Whittlesea Integrated Transport Plan

Background Paper, Final Version

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Institute for Sensible Transport

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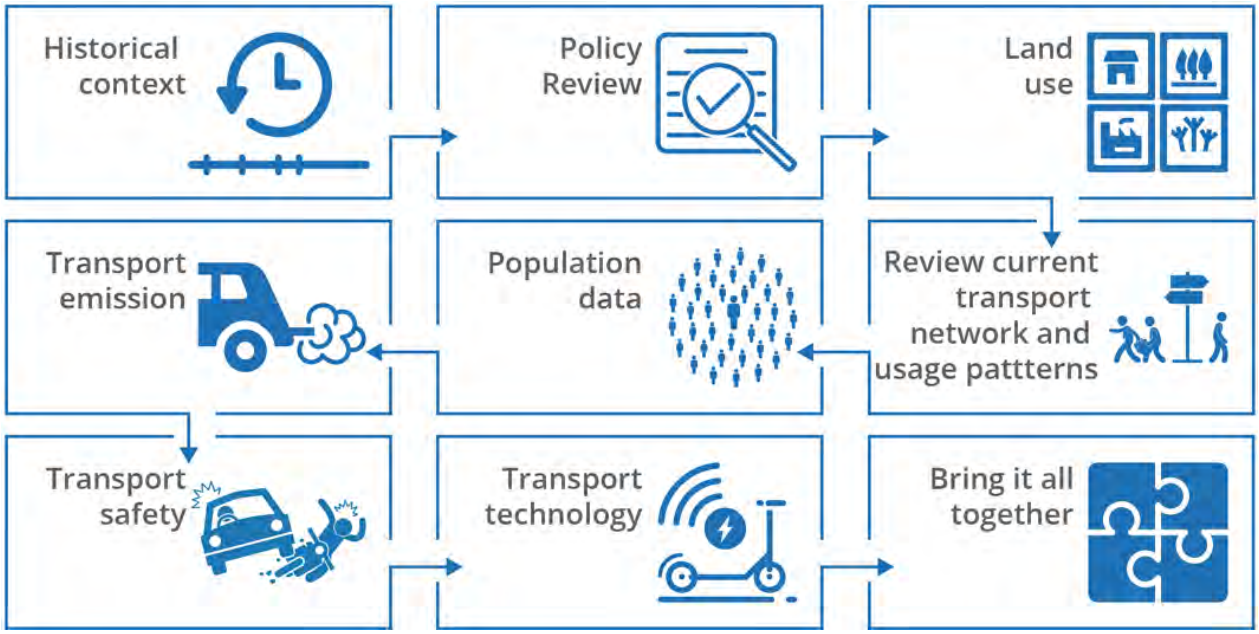
1. Executive Summary

This report offers an analysis of background policy and data relevant to Council as it begins the process of developing its new Integrated Transport Plan (ITP). This is the first of two reports delivered as part of this project. Following this *Background paper,* a *Directions paper* will be produced, intended to guide Council in the development of their in-house ITP.

What does this report cover?

This report provides an analysis of material relevant to Council as it seeks to renew its ITP. This report provides material on eight distinct topics, as identified in the graphic below.



This report provides an analysis of the policy and transport landscape in Whittlesea.

An analysis of the policy and transport landscape in Whittlesea provides a snapshot of the strategic context. By understanding the key themes within Council's strategic planning documents, demographic features and forecasts, as well as land use changes, Council will be in a strong position to develop its own ITP. This report has also examined transport emissions and safety issues in Whittlesea, helping to draw out some of the key challenges the new ITP will need to address. Finally, major changes in transport technology have taken place since the past ITP was developed, almost ten years ago. Ensuring the new ITP is future focused will help Whittlesea achieve its long term objectives. Capitalising on the emergence of smaller, cleaner and more efficient methods of travel, such as electric vehicles and e-bikes, as well as shared transport will help the Whittlesea community meet its mobility needs in a more sustainable way.

Key findings

Policy review

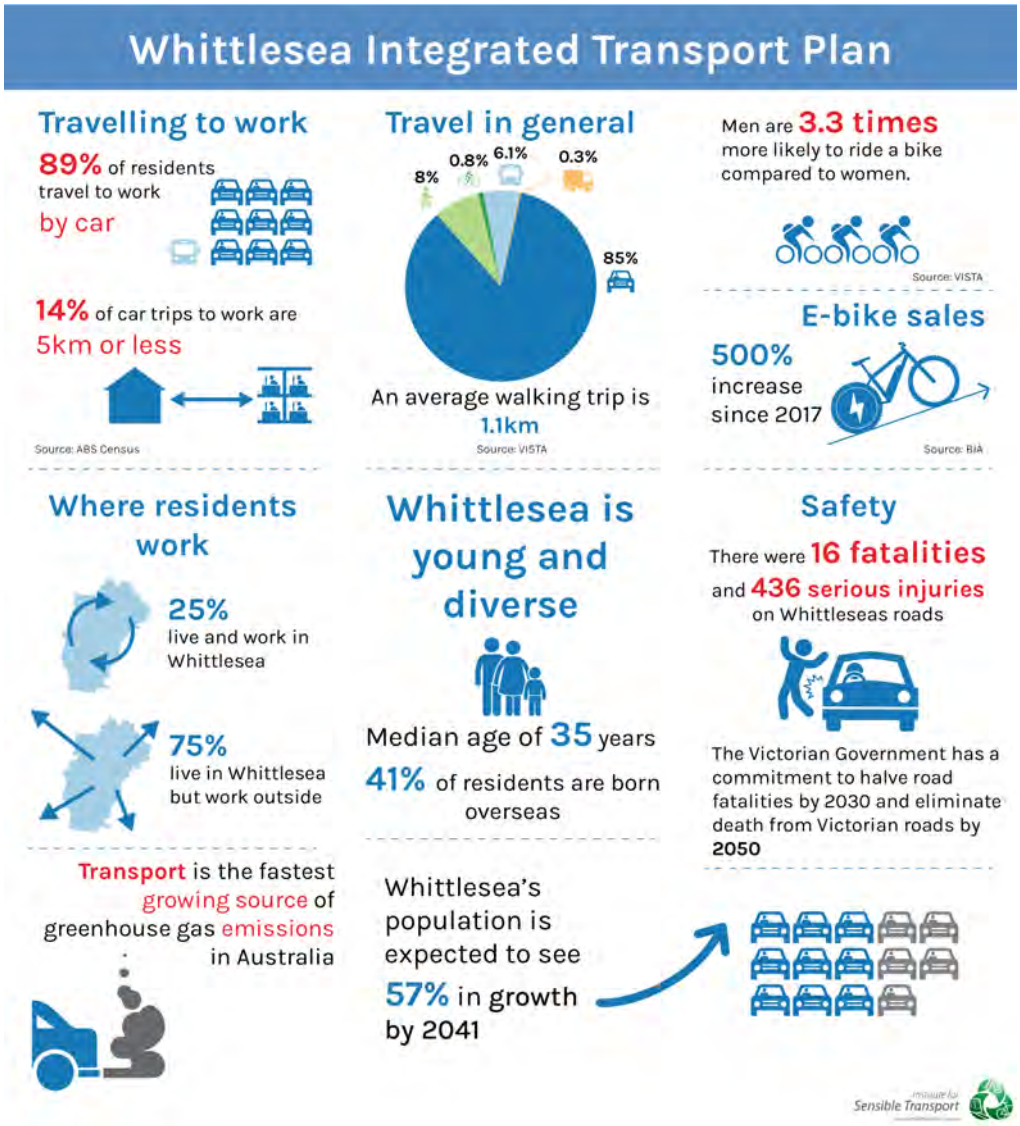
The review of Whittlesea's policies and strategies have revealed that there is a strong desire for Council and the community to achieve a more sustainable, vibrant and healthy City in the future, with less reliance on motor vehicles. Creating liveable neighbourhoods, a strong economy and a sustainable society are core features embedded within the Council policies reviewed as part of this report.

Many of the state and Commonwealth policies are also supportive of a more sustainable future in which more attention is placed high quality urban spaces, and more trips to meet day-to-day needs are able to be done within a short distance from people's homes, by sustainable forms of transport.

The need for a safe climate and provide people with a greater diversity of transport options are two key themes to arise from the review of Council's existing policy.

Travel patterns and transport data

A snapshot of key findings from the analysis of travel patterns in Whittlesea is shown below.



The key theme to emerge from the data presented in the graphic above is that Whittlesea has a transport system dominated by car use. An almost 60% increase in population is forecast by 2041. If significant steps are not taken to increase the diversity of transport options, Whittlesea may become a less vibrant place to live and work. Council has set a target to grow walking and cycling, to 25% of all trips by 2030, up from 9% currently.

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Major implications

In order for Whittlesea to achieve its long term strategic objectives, a step change is required in terms of:

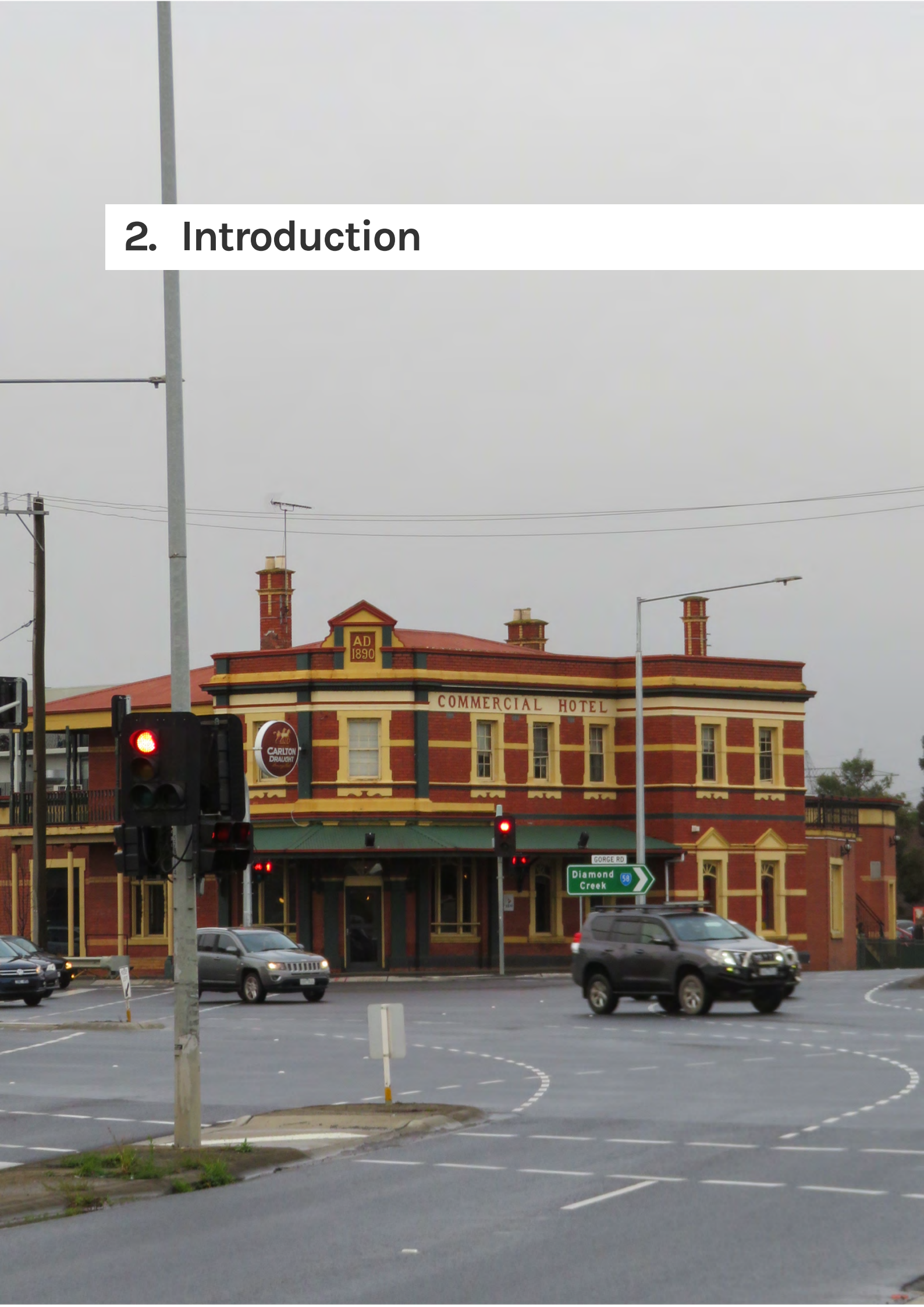
- Creating high quality, connected walking and cycling infrastructure; this is required to give people regardless of age, income or gender the ability to easily access destinations by foot and bicycle.
- Stronger advocacy on improvements to the public transport network
- Planning controls on new developments that build in a higher diversity of destinations, in order to create more local trips and higher levels of active transport.

Next steps

A *Directions Paper* will be prepared as the second and final report produced as part of this project. The Directions Paper will:

- Highlight ongoing and emerging challenges
- Propose objectives and draft principles for transport planning in Whittlesea
- Offer mode hierarchies, to enable Council to track its progress
- Present different future scenarios, including different transport and land use planning approaches and outcomes
- Offer guidance on the development and implementation of the ITP.

2. Introduction



This project has been commissioned by the City of Whittlesea (Council) to provide important background and directions for the development of a new Integrated Transport Plan (ITP). Figure 1 illustrates the two components of this project. This report is focused on the *background* information that will inform the development of the *directions* paper, delivered in the second half of this project.

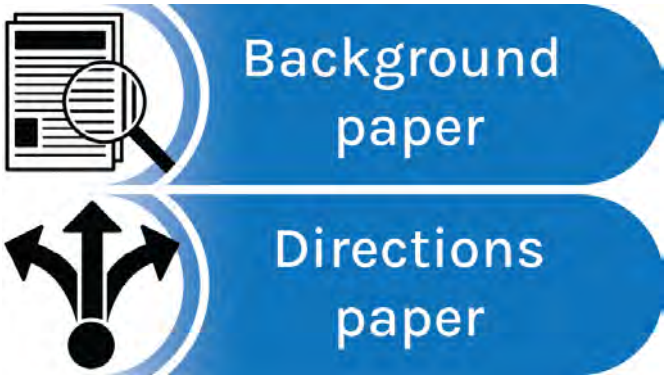


Figure 1 Two project components

This *Background Report* gathers information relevant to the future ITP, including policy and strategy material, mobility data, the transport network and changes to transport technology. It identifies trends and gaps, and suggest ways to improve the efficiency and sustainability of the transport system. It also considers past engagement activities to guide future Integrated Transport Plans (ITP).

2.1 What will the Integrated Transport Plan need to cover?

The future *Integrated Transport Plan,* which will be developed in house by Council, will need to cover the following areas, and has therefore acted as a guide for the development of this Background Report:

- All modes of land transport, including walking, cycling, public transport, car use, parking and freight. The integration of active and public transport, as well as more effective management of car use will be crucial to Council's success.
- Relationship between land use and mobility patterns (e.g. transit oriented development).
- Sustainability and emissions reduction.
- The need to create more vibrant townships and a reduction in short car trips.
- Road safety.
- Gender equality issues.
- Behaviour change focused on more sustainable transport choices.
- Strengthening economic outcomes.
- Transport technology and emerging transport options.

2.2 Guiding principles

In 2018, the Council adopted the *Whittlesea 2040* vision to guide its efforts and collaborations with the community and stakeholders. Whittlesea 2040 outlines four objectives:

- Connected communities
- Liveable neighbourhoods
- Strong local economy
- Sustainable environment.

These principles have a strong overlap with transport, and there is considerable capacity for the future Integrated Transport Plan to support the principles set out in Whittlesea 2040.

2.3 Key components of the Background Report

Figure 2 highlights the key chapters of this Background Report. Chapter 2 provides historical context, Chapter 3 reviews relevant Council policies, as well as those of the state and Commonwealth level. Chapter 4 examines the current transport system and usage patterns. Chapter 5 describes population data and demographics. Transport emissions are discussed in Chapter 6, and Chapter 7 focuses on transport safety. The impact on gender is assessed across the report.

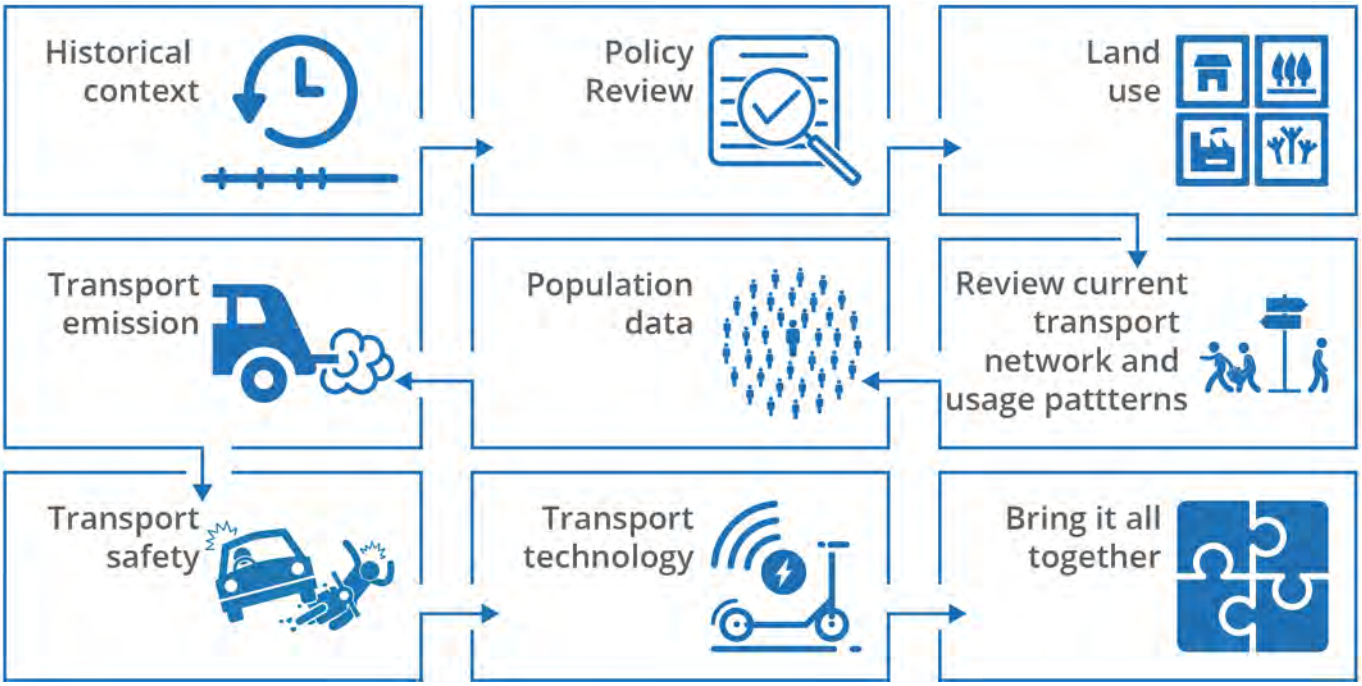
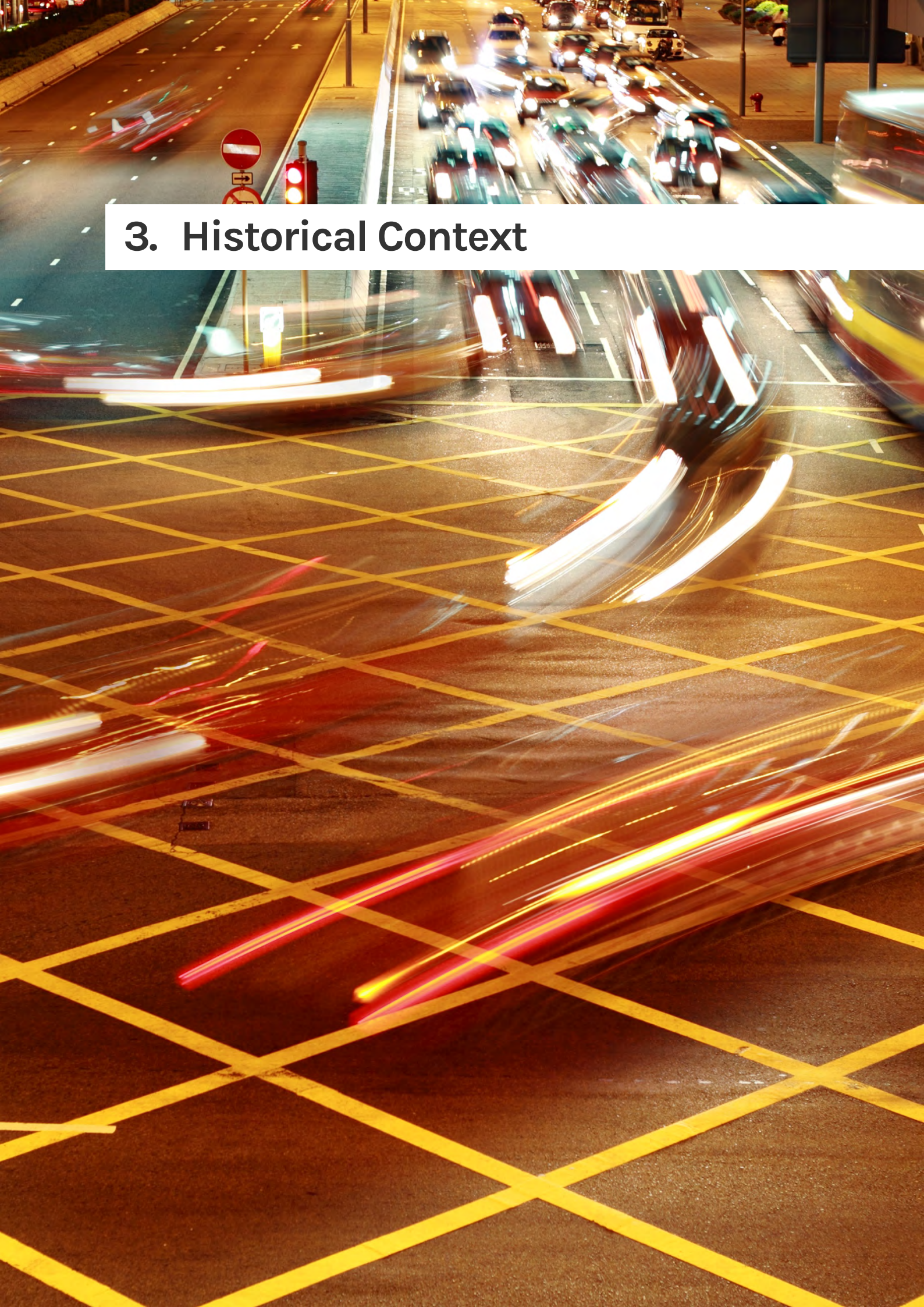


Figure 2 Key report components



3. Historical Context

This section provides a brief overview of the key historical developments related to transport in the Whittlesea region.

3.1 Pre-European

Before European settlement, indigenous people, particularly the Wurundjeri people, had inhabited the land now known as Whittlesea, for thousands of years. Their connection to the land was deeply rooted in their cultural and spiritual traditions, and they sustained themselves through hunting, gathering, and managing the land's resources.

3.2 Colonial and industrial

European explorers, including Captain W.H. Hovell and Hamilton Hume travelled through the region in 1824, providing descriptions of the landscape's beauty and potential for European settlement. John Batman, in 1835, signed a treaty with local Indigenous elders, known as the Douta Galla treaty, which, while controversial and lacking official recognition, reflected the eagerness of European settlers to claim this land.

Following these explorations and the signing of the treaty, the government formally surveyed the area in 1838/39 under the guidance of Robert Hoddle. This surveying effort not only measured and mapped the land but also established key north-south routes, including what would become known as Epping Road, Sydney Road (now the Hume Highway), and Plenty Road. These routes would play a crucial role in the region's future development.

The following are some highlights in the development of the transport network following European settlement:

- Establishing a Road Network in the 19th Century:
  - Sydney Road and the Plenty Road were among the earliest established roads in the City.
  - Sydney Road connects Melbourne and Seymour, and played a significant role in early mail services.
  - Plenty Road was gazetted in 1848 and became a major highway in the district.
- Bridges:
  - In 1866, the Victorian Parliament allocated funds to construct bridges across the state, addressing the lack of bridges in the region.
  - Notable bridge construction included one over the Merri Creek on Yan Yean Road and another over the Mill Creek in Donnybrook.
- Whittlesea Railway:
  - In 1853, a tramway was constructed adjacent to the Yan Yean water supply pipeline, providing a transport link.
  - Proposals for a railway line from North Fitzroy to Whittlesea emerged in the late 1860s.
  - The railway line to Whittlesea officially opened on December 21, 1889, with significant economic and social impacts on the region.
- Railway to Albury/Sydney:
  - Construction of the North Eastern Railway connecting Melbourne and Sydney began in 1869 and reached Albury in 1883.
  - The line between Donnybrook and Beveridge was duplicated.
  - In 1962, a standard gauge line was constructed adjacent to the main line.
- Donnybrook Railway Station:
  - Donnybrook Railway Station was opened on October 14, 1872.
  - The station featured platforms, a goods shed, and level crossing gates.
  - In September 1900, the existing station building was opened.
  - Level crossing gates were replaced by flashing light signals in August 1961.

These historical details highlighting the importance of roads and railways in shaping the region.

After the conclusion of World War I, Melbourne experienced a rapid population growth that exerted significant pressure on the city to expand its boundaries. The electrification of the Whittlesea railway to Thomastown, completed by 1929, played a pivotal role in stimulating development in the southern parts of Whittlesea. This era witnessed the creation of the first suburban subdivisions,

primarily in Thomastown, during the late 1920s and early 1930s.

Following World War II, the resumption of development was facilitated by a growth in motor vehicle ownership. This provided a diversification of travel patterns, beyond the reach of the public transport network. Thomastown's proximity to the city centre and available land attracted many residents, including a significant number of migrants. In the early 1950s, the Melbourne & Metropolitan Board of Works began planning for Melbourne's future growth, releasing a comprehensive plan in 1954 that covered the entire metropolitan area. Thomastown was included in the plan, and the concept of growth corridors radiating from the city core along key transport routes was introduced.

Additionally, post-World War II housing shortages in Victoria, exacerbated by population growth and material shortages, led to various government initiatives. In 1946, the Federal Government initiated a joint-venture housing and building program with the states to address the housing shortage. This program aimed to employ 130,000 workers in the construction industry over a decade, creating not only jobs but also houses to reduce rents and stimulate investment. Cooperative housing societies were also established with government support, providing financing and enabling co-operative development models that made housing more affordable. One of the first co-operative societies, the Peter Lalor Cooperative, was established in what would later become the suburb of Lalor. These initiatives played a crucial role in addressing post-war housing shortages and shaping the suburban landscape of the City of Whittlesea.

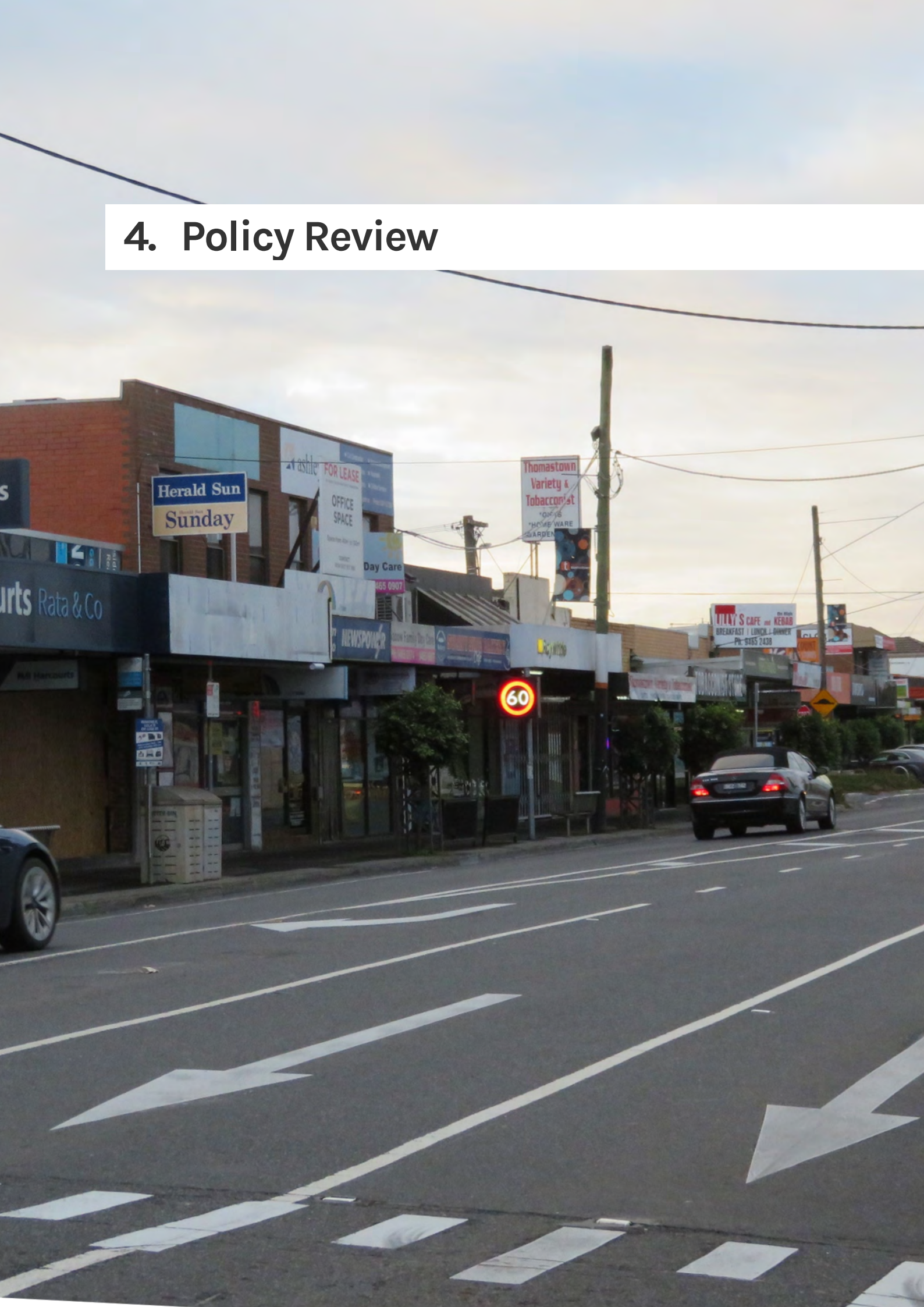
3.3 Post-COVID-19 changes

During COVID-19, the City of Whittlesea allocated a budget of $33.62 million for the improvement of existing roads and the construction of new ones, alongside an additional $2.86 million earmarked for enhancing pedestrian and cycling pathways. Improvements to the transport network in growth areas are included in new Precinct Structure Plans (PSP). Notable road projects featured in the Draft Budget for 2020-21 including:

- $13.05 million for the enhancement of Boundary Road in Wollert.
- $3 million to finalise the extension of Findon Road to Plenty Road.
- $400,000 designated for the creation of a pedestrian and cycling path along Hendersons Road drain, stretching from Childs Road to Findon Road.
- Moreover, they allocate $4.83 million for traffic management service including behaviour change program and school crossings.

The City of Whittlesea also saw significant state government investment as part of Victoria's Big Build project including significant project such as Bridge Inn Road upgrade, Plenty Road upgrade, Yan Yean Road upgrade, Childs Road upgrade, Epping Road upgrade.

4. Policy Review



This section provides a succinct description of policies related to transport in Whittlesea, across Council, state and Commonwealth government.

4.1 Council policies and strategies

In this section, a concise summary of Council policies and strategies is presented, along with their relevance to the integrated transport plan.

4.1.1 Whittlesea 2040: A Place for All

Whittlesea 2040 is a collaborative effort between the Council and the community to envision the future of their municipality. It provides a broad perspective on various issues in Whittlesea.

In Whittlesea, many residents work in healthcare and industry, but technology is changing jobs. Limited public transport has resulted in car dependency (see Figure 3). Population growth without a diversified mix of alternative transport options is likely to worsen congestion but also create job and service opportunities.

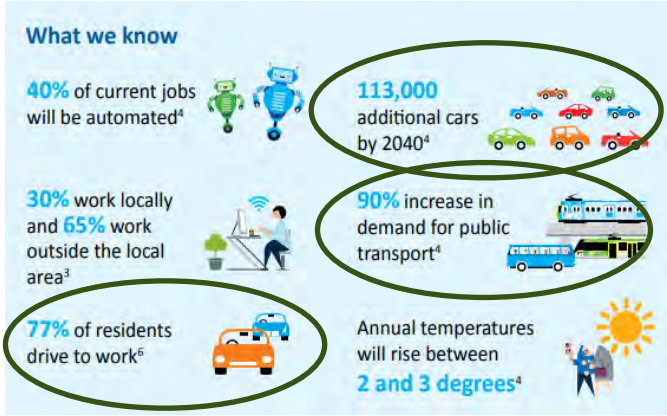


Figure 3 Whittlesea 2040

Source: Whittlesea 2040: A Place for All

There are four main goals for Whittlesea 2040 are identified below:

- Connected community
- Liveable neighbourhood
- Strong local economy
- Sustainable environment.

All of the above goals have a connection to transport. There is considerable opportunity for the new ITP to be able to align and support the goals identified in Whittlesea 2040.

Liveable neighbourhoods value nearby amenities and seeks to improve the quality of the public realm. Affordable homes and the diverse neighbourhood mix are priorities. Public transport should grow with the community. Safe pathways that connect people to services and other destinations help to enhance active transport outcomes. Innovative travel options like shared cars and electric vehicles (EVs) are intended to reduce traffic and environmental impact. The future ITP has the potential to align with the goals of *liveable neighbourhoods* by enhancing access to amenities and improving active transport. Since the previous ITP was provided (in 2014), a significant increase in transport technology has occurred. This opens up the possibility of shared, electric and micro transport options to reduce some of the consequences of car dependency. This transport technology opportunities will be discussed further in Section 9.

Sustainable environment focused on access to parks, prioritising their protection. Outdoor activities, clean air, and local produce are important. Its goal is a sustainable, eco-conscious community that preserves green spaces. The future ITP should consider how improvements to mobility choices can enhance sustainability; both in terms of emissions reduction, and connection to natural places.

4.1.2 Liveable Neighbourhoods Strategy

The *Liveable Neighbourhoods Strategy Background Report* outlines Whittlesea's integrated planning framework, community plan, and the Liveable Neighbourhoods Strategy. It aims to enhance the quality of life for residents by creating a place for all and is based on three key directions:

- Key Direction 1: *Smart, Connected Transport Network*
  - Challenges include long commutes, car dependency, traffic congestion, and poor public transport coverage.
  - Fast population growth contributes to car-centric travel behaviour.

- A shift to EVs may increase congestion, by lowering transport cost.
- Sustainable alternatives like walking, cycling, and public transport are encouraged.
- Advocacy for improved public transport, including Wollert Rail and bus services.
- Consideration of holistic solutions beyond road construction.

The Liveable Neighbourhoods Strategy identified that holistic transport solutions are required, that look beyond road construction.

- Key Direction 2: *Well-Designed Neighbourhoods and Vibrant Town Centres*
  - Walkable neighbourhoods within 800m of amenities promote physical activity and well-being.
  - Vibrant town centres support local economies, community connections, and safety.
  - Adequate density is vital for town centre vitality.
  - Council works on town centre revitalisation and open space improvement.
  - Prioritising people-cantered design, active frontages, and public spaces.
  - Ongoing open space expansion and development.
  - Focus on improving urban structure, walkability, and density in growth areas.
- Key Direction 3: *Housing for Diverse Needs*
  - Rapid population growth necessitates 50,000 new dwellings by 2040.
  - Housing stress is a concern for many residents.
  - Affordable housing options are limited.
  - Encouraging medium and high-density housing in appropriate areas.
  - Accessibility and support for people with disabilities are priorities.
  - Need to understand residents' housing preferences and provide housing diversity.
  - Investigating opportunities for social and affordable housing in new developments and on Council-owned land.
  - Enhancing the range, quality, and sustainability of housing options.

4.1.3 Integrated Transport Strategy 2014

Whittlesea's *Integrated Transport Strategy* 2014 discusses the need for a more sustainable transport system and choices. Figure 4 provides a summary of key transport data developed as part of the Strategy.

The main identified issues are:

- Private vehicle reliance
- Traffic congestion
- Inadequate public transport
- A lack of active transport infrastructure
- Network connectivity limitations
- Road trauma
- Poor sustainability outcomes.

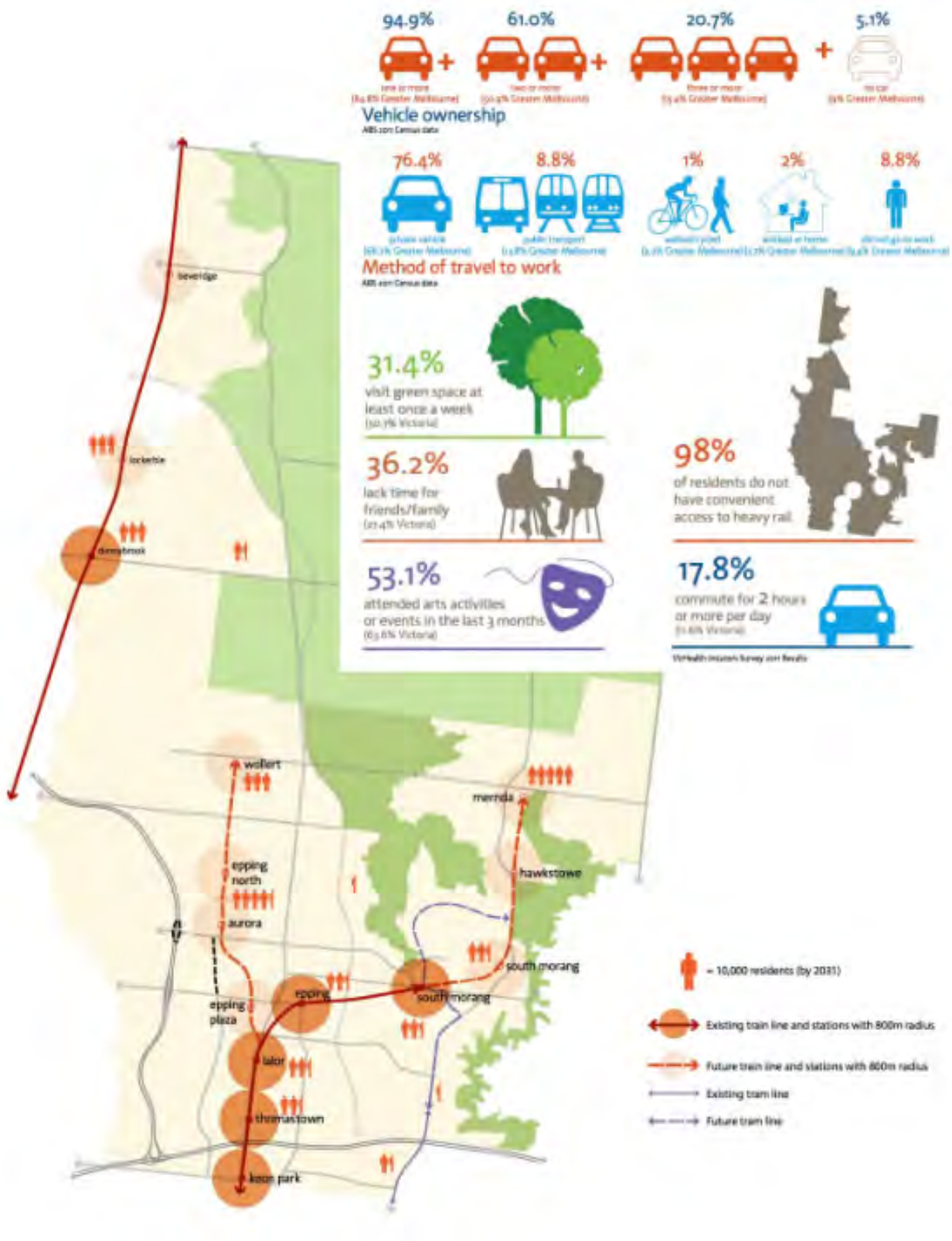


Figure 4 Transport snapshot

Source: Integrated Transport Strategy 2014

This Strategy focuses on various aspects of transport and urban development. Some of the action plans in each aspect include:

- Land Use and Transport
  - Apply integrated design principles to create attractive public spaces that integrate transport and urban design.
  - Advocate to the State Government for timely delivery of transport infrastructure.

  - Implement active transport initiatives, focusing on schools and evidence-based interventions.
- Walking
  - Collaborate with schools to promote walking and create safe routes.
  - Improve pedestrian accessibility in projects, advocate for safer crossings, and prioritise pedestrian movements in key areas.
- Cycling
  - Prioritise bicycle infrastructure in projects, advocate for safer crossings, and match funding for cycling networks.
  - Promote cycling at schools to reduce car travel and enhance safety.
  - Create a *Cycling Plan* focusing on encouraging local cycling, addressing barriers, improving infrastructure, and collaborating with schools and other councils.
- Public Transport
  - Advocate for better public transport, including rail and bus improvements.
  - Collaborate with Public Transport Victoria for planning and accessibility.
  - Set service targets for quality public transport
  - Work on rail capacity, Mernda Rail, Wollert corridor, and Route 86 Tram extensions.
- Roads and Freight
  - Enhance road safety through a revised *Road Safety Strategy*.
  - Implement *SmartRoads* to manage roads efficiently.
  - Develop a *Road Network Plan* for investment priorities.
  - Design industrial areas to meet freight vehicle demands.
  - Advocate for key road improvements, including O'Herns Road interchange and Edgars Road extension.
- Community Transport
  - Define the role of community transport based on shared vision and principles.
  - Develop a sustainable and cost-effective community transport model.
  - Create a funding model for community transport.
  - Establish and implement an agreed-upon plan.
  - Develop a Council policy on community transport.

4.1.4 Climate Change Plan 2022 – 2032

This plan details Council's responsibilities in reducing its own carbon emissions while also assisting the community in addressing climate change through mitigation and adaptation efforts. It aligns with the *Whittlesea 2040* objectives for a sustainable environment, focusing on three main goals:

- Valued natural landscape and biodiversity
- Climate ready
- Leaders in clean, sustainable living.

Road transport is the second largest source of greenhouse emissions, accounting for 15% of total municipal emissions.

Transport is a significant focus of the Climate Change Plan. It identifies road transport as the city's second largest source of greenhouse emissions, accounting for 15% of total municipal emissions. The Plan highlights the need to reduce transport emissions through sustainable and active transport initiatives, such as:

- Promoting accessible, affordable, and convenient public transport options
- Undertaking behaviour change campaigns to encourage more people to use public transport
- Supporting community shuttle buses
- Collaborating with relevant partners to create *20-minute neighbourhoods*.

The plan also outlines specific actions to reduce transport emissions, such as:

- Developing a community-wide EV transition plan (this was completed in 2022).
- Advocating for accessible and affordable public transport
- Supporting initiatives to encourage more people to walk and cycle.

The Plan is very closely related to the ambitions of the future ITP as it seeks to reduce carbon emissions by promoting sustainable transport options like public transport, walking, and cycling.

4.1.5 Climate Ready Whittlesea

Climate Ready Whittlesea outlines the impact of climate change on the City of Whittlesea (see Figure 5). It also highlights current work being done, opportunities and challenges, and a detailed adaptation plan.

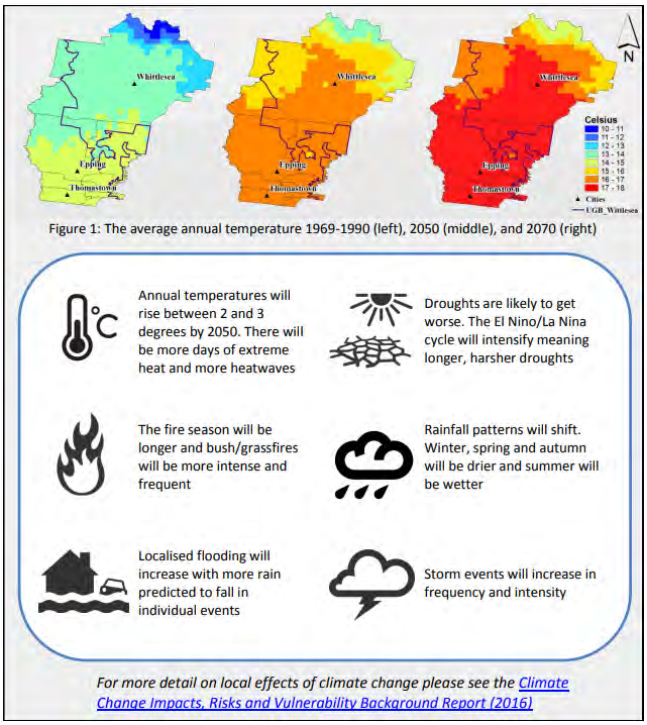


Figure 5 Impact of climate change on Whittlesea

Source: Climate Ready Whittlesea

Some of the actions included in Climate Ready Whittlesea include:

- Developing a better understanding of how heat affects the City
- Increasing the thermal comfort of private dwellings
- Cultivating the City of Whittlesea's urban forest
- Improve the resilience of the City's assets to climate change
- Identify how climate change will impact the City of Whittlesea's biodiversity values
- Advocate for community outcomes that enhance their climate resilience
- Build partnerships.

Climate Ready Whittlesea and the future ITP are closely linked as they share goals related to the need to lower emissions and enhance outcomes for sustainable transport.

4.1.6 Community Safety and Crime Prevention Strategy 2016 - 2020

The City of Whittlesea's *Community Safety and Crime Prevention Strategy 2016-2020* outlines the City's commitment to work collaboratively with the community and local agencies to prevent crime and improve safety for residents. The Strategy outlines 10 goals related to community safety and crime prevention including:

- Create a safe and welcoming built environment that promotes community connection.
- Reduce crime against property.
- Empowering young individuals by providing education and job prospects.
- Safe roads and responsible driving.
- Minimising negative impacts of financial difficulties.
- Reducing the adverse effects of alcohol.
- Minimising drug-related harms.
- Minimising family violence.
- Youth offending is minimised.
- Minimising negative community safety impacts from electronic and online crime.

The Strategy's emphasis on *safe roads* and *responsible driving* directly connects to transport safety. Additionally, creating a secure environment and reducing crime against property contribute to safer public spaces, which can include transport areas. By incorporating these safety aspects, the strategy enhances the broader goals of an ITP,

fostering a secure, accessible, and connected community environment.

4.1.7 City of Whittlesea Advocacy Prospectus 2022

The *Advocacy Prospectus* outlines a proposal for the Victorian Government to invest in 19 key initiatives spanning seven economic domains:

- Infrastructure and community services
- employment
- public transport
- health and wellbeing
- affordable housing
- roads
- environmental sustainability.

These initiatives are interconnected, with investments in one domain generating positive outcomes in others. The exception is *roads*, in which an increase in provision leads to a reduction in some other areas (e.g., sustainability and health).

Public transport advocacy includes the following projects:

- Construction of the rail line to Wollert from the existing Lalor Station on the Mernda Line by 2030
- Better bus services via more direct and updated bus routes connecting Epping North with the Epping Central Activity Centre in Thomastown. Moreover, introduce a temporary 10-minute high-quality bus service between Epping and Wollert until the Wollert Rail project is finished.
- Extend Tram Route 86 (T86) from the Plenty-McKimmies roads intersection to the Plenty Valley Town Centre.

Road advocacy projects include:

- Start building the E6 Freeway (Outer Metropolitan Ring Road) in 2027 so that it's finished by 2035. This is intended to connect Werribee, Melton, Tullamarine, Craigieburn/Mickleham with Epping and Thomastown.
- Collaborate with the Council to officially designate and replicate essential roads to reduce traffic jams, enable bus routes, and accommodate the rising population and increased traffic.

These investment initiatives are part of an integrated transport plan that aims to improve transport in the region. They include expanding rail and bus services, extending tram routes, and enhancing road infrastructure to reduce congestion and accommodate population growth.

It is important to note that many of these road projects are unlikely to support Council's wider strategic ambition. While they may temporarily increase vehicle speed, ultimately, they reduce funding and space for more sustainable transport infrastructure. They also ignore the concept of the *Marchetti Constant* and hypermobility, in which increases in travel speed result not in reduced travel time, but rather increases in travel distance.[1]

The new ITP is an opportunity for Council to reflect on previous advocacy projects and ensure the new set of advocacy projects align with the principles contained in Whittlesea's strategic planning documents.

4.1.8 Destination Plan 2023 – 2026

The City of Whittlesea *Destination Plan 2023-2026* aims to increase tourism visitation, length of stay, and spend in the city. The plan identifies challenges and opportunities for the city, including:

- Heritage, arts, and culture
- Nature-based tourism
- Food and drink
- Infrastructure.

This Plan outlines several transport-related challenges and opportunities for visitors to the city.

The City has been a popular cycling spot and will remain so as trails continue to develop and connect trails.

[1] https://bigthink.com/strange-maps/marchettis-constant/

The Plan mentions that one of the main challenges is the lack of public transport and inadequate road infrastructure in growth areas, which can be an inhibiting factor for visitors. Most visitors depend on cars and road links, particularly in the growth areas, which can lead to congestion and traffic issues. While this content was included within the *Destination Plan,* there is little evidence cited that a lack of road infrastructure prevents visitations that would otherwise occur. In general, it is the quality of attraction, rather than the quality of roads that predict visitation levels. As an example, three of the most popular locations for visitors in Victoria (City of Melbourne, the Dandenong's and Phillip Island) all have constrained road access, yet all remain popular.

4.1.9 Equal and Safe Strategy 2019

The *Equal and Safe Strategy* 2019 outlines Whittlesea's efforts to improve gender equality and prevent violence against women. The Strategy provides an in-depth analysis of the policy context, community attitudes, and local government's role in addressing gender inequality and violence against women. It outlines four objectives to have a gender equitable, safe, and respectful community including:

- Foster a safe workplace challenging gender inequality, focusing on workforce improvement and capacity building.
- Offer services promoting gender equality and addressing family violence, aiming for inclusivity within the community.
- Ensure safe, equitable access to community facilities and spaces, enhancing engagement and safety.
- Empower the community with knowledge about gender equality, healthy relationships, and violence prevention.

While the Strategy is not directly about transport, its objectives align with what might be included in the future ITP's goals. Ensuring safe access to community spaces and empowering the community with knowledge corresponds to the future ITP's ambitions regarding safety and education. Additionally, offering services promoting inclusivity connects with the need to provide a transport system that seeks to accommodate people with diverse transport needs.

4.1.10 Gender Equality Action Plan 2021 – 2025

Whittlesea's *Gender Equality Action Plan* 2021–2025 focuses on improving gender equality outcomes for its staff. Aligned with the Gender Equality Act 2020, the plan underscores key principles, including:

- Promoting safe and equal society
- Acknowledging gender equality's wide-ranging benefits
- Addressing its role in preventing violence against women.

The plan also emphasises inclusivity through measures like diverse hiring and promoting employee well-being. Intersectional gender inequality is considered, and efforts are made to include diverse perspectives. The plan's implementation seeks to enhance workforce experiences, drive cultural change, and contribute to a more respectful and safer workplace environment.

Similar to Equal and Safe Strategy, although it is not about transport, it has the potential for alignment with the future ITP's goals around an equitable and respectful community. Both plans seek to ensure safety, accessibility, and well-being for everyone, contributing to a more inclusive and respectful environment.

4.1.11 Sustainable Environment Strategy 2022 -2032

The *Sustainable Environment Strategy* 2022-2032 outlines Council commitment to achieving a sustainable, net zero emissions, and climate resilient future.

The Strategy outlines three key directions:

- *Valued Natural Landscapes and Biodiversity*:
  - Protect, improve, and value landscapes, waters, and species.
  - Promote sustainable land management and use.
  - Enhance resilience of the natural environment and biodiversity to climate change.
- *Climate Ready*:

  - Support communities and businesses in becoming climate ready.
  - Develop built environment and infrastructure for safe living in a changing climate.
  - Strive for net-zero emissions as a municipality.
- *Leaders in Clean, Sustainable Living*:
  - Manage water resources integrally.
  - Transition to a circular economy and reduce waste.
  - Focus on clean energy, sustainable transport, and overall well-being.

The *Sustainable Environment Strategy* and an ITP are closely related as they share goals for a sustainable and resilient community. The strategy's focus on climate readiness, efficient water use, clean energy, and sustainable transport may align with a future ITP by creating an eco-friendly, safe, and well-connected transport system.

4.1.12 Thomastown Lalor Place Framework

The Place Framework for Thomastown and Lalor is an ongoing, collaborative approach intended to shape local places, improve public spaces, precincts, infrastructure, built form, and transport. The framework is designed to guide and support the vision concepts and strategic directions of Whittlesea policies and other relevant policies.

The framework highlights that the community supports:

- More green space
- More community space and facilities
- Removing level crossings
- More active transport infrastructure.
- Some of the transport related goals based on community needs are:
- Accessible and easy to find car parks
- Responsive public space
- Enhances connectivity to increase quality of active transport
- High quality regional trail
- High street as a place
- Improve wayfinding to regional trails.

The Place Framework for Thomastown and Lalor is likely to align with a future ITP by emphasising community preferences for green spaces, improved public facilities, active transport, wayfinding, and safety. These elements can be integrated into the ITP to create a more community-oriented and accessible transport system.

4.1.13 Roads and Public Transport Plan 2017

Whittlesea's *Road and Public Transport Plan* addresses significant transport challenges faced by residents. It outlines actions and solutions to improve transport within Whittlesea, considering both immediate needs and long-term urban growth. Whittlesea experiences transport issues due to:

- Heavy reliance on private vehicles
- Some congestion on particular parts of the road network, at certain times of the day
- Limited public transport access
- Insufficient active transport infrastructure.

The Plan identifies that residents prefer trains, but usage is limited, partly due to a network that does not connect to where communities reside. Walking is popular for recreation, particularly to nearby amenities. However, better footpaths and bike lanes are needed to promote cycling and walking. The impact of rat-running by motorists seeking alternatives to congested roads affects local amenities negatively.

Figure 6 provides a map included in the Plan, highlighting wide range of road duplications Council would like implemented. As highlighted earlier, the duplication of these roads is unlikely to support the principles identified in *Whittlesea 2040*.

The impact of rat-running by motorists seeking alternatives to congested roads affects local amenities negatively.

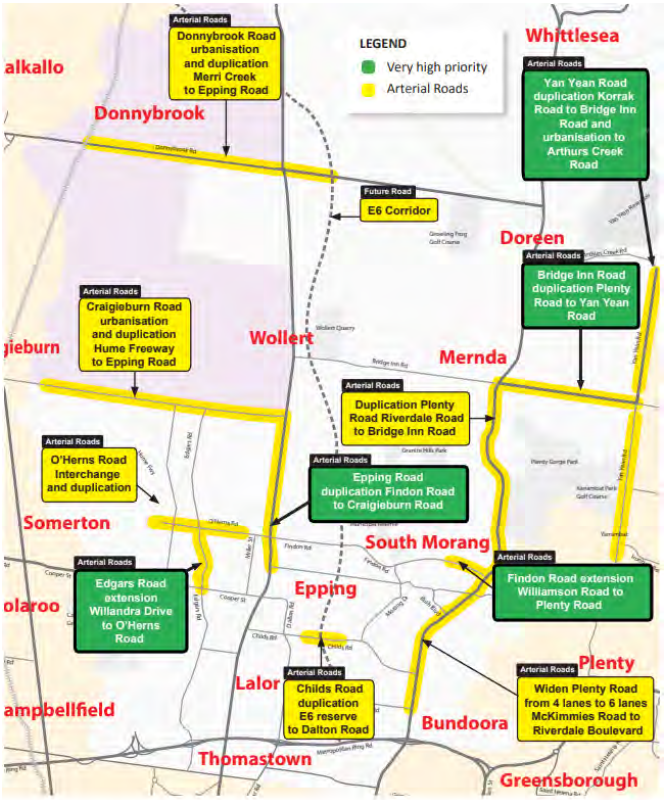


Figure 6 Arterial roads map

Source: Roads and Public Transport Plan 2017

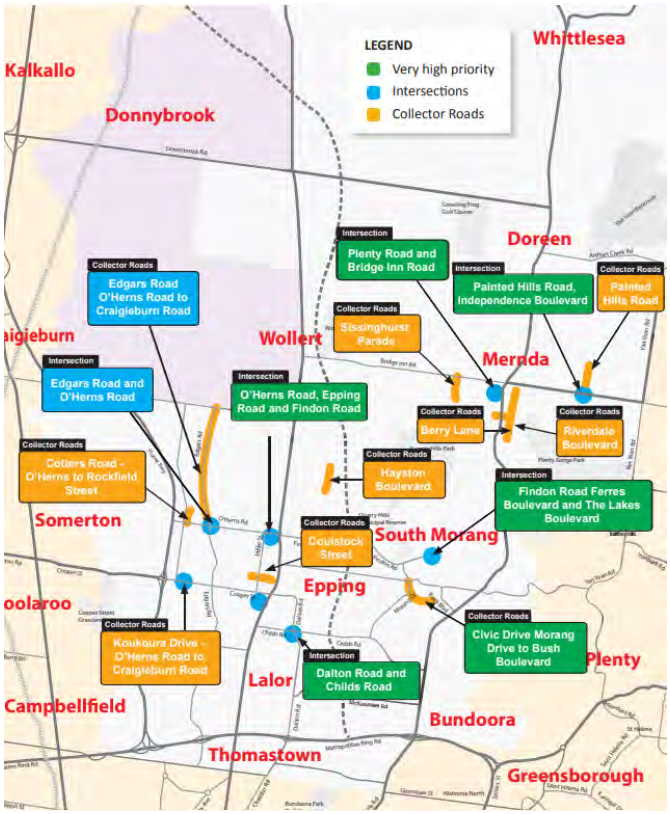


Figure 7 Intersections and collector roads

Source: Roads and Public Transport Plan 2017

The Plan emphasises infrastructure development to combat congestion, enhance public transport, and create a liveable environment. Priorities include:

- Investing in arterial roads (see Figure 6)
- Upgrading intersections (see Figure 7)
- Expanding the public transport network (see Figure 8)
- Completing local connector roads (see Figure 7).
- Improved cycling and walking infrastructure (see Figure 9)
- Improved accessibility for those with mobility issues.

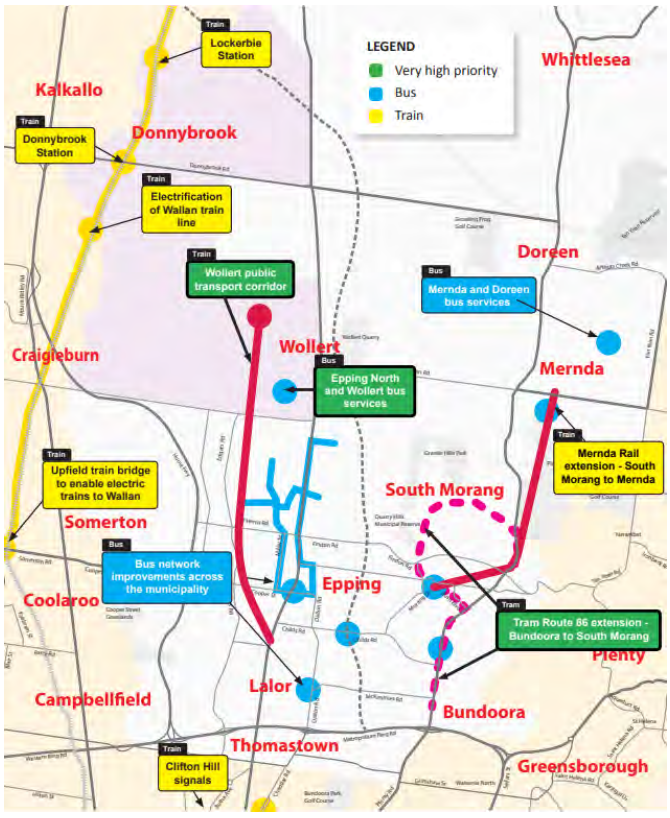


Figure 8 Public transport

Source: Roads and Public Transport Plan 2017

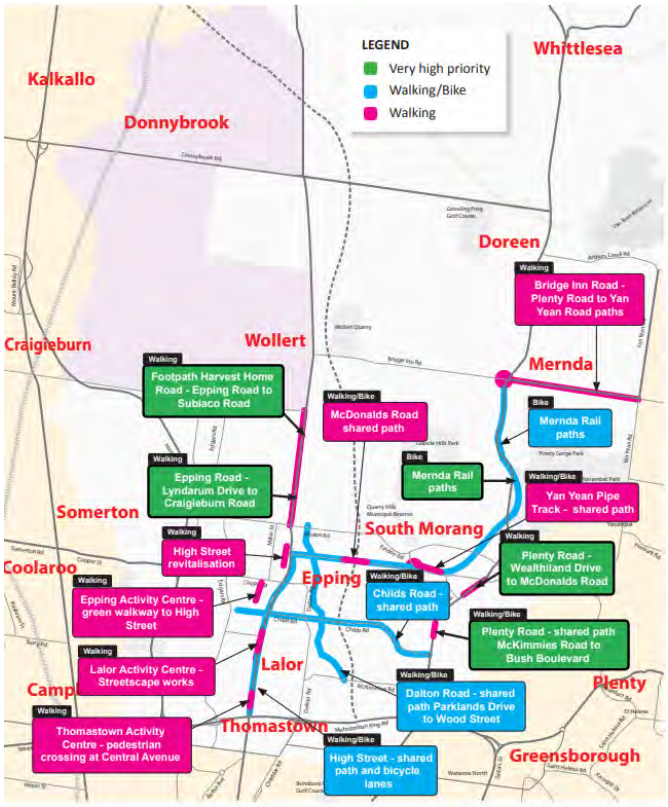


Figure 9 Walking and cycling

Source: Roads and Public Transport Plan 2017

The *Road and Public Transport Plan* seeks to add road volume to the network and enhance public transport services. This is likely to provide a mixed outcome in terms of its ability to align with a future ITP. As highlighted earlier, the duplication of roads will cause hypermobility without reducing travel time in the long term. The public transport improvements will help reduce the car dependency that currently limits people's transport choices. The public transport improvements are likely to result in a stronger uptick in use *without* the road infrastructure improvements. This is because public transport will offer a comparatively higher level of service if the road duplications do not take place.

4.1.14 Transport Directions Paper – Background Paper 2011

The *Transport Directions Paper* is a guide to updating the area's integrated transport planning strategies and policies. The paper discusses the challenges facing transport in the City of Whittlesea, including the need to connect people with schools, hospitals, community facilities, and important services safely.

The challenges highlighted include ongoing population growth, limited funding, and a reliance on private cars. The Paper highlight that residents in Whittlesea have low public transport use, high congestion, and a need to reduce greenhouse gas emissions. The Plan identifies that growth areas require tailored transport solutions, and they must consider interconnections with neighbouring councils. The challenge is to promote sustainable transport modes, protect ecological systems, and meet the community's evolving needs while preparing for an uncertain future, according to the Plan.

While it is important to recognise that this Plan was developed more than a decade ago, some of the data analysis conducted in its preparation revealed:

- Demographic Trends: The rapid and ongoing population growth will lead to increased demand for transport services, particularly among non-car users, children, migrants, and the elderly.
- Urban Growth Trends: The City of Whittlesea is a major area for greenfield housing and employment growth, necessitating funding for infrastructure and better transport options, especially in growing areas around Epping North, Mernda-Doreen, and South Morang.
- Environmental Trends: Greenhouse gas emissions from transport are expected to rise, highlighting the importance of efficient public transport, walking, and cycling options to reduce emissions.
- Economic Trends: Low employment self-containment within the City of Whittlesea results in a high number of residents commuting outside the municipality, particularly to Hume City, a significant freight-generating area, necessitating infrastructure and transport support.
- Social Trends: Many outer suburban areas, including parts of the City of Whittlesea, face high levels of social exclusion due to limited transport services, particularly affecting vulnerable suburbs on the urban fringe.
- User Attitudes: Community attitudes are shifting towards using public transport, walking, and cycling if these modes offer convenience and

quality, highlighting an opportunity to reduce car dependency.

