designed with consideration given to accessibility for persons with a disability.
- Be well-lit to reduce the tripping risk for pedestrians and the risk to EVSE from vehicle impact or vandalism.

Figure 7.6 presents the preferred locations of an EVSE in a commercial car parking environment, noting the positioning to minimise pedestrian traffic through the likely cable routing between the vehicle and the EVSE.

[9] Guidance on Land-use Planning for Electric Vehicle Parking and Charging, State Government Victoria, 2012.

Figure 7.6: Preferred Locations for EVSE in a Commercial Car-Parking Site



Source: Guidance on Land-use Planning for Electric Vehicle Parking and Charging, State Government Victoria, 2012

8 Green Travel Plans

8.1 Overview

Green Travel Plans (GTP) are commonplace in the UK but have yet to be commonly adopted in Australia. There are two different approaches to the development of GTPs that can be taken, and both are applicable for West Belconnen.

The first form of GTP is produced by a developer during the planning and application stages for their proposed development. Similar to how a traffic impact assessment details the way that vehicular traffic needs to be accommodated by a site and how that traffic will affect the surrounding road network, a GTP is developed to consider the impact of the site on all other transport modes. It will highlight opportunities for accessing the site by public transport, cycling and walking, and may set target mode shares for each. It will provide information about on-site facilities that will be provided such as bicycle storage and showers. Finally, it will lay out a strategy for informing potential buyers of the site about the alternative travel modes that are available, and similarly informing new residents or employees of the site of those options.

This leads into the second form of GTP, which is managed by an appointed Travel Plan Coordinator, which informs residents or employees of that site of all of their travel options. By providing this information, updating it regularly and reinforcing the message, greater uptake of sustainable travel modes is usually achieved simply through increased awareness.

8.2 Application to West Belconnen

The opportunity presented by a greenfield development such as West Belconnen, in relation to sustainable travel, is that residents moving to the area are already making a significant change to their lifestyle. It is the perfect time to encourage new residents to also change their transportation mode reliance, and this will be assisted if a comprehensive Green Travel Plan is in place.

Given the staged delivery of the West Belconnen community over several decades, a GTP would need to combine elements of both of the forms, listed above. It would be a constantly evolving plan, changing as precincts move from planning, to delivery, to full tenancy, and capturing both the changes in the structure of West Belconnen, and also the available transport service offering.

A successful GTP for West Belconnen will need to include:

- A statement of targets or objectives of the plan.
- An audit of available travel options for the site.
- An assessment of the travel needs generated by the site.
- A set of measures that promote sustainable travel, including but not limited to:
  - Public transport passes – provide public transport passes for new residents in lieu of free parking spaces at the internal key destinations. These would be in the form of a MyWay card that would offer free or discounted travel for journeys travelling from or to West Belconnen.
  - Personalised travel plans – provide personalised transport plans for new residents to show the range of other options available for their commute to and from work, and journeys to and from key destinations.
  - Parking cashback scheme – encourage businesses to reduce the number of parking for employees by offering either a car park or bonus cash to their employees.
- A detailed implementation programme for sustainable travel measures.
- Appointment of a Travel Plan Coordinator.
- The implementation of ongoing monitoring and reporting measures.

- A demonstrated commitment to the ongoing operations of the Green Travel Plan.

Possible incentives could include providing new residents with a public transport pass valid for 6 or 12 months, welcome kits for new residents and a Travel Plan Co-Ordinator to provide personalised travel plans for new residents.

Given that construction work will be a major employer in West Belconnen in early years and will continue over many decades, construction contractors and workforces should also be subject to the Green Travel Plan process and encouragements to reduce construction-related traffic.