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Creamery Road PSP Technical Transport and Access Report

Final Report

Prepared for
City of Greater Geelong

Prepared by
PMP Urbanists, Melbourne, Australia

Document Information

Project Name	Creamery Road PSP Technical Transport and Access Report
Status	Final Report
Client	City of Greater Geelong
Client Reference	
PMP Urbanists Reference	7290
File Name	https://pmpurbanists.sharepoint.com/sites/PMP-Urbanists/Projects/7200-7299/7290 - Creamery Road PSP Technical Report/06_Deliverables/Reports/Final report/Creamery Road PSP Technical Transport and Access Report -- Final report.docx

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Quality Assurance Register

Issue	Description	Prepared by	Reviewed by	Authorised by	Date
1	Draft Report	MW	KL	KL	13 May 2022
2	Final Report	MW	MW	MW	11 April 2023

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A GUIDE ON HOW TO READ THIS REPORT:

We appreciate that this report is substantial, but we have sought to make it as user-friendly and accessible as possible. Throughout the report you will find the following colours used, these colours act like guides to ensure that readers are able to easily access the information that they are seeking.

TABLES WITH THIS COLOUR SUMMARISE HOW PRINCIPLES INFLUENCE OUR DESIGN CHOICES (WHY)

PARAGRAPHS WITH THIS COLOUR ANSWER KEY WHY QUESTIONS (SIMILAR TO AN FAQ)

THESE PARAGRAPHS HIGHLIGHT A KEY SOURCE

FURTHER READING: SUPPLEMENTARY GUIDANCE

1 Report overview

The purpose of this report is to summarise the work carried out by PMP Urbanists, in consultation with City of Greater Geelong's Urban Design, Planning and Growth, and Engineering Services departments (the City). The report seeks to capture all relevant information that has evolved during 2021, that has resulted in the development of the Creamery Road Precinct Structure Plan (PSP). As such, it is envisaged that this report be read in conjunction with the Creamery Road PSP, *Complete Streets* chapter.

This report provides guidance and seeks to explain in detail the rational as to how and why PMP Urbanists and the City, developed the principles, transport networks, cross sections and intersection designs that are envisaged to be applied to Creamery Road precinct. More broadly, this work will inform the broader Northern and Western Geelong Growth Areas (NWGGA), thereby providing a consistent and legible environment for the 110,000 residents that will seek to call these new communities home over the next thirty years.

PMP Urbanists work has been strongly guided by two key Council objectives to be achieved by 2047:

- **50% of journeys to work are made by public transport, walking or cycling.**
- **Being able to access all parts of Greater Geelong within 30 minutes through a variety of travel options.**

These objectives, present both an opportunity and a challenge for the City, and its future new communities.

Today, travel to work in Geelong is predominantly by car (90%), public transport trips only make up 8.6% of all journeys. Furthermore, modelling conducted by GTA in the 2019 Movement & Access Report indicated that a business-as-usual approach to planning, would result in a largely car dominant North and West Growth region, similar to how Geelong travels today (refer to table below).

Table 4.5: NWGGA Mode Splits within S-VITM (PC02 & 04)

Growth Area	Year	Car (Driver and Passenger)	Public Transport	Active Transport
NGGA	2031	90.8%	1.2%	8%
	2051	90.3%	1.7%	8%
WGGA	2031	90.8%	1.2%	8%
	2051	90.3%	1.7%	8%

The modal share results show that car is the main travel mode for NWGGA and is not expected to change substantially between 2031 and 2051. This modelled mode share suggests a similar reliance on private vehicle travel to the existing residents in the City of Greater Geelong (refer to Section 2.6).

To achieve Council's ambitious target of 50% of journeys to work by 2047, we need a radically different approach to planning our future transport networks from what we currently have today.

PMP Urbanists have adopted a 'pedestrian first' approach when contemplating the transport network for the NWGGA. As sustainable transport consultants, we know that great places to live, work and play are places that prioritise human movement over all else. What we are proposing is not new, in fact it has been tried many times before but planning for new communities is challenging. Competing

priorities, numerous stakeholders, available funding, staging and evolving guidelines make planning for future growth and communities a complex environment.

In order to effect a different outcome from what we see today we need to think holistically (beyond kerb to kerb) and take into consideration both movement and place functions of Creamery Road precinct.

This report seeks to detail some of the different tools that we are looking to apply in order achieve the collective vision for Creamery Road and beyond, as was envisaged in the NWGGA Framework Plan:

MOVEMENT considers the integrated transport network of the Northern and Western Geelong Growth Areas, establishing neighbourhoods that encourage walking and cycling, reduced car dependency and promote community safety and connectivity.

This report will detail some of the 'tools' that we are seeking to implement that will deliver a different future for residents of the Creamery Road precinct. Some of these tools include:

- Separated bus (transit) lanes, ensuring priority over cars meaning that public transport is reliable and time-competitive with car travel
- Protected bike lanes that form part of a holistic bike network meaning that people can choose to ride everywhere safely
- Human scale street widths, making it easier to connect with both sides of the street
- Narrow street and laneway choices, providing pedestrian permeability as lots of passive surveillance making people feel safe at all times of day and night
- Compact and walkable intersections, that prioritise people of all abilities
- Design for place activity (and appropriately respond to adjacent land use)
- Design comfortable and attractive streets for walking, again for people of all abilities and taking into consideration prams and walking aids
- Accepting that some levels of traffic congestion mean a healthy and functioning town and centre

To bring to life many of these 'tools' we have developed the following 8 major street typologies.

This report will detail each of these street typologies (along with a series of sub-typologies that have been specifically designed for key parts of Creamery Road).

Where possible, these street typologies have sought to maintain the same road reserve widths as provided by VPA standard cross sections. By repurposing how we use the allocated space, we have created a set of cross sections that we believe will deliver a community that will enable and encourage use of walking, cycling and public transport rather than defaulting to private vehicle use for all trips. At the same time, we acknowledge that car trips are important and ensuring that new residents can get around in cars has resulted in a road network that seeks to better balance car, public transport and active transport.

Finally, the report also seeks to address the importance of car parking when planning new communities. By providing free and abundant car parking in new areas because we have the land to do so means that we are designing communities to drive. By providing more attention and being more considerate of how

and where we locate our car parking, we are able to create communities that prioritise human movement and create places where people feel more comfortable to walk, ride and catch public transport because they are provided with real choice.

2 Strategic Planning Context

To inform our thinking, PMP Urbanists have regularly consulted the broader strategic context while developing this report. Central to the development of this report are the following strategic and technical documents that have been developed over the past five years.

Year	Strategic / Technical Document
2017	Movendo Planning & Design Principles for Promoting Active Transport (Aug)
2018	AECOM Clever & Creative Corridor (Sept)
2019	GTA Movement & Access Report (June)
2020	North West Geelong Growth Area (NWGGA) Framework Plan (Aug)
	VPA Guidelines for Precinct Structure Planning in Melbourne's Greenfields
	COG Activity, Centre Design, Built Form & Density (Nov)
	Key documents within the Movement and Place in Victoria framework, including the User Guide and Technical Appendix
2021	Development of Creamery Road PSP
	New VPA Guidelines 2.0 (Oct)
	Amendment VC204 – updates to State planning policy for transport (including Clause 18 Transport)

Without doubt, the Framework Plan has been a central document in developing the Creamery Road PSP, Complete Streets Chapter. The following vision and community aspirations for the Movement network from the Framework Plan has been central to the development of this report along with the two Council objectives as detailed earlier:

MOVEMENT in the Northern and Western Geelong Growth Areas will be guided by these community aspirations, one planet principles and project objectives.

The additional Urban Development Objectives that seek to stage development to ensure the efficient and orderly provision of infrastructure and services for the Western Geelong Growth Area (WGGA), which Creamery Road forms a part, also forms an important part of this report when we turn our mind to the delivery of items such as the Clever and Creative Corridor:

Ensure that staging of development creates early provision of public transport to central Geelong and preserves long term development aspirations adjoining the Batesford quarry. (NWGGA, Framework Plan)

Finally, the Framework Plan provides a series of actions that have been used to inform the thinking and development of the Creamery Road PSP and this report.

3 Existing Transport Network

3.1 How Geelong Travels

Greater Geelong has strongly car-based travel behaviour typical of most regional Australian cities, and the ability of the city to change these habits as it grows will be a major factor determining its future liveability and the quality of its new communities, which is reflected in the Framework Plan's objectives for mode shift and sustainable travel growth.

Census data presented in Figure 1 indicates that Geelong residents overwhelmingly rely heavily on private vehicle use to get to/from work, which is a trend most likely reflected in mode choices for other trip purposes. Key observations from the ABS data are:

- 90% of Geelong residents use private vehicles to get to work, compared to 75% for Greater Melbourne
- 5% of Geelong residents use public transport to get to work, compared to 19% for Greater Melbourne
- 4% of Geelong residents use active travel modes to get to work, compared to 5% for Greater Melbourne.

Further review of the ABS data highlights the following employment destinations for residents of Greater Geelong:

- 82% to Greater Geelong
- 10% to Metropolitan Melbourne:
    - 4.8% to City of Melbourne
    - 2.7% to Wyndham
    - 0.9% to Hobsons Bay
    - 0.8% to Hume (includes Melbourne Airport).
- 8% to other areas (Surf Coast, Golden Plains, etc.)

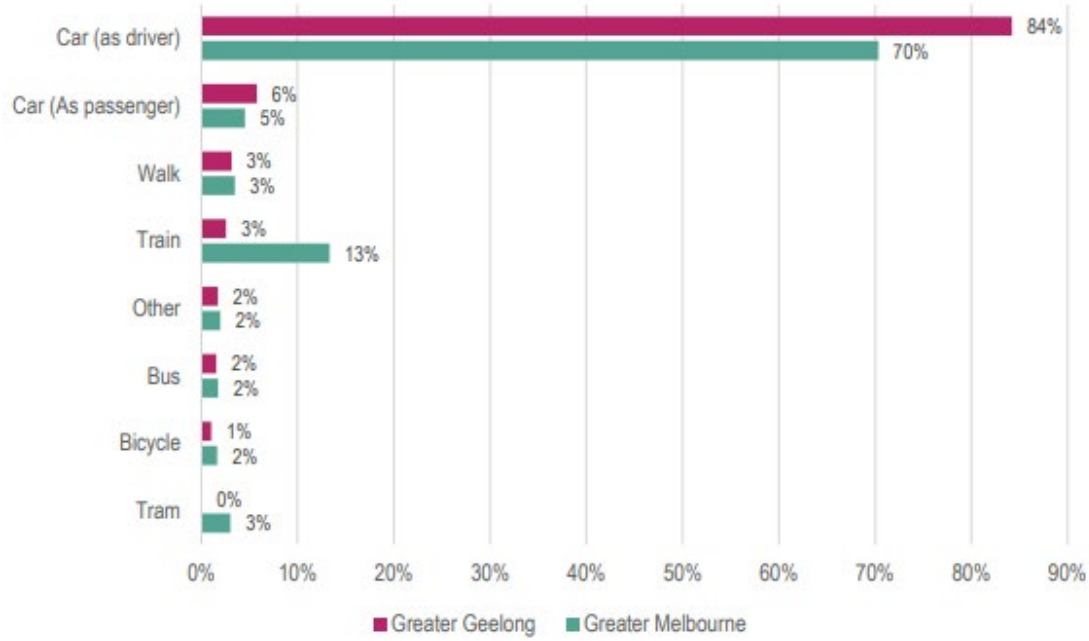


Figure 1: ABS journey to work data - Greater Geelong v Greater Melbourne (source: GTA Consultants)

These figures are unsurprising given the ease of car travel in Greater Geelong, however this is purely a result of past investments in the transport network rather than a reflection of the future viability of other modes. As shown in Figure 2, the WGGA is currently broadly accessible to all areas of Greater Geelong within about a 20-minute drive, and within a 10-minute drive to central Geelong. As Figure 3 shows, past investments in the transport network have delivered a road network that will operate to 2051 largely free of congestion for private vehicles without the development of the NWGGA.

Considering the current lack of high-quality medium capacity public transport in Geelong, and the almost entire absence of a safe and legible network of protected on-street bike lanes, Geelong's current reliance on private vehicles is a natural consequence, but it should not define its future. As Geelong grows substantially over the next 30 years, successful, sustainable, healthy and vibrant communities will depend on reducing the scale of this car dependency. The demand for road space, the private and public cost, and the impact on the function and quality of new communities will be untenable. Instead, moving Geelong's future population will require high-quality public and active transport choices that provide a genuine alternative to private car trips for much more people than the current environment achieves. This imperative is well understood and reflected by the Framework Plan's transport objectives.

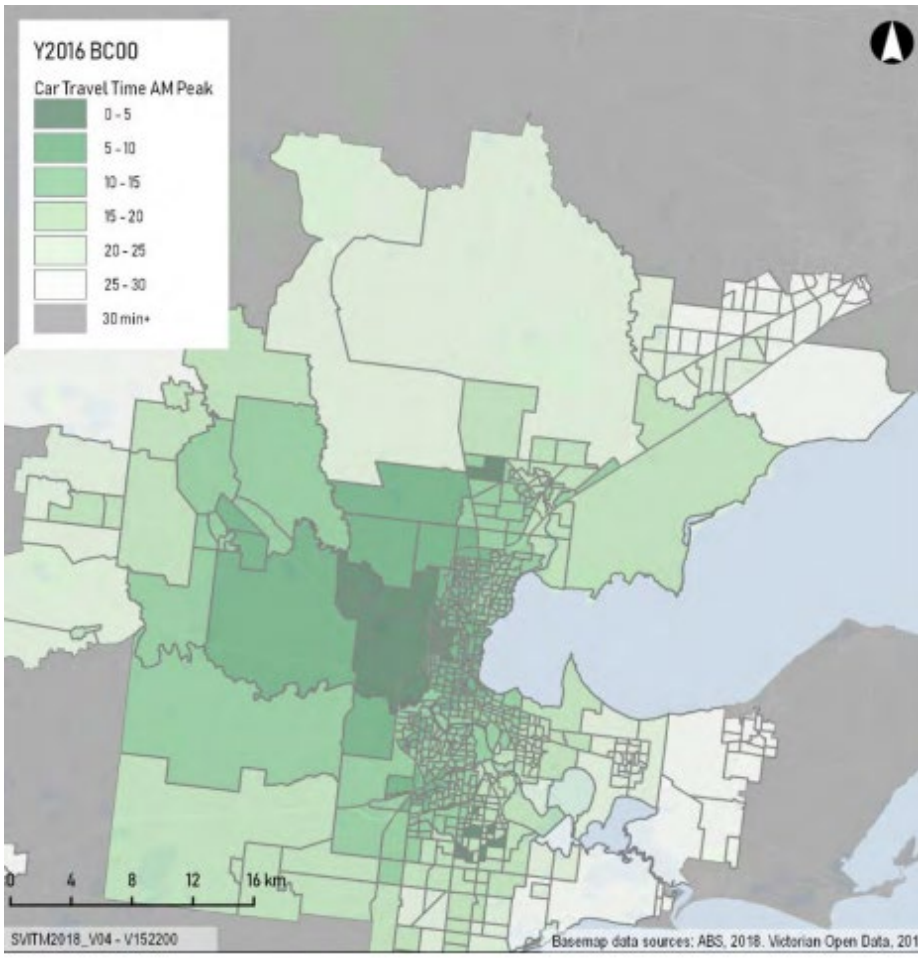


Figure 2: Journey times by car from the Western Geelong Growth Area (AM peak 2-hour) (source: GTA Consultants)

Figure 3: 2051 volume to capacity ratio (without Growth Area development)

3.2 Existing Roads

Figure 4 shows the classification of the declared state road network in the vicinity of the Creamery Road precinct.

Table 1 summarises the features of existing roads within and adjacent to the Creamery Road precinct and their future role and function.

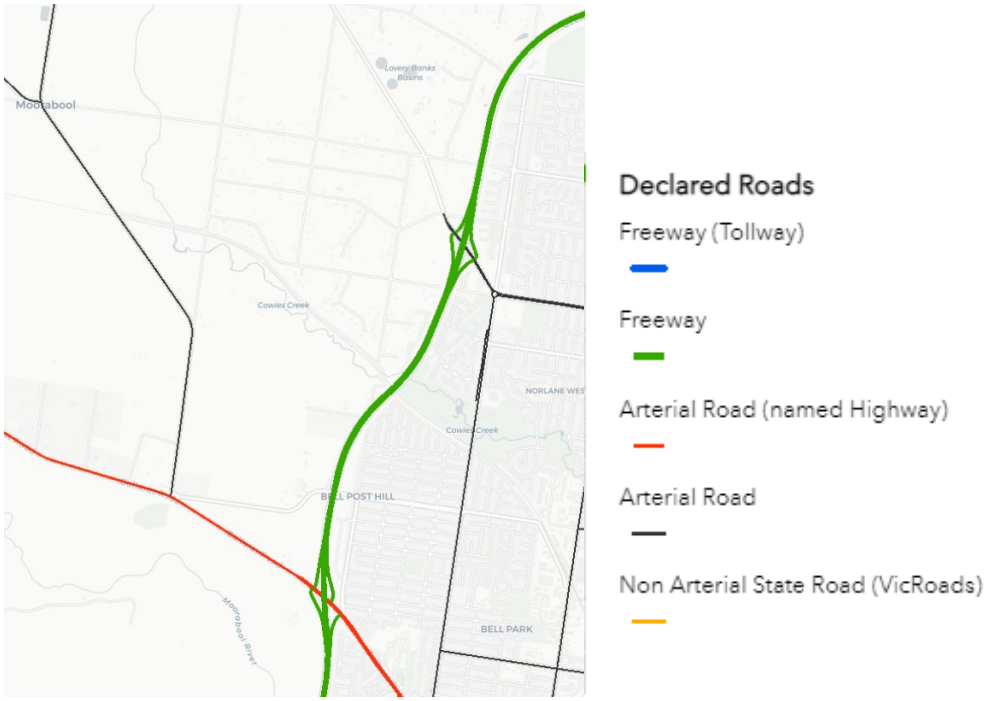


Figure 4: Classification of existing Declared Roads (state-controlled roads)

Table 1: Existing street classifications

Image	Current description	Role in 2051
	Geelong Ballan Road is a two-lane declared arterial road. It has a posted speed limit of 100 km/h in the vicinity of the site.	Geelong-Ballan Road will be a four-lane arterial road (subject to DoT agreement) that provides a preferred traffic route bypassing the Creamery Road precinct, and facilitates access to internal destinations via connector roads. It will provide an arrival experience with an avenue of street trees and will include wide shared paths on both sides. It will have a posted speed limit of 60 km/h.
	Midland Highway is a two-lane arterial road in the vicinity of the site. It has a posted speed limit of 80 km/h and has a shared path located within the northern verge.	The Midland Highway will be a multi-lane declared arterial road that will cater to the efficient movement of goods and people. It will be a crucial connection for transit,

Image	Current description	Role in 2051
		freight and private vehicles into central Geelong.
	Creamery Road is a local two-lane road with unsealed shoulders. It has a posted speed limit of 80 km/h in the vicinity of the site.	Creamery Road will have a connector street cross section with parking protected bike lanes. Buses will be accommodated in mixed traffic, but the corridor will provide an important east-west transit connection for services connecting to central Geelong and destinations to the east.
	Braund Avenue is a local two-lane road with a wide planted central median. It has a 60 km/h posted speed limit and serves bus routes providing access to key community destinations, including Corio Village.	Braund Avenue will continue to service its current role, with increases in service frequency for buses facilitated in part by a new connection over the rail line between Furner Avenue and Morgan Street (currently being investigated by the State Government).
	Evans Road is a two-lane local road with unsealed shoulders and a posted speed limit of 80 km/h. Evans Road connects the Creamery Road precinct with the Northern Geelong Growth Area and has an existing level crossing at the Geelong to Ballarat railway line.	Evans Road will provide the preferred link between the Creamery Road precinct and the Northern Growth Area for private vehicle and public transport. It will include active transport links for walking and cycling.
	Bluestone Bridge Road a two-lane local road with a posted speed limit of 60 km/h. Bluestone Bridge Road connects the Creamery Road precinct across Cowies Creek and the Geelong to Ballarat freight railway line via a heritage listed railway underpass.	Bluestone Bridge Road will form a connector street with bus capability and protected bike lanes for local neighbourhood travel (south of Avonlea Road). North of Avonlea Road, Bluestone Bridge Road will accommodate a shared path connecting to the Ted Wilson Trail and Strategic Cycling Corridor north of the rail line.

Image	Current description	Role in 2051
	Warners Road is an unsealed local road that provides a connection between Geelong-Ballan Road and Evans Road north of Cowies Creek and the Geelong to Ballarat railway line.	Warners Road will maintain its current form and function.
	Lovely Banks Road is a two-way local road with unsealed shoulders that provides a connection between Geelong-Ballan Road and Evans Road north of Cowies Creek and the Geelong to Ballarat railway line.	Lovely Banks Road will maintain its current form and function.

4 Future Transport Network 2051

4.1 Future Urban Structure

The Future Urban Structure (FUS) of the Creamery Road precinct is shown in Figure 5.

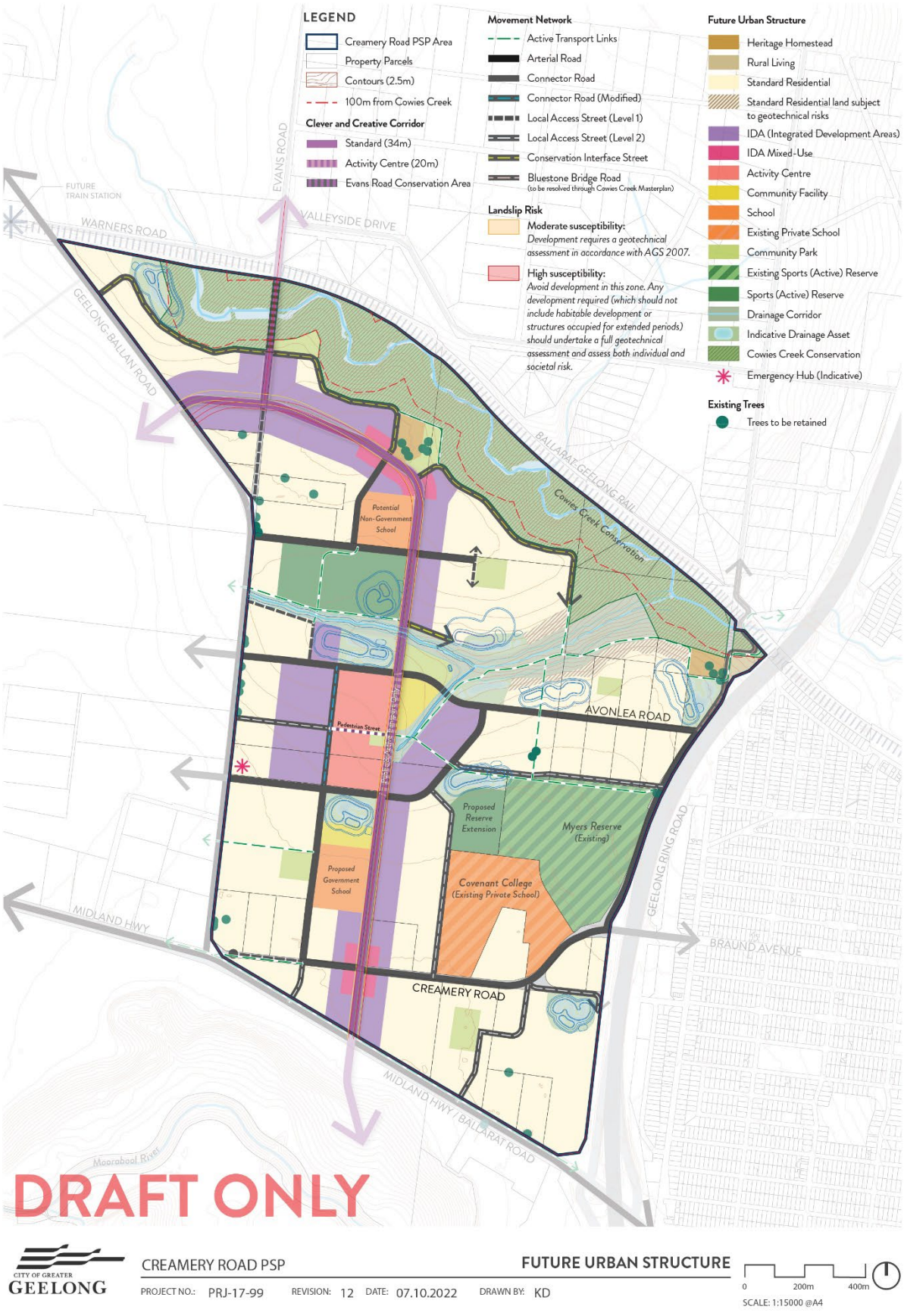


Figure 5: Creamery Road Future Urban Structure (FUS)

4.1.1 Purpose of the Clever and Creative Corridor

The Clever and Creative Corridor (CCC) is a flagship element of the FUS that will be a key to its future success. The CCC will be the lifeblood of the Creamery Road precinct's activity centres that links the communities most vibrant public places with the highest quality active and public transport choices. The CCC will include:

- One vehicle travel lane in each direction
- Parallel on-street parking
- Separated bus lanes located in a wide median flanked by avenue street tree planting
- A separated two-way bicycle highway located within the central median.

4.1.2 Relocating the Clever and Creative Corridor

The location of the Clever and Creative Corridor within the FUS presents one major departure from the Framework Plan. While the Framework Plan included the CCC on Geelong-Ballan Road, its relocation to an internal alignment was necessitated by a electricity easement limiting the type and intensity of land use possible adjoining Geelong-Ballan Road, noting the requirement for a 15m easement.

> ***The Clever and Creative Corridor … is fundamental to the success of Geelong's new neighbourhoods and is envisaged as a tree-lined, boulevard style transit corridor that prioritises public transport, walking and cycling between the activity centres, schools and community facilities, sports reserves and local parks in each neighbourhood. The Clever and Creative Corridor will also provide a focal point for the design of liveable neighbourhoods that are interconnected and centred around the corridor.***
> **(NWGGA Framework Plan, p. 49)**

By relocating the Clever and Creative Corridor to within the Creamery Road precinct, we are able to maintain the vision of the corridor as detailed in the Framework plan, ensure the Clever and Creative Corridor connects most directly to and through the Neighbourhood Activity Centre, and maximise the walkable catchment to the corridor within the precinct.

4.1.3 Clever and Creative Corridor beyond the Creamery Road precinct

The Clever and Creative Corridor will extend beyond the Creamery Road precinct in the following ways:

- Batesford North PSP – the corridor will extend west into the Batesford North PSP to connect to subsequent activity centres and key internal destinations.
- Evans Road – the corridor will connect via Evans Road to the NGGA. While separated bus lanes are not maintained on Evans Road, the forecast level of future traffic is expected to enable high quality service frequencies and reliability to be accommodated within shared traffic lanes given the rural adjoining land use.

4.1.4 Public transport

Bus Rapid Transit (BRT) stops are included on the Clever and Creative Corridor at the approximate locations shown in Figure 6. As outlined in Victoria's Bus Plan (2021) BRT routes aim to deliver faster, more frequent and more reliable journeys on busy public transport corridors, and are characterised by extensive on-road priority, premium stop infrastructure and a rail-like experience for passengers. In comparison, connector and local routes generally operate in mixed traffic.

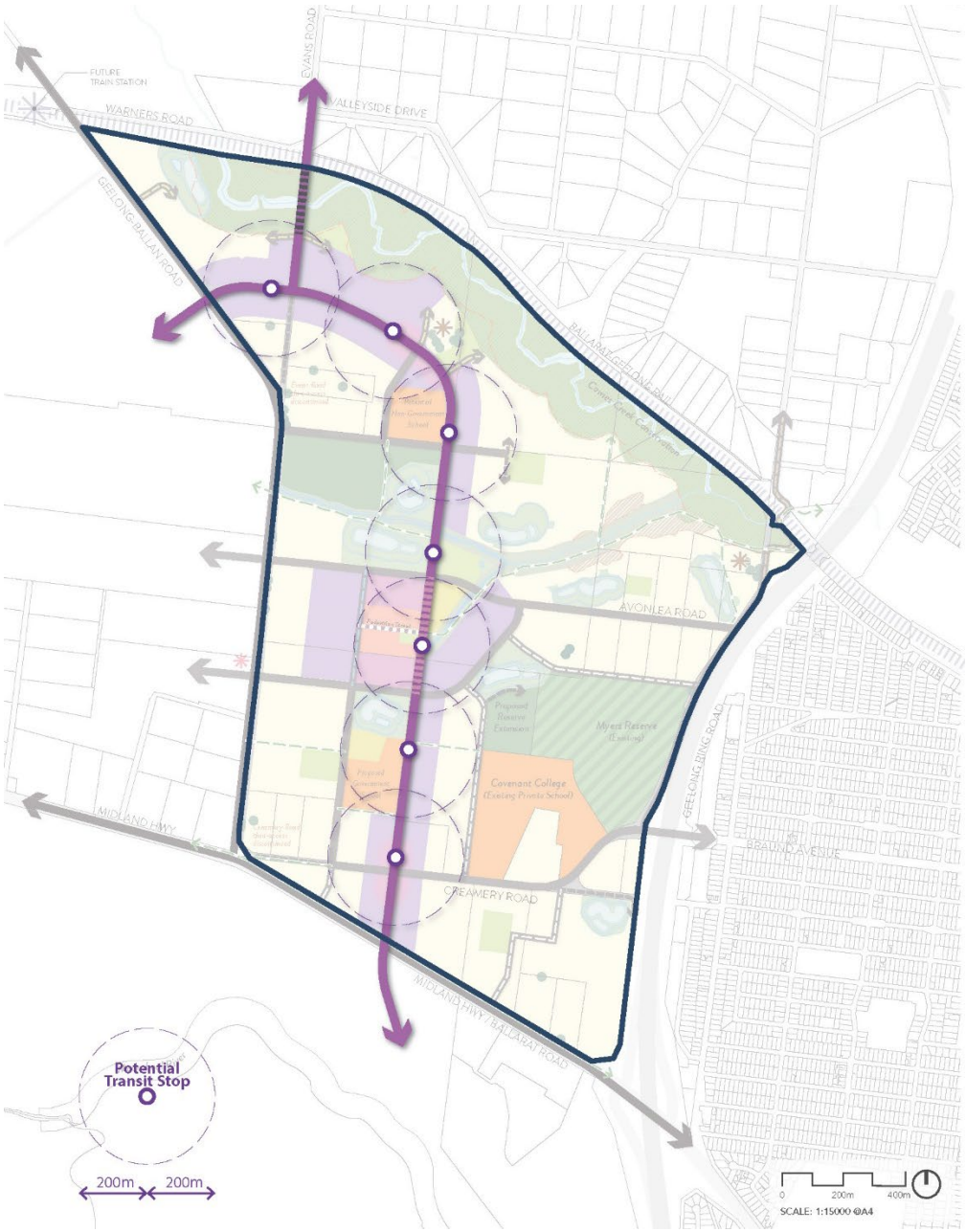


Figure 6: Clever and Creative Corridor public transport service coverage

4.1.5 Active Transport

The Clever and Creative Corridor seeks to provide a trunk bicycle facility as the flagship element of the Creamery Road precinct's active transport network. The Clever and Creative Corridor enables longer distance bike trips, including commutes to activity centre workplaces, by providing a separated two-way bicycle highway located within the wide median.

In addition to the CCC, a network of protected bike lanes on all connector streets maximises the coverage of a high-quality principal bike network fully separated from general vehicle traffic, while local streets are designed to be safe and comfortable for riders of all levels of confidence and experience to mix with general traffic.