- Travel Purpose: Private vehicles dominate commuting and non-work trips, even for short distances, indicating potential for reducing car use for shorter trips by promoting walking, cycling, and public transport.
- Network Characteristics: Integrating metropolitan networks with regional and local planning in order to protecting transport corridors.
- Safety Considerations: While the crash rate is below the metropolitan average, a higher risk of serious injury or death in crashes necessitates the review of crash data, road safety strategies, and addressing safety concerns in pedestrian-heavy areas.

It is interesting to note that in the 12 years since the above paper was developed, all the issues identified are still pertinent, and in many cases, exacerbated.

In the 12 years since the developed of the Transport Directions paper – all the issues identified are still pertinent, and in many cases, exacerbated.

4.1.15 Transport Directions paper – Summary Paper, 2012

The 2012 *Transport Directions Paper* identifies various challenges that must be addressed during the development of the ITP, including:

- Whittlesea's population is expected to keep expanding.
- A significant portion of the population commutes to different areas of Melbourne for employment.
- Encouraging more eco-friendly modes of travel will present a challenge.
- Preserving a healthy environment will require change.
- Whittlesea consists of diverse regions and communities, each having distinct transport requirements.
- Urban planning and land use decisions will influence transport.
- Ensuring road safety remains a persistent issue.
- Communities are receptive to embracing modifications.

This Paper identified four possible scenarios (see Figure 10) regarding the balance between residents and jobs. In the eleven years since this paper was prepared, it would appear that Scenario 1 or Scenario 4 has been reached, whereby most workers must travel outside the LGA for work, but the transport system they use *does* get them there, albeit with a much higher level of *forced car use* than desired.

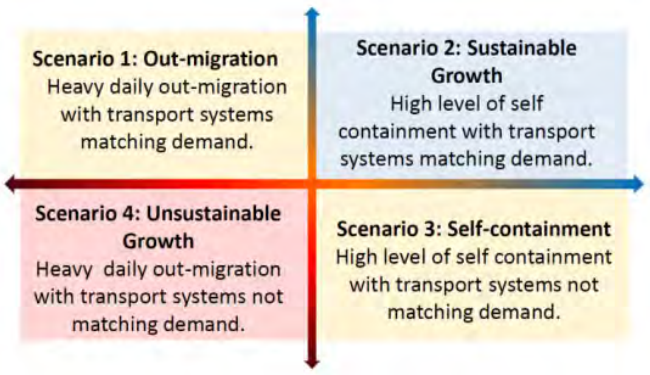


Figure 10 Possible future scenario

Source: Transport Directions paper – Summary Paper, 2012

The Paper outlines potential actions for two ITP packages:

- *Package 1: Business as usual*
  - Actions driven by development demand, lagging behind in infrastructure and service provision.
  - Infrastructure and service delivery similar to past decades, with both Council and State infrastructure lagging behind demand.
  - Closely aligned with Scenario 4.
- *Package 2: Significant change*
  - Actions driven by development demand, matching development more closely.
  - Infrastructure and service provision keeps pace with development.

– Closely aligned with Scenario 2.

In the 11 years since the paper was prepared, it would appear that *business as usual* has eventuated, resulting in high numbers of residents being housed in locations without easy access to jobs and high levels of car dependence.

4.1.16 Road Safety Strategy 2017

At the time of writing, the City of Whittlesea had seen fewer fatal and serious traffic collisions. To further enhance this trend and work towards achieving zero fatalities and severe injuries, this Road Safety Strategy focused on addressing specific factors that commonly lead to crashes.

The City of Whittlesea vision for road safety is:

'That no person is killed or seriously injured as a result of travelling on our roads and paths.'

The primary focus of the *Road Safety Strategy* is vulnerable road users, such as people on foot or bicycle. The Strategy adopts elements of the *'Safe Systems'* approach, which takes a holistic view of the road transport system, considering factors like roads, travel speeds, vehicles, and road users. The following concerns are addressed in the strategy:

- Speeding
- Distraction
- Vehicle safety.

Some of the strategic challenges are:

- Improving accessibility for people with disability
- Support older road users
- Encourage and facilitating active travel
- Promoting good behaviour among road users
- Increase mode choice for all trips.

The *Road Safety Strategy* closely relates to the ITP by sharing a vision of preventing accidents, using a holistic approach to transport, focusing on vulnerable road users, addressing common safety concerns, and tackling shared challenges such as accessibility and promoting safer, more inclusive transport.

4.1.17 Walking and Cycling Plan 2022 – 2027

The *Walking and Cycling Plan* seeks to enhance walking and cycling opportunities, to increase the number of people who use active transport in Whittlesea. The Plan identifies that the challenges/barriers to active transport include:

- Distances to destinations can be too far to walk and cycle
- Lack of safe, attractive infrastructure to enable people to walk and cycle
- Limited access to open spaces
- Inconvenient, and unsafe crossing opportunities.
- Missing link in footpath network.

Active transport is considered particularly important to Whittlesea, given that more than half of residents are overweight, and nearly 36% engage in less than an hour of physical activity per week. The Strategy has set a target of 25% of people to walk or bike by 2030.

The Strategy has set a target of 25% of people to walk or bike by 2030.

Figure 11 represents the proposed cycling routes in Whittlesea. Current cycling network consists of 524 km of on-road facilities, 855 km of off-road paths, and 150 km of informal cycling routes. While this may appear to be a large quantity of infrastructure, in many cases, the *quality* of this infrastructure will not meet the general public's minimum standards of safety. In some cases, it is legal to park over an on road lane, and in many cases, a painted lane ends prior to the approach of an intersection.

Figure 11 Cycling infrastructure in Whittlesea

Source: Walking and Cycling Plan 2022 – 2027

Key issues highlighted in the *Bike Spot 2020* report include:

- The absence of bicycle lanes in certain areas
- The presence of unsafe or prematurely ending bicycle lanes
- Hazardous intersections
- Narrow bicycle lanes.

The Plan outlines key directions including:

- Make active travel safer, via the provision of higher quality infrastructure
- Encourage and promote active travel
- Build and maintain a high-quality network
- Monitor active travel in the future.

The *Walking and Cycling Plan* and the future ITP are closely related in their goals. The challenges addressed, such as lack of paths and unsafe intersections, are likely to resonate with the future ITPs aim to create safe and accessible routes.

4.1.18 Northern Trails Strategy 2022

Northern Trails 2022 is a regional trails strategy for Northern Melbourne, spanning six local government areas. It aims to guide the planning and development of regional trails over the next decade. These trails (see Figure 12) are characterised by multiple user groups, and off-road routes. These trails offer recreational opportunities and promote active lifestyles across the region, connecting various communities and landscapes. The study area includes diverse urban, suburban, and rural landscapes, serving a population of over one million people.

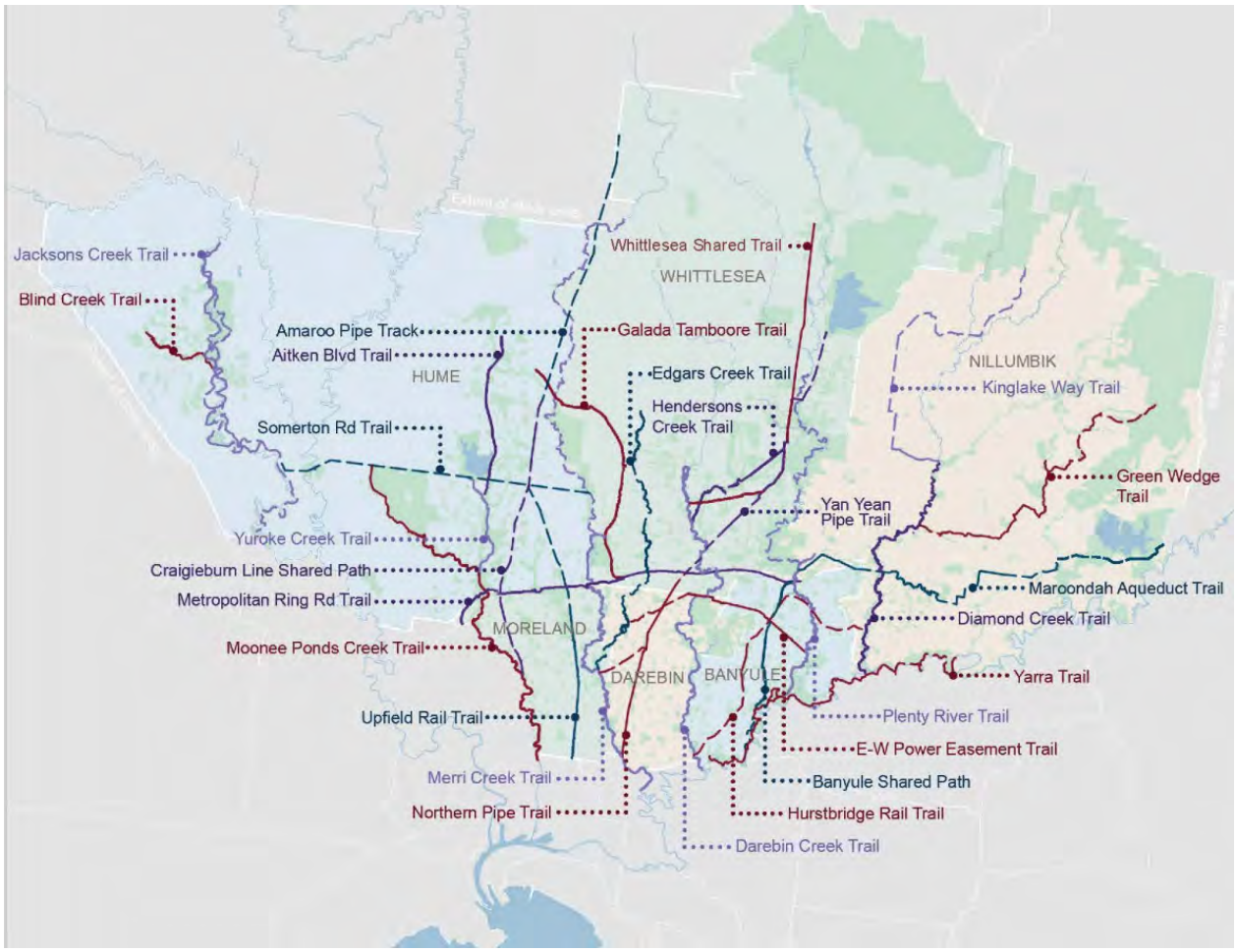


Figure 12 The northern Melbourne regional trails

Source: Northern Trails Strategy 2022

Some of the benefits of trails identified in the Strategy include:

- Social interaction
- Health benefits
- Environmental impact
- Economic benefits.

The Strategy had recommendations in six groups:

- Trail infrastructure
- Trail management
- Trail marketing
- Trail improvement projects
- Prioritisation of projects
- Trail improvement filters.

Table 1 indicates trails in Whittlesea and recommendations in 2016 Strategy and their current status.

Table 1 Whittlesea and recommendations in 2016 Strategy and their status

Source: Northern Trails Strategy 2022

Trail	Project description	Status
Merri Creek Trail	New trail construction (0.34km) from the Merri Creek Trail to the Whittlesea Public Gardens	Constructed
Whittlesea Rail Trail (also known as the Whittlesea Shared Trail)	New Trail construction (16.8km) along the train line from McDonalds Road, South Morang to Laurel Street, Whittlesea	No design undertaken to date

Trail	Project description	Status
Merri Creek Trail	Upgrade existing trail in the City of Whittlesea from granitic sand to concrete	
Hendersons Road Drain Trail	Upgrade existing trail in the City of Whittlesea from granitic sand to concrete	
South Morang Pipe Trail	Upgrade existing trail in the City of Whittlesea from granitic sand to concrete	

Source: Northern Trails Strategy 2022

4.1.19 Northern Region Transport Strategy (NCA) 2020

The *Northern Region Transport Strategy* aims to address the transport and land-use challenges in the Northern Region, which consists of seven Local Government Areas in Melbourne. The region faces several transport challenges, as identified through one-on-one interviews and public consultation. These include:

- Unreliable or unavailable public transport
- Poor connections in growth areas
- Inadequate cycling infrastructure
- Poor East-West connections
- Congestion
- Safety concerns on public transport.

The key headline issues that have been agreed upon by governments and key stakeholders in the Northern Region are as follows:

- Access to jobs and activity through connectivity
- Growth and capacity for travel needs
- Neighbourhood and places
- Freight and associated job impact
- Safety and security.

The NCA Northern Regional Transport Strategy directions would appear to be broadly aligned with a future ITP as it addresses transport challenges, emphasises key issues like access, growth, safety, and involves collaboration to create a comprehensive and efficient transport network.

4.1.20 Community Plan 2021 – 2025

The City of Whittlesea's *Community Plan* for 2021-2025 shapes its future based on input from the community. It explains the directions for action Council will take, including:

- Preventing family violence
- Addressing climate change
- Promoting fairness
- Improving access to services
- Increasing job opportunities
- Communicating inclusively
- Stopping discrimination against people with disabilities.

The Council engaged with people from all parts of the City of Whittlesea, including diverse groups, to shape their plans for the next four years. The community strongly supported ideas like:

- More parks
- Better road safety
- Support for local businesses
- Biodiversity conservation
- Improved waste management
- Cleaner streets.

The community's goals and preferences in the City of Whittlesea's *Community Plan* have some overlap with the potential future directions of an ITP. These include priorities such as road safety, better transport options, and eco-friendly practices.

4.1.21 Municipal Public Health and Wellbeing partnership Plan 2017 - 2021

The *Health & Wellbeing Partnership Plan* (HWPP) is a roadmap for health and wellbeing planning in the

City of Whittlesea from 2017 to 2021. Actions in the Environments for Health framework includes:

- Built Environment – considering elements such as public transport, road infrastructure, housing, and recreational facilities.
- Social Environment - Addressing factors like community cohesion, social support, inclusivity, and freedom from discrimination.
- Economic Environment - Focusing on aspects like employment opportunities, job stability, reasonable commuting times, and financial well-being.
- Natural Environment - Covering areas related to access to green spaces, air quality, and strategies to combat climate change.

Just 27% of households believe that Whittlesea has great cycling facilities.

The Whittlesea area has experienced rapid residential development, leading to an imbalance in transport infrastructure. Cars dominate travel, causing consistent issues with traffic management. Community surveys highlight traffic management as a key concern. Residents also report low levels of physical activity and limited opportunities for active travel like walking and cycling. These statistics underscore the need for better transport options, improved safety, and increased physical activity in the community.

Long term, desirable transport outcomes include:

- More residents using active transport
- Improved safety for pedestrians and cyclists.
- Reduced traffic congestion
- Increased physical activity among the population
- Enhanced walkability of the area.

Short term transport outcomes include:

- Prioritisation of active travel in neighbourhood planning
- Greater accessibility to cycling and walking opportunities
- Implementation of lower speed limits (e.g. 40km/h) in Activity Centres.
- Improved behaviour and attitudes of drivers toward vulnerable road users
- Improved aesthetics and safety along key pedestrian routes, at stations, and public transport hubs
- Development of a strong and sustainable community transport sector.

The Health & Wellbeing Partnership Plan (HWPP) is closely linked to the potential directions of a future ITP as it addresses various aspects of transport and its impact on community health.

4.1.22 Whittlesea Disability Action Plan

The plan highlights the importance of accessible public transport for people with disabilities so they can easily travel to school, work, and social events. In the City of Whittlesea, residents with disability raise three key challenges to accessing public transport:

- Limited and disconnected public transport.
- Unequal distribution of accessible public transport, and;
- A lack of transport stops in safe locations, with proximity to services and venues.

However, the transport needs of people with disability extend beyond accessible public transport. People with severe physical impairments and many with cognitive, intellectual, sensory and psychosocial disabilities have limited capacity to use public transport safely and independently. Affordable and reliable community transport is essential to their wellbeing and quality of life. Further, a majority of the municipality's NDIS participants rely on commercial service providers for transport and short vehicle trips are crucial to their social and economic participation and access to services. Accessible car and bus parking, longer parking times and short walking distances to destinations are needed to support these user journeys. The Disability Action Plan is related to an ITP as it focuses on making the transport system more accessible to people with disabilities. It aligns with broader strategies and aims to address issues like limited availability and unequal distribution of accessible transport.

4.1.23 COVID-normal Public Transport Safety, 2022

This report presents findings from a survey commissioned by the City of Whittlesea to assess public transport accessibility, safety, and usage intentions in their municipality. Key findings are:

- About half of respondents used public transport, mainly trains.
- COVID-19 led to reduced usage, but it's not a major future concern.
- Most felt safe during the day but slightly less so at night.
- Improved safety, more frequent services, and better connectivity could boost use.
- Personal preference was the main reason for not using public transport.
- COVID-19's impact on work arrangements might influence future transport choices.

In summary, the report highlights the importance of safety, service frequency, and personal preference in public transport use, with potential shifts due to changing work arrangements. It highlights the need to improve safety, increase service frequency, and consider changing work patterns to encourage more people to use public transport. These factors are essential for creating a more efficient and user-friendly transport system in line with the goals of an integrated transport plan.

4.1.24 Integrated Movement and Place Plan for Whittlesea 2022

The *Integrated Movement and Place Plan for Whittlesea* has been developed to ensure the streets in Whittlesea are designed to support Council strategic direction, as set out in *Whittlesea 2040*. By designing streets that function more effectively as high quality, people orientated places, as well as creating better outcomes for sustainable transport, Whittlesea will be better placed to achieve the ambitions set out in *Whittlesea 2040.*

The Plan identifies that Whittlesea faces transport-related issues such as:

- Climate emergency
- Population growth and increased travel demand
- Health impacts from a car dependent transport network
- Social and cultural barriers to walking and cycling.

The *Integrated Movement and Place Plan* highlights the need to aligning planning mechanisms with the 20 minute neighbourhood concept and dramatically lower transport emissions. It also serves to highlight that car dependence is the key contributor to traffic congestion.

The Plan establishes a strategic framework that integrates the movement and place concept into how the city plans and designs its networks, streets, and places. A significant part of Whittlesea's north-west region is designated for growth, with an expected population of up to 180,000 residents, workers, and visitors. The Precinct Structure Plans (PSPs) offer guidance on how various elements such as road networks, new town centres, railway stations, community facilities, and extensive residential areas will be developed over time.

Completed PSPs offer a level of assurance regarding future road networks, while the *Ultimate Movement & Place Network* (see Figure 13) prioritises direct routes to key destinations such as town centres, green spaces, schools, community amenities, and connections to other active transport routes outside the PSP-designated zones.

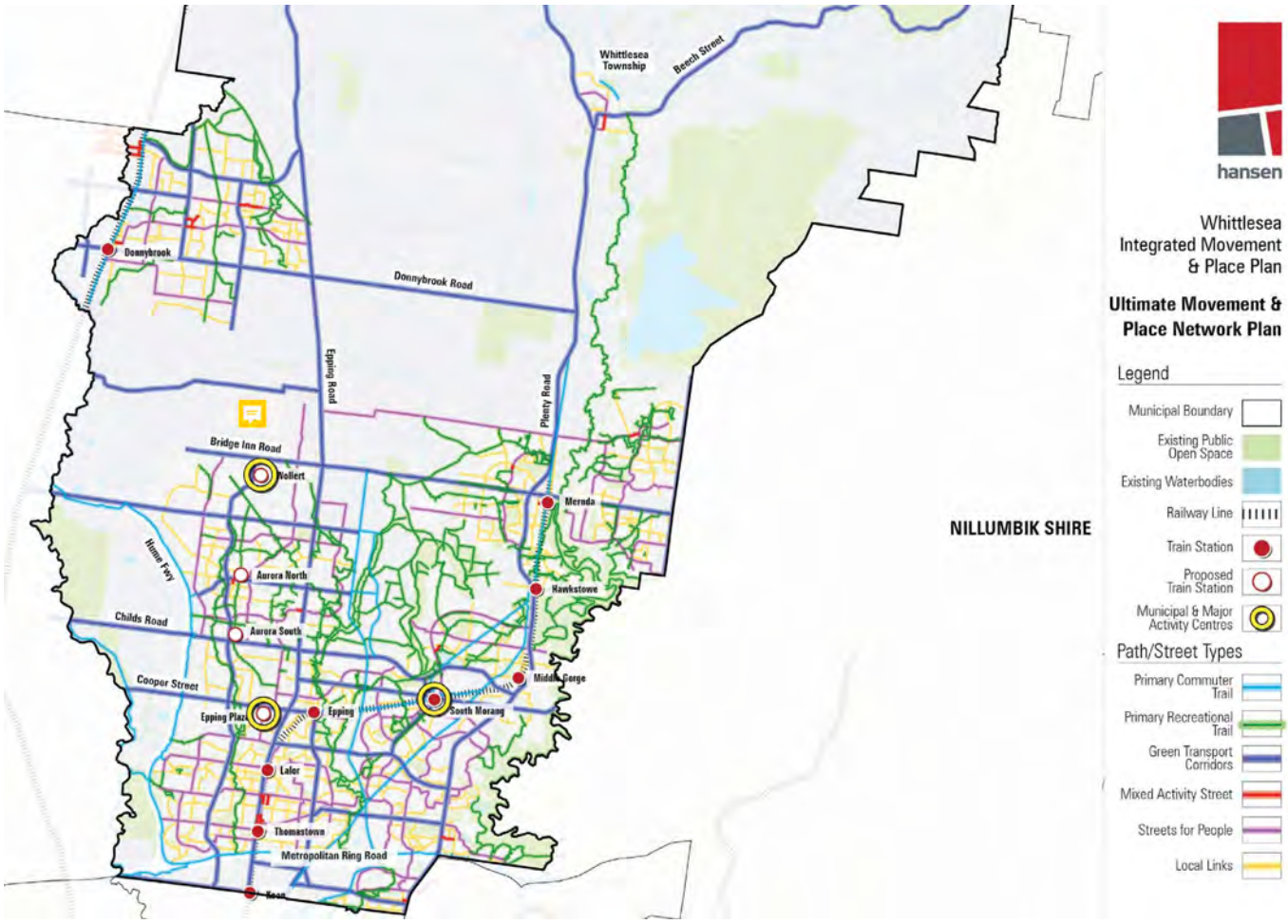


Figure 13 Ultimate movement and place network

Source: Integrated Movement and Place Plan for Whittlesea 2022

The report discusses four street types (see Figure 14):

The Plan identifies different types of street typologies and how these have evolved over time. These are characterised as follows:

- Traditional Grid: Straight roads, good for walking permeability but may limit access.
- Post War Suburban 1: Like traditional grid but harder to navigate due to cul-de-sacs.
- Post War Suburban 2: Designed for cars, not pedestrians or cyclists, promoting car dependency.
- Fused Grid: Mix of straight and wavy roads, offers varied routes and safety but fewer access points and longer walks.

Figure 14 Street types

Source: Integrated Movement and Place Plan for Whittlesea 2022

Moreover, the report introduced Street/Path User Profiles summarise key aspects of users' travel scales, typical destinations, and considerations for different path users in Whittlesea. It recognises ten different path user groups:

- Active Pedestrians
- General pedestrians
- Place dwellers pedestrians
- Commuting Cyclists
- Recreational Cyclists
- Horse Riders
- Public Transport Users
- Freight vehicle
- Servicing vehicle
- General traffic vehicle.

Their typical travel scales, destination types, and key considerations is different for each user group.

This Plan is closely aligned with the needs of a future ITP for Whittlesea, as it addresses key transport challenges such as climate concerns, population growth, and health benefits of active transport.

4.1.25 Positive Ageing Strategy 2016 - 2025

The *Positive Ageing Strategy* aims to promote active and healthy ageing for residents aged 50 and over. It seeks to enhance access, safety, and affordability of public and community transport, which aligns with the Integrated Transport Plan's goal of creating efficient and accessible transport networks.

It identifies several transport-related issues that affect older people's quality of life and wellbeing. These include:

- Car dependency and reduced capacity to drive as one ages.
- Lack of infrastructure (e.g., toilets, seating, shelter, paths) in public places
- Lack of accessible and affordable public and community transport
- Lack of familiarity/confidence in using public transport
- Affordability.

The Strategy proposes several strategic focuses to address these issues:

- Promoting enhanced accessibility, safety, affordability, and age-friendly features in public and community transport choices
- Exploring enhancements in infrastructure to facilitate walking and the use of public areas.
- Implementing principles that considers the needs of older individuals to facilitate their mobility across the municipality.

The aim is to improve access to a variety of transport options to assist community participation, maintain social engagement, and access facilities and services.

4.1.26 Advocacy fact sheets

The City of Whittlesea has developed a series of advocacy fact sheets across a range of transport issues, and these are briefly summarised below.

4.1.26.1 Bus service improvements

This fact sheet emphasises the urgent need for improved bus services in the Epping to Wollert corridor due to rapid population growth and limited public transport options. Current bus services are insufficient, leading to congestion and reduced liveability. The proposal seeks to enhance convenience, increase capacity, and provide better access to key destinations, aligning with the City of Whittlesea's vision for a more accessible community. Immediate action is crucial to meet the transport needs of the growing population until the planned Wollert Rail becomes operational by 2030.

4.1.26.2 Rail extension to Wollert

This fact sheet emphasises the need for a rail extension to Wollert by 2030 to address traffic congestion and limited public transport access in Epping North and Wollert. Delaying it until 2040 would result in significant economic and social losses. The study also highlights substantial benefits, including travel time savings, reduced congestion, increased property values, higher salaries, and better job access.

4.1.26.3 Epping road upgrade

The City of Whittlesea is seeking the State Government to investment in the duplication of Epping Road, between Craigieburn Road East and Bridge Inn Road, addressing traffic congestion and safety issues in the rapidly growing suburbs of Epping North and Wollert. This expansion will stimulate the local economy, create jobs, and enhance road safety while accommodating projected population growth. The project aligns with the Council's vision for a more accessible and liveable community and is said to be essential for the region's development and economic prosperity.

4.1.26.4 Tram route 86 extension

The proposed Tram Route 86 (T86) extension is a critical development issue for the City of Whittlesea. Traffic congestion, especially on Plenty Road, is a pressing concern for our residents, impacting their daily lives. Existing bus services are inadequate for Whittlesea's growing community, which includes education and employment centres like University Hill and RMIT. To address these challenges, a higher-capacity tram extension is essential. This project will improve access to key centres like RMIT Bundoora and La Trobe University while offering convenient transfers for Mernda train users at South Morang Station.

4.1.26.5 Craigieburn road east duplication

The advocacy sheet highlights the pressing issue of population growth in Epping North and Wollert, leading to congestion and safety risks on Craigieburn Road East. The proposed solution involves duplicating and urbanising this road segment between Epping Road and the Hume Freeway. This initiative promises numerous benefits, including improved traffic flow, enhanced road safety with dedicated cycling lanes and pedestrian facilities, new bus routes for better access to town centres and employment hubs. An estimated travel time savings of $295 million is included in the fact sheet.

4.1.26.6 Donnybrook Road duplication

The City of Whittlesea community advocates for the duplication and urbanisation of Donnybrook Road, citing the increasing population and congestion concerns in the region. With the population is forecasted to surge from 995 to 50,350 in Donnybrook and 2,860 to 18,670 in Kalkallo by 2041, the need for improved road infrastructure is considered pressing. Safety concerns encompass traffic collisions, pedestrian access to schools, and the road's inappropriateness for high traffic volumes. Duplication and upgrades are deemed essential to cater to future traffic demand. Higher frequency, faster bus routes are also required, as well as measures to enhance pedestrian safety. The travel time savings are calculated at $91 million.

4.1.26.7 E6 Freeway construction

The City of Whittlesea advocates for the construction of the E6 Freeway, a 23km north-south corridor connecting the Hume Freeway to the M80 Ring Road. This project aims to alleviate traffic congestion, provide connectivity for residents in growing areas such as Epping North, Wollert, Donnybrook, Kalkallo, Beveridge, and Wallan, and enhance road capacity on key arterial routes. The E6 Freeway would also serve as a designated route for heavy vehicle freight movements, support freight traffic to/from the Beveridge Intermodal Freight

Terminal and Melbourne Airport and stimulate economic growth in the Northern Growth Corridor.

4.1.26.8 Findon Road duplication and extension

The City of Whittlesea community is proposing the duplication and extension of Findon Road, which is planned as an essential east-west arterial road to provide connectivity and alleviate traffic congestion in the municipality. Currently, the primary east-west route is McDonalds Road, which has exceeded its capacity and causes traffic issues. The proposed project seeks to extend and duplicate Findon Road from Williamsons Road to Plenty Road, transforming it into a four-lane divided road with pedestrian footpaths and cycling infrastructure. This expansion aims to improve road capacity, reduce congestion, and enhance road safety by providing better pedestrian and cyclist facilities. With projected population growth in the area, the City of Whittlesea asserts the urgency of completing this upgrade by 2030 to improve residents' well-being and overall liveability.

4.1.26.9 Railway line to Wollert

The Whittlesea community is advocating for the State Government's support in securing land for a railway line extension from Lalor to Epping North and Wollert, addressing the current absence of reliable public transport services in these burgeoning communities. The proposal stems from predictions of a significant population surge, estimating an increase from 53,000 residents today to 115,000 by 2040. To facilitate this expansion, Council suggests leveraging Public Acquisition Overlay tools to safeguard the train corridor promptly. By doing so, they aim to protect the corridor for public transport, minimise acquisition costs, provide clarity to property owners, and facilitate comprehensive planning for active travel infrastructure. Additionally, they have outlined a series of commitments, including land acquisition, initiating a feasibility study, and aligning plans with other transport projects. The document emphasises the urgency of improving public transport to alleviate the increasing traffic congestion and enhance residents' quality of life and economic opportunities.

4.1.27 Community Priorities Focus Group

The *Whittlesea Community Priorities Focus Group* was held in June 2023. The purpose of these focus groups was to inform the development of three pivotal strategies:

- the Connected Communities Strategy
- Liveable Neighbourhood Strategy, and
- Long-Term Community Infrastructure Plan

Each of these documents align with the community's vision for *A Place for All* in 2040.

A total of 64 community members applied to participate, with 25 selected based on eligibility and diversity criteria. The focus groups employed a structured format with discussions on specific topics related to the strategies, fostering engagement and idea-sharing among participants. Key learnings included the importance of information sharing, active participation, and community engagement. The report underscores key themes emerging from the discussions, including:

- Improving communication
- Enhancing public spaces
- Promoting diversity and inclusion
- Supporting youth
- Addressing housing issues
- Vibrate town centres.

These insights influenced the formulation of strategies that will guide the City of Whittlesea's actions for the next 5-10 years, ensuring they align with the community's needs and aspirations.

The Whittlesea *Community Priorities Focus Group* discussions are closely related to an ITP, as they emphasise the importance of accessible public spaces, better transport options, affordable housing near public transport, and vibrant town centres. All of these features are important elements in a future ITP.

4.1.28 Community Electric Vehicle Transition Plan, 2022

The Northern Councils Alliance (which includes Whittlesea City Council) developed a plan to grow the availability of public charging infrastructure, in

order to reduce greenhouse gas emissions. The report included:

- An assessment of the future demand for EVs and charging infrastructure
- A characterisation of the different EV charging markets and charger types, including costs
- A prioritisation framework to assist NCA understand which activity centres are likely to have the highest demand for charging
- A recommended roll out plan for EV chargers across the NCA region
- A set of recommendations designed to bring about wider improvements in the sustainability of the transport system in Melbourne's north.

4.2 State government policies and strategies

A concise summary of relevant Victorian policies and strategies is included in this section, along with a statement of their relevance to the future ITP.

4.2.1 Movement and Place Framework

Movement and Place is a framework that is used in a growing number of state and local governments, both in Australia, New Zealand and a number of other countries.

***Movement and Place* recognises the disconnect that transport and land use planning pose and offers a method for reconciliation.**

At the heart of *Movement and Place* is a recognition of the dual role that streets perform in terms of being a *movement* corridor and a *place* in itself. Implicit in the Movement and Place framework is an acknowledgement that in past decades, the role of the motor vehicle and vehicle throughput has been the primary goal underpinning street design, and this can at times be to the detriment of the *place* function that many streets perform, as well as their ability to support walking and cycling.

The frameworks have also been integrated into the planning system to help resolve the existing conflicts in the evolving role of streets to provide better outcomes for place-based outcomes (e.g., urban vibrancy). Although they are applied state-wide, the one-size-fits-all matrixes are city-oriented, leaving its application outside the metropolitan boundaries less significant.

Figure 15 captures Austroads work to combine Movement and Place with Safe Systems, and is broadly in line with the work conducted by the Victorian government on Movement and Place.

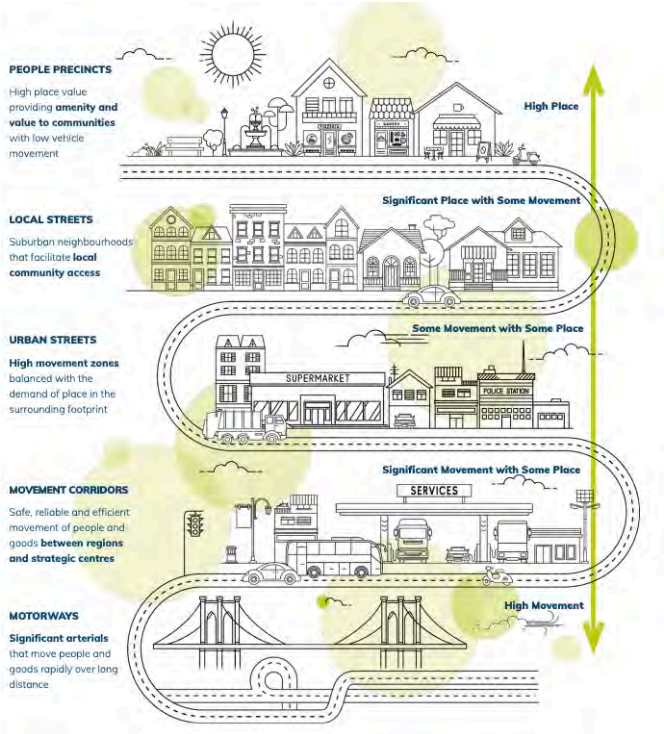


Figure 15 Movement and Place with Safe Systems, National Road Safety Strategy 2021 – 2030

Source: Corben (2020)

4.2.1.1 Victorian Movement and Place

The Victorian Government has acknowledged the evolving approach to the planning of roads in Victoria, from one in which keeping vehicles moving was the overwhelming priority, to one in which the *place* function of streets is integral to the design outcome.

The Movement and Place (M&P) Framework, developed jointly by VicRoads and Transport for Victoria enables local government and the community understand the dual role that streets perform in terms of being a movement corridor and a place in itself. Streets provide for movement of

people and goods, and serve as places for people to recreate, socialise, shop etc. There is a natural tension between these two functions, therefore careful consideration is required to determine a street's level of priority, from movement and place perspective.

The Movement and Place framework consists of four broad modules, of which the first two modules are on a strategic level and the third and fourth module on a project or local level.

- Module 1: Network classifications matrix
- Module 2: Performance Assessment
- Module 3: Toolbox & Design Guides
- Module 4: Options Assessment

Figure 16 illustrates the graphic used in Module 2 of Victoria's Movement and Place framework. Many local governments in Victoria have taken an interest in Movement and Place, and seeking to use it to create better outcomes for active transport.

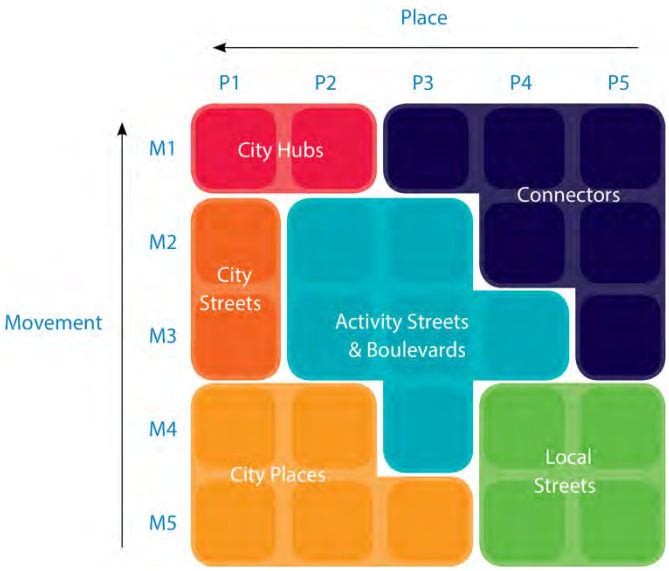


Figure 16 Movement and Place matrix for Victoria
Source: Victorian State Government

The core of the Movement and Place framework is shown in Figure 17. This highlights that instead of only viewing roads through a prism of movement, we can consider a matrix of, each one with a specific movement designation and a specific place designation. We can use this matrix to compare and contrast the way streets are performing today to how we would like them to perform in the future.

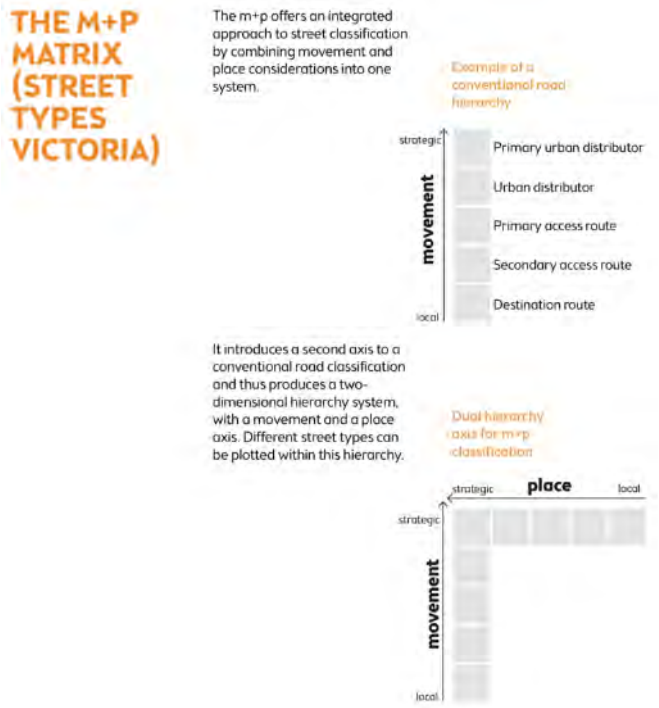


Figure 17 Understanding Movement and Place
Source: Department of Transport

4.2.2 Safe Systems Approach

The Safe Systems approach refers to a transport planning/road safety theory in which the fallibility of the road user is acknowledged, with the intention of designing a forgiving system. Such an approach has received widespread policy approval in terms of its ability to reduce the risk of road traffic injury and has now been adopted by state governments around Australia, including Victoria. The Safe Systems approach is highly complementary to *Vision Zero* – in which any fatality or serious injury is unacceptable, and road agencies aim to bring road death and serious injury to zero by 2050. The underlying philosophy behind these approaches and the practical policy implications of this are necessary considerations for active travel and will be embedded in the subsequent stages of this project.

4.2.3 Plan Melbourne and 20 minute neighbourhoods

Plan Melbourne 2017-2050 is the Victorian State Government's metropolitan strategy for Melbourne. It seeks to '*plan to manage growth in the city and suburbs to the year 2050*' and '*to integrate long-term land use, infrastructure and transport planning, and, in doing so, meet the city's future*

environmental, population, housing and employment needs.'

The purpose of Metropolitan Activity Centres is '*to provide a diverse range of jobs, activities and housing for regional catchments that are well served by public transport.*' Plan Melbourne views these centres as playing a major role in delivery of government services, while also providing retail and commercial opportunities.

There are some related principles that are related to Whittlesea Integrated Transport Plan:

- Environmental resilience and sustainability
- Living locally – 20-minute neighbourhoods
- Strong and healthy communities.

In order for Melbourne to maintain its global connectivity and liveability, a reduction in car use and an increase in walking and cycling is required.

While Plan Melbourne 2017-2050 has no transport projects specific to Whittlesea, many transport objectives are relevant to Whittlesea.

- Outcome 3: an integrated transport system connecting people with jobs and facilitating commerce.
- Outcome 5: focuses on inclusive, vibrant, and healthy neighbourhoods.
- Outcome 6: refers to sustainability and resilience of Melbourne which is related to micromobility, given that small footprint transport is also low carbon transport.

Outcome 3 of Plan Melbourne is for Melbourne to have an integrated transport system connecting people with jobs and facilitating commerce.

Of relevance to Whittlesea, Policy 3.1.6 is to support cycling for commuting. Direction 3.3 and 5.1 outlines the policy of the 20-minute neighbourhood. This aims to create neighbourhoods which contain all necessary services, recreation, and social activities, as well as personal business and education.

The 20-minute neighbourhood aims to create neighbourhoods which contain all necessary services, recreation, and social activities, as well as personal business and education.

20-minute neighbourhoods increase travel choice as most local needs are within a walkable or cyclable distance. The creation of areas which are pedestrian friendly, with a network of cycling links, and have transport choice is critical to achieving 20-minute neighbourhoods.

Policy 5.2.1 seeks to incorporate walking and cycling into everyday routines. The creation of environments that are supportive of micromobility options helps to support this policy.

Policy 6.1 focuses on creating low-carbon urban environments, aligning with Victoria's objective of net zero greenhouse gas emissions by 2050. This policy underscores the importance of integrating sustainable micromobility options as a key element in reducing carbon emissions and promoting environmentally friendly transport alternatives.

4.2.4 Victorian Transport Integration Act 2010

The Act aims to establish a framework for an integrated and sustainable transport system in Victoria, aligning with the aspirations of Victorians for a system that fosters inclusivity, prosperity, and environmental responsibility.

The Act outlines several key objectives for the transport system in Victoria:

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

- Safety and health and wellbeing.

A future ITP should be designed to align with the objectives outlined in the Act, working towards a comprehensive and sustainable transport system that benefits the community.

4.2.5 Victorian Gender Equality Act 2020

The *Gender Equality Act 2020* aims to promote gender equality in various areas. The Act has several objectives, including:

- Promote gender equality and improve women's status.
- Remove systemic causes of gender inequality in policies, programs, and services.
- Recognise that gender inequality can overlap with other forms of discrimination.
- Fight disadvantage, stigma, prejudice, and violence, making structural changes for different genders.
- Boost economic and social participation for all genders.
- Uphold the right to equality as per human rights and anti-discrimination conventions.

The Gender Equity Act 2020 required a gender impact assessment (GIA) for public sector policies/strategies. It has four major steps:

- Define the issues and challenge assumptions
- Understand your context
- Options analysis
- Make recommendations.

The first two step are covered throughout this report. It is crucial to emphasise that the responsibility for conducting a comprehensive Gender Impact Assessment (GIA) is with the Council whenever they develop an integrated transport strategy.

A future ITP should be consistent with the objectives included in the *Gender Equality Act 2020* Act.

4.2.6 Climate Change Act 2017

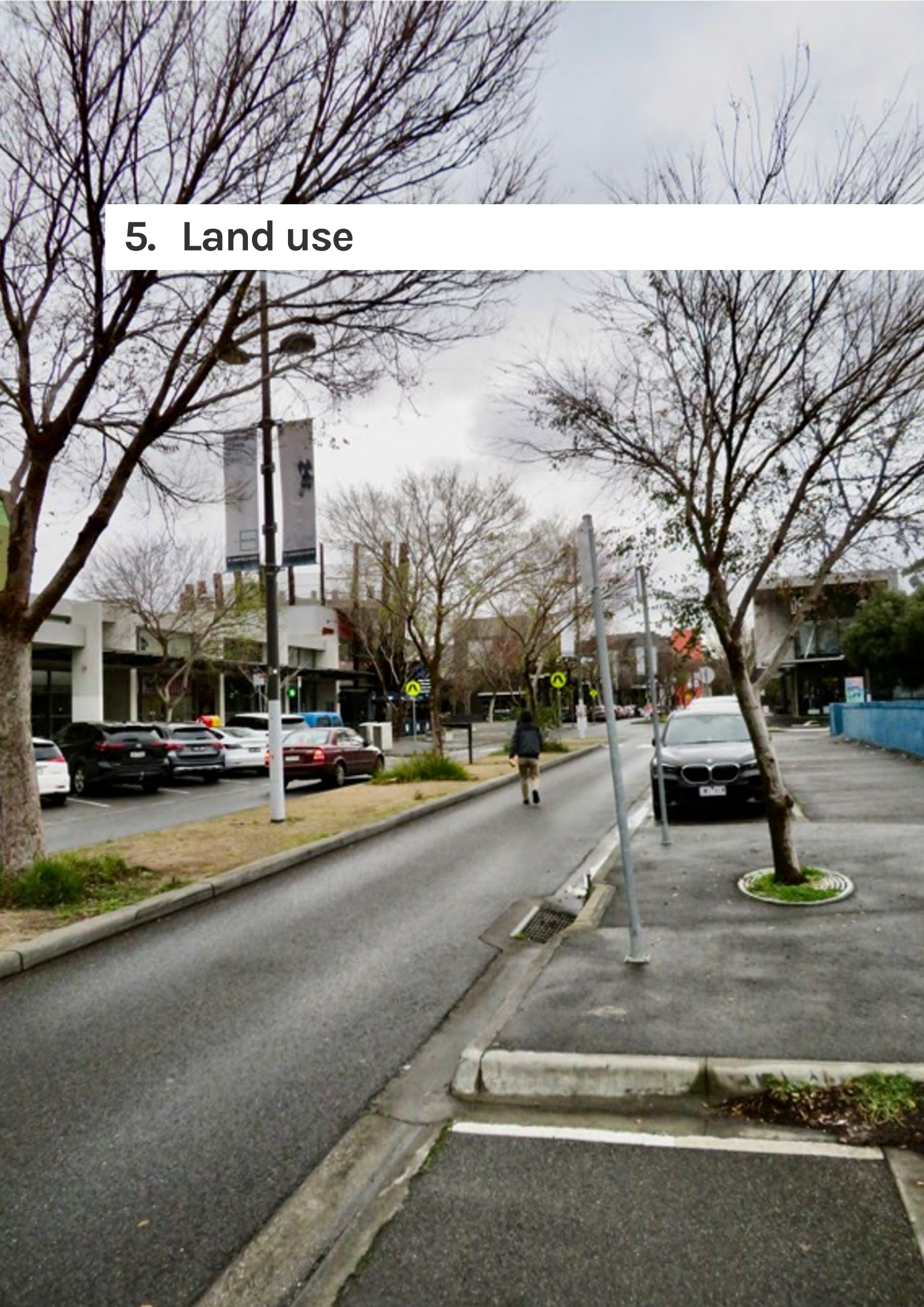
In 2017, the Victorian Parliament passed the *Climate Change Act* 2017, which includes a long-term goal of achieving net zero greenhouse gas emissions by 2050. It recognises that everyone, including government, businesses, and individuals, play a role in reducing emissions and preparing for climate change impacts. It provides a clear framework for action, setting targets for a net-zero emissions economy by 2050. Businesses are encouraged to make voluntary pledges to reduce emissions, and the Act supports their transition. Communities are informed about climate risks and progress, while local governments are not mandated but encouraged to participate in emissions reduction efforts. Overall, the Act aims for a coordinated and proactive approach to tackle climate change and build a resilient future for Victoria.

Adaptation Action Plans (AAPs) under the Climate Change Act 2017 aim to enhance Victoria's resilience and prepare for the inevitable impacts of climate change. AAPs will be developed every five years, covering key systems like:

- Built environment
- Education
- Health services
- Natural environment
- Agriculture
- Transport
- The water cycle.

The future ITP must be developed in a manner that supports a reduction in transport emissions. Based on current trajectories, transport is expected to be the largest single source of emissions in around 2030.

5. Land use



This section describes the land use policies and legislation that influence transport behaviour. Land use has a powerful impact on travel patterns. Low density, single use zoning is associated with high levels of car use. Conversely, medium density, mixed use development, especially when coupled with high quality public transport, has been shown to diversity transport opportunities.

The *Whittlesea 2030 Strategic Community Plan* outlines the community's vision for the future of the City of Whittlesea. It envisions a future characterised by inclusivity, accessibility, economic growth, connected places and spaces, a focus on health and wellbeing, as well as sustainable living.

The City of Whittlesea faces significant urban growth, with its population expected to reach 300,000 by 2030. This growth is concentrated in developing areas such as Mernda/Doreen, South Morang, Epping North, Wollert, and Donnybrook/Woodstock. Managing this rapid expansion is a primary challenge, with a focus on protecting natural areas, addressing bushfire hazards, and planning for required infrastructure effectively.

The plan emphasises the development of activity centres, including Epping Central and Plenty Valley (South Morang), to meet housing, employment, and service needs.

Urban and building design, neighbourhood character, and environmentally sustainable design principles are key considerations to retain the municipality's character amid development. Furthermore, the plan aims to support integrated transport systems, including rail extensions and road networks, to connect residents and businesses efficiently. Melbourne Airport's proximity and access are recognised as valuable assets to maintain for the municipality's competitiveness.

The linkage between land use and transport/mobility patterns is a foundational concept in urban planning. It is based on the intricate relationship between the way land is developed and the transport choices individuals make. Some of the contributing factors are:

- Location of activities
- Land-use mix
- Access to different transport modes.

Sustainable land use planning can actively encourage sustainable, efficient, and environmentally responsible transport choices, leading to tangible benefits, including reduced traffic congestion, improved air quality, and an enhanced quality of life for residents.

5.1 Municipal framework plan and planning mechanisms

Figure 18 illustrates various land uses within the Whittlesea region, with the *urban growth boundary* predominantly located in the southern part of Whittlesea. Meanwhile, Figure 19 shows the existing and potential future transport infrastructure in Whittlesea. This shows that most future developments in transport infrastructure are concentrated within the urban growth boundary.

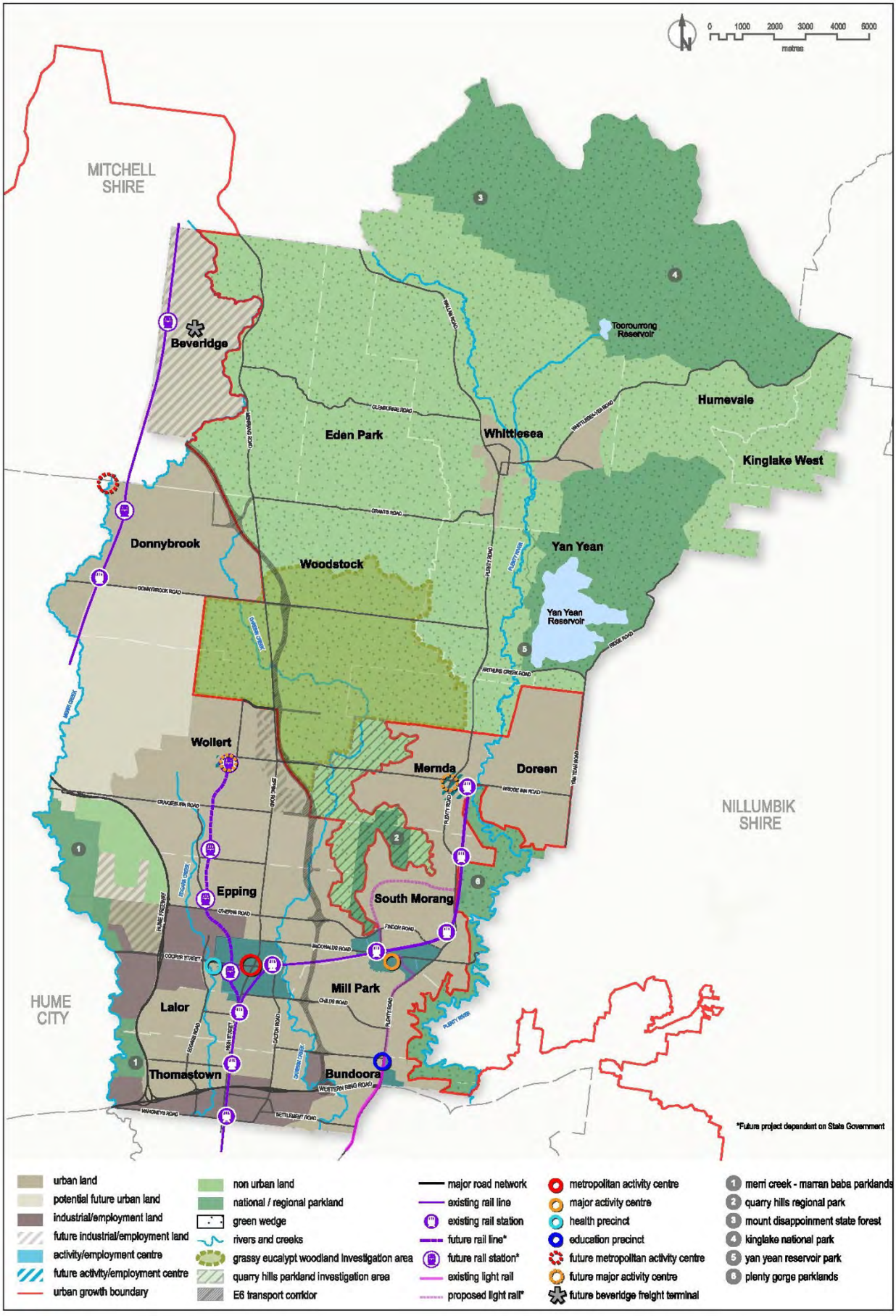


Figure 18 Municipal framework plan

Source: Whittlesea Planning Scheme

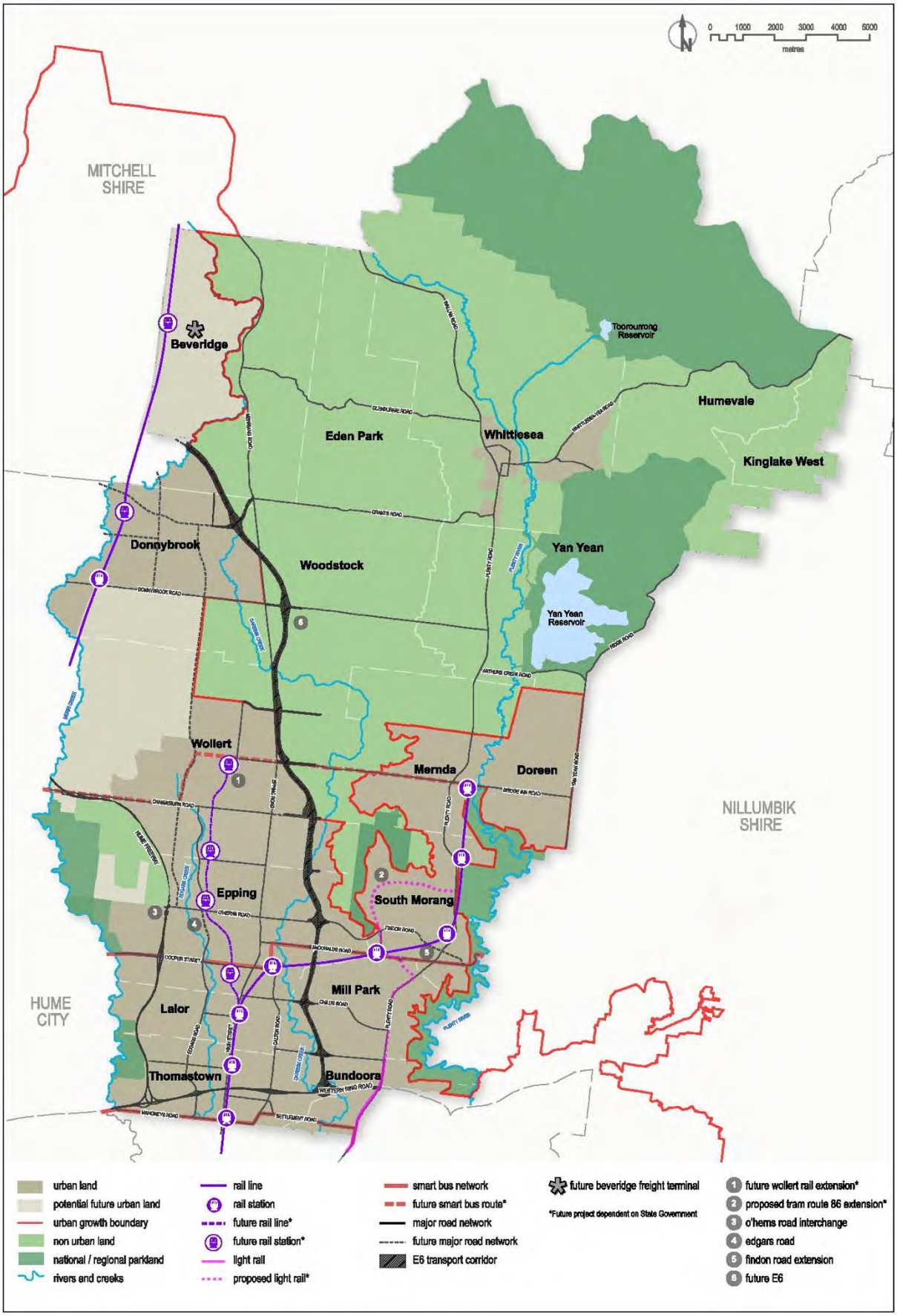


Figure 19 Current and potential future major transport infrastructure

Source: Whittlesea Planning Scheme

5.1.1 Car parking requirements

State-wide car parking provision requirements are set out in *Victorian Planning Provision Clause 52.06.* Councils may vary parking requirements through the implementation of Victorian Planning Provision Clause 45.09 Parking Overlay.

A *Car Parking Plan* must be prepared prior to a Parking Overlay. A Car Parking Plan is broader, looking at complimentary parking controls and planning mechanisms, such as:

- Parking permits for residents, workers and visitors
- Management of public and private parking (for example, through time restrictions or fines)
- Special rate charges – a requirement for land owners to pay towards the related provision of new spaces
- Shared car parking requirements.

Parking Overlays are intended to be used at a precinct level, rather than site-by-site, to vary parking requirements. They could be used for smaller precincts or areas of a Local Government Area, which is most common, or for an entire Local Government Area.

Parking Overlays are the implementation of a Car Parking Plan. The Schedule to the overlays contains the parking objectives, and other factors, such as:

- The number of car parking spaces to be provided for any use
- Financial contributions (such as a cash-in-lieu scheme) to be made as a way of meeting car parking requirements where appropriate
- Application requirements
- Design requirements
- Decision guidelines.

The number of car parking spaces can be used to vary what is required under 52.06. This may be in allowing a Column B rate of 52.06, or by establishing a new measure and rate for any use. It is also possible to establish a maximum amount of parking to be provided for any use, whereby a permit would be required to provide in excess of the maximum stipulated. The notion of *maximums* has gained considerable interest from land use and transport planners over the last decade. Maximum parking rates are considered an effective tool for lowering car use and reducing the space and financial cost of providing parking in excess of what is necessary.[2] For any use not defined, the standard parking rates of Column A in 52.06 apply.

5.1.2 Bicycle parking

Whittlesea's requirements are stipulated in state-wide Victoria Planning Provision Clause 52.34. The number of bike spaces required is not dependent on car parking spaces and varies depending on use. Additionally, Clause 52.34 requires the provision of showers for employees:
'If 5 or more employee bicycle spaces are required, 1 shower for the first 5 employee bicycle spaces, plus 1 to each 10 employee bicycle spaces thereafter.'

Change rooms can also be required, with:
'1 change room or direct access to a communal change room to each shower. The change room may be a combined shower and change room.'

Should Councils wish to increase cycling participation, higher rates must be provided. For dwellings, it may be more appropriate to require *one bicycle space per bedroom*.

5.2 Structure Plans

In this section, a review of the precinct structure plans in Whittlesea has been undertaken, with a focus on evaluating the associated requirements and guidelines for integrated transport plan.

5.2.1 Wollert Precinct Structure Plan

The Wollert precinct structure plan aims to create a self-sustaining community that embraces its natural heritage. It will have distinct urban villages, green networks, diverse housing, and sustainable living (see Figure 20). Town centres will be vibrant hubs, and the plan aims to create local jobs and future public transport options. Walkways and cycle paths will promote an active transport and a connected community.

[2] http://shoup.bol.ucla.edu/Trouble.pdf and https://tinyurl.com/e2ejth98

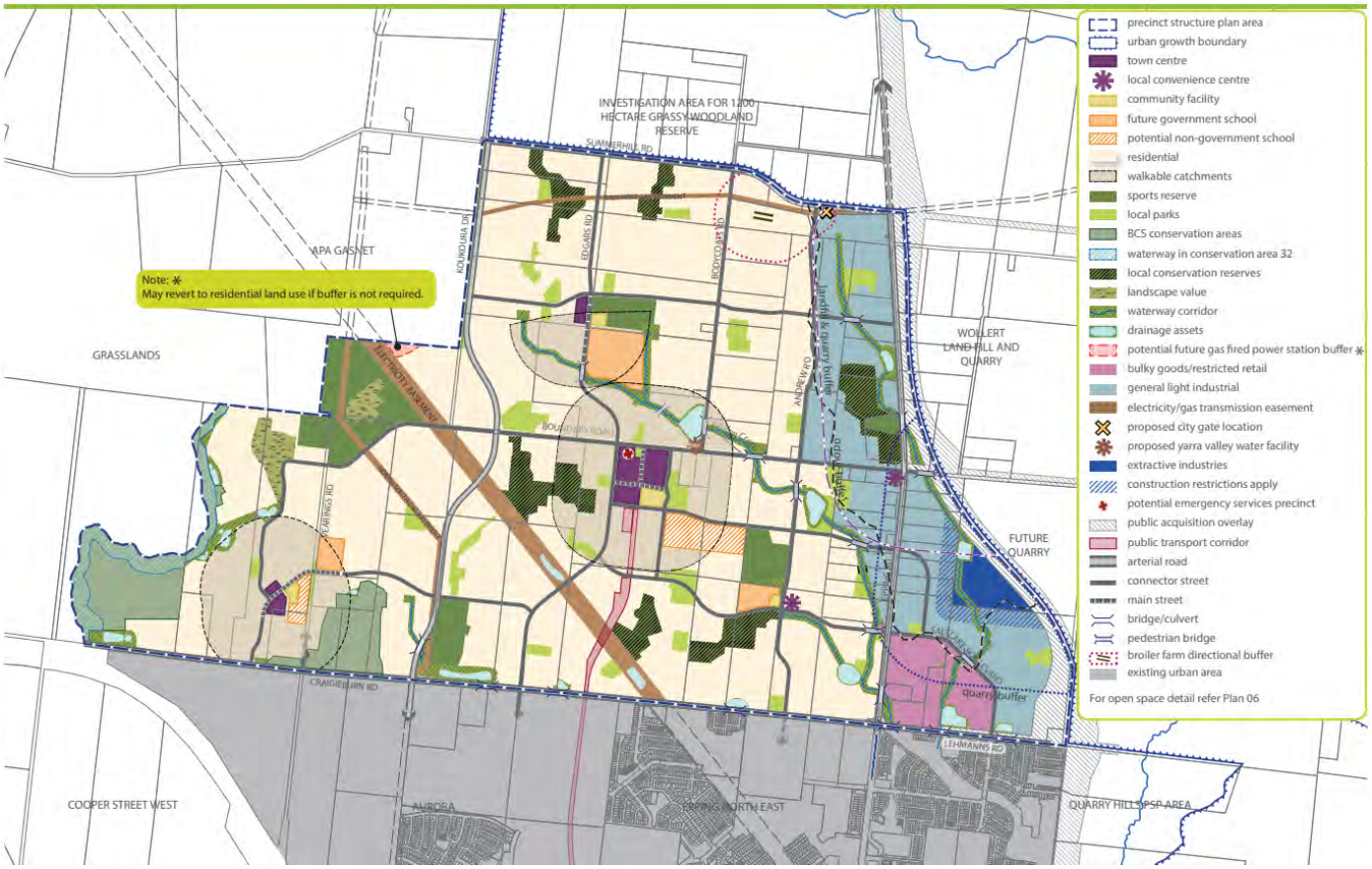


Figure 20 Future urban structure

Source: Wollert Precinct Structure Plan – June 2017 (amended February 2022)

Some of the transport and built environment related objectives of Wollert Precinct Structure Plan are:

- Create a walkable and bike-friendly transport network
- Design streets with natural and heritage features in mind
- Develop green pedestrian and cycle paths
- Enhance accessibility to surrounding networks and key destinations
- Reserve land for the Epping North Wollert transport corridor
- Offer diverse recreational spaces for everyone
- Connect open spaces with pedestrian and cycling trails
- Preserve indigenous trees and natural assets
- Orientate development toward open spaces for activity and diversity.

Some of the transport and built environment requirements and guidelines are:

- Public transport
  - Ensure intersections on bus routes and connector level streets accommodate ultra-low-floor buses
  - Incorporate bus stop facilities as integral components of town centres and activity areas
  - Target 95% of households within 400 meters of public transport
  - Design subdivision layouts to enable active interfaces with the Public Transport Corridor
  - Do not create street connections over the Public Transport Corridor.
- Walking and cycling
  - Design paths for walking and cycling with a focus on safety, wayfinding, surveillance, shade, seating, lighting, and secure crossings.
  - Give priority to pedestrian and cyclist needs, including footpaths, shared paths, safe

crossings, and smooth transitions between on- and off-street bicycle networks.

- Ensure shared paths along waterways adhere to flood level standards.
- Install bicycle parking facilities at key destinations.
- Guarantee cyclist safety at intersections through dedicated off-road paths.
- Develop off-road bicycle paths suitable for speeds up to 30km/h.
- Provide regular pedestrian crossings over creeks and waterways.
- Create end-of-trip facilities for large employment-based developments.

- Street network
  - Establish a permeable, low-speed local street network to ensure safe and convenient access.
  - Create a coherent, interconnected grid-based movement network.
  - Stage subdivisions to ensure timely connections and emergency access.
  - Configure school-abutting streets for slow vehicle speeds and pedestrian/cycling crossings.
  - Include indented car parking along connector streets and school/reserve areas.
  - Provide convenient access to the connector street network through neighbouring properties.
  - Grant vehicle access to lots fronting arterial streets via specific roads.
  - Maintain adequate separation between crossovers to accommodate on-street parking.
  - Ensure access to lots less than 7.6 meters wide is through rear laneways.
  - Design roundabouts for safety and connectivity.
  - Restrict slip lanes in pedestrian-heavy areas, emphasising cyclist and bus safety.

5.2.2 Donnybrook-Woodstock Precinct Structure Plan

The Donnybrook-Woodstock precinct aims to become an attractive and sustainable community. It emphasises preserving natural features and quality landscaping while connecting residents to transport and community facilities (see Figure 21). The development plan includes diverse residential neighbourhoods, and educational institutions to promote self-sufficiency (see Figure 22). Additionally, it leverages proximity to Donnybrook train station and potential future developments like Lockerbie Principal Town Centre and Lockerbie Train Station. The road network enhancements will improve connectivity with surrounding areas. A comprehensive street network will encourage walking and cycling. Priorities include preservation of natural and man-made features, including railway crossings, Merri Creek, and Darebin Creek corridors. These areas will also promote environmental conservation and recreational activities.

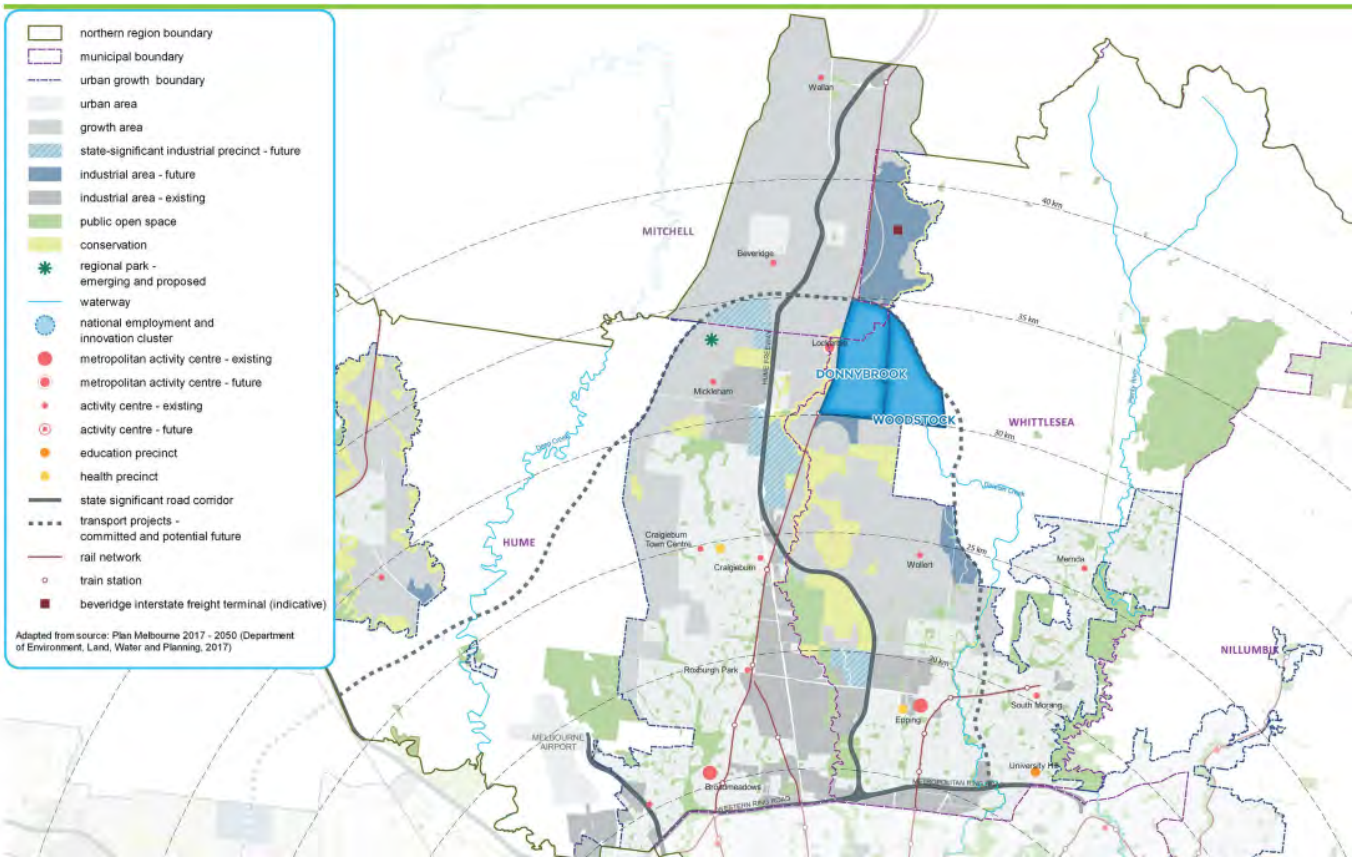


Figure 21 Donnybrook-Woodstock Precinct Structure Plan

Source: Donnybrook–Woodstock Precinct Structure Plan – October 2017

Some of the transport and built environment related objectives of Donnybrook–Woodstock precinct structure plan are:

- Create a well-connected transport network.
- Enhance connections to surrounding roads.
- Design roads that encourage walking, cycling, and public transport.
- Foster green spaces and views through road layouts.
- Reduce dependence on private cars.
- Ensure safe walking and cycling routes to train stations.
- Improve overall accessibility.
- Establish road and path networks that link to train stations.
- Promote unique places where nature and heritage intersect.
- Develop an accessible network of public open spaces.
- Connect open spaces with walking and cycling trails.
- Preserve scattered River Red Gums and indigenous trees.
- Respect historical and Aboriginal heritage in urban planning.
- Direct development toward open spaces.
- Thoughtfully plan urban interfaces with Merri Creek and Darebin Creek.
- Preserve and enhance the surroundings of Merri Creek and Darebin Creek.
- Keep most of Hayes Hill in its natural state.

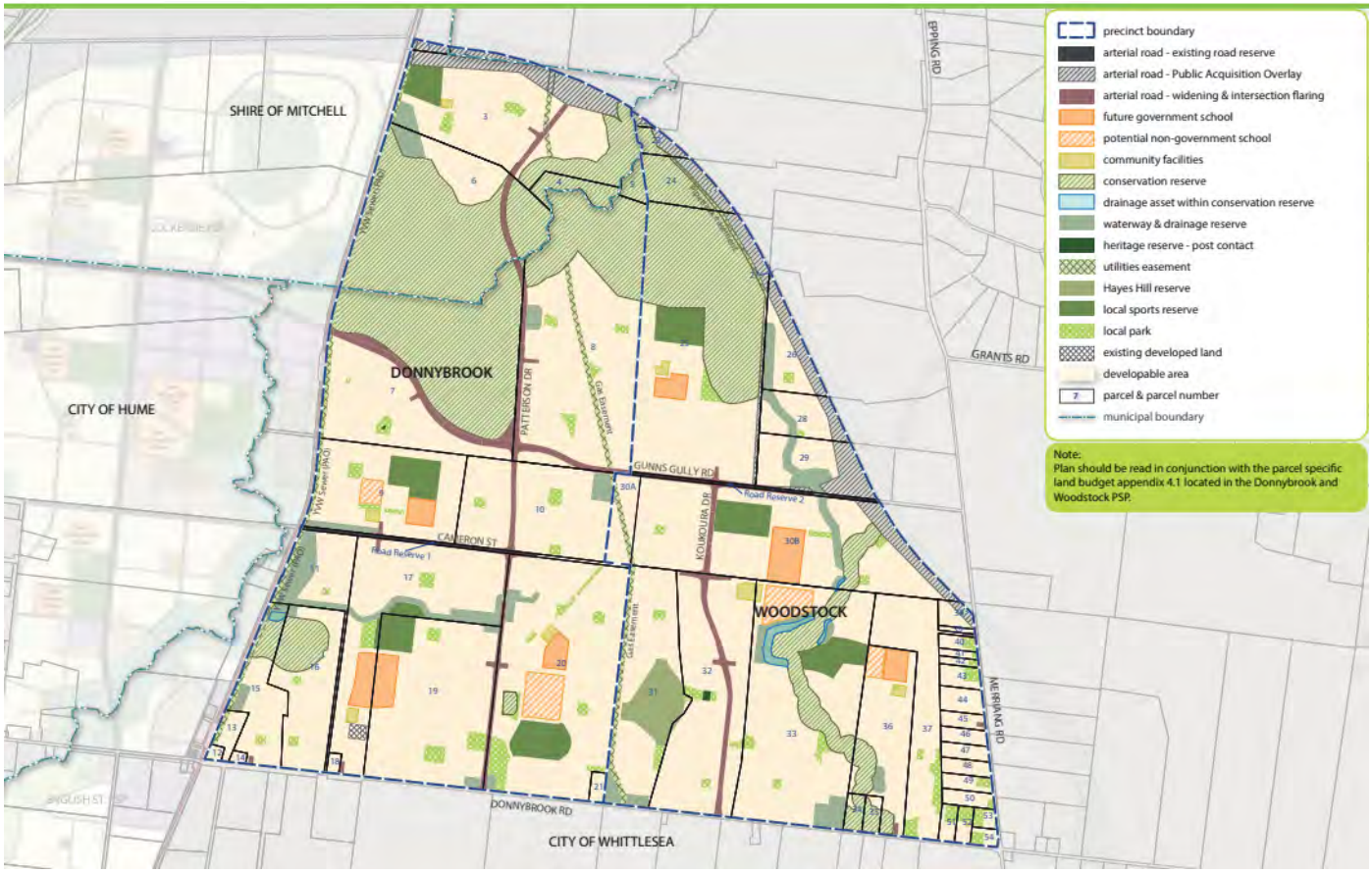


Figure 22 Land use budget

Source: Donnybrook–Woodstock Precinct Structure Plan – October 2017

Some of the transport and built environment requirements and guidelines are:

- Street Network Requirements:
  - Create safe walking and cycling networks.
  - Encourage walking and cycling.
  - Ensure convenient access to local amenities.
- Public Transport Requirements:
  - Accommodate buses and prioritise public transport.
  - Design bus stops for convenience.
  - Follow urban design frameworks near train stations.
- Street Network Guidelines:
  - Plan streets for easy access to destinations.
  - Keep street blocks short for safety.
  - Cross gas pipelines at 90-degree angles.
  - Avoid dead-end streets that hinder connections.
  - Follow signalised intersection guidelines.
  - Reduce driveway entrances on wider roads.
  - Prioritise streets near waterways.
  - Avoid slip lanes in busy areas.

These guidelines help create neighbourhoods that are pedestrian-friendly, connected, and accessible to public transport.

5.2.3 English Street Precinct Structure Plan

The English Street precinct's vision is to become a vibrant, self-sufficient urban area, featuring a mix of businesses, retail, community assets, and housing (see Figure 23). It aims to enhance the area's appearance, roadways, and connections to neighbouring communities, prioritizing high-quality landscaping and preservation of natural features like Merri Creek.

Some of the transport and built environment related objectives of English Street precinct structure plan are:

- Establish an integrated public open space network.

- Provide pedestrian and cycle paths along the waterway corridor.
- Ensure access to the creek and open space.
- Support recreational uses while preserving environmental objectives.
- Restore and revitalise creeks and open space.
- Improve external road connections.
- Create a legible and permeable road network.
- Maximise connections to Donnybrook train station.
- Provide alternatives to private vehicles.

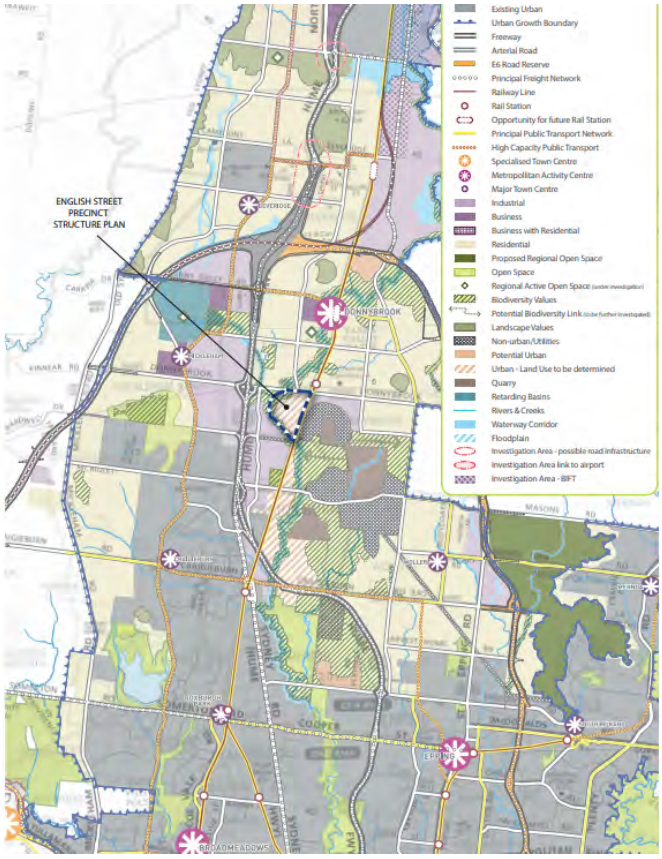


Figure 23 English Street Precinct Structure Plan

Source: English Street Precinct Structure Plan - November 2015

Some of the transport related requirement and guidelines are:

- Public transport requirements emphasise the need for well-designed bus stop facilities integrated into town centres and activity areas to connect with train stations and other hubs.
- Walking and cycling requirements prioritise pedestrian and cyclist needs with features like wide footpaths, shared paths, safe crossings, and lighting. Shared paths along waterways must be above flood levels.
- Bicycle parking facilities with wayfinding signage should be provided at key destinations like parks and convenience centres.
- Road network requirements include timely connections for essential infrastructure, road links, and pedestrian and cyclist networks.
- Alternative cross sections for streets within subdivisions aim to create variety while maintaining safety and pedestrian/cycling functionality.
- Streets must reach property boundaries for inter-parcel connections.
- Access to lots fronting arterial roads should be from service roads, local internal roads, or rear lanes.
- Guidelines encourage convenient routes, discourage culls-de-sac, limit slip lanes in high pedestrian areas, and minimise vehicular crossovers on widened verges.

5.2.4 Quarry Hills Precinct Structure Plan

Quarry Hills aims to be a unique, sustainable community with a strong connection to its natural surroundings, characterised by green links (see Figure 24). Key objectives of structure plan related to transport and built environment are:

- High-amenity environment
- Diverse housing
- Logical, connected, and permeable layouts
- Convenient access to local open space and community centre and schools
- Indigenous landscaping.
- Preserve heritage.
- Adapt to landform.
- Central town centre
- Pedestrian-friendly main street
- Unique identity
- Multi-modal accessibility
- Integrated, diverse-use community facility.
- Creating a connected precinct with open space network

- Establishing accessible neighbourhood parks
- Integrated, permeable transport network
- Road network connectivity
- Street design that accommodates large canopy trees
- Pre-development structure support for cohesive neighbourhoods
- Coordinated development staging with infrastructure delivery.

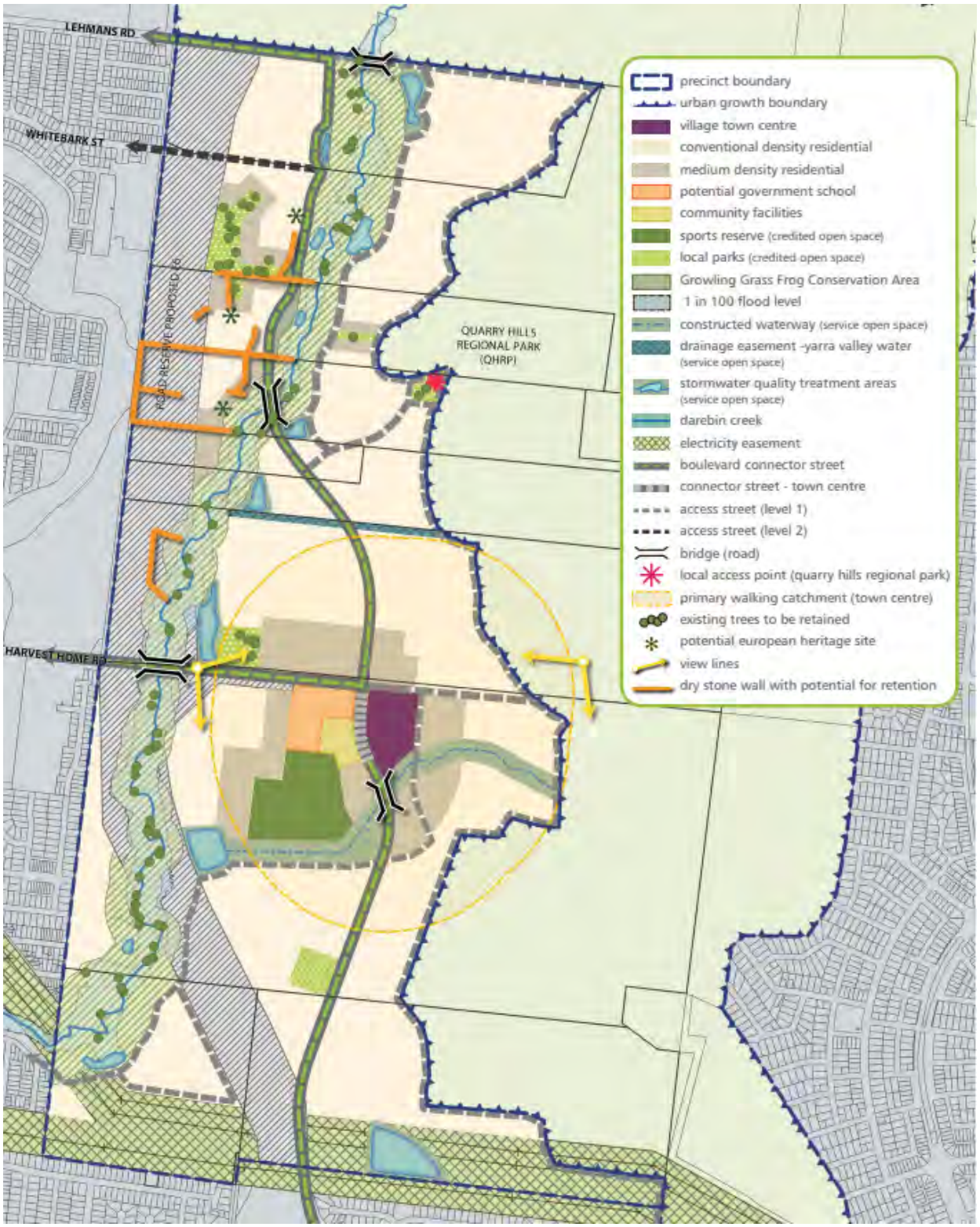


Figure 24 Quarry Hills Precinct Structure Plan

Source: Quarry Hills Precinct Structure Plan - June 2016

Some of the guidelines related to transport infrastructure are:

- Pedestrian Prioritisation
  - Widened footpaths should be included for outdoor dining and pedestrian movement.
  - Prioritise pedestrian movement in the "main street" design and layout.
- Pedestrian Canopies and Lighting
  - Use pedestrian canopies for weather protection at entries.
  - Provide quality footpath and shopfront lighting for visibility and safety.
- Street Furniture and Level Changes
  - Place street furniture in visible areas without obstructing pedestrian movements.
  - Minimise level changes between building entries from public streets.
- Traffic Speed and Bicycle Parking
  - Design for a speed limit of 40km/h or less in the "main street" precinct.
  - Provide visible bicycle parking near pedestrian gathering spaces.
- Parking Design and Heavy Vehicles
  - Rear-location for off-street car parking behind buildings.
  - Keep heavy vehicle movements (loading and deliveries) away from the main street.
- On-Street Parking and Access
  - Provide parallel on-street parking for short stays.
  - Group and limit car parking crossovers.
  - Design vehicle access and parking areas to minimise pedestrian/vehicle conflict and maximise pedestrian visibility.
  - Include appropriate landscaping in car parking areas, such as canopy tree planting.

Transport related requirements include:

- Public Transport Requirements:
  - Bus stops should be integrated into the Village Town Centre and activity areas.
  - Road network design should ensure 95% of households are within 400 meters of public transport.
  - Roundabouts on bus routes must accommodate low-floor buses.
- Walking and Cycling Requirements:
  - Walking and cycling paths should connect key destinations in the area.
  - Path locations should prioritise passive surveillance.
  - Road and path networks should promote walking and cycling, reduce car use, and prioritise pedestrian and cyclist needs.
  - Streets should include footpaths, shared paths, safe crossings, and transitions between on and off-road cycling.
  - Paths along waterways should be above flood levels and maintain hydraulic function.
  - Off-road bicycle paths should accommodate speeds up to 30 km/h.
  - Bicycle priority at intersections should be visually and physically clear.
- Road Network Requirements:
  - Street layouts should provide efficient access for pedestrians, cyclists, and vehicles.
  - Road networks should connect to employment and public transport outside the precinct.
  - Road networks and street types should follow specified cross-sections unless otherwise agreed.
  - Water-sensitive urban design initiatives, such as rain gardens and swales, should be implemented.

5.2.5 Mernda Strategy Plan

Key objectives and strategic actions for planning and design in the Mernda growth area (see Figure 25) are:

- Create interconnected neighbourhoods with distinctive characters.
- Ensure community participation, economic development, and adaptability.
- Develop precinct-based plans for Mernda's growth area.

- Design distinct precincts with self-containment and connectivity.
- Apply varying residential densities based on location.
- Encourage higher densities near activity centres and transport hubs.
- Promote innovative medium-density housing forms.
- Design low-density development in areas with landscape or environmental values.
- Incorporate Water Sensitive Urban Design (WSUD) in new developments.
- Allocate land for an "employment park" in the Mernda Town Centre.
- Create employment opportunities in precinct activity centres.
- Implement visually sensitive design treatments in identified areas.
- Protect landscape values and red gums in low-density development areas.
- Incorporate modulated and articulated facades for large buildings in exposed areas.

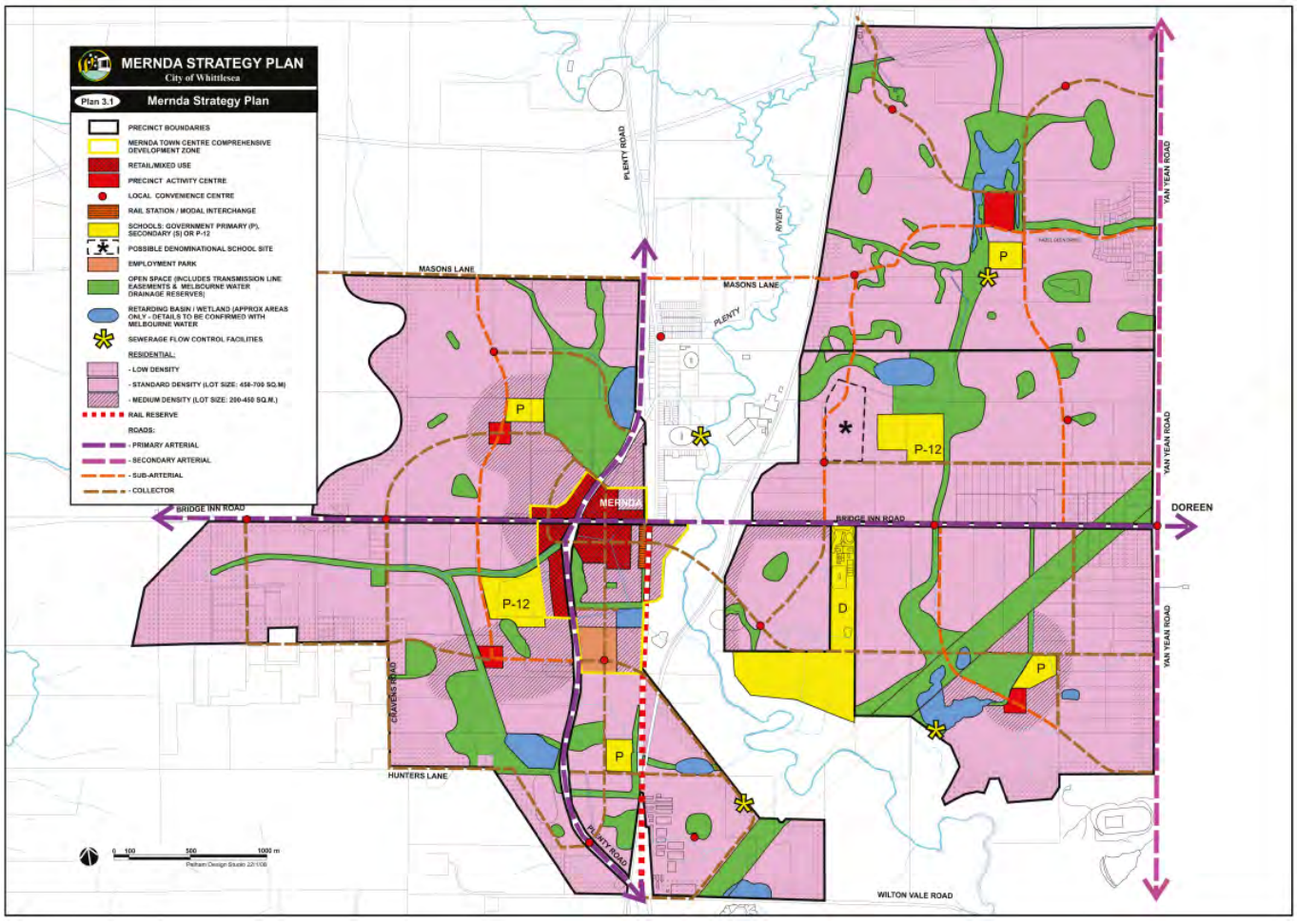


Figure 25 Mernda Strategy Plan

Source: Mernda Strategy Plan- incorporated document

5.2.6 Epping Central Structure Plan

The Epping Central Structure Plan, created with community input, is a framework for the future growth of Epping Central, aiming to make it a thriving hub in the Northern Growth Corridor. This plan ensures orderly development, job creation, and better public spaces while adhering to state planning strategies. Key principles of this plan are:

- Urban living
- Movement and transport
- Employment and investment
- Community facilities and services
- Public realm, design and natural environment.

Epping Central holds a pivotal location between established southern suburbs and the rapidly growing northern corridor (see Figure 26).

Epping Central benefits from strong connections to local, regional, and state transport networks, including the Hume Freeway and key roads. Public transport, including the route 901 Smart Bus and bus interchange, provides decent connectivity, but improvements such as the Wollert Rail corridor extension and enhanced local bus services are crucial for future growth. Improved walking and cycling infrastructure and open space enhancements are essential for reducing car dependence and promoting a more accessible and enjoyable environment for residents and visitors.

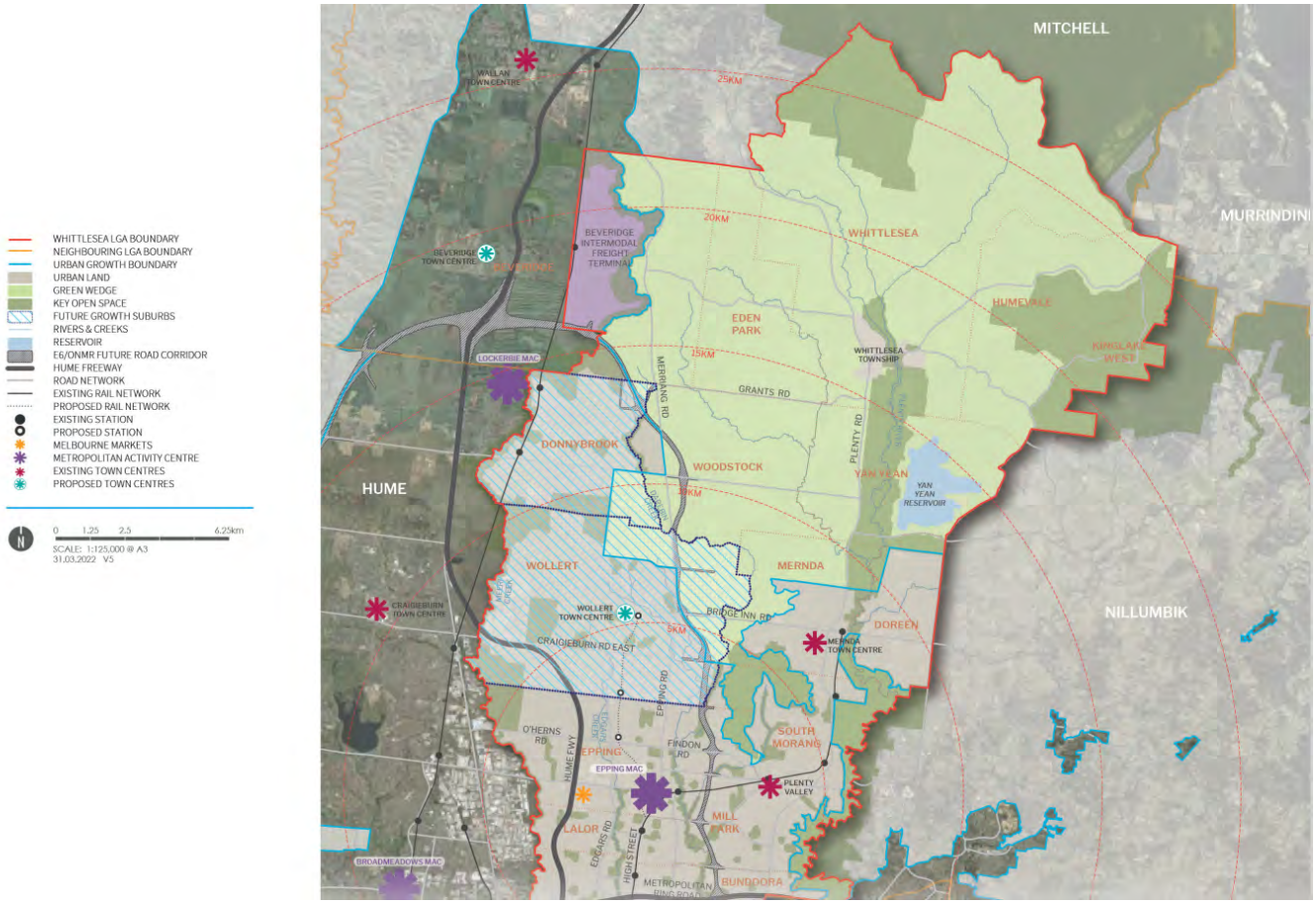


Figure 26 Regional context

Source: Epping Central Structure Plan- 20

Better walking and biking paths, connected to public transit, will link people to community resources and each other.

Strategic directions in this plan are:

- Promote urban core development and diversity.
- Expand the health precinct around the Northern Hospital.
- Foster varied employment opportunities in key areas.
- Prioritise pedestrian-friendly urban core and connectivity.
- Improve Darebin and Edgars Creek corridors.
- Enhance public spaces and greenery in Epping.
- Enhance Cooper and High Streets built form and pedestrian friendly.
- Plan for the Wollert Rail extension and transport hub.
- Redevelop key sites for housing and jobs.
- Encourage new development in High Street Village and New Epping neighbourhoods.

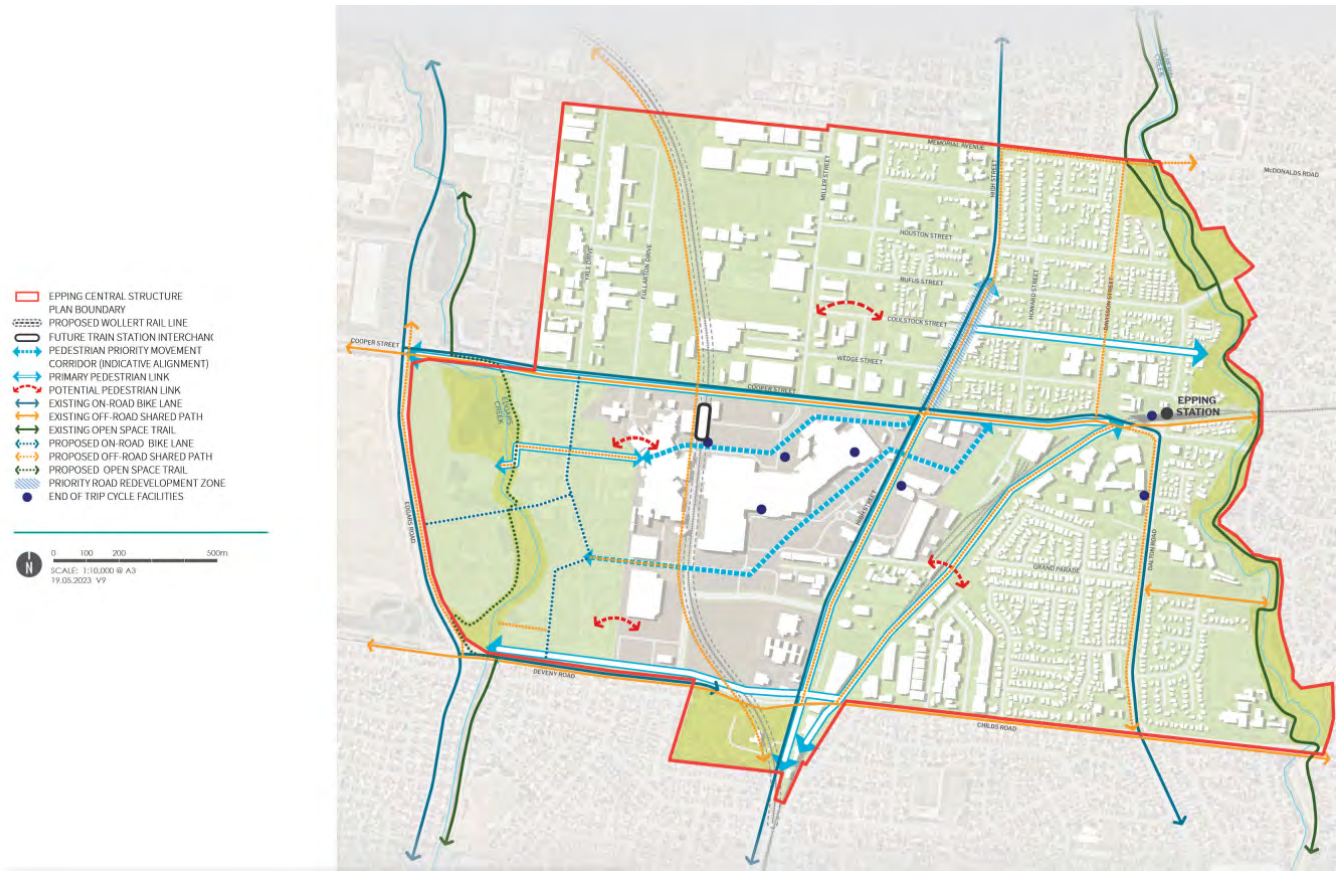


Figure 27 Pedestrian and bicycle transport movement plan

Source: Epping Central Structure Plan- 20

The transport considerations in this plan are:

- Roads:
  - Advocate for bus priority.
  - Upgrade roads for safety and convenience.
  - Prioritise pedestrians, cyclists (see Figure 27 and Figure 28), public transport, and freight in road design.
  - Encourage sustainable road construction.
  - Enhance arterial roads with bike lanes and bus routes.
- Parking:
  - Position car parks to minimise impact on emission and pedestrian movement.
  - Incorporate landscaping, lighting, and pedestrian safety in car park design.
  - Create pedestrian-friendly links between major car parks.
  - Promote electric vehicle parking.
  - Avoid temporary car parking along key road networks.
- Public Transport:
  - Advocate for improved public transport infrastructure (see Figure 28).
  - Support high-density development near train stations and bus interchanges.
  - Plan for multi-modal interchanges.
  - Promote transit-oriented urban regeneration.
  - Advocate for grade separation at level crossings.

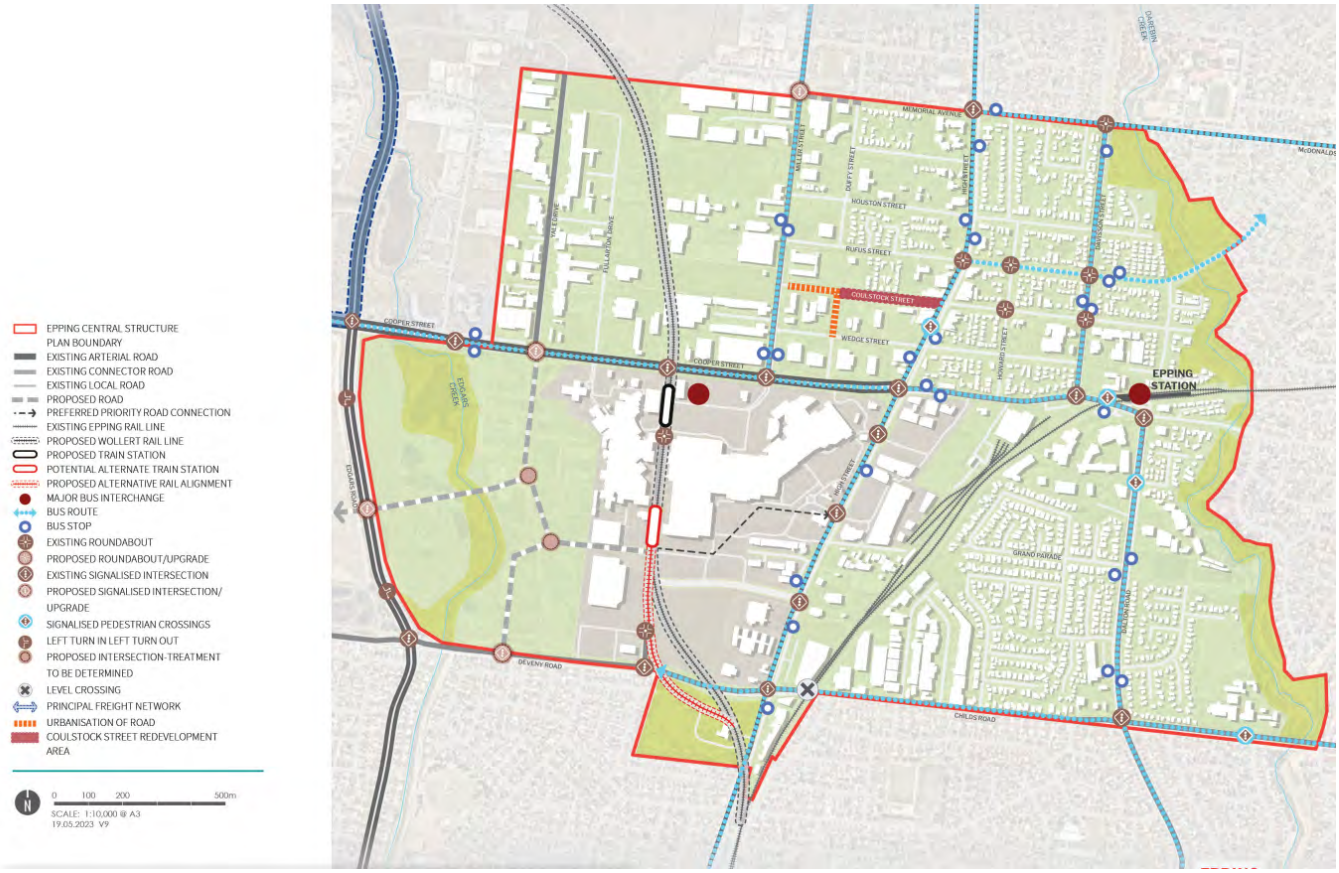


Figure 28 Roads and public transport

Source: Epping Central Structure Plan- 20

5.3 20-minute neighbourhoods

According to *Plan Melbourne*, 20-minute neighbourhoods is a concept in urban planning that aims to create local communities where residents can easily access most of their daily needs within a 20-minute (return) by foot, bicycle or public transport. These neighbourhoods are characterised by several key features (see Figure 29):

- Accessibility
- Safety
- Mixed-use
- Connectivity
- Proximity to essential services
- Community interaction.

The analysis in this section is based on nine metrics that are representative for 20-minute neighbourhoods. In sum, these maps provide a clear illustration of which residential areas within Whittlesea allow for residents to meet their daily needs within a 20-minute walk and cycle.

The result can help guide areas for future investment in 20-minute neighbourhoods by identifying the areas that have the lowest score in walking and cycling. Actions focusing on these areas are likely to increase services accessibility and connectivity.

It is important to note that inclusive urban planning recognises the importance of adapting neighbourhood design standards to accommodate the needs of individuals with disabilities. This helps to ensure equitable access to essential community spaces and places. Adapting 20-minute neighbourhood designs for people with disabilities is crucial. This can be achieved this providing high quality walking environments and providing higher levels of DDA parking closer to destinations, providing shade and seating for resting, referencing 10-minute neighbourhood indicators. These changes make the neighbourhood more accessible and inclusive for all residents, including those with limited mobility.

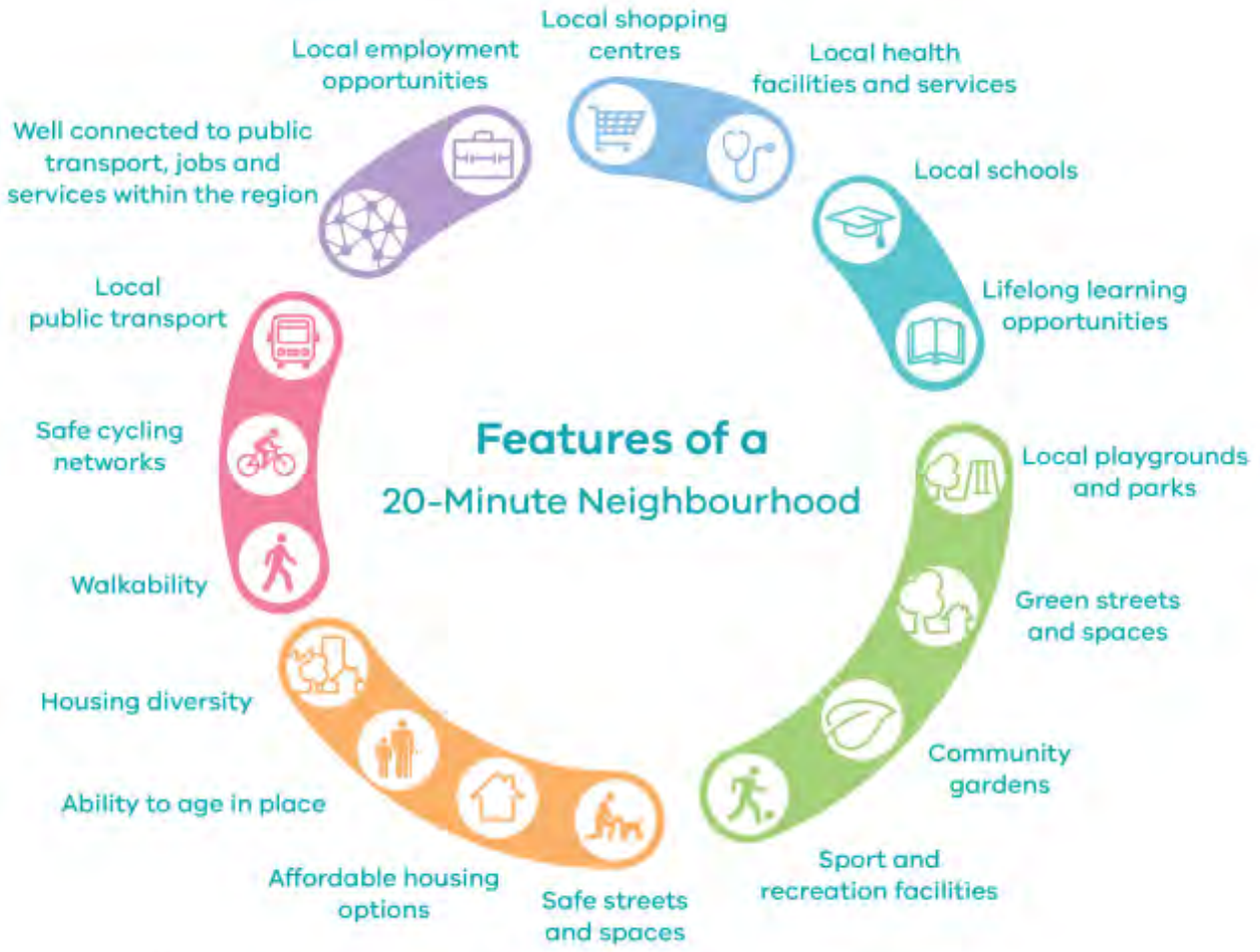


Figure 29 Features of a 20-minutes neighbourhood

Source: Plan Melbourne

5.3.1.1 Methodology

The 20-minute neighbourhood analysis combines nine variables which represents 20-minute neighbourhoods features. Variables in this analysis include:

- Commercial zones (which indicate provision of goods, services, and employment)
- Health facility (doctors)
- Libraries
- Swimming pools and aquatic centres
- Open spaces walkable catchment
- Playgrounds
- Childcare facility
- Primary schools
- Secondary schools.

For each residential block, our analysis considers an 800-meter walking catchment and a 2000-meter cycling catchment. A scoring system has been employed to evaluate the accessibility of essential services within these specified walking and cycling catchments. This assessment illuminates the extent to which residential areas within the Whittlesea facilitate the fulfillment of daily necessities for their inhabitants within 20 minutes, including both walking and cycling modes of transport.

A residential block gets one point for each of the above variables within the catchment, for walking and cycling. As goods, services and employment are critical to the success of 20-minutes neighbourhoods, commercial zones are rated at double the other metrics. This creates a score between zero and ten, with ten indicating proximity

to all neighbourhood features, and zero indicating proximity to none.

5.3.1.2 Results

In this section, results for walking and cycling score for each residential block is presented.

Walking

The distribution of 20-minute neighbourhood performance rating - Walking is presented in

Figure 30.

The best performing suburbs are:

- Blocks around Main Street recreation reserve
- Whittlesea
- Blocks around Redleap recreation reserve

The lowest rating suburbs are:

- Donnybrook
- Eden Park
- East side of Whittlesea
- East side of Doreen
- Blocks around Hutmil Reserve, Hilcroft Park, Hendersons Creek Linear Park.

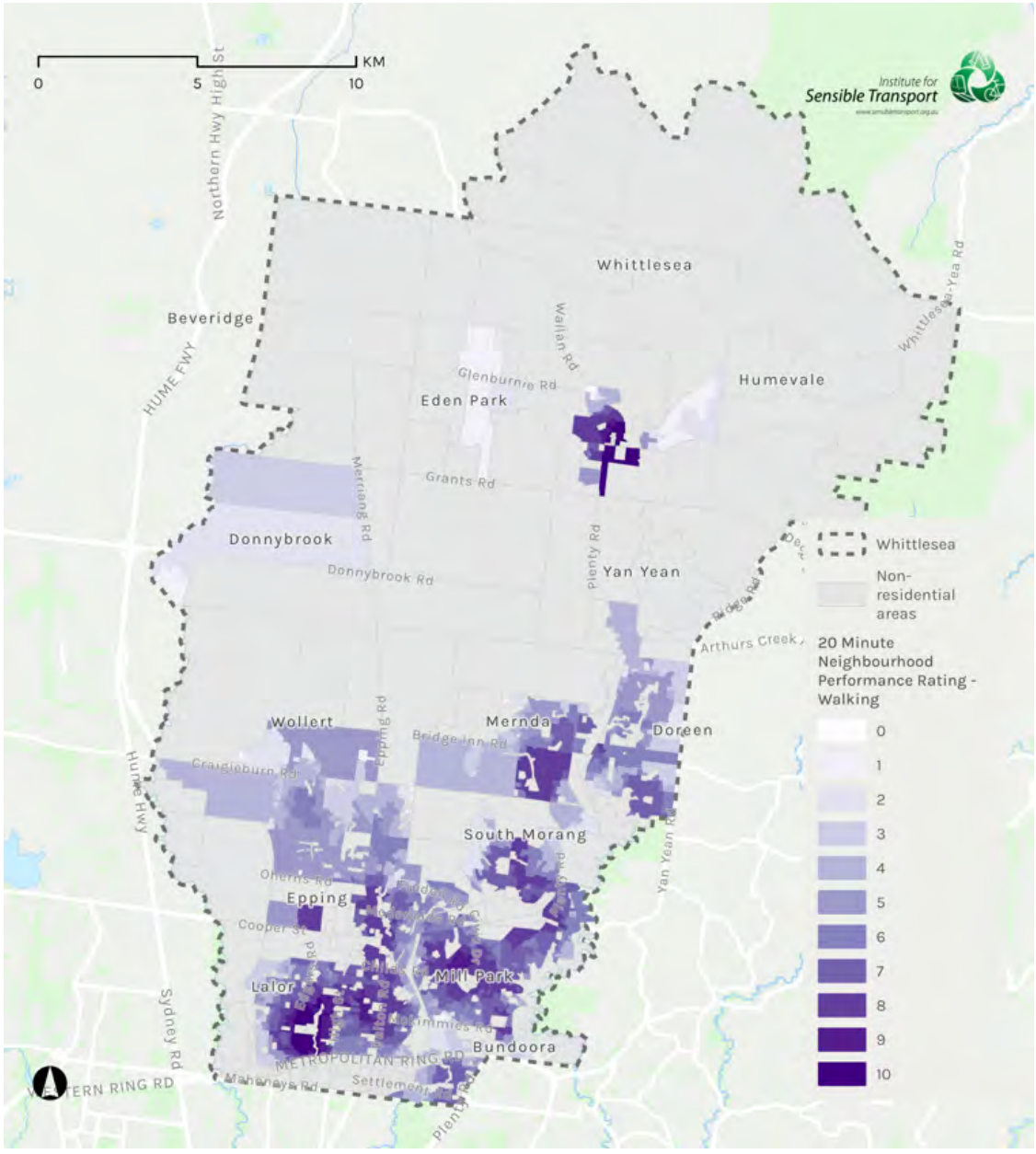


Figure 30 20-minute neighbourhood performance rating - Walking

Source: DTP

Cycling

The distribution of 20-minute neighbourhood performance rating - Cycling is presented in Figure 31.

The best performing suburbs are:

- Lalor
- Thomastown
- Mill park
- Whittlesea

The lowest rating suburbs are:

- Donnybrook
- Eden Park,
- East side of Whittlesea

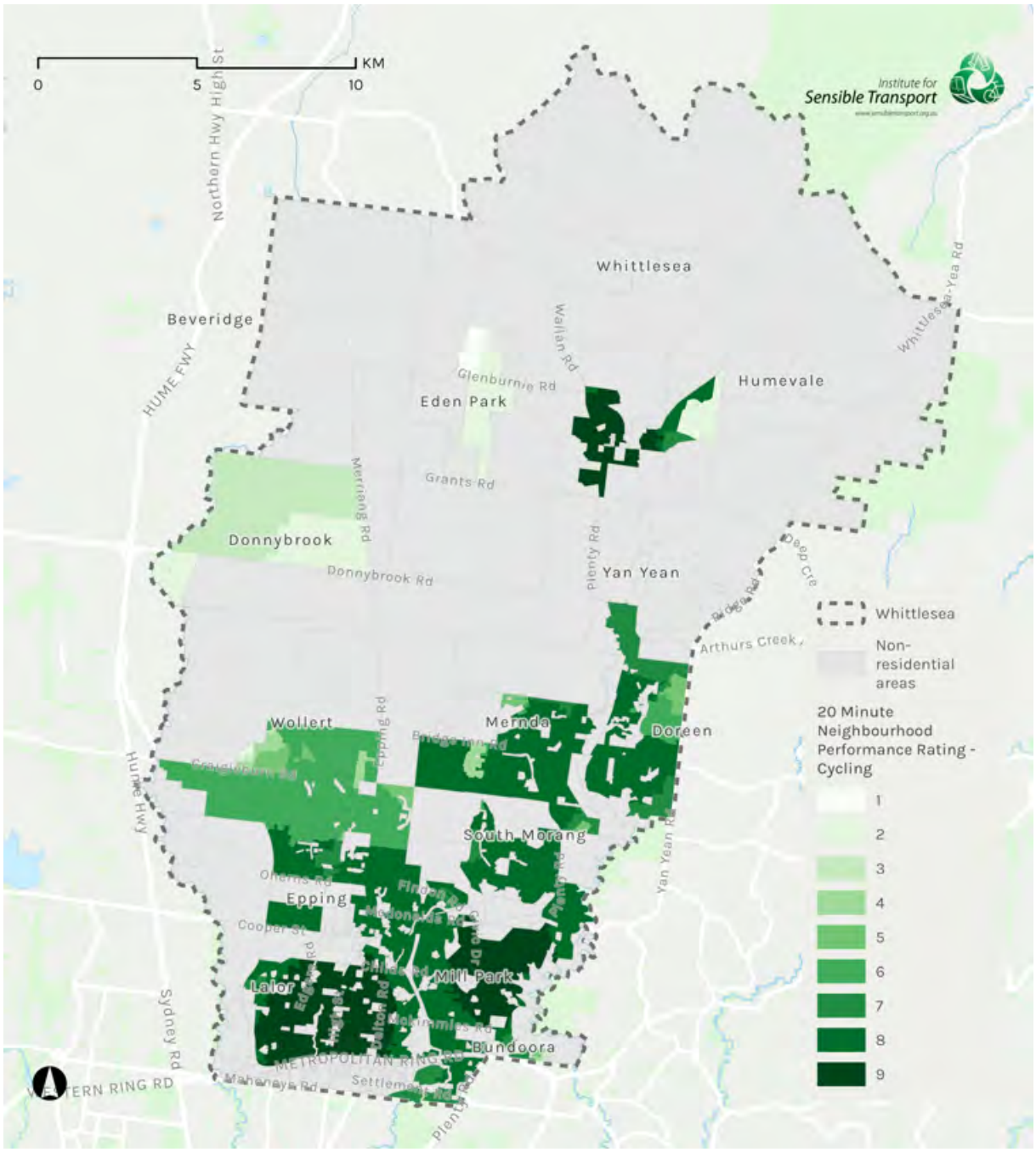


Figure 31 20-minute neighbourhood performance rating - Cycling

Source: DTP

6. Existing transport patterns and networks

A strong understanding of existing travel patterns in Whittlesea is critical for the development of the ITP. By providing a description of existing transport patterns and a review of the current transport network, a baseline is created that can be used to inform future stages of the ITP.

6.1 Journey to Work

Travel to work data is captured at every Census. It is the most complete dataset relating to transport available in Australia. The most recently available Census was conducted in 2021. The 2021 Census was conducted while metropolitan Melbourne was subject to health orders which restricted movement to halt the spread of COVID-19.

Although the COVID-19 pandemic restrictions had an impact on the responses, the mode shares of those who *did travel* to work are similar to pre-pandemic patterns. The largest change was in working from home, which increased from 3% to 22%, and in the number of workers who did not go to work. For those who did travel to work, the mode shares pre-pandemic and during movement restrictions were largely similar, albeit with a decrease in public transport use and increase in motor vehicle use.

6.1.1 Mode share

Mode share is a term used to describe the proportion of trips by various modes. Figure 32 shows the change in journey to work mode share for Whittlesea and Greater Melbourne over the last decade. Like the rest of Melbourne, the car is the dominant mode of transport in Whittlesea. Despite several policies described in Section 4 that commit to achieving a more sustainable transport system, Census data indicates limited growth in active transport participation. Car use has remained high, with no significant reductions over the past decade. Since 2011, the car accounted for 85% to 90% of all journeys to work for Whittlesea residents. This is significantly higher than the rest of metropolitan Melbourne. The Greater Melbourne car mode share for journey to work in 2011 and 2016 was around 10% lower, at 81% and 75% respectively.

Car use is the dominant travel mode in Whittlesea, accounting for 89% of trips to work in 2021. The proportion of people who use the car to travel to work has remained largely unchanged in the last fifteen years.

Public transport patronage is slightly lower in Whittlesea comparted to the rest of Greater Melbourne. This may be partly attributed to the smaller train and bus network, particularly in the northern area of the City. Journey to work trips completed by train increased more than twofold from 5% in 2011 to 11% in 2016, before halving again to 5% in 2021. This is likely to have been influenced by COVID-19. The bus is among the least used mode for travelling to work in Whittlesea.

Active transport is consistently among the least reported mode of travel to work in Whittlesea. Only 1% of journey to work trips in Whittlesea were walked. This is 3 to 4 times lower than the proportion of trips for Greater Melbourne. Journey to work trips completed by bike is the least reported mode of travel to work, at 0.2%. This is significantly lower than Greater Melbourne, where bike mode share for journey to work pre-pandemic was almost ten times higher than it is in Whittlesea.

A comparison of journey to work mode shares between Whittlesea and other LGAs (growth area LGAs, nearby LGAs, and City of Yarra which is in along the same tram and train routes) is shown in Figure 33. This shows that the journey to work mode shares in Whittlesea are similar to other growth areas. However, car use is higher than in Merri-bek or Darebin, which are immediately to the south, and substantially higher than Yarra.

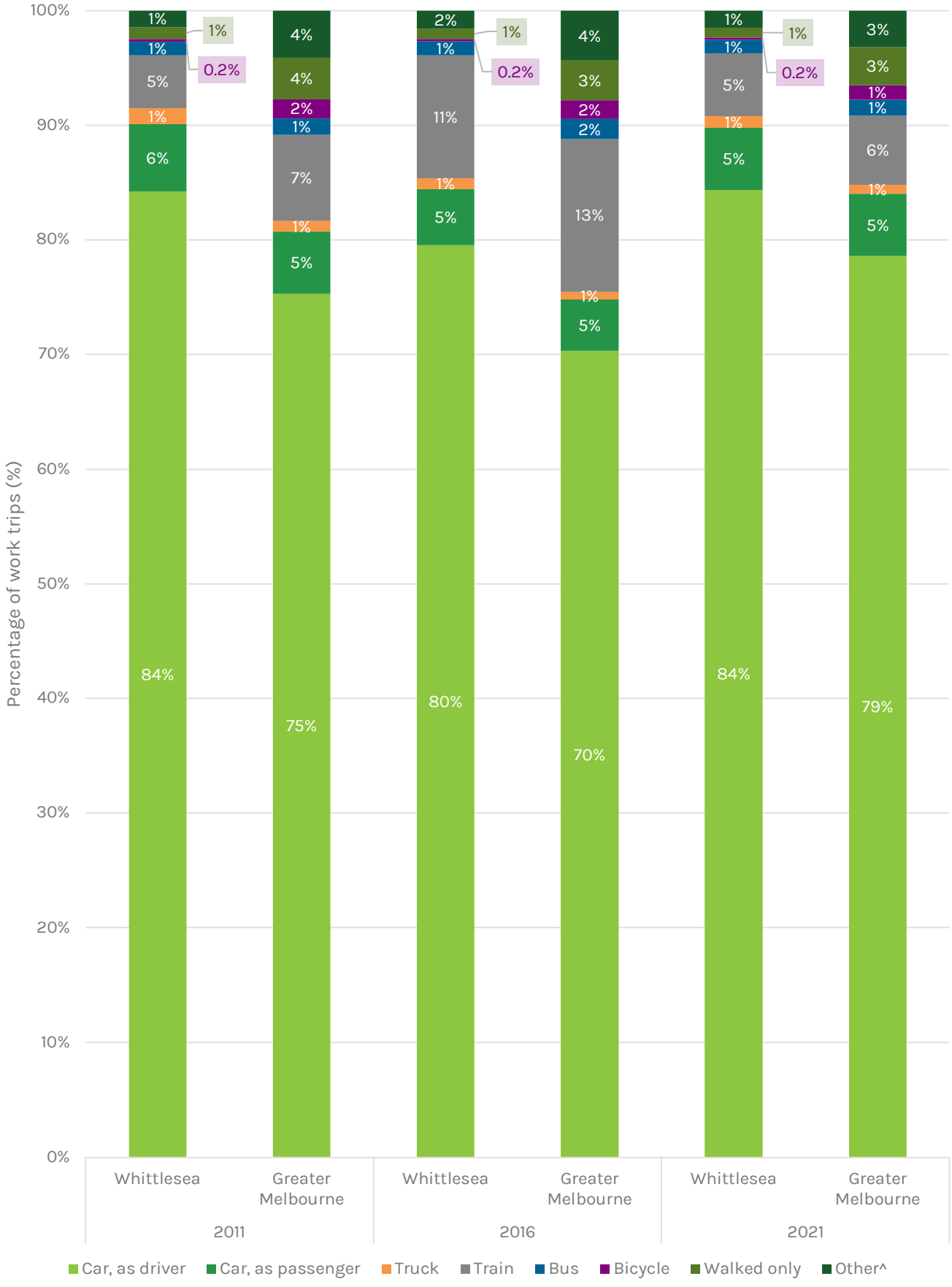


Figure 32 Journey to work mode share, Whittlesea and Greater Melbourne

Source: ABS Census Data

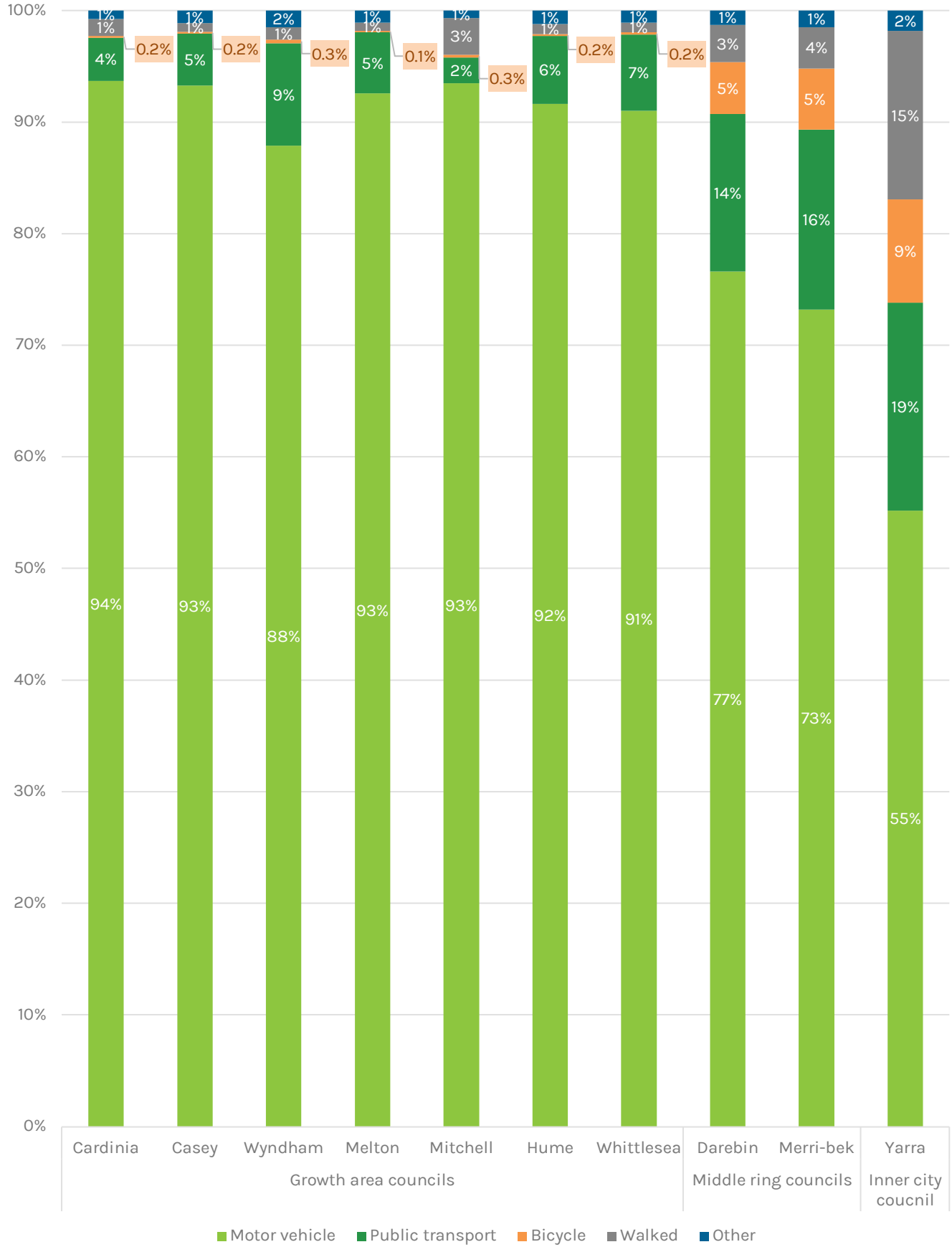


Figure 33 Mode share of Whittlesea compared to other Melbourne LGAs

Source: ABS Census Data

Gender analysis of mode share is presented in Figure 34. It is noteworthy that the car remains the primary mode of transport for both female and male individuals. However, it is observed that women's participation in car trips is relatively less pronounced. It is evident that women exhibit a higher usage of public transport in comparison to men, with a respective mode share of 8.5% versus 5.4%. Women also demonstrate a greater prevalence of 'walked only' trips. This could be attributed to women often running errands within walking distance or having shorter commutes.