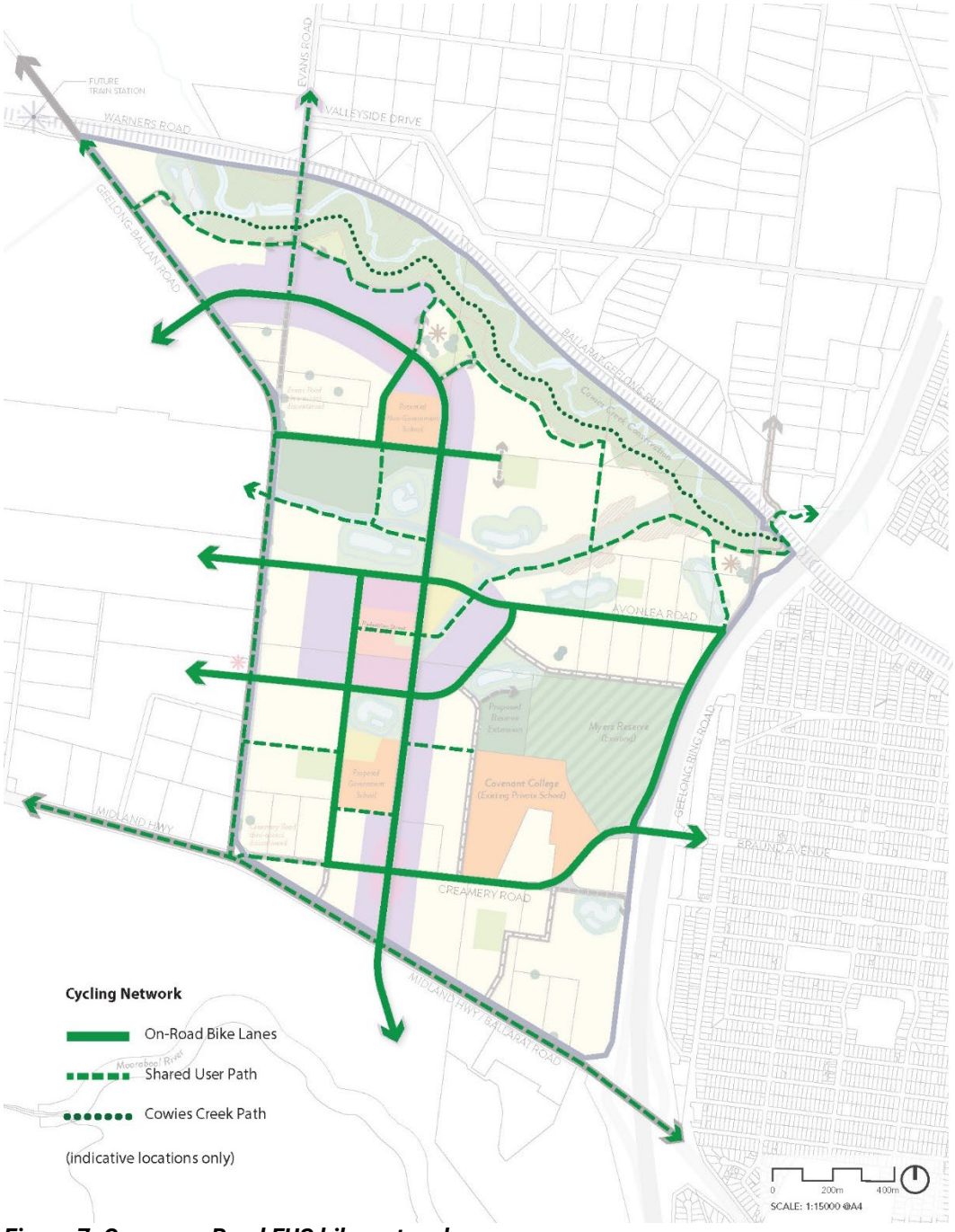


Figure 7: Creamery Road FUS bike network

4.1.6 Road Network

The Clever and Creative Corridor enables motor vehicle access but discourages use as a through route for general traffic as a 40km/h road with only one general traffic lane in each direction. This means car travel along the CCC is possible however the highest priorities are active travel, public transport and creating a high-quality place. A car-free section of the corridor in the Neighbourhood Activity Centre (NAC) diverts through traffic to Geelong-Ballan Road and/or the connector road network surrounding the NAC, and enables the corridor to maximise its value as a place and sustainable travel avenue.

Geelong-Ballan Road will provide a preferred orbital traffic route that reduces non-local traffic intrusion on the Creamery Road precinct, and enables higher quality internal place outcomes.

Connector Streets connect local street networks to the orbital arterial (Geelong-Ballan Road) and the Clever and Creative Corridor for private vehicle trips.

The design of all internal intersections will prioritise the creation of active and vibrant streetscapes and the safe and comfortable movement of pedestrians and cyclists. The Victorian Integrated Transport Model (VITM) has been used to model the future transport network for NWGGA, however, like all models, it has some limitations. These limitations may result in understated future public and active transport trips and overstated private vehicle trips, largely because VITM does not explicitly model intersections or active transport (see Appendix A).

4.1.7 Car Parking

Parking provision and management will have a significant impact on travel behaviour in the Creamery Road precinct. Rather than pursuing ample and free parking, lower rates of parking supply are encouraged in the Creamery Road precinct in order to disincentivise short car internal car trips and encourage use of sustainable travel modes. In order to achieve this, we recommend removing minimum parking requirements within the NAC, as outlined in Table 2.

Table 2: Parking supply guidelines

Precinct Type	**Residential** **(minimum parking per unit)**	**Retail and Office** **(minimum parking per 100sqm gross floor area)**
Activity Centre	0	0

5 Movement and Place

The Department of Transport's Movement and Place framework recognises that streets are not only for moving people, cars and freight, but are also places for people to live, work and enjoy. The framework offers a common language to support meaningful discussions with communities about how future transport challenges can be addressed.

At its heart, the framework organises transport links by their place and movement roles, and guides the classification of all streets by modal and place functions. It then provides network performance measures and target levels of service for different network classifications in order to resolve network and street design priorities.

At a strategic level, the Framework can:

- set aspirations to enact the State's vision for an integrated and sustainable transport system
- classify the transport network and assign future vision for roads and streets
- promote thinking about the performance of the network as a whole rather than as individual transport links
- assess network problems, assist with investment decisions and project identification and prioritisation.

At a project level, the Framework can:

- translate the experience and requirements of different users during their journey within a street
- provide design guidance for the development of project options and solutions
- provide a framework for project impact evaluation that can be aligned with wider network performance assessment
- guide asset maintenance regimes
- assist community engagement.

In conversation with and as directed by the Department of Transport, the transport network for the precinct (including proposed street typologies) was developed based on broad principles developed by PMP Urbanists addressing the movement and place requirements of streets within the precinct, as outlined in this report. Subsequently, a complete Movement and Place assessment was completed in accordance with Department of Transport guidelines based on the street typologies outlined in this report (see Section 5.2). The findings of the Movement and Place assessment broadly support the approach and outcomes of the process described in this report.

5.1 Place

Streets are not only corridors for moving people and goods but are some of the community's most prevalent and important public spaces. Main streets are crucial local destinations for social and economic exchange where we meet, shop, dine, set up businesses and socialise. Good streets are vibrant, interesting and engaging places that form the lifeblood of their local communities. Residential streets can be places for respite, play and exploring, and the best streets provide an extension of our private backyard space.

'Place' refers to the myriad ways that streets are used by people to spend time in, rather than move through, and recognises the importance of this role has on the community.

5.1.1 Streets for living

Key streets: Pedestrian Streets, Micro Streets, Local Access Streets, Parking Streets, Conservation Interface Street, Suburban Connector Streets, Clever and Creative Corridor

The Framework Plan objectives require a commitment to achieve significantly higher rates of active and public transport use. Residential streets are crucial because they are our first interaction with the mobility network every day, and they have a major influence on the transport choices we make for the rest of the day. Once someone chooses to leave home with their car, they are more likely to use it for short errands throughout their day, so it is crucial that residential streets present a safe and attractive option for walking and riding as the first step to encourage people to leave their car at home. The first link in the active transport network shouldn't be the weakest.

Residential streets are also valuable components of Geelong's open space network and provide space for public living space, backyard activity, and play space. Local streets are increasingly important spaces for residents as backyard spaces become increasingly smaller, and have an influence on children's independent mobility (see Appendix A). While DoT's Movement and Place framework provides high level guidance on classifying and evaluating place performance, these are general in nature and are not closely tailored to different adjoining land uses. Table 3 provides more detailed place principles developed by PMP Urbanists that are targeted to the specific requirements of residential streets. These additional place requirements for residential streets are developed further in PMP Urbanists' *Creamery Road Movement and Place Classification* reported dated 3 February 2023.

Table 3: Residential place principles

Principle	Description	Influence
Places for improvised play	Spaces that are suitable for a range of uses, including play. Street furniture that can be interpreted for a range of purposes (climbing, improvised games, etc), rather than dedicated play equipment.	Micro Streets and 10m Pedestrian Streets provide shared and car-free environments for improvised play. Laneways provide opportunities for improvised play.
Places for programmed play	Streets that include specific infrastructure dedicated to play.	16m Pedestrian Street provides expansive spaces that can include dedicated places and infrastructure for play.
Comfortable and attractive spaces for relaxation and recuperation	Shaded areas for sitting, staying, and meeting in a backyard-like setting.	Micro Streets and Pedestrian Streets prioritise space for people.
Invitations to walk for transport and recreation.	Streetscapes with shade, points of interest and pedestrian priority treatments that make walking an attractive choice.	Residential streets include wider than standard footpaths, avenue street tree planting and priority crossing treatments for pedestrians.
Cars treated as guests in human centric space.	Car access is secondary to the quality and function of the street as a place for people.	Use of rear laneways for property access enable the creation of car-free and shared street options for residential streets.

Figure 8: Examples of streets that support programmed or improvised play space

5.1.2 Main streets

Key streets: Urban Connector, Modified Urban Connector, Clever and Creative Corridor (Activity Centre)

Main streets are the lifeblood of local business and are at the centre of community life. They are spaces for social and economic exchange and are essential to vibrant and healthy neighbourhoods.

Good main streets need to fill a range of diverse purposes, including:

- Places to meet and socialise
- Places to walk and browse shops
- Places to stop and dine
- Places to sit, rest and relax
- Places to ride

In addition, main streets usually perform a traffic function through and between neighbourhoods, and scarce street space needs to be allocated to a range of travel modes.

Table 4: Main street place principles

Principle	Description	Influence
Human scale streets	Short blocks and narrow widths invite people to walk and engage with both sides of the street (see Appendix A)	Collector Street options include a Modified Urban Connector that removes on-street parking in order to create a compact main street experience. Laneways create compact urban street choices for activity centres. Car-free variant of the Clever and Creative Corridor reduces street width through the Activity Centre.
Places to stop and stay	Footpaths include travel and dwell zones and opportunities for on-street dining.	Urban streets include wide footpaths with avenue street tree plantings and space for on-street dining and other place activities.
Space allocation prioritises place and sustainable modes	Scarce street space prioritises place quality and is allocated to people stopping, staying and using sustainable travel modes of private vehicles.	Private vehicles are removed from the Clever and Creative Corridor through the Activity Centre.

5.2 Movement

5.2.1 Hierarchy of needs

The design of the transport network needs to allocate road space equitably to support the objectives of the Framework Plan. Keeping the needs of different street users at the forefront of design thinking ensures the transport and street network does not create barriers for active and public transport that reinforces car dependency.

This chapter articulates the broad requirements of key transport modes and place functions. Victoria's Movement and Place Framework assigns priority classifications to each mode for all streets and roads, however there are nonetheless situations that require consideration of competing user requirements with equal priority classifications. In principle, the transport network should prioritise sustainable modes in these situations. NSW's Road User Space Allocation Policy provides a useful graphic that illustrates a hierarchy of road users that is largely consistent with the themes expressed in Victoria's Movement and Place framework (Figure 11) (albeit not explicitly replicated).

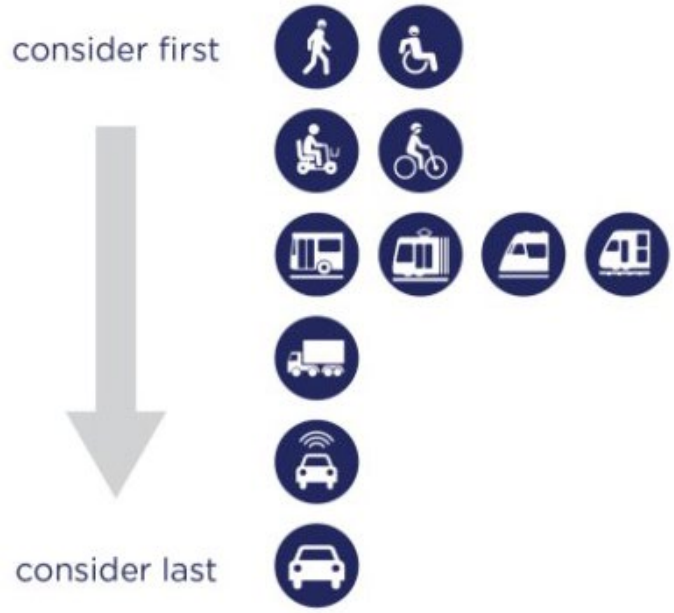


Figure 9: The transport network should demonstrate a prioritisation of sustainable transport modes where competing needs are present (source: Transport for NSW Road User Space Allocation Policy)

5.2.2 People walking

Industry best practice reference: Transport for London (2020) *The planning for walking toolkit*

Quality walking environments are essential to the creation of a future transport network that satisfies the intent of the Framework Plan. We have drawn on industry recognised best practice principles from Transport for London's *Planning for Walking Toolkit* to inform the design of the street network for walking. Transport for London's pedestrian network design principles are:

1. Safe
2. Inclusive
3. Comfortable
4. Direct
5. Legible
6. Connected
7. Attractive

These principles and their influence on the Creamery Road precinct are explained in Table 5.

Table 5: Principles for good walking environments

Principle	Description	Influence
Safe	The public realm should be safe to use at all times of day and for people to feel safe to spend time in.	Wombat crossings provided at the approaches of roundabouts on local and connector streets. Raised wombat crossings provided at side street crossings to provide clear and unambiguous priority to pedestrians particularly near key destinations and places of high pedestrian activity.
Inclusive	All walking environments should be accessible, comfortable and inviting to people of all ages and abilities.	Zebra crossings provided at the approaches of roundabouts on local and connector streets. Raised wombat crossings provided at all side street crossings to provide clear and unambiguous priority to pedestrians as well as making the path more accessible to a wheelchair or mobility aid user through maintaining a level path of travel. Minimum footpath width of 1.8m provided on all streets to allow people to walk side by side in conversation and to allow two wheelchair or pram users to pass unimpeded.
Comfortable	Walking should be enjoyed through high quality pavement surfaces, attractive landscape design and architecture, and as much freedom as possible from the noise and fumes and harassment arising from proximity to motor traffic. Opportunities for rest and shelter should be provided.	Minimum footpath width of 1.8m provided on all streets to allow people to walk side by side in conversation and to allow two wheelchair or pram users to pass unimpeded. Large canopy street trees accommodated across the street network. Network design and street design approach aims to reduce vehicle speeds and volumes across the precinct.
Direct	Walking facilities should be positioned to provide the most convenient links to destinations.	Wombat crossings provided at the approaches of roundabouts on local and connector streets. Street and path network is designed to provide direct routes to destinations within the precinct for people walking, and avoid severance issues created by cul-de-sacs and large arterial roads.
Legible	Features should be consistent and easy to understand for all pedestrians to know intuitively how to navigate the network.	Clever and Creative Corridor and Pedestrian Street choices provide conspicuous walking corridors.

Principle	Description	Influence
		Wombat crossings provided at the approaches of roundabouts on local and connector streets. Raised wombat crossings provided at all side street crossings to provide clear and unambiguous priority to pedestrians.
Connected	Walking networks should have a high density of route option to suit pedestrians' needs	Increased shade and footpath width on Connector Streets improve quality of trunk walking network. Pedestrian Streets provide car-free connections through local neighbourhoods to link parks, conservation areas, schools and other key destinations. Pedestrian priority provided at all local and connector street intersections
Attractive	Walking environments should be inviting for pedestrians to pass through or spend time in.	Increased shade and footpath width on Connector Street improve quality of trunk walking network. Car-free Pedestrian Streets and shared Micro Streets prioritise residential place value and improvised play space. Urban streets include wide footpaths with space for movement and dwelling. Narrow human scale street choices provided to create genuine main street experience. Car-free Pedestrian Streets and shared Micro Streets prioritise residential place value and improvised play space.

5.2.3 People riding bikes

Industry best practice reference: CROW Design Manual for Bicycle Traffic
Secondary reference: Austroads Guide to Road Design

5.2.3.1 The three components of a useful bike network

Dutch design approaches help us understand the roles and qualities of three essential components of a useful bike network.

The design of the Creamery Road precinct, layout of the street network, and design of street cross sections has borrowed from the intent of the CROW manual to ensure the Creamery Road precinct

caters to riders of all ages and abilities and meets the needs of diverse trip purposes in a coherent and logical network. This approach is essential given the intent and objectives of the Framework Plan.

Local streets

Key street types: Pedestrian Streets, Micro Streets, Local Access Streets, Parking Streets, Conservation Interface Streets

In built up areas local streets form the elementary 'last-mile' connections to residences in local neighbourhoods. They are typically characterised by shared on-road cycling environments, and as a result require careful network planning and street design consideration to ensure traffic volumes and speeds and low and slow (e.g. less than 2,000 vehicles per day and less than 30 km/h), and riders are safe and comfortable. This basic network comprises all local streets and paths open to riders, and riders must be offered a safe and comfortable environment to share with other users.

Figure 10: Local streets for cycling (City of Unley)

Main cycle network

Key street types: Suburban Connector, Urban Connector, Modified Urban Connector, arterial network

The main cycle network provides connections at a district level which ensure that all districts and neighbourhoods are connected to key destinations such as activity centres, schools, parks and shops. These routes must offer riders maximum quality comfort and safety by providing riding environments that are separated from other modes. They are typified by protected on-road bicycle lanes on connector level streets, or off-road bicycle or shared paths on the arterial network.

Figure 11: Protected bike lanes form the bones of the principal bike network

Bicycle highways

Key street types: Clever and Creative Corridor

Bicycle highways are regional major cycle routes that enable comfortable cycling over longer commutes (between 5 and 30 km). Bicycle highways help bike travel compete with travel by car in terms of journey time and are of a higher standard of quality to the main bike network (e.g. complete separation from general traffic).

Bike highways connect the most important locations in a region (cities, hubs, activity centres, office parks, hospitals, TAFEs, universities and high schools) and run from 'gateway to gateway' through urban regions.

Figure 12: Bicycle Highway, Antwerp

Table 6: Principles for bike network design

Type	Description	Influence
Basic structure	Local streets and paths forming last mile connections to neighbourhoods and residences.	Local street typologies include slow, shared and car-free street options that optimize the local riding environment.
Main cycle network	High quality district level connections between neighbourhoods, centres and key destinations.	All Connector Streets include physically separated protected bike lanes.
Bicycle highways	Regional routes that enable cycling over longer commutes and connect the most important locations to help bikes compete with car travel journey times.	We are considering two options for the Clever and Creative Corridor that cater to longer distance cycling trips: a median located two-way bike path, or parking protected kerbside lanes.

5.2.3.2 Design principles

The Dutch CROW Bike Design Manual provides five principles for bike infrastructure that are generally accepted to represent best practice in the industry. Austroads Guide to Road Design Part 6A Section 3.1, provides different principles that are analogous to the Dutch principles of directness, safety, comfort, attractiveness and cohesion.

Dutch CROW Bike Design Manual	Austroads Guide to Road Design
Directness	Connected and Convenient
Safety	Safe
Comfort	Comfortable
Attractiveness	Pleasant
Cohesion	Universal and Legible

The five internationally recognised principles are explained below as requirements for the design of routes that meet the needs of all types of bike riders.

Table 7: Principles for bike infrastructure design

Principle	Description	Related concepts	Influence
Cohesion	Bike routes and networks should include a dense and well-connected mix of routes linking all origins to all destinations, without interruption.	-	Local streets are designed to provide safe spaces for riders to share with general traffic, and link the principal bike network to local destinations to create a dense mix of viable routes through neighbourhoods. Protected bike lanes are provided on all connector streets. The Clever and Creative Corridor provides a central cycling spine through the Creamery Road precinct and may include either a median located bike path, or parking protected kerbside bike lanes.

Principle	Description	Related concepts	Influence
Directness	Direct routes reduce travel time and distance and help bike trips compete with private vehicles.	-	Median bike lanes are provided on the Clever and Creative Corridor. Filtered permeability (see Appendix A) on the Corridor through the activity centre helps bike travel compete with private vehicles in terms of travel time and convenience. Kerbside protected bike lanes on connector streets create a grid-like network of safe cycling routes throughout all neighbourhoods.
Safety	Riding environments should be safe and feel safe for riders of all ages and abilities.	Avoiding conflicts with intersecting traffic Segregating vehicle types Reducing speeds at points of conflict Traffic health	Clever and Creative Corridor includes parking protected kerbside bike lanes or a median located bike path. All connector streets include protected kerbside lanes. Raised bicycle crossing treatments provided at all side streets on the CCC and connector streets. Signalised intersections and roundabouts include physical protection and priority for cyclists on connector streets and the CCC.
Comfort	Riding environments are free of the threat caused by vehicles or pedestrians, are easy and practical to use, and include quality shade and end of trip facilities.	Traffic nuisance: *discomfort caused by traffic due to perceived risk of turning traffic, undue vehicle noise, etc.* Stop frequency.	Parking protected kerbside bike lanes or median bike path on the CCC provide comfortable riding environment separated from general traffic. Potential median bike path on the CCC reduces exposure to traffic nuisance resulting from frequent crossings of side streets. Signalised intersections and roundabouts include physical protection and priority for cyclists on connector streets and the CCC.
Attractiveness	Conspicuously high-quality cycling infrastructure can provide an overt invitation to ride.		Protected bike lanes on connector streets create conspicuous high quality cycling choices. Bike highway on the CCC creates a best practice cycling spine to encourage greater cycling participation.

5.2.4 People using public transport

Best practice reference: ITDP (2016) *The BRT Standard*
Best practice reference: Jarret Walker, *Human Transit*

Achieving the Framework Plan's bold objectives for future public transport patronage will require adherence to best practice approaches to network planning in the Creamery Road precinct. Key network design principles are highlighted in Table 8.

Table 8: Principles for public transport provision

Principle	Description	Influence
Mobility	The movement of people of distance. Mobility is a measure of how far a passenger can travel in a given time.	The Clever and Creative Corridor provides a bus rapid transit (BRT) service quality designed to efficiently move people around the region, including Central Geelong, noting that DoT will be responsible for service delivery.
Access	The ability to reach a range of destinations. Access is a measure of how many useful things a passenger can travel to using a service.	All properties are located within 400m walking distance to potential bus stops on the Clever and Creative Corridor, Connecter Streets, and Key Local Access Streets. The NAC, schools and higher intensity mixed land use is clustered around the Clever and Creative Corridor.
High frequency	Service frequencies of 15 minutes or less that reduce waiting times sufficiently that most passengers do not need to consult a timetable to plan their journey.	The Clever and Creative Corridor provides 10-minute service frequencies, subject to delivery by DoT.
Reliability	Passengers have certainty regarding the quality of service that they will experience when travelling.	BRT standard bus corridor on the Clever and Creative Corridor separates transit services from general traffic and congestion.
Attractiveness	Services are comfortable and user friendly and provide an enjoyable travel experience.	Median located BRT on the Clever and Creative Corridor provides a conspicuous transit offering with strong visual cues that suggest the presence of reliable high quality public transport and highly visible stop locations.

5.2.5 Freight

The design of the street network needs to consider the needs of deliveries, emergency services and freight.

Table 9: Freight considerations

Consideration	Description	Influence
Design vehicle	The arterial network should be designed to meet the needs of regular freight vehicles. Local street networks should accommodate infrequent large vehicles, however this should not dictate the quality of design outcomes for people using other modes.	Local intersections accommodate large trucks (e.g. refuse collection vehicles) by enabling trucks to utilise the entire carriageway when negotiating turns. Compact roundabout intersections on local streets do not include splitter islands to enable the compact footprint to accommodate refuse collection vehicles and infrequent delivery trucks (wombat crossings remove need for splitter islands to facilitate staged crossings for pedestrians)
Refuse collection	Refuse collection vehicles must be able to access all properties safely and practically.	8m laneways accommodate refuse collection vehicles for lots with car-free frontage streets.
Emergency access	All streets must accommodate emergency service vehicles.	Carriageways designed to maintain clear path for emergency service vehicles. 3.5m shared paths provided on pedestrian streets to accommodate emergency and maintenance access.

5.2.6 Private vehicles

The design of the street network needs to consider the needs of general traffic.

Table 10: General traffic considerations

Consideration	Description	Influence
Congestion	Prioritise reliable network performance (i.e. consistent travel time) rather than minimal delays. Avoid inappropriately sized arterials and intersections that may contribute to excessive induced demand for private vehicle travel (see Appendix A).	Through traffic discouraged from CCC and directed to arterial road network by filtered permeability. Geelong-Ballan Road designed to cater to up to 20,000 vehicles per day with travel lanes, representing a space saving over typical VPA 4-lane secondary arterial. Internal intersections are designed to meet a minimum standard for active transport safety and comfort and place quality.
Network resilience	Versatile networks with alternative travel choices that can accommodate incidents, maintenance and other issues.	BRT corridor on the Clever and Creative Corridor operates largely independently of general traffic and ensures traffic congestion does not impact quality of public transport choices. This provides drivers alternative transport choices during periods of abnormal congestion, and allows emergency service vehicles to bypass traffic congestion if appropriate when attending emergencies.
Property access	Property access for private vehicles, deliveries and servicing.	Laneways used to provide rear property access in order to create opportunities for improved frontage streets. Property access limited on Clever and Creative Corridor to minimise conflicts between cars and kerbside bike lanes.
Resident parking	Off-street choices for residents. Some on-street parking options for dwellings with multiple cars (e.g. multi-family households, share houses, etc).	Parking Street provides consolidated on-street parking for residents of streets with no on-street parking (e.g. Micro Streets and Pedestrian Streets). It is expected that most residences will have some off-street parking and this is enabled by the Laneway.
Residential visitor parking	Parking choices for visitors to local residences within a short walk.	Parking Street provides consolidated on-street parking for residents of streets with no on-street parking (e.g. Micro Streets and Pedestrian Streets).
Emergency vehicles	Access to all properties for emergency service vehicles.	All streets and laneways maintain suitable clearance for emergency vehicles. Pedestrian Streets include 3.5m shared path to accommodate emergency service vehicles.

6 Network development

6.1 Approach to Transport & Access

6.1.1 Travel to, through and within

The Creamery Road precinct consists of various types of streets performing different functions and having different characteristics. Tailoring street types, including arterials, connectors and local streets, to their movement and place function is key to successfully delivering liveable urban communities.

Our approach to transport and access in the Creamery Road precinct aims to ensure non-local traffic (through traffic not associated with internal destinations) does not impinge on the potential for internal streets to become high quality, human scale places for people to spend time and enjoy.

The approach aims to separate three distinct types of travel:

- Travel **to** the precinct – trips from outside the precinct to internal destinations.
- Travel **through** the precinct – longer trips between external origins and destinations.
- Travel **within** the precinct – short trips between internal origins and destinations.

The rationale for this approach is detailed in Table 11.

Table 11: Network development approach – through, to and within

Trip Type	Description	Approach	Rationale
Travel **through** the Creamery Road precinct	Longer trips between external origins and destinations	Vehicles are diverted around the Creamery Road precinct on perimeter arterial roads (e.g. Geelong-Ballan Road and Midland Highway) by removing private vehicles from a small section of the CCC in the activity centre.	1. Removing vehicles accessing neither local origins nor destinations protects the amenity of the NAC, CCC and connector streets. 2. Geelong-Ballan Road provides an arterial route (pending DoT approval) with sufficient proximity to the activity centre for land uses that benefit from passing trade (e.g. bulky goods)
Travel **to** the Creamery Road precinct	Trips from outside the Creamery Road precinct to internal destinations	Travel on the CCC is limited to 'last-mile' access to local destinations. This is achieved by the car-free section of the CCC within the NAC. Vehicles accessing destinations in the NAC circle the perimeter of the Creamery Road precinct on the arterial road network to access connectors streets linking to the NAC and the CCC.	1. Limiting traffic on the CCC allows the streetscape to provide greater priority to place quality, people riding bikes, and the BRT. 2. Diverting arterial traffic enables active and public transport on the CCC to offer the most direct connection through the Creamery Road precinct, which incentivises these modes for travel to internal destinations consistent with the Framework Plan objectives. 3. Connector streets provide primary access points to the Creamery Road precinct from the arterial network for private vehicles.

Trip Type	Description	Approach	Rationale
Travel **within** the Creamery Road precinct	Short trips between internal origins and destinations	Short internal car trips are less attractive due to the car free section in the activity centre. People who need to travel the length of the CCC by car can do so by circling the perimeter of the Creamery Road precinct via the arterial and connector street network. Very high-quality walking, cycling and public transport networks provide genuinely attractive travel choices for the community.	1. Short trips comprise a significant proportion of car trips in Victoria. 2. Encouraging more short local trips (e.g. less than 5km) to be undertaken by walking or cycling requires both incentives to use alternative modes and disincentives to drive. 3. Car-free section of the CCC makes vehicle traffic less attractive for those with alternative choices available. 4. Separated bicycle facilities and the BRT on the CCC, as well as the network of protected bike lanes on connector streets, create quality travel options that offer viable alternatives to short vehicle trips.

What about destinations that benefit from proximity to arterial roads?

Some destinations benefit significantly from passing traffic, and the proximity to arterial and highway traffic can influence the viability of some sites for certain tenants. Big box retail and bulky goods are an example of such uses. Additionally, these tenancies can be anchors that attract visitation to a broader centre.

The Future Urban Structure has been developed to ensure:

- Bulky good sites are positioned to the west of the NAC with visibility and access to traffic on Geelong-Ballan Road.
- The NAC is located on the CCC and benefits from reduced non-local traffic through the activity centre, allowing for the creation of a more attractive and high-quality destination.
- Bulky goods destinations are separated from the NAC to ensure the NAC achieves a walkable and compact built form, however they are located within walking distance of the NAC, allowing both to share agglomeration benefits from visitors walking between destinations.
- Proximity and siting of the bulky good site relative to the NAC creates an opportunity for a shared consolidated parking facility to meet the needs of both. This promotes park once and walk behaviour, leading to longer stays, increased spends, and reduced circulating traffic.

6.1.2 The Clever and Creative Corridor

The Clever and Creative Corridor is the flagship place and movement corridor through the Creamery Road precinct, and co-locates a high-quality BRT corridor and bicycle facility with the most vibrant and active land use in the precinct (the NAC). The CCC connects the NAC and Integrated Development Areas to residential neighbourhoods and schools, and provides a central spine that enables active and public transport to compete with private vehicles in terms of travel time for a range of trip purposes.

A key element that facilitates this active and public transport advantage is the car-free segment of the corridor through the NAC. This section diverts vehicle traffic to connectors and arterial roads on the perimeter of the Creamery Road precinct, but permits though movement for active modes, creating more direct connections for people walking, riding or using public transport. In this way the CCC works in tandem with Geelong-Ballan Road to separate arterial through traffic from essential local traffic. Ultimately, this ensures the amenity impacts of excessive traffic are avoided on the CCC and the most place-intensive land use surrounding the corridor, and builds in incentives to walk, cycle and take public transport, whilst still enabling (but not prioritising) essential private vehicle travel along the corridor.

Further detail, including drawings of proposed cross sections, is provided in Section 5.2.

6.1.3 Arterials

Arterials form the boundary of the Creamery Road precinct and cater primarily for strategic, higher volume and longer distance through traffic and freight that is not associated with internal origins or destinations. They are also important trunk public transport corridors and provide important cycling connections.

- Primary arterials will normally comprise four to six lanes and have higher speed limits of 70 – 80 km/hr, while local arterials (secondary arterials) may include two to six traffic lanes (see Appendix A – arterial road capacity)
- Arterials may provide entry points to larger developments such as public facilities and shopping centres
- New activity centres may abut, but must not straddle, arterials
- Road space may be dedicated to public transport services or bicycle highways.

Further detail, including drawings of proposed cross sections, is provided in Section 5.2.

6.1.4 Connectors

The purpose of the connector streets is to connect neighbourhoods and link local streets to the arterial road network and Clever and Creative Corridor. They enable vehicles to move between preferred arterial routes and local origins as well as destinations, and create an important grid of connected protected bike lanes. They are also important destinations in their own right, and perform important 'main street' roles for local neighbourhoods in town centre and activity centre locations.

These streets will have a single traffic lane in each direction and protected bike lanes on each side. Pedestrians and cyclists should be provided with physical separation and priority crossings at all intersections on connector streets.

- Connector streets should provide for up to approximately 7,000 vpd (or 10,000 vpd in activity centres) and when volumes exceed this, additional links to the arterial network may be required (this may include minor street intersections or additional connector level links).
- Connector streets typically intersect with arterial roads at controlled intersections (traffic signals) or roundabouts with appropriate treatments for pedestrians to cross with priority.

- Schools, shops and local facilities including Neighbourhood Activity Centres (NACs) are typically anchored to connectors and the cross section accommodates buses, bus stops, protected on-street bicycle lanes and, where appropriate, on-street parking.
- Connector streets should have pedestrian and bike friendly intersection configurations, including protected signalised intersections (i.e. with physical separation for bikes) and roundabouts with wombat crossings and physical separation for bikes.
- Connector streets are crucial elements of the principal bike network and should create a legible and connected network of protected bike lanes than link to and support to a bicycle highway on the Clever and Creative Corridor. Connector streets will be the primary bicycle link used by many riders travelling short distances to local destinations such as schools and local shops.

Further detail, including drawings of proposed cross sections, is provided in Section 5.2.

6.1.5 Local Streets

Local streets consist of lanes, micro streets, pedestrian streets, parking streets and local access streets that connect residents, shops and other land uses to connector streets. They are important local spaces for residents that can provide attractive places to live with green space, local amenity and play space. These streets are also important to connect residents to principal walking and cycling networks located on the connector streets, as well as local private vehicle access to properties. Local streets can incorporate filtered permeability, traffic calming and other local area traffic management (LATM) interventions that provide property access while discouraging through traffic, ensuring speeds and volumes remain cyclist-friendly.