Conversely, the data reveals that women's involvement in cycling is notably lower than men. This trend is similar to that found across Greater Melbourne.

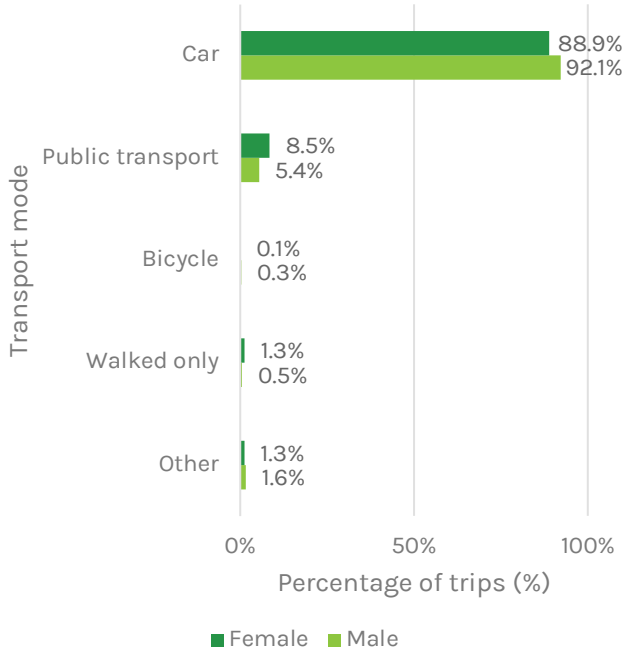


Figure 34 Mode share by sex

Source: ABS 2021

Unsurprisingly, there have been significant changes to the *work from home* population in Whittlesea. Figure 35 shows that the *work from home* population in Whittlesea *prior* to the COVID-19 pandemic was approximately half of the rest of Greater Melbourne. In 2021, the proportion who worked from home increased dramatically, rising from below 3% to 21.6% among Whittlesea workers. It can be expected this figure will reduce somewhat by the 2026 Census but remain higher than 2016.

Figure 35 Work from home population

Source: ABS Census Data

Prior to the COVID-19 pandemic, a greater proportion of females worked from home. The work from home population for males was approximately half, at 1% in 2011 and 2% in 2016. Both populations saw significant growth in 2021 as a result of the changed working conditions from COVID lockdowns, increasing to 17% for males and 27% for females.

Of those who worked from home, 10% were lone parents. Lone parents who worked from home in Whittlesea are predominantly female, at 8.3% of the 10%. This is substantially greater than the proportion of male lone parents who worked from home, at 1.7%. This has implications on the gender gap, as more women are disproportionally impacted by greater responsibilities involving housework, and childcare.

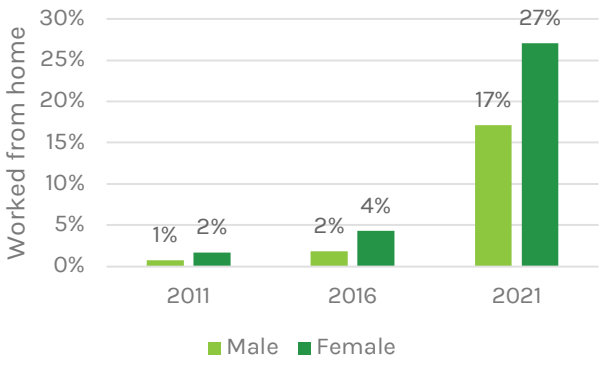


Figure 36 Work from home population by sex

Source: ABS 2021

The mode of transport used by commuters from points of *origin* in Whittlesea is shown in Figure 37. The car is the most common mode of transport used by residents living across the municipality. Taking public transport to work is more concentrated in the southern area of Whittlesea, particularly for those residing in South Morang, Mernda and Doreen, and around the railway stations in Lalor and Thomastown. For all trips to work completed by car, 13.4% were short trips (less than 5 km).

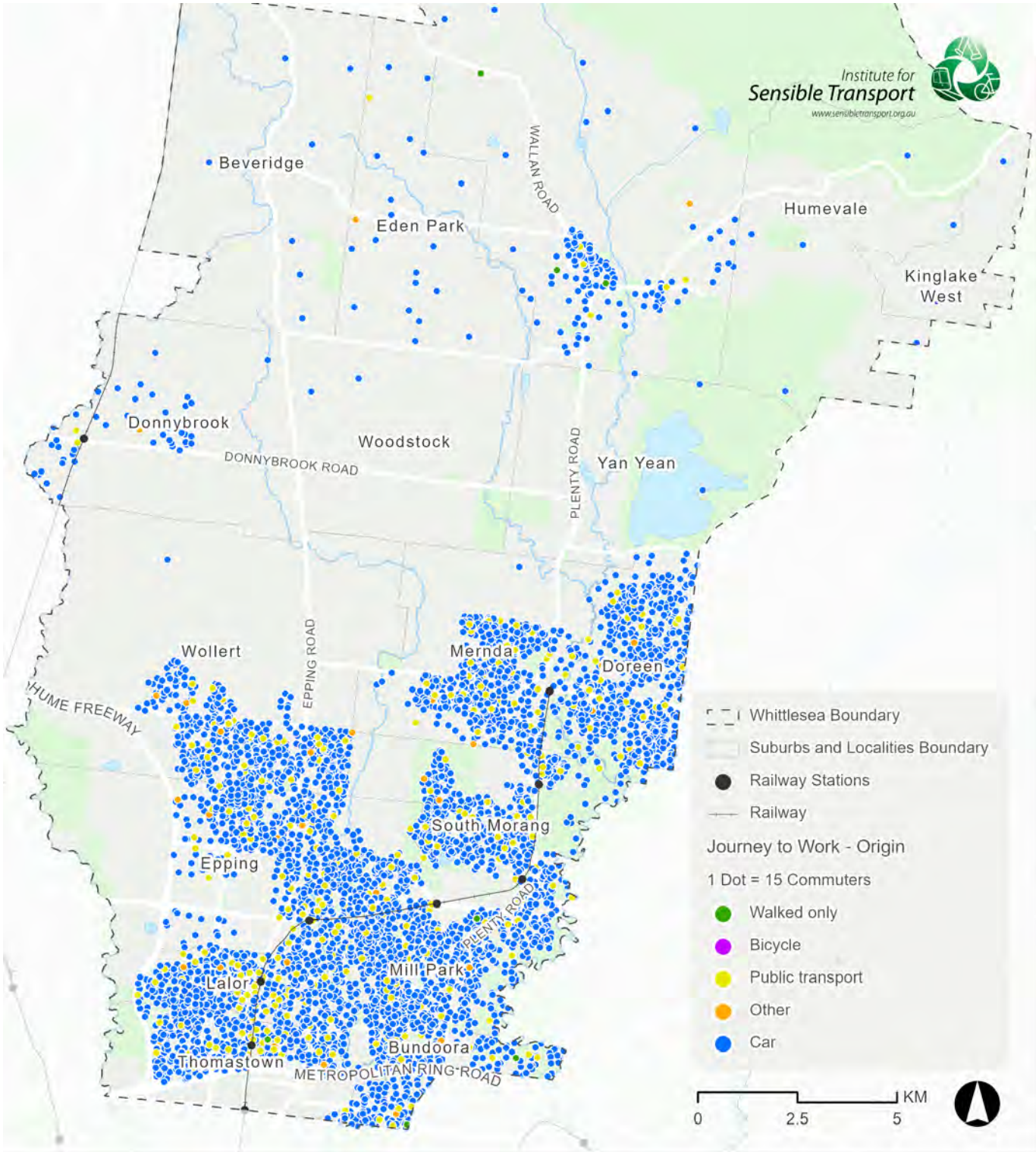


Figure 37 Journey to work from Whittlesea

Source: ABS Census Data

Table 2 Transport mode to work from Whittlesea

SA2 (UR)	Car	Public transport	Bicycle	Walked only	Other	Total
Wollert	7522	539	7	42	104	8214
Wallan	7669	243	5	101	66	8084
Mill Park - North	5514	334	12	59	78	5997
Thomastown	5058	569	29	77	114	5847
Doreen - North	4883	233	10	49	40	5215
South Morang - North	4083	269	3	16	45	4416
South Morang - South	3936	289	7	29	38	4299
Epping - East	3863	249	7	30	62	4211
Epping - West	3682	278	11	32	61	4064
Mernda - South	3719	276	6	23	38	4062
Lalor - West	3427	326	10	23	75	3861
Mill Park - South	3491	194	6	26	53	3770
Mernda - North	3350	271	4	33	45	3703
Doreen - South	3271	203	0	11	31	3516
Whittlesea	3243	135	5	65	24	3472
Lalor - East	2459	325	14	22	48	2868
Epping - South	2241	300	8	46	50	2645
Bundoora - North	2133	154	5	32	28	2352
Bundoora - West	1750	145	3	31	35	1964

Source: ABS Census Data 2021

For those who did *not* use the car, Figure 38 shows the mode of transport travelling to work from Whittlesea. This map shows the *train* is the most common non-car mode of transport across the municipality. This is followed by the bus in the southern area of Whittlesea. Walking mode share is higher than bus mode share for journey to work trips in Mernda, Doreen, and residents living near the intersection of Plenty Road and Wallan Road in the north of the city. Cycling is the least used mode of transport across the city. The majority of journey to work trips completed by bike originated in Thomastown and Epping. There were zero journey to

work trips completed by bike north of Donnybrook Road.

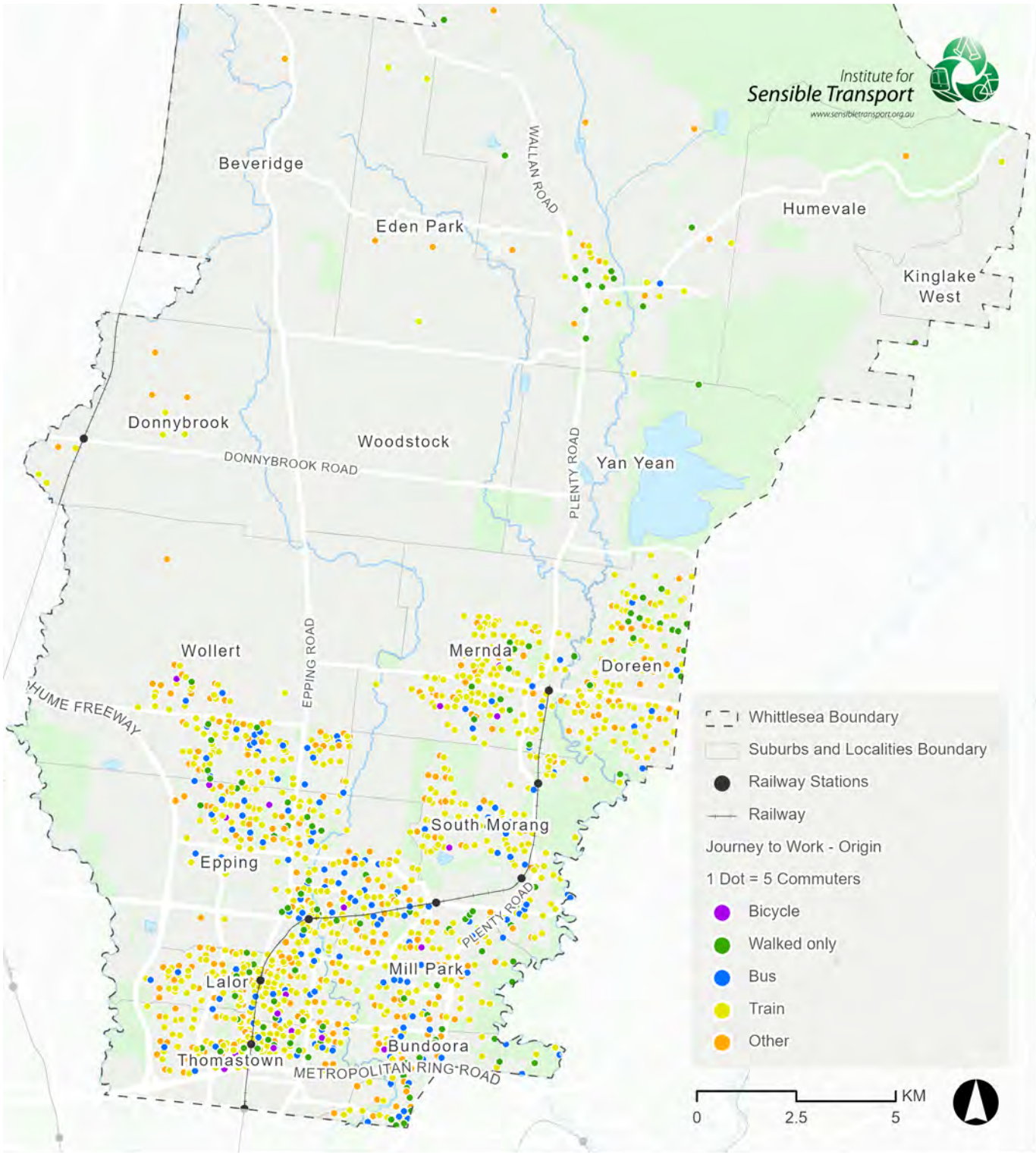


Figure 38 Journey to work excluding cars, from Whittlesea

Source: ABS Census Data

The mode of transport used by commuters to *destinations* within the City of Whittlesea is shown in Figure 39. This shows that for many destinations across Whittlesea, the car is the dominant mode of travel. Unsurprisingly, levels of commuting via train or bus are higher in the southern area of Whittlesea where there are connections to the metropolitan railway line and bus network. Areas of Epping, Mill Park and Thomastown have the highest levels of commuting via public transport in Whittlesea.

There are very low levels of walking and cycling to work destinations in Whittlesea.

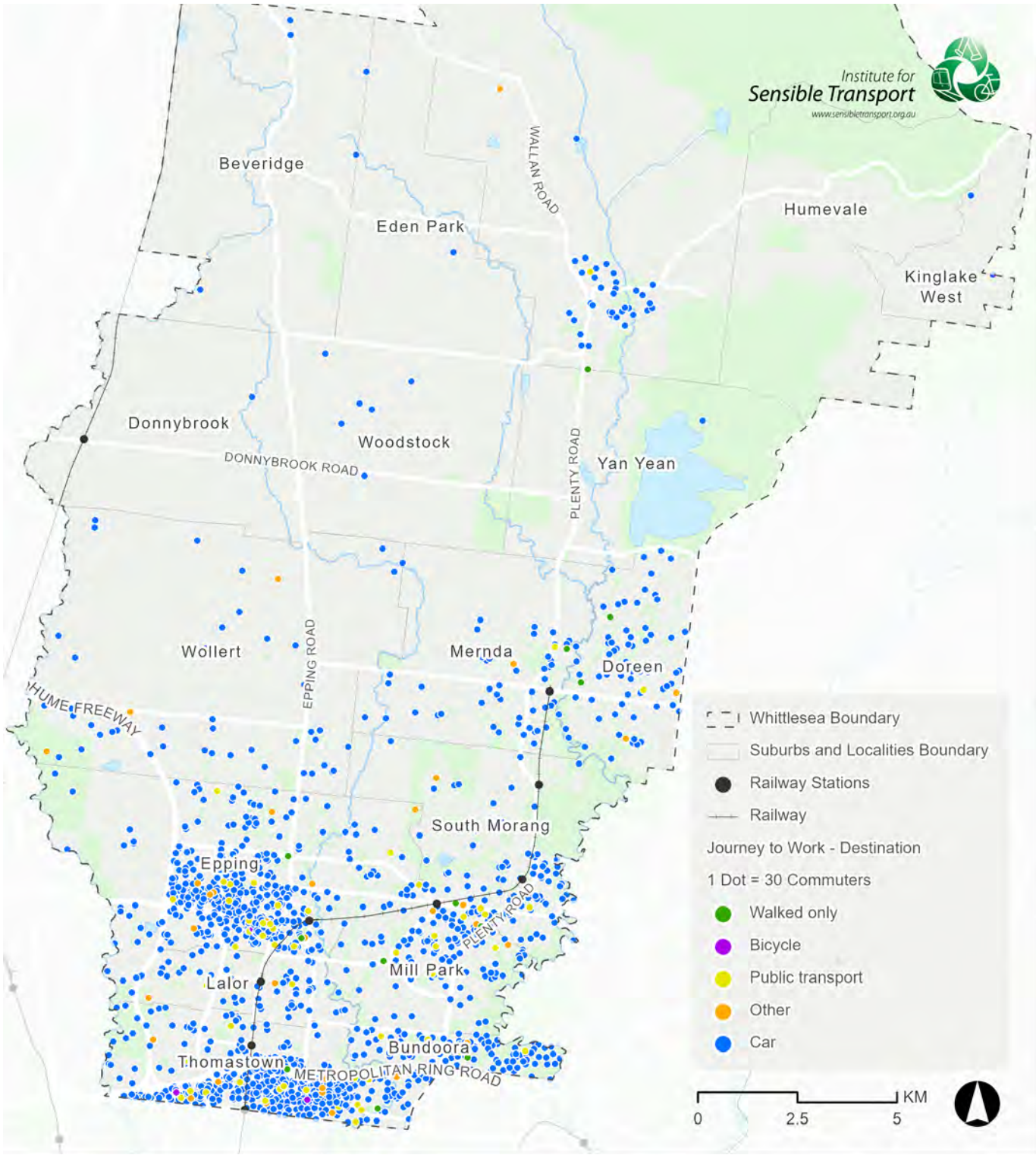


Figure 39 Place of work, Whittlesea

Source: ABS Census Data

Table 3 Transport mode to place of work in Whittlesea

SA2 (POW)	Car	Public transport	Bicycle	Walked only	Other	Total
Thomastown	13,710	477	91	105	173	14,556
Epping - South	11,291	492	46	70	114	12,013
Mill Park - North	3,461	226	12	62	47	3,808
Bundoora - North	2,961	125	8	39	31	3,164
Epping (Vic.) - West	2,723	73	8	40	45	2,889
Wallan	2,383	12	4	87	21	2,507
South Morang - South	2,082	89	7	39	34	2,251
Lalor - West	2,102	51	9	14	21	2,197
Whittlesea	1,609	32	3	60	9	1,713
Doreen - North	1,537	33	3	47	15	1,635
Wollert	1,369	29	0	18	47	1,463
Bundoora - West	1,301	51	5	47	20	1,424
Lalor - East	895	47	7	16	26	991
Epping - East	854	43	0	12	37	946
Mernda - South	846	17	0	25	17	905
Mernda - North	658	17	0	26	7	708
Doreen - South	558	11	0	8	14	591
South Morang - North	433	3	0	14	5	455
Mill Park - South	413	14	3	14	6	450

Source: ABS Census Data 2021

For trips ending in Whittlesea, the mode of transport to work of those who did *not* use a car is shown in Figure 40. There is a high level of commuter trips via public transport and active modes recorded in Epping, in Mill Park south of the Mernda railway line, and in Thomastown south of the Metropolitan Ring Road. Similarly, these areas have some pockets of cycling use.

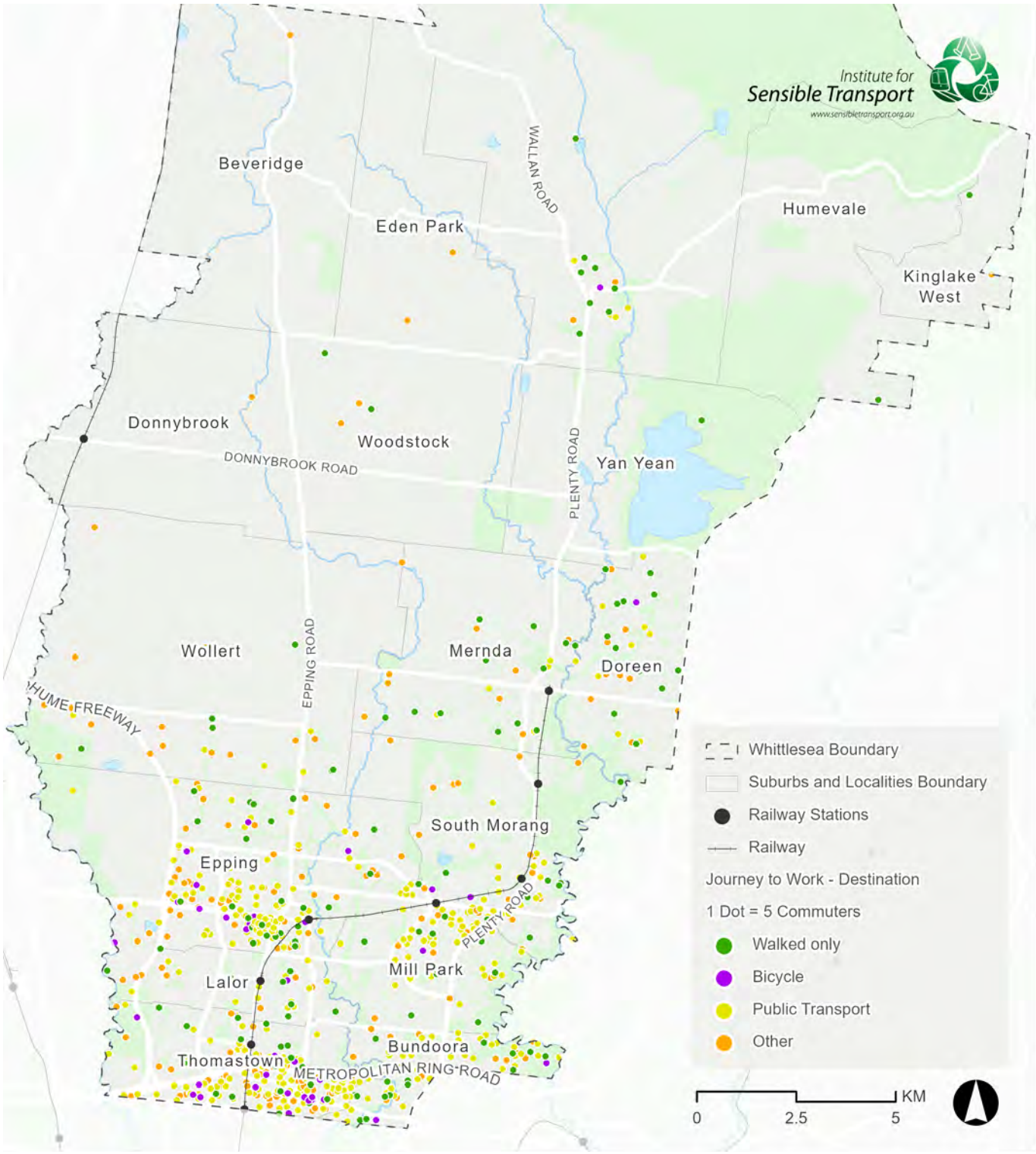


Figure 40 Place of work excluding cars, Whittlesea

Source: ABS 2021

6.1.2 Trip distance to work

An understanding of trip distance is critical for making strategic change to the transport system and providing people with better mobility choices. ABS Census data helps us to develop a picture of how far people travel to work. A significant proportion of Whittlesea residents who travelled to work travelled over 5km (85.9%). Trip distances between 2.5 to 5km were the next most reported, at 7.3%. Moreover, 3.7% of commuters travelled 1 to 2.5km.

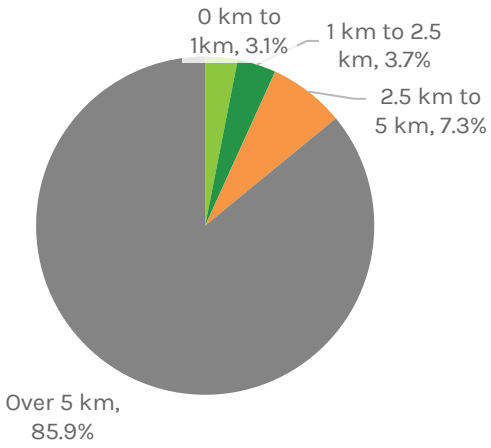


Figure 41 Trip distance for those who travelled to work, Whittlesea

Source: ABS 2021

The data shown in Figure 41 highlights the potential for achieving a shift towards more sustainable modes of transport. Most walking trips will be around 1km, while people will use a bike for trips up to around 5 – 6 km. Some 14.1% of trips to work in Whittlesea are short enough that people could walk or cycle, providing the conditions were safe, attractive and convenient.

The mode share for all trips to work under 5km in Whittlesea is shown in Figure 42. Even for these shorter trips, the car is dominant, with over 86% of people using a car, either as a driver or passenger. Walking is the next highest mode share (5%).

Even for trips under 5km, some 86% of people used a car, either as a driver or passenger.

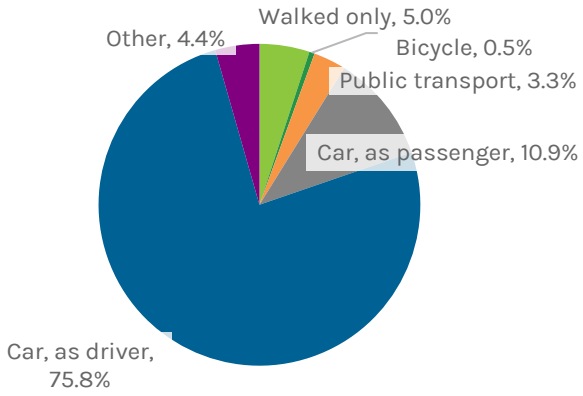


Figure 42 Mode share of trips under 5km to work

Source: ABS 2021

It is important to consider gender variations around transport mode for journey to work. Figure 43 shows the mode share of trips under 5km to work, for males and females, respectively. Overall, males are more likely to use the car for short trips to work than females, with 79% as drivers and 8.2% as passengers. Public transport patronage and walking participation is higher for females at 4.4% and 7.2%, respectively. For males, the proportion of short trips to work via public transport or walking only is approximately half that of females.

Cycling participation to work for females is significantly lower than their male counterparts, at 0.2%. This may be attributed to the perception of safety associated with cycling, and for females to be more sensitive to the rider environment. It may also be the case that women undertake a large proportion of trips to get children to/from school etc, which reduces their chances of using the bicycle.

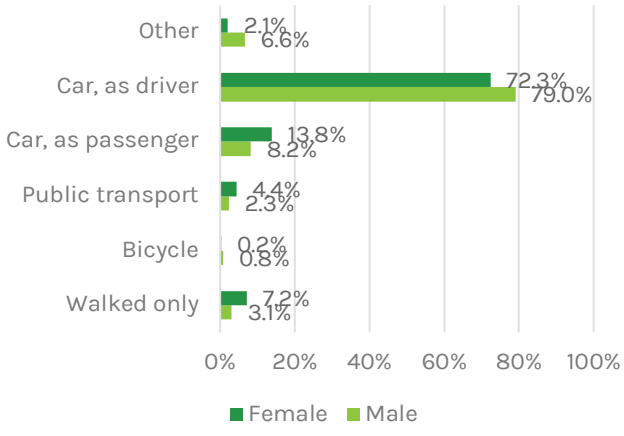


Figure 43 Mode share of trips under 5km to work by sex

Source: ABS Census 2021

6.1.3 Origin Destination Analysis

The relationship between *origin* and *destination* for commuters travelling to and from Whittlesea is visualised in Figure 44. The volume of people travelling to Whittlesea for work, *and* residents travelling elsewhere for work is represented by line thickness. The thicker the line, the more commuters. The extent of the map includes Campaspe and Greater Shepparton to the north, Mansfield to the east, Mornington Peninsula and Bass Coast to the south and commuter volumes west of Whittlesea towards Glenelg. The ring in Whittlesea indicates the volume of work trips which both *start* and *end* in the municipality.

The majority (66%) of residents travelled within metropolitan Melbourne's inner-north to go to work. A quarter (25.2%) of residents travelled within Whittlesea to go to work. Hume is the most reported destination for work outside Whittlesea (13.6%), followed by the City of Melbourne (10.3%), Darebin (8.7%), Banyule (7.9%), Moreland (3.6%), and Nillumbik (3.6%).

Of those who work in the inner City of Melbourne, approximately two thirds are in managerial, professional or clerical jobs. The proportion of workers who live in Whittlesea and work in City of Melbourne, and the types of jobs they work is the same across the established and growth areas of Whittlesea.

Short commute trips under 5km were analysed and shown in Table 4. As the ABS SA2 geographical boundary is the lowest common denominator for Usual Residents and Place of Work data, areas in and part of Whittlesea were examined.

There were 13,389 short commute trips, up to 5km, in Whittlesea. Over 50.4% of short commutes are by residents who both *live* and *work* in the same SA2 area. Thomastown had the highest local workforce (50.8%), followed by Whittlesea (45.2%), and Epping South (43.6%). For the rest of the SA2 areas, 70% - 90% of residents travelled outside their local area for work. South Morang North had the smallest local workforce at 10.4%.

Lalor East had the greatest proportion of commuters (70.1%) who travelled less than 5km to their work destination, followed by Epping South (62.8%), Bundoora West (61.9%), Lalor West (60.2%), and Thomastown (59.6%). Conversely, Mernda South and Mernda North have the greatest proportion of commuters who travel *over* 5km to their work destination, at 74.3% and 73.1%, respectively.

Table 4 Residents who work locally

Area	Total residents*	Work locally	Work elsewhere
Thomastown	1,922	50.8%	49.2%
Whittlesea	1,625	45.2%	54.8%
Epping - South	1,052	43.6%	56.4%
Doreen - North	2,283	29.2%	70.8%
Mill Park - North	2,542	28.6%	71.4%
Bundoora - West	540	28.1%	71.9%
Bundoora - North	869	25.4%	74.6%
Epping - West	1,734	22.0%	78.0%
South Morang - South	1,869	21.0%	79.0%
Wollert	3,309	20.2%	79.8%
Doreen - South	1,320	19.5%	80.5%
Lalor - West	1,321	19.3%	80.7%
Mernda - South	1,737	17.2%	82.8%
Lalor - East	1,084	17.1%	82.9%
Mernda - North	1,616	15.3%	84.7%
Epping - East	1,827	12.2%	87.8%
Mill Park - South	1,441	10.6%	89.4%
South Morang - North	2,116	10.4%	89.6%

*Total residents only include those who travelled for work.

Source: ABS 2021

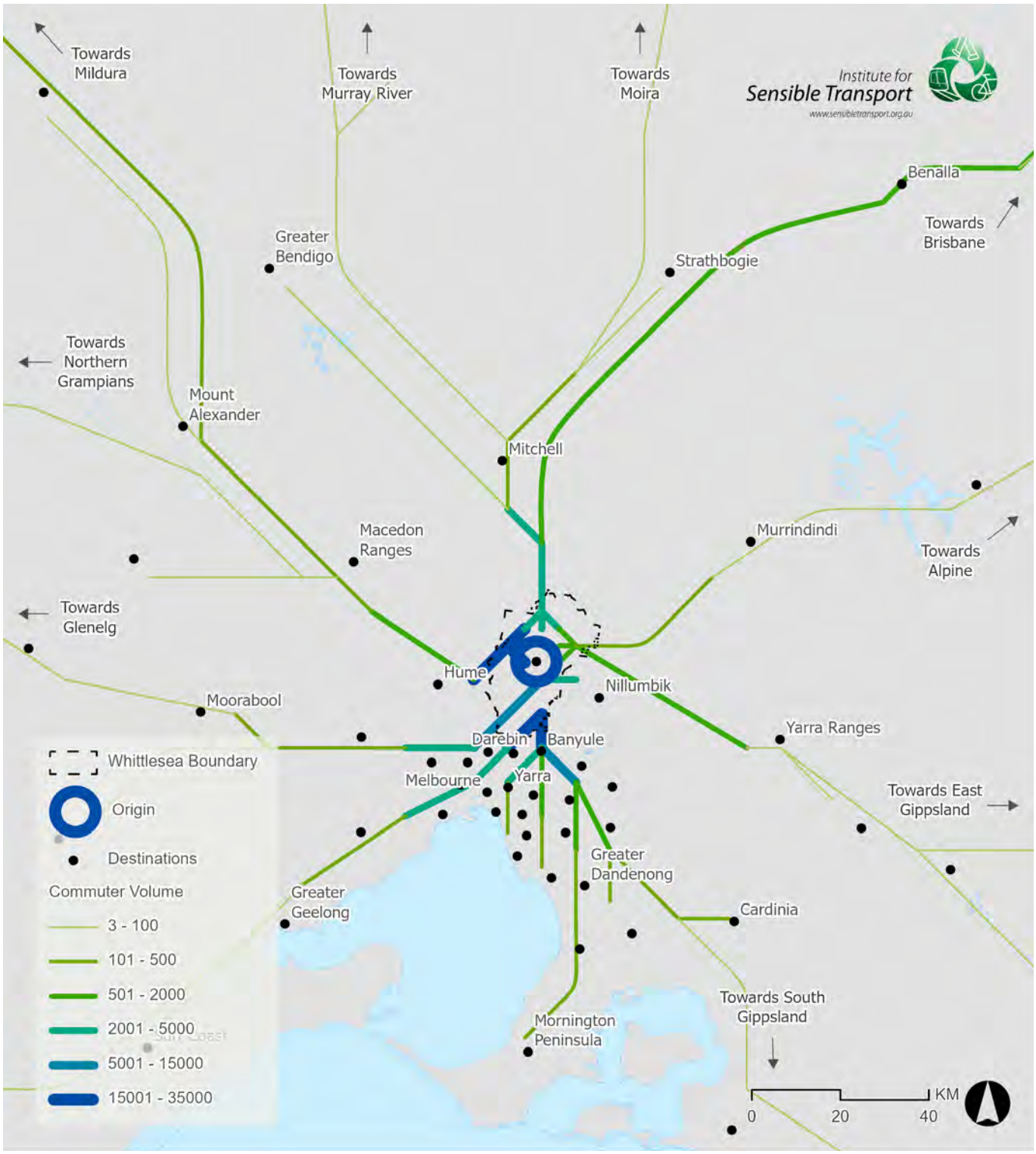


Figure 44 Journey to work destinations

Source: ABS 2021

Work related trips are the largest single trip type category. By creating a set of transport choices that prioritise walking, cycling and public transport, Council can have a significant impact on boosting the sustainability of journey to work trips. Ensuring strong active transport connections to public transport will help people travelling outside of Whittlesea for work to do so without the current level of dependence on motor vehicles.

6.2 Victorian Integrated Survey of Travel and Activity (VISTA) data

The *Victorian Integrated Survey of Travel and Activity* (VISTA) is a travel diary survey that records information about people's travel, including mode, distance, and purpose. Demographic data about the person is also collected, allowing an analysis to differentiate based on sex[3]. This is an important data set because the ABS Journey to Work only covers around 20% of trips. The VISTA data set builds a more comprehensive picture of mobility patterns in Whittlesea.

6.2.1 Mode share and travel patterns

All trips recorded in VISTA that start or end in Whittlesea has been analysed as part of this Background Report. Based on this data, it is estimated that there are roughly 630,000 trips either starting or ending in Whittlesea on a usual weekday. Half of all trips in Whittlesea are completed by females.

The mode share of all trips starting or finishing in Whittlesea is shown in Figure 45. The largest mode share is for motor vehicles at 85% (59% as a driver, and 26% as a passenger). However, 8.8% of trips are walking or cycling, with 8% walked and 0.8% cycled. This is higher than public transport with a combined 6.1%.

8.8% of trips are active, with 8% walked and 0.8% cycled.

The average trip distance across all modes is 12.7km, however, this varies depending on mode, as shown in Figure 46. Walking trips average 1.1km and bicycle trips average 4.8km. Tram, bus and car trips have similar average distances, while train trips have the longest average distance.

Walking trips average 1.1km and bicycle trips average 4.8km.

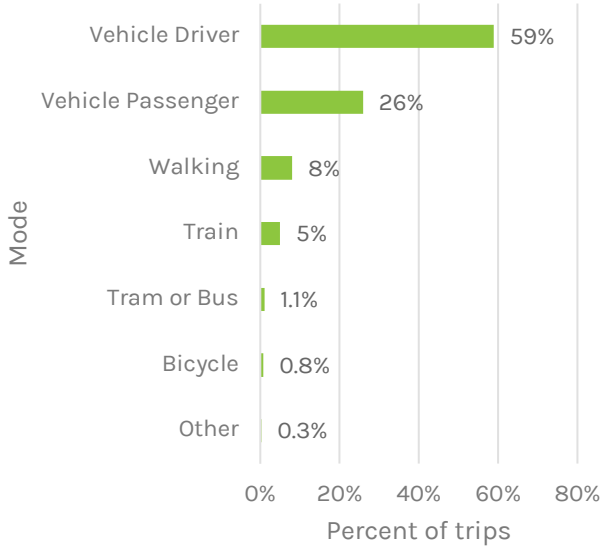


Figure 45 Mode share in Whittlesea, VISTA

Source: DTP

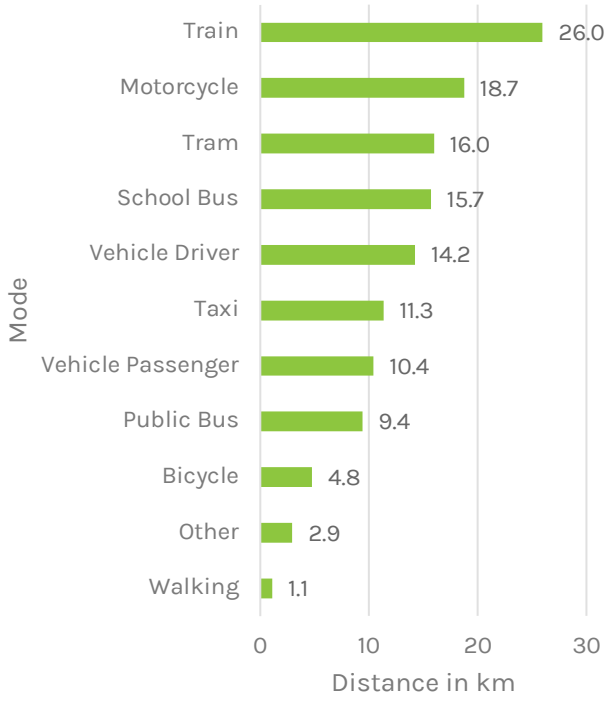


Figure 46 Average trip distance by mode, Whittlesea, VISTA

Source: DTP

[3] Note that only binary data about sex is shown in VISTA data.

Mode shares vary significantly, based on trip distance, as shown in Figure 47. For trips up to 1km, 55% were walked, and 0.6% were done with a bicycle. At 5km, 21% were walking trips and 1.6% done with a bicycle. This shows that people are more likely to walk shorter distances than use any other mode of travel, however, the willingness to walk decreases as distances grow. For all trips of up to 10km, 14% are walked, and overall, 8% of trips are walked.

55% of trips under 1km were walked.

Another way of looking at mode share over distance is to look at cumulative trips by distance band, by mode, as shown in Figure 48. This shows that walking trips are generally shorter, with over 63% being up to 1km and 96% up to 3km. Interestingly, vehicle trips and tram or bus trips follow a more similar distribution.

Of all trips in Whittlesea recorded in VISTA, 9% are less than 1km; 38% are less than 5km; and 56% are less than 10km. Only 44% of trips which start or finish in Whittlesea are over 10km.

38% of trips in Whittlesea are less than 5km.

The trip distances in Whittlesea have implications for potential to shift modes. The data shows that many journeys which currently use motor vehicle are of a distance which could be shifted to walking or cycling. Walking trips already make up a large share of shorter trips, however, this quickly drops as distance increases. While cycling also increases, from 0.6% of all trips under 1km to 1.7% of all trips under 4km.

45% of trips under 1km are by car, either as a driver or passenger.

Active transport has the greatest potential for mode shift for trips below 5km. Based on existing travel data, up to 38% of trips in Whittlesea have the potential to be taken by active transport. For longer trips, public transport is likely to be a more suitable substitute.

Active transport has the greatest potential for mode shift for trips below 5km. For longer trips, public transport is likely to be a more suitable substitute.

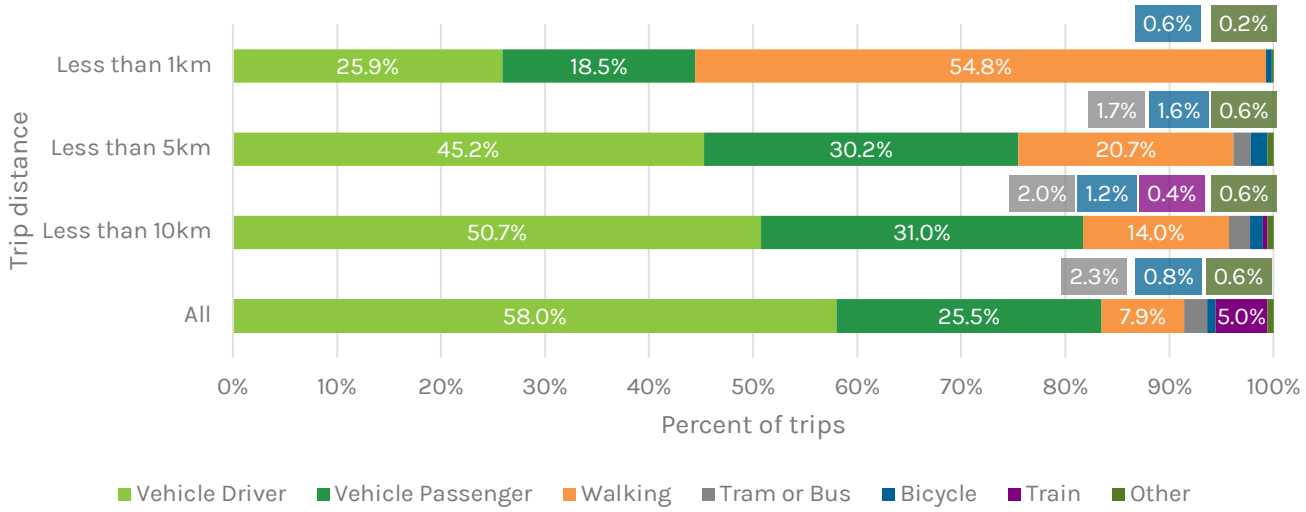


Figure 47 Mode share by distances travelled in Whittlesea, VISTA

Source: DTP

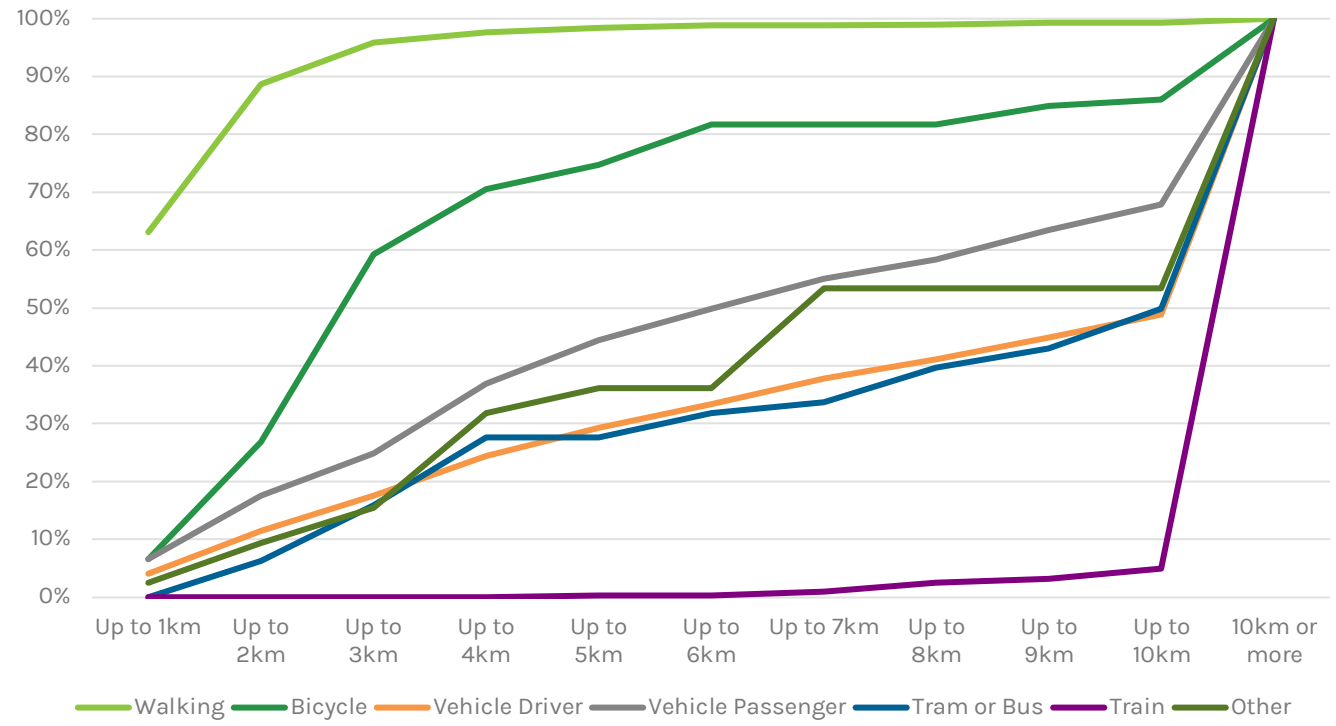


Figure 48 Cumulative percent of trips per mode, by distance, VISTA

Source: DTP

6.2.2 Trip purpose

VISTA data include trip purpose, which is shown in Figure 49. Trips included in this figure are for trips made by residents beginning in Whittlesea. Work trips make up 22% of all trips, the highest category. Purchasing things, socialisation, and picking up or dropping off someone are next highest, at 18%, 15% and 12% respectively. Almost one quarter of all trips (22%) beginning in Whittlesea have a social or recreational purpose.

Almost one quarter of trips in Whittlesea have a social or recreational purpose.

Some 8% of trips are people travelling to education, 8% for personal business, and 6% to accompany someone. Combined, this accounts for 29% of all trips. An additional 2% are picking-up or dropping off something, and 1% were transiting through.

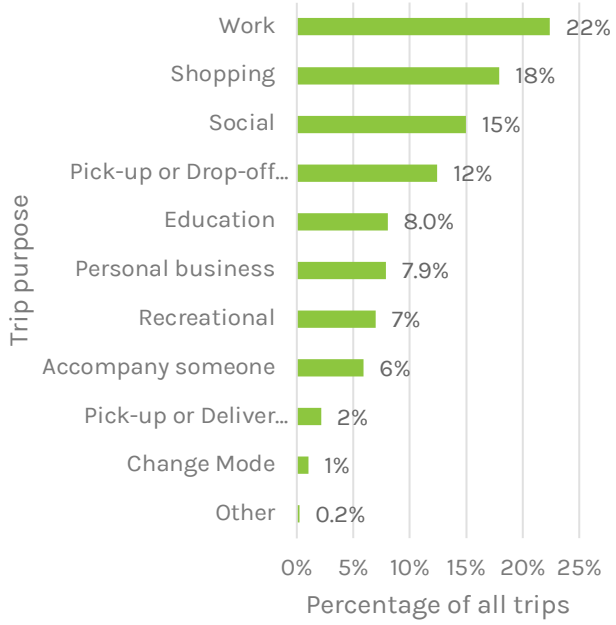


Figure 49 Trip purpose, Whittlesea residents

Source: DTP

Understanding trip types is important, as some (e.g., social and recreational) are more likely to be able to be done by walking or on a bicycle. By comparison, shopping trips, picking-up or dropping off someone, or picking-up or dropping off something are less likely as they involve moving other people and/or objects.

Similar trip purposes were reported for all trips ending in Whittlesea, as shown in Figure 50.

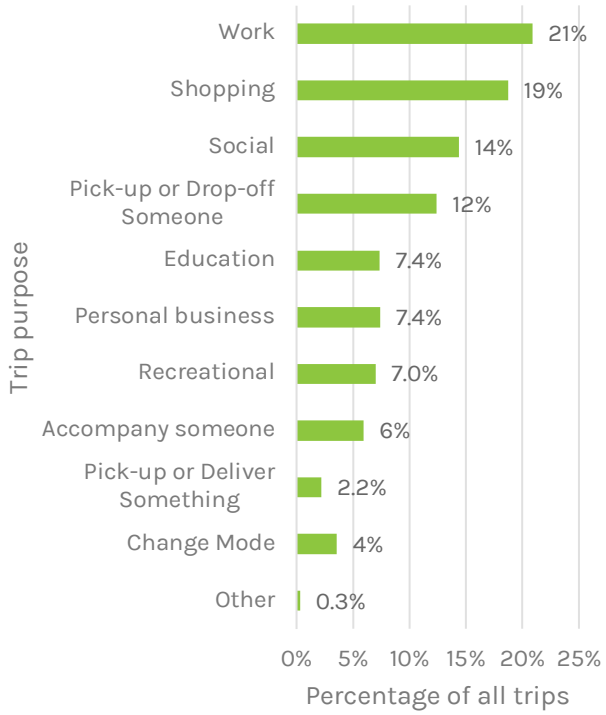


Figure 50 Trip purpose, Whittlesea as a destination

Source: DTP

6.2.2.1 Trip purpose by mode

For almost all trip purposes, the car is by far the dominant mode of travel, as shown in Figure 51. The exception is for those transferring from one mode to another, where 87% were walked. Walking is the next most recorded mode for all trip purposes, where trips completed for recreation was highest (39%), followed by personal business (32%), and education (21%). Similarly, trips for recreation recorded the most trips cycled (4%), followed by education (3%). Public transport was only reported for trips to change mode, accompany someone, or for education.

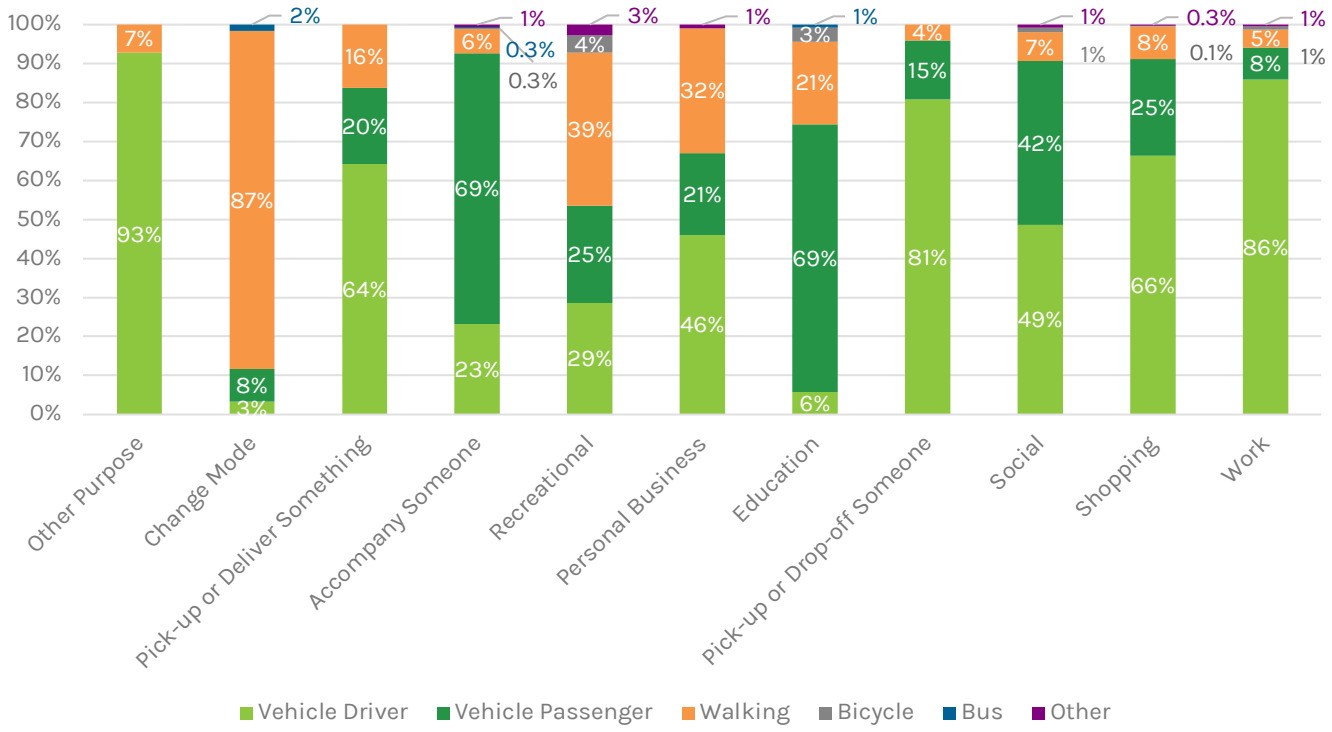


Figure 51 Trip purpose by mode

Source: DTP

6.2.3 Mobility differences between sexes

As VISTA data contains basic demographic information, travel differences between sexes can be analysed.

The average trip distance for females is lower than for males, as shown in Figure 52. This means that lower cycling participation and higher car use cannot be attributed to longer trips. Indeed, the opposite is true, with females averaging a trip distance of 10.9km, while males have an average trip distance of 14.5km.

There is a noticeable difference in mode share between females and males, as shown in Figure 53. Both females and males complete approximately 8% of trips by active transport, where the split between bicycle use is noticeable. Females walk for 8% of trips and use a bicycle for 0.4%. Males walk for 7% of trips and use a bike for 1.3%. In Whittlesea, bike mode share for males is 3.3 times the bike mode share for females.

Males are over three times as likely to cycle as females.

Females and males travel in motor vehicles for almost equal proportions of their trips (either as a driver or a passenger). Females travel in motor vehicles as a passenger for a greater proportion of trips than males, whereas males have a greater mode share as a vehicle driver. Similarly, mode share split is relatively even for females and males on public transport.

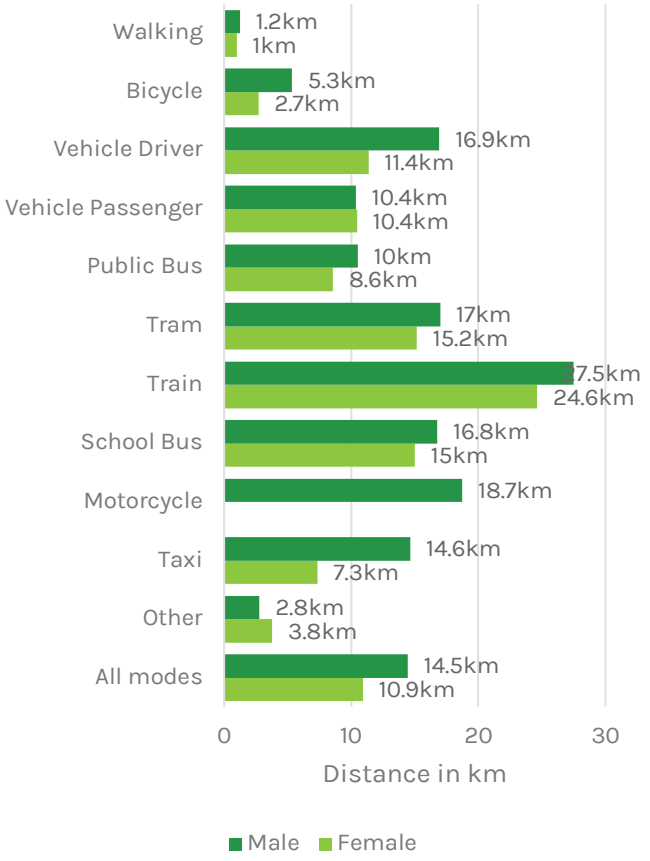


Figure 52 Average trip distance by mode, by sex, VISTA

Source: DTP

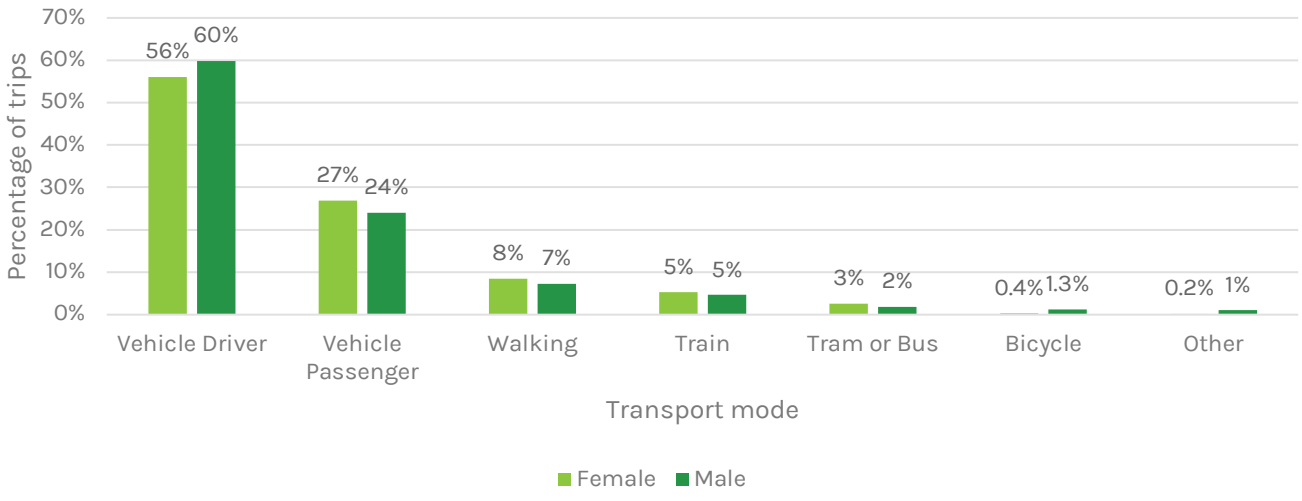


Figure 53 Mode share in Whittlesea by sex, VISTA

Source: DTP

Greater detail in the differences between female and male trip distances is shown in Figure 54. This shows that 58% of female's trips are over 5km, while 67% of male's trips are over 5km.

There are noticeable differences in trip purposes for female and males, as shown in Figure 55. Males complete substantially more work-related trips (36%) than females (25%). Conversely, females complete 1.8 times as many trips to pick-up or drop-off someone, and twice as many trips to pick-up or deliver something. Females also complete more shopping trips (13%) and personal business trips (8%) than males in Whittlesea.

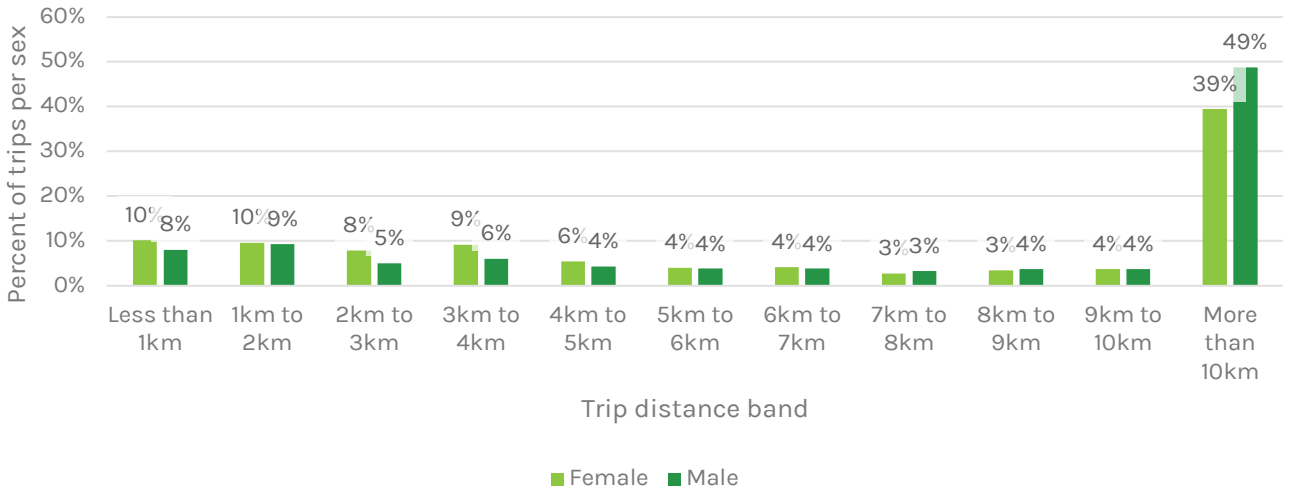


Figure 54 Percent of trips per distance, by sex, VISTA

Source: DTP

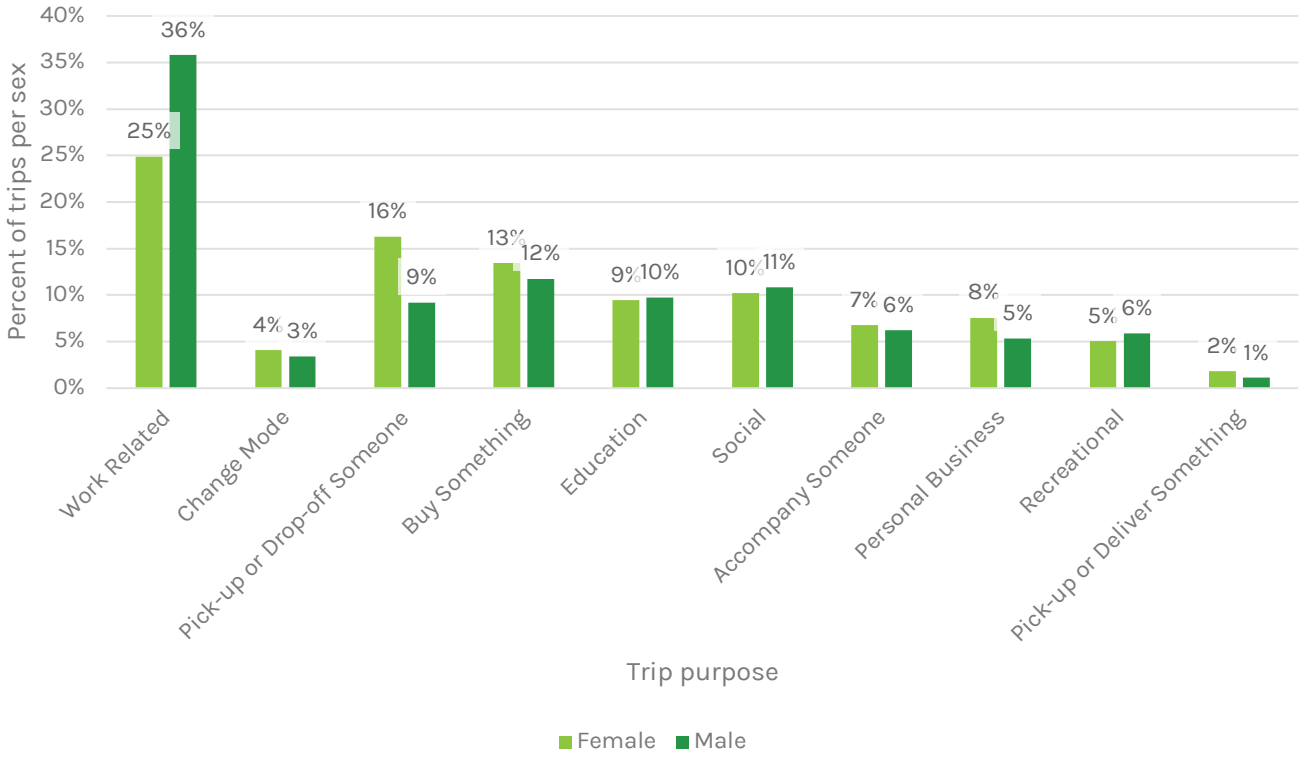


Figure 55 Percent of trips by purpose, by sex, VISTA

Source: DTP

Females complete 1.8 times as many trips to pick-up or drop-off someone, and twice as many trips to pick-up or deliver something, as males.

Females are also more likely to perform trip chaining, where trips include more than one stop before arriving at the final trip destination, as shown in Figure 56. Overall, 54% of trips that involved trip chaining were completed by females, compared to 44% for males. A significant proportion of people who trip chained made 3 stops.

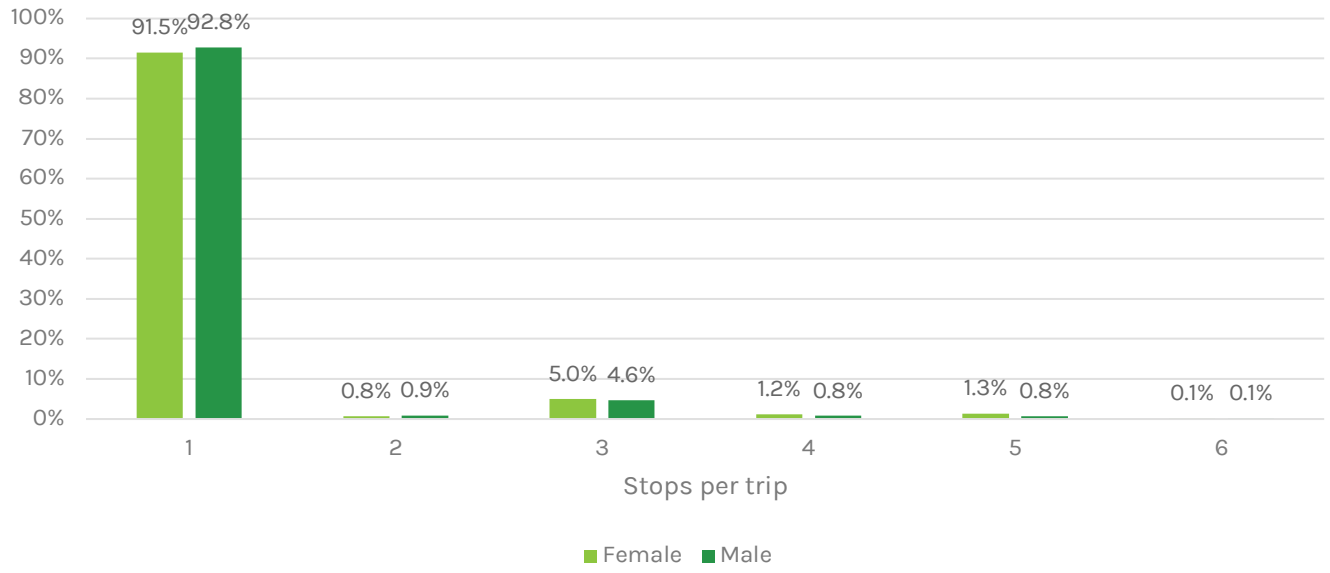


Figure 56 Trip chaining by sex, VISTA

Source: DoT

The VISTA data provides more detailed information about travel patterns in Whittlesea, allowing for a more inclusive and comprehensive understanding of mobility. This data enhances Council's ability to craft an ITP that is sensitive to the specific mobility patterns of a larger proportion of trip types.

6.3 City of Whittlesea Annual Household Survey 2021

The 2021 Household Survey conducted by the City of Whittlesea aimed to provide valuable insights into various aspects of the community within the City of Whittlesea. One of the key aspects covered in the survey was transport. An overview of the transport-related findings from the survey is provided in this section. It is worth noting that gender cross section of this survey was not provided to us.

6.3.1 Transport mode

As shown in Figure 57, the car is the most common mode of transport in Whittlesea, followed by train and walking.

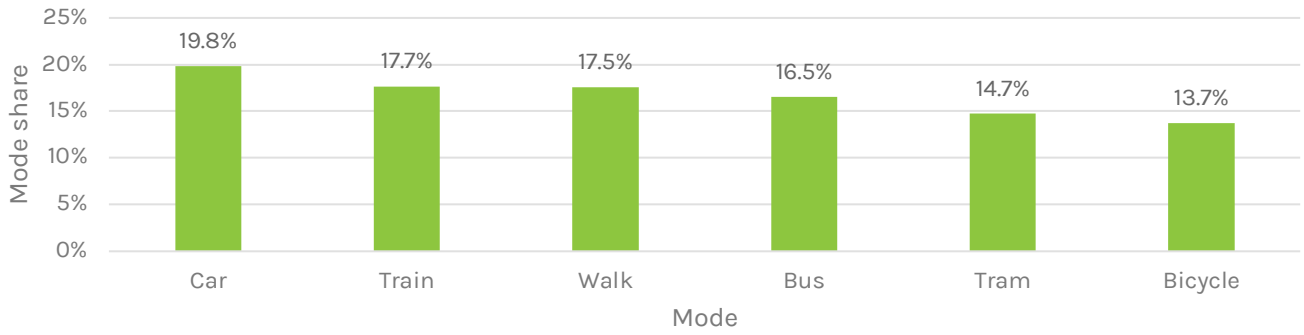


Figure 57 Whittlesea mode share, all trips

Source: Whittlesea Household Survey 2021

Figure 58 reveals trends in *convenience* since 2017. Scores ranging from 0, very difficult, to 10, very easy, represent the ease of getting to local destinations. Train and bus convenience has improved, while cycling, walking, and tram experiences have worsened for users. It suggests that local transport improvements have positively impacted train and bus services. However, challenges affecting cycling, walking, and tram experiences should be investigated further to enhance user convenience.

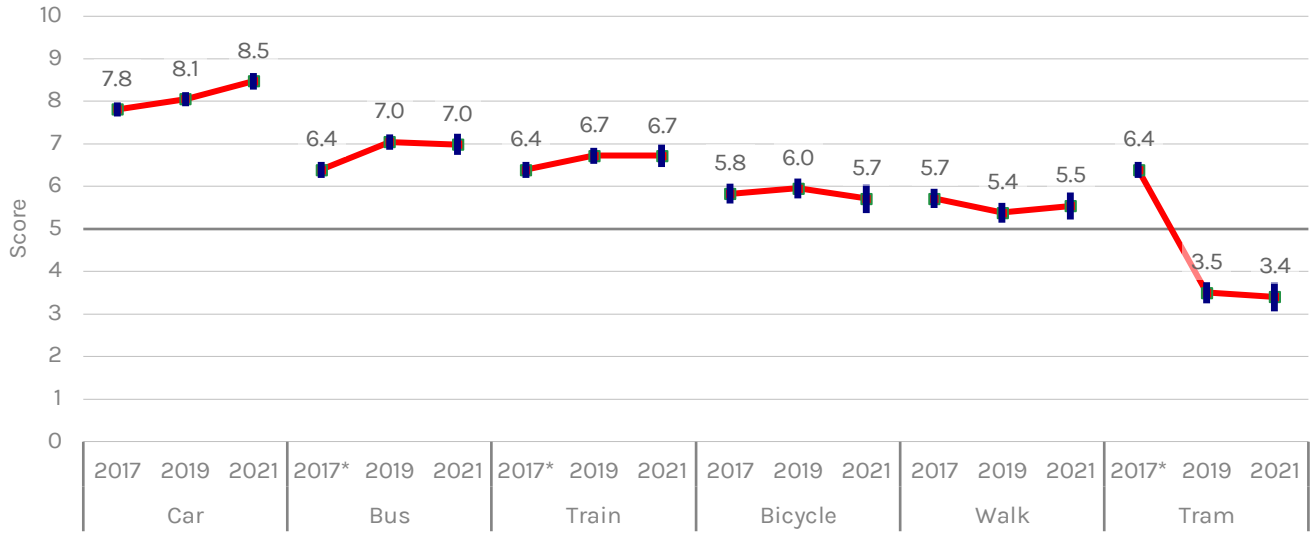


Figure 58 Convenience of transport modes to access local destinations

Source: Whittlesea Household Survey 2021

For further investigation, Figure 59, Figure 60, and Figure 61 reveal walking, cycling and tram convenience to access local destinations in different precincts for 2021. Figure 59 indicates the walking experience for those in Mernda and Whittlesea townships, as well as the Rural north is in the *difficult* range.

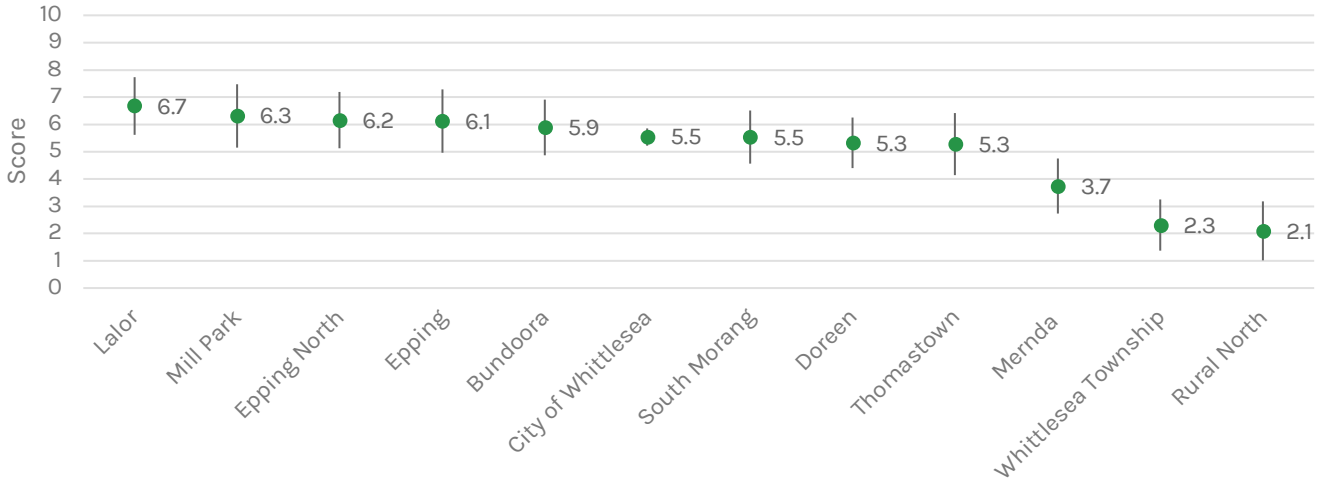


Figure 59 Walking convenience in different precincts

Source: Whittlesea Household Survey 2021

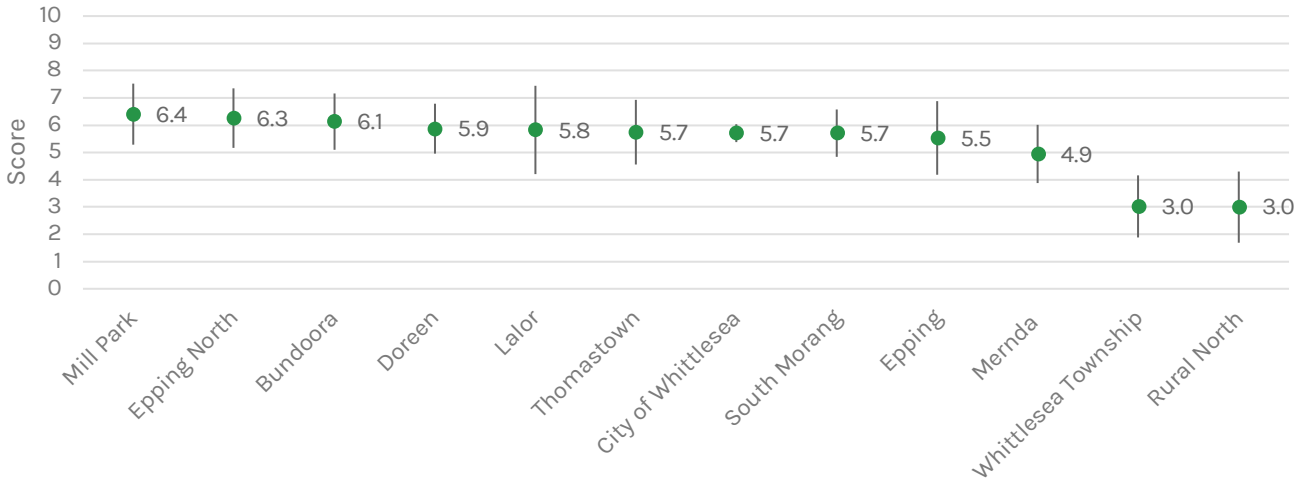


Figure 60 Cycling convenience in different precincts

Source: Whittlesea Household Survey 2021

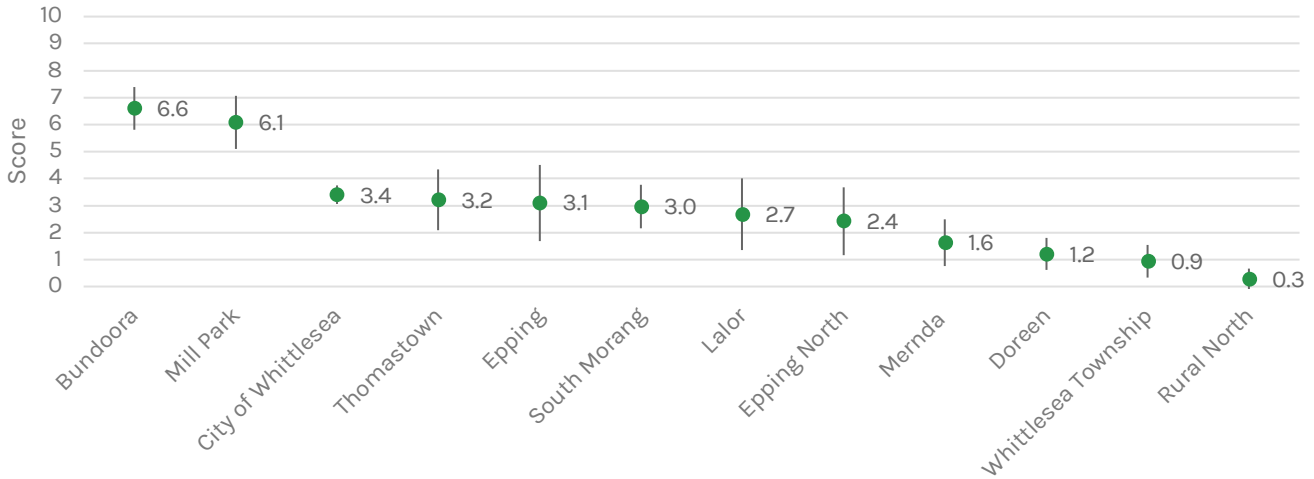


Figure 61 Tram convenience in different precincts

Source: Whittlesea Household Survey 2021

6.3.2 Commute time

Figure 62 shows commute time across different precincts for employed respondents. At least half the trips in Lalor, Epping North, Epping, and Thomastown are less than 30 minutes. In Rural North, Doreen, Mernda, and the Whittlesea Township, the majority of commute times are between 30 to 89 minutes. This graph reveals the disparities in travel time across different precincts which could be due to public transport availability, population density and access to employment centres.

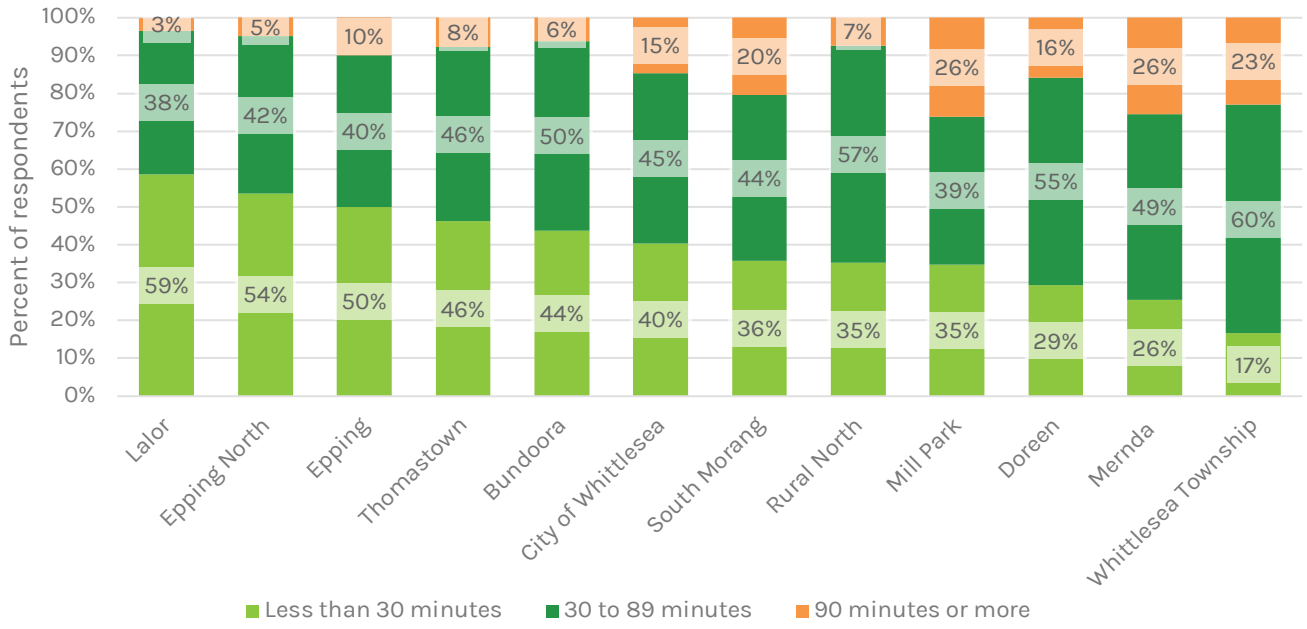


Figure 62 Commute time across different precincts

Source: Whittlesea Household Survey 2021

Figure 63 shows commute time based on employment location for employed respondents. The majority of people who work in the City of Whittlesea (80%) have a commute time of less than 30 minutes. Conversely, as one's workplace moves farther away from the City of Whittlesea, commute times tend to increase.

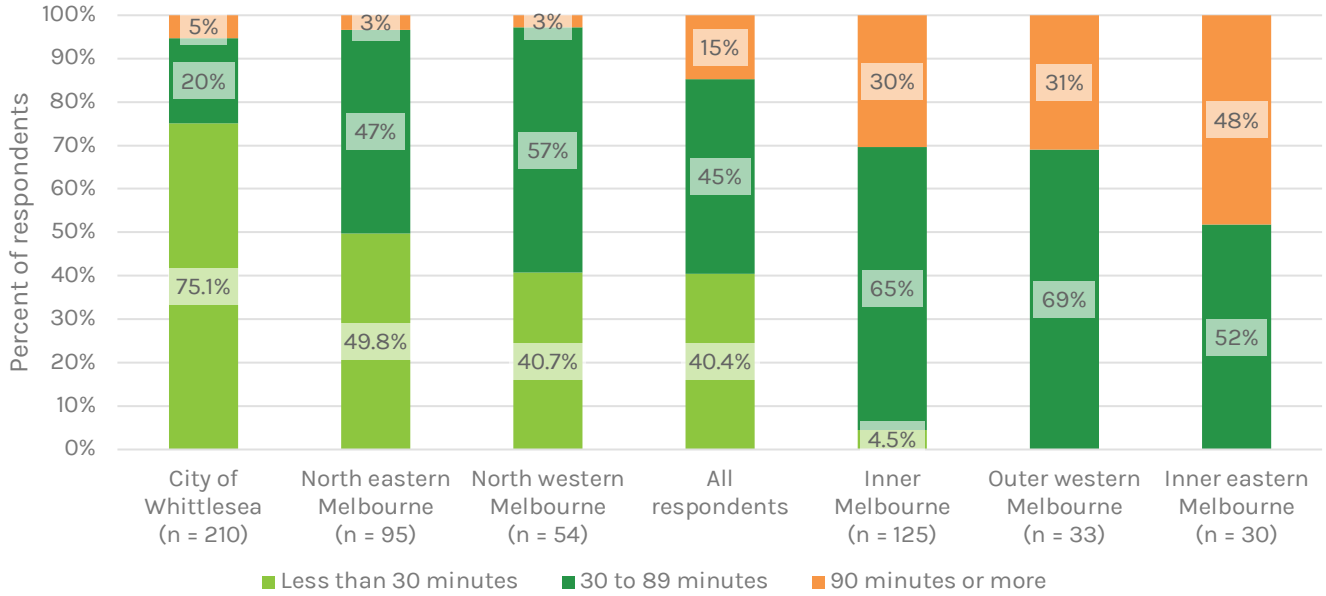


Figure 63 commute time comparison by region of employment

Source: Whittlesea Household Survey 2021

Key considerations for the future ITP should encompass enhancing public transport availability and efficiency, particularly in precincts with longer commute times. Additionally, the ITP could focus on strategies that promote mixed-use development, reducing the need for long-distance commuting and minimising population density-related congestion.

6.3.3 Cycling

Figure 64 provides an overview of the cycling experiences of Whittlesea residents. Residents gave scores indicating their level of agreement to selected statements on a scale of 0 (strongly disagrees) to 10 (strongly agree). Generally, there is an upward trend in satisfaction over the past years, with individuals reporting improved connectivity, cycling facilities, signage, and safety within the region. However, it is noteworthy that maintenance, off-road and on-road cycling infrastructure, emerges as an area requiring more focused attention due to comparatively slower progress in comparison to other aspects. It is also critical to note that very few Whittlesea residents cycle. Thus, these results cannot be expected to be representative of the general Whittlesea population.

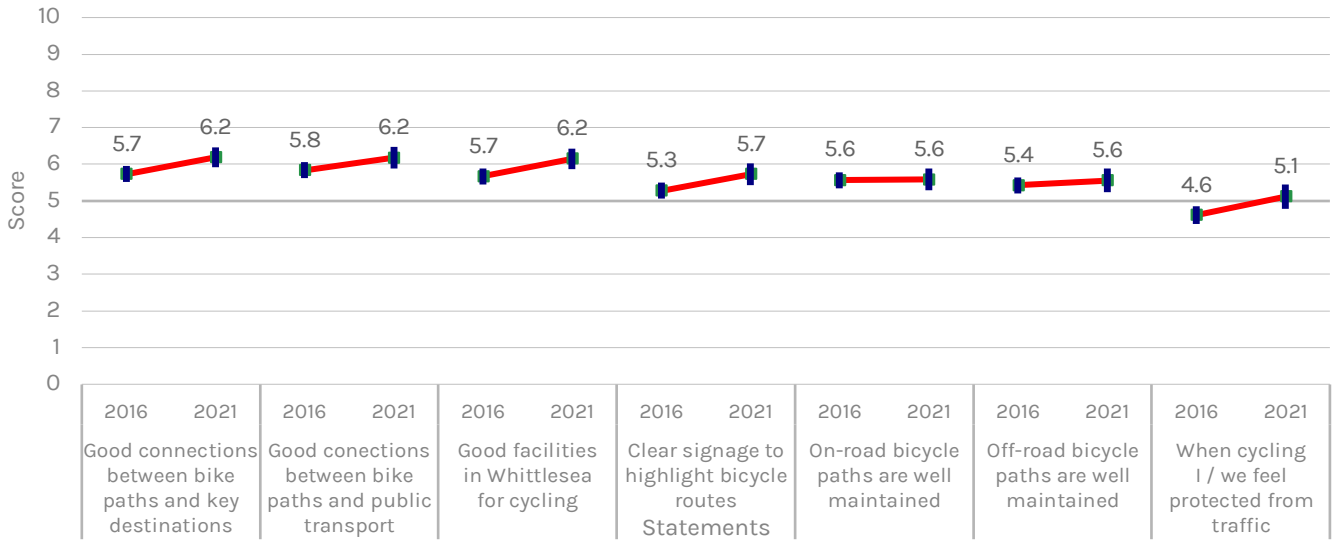


Figure 64 Cycling user experience

Source: Whittlesea Household Survey 2021

Figure 65 represents the average time spent cycling by frequency of trips among Whittlesea residents.

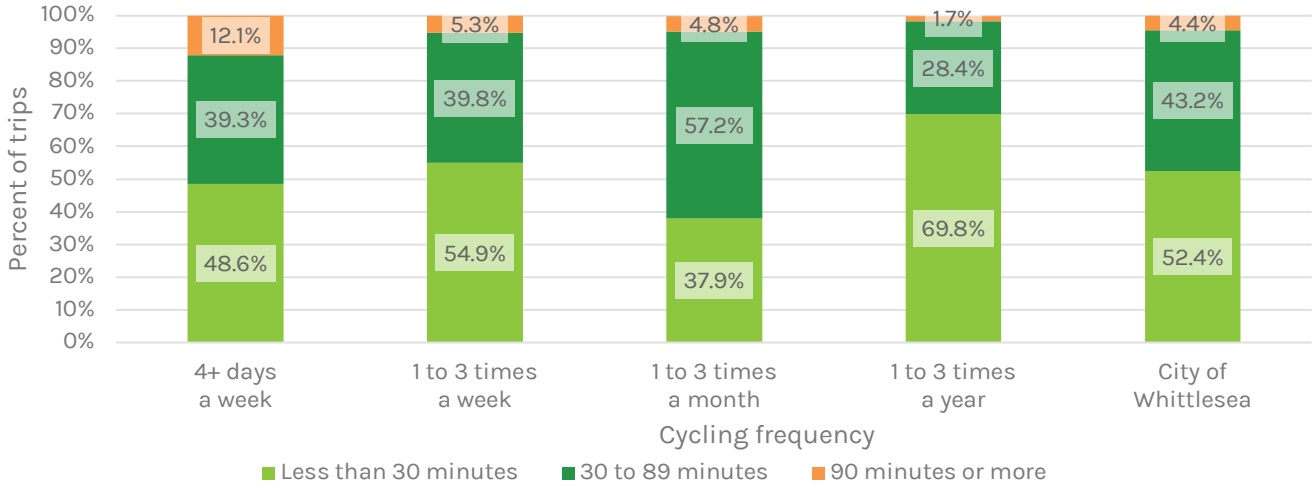


Figure 65 Average time spent cycling by frequency of cycling trips

Source: Whittlesea Household Survey 2021

Figure 66 offers a sociodemographic cross-section analysis of the time allocation for cycling. Across nearly all demographic groups, it is evident that the majority of individuals engage in cycling activities for durations of less than 30 minutes.

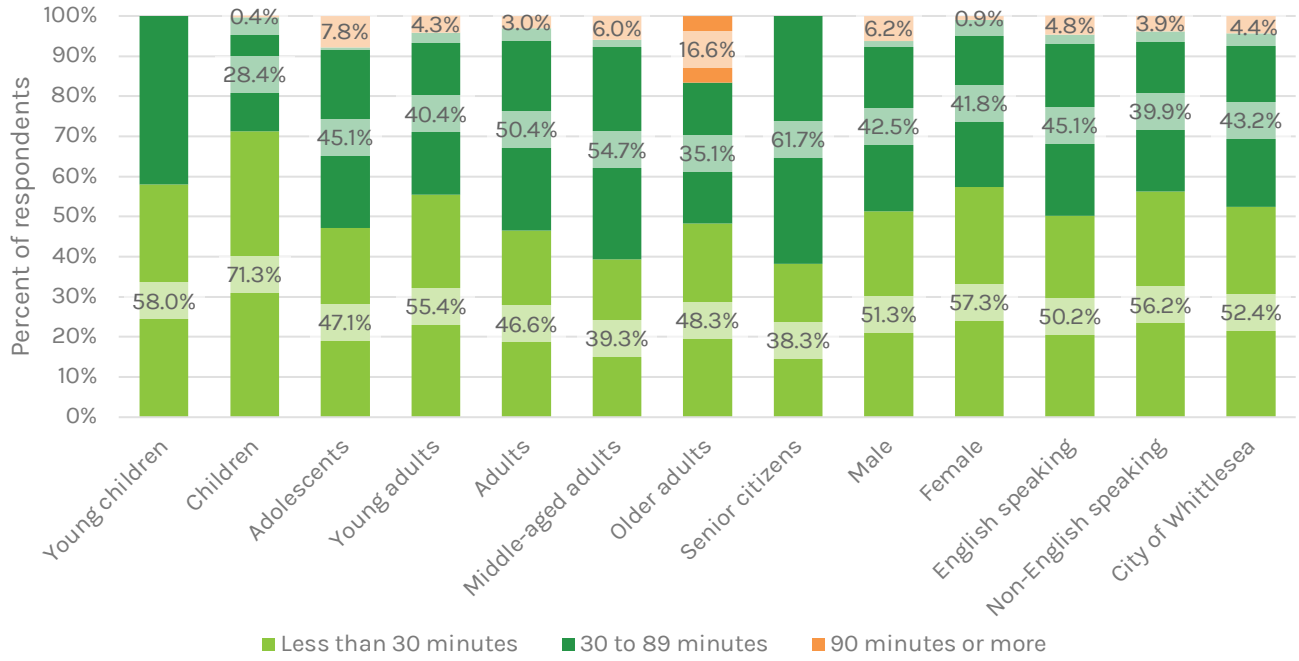


Figure 66 Average total time spent cycling by socio-demographic group

Source: Whittlesea Household Survey 2021

Figure 67 represents the average time spent for cycling across different precincts. In most of precincts, people ride a bike for less than 30 minutes.

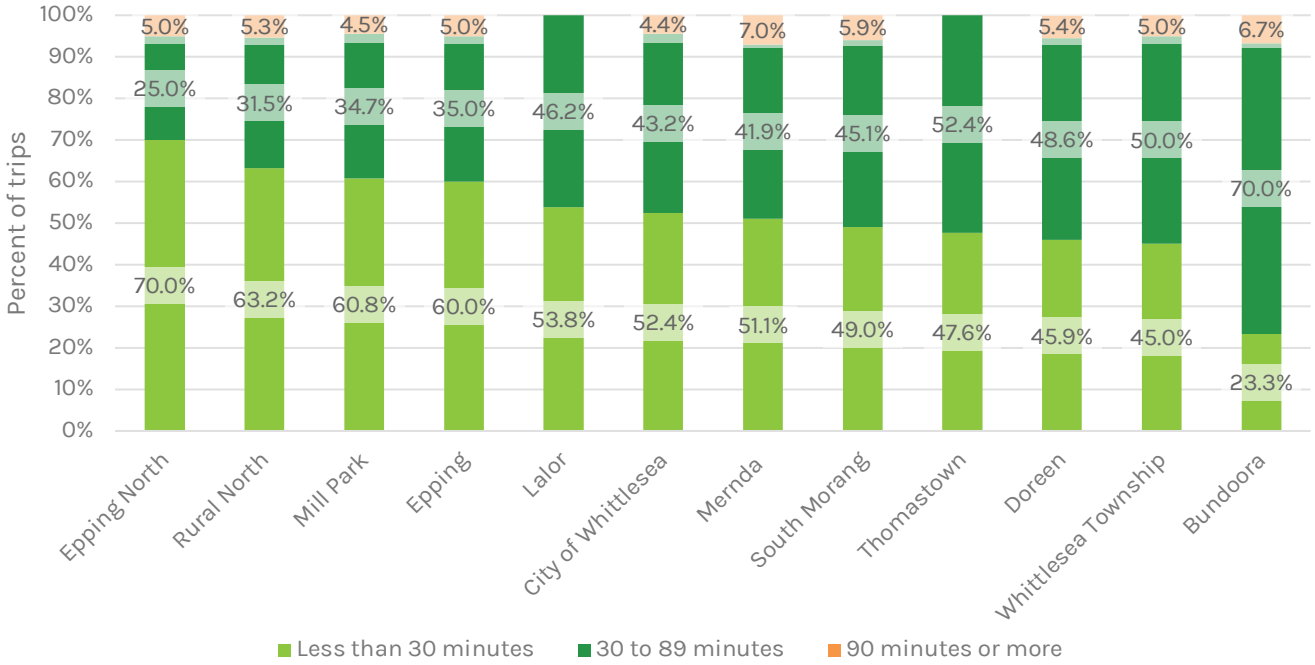


Figure 67 Time spent for cycling across different precincts

Source: Whittlesea Household Survey 2021

Figure 68 represents the primary motivations for cycling within the Whittlesea community. It reveals that the predominant reason for cycling is leisure, followed by school-related trips and work-related commutes.

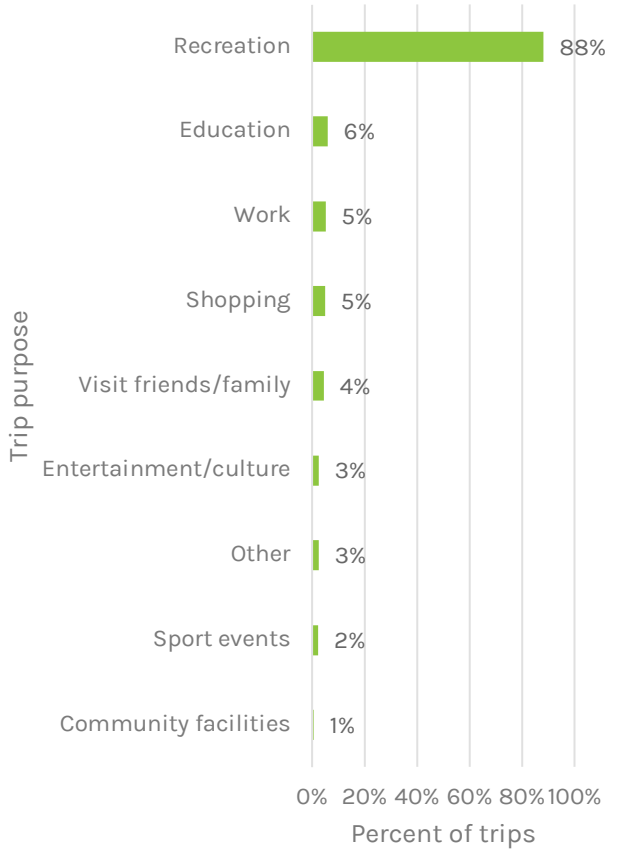


Figure 68 Reasons for cycling

Source: Whittlesea Household Survey 2021

Figure 69 highlights the frequency of cycling within the City of Whittlesea. Notably, there has been a substantial increase in the number of frequent riders, defined as those who cycle more than four times a week, with a fourfold rise compared to the data from 2016. Furthermore, there is a noteworthy reduction in the percentage of individuals who never engage in cycling.

Around 2 in 3 people in Whittlesea never ride a bicycle.

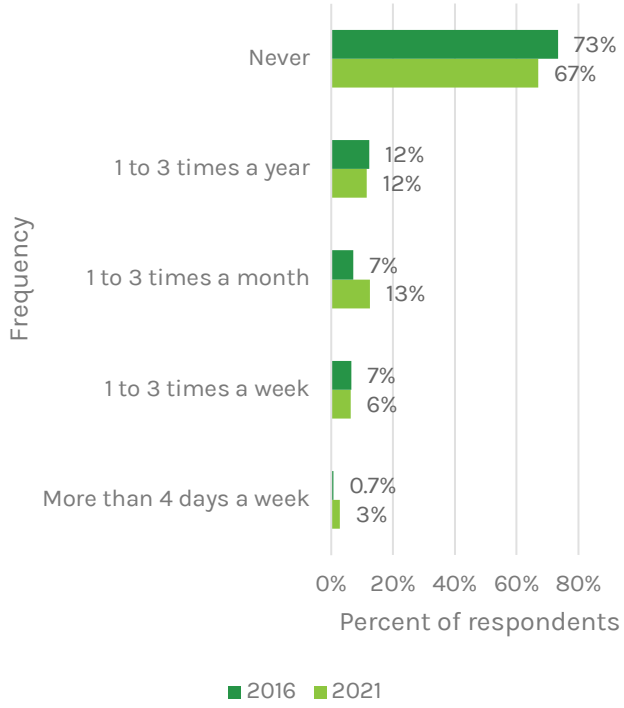


Figure 69 Frequency of cycling

Source: Whittlesea Household Survey 2021

In summary, the data suggests positive trends in cycling satisfaction, with improved facilities and safety. As highlighted earlier, the fact that only 1/3 of residents have ever ridden a bike suggests the current conditions are not conducive to cycling. The maintenance of cycling infrastructure requires improvement. Regular riders tend to have shorter rides, while casual riders go for longer trips. Most people, across demographics and precincts, prefer shorter cycling durations. Leisure is the primary reason for cycling, followed by school and work trips. A future ITP can work to enhance conditions for cycling, to broaden its appeal to a wider proportion of the population.

6.3.4 Journey to work

Figure 70 represents mode distribution of work trips. It is evident that the predominant mode of transport for work trips (80%) is by car. The second and third most employed options for work commutes are train and car, as well as public transport.

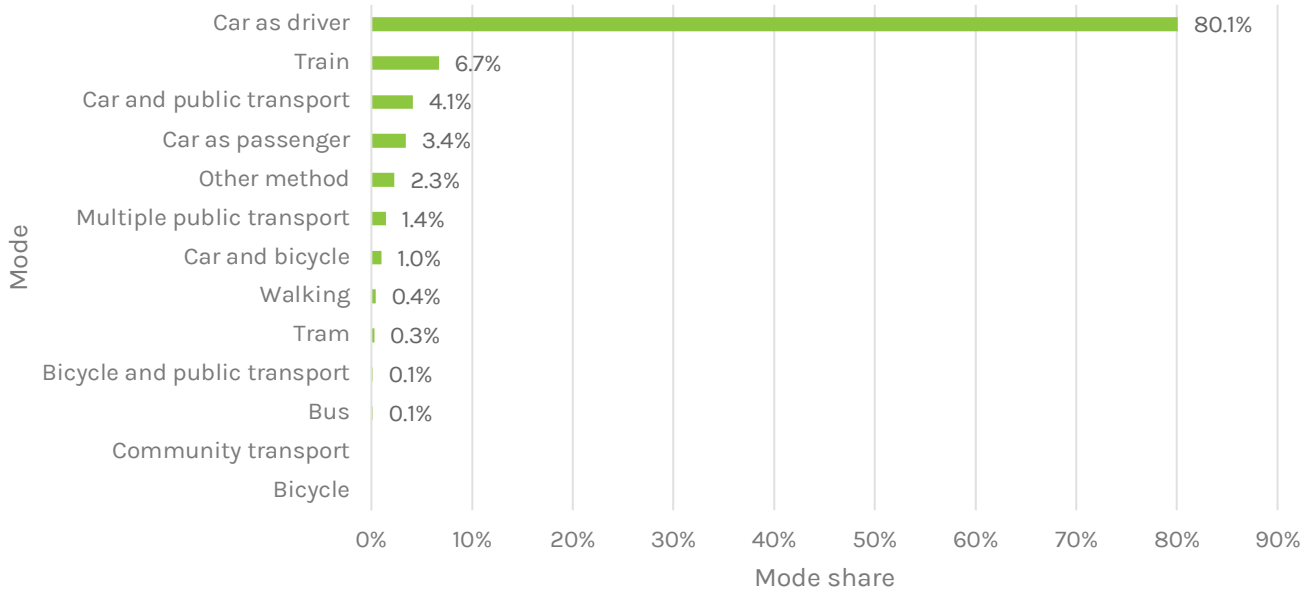


Figure 70 Journey to work mode share

Source: Whittlesea Household Survey 2021

Figure 71 represents trend of car and public transport usage for work trips over time. The data reveals that, since 2016, there was a notable rise in public transport usage and a corresponding decline in car usage. However, this trend experienced a reversal after 2019, with an increase in car usage and a decrease in public transport utilisation in 2021. It is worth considering that these shifts may be attributed, at least in part, to the impact of the COVID-19 pandemic on commuting patterns.

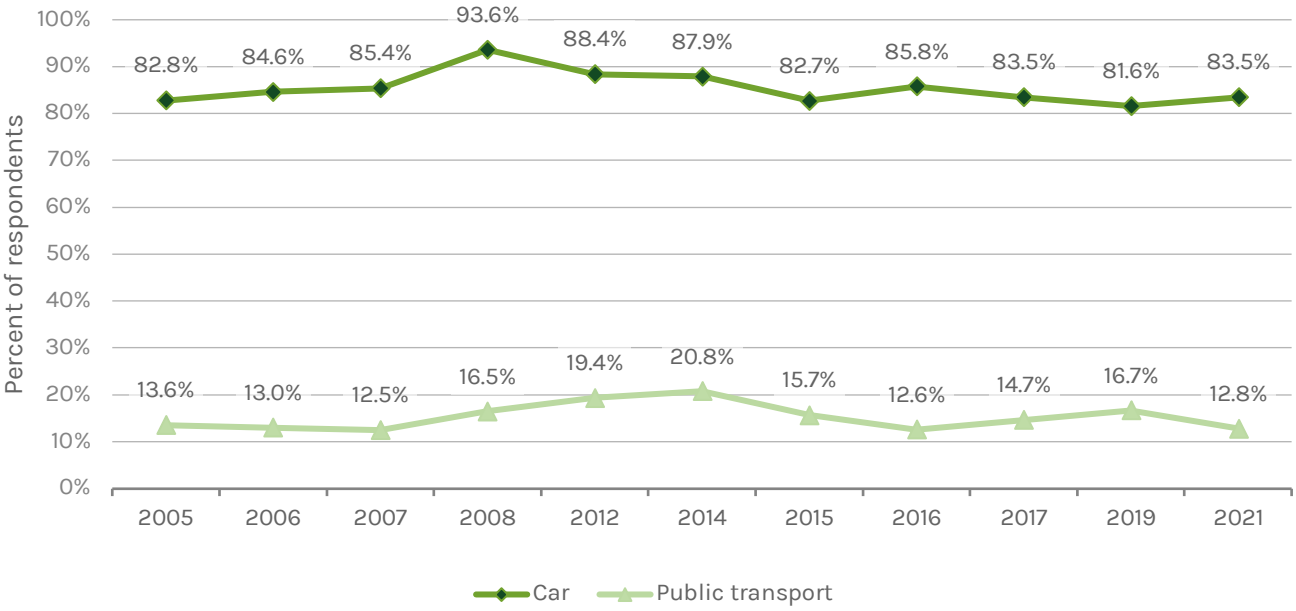


Figure 71 Comparison of car and public transport for journey to work across time

Source: Whittlesea Household Survey 2021

Figure 72 represents commute time for different modes of transport. It is evident that car trips predominantly fall within the bracket of less than 30 minutes, whereas journeys that incorporate public transport typically span the range of 30 to 89 minutes.

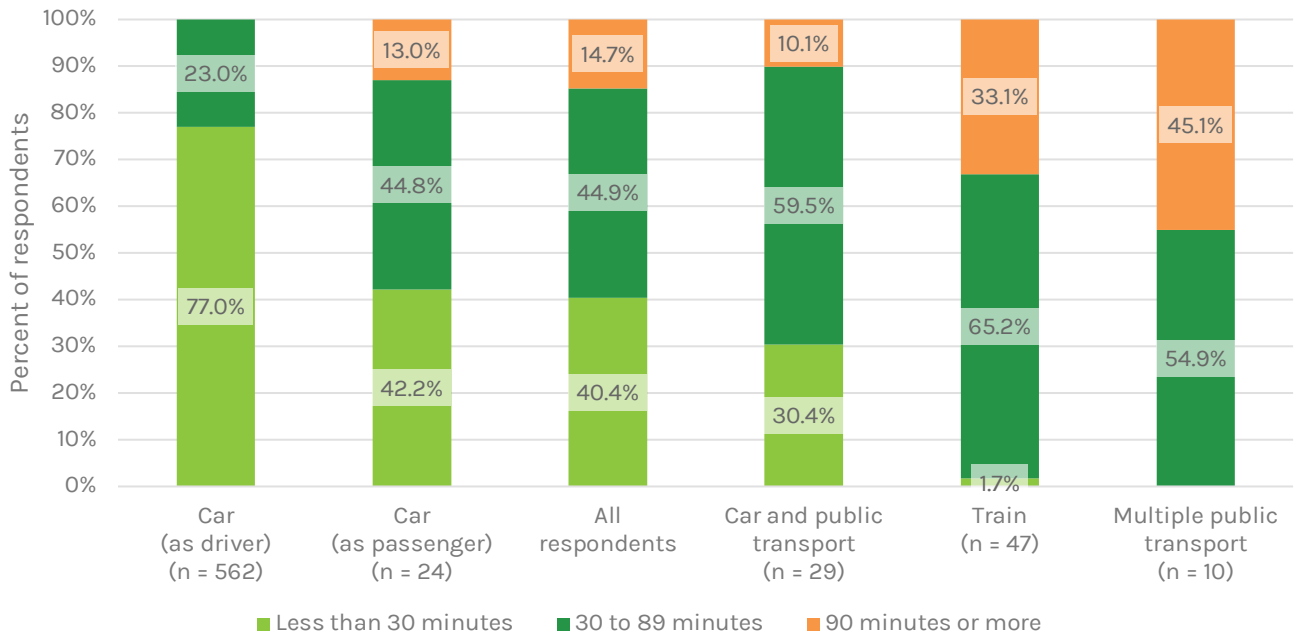


Figure 72 Commute time comparison across different mode of transport

Source: Whittlesea Household Survey 2021

In summary, the data highlights a reliance on cars for work trips, with a recent shift towards public transport usage, likely influenced by the pandemic. Commute times vary, with cars being quicker. An effective ITP should grow the diversity of transport options, to enable more people to access jobs and services without needed a motor vehicle.

6.3.5 Journey to study

Figure 73 represents mode share of study trips. Notably, the predominant mode of transport is by car, encompassing both drivers and passengers, accounting for 68.7% of total trips. The second and third most utilised modes for study-related journeys are car and public transport, followed by train.

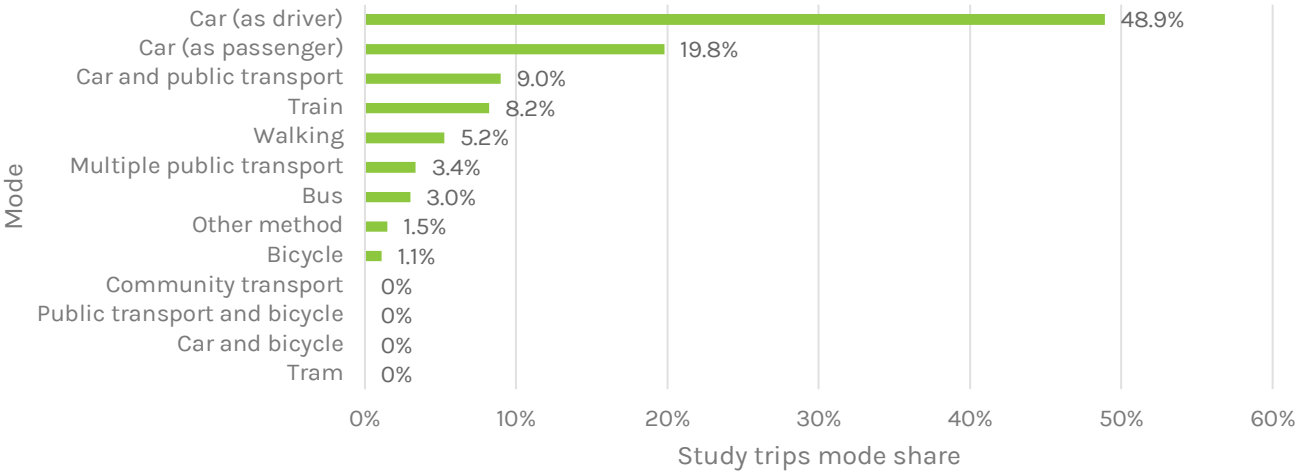


Figure 73 Journey to study mode share

Source: Whittlesea Household Survey 2021

Figure 74 depicts the historical trend in the utilisation of cars and public transport for study-related trips over time. The data demonstrates a significant decline in public transport usage after 2014. Moreover, a further decrease in public transport utilisation is observed after 2019, coinciding with a notable increase in car usage. It is imperative to acknowledge that external factors, notably the impact of the COVID-19 pandemic, may have played a role in influencing these fluctuations in transport choices.

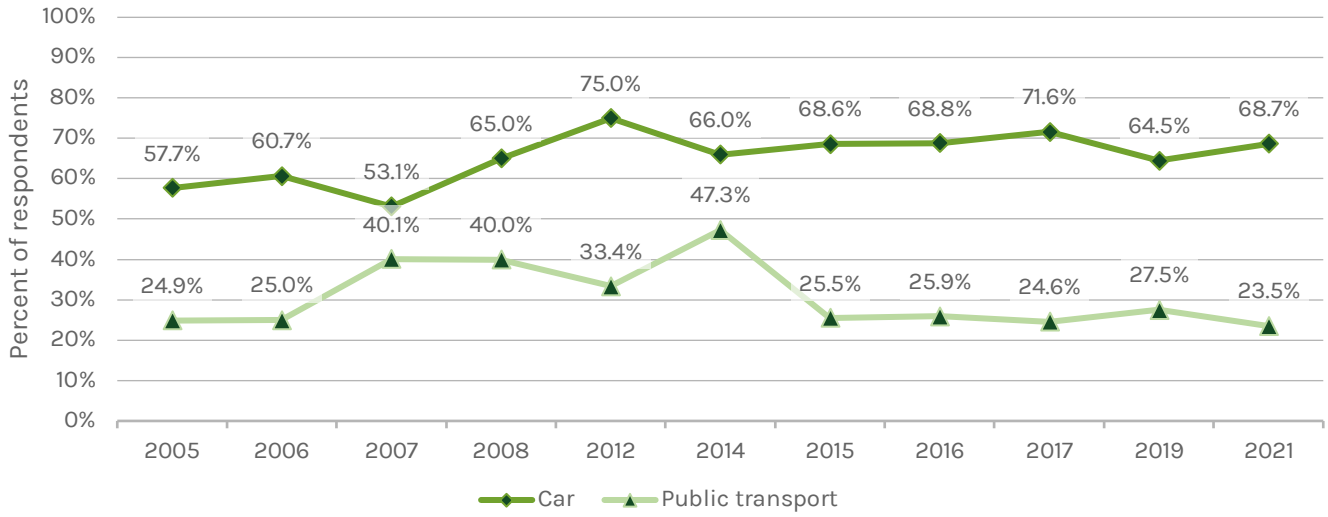


Figure 74 Comparison of car and public transport for journey to study across time

Source: Whittlesea Household Survey 2021

In summary, car travel dominates study trips, while public transport has declined since 2014, with a further drop after 2019, possibly due to the pandemic. To address this, an effective ITP should prioritise sustainable public transport options while considering external factors affecting travel choices, such as land use planning and access to jobs and services.

6.4 Transport network

The sections below describe elements of the transport system.

6.4.1 Public transport

There are numerous public transport options to residents in Whittlesea, as shown in Figure 75. Public transport options are generally higher quality in the more established areas of Whittlesea, which are largely in the south. However, some growth areas have reasonable public transport options, such as Mernda.

The following section provides insight into the extent of train, tram, and bus services available in the City of Whittlesea, and their patronage levels. It should be noted public patronage levels decreased substantially following the COVID-19 pandemic as a result of increased public health concerns, a shift towards private vehicle travel, and the adoption of remote/flexible work arrangements. It is expected that public transport patronage will gradually recover, but it may take some time for ridership to return to pre-pandemic levels.

The integration of public transport modes and increasing their frequency will play a crucial role in providing a more diverse set of transport options. For the new ITP, developing a coordinated advocacy role to ensure new, high quality public transport options are provided to existing and residential areas is essential.

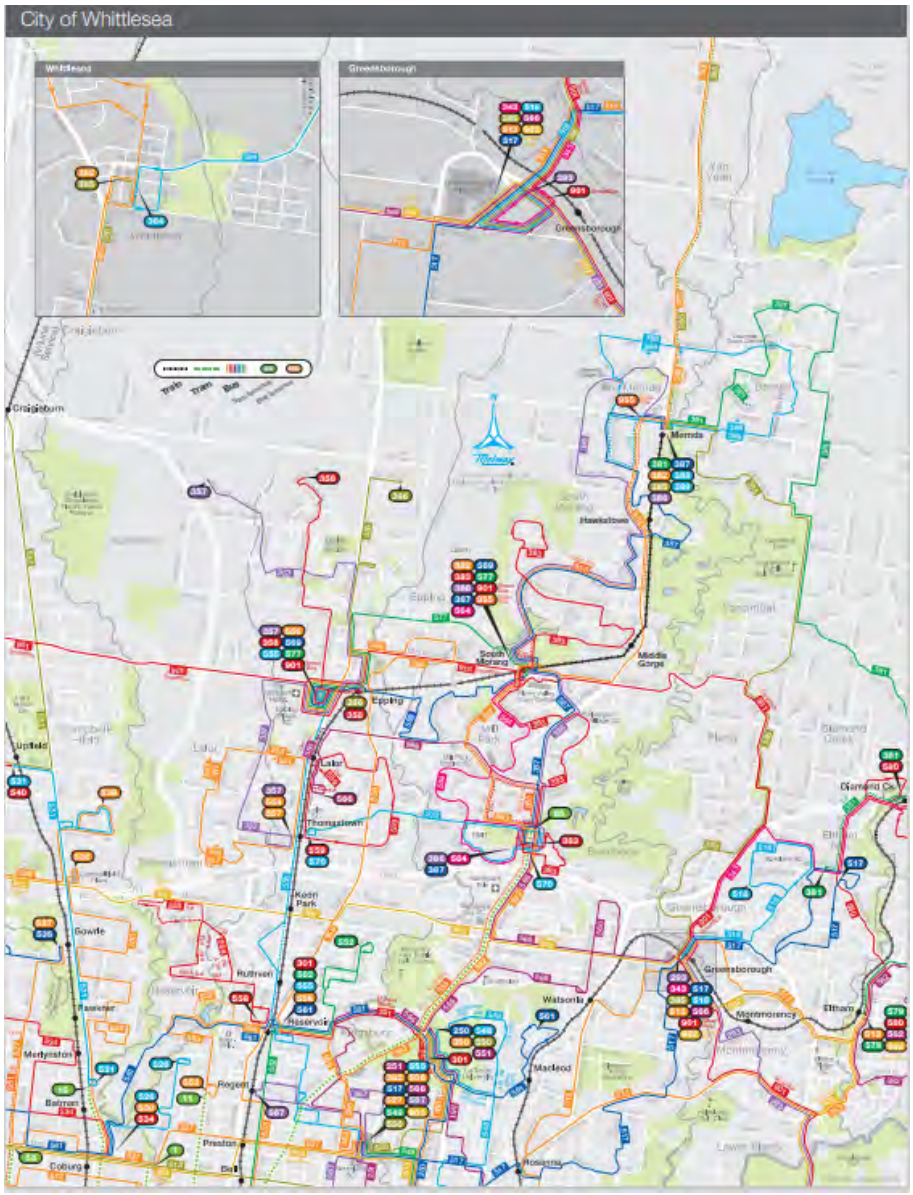


Figure 75 Public transport in City of Whittlesea

Source: PTV

6.4.1.1 Train

There are two train services operating within Whittlesea: the Mernda railway line, which is part of Melbourne's metropolitan railway system, and Donnybrook Station on the Seymore regional railway, serviced by V/Line.

The Mernda railway line is 33km, running from the Melbourne CBD to Mernda, in the centre of Whittlesea. There are eight stations on the Mernda line within Whittlesea, as shown in Table 5. These stations have around 165 services each day, in both directions. On the average weekday in 2022-23, 11,200 people use stations located in Whittlesea, dropping to an average of 5,850 on weekends. In total, these stations have 3.4 million passengers each year.

Donnybrook Station is located in the north-west of Whittlesea, with quite rapid fragmented growth in the surrounding area. The station has 38 services per weekday. Patronage data is not available.

6.4.1.2 Tram

The northern portion of tram route 86 runs in Whittlesea for approximately 2.6km from Grimshaw Street to McKimmies Road. There are seven stops along the way, with the tram taking six minutes to traverse the section, meaning the tram averages 26km/h, significantly faster than other parts of Melbourne. However, tram coverage is highly contained, meaning that many residents are not within an accessible distance. Further, it takes 67 minutes to travel to the Melbourne GPO in the morning peak, which is likely to decrease attraction for many travellers.

Patronage data for tram route 86 is not available. However, VISTA data shows around 2,220 people using trams to travel to, from, or within Whittlesea on the average weekday.

Table 5 Mernda line railway stations in Whittlesea, 2022-23

Station name	Services per day (both directions)	Weekday patronage	Weekend patronage	Annual patronage
Mernda	165	2,200	1,150	672,750
Hawkstowe	164	550	250	159,150
Middle Gorge	164	650	225	188,600
South Morang	165	1,650	925	510,050
Epping	167	2,200	1,125	672,900
Lalor	164	1,250	650	388,600
Thomastown	167	1,800	1,075	571,800
Keon Park	164	900	450	271,900

Source: DTP

First and last mile

The 'first mile' and 'last mile' are the short but crucial segments at the start and end of a journey. These segments often present challenges in terms of accessibility, distance, and congestion. Many cities have developed strategies for increasing the efficiency of the first and last mile. These actions can include:

- Improve walking and cycling infrastructure.
- Introduce micro-mobility options like e-bikes and shared micromobility schemes.
- Ensure seamless integration between different modes of transport.
- Use technology for real-time information.

Addressing first and last mile connectivity enhances accessibility, encourages the use of public transport, and improves overall transport efficiency, contributing to a better quality of life for residents.

Box 1 First and last mile

6.4.1.3 Bus

There are 25 bus routes which run in Whittlesea, shown in Table 6. Two of these routes are SmartBus routes which have higher levels of stop amenity, run on more direct routes, and are envisaged as having more 'tram like' frequencies. Most routes provide a decent level of service, of over 30 trips in each direction per day (which is usually a bus every 20 to 30 minutes, with shorter waits during peak periods). It is worth noting that buses in Whittlesea are more focussing on activity centres than workplaces and perhaps use of bus as a travel mode to work is lowest.

However, three routes, 384, 385, and 511, have fewer weekday frequencies than many people would require of a reliable public transport service. They are therefore unlikely to have broad appeal for those who have other transport choices.

While many routes take reasonably direct routes, there are several which are indirect, meandering through areas. A *directness ratio* is shown in Table 6. The directness ratio is the route distance divided by the straight-line distance between the start and finish of a route. The closer this ratio is to 1, the more direct the route is. This has implications for travel time, and therefore the willingness of people to use public transport.

It should be recognised that sometimes a route is indirect by design, and that does not impact is usefulness. For example, the 901 and 902 SmartBus routes are orbital, meaning they are indirect with regards to start and end, however, the generally run more directly between destinations along the way.

There are several larger bus interchanges or hubs throughout Whittlesea at:

- Epping – 9 routes
- Thomastown – 5 routes
- Bundoora – Tram route 86 terminus – 5 routes
- South Morang – 8 routes
- Mernda – 8 routes.

These locations provide excellent opportunities for passengers to change between transport modes, expanding the reach of their local public transport services. All these locations are also activity centres, and the public transport is likely to strengthen this role. However, there are not always strong, direct connections between these hubs. This is particularly true of the tram route 86 terminus, while it has connected to other hubs, these are not always direct.

Similarly, there can sometimes be multiple routes connecting two places, but these routes take different paths with (widely) different travel times. This means that passengers will require specific knowledge about which route they need to catch for the most efficient journey, which can be a barrier to less confident users.

Patronage data for bus routes are not available. However, VISTA data shows around 6,800 people using buses to travel to, from, or within Whittlesea on the average weekday.

Table 6 Bus routes in Whittlesea, 2023

Route number	Destinations	Weekday services (each way)	Directness ratio
356	Epping Station - Wollert East	38	1.4
357	Thomastown Station - Wollert West (operates 24 hours on weekends)	37	2.0
358	Epping Station - Wollert	38	1.5
381	Mernda Station - Diamond Creek Station	32	1.5
382	Northland SC - Whittlesea	32	1.3
383	University Hill - Palisades (counter-clockwise only)	28	2.2
384	Whittlesea - Kinglake	11	1.1
385	Greensborough - Mernda Station/Whittlesea	19	1.4
386	Bundoora RMIT - Mernda Station (operates 24 hours on weekends)	37	3.5
387	Bundoora RMIT - Mernda Station	36	2.0
388/389	Mernda Station Loop	38	N/A
390	Craigieburn Station - Mernda Station	33	1.3
511	Donnybrook Station - Mandalay	7	2.7
525	Craigieburn Station - Donnybrook Station	31	3.0
554/557	Lalor Loop	33	N/A
555	Epping Plaza SC - Northland SC	42	1.3
556	Northland SC - Epping Plaza SC	41	2.0
559	Thomastown Station (counter-clockwise only)	44	N/A
564	Bundoora RMIT - South Morang Station	32	2.5
566	Northland SC - Lalor	39	3.7
569	South Morang Station - Epping Plaza SC	32	1.9
570	Bundoora RMIT - Thomastown	45	1.3
577	South Morang Station - Epping Plaza SC	41	1.8
901	Melbourne Airport - Frankston (operates 24 hours on weekends) – SmartBus Route	37	2.0
902	Airport West - Chelsea – SmartBus Route	34	1.4

Source: DTP

6.4.1.4 Public Transport Accessibility Index

A *Public Transport Accessibility Index* was produced for Whittlesea, as shown in Figure 76. Analysing bus, train and tram access altogether, it accounts for the number of services and average daily (weekday) frequency at each public transport stop. To account for ease of access, areas within a closer distance to stops were weighted more favourably. For bus and tram stops, this was done at intervals of 400, 600 and 800 metres distance. For train stations, larger intervals of 800, 1200 and 1600 metres was used. The distances are as broadly accepted distances that people will generally walk for, a higher order mode of transport, people are more willing to walk a greater distance for trains.