Car-free local streets supported by rear-access laneways (laneways being a VPP requirement for properties with frontages of 7.5m or less) are an excellent opportunity to remove redundant car access and create frontage streets that augment small private backyards with genuinely usable open space. These streets are important elements of the open space network and can improve the connectivity and attractiveness of the pedestrian network.

- Street length should be limited to 240m (see Clause 56 of VPP's)
- A grid street and block pattern should be used to promote accessibility, choice of route, connectivity and continuity of route.
- Some schools, shops and local facilities gain access from key local access streets.
- Local streets are typically not used for bus routes
- Local streets should be designed for safe and comfortable mixing of bikes with general traffic by achieving low traffic volumes and speeds (less than 2,000 vpd *and* less than 30 km/h) through careful streetscape design, use of LATM treatment, and filtered permeability treatments.

6.2 Street Typologies

The VPA's *Our Roads: Connecting People* PSP Notes[1] supplement the PSP Guidelines to provide recommended road cross sections for use in PSPs for new communities.

Our Roads outlines six standard cross sections that are widely applied in new communities across Victoria and would be recognisable to the industry as typical street layout and design practice.

While these cross sections are commonplace, there are limitations to these designs that make them unlikely to achieve the objectives set out in the NWGGA Framework Plan. The limitations relate to:

- Lack of separated public transport lanes
- Lack of protected on-street bike lanes for cyclists of all ages and abilities

[1] Growth Areas Authority (Year) *PSP Notes Our Roads: Connecting [People https://vpa.vic.gov.au/wp-content/Assets/Files/PSP-Note-Our-Roads-Connecting-People1.pdf]*

- Excessive carriageway space dedicated to private vehicles at the expense of place quality and sustainable travel modes
- Poor responses to place function and quality.

This section outlines the proposed alternative street cross sections and details how and why they deviate from corresponding VPA cross sections. The complete set of street cross section drawings are provided in **Appendix B**.

Table 12: VPA Our Roads: Connecting People standard street types

	Access Level 1	**Access Street Level 2**	**Connector Street**	**Connector Street in Local Town Centre**	**Secondary Arterial**	**Primary (declared) arterial**
Road reserve	16m	20m	26-28m	20-24m	34m	41m
Posted speed	50	50	50	40	60-70	70-80
Desired travel speed	30	40	50	30	60-70	Consult with VicRoads
Approx vehicles / day	Up to 2,000	2,000 – 3,000	3,000 – 7,000	3,000 – 7,000	12,000 – 40,000	More than 30,000
Bus services	No	Local services	Shared with general traffic	Shared with general traffic	Shared with general traffic	Shared with general traffic
Footpaths	1.5m minimum on both sides of the street	1.5m minimum on both sides of the street 2.0m for key high pedestrian locales	1.5m minimum on both sides of the street 2.0m for key high pedestrian locales	Up to 3.5-5.5m in high pedestrian zones	1.5m minimum on both sides of the street	1.5m minimum on both sides of the street
Bicycles	Shared with traffic	Shared with traffic	1.7m wide on road bike lanes (between parking and travel lanes)	4.2m shared bicycle and traffic lane	2.0m on road bicycle lanes on both sides (between parking and travel lanes). 3.0m off-road shared path on both sides	2.0m on road bicycle lanes on both sides (between parking and travel lanes). 3.0m off-road shared path on both sides

6.2.1 New Approach (10 street types)

Instead of the VPA's *Our Roads* cross sections, we have developed a new suite of 10 typical street designs designed to help the Creamery Road precinct respond to and meet Framework Plan objectives.

The 10 street types are:

Table 13: Proposed street typologies

Street type	Description	Use instead of:
Laneway (8m)	Property access	N/A
Micro Street (10m)	No property access Used with rear laneways Provides play space Shared street environment	Local Access 1 (16m)
Pedestrian Street (10-16m)	Car-free Used with rear laneways Provides 'backyard' play space Ideal for water sensitive urban design treatments	Local Access 1 (16m)
Local Access Street (16m)	Direct property access	Local Access 1 (16m)
Parking Street (16m)	Angled parking to meet needs of neighbourhoods with limited car access (micro streets and pedestrian streets) Limited permeability for cars to create safe riding environment	Local Access 1 (16m)
Key local access street (20m)	Direct property access Bus capable	Local Access 2 (20m)
Suburban Connector (25m)	Protected bike lanes Bus capable	Connector Street (26-28m)
Urban Connector (25m)	Protected bike lanes Bus capable	Connector Street in Local Town Centre (20-24m)
Modified Urban Connector (21.6m)	Protected bike lanes Bus capable	Connector Street in Local Town Centre (20-24m)
Clever and Creative Corridor (20-34m)	Protected bicycle lanes or median bicycle path Separated bus lanes	Secondary Arterial (34m)

6.2.2 The Clever and Creative Corridor

The Clever and Creative Corridor is the flagship element of the place and movement network and provides backbone cycling and transit connections through the Creamery Road precinct and the NAC. While the CCC is an active and public transport arterial and generally caters for some private vehicle access, the corridor is not intended to cater to long-distance through traffic for private vehicles, and a car-free section of the corridor through the NAC creates a modal filter that diverts non-local traffic to the arterial road network at the perimeter of the Creamery Road precinct and/or the internal connector street network.

In comparison to a conventional secondary arterial, the CCC is anticipated to have a greater people carrying capacity through the prioritisation of spatially efficient transport modes. Protected cycling infrastructure aims to create a separated bicycle highway level of service for riders of all ages and abilities, while a central median running bus corridor flanked by avenue tree planting aims to create a conspicuously attractive transit offering that delivers Bus Rapid Transit (BRT) standards of service frequency, mobility, access and reliability. By co-locating the highest quality transit and cycling links with the most active and vibrant land use in the Creamery Road precinct (the NAC), the Clever and Creative Corridor aims to support a sustainable and human-scaled town centre for the community and help sustainable travel modes compete with private car trips for travel time and convenience.

Proposed cross section

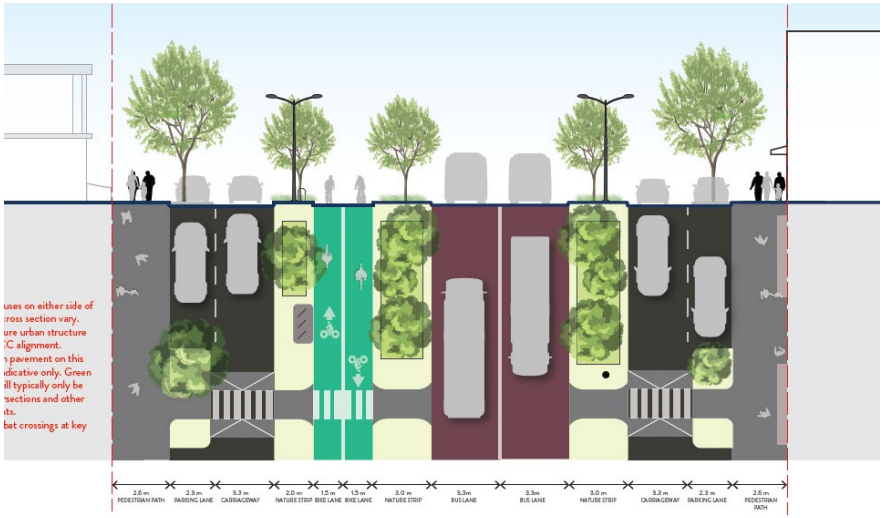


Figure 13: Cross section of the Clever and Creative Corridor (34m)

Standard *Our Roads* cross section

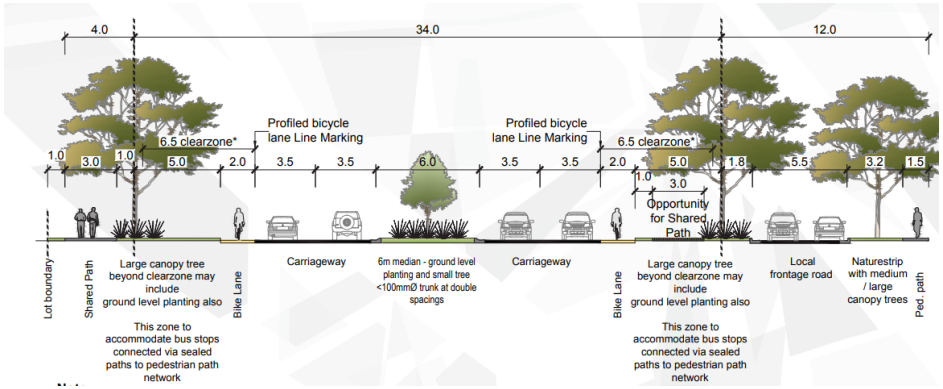


Figure 14: Cross section of the VPA Secondary Arterial (34m)

Table 14: Key attributes of the Clever and Creative Corridor design

Purpose	To provide trunk corridor for active and public transport between growth areas and across Greater Geelong.
Width	34m
Bus	Median located BRT corridor (fully separated from general traffic)
Bike	Bicycle highway located within central median.
Traffic volume	15,000 -20,000 vpd
Lot access for cars	No
Typical frontage width	5m +
Posted speed	50 km/h
Target speed	40 km/h for general traffic, 60 km/h for BRT corridor
Maximum block length	240m

A narrower cross section is proposed on CCC through the NAC to provide a modal filter that prevents non-local through traffic and creates a compact and human-scale main street environment that maximises the place potential of the space. This section maintains protected cycling space and BRT access, and provides generous travel and dwell space for pedestrians.

Proposed cross section

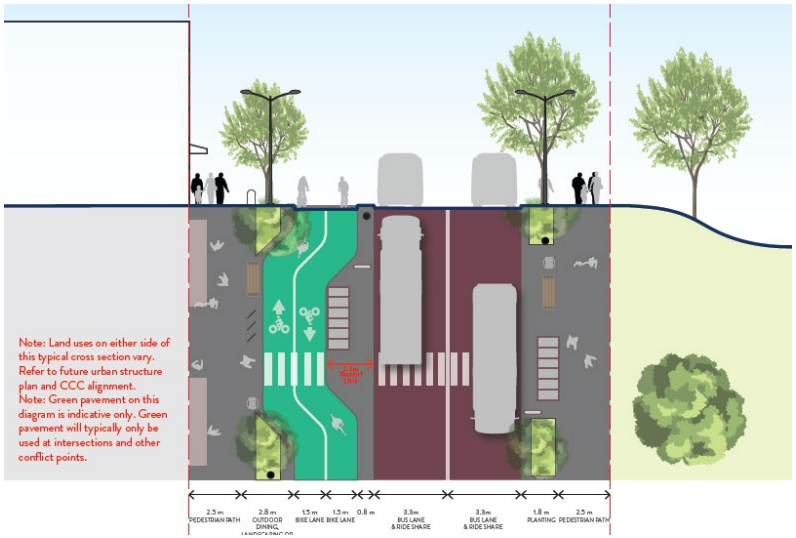


Figure 15: Cross section of the CCC within the Activity Centre (20m)

Standard *Our Roads* cross section

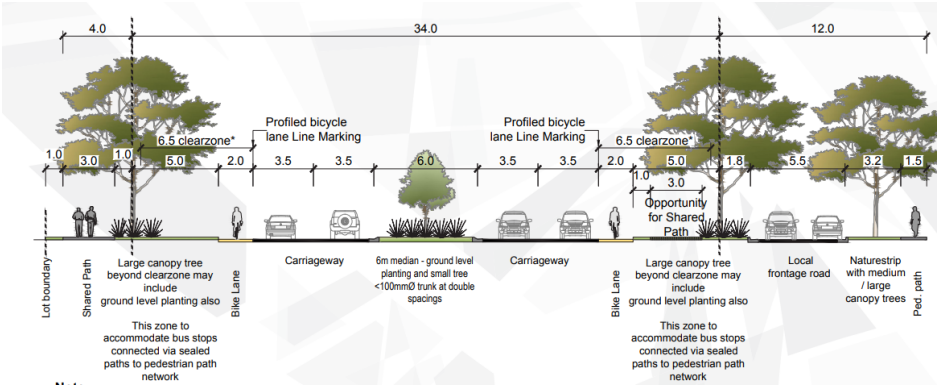


Figure 16: Cross section of the VPA Secondary Arterial (34m)

Table 15: Key attributes of the Clever and Creative Corridor (Activity Centre) design

Purpose	To provide BRT and bicycle highway access through and to the NAC. To divert through traffic to Geelong-Ballan Road.
Width	20m
Bus	BRT corridor
Bike	Bicycle highway
Traffic volume	Nil (general traffic)
Lot access for cars	No
Typical frontage width	5m +
Posted speed	NA
Target speed	NA
Maximum block length	120m

6.2.3 Geelong-Ballan Road

Geelong-Ballan Road will provide a preferred arterial route to allow non-local traffic to bypass the Creamery Road precinct. Flanking the western boundary of the precinct, Geelong-Ballan Road will also allow vehicle traffic to destinations within the precinct to travel around the perimeter and then into the precinct, minimising traffic and vehicle intrusion on the Clever and Creative Corridor. Geelong-Ballan Road can cater to up to 40,000 vpd in a 34m cross section, and represents a more comfortable and amenable outcome for people walking and cycling in comparison to the VPA's 34m 4-Lane Secondary Arterial Road cross section.

Geelong-Ballan Road also has an important role to play providing an arrival experience for traffic as it approaches the Creamery Road precinct, with avenue street tree planting providing strong visual cues of the significance of the adjoining precinct as a place-oriented destination. The provision of these and other streetscape elements encourages drivers to slow down, emphasises the presence of people walking and cycling, and provides an invitation to stop.

As an important part of the trunk active transport network, Geelong-Ballan Road features 3.0m shared paths on both sides and wide verges to accommodate large canopy street trees.

Proposed cross section

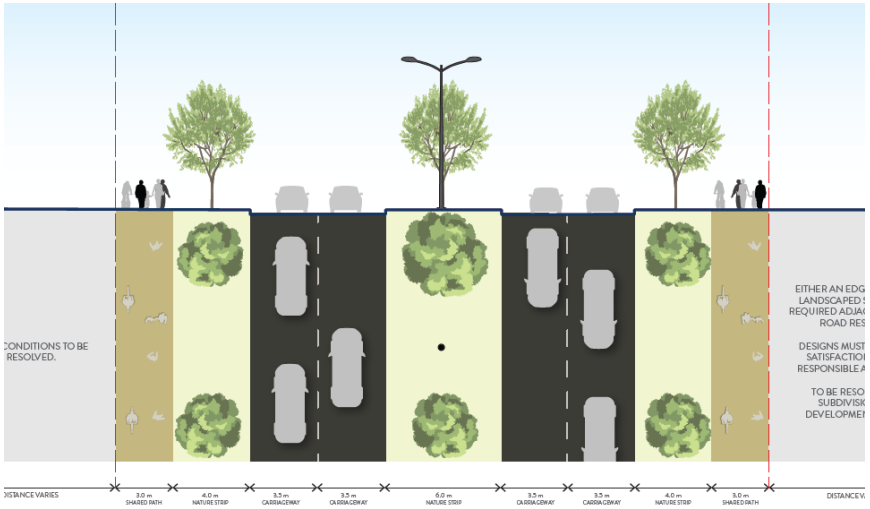


Figure 17: Cross section of Geelong-Ballan Road (34m)

Standard *Our Roads* cross section

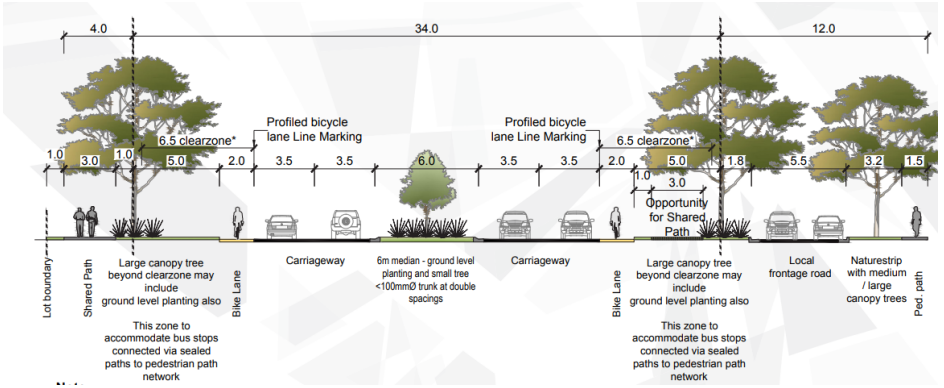


Figure 18: Cross section of the VPA Secondary Arterial (34m)

Table 16: Key attributes of the Geelong-Ballan Road design

Purpose	To provide a principal route for the movement of vehicles and goods to the Creamery Road precinct and bypassing the precinct.
Bus	Bus capable (shared with general traffic)
Bike	Shared paths on both sides
Notional Vehicle Traffic Volume	Up to 40,000 vpd
Lot access for cars	No
Typical frontage width	Varies
Posted speed	60 km/h
Target speed	50 km/h
Maximum block length	Varies

6.2.4 Evans Road

Evans Road is an important public transport and traffic connection between the Creamery Road precinct and the Northern Growth Area.

The future Evans Road cross section accommodates public transport services within two travel lanes shared with general traffic, and features an off-street bidirectional bike path separated from traffic and pedestrians.

Evans Road also provides a trunk active travel link to Cowies Creek, and provides places to stop and rest for people.

Proposed cross section

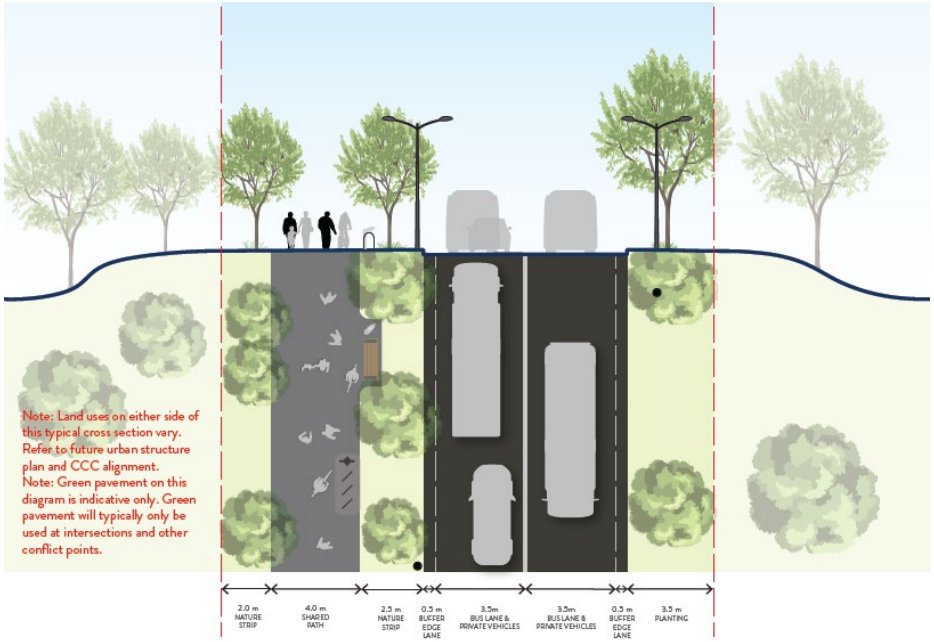


Figure 19: Cross section of Evans Road (20m)

Standard *Our Roads* cross section

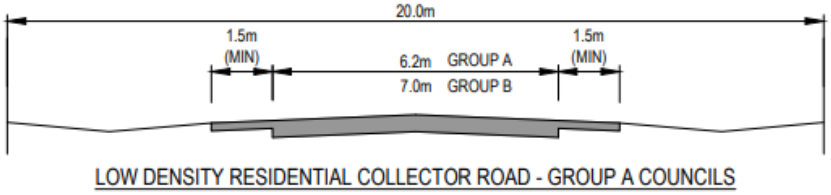


Figure 20: Cross section of Local Government IDM low density residential collector road (20m)

Table 17: Key attributes of the Evans Road design

Purpose	To provide the principal connection for the local movement of people, vehicles and goods between the Northern and Western Geelong Growth Areas.
Bus	Bus capable (shared with general traffic)
Bike	Off-street bike path with separated pedestrian path
Notional Vehicle Traffic Volume	Up to 20,000 vpd
Lot access for cars	Yes
Typical frontage width	Varies
Posted speed	70 km/h
Target speed	70 km/h
Maximum block length	Varies

6.2.5 Connector Street (Suburban)

Proposed cross section

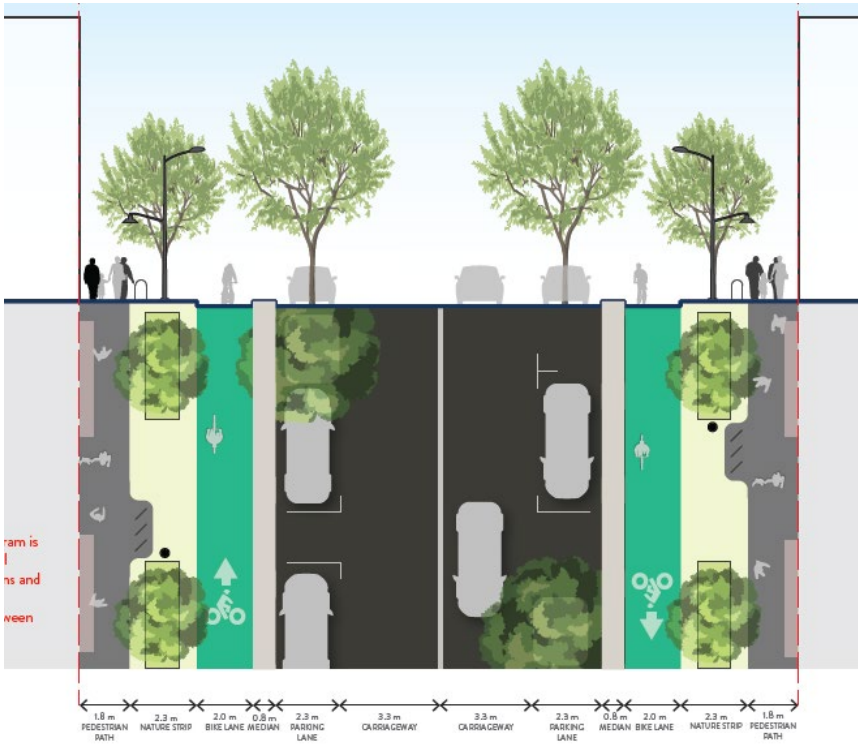


Figure 21: Cross section of the Suburban Connector Street (25m)

Standard *Our Roads* cross section

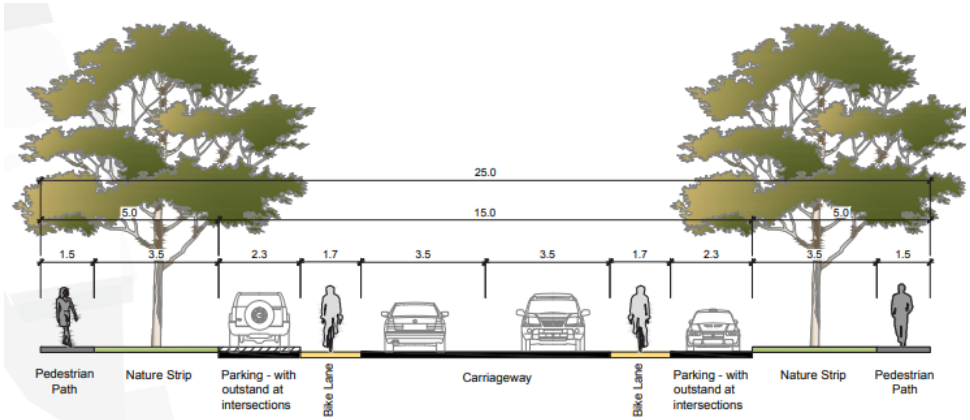


Figure 22: Cross section of the VPA Connector Street – Residential (25m)

The Suburban Connector Street provides a connection between local streets and key neighbourhood destinations for people walking, riding, taking public transport, or driving. Suburban Connector Streets are key all-modes conduits that stitch together residential areas and ensure activity centres and other key destinations can be accessed by a range of high quality transport choices. The balanced design response is essential to ensure walking and cycling alternatives are presented as visible, practical and high quality alternatives to private vehicle travel in service of the Framework Plan objectives.

The carriageway accommodates bus services and typical refuse collection and service vehicles, however it features a range of elements to create a sense of narrowing and edge friction to control vehicle speeds and heighten driver awareness of other modes. These include:

- Minimum lane widths (3.3m) for bus capable streets
- Two rows of avenue of street tree planting to create a sense of enclosure
- Street tree plantings located in kerb outstands within on-street parking lanes to emphasise the narrowing effect, and impart a sense of narrowing when parked cars aren't present.

Avenue street tree plantings also provide shade to footpaths and bike lanes to improve comfort levels and place quality, and help to alleviate the urban heat island effect. Slightly widened footpaths (1.8m) provide significant useability benefits compared to VPA standards (1.5m) by permitting two wheelchair or pram uses to pass freely, and provide a more comfortable space for people to walk side by side in conversation.

Protected bike lanes on Suburban Connector Streets provide the principal bike network consistent coverage and a choice of routes with safe and comfortable places to ride. Wide (2m) protected bike lanes cater to a range of riders and permit bikes of different speeds and sizes to pass comfortably. While the VPA's Our Roads connector street includes painted bike lanes between parked cars and travel lanes, this design extends the choice to ride to riders of all ages and abilities and exposes riders to significantly less traffic stress by locating bikes between parked cars and the kerb. Protected bike lanes also create a more conspicuous and legible bike network that should lead to a greater uptake of cycling and seed the development of a genuine cycling culture for a range of trip purposes.

Vertical separation is provided by half-height kerbs between the parking lane and the bike lane, and between the parking lane and footpath to ensure the spaces will be interpreted unambiguously by all street users as designated spaces for each street user. This demarcation of space is important to limit the encroachment of parked cars and pedestrians onto the bike lane. Providing vertical separation for the bike lane ensures medians or other raised barriers are not required, which maximises the permeability of the street for pedestrians and limits trip hazards for people accessing parked cars, or informally crossing the street at midblock locations. Importantly, a horizontal buffer is provided between the parking lane and the bike lane to reduce the risk of 'dooring' from passengers egressing parked cars.

Figure 23: Vertical separation provided between the parking lane, bike lane and footpath demarcates space for each mode (Wilson St, Newtown NSW)

Table 18: Key attributes of the Suburban Connector Street design

Purpose	To connect neighbourhoods and link local streets to the Clever and Creative Corridor and the external arterial road network through residential areas. To provide safe and direct places to walk, ride and drive between neighbourhoods and local centres
Bus	Bus capable (shared with general traffic)
Bike	Protected kerbside bike lanes.
Notional Vehicle Traffic Volume	3,000 – 7,000 vpd
Lot access for cars	Yes
Typical frontage width	5m +
Posted speed	50 km/h
Target speed	40 km/h
Maximum block length	120m

6.2.6 Connector Street (Urban)

The Urban Connector Street provides connections between local streets and key neighbourhood destinations for people walking, riding, taking public transport, or driving in a similar fashion to the Suburban Connector Street, however it includes fully paved verges that respond to the place needs of urban centres (such as opportunities for outdoor dining).

The Urban Connector Street features wide footpaths with distinct thoroughfare and dwelling spaces that invite people to stop and stay in a main street environment, and create opportunities for local retailers and restaurants to use the space to create destination experiences (e.g. on-street dining, etc).

Proposed cross section

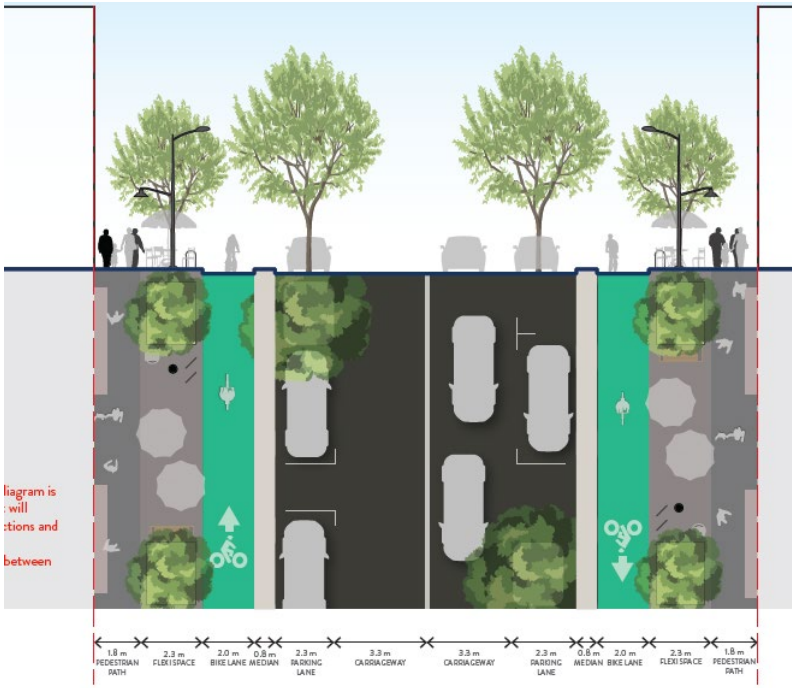


Figure 24: Cross section of the Urban Connector Street (25m)

Standard *Our Roads* cross section

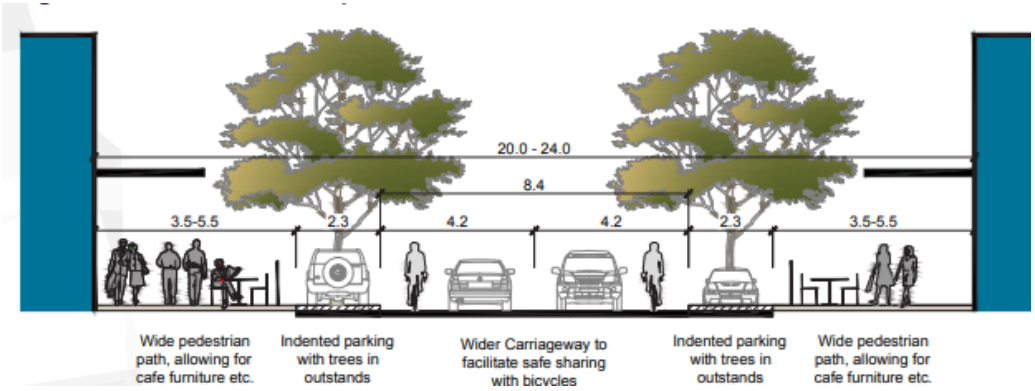


Figure 25: Cross section of the VPA Connector Street – Main Street for LTC (20-24m)

Table 19: Key attributes of the Urban Connector Street design

Purpose	To connect neighbourhoods and link local streets to the Clever and Creative Corridor and the external arterial road network through urban areas. To provide connections to, and provide a focal point for local neighbourhood centres. The street is a destination and a place to stay and dwell
Bus	Bus capable (shared with general traffic)
Bike	Protected kerbside bike lanes.
Notional Vehicle Traffic Volume	3,000 – 10,000 vpd
Lot access for cars	No
Typical frontage width	5m +
Posted speed	50 km/h
Target speed	40 km/h
Maximum block length	120m

6.2.7 Connector Street (Modified Urban)

The Modified Urban Connector Street provides a genuine main street experience for central activity centre locations. This street typology removes on-street parking to provide a more compact and human scale streetscape that encourages pedestrian engagement with frontages on both sides of the street.

Proposed cross section

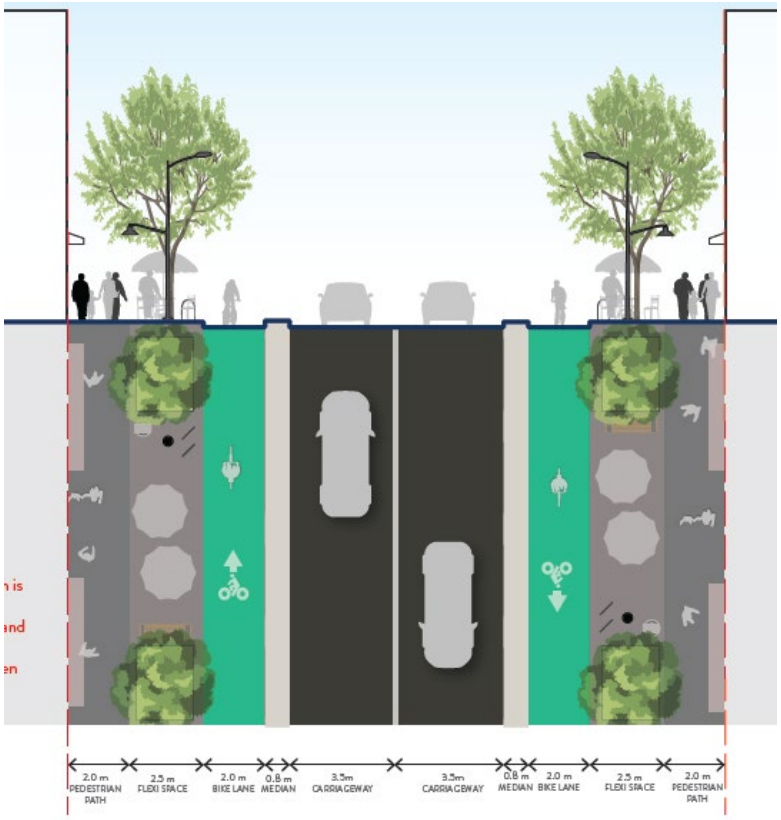


Figure 26: Cross section of the Modified Urban Connector Street (21.6m)

Standard *Our Roads* cross section

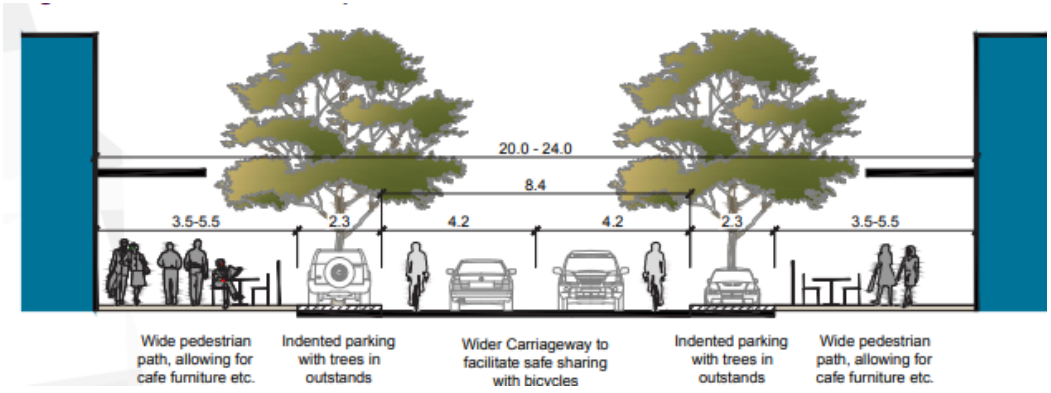


Figure 27: Cross section of the VPA Connector Street – Main Street for LTC (20-24m)

Table 20: Key attributes of the Modified Urban Connector Street design

Purpose	To provide a primary connection for people and goods through the centre of Activity Centres that creates a main street experience with very high place quality outcomes. To provide connections to, and provide a focal point for Activity Centres. The street is a key community destination and place to meet, stay and dwell.
Bus	Bus capable (shared with general traffic)
Bike	Protected kerbside bike lanes
Notional Vehicle Traffic Volume	3,000 – 10,000 vpd
Lot access for cars	No
Typical frontage width	5m +
Posted speed	40 km/h
Target speed	30 km/h
Maximum block length	120m

6.2.8 Local Access Street

The Local Access Street serves to provide direct property access for local residences within a comfortable and amenable living street environment.

Comparable to VPA Our Roads Local Access 1, the Local Access Street permits two-way vehicle movement within a 7.3m carriageway, however kerb outstands are provided at regular intervals to impart road narrowing that requires opposing traffic to negotiate passing opportunities. The effect this creates is similar to the typical presence of parked cars, but ensures that narrowing is present even in the absence of parked cars, hence enforcing a consistently slow speed environment at all times. Kerb outstands also enable larger avenue plantings of street trees to improve access to shade and create an identifiable sense of residential place quality.

Wider footpaths (1.8m) ensure a comfortable and inviting walking environment that allows two wheelchair or pram users to pass unimpeded, and allows friends and family to walk side by side in conversation. These are subtle walkability improvements that ensure active travel trips present as viable alternatives to driving at the beginning of each resident's day.

Local Access Streets invite people riding bikes to share space with general traffic and therefore require consideration to limit traffic volumes and speeds. Network connectivity for cars (using filtered permeability treatments) should be limited to discourage non-local traffic and inappropriate speeds or volumes.

Proposed cross section

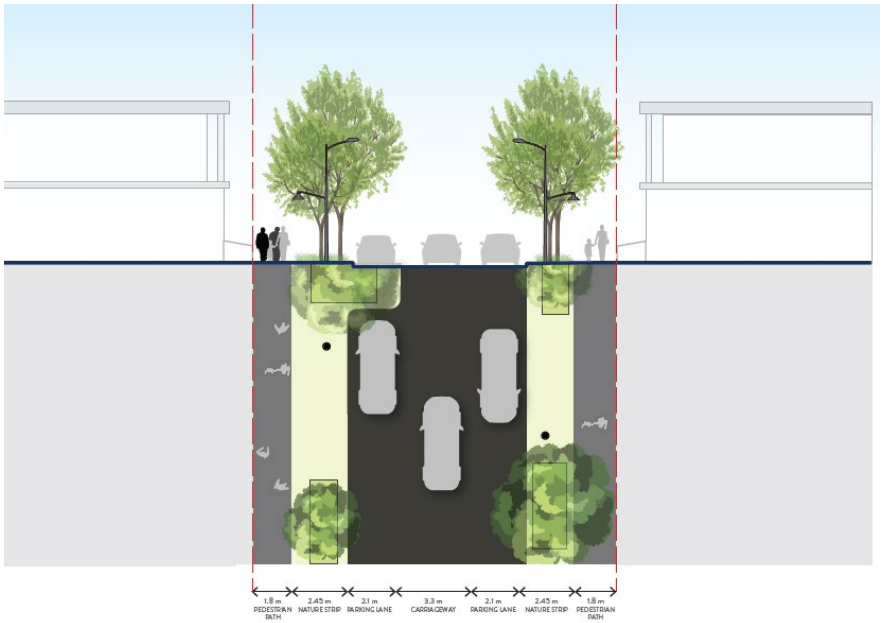


Figure 28: Cross section of the Local Access Street (16m)

Standard *Our Roads* cross section

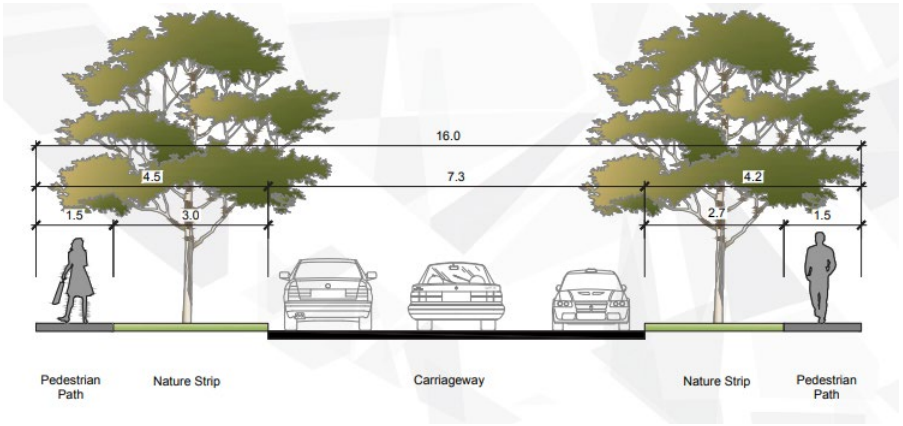


Figure 29: Cross section of the VPA Local Access Street 1 (16m)

Table 21: Key attributes of the Local Access Street design

Purpose	To provide property access in local sub-divisions in an amenable and attractive residential environment.
Bus	No
Bike	Shared with general traffic
Parking	Parallel on both sides
Notional Vehicle Traffic Volume	1,000 – 2,000 vpd
Lot access for cars	Yes
Typical frontage width	10m +
Posted speed	50 km/h
Target speed	30 km/h
Maximum block length	240m

6.2.9 Key Local Access Street

The Key Local Access Street has a similar purpose to the Local Access Street, however is provided with additional width to accommodate local bus services. Additional width provides two lanes of travel that removes the need for opposing traffic to negotiate passing opportunities. People on bike share space with general traffic.

Proposed cross section

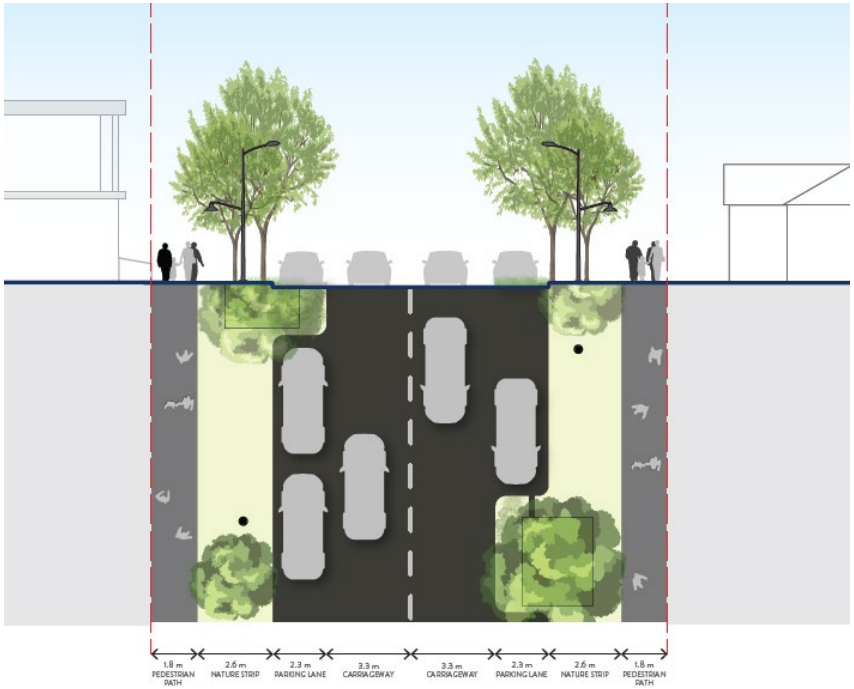


Figure 30: Cross section of the Key Local Access Street (20m)

Standard *Our Roads* cross section

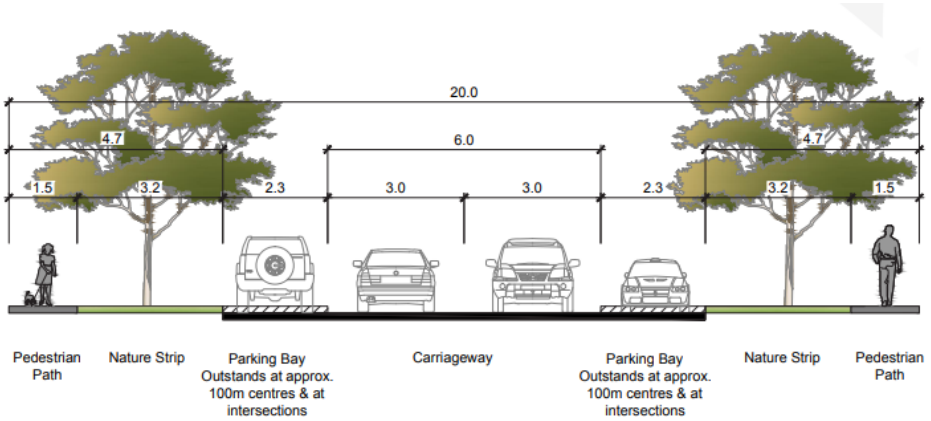


Figure 31: Cross section of the VPA Local Access Street 2 (20m)

Table 22: Key attributes of the Key Local Access Street design

Purpose	To provide property access in local sub-divisions with provision for local bus routes in an amenable and attractive residential environment.
Bus	Bus capable (shared with general traffic)
Bike	Shared with general traffic
Notional Vehicle Traffic Volume	2,000 – 3,000 vpd
Lot access for cars	Yes
Typical frontage width	15m +
Posted speed	50 km/h
Target speed	30 km/h
Maximum block length	240m

6.2.10 Conservation Interface Street

The Conservation Interface Street provides amenable access to conservation areas and invites active transport participation for both recreation and transport via a generous 4m off-street shared path within a 20m road reserve.

Proposed cross section

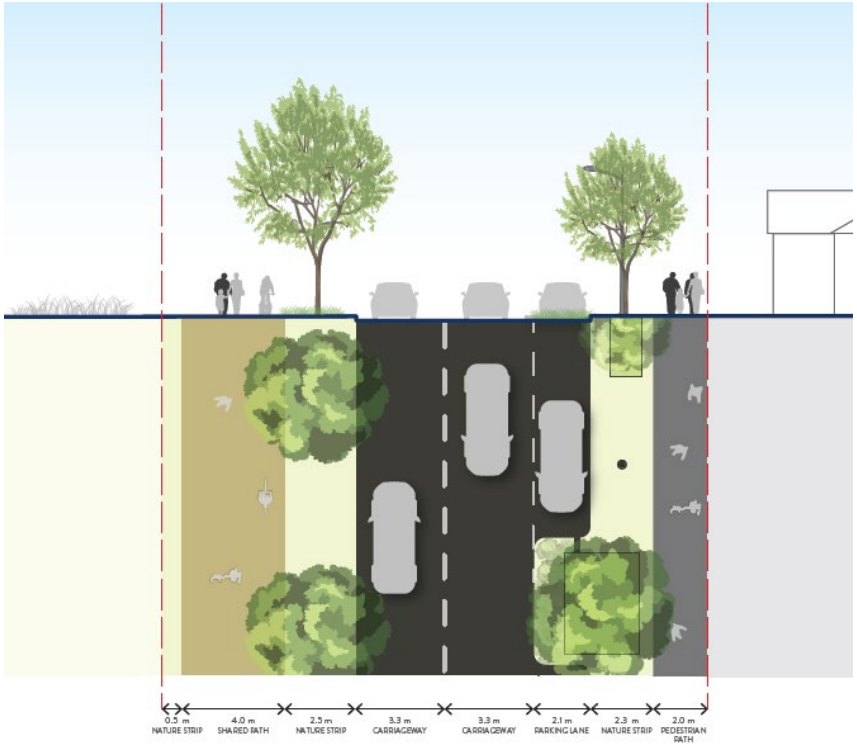


Figure 32: Cross section of the Conservation Interface Street (20m)

Standard *Our Roads* cross section

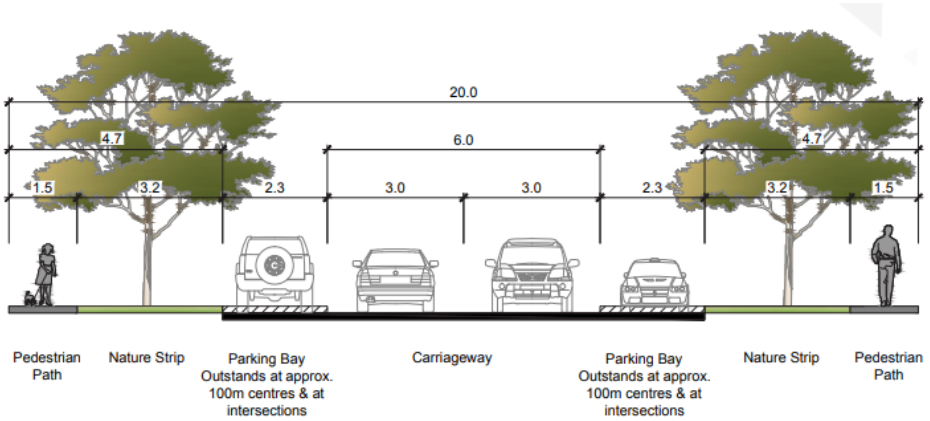


Figure 33: Cross section of the VPA Local Access Street 2 (20m)

Table 23: Key attributes of the Conservation Interface Street design

Purpose	To provide an amenable interface to conservation areas that provides access to walking and cycling routes for transport and recreation.
Bus	Bus capable (shared with general traffic)
Bike	Shared with general traffic
Notional Vehicle Traffic Volume	2,000 – 3,000 vpd
Lot access for cars	Yes
Typical frontage width	15m +
Posted speed	50 km/h
Target speed	30 km/h
Maximum block length	240m

6.2.11 Parking Street

Parking streets provide consolidated on-street parking opportunities to meet the visitor and overflow parking needs of residents of Micro Streets and Pedestrian Streets. Parking Street can be located on the perimeter of these car-free or car-light neighbourhood clusters to maintain fair and practical access to on-street parking within a relatively short walk.

On-street parking is accommodated within a wide verge that can be located on alternate sides of the street. The wide verge also accommodates generous landscaping and stopping and staying opportunities interspersed between clusters of parking. This includes large regularly spaced canopy trees to provide shading to footpaths and improved perceptions of place quality.

General traffic lanes are bus capable and cater to bike riders on-street. Streetscape tools such as cobbling (see Figure 52) emphasise the presence of cyclists and encourage riders to claim the centre of the lane rather than ride in the space directly behind parked cars.

Figure 34: Surface treatments and cobbling can guide rider placement within travel lanes

Figure 35: Safe riding environment in a local streetscape with angled parking

Proposed cross section

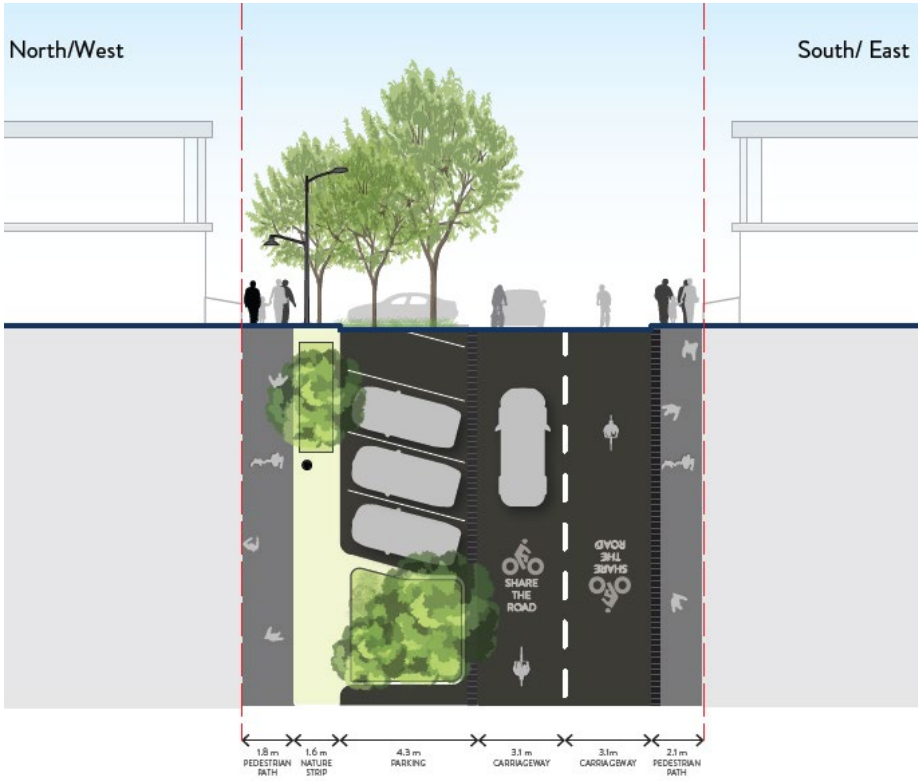


Figure 36: Cross section of the Parking Street (16m)

Standard *Our Roads* cross section

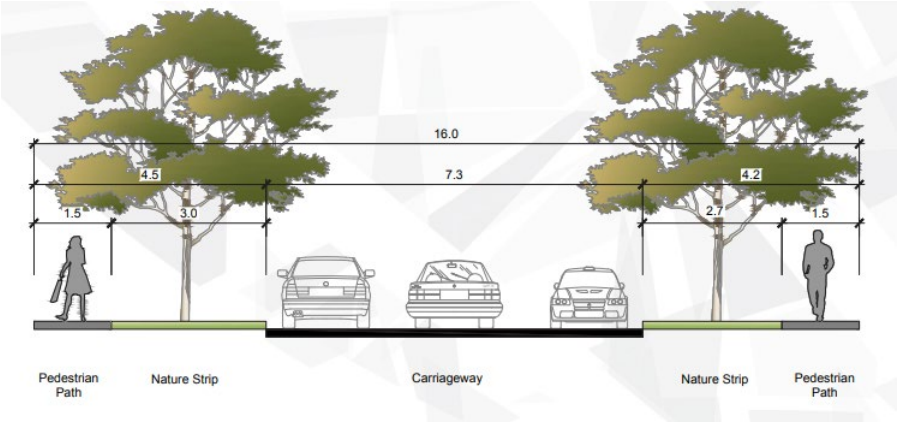


Figure 37: Cross section of the VPA Local Access Street 1 (16m)

Table 24: Key attributes of the Parking Street design

Purpose	To provide a safe and amenable street environment that can accommodate on-street parking on the periphery of Micro Street and Pedestrian Street clusters.
Bus	Bus capable (shared with general traffic)
Bike	Shared with general traffic
Notional Vehicle Traffic Volume	1,000 – 2,000 vpd
Lot access for cars	Yes (on one side)
Typical frontage width	10m +
Posted speed	40 km/h
Target speed	30 km/h
Maximum block length	240m

6.2.12 Micro Street

Micro Streets provide limited access to vehicles in a shared streetscape oriented strongly towards providing flexible public open space for improvised play and other residential land use aligned place activity. They provide an option for a compact living street that, used in conjunction with the requisite rear laneway, require little more space in comparison to conventional 16m local streets. Micro Streets offer significantly better place outcomes for residents than current VPA standard cross sections deliver, and provide useable outdoor space for play and respite.

Proposed cross section

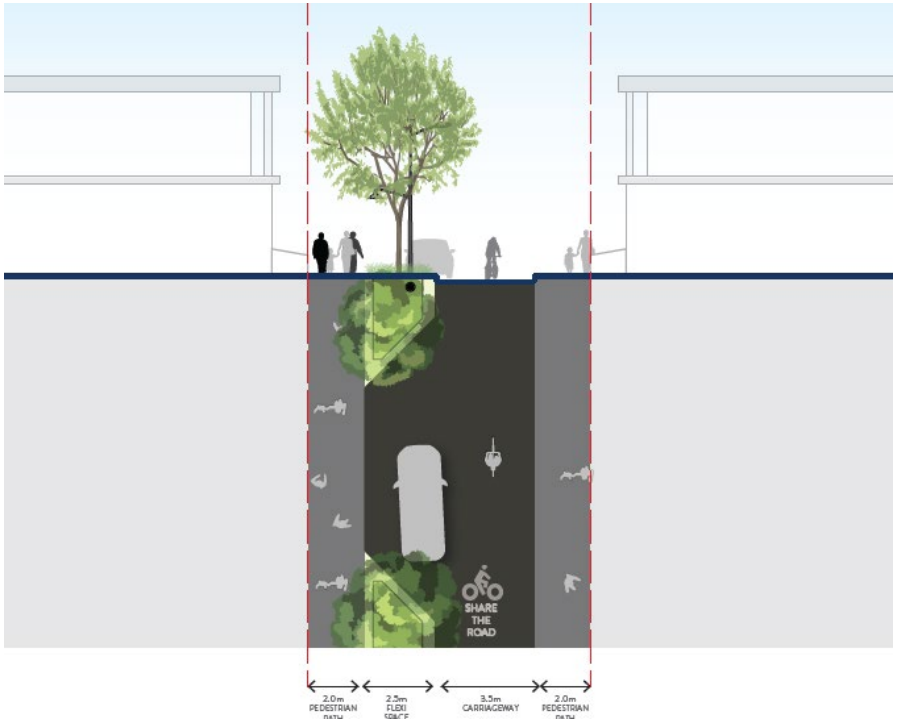


Figure 38: Cross section of the Micro Street (10m)

Standard *Our Roads* cross section

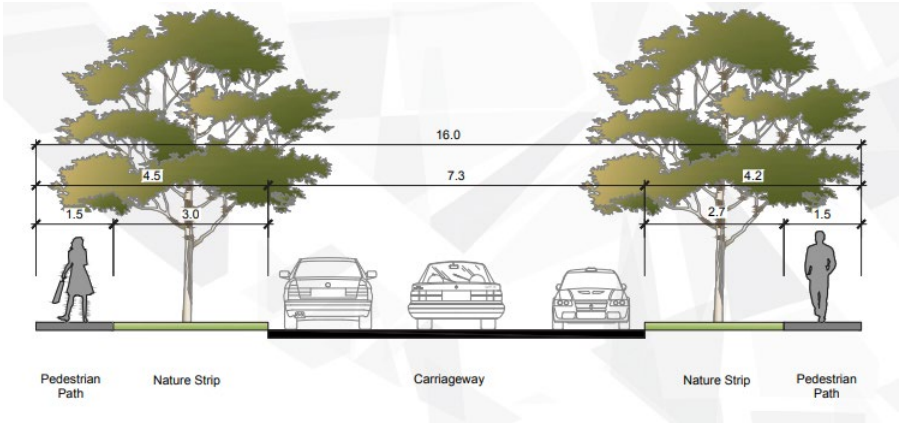


Figure 39: Cross section of the VPA Local Access Street 1 (16m)

Direct property access is not permitted (laneways provide rear garage access), however the Micro Street provides opportunities for drop offs, deliveries and other occasional access requirements. Traffic volumes are consequently very low and the opportunity is taken to treat drivers as guests in a pedestrian oriented place. Design cues are used to reinforce pedestrian priority and restrict speeds, and the inclusion of generous landscaping and canopy trees creates a quality experience of local place function. The shared carriageway invites a range of uses, including informal play, and serves to provide a 'public backyard space' that responds to market conditions dictating shrinking private yard spaces.

The 3.0m carriageway with occasional passing / drop off bays is functionally similar to typical local access streets with parking on both side – i.e. two way travel reliant on opposing vehicle negotiating passing opportunities and a slow environment that enable cars and bikes to share the street.

Table 25: Key attributes of the Micro Street design

Purpose	To provide inviting place-oriented public space where private vehicles are permitted as guests.
Bus	No
Bike	Shared with general traffic
Notional Vehicle Traffic Volume	1,000 vpd
Lot access for cars	Limited
Typical frontage width	5-15m
Posted speed	10 km/h shared zone
Target speed	10 km/h
Maximum block length	120m

6.2.13 Pedestrian Street

Pedestrian Streets provide an entirely car-free environment dedicated to residential place activity, play space and public backyard space. Rear access laneways provide access to properties fronting pedestrian streets and facilitates refuse collection and service vehicles. The 3.5m shared path also allows for emergency vehicle access.

Pedestrian streets can be accommodated within a 10m or 16m road reserve, and when paired with the requisite rear laneway the 10m variant requires little more space than a typical 16m local access street. Both variants provide an excellent opportunity to locate utilities in accessible locations, and to create green connections between key neighbourhood destinations such as schools, parks, conservation areas and shops.

Proposed cross section

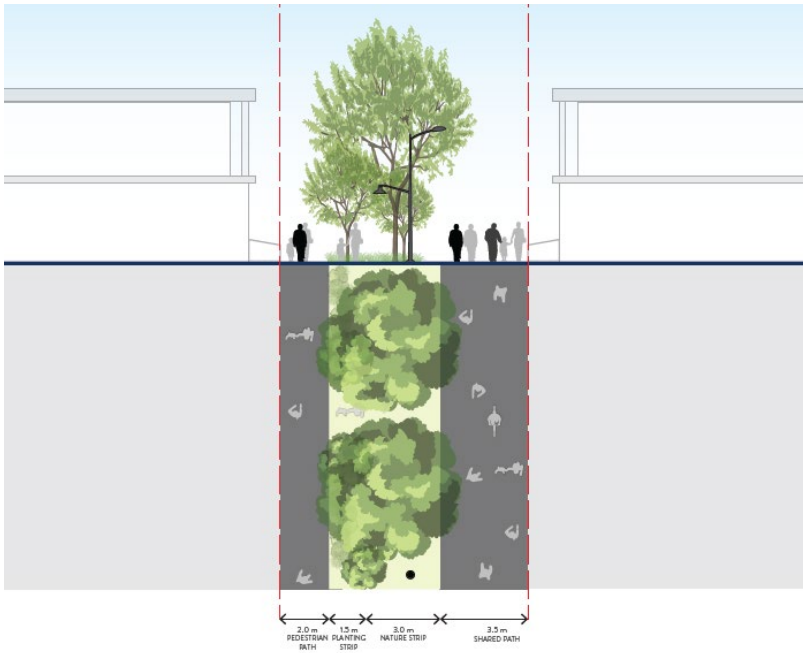


Figure 40: Cross section of the Narrow Pedestrian Street (10m)

Standard *Our Roads* cross section

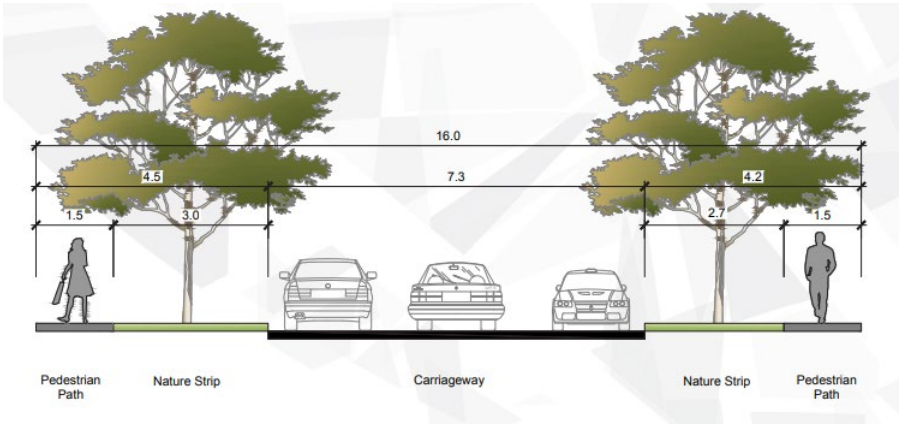


Figure 41: Cross section of the VPA Local Access Street 1 (16m)

Proposed cross section

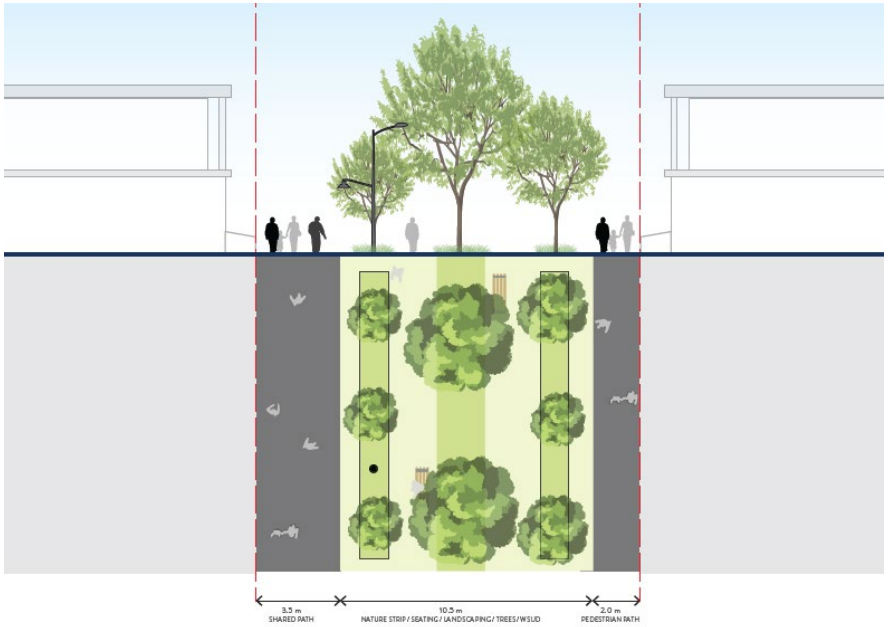


Figure 42: Cross section of the Wide Pedestrian Street (16m)

Standard *Our Roads* cross section

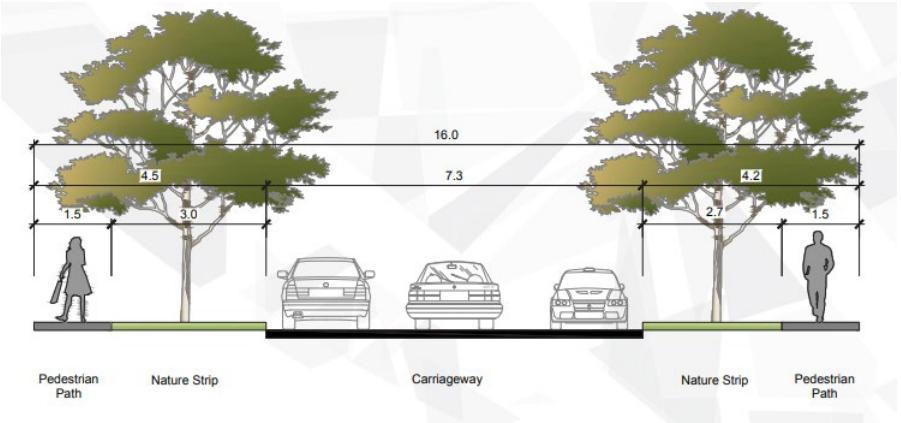


Figure 43: Cross section of the VPA Local Access Street 1 (16m)

Pedestrian streets provide large street tree plantings for shade and urban heat island effect mitigation, and can easily incorporate a range of water sensitive urban design treatments that link to natural waterways.