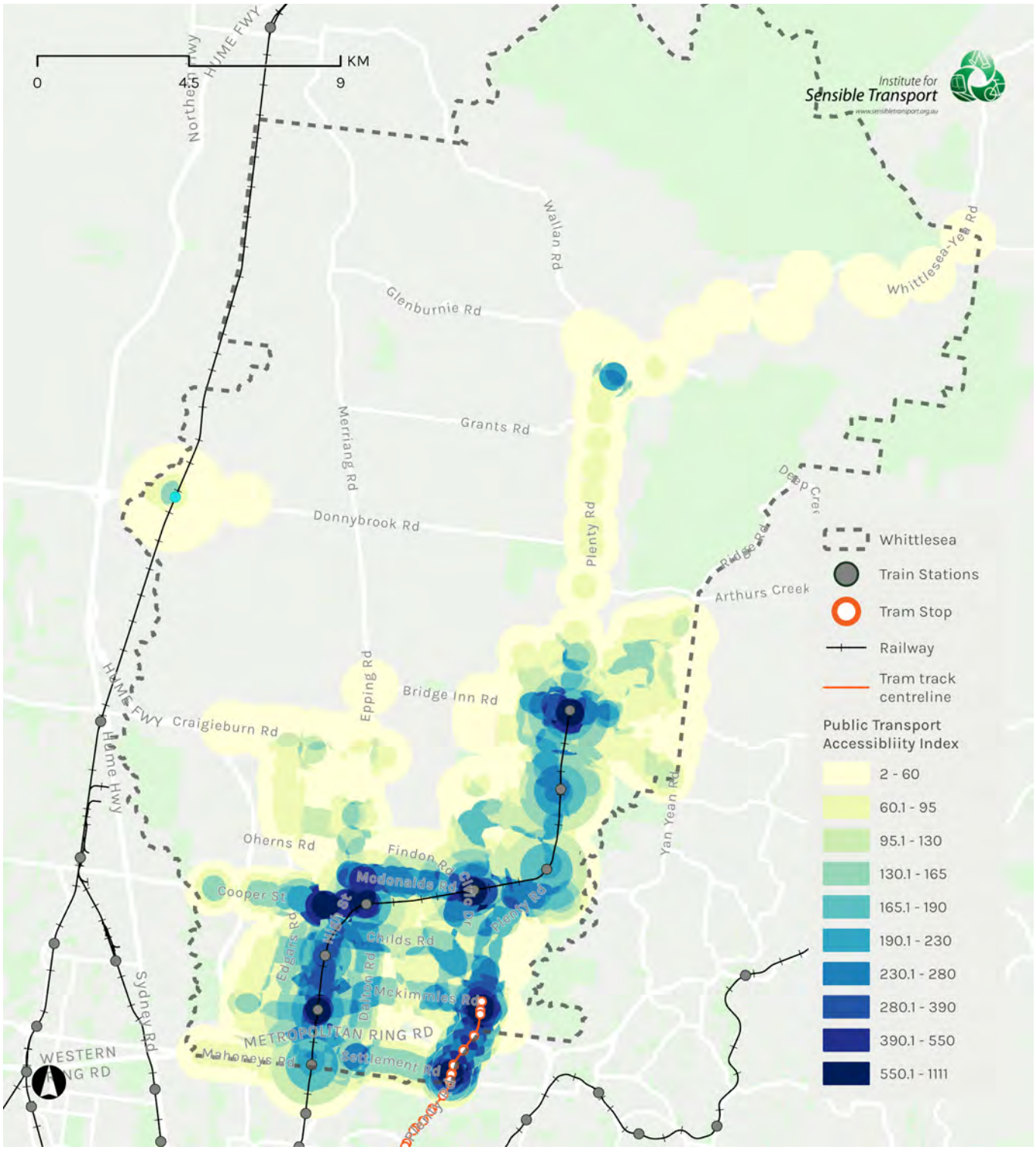


Figure 76 Public Transport Accessibility Index for Whittlesea

Source: GTFS, PTV

The values for bus, tram and train accessibility were combined and Figure 76 shows the resultant index for the whole municipality. The Index is provided as a decile where the darker colours indicate greater access. RMIT Bundoora along with Bundoora Square were the highest scoring areas. Higher tram and bus frequency outperforms the rail network in the local government area. South Morang, Epping and Thomastown Railway Stations also have high public transport accessibility with the combined access of both train and bus.

The accessibility is complementary to observed journey to work data discussed in Section 6.1. Use of public transport is generally higher in areas which the index reveals as having higher accessibility. Both sections highlight RMIT Bundoora, Bundoora Square and the railway stations at Thomastown, Epping, South Morang and Mernda to have higher accessibility to public transport and use of public transport.

Middle Gorge, Keon Park, and Lalor Railway Stations serve significant residential population that could benefit from improved access.

6.4.2 Cycling

The Principal Bicycle Network (PBN) is produced by the state government to guide investment into developing the cycling network in Victoria. The network is made up of existing and proposed infrastructure, with the majority of the network within the *proposed* category. The network consists of on road cycleways and off-road bicycle paths, as well as undesignated infrastructure. In Whittlesea, the southern suburbs are more connected to the network as shown in Figure 80.

It is important to recognise that while Figure 80 shows a number of major roads have on road lanes, these are generally painted lanes that lack the vertical protection required to meet most people's minimum safety standards. An example of this can be seen in Figure 77, where the painted bicycle lane is on a heavy trucking route that has three lanes of traffic in each direction, widening to up to six lanes in some areas.

Figure 77 Cooper Street bike lane

Source: Google

The type of bicycle infrastructure must be appropriate to the function and design of the road in which it is located. Figure 78 presents work completed for Austroads, indicating the most suitable type of infrastructure based on the speed and volume of motor vehicles. For a road such as Cooper Street. A separated off-road path is most appropriate. This approach is recommended as Whittlesea embark on the development of their ITP.

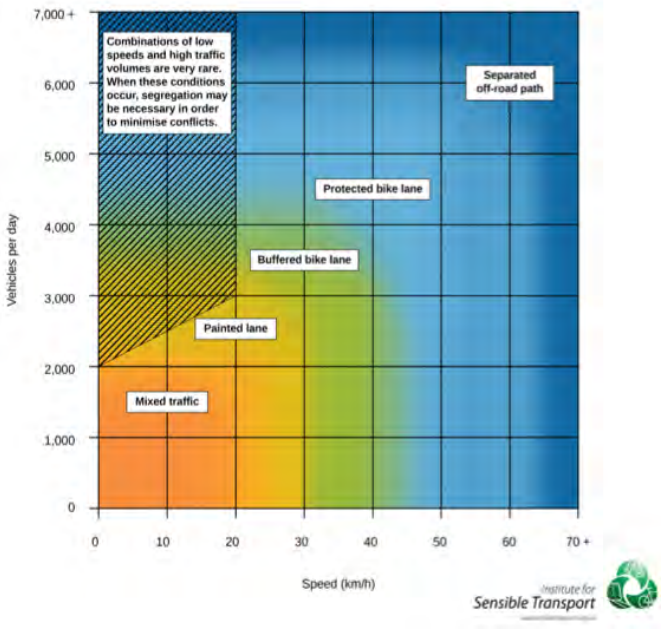


Figure 78 Bicycle infrastructure design based on the speed and volume of motor vehicle traffic

Source: Institute for Sensible Transport

There are said to be four main types of cyclists, as highlighted in Figure 79. It is important to recognise that someone might be enthused and confident for some rides (riding alone), but

interested and concerned for others (riding with young children).

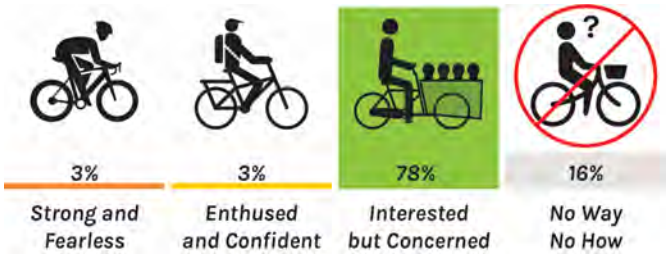


Figure 79 Four types of cyclists

Source: Geller, 1994

Finally, it is important to recognise that some of the apparent bicycle routes shown in Figure 80 do not exist. For example, the route shown on High Street, does not actually exist.

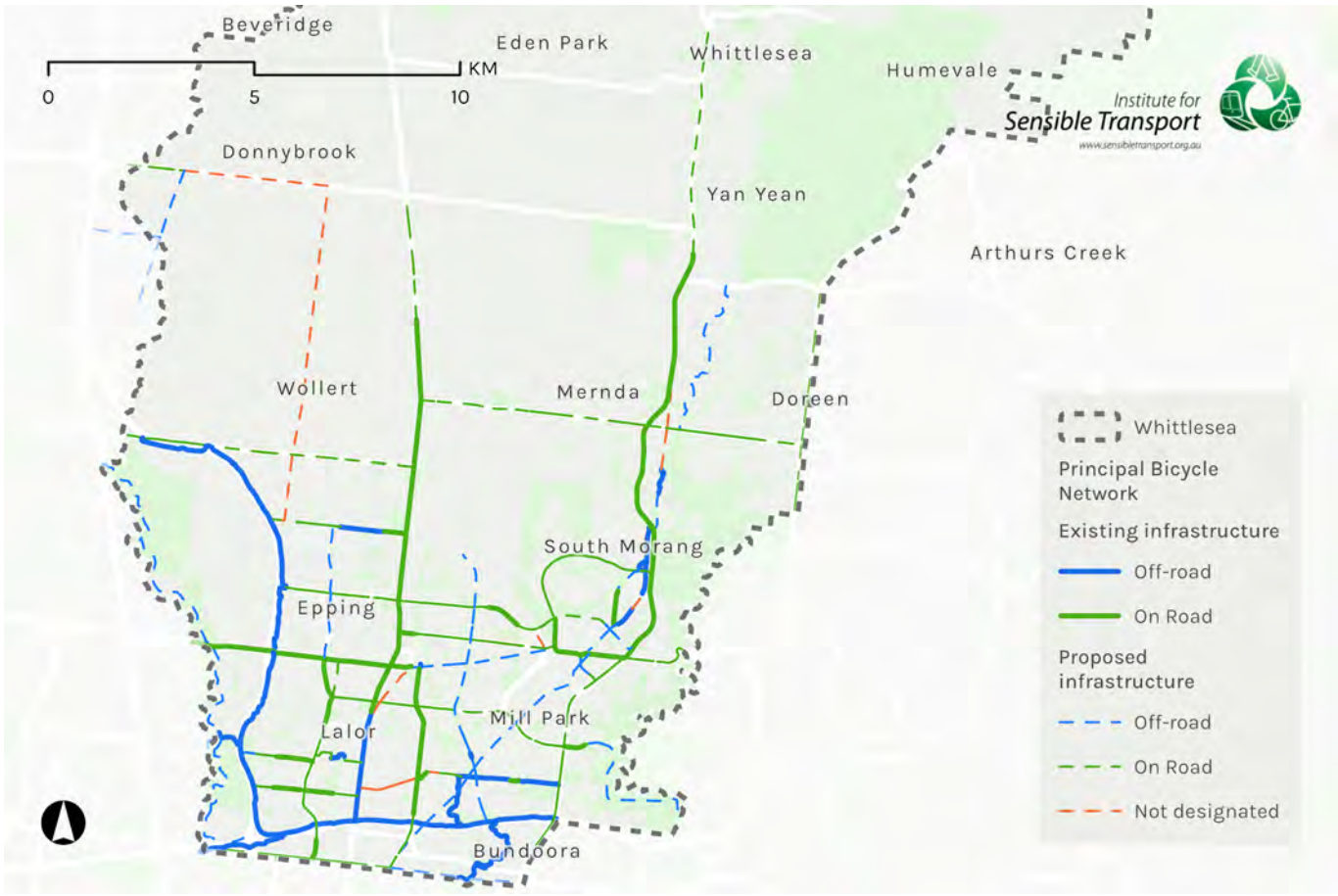


Figure 80 Principal Bike Network - Existing and proposed infrastructure

Source: Department of Transport and Planning

6.4.2.2 Bike Use Propensity Index

High quality bicycle infrastructure can be expensive and government budgets are limited. It is therefore important, when planning a future cycling network to determine the spatial variation in the *latent demand* for cycling. Through peer reviewed research, a number of Census collected variables have been isolated, in order to provide a heat map of latent demand for cycling, known as the *Bike Use Propensity Index*.

The Index is based on seven Census collected variables that are statistically significant predictors of bike use, shown in Figure 81. In sum, these maps provide a clear illustration of the spatial variation in latent demand for cycling in Whittlesea.

The Index can help guide areas for future investment in cycling infrastructure by identifying the areas where the greatest uptake in cycling is likely to occur. Actions focusing on high propensity areas are likely to include infrastructure projects but should also consider behaviour change initiatives and other support programs to encourage greater cycling uptake. This exercise is particularly useful for Whittlesea, which has no connected, high quality bicycle infrastructure.

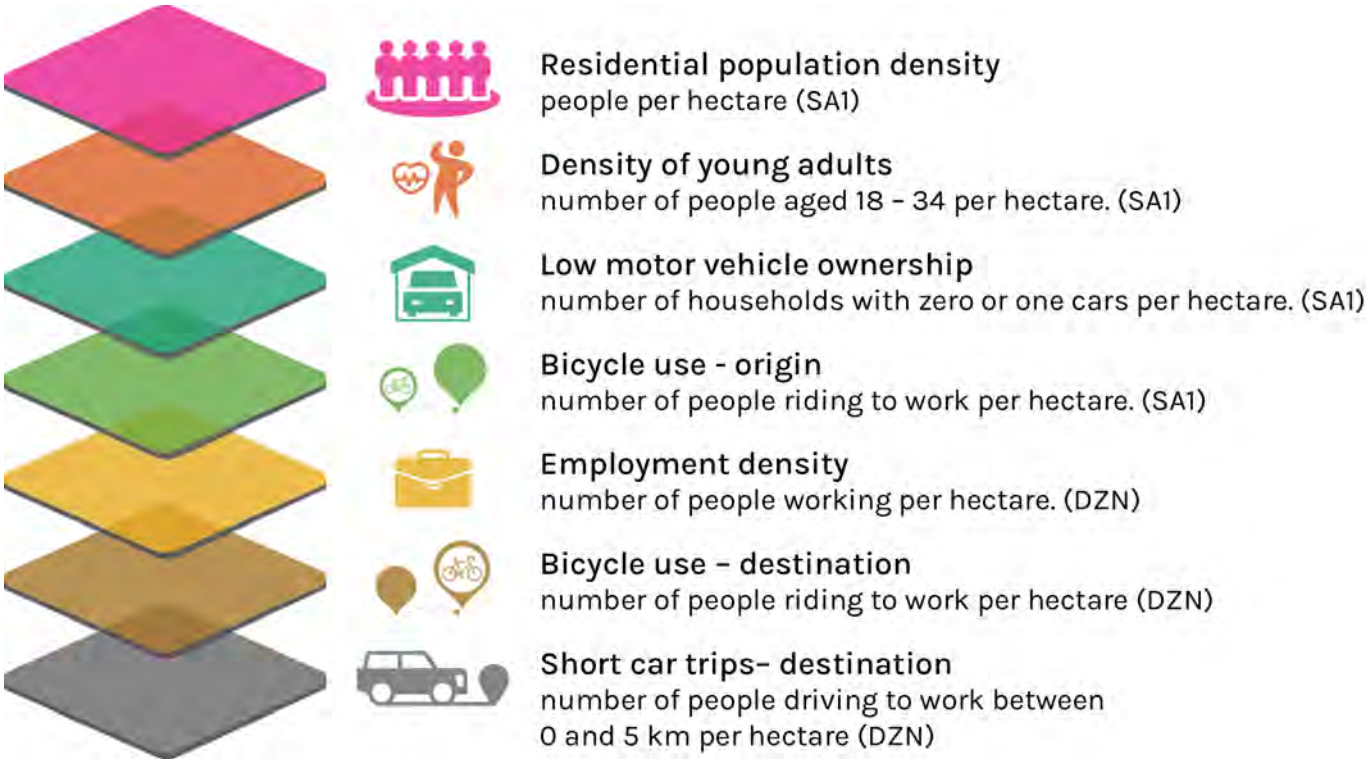


Figure 81 Variables for Bike Use Propensity Index

Source: Institute for Sensible Transport using ABS Census data

Methodology

The *Bike Use Propensity Index* combines seven variables, all of which are collected as part of the ABS Census. The statistical basis for the Index was developed through the collection of data on riding behaviour and demographic factors. This data was analysed using binary logistic regression in SPSS and STATA. The results, published in Transportation Research Part A revealed that there are some statistically significant factors for propensity to cycle.

The *Bike Use Propensity Index* has been designed to show the variation in the relative propensity to cycle, at the highest possible level of spatial detail.

The Index contains more residential-oriented variables than it does employment, or destination, variables. To ensure that employment rich areas that have comparatively lower residential

populations are not undervalued, the employment variables in the index are weighted the same as residential factors. Doing this helps ensure important bike destinations, such as employment hubs, are adequately considered in the Index.

Geographic areas are given an absolute score, of between 0 and approximately 5 for each of the variables. These scores are then averaged to reveal an overall bike use propensity score of between 0 and approximately 5. A score close to 0 indicates a low propensity to cycle, while a score of 5 indicates a high propensity to cycle. The mapped values are aggregates of the attributes' scores.

SA1s that receive very high Index scores will have scored highly across all the variables included in the Index. In almost all cases, an SA1 that scores above 4.5 will have been highest scoring in most variables. The maps used in this report have been colour-scaled to be comparable within the study area. However, the score is relative to all other areas in Australia (for example, the Melbourne and Sydney CBDs have areas with scores above 4.5).

Results

The *Bike Use Propensity Index*, for all seven factors, for Whittlesea, is shown in Figure 82. The suburbs with the highest propensity for cycling are Bundoora, Epping, Lalor, Mill Park and Thomastown.

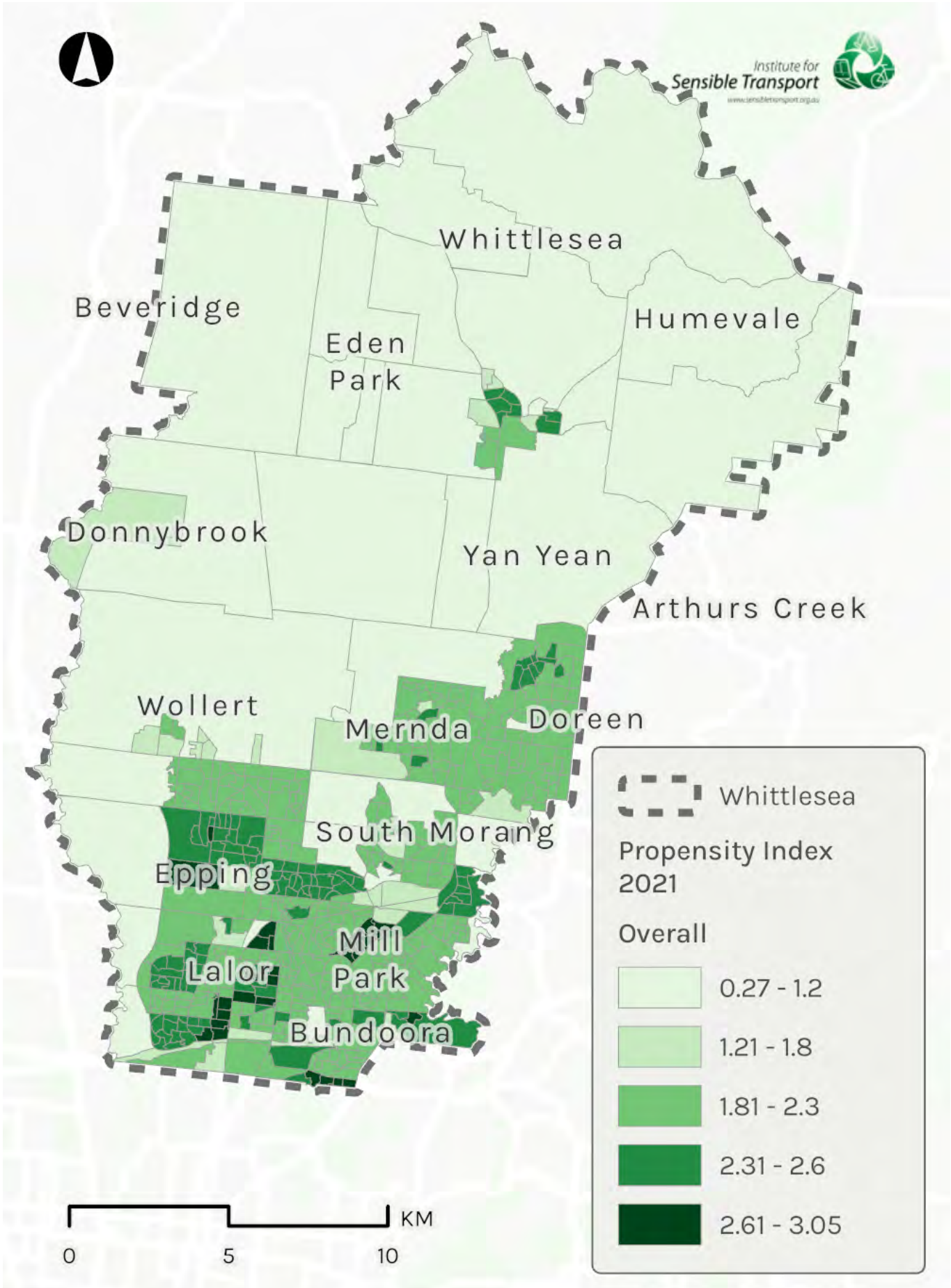


Figure 82 Bike Use Propensity Index – Overall

Source: Based on ABS Census Data

Figure 83 shows the origin score for the *Index*. The value indicates the willingness of residents living in that area who are more likely to consider bike riding for transport trips. Residential parts of Bundoora, Epping, Lalor, Mernda, Mill Park, South Morang, Thomastown and Wollert were among the highest scoring areas.

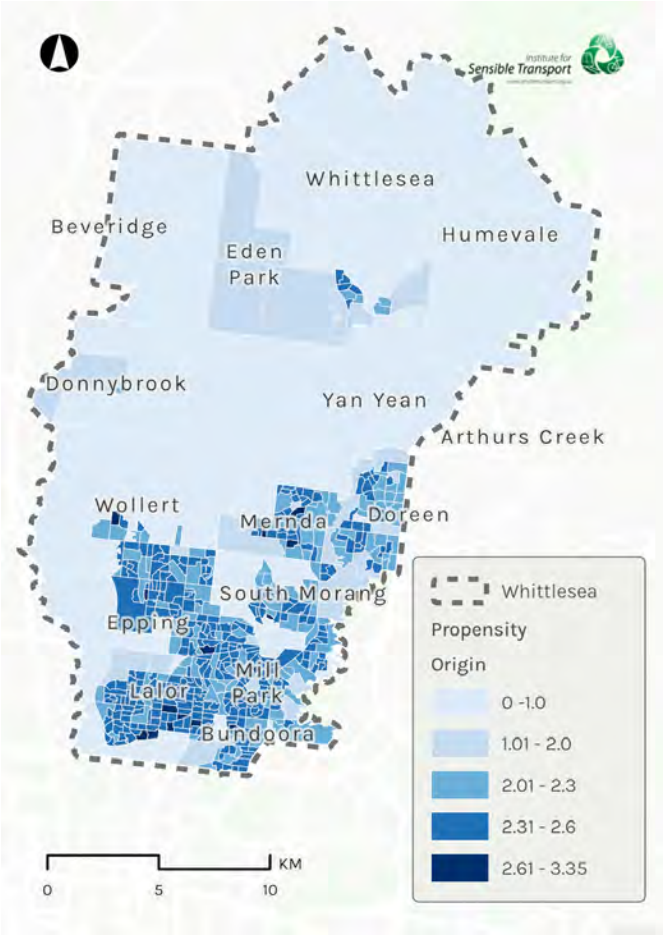


Figure 83 Bike Use Propensity Index – Origin

Source: Based on ABS Census Data

Figure 84 shows the destination scores of the *Index*, areas where people are more likely to consider bike riding to, for transport trips in Whittlesea. The highest scoring destinations are in the major industrial areas located in the southern suburbs of Epping and Thomastown.

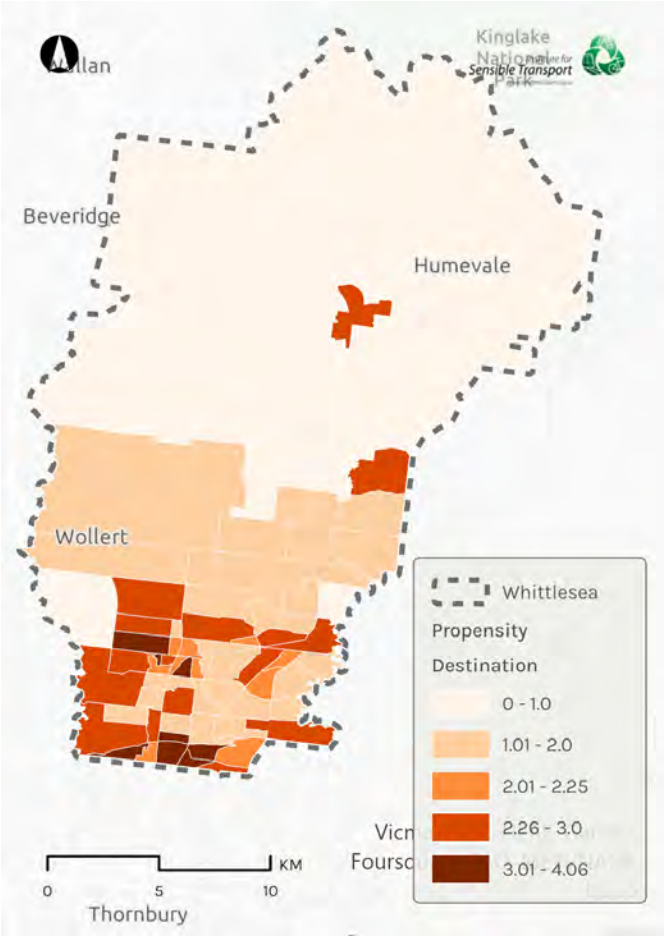


Figure 84 Bike Use Propensity Index - Destination

Source: Based on ABS Census Data

Implications

The *Bike Use Propensity Index* highlights how Whittlesea can make prudent decisions when investing in bicycle infrastructure, focusing on maximising people's opportunity to cycle. The bicycle infrastructure opportunities will include how different bike infrastructure typologies (e.g., painted bike lane, separated bike lane) can be used to maximise the appeal of cycling, especially in areas of Whittlesea with higher latent demand. Figure 85 shows the existing cycling network and railway line, layered on top of the Index.

Based on the results shows in this section, there are several areas of high latent demand for cycling. These areas should be a focus for future cycling infrastructure investments.

As highlighted earlier, the 'existing' bicycle infrastructure shown in Figure 85 contains links that do not actually exists. As Council moves

towards the development of the ITP, it will be important to prepare accurate maps that correctly show which streets have existing bicycle infrastructure, and what infrastructure is *proposed.*

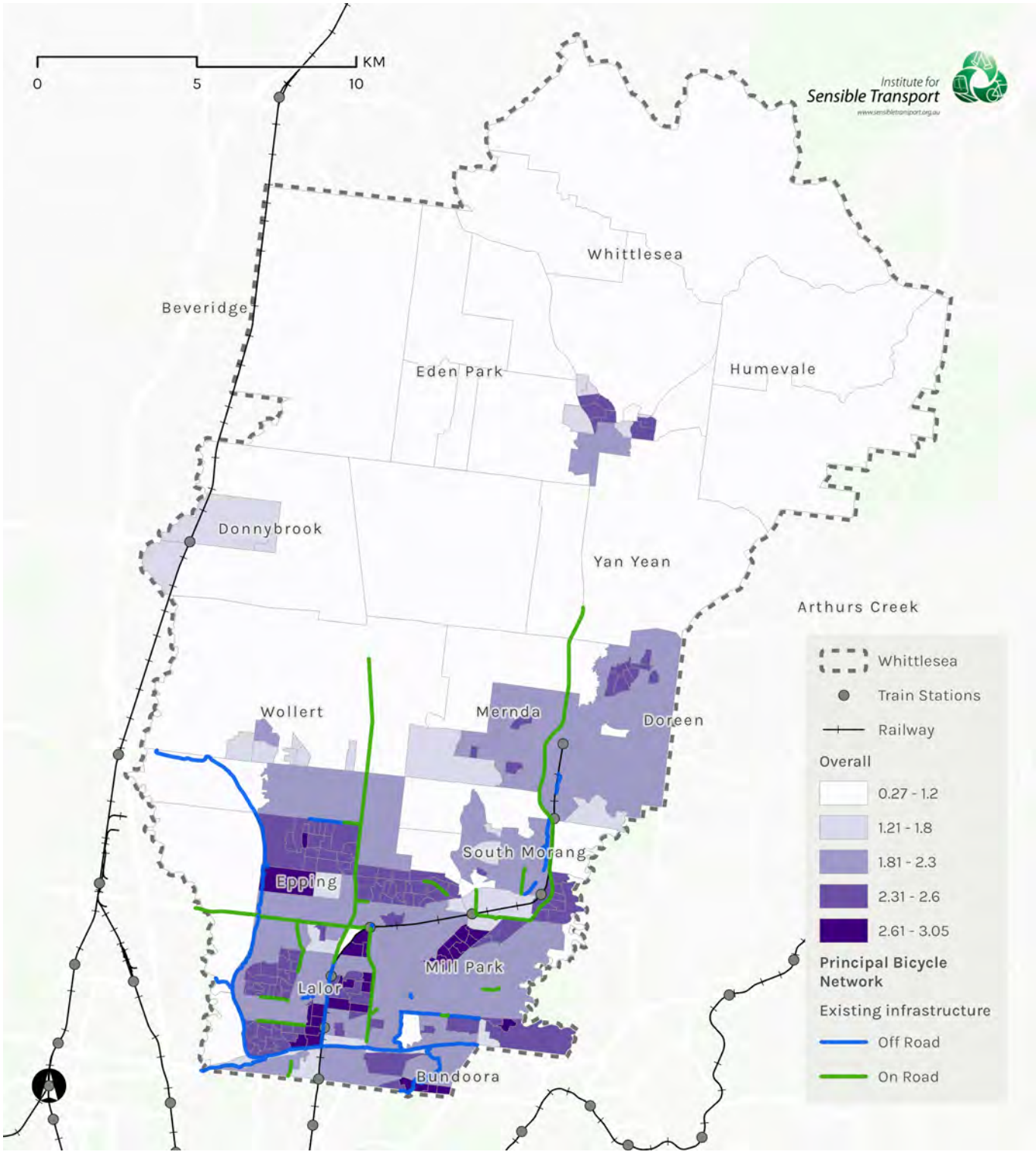


Figure 85 Bike Use Propensity Index and existing infrastructure

6.4.3 Walking

Footpaths are an essential component of the transport network and facilitates the most fundamental transport mode. Regardless of people's mode of transport, walking will generally form an important link at the beginning and end of any trip. In Whittlesea, the footpath network is concentrated in the southern suburbs, around the main population centres (shown in Figure 86).

In the emerging suburb of Donnybrook, footpaths are being developed alongside the new developments. Figure 87 shows the existing network in Donnybrook, which also show the new residential developments. The footpaths are consistently on both sides of the street. There remains an opportunity to connect the three developments along Donnybrook Road. With Donnybrook Road consistently facing traffic congestion, a shared user path on the north side of the road would provide residents with a more reliable option to the train station.

The northmost footpaths are in the township of Whittlesea. In the west of the town, footpaths are generally on both sides of the street as shown in Figure 88. Towards the west, a footpath on the north side of Whittlesea – Yea Road could be beneficial for providing greater access to the Whittlesea Showground. Residents living between Paddock Street and Evelyn Street, south of the Showground, could be better connected to bus stops and the Whittlesea Monday Market.

For the future ITP, this section highlights the need for a comprehensive network of footpaths and shared paths. It is also important to understand that people's ability to work is not simply a function of the footpath network. The number of destinations within a close walk of people's home is also a central determinant of walking frequency. Finally, ensuring high quality, prioritised crossings are located in areas of high pedestrian demand is also crucial.

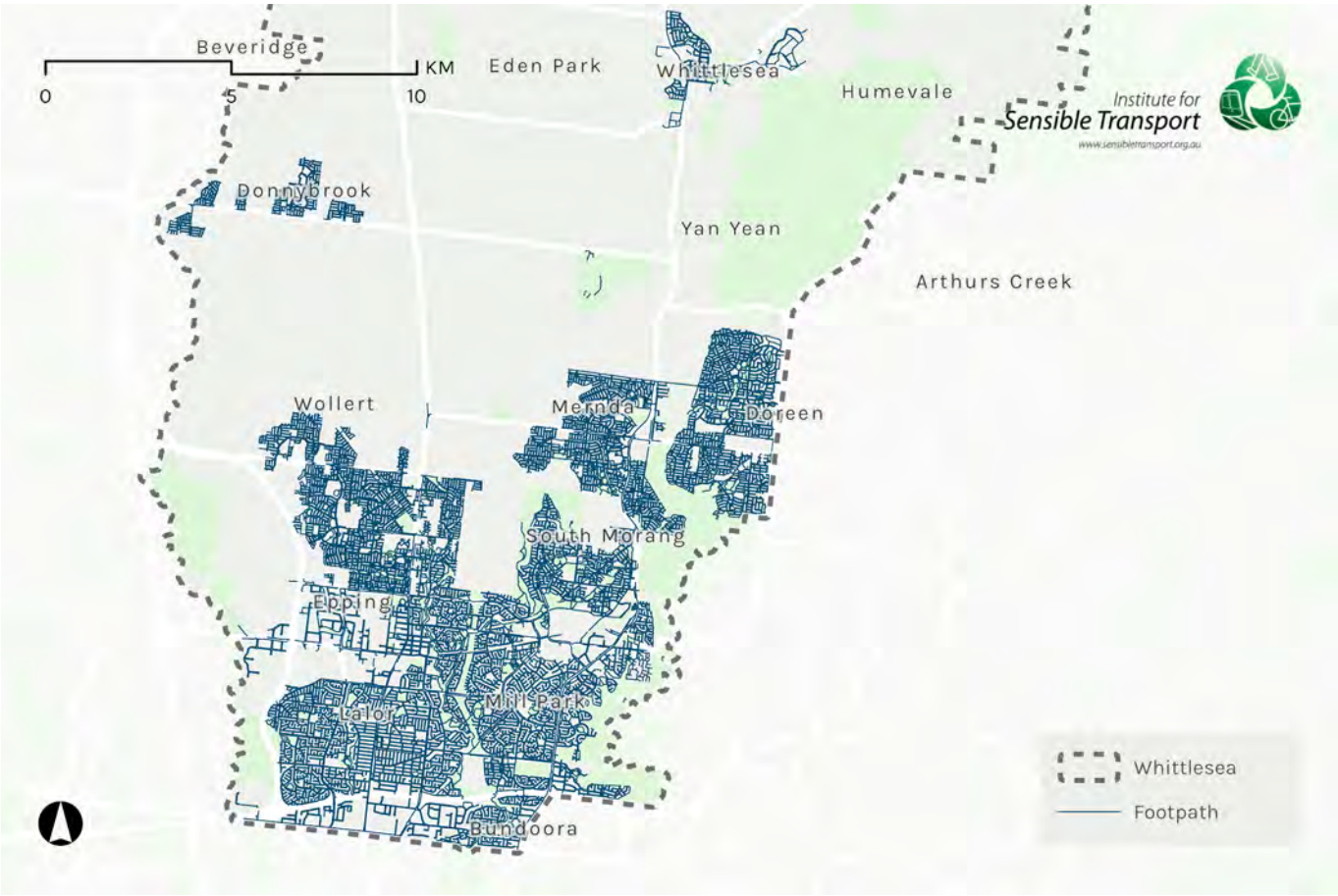


Figure 86 Footpath network in Whittlesea

Source: City of Whittlesea

Figure 87 Footpath network in Donnybrook

Source: City of Whittlesea

Figure 88 Footpath network in the suburb of Whittlesea

Source: City of Whittlesea

6.4.4 Road network

The hierarchy of the road network in the City of Whittlesea, from freeways down to walking and cycling trails, is shown in Figure 89. The Hume Freeway provides the North – South link for residents into central Melbourne, and the Metropolitan Ring Road is a North - West connector between Greensborough in the north and Altona in the west.

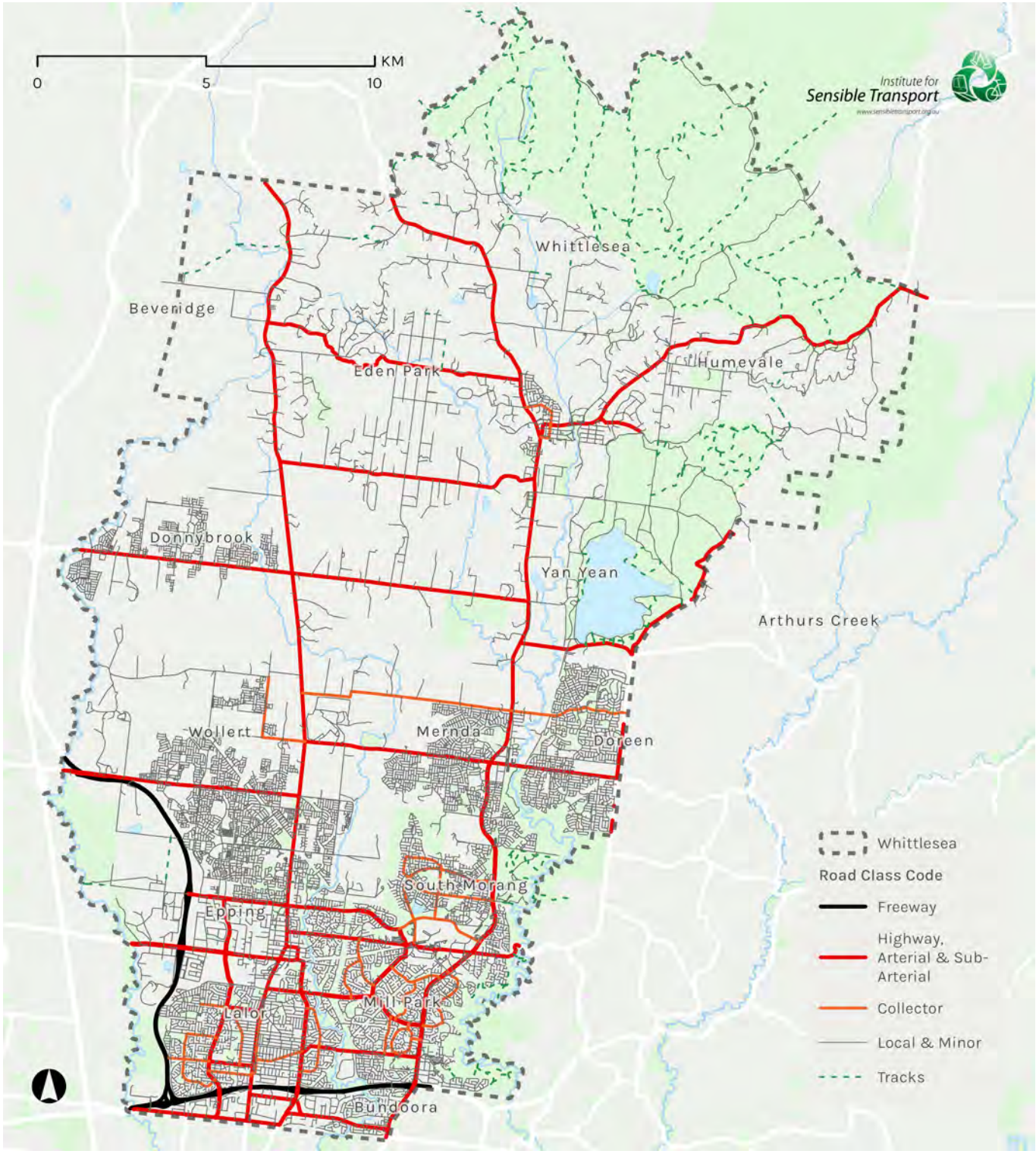


Figure 89 Road network of Whittlesea LGA, by classification

Source: Department of Transport and Planning

6.4.4.1 Speeds

The posted speed limit for every street in the City of Whittlesea, based on Department of Transport and Planning data, is show in Figure 90. Of note, most residential streets in Whittlesea remain at 50km/h, with pockets of 40km/h around schools. The only road under 40km/h is a section of Foxtail Terrace in South Morang, which is a shared zone. Arterial roads generally have a posted speed limit of between 60 and 80km/h.

The new Whittlesea ITP represents an opportunity to align speed limits with the *Safe Systems* approach to road safety and minimise the potential and severity of injury from crashes. In the almost ten years since the previous Whittlesea Integrated Transport Strategy, many local governments have begun to lower their default speed limit to 40km/h in residential streets and create shared zones with even safer speeds.

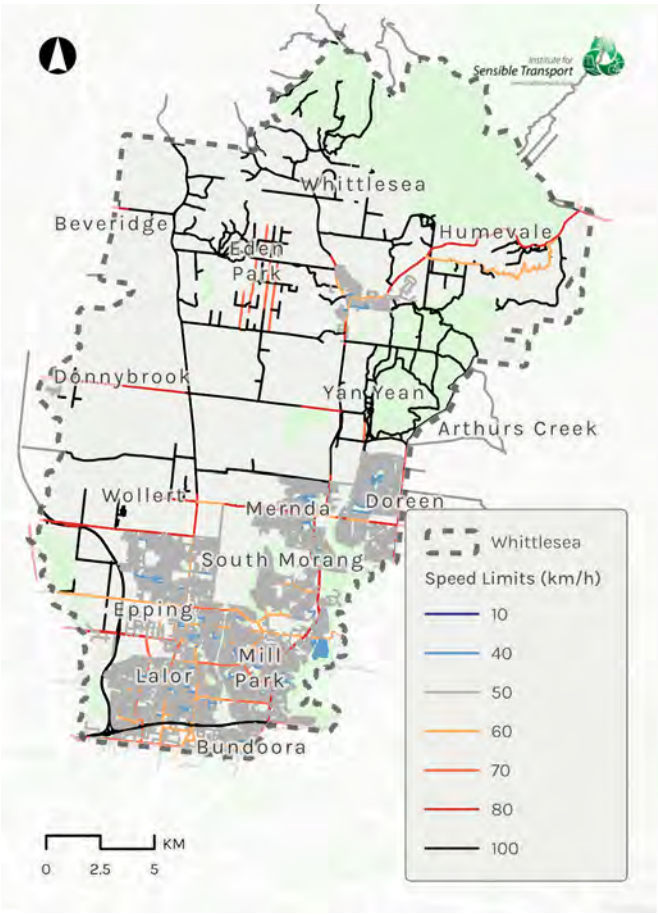


Figure 90 Sign speeds in Whittlesea, LGA

Source: Department of Transport and Planning

6.4.4.2 Traffic volumes

Traffic volume data is collected for declared roads in Victoria by VicRoads. The recorded two-way yearly volume is divided by 365 and represented by a single line to show average daily volume for all vehicles. The results of this exercise in shown in Figure 91.

As expected, the highest road volumes are on the major highways and arterials such as the Hume Freeway and the Metropolitan Ring Road. Sections of Plenty Road and Dalton Road intersecting with the Metropolitan Ring Road also have high volumes.

Being a municipality at the metropolitan growth boundary, there are obvious discrepancies to certain areas due to the constant development of land use. As the traffic volume data was recorded in 2020, newer developments completed in 2021 along Donnybrook Road were not a factor in the data collection.

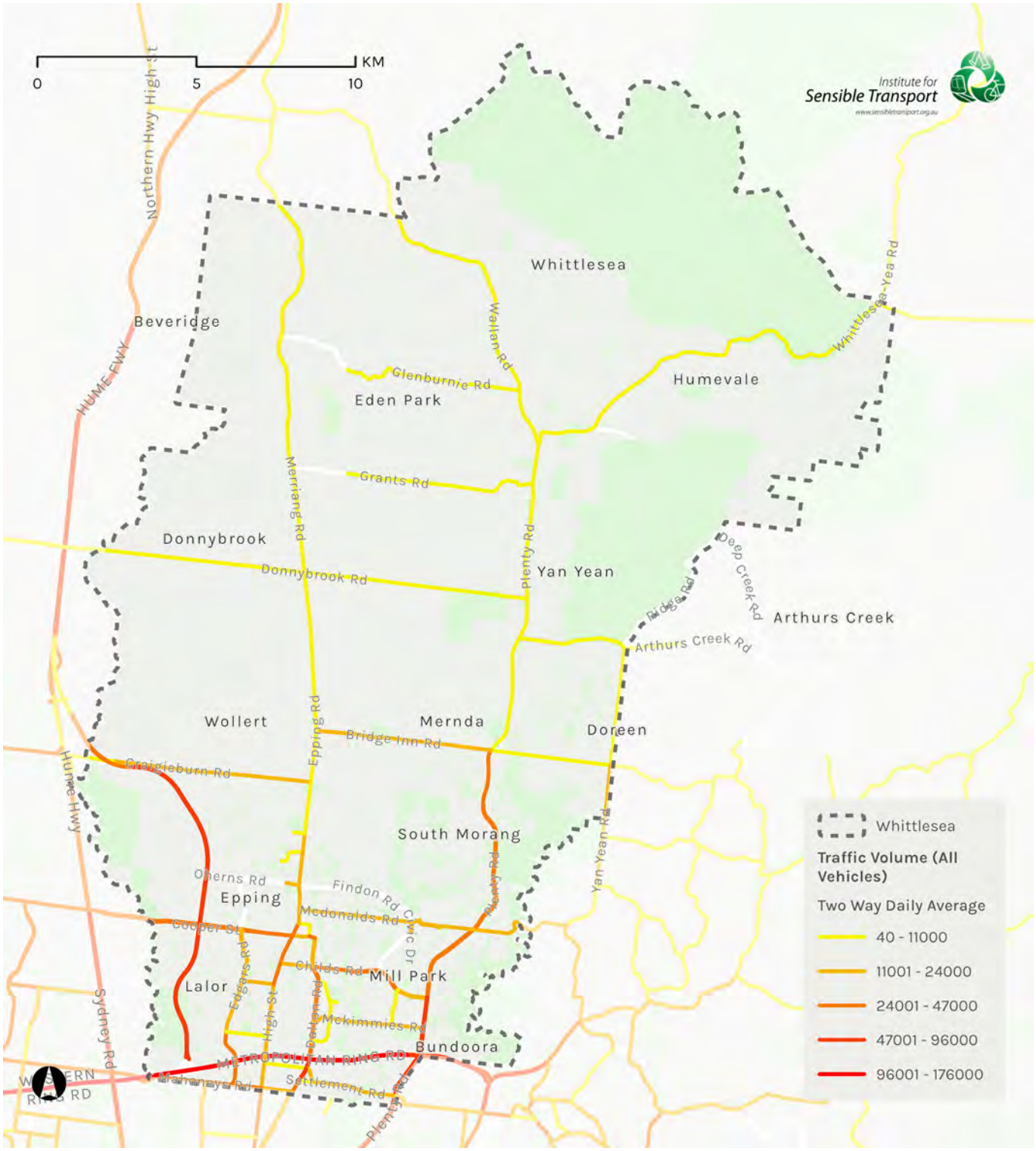


Figure 91 Traffic volume for freeways and arterial roads

Source: VicRoads

6.4.5 Freight

Victoria's key road and rail freight routes and places are identified in the *Principal Freight Network*. Figure 92 shows both Western Ring Road and Metropolitan Ring Road feed into the Hume Highway in Thomastown, south of the municipality. The Hume Highway is a lynchpin of freight movement between Melbourne and Sydney. As a testament to the municipality's significance in the interstate freight movement, an interstate freight terminal has been planned for development north of Donnybrook. The Outer Metropolitan Ring Road, a planned PFN road will meet the Hume Highway south of the future *Beveridge Interstate Freight Terminal*. It will then travel south east, meeting Donnybrook Road before intersecting with the Metropolitan Ring Road, effectively creating a new link to Melbourne Airport, and the North East Link.

The Broadmeadows – Mangalore Railway runs along the western boundary of the municipality. An Outer Metropolitan Ring Railway has also been planned to run parallel with the Outer Metropolitan Ring Road.

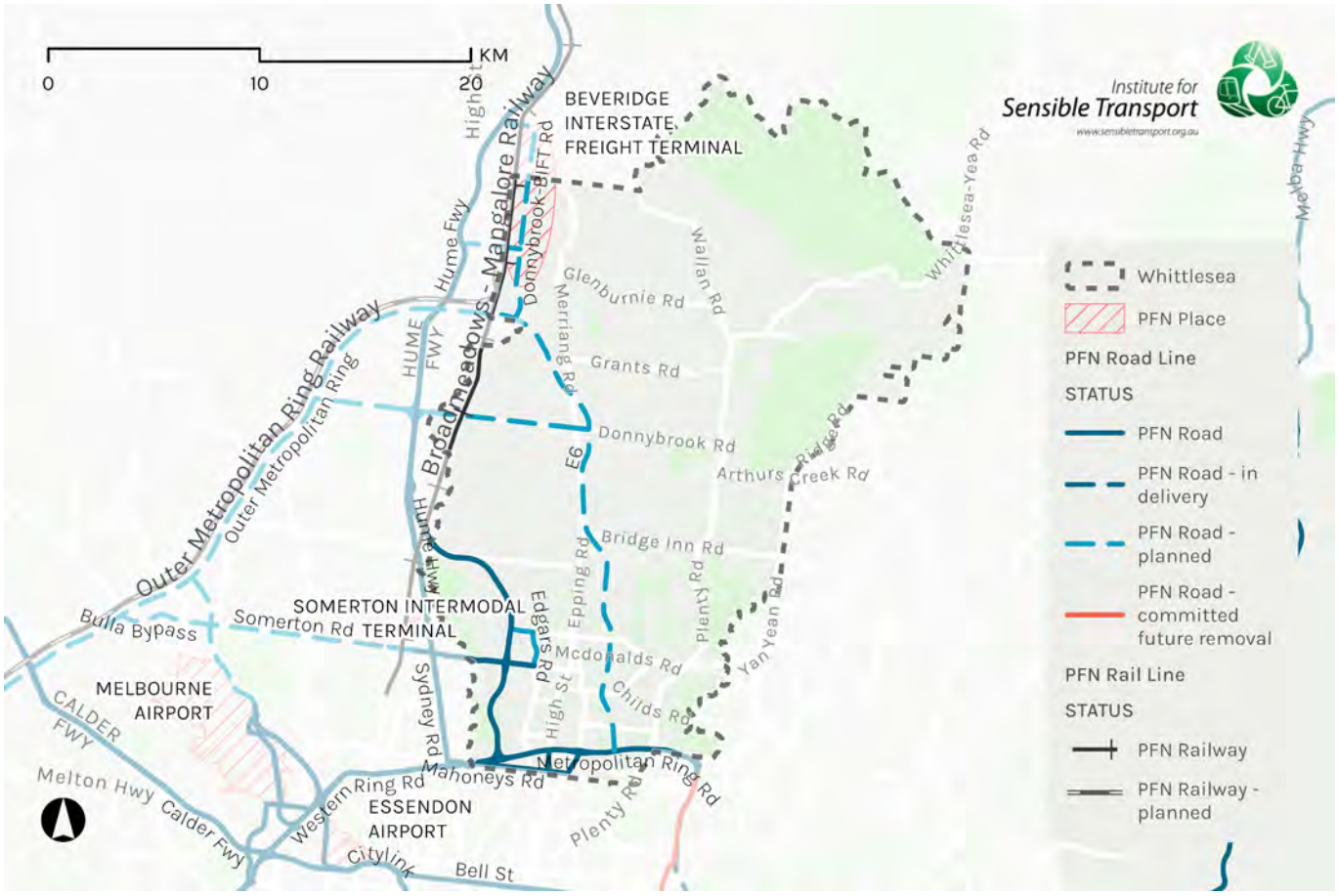


Figure 92 Principal Freight Network in Whittlesea

Source: Department of Transport and Planning

The two-way average daily volume for trucks is shown in Figure 93. Similar to road volumes for all vehicles described in Section 6.4.4.0 , the highest two-way daily average truck volume is found along the two highways, Hume Freeway and Metropolitan Ring Road, located in Whittlesea. Both highways are integral to the Hume Corridor between Melbourne to Sydney.

The Hume Freeway and Metropolitan Ring Road also run through the Northern Industrial Precinct in the southern end of the local government area. The Northern Industrial Precinct is one of five State Significant Industrial Precincts (SSIP) named in Plan Melbourne and includes both Thomastown and Epping industrial areas.

The description of Victoria's Principal Freight Network in Whittlesea implies the need for the Integrated Transport Plan (ITP) to prioritise efficient freight transport, explore road-rail integration, support industrial precinct development, and address the impact of heavy truck traffic.

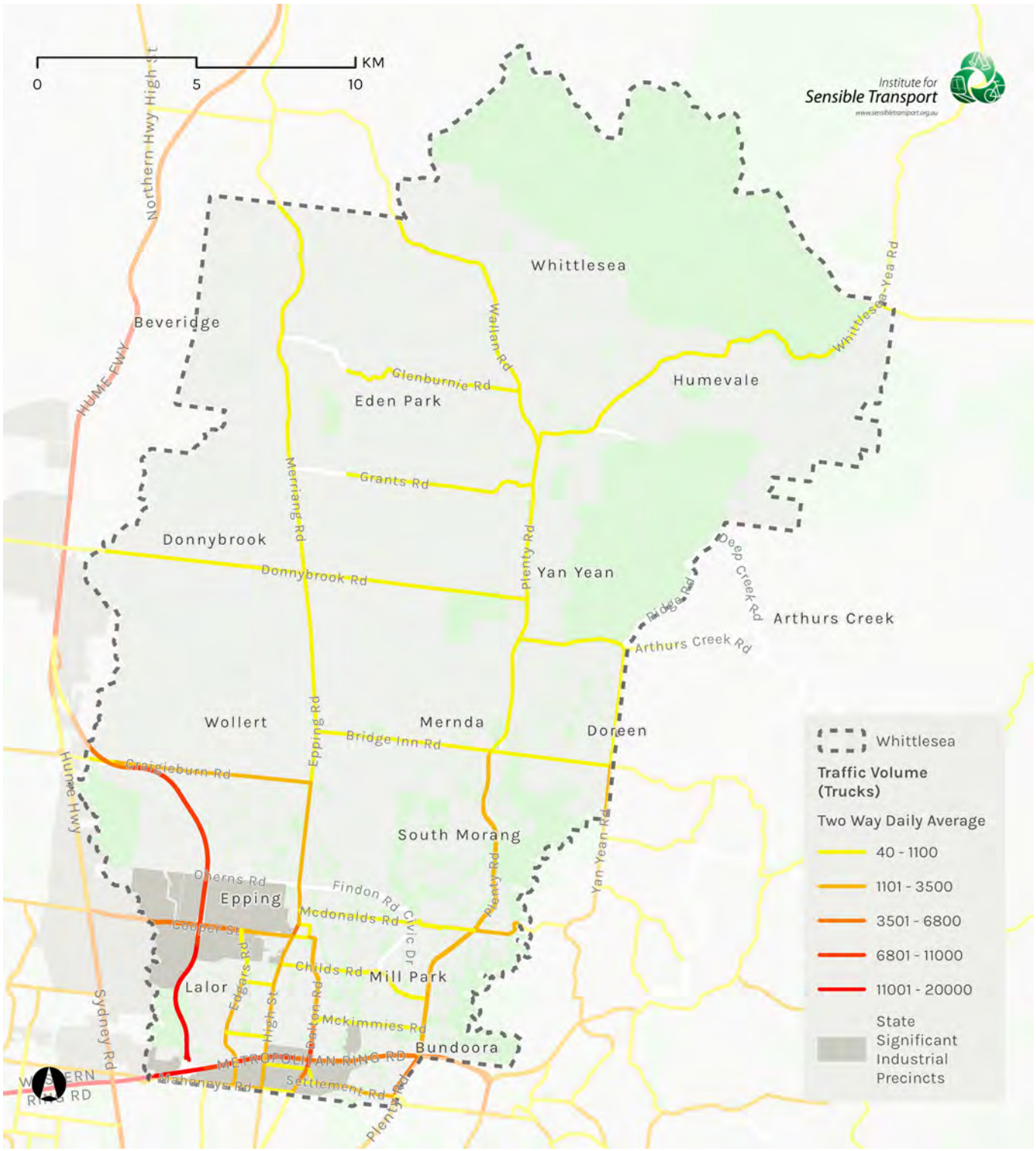


Figure 93 Truck volume for declared roads

Source: VicRoads

7. Population and demographics

This section describes current population and demographic patterns of relevance to transport and access in Whittlesea.

7.1 Current population

As mentioned in *Sustainable Environment Strategy 2022- 2032*, Whittlesea is a large and fast-growing area, covering 489 km^2. The population is culturally diverse, with over 41% born overseas. It also has a significant Aboriginal and Torres Strait Islander population, which is the second largest in the Melbourne area.

The population of Whittlesea is expected to keep growing. By 2040, it is expected an additional 150,000 people may live in the City of Whittlesea. This would make Whittlesea the third most populous local government area in Victoria Figure 94 illustrates the spatial distribution of the Whittlesea population, where one dot represents 10 persons, based on their residential location, as of the 2021 Census.

One fact to emerge from the examination of population densities is that while the City of Whittlesea occupies a vast land area, most the population actually lives in small proportion of the total land mass. Approximately 85% of the population live on just 10% of the land (see Figure 95). This highlights the relatively compact urban environment of the Whittlesea. This makes the task of providing an effective, sustainable transport system easier than if the population was evenly distributed across LGA.

Around 85% of the Whittlesea population live within just 10% of the land.

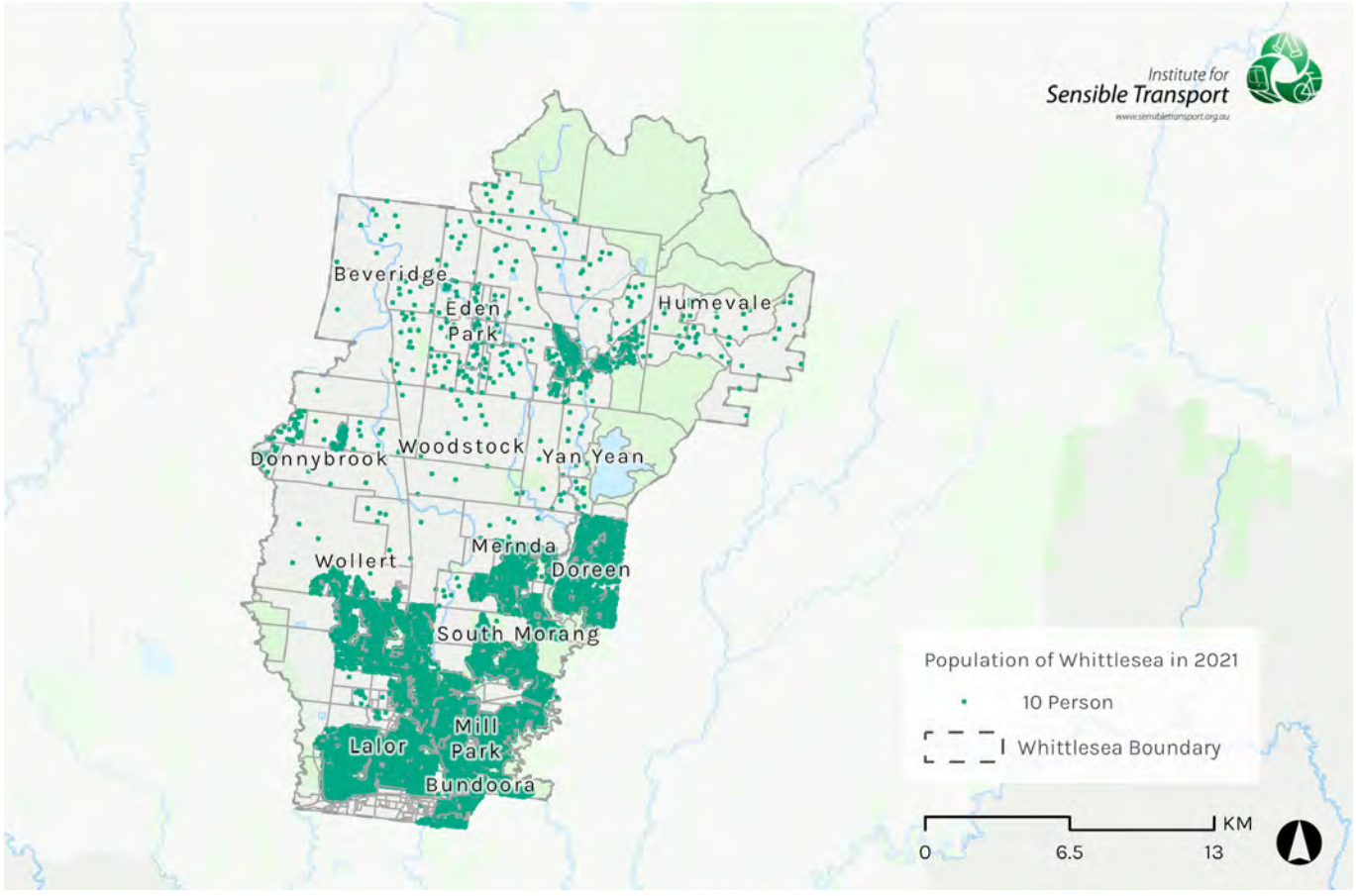


Figure 94 Population of Whittlesea in 2021
Source: ABS 2021

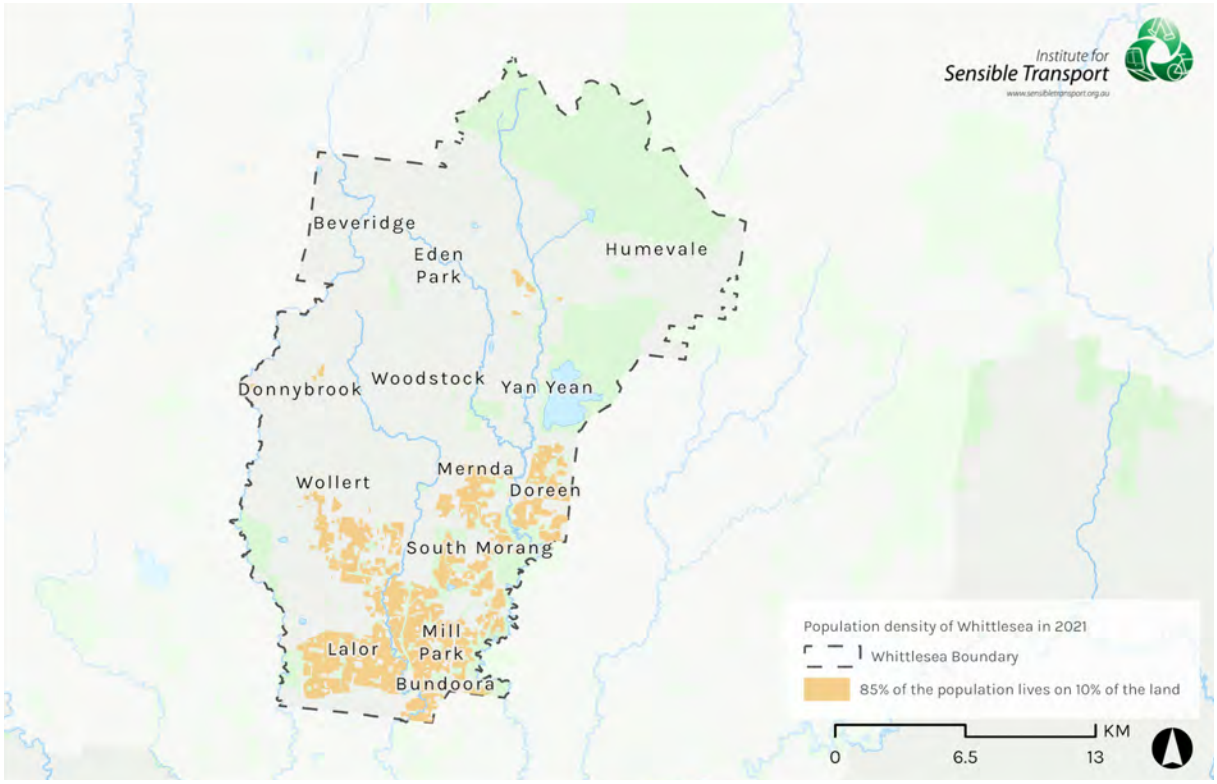


Figure 95 85% of the population live on 10% of the land

Source: ABS 2021

Figure 96 and Figure 97 provide a population density map for the region, which is better able to highlight density differences within the built-up area. This represents the population per hectare at the mesh blocs scale in Whittlesea. South of the Whittlesea has highest population density.