The central nature strip creates a genuine 'public backyard space' that invites use by nearby residents to augment public parks and small private backyards. Streetscapes can include open space for unprogrammed play, or a mix of street furniture such a play equipment, seating, BBQs and other elements.

In order to ensure access to bikes and emergency vehicles is maintained, a wide shared path is provided on one side.

Table 26: Key attributes of the Pedestrian Street design

Purpose	To provide streets for people, enabling public 'backyard' space
Bus	No
Bike	Shared path provided
Notional Vehicle Traffic Volume	NA
Lot access for cars	No
Typical frontage width	5-15m
Target speed	NA
Maximum block length	240m

6.2.14 Laneways

Laneways serve to provide direct property access to lots fronting streets with limited or no driveway access, such as Pedestrian Streets, Micro Streets, Parking Streets and the Clever and Creative Corridor. Laneways enable higher quality walking environments and place outcomes to be achieved on frontage streets by consolidating vehicle access in a compact dedicated space.

Laneways provide access to garages on both sides within a 6m reserve that is designed to provide adequate manoeuvring space for vehicles without providing excessive width that encourages illegal parking. Pavement space is softened by occasional landscaping and tree planting and serves to provide shade and mitigate the urban heat island effect.

Buildings that overlook and engage with the laneway are important and help create a safe environment that local residents value and take stewardship over as a valuable part of their local neighbourhood. Successful laneways also provide useful places for improvised play.

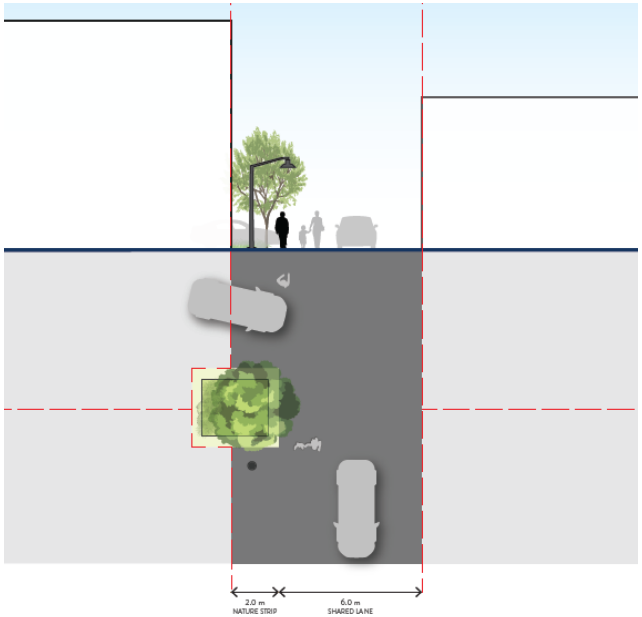
Proposed cross section	**Standard *Our Roads* cross section**
	Not applicable

Figure 44: Cross section of the Laneway (8m)

Table 27: Key attributes of the Laneway design

Purpose	To provide car access to enable car-free frontage streets, providing streets for people
Bus	No
Bike	Shared with general traffic
Notional Vehicle Traffic Volume	300 vpd
Lot access for cars	Yes
Typical frontage width	5-15m
Posted speed	10 km/h shared zone
Target speed	10 km/h
Maximum block length	120m

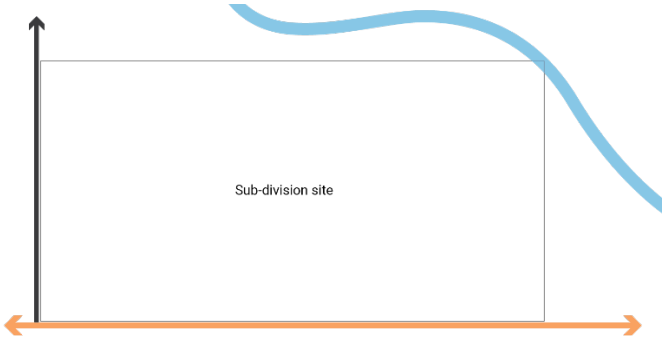
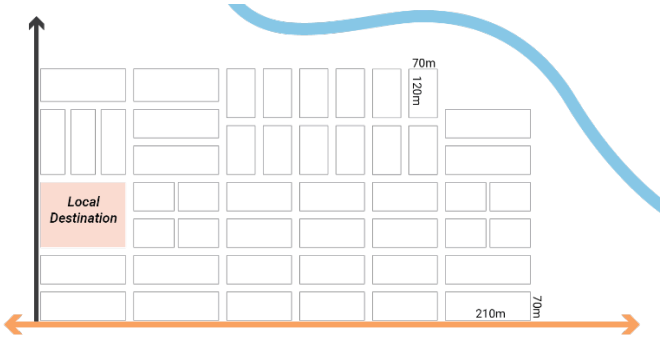
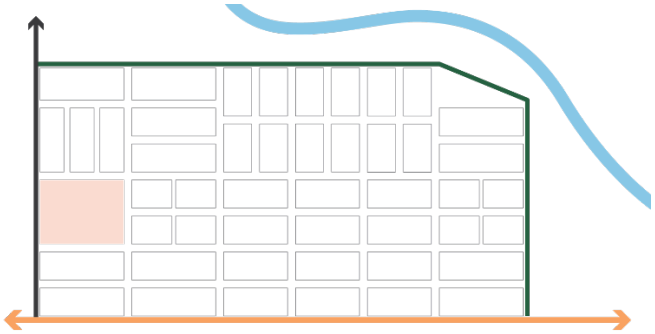
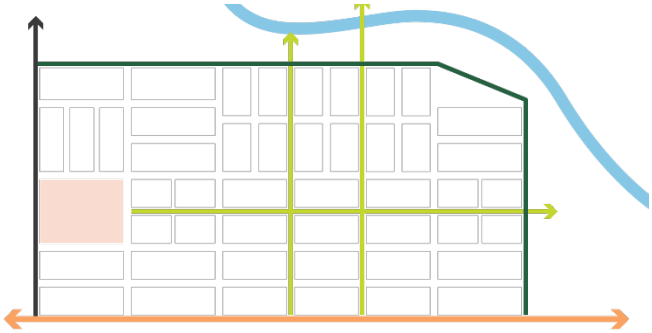
6.3 Local sub-division structure

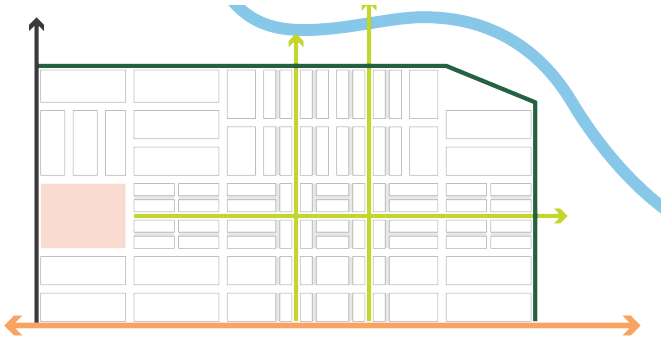
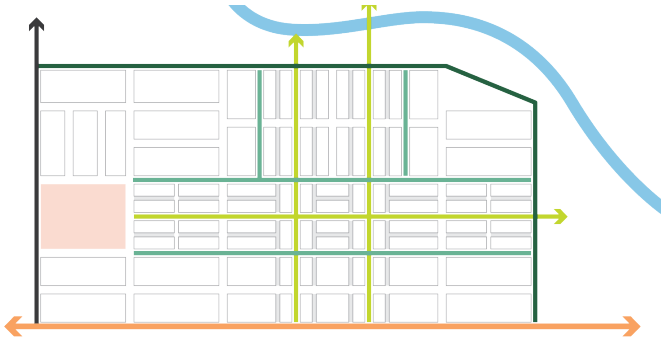
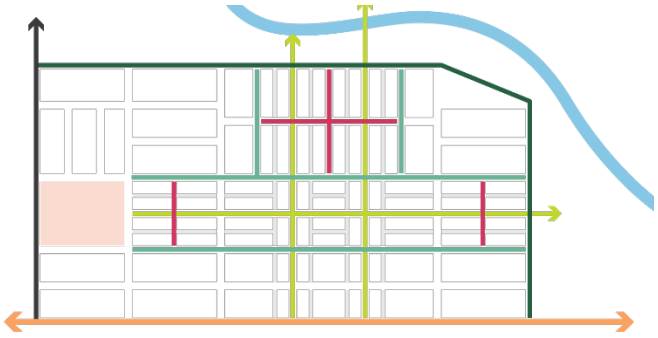
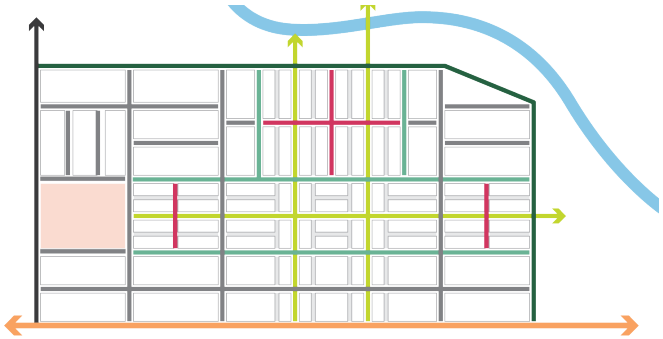
Designing local sub-divisions involves arranging local street options to ensure residents have efficient property access through streets and laneways that link to connector streets. The network should be designed to limit vehicle speeds and volumes on local streets to enable the local network to provide a permeable network of walking and safe cycling connections.

Market demands for medium density attached housing options with narrow frontages (7.5m or less) will create opportunities for lots with rear access lanes, and the opportunity to create car-free or shared frontage streets should be taken as much as possible to provide the community with place-oriented streetscapes with space to walk, ride and play. In order to achieve this, the design of local networks should consider the following steps:

1. Consider the location of the larger grid (connectors and key local access streets).
2. Layout a basic grid taking into account lot size, block length and orientation, and local destinations.
3. Add conservation interface streets where streets straddle conservation zones.
4. Find opportunities for pedestrian streets, particularly where streets connect open space and local destinations.
5. Add laneways to support pedestrian streets
6. Use parking streets on the perimeter of car-free neighbourhood cells
7. Consider the opportunity to include Micro Streets where opportunities exist to utilise existing laneways, or on streets with limited connectivity.
8. Add local access streets to provide preferred vehicle connections to connector streets.
9. Add local area traffic management tools, including pinch points, filtered permeability and closures to manage volumes and speeds on sensitive streets such as Parking Streets and Micro Streets.

The above steps are detailed in Figure 63 and the key attributes of each street type, which should be considered when designing local networks, are provided in Table 32 and Table 33.

Step	Output	Considerations
1		• Treatment of major site access intersections • Proximity to conservation areas and waterways. • Target yields.
2		• Location of schools, centres, etc. • Maintenance of a connected grid structure with direct, legible walking routes. • Diversity of housing types and lot sizes. • Changes in grid orientation.
3		• Wider cross section available to provide bus capability. • Provide logical connections to shared path at either end.
4		• Quality walking links between key sites (schools, open space, etc) • Consider opportunities for locating utilities and WSUD connections to creeks. • Extend green connections across waterways. • Provide orthogonal links to improve permeability of sub-division for walking.

Step	Output	Considerations
5		• Ensure laneways provide rear property access to lots with Pedestrian Street frontages. • Add additional through block links to ensure laneway length is less than 120m.
6		• Provide parking on the side of the street with rear lane access to maximise opportunities for parking and landscaping. • Provide Parking Streets on the longer grid blocks to maximise space available for parking, trees, etc.
7		• Create sequence of parallel streets with rear laneway access to maximise spatial efficiency of narrow street + laneway configuration. • Use for end of block locations where end lots can have car access from adjoining streets • Use to break up long laneway blocks, particularly laneways. • Use in locations where traffic function is low for cars.
8		• Consider bus accessibility. • Consider logical spacing of streets to create usable preferred local network for cars. • Ensure practical access for refuse collection through neighbourhood.

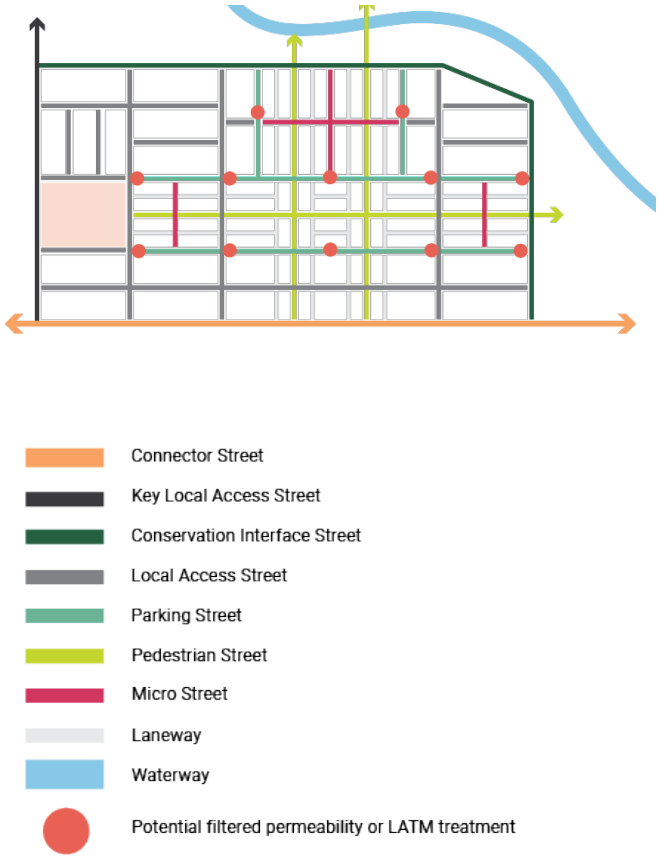
Step	Output	Considerations
9		• Limiting car speeds and volumes on parking streets to create safe riding environment given the presence of angled parking. • Filtered permeability to limit through movement of cars on Parking Street • Pinch points and LATM measures to encourage 30 km/h or lower speeds on local streets.

Figure 45: Sub-division design steps and considerations

It is expected that following the above process may result in a range of outcomes depending on local constraints and context, particularly typography and market demands for different housing typologies.

Table 28: Street typologies and key attributes (local streets)

Street Type	**Laneway (8m)**	**Micro Street (10m)**	**Pedestrian Street (10m & 16m)**	**Parking Street (16m)**	**Local Access 1 (16m)**	**Local Access 2 (20m)**	**Conservation Interface Street (20m)**
Purpose	To provide car access to enable car-free frontage streets, providing streets for people.	To provide inviting place-oriented public space where private vehicles are permitted as guests.	To provide streets for people, enabling public 'backyard' space	To provide a safe and amenable street environment that can accommodate on-street parking on the periphery of Micro Street and Pedestrian Street clusters.	To provide a choice for local residential neighbourhoods that prioritises private vehicles.	To provide a choice for local residential neighbourhoods that accommodates local bus services (noting no dedicated cycling infrastructure).	To provide an amenable interface to conservation areas that provides access to walking and cycling routes for transport and recreation.
Application	Clever and Creative Corridor, Micro Streets, Pedestrian Streets. Nb: Mandatory for 7.5m frontage width	In conjunction with laneways, pedestrian streets and generally all local streets	In conjunction with laneways, pedestrian streets and generally all local streets providing highly permeable places for people	On the perimeter of walkable clusters comprised of Micro Streets and Pedestrian Streets (ideally within 5min walking distance / 400m)	For all local street areas	For local Streets with bus services	Streets adjoining a conservation area
Number of travel lanes for cars	Shared carriageway	Shared carriageway	0	2	1 + unmarked parking lanes on both sides	2	2
Lot access for cars	Yes	Limited	No	Yes	Yes	Yes	Yes
Typical frontage width	5-15m Nb: Read in conjunction with 56.06-8	5-15m Nb: Read in conjunction with 56.06-8	5-15m Nb: Read in conjunction with 56.06-8	10m +	10m +	15m +	15m +
Target speed (not posted speed)	10 km/h (shared)	10 km/h (shared)	NA	30 km/h	30 km/h	40 km/h	40 km/h
Notional Vehicle Traffic Volume	< 300 vpd (per Cl 56.06-8)	< 1,000 vpd (per Cl 56.06-8)	N/A	1,000 – 2,000 vpd (per Cl 56.06-8)	1,000 -2,000 vpd (per Cl 56.06-8)	2,000-3,000 vpd (per Cl 56.06-8)	2,000-3,000 vpd (per Cl 56.06-8)
Bus Capable	No	No	No	No	No	Yes	Yes
Maximum block length for subdivision design	<120m	<120m	<120m	120m	120m	120m	120m

Table 29: Street typologies and key attributes (connector streets, CCC and arterial roads)

Street Type	Modified Urban Connector (21.6m)	Connector (Suburban) (25m)	Connector (Urban) (25m)	Clever and Creative Corridor (34m)	CCC (Activity Centre) (20m)	Evans Road (20m)	Geelong Ballan Road (34m)
Purpose	To provide a primary connection for people and goods through the centre of Activity Centre that creates a main street experience with very high place quality.	To connect neighbourhoods and link local streets to the Clever and Creative Corridor and the external arterial road network through residential areas. To provide safe and direct places to walk, ride and drive between neighbourhoods and local centres.	To provide connections to, and provide a focal point for local neighbourhood centres. Street is a destination, offering a place to stay and dwell.	To provide dedicated public and active transport corridors, promoting the use of sustainable transport as the most direct route connecting activity centres.	To provide sustainable transport access to and through the activity centre. Promotes filtered permeability creating a higher quality of place free of cars.	To provide the principal connection for the local movement of people, vehicles and goods between the Northern and Western Geelong Growth Areas.	To provide trunk traffic corridor between growth areas and across Greater Geelong.
Application	To provide connections to, and provide a focal point for Activity Centres. The street is a key community destination and place to meet, stay and dwell.	Connections between neighbourhoods and major local destinations on corridors with bus services and traffic volumes of up to 7,000 vehicles per day	Main street connections through local activity centres with bus services and traffic volumes of up to 10,000 vehicles per day	34m cross section to be applied along Clever and Creative Corridor between activity centres	20m cross section applied at the clever and creative corridor where it interfaces with the NAC (activity centre)	Evans Road within the Creamery Road precinct.	Geelong Ballan Road adjacent the precinct.
Number of travel lanes for cars	2	2	2	2	0	2	4
Lot access for cars	No	Yes	No	No	No	Yes	No
Typical frontage width	5m+	5m +	5m +	5m +	5m +	10m +	5m +
Target speed (not posted speed)	30km/h	40 km/h	40 km/h	40 km/h (general traffic) 60 km/h (BRT)	10 km/h (shared)	70 km/h	50km/h
Notional Vehicle Traffic Volume	3,000 -10,000 vpd	3,000 – 7,000 vpd (per Cl 56.06-8)	3,000 -10,000 vpd	15,000 vpd maximum	Buses and emergency vehicles only	Up to 20,000 vpd	Up to 40,000 vpd
Bus Capable	No	Yes	Yes	Yes	Yes	Yes	Yes
Maximum block length for subdivision design	120m	120m	120m	240m	120m	240m	240m

6.4 Intersection Designs

6.4.1 Principles

Creating high quality intersections that give greater priority to walking and cycling will help reduce car usage below what is modelled using VITM (which does not model intersections or active travel). If the Creamery Road precinct is to deliver outcomes consistent with the intent of the Framework Plan (e.g. significantly great active and public transport participation), the strategic approach to designing intersections cannot simply be to meet forecast traffic demand without considering the detrimental impact of car-oriented intersection designs on other travel modes. In recognition of this, proposed intersection configurations have been developed to ensure the future street network responds to the intent of the Framework Plan.

Table 34 below summarises the principles that inform the design of typical intersection treatments within the Creamery Road precinct.

The suite of intersection design drawings are provided in **Appendix C**. These are intended to demonstrate the key outcomes sought for intersections within the precinct and how this differs to typical practice, however they are not intended to provide a comprehensive outline of intersections involving all street combinations.

Table 30: Intersection design principles

Principle	Description	Influence
Safe places for pedestrians and bike riders to cross with priority	Safe street crossings that provide priority for active transport users are essential in urban areas and allow users of all abilities to cross safely, comfortably and using the shortest and most direct route. Formal priority for pedestrians is essential for people with reduced mobility or vision.	Wombat crossings provided across side streets on the CCC Connector Street / Connector Street intersections to be signalised or provided with a roundabout with raised pedestrian and cyclist crossings on all approaches. Local roundabouts provided with raised zebra crossings (wombat crossings) on all approaches.
Safe speeds	Intersections should encourage slower speeds using compact geometry (reduced kerb radii, etc), landscaping, etc.	Compact roundabouts used for local intersections. Slip lanes omitted from all intersections.
Comfortable environments for people on bikes	Intersections should provide physical protection from general traffic and priority at conflict points.	Streets with protected bike lanes are provided with Dutch-style signalised intersection and roundabout treatments.
Embrace some level of traffic congestion	Traffic congestion is inevitable in busy and active urban areas. Large intersections that seek to minimise traffic delay should not be prioritised at the expense of the quality of walking and cycling networks or the place quality of streets.	Intersection footprints have been designed to accommodate no more than two approach lanes and two departure lanes at each approach. Slip lanes omitted from all intersections. Roundabouts limited to one circulation lane.

6.4.2 Compact roundabout (local streets)

Compact roundabouts are intended to be used in locations where two local streets intersect, and provide slow speed environments to improve safety for all users and provide traffic calming effects that discourage non-local traffic.

Key features:

- Raised zebra crossings (wombat crossings) on all approaches provide priority for pedestrians maximise the accessibility of the local street network for people of all abilities. Zebra crossings are essential at roundabouts to ensure people with reduced mobility or vision can cross safely and comfortably.
- Zebra crossings located a close as possible to pedestrian desire lines.
- Absence of splitter island on approaches enables more compact geometry and enables occasional large trucks to use more than one lane when turning at slow speed.
- Semi-mountable central island accommodates swept path requirements of occasional large trucks
- Compact geometry and tight kerb radii encourages slow travel speeds

Compatible street types:

Major Street	Minor Street
Key Local Access Street	Key Local Access Street
Local Access Street	Local Access Street
Conservation Street	Conservation Street
Parking Street	Parking Street
Micro Street	Micro Street

6.4.3 Connector Street / Connector Street roundabout

Dutch-style cycle-friendly roundabouts are intended to be used at 4-way intersections with Connector Streets. They maintain physical separation from traffic for cyclists negotiating the roundabout and provide safe places for people walking and cycling to cross with priority.

Key features:

- Raised wombat crossings with priority for pedestrian and cyclists on all approaches. Zebra crossings are essential at roundabouts to ensure people with reduced mobility or vision can cross safely and comfortably. Victorian Road Rules require cyclists to dismount at zebra crossings, so separate bike lanes with priority signage for cyclists are required.
- Semi-mountable apron surrounding the central island accommodates manoeuvring requirements of large vehicles while providing compact geometry for general traffic in order to reduce speeds.
- Crossings are located one car length back from the hold line at the entrance to the circulation lane to prevent vehicles queuing across the crossing.

Compatible street types:

Major Street	Minor Street
Connector Street (Suburban) Connector Street (Urban) Modified Connector Street (Urban) Two-lane arterials	Connector Street (Suburban) Connector Street (Urban) Modified Connector Street (Urban) Two-lane arterials

6.4.4 Connector Street / Connector Street signalised intersection

Dutch-style protected signalised intersections can be used at at 4-way intersections with Connector Streets. They maintain physical separation from traffic for cyclists negotiating the roundabout and provide safe places for people walking and cycling to cross with priority.

Key features:

- Islands located on the apex of each corner maintain physical separation for bikes through the intersection, provide storage space for right turning cyclists, and control vehicle speeds at conflict point between cyclists at turning traffic.
- Auxiliary turning lanes accommodated by parking lanes and localised narrowing of verges as required.
- Advance pedestrian and bike lantern (red left arrow drop out) phasing reduces conflicts between cyclists and left turning traffic.

Compatible street types:

Major Street	Minor Street
Connector Street (Suburban) Connector Street (Urban) Modified Connector Street (Urban) Two-lane arterials	Connector Street (Suburban) Connector Street (Urban) Modified Connector Street (Urban) Two-lane arterials

6.4.5 Connector Street / Local Street intersection

Local street connections to connector streets are provided with raised wombat crossings to prioritise the safe and comfortable movement of pedestrians, and include compact geometry to slow turning vehicles and emphasise the potential presence of pedestrians and cyclists.

Key features:

- Wombat crossing slows vehicle speeds, emphasises conflict points with pedestrians and cyclists, and provides priority to pedestrians.

Compatible street types:

Major Street	Minor Street
Connector Street (Suburban) Connector Street (Urban) Modified Connector Street (Urban) Two-lane arterials	Key Local Access Street Local Access Street Conservation Street Parking Street Micro Street

6.4.6 Clever and Creative Corridor / Local Street intersection

Local street connections to the Clever and Creative Corridor restrict traffic movements to ensure the safe and efficient operation of the CCC, in particular the BRT corridor and bicycle facilities. Footpath crossings of the minor streets are provided with raised wombat crossings to prioritise the safe and comfortable movement of pedestrians.

Key features:

- Restricting general traffic movements to left in / left out removes unsafe uncontrolled crossings of the BRT corridor and the median bike path
- Left in / left out treatment reduce the permeability of the local network for cars without impacting active modes, creating cues and advantages to walk for short local trips.
- Wombat crossings on side streets provide unambiguous priority to pedestrians and consistent step-free footpath surface.
- Kerb extensions provided on Clever and Creative Corridor to reduce crossing distance for pedestrians crossing the corridor.
- Wombat crossing or signalised crossing of Clever and Creative Corridor may be provided adjacent to key destinations (e.g. schools).

Compatible street types:

Major Street	Minor Street
Clever and Creative Corridor	Key Local Access Street Local Access Street Conservation Street Parking Street Micro Street

6.4.7 Clever and Creative Corridor / Connector Street intersection

Signalised protected intersections for cyclists are used at intersections between the Clever and Creative Corridor and Connector Streets. Signalisation is essential to ensure conflicts between different modes and movements are safely managed, appropriate traffic movement is supported, and safe and efficient operation of the BRT corridor is achieved.

Key features:

- Islands located on the apex of each corner maintain physical separation for bikes through the intersection, provide storage space for right turning cyclists, and control vehicle speeds at conflict points between cyclists and turning traffic.
- Auxiliary turning lanes are accommodated by parking lanes and localised narrowing of verges as required.
- BRT corridor, median bike path and through traffic on the CCC (with red right turn arrow) operate in shared green phase.

Compatible street types:

Major Street	Minor Street
Clever and Creative Corridor	Connector Street (Suburban) Connector Street (Urban) Modified Connector Street (Urban) Two-lane arterials

6.4.8 Clever and Creative Corridor / CCC Activity Centre intersection

This intersection implements a filtered permeability treatment to permit bike and bus movement through the Activity Centre while removing general traffic.

Key features:

- Islands located on the apex of each corner maintain physical separation for bikes through the intersection, provide storage space for right turning cyclists, and control vehicle speeds at conflict points between cyclists at turning traffic.
- Auxiliary turning lanes are accommodated by parking lanes and localised narrowing of verges as required.
- BRT corridor and bicycle facilities operate in shared green phase.

Compatible street types:

Major Street	Minor Street
Clever and Creative Corridor Clever and Creative Corridor (Activity Centre)	Connector Street (Suburban) Connector Street (Urban) Modified Connector Street (Urban) Two-lane arterials

Appendix A – Supplementary guidance

Children's independent mobility

The independent mobility of children is a fundamental facet in their learning and understanding of the world they live in. It essentially relates to 'freedom for children to travel around their neighbourhood without any adult supervision'. Children are naturally inquisitive and part of their learning and development comes from their ability to interact with their immediate neighbourhood environment. Safe streets and public spaces enable children to play, explore, rest and form meaningful connections to places, family and friends.

Over the last four decades children's independent mobility has been declining drastically, driven by many factors often inter-related to changing societal and living conditions geared towards increased use and reliance on motor vehicles. From 1991-2012 the proportion of children independently travelling to school in Australia reduced from 61% to 32% (Bhosale, 2015). A recent study of 212 Australian children aged 8-12 years old found 32% of the participants had an independent mobility range less than 100m, and 12% of all children were not allowed to walk or cycle without an adult. Other studies indicate that at least every one in ten 15 year old's in Australia are not allowed to go places within walking distance alone.

This is a significant problem because independent mobility has been shown to contribute to physical activity, social and motor skills development, and is positively associated with other health and wellbeing outcomes for children. Unicef child well-being scores show a positive correlation between high well-being scores and children's degree of freedom to travel and play without adult supervision. The flow on impact on parents who are required to taxi their children to almost all destinations is also significant.

Independent mobility for children is often a 'licence' granted by their parents to explore their neighbourhood, walk/cycle to school and play with friends in the street without supervision. This decision to 'grant' such a 'license' is heavily reflected in the built environment the child's neighbourhood is located in. While stranger danger is a concern, parents concerns relating to roads and traffic also have a major impact, and a recent Australian study found a significant decrease in independent mobility for 10-12 year olds if they lived on a busy road. Another study of children aged 12-13 demonstrated that the majority of boys (93%) and girls (85%) felt safe walking or cycling in their neighbourhood, however fewer than half of their parents agreed (Bhosale, 2015).

Human scale streets encourage social and economic exchange

The scale of the street network influences how people experience urban environments, how they move, and how they choose to use spaces. Human scale streets encourage people to linger by creating environments that are engaging, interesting and easy to explore on foot.

Human scale blocks

Fine-grained street networks help create varied and interesting places with opportunities to walk and explore. There is also strong evidence that shorter block lengths reduce car use by making other modes more convenient and inviting. Ewing and Cervero (2010) conducted a meta-analysis of built environment and transport literature to identify relationships between vehicle distance travelled, walking, and various land use and urban form indicators. The study found that short blocks and high intersection density is associated with shorter vehicle travel distances due to the increased attractiveness of other modes, particularly walking and cycling. Moreover, short blocks and high intersection density were found to have a greater influence on walking than other more widely referenced indicators such as density and land use diversity.

A significant amount of research is also available to identify the specific block dimensions that encourage walking and interesting places.

Siksna (1996) reviewed initial block sizes in twelve city centres in Australia and North America and analysed subsequent sub-division, laneway and arcade development patterns. The study shows that city centres with larger initial block sizes tend to adapt more fine-grained networks as sub-division occurs, while cities with smaller blocks to begin with undergo very little change due to their more favourable performance.

Siksna suggests these smaller block sizes remain unchanged over time due to their optimal ability to serve the needs of people walking in city centres with high pedestrian activity. Siksna finds that square blocks of around 60-80m produce finer-mesh circulation patterns, more potential lot frontages, more coherent block fabrics and finer-grain continuous urban fabrics, both with low-rise and high-rise buildings. Siksna goes on to suggest that pedestrian networks at average spacings of 50-70m are ideal for areas of high pedestrian activity.

The adaption of larger blocks over time, while addressing the need for a mesh of human scale streets and laneways, may be less suited to the creation of good public streets and spaces. Jan Gehl (2010) refers to the adaptation of private blocks to include arcades and private laneways as the ‘privatisation of public space’, or the ‘Swiss cheese syndrome’, because of the disconnected and compromised public streetscapes created by this form of development. Providing pedestrian connections with private shopping arcades is seen to strip the city’s streets of public life and vitality, and Gehl suggests limiting block lengths to less than 100m to discourage a reliance on pedestrian connections through private property.

"The Swiss cheese syndrome. " A maze of private shopping arcades crisscrossing the urban blocks. (Perth, Western Australia.)

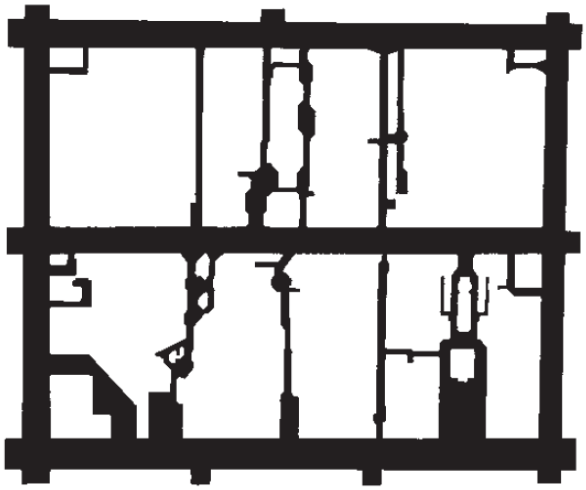


Figure: Large blocks encourage private arcades (Gehl, 2010)

Human scale spaces

Places that are 'human-scale' create interesting, comfortable and enjoyable environments for people to spend time.

Jan Gehl (2010) discusses the social field of vision, which relates to people's ability to discern our surroundings and interact with our environment from certain distances. Gehl identifies 100m as the limit to our social field of vision. At a distance of 70-100m we can see human outlines, identify they are people, and perhaps see their approximate age and what they are doing. We may also be able to tell what sort of clothing they are wearing, and perhaps some of their more obvious mannerisms.

At considerably closer distances of around 30m we can see facial features, hairstyles and loose acquaintances may be recognised. At 20-25m people can generally identify moods of others, and meeting, stopping and talking becomes truly interesting and possible.

Figure: Social field of vision (Gehl, 2010)

Gehl recommends that distances inform the dimensions of street blocks and cross-sections as follows:

- **Block length**
  Street blocks should be no longer than 100m. Beyond this length, people cannot discern meaningful detail along the entire block. Shorter block lengths create more legible and interesting street environments that encourage people to explore on foot.
- **Street width**
  Streets should not be wider than approximately 25m. Beyond this limit, recognising and meeting friends and acquaintances from across the street and meaningful interaction with frontages on both sides of the street becomes unlikely.
- **Frontage variation**
  There should be variations in building frontages at least every 20m. Longer frontages extend beyond people's field of detailed vision, creating building frontages that appear blank and uninteresting.

The limitations of traffic modelling

The Victorian Integrated Transport Model (VITM) is a statewide strategic level transport model that is used to evaluate the impacts of transportation and land use projects and assess the performance of the transport system under existing and future demands. VITM has been used to model the future transport network for NWGGA, however, like all models, it has some limitations. These limitations may result in understated future public and active transport trips and overstated private vehicle trips

Infrastructure Victoria's Victorian Land Use and Transport Integration (VLUTI) Model Architecture Report (2021) reviews the benefits, shortcomings and relationships between the various models that comprise Victoria's transport and land use modelling ecosystem. Key limitations of VITM highlighted by the report are:

- *"Intersections not explicitly modelled:*
  - *the model will not fully represent the impacts that significant capacity bottlenecks may cause over wider extents of the network. It also presents limitations in assessing projects that involve intersection improvements.*
  - *A key assumption inherent in the modelling approach is that upgrade projects will incorporate intersection improvements that are compatible with the changed traffic patterns in the project corridor.*
- *Active transport:*
  - *VITM is focusing on motorised transport and, whilst it considers active transport trips, it does not explicitly model them."*

These limitations are important considering the objectives surrounding active and public transport outcomes in the Framework Plan. While VITM modelling assumes that future intersections will be designed to meet forecast traffic demand, the strategic intent of the Framework Plan supports more compact intersections that are safer and more comfortable for people walking and riding, but may have a lower traffic capacity. Such designs are likely to increase the relative attractiveness of active transport and transit that does not mix with general traffic, however VITM does not estimate the resultant potential mode shift. On this basis, VITM will likely overstate private vehicle volumes, however we are unable to quantify how much.

Rider confidence

Several methods have been developed to classify the stress tolerance of people who ride, or who may consider riding. Most notable, however, is the scheme developed by Portand's bicycle coordinator, Roger Geller. Geller categorises riders into four types:

- The strong and fearless (1-7% of the population)
- The enthused and confident (5-10% of the population)
- The interested but concerned (50-60% of the population)
- The no way, no how (30-37% of the population)

Strong and fearless bike riders make up a small portion of the total share of groups of riders. These riders will ride in almost all traffic conditions, and are happy to mix it with relatively high levels of traffic moving at high speed. The strong and fearless are generally experienced and capable riders.

At the other end of the spectrum, the no way no how group will not ride a bike no matter what cycling infrastructure is available or how low the cycling stress level is.

Enthused and confident riders are those riders who will mix with traffic if they believe it is safe to do so, however they prefer more comfortable facilities that offer protection from general traffic. Again, these riders are often relatively experienced, but will be discouraged from riding on roads with little to no dedicated cycling facilities.

The largest category of potential cyclists is the interested but concerned group. These riders are open to riding, however will not ride in environments that expose them to appreciable levels of traffic stress. If provided safe, comfortable and attractive infrastructure, such as separated bike lanes or off-road cycle paths, a significant growth in cycling participation can be generated primarily from this cohort.

Separation from traffic lowers cycling stress and provides inclusive cycling spaces

Building upon Geller's rider classification work, the Mineta Transportation Institute in the US developed a criteria to categorise street environments into four levels of traffic stress. Streets with low traffic volumes and speeds or physical separation from vehicles offer a relaxing ride for cyclists with little or no interaction with cars, and are more likely to encourage 'interested but concerned' riders to participate in cycling. Conversely, streets with higher traffic stress are unlikely to be used by any but the most enthused and confident riders. This categorisation has been widely accepted by the industry and has been replicated in best practice Australian street design guidelines, including NSW's *Cycling Design Toolbox* (2020). The four levels of traffic stress are:

- Stress level 4 includes mixed traffic riding on roads with relatively high volumes and speeds and multiple travel lanes. There is a high risk of injury or fatality, and interactions with vehicles are ongoing and intimidating. This is uncomfortable for almost all riders and only the strong and fearless riders will ride at this stress level for prolonged periods, if at all.

- Stress level 3 consists of mixed traffic riding on road, or on unprotected bike lanes along a busy road. There is still a significant risk of injury or fatality. This is the minimum comfortable level for enthused and confident riders, who will however still prefer dedicated spaces to ride.

- Stress level 2 generally features on-road bike lanes on low speed roads with buffers between the bike lane and traffic. There are moderate risks of injury or fatality, however adults in the interested but concerned cohort can generally feel safe riding.

- Stress level 1 is a fully separated bicycle lane facility along a quiet street with low traffic speeds. There is a low a risk of bike rider injury or fatality and this level is generally suitable for all riders, including children.

A 2008 study, conducted by Lee and Moudon who surveyed 608 participants to assess the environmental barriers and the facilitating factors in cycling captured the safety, social environment, visual quality, and maintenance issues. The environmental barriers to cycling across all groups included too much traffic (42.0%), too many hills (30.5%), no bike lanes or bike trails (29.0%), no safe place to cycle nearby (20.5%), badly maintained streets such as rough surfaces (16.0%), distances to places too great (12.5%) and no interesting places to which to cycle (12.0%). Continuous bike lanes/ trails were the top facilitator across both active groups (74%) and inactive groups (77%). Other factors mentioned were, in order of importance, continuous bike lanes or bike trails, good lighting at night, bike racks at destinations, closer to interesting places to cycle other than parks and recreational facilities, closer to parks and recreational facilities, shower facilities at work, and more trees along streets.

Further Reading: Induced Demand and Disappearing Traffic

Induced traffic is the observed increased rate of traffic growth that follows road projects that aim to remedy traffic congestion. The consequence of induced traffic is that road projects experience a return to pre-upgrade levels of traffic congestion much sooner than anticipated.

Induced traffic is explained by the economic axiom that a reduction in price of a good or service results in a corresponding increase in demand for the same good or service. In this case, induced traffic "Is all traffic which would be present if an expansion of road capacity occurred, which would not be there without the expansion"[2]. The price of transport reflects all costs associated with travelling. If there is a change in cost (i.e., shorter trip duration) then there is likely to be a change in demand. This change in demand can be a result of new trips that people choose to make, or due to people choosing to shift from alternative transport modes (e.g. walking, cycling or public transport) because driving has been made easier.

Induced demand is well a recognised phenomenon that is nonetheless regularly unaccounted for when planning future networks. The upgrade of the Pacific Motorway between Logan and Gaven in Southeast Queensland in 2000 is just one good example of induced demand in an Australian context (ref 1). The project widened a 36km segment of the highway to 8 lanes, representing an increase in capacity of 33%. The two years post-construction, however, saw a volume increase of 38%, and within just a few years, the traffic volume had increased by 25% above pre-construction traffic growth levels. Following this sharp increase in demand, traffic growth returned to pre-upgrade rates, suggesting the increase in capacity was responsible for the significant increases in demand observed, not underlying factors such as land development. A study of volume to capacity ratios (VCR) compared pre- and post-construction VCRs to predicted VCRs if the project did not go ahead[3]. The project was found to initially lower the VCR of the highway for the first few years, however three to six years post-construction the VCR exceeded pre-construction levels and was "approximately on par with the estimated VCR had the upgrade not taken place". At a cost of $1.48 billion in 2014 prices, the project had no lasting remedial impact on traffic congestion.

[2] Long term evidence on induced traffic: A case study on the relationship between road traffic and capacity of Budapest bridges. Bucsky, P. Juhasz, M.
[3] What effect do Queensland's major road infrastructure projects have on traffic volume and growth rates? Davies, W.

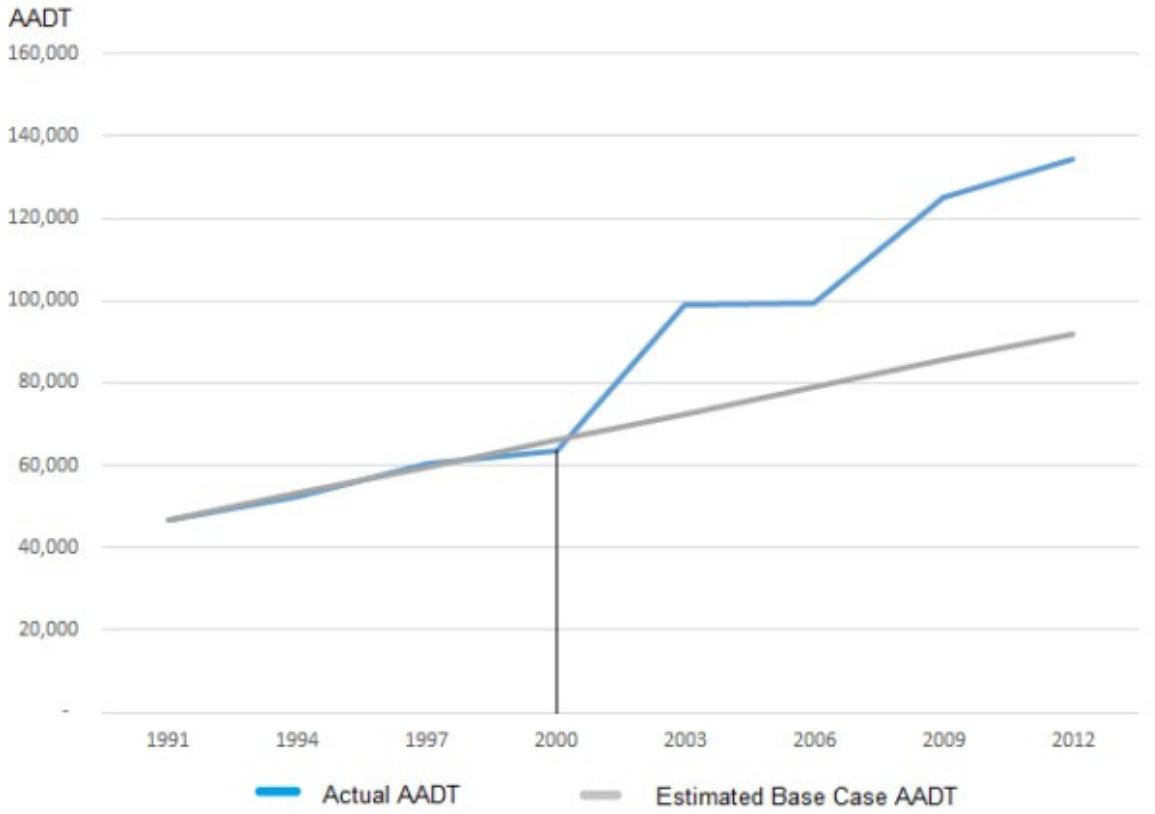


Figure: Traffic volumes on the Pacific Motorway Upgrade site (Logan to Gaven) (Davies, 2015)

Edge friction is the best speed control device

Streetscapes that are safe to walk, ride, play, meet and spend time require low traffic speeds. While regulatory signage and enforcement is part of the solution, better compliance and a more harmonious environment for all users can often be created by crafting streetscapes that promote self-regulation. The key to creating these sorts of self-explanatory speed environments is a concept call 'edge friction' (or side friction).

Edge friction refers to the effect that elements such as street trees, furniture, materiality and human activity has on drivers' awareness of their surroundings and how they interpret perceived risk, ultimately leading them to drive slower and display greater respect to the amenity of the street. Edge friction is essentially the degree of interaction between all activities within a streetscape and how it influences driver behaviour, with a particular focus on traffic speed. The 'friction' is created by the sense of enclosure and risk that vibrant streets with intermixing pedestrians, cyclists, built forms and landscape elements impart on motorists by allowing social protocols to dictate speed.

Enhancing the edge friction can be achieved by a range of elements. The narrower the roadway is, the greater the perceived risk is for a driver, and so they self-adjust their speed to suit the conditions. Road narrowing has been shown to contribute to up to a 35%[4] reduction in the speed of vehicles along a street. Speed can also be reduced further by increased pedestrian presence. Studies have shown that the overall speed of the vehicle is reduced by 0.35km/h[5] for every pedestrian a vehicle encounters.

Street trees with a canopy that extends over the street to form somewhat of an 'enclosure' are also associated with lower speeds, as well as fewer vehicle crashes, injuries and, improved streetscape safety[6]. This effect can also be enhanced by planters, seating, bike parking, lighting, bollards and other signifiers of pedestrian presence and place activity.

Good urban spaces have multiple uses and activities that bring streets to life and contribute to the vitality of a neighbourhood. Street designs should leverage this activity to create well scaled streets with a sense of vibrancy and enclosure that encourage self-regulating lower speed traffic behaviour.

[4] Evaluation of the benefits of traffic calming on vehicle speed reduction. Distefano, N. Leonardi, S.
[5] Side friction parameters and their influences on capacity of Indian undivided urban streets. Biswas, S. Chandra, S. Ghosh, I.
[6] Urban clear zones, street trees, and road safety. Marshall, P.E. Wesley, E. Coppola, N. Golombek, Y.

Arterial road capacity

While the VPA Our Roads guidance suggests 4 lane secondary arterials with a suggested capacity of 12,000-40,000 vpd for roads that carry more than connector roads (7,000 vpd), there is significant evidence that two lane arterial roads can comfortably carry upwards of 20,000 vpd in typical Victorian contexts.

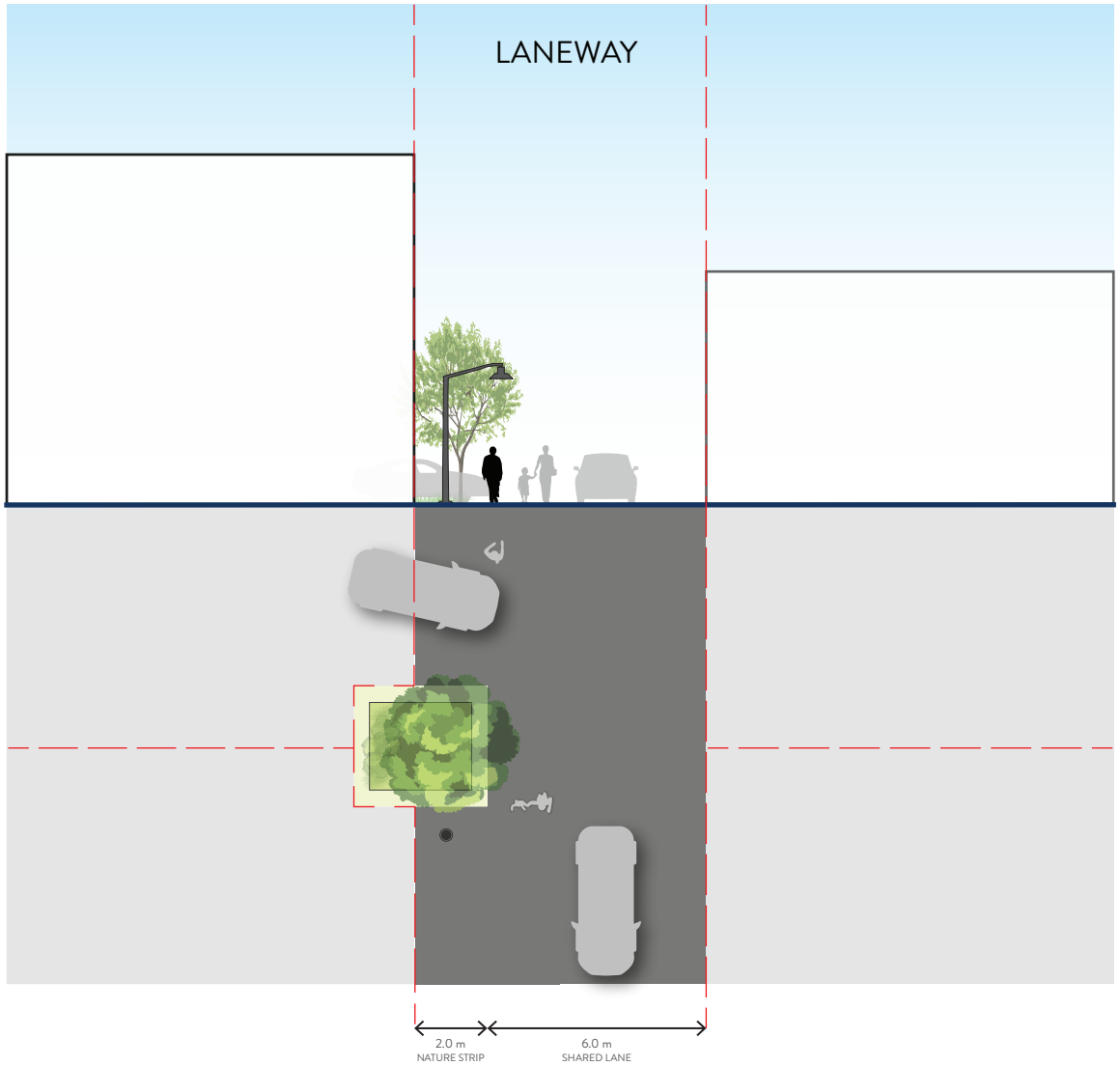
Figure: Spring Street, Reservoir (21,000 vpd)

Figure: Williamstown Road, Kingsville (20,000 vpd)

Spring Street in Reservoir and Williamstown Road in Kingsville are just two example of arterial roads in Victoria that carry upwards of 21,000 vpd in urban settings and generally operate with a good level of service.

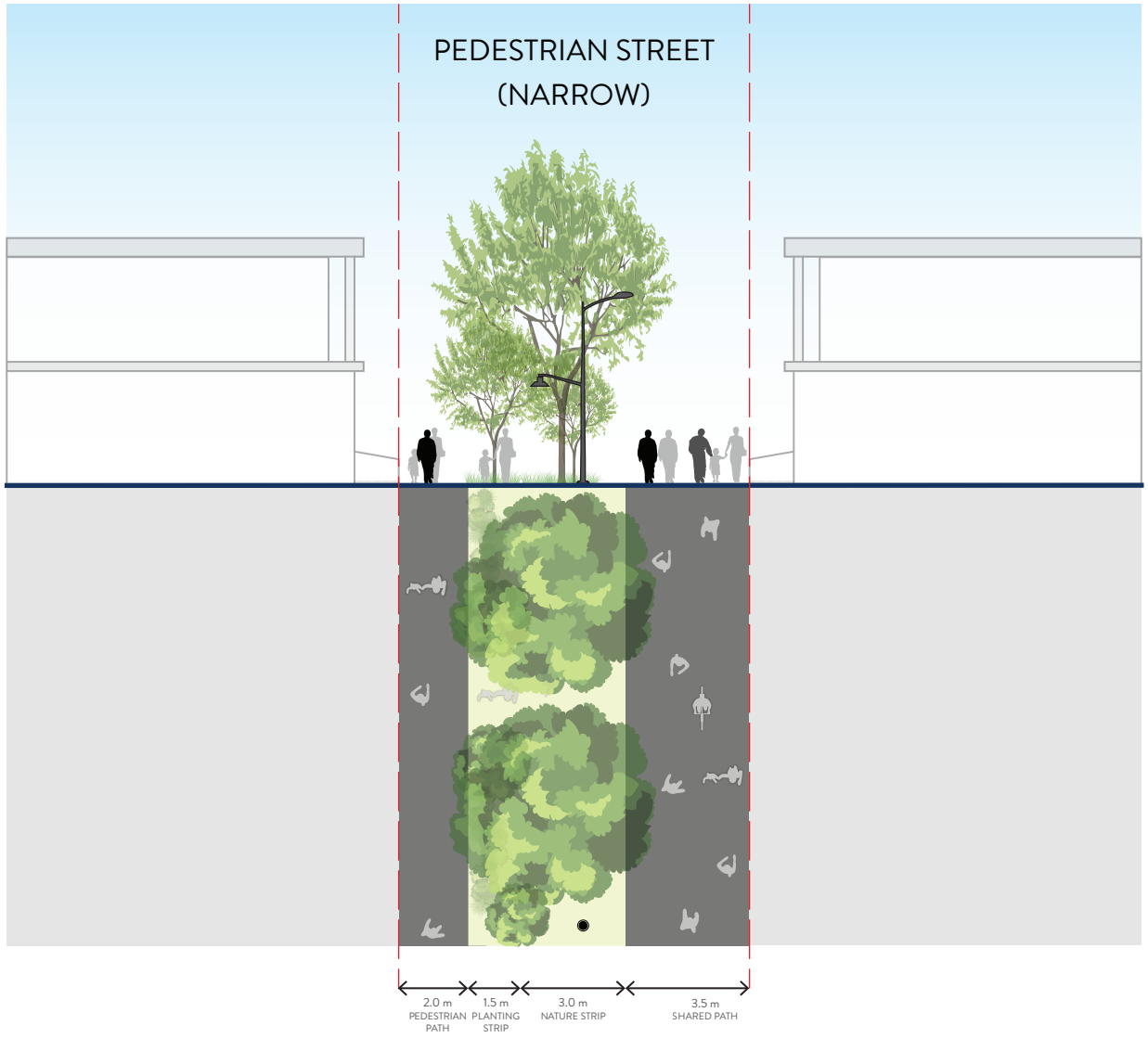
On this basis, while typical practice may include the application of a 4-lane secondary arterial cross section for streets carrying upwards of 7,000 vpd, our approach is to utilize a narrower 2-lane arterial cross section to reduce the amount of road space in the Creamery Road precinct and avoid inducing unnecessary car traffic.

Appendix B – Street Designs



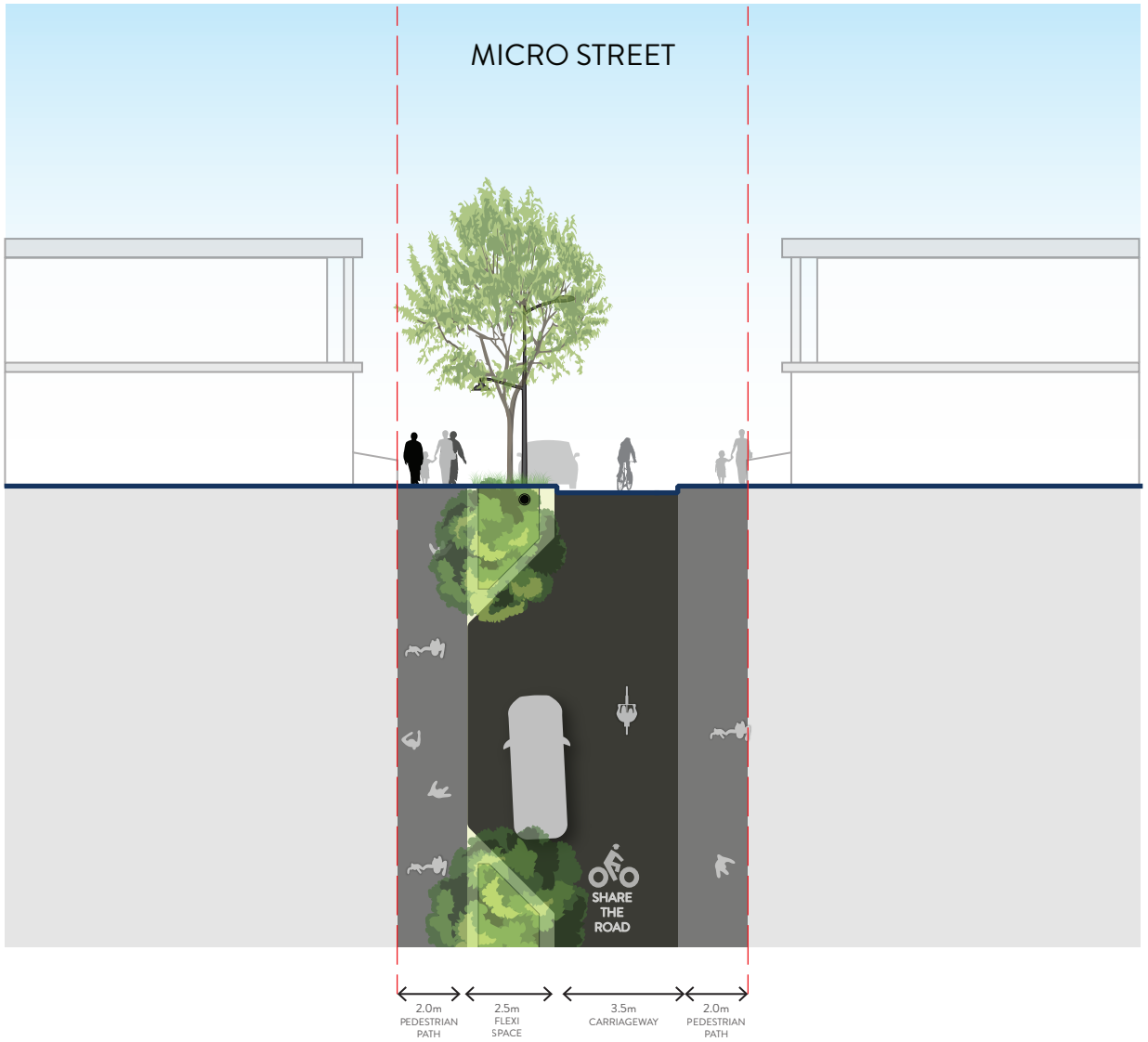
Cross-Section 1	8.0m

Refer to Servicing Placement Guidelines for direction on utility servicing provision



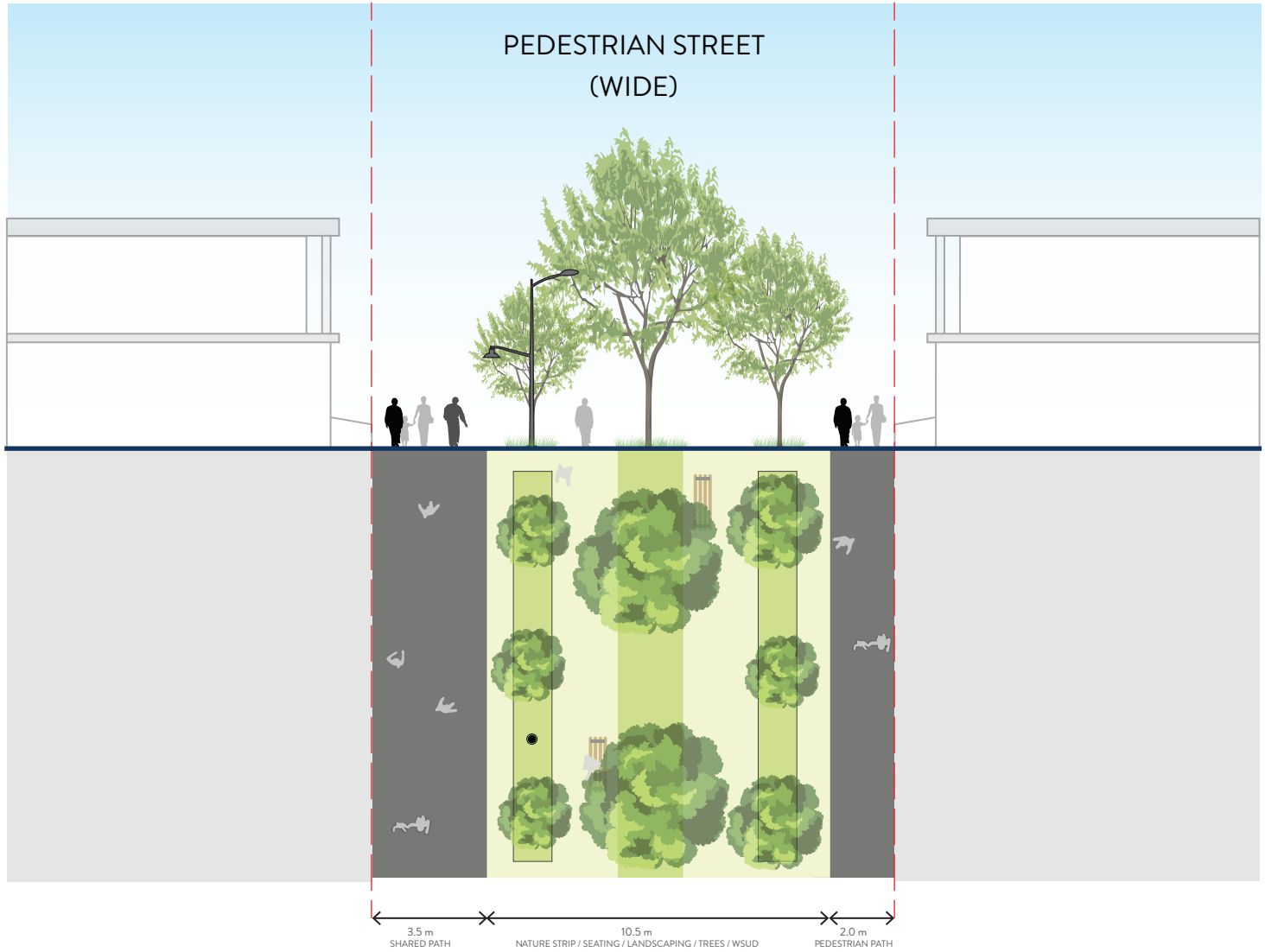
Cross-Section 2	10.0m

Refer to Servicing Placement Guidelines for direction on utility servicing provision



Cross-Section 3	10.0m

Refer to Servicing Placement Guidelines for direction on utility servicing provision



Cross-Section 4	16.0m

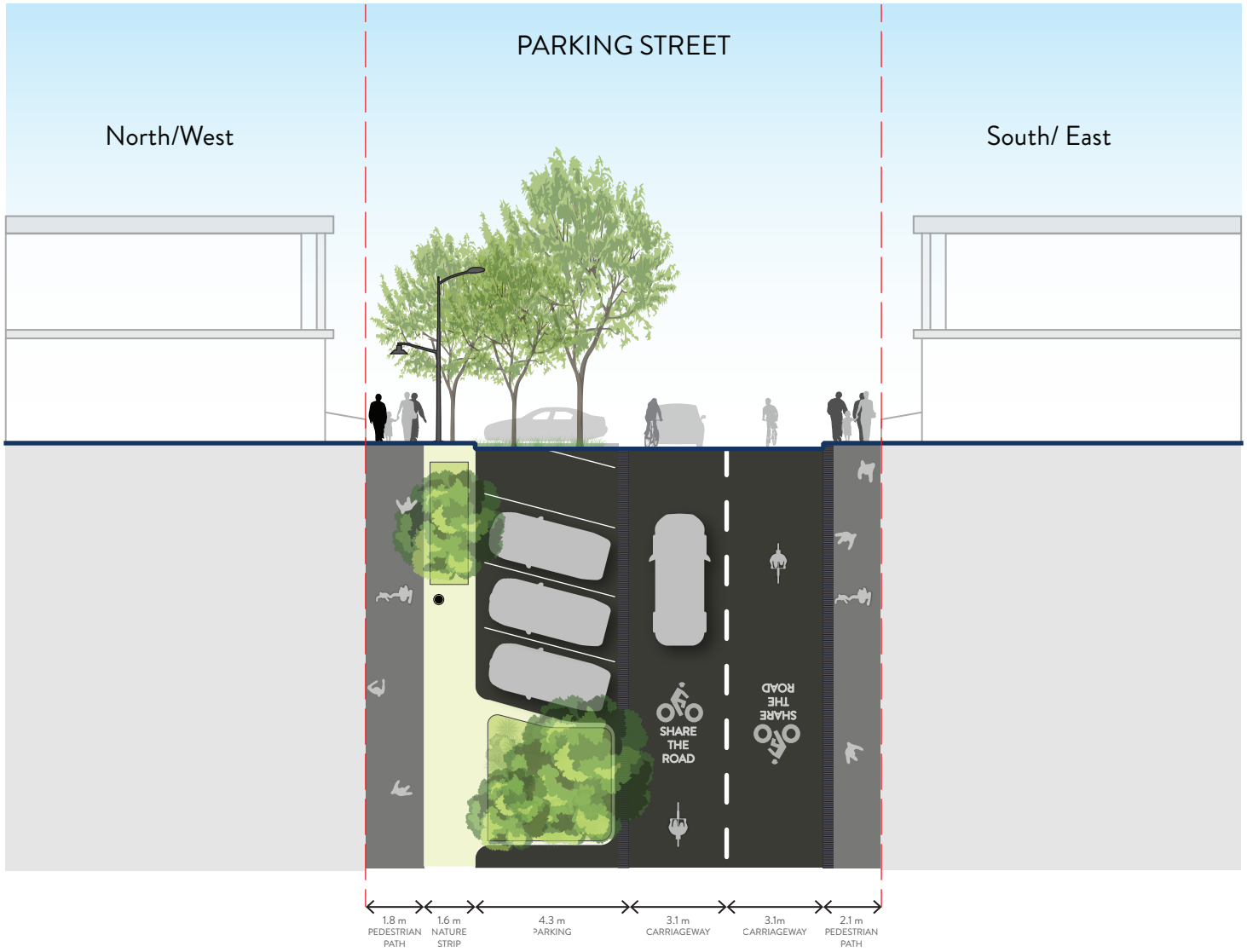
Refer to Servicing Placement Guidelines for direction on utility servicing provision