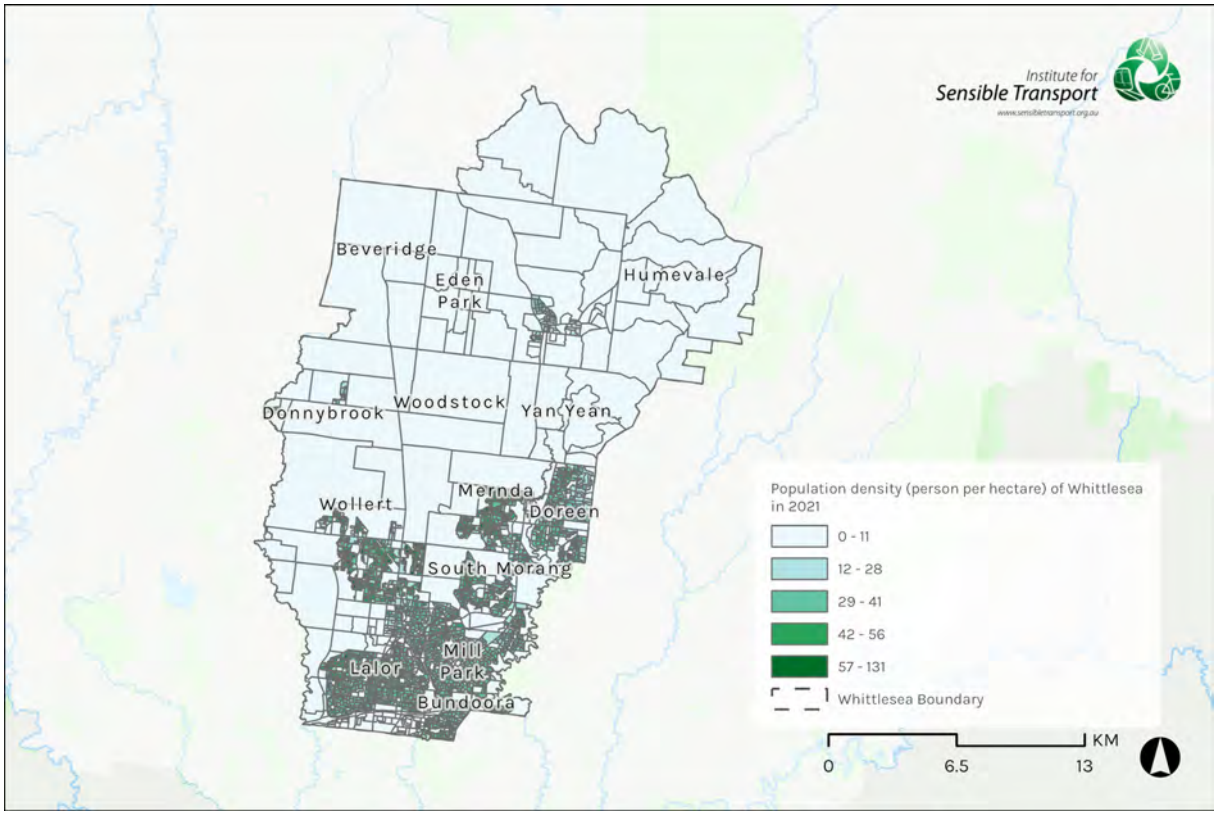


Figure 96 Population density (hectare) in 2021

Source: ABS 2021

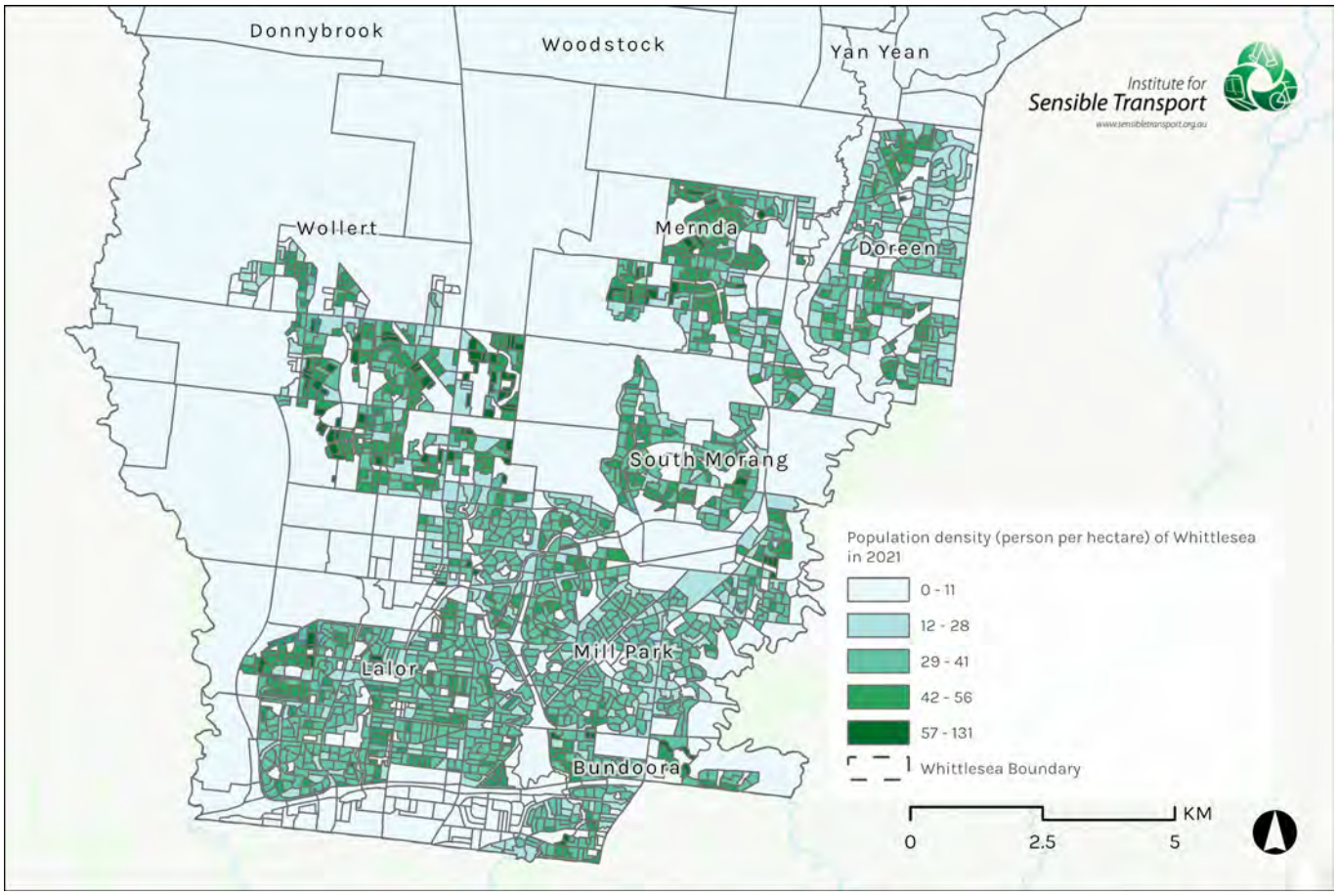


Figure 97 Population density (hectare) in 2021 Zoomed in
Source: ABS 2021

Figure 98 shows the density of jobs per square kilometre in 2021 for Whittlesea. Jobs are concentrated in the south of the municipality, with pockets moderate levels of employment in the suburbs of Doreen, Mernda, and Whittlesea.

Unsurprisingly, job density is greatest in state significant industrial precincts found in Epping, Thomastown and Bundoora. In 2021, 29% of jobs in Whittlesea were located in Epping. Across the municipality, job density is highest in parts of Epping South where the Northern Hospital (33,006 jobs per sq km) and Epping Plaza Shopping Centre (9,141 jobs per sq km). Thomastown accounted 24.9% of jobs in Whittlesea, where the major industrial precinct south of the Metropolitan Ring Road recorded job densities between 2,500 – 4,200 jobs per sq km. Bundoora reported 500 – 1,500 jobs per sq km, with higher job densities north of the Metropolitan Ring Road on Plenty Road. Key work destinations in this area include RMIT University's Bundoora Campus, and University Hill Town Centre and the surrounding industrial area.

While job density in Wollert and Donnybrook are currently low, considerable employment growth can be expected in future years, due to the proximity to state significant industrial precincts and activity centres concentrated along the western spine of the municipality.

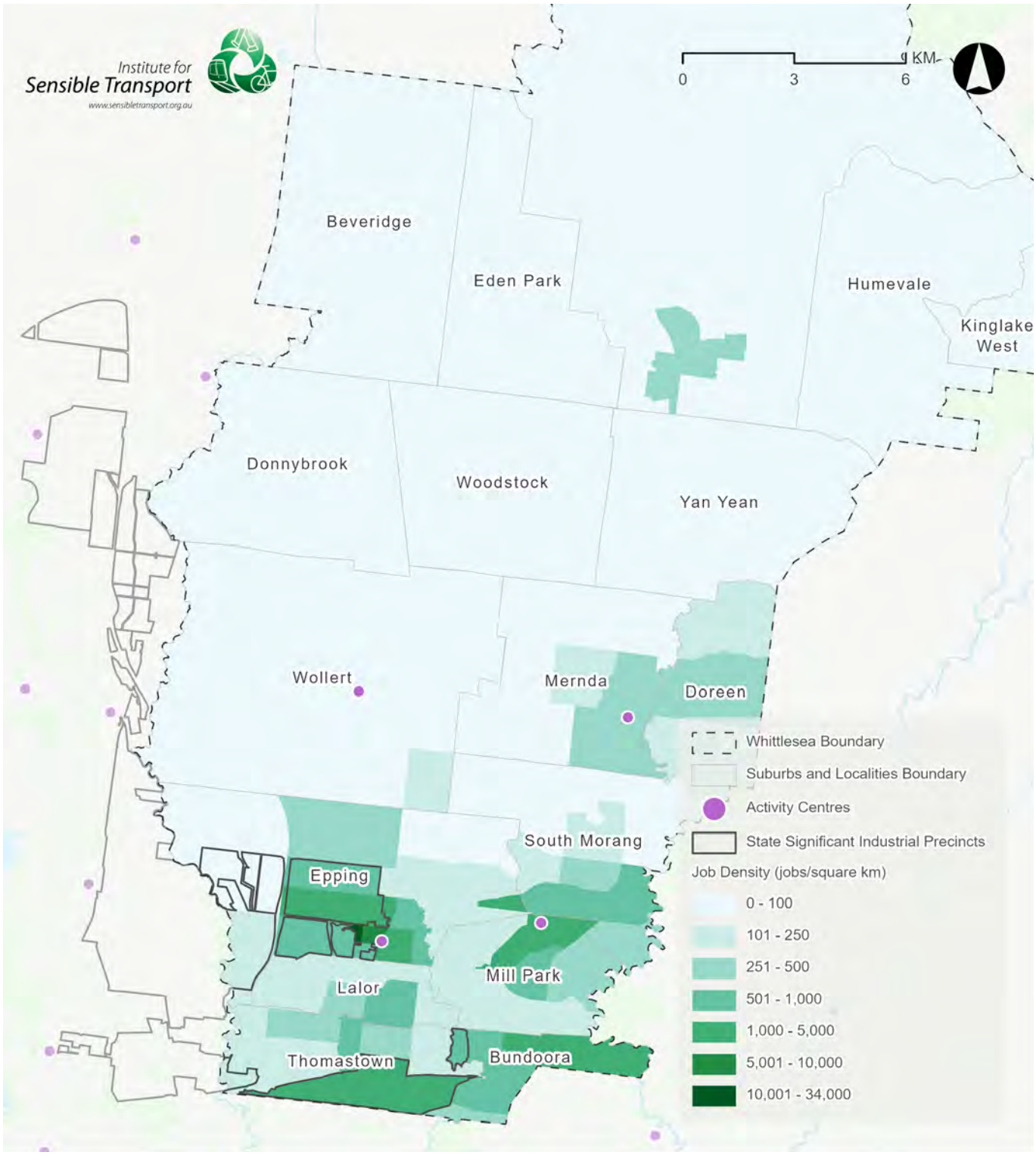


Figure 98 Job densities in 2021

Source: ABS 2021

7.1.1 Age of population

Figure 99 shows the age profile of Whittlesea compared to the Greater Melbourne average. It shows that the variation in age groups largely follow the Greater Melbourne average, though Whittlesea has a slightly higher proportion of young people.

Figure 100 shows gender distribution within each age group among Whittlesea residents. Males tend to outnumber females up to 50 years old, after which, the life expectancy of females is longer than males.

As the population ages, some people will need to consider whether they continue to be fit to drive. This will present a significant problem for social connectedness in car dependent areas. Women are more likely to recognise they are no longer fit to drive than males.[4]

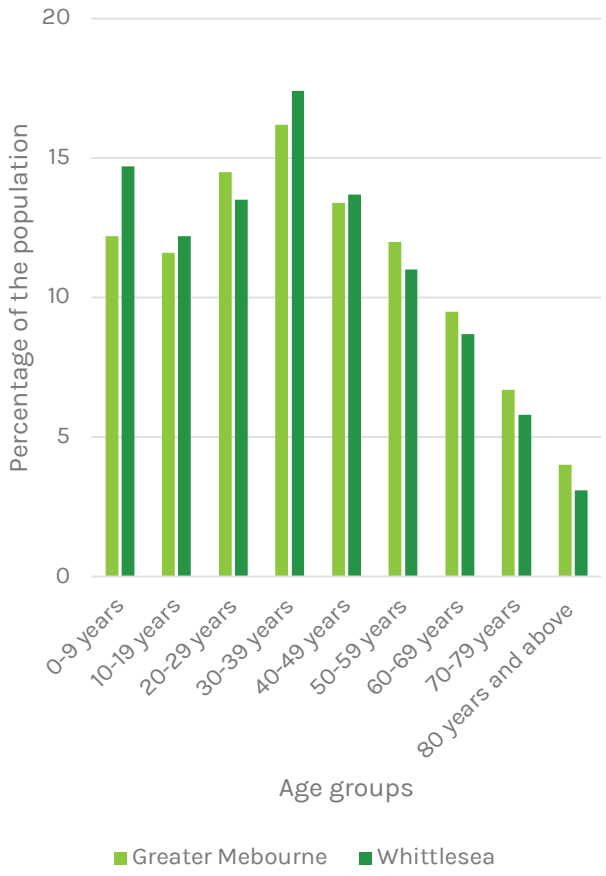


Figure 99 Age-group in 2021
Source: ABS 2021

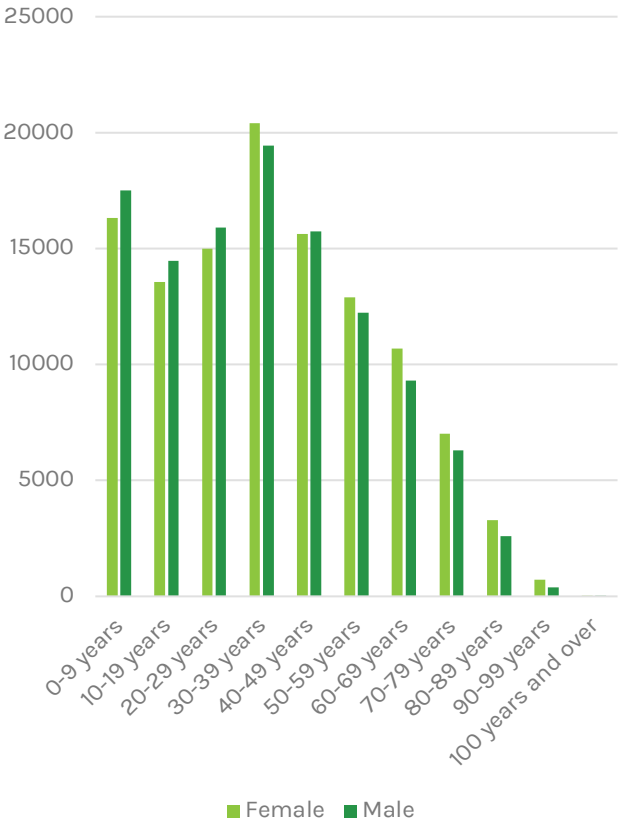


Figure 100 Gender distribution of age groups
Source: ABS 2021

7.2 Future population

Plan Melbourne 2017-2050 includes Whittlesea as part of the northern region which is expected to see the second highest population growth across Melbourne. This intense population growth is expected to be in greenfield areas. The 229,396 residents recorded in the 2021 Census is expected to increase by 131,296 residents (57%) by 2041.

A spatial distribution of the 2023 population (244,124 people) and the projected 2041 population (360,692 people) has been visualised in Figure 101. As part of the growth area demarcated in Plan Melbourne, Donnybrook and Wollert are the expected to welcome an additional 42,913 (824%) and 27,125 (411%) new residents respectively.

Note that the empty areas identified in the growth boundary, at Beveridge and south of Donnybrook are planned to be industrial land, rather than residential.

[4] Gwyther, H., & Holland, C. (2012). The effect of age, gender and attitudes on self-regulation in driving. Accident Analysis & Prevention, 45, 19–28. https://doi.org/10.1016/j.aap.2011.11.022

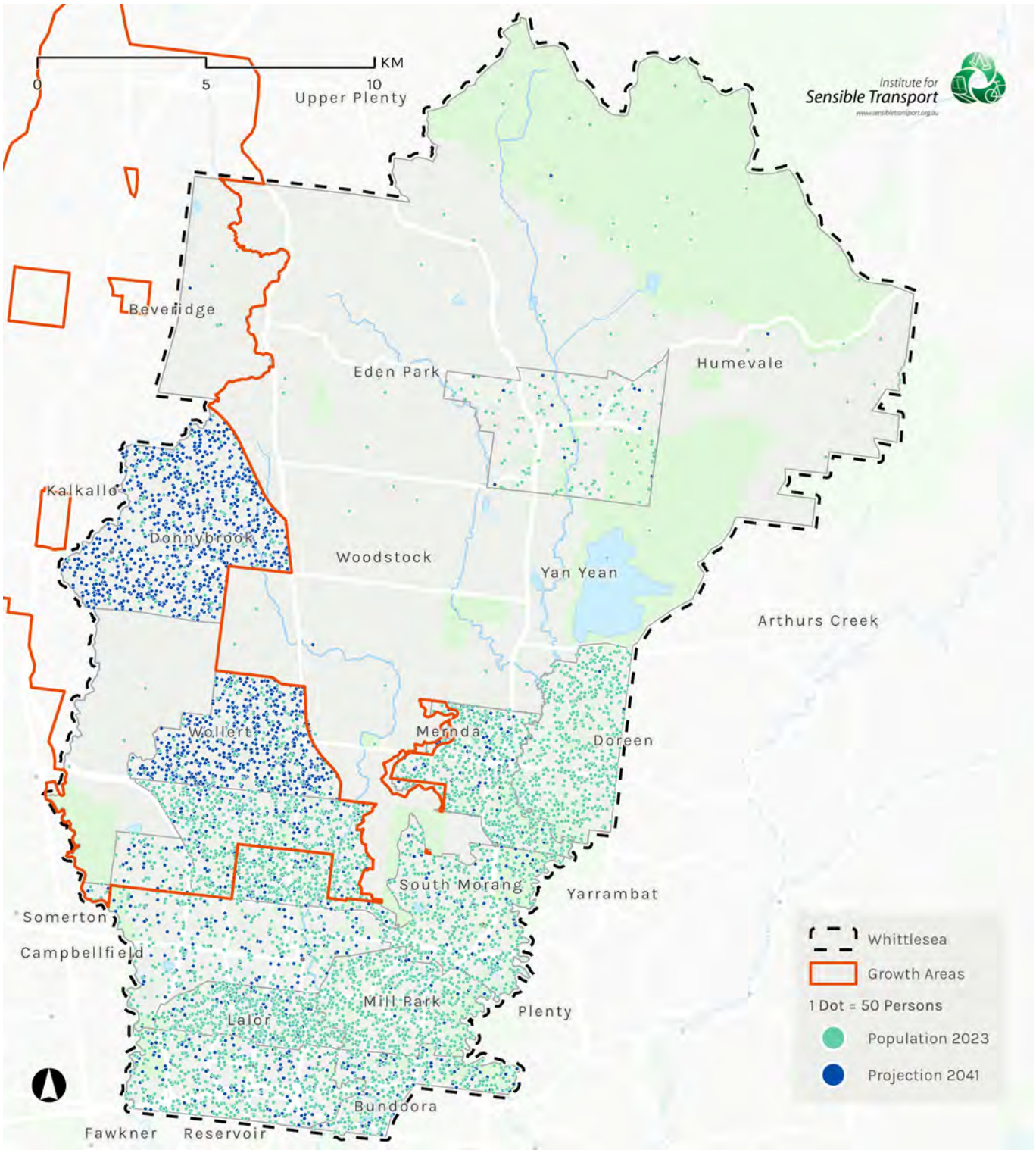


Figure 101 Population growth in small areas

Source: Forecast .id

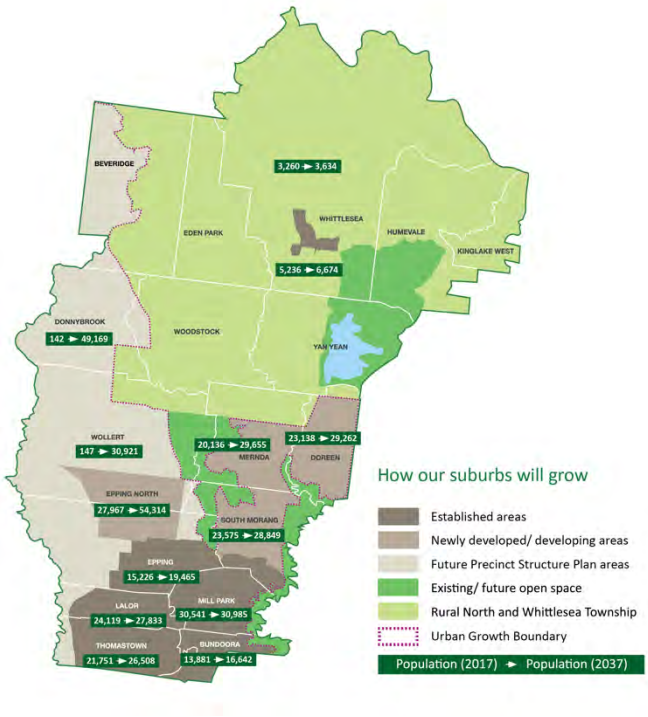


Figure 102 Population growth for suburbs

Source: Roads and Public Transport Plan 2017

7.3 Socio-economic profile

The ABS measures socio-economic status through a series of indexes called Socio-Economic Indexes For Areas (SEIFA). The Index of Relative Socioeconomic Advantage and Disadvantage (IRSAD) summarises the average level of advantage or disadvantage within an area. IRSAD scores for statistical areas across Australia are ranked and divided into equal groups of ten, known as deciles. Areas with decile numbers of 1 have the highest average level of disadvantage, and areas with decile numbers of 10 have the highest average advantage.

The SEIFA Index by IRSAD for Whittlesea (LGA) is shown in Figure 103. The IRSAD Index at the national scale reveal a wide range of advantage and disadvantage exists in the municipality. The most intense areas of disadvantage are in Lalor and Thomastown, and the southern part of the suburb of Whittlesea. Areas scoring 4 and below on the Index make up almost 23% of the local government area.

Housing close to the peri-urban boundary is often more affordable. It is important to monitor areas ranked low on the IRSAD Index (i.e. Lalor), as renters there could be face commuting burden as a result of a lack of housing affordability.[5] To alleviate the need to drive to work, improving public transport options should be further investigated in these areas.

Lower-income suburban and peri-urban households are also more likely to live in areas of poor transport choice. This compounds socio-economic disadvantage with transport disadvantage and leads to higher levels of car ownership, in what Currie calls 'forced car ownership'.[6] This can also expose households to increased vulnerability from changes to interest rates and oil prices.[7]

The northern part of Whittlesea (LGA) has large areas of advantage, with the most advantageous areas are in Bundoora- North, South Morang – North, Wollert and Doreen – North.

Wollert and Donnybrook have been designated as future growth areas as discussed earlier in Section 7.2, it is important to continually evaluate the performance of transport routes in these areas as they densify, ensuring that residents have reliable public transport options.

[5] Dodson, J., Li, T., Taylor, E., & Goldie, X. (2020). Commuting burden and housing affordability for low-income renters. AHURI Final Report, 335. https://doi.org/10.18408/ahuri5320201

[6] Curry, G, Delbosc, A, & Pavkova, K, (2018). Alarming Trends in Growth of Forced Car Ownership in Melbourne. ATRF 2018. https://www.monash.edu/__data/assets/pdf_file/0004/1515676/ATRF2018_Paper_8_Forced-Car-Ownership-in-Melbourne-.pdf

[7] Dodson, J & Sipe, N. 2008. Unsettling Suburbia: The New Landscape of Oil and Mortgage Vulnerability in Australian Cities. Griffith University Urban Research Program. https://apo.org.au/sites/default/files/resource-files/2008-08/apo-nid449.pdf

NDIS population in Whittlesea

Whittlesea has one of the fastest growing populations of National Disability Insurance Scheme participants, with 5,824 currently registered and projected growth at 200 per quarter. Many NDIS participants have limited capacity to independently use public transport and rely heavily on service providers to transport them around the community for social and economic participation and to access services. This entails short vehicle trips, typically in minibuses that can hold large groups and wheelchairs. Appropriate parking, including ample space to park and unload passengers from buses and extended parking times are required to facilitate these journeys. Short walking distances from carparks to spaces and places also ensures service providers can safely deliver large groups to their destinations.

Box 2 NDIS population in Whittlesea

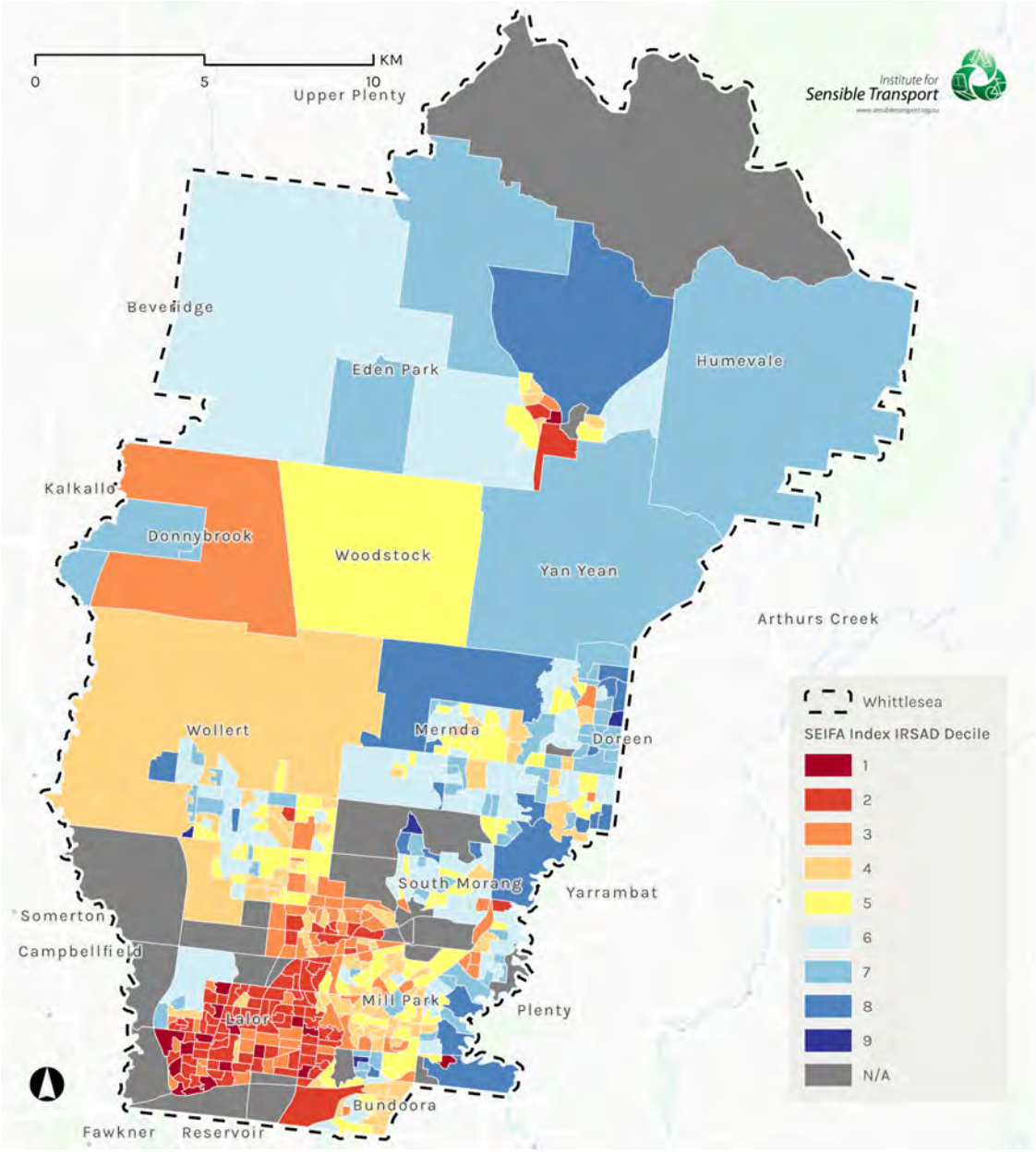
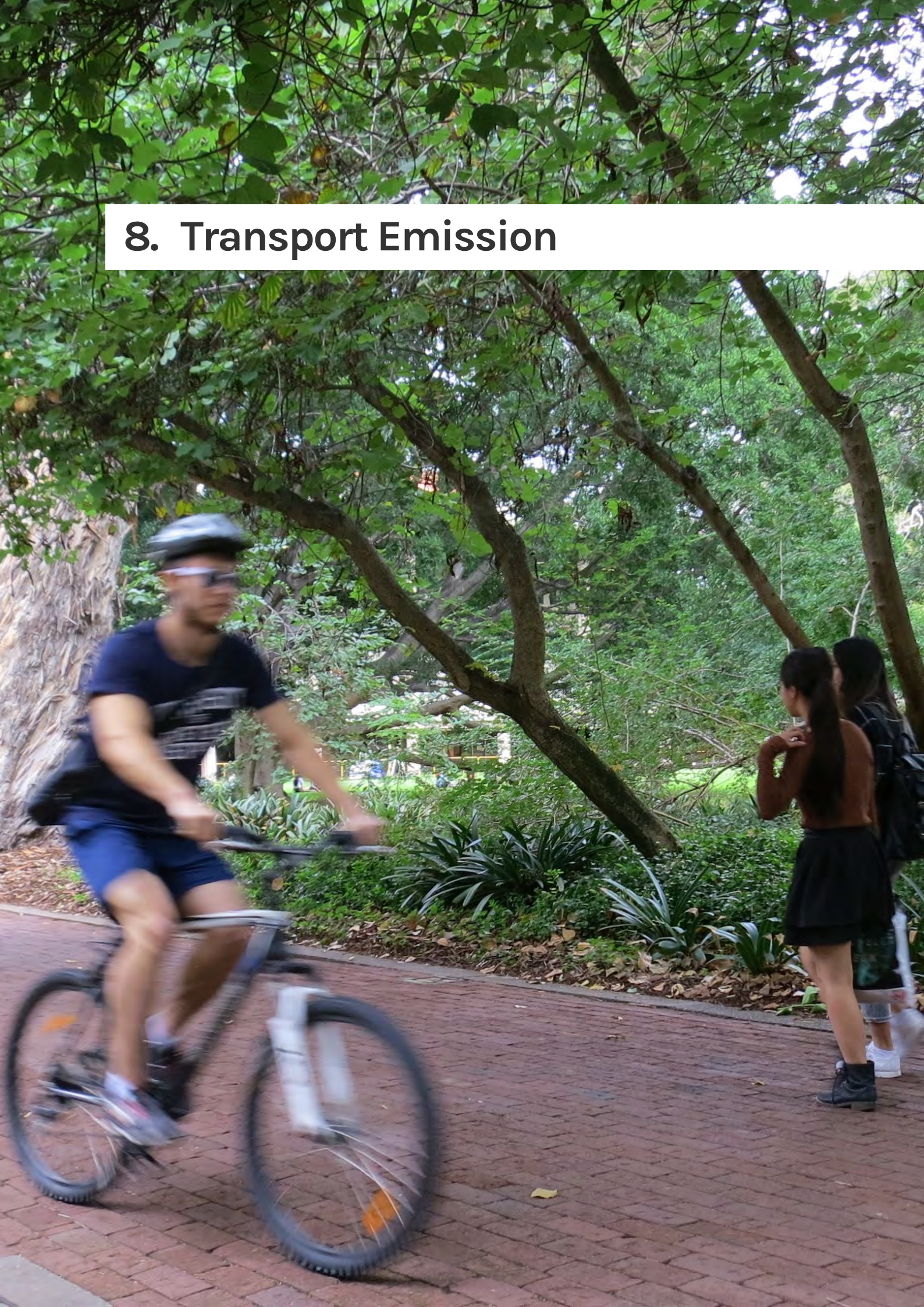


Figure 103 SEIFA Index - IRSAD for Whittlesea

Source: ABS Census 2021

8. Transport Emission



This section provides an estimate of greenhouse gas emissions associated with transport in Whittlesea. The importance of this section is underlined by increasing recognition of the need to transition to a net zero emission society by 2050. Unlike many other sectors, transport has not achieved emission reductions, and in fact, emissions have increased in the transport sector in Australia. Transport emissions are on track to become the largest source of emissions in Australia by 2030.

8.1 Overview

The following section provides estimates of greenhouse gas emissions associated with transport in Whittlesea. The methodology and outputs are compliant with a *Global Protocol for Community-Scale Greenhouse Gas Emission* methodology. These protocols have three scopes.

- **Scope one emissions** – These represent the direct emissions associated with transport activity inside Whittlesea (e.g., an internal combustion engine vehicle being used on the streets of Whittlesea). Scope one emissions from all transport are included.
- **Scope two emissions** – Emissions generated elsewhere from the activity (e.g. the electricity generation from charging an EV battery). Due to low Electric Vehicle take-up in Whittlesea, and poor data, scope two emissions are not calculated for road transport. All emissions from electricity used to power Metro Trains Melbourne trains are included.
- **Scope three emissions** – Emissions which occur outside of the area but are associated with an activity within the area. This assessment does not include any scope three emissions for transport.

8.1.1 Summary of transport emissions

A summary of transport emissions in Whittlesea is provided in Table 7 and Figure 104. Notably, 98% of transport emissions in Whittlesea are estimated to be from private motor vehicle use and road based freight, as shown in Figure 104. Much of these emissions are from local passenger and light vehicles, while heavy and commercial vehicle through traffic also generates significant emissions.

98% of transport emissions in Whittlesea are estimated to be from motor vehicle use.

Public Transport Victoria buses and Metro Trains Melbourne services combined, contribute 1.5% of transport emissions. Yarra Trams does not have any emissions as they are fully offset via renewable energy. V/Line trains account for an estimated 0.1% of emissions.

Within this context, the largest potential to decrease emissions is from reduced motor vehicle usage or increased uptake of EVs, powered by renewable energy.

Table 7 Estimate transport emissions of Whittlesea, 2023

Sector	Component	Emissions (t-CO_2e) per annum
Road	Passenger vehicles, light commercial, motorcycles	467,015
Road	Light and heavy trucks	236,371
Road	PTV Buses	4,826
Rail	Yarra Trams	0
Rail	Metro Trains Melbourne	6,026
Rail	V/Line	756
Rail	Freight trains	2,812
Total		**717,806**

Source: Institute for Sensible Transport

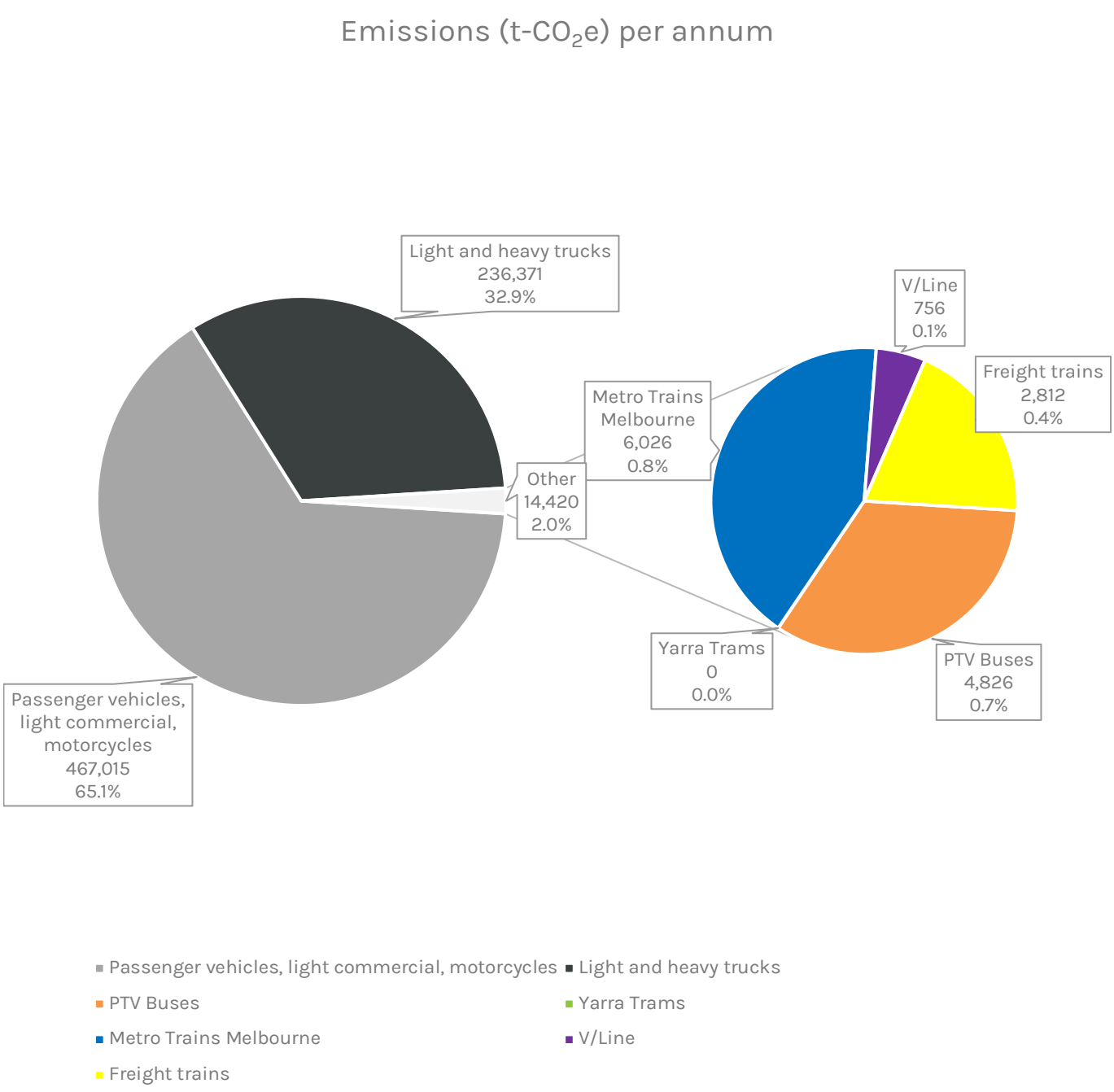


Figure 104 Transport emissions of Whittlesea, by source, for 2021

Source: Institute for Sensible Transport

The largest potential to decrease emissions is from reduced motor vehicle usage.

8.2 Methodology

The following sections outline the methodology for calculating emissions from road based transport, rail based transport, and aviation.

Due to a lack of detailed transport usage data, there are generalised estimates made for road based transport, based on car ownership and use data. These estimates are only made for scope one emissions.

Timetabled services, and running distances are used to estimate rail and aviation emissions through the LGA of Whittlesea. Again, these emissions are scope one.

National Greenhouse Accounts Factors 2022[8] were used for emissions estimates, as shown in Table 8.

Electric trains are assumed to have an emissions intensity of 0.85 kg of CO_2 per kWh, the same as the Victorian electricity grid, as reported in the National Greenhouse Accounts Factors 2022.

Table 8 kgs of CO_2-e emissions per litre of fuel

	CO_2	CH_4	N_2O	CO_2-e
Petrol	2.3	0.02	0.05	2.4
Diesel	2.7	>0.00	0.02	2.7
LPG	1.6	0.02	0.02	1.6
Aviation (Kerosene)	2.6	>0.00	0.02	2.6

Source: National Greenhouse Accounts Factors 2022

NB: Numbers may not add up due to rounding.

8.2.1 Road based

Two different methods were used for estimating road based emission:

1. Those associated with vehicle travel *within* the LGA of Whittlesea; and
2. Those associated with vehicle travel *through* the LGA of Whittlesea.

8.2.1.1 Road emissions within

Emissions for travel within the LGA of Whittlesea is estimated based on car ownership rates and average vehicle use. ABS Motor Vehicle Census data was used to identify how many vehicles are registered in the postcodes of Whittlesea.[9] This data revealed the number of passenger vehicles, light commercial vehicles, and motorcycles per postcode.

The ABS Survey of Motor Vehicle Use was used to determine the number of kilometres each vehicle would travel on average, per annum.[10] An estimate of fuel source was also made, allocating kilometres travelled to different fuel sources.[11] An average consumption per fuel source was applied to each vehicle type, estimating total fuel consumption [12]. Greenhouse gas emissions rates were applied to fuel consumption estimates.

This method provides an estimate of the amount of VKT and amount of carbon emissions per postcode, which can be aggregated to the study area. It should be noted that this method attributes all emissions from vehicles registered in Whittlesea to the areas of Whittlesea. Similarly, it does not account for vehicles outside of the LGA of Whittlesea who travel to or through Whittlesea.

These simplifications add some level of irregularity to the estimates. However, the method is simple, and repeatable, allowing for a tracking of change over time. It is assumed that basing estimates of emissions on cars registered in Whittlesea is broadly representative of car use and emissions with the LGA.

8.2.1.2 Road emissions through

While the above method estimates emissions associated with travel *within* Whittlesea, it is important to recognise the significant through traffic associated with the Hume Highway and Metropolitan Ring Road.

[8] From National Greenhouse Accounts Factors 2022, Table 7 < https://www.dcceew.gov.au/sites/default/files/documents/national-greenhouse-accounts-factors-2022.pdf >.

[9] These postcodes are: 3074; 3075; 3076; 3082; 3083; 3750; 3751; 3752; 3754; 3755; and 3757.

[10] Based on the 'other areas' category of Survey of Motor Vehicle Use Table 8.

[11] Based on Survey of Motor Vehicle Use Table 11.

[12] Based on Survey of Motor Vehicle Use Table 6.

These emissions are estimated based on observed VicRoads traffic count data[13] (which is unavailable in fine enough detail for the rest of Whittlesea's road network).

These count data reveal light and heavy vehicle counts. All light vehicles are assumed to have the same fuel source mix and consumption as passenger vehicles. Heavy vehicles are assumed to be 43% rigid trucks and 57% articulated trucks, all being diesel powered, based on revealed use in the ABS Survey of Motor Vehicles for the national fleet.[14]

Vehicle kilometres travelled were calculated on a section-by-section basis, revealing an estimated vehicle kilometres travelled along the entirety of the freeway network, to which fuel consumption rates[12] and associated emissions are applied.

Public Transport Buses

Emissions from buses were calculated separately. The General Transit Feed Specification (GTFS) data were analysed to determine the length of each bus route within the LGA of Whittlesea. Timetable data in GTFS were analysed to determine how many services operate per annum.

The route length, multiplied by services revealed the number of kilometres travelled per year. A consumption rate from the ABS Survey of Motor Vehicle Use was applied to estimated vehicle kilometres travelled.[12] Lastly, emissions factors were applied to estimated fuel consumption.

8.2.1.3 Rail

Electric

Emissions from Metro Trains Melbourne were calculated separately from diesel. The GTFS data were analysed to determine the length of each rail route within Whittlesea. Timetable data in GTFS were analysed to determine how many services operate per annum.

The route length, multiplied by services revealed the number of kilometres travelled per year. An electricity consumption rate per km was applied to estimated vehicle kilometres travelled.[15] Lastly, emissions factors were applied to estimated electricity consumption.

Trams in Melbourne are powered by 100% renewable energy.[16] As such, no emissions are assumed from their operation.

Diesel

Emissions from diesel V/Line passenger rail services are estimated based on analysis of timetables. Track distance within the LGA of Whittlesea was measured, to determine travel distance within Whittlesea. Timetables were analysed to determine the number of passenger trains per year. This revealed the number of kilometres travelled per year. A fuel consumption rate per km was applied to estimated vehicle kilometres travelled.[15] Lastly, emissions factors were applied to estimated fuel consumption.

Emissions from diesel freight rail are estimated based on freight gross tonnage was accessed from BITRE.[17] Total tonnage km between Albury and Tottenham yard was calculated, and then scaled down to the portion of freight rail within Whittlesea, to represent movement through Whittlesea. Fuel consumption rates were applied per tonne/km. Lastly, emissions factors were applied to estimated fuel consumption.

[13] VicRoads Traffic Volume < https://vicroadsopendata-vicroadsmaps.opendata.arcgis.com/datasets/traffic-volume/explore >.

[14] Based on Survey of Motor Vehicle Use Table 11.

[15] From Melbourne Metro Rail Project Greenhouse Gas Impact Assessment, page 34 < https://bigbuild.vic.gov.au/__data/assets/pdf_file/0016/51091/MT-Technical-Appendix-V-Greenhouse-Gas.pdf >.

[16] Department of Transport and Planning , Solar-powered trams < https://dtp.vic.gov.au/our-transport-future/future-directions-for-transport/our-strategic-directions/environmentally-sustainable-transport/solar-powered-trams >.

[17] From BITRE Trainline 9, Table 6 < https://www.bitre.gov.au/publications/2022/trainline-9 >.

8.3 Emissions estimates

The following sections estimate the amount of greenhouse gas emissions associated with transport in the LGA of Whittlesea.

8.3.1 Road based emissions

8.3.1.1 Road emissions within

The ABS Motor Vehicle Census reveals there are 173,170 passenger, light commercial vehicles and motorcycles registered in postcodes within LGAs of Whittlesea, as shown in Table 9.

Table 9 Registered Vehicles in Whittlesea, 2021

	Passenger vehicles	Light commercial vehicles	Motorcycles
Registered vehicles	145,405	21,115	5,810

Applying ABS Survey of Motor Vehicle Use annual vehicle kilometre travelled figures to the registration data reveals an estimated 1,805,888,800km is travelled due to the use of these vehicles, as shown in Table 10.

Table 10 Estimated Vehicle Kilometres Travelled, per vehicle type, 2021

	Passenger vehicles	Light commercial vehicles	Motorcycles
VKT per annum	1,497,640,600	294,237,200	18,011,000

Applying ABS Survey of Motor Vehicle Use ratios of fuel type, allows for an estimate of consumption of different fuel types for each type of vehicle. This is shown in Table 11.

Table 11 Estimated fuel (litres) consumption per vehicle type and fuel type, 2021

	Passenger vehicles	Light commercial vehicles	Motorcycles
Petrol consumption	129,195,988	9,558,741	1,098,671
Diesel consumption	17,869,782	26,572,567	-
Other (LPG) consumption	7,999,471	285,794	-

Estimated emissions per vehicle type, using fuel consumption estimates and emissions factors, is shown in Table 12. It is estimated that 467,015 tonnes of CO_2-e emissions are associate with vehicles in Whittlesea for the 2021 year.

Table 12 Estimated CO_2-e emissions (tonnes), per vehicle type, 2020

	Passenger vehicles	Light commercial vehicles	Motorcycles
Emissions (t-CO_2-e) per annum	368,977	95,423	2,615

8.3.1.2 Road emissions through

VicRoads Traffic Count data reveals that there are an estimated 678,545,519km travelled along the Hume Freeway and Metropolitan Ring Road in Whittlesea in 2021, as shown in Table 13.

Table 13 Estimated Vehicle Kilometres Travelled along freeways, per vehicle type, 2021

	Light	Heavy
VKT per annum	615,672,506	62,873,012

Applying ABS Survey of Motor Vehicle Use ratios of fuel type, allows for an estimate of consumption of different fuel types for each type of vehicle. This is shown in Table 14.

Table 14 Estimated fuel (litres) associated with freeway travel, per vehicle type and fuel type, 2021

	Light	Heavy
Petrol consumption	58,370,416	
Diesel consumption	7,683,158	26,761,898
Other (LPG) consumption	2,376,179	

Estimated emissions per vehicle type, using fuel consumption estimates and emissions factors, is shown in Table 15. It is estimated that 236,371 tonnes of CO_2-e emissions are associate with vehicles travelling along freeways for the 2021 year.

Table 15 Estimated CO_2-e emissions (tonnes) associated with freeways, per vehicle type, 2021

	Light	Heavy
Emissions (t-CO_2-e) per annum	163,648	72,724

8.3.1.3 Public Transport Buses

Analysis of GTFS feeds and timetables reveals that PTV buses in Whittlesea travelled an estimated 6,319,411km in 2022-2023. By applying the Victorian average diesel bus fuel consumption rate, it is estimated that 1,775,754l of diesel is consumed. It is estimated that public transport buses emitted 4,826 tonnes of CO_2-e in Whittlesea for the 2022-2023 year.

8.3.2 Rail based emissions

8.3.2.1 Passenger

Electric

Analysis of GTFS feeds and timetables reveals that Metro Trains Melbourne in Whittlesea travelled an estimated 310,958km in 2022-2023. By applying the average electricity consumption of the Metro Trains Melbourne fleet, of 22.8kWh per km, it is estimated that 7,089,836kWh of electricity is consumed. It is estimated that Metro Trains Melbourne trains emitted 6,026 tonnes of CO_2-e in Whittlesea for the 2022-2023 year.

Diesel

Analysis of passenger rail timetables reveals that V/Line operate 268 trips every week (in both directions combined). The track distance V/Line services traverse 9.95km. It is estimated that passenger trains travel 139,044km per annum. It is estimated passenger rail uses 2 litres per kilometre, equating to 278,088 litres of diesel being consumed per year. It is estimated that passenger rail emitted 756 tonnes of CO_2-e in Whittlesea for the 2022-2023 year.

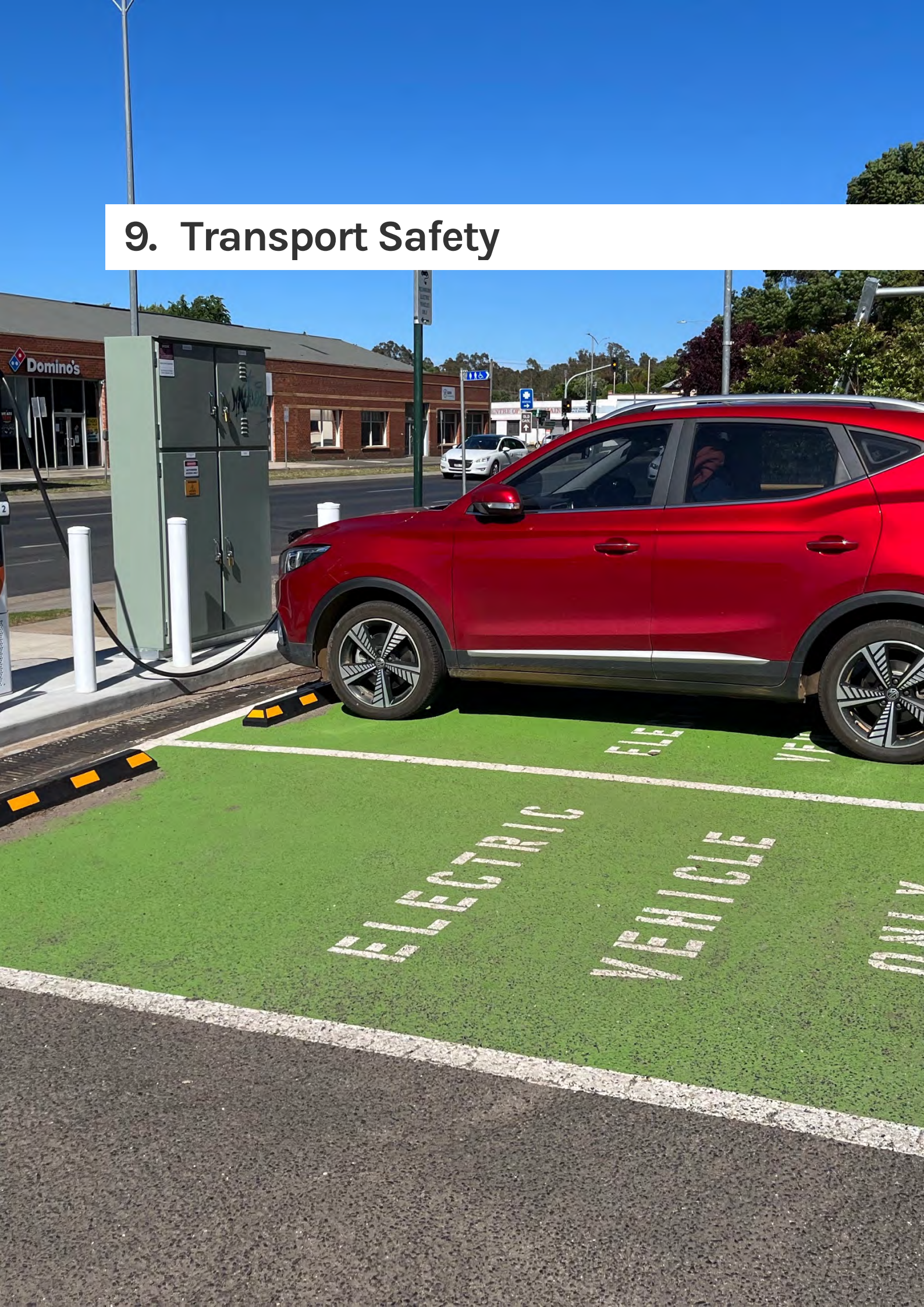
8.3.2.2 Freight

Analysis of BITRE Data shows there is 10.4 million gross tonnes hauled along the Albury – Tottenham rail corridor in 2019-20. This equates to 3,062 million Gross Tonne Kilometres, along a 294.5km section of track. Scaling this down to the track distance within Whittlesea (9.95km) equates to an estimated 103.5 million Gross Tonne Kilometres. Previous research has revealed average consumption of 10 litres of diesel per 1,000 Gross Tonne Kilometres. Using the consumption rate, it is estimated 1,034,800 litres of diesel is consumed by freight trains within Whittlesea. It is estimated that freight rail emitted 2812 tonnes of CO_2-e in Whittlesea in the 2019-2020 year.

8.4 Implications for Whittlesea ITP

Transport emissions in Whittlesea are high, and expected to rise over coming years. Current and future emissions from transport are inconsistent with Australian and Victorian government emission targets. While the responsibility to reduce emissions are not solely within the hands of local government, this is significantly more that can be done at the municipal level to lower emissions. The new ITP is an opportunity to ensure all actions, including advocacy projects, align with Council's stated ambition for a safe climate.

9. Transport Safety



The Victorian government has adopted the *Safe Systems* approach to road safety. This places an emphasis on the fallibility of the road user and seeks to provide a forgiving transport system in which mistakes do not result in death or serious injury. This section examines Victorian government crash data between 2016 and 2020 in Whittlesea. Using GIS, we pinpoint crash clusters and hotspots, categorising data by mode and severity. Wherever possible, data has been disaggregated by gender.

9.1 Crash analysis

A total of 2,203 people were involved in 1,432 crashes recorded within Whittlesea between 2016 and 2020. For Whittlesea, the number of crashes initially reduced from 386 in 2016 to 299 in 2017, before stabilising at around 300 crashes recorded annually until the COVID-19 pandemic in 2020. Figure 105 shows the crash trend in Whittlesea between 2016 and 2020.

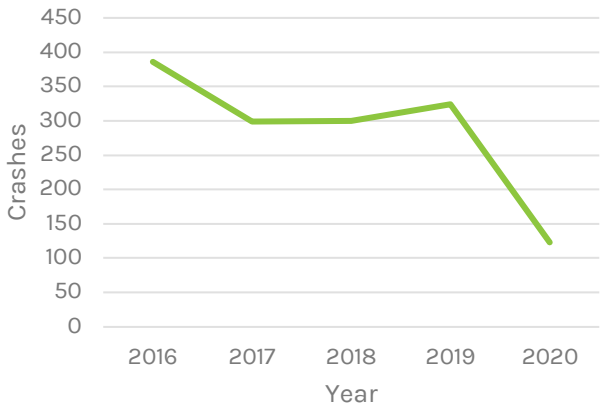


Figure 105 Number of crashes per year, Whittlesea
Source: VicRoads

The Victorian government's *Road Safety Strategy* seeks to halve road fatalities by 2030 and eliminate death from Victorian roads by 2050. These commitments cannot be met without Whittlesea making substantial improvements to the safety of the transport network. Introducing measures beyond those tried in the past will be required in order for crash reductions to align with state government targets. This has direct implications for the actions that will need to form part of the future ITP.

The identification of crash clusters and opportunities to enhance road safety outcomes will contribute to making roads safer for all users.

9.1.1 Crashes by location

Table 16 shows the number of crashes by their location within the road network. It shows that 31.3% of crashes across the LGA occurred at intersections, while 68.6% are recorded mid-block. Two crashes occurred at a dead end. Approximately 66% of crashes occurred during the day. Of the crashes recorded in low light conditions, 16.5% of crashes occurred on roads without street lights, and 2.3% occurred on roads where street lights were off.

Table 16 Crashes by location

Crash location	Number of crashes
Intersection	448
Mid-block	982
Dead end	2

Figure 106 illustrates that the majority of crashes occurred on Plenty Road (111), High Street (87), Cooper Street (73), the Metropolitan Ring Road (72), and Epping Road (68). Crashes are concentrated in the southern area of the LGA, with crash clusters across various transport modes located on Epping Road, High Street, and Cooper Street, where speed zones are 80km/h.

While crashes are relatively dispersed north of Bridge Inn Road, a cluster of 18 crashes was recorded near the intersection of Wallan Road-Laurel Road, and Plenty Road-Whittlesea-Yea Road. Currently, road traffic controls include signalled traffic lights at the major intersection and reduced school zone speeds of 40km/h during peak travel times. Unprotected bicycle lanes run along Plenty Road and Whittlesea Road that begin and end abruptly. There is limited signage for cyclists and pedestrians.

Of the crashes involving pedestrians or cyclists, 61.8% occurred mid-block. Most of these crashes occurring on Plenty Road (14), High Street (11), and McDonalds Road (7).

The majority of crashes occurred on arterial roads where speed zones are 80km/h.

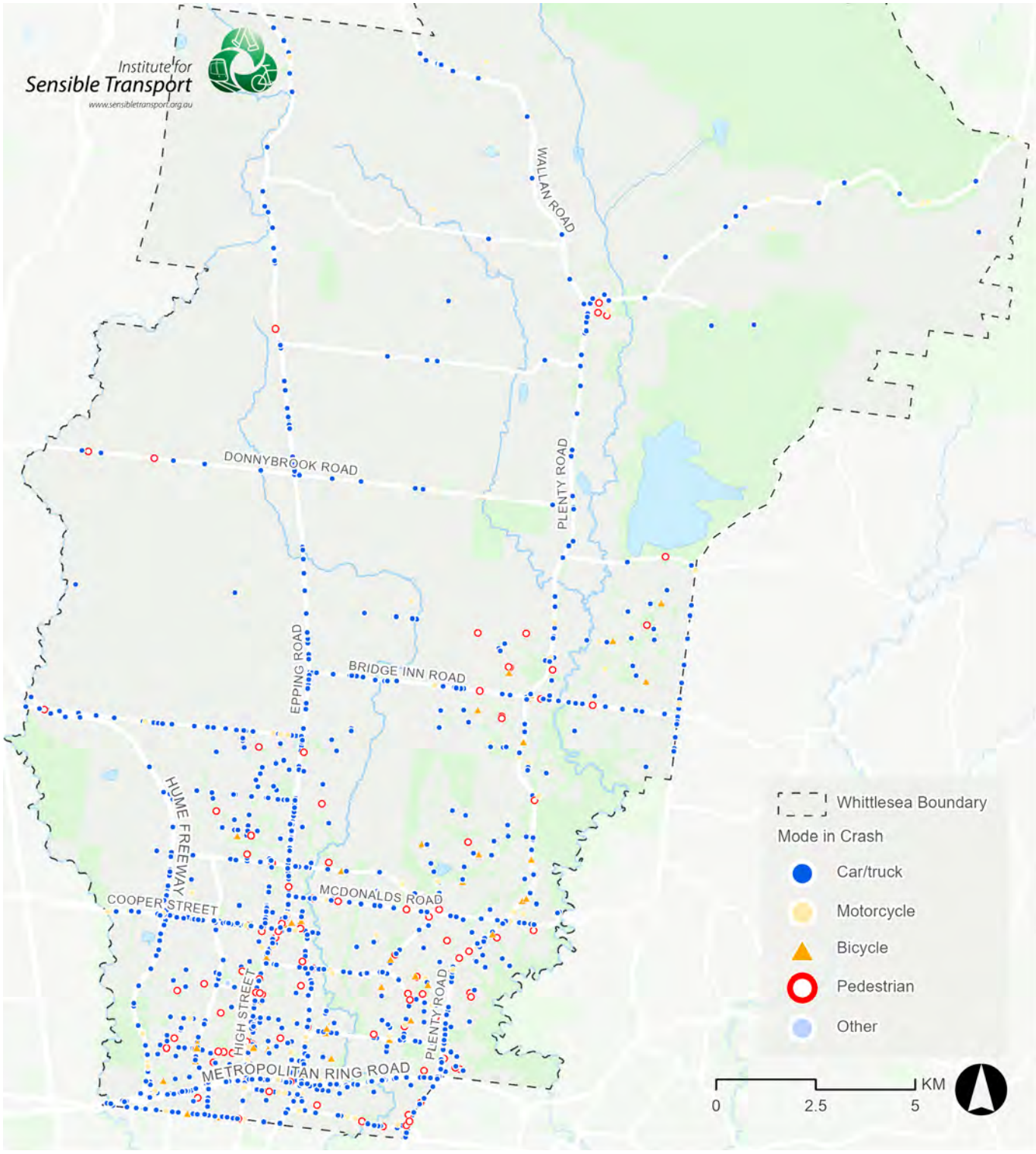


Figure 106 Crashes by transport mode, 2015 - 2020

Source: VicRoads

9.1.2 Crashes by vulnerable modes

As crashes may involve multiple transport modes, Figure 107 shows the most vulnerable mode involved in the crash across the municipality. The majority of crashes involve cars or trucks, followed by motorbikes.

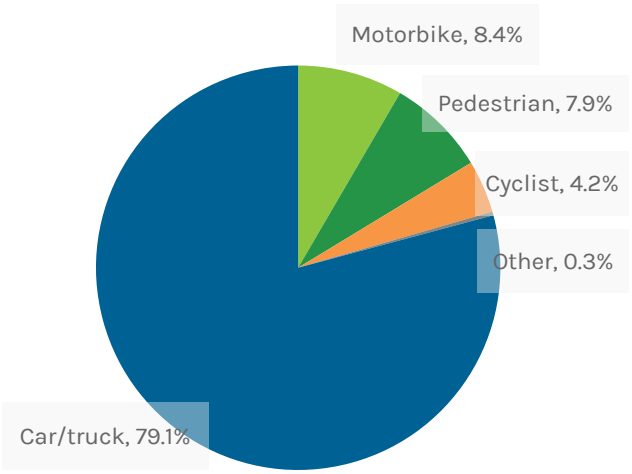


Figure 107 Proportion of crashes by most vulnerable mode involved

Figure 108 provides a closer look at the crash cluster near the intersection of Wallan Road and Plenty Road.