Cross-Section 5	16.0m

Refer to Servicing Placement Guidelines for direction on utility servicing provision

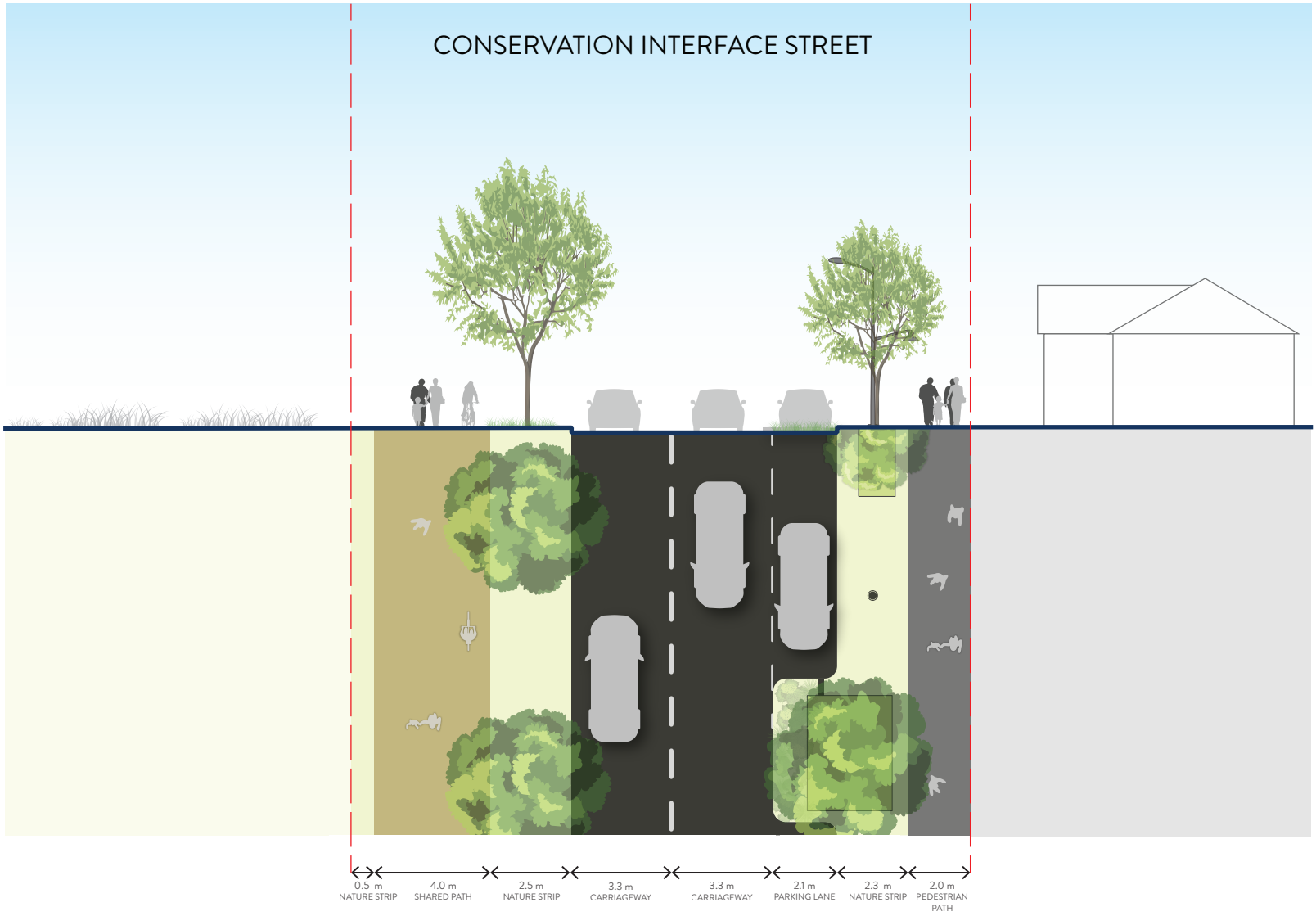
Cross-Section 6	20.0m

Refer to Servicing Placement Guidelines for direction on utility servicing provision



Cross-Section 7	16.0m

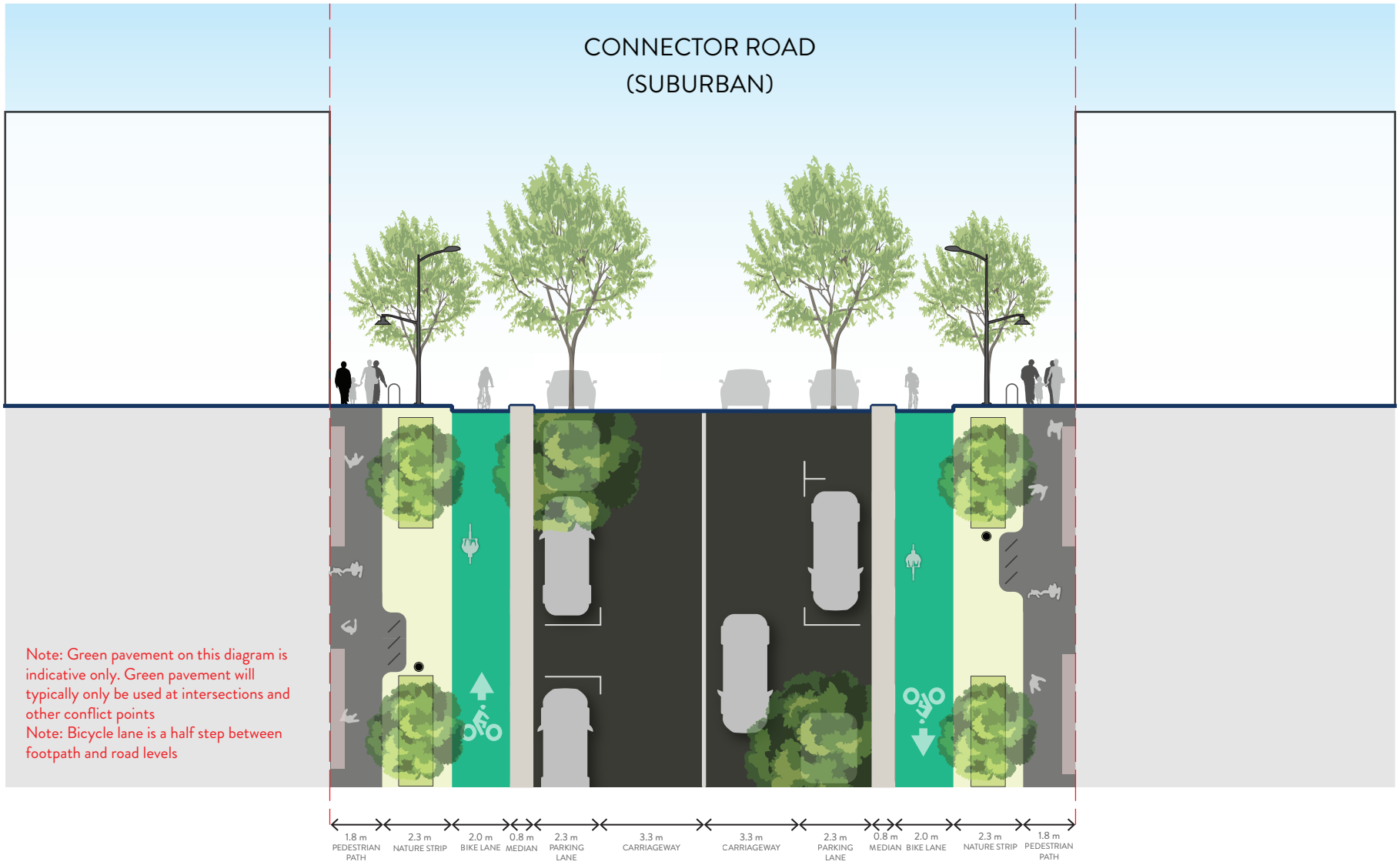
Refer to Servicing Placement Guidelines for direction on utility servicing provision



Cross-Section 8	20.0m

Refer to Servicing Placement Guidelines for direction on utility servicing provision

CONNECTOR ROAD (SUBURBAN)



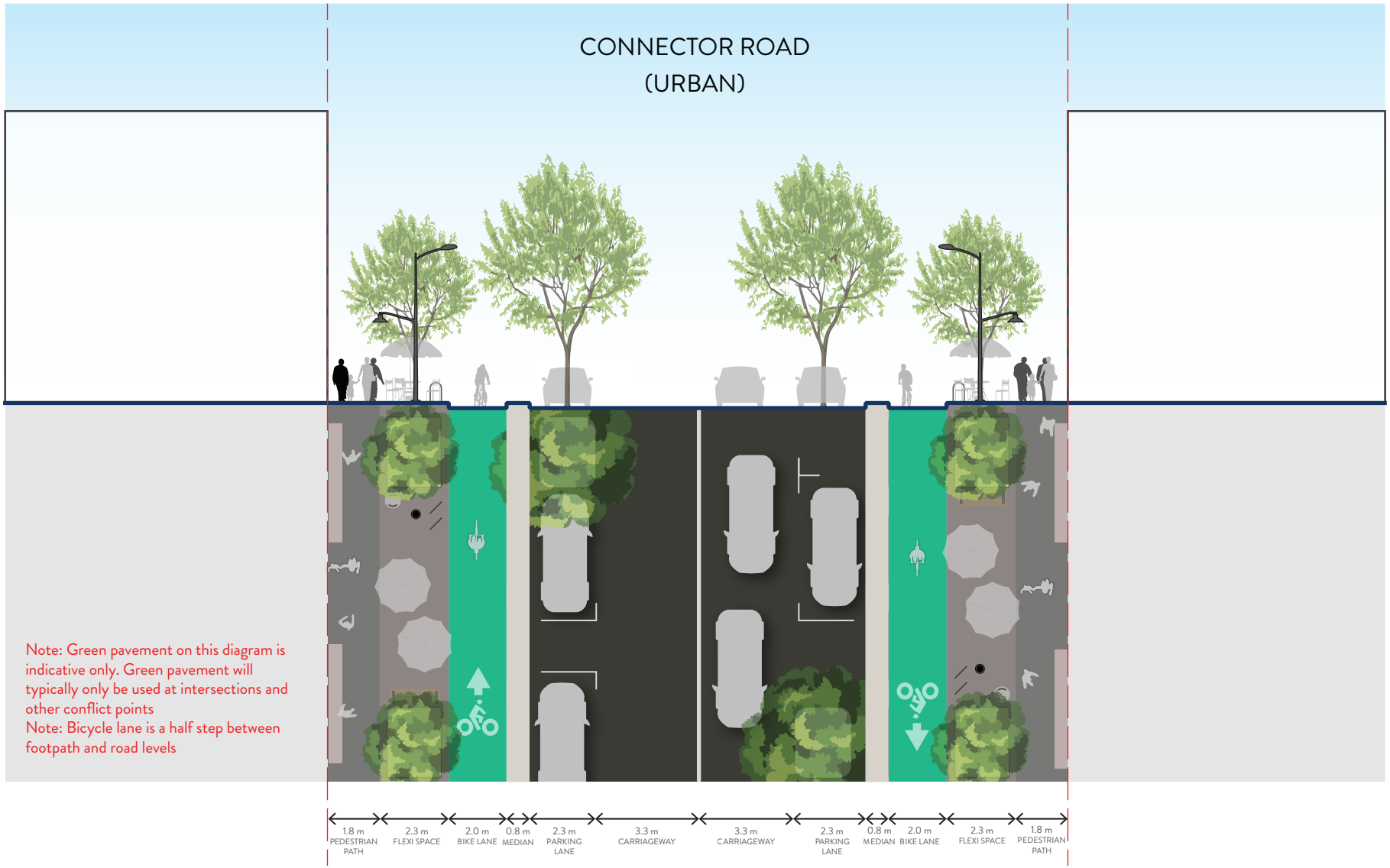
Note: Green pavement on this diagram is indicative only. Green pavement will typically only be used at intersections and other conflict points

Note: Bicycle lane is a half step between footpath and road levels

Cross-Section 9	25.0m

Refer to Servicing Placement Guidelines for direction on utility servicing provision

CONNECTOR ROAD
(URBAN)

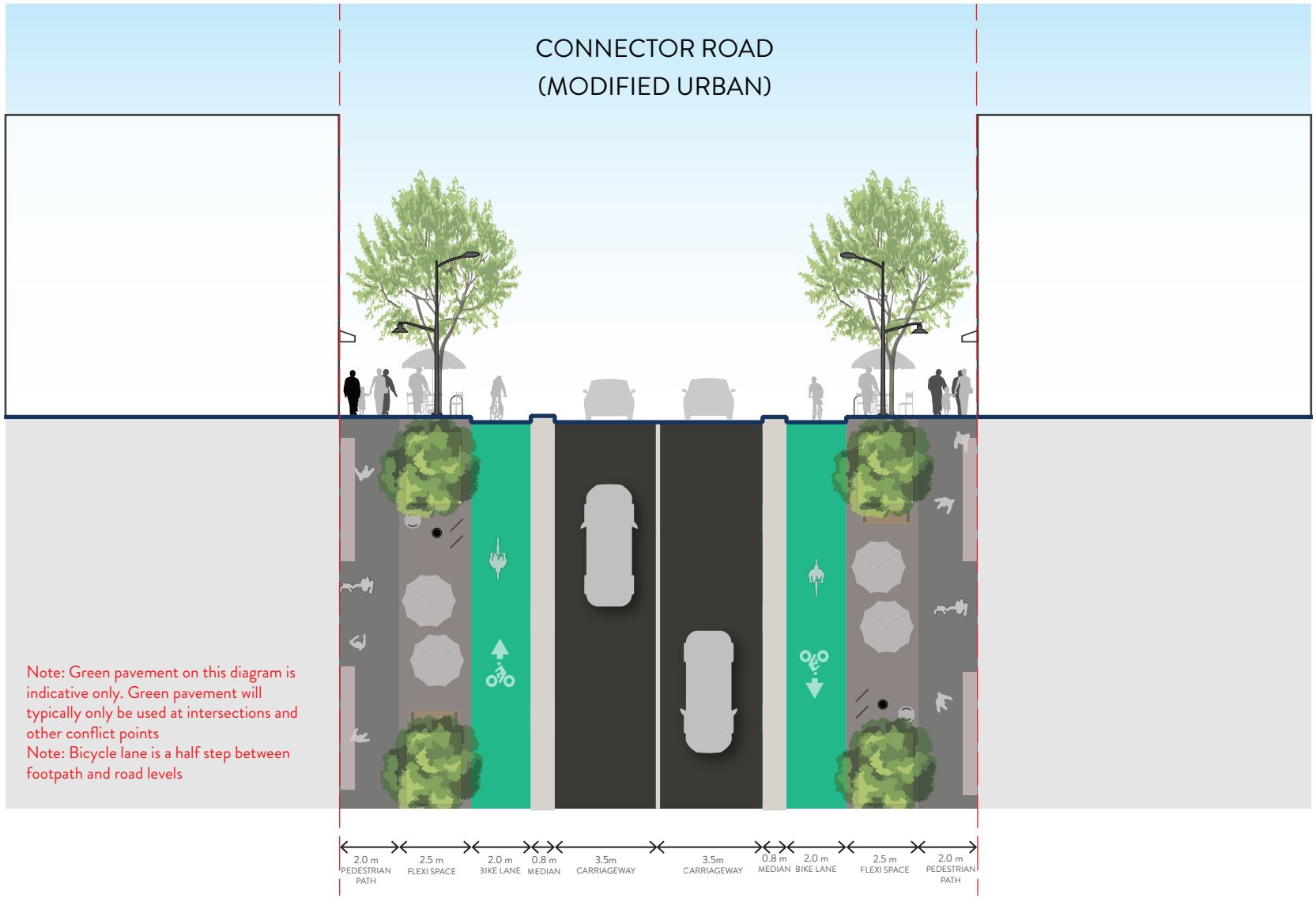


Note: Green pavement on this diagram is indicative only. Green pavement will typically only be used at intersections and other conflict points
Note: Bicycle lane is a half step between footpath and road levels

Cross-Section 10	25.0m

Refer to Servicing Placement Guidelines for direction on utility servicing provision

CONNECTOR ROAD
(MODIFIED URBAN)

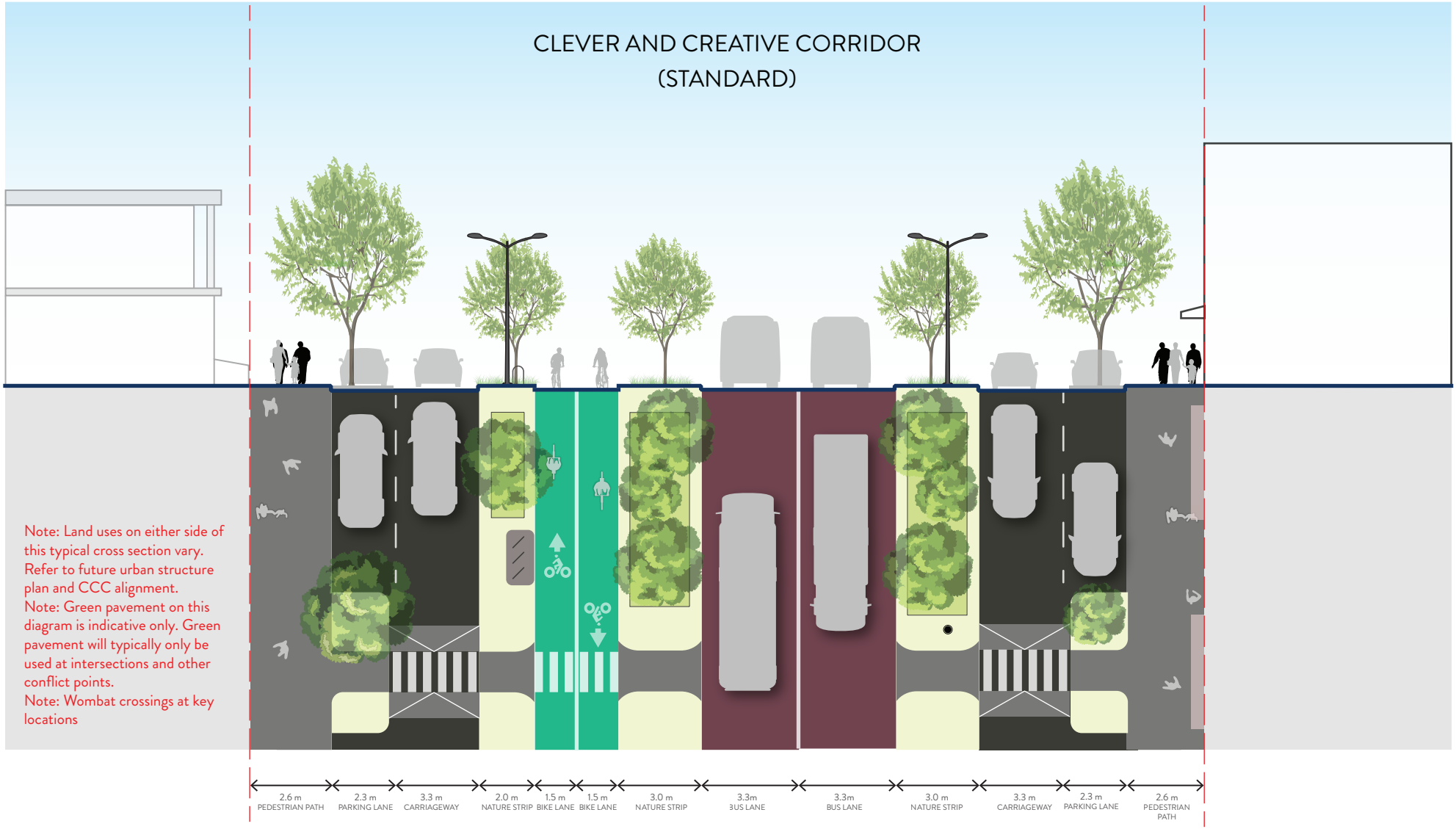


Note: Green pavement on this diagram is indicative only. Green pavement will typically only be used at intersections and other conflict points
Note: Bicycle lane is a half step between footpath and road levels

Cross-Section 11	21.6m

Refer to Servicing Placement Guidelines for direction on utility servicing provision

CLEVER AND CREATIVE CORRIDOR (STANDARD)

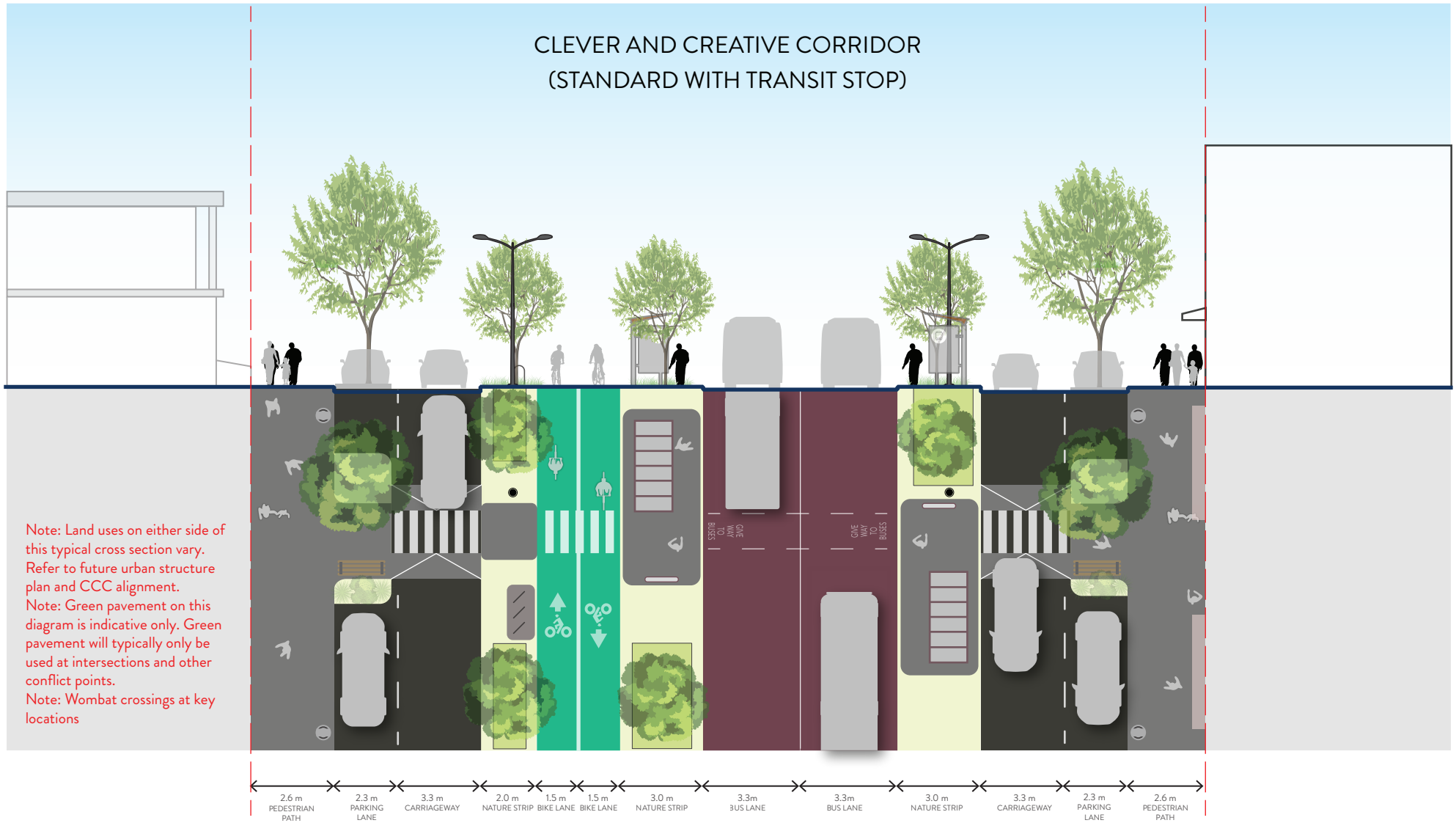


Note: Land uses on either side of this typical cross section vary. Refer to future urban structure plan and CCC alignment.
Note: Green pavement on this diagram is indicative only. Green pavement will typically only be used at intersections and other conflict points.
Note: Wombat crossings at key locations

Cross-Section 12A	34.0m

Refer to Servicing Placement Guidelines for direction on utility servicing provision

CLEVER AND CREATIVE CORRIDOR
(STANDARD WITH TRANSIT STOP)

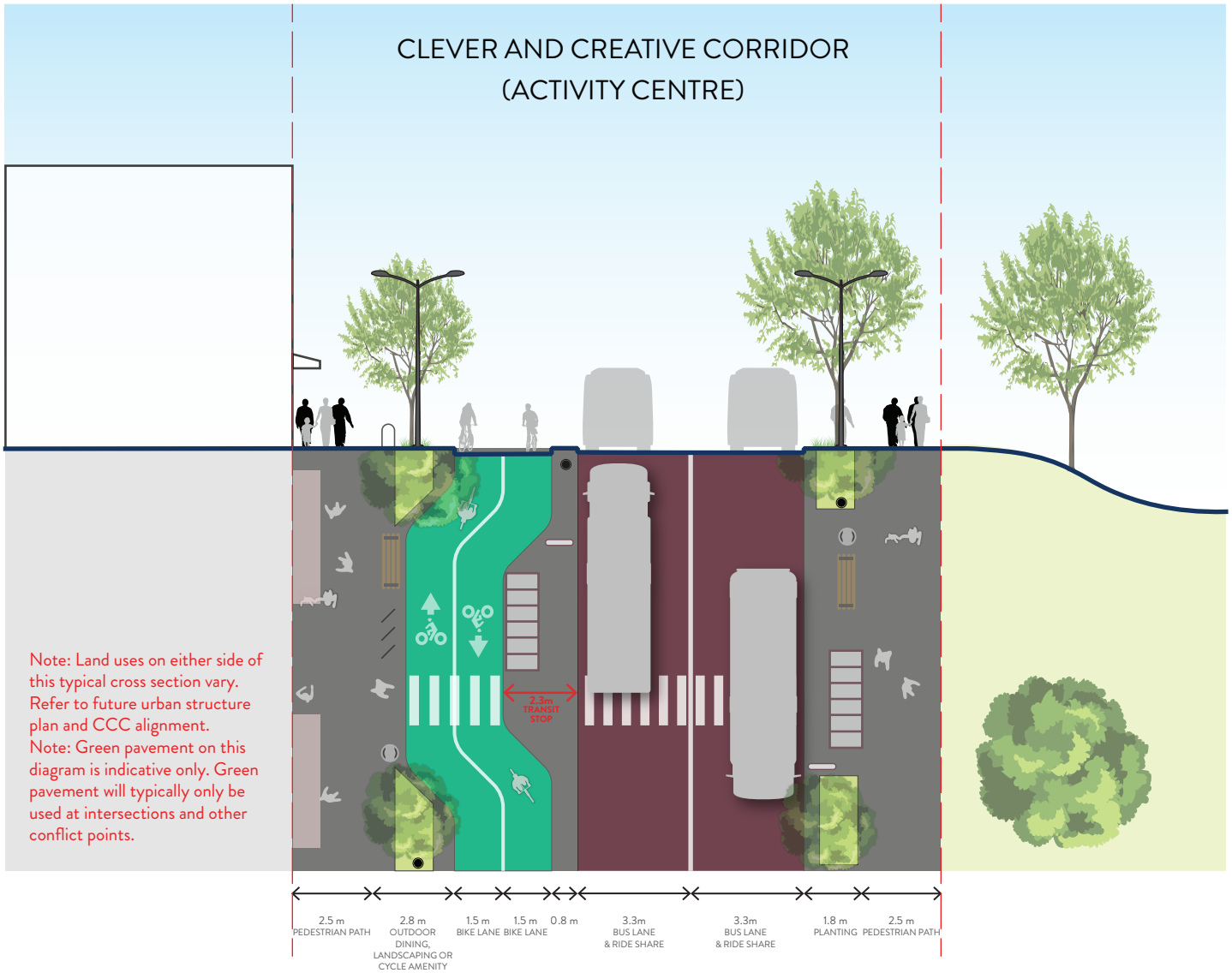


Note: Land uses on either side of this typical cross section vary. Refer to future urban structure plan and CCC alignment.
Note: Green pavement on this diagram is indicative only. Green pavement will typically only be used at intersections and other conflict points.
Note: Wombat crossings at key locations

Cross-Section 13	34.0m

Refer to Servicing Placement Guidelines for direction on utility servicing provision

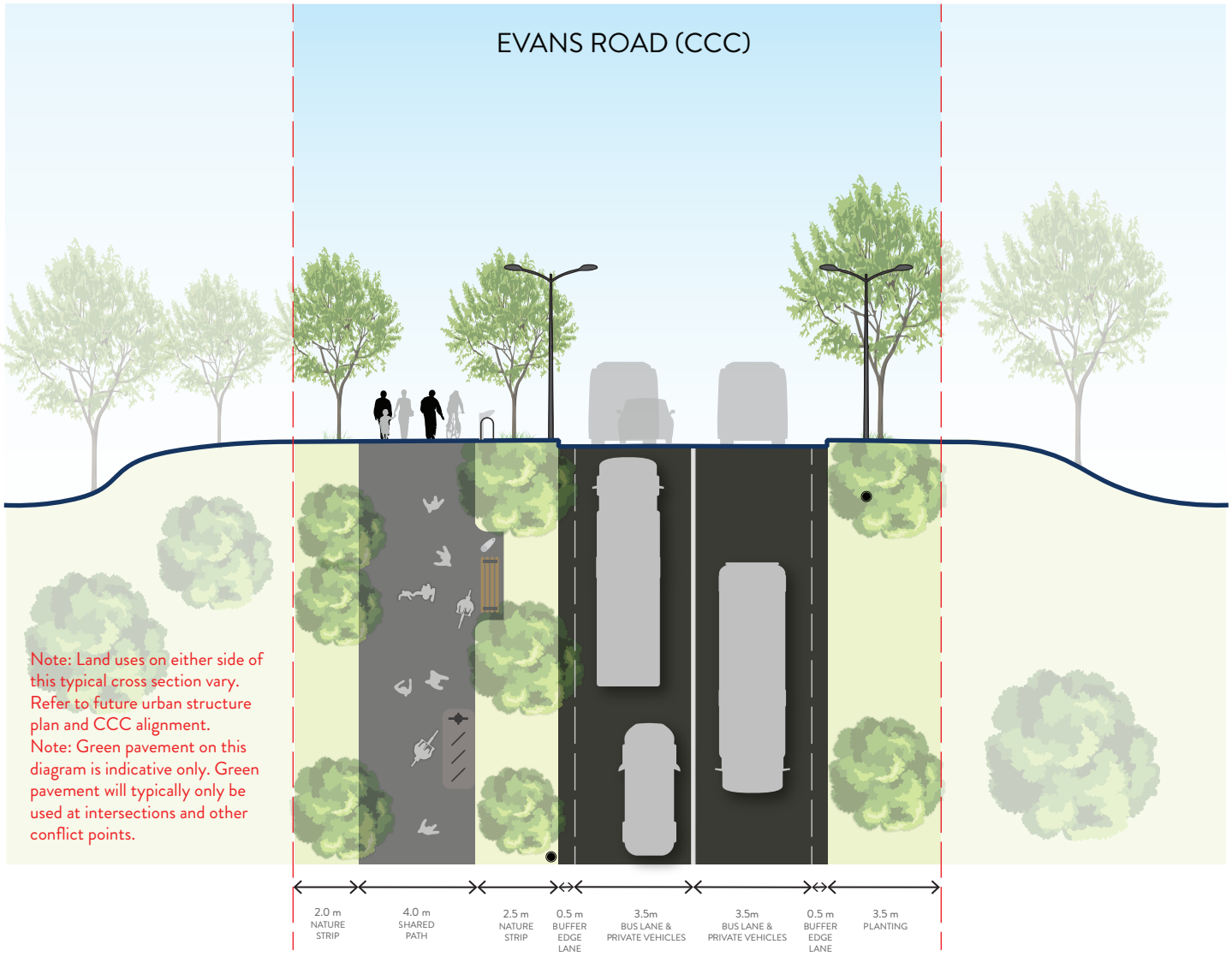
CLEVER AND CREATIVE CORRIDOR (ACTIVITY CENTRE)



Note: Land uses on either side of this typical cross section vary. Refer to future urban structure plan and CCC alignment.
Note: Green pavement on this diagram is indicative only. Green pavement will typically only be used at intersections and other conflict points.

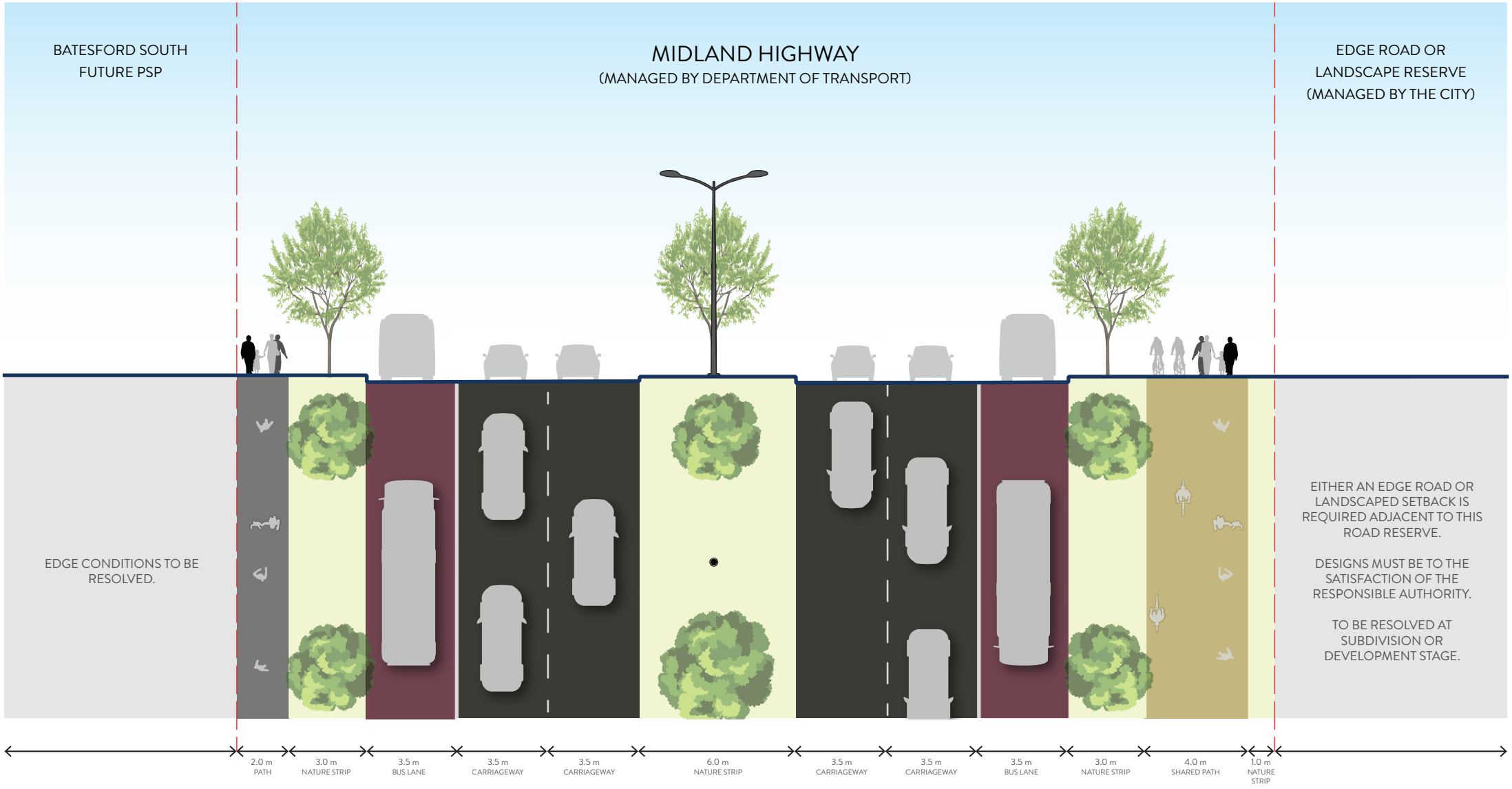
Cross-Section 14	20.0m

Refer to Servicing Placement Guidelines for direction on utility servicing provision



Cross-Section 15	20.0m

Refer to Servicing Placement Guidelines for direction on utility servicing provision



Note: Landuses on either side of this typical cross section vary. Refer to future urban structure plan.

Cross-Section 16	40.0m

Refer to Servicing Placement Guidelines for direction on utility servicing provision

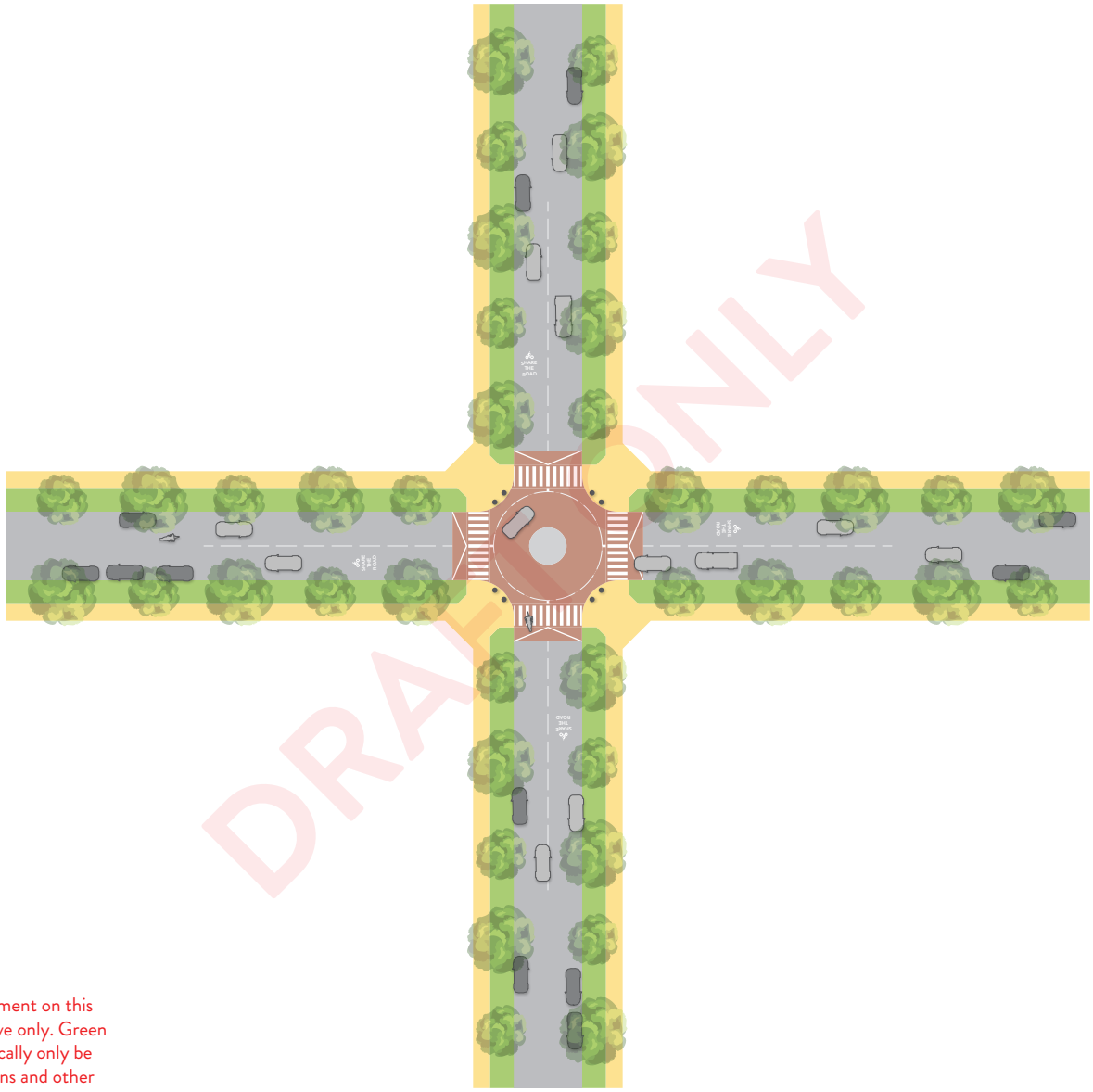
Note: Landuses on either side of this typical cross section vary. Refer to future urban structure plan.

Cross-Section 17	34.0m

Refer to Servicing Placement Guidelines for direction on utility servicing provision

Appendix C – Intersection Designs

Compact Roundabout
Local Access Streets

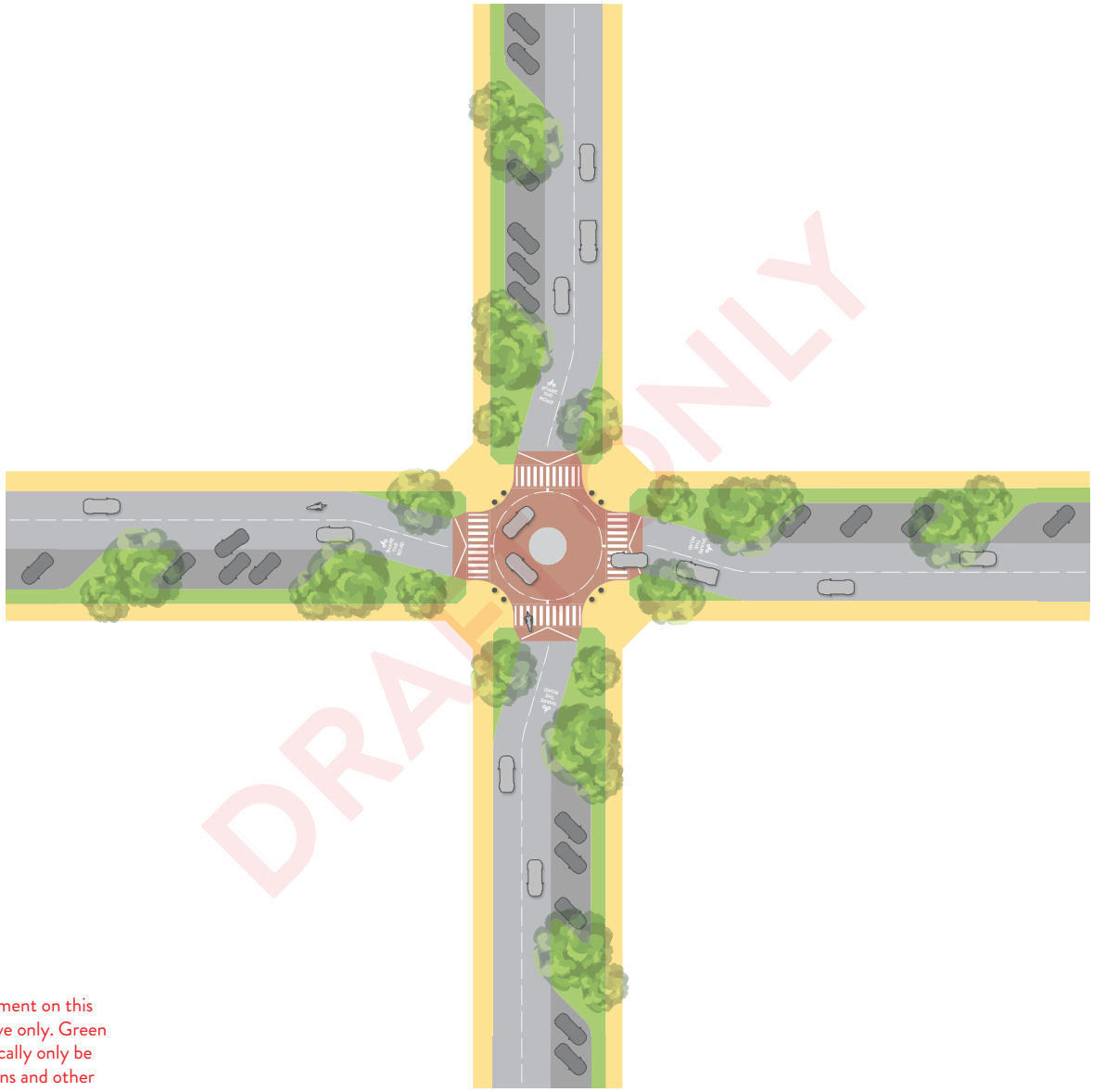


Note: Green pavement on this diagram is indicative only. Green pavement will typically only be used at intersections and other conflict points.

LEGEND

- Vehicle Lanes/Parking
- Dedicated Bus Lanes
- Pedestrian Paths
- Bicycle Lanes
- Indicative Verge/Curb
- Raised Areas of Intersection

Compact Roundabout
Parking Streets

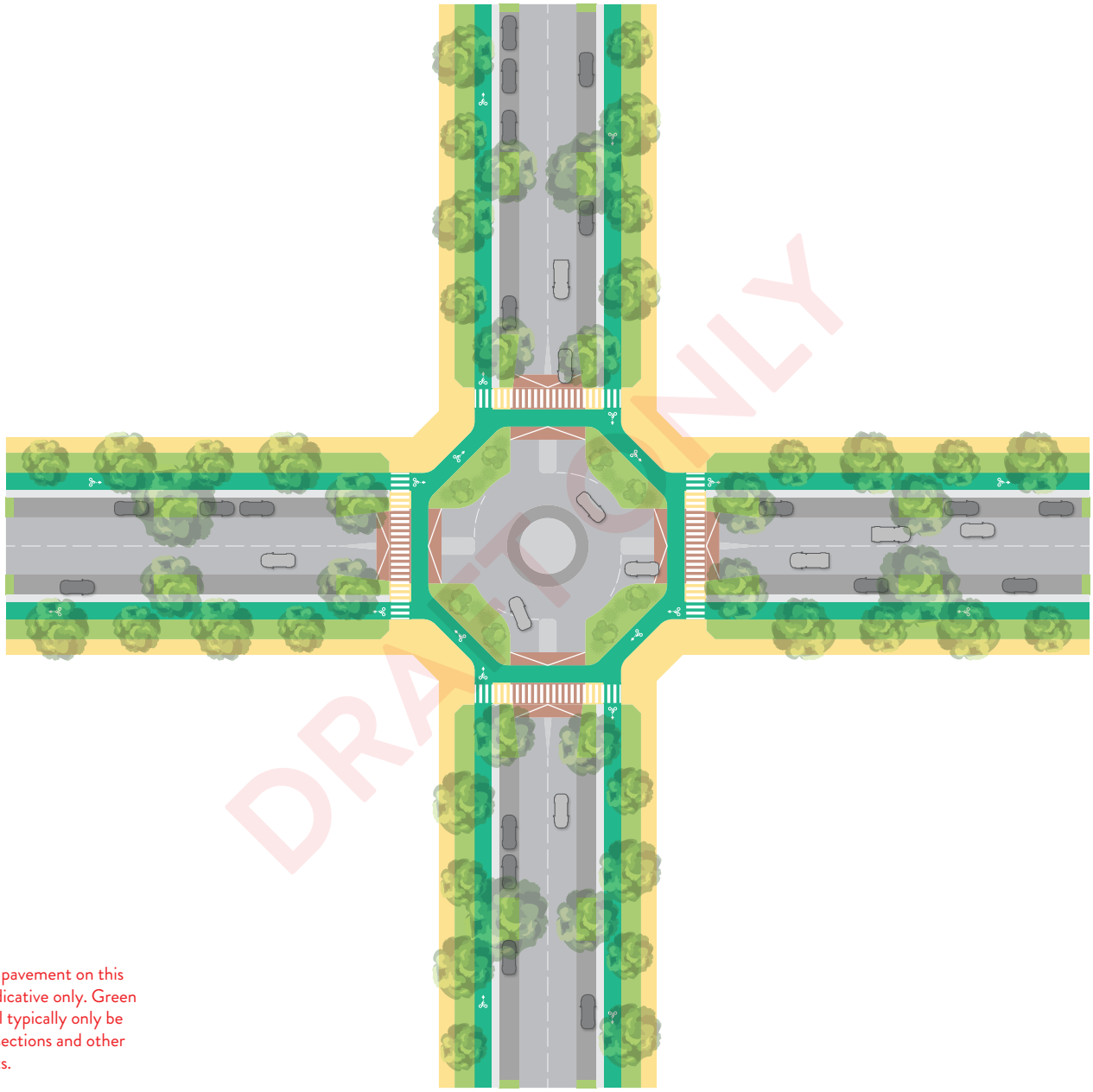


Note: Green pavement on this diagram is indicative only. Green pavement will typically only be used at intersections and other conflict points.

LEGEND

- Vehicle Lanes/Parking
- Dedicated Bus Lanes
- Pedestrian Paths
- Bicycle Lanes
- Indicative Verge/Curb
- Raised Areas of Intersection

Roundabout
Connector Roads



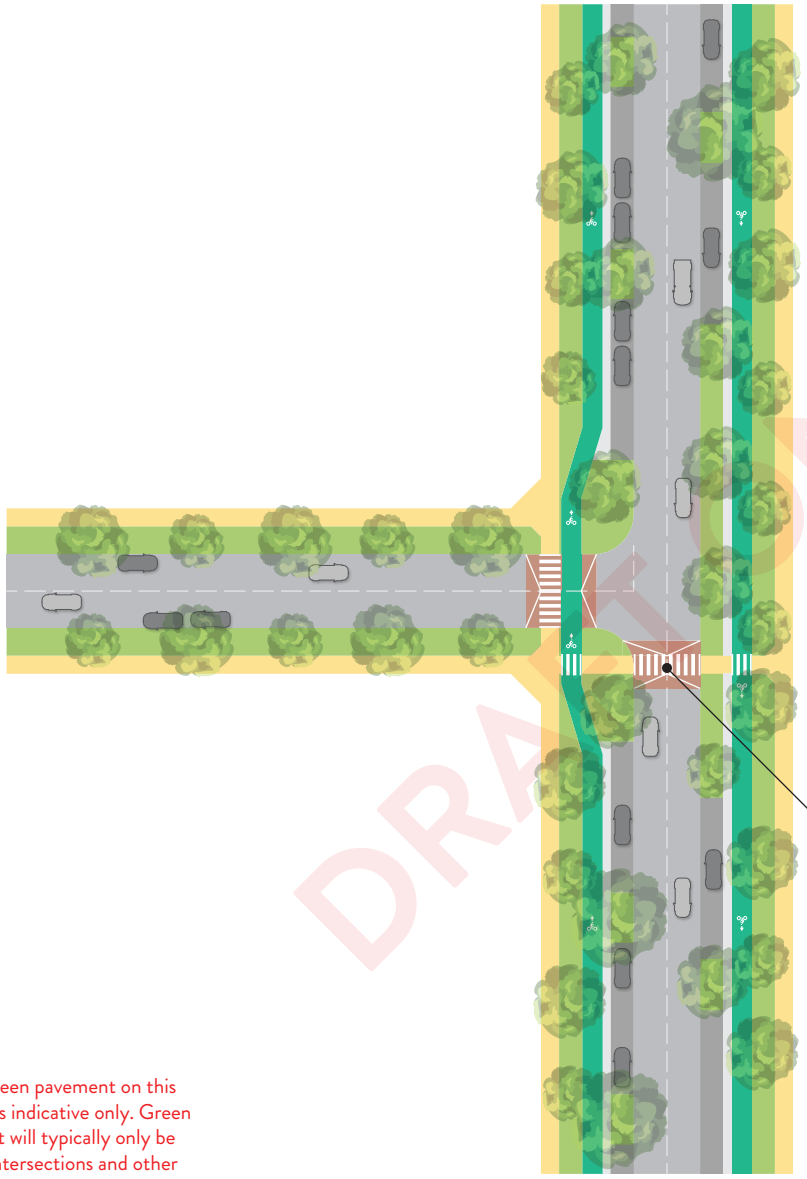
Note: Green pavement on this diagram is indicative only. Green pavement will typically only be used at intersections and other conflict points.

LEGEND

- Vehicle Lanes/Parking
- Dedicated Bus Lanes
- Pedestrian Paths
- Bicycle Lanes
- Indicative Verge/Curb
- Raised Areas of Intersection

Give Way T-Intersection

Local Access Streets + Connector Road



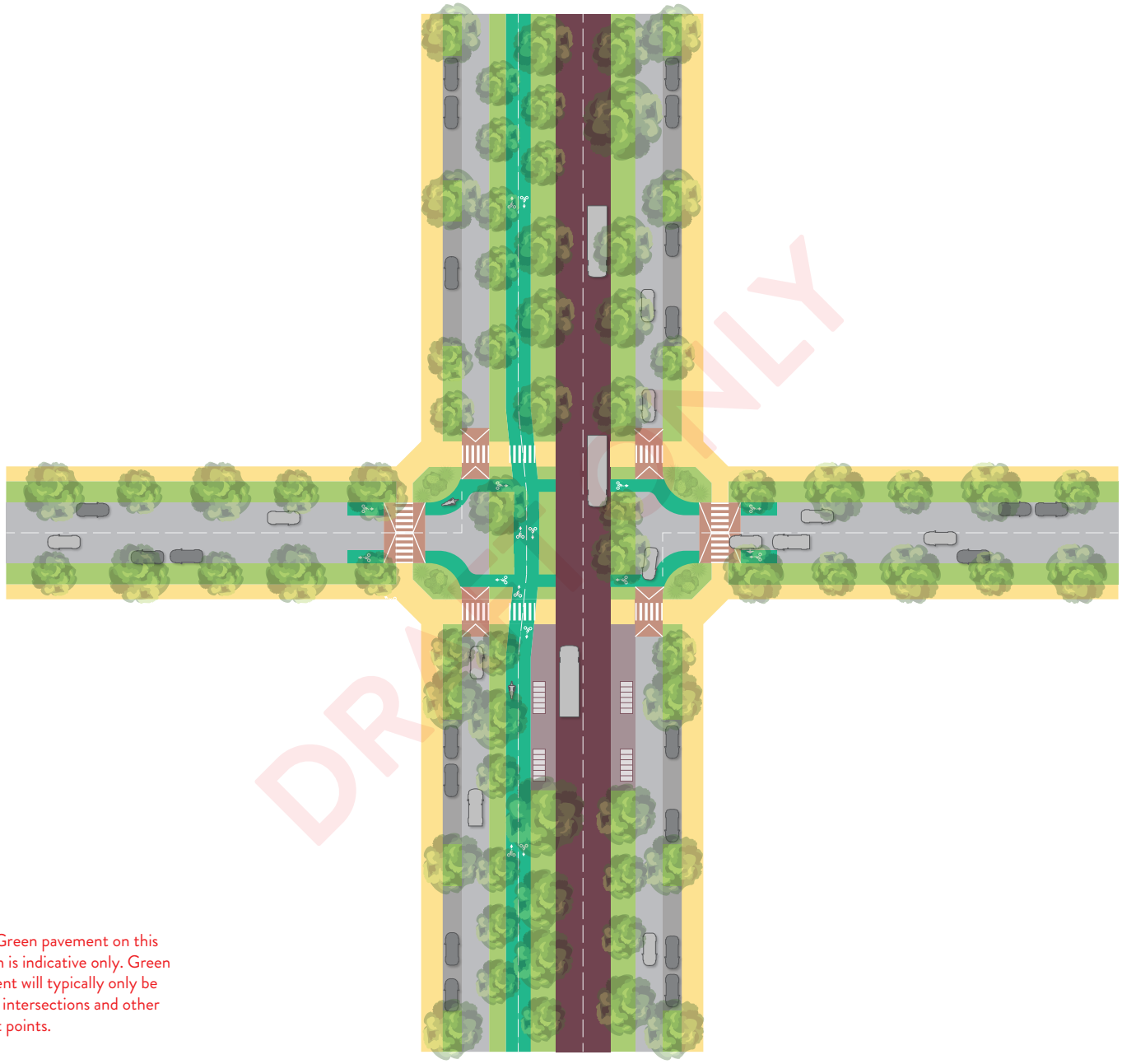
Wombat crossing to be provided next to key destinations (e.g. schools) only'

Note: Green pavement on this diagram is indicative only. Green pavement will typically only be used at intersections and other conflict points.

LEGEND

- Vehicle Lanes/Parking
- Dedicated Bus Lanes
- Pedestrian Paths
- Bicycle Lanes
- Indicative Verge/Curb
- Raised Areas of Intersection

Clever & Creative Corridor
Left-In, Left-Out
Local Access Streets + CCC

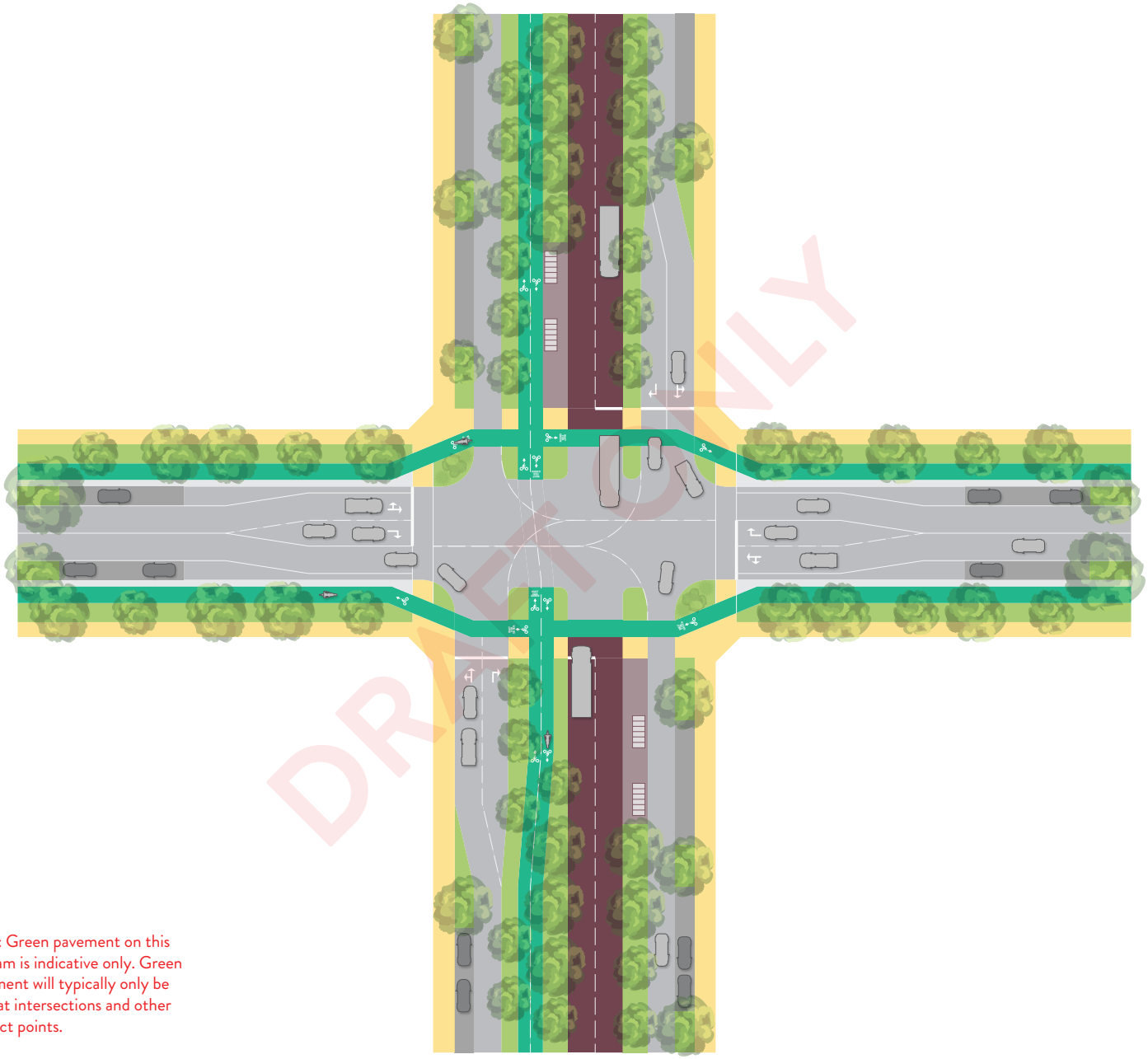


Note: Green pavement on this diagram is indicative only. Green pavement will typically only be used at intersections and other conflict points.

LEGEND

- Vehicle Lanes/Parking
- Dedicated Bus Lanes
- Pedestrian Paths
- Bicycle Lanes
- Indicative Verge/Curb
- Raised Areas of Intersection

Clever & Creative Corridor
Signalised Intersection
Connector Road + CCC

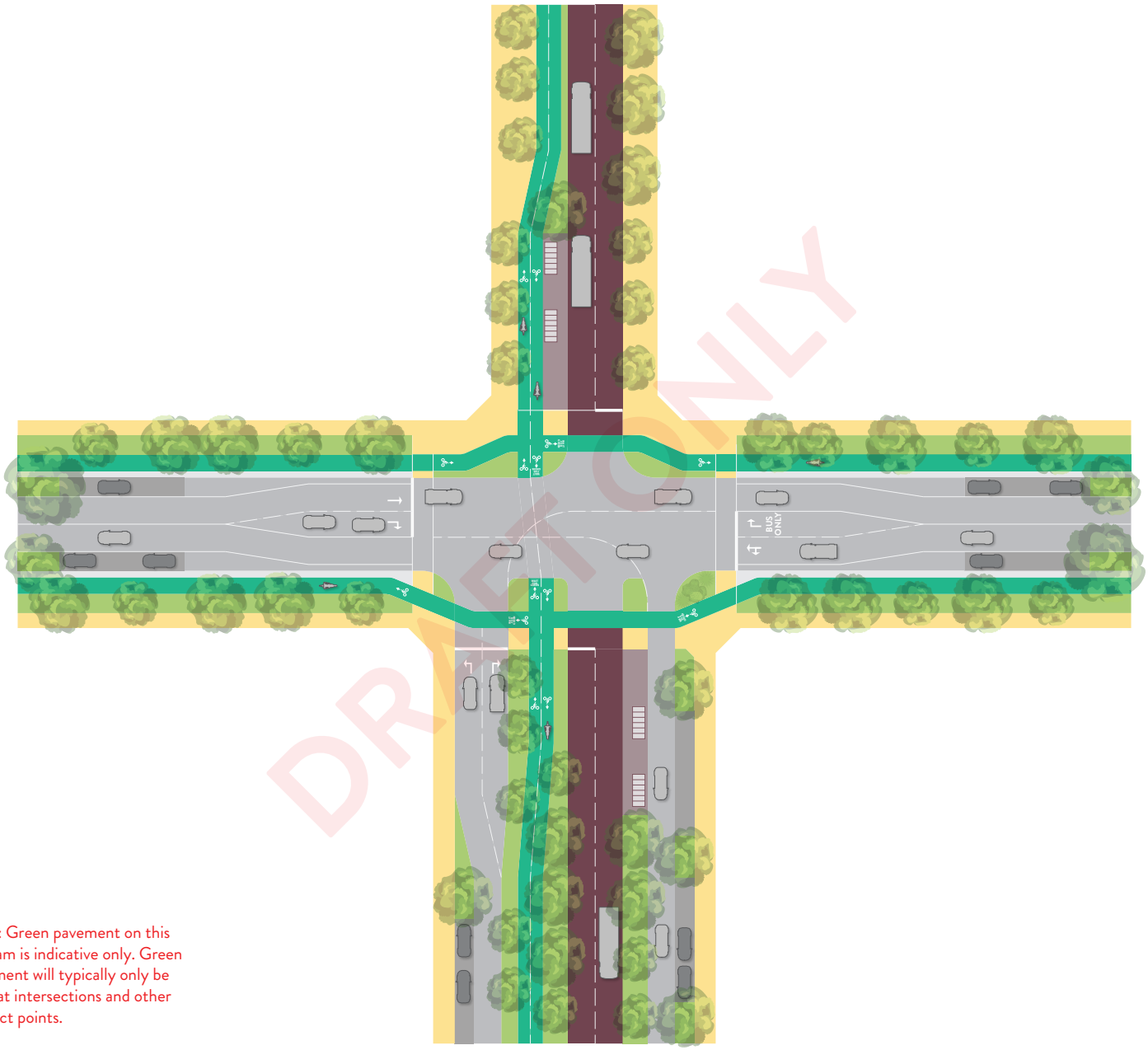


Note: Green pavement on this diagram is indicative only. Green pavement will typically only be used at intersections and other conflict points.

LEGEND

- Vehicle Lanes/Parking
- Dedicated Bus Lanes
- Pedestrian Paths
- Bicycle Lanes
- Indicative Verge/Curb
- Raised Areas of Intersection

Clever & Creative Corridor
NAC Signalised Intersection
Connector Road + CCC



Note: Green pavement on this diagram is indicative only. Green pavement will typically only be used at intersections and other conflict points.

LEGEND

- Vehicle Lanes/Parking
- Dedicated Bus Lanes
- Pedestrian Paths
- Bicycle Lanes
- Indicative Verge/Curb
- Raised Areas of Intersection