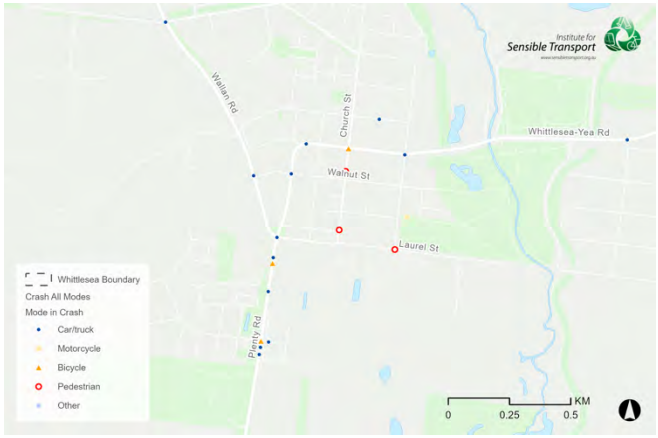


Figure 108 Crash cluster in school zone, Wallan Road-Plenty Road

Source: VicRoads

Figure 109 shows crash locations involving pedestrians and cyclists. A total of 173 crashes involved a pedestrian or cyclist. The most recorded locations of crashes involving active modes in Whittlesea are:

- Plenty Road – 14 crashes, where 6 of these crashes occurring within 2 km between Childs Road and McDonalds Road. All but two crashes on Plenty Road occurred in 80km/h speed zones.
- High Street – 11 crashes, where six of these crashes occurred in a 70km/h speed zone between Kingsway Drive and Cooper Street. This section of High Street is adjacent to Epping Plaza Shopping Centre.
- McDonalds Road – seven crashes. Of these crashes, two occurred at signalised pedestrian crossings, and two occurred near a children's crossing. For the crash located near Gibbons Drive, the closest pedestrian crossing to access the bus stop connection is more than 200 metres away.
- Edgars Road – six crashes. The speed zone at all crash locations is 70km/h. Three of these crashes occurred at T-intersections, where the closest pedestrian crossing is at least 180 metres away.
- Dalton Road – five crashes, where four involved a pedestrian and 1 involved a cyclist. The crash locations are in 60km/h speed zones.

Almost a third of all crashes involving a cyclist or pedestrian occurred in 60km/h and 70km/h speed zones. Bike lanes on roads are generally unprotected, start and end abruptly, and there are low levels of signage at intersections and turns.

Almost a third of all crashes involving a cyclist or pedestrian occurred in 60km/h and 70km/h speed zones.

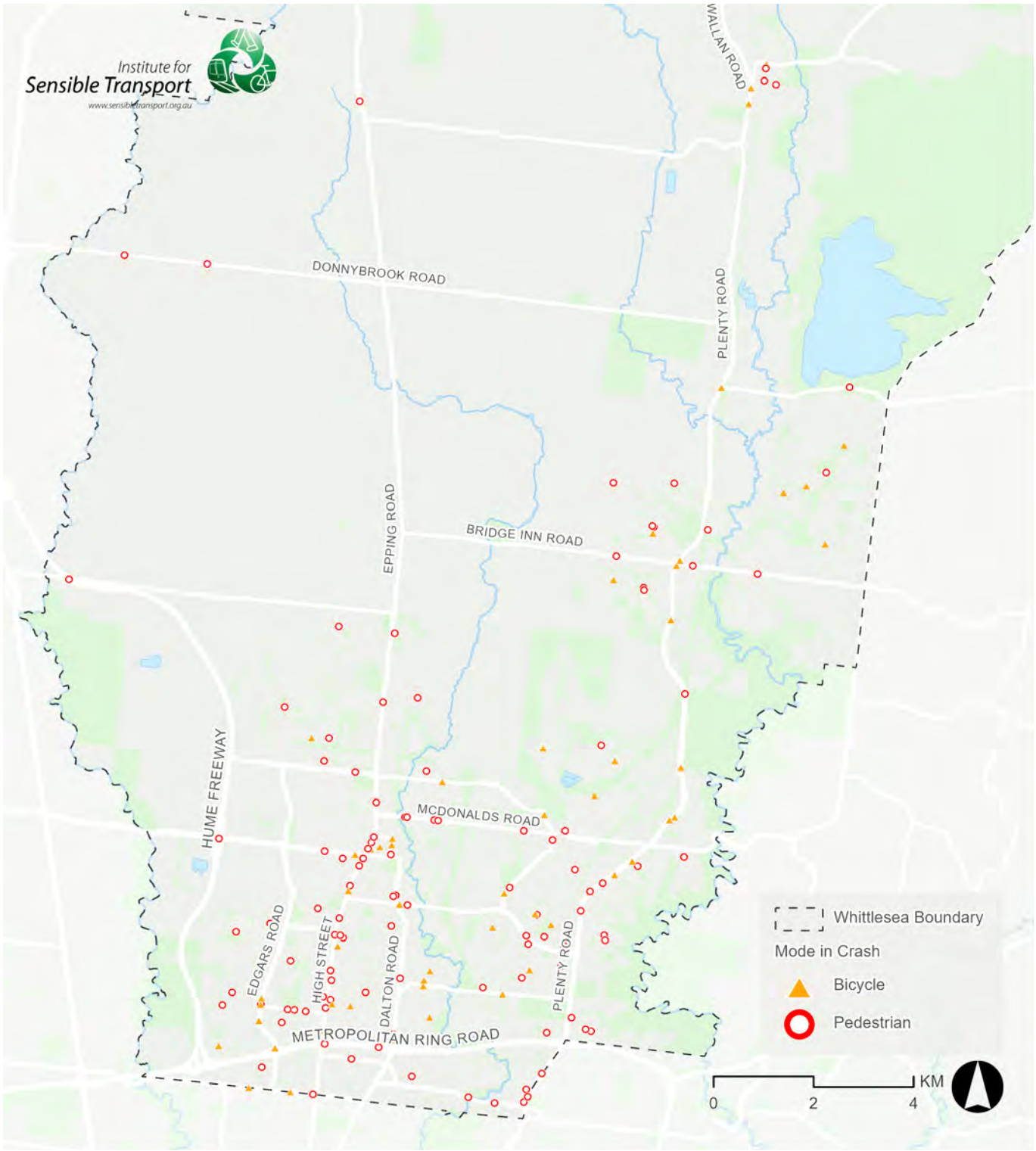


Figure 109 Crashes involving active modes, 2016-2020

Source: VicRoads

9.1.3 Crash density

As crashes occur all over the road network, a density analysis was undertaken to determine which areas in the network were the most dangerous and likely to record a crash.

In Figure 104 and Figure 105 the distribution of road crashes has been estimated using a Kernel Density Estimation algorithm. This function creates a grid of cells and predicts the probability of a crash occurring at that point based on the number, density and distribution of crashes that have been recorded nearby. In order to reflect true travelling distances, the search distance of 150 metres for nearby crashes was constrained to a buffer of the transport network. As this is a statistical prediction, the numbers estimated reflect a relative heatmap of crash locations.

The analysis revealed that suburbs south of McDonalds Road accounted for the highest densities for crashes. This includes Thomastown, Epping, Lalor, Bundoora, and Mill Park. The findings corroborate with the categorisation of the general crash location, where crash locations are highest on High Street, Epping Road, the Metropolitan Ring Road, Plenty Road, and Cooper Street.

Beside the crash hotspots in the south of the municipality, other notable areas include:

- The intersection of Wallan Road and Plenty Road, where there are three schools within proximity,
- Bridge Inn Road in Mernda and Doreen,
- Sections of Plenty Road between South Morang and Whittlesea, and
- Sections of Epping Road between Wollert and Beveridge.

The locations identified in Figure 110 and Figure 111 are likely hotspots for future crashes and should be a focus for further road safety work.

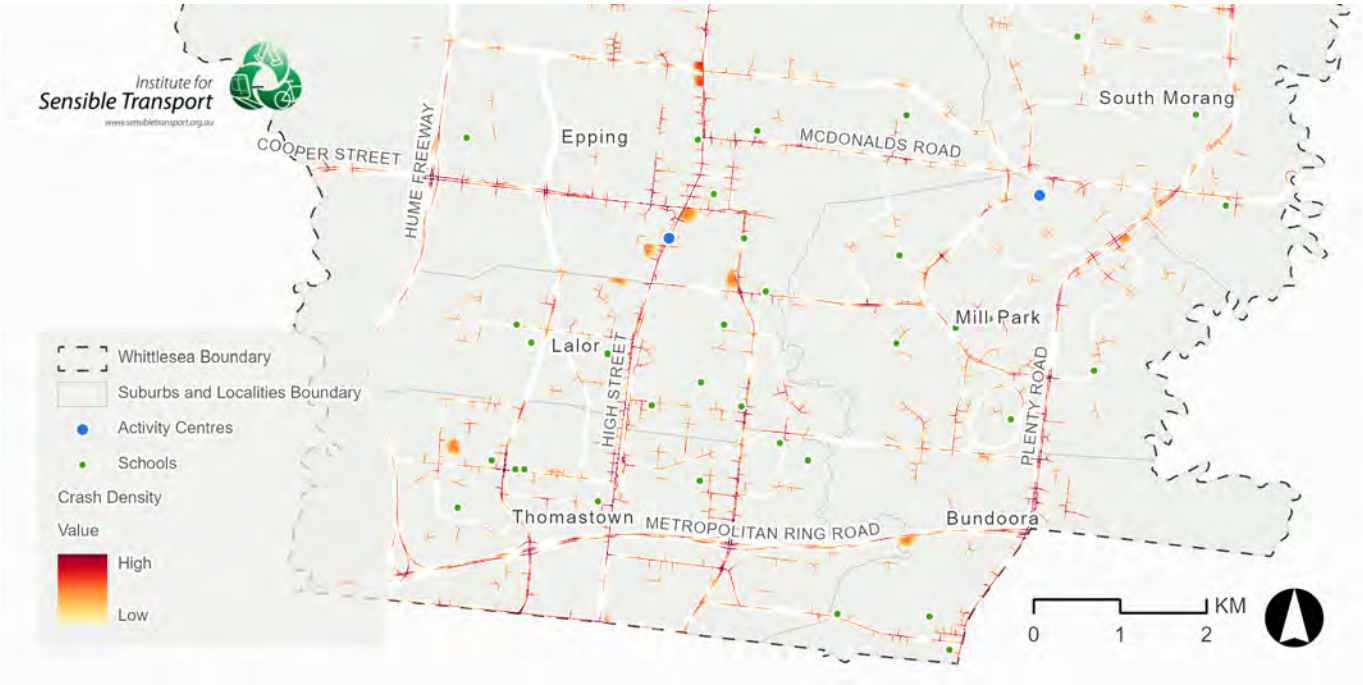


Figure 110 Crash density, Whittlesea south

Source: VicRoads

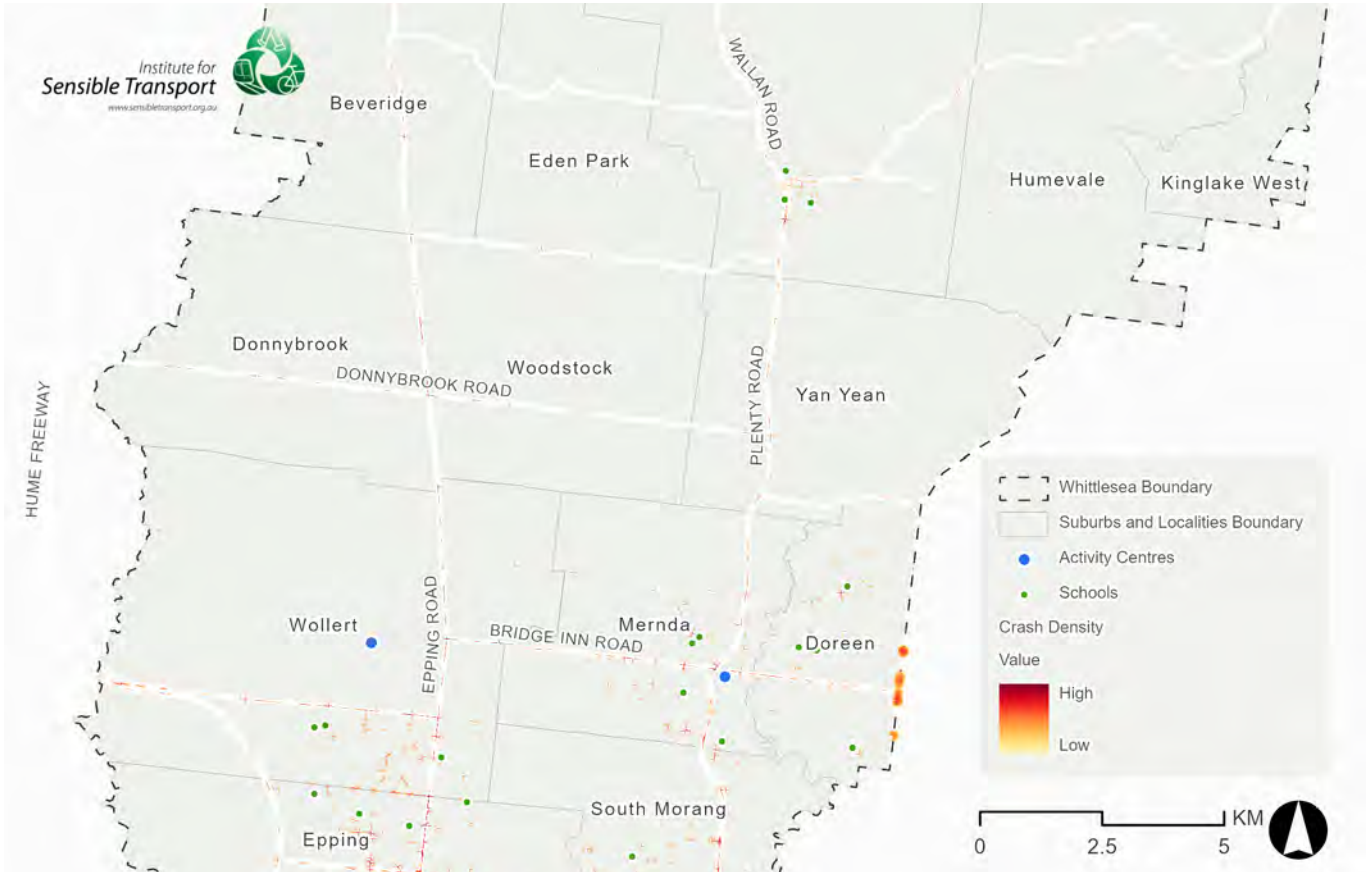


Figure 111 Crash density, Whittlesea north

Source: VicRoads

9.1.4 Crashes by severity

Table 17 shows the severity of recorded crashes in Whittlesea between 2016 and 2020. A total of 1,432 crashes were recorded within the LGA. This included 16 crashes involving a fatality, 436 serious injuries, and 980 'other' injuries.

Table 17 Crashes by severity

Crash severity	Crashes involving active modes	Total crashes
Fatal	2	16
Serious injury	62	436
Other injury	109	980
Total	173	1,432

More than a third of all crashes involving active modes resulted in a fatality or serious injury.

Of these crashes, 173 involved active modes, with 2 fatalities, 62 serious injuries, and 109 minor or 'other' injuries involving a pedestrian or cyclist.

Figure 112 shows the location of crashes recorded in Whittlesea between 2016 and 2020, broken down by the severity of the crash.

Of the 16 fatalities from recorded crashes, 5 occurred in speed zones between 70km/h to 100km/h. Epping Road, High Street, and Merrigang Road were the location of two fatalities, each. Over 40% of all crashes occurred in 60km/h speed zones, with 119 crashes resulting in serious injuries, and 6 crashes resulting in fatalities. The number of recorded crashes in speed zones over 70km/h resulted in almost twice as many serious injuries than in 50km/h or lower speed zones.

Cooper Street was the most reported location for serious Injuries, followed by Epping Road, Plenty Road, and High Street. Plenty Road and High Street was the location for the highest number of crashes resulting in 'other' injuries, and crashes involving active modes.

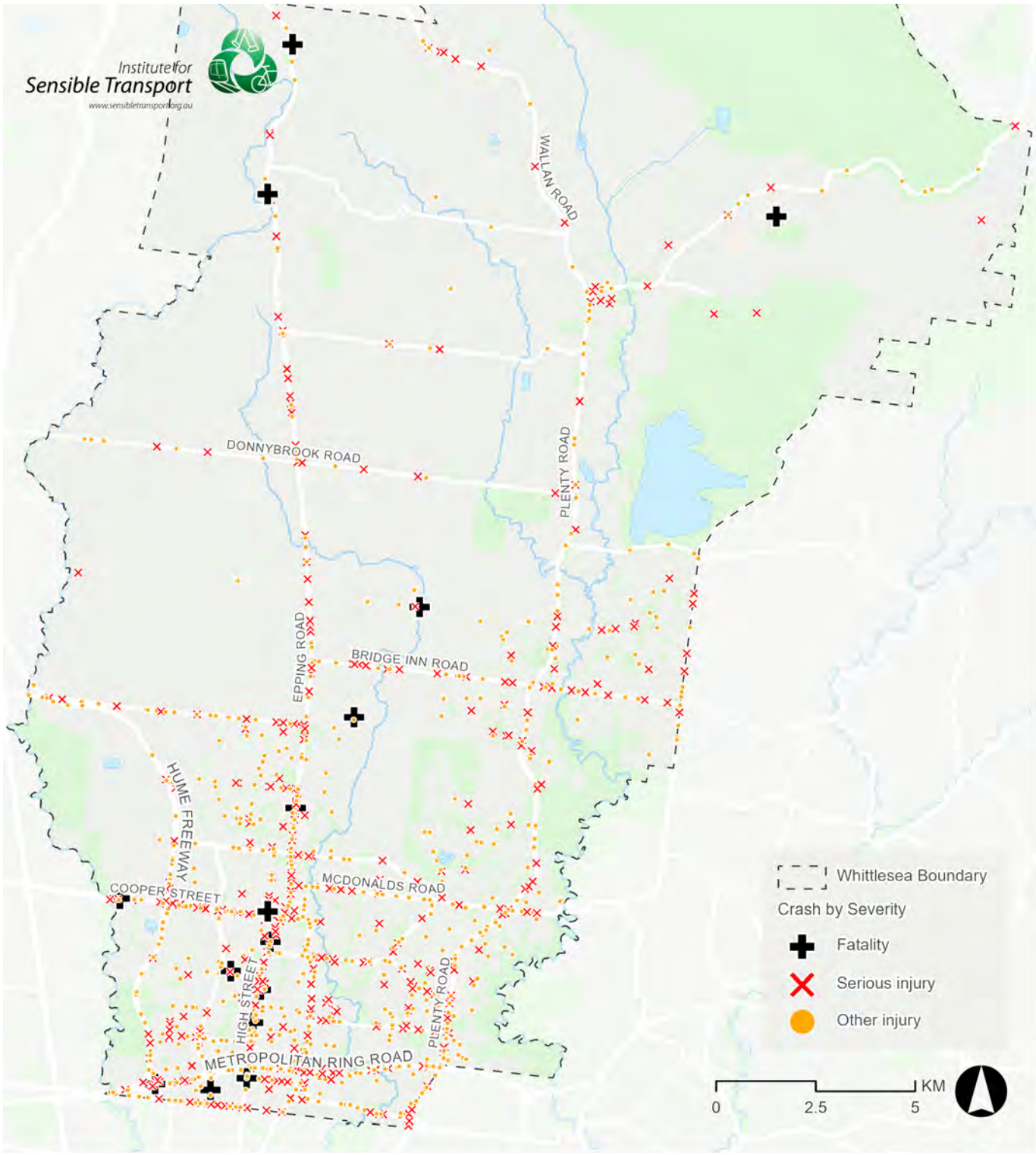


Figure 112 Crashes by severity, 2016-2020

Source: VicRoads

Crash severity for vulnerable modes is shown in Figure 113. Injuries that were serious or more severe were most reported in speed zones 60km/h or over, where 1 fatality, 37 serious injuries, and 50 other injuries was reported. The number of injuries to vulnerable modes were considerably lower on roads where speed zones were 40km/h or lower. A total of 20 injuries were reported in slower speed zones, where 8 were serious injuries, and 12 crashes resulted in other injuries.

Hotspots for crashes involving vulnerable modes include:

- Plenty Road, between Childs Street and Bridge Inn Road (14 crashes)

- High Street, between Main Street and Cooper Street (11 crashes)
- McDonalds Road (7 crashes)
- Edgars Road (6 crashes).

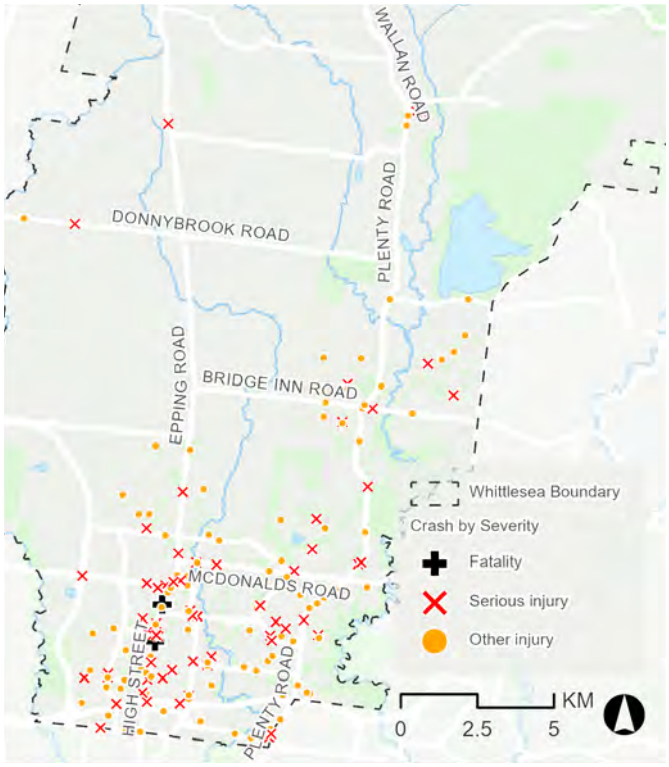


Figure 113 Crash severity for vulnerable modes

Source: VicRoads

9.1.5 Crashes by sex and age

Crash data provides insight into disparities between the sex and age of crash victims. Analysis of this data helps to identify vulnerable groups with increased risk of crash, and increased risks of fatalities or serious injuries, in Whittlesea.

This analysis is based on crash data that categorises individuals into two gender categories: male and female. We recognise that these binary categories do not fully represent the diversity of gender identities and acknowledge this limitation may not capture the full scope of gender related factors. Further, while this data looks only at the direct impacts on crash victims, women often bear the burden of crashes following a crash, regardless of their involvement in a crash (e.g., taking up additional housework and caregiver duties). These factors should be taken into consideration in addition to the following findings.

In this five-year period, 791 crash victims (55%) for all transport modes in Whittlesea were men. In comparison, 590 crash victims (41.2%) were women.

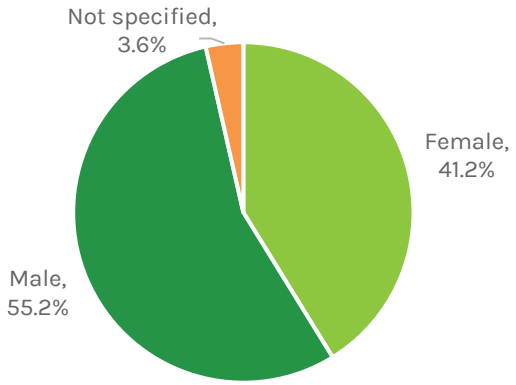


Figure 114 Mode in crash by sex, all modes

Source: VicRoads

Figure 115 provides a breakdown of crashes by sex and the most vulnerable mode. In crashes involving a car, men accounted for 41.7% of all crashes, compared to 34.5% for women. Men were four times as likely to be involved in a motorbike crash as women.

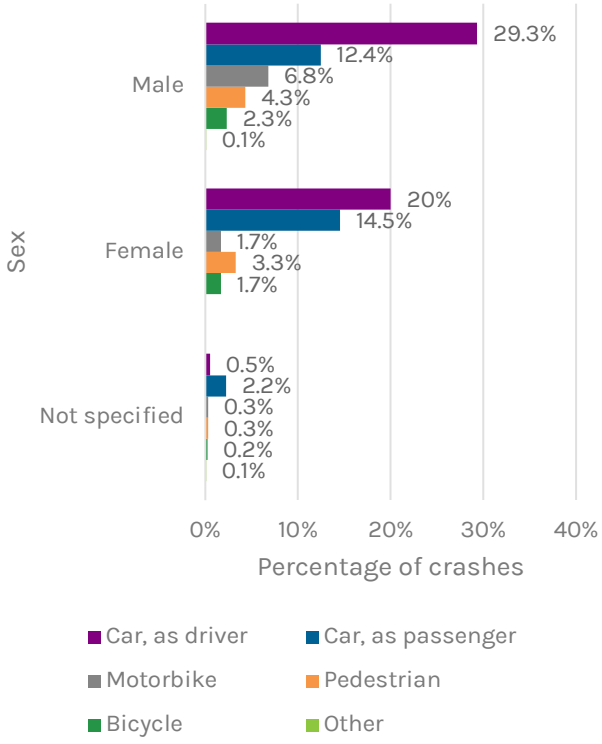


Figure 115 Mode in crash by sex

Source: VicRoads

Similarly, Figure 116 shows men were more likely to report serious injuries or a fatality, compared to women.

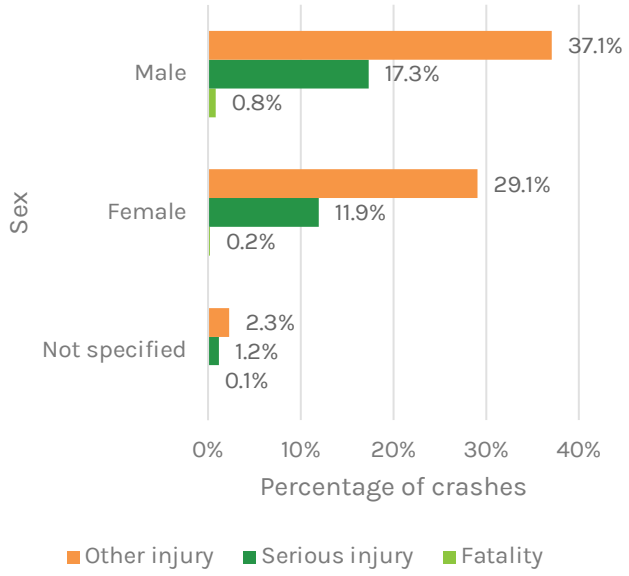


Figure 116 Crash severity by sex

Source: VicRoads

The implications of road crashes for different age groups are considerably varied, as shown in Figure 117. Young people are disproportionately impacted, with over a quarter of all crashes on roads within the City of Whittlesea involving 20-24-year-olds, and 25-29-year-olds. Children under 14 years old and people aged 65 or over are among the most vulnerable groups to crashes, at 9.8% and 10.3%.

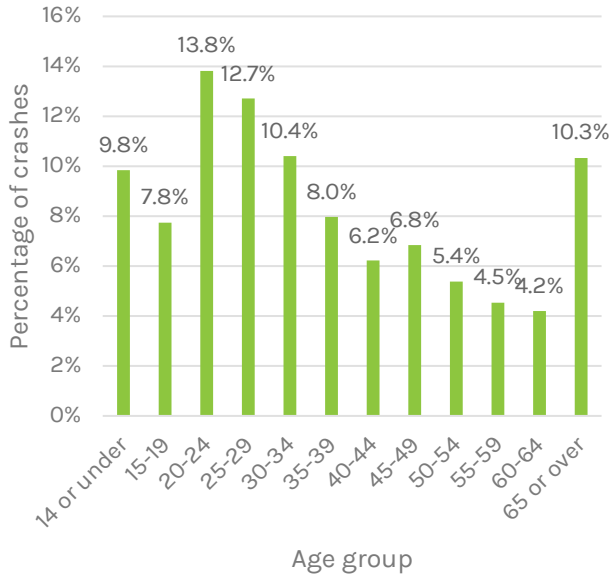


Figure 117 Mode in crash by age, all modes

Source: VicRoads

Unsurprisingly, the *car/truck* is the most reported mode in crashes for all age groups. Approximately 29.1% of all crashes involved people in the 15-35-year age group using a car/truck. People aged 65 or over who used a car/truck was the next most reported at 8.3%.

Table 18 Mode in crash by age

Age group	Pedestrian	Bicycle	Motorbike	Car/truck	Other
14 or under	1.6%	0.3%	0.3%	7.5%	0.1%
15-19	0.4%	0.1%	0.8%	6.3%	0.1%
20-24	0.6%	0.3%	1.7%	11.2%	-
25-29	1.4%	0.3%	1.4%	9.6%	-
30-34	0.3%	0.8%	1.0%	8.2%	-
35-39	0.5%	0.3%	0.5%	6.6%	-
40-44	0.5%	0.4%	0.3%	5.0%	-
45-49	0.3%	0.3%	0.8%	5.4%	-
50-54	-	0.3%	0.6%	4.4%	-
55-59	0.4%	0.3%	0.4%	3.4%	-
60-64	0.6%	0.4%	0.2%	2.9%	-
65 or over	1.2%	0.3%	0.6%	8.3%	-

Source: VicRoads

Crash injuries were more severe for young adults in the 20-24 and 24-29 age group, as shown in Figure 118. These age groups reported the greatest proportion of injuries that were serious or resulted in a fatality, at 4.8% and 3.8% respectively. This is followed by people aged 65 or over (3.8%), and children aged 14 or under (3.1%).

In summary, groups reporting higher risk of crash include young adults in their 20's, where men were most vulnerable, people 65 years old or older, and children aged 14 or under.

Men in their 20's are the most vulnerable group to road crashes, fatalities, and serious injuries in Whittlesea.

Similarly, these groups also reported more serious injuries and fatalities, with young men in the 20-24- and 25-29-year-old age groups accounting for 5.1% of all crashes resulting in a fatality or serious injuries.

Children under 14 years old are among the most vulnerable groups to road crashes in Whittlesea.

These findings have implications on the development of Whittlesea's Integrated Transport Plan. While the plan will focus on implementing a combination of measures that promote safer road behaviours and infrastructure design across the City of Whittlesea, additional targeted measures should be implemented to address vulnerable groups in road crashes.

This may involve:

- Targeted educational campaigns for young male drivers;
- Enhanced school safety initiatives to protect children;
- Traffic calming and slower speeds in school zones and high pedestrian activity areas.

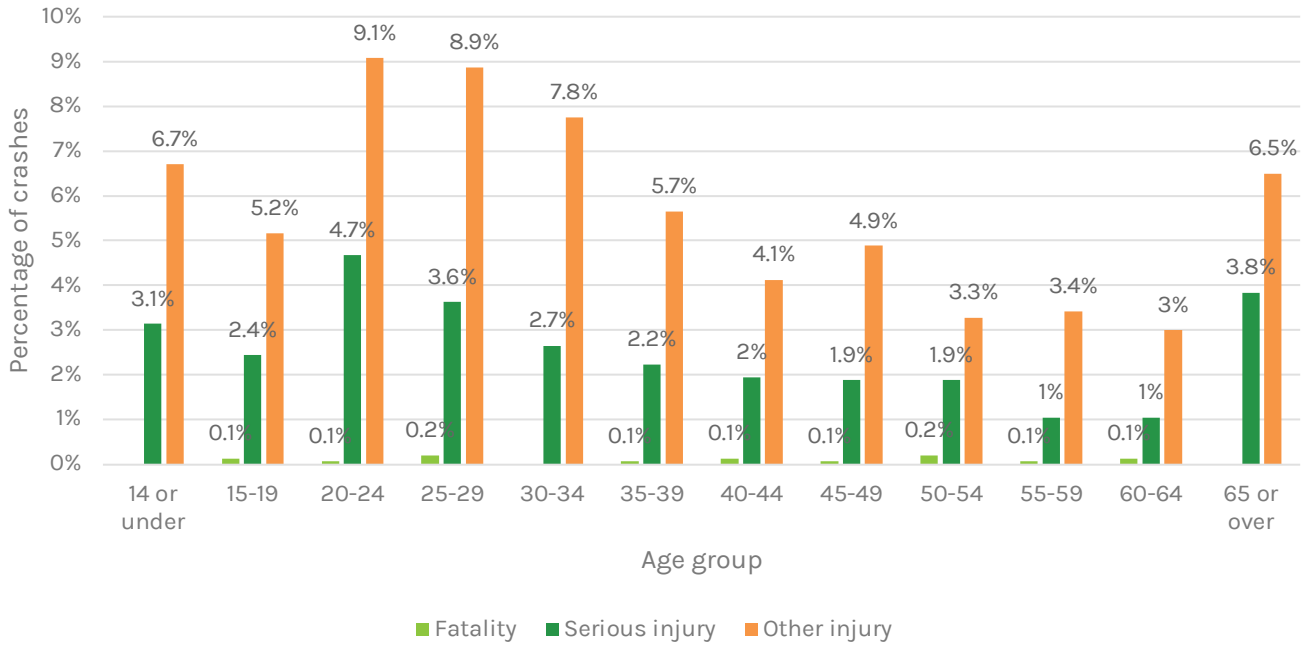


Figure 118 Crash severity by age

Source: VicRoads

10. Transport technology

Emerging transport technology offers the potential for improved efficiency relating to the use of road space and resources. The development of connected, cloud-based technology has enabled the provision of real time information on car parking availability, helped to better manage the balance of supply and demand without the need for additional parking. Electric vehicles and micro mobility are beginning to revolutionise mobility options. While e-micro mobility (such as e-scooters, e-bikes and e-cargo bikes) offers considerable potential to enhance liveability and sustainable outcomes for Whittlesea, investment in pedestrianised areas and connected, protected bicycle networks will be required for these new opportunities to flourish.

This section details existing and emerging transport technology that has the potential to assist Whittlesea in achieving its long-term vision.

The transport sector is currently undergoing its most rapid transformation in decades (Fishman, 2016). Disruptive transport technologies, such as App based ride sourcing platforms, innovations in car sharing, real time public transport information and autonomous vehicles are set to change travel behaviour in our cities over the next 5 – 15 years.

This sharp increase in technologically driven transport innovation comes during a period in which decades-long transport trends are beginning to change. Vehicle ownership rates and even the proportion of young people with a driver's license, once considered among young Australians a rite of passage, are beginning to decline. Since 2004, per capita vehicle kilometres in many OECD countries have begun to decline (Goodwin and Van Dender, 2013).

10.1 Driverless vehicles

Once the stuff of science fiction, driverless cars have made considerable advances over the last two decades. Their operation in cities still face considerable hurdles, and it is plausible that driverless cars never become a mainstream option in built up areas. Google is perhaps the most advanced of the companies involved in driverless cars. They have created the company *Waymo*, which has begun live testing with members of the public. These fleets have travelled millions of kilometres and are already showing impressive safety records. While driverless technology is yet to have an impact on the transport patterns of people living and working in Whittlesea, bodies such as Infrastructure Victoria and the National Transport Commission are preparing the legislative framework for their operation on public roads.

The next 10 – 30 years is widely acknowledged to be a period of profound disruption in the transport sector. Creating the right set of policy tools to ensure these technological changes serve to reduce our emissions and respond to climate change, whilst accommodating Whittlesea's growth will be the key challenge. It is difficult to overstate the magnitude of this task. Meeting this challenge will require bold innovations, unconstrained by conventional traffic engineering practices alone.

The move towards autonomous vehicles is widely predicted to be a central feature of what has become known as mobility-as-a-service (MaaS), in which the benefits of the automobile can be enjoyed without the need for ownership. Cars are the second most expensive item most people will ever buy, yet the typical car sits unused for 96% of its lifetime. An asset utilisation of 4% is very poor for an item as expensive as a car, and for this reason, many companies are set to disrupt the established auto industry by offering cars on demand, without a driver.

Box 3 identifies some of the unintended consequences of driverless vehicles.

Autonomous vehicles and congestion

Autonomous vehicles have been hailed as a potential solution to traffic congestion. Some scholars (e.g. see Fagnant and Kockelman, 2015) have suggested that congestion may *increase* due to the availability of autonomous vehicles, for the following reasons:

- People too young or old to drive themselves will be able to summon a ride. Some of these people may have been chauffeured previously, but some will be either making a trip they would not otherwise have made, or do so by autonomous vehicle rather than use another mode (e.g., public transport, bicycle).
- Pooled autonomous vehicles may be able to compete on price with public transport. Even if the cost is slightly higher than public transport, many non-CBD based trips may be substantially quicker than the same trip by public transport and this may result in declining public transport use.
- By not having to focus on driving, the rider avoids the 'time cost' of driving, which may increase their willingness to travel further or spend more time in congested traffic (Adams, 2015)
- Cars may be able to drive without any occupants. Whilst this may reduce demand for car parking, it is likely to exacerbate congestion by increasing vehicle kilometres travelled. This is especially the case with those who choose to own their autonomous vehicle (as opposed to those accessing a fleet of vehicles). For instance, an owner may choose to travel in their autonomous vehicle from their home in Whittlesea to central Melbourne for work and rather than paying for parking, send their car back to park at home (empty), until it is time for them to travel home again, at which time it is summoned again, travelling into central Melbourne (empty) to pick up their owner.

Box 3 Unintended congestion consequences of driverless vehicles

10.2 Mobility as a Service

While the sharing of transport resources is not new (e.g., taxi services, borrowing friend's/neighbour's cars, and of course public transport), the ubiquity of the Internet has spawned a dramatic growth in the diversity of shared mobility options.

10.2.1 Autonomous shuttle bus – LaTrobe Case Study

In 2016, an autonomous shuttle bus was funded to operate as a trial at LaTrobe University, Bundoora. No independent evaluation of the trial can be found. Full automation (no driver required) is still considered to be at least a decade away and an increasing number of commentators. The only report able to be found was published by the same organisations involved in the trial. See https://www.latrobe.edu.au/__data/assets/pdf_file/0009/943794/Autonobus-report.pdf

10.2.2 Car Share

Car share can be seen as consisting of three distinct offerings, each of which hold characteristics of *disruptive technology.* The first has been around for just about as long as the car itself, rental *by-the-day* (e.g., Hertz, Budget, and Avis). This category has now evolved, such that rather than just accessing a car in full day increments, they can be accessed *by-the-hour*, and this is becoming a very dynamic part of the market. At first these "clubs" operated distinct from traditional car rental companies, and although many still do, there is an industry shift (e.g., Hertz) to enter the *by-the-hour* market.

Some car manufacturers are also entering the *by-the-hour* market due to an appreciation that changing consumer preferences are valuing *access* over *ownership*. *Share Now*, owned jointly by BMW and Daimler AG, offers premium end vehicles in cities across Germany, and other European countries. As of 29th February 2020, Share Now exited the North American market, as it became clear that it was not commercial. An offshoot of the *by-the-hour* car share offer is *one-way* usage, in

which the user is no longer required to return the car to its original pick-up location. The Institute for Sensible Transport understand that most Melbourne car share companies are exploring opportunities to offer *one-way* to its members. The benefits to the user are significant when one considers that the typical *by-the-hour* car share rental lasts six hours, but involves less than an hour of actual driving (City of Melbourne, 2015).

Access to commercial car share providers is still emerging in the City of Whittlesea. Currently, GoGet Car Share is the only commercial car share provider operating in the municipality. There are 2 vehicle pods in the municipality, located at the Bundoora RMIT University Campus. Alternatively, residents and visitors have the option to utilise private car share services like Turo and Uber CarShare. At the current point in time, it is unclear whether there is a sufficient market to support expansion of the car share network, without subsidy. Whittlesea could enhance the prospects of enticing car share providers to enter the market by Council using the cars as part of their organisational fleet. The cars could then be booked out by members of the public at times that they are not required for Council business.

10.2.3 Ride sourcing

Routinely described in the media as "ride sharing", services such as *Uber* are in fact not technically "shared transport", as the driver is making a trip purely to transport the passenger. A more accurate term for these sort of services is *ride sourcing* (Rayle et al., 2014) and use an App to connect a driver with a paying passenger. Uber has been operating in Australia since 2012 and its cheaper version *UberX* currently operates in Greater Melbourne, including Whittlesea. Uber drivers must show they have comprehensive car insurance, pass a police check and have a good driving record. Some evidence has emerged to suggest that Uber and Uber like services can *increase* rather than decrease congestion, by acting as a placement for trips formally done by public transport.

10.2.4 Bike share and other forms of shared micromobility

Shared transport is not solely focused on four wheeled vehicles. The burgeoning two wheeled shared transport sector has been especially active and innovative over the last five years. The number of shared use bicycles has ballooned to over 4.5 million, and many of these bikes are dockless systems that rely on GPS and other technologies to track bikes and integrate with user smartphone to unlock and pay for the bikes (Fishman, 2019).

One of the most exciting innovations in bike share has been the development of electric assist bikes, which are used more than three times as frequently as non-electric bike share bikes. Figure 119 provides an image of one of the LIME e-bikes in use in Melbourne.

Given that a significant number of trips that take place in Whittlesea are short (especially in the southern third of the municipality), shared e-bikes (and e-scooters) could be well placed to form an additional transport offering. However, as highlighted earlier, the infrastructure network for cycling must improve considerably if such a system is expected to be successful. The infrastructure needs for e-scooters are the same as for regular bicycles and therefore the key implication for Council is to build a connected, high quality network of bicycle paths and lanes, as well as quiet routes.

Figure 119 LIME e-Bike share, Melbourne

Source: Institute for Sensible Transport

10.2.4.1 E-bikes

The global electric bicycle (e-bike) market has grown substantially in the last decade. E-bikes represent the largest, most rapid uptake of alternative fuelled vehicles in the history of motorisation (Fishman and Cherry, 2015). E-bike owners ride more often, and further than other cyclists and are able to better maintain speed with less effort. E-bike ownership reduces car use to an even greater extent than regular bicycles. Figure 120 provides an image of a modern e-bike. Such bikes are general capable of travelling ~80km between charges. These bicycles are particularly relevant to enhancing sustainable mobility options in Whittlesea, primarily due to *distances* being longer in Whittlesea than in more inner city areas.

Research suggests that the main barriers to a greater take up of e-bikes relate to a higher purchase price, and the concerns of riding on inadequate infrastructure.

Figure 120 Modern e-bike

Source: Gazelle

Australia's harmonisation of e-bike regulation, which broadly equates to European standards, coupled with growing market interest, has resulted in a flourishing local e-bike sector.

Importantly however, people do not make transport decisions in isolation; they weigh the pros and cons of the different modes and choose the one that makes sense to them, often from a safety, cost and time perspective.

People do not make transport decisions in isolation; they weigh the pros and cons of the different modes and choose the one that makes sense to them, often from a safety, cost and time perspective.

Unless bike share offers a compelling value proposition, it is unlikely to be a popular choice in Whittlesea. This means a growth in high quality bike lanes, places to park and bikes that meet people's needs.

Benefits of e-bikes

E-bikes offer the user quicker travel time, with less effort. E-bikes have been found to lessen some of the common barriers to conventional bikes, including the ability to overcome topographical challenges, physical limitations of the rider and arriving at work without perspiring. Moreover, e-bike owners report that being able to ride with

greater loads (e.g. children or groceries) opens up greater possibilities for cycling, including replacing some car use. E-bikes are generally more expensive than conventional bikes (~$2,000 – 4,000), and this acts as a barrier to increased adoption.

Figure 121 presents a snapshot of the benefits of e-bikes.

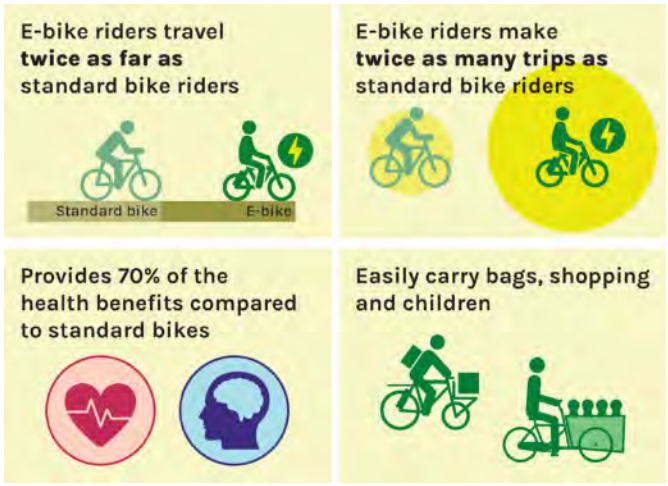


Figure 121 Benefits of e-bikes

Source: Fishman and Cherry, 2015

A brief summary of the benefits of e-bikes is provided below:

- Replace car trips. E-bikes have been shown to replace car trips more readily, compared to conventional bicycles. One US study of 1,800 e-bike owners found 76% of e-bike trips would have otherwise been made by car. Reducing car use helps:
  - Reduce congestion
  - Reduce transport emissions
  - Lower car parking demand
  - Reduce transport costs.
- Ride further with less effort. Studies have found that people who own an e-bike use them 50% more often than people with regular bikes, and each trip is on average 50% longer.
- Physical activity. Physiological studies have found that people riding e-bikes gain about 60 – 70% of the physical activity benefits of those riding regular bikes. This, combined with the extra cycling associated with e-bikes means e-bikes still provide the necessary level of physical activity to protect from sedentary lifestyle disease.1
- Increase female participation: Females are under-represented in cycling participation in Australia and e-bikes have been shown to reduce the gender imbalance.

As Whittlesea continues to grow and move towards a zero emission economy, e-bikes have the potential to lower emissions and transport costs, while reducing congestion.

10.3 Smarter parking management

To ensure Whittlesea is able to manage growth in a manner that protects and enhances its liveability, vibrancy and productivity, best practice parking management principles are essential. Best practice parking management considers how best to allocate scarce space to deliver the greatest public benefit. Box 4 provides a snapshot of some key facts related to car parking. It is important to recognise that any introduction of smarter parking management must consider the needs of people with a disability. Accessible parking should always be in close proximity to key destinations.

Summary of facts related to car parking

- Cars sit idle for 95% of the time
- Historically, car parking policies have shaped cities into car dominated landscapes
- On average, 40% of off-street, residential parking is vacant
- On- and off-street parking can account for 50% of all land use in a city
- Car parking adds $30,000 - $122,500 to the price of a residential dwelling in multi dwelling developments
- Up to 30% of all traffic is caused by people seeking no-fee kerbside parking space.

Box 4 Key parking facts

Emerging technologies, to better manage existing parking, already exist and should be examined as part of measures to utilise the parking assets more efficiently with key activity centres in Whittlesea. These include a range of technologies, including those briefly discussed below.

10.3.1 Parking Overstay Detection System (PODS)

PODS are small in-ground sensors linked to a central computer system that provides Council with precise data on the length of time spent by each car in a PODS parking space. It is used to increase parking enforcement and improve parking compliance. It is also useful for providing Council with detailed occupancy data for high-demand areas.

10.3.2 Real time parking availability information

PODS can be integrated with real-time parking information. This can improve the efficiency of existing parking supply by directing drivers to available parking spaces. This reduces congestion caused by cars cruising for a free space and provides the community with an accurate and up-to-date understanding of car occupancy in the area. Other cities have integrated real-time parking information into apps and websites, improving the parking experience.

Figure 122 provides an illustration of PODS, which have become a popular method for local government to monitor occupancy and vehicle overstay.

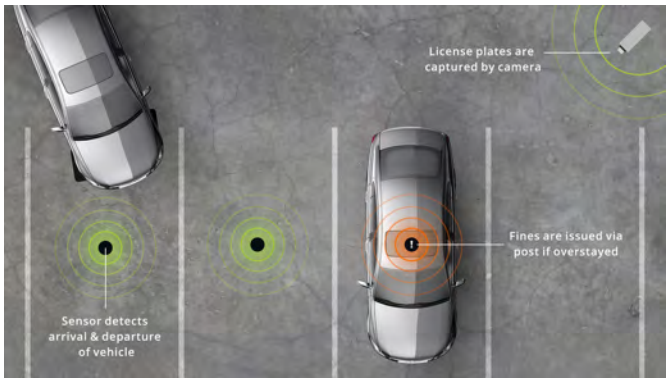


Figure 122 Better management of parking with technology

Source: ESmart 21

Figure 123 illustrates the use of real time parking displays. These require the installation of parking sensors in individual bays.

Figure 123 Real time information displays

Source: Northern Beaches Council

As Whittlesea continues to grow, it is likely there will be increasing competition for parking spaces. Rather than increase supply in the first instances, introducing technological solutions, such as those discussed above, should be considered first. This will help preserve land for other uses, and reduce frustration associated with finding a car park in commercial areas.

10.4 Electric vehicles

Electric vehicles (EVs) are experiencing a surge in growth globally, and while Australia is behind most OECD countries in terms of sales, the trend is rising sharply. In the last few years, the number of EVs owned in the Whittlesea LGA has risen rapidly, and this is expected to continue.

10.4.1 What is an electric vehicle?

There are several different categories of EVs, and it is important to identify the main types, as shown in Figure 124.

The following provides a brief description of each of the vehicle categories listed in Figure 124.

- *Conventional vehicle* – also referred to as an Internal Combustion Engine (ICE) vehicle, is the standard vehicle type widely known and used since the invention of the motor vehicle. The fuel source for most ICE vehicles is petrol, diesel or

gas, with some able to utilise renewable fuels such as ethanol. It is not an EV.

- *Hybrid vehicle* – a vehicle that uses petrol/diesel as its only fuel source, but also has an electric motor and battery that can store energy from regenerative breaking. A Toyota Prius is a common example of a hybrid vehicle.
- *Plug-in Hybrid Electric Vehicles* (PHEV) - combines a mixture of fuel combustion and electricity. It is similar to the hybrid vehicle described above; however, it has the ability to take electricity from a socket and can store this in a battery. A Mitsubishi Outlander is an example of a model available as a PHEV.
- *Battery Electric Vehicles* (BEV), or All-Electric, take electricity from a socket and rely entirely on the electricity stored in an on-board battery for propulsion. A Tesla Model 3 and Nissan Leaf are two popular models of BEV.

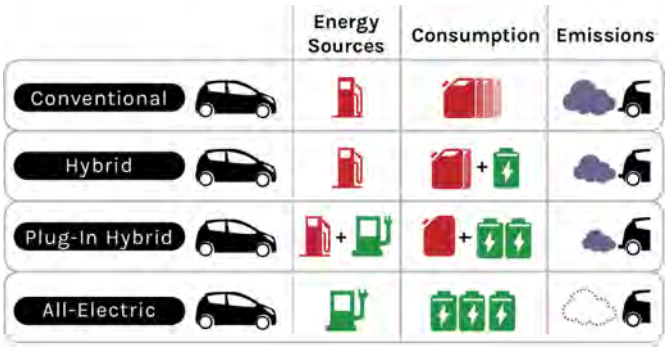


Figure 124 Different types of consumption and electric vehicles

Source: Institute for Sensible Transport

10.5 Electric vehicle sales in Australia

While Australia has among the lowest levels of EV adoption in the OECD, it has begun to increase rapidly, from around 2% of new vehicle sales in 2021, to 6.8% in March, 2023. Figure 125 captures the latest annual EV sales in Australia, both in total and as a percentage of light vehicle sales.

A number of surveys have found around 50% of consumers are considering an EV for their next vehicle purchase. In April 2023, with petrol prices around $2.00 per litre, around 1 in 5 website searches for carsales.com.au were for EVs.

At the time of writing, one of the main barriers to EV adoption is the supply of EVs into the Australian market. There have recently been significant supply constraints, with many models require a six month wait (or more) once ordered.

Around half of consumers are considering an EV for their next vehicle purchase.

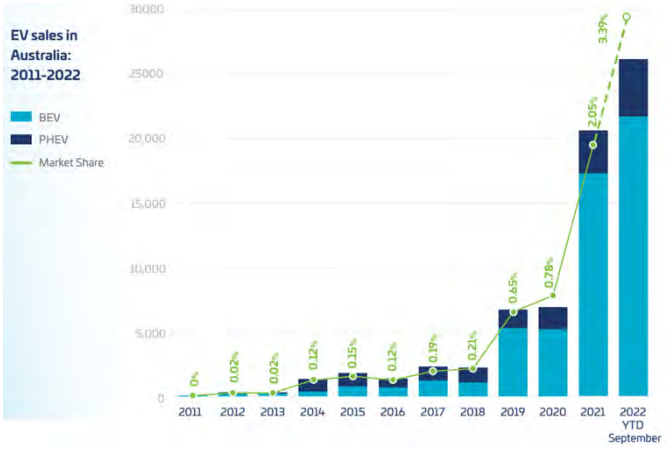


Figure 125 Electric vehicle sales in Australia

Source: Australian Electric Vehicle Council

10.5.1 Brief introduction in electric vehicle charging for Whittlesea

The last Integrated Transport Plan was produced in 2014, when EVs were in their infancy. There were very few chargers, and little demand for them. In the subsequent nine years, considerable growth in EVs and charging opportunities have occurred. These trends are expected to continue, and the future ITP will need to identify how Whittlesea will support the transition to zero emission motoring.

It can be helpful to categorise how EV users differ in terms of their charging needs. Figure 126 segments the market into three main categories, based on their circumstance and the charge time they are likely to consider acceptable. At the base of each of the three categories is a suggested charger speed.

A *passing through motorist* will generally not want to spend a long time waiting for their battery to charge and their priority is to continue their journey with minimal delay. Fast chargers are preferred in these situations and are most suitable close to high volume arterial roads and motorways, as these locations have a much larger catchment of

potential users. These are often co-located at, or within close proximity to petrol stations, fast food outlets or other roadside amenities. This enables users go to the toilet, buy a coffee etc., while their vehicle is charging. Typical duration of stay is around 15 – 30 minutes. There are a number of suitable locations within Whittlesea for these type of chargers (e.g. Metropolitan Ring Road, Hume Highway). These ultra-fast chargers are expensive and require funding from the state or Commonwealth.

Opportunistic charging describes the charging that takes place when someone was going to that particular location anyway, and takes the opportunity to top up, because of the availability of a charger. This can be thought of as analogous to charging a phone not because you are low on charge, but because it is convenient for you to top up the battery. It is common for batteries to have more than 20% charge when entering a charging location in these contexts.

A *local resident* without the ability to charge in an off-street car park will generally find a slow, 7kW public charger suitable for their needs, as overnight charging is possible. These chargers need to be close to where users would have parked anyway and are intended to provide a charging opportunity for those that lack an off-street parking bay in which a charger can be easily installed. Given the type of housing stock in Whittlesea, it is unlikely these type of chargers will be required. Indeed for houses built from 2024, the new National Building Codes will require parking bays to be EV ready.

Finally, it is important to recognise that an EV owner is likely to move between these different charging categories at different times. A family on a road trip may be a passing through charger at one time, and later the same week an opportunistic charger.

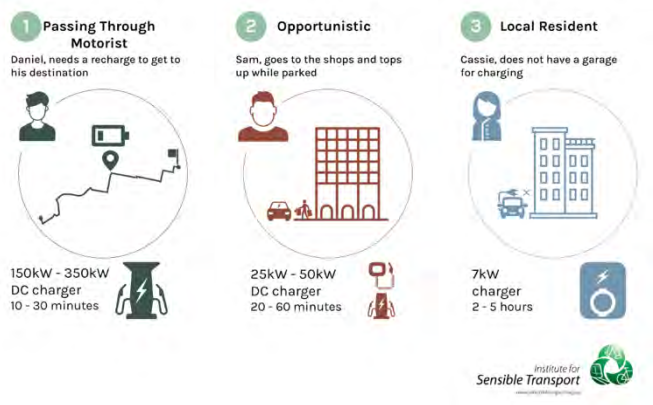


Figure 126 Differentiating the charging market

Figure 127 provides a conceptual illustration of how different types of chargers integrate with different land use types, based on the typical duration of stay.

Figure 127 EV charging eco-system

Source: Institute for Sensible Transport

10.5.2 Further information on electric vehicles in Whittlesea

For further information on electric vehicles and Whittlesea, please refer to the *NCA's Community Electric Vehicle Transition Plan* (see https://www.northerncouncils.org.au/post/release-of-nca-s-community-electric-vehicle-transition-plan).

10.6 Travellers' navigation system and route and mode choice

A travellers' navigation system plays an important role in helping people plan their routes and make

mode choices for their journeys specifically for unfamiliar users. Here's how travellers' navigation systems work and how they influence route and mode choices:

- Route planning
- Real-time traffic update
- Mode choice
- Integration with ride-sharing services

A study in U.S showed that 93% of drivers depend on navigations systems[18]. Navigations systems has this potential to impacts road traffic. By providing real-time traffic information, they are offering fast journey which might increase motor vehicle usage on local roads. This diverted traffic can have negative consequences for residential streets. In this case, local government needs to design traffic calming treatments to discourage cut-through traffic and speeding on residential streets.

Many navigation systems offer multi modal routing. They present different options to users. Therefore, users can compare cost, time, and convenience of each mode and decide for their journey.

Many navigation systems have integrated with ride-sharing services like Uber and DiDi. This integration allows users to seamlessly book rides, carpool with others, and combine multiple modes of transport in a single journey. It promotes shared mobility and can help reduce the number of individual vehicles on the road, ultimately easing congestion and reducing emissions.

In summary, travellers' navigation systems have changed the way people plan their routes and make mode choices for their journeys. They offer real-time traffic updates and can even integrate with ride-sharing services. However, as these systems continue to evolve, it is crucial to strike a balance between convenience and the well-being of residential neighbourhoods affected by increased road traffic.

10.7 Implications of transport technologies for the Integrated Transport Plan

The rapid transformation of the transport sector, driven by technologies such as ride-sourcing platforms, electric vehicles, and autonomous cars, presents both challenges and opportunities for Whittlesea and its new Integrated Transport Plan. These changes have the potential to significantly alter travel behaviour, congestion, and the overall mobility landscape in Whittlesea.

10.7.1 Autonomous vehicles

The emergence of autonomous vehicles requires proactive policy development to ensure safety, manage congestion, and reduce emissions. While national and state governments will have the primary responsibility for managing the introduction of these vehicles on our roads, local government can help to ensure they do not add to road safety risk or increase vehicle kilometres travelled. Council may wish partner with other councils to ensure the state has policies in place to reduce unintended consequences, such as an increase in overall vehicle travel as a result of autonomous vehicles.

10.7.2 Mobility as a Service

Through its ITP, Whittlesea has the potential to influence levels of MaaS use. The key factors Council should consider when designing their ITP, in order to increase the level of MaaS use are summarised in Figure 128.

[18] https://www.carpro.com/blog/where-drivers-are-most-dependent-on-gps-systems#:~:text=93%25%20of%20Drivers%20Depend%20On,would%20get%20lost%20without%20it.

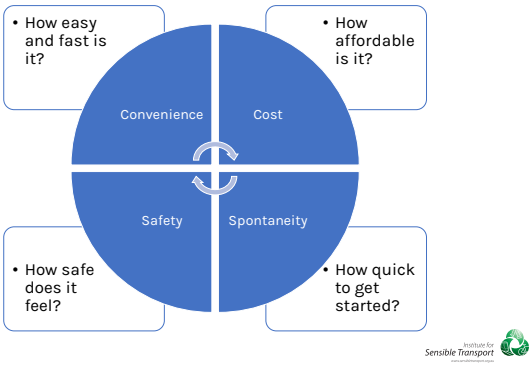


Figure 128 The four elements of a compelling value proposition for MaaS

Source: Institute for Sensible Transport

10.7.3 Electric vehicles

The most impactful way Council can lower barriers to the uptake of EVs will be by facilitating the development of the EV charging infrastructure network. As highlighted in the recent Northern Councils Alliance *Community Electric Vehicle Transition Plan.*

For e-bikes and e-scooters, the most important action Council can take is increase the network of bike lanes and paths. In terms of charging infrastructure, as highlighted in the *Community Electric Vehicle Transition Plan*, working with cafes, libraries, etc to encourage them to allow customers to charge their batteries where required may help people who require an out of home charge. In generally however, this will be a rare event and there will be little need for this to occur. Council should keep up to date with state and national authorities working on battery fire safety, to ensure any actions they take align with best practice safety standards.

10.7.4 Smarter Parking Management

Council can consider the inclusion of technology that better manages car parking. This can help to reduce the need for additional parking, by making better use of existing resources.

10.7.5 Navigation systems

Existing navigation systems allow people to have confidence to travel by modes they do not have extensive experience with. This is particularly important for active and public transport. By increasing the provision of walking and cycling paths, and ensuring mapping platforms (such as Google Maps) are aware of these additions, more people will feel confident using active travel. Working with navigation platforms to preference arterial roads over local streets will help to reduce rat running. Installing traffic calming on local streets where there is a desire to lower the level of through traffic will also assist navigation platforms to avoid residential areas.

Bringing it all together

The infographic in Figure 129 captures some of the key findings from this background report.

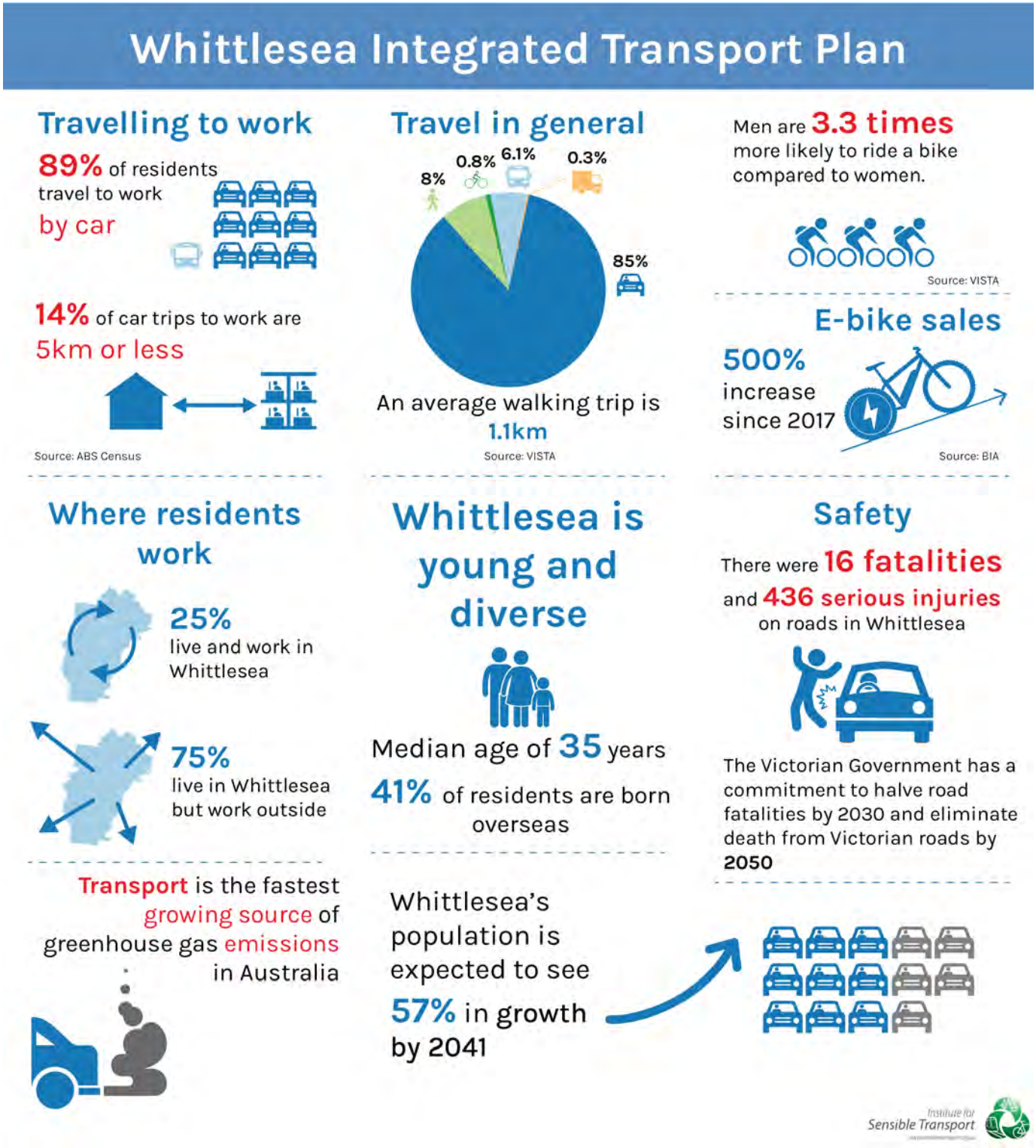


Figure 129 A snapshot of key transport facts in Whittlesea
Source: ABS, City of Whittlesea and ID unless otherwise noted

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